appendix

The contents of the TSP Appendix represent an iterative process in the development of the TSP. Refinements to various plan elements occurred throughout the process as new information was obtained. The TSP supersedes any appendix materials.

appendix

TECHNICAL MEMORANDUM #1

DATE: April 12, 2021

TO: Project Management Team

FROM: Darci Rudzinski and Emma Porricolo | Angelo Planning Group

Reah Flisakowski, Kevin Chewuk, and Dock Rosenthal | DKS Associates

SUBJECT: City of Sandy Transportation System Plan

Policy Framework and Code Review (Task 2.1) Project #20020-001

This memorandum summarizes planning documents, policies, and regulations that will apply to the City of Sandy Transportation System Plan (TSP) as it is developed through this process. State documents that guide TSP development include:

- Transportation Planning Rule
- Oregon Access Management Rule
- ODOT Highway Design Manual
- The Oregon Transportation Plan
- Oregon Highway Plan
- Oregon Bicycle and Pedestrian Plan
- Oregon Transportation Options Plan
- Oregon Transportation Safety Action Plan
- Statewide Transportation Improvements Programs
- ODOT Transportation System Plan Guidelines
- Oregon Statewide Transportation Strategy: A 2050 Vision for Greenhouse Gas Emissions Reduction
- The Greenhouse Gas Emissions Reduction Toolkit

The TSP update will also need to consider locally adopted plans that have recommended improvements or implementation measures that would impact Sandy's transportation system. Local documents in this review include:

- Clackamas County Transportation System Plan
- City of Sandy Comprehensive Plan
- City of Sandy Transportation System Plan
- City of Sandy Development Code
- City of Sandy Transit Master Plan

- Oregon Trail School District Safe Routes to School (SRTS) Plan
- City of Sandy Parks and Trails Master Plan
- Special Transportation Area (STA) Management and Design Plan
- Downtown Parking Management Study
- Downtown Walkability Assessment (in draft form)
- Urban Growth Boundary Expansion Analysis Report
- US 26 Gateway Plan

This Policy Framework and Code review document concludes with the ***Managing and Monitoring the Transportation System*** section that summarizes the design, mobility, and spacing standards associated with the highway and local roadway system.

As solutions and strategies for addressing transportation needs in the City of Sandy are proposed in later work tasks, a cross-check will be required to ensure compliance and coordination with the state and regional plans, policies, and regulations.

STATE PLANNING DOCUMENTS

TRANSPORTATION PLANNING RULE

Transportation system planning in Oregon is required by Statewide Planning Goal 12 – Transportation[1]. The Transportation Planning Rule (TPR), OAR 660-012, describes how to implement Statewide Planning Goal 12 [2].

By implementing Statewide Planning Goal 12 (Transportation), the TPR promotes the development of safe, convenient, and economic transportation systems that are designed to reduce reliance on the automobile. Key elements include direction for preparing TSPs under OAR 660-012-0015 through 0040.

OAR 660-012-0020 specifies required plan elements for TSPs, including an inventory and assessment of existing conditions; forecasts of transportation needs; a road system plan; a public transportation plan; a bicycle and pedestrian plan; air, rail, water, and pipeline plans as applicable; transportation system and demand management plans; a financing program; and implementing policies and land use regulations.

OAR 660-012-0035 describes the evaluation and selection of transportation system alternatives in the TSP. 660-012-0035(2) allows jurisdictions to evaluate alternative land

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[1] Statewide Planning Goals: https://www.oregon.gov/lcd/OP/Pages/Goals.aspx

[2] Transportation Planning Rule: https://secure.sos.state.or.us/oard/displayDivisionRules.action?selectedDivision=3062

use designations, densities, and design standards to meet local and regional transportation needs.

OAR 660-012-0045 describes implementation of the TSP. It includes the requirement for each local government to amend its land use regulations to implement the TSP. It also requires local government to adopt land use or subdivision ordinance regulations consistent with applicable federal and state requirements, to protect transportation facilities, corridors, and sites for their identified functions. This policy is achieved through a variety of measures, including access control measures, standards to protect future operations of roads, and expanded notice requirements and coordinated review procedures for land use applications. Measures also include a process to apply conditions of approval to development proposals, and regulations assuring that amendments to land use designations, densities, and design standards are consistent with the functions, capacities, and performance standards of facilities identified in the TSP.

OAR 660-012-0050, Transportation Project Development, requires that transportation projects be reviewed for compliance with local and regional plans and, when applicable, undergo a NEPA environmental review process.

OAR 660-012-0060, Plan and Land Use Regulation Amendments, specifies a category of facilities, improvements, and services that can be assumed to be "in-place" or committed and available to provide transportation capacity over a 20-year planning horizon. The TPR guides local jurisdictions in determining what transportation improvements are "reasonably likely to be provided by the end of the planning period" when considering amendments to local plans and land use regulations.

Amendments made to Section -0060 are among the most significant changes that have been made to the TPR since adoption of the City's 2011 TSP. The amendments require local jurisdictions to balance the need for development with the need for transportation improvements, establish the end of the planning period as the measure for determining "significant effect," define the transportation improvements that a local government can consider in determining significant effect, and identify methods to determine whether a needed transportation facility is reasonably likely to be provided within the planning horizon.

What this means for the City of Sandy TSP:

The TSP must address the policy and regulatory requirements included in the OTP, State Modal Plans, and TPR as described in the ODOT TSP Guidelines and the specific policy documents. Requirements in TPR Sections -0020 and -0035 will guide the development of the updated TSP, including the evaluation of alternatives and project prioritization. Requirements in Sections -0045 and -0060 will help reviewers identify and facilitate potential changes to the Sandy Development Code that help implement the TSP.

OREGON ACCESS MANAGEMENT RULE (OAR 734-051) (2014)

Oregon Administrative Rule (OAR) 734-051 defines the state's role in managing access to highway facilities in order to maintain functional use and safety and to preserve public investment. Oregon Highway Plan (OHP) Policy 3A and OAR 734-051 set access spacing standards for driveways and approaches to the state highway system.[3] The most recent amendments presume that existing driveways with access to state highways have written permission from the Oregon Department of Transportation (ODOT) as required by Oregon Revised Statutes (ORS) 734. The standards are based on state highway classification and differ depending on posted speed and average daily traffic volume.

The TPR does not regulate access management. ODOT adopted OAR 734-051 to address access management and it is expected that ODOT, as part of this TSP update, will coordinate with the City of Sandy in planning for access management on state roadways consistent with its Access Management Rule.

What this means for the City of Sandy TSP:

Analysis for the TSP update and final project recommendations will need to reflect State requirements for State facilities; the updated TSP will comply or move in the direction of meeting access management standards for State facilities. Project recommendations where access rights are needed will be identified. Implementation measures related to the updated TSP may entail amendments to the Development Code to ensure that they are consistent with state access management requirements, as well as local TSP

ODOT HIGHWAY DESIGN MANUAL (2012)

The 2012 Highway Design Manual (HDM) provides ODOT with uniform standards and processes for project development for the state's roadways. The HDM is to be used for all projects that are located on state highways. It is intended to provide guidance for the design of new construction; major reconstruction (4R); resurfacing, restoration, and rehabilitation (3R); or resurfacing (1R) projects.

National Highway System or Federal-aid projects on roadways that are under local jurisdiction will typically use AASHTO design standards (Policy on Geometric Design of Highways and Streets manual, the "Green Book) or ODOT 3R design standards. The flexibility contained in the HDM supports the use of Practical Design concepts and Context Sensitive Design practices. The Blueprint for Urban Design (BUD), published in 2020, furthers these concepts by recognizing how transportation needs and solutions are different in urban areas. The BUD is a "bridging document" that establishes revised criteria to be

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[3] ODOT Access Management Standards – OHP Appendix C Revisions to Address Senate Bill 264 (2011): http://www.oregon.gov/ODOT/TD/TP/docs/ohp_am/apdxc.pdf

used when designing urban projects on the state system. The document provides guidance for urban design on Oregon state highways until such time that all ODOT manuals related to urban areas are updated to include the revised design criteria.

Table 1 shows which design standards are applicable for certain projects based on project type, and whether the project involves a state route. State and local planners will also use the manual in determining design requirements as they relate to the state highways in TSPs, Corridor Plans, Special Transportation Areas and Refinement Plans. Some projects under ODOT roadway jurisdiction traverse across local agency boundaries. Some local agencies have adopted design standards and guidelines that may differ from the various ODOT design standards. Although the appropriate ODOT design standards are to be applied on ODOT roadway jurisdiction facilities, local agency publications, and design practices can also provide additional guidance, concepts, and strategies related to roadway design.

TABLE 1: DESIGN STANDARDS SELECTIONS MATRIX, ODOT HIGHWAY DESIGN MANUAL[4]

Project Type	**Roadway Jurisdiction**				
	State Highways			Local Agency Roads	
	Interstate	Urban State Highways	Rural State Highways	Urban	Rural
Modernization[5]/ Bridge New/Replacement	ODOT 4R/New Freeway	ODOT 4R/New Urban	ODOT 4R/New Rural	AASHTO / Local Design Standards	
Preservation/ Bridge Rehabilitation	ODOT 3R Freeway	ODOT 3R Urban	ODOT 3R Rural	AASHTO / Local Agency Standards	ODOT 3R Rural
Preventive Maintenance	1R	1R	1R	NA	NA
Safety- Operations- Miscellaneous/ Special Programs	ODOT Freeway	ODOT Urban	ODOT Rural	AASHTO / Local Agency Standards	ODOT 3R Rural

[4] See HDM Chapter 1, pg. 23, https://www.oregon.gov/ODOT/Engineering/Documents_RoadwayEng/HDM_01-Design-Standard.pdf

[5] Note that modernization projects are defined as improvements that will accommodate existing traffic and/or projected traffic growth through adding capacity by either adding lanes or building new highways.

The HDM includes mobility standards related to project development and design that are applicable to all modernization projects, except for development review projects (see Table 2, "Outside UGB"). The v/c ratios in the HDM are different than those shown in the OHP. The v/c ratio values in the OHP are used to assist in the planning phase to identify future system deficiencies; the HDM v/c ratio values provide a mobility solution that corrects those previously identified deficiencies and provides the best investment for the state over a 20-year design life.

TABLE 2: 20-YEAR DESIGN MOBILITY STANDARDS (VOLUME/CAPACITY [V/C]) RATIO

Highway Category	**Inside UGB**				**Outside UGB**	
	Special Transportation Areas (STA)	**MPO**	**Non-MPO/ STA, MPH <45**	**Non-MPO/ STA, MPH 45+**	**Uninc. Comm.**	**Rural Land**
Interstate Hwy & Statewide (NHS) Expressways	N/A	0.75	0.70	0.65	0.60	0.60
Statewide (NHS, Freight Rte)	0.85	0.75	0.70	0.70	0.60	0.60
Statewide (NHS, Non-Freight Rte)	0.90	0.80	0.75	0.70	0.60	0.60
Regional/District Expressways	0.90	0.80	0.75	0.70	0.60	0.60
Regional Highway	0.95	0.85	0.75	0.75	0.70	0.65
District/Local Interest Roads	0.95	0.85	0.80	0.75	0.75	0.70

BLUEPRINT FOR URBAN DESIGN (2020)

The Blueprint for Urban Design (BUD) is a "bridging document" that establishes revised criteria to be used when designing urban projects on the state system. The document provides guidance for urban design on Oregon state highways until such time that all ODOT manuals related to urban areas are updated to include the revised design criteria. The key takeaways from the BUD are:

- Supplements and overrides existing HDM and other design manuals on any conflicting guidance,
- Describes planning and design by urban context in addition to existing roadway classification and designation,
- Highlights flexibility in design,

- Provides a performance based design approach,
- Focuses on the highest level of protection for vulnerable users, and
- Includes a new design documentation process.

The BUD provides new design principals for ODOT owned and operated facilities, however local governments that are leading their own projects make their own design decisions for local facilities. The City of Sandy will coordinate with ODOT on the application of the BUD along US 26, if necessary, through the TSP update process.

ODOT TRAFFIC MANUAL (2020)

The Traffic Manual provides guidance on state traffic engineering policies, establishes uniform methods and procedures, and includes information about traffic engineering and operations on state highways. The Traffic Manual complements the HDM - it does not contain roadway design policies but rather contains standards and guidelines, as well as lists needed approvals and processes.

What this means for the City of Sandy TSP:

The HDM and Blueprint for Urban Design (BUD) provide design standards for state roadways; the Traffic Manual governs engineering methods and procedures for highway improvements. The analysis for the TSP update and final project recommendations will need to be consistent with requirements for state facilities in Sandy. The HDM and BUD can be referenced for additional guidance, concepts, and strategies for design during this planning process.

OREGON TRANSPORTATION PLAN

As the guiding document for local TSPs, the OTP[6] establishes goals, policies, strategies, and initiatives that address the core challenges and opportunities facing transportation in Oregon. The goals and policies are further implemented by various modal plans, including the Highway Plan, Freight Plan, Bicycle and Pedestrian Plan, Transportation Options Plan, Transportation Safety Action Plan, Public Transportation Plan, and the Rail Plan. Each of the OTP's seven goals are defined by more specific policies and strategies.

OREGON HIGHWAY PLAN

The 1999 Oregon Highway Plan (OHP) defines policies and investment strategies for Oregon's state highway system for the next 20 years by further refining the goals and policies of the Oregon Transportation Plan (OTP). One of the key goals of the OHP is to

[6] Oregon Transportation Plan: https://www.oregon.gov/ODOT/Planning/Documents/OTP_Volume_I.pdf

maintain and improve safe and efficient movement of people and goods, while supporting statewide, regional, and local economic growth and community livability. The implementation of this goal occurs through a number of policies and actions that guide management and investment decisions by defining a classification system for state highways, setting standards for mobility, employing access management techniques, supporting intermodal connections, encouraging public and private partnerships, addressing the relationship between the highway and land development patterns, and recognizing the responsibility to maintain and enhance environmental and scenic resources.

OHP POLICY 1A - STATE HIGHWAY CLASSIFICATION SYSTEM

Among the policies established through the OHP, Policy 1A calls for the implementation of a classification system for state highways to identify management objectives. This policy classifies US 26 as a Statewide Highway. According to the OHP, Statewide Highways are typically intended to provide inter-urban and inter-regional mobility and provide connections to larger urban areas, ports, and major recreational areas that are not directly served by Interstate Highways. Providing connections for intra-urban and intra-regional trips is a secondary function. For such highways, the management objective is to provide safe and efficient, high-speed, continuous-flow operation. In constrained urban areas, interruptions to flow should be minimal.

Beyond the classification as a Statewide Highway, Policy 1A further designates the segment of US 26 between Powell Valley Road in Gresham to Orient Drive in Sandy as an expressway. Expressways are intended to provide for safe and efficient high-speed and high-volume travel and are primarily focused on inter-urban and connections to ports and major recreational areas with minimal interruptions. A secondary function is to provide for long-distance intra-urban travel in metropolitan areas. Speeds are high in rural areas, ranging from moderate to high in urban areas. Usually, there are no pedestrian facilities and bikeways may be separated from the roadway.

Other characteristics of expressways include:

- Discouraging private access with the long-range plan to eliminate existing approaches as opportunities arise,
- Purchasing of access rights,
- Public road connections are highly controlled,
- Traffic signals are discouraged in rural areas,
- Non-traversable medians are encouraged, and
- Parking is prohibited.

In December 2020, ownership of OR 211, within the City of Sandy, was transferred to the City. It is currently classified as a Minor Arterial within the City's functional classification system and local design standards apply.

OHP POLICY 1B - LAND USE AND TRANSPORTATION

The purpose of this policy is to facilitate coordination of land use and transportation decision making to efficiently use public infrastructure investments to:

- Maintain the mobility and safety of the highway system;
- Foster compact development patterns in communities;
- Encourage the availability and use of transportation alternatives;
- Enhance livability and economic competitiveness; and
- Support acknowledged regional, city and county transportation system plans that are consistent with the Oregon Highway Plan.

US 26 serves as the main street for the City of Sandy. Note that US 26 Eastbound (Pioneer Blvd.) between MP 23.87 and 24.61 through the downtown couplet is a City street.[7] Policy 1B strives to maintain a balance between serving the function of a main street and a state highway. Key elements from this policy include:

- Encourage the availability and use of transportation alternatives.
- State and local government must work collaboratively in planning and decision-making relating to transportation system management.
- The OHP also provides specific guidance for STAs in Policy 1B. US 26 in downtown Sandy (Proctor Boulevard westbound and Pioneer Boulevard eastbound) between Bluff Road and Ten Eyck Road/Wolf Drive is designated as an STA. The primary objective of an STA is to provide access to community activities, businesses, and residences and to accommodate pedestrian movement along and across the highway in a downtown, business district and/or community center. In an STA, direct property access to highways is discouraged and direct street connections and shared on-street parking are encouraged. Local auto, pedestrian, bicycle, and transit movements are generally as important as the through movement of traffic. Traffic speeds are low, generally 25 miles per hour or less.

OHP POLICY 1C - FREIGHT ROUTE

US 26 has been designated as a Freight Route through the entire city of Sandy by ODOT. This emphasizes efficient operation to ensure the timely and dependable movement of goods. To support this function, special management objectives for freight routes were developed as outlined in Policy 1C of the OHP. Key objectives relating to this plan include:

- Application of higher highway mobility standards than other Statewide Highways.
- Examine options to treat designated freight routes as expressways where the routes are outside of urban growth boundaries and unincorporated communities and continue to treat freight routes as expressways within urban growth boundaries where existing

[7] ODOT uses Pioneer Boulevard for the eastbound lanes of US 26 per the terms of an intergovernmental agreement (#2811) dated February 10, 1965 between the City of Sandy and the (then) Oregon Highway Department.

facilities have limited access or where corridor or transportation system plans indicate limited access.

- Consider the importance of timeliness in freight movements in developing and implementing plans and projects.

Amendment 13-23 (added in August 2013) identifies US 26 as a Reduction Review Route. Identification as a Reduction Review Route means changes to the vehicle-carrying capacity of this route require review as identified in OAR 731-012-0010.

OHP POLICY 1D - SCENIC BYWAYS

Several highways throughout the state have been designated as Scenic Byways, which are defined as having exceptional scenic value. To protect the scenic assets of its Scenic Byways, ODOT has developed guidelines for aesthetic preservation and created design elements within the public right-of-way that are appropriate for Scenic Byways. US 26 is designated as a National Scenic Byway from Bluff Road to the junction with OR 35.

OHP POLICY 1F - HIGHWAY MOBILITY STANDARDS

ODOT has adopted standards for mobility for state facilities through the OHP and the *Highway Design Manual* as amended (HDM). The OHP mobility standards are intended to be used for identifying needs, while the amended HDM standards represent the level of operation for which state facilities are to be designed. For this study, the OHP standards will be applied on ODOT facilities.

If the mobility standards from the OHP cannot be met, alternate mobility standards will be determined. This process will involve ODOT and the City of Sandy. The resulting mobility targets will balance the objectives of the following categories:

- Land use
- Economic development
- Social equity
- Mobility for all modes
- Safety for all modes

Table 6 in Policy 1F of the OHP (Amended May 2015) displays the maximum allowable volume to capacity (v/c) ratios for the 30th highest annual hour of traffic in areas outside of the Portland Metropolitan Area. These mobility standards are tabulated in the Motor Vehicle Mobility Targets in the ***Managing and Monitoring the Transportation System*** section.

OHP POLICY 1G - MAJOR IMPROVEMENTS

Policy 1G in the OHP pertains to Major Improvements and states that ODOT places a priority on improving system efficiency and management before adding capacity where improvements are needed. Action 1G.1 outlines the following hierarchy:

- First priority – Protect the existing system

- Second priority – Improve efficiency and capacity of existing highway facilities
- Third priority – Add capacity to the existing system
- Fourth priority – Add new facilities to the system

According to this policy, the highest priority should be placed on protection of the existing system, followed by improvements in efficiency and capacity of existing facilities. Once these options have been reviewed and analyzed, the third and fourth priorities would be to add capacity to the existing system and then to add new facilities.

OHP POLICY 1H - BYPASS POLICY

The Bypass Policy of the OHP deals with increasing congestion on state highways and the need to potentially separate regional travel and local access. According to the policy, "bypasses are highways designed to maintain or increase statewide or regional mobility. Generally, they relocate a highway alignment around a downtown, an urban or metropolitan area or an existing highway. The goal of bypass facilities is to effectively serve state and regional traffic trips."

The policy states that the desire for a bypass often evolves from increases in congestion and safety problems on a state highway that is serving both as a regional highway and as a main street for a city. The highway is typically trying to serve both as an efficient freight and through travel route, while also providing access to local businesses and residential areas. As traffic increases, the highway does not typically serve either purpose well, resulting in inefficient travel for through traffic and congested and unsafe access for local businesses and residences.

The need for a highway bypass of US 26 in Sandy is being reviewed as part of the Sandy Bypass Feasibility Reevaluation; more detailed planning considerations are included in the Policy and Regulatory Considerations Memo, included as an attachment to this memorandum. These findings will be incorporated in the TSP update as appropriate. The process for this is outlined in Action 1H.1 as follows:

- ODOT and the affected local governments shall identify the need for a bypass in a transportation system plan and/or corridor plan in a manner consistent with Oregon Highway Plan Policy 1G.
- In establishing the purpose and need for the bypass facility to guide its planning, design, and development, ODOT and the affected local governments shall analyze the following:
    - Percentages of local and through trips projected at least over a 20-year period on the bypass.
    - Percentages, volumes and impacts of freight truck traffic.
    - Average trips on the proposed bypass facility based on build-out of the comprehensive land use plan.
    - Crash data history on the nearby or impacted facility.

The other provisions of *OHP Policy 1H* would need to be addressed in a refinement plan or NEPA process if a bypass is determined to be an appropriate solution and as the location and design of the bypass become more specific.

OHP POLICY 2B - OFF-SYSTEM IMPROVEMENTS

It is a State of Oregon policy to provide financial assistance to local jurisdictions to develop, enhance, and maintain improvements on local transportation systems when these projects are deemed cost-effective in improving the state highway system. For instance, construction of portions of Dubarko Road and improvements to Pleasant Ave. were partially funded through the ODOT Local Streets Network (LSN) program to provide alternative routes to US 26 for local traffic and improve mobility and relieve congestion along US 26. This policy includes a specific set of criteria to be met when considering financial support for off-system improvements, including:

- The off-system costs are less than or equal to on-system costs, and/or the benefits to the state system are equal to or greater than those achieved by investing in on-system improvements.
- Local jurisdictions adopt land use, access management and other policies and ordinances to assure the continued benefit of the off-system improvement to the state highway system.
- Local jurisdictions agree to provide advance notice to ODOT of any land use decisions that may impact the off-system improvement in such a way as to adversely impact the state highway system.
- Local jurisdictions agree to a minimum maintenance level for the off-system improvement that will assure the continued benefit of the off-system improvement to the state highway system.

Furthermore, as one of the actions listed to implement this policy, ODOT is directed to work with local governments to identify and evaluate off-system improvements that would be cost-effective in improving performance of the state highway when preparing corridor plans, transportation system plans and project plans.

OHP POLICY 2F - TRAFFIC SAFETY

This policy emphasizes the State's efforts to improve safety for all users of the highway system. Action 2F.4 addresses the development and implementation of the Safety Management System, which targets resources for sites with the most significant safety issues. The TSP update process will include citywide crash analysis to identify sites with a history of fatal and serious injury crashes and identify potential countermeasures to reduce crashes.

OHP GOAL 3

The management of access to state highways is addressed by Goal 3 of the OHP, along with several supporting policies. Policy 3A sets the foundation for much of ODOT's access management practices by pairing the classification system defined in Policy 1A with detailed access management objectives and associated access spacing standards. As a Statewide Highway in an urban environment, US 26 through the City maintains the following access management objectives.

- Provision of high to moderate speed operations with limited interruptions in traffic flow.
- Direct access to the abutting property is a minor objective.
- The function of the highway is consistent with the purchasing of access rights. As the opportunity arises, access rights should be purchased with a preference to purchase access rights in full.
- The primary function of these highways is to provide connections to larger urban areas, ports, and major recreational areas of the state not served by freeways or expressways.

Furthermore, the segment of US 26 that has been designated as an expressway, from Orient Drive to Powell Valley Road, maintains unique access management objectives that put a higher priority on through travel. These objectives include:

- Provision of safe and efficient high-speed and high-volume travel.
- Private access is discouraged. There is a long-range plan to eliminate, as possible, existing approach roads as opportunities occur or alternate access becomes available. Access rights will be purchased and a local road network may be developed consistent with the function of the roadway.
- Public road connections are highly controlled and must be spaced appropriately. Future grade separations (interchanges) may be an option. Compatible land use actions may be necessary and shall be included in local comprehensive plans.
- Traffic signals are discouraged. Where signals are allowed, their impact on through traffic must be minimized by ensuring the efficient progression of traffic is achieved.
- Parking is prohibited.
- The primary function of expressways is to provide connections to larger urban areas, ports, and major recreational areas of the state with minimal interruptions.
- Median treatments are considered in accordance with criteria in Action 3B.3.

Spacing Standards for State Highways

To support these objectives, access management spacing standards have been adopted for each highway classification. Within the City, US 26 would have these spacing standards applied. Where approaches to the highway will be allowed that do not comply with adopted access spacing standards, a deviation to those standards must be documented, as described in Policy 3D. Spacing standards are tabulated in the Street and Driveway Spacing Standards in the ***Managing and Monitoring the Transportation System*** section of this technical memorandum.

Policy 3B in the OHP addresses the installation on non-traversable medians in state highways. According to this policy, the installation of non-traversable medians shall be considered for:

- Modernization of all urban, multi-lane Statewide Highways.
- Multi-lane highways undergoing 3-R or 4-R improvements.

- Highways not undergoing modernization where a median could improve safety.
- Highways where forecasted average daily traffic is anticipated to be 28,000 vehicles per day during the 20-year planning period.
- The annual accident rate is greater than the statewide average accident rate for similar roadways.
- Pedestrians are unable to safely cross the highway, as demonstrated by an accident rate that is greater than the statewide annual average accident rate for similar roadways.
- Topography and horizontal or vertical alignment result in inadequate left-turn intersection sight distance and it is impractical to relocate or reconstruct the connecting approach road or highway to improve the situation.

Reasons for not using non-traversable medians when any of these conditions are present must be documented and reviewed and approved by the ODOT Region Manager.

Full and directional median openings shall be restricted to locations that meet applicable access spacing standards and shall be designed with a left turn bay and deceleration lane. Full median openings will be given preference to public road connections that are part of a continuous and comprehensive public road network.

Furthermore, using raised median pedestrian refuge islands and mid-block crosswalks in urban areas that are pedestrian and/or transit oriented should be considered.

POLICY 4A - EFFICIENCY OF FREIGHT MOVEMENT

This policy emphasizes the need to maintain and improve the efficiency of freight movement on the state highway system. It seeks to balance the needs of long distance and through freight movements with local transportation needs on highway facilities in both urban and rural areas. US 26 is a designated Freight Route.

POLICY 4B- ALTERNATIVE PASSENGER MODES

Policy 4B encourages the development of alternative passenger services and systems as part of broader corridor strategies. The policy promotes the development of alternative passenger transportation services in commuter highway corridors, as well as those located off the highway system to help preserve the performance and function of the state highway system. Sandy Area Transit (SAM) provides public transportation service in the City.

POLICY 4D - TRANSPORTATION DEMAND MANAGEMENT (TDM)

This policy supports the efficient use of the state transportation system through investment in transportation demand management (TDM) strategies. Action 4D.1 calls for reducing peak period single-occupancy vehicle travel and moving traffic demand out of the peak period so as to improve the flow of traffic on state highways. The TSP update process will review TDM strategies that can be adopted as policy, development requirements, and/or incentive programs instituted by employers and other organizations in Sandy.

What this means for the City of Sandy TSP:

This Plan serves as the guiding policy for highway planning, including any improvements, modifications, or local policies that would affect state facilities within Sandy. The TSP will incorporate the goals and performance measures of the Plan when modifications are proposed to the highway system within Sandy.

OREGON BICYCLE AND PEDESTRIAN PLAN (2016)

The Oregon Bicycle and Pedestrian Plan provides a decision-making framework for walking and biking efforts in the State within the context of the overall transportation system. The Plan is an element of the Oregon Transportation Plan and provides local plans guidance in its implementation. The policies and strategies in the Plan impact transportation decisions of local jurisdictions through their transportation system plans and other planning efforts, which must be consistent with statewide policy plan direction. The nine goals of the plan, described below, reflect statewide values and desired accomplishments, and refine and expand upon the broad goals of the OTP.

- **Safety -** The safety goal is written to align with "Vision Zero" and other federal and local initiatives that target the elimination of the most serious safety issues. Policies and strategies call for a multimodal look at roadway cross-sections, updating design guidance to identify the most appropriate walking or biking facility depending on context (such as physical separation), more visible pedestrian crossings, and examination and consideration of lower speeds where appropriate. Within the walking and biking system goal areas include education and encouragement, comfort and security, and an assessment of the system to determine safety issues.
- **Accessibility and Connectivity -** This goal targets making walking and biking accessible in areas where it currently is not, filling in gaps, and connecting to other transportation modes. Policies and strategies call for such things as system inventories to identify gaps and prioritize walking and biking needs, retrofitting existing facilities to accommodate pedestrians and cyclists, wayfinding signage, bike share, and enhancing connections to other modes, especially public transportation.
- **Mobility and Efficiency -** This focuses on assuring that pedestrians and cyclists can move freely and easily on the existing system. Policies and strategies seek to reduce physical barriers that may impede movement, address maintenance practices, seek to assure movement through or around construction zones, and reference design elements such as signal timing and bicycle detection, among other issues.
- **Community and Economic Vitality -** Both land use and tourism are included under this goal area. Specifically, the land use policy framework identifies the need for model code assistance, siting schools and government buildings so they are accessible to walking and biking, considering land use attractors to assure safe connections, bicycle parking, and prioritizing employment centers and main streets as critical connection points that serve the community and economy. Tourism policies and strategies focus on partnerships, collaboration opportunities, and

disseminating information as ways to encourage pedestrian and bicycle recreational travel.

- **Equity -** This goal focuses on making walking and biking options equally available to all. Assuring access for underserved areas and transportation disadvantaged populations is identified. The policies and strategies under this goal are designed to address issues that may prevent certain portions of the population from walking and biking, such as looking at census data, conducting research, and doing network gap analysis that looks at demographics. This goal also focuses on integrating equity criteria and considerations into decision making, locating, and prioritizing transportation disadvantaged populations, and helping to close the gap between areas served and not served.
- **Health -** This goal highlights the link between personal and public health. Policies and strategies identify such things as integrating health criteria in transportation decision making, engaging health professionals, strengthening partnerships, and improving data collection and sharing.
- **Sustainability -** This goal highlights the impacts that zero emission modes can have on helping the state reduce Greenhouse Gas emissions, have cleaner air and water, and reduce impacts to the environment. Strategies promote innovations such as electric bikes or scooters, which may attract more people to use those modes.
- **Strategic Investment -** This goal highlights the contribution that walking and bicycling facilities make to the entire transportation system. A strategic approach is needed to spend existing resources on the highest need and greatest value investments, leverage what is available, and to identify additional funding sources. An investment prioritization framework lays out priorities as follows: protect the existing system (e.g., maintenance and preservation) and address significant safety issues; add critical connections; complete the system (e.g., separation, and bicycle parking); and increase connectivity in lower priority areas of the system.
- **Coordination, Cooperation, and Collaboration -** With an interest in creating an integrated and seamless system, this coordination, cooperation, and collaboration goal assures communication between entities in decision making. Policies and strategies call for a checklist of communication needs, and guidance for coordinating.

The Plan includes performance measures to track and monitor implementation progress.

- Number of pedestrian and bicycle fatalities (five-year average)
- Number of pedestrian and bicycle serious injuries (five-year average)
- Perceived safety of walking and biking
- Utilization of walking or biking for short trips
- Identifying data needs for pedestrian and bicycle performance measures
- Pedestrian access to transit

The performance measures indicate whether safety is improving, use of the system is increasing (assumed through overall improvements to the network), and that data needs are being understood and data collected for more robust performance measures in the future.

The OBPP also provides background information related to state and federal laws, funding opportunities, and implementation strategies proposed by ODOT to improve bicycle and pedestrian transportation. It outlines the role that local jurisdictions play in the implementation of the OBPP, including the development of local pedestrian and bicycle plans as stand-alone documents within TSPs.

What this means for the City of Sandy TSP:

This Plan serves as the guiding policy for bicycle and pedestrian planning and local street standards. The TSP should work to incorporate the goals and performance measures of the Plan. In addition, bicycle and pedestrian system improvements recommended in the updated Sandy TSP should reflect recommended implementation strategies from the OBPP.

OREGON TRANSPORTATION OPTIONS PLAN

The Oregon Transportation Options Plan is an element of the Oregon Transportation Plan and provides policy guidance for state and local partners to enhance and expand transportation access for all people while ensuring that transportation investments are efficient and support broader community goals. The Oregon Transportation Options Plan:

- Identifies opportunities to expand transportation choices.
- Looks to increase funding opportunities for transportation programs and investments.
- Provides information to better integrate transportation options into local, regional, and state transportation planning.

Policies, strategies, and programs described in the Oregon Transportation Options Plan promote efficient use of existing transportation system investments, thus reducing reliance on the single-occupancy vehicle and facilitating additional walking, biking, transit, and rideshare. While transportation infrastructure and operations are critical to the success of a balanced transportation system, this Plan focuses on the programs, strategies, and investments that support the efficient use of transportation infrastructure.

The Transportation Options Plan process identifies a critical need to establish responsive and reliable funding for transportation options programs. Opportunities exist to expand funding by integrating transportation options into existing transportation planning processes and identifying and leveraging new sources of funding.

Performance measures identified in this plan include:

- Number of transportation options staff per capita – This measure indicates the ability of transportation programs to conduct outreach, deliver information and manage programs.

- Motor vehicle miles traveled per capita – As vehicle miles travelled per capita declines more people tend to use the transportation system and system reliability is improved for freight.
- Percent of trips that use a mode other than driving along during the peak hour – Tracking mode share during the peak hour documents congestion and system efficiency benefits.

What this means for the City of Sandy TSP:

The policies, strategies, and programs of this plan provide guidance for the TSP to support the efficient use of existing and future transportation infrastructure.

OREGON TRANSPORTATION SAFETY ACTION PLAN

The Oregon Transportation Safety Action Plan (TSAP) is an element of the Oregon Transportation Plan and "provides long-term goals, policies and strategies and near-term actions to eliminate deaths and life-changing injuries on Oregon's transportation system by 2035." The goals, policies, and strategies in the Plan are focused on changing safety culture and proactively planning, designing, operating, and maintaining a transportation system that eliminates fatalities and serious injuries.

The Plan includes emphasis areas to provide a framework for the near-term component. Emphasis areas are focus areas directly related to the long-term goals, policies, and strategies. The emphasis areas include:

- **Risky Behaviors -** Reductions in fatalities and serious injuries can be accomplished by deterring unsafe or risky behaviors made by drivers and other transportation users. For this emphasis area, actions are identified to minimize impaired, unbelted, speeding, and distracted driving crashes.
- **Infrastructure -** Transportation facilities can be constructed or retrofitted to reduce fatal and serious injury crashes. Opportunities to do this include implementing safety treatments on a site-specific basis or implementing low-cost treatments system-wide. Actions are identified to minimize intersection and roadway departure crashes.
- **Vulnerable Users -** Vulnerable road users can be characterized by the amount of protection they have when using the transportation system – pedestrians, bicyclists and motorcyclists are more exposed than people in vehicles, making them more susceptible to injury in the event of an incident. Older drivers and pedestrians can also be more vulnerable to severe injuries in the event of a crash because of increasing fragility and potentially longer recovery times. Actions are identified to minimize pedestrian, bicycle, motorcycle, and older road user crashes.
- **Improved Systems-** Opportunities to address and improve transportation safety come in several forms. Actions have been identified to continually improve data, train and educate transportation and safety staff, support law enforcement and emergency responders, and minimize commercial vehicle crashes.

Performance measures can be grouped into two categories.

- Efficiency – tracks the effort and output of a program.

- Effectiveness – tracks the results of a program or activity.

The Plan identifies the following safety performance measures.

- FHWA performance measures
  - Number of fatalities
  - Number of serious injuries
  - Roadway fatalities per vehicle miles traveled
  - Roadway serious injuries per vehicle miles traveled
  - Combined nonmotorized fatalities and nonmotorized serious injuries
- Oregon Traffic Safety Performance Plan and NHTSA Performance Measures
  - Fatalities
  - Serious Traffic Injuries
  - Fatalities/100M VMT
  - Rural Road Fatalities/100M VMT
  - Urban Road Fatalities/100M VMT
  - Unrestrained Passenger Vehicle Occupant Fatalities, All Seat Positions
  - Alcohol Impaired Driving Fatalities Involving a Driver or Motorcycle Operator with a BAC of 0.08 and Above
  - Speed-related Fatalities
  - Motorist Fatalities
  - Unhelmeted Motorcyclist Fatalities
  - Drivers Age 20 or Younger in Fatal Crashes
  - Pedestrian Fatalities
  - Bicyclist Fatalities
  - Statewide Observed Seat Belt Use, Passenger Vehicles, Front Seat Outboard Occupants

What this means for the City of Sandy TSP:

The policies, strategies, and programs of this plan provide guidance for the TSP to evaluate safety performance. The TSP update process will consider safety in the selection and prioritization of transportation projects, consistent with the TSAP.

2021-2024 STATEWIDE TRANSPORTATION IMPROVEMENTS PROGRAM

The State Transportation Improvement Program (STIP) is the four-year programming and funding document for transportation projects and programs on the state and regional transportation systems, including federal land and Indian reservation road systems; interstate, state, and regional highways; bridges; and public transit. The STIP includes state-funded and federally-funded system improvements.

The projects and programs considered for the STIP undergo a selection process that is held every two years. The current STIP is the 2021-2024 Active STIP. The STIP is adopted by the OTC and is approved by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) as required by federal law.

2021-2024 Active STIP projects located in Sandy are:

- US 26: Ten Eyck Rd/Wolf Dr – Vista Loop (Project Key 18823): Construct sidewalk on the north side of US 26 in accordance with the Americans with Disabilities Act. Install illumination to allow safer travel for pedestrians. Estimated Project Cost - $3.685 million.
- Installation of Signals at Dubarko Rd. and OR 211 (Project Key: 20339): Two streetlights installed at the intersection of Dubarko Rd. and OR 211.
- US 26 Curb Ramps (Sandy) (Project Key 22112): Pilot project to construct curb ramps to meet compliance with the Americans with Disabilities ACT (ADA) standards. Estimated Project Cost - $3.086 million.

What this means for the City of Sandy TSP:

The TSP update process will take into account projects that are programmed in the STIP. An expected outcome of this planning process is the identification of projects and/or programs that are recommended for inclusion in the STIP. The policies, strategies, and programs of this plan provide guidance for the TSP to evaluate safety performance.

ODOT TRANSPORTATION SYSTEM PLAN GUIDELINES (2018)

The Transportation System Plan Guidelines are intended to assist local jurisdictions in the preparation and update of city and county TSPs. The guidelines help jurisdictions develop plans that meet local needs and comply with state regulation and policy direction, including applicable elements of the TPR, as well as the OTP and associated mode and topic plans. The TSP Guidelines answer the “What, Why and When” questions surrounding TSP projects and provide detailed direction on scoping, developing, and administering TSPs. The planning guidance is best accessed via a web-based platform[8] and includes helpful information and examples for both citizens and practitioners.

[8] https://www.oregon.gov/odot/Planning/TSP-Guidelines/Pages/default.aspx

What this means for the City of Sandy TSP:

The TSP Guidelines will be a reference for the Project Management Team to ensure that required plan elements and methodology are employed in the updated TSP. They may also be used to inform citizens and local decision makers on the required planning steps in the TSP update process and plan implementation.

OREGON STATEWIDE TRANSPORTATION STRATEGY

The Oregon Statewide Transportation Strategy: A 2050 Vision for Greenhouse Gas (GHG) Emissions Reduction Goal (STS) describes how the transportation sector can move towards the goal of a 75% reduction in GHG emissions from 1990 levels by 2050. The STS contains no specific policies or goals, rather it includes strategies for greenhouse gas reductions. The STS furthers and supports the OTP and its goals to provide a safe, efficient and sustainable transportation system that enhances Oregon's quality of life and economic vitality. In time, the strategies may be incorporated into the Oregon Transportation Plan and its related modal plans.

In total, the STS contains 18 strategies, which are categorized into the following six categories.

- **Vehicle and Engine Technology Advancements** – Strategies in this category increase the operating efficiency of multiple transportation modes through transition to more fuel-efficient vehicles, improvements in engine technologies, and other technological advances.
- **Fuel Technology Advancements** – Strategies in this category increase the operating efficiency of fuel-powered transportation modes through transitions to fuels that produce fewer GHG emissions or have a lower lifecycle carbon intensity.
- **Enhanced System and Operations Performance** – Strategies in this category improve the efficiency of the transportation system and operations through technology, infrastructure investment, and operations management.
- **Transportation Options** – Strategies in this category increase opportunities for travelers and shippers to use transportation modes that are more energy efficient and produce fewer emissions.
- **Efficient Land Use** – Strategies in this category promote more efficient movement throughout the transportation system by supporting compact growth and development. This development pattern reduces travel distances and increases opportunities for using lower energy and zero- energy transportation modes.
- **Pricing and Funding Mechanisms** – Strategies in this category support a transition to more sustainable funding sources to maintain and operate the transportation system, pay for environmental costs of climate change, and provide market incentives for developing and implementing efficient ways to reduce emissions.

Integrating the STS into regional and local planning processes is important to the successful implementation of the STS. Additionally, the STS will point to efforts that may be engaged in at the state or national level that help the metropolitan areas meet their targets.

What this means for the City of Sandy TSP:

In developing the TSP, the Project Management Team should consider including STS into the policies, programs, and projects.

GREENHOUSE GAS EMISSIONS REDUCTION TOOLKIT

The Greenhouse Gas, or GHG, Emissions Reduction Toolkit is a collection of strategy reports and case studies designed to help local jurisdictions identify and explore the kinds of actions and programs they can undertake to reduce vehicle emissions. Additionally, strategies are designed to meet other community goals, such as spur economic development, increase biking and walking, support downtowns, create healthy livable communities and more.

The reports relevant to transportation in Sandy are:

- Bicycle and Pedestrian Connectivity
- Bicycle and Pedestrian Marketing Campaigns
- Bicycle and Pedestrian Safety
- Bicycle Facilities
- Car Sharing
- Complete Streets
- Increased Connectivity and Shorter Block Lengths
- Parking Management
- Parking Pricing
- Pedestrian Crossings
- Pedestrian Environment
- Transit Services and Facilities
- Transportation Demand Management
- Transportation System Development Charges
- Vehicle Access Management to Public Roads
- Yield Signs and Roundabouts

What this means for the City of Sandy TSP:

The TSP update planning project will consider strategies identified in the Greenhouse Gas Emissions Reduction Toolkit in updating policy and developing local transportation solutions.

LOCAL PLANNING DOCUMENTS

CLACKAMAS COUNTY TRANSPORTATION SYSTEM PLAN (2013)

The Clackamas County TSP identifies six goals:

- **Sustainable**: Provide a transportation system that optimizes benefits to the environment, the economy, and the community.
- **Local Business and Jobs**: Plan the transportation system to create a prosperous and adaptable economy and further the economic well-being of businesses and residents of the county.
- **Livable and Local**: Tailor transportation solutions to suit the diversity of local communities.
- **Safety and Health**: Promote a transportation system that maintains or improves our safety, health, and security.
- **Equity**: Provide an equitable transportation system.
- **Fiscally Responsible**: Promote a fiscally responsible approach to protect and improve the existing transportation system and implement a cost-effective system to meet future needs.

Projects in the City of Sandy are listed in the Appendix. No projects within Sandy were included in the 20-year Capital projects (high priority) list. In 2015 an Active Transportation Plan was added to the TSP. The active transportation plan identifies two corridors through the City of Sandy. They include:

- Tickle Creek Trail/Cazadero Trail – This trail is proposed as a multi-use path, 23.5 miles in length, connecting the City of Sandy to the City of Estacada with a northern connection to the Springwater Corridor trail in the Portland Metro area.
- Sandy to Mount Hood – This trail is proposed as a shoulder bikeway or shared-street, 49.8 miles in length, connecting the City of Sandy with Government Camp and the City of Gresham.

What this means for the City of Sandy TSP:

The goals and projects identified in the 2013 TSP will be evaluated, updated, and carried over into the current TSP, as appropriate and with approval by the Project Management Team (PMT).

CITY OF SANDY COMPREHENSIVE PLAN (1997)

The City's Comprehensive Plan is designed to guide land development within the City Limits. The plan also establishes the goals, policies, and strategies to guide the City's future growth. Plan goals and policies are implemented through subsequent measures, such as zoning and development ordinances, that provide decision-making criteria and standards by which proposals can be evaluated.

The Comprehensive Plan addresses the 14 relevant statewide planning goals. Transportation policies are outlined in Goal 12 of the Plan and provide the policy direction in developing the TSP and transportation-related Development Code regulations. The overall Transportation Goal is to "establish policies to provide and encourage a safe, convenient, and economic transportation system."

The policies in Goal 12 are focused on six specific topic areas, Neighborhood Street System, Pedestrian Friendly Street and Streetscape Design, Bicycle Facilities, Transit, Major Roadway Circulation, and Parking. The policies for each of these topic areas are important to the TSP update and include:

Neighborhood Street System

1. Support a pattern of connected streets, sidewalks, and bicycle routes to: a) provide safe and convenient options for cars, bikes, and pedestrians; b) create a logical, recognizable pattern of circulation; and c) spread traffic over local streets so that collector and arterial streets are not overburdened.

2. Work with fire district, police, and other emergency service providers to ensure that adequate emergency access is possible on all streets.

3. Require connected streets that form pedestrian-scaled blocks, except where it is shown that topography, existing land ownership patterns, or other conditions preclude the creation of blocks.

4. Discourage the use of cul-de-sacs and dead-end streets, except where it is shown that topography or other existing conditions make them necessary. If cul-de-sacs or dead-end streets are found necessary, the City shall consider requiring pathways that connect these streets to adjacent through streets.

5. Encourage the use of parks and open space corridors as pedestrian and other non-auto-oriented linkages within the urban area. Where possible, connect these pathways to a regional system of trails linking public and private open space, parks, and recreational resources within and between jurisdictions.

6. Encourage the development of neighborhood parks or other public or private open spaces connecting short cul-de-sac streets or other local streets in order to provide neighborhood focal points.

7. Encourage joint use of major power line or utility corridors as pedestrian/bicycle linkages where feasible.

Pedestrian Friendly Street and Streetscape Design

8. Encourage the planting of street trees in tree-deficient areas of the city.

9. Require buildings, awnings, landscaping, and modifications to the street width and sidewalks in commercial areas to create a sheltered, interesting, and safe environment that works for pedestrians as well as for automobiles.

10. Encourage the development of sidewalks on both sides of all streets, especially in high pedestrian activity areas such as near schools and in the downtown area.

11. Develop street, bicycle, and pedestrian facilities that encourage pedestrian-friendly streetscapes.

Bicycle Facilities

12. Establish a system of designated bicycle routes and pathways that link neighborhoods, schools, parks, employment centers, and other points of interest.

13. Establish a logical and coherent transportation network within the city, and provide connections to larger, regional facilities. Bicycle facilities should be constructed in accordance with the design standards of the Oregon Bicycle and Pedestrian Plan or another approved plan.

14. Make provisions for bicycle facilities in accordance with the bicycle network map. Recognize that this map represents a conceptual plan. Actual bicycle routes will be determined when the proposed street network is more fully developed.

15. Identify and develop local or collector streets which can provide good parallel bicycle facilities with less vehicular traffic within a short distance of an arterial as the preferred bicycle route.

16. Encourage the provision of bicycle racks for existing commercial, industrial, civic, and school facilities.

Transit

17. Promote local transit service for Sandy.

18. Promote the creation of transit stops in neighborhood centers and other areas of the city. The City shall consider the possibility of locating park-and-ride lots immediately adjacent to, or within, the downtown and other neighborhood centers.

19. Identify bus pull-outs and spaces for bus stops and shelters. Some type of bus shelter or other protection from weather should be included at all bus stops in the downtown area. Such protection may consist of awnings or other overhangs from adjacent buildings, provided the sheltered area is adequate to meet the needs of waiting transit riders as well as pedestrians.

Major Roadway Circulation

20. Work with property owners and developers to limit the number of accesses onto major roadways. Encourage the use of shared driveways, off-street connections between properties, and access from lower order streets.

21. Work with ODOT to determine locations for necessary traffic control signals. Proposed locations for future traffic signals have been determined for the downtown area in the City of Sandy Transportation System Plan. Other locations need to be determined in order to improve the safety and convenience of pedestrians, bicycles, and automobiles. The location of traffic signals should be consistent with the street network indicated in the Comprehensive Plan Map and current traffic engineering standards.

22. Submit notice of development proposals impacting Highways 26 and 211 to ODOT for review and comment.

Parking

23. Wherever feasible, encourage the provision of on-street parking on both sides of streets. Cooperation with ODOT will be necessary along Highway 26 and Highway 211.

24. Reduce parking requirements for development proposals where existing on-street parking and excess parking from adjacent development is available to meet parking requirements. Consideration should also be given to allowing payment of fees in lieu of required on-site parking. The fees shall be dedicated to the development of public parking lots.

25. Public parking lots may be developed for commercial and other areas in order to help relieve obligations for off-street parking and to encourage commercial development with higher floor-to-area ratios.

26. Encourage shared parking arrangements when parking demands for the sharing uses can be satisfied.

27. Require convenient and safe bicycle parking as part of the parking requirement for all new development, except single-family houses.

28. Require that each downtown development project be connected to adjacent developments by a direct and continuous sidewalk.

What this means for the City of Sandy TSP:

The updated TSP will be adopted as the transportation element of the Comprehensive Plan; updated policy that results from this planning process will need to be reflected in the Comprehensive Plan document. It is expected that recommendations that result from this planning process will necessitate an update to Sandy Comprehensive Plan Goal 12 Section. This will entail referencing the updated TSP or modifying Goal 12 goals to be consistent with the updated TSP.

Note: The City of Sandy intends to update the entire Comprehensive Plan in the 2022 to 2024 biennial budget cycle.

CITY OF SANDY TRANSPORTATION SYSTEM PLAN (2011)

The current adopted TSP was completed in 2011 and planned a transportation system for forecasted growth in the City through 2029. The TSP identified the following goals to guide the planning process.

Mobility/Circulation/Safety Goals

- Develop a transportation system to encourage all travel modes (transit, bicycle, pedestrian)
- Improve the safety and accessibility of transit facilities
- Improve mobility for the transportation disadvantaged
- Improve vehicular/pedestrian interface along all arterial and collector streets
- Ensure sufficient capacity to accommodate future travel demand (transit, vehicular, bicycle, pedestrian, etc.) to, within, and through the City of Sandy
- Emphasize improvements to the City street system, in an effort to reduce reliance on US 26 and OR 211 for local trips

Capital Improvement Goals

- Maximize the useful life of existing facilities
- Maximize the cost effectiveness of transportation improvements
- Seek opportunities to combine transportation, other infrastructure, and environmental mitigation projects

Community Goals

- Protect the scenic resources of the City of Sandy
- Preserve the historic character of Sandy
- Identify gateway and beautification treatments for OR 211
- Support Mt Hood Scenic Byway Enhancements

- Incorporate street network and transportation improvements contained within the Bornstedt Village Plan
- Explore transfer of OR 211 from ODOT to City jurisdiction[9] **Economic Development Goals**
- Balance local access to US 26 and OR 211 with the need to serve regional and statewide traffic, while supporting adjacent land uses
- Develop a transportation system that supports balanced growth of population and employment and the internalization of trips
- Support ODOT adoption of an alternate mobility standard for US 26 that allows for efficient use of capacity in the highway corridor, especially during peak seasonal travel periods

Environmental Goals

- Avoid or mitigate transportation project impacts to environmental resources including creeks and wetlands, cultural resources, and wildlife corridors
- Support energy conservation through the provision of public transit, transportation demand management, a multi-modal transportation system, and improvements in City fleet operations and maintenance activities
- Encourage alternative (environmentally sensitive) transportation facility construction methods
- Minimize street cross-sections to protect and preserve open space and reduce impervious surface

The TSP also identified pedestrian, bicycle, and motor vehicle projects. These projects are identified and tabulated in its Appendix.

Future intersection operations along state highway corridors in Sandy were expected to exceed mobility targets, even with preferred improvements. The TSP recommends the adoption of alternate mobility targets, in coordination with ODOT, at these locations.

What this means for the City of Sandy TSP:

The goals and projects identified in the 2011 TSP will be reviewed and updated for inclusion in the updated TSP, where appropriate and approved by the PMT. Future traffic forecasts will be updated to a 2040 horizon and mobility will be reevaluated. The issue of alternate mobility targets will be considered at locations where other strategies, such as travel demand management, are insufficient.

CITY OF SANDY DEVELOPMENT CODE (AMENDED 2020)

[9] The jurisdictional transfer was completed in December 2020.

The Sandy Development Code regulates development within the Sandy urban growth boundary (UGB) and helps implement the long-range land use vision embodied in the Comprehensive Plan and TSP. The Development Code contains several sets of requirements that address the relationship between land use and transportation system development. Those requirements are summarized below and address access, transportation improvements, clear vision areas, traffic impact analysis, parking, and street design standards. TSP-related items covered in the code include sidewalk, parking, driveway, and access requirements, as well as building setback specifications for properties abutting arterials and collector streets. Specific sections of the Development Code that are of importance to the TSP are summarized below.

Chapter 17.80 requires additional setbacks, a minimum of 20 feet, on collector and arterial streets. Improvements required with developments are described in Chapter 17.84, which describes timing of improvements, and required improvements for bicycle and pedestrian, transit, and streets. The requirements include a Transportation Impact Study section that was revised in 2020 after consultation with the city transportation engineer.

Chapter 17.82 addresses special setbacks on transit streets. Transit streets are defined as collectors or arterial streets unless the Transit System Plan includes specifically designated streets. Development on transit streets is required to have primary entrances oriented toward the street and dwellings are required to have clearly marked, convenient, safe, and lighted pedestrian routes from the building entrance to the street.

Parking, loading, and access requirements are found in Chapter 17.98. Off-street vehicle and bicycle parking requirement are in Section 17.98.20. Options for parking reductions and shared parking are found in Sections 17.938.30 and 17.98.40, respectively. Amendments to Chapter 17.98 in 2020 eliminated the requirement for off-street parking in the C-1 zone. Standards for access onto arterial and collector streets are found in Section 17.98.80. Design and location of bicycle parking facilities are found in Section 17.98.160.

Improvements required with development, consistent with the standards of Chapter 17.84, are listed in Chapter 17.100, Land Division and include sidewalks, streets, traffic control devices, and signs (Section 17.100.310). Provisions also address US 26 access management, requiring notice to ODOT for proposed public and private access and that future development reduce noncompliance with the OHP Access Management Policies (Section 17.100.90). This chapter includes standards for streets design, connectivity, and spacing. Street design standards and classifications are found in Section 17.100.110. B.

Blocks and accessway standards are in Section 17.100.120 and specify that blocks for residential areas should generally not exceed 400 feet in length and blocks for commercial areas shall not exceed 400 feet in length. A minimum 10-foot-wide pedestrian and bicycle accessway must be provided in the middle of a block when its length exceeds 600 feet in a commercial or residential area.

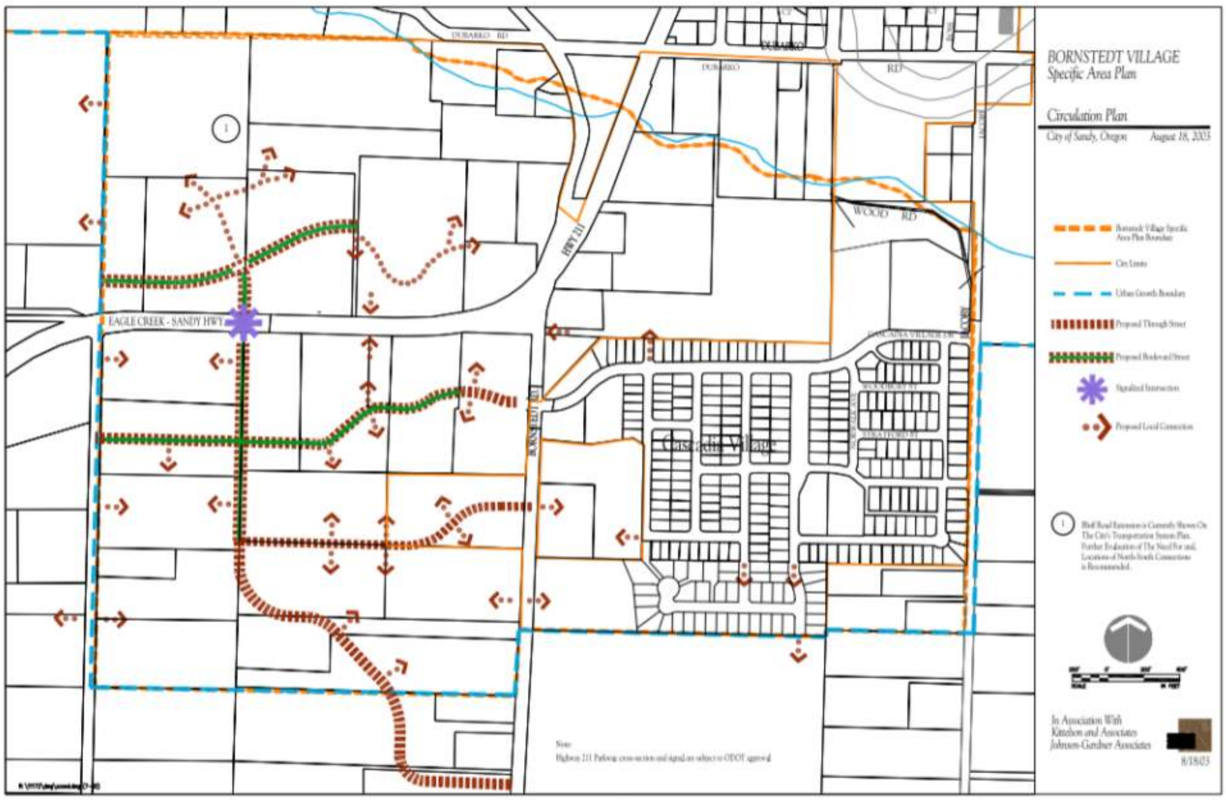
Section 17.100.180 specifies the requirements for the construction of City intersections and the curve radii of local streets, including the following provisions.

> *A. Intersections. Streets shall be laid out so as to intersect as nearly as possible at right angles. A proposed intersection of two new streets at an angle of less than 75 degrees shall not be acceptable. No more than two streets shall intersect at any one point unless specifically approved by the City Engineer. The city engineer may require left turn lanes, signals, special crosswalks, curb extensions and other intersection design elements justified by a traffic study or necessary to comply with the Development Code.*
>
> *B. Curve Radius. All local and neighborhood collector streets shall have a minimum curve radius (at intersections of rights-of-way) of 20 feet, unless otherwise approved by the City Engineer. When a local or neighborhood collector enters on to a collector or arterial street, the curve radius shall be a minimum of 30 feet, unless otherwise approved by the City Engineer.*

Sidewalks are required to be installed on both sides of a public street and in any special pedestrian way within a subdivision, pursuant to Section 17.100.270; the Development Services Director or Planning Commission can require installation of bicycle lanes within streets, per Chapter 17.100.280.

The Bornstedt Village Overlay district also includes street specifications for the district (Section 17.54.120). Development in the overlay must be consistent with the Bornstedt Village Circulation Plan shown in Figure 1 (Figure 7 of the Bornstedt Village Specific Area Plan). OR 211 cross sections must meet the design requirements of the Bornstedt Village Specific Area Plan but are subject to ODOT approval. Modifications can be approved by the City Engineer. Boulevard roads are required in certain areas of the overlay and have their own requirements, described in Section 17.54.120.C.

FIGURE 1. BORNSTEDT VILLAGE CIRCULATION PLAN



What this means for the City of Sandy TSP:

Amendments to the Sandy Development Code are necessary to ensure consistency between the updated TSP and development requirements. Code requirements related to connectivity, pedestrian and bicycle access and circulation, bicycle parking, development review coordination, zoning and plan amendments, and other transportation system-related provisions will be reviewed and updated as part of implementation of the updated TSP. Proposed amendments will address consistency with the TPR and will implement recommendations in the updated TSP. Ultimately, consistency will need to be ensured between standards in the Sandy Development Code, updated TSP, and Engineering Standards.

CITY OF SANDY TRANSIT MASTER PLAN (2020)

The Sandy Transit Master Plan includes an evaluation of existing transit service and provides a framework for service expansion. The Master Plan update was completed in 2020 and referenced the previous Transit Master Plan completed in 2009.

The plan identifies two goals and seven policies to implement the goals.

Goal 1: *To provide effective, safe, and equitable transit service that gives Sandy residents, workers, businesses, and visitors more freedom to meet their needs within the city, the region, and the state.*

Goal 2: *To create a transit system that offers an alternative to private automobile use, supports efficient use of roadways, and reduces air pollution and energy use.*

Policy 1: *Provide service that is safe, comfort-able, and useful to many different kinds of people.*

Policy 2: *Collaborate with other transportation agencies and support user-friendly connections between transit systems.*

Policy 3: *Increase service as the numbers of residents and jobs in Sandy grow.*

Policy 4: *Improve accessibility to transit and connections between transit services for people arriving by foot, by bicycle or with a mobility device.*

Policy 5: *Increase public awareness of Sandy Transit and its connectivity to other transit systems and transportation modes.*

Policy 6: *Operate with the highest degree of fiscal responsibility.*

Policy 7: *Reduce air pollution and energy use through strategies such as conservation, improved technology, and alternative fuels.*

The public outreach conducted for the Master Plan identified consensus around four aspects of transit service in Sandy:

- Regional service is a slightly higher priority than local service.
- Local routes should be designed with the expectation that many riders will walk to a main street.
- The current balance is about right between services that attract high ridership and services that attract low ridership but are important for other reasons.
- Getting places when it matters is more important than other amenities.

The plan identifies a variety of projects to improve service to meet future demand. These are included in the Master Plan's Appendix.

The Master Plan specifically addressed the overlap between its objectives and the TSP. These common objectives are:

- Better street connectivity
- Pedestrian improvements
- Redefinition of "transit street"

What this means for the City of Sandy TSP:

The PMT will review the projects identified in the Transit Master Plan and incorporate them as needed into the updated project list. The Master Plan goals and policies will inform the transit-related TSP policies.

OREGON TRAIL SCHOOL DISTRICT SAFE ROUTES TO SCHOOL (SRTS) PLAN (2020)

The Oregon Trail School District Safe Routes to School (SRTS) Plan lays the foundation for reducing barriers to students walking and biking to Cedar Ridge Middle School and Sandy Grade School. The plan is designed to create a collaborative approach and establish recommendations for the two schools, the community, the City of Sandy, Clackamas County, and ODOT, ultimately to achieve SRTS objectives.

Recommendations were developed through data analysis and a safety assessment for each school. The SRTS Plan includes both recommendations for short and long-term construction projects, as well as ideas for education and engagement events to promote healthy, active lifestyles.

The Plan includes a list of recommended projects that are organized by priority, including high priority improvements for the ODOT Infrastructure Grant Application.[10] These improvements include:

- Cedar Ridge Middle School
    - Widen sidewalk to fence along east side of Bluff Rd between Hood St and school vehicle entrance.
    - Replace "7AM - 5PM" 20 MPH school zone signs on Bluff Rd with "WHEN FLASHING" 20 MPH school zone signs and flashing beacons (S5-1).
    - Replace existing crossing signage on Bluff Rd at Marcy St with a Rectangular Rapid Flashing Beacon (RRFB) with School Crossing Assembly (S1-1 and W16-7P), and high visibility crosswalks across the north and east sides of the intersection.
    - Construct approximately 225 LF of sidewalk along west side of Bluff Rd from Meeker St north to existing sidewalk.
    - Install a curb extension including perpendicular curb ramps and tactile domes at northeast corner of Bluff Rd at Hood St.
    - Install a curb extension to provide clearance from existing pole, including perpendicular curb ramps and tactile domes, at southeast corner of Bluff Rd at Hood St.
    - Mark crosswalk and stop bar across the east leg of intersection of Bluff Rd at Hood St.

[10] https://www.oregon.gov/odot/Programs/Pages/SRTS-Competitive-Infrastructure-Grant.aspx

- At Beers Ave and Hood St, repaint stop bars on west and east sides of intersection. Consider installation of a 4 way stop at Beers Ave, which experiences higher traffic volume than other north-south streets in Sandy.
    - Install 100 ft of new sidewalk on north side of street between 38661 Hood St and Scales Ave.
    - Install perpendicular curb ramps with tactile domes at northwest and southwest corners of the intersection of Hood St and Scales Ave. Install tactile domes at the northeast and southeast corners. Repaint stop bars.
    - Install tactile dome at southwest corner of Bruns Ave and Hood St.
- Sandy Grade School
    - Mark stop bars in advance of crosswalks at all STOP control approaches at the intersections of Pleasant St at Strauss Ave, Alt Ave, and Smith Ave.
    - Construct approximately 125 LF of sidewalk along the north side of Pleasant St between Bruns Ave and Strauss Ave.
    - Consider installation of advanced school warning signage with flashing beacons (S5-1) to raise awareness of school speed zone on both sides of Pleasant St approaching school.
    - Consider revising the intersection of Pleasant St and Strauss Ave to be a four-way stop (currently STOP control north- and southbound only).
    - Replace existing diagonal curb ramps at all four corners with perpendicular curb ramps with tactile domes at the intersection of Pleasant St and Alt Ave.
    - Install a curb ramp on the east side of the south leg of the intersection of Strauss Ave at Hood St. Add tactile domes and a stop bar associated with the crosswalk across the west leg of the intersection.

The SRTS Plan includes cost estimates for the infrastructure projects and describes potential funding sources.

The SRTS Plan notes that recommendations for US 26 were not included in the grant prioritization for this project because, at the time the plan was developed, traveling on the highway "is not critical for school travel, nor would the proposed facilities be used primarily by school students." The plan further notes that ODOT staff had acknowledged during a field visit that safety improvements for walking and biking on US 26 are an important community issue and indicated that they are being addressed in a planning process outside the scope of SRTS.

What this means for the City of Sandy TSP:

The SRTS Plan suggests that some projects could be integrated in the Sandy TSP for future consideration and that the City is a key partner in accessing ODOT Safe Route to School grant funds. This can assist the likelihood of successful grant applications for the projects. SRTS projects will be evaluated and prioritized along with other transportation projects for inclusion in the updated TSP.

SANDY PARKS AND TRAILS MASTER PLAN (IN PROGRESS)

The Parks and Trails Master Plan update is currently in progress.[11] The Master Plan is intended to identify the parks and trails needed to accommodate existing and future residents of the City and to ensure that these facilities are distributed and built in an equitable manner so that they serve everyone in the city. The City currently has a park and trail inventory that details amenities and includes a level of service analysis.

What this means for the City of Sandy TSP:

To the extent possible and depending on the timing of the two planning projects, the TSP update will consider the recommendations from the Parks and Trails Master Plan and will evaluate transportation and access needs to existing and planned facilities. The trails system will be reflected in the updated TSP maps for the non-motorized modes.

INTERGOVERNMENTAL SPECIAL TRANSPORTATION AREA MANAGEMENT AND DESIGN PLAN – CITY OF SANDY (LAST AMENDED 2003)

The City of Sandy's STA is located along the one-way couplet of US 26 between the intersections of Bluff Road and Ten Eyck Road (MP 23.87 to 24.61). An intergovernmental agreement (#21319) outlines specific responsibilities and authorities granted to the City by ODOT,[12] including:

- The City is an Agent of ODOT and therefore isn't required to seek ODOT permits for roadway projects within STA, with the exception of signals, which must be approved by the State Traffic Engineer.
- The City will maintain the projects it designs and constructs on the State Highway within the STA area.
- ODOT will maintain the projects it designs and constructs on the State Highway within the STA area, but may delegate these projects to the City.

The agreement also identifies needed improvements along US 26 within the STA area including:

- New signals on Pioneer and Proctor Boulevards at Scales and Strauss Avenues,
- Signal coordination, sidewalks, curb extensions and crosswalks at the signalized intersections as well as Proctor and Hoffman, Alt, Bruns, and Beers, and at Pioneer and Hoffman, Shelley, Bruns, Scales, and Beers

[11] https://www.ci.sandy.or.us/parksrec/page/parks-and-trails-master-plan-update

[12] This section is an excerpt Technical Memorandum #1, May 26, 2009, included in the 2011 Sandy TSP Appendix.

When new or modified improvements within the STA are identified through this TSP update process, design standards identified in the STA Agreement apply, including:

- Speed limit: 25
- Pedestrian Signals: Additional pedestrian signals in the STA area must be timed with the signals at Bluff and Meinig. Possible locations include Alt/Shelly, Bruns and Beers, or Strauss and Scales.
- Access Management: Where possible, the number of driveways accessing US 26 (i.e., Proctor and Pioneer) should be reduced.
- Through Traffic: Coordinate signal timing to provide for smooth traffic flow.
- Transportation System: Maintain the one-way couplet and consider the construction of a bypass to re-route truck traffic out of the downtown.
- Cross-section:
  - The City will follow AASHTO Guidelines for lane widths and striping. The minimum lanes widths are:
    - Travel lanes: 11 feet
    - Parking Lanes 8 feet
    - Bicycle Lanes 4 feet
  - Right-of-way Allocation:
    - Sidewalks: 8 feet max,
    - Lanes widths: 11 feet minimum, and
    - Bicycle lanes: since US 26 is a Statewide Bike Route, bicycle lanes may only be removed if an adequate alternative bike route is designated, and the TSP is amended.
  - Traffic Calming:
    - Allowed treatments include signing or striping, curb extensions, overhead flashers, Landscaped medians at either end of the couplet, narrowed travel lanes and widened sidewalks, street trees and other pedestrian-oriented amenities, speed enforcement and photo radar.
  - Disallowed treatments include speed humps or other intentional mutilation of the road surface.

What this means for the City of Sandy TSP:

In developing the policies, strategies, and recommended US 26 improvements needed to support the local system, the updated TSP will need to reflect the STA or include recommendations for modifications to this STA, an adopted element of the OHP.

SANDY DOWNTOWN PARKING MANAGEMENT STUDY (2012)

The objective of the Downtown Parking Management study was to identify key issues regarding parking in Sandy's downtown core and determine impacts on the continuing economic vitality of the downtown. The result of the analyses were a number of recommendations and strategies proposed for adoption.

A review of parking data and observations in the field identified the following issues in the inventory area that informed the recommendations:

- Lack of oversight and review of downtown parking issues.
- No dedicated funding to cover future public parking lot improvements.
- No mechanism exists to allow developers of new projects in the downtown to reduce parking requirements and build at higher densities.
- Lack of enforcement of time limited parking areas.
- No incentive for downtown employees to park in private off-street parking lots.
- Inadequate signage directing individuals to parking opportunities.
- Limited on-street ADA parking spaces.
- A number of curbs are unnecessarily painted yellow.
- An excessive number of time variations and applicable time variations for restricted parking.
- Arrows on time restriction signs are non-descriptive and lead to confusion.
- The public parking lot located in Block 3B (behind Otto’s Ski Shop) is underused.

The study recommended continued parking monitoring to allow for transitions in management, as the recommendations were implemented and parking needs and conditions in the downtown shifted. There are many recommendations in the plan that were proposed to be phased. Recommendations that could inform the TSP update include:

- Review pedestrian accessibility issues relating to parking, including street crossing placements.
- Establish a Downtown Parking Fund to direct funds derived from parking into a dedicated fund to cover future public parking improvements.
- Develop criteria for installing time limited signs and handicapped/ADA signs. Evaluate other areas within the downtown for time limitation potential and necessity.
- Develop a wayfinding plan that includes the location and design of signs for City owned public parking lots.
- Evaluate the need to provide additional on-street ADA parking and evaluate the practicality to modify the existing on-street ADA parking space to meet state standards.
- If applicable, install additional on-street ADA parking spaces at identified locations and modify the existing on-street ADA parking space.
- Coordinate with Sandy Transit regarding the designation of a portion of the public parking lot to the south of Pioneer Boulevard and between Bruns Avenue and Scales Avenue as a park-and-ride facility.
- Initiate a fee-in-lieu option for new parking development in downtown that would allow developers to build at higher densities while providing the City of Sandy with money to purchase land for future off-street parking.
- Lease/acquire strategically located land for use as future public off-street parking.

- Sponsor employer-based initiatives to encourage employee use of alternate modes of travel and/or car-pools.
- Further evaluate off-street parking capacity solutions for high demand blocks.
- Continue to monitor downtown parking use and function.

What this means for the City of Sandy TSP:

The update TSP should be consistent with, or should update, the recommendations of the parking study related to access to parking, wayfinding, ADA accessibility, access to transit, and park and ride facilities. Specific projects that have not been implemented and that are prioritized through this planning process should be considered for inclusion in the updated TSP projects list.

SANDY URBAN GROWTH BOUNDARY EXPANSION ANALYSIS REPORT (2017)

The report evaluated and determined the need for a UGB expansion. The report analyzed future land needs and developed a single preferred expansion alternative. Ultimately, the preferred alternative was used for the City's UGB expansion in 2017.

The report includes a Transportation Analysis of the Proposed Rezoning (in Appendix D) for parcels located in the City that were proposed for rezoning as a part of the UGB expansion. The Transportation Analysis Report focused on 10 parcels in the City, ranging from 10 acres to 0.1 acres. Key findings include:

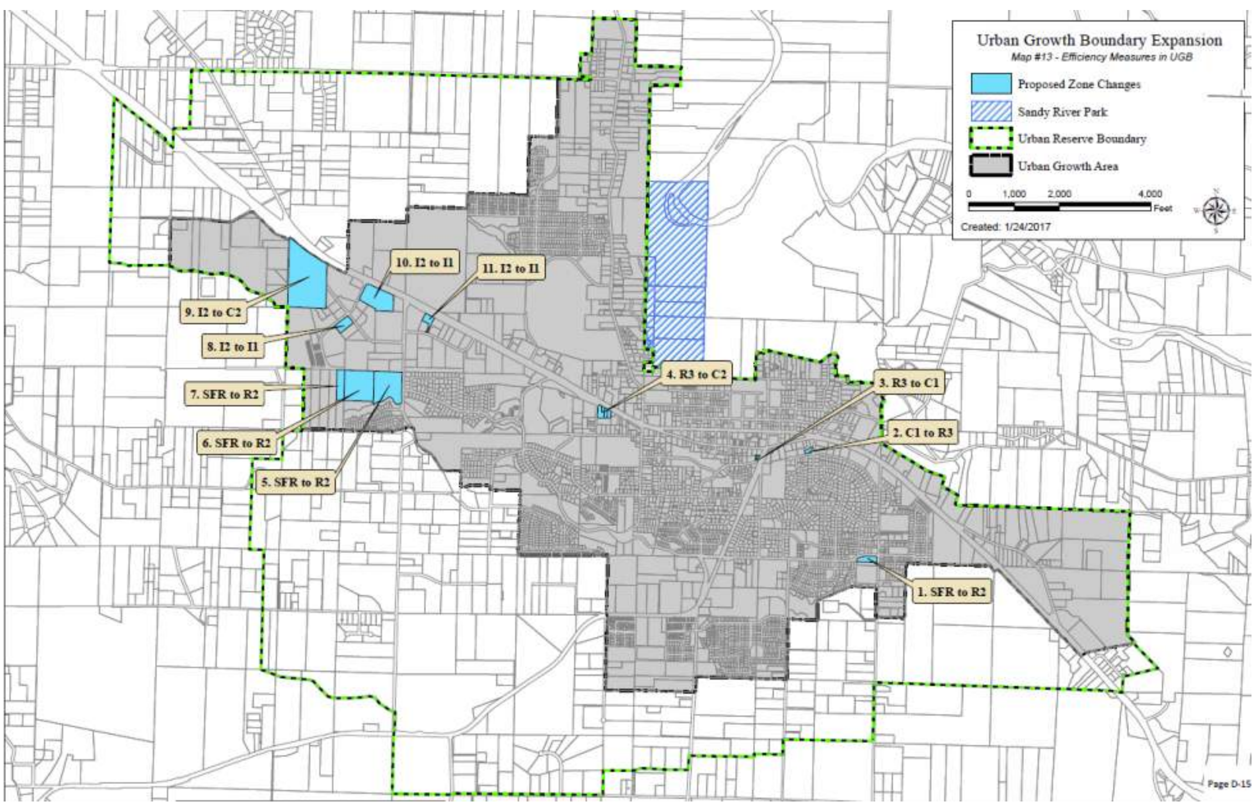
- The trip generation potential of each proposed rezoning was calculated using a reasonable worst case development scenario under existing and proposed zoning.
- Six of the parcels have predicted PM peak hour trip generation that differ so little between current and proposed zoning that the transportation impact can be considered insignificant.
- To support a finding of no significant impact for the other parcels, the use of a trip cap for the three remaining cases was applied. For all three, the recommended trip cap is based on the current zoning. The recommended trip cap based on the trip generation in the PM peak hour is presented in Table 3 in the Analysis Report.

TABLE 3: PROPOSED TRIP CAPS IN CONNECTION WITH REZONING

Map Number	Map & Tax Lot	Gross Acres	Net Acres	Existing Zoning	Proposed Zoning	Recommended PM Peak Hour Trip Cap
4	24E14AD03500	0.73	0.73	R-3	C-2	19 trips (combined for all tax lots)
	24E14AD03600	0.16	0.16			
	24E14AD03700	0.32	0.32			
	24E14AD03800	0.32	0.32			
8	24E15A 00205	1.69	1.69	I-2	I-1	90 trips
10	24E10 05700*	6.88	6.88	I-2	I-1	Current Forest Service PM peak trips plus 92 trips

- Based on the implementation of the recommended trip cap, the proposed rezoning of the parcels will also have an insignificant impact on the transportation system.

FIGURE 2. UGB EXPANSION REZONED PROPERTIES TRANSPORTATION ANALYSIS IDENTIFICATION



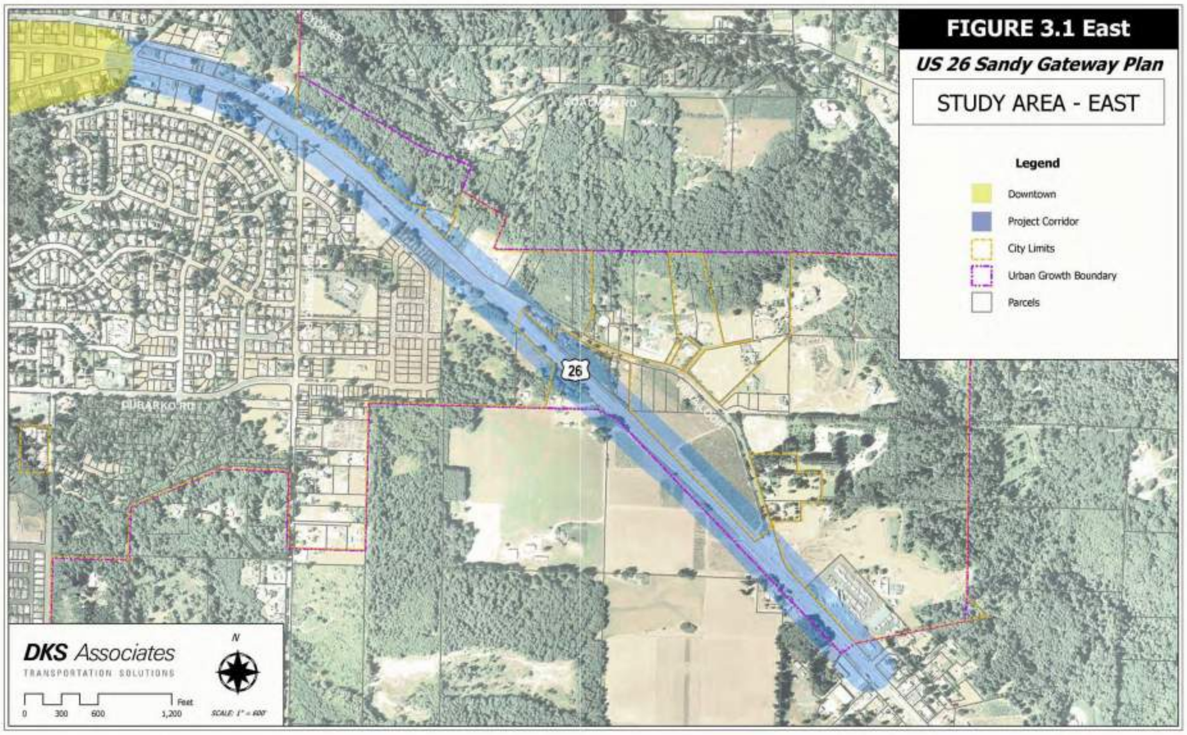
What this means for the City of Sandy TSP:

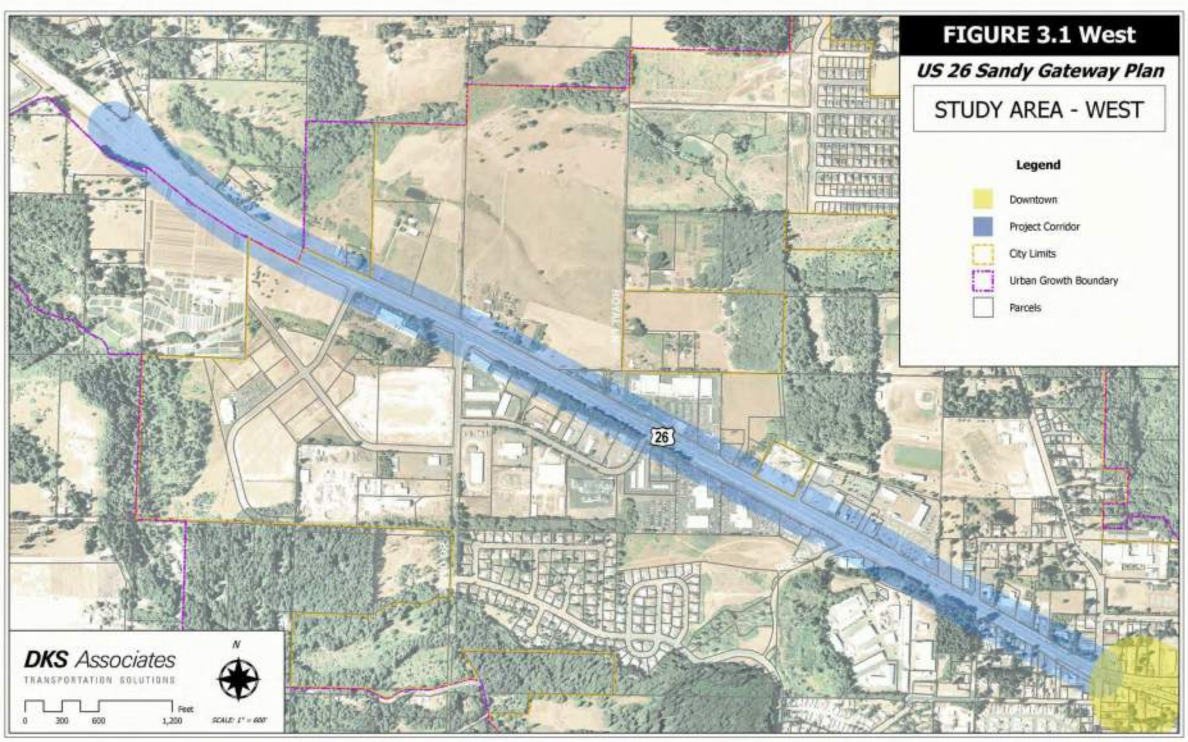
The trip caps identified in the Report "freeze" trip generation potential of identified parcels based on existing zoning at the time the UGB was amended in 2017. These assumptions should be reflected in existing conditions and future trip generation forecasting for the TSP update.

US 26 SANDY GATEWAY PLAN (2008)

The US 26 Sandy Gateway Plan provides a vision and implementation plan for safety, operational, and aesthetic enhancements in the US 26 corridors between the west and east UGB boundaries and the downtown couplet (the couplet was not included). Study area maps are shown in Figure 3.

FIGURE 3. US 26 SANDY GATEWAY PLAN STUDY AREA





Key elements of the plan include: a system inventory, a needs assessment, an access management vision, streetscape designs with typical cross-sections, recommendations for traffic control and geometric improvements, and implementation recommendations.

> *The vision for the US 26 Gateway Plan is a safe and efficient multi-modal highway with design elements that reflect the unique scenic values and historic character of the City of Sandy. Highway design elements enhance motorist awareness as they transition from rural to suburban to urban settings, support community livability as well as provide for statewide travel and freight movement.*

Chapter 7 addresses implementation of the concepts described in the plan, including the following actions and recommended improvements:

- Streetscape design for US 26 (includes typical cross sections for the study area)
- Pedestrian improvements - three key improvements prioritized:
  - Fill in the gaps in the existing sidewalk system consistent with HDM design standards.
  - Upgrade current sidewalks to meet the proposed design standards.
  - Pedestrian crossing improvements where feasible and safe.
- West and east gateways for the downtown couplet
- An access management plan - reviewed every access point in the study area and the intended future plans for each (e.g., close, or constructing alternative approaches, or limiting permitted turns) and the trigger for action (e.g., change of use, as opportunity arises, or construction of public and private roadways).

The plan includes cost estimates for the recommended streetscape elements, listed in 2007 dollars.

What this means for the City of Sandy TSP:

Plan recommendations include that it be adopted as an amendment to the Sandy TSP in order to facilitate implementation of suggested improvements and design treatments. However, only the typical roadway sections were included in the 2011 Sandy TSP – all other Gateway Plan elements were deferred. The Gateway Plan vision and policies should be considered in developing TSP guiding policies. Additionally, recommended improvements that were not previously included in the TSP and have yet to be adopted or implemented should be considered for incorporation into the TSP project list. Additionally, the TSP could include a recommendation to update the Gateway Plan.

DOWNTOWN WALKABILITY ASSESSMENT

This document evaluated the walkabilty of downtown Sandy, primarily the US 26 couplet consisting of Pioneer and Proctor Boulevard between Bluff Road and Ten Eyck Road but also including the area north of the couplet to Hood Street. The following goals were identified:

- Goal 1: Improve pedestrian safety and comfort in the downtown.
- Goal 2: Improve pedestrian accessibility in the downtown.
- Goal 3: Improve pedestrian connectivity to the downtown.

The existing conditions were evaluate using the Pedestrian Environmental Quality Index (PEQI). This measurement system includes a variety of “indicators” that contribute to the quality of the pedestrian experience. Some of these indicators are the number of lanes in a road, the sidewalk width, vacant buildings along the route and the presence of trees. Following this qualitative evaluation there was a public involvement process that documented the perceptions of the community towards the pedestrian environment.

The recommendations of this document are:

Goal 1 – Increase pedestrian safety and comfort in the downtown.

- Recommendation A: Partner with Oregon Department of Transportation (ODOT) to find techniques to accomplish improved pedestrian safety in the downtown via reduction of speed limits.
- Recommendation B: Partner with the Sandy Police Department to enforce speed limits in the downtown in order to increase pedestrian safety and reduce traffic crash outcomes.
- Recommendation C: Reduce speed on Hwy 26 east of downtown to provide for a better transition to reduced speeds in the downtown (reduction of 40mph current speed limit).
- Recommendation D: Create traffic calming measures such as rumble strips to deter erratic driving.
- Recommendation E: Increase landscaping and street trees on busy streets in order to increase separation of pedestrians and automobiles.
- Recommendation F: Improve sight lines for pedestrian visibility by ensuring parking and street trees are placed away from intersections through municipal code.
- Recommendation G: Increase number of marked crosswalks on Highway 26 in the downtown.
- Recommendation H: Transition all marked crosswalks on Pioneer Blvd. and Proctor Blvd. to high visibility crosswalk paint.
- Recommendation I: Increase signage and/or signalized flashing beacons at marked crosswalks.
- Recommendation J: Increase number of pedestrian bulb-outs for pedestrian safety in crossing the street.
- Recommendation K: Increase number of streetlights on street segments in the downtown to provide for increased pedestrian safety and comfort.

Goal 2 – Improve pedestrian accessibility in the downtown.

- Recommendation A: Construct missing sidewalks within project boundaries to improve walking and rolling in the downtown.
- Recommendation B: Create a sidewalk maintenance plan to provide continuation of pedestrian enhancements.
- Recommendation C: Increase pedestrian walk signal times at the intersections at the edges of downtown (Bluff Rd. and Ten Eyck Rd.) and at major intersections within the couplet. Increased pedestrian signal times will allow people with mobility impairments, older adults, or children cross in a safe amount of time.
- Recommendation D: Widen narrow sidewalks within project boundaries.
- Recommendation E: Upgrade sidewalks with major impediments and in poor condition.
- Recommendation F: Improve and prioritize ADA accessibility along sidewalks and pedestrian crossings in downtown. This includes, but is not limited to, increasing audible pedestrian crossing signals, lengthening time of pedestrian crossing signals, transitioning to automated pedestrian cross times to decrease the need to push buttons (which can be an impediment for people with mobility impairments), and implementing more truncated domes at curb cuts.

Goal 3 – Improve pedestrian connectivity to the downtown.

- Recommendation A: Create and post wayfinding for pedestrians detailing length of time from location to the downtown via walking/rolling.
- Recommendation B: Construct sidewalks on connecting streets with missing sidewalks.
- Recommendation C: Complete and widen sidewalks on Pleasant Street (for more information reference Pleasant Street Master Plan) to create a more pedestrian friendly environment on Pleasant St.
- Recommendation D: Improve the safety of the crosswalk at the intersection of Alt Ave. and Proctor Blvd. to connect Pleasant St and Proctor Blvd. This improvement will create a safer pedestrian environment for students traveling to and from the Sandy Public Library to Sandy Grade School.
- Recommendation E: Encourage more events downtown with instructions for pedestrian access from neighboring areas to attract more pedestrian activity in the downtown.

What this means for the City of Sandy TSP:

Plan recommendations will be considered when developing proposed improvements during the solutions portion of the TSP.

OREGON TRAIL SCHOOL DISTRICT SAFE ROUTES TO SCHOOL PLAN

The Oregon Trail School District Safe Routes to School (SRTS) Plan lays the foundation for schools, the community, the City of Sandy, Clackamas County, and the Oregon Department of Transportation (ODOT) to work together on reducing barriers for students walking and biking to school.

SRTS is a comprehensive program to make school communities safer by combining engineering tools and enforcement with education about safety and activities to enable and encourage students to walk and bicycle to school. SRTS programs typically involve partnerships among municipalities, school districts, community members, parent volunteers, and law enforcement.

The plan outlines goals, objectives, and actions related to Safety, Equity, and Heath.

- Safety - Increase safety for families traveling to school, including perceptions of safety, since perceived barriers can have a real impact on whether parents allow their students to walk or bike.
- Equity - Increase access and opportunity for all residents, including disadvantaged, minority, and low-income households.
- Health - Increase student access to physical activity and reduce emissions near schools, contributing to better air quality.

There are many construction needs and recommendations identified in the plan. The transportation system improvements are:

- Cedar Ridge Middle School
    - Bluff Road in Front of School
        - Widen sidewalk to fence along east side of Bluff Rd between Hood St and school vehicle entrance.
        - Widen sidewalk in the vicinity of telephone poles north of school entrance and move associated utility structures as needed.
        - Replace “7AM - 5PM” 20 MPH school zone signs on Bluff Rd with “WHEN FLASHING” 20 MPH school zone signs and flashing beacons (S5-1).
        - Replace existing crossing signage on Bluff Rd at Marcy St with a Rectangular Rapid Flashing Beacon (RRFB) with School Crossing Assembly (S1-1 and W16-7P), and high visibility crosswalks across the north and east sides of the intersection.
        - Construct approximately 225 LF of sidewalk along west side of Bluff Rd from Meeker St north to existing sidewalk.
        - If redistricting occurs, install marked crosswalk with curb ramps, tactile domes, HAWK beacon and median refuge island across north leg of the Meeker St at Bluff Rd intersection.
        - If redistricting occurs, construct sidewalk along the north side of Meeker between Bluff Rd and the existing sidewalk west of Bluff Rd.
    - Bluff Road at Hood Street
        - Intersection Improvement
            - Install a curb extension including perpendicular curb ramps and tactile domes at northeast corner of Hood St.

        - Install a curb extension to provide clearance from existing pole, including perpendicular curb ramps and tactile domes, at southeast corner.
        - Mark crosswalk and stop bar across the east leg of intersection.
  - Bluff Road at US 26
    - Intersection Improvement
        - Increase pedestrian signal crossing time to be based on a walking rate of 3.0 feet per second.
        - Reconfigure crossing to provide perpendicular curb ramps with tactile domes and reduce curb radius at all corners. Add pedestrian-scale lighting.
        - Reallocate existing roadway space to provide buffered bike lanes along Highway 26 and consider the use of green pavement markings in the vicinity of Bluff Rd. Consider installing vertical delineators with buffered bike lanes contingent on city maintenance agreement, or construct a fully grade-separated bicycle facility.
  - Hood Street
    - Beers Avenue Intersection Improvement
        - At Beers Ave, repaint stop bars on west and east sides of intersection. Consider installation of a 4 way stop at Beers Ave, which experiences higher traffic volume than other north-south streets in Sandy
    - Reconstruct and widen 60 ft of sidewalk in front of 38641 Hood St.
    - Install 100 ft of new sidewalk on north side of street between 38661 Hood St and Scales Ave.
    - Scales Avenue Intersection Improvement
        - Install perpendicular curb ramps with tactile domes at northwest and southwest corners of the intersection of Hood St and Scales Ave. Install tactile domes at the northeast and southeast corners. Repaint stop bars.
    - Bruns Avenue Intersection Improvement
        - Install tactile dome at southwest corner of Bruns Ave and Hood St.
    - Remove unutilized pipe causing sidewalk slope between 38795 and 38785 Hood St.
    - Require 6 ft-wide sidewalk infill as part of future development.
- Sandy Grade School
  - Pleasant Street in Front of School
    - Mark stop bars in advance of crosswalks at all STOP control approaches at the intersections of Pleasant St at Strauss Ave, Alt Ave, and Smith Ave.
    - Construct approximately 125 LF of sidewalk along the north side of Pleasant St between Bruns Ave and Strauss Ave.
    - Consider installation of advanced school warning signage with flashing beacons (S5-1) to raise awareness of school speed zone on both sides of Pleasant St approaching school.
  - Pleasant Street and Strass Avenue
    - Intersection Improvement
        - Mark stop bars in advance of crosswalks.

        - Consider revising the intersection of Pleasant St and Strauss Ave to be a four-way stop (currently STOP control north- and southbound only).
  - Pleasant Street at Alt Avenue
    - Intersection Improvement
      - Mark stop bars in advance of crosswalks.
      - Replace existing diagonal curb ramps at all four corners with perpendicular curb ramps with tactile domes.
      - Construct a raised intersection at Pleasant St at Alt Ave.
  - Pleasant Street at Smith Avenue
    - Intersection Improvement
      - Mark stop bars in advance of crosswalks.
      - Relocate southbound school advance crossing assembly (S1-1 & W16-9P) and school speed limit assembly (S4-3P & R2-1) along Smith Ave to approximately 100 ft and 175 ft north of intersection, respectively.
  - Strass Avenue and Hood Street
    - Relocate southbound school advance crossing assembly (S1-1 & W16-9P) and school speed limit assembly (S4-3P & R2-1) along Strauss Ave to approximately 100 ft and 175 ft north of intersection, respectively.
    - Repair approximately 150 LF of degraded sidewalk along the east side of Strauss Ave at the intersection with Hood St, and widen sidewalk at encroaching utility pole.
    - Install a curb ramp on the east side of the south leg of the intersection of Strauss Ave at Hood St. Add tactile domes and a stop bar associated with the crosswalk across the west leg of the intersection.
  - Alt Avenue and US 26
    - Intersection Improvement
      - Increase pedestrian signal crossing time to be based on a walking rate of 3.0 feet per second. Upgrade pedestrian push-buttons to meet current standards with audible indications.
      - Consolidate the two existing crosswalks across Highway 26 at Alt Ave with one high visibility continental crosswalk on the east side of the intersection including advance stop bar, bulbouts, curb ramps, and pedestrian scale lighting.
    - Reallocate existing roadway space to provide buffered bike lanes along Highway 26 and consider the use of green pavement markings in the vicinity of Alt Ave. Consider installing vertical delineators with buffered bike lanes contingent on city maintenance agreement, or construct a fully grade-separated bicycle facility.

What this means for the City of Sandy TSP:

Plan recommendations will be considered when developing proposed improvements during the solutions portion of the TSP.

MANAGING AND MONITORING THE TRANSPORTATION SYSTEM

To ensure that the transportation system maintains acceptable quality, it is monitored with a variety of measures. These measures are typically defined by the agency with maintenance responsibilities, which includes City of Sandy, Clackamas County and ODOT. US 26 is under the jurisdiction of ODOT. Each responsible jurisdiction sets various standards for the streets to maintain its designated classifications.

MOTOR VEHICLE MOBILITY STANDARDS

The state and region have adopted vehicle mobility standards. These mobility standards ensure that the transportation system will have adequate capacity to support planned growth or that the average driver does not experience significant delay, depending on specific policy of the managing jurisdiction. Note that ODOT mobility standards and based on the volume to capacity ratio, a measure volume that can be served by an intersection or approach while the City of Sandy's mobility standards are based on Level of Service, a measure of the delay experienced by drivers.

If changes made in the TSP or City of Sandy Comprehensive plan would cause study intersections to exceed adopted performance measures, mitigation could be necessary before plans are approved. The intersection mobility targets vary by jurisdiction of the roadways. Table 4 below shows the applicable performance standards and road authority for study intersections in the TSP.

TABLE 4: MOBILITY STANDARDS FOR STUDY INTERSECTIONS

INTERSECTION	CONTROL TYPE	MOBILITY STANDARDS	AGENCY
ORIENT DR/US 26	Signal	0.70	ODOT
362ND DR/US 26	Signal	0.80	ODOT
INDUSTRIAL WAY/ US 26	Signal	0.80	ODOT
362ND DR/INDUSTRIAL WAY (NORTH)	Stop Controlled	D	City of Sandy
362ND DR/INDUSTRIAL WAY (SOUTH)	Stop Controlled	D	City of Sandy
RUBEN LN/US 26	Signal	0.80	ODOT
BLUFF RD/US 26	Signal	0.85	ODOT

INTERSECTION	CONTROL TYPE	MOBILITY STANDARDS	AGENCY
BLUFF RD/BELL ST	Stop Controlled	D	City of Sandy
MEINIG AVE (OR 211)/PIONEER BLVD (US 26)	Signal	0.90	ODOT
MEINIG AVE (OR 211)/PROCTOR BLVD (US 26)	Signal	0.90	ODOT
OR 211/ DUBARKO RD	Stop Controlled	D	City of Sandy
OR 211/BORNSTEDT RD	Stop Controlled	D	City of Sandy
TEN EYCK RD/US 26	Signal	0.85	ODOT
LANGENSAND RD/US 26	Stop Controlled	0.80	ODOT
VISTA LOOP DR/US 26	Stop Controlled	0.80	ODOT

OREGON HIGHWAY PLAN

At signalized intersections, these standards are to be applied to the intersection as a whole. At unsignalized intersections, these standards are applicable only to movements that are not required to stop. For other movements at unsignalized intersections the standards for District/Local Interest Roads shall be applied for areas within urban growth boundaries and a maximum volume to capacity ratio of 0.80 shall be applied for areas outside of urban growth boundaries.

CITY OF SANDY

City of Sandy requires a minimum Level of Service D operating condition for signalized and unsignalized intersections.

What this means for the City of Sandy TSP:

System performance will be measured, in part, using the adopted mobility standards. The previous City of Sandy TSP (2011) identified the need for alternative mobility standards at ODOT intersections due to high v/c ratios even with capacity improvements. This update will continue developing alternate mobility standards for those intersections, if needed.

MULTI-MODAL PERFORMANCE MEASURES

The Oregon Transportation Options Plan, The Oregon Transportation Safety Action Plan, and the Oregon Bicycle and Pedestrian Plan identify a variety of performance measures that are partially or wholly focused on non-motorized or non-single-occupant-vehicle trips. These performance measures are reflected in their respective sections. The City has adopted Transportation System Development Charge methodology that uses person-trips instead of motor vehicle trips in order to quantify impacts from all modes of travel and as a funding source for bike-ped improvements.

What this means for the City of Sandy TSP:

The traditional approach to mobility standards has changed in response to many evolving conditions such as transportation funding for projects, economic viability, livability, and funding priorities. The TSP could explore measures to evaluate multi-modal performance.

STREET AND DRIVEWAY SPACING STANDARDS

Access spacing along streets in the City of Sandy will be managed through access spacing standards. Access management is a broad set of techniques that balance the need to provide efficient, safe, and timely travel with the ability to allow access to individual destinations. Proper implementation of access management techniques will promote reduced congestion and accident rates and may lessen the need for additional street capacity.

CITY OF SANDY ROADWAY AND DRIVEWAY APPROACH SPACING STANDARDS

These standards are shown in Table 5 below and regulate access spacing on facilities managed by the City of Sandy. Access spacing on ODOT facilities is also regulated by the access spacing standards from the Oregon Highway Plan.

TABLE 5: CITY OF SANDY ACCESS SPACING

FUNCTIONAL CLASSIFICATION	PUBLIC ROADWAY SPACING (FEET)	DRIVEWAY APPROACH SPACING (FEET)
MAJOR ARTERIAL	See Table 6	See Table 6
MINOR ARTERIAL	5280	300
RESIDENTIAL MINOR ARTERIAL AND COLLECTOR	2640	150
LOCAL STREET	400-660	20

OREGON HIGHWAY PLAN SPACING STANDARDS

The Oregon Access Management Rule[13] (OAR 734-051) attempts to balance the safety and mobility needs of travelers along state highways with the access needs of property and business owners. ODOT's rules manage access to the state's highway facilities in order to maintain highway function, operations, safety, and the preservation of public investment consistent with the policies of the 1999 OHP. Access management rules allow ODOT to control the issuance of permits for access to state highways, state highway rights-of-way and other properties under the State's jurisdiction. In addition, it sets access spacing standards, identifies the ability to close existing approaches and establishes a formal appeal process in relation to access issues. These rules enable the State to direct location and spacing of intersections and approaches on state highways, ensuring the relevance of the functional classification system and preserving the efficient operation of state routes.

OHP Goal 3, Policy 3A and OAR 734-051 set access spacing standards for driveways and approaches to the state highway system.[14] The standards are based on state highway classification and differ based on posted speed. These segments are identified by milepost in the OHP Appendix D. The segments presented in Table 6 below, by intersection, are only approximate.

TABLE 6: OREGON HIGHWAY PLAN SPACING STANDARDS

[13] Access Management Rule: https://secure.sos.state.or.us/oard/displayDivisionRules.action?selectedDivision=3317

[14] ODOT Access Management Standards (Appendix C): https://www.oregon.gov/ODOT/Planning/Documents/OHP.pdf

SEGMENT	CLASSIFICATION	SPEED (MPH)	ACCESS SPACING (FEET)
US 26 – WEST OF ORIENT RD	Rural Expressway Statewide	50	5280
US 26 – BETWEEN 362ND DR & RUBEN LN	Urban Statewide	45	800
US 26 – BETWEEN RUBEN LN & BLUFF RD	Urban Statewide	40	800
US 26 – BETWEEN BLUFF RD & TEN EYCK RD	Special Transportation Area Statewide	25	350[a]
US 26 – BETWEEN TEN EYCK & ANTLER AVE	Urban Statewide	40	800
US 26 – EAST OF ANTLER AVE	Rural Statewide	55	1320

a. Minimum access management spacing for public road approaches is the existing city block spacing or the city block spacing as identified in the local comprehensive plan. Public road connections are preferred over private driveways and in STAs driveways are discouraged. However, where driveways are allowed and where land use patterns permit, the minimum access management spacing for driveways is 150 feet (46 meters) or mid-block if the current city block is less than 300 feet (91 meters).

What this means for the City of Sandy TSP:

There are many proposed street connections and extensions that have been documented from existing plans. These spacing standards will be followed if additional connections are proposed in the TSP.

FACILITY DESIGN

This section covers applicable design guidance from statewide plans.

OREGON BICYCLE AND PEDESTRIAN DESIGN GUIDE (OBPDG)

The OBPDG provides context guidance to select appropriate design criteria. The seven criteria are shown in Table 7 below.

TABLE 7: OREGON BICYCLE PEDESTRIAN DESIGN GUIDE CONTEXT CRITERIA

CONTEXT	SUMMARY	APPLICABILITY
GENERAL LAND USE	Broad terms such as rural, urban, or suburban	Moderate
ADJACENT LAND USE	More specific terms such as residential, commercial, industrial etc.	Moderate/High
OREGON HIGHWAY PLAN	Defines highway segments including: Special Transportation Areas, Urban Business Areas, Commercial Centers, Non-designated Urban Highways, Urban fringe/Suburban, Developed, and Traditional Downtowns/Central Business Districts	Moderate/High
"MAIN STREET"	A standalone guide for communities working to enhance the vitality of their main street	High
THE TRANSECT	A specific land use classification system ranging from most natural to most urban	Very High
PORTLAND METRO'S DESIGN	A reflection of the various functions that streets often perform and the need to reduce the conflicts that arise due to those conflicts. This system includes three classifications: Throughways, Boulevards, and 2040 mixed-use corridors.	High
AASHTO STREET CLASSIFICATION	A system created for highway and street design including arterial, collector, and local classifications.	Low

The guide identifies the following issues that impact walkway and bikeway design.

- Land use and site design
- Interconnected streets
- Access Management
- Public Transit

Bikeways

OBPDG identifies five types of bikeways.

- Shared Roadway – Bicyclists and motorists share the same lane. The OBPDG does not provide cross-section dimensions. This type of bikeway is most appropriate at vehicle speeds less than or equal to 20 miles per hour.
- Bicycle Boulevards – A series of treatments that restrict through vehicle access along a corridor while providing through access for cyclists. This treatment is most appropriate at vehicle speeds less than or equal to 20 miles per hour.

- Shoulder Bikeway – A shoulder bikeway provides a paved shoulder for use by cyclists. This treatment is commonly found in rural areas. A width of six feet is recommended for this facility. A minimum allowance of four feet is permissible in constrained conditions.
- Bike Lane – A bike lane provides a portion of the paved roadway exclusively for cyclist use. This treatment reduces conflicts between motorists and cyclists and is appropriate for higher speed, higher volume roads. The standard width for a bike lane is six feet.
- Shared-use Path – A shared-use path is a separated facility usually shared with other active transportation modes. This treatment is appropriate when the road system provides inadequate connections.

Walkways

OBPDG identifies three types of walkways.

- Sidewalks – This facility is located parallel to a road and is separated by a curb and/or planting strip. -Sandy restricts the use of sidewalks for pedestrians only.
- Paths – These are typically shared-use facilities, as identified in the Bikeways section above. The OBPDG warns against designing paths for exclusive pedestrian use as other active transportation modes will be attracted to the facility.
- Shoulders – This facility is a paved section of the road for use by pedestrians. In rural areas this is the main pedestrian facility. Shoulders that may be used for pedestrians should be at least six feet in width.

What this means for the City of Sandy TSP:

There are many bicycle and pedestrian improvements that have been identified in other plans. If additional improvements are identified in the TSP process this guide will inform the decision on the appropriate treatment.

APPENDIX

CONTENTS

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SECTION 1. PROJECTS FROM ADOPTED PLANS

Projects from Adopted Plans

Project Name/Location	Description	Extent	Plan	Year	Cost (if included)
Local service improvements - Fixed routes	Add Saturday service, lengthening the service hours, adding an additional shuttle route that reaches the Vista Apartments	-	Sandy Transit Master Plan	2020	-
Local service improvements - Flexible services	Add a bus and driver	-	Sandy Transit Master Plan	2020	-
Local service improvements - Electric buses	Purchase one or more electric buses, a charging station and the required maintenance equiptment	-	Sandy Transit Master Plan	2020	-
Additions to regional service - Gresham Express	Higher frequencies on Saturdays or Sundays, more night and morning service on Saturdays or Sundays, Occasional additional trips that go directly to important destinations	-	Sandy Transit Master Plan	2020	-
Additions to regional service - New Clackamas Express	Coordinate with Clackamas County, the City of Boring and TriMet to plan and fund a route connecting these communities	-	Sandy Transit Master Plan	2020	-
Additions to regional service - Improved bus stops	Coordinate with the City of Gresham and TriMet to invest in better stop amenities at the Gresham Transit Center	-	Sandy Transit Master Plan	2020	-
Pedestrian Improvements - Transit Center	Improve access to the transit center by providing crossing treatments from every direction specifically at Proctor and Pioneer Blvd at Hoffman Ave	-	Sandy Transit Master Plan	2020	-
Pedestrian Improvements - Evans St Crossing	Construct a crosswalk or traffic calming treatment on Evans St	-	Sandy Transit Master Plan	2020	-
362nd Dr.	Infill sidewalk gaps	Chinook Dr. to Industrial Way	Sandy TSP (2011)	2011	$ 1,230,000.00
Bluff Rd.	Infill sidewalk gaps	Hood St. to Green Mountain St.	Sandy TSP (2011)	2011	$ 520,000.00
Bluff Rd.	Infill sidewalk gaps	Strawbridge Parkway to Nettie Connett Dr.	Sandy TSP (2011)	2011	$ 505,000.00
Bluff Rd.	Infill sidewalk gaps	Green Mountain St. to Northern UGB	Sandy TSP (2011)	2011	$ 716,000.00
Bornstedt Rd.	Infill sidewalk gaps	Cascadia Village Dr to UGB	Sandy TSP (2011)	2011	$ 1,420,000.00
Dubarko Rd.	Infill sidewalk gaps	East of Melissa Ave. to East of OR 211	Sandy TSP (2011)	2011	$ 3,240,000.00
Dubarko Rd.	Infill sidewalk gaps	Langensand Rd. to Antler Ave.	Sandy TSP (2011)	2011	$ 39,000.00
Industrial Way	Infill sidewalk gaps	362nd Dr. to US 26	Sandy TSP (2011)	2011	$ 1,790,000.00
Jacoby Rd.	Infill sidewalk gaps	Dubarko Rd. to Cascadia Village Dr.	Sandy TSP (2011)	2011	$ 40,000.00
Jewelberry Rd.	Infill sidewalk gaps	Penny Ave. to Kelso Rd.	Sandy TSP (2011)	2011	$ 194,000.00
Langensand Rd.	Infill sidewalk gaps	Dubarko Rd. to US 26	Sandy TSP (2011)	2011	$ 82,000.00
Meinig Ave.	Infill sidewalk gaps	Scenic St. to US 26	Sandy TSP (2011)	2011	$ 95,000.00
Pleasant St.	Infill sidewalk gaps	Beers Ave. to Revenue Ave.	Sandy TSP (2011)	2011	$ 173,000.00
Ruben Rd.	Infill sidewalk gaps	US 26 to Dubarko Rd.	Sandy TSP (2011)	2011	$ 51,000.00
Sandy Heights St.	Infill sidewalk gaps	Bluff Rd. to End	Sandy TSP (2011)	2011	$ 176,000.00

Projects from Adopted Plans

Project Name/Location	Description	Extent	Plan	Year	Cost (if included)
Downtown Core Pedestrian	Infill sidewalk gaps	Side streets perpendicular to US 26	Sandy TSP (2011)	2011	$ 287,000.00
University Ave.	Construct sidewalk	Sunset St. to US 26	Sandy TSP (2011)	2011	$ 107,000.00
New Accessway / Trail	Accessway / Trail	Extension of Tickle Creek Trail to Dubarko Rd.	Sandy TSP (2011)	2011	$ 1,700,000.00
New Accessway / Trail	Accessway / Trail	Bell St. Fields to Kate Schmitz Ave.	Sandy TSP (2011)	2011	$ 230,000.00
New Accessway / Trail	Accessway / Trail	North of Kate Schmitz Ave. to Orient Dr	Sandy TSP (2011)	2011	$ 1,520,000.00
New Accessway / Trail	Accessway / Trail	Industrial Way to Eastern UGB	Sandy TSP (2011)	2011	$ 1,310,000.00
New Accessway / Trail	Accessway / Trail	Marcy to Middle School Fields	Sandy TSP (2011)	2011	$ 370,000.00
New Accessway / Trail	Accessway / Trail	Marcy to Sandy River	Sandy TSP (2011)	2011	$ 370,000.00
New Accessway / Trail	Accessway / Trail	OR 211 to Jacoby	Sandy TSP (2011)	2011	$ 320,000.00
New Accessway / Trail	Accessway / Trail	Meinig Memorial Park Demand Trails	Sandy TSP (2011)	2011	$ 230,000.00
New Accessway / Trail	Accessway / Trail	Meinig Memorial Park Demand Trail to SW Corner	Sandy TSP (2011)	2011	$ 430,000.00
OR 211	Construct sidewalk	South UGB to US 26	Sandy TSP (2011)	2011	Included in other project
OR 211	Pedestrian Overcrossing	Sandy Heights St. to Meinig Ave.	Sandy TSP (2011)	2011	$ 4,900,000.00
US 26	Infill sidewalk gaps	Royal Lane to 362nd Dr.	Sandy TSP (2011)	2011	$ 440,000.00
US 26	Infill sidewalk gaps	362nd Dr. to West UGB	Sandy TSP (2011)	2011	$ 990,000.00
US 26	Infill sidewalk gaps	Ruben Ln. to University Ave.	Sandy TSP (2011)	2011	$ 510,000.00
US 26	Infill sidewalk gaps	Ten Eyck Rd. to Vista Loop Dr. West	Sandy TSP (2011)	2011	$ 3,260,000.00
362nd Dr.	Widen shoulder to 6'	Dubarko Rd. to UGB	Sandy TSP (2011)	2011	$ 1,230,000.00
Bluff Rd.	Re-stripe/widen Rd.	US 26 to Miller Rd.	Sandy TSP (2011)	2011	$ 40,000.00
Bornstedt Rd.	Re-stripe/widen Rd.	OR 211 to UGB	Sandy TSP (2011)	2011	$ 32,000.00
Dubarko Rd.	Re-stripe/widen Rd.	362nd Dr. to Eldridge Dr.	Sandy TSP (2011)	2011	$ 36,000.00
Dubarko Rd.	Re-stripe/widen Rd.	Sandy Heights St. to Melissa Ave.	Sandy TSP (2011)	2011	$ 36,000.00
Langensand Rd.	Re-stripe/widen Rd.	US 26 to UGB	Sandy TSP (2011)	2011	$ 61,200.00
Meinig Ave.	Re-stripe/widen Rd.	Scenic St. to US 26	Sandy TSP (2011)	2011	$ 61,000.00
Meinig Ave.	Re-stripe/widen Rd.	Barker Ct. to Dubarko Rd.	Sandy TSP (2011)	2011	$ 17,000.00
Sandy Heights	Re-stripe/widen Rd.	Bluff To End	Sandy TSP (2011)	2011	$ 40,000.00

Projects from Adopted Plans

Project Name/Location	Description	Extent	Plan	Year	Cost (if included)
Tupper Rd.	Re-stripe/widen Rd.	Long Circle to OR 211	Sandy TSP (2011)	2011	$ 59,000.00
OR 211	Widen shoulder to 6'	UGB to US 26	Sandy TSP (2011)	2011	$ 28,200,000.00
US 26	Widen shoulder to 6'	Ten Eyck Rd. to UGB	Sandy TSP (2011)	2011	$ 3,260,000.00
362nd Dr./ Industrial Way (West)	Remove stop signs on northbound and southbound approaches,Construct an eastbound left turn lane with 50 feet of storage	-	Sandy TSP (2011)	2011	$ 115,000.00
362nd Dr./ Dubarko Rd.	Construct a single-lane roundabout	-	Sandy TSP (2011)	2011	$ 1,165,000.00
US 26/ 362nd Dr.	Construct a second westbound left turn lane, Construct an acceptance lane for second westbound left turn lane to drop at southern access to Fred Meyer property, Construct a northbound through lane, Construct southbound through, right turn and left turn lanes	-	Sandy TSP (2011)	2011	$ 5,350,000.00
US 26/ Industrial Way	Change southbound approach to dual left turn lanes and a shared through/right lane, Construct a northbound left turn lane	-	Sandy TSP (2011)	2011	$ 780,000.00
US 26/ Ruben Lane	Change southbound approach to dual left turn lanes and a shared through/right lane, Change northbound approach to left turn lane, and shared through/right lane	-	Sandy TSP (2011)	2011	$ 770,000.00
OR 211/Proctor Boulevard (US 26)	Construct a northbound left turn lane (restriping only)	-	Sandy TSP (2011)	2011	$ 5,000.00
US 26	US 26 Adaptive Signal Timing	-	Sandy TSP (2011)	2011	$ 400,000.00
US 26/ Ten Eyck Rd. - Wolf Drive	Construct a northbound left turn lane, Construct a southbound left turn lane	-	Sandy TSP (2011)	2011	$ 1,220,000.00
OR 211/ Dubarko Rd.	Construct a northbound right turn lane, Construct a southbound left turn lane, Construct a northbound left turn lane, Construct a traffic signal	-	Sandy TSP (2011)	2011	$ 10,150,000.00
OR 211/ Bornstedt Rd.	Prohibit left turns out of Bornstedt Rd.	-	Sandy TSP (2011)	2011	$ 16,000.00
OR 211/ Arletha Court	Realign Arletha Court approach from the south	-	Sandy TSP (2011)	2011	$ 2,570,000.00
Industrial Way extension to Jarl Rd./ US 26	-	-	Sandy TSP (2011)	2011	$ 10,800,000.00
Dubarko Rd. connection to Champion Way	-	-	Sandy TSP (2011)	2011	$ 6,105,000.00
Extend Bell St. to Orient Dr.	-	-	Sandy TSP (2011)	2011	$ 50,905,000.00
Extend 362nd Dr. to Kelso Rd.	-	-	Sandy TSP (2011)	2011	$ 26,620,000.00
Extend Kate Schmidt St. from US 26 to the proposed Bell St. extension	-	-	Sandy TSP (2011)	2011	$ 7,345,000.00
Extend Industrial Way north to Bell Street extension	-	-	Sandy TSP (2011)	2011	$ 3,820,000.00
Extend Olson Rd. from 362nd Dr. to Jewelberry Ave.	-	-	Sandy TSP (2011)	2011	$ 12,890,000.00
Extend Agnes St. to Jewelberry Ave.	-	-	Sandy TSP (2011)	2011	$ 4,870,000.00
Extend Dubarko Rd. to US 26 opposite Vista Loop Dr. (West)	-	-	Sandy TSP (2011)	2011	$ 3,200,000.00

Projects from Adopted Plans

Project Name/Location	Description	Extent	Plan	Year	Cost (if included)
Gunderson Rd., 370th Ave., Cascade Village Drive, Cascade Village Boulevard, New Collector	-	-	Sandy TSP (2011)	2011	$ 20,000,000.00
New Rd. extension to US 26 opposite Vista Loop Dr. (East)	-	-	Sandy TSP (2011)	2011	$ 16,390,000.00
7-lane US 26: Orient Dr. to Bluff Rd. and Ten Eyck Rd. to Vista Loop Dr. East	-	-	Sandy TSP (2011)	2011	$ 62,100,000.00
US 26 Bypass (west of Orient Dr. to Shorty's Corner - south of the City)	-	-	Sandy TSP (2011)	2011	$ 544,000,000.00
4053 - OR 211	intersection remove or decrease vertical curve and remove vegetation	362nd Dr/OR 211	Clackamas County TSP (2013)	2013	-
2017 - 362nd Ave	Add Paved shoulders	Skogan Rd to OR 211	Clackamas County TSP (2013)	2013	-
3033 - 362nd Drive	Remove or Decrease horizontal and vertical curves	Colorado Rd to Dubarko Rd	Clackamas County TSP (2013)	2013	-
3034 - 362nd Drive	Remove or Decrease vertical curve, relocate intersection	362nd Ave/Deming Rd intersection	Clackamas County TSP (2013)	2013	-
4057 - OR 211	Add shoulders and bikeways	Bornstedt Rd to City of Sandy	Clackamas County TSP (2013)	2013	-
4070 - US 26	Add eastbound right turn lane	US 26/Firwood Rd intersection	Clackamas County TSP (2013)	2013	-
3043 - Firwood Rd	Realign Trubel Rd to remove or decrease downgrade	Firwood Rd/Trubel Rd intersection	Clackamas County TSP (2013)	2013	-
4067 - US 26	Perform Road Safety Audit or transportation safety review to identify appropriate road safety improvements	Ducan Rd to Langesand Rd	Clackamas County TSP (2013)	2013	-
4066 - US 26	Perform Road Safety Audit or transportation safety review to identify appropriate road safety improvements	Kelso Rd to Duncan Rd	Clackamas County TSP (2013)	2013	-
3050 - Orient Dr	Add Paved shoulders	US 26 north to county line	Clackamas County TSP (2013)	2013	-
3055 - Tickle Creek Trail	Construct multi-use path in accordance with the Active Transportation Plan	Springwater Corridor to Sandy city limits	Clackamas County TSP (2013)	2013	-

DRAFT TECHNICAL MEMORANDUM #2

DATE: September 20, 2021

TO: Project Management Team

FROM: Reah Flisakowski and Sarah Keenan | DKS Associates
Darci Rudzinski and Emma Porricolo | Angelo Planning Group

SUBJECT: City of Sandy Transportation System Plan
Project Goals, Objectives, and Evaluation Criteria (Task 2.2) Project #20020-001

The purpose of this memorandum is to initiate the process of developing the transportation-related goals, objectives, and evaluation criteria that will help guide the update of the Sandy Transportation System Plan (TSP) and future investment decisions. This effort will continue through the planning process, shaped by input received from the project management team, community advisory committee, and the general public.

SETTING DIRECTION FOR TRANSPORTATION PLANNING

Collectively, transportation-related goals and objectives state what the community wants to focus on in the TSP update and what they want the future Plan to address. Evaluation criteria can be developed for each objective to help judge how identified solutions or projects developed through the update process meet the community's goals. Ultimately, once the TSP update is complete, TSP objectives can be used to:

- guide future transportation and land use decisions as part of the adopted TSP
- reworked as policy statements
- inform updates to existing transportation policies in the Comprehensive Plan
- combination of the above.

Goals and objectives create manageable stepping stones through which the broad vision statement can be achieved. **Goals** are broad statements that should focus on outcomes, describing a desired end state. Goals should be challenging, but not unreasonable. Each goal must be supported by more finite **objectives**. In contrast to goals, objectives should be specific and identify key issues or concerns that are related to the attainment of the goal.

The solutions recommended through the TSP must be consistent with the goals and objectives. To accomplish this, measurable **evaluation criteria** that are based on the goals and objectives will be developed. For the Sandy TSP, they will be used to inform the selection and prioritization of projects and programs for the plan by describing how well the alternatives support each goal.

DEVELOPING UPDATED TSP GOALS AND POLICIES

The goals and objectives from Sandy's current TSP, adopted in 2011, provided a starting point for setting the direction for the new TSP. The current TSP goals cover a wide range of topics that are relevant and appropriate to carry forward in the TSP Update.

The Transit goals and objectives from the 2020 Sandy Transit Master Plan that are applicable to the TSP were added under the Transit goal. This memo also presents two new goals under the topic headings of Safety and Equity to be considered as part of the Sandy TSP update. The existing goals and objectives have been updated and expanded to provide more detail and reflect current community needs. The headings used for some of the current TSP goals were changed to better reflect the overall topic covered by the objectives. Many objectives support more than one goal. Some existing objectives have also been relocated to the goal that it supports the most.

The TSP goals and objectives provided below will be shared with the advisory committee, with further input sought to refine them. At this time, all goals and objectives are considered to be of equal importance when evaluating and prioritizing TSP projects and programs.

TSP GOALS AND POLICIES

MOBILITY & CONNECTIVITY

Goal 1: Provide a transportation system that prioritizes mobility and connectivity for all users.

- Objective 1.1: Maintain the livability of Sandy through well connected transportation facilities
- Objective 1.2: Improve the safety and accessibility of transit facilities
- Objective 1.3: Improve vehicular/pedestrian interface along all arterial and collector streets
- Objective 1.4: Ensure sufficient capacity to accommodate future travel demand (transit, bicycle, pedestrian, etc.) to, within, and through the City of Sandy
- Objective 1.5: Emphasize local street connections, in an effort to reduce reliance on US 26 and OR 211 for local trips
- Objective 1.6: Minimize access along the City's arterials and consolidate or relocate access points when possible

CAPITAL INVESTMENTS AND FUNDING

Goal 2: Promote cost effective investments to the transportation system.

- Objective 2.1: Maximize the useful life of existing facilities
- Objective 2.2: Seek opportunities to combine transportation, other infrastructure, and environmental mitigation projects
- Objective 2.3: Maximize the use of state and federal funds for transportation capital, operating, service, and demand improvements
- Objective 2.4: Maintain a capital improvement plan that identifies construction priorities and funding
- Objective 2.5: Minimize street cross-sections to reduce maintenance costs

COMMUNITY NEEDS

Goal 3: Provide a transportation system that supports specific community needs.

- Objective 3.1: Protect the scenic resources in Sandy
- Objective 3.2: Preserve the historic character of Sandy
- Objective 3.3: Identify gateway and beautification treatments for OR 211
- Objective 3.4: Support Mt. Hood Scenic Byway Enhancements
- Objective 3.5: Incorporate the street network and transportation improvements contained within the Bornstedt Village Plan
- Objective 3.6: Identify walking and biking needs in the urban growth boundary expansion area

SYSTEM MANAGEMENT

Goal 4: Promote traffic management to achieve the efficient use of transportation infrastructure.

- Objective 4.1: Balance local access to US 26 with the need to serve regional and statewide traffic, while supporting adjacent land uses
- Objective 4.2: Plan for a transportation system that supports projected population and employment growth and maximize travel options by providing efficient routes for all modes of transportation

- Objective 4.3: Support ODOT adoption of an alternate mobility target for US 26 that allows for increased congestion on the highway corridor, especially during peak seasonal travel periods

ENVIRONMENTAL

Goal 5: Minimize environmental impacts on natural resources and encourage carbon-neutral or efficient transportation alternatives.

- Objective 5.1: Avoid or mitigate transportation project impacts to environmental resources including creeks and wetlands, cultural resources, and wildlife corridors

- Objective 5.2: Support energy conservation by supporting public transit, transportation demand management, transportation system management and a multi-modal transportation system

- Objective 5.3: Encourage transportation facility construction methods that reduce environmental impacts

- Objective 5.4: Minimize street cross-sections to protect and preserve open space and reduce impervious surface

TRANSIT

Goal 6: Provide safe, efficient, high-quality transit service that gives Sandy residents, employees, employers, and visitors more freedom to meet their needs within the city, region and state. Create a transit system that offers an alternative to private automobile use, supports efficient use of roadways and reduces air pollution and energy use.

- Objective 6.1: Provide service that is safe, comfortable, and useful to many different kinds of people

- Objective 6.2: Collaborate with other transportation agencies and support user-friendly connections between transit system

- Objective 6.3: Improve accessibility to transit services for people arriving by foot, by bicycle or with a mobility device

- Objective 6.4: Increase public awareness of Sandy Transit (SAM) and its connectivity to other transit systems and transportation modes

SAFETY

Goal 7: Promote a safe transportation system for all users.

- Objective 7.1: Encourage traffic safety through education, enforcement, and engineering
- Objective 7.2: Identify high accident locations and implement specific counter measures to reduce their occurrence
- Objective 7.3: Provide safe pedestrian and bicycle routes between residential areas, schools, and public facilities
- Objective 7.4: Provide transportation design standards that encourage appropriate traffic volumes, speeds, and pedestrian safety
- Objective 7.5: Provide enhanced pedestrians and bicyclists crossings where needed
- Objective 7.6: Improve emergency service response time and evacuation routes through connectivity
- Objective 7.7: Develop street design standards that support emergency service vehicle needs

EQUITY

Goal 8: Support an equitable transportation system and provide transportation choices to all users.

- Objective 8.1: Ensure the transportation system provides equitable access to underserved, disadvantaged, and vulnerable populations and is easy to use and accommodating to travelers of all ages
- Objective 8.2: Ensure the pedestrian and bike facilities are designed clear of obstacles and obstructions (e.g., utility poles, grates) and meet ADA requirements
- Objective 8.3: Provide multi-faceted and inclusive public engagement process that provides all community members an opportunity to provide input on transportation system decisions

HEALTH

Goal 9: Support options for exercise and healthy lifestyles to enhance the quality of life.

- Objective 9.1: Develop recreational walking and biking routes to access employment, schools, shopping, and transit routes.
- Objective 9.2: Provide walking facilities that are physically separated from auto traffic on all arterials and collectors
- Objectives 9.3: Apply traffic calming measures to support neighborhood livability.

EVALUATION CRITERIA

After receiving input, the project team will create a revised set of goals and objectives and develop corresponding evaluation criteria. These will continue to evolve throughout the TSP update process. The evaluation criteria will guide the selection and prioritization of TSP projects and policies.

Sandy's proposed approach to developing transportation projects emphasizes improved system efficiency and management over adding driving capacity. This approach considers four tiers of priorities that included:

- **Highest Priority** – preserve the function of the system through cost-effective management practices such as improved traffic signal operations, encouraging alternative modes of travel, and implementation of new policies and standards.
- **High Priority** – improve existing facility efficiency through minor enhancement projects that upgrade roads to desired standards, fill important system connectivity gaps, or include safety improvements to intersections and corridors.
- **Moderate Priority** – add capacity to the system by widening, constructing major improvements to existing roadways, or extending existing roadways to create parallel routes to congested corridors.
- **Lowest Priority** – add capacity to the system by constructing new facilities.

This approach allows the City to maximize use of available funds, minimize impacts to the natural and built environments, and balance investments across all modes of travel.

TECHNICAL MEMORANDUM #3

DATE: November 10, 2021

TO: Project Management Team

FROM: Reah Flisakowski, Dock Rosenthal | DKS Associates

SUBJECT: City of Sandy Transportation System Plan

Financial Forecast (Task 2.3) Project #20020-001

This memorandum presents the City's historic transportation funding and the forecast for available funding through 2040. The funding estimate will help prioritize the investments the City can make in the TSP and will be utilized to develop reasonable budgeting assumptions when selecting a set of transportation improvement needs identified over the next 20 years.

HISTORIC FUNDING SOURCES

Transportation funding is commonly viewed as a user fee system where the users of the system pay for infrastructure through motor vehicle fees (such as gas tax and registration fees) or transit fares. However, a great share of motor vehicle user fees goes to road maintenance, operations, and preservation of the system rather than construction of new system capacity. Much of what the public views as new construction is commonly funded (partially or fully) through system development charges and frontage or off-site improvements required as mitigation for land development.

The City of Sandy currently utilizes several sources to fund construction and maintenance of its transportation infrastructure as described below. Each source collects revenue each year that is used to repair street facilities or construct new streets, with some restrictions on the type and location of projects. Each funding source is described in the following sections.

STATE HIGHWAY TRUST FUND

The State of Oregon Highway Trust Fund makes distributions from the state motor vehicle fuel tax, vehicle registration and title fees, driver license fees and truck weight-mile taxes. A portion is paid to cities and counties annually on a per capita basis. By statue, the money can only be used for road-related purpose, including walking, biking, bridge, street, signal, and safety improvements. The City of Sandy uses these funds primarily for street operation needs, such as street maintenance (including repaving and pothole repair), street lighting costs, street sign maintenance, winter ice mitigation, and for installing missing sidewalk segments.

Oregon gas taxes are collected as a fixed amount per gallon of gasoline bought. Gas tax in Oregon is currently 36 cents per gallon, and this tax does not vary with changes in gasoline prices. There is no adjustment for inflation tied to the gas tax, therefore the net revenue collected has gradually eroded over time as the cost to construct and repair transportation systems has increased significantly. Fuel efficiency in new vehicles and the prevalence of electric vehicles has further reduced the total dollars collected through gas taxes.

Oregon vehicle registration fees are collected as a fixed amount at the time a vehicle is registered with the Department of Motor Vehicles. Vehicle registration fees in Oregon have recently increased from $86 per vehicle per year to $112 per vehicle per year for passenger cars, with similar increases for other vehicle types. There is no adjustment for inflation tied to vehicle registration fees.

LOCAL GAS TAX

In addition to the State of Oregon gas tax, Sandy collects a local tax from fuel distributors within the city limits. These funds have historically been used for roadway maintenance of streets under City jurisdiction. The gas tax was approved in 2002 at one cent per gallon. The gas tax was increased to two cents per gallon in 2009.

CLACKAMAS COUNTY VEHICLE REGISTRATION FEE

Clackamas County commissioners approved a $30 per year vehicle registration fee to fund road maintenance and construction projects. Forty percent of the fees will go directly to cities in the county. Sandy will receive an estimated $200,000 annually which will be used to construct various transportation projects. The funds may be used as a portion of the Full Faith and Credit Obligation for the 362nd Avenue/Bell Street extension project that is currently in the design phase. This funding source does not have an expiration date.

SYSTEM DEVELOPMENT CHARGES

Street System Development Charges (SDC) are collected from new development applications within the City of Sandy based on the proposed land use. The SDC fees are determined based on each land use’s potential to generate new vehicle trips. SDC’s are a funding source for all capacity adding projects. The funds collected can pay for constructing or improving portions of roadways impacted by applicable development and include roadway improvements, bikeways and pedestrian facilities. The City of Sandy currently applies an SDC of $4,063.21 per single family dwelling unit or $256.03 per adjusted average daily person trip for non-residential land uses.

FEDERAL FUNDS

Sandy has received Federal funds that are disbursed to urban areas based on population. ODOT "holds" these funds for cities and counties in Oregon and when an agency wishes to use them. Sandy received $297,316 in federal funds to construction improvements along Dubarko Road.

GRANTS

Sandy was awarded a Transportation Growth and Management grant to fund the current update to the Transportation System Plan. Future funding of projects from grants are not guaranteed and are awarded through a competitive application and review process. Grants typically provide an opportunity for securing funding for important capital projects that do not have sufficient City funds to complete.

REVENUES AND EXPENDITURES

The City of Sandy revenues and expenditures for the transportation system over the past seven years (2013 to 2020) were reviewed to help estimate the reasonable funding for projects and programs over the next 20 years. The historic and forecasted funding dollars are presented in the following sections and in Table 1.

REVENUES

A review of historic and current funding revenue found the largest contributor was the State Highway Trust Fund with an average annual contribution of $720,000. ODOT estimates the City of Sandy will receive $18.3 million through 2040 from this source. Other primary funding sources were the collection of SDCs and the local gas tax with an average annual revenue of $445,000 and $307,000 respectively. Starting in 2021, the City is anticipating to receive $200,000 annually from Clackamas County vehicle registration fees.

The City has also received approximately $230,000 in other revenues on average annually. This included around $62,000 in interest and $96,000 in miscellaneous funds. Additionally, the City received $297,000 in federal funds in 2014.

Assuming the levels of funding are similar in the future, Sandy can expect to receive approximately $42 million in revenues through 2040 to be used towards transportation projects and programs. For estimating purposes, the City is anticipated to receive two more grants of $300,000 each totaling $600,000 within the next 20 years.

EXPENDITURES

The historic expenditures for the transportation system were also reviewed. Expenditures include personal services, materials and services, capital outlay, debt service, and transfers out. The largest expense was materials and services and debt services, averaging $443,000 and $450,000 per year respectively. In total, the City has spent approximately $1.1 million per year to maintain and operate the transportation system. With the recent jurisdictional transfer of OR 211 to the City, annual maintenance and operation expenditures are expected to increase.

Deferring necessary repair and preservation means spending much more to fix the same streets later, and repair costs rise exponentially as streets are left unmaintained. Every $1 spent to keep a street in good condition avoids $6 to $14 needed later to rebuild the same street once it has deteriorated significantly[1]. Heavy truck traffic and wet weather comprise two of the most critical factors in pavement deterioration. Heavy trucks flex the pavement and create spaces underneath. Wet weather, with cracked pavement or poor drainage, can lead to water undermining pavement.

Assuming historic levels of expenditures, Sandy can expect to spend approximately $31.8 million through 2040 for transportation projects and programs including debt services.

FUNDING FORECAST

Table 1 summarizes the historic revenues and expenditures and the estimated funding available for the transportation system over the next 20 years. The estimate includes an annual escalation rate of 4.5 percent[2] on the current expenditures to account for rising costs and ensure that needed roadway maintenance and repair work will not be deferred through 2040.

Total funding collected through 2040 is estimated to be $42 million with the current sources. The majority of these funds are from the State Highway Trust Fund, Clackamas County vehicle registration fees and local SDC fees. These funds are estimates only and may change in the future. State gas tax does not increase with inflation and new fuel efficient and electric vehicles could reduce the funding. SDC fees are based on the future development. If the forecasted growth does not occur, then the amount of SDC revenue would be reduced.

Total expenditures are estimated to be approximately $31.8 million. Overall, the City is expected to have approximately $10 million available for transportation projects and programs over the next 20 years, as shown in Table 1.

[1] Smart Growth America, American Association of State Highway Officials (AASHTO)

[2] Escalation rate of 4.5 percent based on the Construction Cost Index

TABLE 1: SANDY TRANSPORTATION REVENUE AND EXPENDITURES

REVENUES	AVERAGE ANNUAL AMOUNT	ESTIMATED AMOUNT THROUGH 2040
STATE HIGHWAY TRUST FUND	$720,000	$18,300,000
LOCAL GAS TAX	$307,000	$6,390,578
CLACKAMAS COUNTY VEHICLE REGISTRATION FEE	$200,000	$4,163,243
SYSTEM DEVELOPMENT CHARGES	$445,000	$9,263,216
GRANTS	$40,000	$600,000
INTEREST	$62,000	$1,290,605
MISCELLANEOUS	$96,000	$1,998,357
SALE OF CAPITAL ASSETS	$600	$12,490
TOTAL REVENUES	**$1,870,600**	**$42,018,489**
EXPENDITURES	**AVERAGE ANNUAL AMOUNT**	**ESTIMATED AMOUNT THROUGH 2040**
PERSONAL SERVICES	$250,000	$5,204,054
MATERIALS & SERVICES	$443,000	$9,221,583
CAPITAL OUTLAY	$327,000	$6,806,902
DEBT SERVICE	$450,000	$9,367,297
TRANSFERS OUT	$58,000	$1,207,340
TOTAL EXPENDITURES	**$1,528,000**	**$31,807,177**
20 YEAR FUNDING FORECAST		**$10,211,312**

ADDITIONAL FUNDING SOURCES AND OPPORTUNITIES

New transportation funding opportunities include local taxes, assessments and charges, and state and federal appropriations, grants, and loans. Factors that constrain these resources, include the willingness of local leadership to burden citizens and businesses with taxes and fees; the portion of available local funds dedicated or diverted to transportation issues from other competing City programs; and the availability of state and federal funds. The City should consider all opportunities for providing or enhancing funding for the transportation improvements included in the TSP.

Counties and Cities have used the following sources to fund the capital and maintenance aspects for their transportation programs.

LOCAL FUNDING SOURCES

TRANSPORTATION UTILITY FEE

A transportation utility fee is a recurring monthly charge that could be paid by all residences and businesses within the City. The City can base the fee on the estimated number of trips a particular land use generates or as a flat fee per residence of business. This fee is typically collected through regular utility billing; however, it could be collected as a separate stand-alone assessment. Existing law places no express restrictions on the use of transportation utility fee funds, other than the revenue shall be used for transportation related projects, including construction, improvements, and repairs; however, many choose self-imposed restrictions or parameters on the use of the funds.

For every $1 per month in charged fees for residential units and $0.01 per month per 1,000 square feet of non-residential uses in the city, the City of Sandy could expect to collect about $115,000 annually. Philomath, for example, charges a fee of $4 per month for single family residential units, $3.20 per month for multi-family units, and between $13.60 and $45.50 (based on type and size of the land use) per month for non-residential uses. It should be noted that Philomath does not have a local option fuel tax like Sandy.

SANDY FUEL TAX INCREASE

A local fuel tax increase to 4 cents per gallon could generate an additional $305,000 annually or $6.1 million through 2040. Sandy citizens voted down a measure to increase the gas tax to 3 cents per gallon in 2016.

LOCAL IMPROVEMENT DISTRICTS

Local Improvement Districts (LIDs) can fund capital transportation projects that benefit a specific group of property owners. LIDs require owner/voter approval and a specific project definition. Assessments against benefiting properties pay for improvements. LIDs can supply match for other funds where a project has system wide benefit beyond benefiting the adjacent properties. LIDs are often used for sidewalk and pedestrian amenities that provide local benefit to residents along the subject street. Property owners are assessed a proportional share of the cost at the end of the project, or the City may elect to allow for installment payments with interest.

URBAN RENEWAL

Urban renewal is a financial tool that funds projects and activities in an urban renewal district which have been identified in an urban renewal plan. The purpose is to make public investments in designated geographic areas to remove blight, to improve property values, and to leverage private investment. Improvements are funded with incremental increases in property taxes that result from construction of applicable improvements. This type of tax increment financing has been used in Oregon since 1960.

In 1998, the City of Sandy adopted the Sandy Urban Renewal Plan. It serves to guide development in the downtown area, as well as implement the goals and objectives of Sandy's Comprehensive Plan. It's anticipated that the plan will expire in 2048 if the maximum indebtedness remains at $67 million.

DEBT FINANCING

While not a direct funding source, debt financing is another funding method. Through debt financing, available funds can be leveraged, and the cost can be spread over the project's useful life. Though interest costs are incurred, the use of debt financing can serve not only as a practical means of funding major improvements but is oftentimes viewed as an equitable funding source for larger projects because it spreads the burden of repayment over existing and future customers who will benefit from the projects. One caution in relying on debt service is that a funding source must still be identified to fulfill annual repayment obligations. Three methods of debt financing are listed below:

- General Obligation (GO) Bonds – Subject to voter approval, a City can issue GO bonds to debt finance capital improvement projects. GO bonds are backed by the increased taxing authority of the City, and the annual principal and interest repayment is funded through a new, voter-approved assessment on property throughout the City (i.e., a property tax increase). Depending on the critical nature of projects identified in the TSP and the willingness of the electorate to accept increased taxation for transportation improvements, voter approved GO bonds may be a feasible funding option for specific projects. Proceeds may not be used for ongoing maintenance.
- Limited Tax General Obligation (LTGO) Bonds – Limited Tax General Obligation (LTGO) Bonds are similar to General Obligation (GO) bonds; however, they do not have to be voted on by constituents. A City pledges its general revenues to bondholders along with the utility revenues. The advantages to this option are that it does not require reserves or coverage (such as Revenue bonds) and does not require a vote.
- Revenue Bonds – Revenue bonds are debt instruments secured by rate revenue. For a City to issue revenue bonds for transportation projects, it would need to identify a stable source of ongoing rate funding. Interest costs for revenue bonds are slightly higher than for general obligation bonds due to the perceived stability offered by the "full faith and credit" of a jurisdiction.

ODOT FUNDING SOURCES

The Oregon Department of Transportation manages federal and state transportation funds to support projects throughout Oregon, including dedicated funds for multimodal and safety projects.

CONNECT OREGON

This program provides dedicated funding for air, rail, marine, bicycle, and pedestrian infrastructure throughout Oregon. Since the program's inception, over $1 billion has been awarded, including a dedicated bicycle and pedestrian project funding stream.[3]

STATEWIDE TRANSPORTATION IMPROVEMENT PROGRAM

The Statewide Transportation Improvement Program, also known as the STIP, is the Oregon Department of Transportation's capital improvement plan for state and federally-funded projects. The OTC and ODOT develop the STIP in coordination with a wide range of stakeholders and the public. The 2021-2024 STIP contains approximately $3 billion in projects and programs.

The three steps to developing the STIP include:

- Program allocation: The Commission will distribute funding among programs such as system enhancements, preservation, safety, non-highway, and local roads.
- Project selection: The Commission will review the considerations that guide project selection. ODOT will use data in management systems and advisory committees to create preliminary project lists, estimate costs and schedules, then narrow projects to a final recommended list to include in the draft STIP.
- Public review and approval: The Commission will put the draft STIP out for a formal public comment period. After taking public comment, the Commission will adopt a revised STIP and forward it for review and approval by the Federal Highway Administration and Federal Transit Administration.

The Commission allocates funding among the following major categories:

- Fix-It programs fund projects that fix or preserve the state's transportation system, including bridges, pavement, culverts, traffic signals, and others. ODOT uses data about the conditions of assets to choose the highest priority projects. In recent STIPs, the Commission has allocated most funding to Fix-It programs.
- Enhance programs fund projects that enhance or expand the transportation system. Area Commissions on Transportation recommend high-priority investments from state and local transportation plans in many of the Enhance programs.
- Safety programs reduce deaths and injuries on Oregon's roads. This includes the All Roads Transportation Safety program, which selects projects through a data-driven process to ensure resources have maximum impact on improving the safety of Oregon's state highways and local roads.

[3] *Connect Oregon.* https://www.oregon.gov/ODOT/Programs/Pages/ConnectOregon.aspx. Accessed April 15, 2021.

- Non-highway programs fund bicycle and pedestrian projects and public transportation. Area Commissions on Transportation often help recommend these projects to the Commission.
- Local government programs direct funding to local governments to fund priority projects.

HIGHWAY SAFETY IMPROVEMENT PROGRAM

The Highway Safety Improvement Program (HSIP) is a core federal-aid program under the Fixing America's Surface Transportation (FAST) Act that went into effect in December 2015. The primary goal of the HSIP is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-state owned roads and tribal roads.

Following the HSIP requirements, ODOT developed a new safety program, known as the All Roads Transportation Safety (ARTS) Program. This program provides funding for safety projects on all public roadways within Oregon based on historic crash data. Hotspot safety projects are identified based on existing Safety Priority Index System (SPIS) sites and Safety Implementation Plans, including ODOT's Pedestrian and Bicycle Plan. Additionally, each project site must have had one fatal or serious injury crash within the last five (5) years. Approximately $31 to $37 million annually is available for All Roads Transportation Safety projects, with a third of these funds available for projects within ODOT's Region 1 which includes Sandy.[4]

MULTIMODAL ACTIVE TRANSPORTATION FUND

In 2017, the Oregon Legislature passed Keep Oregon Moving (House Bill 2017), which includes changes to the existing Connect Oregon Grant Fund program that necessitates aligning the implementing rules with the new statutes. The legislation bifurcated the program into two new parts, with a separate allocation of 7% for multimodal active transportation projects.

In 2019, the Oregon Legislature passed House Bill 2592 to clarify and amend House Bill 2017. The legislation establishes the Multimodal Active Transportation (MAT) Fund for bicycle and pedestrian projects, consisting of 7% of the Connect Oregon Fund plus revenues from Oregon's bicycle excise tax. The MAT is a separate grant program from Connect Oregon and requires a new set of administrative rules. The legislation also clarifies roles and responsibilities between ODOT and the Oregon Department of Parks and Recreation to provide funding to bicycle and pedestrian projects with up to $4 million of lottery revenues annually.

OREGON COMMUNITY PATHS PROGRAM

This grant program is dedicated to helping communities create and maintain connections through multiuse paths. ODOT will use monies from the state Multimodal Active Transportation fund and federal Transportation Alternatives Program fund for this program. The goal is to complement existing active transportation programs in communities across the state. Oregon Community Paths combines funds from the Multimodal Active Transportation Fund, Oregon Bicycle Excise Tax, and

[4] *All Roads Transportation Program: Frequently Asked Questions.* https://www.oregon.gov/ODOT/Engineering/Docs_TrafficEng/ARTS_FAQ.pdf. Accessed April 15, 2021.

federal Transportation Alternatives Program to fund primarily off-street pedestrian and bicycle facilities. The program is expected to fund $19 million in grants for 2022 to 2024.

SAFE ROUTES TO SCHOOL PROGRAMS

Safe Routes to School refers to efforts that improve, educate, or encourage children safely walking (by foot or mobility device) or biking to school. ODOT has two main types of Safe Routes to School programs: infrastructure and non-infrastructure. Infrastructure programs focus on making sure safe walking and biking routes exist through investments in crossings, sidewalks and bike lanes, flashing beacons, and the like. Non-infrastructure programs focus on education and outreach to assure awareness and safe use of walking and biking routes. ODOT manages funding competitions for both infrastructure and non-infrastructure programs at the annual levels of $10 million (increasing to $15 million in 2023) and $300,000 respectively.

The Oregon Trail School District SRTS Plan goal is to reduce barriers for students walking and biking to school and making it safer. The Plan includes both recommendations for short and long-term construction projects, as well as ideas for education and engagement events to promote healthy, active lifestyles. Several infrastructure improvements are candidates for the ODOT SRTS Competitive Grant Program, while others could be managed by the school district or integrated into the City’s Transportation System Plan (TSP) update for future consideration. Members of the school community, including administration, teachers, parents, and students, can also contribute through education and encouragement activities to make walking or biking easier and more fun for the school commute.

IMMEDIATE OPPORTUNITY FUND

The purpose of the Immediate Opportunity Fund is to support primary economic development in Oregon through the construction and improvement of streets and roads. Access to this fund is discretionary and the fund may only be used when other sources of financial support are unavailable or insufficient. The Immediate Opportunity Fund is not a replacement or substitute for other funding sources.

DRAFT TECHNICAL MEMORANDUM #4

DATE: August 23, 2021

TO: Project Management Team

FROM: Reah Flisakowski, Dock Rosenthal | DKS Associates

SUBJECT: City of Sandy Transportation System Plan

Transportation System Existing Conditions Inventory (Task 3.1) Project #20020-001

This memorandum summarizes the transportation inventory of existing conditions for the City of Sandy. A review of the existing transportation conditions for walking, biking, transit, motor vehicles, freight, and safety are included in the inventory.

TRANSPORATION SYSTEM INVENTORY

To address changing transportation needs within the City though 2040, we must first look at the existing conditions. The transportation system review documented the existing pedestrian, bicycle, transit, and motor vehicle infrastructure. It also identified shortfalls and limitations of how people can travel within the City (such as lack of bike lanes or sidewalks). Solutions for the transportation infrastructure that do not maintain acceptable service levels for residents will be considered later in the process.

PEDESTRIAN NETWORK

Walking plays a key role in Sandy's transportation network and planning for pedestrians helps the City provide a complete multi-modal transportation system. It also supports healthy lifestyles and addresses a social equity issue ensuring that the young, the elderly, and those not financially able to afford motorized transport have access to goods, services, employment, and education.

Approximately one percent of commuters in the city walk to work, with one percent utilizing public transportation, which often includes walking at the beginning or end of the trip[1]. In addition to the work commute trips, walking trips are made to and from recreational areas, shopping areas, schools, or other activity generators. Continuous and direct sidewalk connections to all activity generators and along all streets, in addition to safe crossing opportunities along major roadways, are desirable to encourage non-motorized travel options.

[1] US Census Bureau, 2015-2019 American Community Survey

The existing pedestrian network in Sandy, shown in Figure 1, is composed of sidewalks, paved paths and unpaved trails, and is fairly well developed.[2]

Sidewalks provide for pedestrian movement and access and enhance connectivity and promote walking. Most local streets in Sandy were developed with sidewalks incorporated into the design. Although many areas have sidewalk coverage, a few streets do not have complete sidewalks on one side of the street, or even on both sides. These gaps are most significant along the following roads.

- US 26 east of SE Ten Eyck Road/Wolf Drive – On some stretches of highway, particularly in rural areas, wide shoulders provide a substitute for sidewalks. On this segment, eight feet is the minimum appropriate shoulder width.[3] The existing shoulders range between five and seven feet wide. Most of the design standards in the 2011 Sandy Transportation System Plan (TSP) also require a landscape buffer.
- Meinig Avenue between Barker Court and HWY 211 – Pedestrians in the southeastern residential area destined for the central business district of Sandy must use Wolf Drive or Hwy 211 via Meinig Avenue. For households, where Meinig Avenue provides a more direct connection the only way to avoid walking in the road is to detour through Meinig Memorial Park.
- Sandy Heights Street between Nettie Connett Drive and Tupper Road – Most of this segment has sidewalk on at least one side but Sandy Heights Street/Tupper Road is the only east-west connection from Meinig Avenue to Dubarko Road and provides important pedestrian access to the commercial area on the west side of the city.

Pedestrian Paths and Trails can serve both recreational and transportation needs for pedestrians. Some are considered shared use paths and are well suited for citywide pedestrian and bicycle travel, and others offer only recreational opportunities for pedestrians. They can be separated or adjacent to the street right-of-way and provide linear park facilities for pedestrian travel. Pedestrian trails exist within Meinig Memorial Park, along Tickle Creek, in Sandy River Park, through Sandy High School campus, and scattered throughout the residential neighborhoods providing accessways between disconnected streets or localized recreational walking and biking opportunities.

STREET CROSSINGS

There are 10 marked crosswalks on US 26 through Sandy. Between Orient Drive and Bluff Road, there are no mid-block crossings and the average spacing between signalized crossings is approximately a third of a mile. This is greater than the typical distance a pedestrian will walk and could encourage crossings outside of crosswalks. In downtown Sandy, there are several marked crosswalks at unsignalized intersections or mid-block locations and the average spacing is 745 feet or approximately 3 block lengths. There are other marked crosswalks along Dubarko Road, particularly at intersections of the Tickle Creek Trail, SE 362nd Drive, Bluff Road, and Bell Street.

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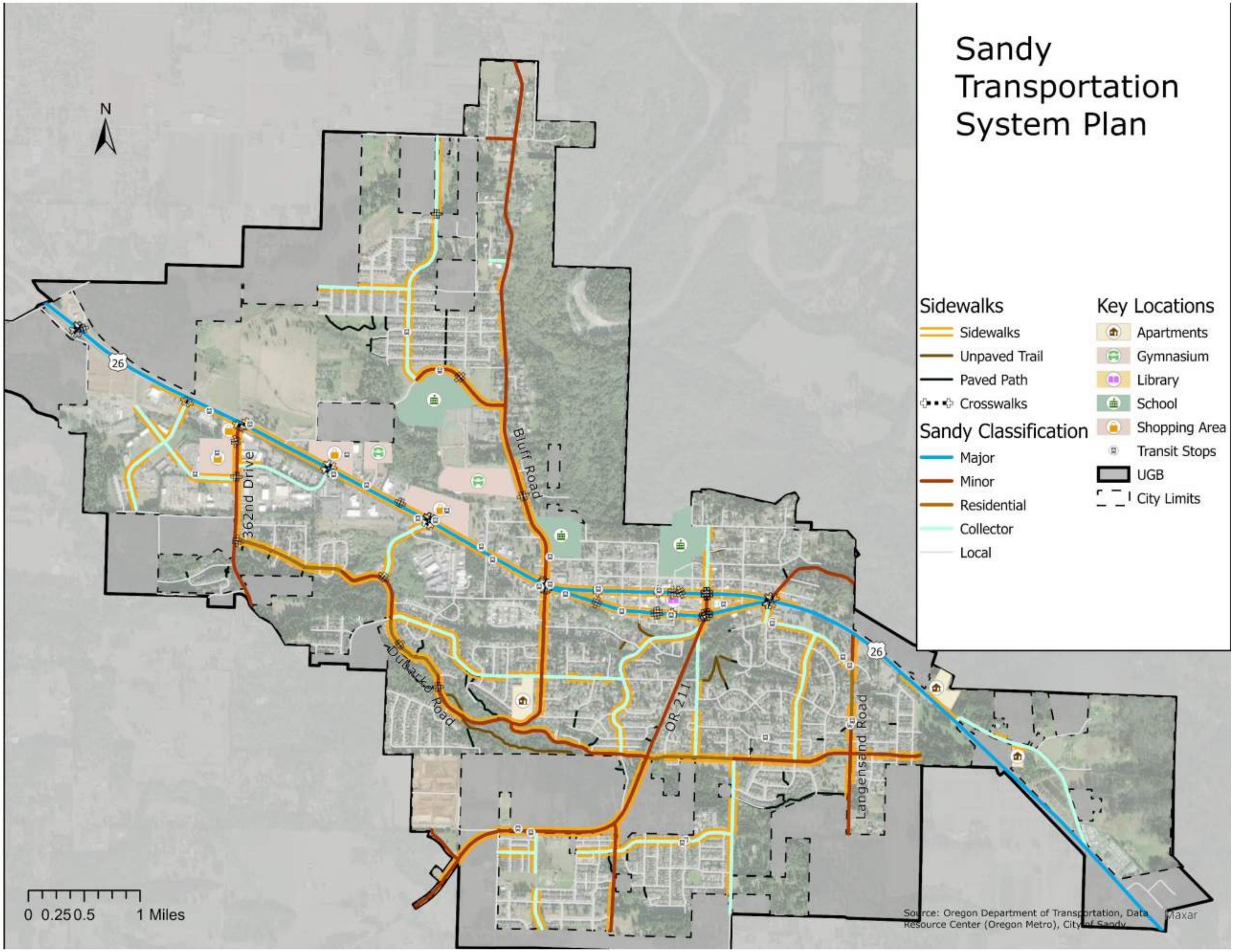
[2] Bicycle and pedestrian system inventory was only completed for roads with a functional classification of collector or higher. Traffic volumes and speeds on local streets are typically conducive to a shared system with motorized and non-motorized traffic.

[3] 2011 Sandy Transportation System Plan, Figure 8, Condition 2B. Highway Design Manual Appendix L, Bicycle and Pedestrian Design Guide, Table 1-2.

FIGURE 1: PEDESTRIAN FACILITIES



Curb Ramps

Many intersections in older parts of the City lack ADA-compliant ramps, which provide important connections between sidewalks, making it easier to cross streets and/or handle the vertical drop at curbs. The presence of curb ramps is fairly consistent at marked crosswalk locations, along US 26, particularly in the central business district, and in the newer neighborhoods in the City.

Non-compliant curb ramps from Kate Schmitz Avenue to Revenue Avenue along US 26 are being replaced through 2022 through an ODOT funded project.

BICYCLE NETWORK

Riding bicycles also plays a key role in the transportation system's ability to support healthy and active lifestyles and provide alternative travel choices to the automobile. While walking tends to be a competitive choice for trips under half a mile, bicycling tends to be suited for longer trips. Bicycle trips can often work well for distances between a half mile and three miles. Sandy's relatively compact size makes biking a great choice for many trips, with local jobs and housing typically in bikeable proximity, however the challenging topography may dissuade some riders. Few of Sandy's commuters currently travel by bicycle[4]. In addition to the work commute trips, bicycle trips are made to and from recreational or shopping areas, schools, or other activity generators. Continuous bicycle connections between all activity generators and arterial/collector roadways are desirable to allow for safe and attractive non-motorized travel options.

The bicycle network in Sandy, shown in Figure 2, is composed of bike lanes, roadway shoulders, shared roadways, and bicycle paths. The characteristics of these facilities are described below.

- **Bike lanes** are portions of the roadway designated specifically for bicycle travel via a striped lane and pavement stencils. Standard width for a bicycle lane is six feet. Bike lanes are most appropriate on arterials and collectors, where high traffic volumes and speeds warrant greater separation of the travel modes.

  In Sandy, significant segments of continuous bicycle lanes exist along US 26, Bluff Road, Bell Street, Jewelberry Avenue, and Dubarko Road. In downtown Sandy, there are narrow parking lanes along US 26 (Proctor Boulevard and Pioneer Boulevard) which result in parked cars partially blocking the bike lane and pushing cyclists into the vehicle lane. These locations are marked in Figure 2.
- **Shoulder bikeways** are paved with striped shoulders wide enough for bicycle travel. Depending on traffic volumes, a paved shoulder between six and eight feet is needed to adequately provide for bicyclists, with a four-foot minimum width in constrained areas. Roadways with shoulders less than four feet are considered shared roadways. Some shoulder bikeways are signed to alert motorists to expect bicycle travel along the roadway. These facilities are typically found in rural areas.

  The bike lane along US 26 in Sandy could be considered a shoulder bikeway west of Champion Way due to the lack of pavement markings.

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[4] US Census Bureau, 2015-2019 American Community Survey

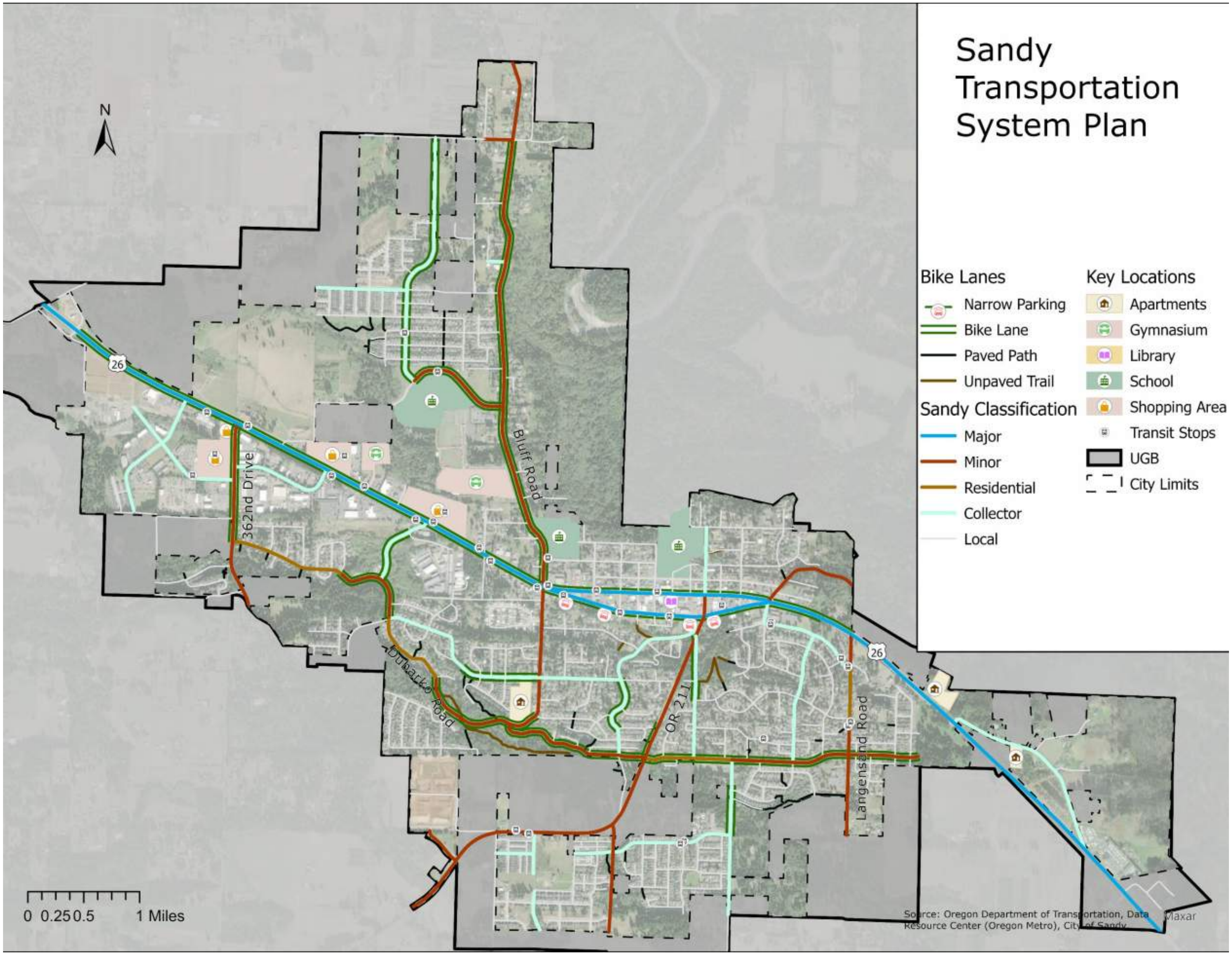
- **Shared roadways** include those on which bicyclists and motorists share the same travel lane. The most suitable roadways for shared bicycle use are those with low speeds (25 mph or less) and low traffic volumes (3,000 vehicles or fewer per day). Shared roadways, often signed as bicycle routes, serve to provide continuity to other bicycle facilities (e.g., bicycle lanes) or can be designated as a preferred route through the community. Common practice is to sign a route with standard Manual on Uniform Traffic Control Devices (MUTCD) green bicycle route signs with directional arrows and/or pavement markings. Shared roadways can have signs that highlight a special route or provide directional information in bicycling minutes or distance.

  Most local roadways in the City are considered shared roadways, but do not have signs or pavement markings.
- **Bicycle Paths** can serve both recreational and transportation needs. They include shared use paths, which allow for citywide pedestrian and bicycle travel, and short path segments providing accessways between disconnected streets or localized recreational biking opportunities. They can be separated or adjacent to the streets right-of-way and provide linear park facilities for bicycle travel.

BICYCLE PARKING

End-of-trip bicycle facilities are a fundamental component of a bicycle network. Lack of safe and secure facilities for either short-term or long-term parking can be an obstacle to promoting bicycle riding. Short-term parking accommodates visitors, customers, and others expecting to depart within two hours. It requires a standard rack, appropriate location and placement, and weather protection. Long-term parking accommodates employees, students, residents, commuters, and others who park for more than two hours. This parking requires a secure, weather-protected and convenient location. Short-term bicycle parking is available throughout Sandy’s central business district and the commercial area to the west of Bluff Road.

FIGURE 2: BICYCLE FACILITIES



TRANSIT NETWORK

The Sandy Transit Master Plan[5] provides a detailed summary of the transit system. Below is a summary of the system from the Plan. The transit network in Sandy is shown in Figure 3.

FIXED BUS ROUTES

Sandy Area Metro (SAM) provides transit service in Sandy via four fixed bus routes including two local shopper routes and two regional routes connecting the City with downtown Gresham and Estacada. Clackamas County operates an additional fixed route service to Mount Hood. The bus routes include:

- Sandy Shoppers (A & B) – Every 60 minutes, afternoons and evenings, Monday through Friday
- Sandy/Gresham Express – Every 30 minutes, Monday through Friday; 60 minutes Saturday and Sunday
- Sandy/Estacada Express – Five trips daily, Monday through Saturday
- Mount Hood Express – Six trips daily (seven in winter), Monday through Sunday

System Characteristics

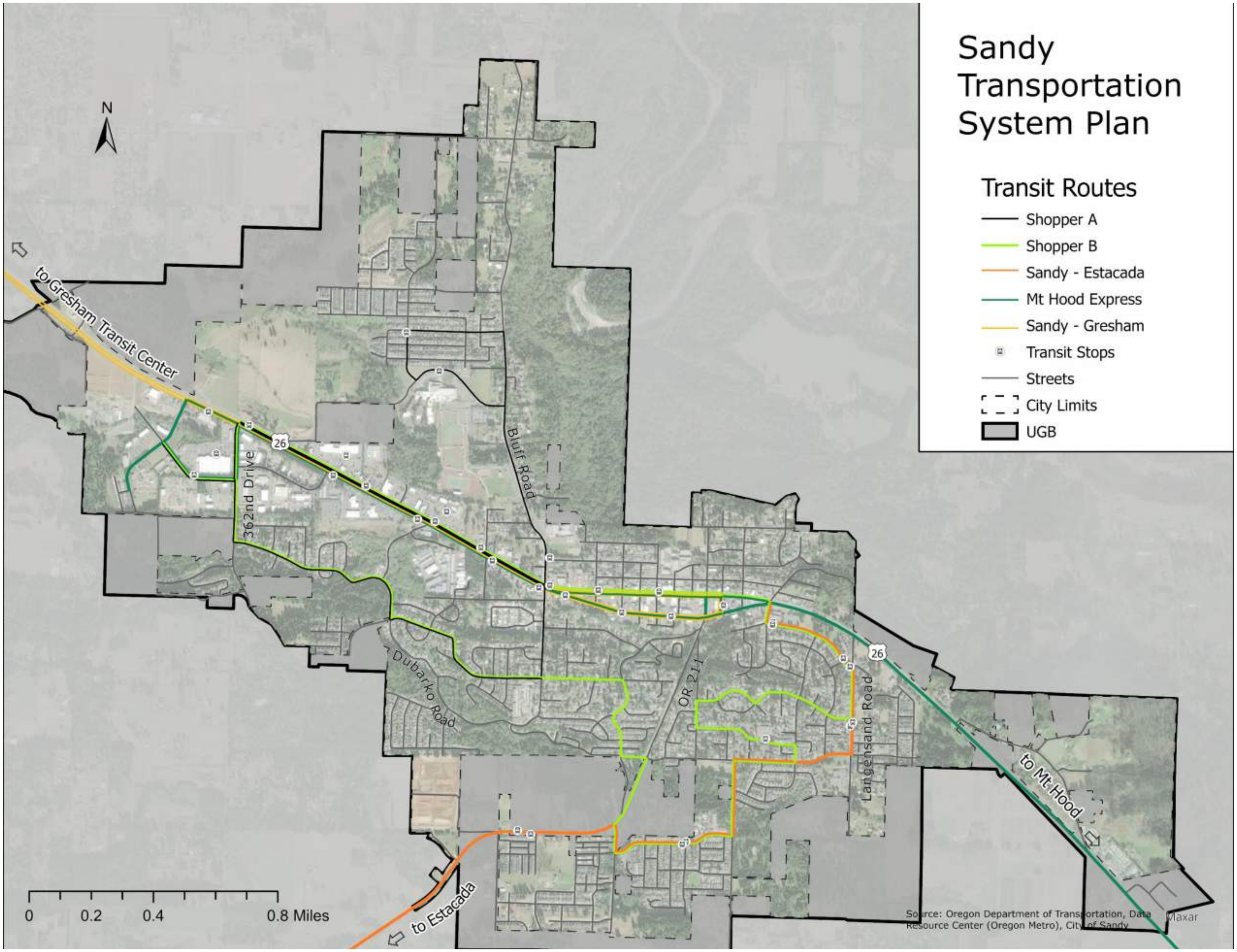
- Transit riders can transfer to TriMet routes at the Gresham Transit Center for access to transit service in the Portland Metro area.
- Sandy Transit is investing in seven new vehicles from 2019 to 2021.
- Bus stops with more than 10 boardings per day should have a shelter and a bench per Sandy Transit's standard. The bus stops in Sandy are currently meeting that standard.
  - The SAM stop at Gresham Transit Center is the highest ridership stop in Sandy Transit's system.
- There is poor connectivity between the regional fixed routes and the local shopper routes. Pedestrian improvements and a new shopper shuttle stop at Proctor Boulevard and Hoffman Avenue are proposed in the Transit Master Plan to remedy this issue.

DIAL-A-RIDE AND PARATRANSIT SERVICE

Sandy Transit's dial-a-ride and paratransit service provides public transportation to persons with disabilities who are unable to use regular fixed route buses. While federal guidelines require that service be provided within 3/4 mile of fixed route service, STAR service is provided for any trip that starts and ends within the City of Sandy. Current ridership of STAR service is approaching capacity. The Transit Master Plan recommends reviewing the operating practices of the STAR service rather than immediately adding another bus and driver to meet future increases in demand.

[5] Transit Master Plan (2020), City of Sandy

FIGURE 3: TRANSIT ROUTES



MOTOR VEHICLE NETWORK

The motor vehicle network in the City of Sandy is constructed around US 26 which provides access to all the various neighborhoods of the city. A majority of the households in Sandy are south of US 26 where there is good connectivity between areas provided by the minor arterials and collectors that intersect with Dubarko Road, the main east-west arterial. The newer residential areas west of Bluff Road have good local street connectivity but are relatively isolated from the rest of the city. Bluff Road is the only north-south street in the city that connects the north and south neighborhoods.

Vehicle classifications for streets helps support the movement of vehicles. It is recommended to determine the level of mobility, access, and use for vehicles. The vehicle classification system recognizes that individual streets do not act independently, but instead form a network that serves travel needs on a regional, citywide, neighborhood, and local level. From highest to lowest intended use, the recommended classifications are Major Arterial, Minor Arterial, Residential Arterial, Collector, and Local Streets. Streets with higher intended usage generally limit access to adjacent property in favor of more efficient motor vehicle traffic movement (i.e., mobility). Local roadways with lower intended usage have more driveway access and intersections, and generally accommodate shorter trips to nearby destinations.

FUNCTIONAL CLASSIFICATION

Major Arterial

Major arterials are typically three to five-lane highways that operate as two-way streets or as a one-way couplet. These roads are intended to handle high volumes of traffic, typically 16,000 ADT (Average Daily Traffic) or more. Major arterials provide greater regional mobility, are managed to favor through traffic capacity and safety over direct access and should generally be spaced approximately one mile apart. Private driveway access, on-street parking, and traffic calming measures are typically discouraged along major arterial routes and the provision of bike lanes or shoulders is required.

Minor Arterial

Minor arterials are high-volume, intra-city streets providing connectivity and parallel features and should generally be spaced approximately one mile apart. These roads have a typical capacity between 8,000 and 16,000 ADT. Minor arterials are generally the most critical classification for circulation in the urban areas of Sandy and are intended to serve longer local trips. Private driveway access is discouraged where access to facilities of lower classification is available and traffic calming measures and on-street parking should be avoided. The provision of bike lanes is required.

Residential Minor Arterial

Residential minor arterials are a hybrid between minor arterial and collector type streets that allows for moderate to high traffic volumes on streets where over 90% of the fronting lots are residential. These roads have similar typical capacity to minor arterials, 6,000 to 10,000 ADT. They are intended to provide some relief to the strained arterial system while ensuring a safe residential environment. Residential minor arterials may include on-street parking and traffic calming measures may be applied. Direct access to properties is managed in a manner similar to collector streets. The provision of bike lanes is required.

Collector

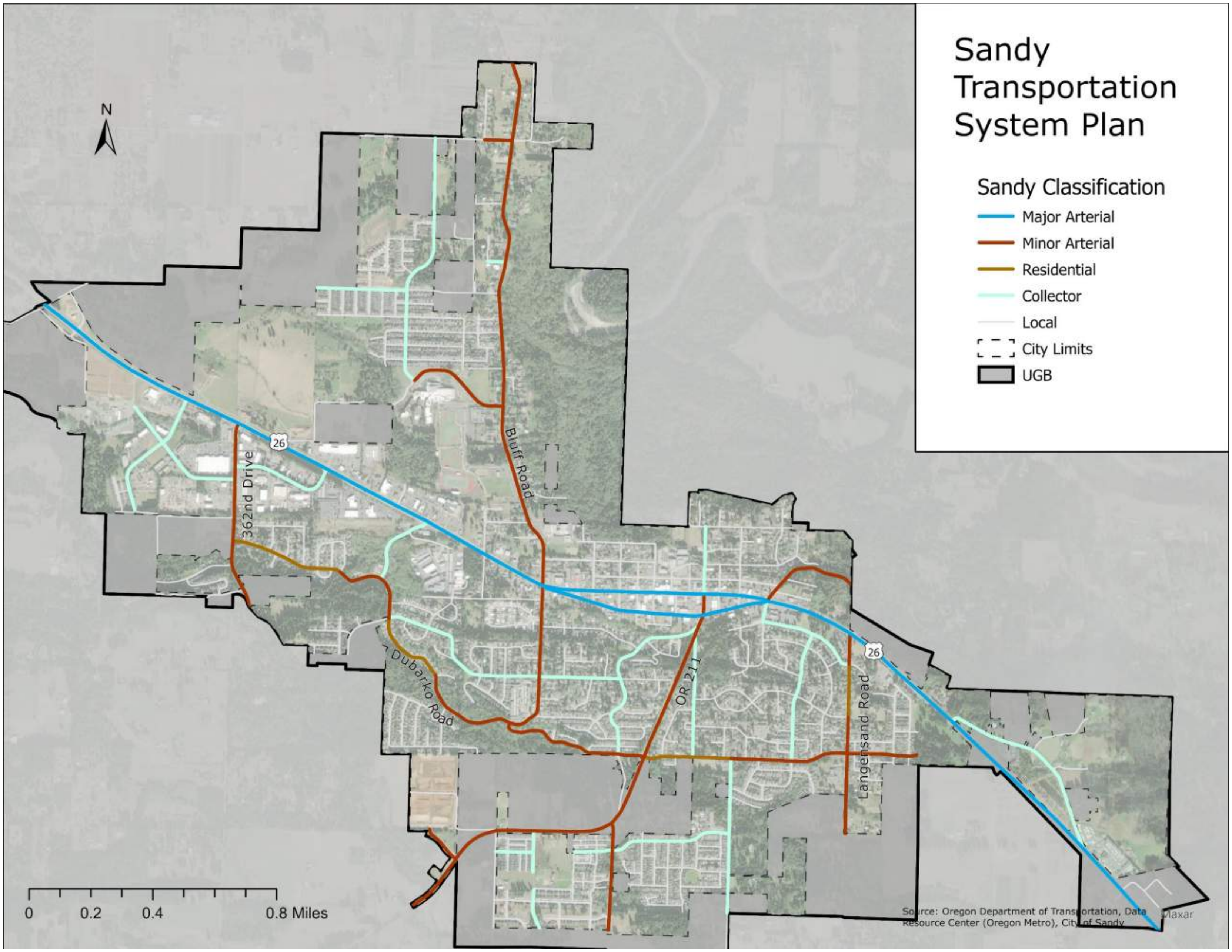
Collector streets provide both access and circulation within and between residential and commercial areas. These roads have a typical capacity between 1,000 and 6,000 ADT. Collectors differ from arterials in that they provide more of a citywide circulation function, do not require as extensive control of access (compared to arterials), and penetrate residential neighborhoods, distributing trips from the local street system to minor and major arterials. Collectors may provide on-street parking, may incorporate traffic calming measures, and should be spaced approximately a half mile apart. Bike lanes are required on collectors.

Local Street

Local streets have the sole function of providing immediate access to adjacent land. These streets have a typical capacity less than 1,000 ADT. Service to through traffic movements on local streets is deliberately discouraged by design. All other City streets in the City of Sandy that are not designated as arterial streets or collector streets are considered to be local streets. Local streets should allow on-street parking and may incorporate traffic calming measures. Bike lanes are not required.

The function classification system for the City of Sandy is shown in Figure 4.

FIGURE 4: FUNCTIONAL CLASSIFICATION



FREIGHT NETWORK

Efficient truck movement plays a vital role in the economical movement of raw materials and finished products. The designation of through truck routes provides for this efficient movement, while maintaining neighborhood livability, public safety, and minimizing maintenance costs of the roadway system. Through the City of Sandy, US 26 is an Oregon Freight Route and Reduction Review Route, meaning that any changes to the vehicle-carrying capacity requires a review. Vehicle-carrying capacity is defined as "a permanent reduction in the horizontal or vertical clearance of a highway section, by a permanent physical obstruction to motor vehicles located on useable right-of-way subject to Commission jurisdiction."

RAIL NETWORK

There are no existing freight or passenger rail facilities in Sandy.

AIR NETWORK

There are no airports within the City of Sandy. Regional and international air service for passengers and freight is provided via Portland International Airport (PDX). The airport is located approximately 25 miles (around 35 minutes) to the northwest of Sandy and is connected via US 26, I-84, and I-205.

WATERWAY NETWORK

Sandy is bordered by the Sandy River on the north side of the city. This waterway only serves recreational boating and is not navigable for marine freight facilities.

SYSTEM PERFORMANCE

EXISTING MOTOR VEHICLE OPERATIONS

Motor vehicle operations were evaluated in Synchro, a Highway Capacity Manual analysis tool, at 8 signalized intersections, 6 two-way-stop controlled (TWSC) intersections, and 1 all-way-stop controlled (AWSC) intersection. Intersection turning movement counts were collected in October 2020. The ODOT traffic volume patterns report that monitors the impact of COVID-19 indicated that traffic volumes on US 26 were within 5 percent of 2019 volumes for the week that counts were collected.

The turning movement counts were future adjusted to estimate the 30th highest hour volume. The nearest automatic traffic recorder indicated that seasonal peak volumes were typically 6.6 percent higher compared to October for the 5-year period from 2015 to 2019.

Two intersections exceed mobility targets: Orient Drive & US 26 and 362nd Drive & US 26. The intersection at Orient Drive serves high eastbound through traffic volumes and high southbound left traffic volumes that typically extend their green phases to the maximum length. This intersection is just outside the urban growth boundary, resulting in a lower mobility target than the other signalized intersections along the US 26 corridor. The intersection at 362nd Drive serves a high eastbound through volume that is approaching the available capacity of the existing timing and a high northbound left volume. Existing intersection operations are shown in Table 2 below.

TABLE 2: EXISTING INTERSECTION OPERATIONS

	CONTROL TYPE	MOBILITY TARGET	LEVEL OF SERVICE	DELAY (SECONDS)	V/C RATIO
ORIENT DR/US 26	Signal	0.80	C	33	0.90
362ND DR/US 26	Signal	0.80	C	28	0.83
INDUSTRIAL WAY/ US 26	Signal[a]	0.80	C	28	0.72
362ND DR/INDUSTRIAL WAY (NORTH)	TWSC[b]	D	A [C]	8 [18]	0.24
362ND DR/INDUSTRIAL WAY (SOUTH)	AWSC	D	D	32	0.70
RUBEN LN/US 26	Signal[a]	0.80	C	27	0.73
BLUFF RD/US 26	Signal	0.85	D	36	0.79
BLUFF RD/BELL ST	TWSC	D	A [B]	8 [15]	0.08
MEINIG AVE (HWY 211)/PIONEER BLVD (US 26)	Signal	0.90	C	29	0.68
MEINIG AVE (HWY 211)/PROCTOR BLVD (US 26)	Signal	0.90	C	33	0.71
HWY 211/ DUBARKO RD	TWSC	0.90	A [D]	8 [29]	0.29
HWY 211/BORNSTEDT RD	TWSC	0.90	A [C]	9 [17]	0.36
TEN EYCK RD/US 26	Signal	0.85	C	31	0.58
LANGENSAND RD/US 26	TWSC	0.80	B [F]	13 [63]	0.30
VISTA LOOP DR W/US 26	TWSC	0.80	B [C]	10 [19]	0.09
VISTA LOOP DR E/US 26	TWSC	0.80	A [E]	10 [37]	0.05

a. This signal reported using HCM 2000 due to non-standard characteristics

b. Two-way Stop Controlled (TWSC) measures are reported as worst major [worst minor] approach for LOS and Delay and as worst movement for V/C

SAFETY

The most recent five years of available data, 2014 to 2018, was analyzed to evaluate collisions with fatalities or serious injuries and systemic and reoccurring safety issues within the City of Sandy. The safety data is summarized in Figure 5.

There were three sites in the top 10th percentile of the Safety Priority Index System (SPIS) locations for the most recent analysis. The Safety Priority Index System provides a ranking of locations of safety hotspots on roadways throughout Oregon. The three SPIS sites in the City of Sandy are:

- US 26 west of Orient Drive
- US 26 west of 362nd Drive
- US 26 west of Ruben Lane

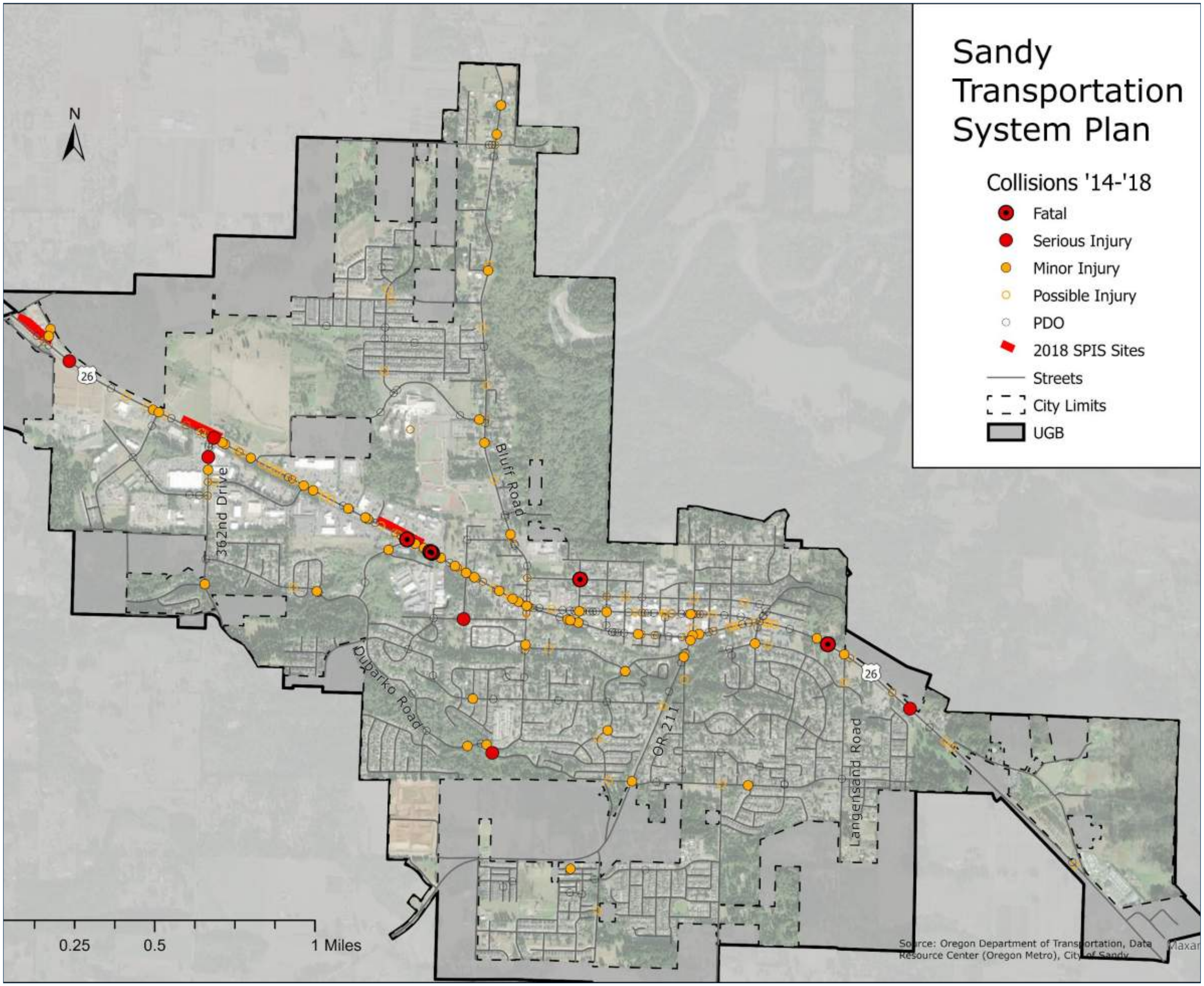
COLLISIONS BY SEVERITY

- **5 collisions with a fatality**
  - 4 of these collisions occurred along US 26.
  - 4 involved a pedestrian, alcohol was involved, and all occurred during low light conditions.
    - 2 pedestrian fatalities occurred near the intersection of US 26 & Ruben Lane (SPIS site).
      - 1 collision was caused by the pedestrian improperly crossing outside of the intersection, east of the intersection.
      - 1 collision was caused by the pedestrian disregarding the traffic signal and improperly crossing.
    - 1 pedestrian fatality occurred near the intersection of US 26 and Langensand Road, the driver was impaired.
    - 1 pedestrian fatality was speed related and occurred at the local intersection of Beers Avenue and Hood Street.
  - The 1 non-pedestrian fatality occurred near the intersection of US 26 and Ruben Lane (SPIS site). The driver veered left of the centerline and struck a tow truck.
- **8 collisions with a serious injury**
  - 5 of these collisions occurred along US 26.
    - A pedestrian, illegally in the road, that was not visible to the driver was stuck near the intersection of SE Orient Drive (SPIS site).
    - 3 collisions were caused by a failure to yield or improper turn.
      - A westbound left turning vehicle was struck by an eastbound though vehicle at the intersection of US 26 and 362nd Drive (SPIS site).
      - An eastbound left turning vehicle was struck by a westbound through vehicle at the intersection of US 26 and Ruben Lane (SPIS site).
      - A southbound left turning vehicle was struck by a northbound through vehicle at the intersection with Ruben Lane (SPIS site).
    - 1 collision occurred near the intersection of Langensand Road when a vehicle struck a parked vehicle at dawn.

- 1 collision occurred when a vehicle turning into the driveway that accesses Fred Meyer was struck by a vehicle traveling southbound on 362nd Drive.
- A southbound left turning vehicle was struck by a speeding westbound vehicle at the intersection of Sunset Street and University Avenue.
- A driver on Dubarko Road was careless, departed the road, and struck a fixed object near Bluff Road in wet conditions.

- **82 collisions with a minor injury and 210 collisions with a possible injury**
  - 148 were rear end collisions.
  - 70 were turning collisions.
  - 23 were collisions with a fixed object.
  - 169 occurred along US 26.
  - 27 occurred along Bluff Road.
  - 23 occurred along Dubarko Road.
  - 146 were intersection related.
    - 25 occurred at US 26 and 362nd Drive.
    - 18 occurred at HWY 211 and Dubarko Road.
    - 12 occurred at US 26 and Ruben Lane.
- **281 collisions with no injury, property damage only**
  - US 26 – 67 collisions.
  - 362nd – 22 collisions.
  - Bluff Road – 17 collisions.
  - Ruben Lane – 13 collisions.
  - 104 of these were rear end collisions.
- **20 collisions involving a pedestrian and 4 collisions involving a bicycle**

FIGURE 5: CITY OF SANDY SAFETY – 2014 TO 2018



CRITICAL CRASH RATE

The crash data above provides some information about locations where crashes are reoccurring issues but is not adjusted to reflect the volume of traffic using these facilities. The critical crash rate calculation adjusts the number of crashes at an intersection to a rate per million entering vehicles. This rate facilitates an easy comparison with similar facilities within the study area, the statewide critical rate, and the 90th percentile rate from ODOT's Analysis Procedures Manual (APM). There are two study intersections that were flagged in this analysis.

- US 26 and 362nd Drive – this intersection's crash rate exceeds the critical rate of the reference population sample and the statewide rate for four-leg, signalized intersections.
- HWY 211 and Dubarko Road – this intersection does not have a valid reference population to compare against because it is the only four-leg, stop controlled intersection in the population. However, the rate at this intersection significantly exceeds the statewide rate and the 90th percentile rate from the APM.

CRASH ANALYSIS SUMMARY

The analysis above revealed the TSP solutions analysis should focus on the following four locations.

- US 26 and 362nd Drive – This is a critical crash rate and SPIS location, most collisions at this intersection are rear end collisions caused by a failure to avoid a stopped vehicle and turning collisions caused by a driver not yielding.
- US 26 and Ruben Lane – This is a SPIS location and the location of three fatal crashes in the five years from 2014 to 2018. Most collisions at this intersection are turning collisions caused by a driver not yielding and rear end collisions caused by a failure to avoid a stopped vehicle or following too close.
- US 26 and Orient Drive – This is a SPIS location and the location of a serious pedestrian injury. Most collisions at this intersection are rear end collisions caused by a failure to avoid a stopped vehicle.
- HWY 211 and Dubarko Road – This is a critical crash rate location. Most collisions at this location are turning collisions caused by a driver not yielding.

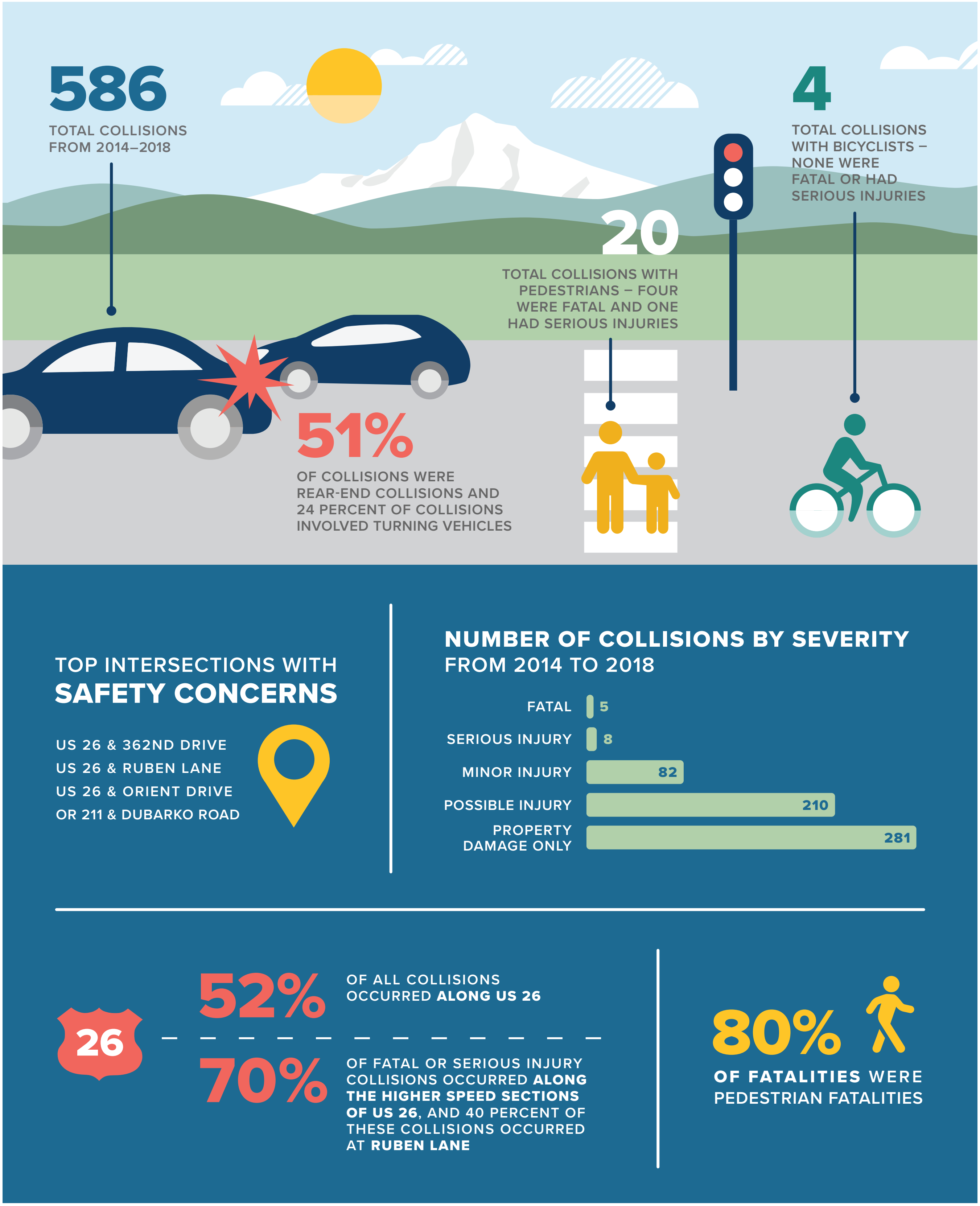


FIGURE 6. SAFETY STATISTICS FROM 2014 TO 2018

EXISTING CONDITIONS SUMMARY

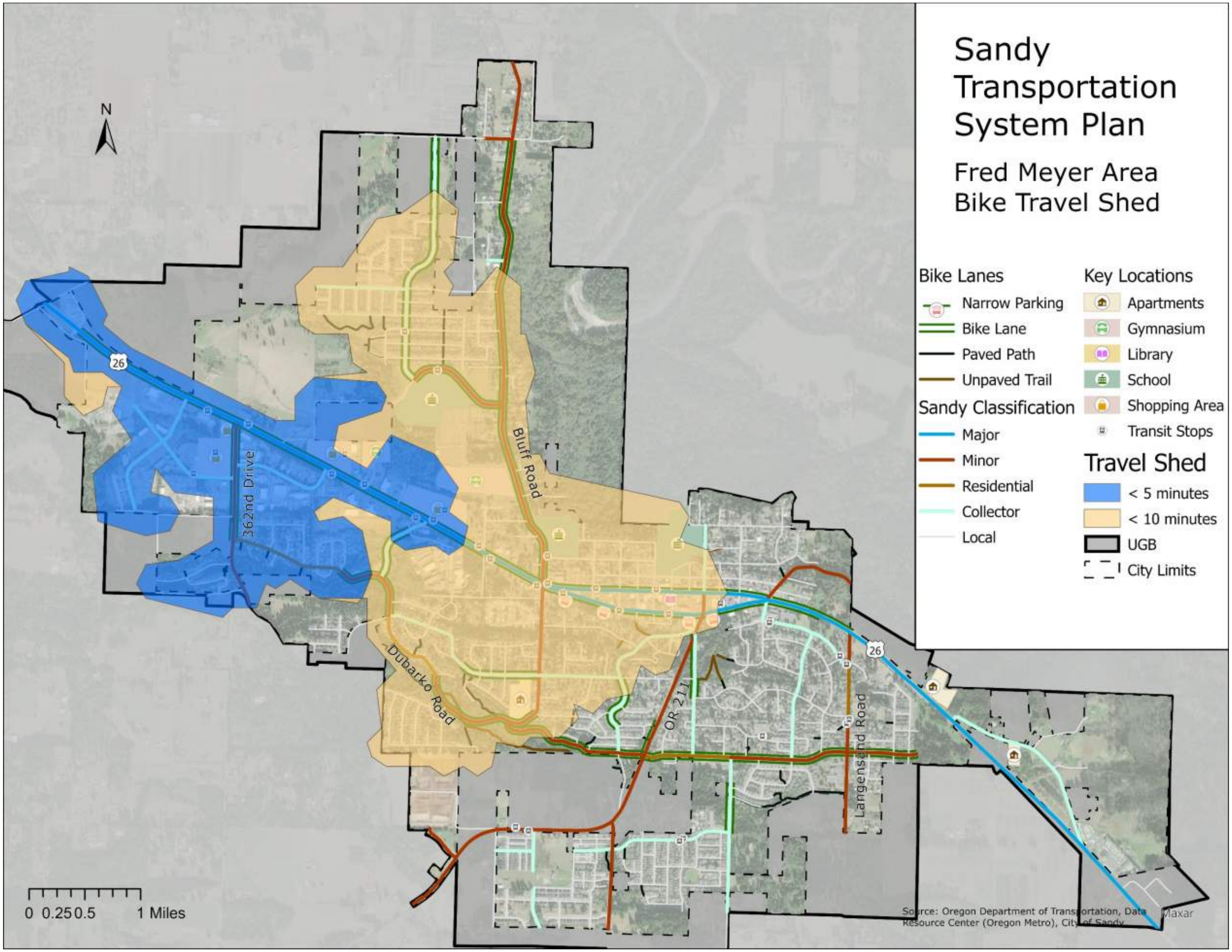
- **Pedestrian Network**
  - Sidewalk gaps along Sandy Heights Street reflect poor east-west connections for the neighborhood south of US 26. Infill of these gaps will improve the quality of the pedestrian network.
  - Sidewalk gaps along US 26 east of SE Ten Eyck Road isolate pedestrians in the Sandy Vista Apartments and Grand Fir Apartments, sidewalk connecting the apartments with downtown Sandy is needed.
- **Bicycle Network**
  - Improved north-south and east-west connections are needed in the neighborhood south of US 26. Important connections without bike lanes or with gaps include Bluff Road, HWY 211, Meinig Road, Sandy Heights Street, and Tupper Road.
  - Bicycle Network gaps along US 26 east of SE Ten Eyck Road isolate people who bike from or to the Sandy Vista Apartments and Grand Fir Apartments. Bike lanes connecting the apartments with downtown Sandy are needed.
- **Transit Network**
  - Improved connections between the regional fixed route service and local fixed route service are needed to provide a better "last mile" connection for transit trips that start or end in Sandy.
  - The dial-a-ride/paratransit STAR system is approaching capacity and operational changes or additional vehicles will be needed to address the limits of the existing system.
- **Motor Vehicle Network**
  - Four intersections exceed mobility targets or have reoccurring safety issues.
    - US 26 and Orient Drive – safety and mobility targets.
    - US 26 and 362nd Drive – safety and mobility targets.
    - US 26 and Ruben Lane – safety.
    - HWY 211 and Dubarko Road – safety.

The issues identified above will inform the development of solutions for the Transportation System Plan.

APPENDIX

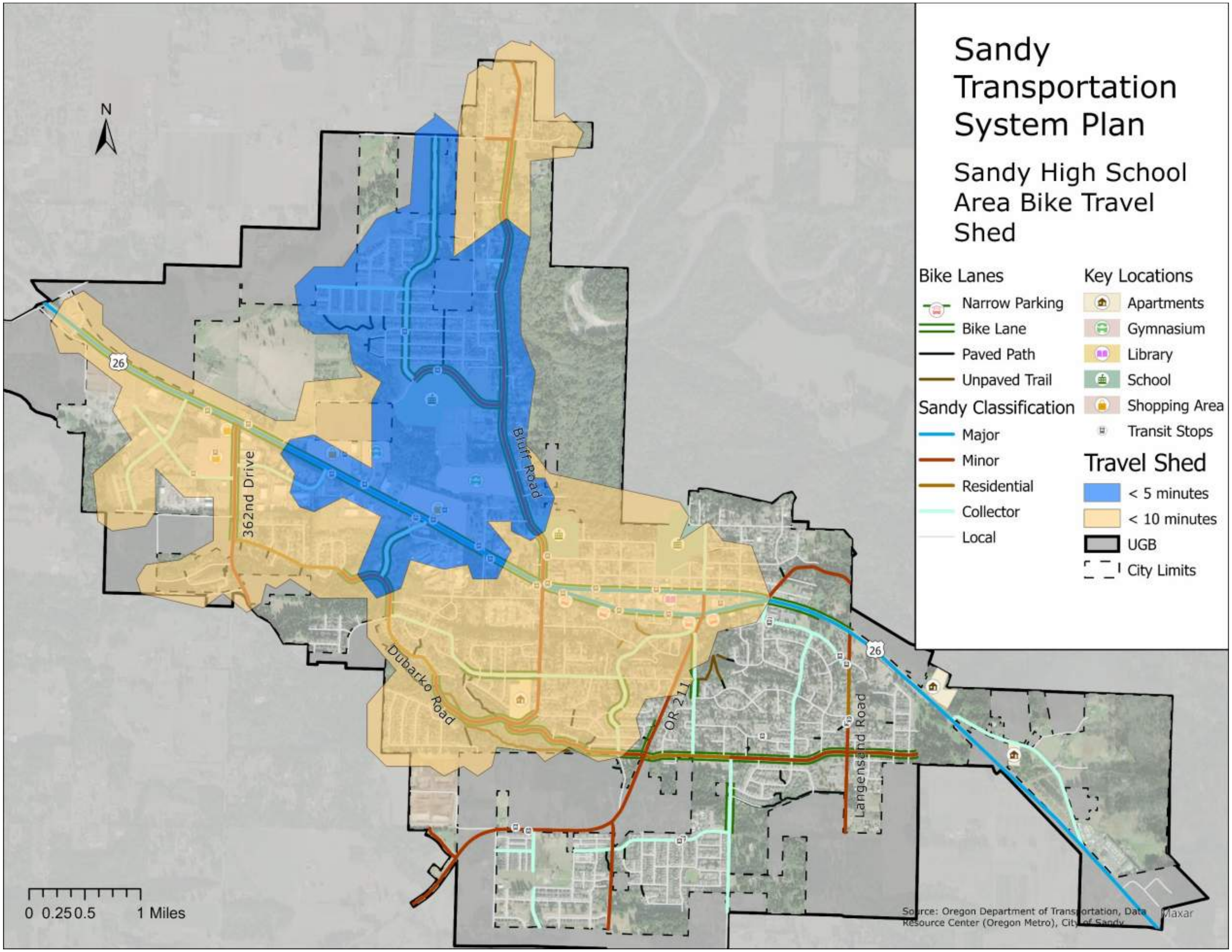
CONTENTS

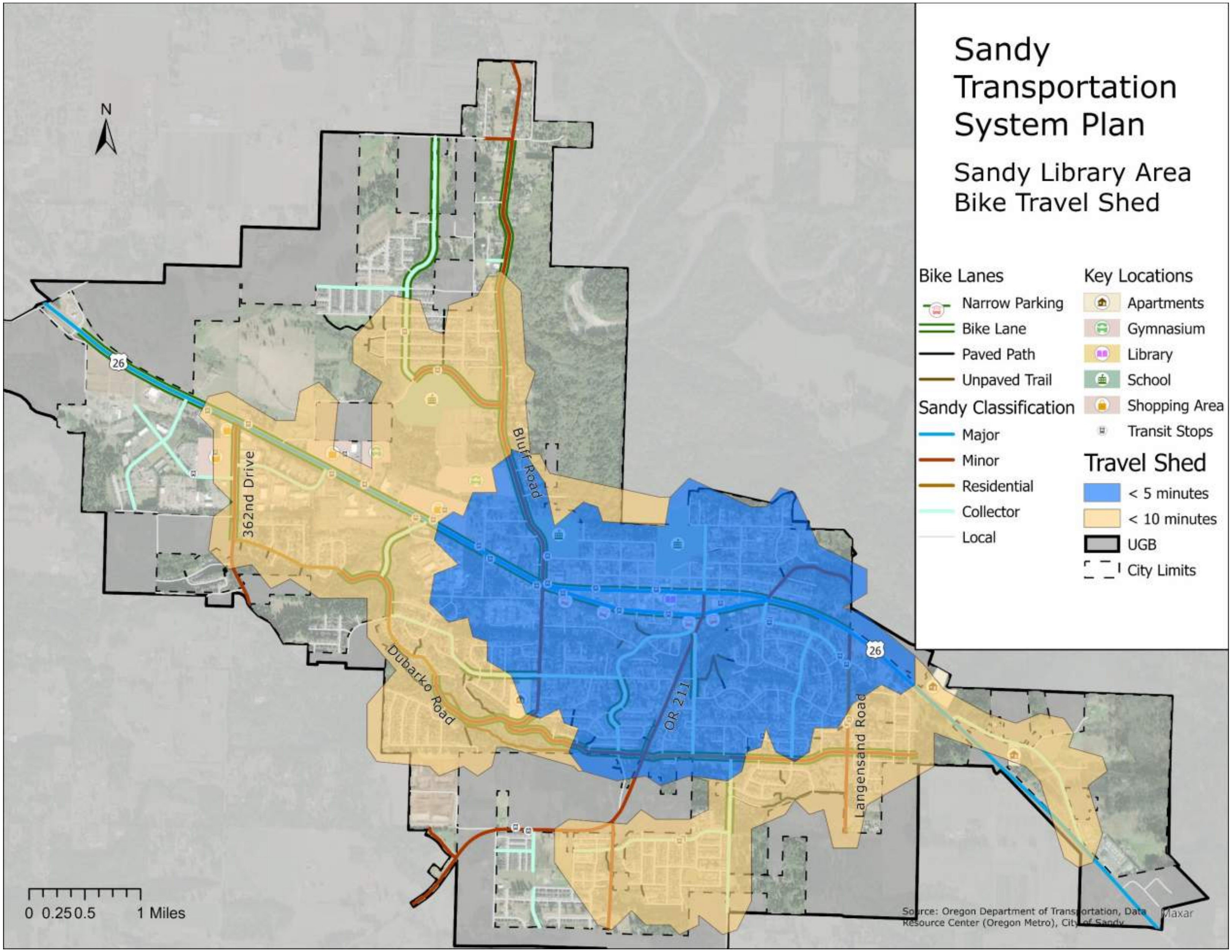
SECTION 1. BICYCLE TRAVEL SHEDS



Sandy Transportation System Plan
Fred Meyer Area Bike Travel Shed
Bike Lanes
Narrow Parking
Bike Lane
Paved Path
Unpaved Trail
Sandy Classification
Major
Minor
Residential
Collector
Local
Key Locations
Apartments
Gymnasium
Library
School
Shopping Area
Transit Stops
Travel Shed
< 5 minutes
< 10 minutes
UGB
City Limits
N
26
362nd Drive
Bluff Road
Dubarko Road
OR 211
Langensand Road
0 0.25 0.5 1 Miles

DKS


Sandy Transportation System Plan
Sandy High School Area Bike Travel Shed
Bike Lanes
Narrow Parking
Bike Lane
Paved Path
Unpaved Trail
Sandy Classification
Major
Minor
Residential
Collector
Local
Key Locations
Apartments
Gymnasium
Library
School
Shopping Area
Transit Stops
Travel Shed
< 5 minutes
< 10 minutes
UGB
City Limits
N
0 0.25 0.5 1 Miles
362nd Drive
Bluff Road
Dubarko Road
OR 211
Langensand Road
26
Source: Oregon Department of Transportation, Data Resource Center (Oregon Metro), City of Sandy
Maxar



Sandy Transportation System Plan
Sandy Library Area Bike Travel Shed
Bike Lanes
Narrow Parking
Bike Lane
Paved Path
Unpaved Trail
Sandy Classification
Major
Minor
Residential
Collector
Local
Key Locations
Apartments
Gymnasium
Library
School
Shopping Area
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Travel Shed
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City Limits
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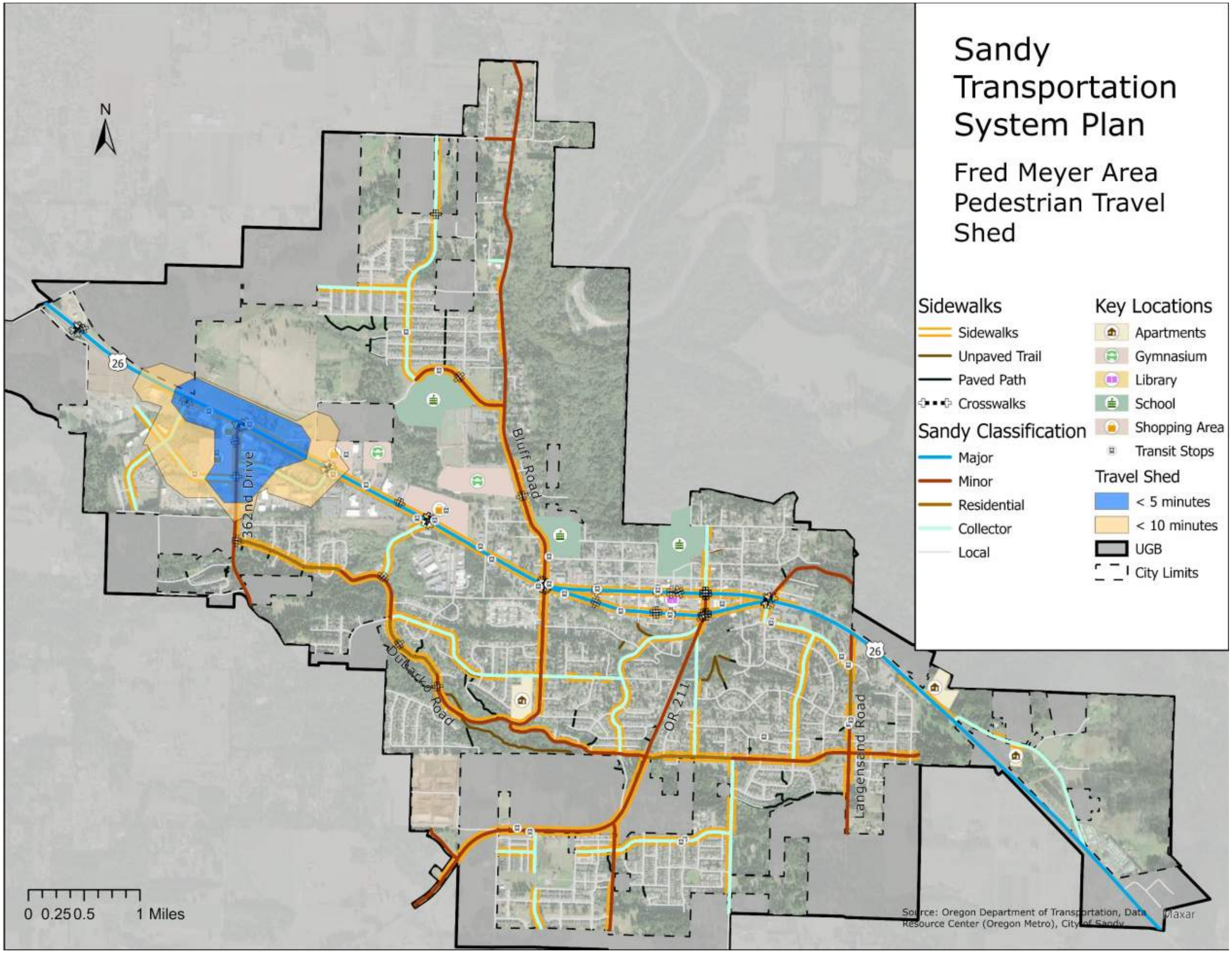
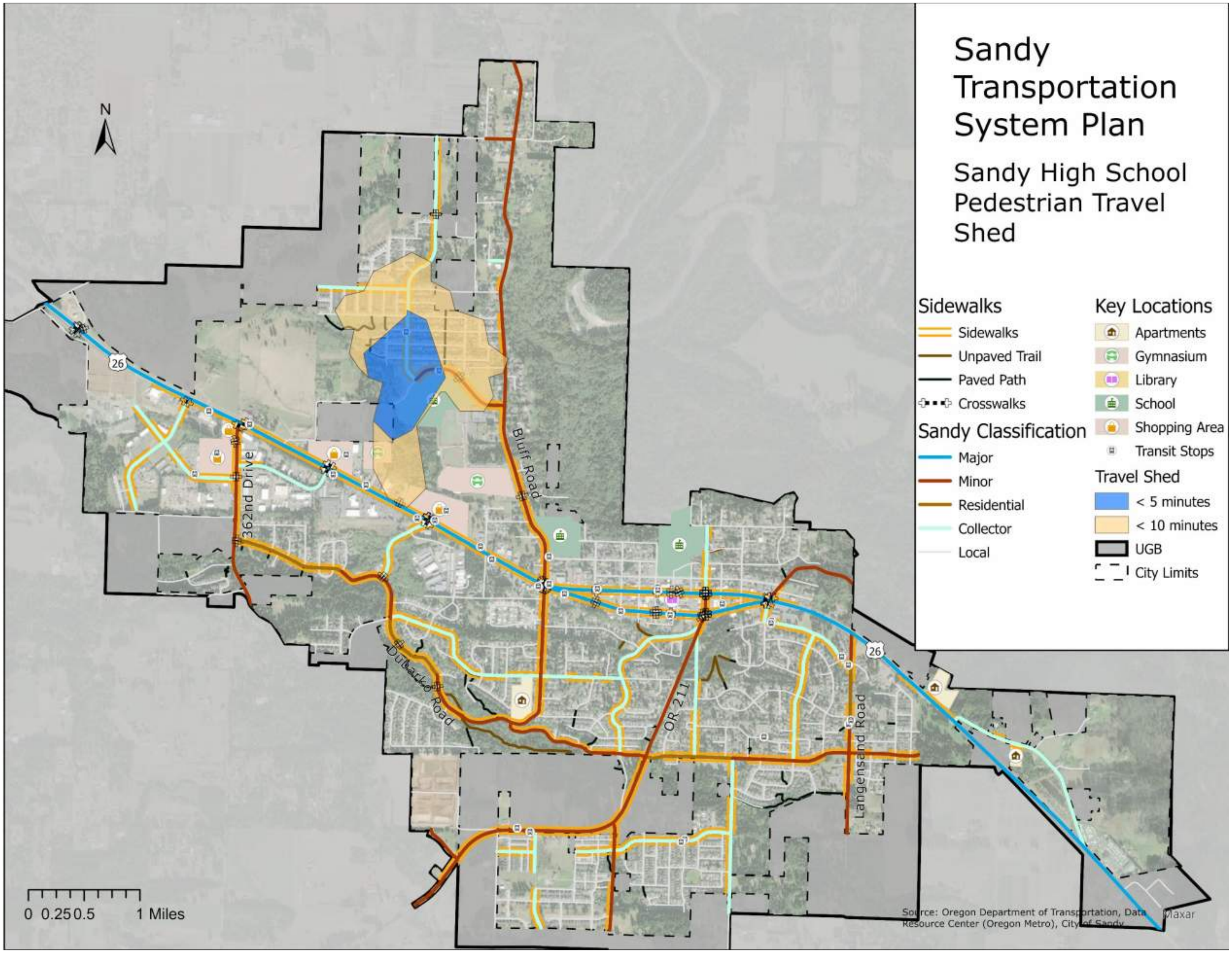
362nd Drive
Bluff Road
Dubarko Road
OR 211
Langensand Road
26
0 0.25 0.5 1 Miles
Source: Oregon Department of Transportation, Data Resource Center (Oregon Metro), City of Sandy
Maxar

DKS

SECTION 2. PEDESTRIAN TRAVEL SHEDS


Sandy Transportation System Plan
Fred Meyer Area Pedestrian Travel Shed
Sidewalks
Sidewalks
Unpaved Trail
Paved Path
Crosswalks
Sandy Classification
Major
Minor
Residential
Collector
Local
Key Locations
Apartments
Gymnasium
Library
School
Shopping Area
Transit Stops
Travel Shed
< 5 minutes
< 10 minutes
UGB
City Limits
N
26
362nd Drive
Bluff Road
Dubarko Road
OR 211
Langensand Road
0 0.25 0.5 1 Miles
Source: Oregon Department of Transportation, Data Resource Center (Oregon Metro), City of Sandy
Maxar



Sandy Transportation System Plan
Sandy High School Pedestrian Travel Shed
Sidewalks
Sidewalks
Unpaved Trail
Paved Path
Crosswalks
Sandy Classification
Major
Minor
Residential
Collector
Local
Key Locations
Apartments
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School
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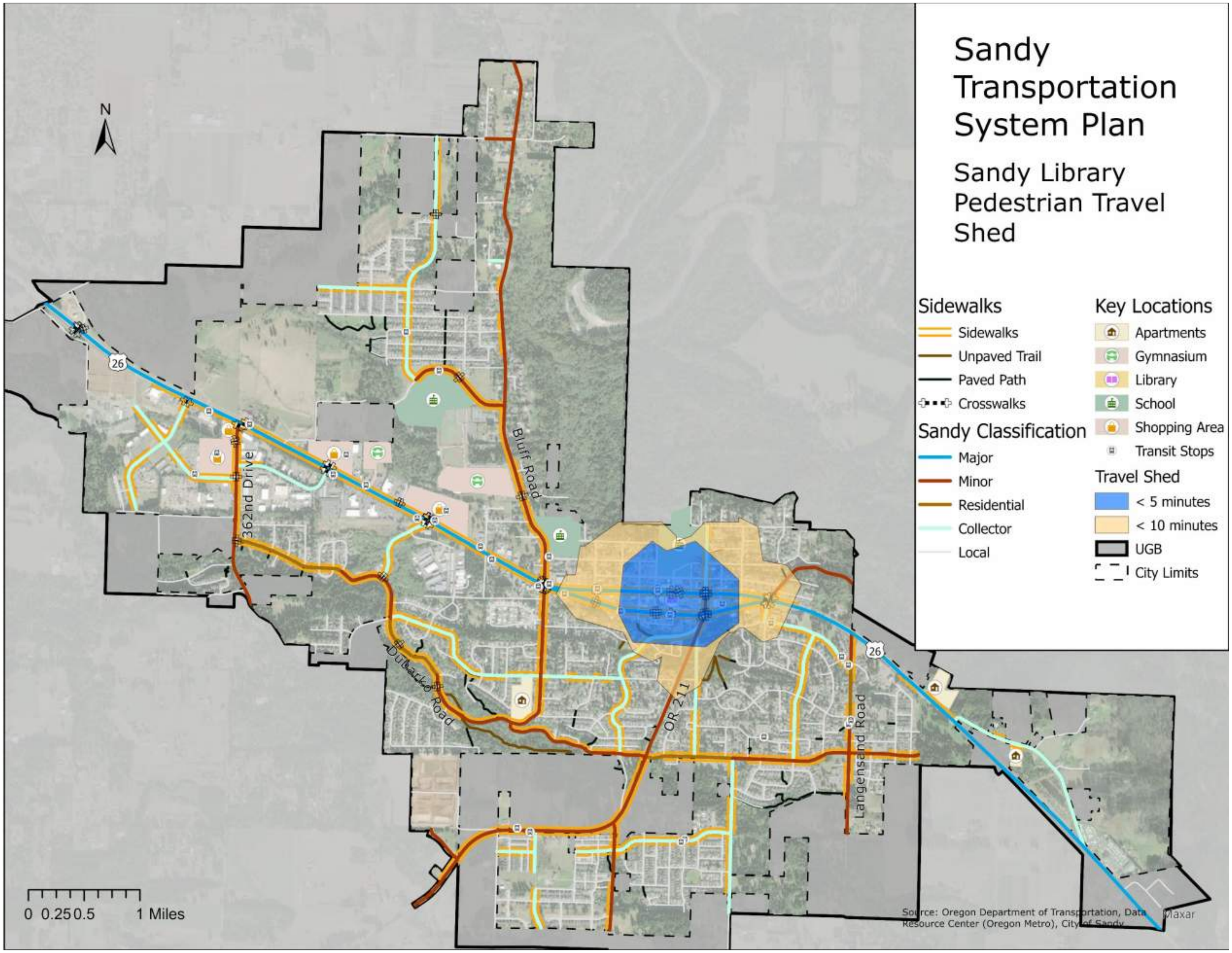
Bluff Road
Dubarko Road
OR 211
Langensand Road
0 0.25 0.5 1 Miles
Source: Oregon Department of Transportation, Data Resource Center (Oregon Metro), City of Sandy, Maxar

DKS


Sandy Transportation System Plan
Sandy Library Pedestrian Travel Shed
Sidewalks
Sidewalks
Unpaved Trail
Paved Path
Crosswalks
Sandy Classification
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362nd Drive
Bluff Road
Dubarko Road
OR 211
Langensand Road
0 0.25 0.5 1 Miles
Source: Oregon Department of Transportation, Data Resource Center (Oregon Metro), City of Sandy
Maxar

SECTION 3. TRAFFIC PERFORMANCE REPORTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	1790	5	5	1200	185	5	5	5	230	5	10
Future Volume (veh/h)	15	1790	5	5	1200	185	5	5	5	230	5	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	16	1946	5	5	1304	0	5	5	5	250	5	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	78	1940	865	77	1910		13	13	13	295	6	13
Arrive On Green	0.05	0.58	0.58	0.05	0.58	0.00	0.03	0.03	0.03	0.19	0.19	0.19
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	496	496	496	1579	32	69
Grp Volume(v), veh/h	16	1946	5	5	1304	0	15	0	0	266	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1489	0	0	1680	0	0
Q Serve(g_s), s	0.9	56.0	0.1	0.3	26.7	0.0	1.0	0.0	0.0	14.9	0.0	0.0
Cycle Q Clear(g_c), s	0.9	56.0	0.1	0.3	26.7	0.0	1.0	0.0	0.0	14.9	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.33		0.33	0.94		0.04
Lane Grp Cap(c), veh/h	78	1940	865	77	1910		38	0	0	314	0	0
V/C Ratio(X)	0.20	1.00	0.01	0.07	0.68		0.39	0.00	0.00	0.85	0.00	0.00
Avail Cap(c_a), veh/h	191	1940	865	188	1910		169	0	0	363	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	44.6	20.6	8.8	44.3	14.4	0.0	46.4	0.0	0.0	38.2	0.0	0.0
Incr Delay (d2), s/veh	0.8	21.1	0.0	0.2	1.3	0.0	2.4	0.0	0.0	15.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	22.7	0.0	0.1	8.3	0.0	0.4	0.0	0.0	7.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	45.4	41.7	8.8	44.5	15.7	0.0	48.8	0.0	0.0	53.2	0.0	0.0
LnGrp LOS	D	F	A	D	B		D	A	A	D	A	A
Approach Vol, veh/h		1967			1309	A		15			266	
Approach Delay, s/veh		41.7			15.8			48.8			53.2	
Approach LOS		D			B			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.5	60.0		22.2	8.5	60.0		6.5
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5
Max Green Setting (Gmax), s	10.5	53.0		20.0	10.5	53.0		10.5
Max Q Clear Time (g_c+I1), s	2.9	28.7		16.9	2.3	58.0		3.0
Green Ext Time (p_c), s	0.0	13.6		0.3	0.0	0.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	33.0
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1415	340	265	1115	320	305
Future Volume (veh/h)	1415	340	265	1115	320	305
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1772	1772	1744	1744	1786	1786
Adj Flow Rate, veh/h	1505	362	282	1186	340	324
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	4	4	1	1
Cap, veh/h	1727	770	423	2688	431	578
Arrive On Green	0.51	0.51	0.25	0.81	0.13	0.13
Sat Flow, veh/h	3455	1502	1661	3400	3300	1514
Grp Volume(v), veh/h	1505	362	282	1186	340	324
Grp Sat Flow(s),veh/h/ln	1683	1502	1661	1657	1650	1514
Q Serve(g_s), s	54.3	21.4	21.0	14.5	13.8	0.0
Cycle Q Clear(g_c), s	54.3	21.4	21.0	14.5	13.8	0.0
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1727	770	423	2688	431	578
V/C Ratio(X)	0.87	0.47	0.67	0.44	0.79	0.56
Avail Cap(c_a), veh/h	1732	773	423	2688	717	709
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.73	0.73	1.00	1.00
Uniform Delay (d), s/veh	29.6	21.6	46.1	3.8	58.1	33.5
Incr Delay (d2), s/veh	6.4	2.1	2.6	0.4	2.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	21.5	7.4	8.7	3.1	5.8	8.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	36.0	23.6	48.7	4.2	60.1	34.1
LnGrp LOS	D	C	D	A	E	C
Approach Vol, veh/h	1867			1468	664	
Approach Delay, s/veh	33.6			12.8	47.4	
Approach LOS	C			B	D	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	41.2	74.8				116.0		22.0
Change Period (Y+Rc), s	6.0	* 6				6.0		4.5
Max Green Setting (Gmax), s	25.0	* 69				98.0		29.5
Max Q Clear Time (g_c+I1), s	23.0	56.3				16.5		15.8
Green Ext Time (p_c), s	0.2	12.5				67.6		1.8

Intersection Summary		
HCM 6th Ctrl Delay		28.2
HCM 6th LOS		C

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	1615	5	25	1245	35	40	20	70	160	10	65
Future Volume (vph)	50	1615	5	25	1245	35	40	20	70	160	10	65
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0		4.0		4.0	4.0	4.0
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (prot)	1676	3316		1644	3358	1471		1627		1624	1638	1508
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (perm)	1676	3316		1644	3358	1471		1627		1624	1638	1508
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	51	1648	5	26	1270	36	41	20	71	163	10	66
RTOR Reduction (vph)	0	0	0	0	0	16	0	29	0	0	0	59
Lane Group Flow (vph)	51	1653	0	26	1270	20	0	103	0	86	87	7
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases						6						4
Actuated Green, G (s)	18.7	96.2		5.0	82.5	82.5		13.7		15.7	15.7	15.7
Effective Green, g (s)	19.2	97.6		5.0	83.9	83.9		13.7		15.7	15.7	15.7
Actuated g/C Ratio	0.13	0.66		0.03	0.57	0.57		0.09		0.11	0.11	0.11
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4		3.0		2.3	2.3	2.3
Lane Grp Cap (vph)	217	2186		55	1903	833		150		172	173	159
v/s Ratio Prot	0.03	c0.50		0.02	c0.38			c0.06		0.05	c0.05	
v/s Ratio Perm						0.01						0.00
v/c Ratio	0.24	0.76		0.47	0.67	0.02		0.69		0.50	0.50	0.04
Uniform Delay, d1	57.8	17.1		70.2	22.3	14.1		65.1		62.4	62.5	59.4
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	0.3	2.5		3.7	1.9	0.1		12.3		1.3	1.3	0.1
Delay (s)	58.1	19.6		73.9	24.2	14.1		77.3		63.8	63.8	59.5
Level of Service	E	B		E	C	B		E		E	E	E
Approach Delay (s)		20.8			24.9			77.3			62.6	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	27.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	148.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	1630	110	40	1230	65	50	20	35	165	25	80
Future Volume (vph)	110	1630	110	40	1230	65	50	20	35	165	25	80
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.94	1.00	1.00	*0.97	1.00		1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97		1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.97	1.00	0.95	0.96	1.00
Satd. Flow (prot)	1676	3318	1466	1644	3358	1431		1687	1461	1624	1649	1507
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.97	1.00	0.95	0.96	1.00
Satd. Flow (perm)	1676	3318	1466	1644	3358	1431		1687	1461	1624	1649	1507
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	111	1646	111	40	1242	66	51	20	35	167	25	81
RTOR Reduction (vph)	0	0	28	0	0	25	0	0	32	0	0	74
Lane Group Flow (vph)	111	1646	83	40	1242	41	0	71	3	95	97	7
Confl. Peds. (#/hr)			1			3	1		4	4		1
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases			2			6		8	8			4
Actuated Green, G (s)	12.6	92.1	92.1	9.7	89.2	89.2		13.7	13.7	13.1	13.1	13.1
Effective Green, g (s)	12.6	93.5	93.5	9.7	90.6	90.6		13.7	13.7	13.1	13.1	13.1
Actuated g/C Ratio	0.09	0.64	0.64	0.07	0.62	0.62		0.09	0.09	0.09	0.09	0.09
Clearance Time (s)	4.0	5.4	5.4	4.0	5.4	5.4		4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4	5.4	2.3	5.4	5.4		2.3	2.3	2.3	2.3	2.3
Lane Grp Cap (vph)	144	2124	938	109	2083	888		158	137	145	147	135
v/s Ratio Prot	0.07	c0.50		0.02	c0.37			c0.04		0.06	c0.06	
v/s Ratio Perm			0.06			0.03			0.00			0.00
v/c Ratio	0.77	0.77	0.09	0.37	0.60	0.05		0.45	0.02	0.66	0.66	0.05
Uniform Delay, d1	65.3	18.7	10.0	65.2	16.7	10.8		62.6	60.1	64.3	64.3	60.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.9	2.8	0.2	1.2	1.3	0.1		1.2	0.0	8.6	8.7	0.1
Delay (s)	86.2	21.6	10.2	66.4	18.0	10.9		63.8	60.1	72.9	73.0	60.9
Level of Service	F	C	B	E	B	B		E	E	E	E	E
Approach Delay (s)		24.7			19.0			62.6			69.4	
Approach LOS		C			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	27.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	146.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	1570	150	65	1155	150	95	40	60	155	45	115
Future Volume (veh/h)	120	1570	150	65	1155	150	95	40	60	155	45	115
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786
Adj Flow Rate, veh/h	122	1602	153	66	1179	153	97	41	61	158	46	117
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1
Cap, veh/h	357	2036	907	83	1285	640	119	71	106	182	66	169
Arrive On Green	0.21	0.60	0.60	0.05	0.44	0.44	0.07	0.11	0.12	0.11	0.15	0.15
Sat Flow, veh/h	1688	3367	1499	1647	2941	1464	1701	637	948	1701	445	1132
Grp Volume(v), veh/h	122	1602	153	66	1179	153	97	0	102	158	0	163
Grp Sat Flow(s),veh/h/ln	1688	1683	1499	1647	1470	1464	1701	0	1586	1701	0	1577
Q Serve(g_s), s	7.8	45.6	5.7	5.0	47.9	5.8	7.1	0.0	7.7	11.6	0.0	12.4
Cycle Q Clear(g_c), s	7.8	45.6	5.7	5.0	47.9	5.8	7.1	0.0	7.7	11.6	0.0	12.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.60	1.00		0.72
Lane Grp Cap(c), veh/h	357	2036	907	83	1285	640	119	0	178	182	0	235
V/C Ratio(X)	0.34	0.79	0.17	0.80	0.92	0.24	0.81	0.00	0.57	0.87	0.00	0.69
Avail Cap(c_a), veh/h	357	2036	907	143	1297	646	188	0	375	188	0	373
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.59	0.59	0.59	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	42.5	18.9	11.0	59.7	33.6	11.0	58.2	0.0	53.4	55.8	0.0	51.1
Incr Delay (d2), s/veh	0.2	1.9	0.2	10.1	11.8	0.9	9.7	0.0	1.8	31.2	0.0	2.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	16.8	2.0	2.4	19.0	3.0	3.4	0.0	3.2	6.6	0.0	5.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.7	20.8	11.3	69.8	45.4	11.8	67.9	0.0	55.1	87.0	0.0	53.4
LnGrp LOS	D	C	B	E	D	B	E	A	E	F	A	D
Approach Vol, veh/h		1877			1398			199			321	
Approach Delay, s/veh		21.5			42.9			61.4			69.9	
Approach LOS		C			D			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.4	80.8	12.9	22.9	31.7	59.5	17.6	18.2
Change Period (Y+Rc), s	4.0	4.8	4.0	4.5	4.8	* 4	4.0	4.5
Max Green Setting (Gmax), s	11.0	55.2	14.0	29.5	11.0	* 56	14.0	29.5
Max Q Clear Time (g_c+I1), s	7.0	47.6	9.1	14.4	9.8	49.9	13.6	9.7
Green Ext Time (p_c), s	0.0	7.3	0.0	0.5	0.0	5.7	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	35.5
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	2.1					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	55	75	210	250	5
Future Vol, veh/h	5	55	75	210	250	5
Conflicting Peds, #/hr	1	1	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	180	0	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	4	4	1	1	3	3
Mvmt Flow	6	63	85	239	284	6

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	699	290	292	0	-	0
Stage 1	289	-	-	-	-	-
Stage 2	410	-	-	-	-	-
Critical Hdwy	6.44	6.24	4.11	-	-	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	2.209	-	-	-
Pot Cap-1 Maneuver	403	744	1275	-	-	-
Stage 1	756	-	-	-	-	-
Stage 2	666	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	374	742	1273	-	-	-
Mov Cap-2 Maneuver	374	-	-	-	-	-
Stage 1	704	-	-	-	-	-
Stage 2	665	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.7	2.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1273	-	374	742	-	-
HCM Lane V/C Ratio	0.067	-	0.015	0.084	-	-
HCM Control Delay (s)	8	0	14.8	10.3	-	-
HCM Lane LOS	A	A	B	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0	0.3	-	-

Intersection	
Int Delay, s/veh	1.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	40	40	410	35	25	470
Future Vol, veh/h	40	40	410	35	25	470
Conflicting Peds, #/hr	0	2	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	125	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	4	4	1	1	3	3
Mvmt Flow	43	43	436	37	27	500

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1009	457	0	0	473	0
Stage 1	455	-	-	-	-	-
Stage 2	554	-	-	-	-	-
Critical Hdwy	6.44	6.24	-	-	4.13	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	-	-	2.227	-
Pot Cap-1 Maneuver	264	599	-	-	1084	-
Stage 1	635	-	-	-	-	-
Stage 2	572	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	257	598	-	-	1084	-
Mov Cap-2 Maneuver	257	-	-	-	-	-
Stage 1	635	-	-	-	-	-
Stage 2	558	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.1	0	0.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	359	1084	-
HCM Lane V/C Ratio	-	-	0.237	0.025	-
HCM Control Delay (s)	-	-	18.1	8.4	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	0.9	0.1	-

Intersection	
Intersection Delay, s/veh	24.4
Intersection LOS	C

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	130	160	90	315	480	30
Future Vol, veh/h	130	160	90	315	480	30
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	138	170	96	335	511	32
Number of Lanes	1	0	0	1	1	0

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	1	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	1
HCM Control Delay	16.1	21.3	31.5
HCM LOS	C	C	D

Lane	NBLn1	EBLn1	SBLn1
Vol Left, %	22%	45%	0%
Vol Thru, %	78%	0%	94%
Vol Right, %	0%	55%	6%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	405	290	510
LT Vol	90	130	0
Through Vol	315	0	480
RT Vol	0	160	30
Lane Flow Rate	431	309	543
Geometry Grp	1	1	1
Degree of Util (X)	0.696	0.529	0.842
Departure Headway (Hd)	5.813	6.168	5.584
Convergence, Y/N	Yes	Yes	Yes
Cap	616	580	646
Service Time	3.897	4.256	3.661
HCM Lane V/C Ratio	0.7	0.533	0.841
HCM Control Delay	21.3	16.1	31.5
HCM Lane LOS	C	C	D
HCM 95th-tile Q	5.5	3.1	9.2

Intersection	
Int Delay, s/veh	0.1

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	3	1055	850	5	5	0
Future Vol, veh/h	3	1055	850	5	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	1122	904	5	5	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	909	0	-	0	1474	455
Stage 1	-	-	-	-	907	-
Stage 2	-	-	-	-	567	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	745	-	-	-	117	552
Stage 1	-	-	-	-	354	-
Stage 2	-	-	-	-	531	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	745	-	-	-	117	552
Mov Cap-2 Maneuver	-	-	-	-	117	-
Stage 1	-	-	-	-	353	-
Stage 2	-	-	-	-	531	-

Approach	SE	NW	SW
HCM Control Delay, s	0	0	37.2
HCM LOS			E

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	-	-	745	-	117
HCM Lane V/C Ratio	-	-	0.004	-	0.045
HCM Control Delay (s)	-	-	9.9	-	37.2
HCM Lane LOS	-	-	A	-	E
HCM 95th %tile Q(veh)	-	-	0	-	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	155	995	15	270	45	0	0	35	25
Future Volume (veh/h)	0	0	0	155	995	15	270	45	0	0	35	25
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.99	0.99		1.00	1.00		0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772
Adj Flow Rate, veh/h				168	1082	16	293	49	0	0	38	27
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2
Cap, veh/h				224	1520	23	354	49	0	0	262	186
Arrive On Green				0.52	0.52	0.52	0.27	0.27	0.00	0.00	0.27	0.27
Sat Flow, veh/h				434	2949	45	1076	180	0	0	960	682
Grp Volume(v), veh/h				661	0	605	342	0	0	0	0	65
Grp Sat Flow(s),veh/h/ln				1708	0	1721	1256	0	0	0	0	1642
Q Serve(g_s), s				33.6	0.0	28.9	26.6	0.0	0.0	0.0	0.0	3.3
Cycle Q Clear(g_c), s				33.6	0.0	28.9	29.9	0.0	0.0	0.0	0.0	3.3
Prop In Lane				0.25		0.03	0.86		0.00	0.00		0.42
Lane Grp Cap(c), veh/h				880	0	887	403	0	0	0	0	448
V/C Ratio(X)				0.75	0.00	0.68	0.85	0.00	0.00	0.00	0.00	0.15
Avail Cap(c_a), veh/h				1118	0	1126	403	0	0	0	0	448
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.91	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				21.1	0.0	19.9	41.6	0.0	0.0	0.0	0.0	30.3
Incr Delay (d2), s/veh				5.9	0.0	4.2	17.9	0.0	0.0	0.0	0.0	0.1
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				14.5	0.0	12.4	11.2	0.0	0.0	0.0	0.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				26.9	0.0	24.2	59.5	0.0	0.0	0.0	0.0	30.4
LnGrp LOS				C	A	C	E	A	A	A	A	C
Approach Vol, veh/h					1266			342			65	
Approach Delay, s/veh					25.6			59.5			30.4	
Approach LOS					C			E			C	
Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				34.0		60.7		34.0				
Change Period (Y+Rc), s				4.0		4.0		4.0				
Max Green Setting (Gmax), s				30.0		72.0		30.0				
Max Q Clear Time (g_c+I1), s				5.3		35.6		31.9				
Green Ext Time (p_c), s				0.2		21.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			32.7									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	75	1310	365	0	0	0	0	240	125	25	185	0
Future Volume (veh/h)	75	1310	365	0	0	0	0	240	125	25	185	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772				0	1772	1772	1730	1730	0
Adj Flow Rate, veh/h	79	1379	0				0	253	132	26	195	0
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2				0	2	2	5	5	0
Cap, veh/h	97	1777					0	580	484	33	663	0
Arrive On Green	0.54	0.54	0.00				0.00	0.33	0.33	0.01	0.13	0.00
Sat Flow, veh/h	178	3268	1502				0	1772	1480	1647	1730	0
Grp Volume(v), veh/h	781	677	0				0	253	132	26	195	0
Grp Sat Flow(s),veh/h/ln	1763	1683	1502				0	1772	1480	1647	1730	0
Q Serve(g_s), s	39.9	33.8	0.0				0.0	12.3	7.2	1.7	11.2	0.0
Cycle Q Clear(g_c), s	39.9	33.8	0.0				0.0	12.3	7.2	1.7	11.2	0.0
Prop In Lane	0.10		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	959	915					0	580	484	33	663	0
V/C Ratio(X)	0.81	0.74					0.00	0.44	0.27	0.79	0.29	0.00
Avail Cap(c_a), veh/h	959	915					0	580	484	150	786	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	20.6	19.2	0.0				0.0	29.0	27.3	54.4	34.5	0.0
Incr Delay (d2), s/veh	7.6	5.4	0.0				0.0	2.4	1.4	22.2	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	17.8	14.1	0.0				0.0	5.5	2.7	0.9	5.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.1	24.5	0.0				0.0	31.4	28.7	76.6	34.7	0.0
LnGrp LOS	C	C					A	C	C	E	C	A
Approach Vol, veh/h		1458	A					385			221	
Approach Delay, s/veh		26.4						30.5			39.6	
Approach LOS		C						C			D	
Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		63.8		46.2			6.2	40.0				
Change Period (Y+Rc), s		4.0		4.0			4.0	4.8				
Max Green Setting (Gmax), s		52.0		50.0			10.0	35.2				
Max Q Clear Time (g_c+I1), s		41.9		13.2			3.7	14.3				
Green Ext Time (p_c), s		8.6		0.5			0.0	1.1				
Intersection Summary												
HCM 6th Ctrl Delay			28.6									
HCM 6th LOS			C									

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	160	1095	125	5	815	20	95	25	10	45	20	120
Future Volume (veh/h)	160	1095	125	5	815	20	95	25	10	45	20	120
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758
Adj Flow Rate, veh/h	168	1153	132	5	858	21	100	26	11	47	21	126
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	7	7	7	0	0	0	3	3	3
Cap, veh/h	607	1607	716	399	1176	524	177	43	14	92	42	173
Arrive On Green	0.36	0.48	0.48	0.25	0.36	0.36	0.16	0.17	0.15	0.16	0.17	0.15
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	717	254	85	305	252	1032
Grp Volume(v), veh/h	168	1153	132	5	858	21	137	0	0	194	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1500	1621	1617	1442	1056	0	0	1589	0	0
Q Serve(g_s), s	7.8	29.9	5.5	0.3	25.3	1.0	2.2	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	7.8	29.9	5.5	0.3	25.3	1.0	14.8	0.0	0.0	12.7	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.73		0.08	0.24		0.65
Lane Grp Cap(c), veh/h	607	1607	716	399	1176	524	229	0	0	300	0	0
V/C Ratio(X)	0.28	0.72	0.18	0.01	0.73	0.04	0.60	0.00	0.00	0.65	0.00	0.00
Avail Cap(c_a), veh/h	607	2020	900	399	1793	800	261	0	0	335	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	25.0	22.8	16.5	31.4	30.3	22.6	44.7	0.0	0.0	43.9	0.0	0.0
Incr Delay (d2), s/veh	0.1	2.8	0.6	0.0	4.0	0.1	2.3	0.0	0.0	3.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	12.3	2.0	0.1	10.1	0.4	3.8	0.0	0.0	5.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.2	25.6	17.0	31.4	34.3	22.7	47.0	0.0	0.0	47.1	0.0	0.0
LnGrp LOS	C	C	B	C	C	C	D	A	A	D	A	A
Approach Vol, veh/h		1453			884			137			194	
Approach Delay, s/veh		24.8			34.0			47.0			47.1	
Approach LOS		C			C			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	31.1	56.5		22.4	43.6	44.0		22.4				
Change Period (Y+Rc), s	4.5	4.0		5.5	4.5	4.0		5.5				
Max Green Setting (Gmax), s	10.5	66.0		19.5	15.5	61.0		19.5				
Max Q Clear Time (g_c+I1), s	12.3	31.9		14.7	9.8	27.3		16.8				
Green Ext Time (p_c), s	0.0	20.6		0.2	0.2	12.7		0.1				

Intersection Summary		
HCM 6th Ctrl Delay		30.6
HCM 6th LOS		C

Intersection						
Int Delay, s/veh	0.5					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	50	1050	850	0	5	20
Future Vol, veh/h	50	1050	850	0	5	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	300	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	6	6	0	0
Mvmt Flow	53	1105	895	0	5	21

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	895	0	-	0	1554	448
Stage 1	-	-	-	-	895	-
Stage 2	-	-	-	-	659	-
Critical Hdwy	4.16	-	-	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	2.23	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	748	-	-	-	106	564
Stage 1	-	-	-	-	364	-
Stage 2	-	-	-	-	482	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	748	-	-	-	98	564
Mov Cap-2 Maneuver	-	-	-	-	98	-
Stage 1	-	-	-	-	338	-
Stage 2	-	-	-	-	482	-

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	18.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	748	-	-	-	289
HCM Lane V/C Ratio	0.07	-	-	-	0.091
HCM Control Delay (s)	10.2	-	-	-	18.7
HCM Lane LOS	B	-	-	-	C
HCM 95th %tile Q(veh)	0.2	-	-	-	0.3

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	45	60	30	45	25	50	260	50	15	365	15
Future Vol, veh/h	10	45	60	30	45	25	50	260	50	15	365	15
Conflicting Peds, #/hr	1	0	0	0	0	1	4	0	1	1	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	125	-	-	-	-	-	-	-	325
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	2	2	2	2	2	2	3	3	3
Mvmt Flow	11	49	65	33	49	27	54	283	54	16	397	16

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	890	879	401	913	868	312	417	0	0	338	0	0
Stage 1	433	433	-	419	419	-	-	-	-	-	-	-
Stage 2	457	446	-	494	449	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.12	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.218	-	-	2.227	-	-
Pot Cap-1 Maneuver	266	288	653	254	290	728	1142	-	-	1216	-	-
Stage 1	605	585	-	612	590	-	-	-	-	-	-	-
Stage 2	587	577	-	557	572	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	207	265	651	185	267	727	1138	-	-	1215	-	-
Mov Cap-2 Maneuver	207	265	-	185	267	-	-	-	-	-	-	-
Stage 1	567	573	-	575	555	-	-	-	-	-	-	-
Stage 2	484	542	-	451	560	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	18	21.5	1.2	0.3
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1138	-	-	207	401	185	345	1215	-	-
HCM Lane V/C Ratio	0.048	-	-	0.053	0.285	0.176	0.221	0.013	-	-
HCM Control Delay (s)	8.3	0	-	23.4	17.5	28.6	18.4	8	0	-
HCM Lane LOS	A	A	-	C	C	D	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	1.2	0.6	0.8	0	-	-

Intersection	
Int Delay, s/veh	4.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	240	60	210	235	35	115
Future Vol, veh/h	240	60	210	235	35	115
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	1	1	1	1
Mvmt Flow	267	67	233	261	39	128

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	334	0	1028	301
Stage 1	-	-	-	-	301	-
Stage 2	-	-	-	-	727	-
Critical Hdwy	-	-	4.11	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.209	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	1231	-	260	741
Stage 1	-	-	-	-	753	-
Stage 2	-	-	-	-	480	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1231	-	211	741
Mov Cap-2 Maneuver	-	-	-	-	211	-
Stage 1	-	-	-	-	753	-
Stage 2	-	-	-	-	389	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.1	16.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	467	-	-	1231	-
HCM Lane V/C Ratio	0.357	-	-	0.19	-
HCM Control Delay (s)	16.9	-	-	8.6	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	1.6	-	-	0.7	-

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1085	85	20	845	25	20
Future Vol, veh/h	1085	85	20	845	25	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	300	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	6	6	0	0
Mvmt Flow	1154	90	21	899	27	21

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1244	0	1646	577
Stage 1	-	-	-	-	1154	-
Stage 2	-	-	-	-	492	-
Critical Hdwy	-	-	4.22	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.26	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	534	-	92	465
Stage 1	-	-	-	-	267	-
Stage 2	-	-	-	-	586	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	534	-	88	465
Mov Cap-2 Maneuver	-	-	-	-	88	-
Stage 1	-	-	-	-	267	-
Stage 2	-	-	-	-	563	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	40.7
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	88	465	-	-	534	-
HCM Lane V/C Ratio	0.302	0.046	-	-	0.04	-
HCM Control Delay (s)	62.7	13.1	-	-	12	-
HCM Lane LOS	F	B	-	-	B	-
HCM 95th %tile Q(veh)	1.1	0.1	-	-	0.1	-

TM #5: TRANSPORTATION SYSTEM NEEDS ANALYSIS

DATE: November 22, 2021

TO: Project Management Team

FROM: Reah Flisakowski, Dock Rosenthal | DKS Associates

SUBJECT: Sandy Transportation System Plan P# 20020-001

This memorandum summarizes the future transportation system performance and needs analysis for the City of Sandy, Oregon. This analysis includes the comprehensive review of motor vehicle, bicycle, pedestrian, transit systems, and safety needs. The analysis was based on future transportation system performance and the expected year 2040 travel conditions through the TSP planning area.

FUTURE TRAFFIC PERFORMANCE AND CAPACITY NEEDS

Future year 2040 operating conditions for vehicles were assessed using data and findings developed for the existing conditions analysis[1] and available growth pattern data for the study area and US 26. The study intersections are shown in Figure 1. The following sections summarize the methodology and operations analysis which is consistent with the Sandy Bypass Feasibility Report.[2] The findings were used to develop and evaluate the need for future system improvements.

JURISDICTIONAL MOBILITY STANDARDS

The mobility standards for intersections vary according to the agency of jurisdiction for each intersection. Five of the study intersections are under City jurisdiction (362nd Drive/Industrial Way – North and South, Bluff Road/Bell Street, OR 211/Bornstedt, and OR 211/Dubarko) while the remaining 11 intersections are under ODOT jurisdiction. Current ODOT mobility targets require a volume to capacity ratio between 0.80 and 0.90 or less to be maintained at study intersections (see Table 1) and the City of Sandy operating standards require that a level of service "D" or better be maintained for any signalized intersection and unsignalized intersections with stop control on the minor approach[3].

[1] Existing Transportation System Performance memo, DKS Associates, April 19, 2021.

[2] Sandy Bypass Feasibility Report, DKS Associates, October 2021.

[3] City of Sandy Transportation System Plan, DKS Associates, 2011.

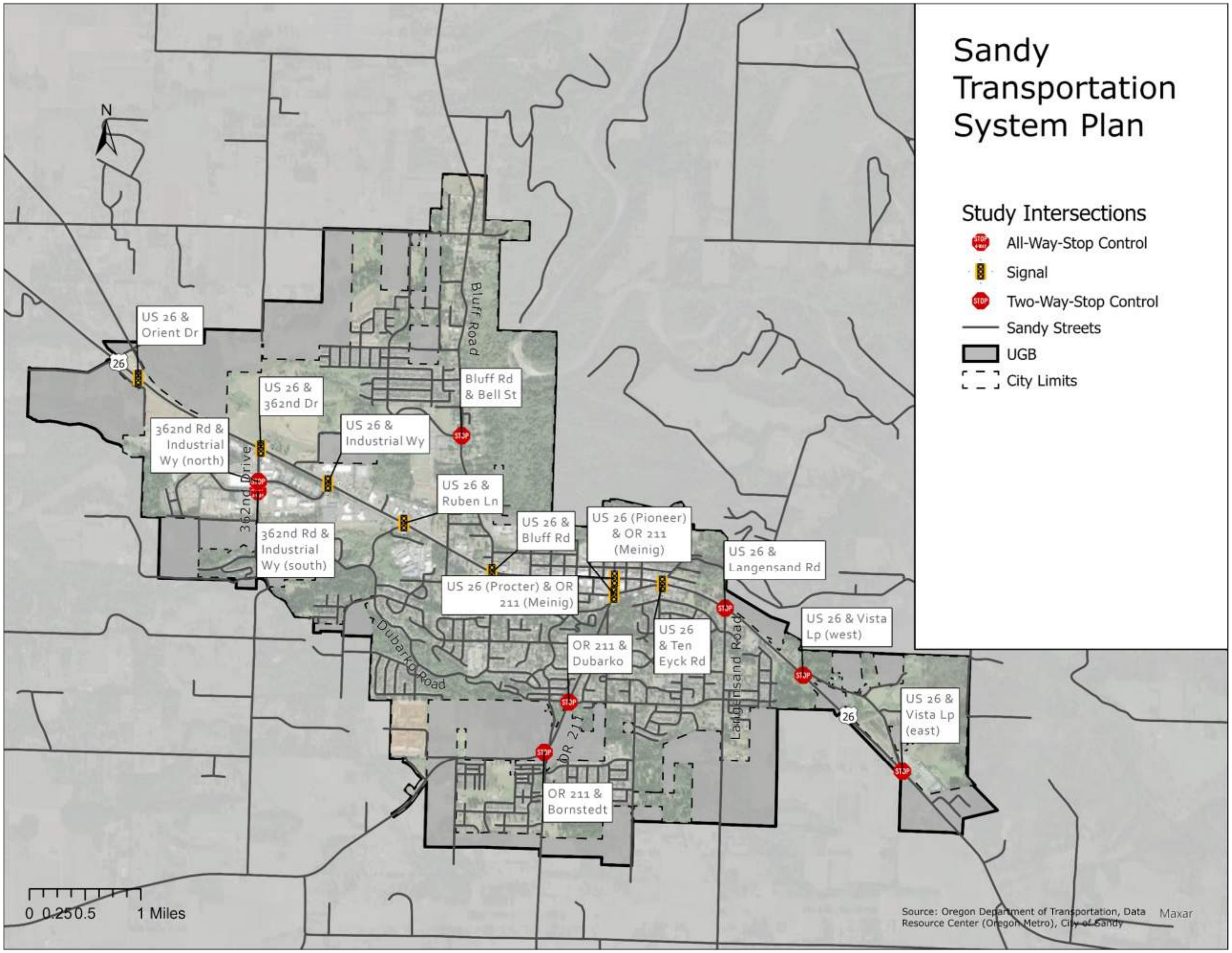

FIGURE 1: STUDY INTERSECTIONS WITH EXISTING CONTROL

2040 NO BUILD BASELINE CONDITIONS

FUTURE FORECASTING

Traffic forecasts for the future 2040 No Build conditions were developed using a combination of available data and prior modeling analysis and findings. The forecasts relied on recent year 2020 intersection counts[4], year 2029 analysis from the 2011 Sandy TSP, and ODOT Volume Tables. The forecasts were developed for the TSP study intersections and focused on the peak hour. Future volumes can be found in the operation reports in the appendix.

FUTURE NETWORK IMPROVEMENTS

A No Build Alternative would typically be based on the existing system and not include future improvements. However, there are several roadway projects that are fully funded and currently in the design phase with an anticipated year 2023 opening. It was determined these projects should be included in the No Build Alternative due to the high level of certainty that they will be part of the future system. These projects are listed below and shown in Figure 2.

- Extend Bell Street to 362nd Avenue (#14a)
- Extend 362nd Avenue to Bell Street (#15a)

FUTURE INTERSECTION OPERATIONS

Motor vehicle conditions were evaluated for the 2040 peak hour at the study intersections under each of the future improvement alternatives. The evaluation utilized the Highway Capacity Manual (HCM) 6th Edition methodology. Table 1 provides a summary of the intersection operations. The detailed intersection operation reports are shown in the appendix. The study intersections that are forecasted to exceed mobility targets include:

- **US 26 and Orient Drive** – The eastbound through movement at this intersection requires more capacity but is limited by the split phasing for Orient Drive/Jarl Road which serves a high southbound left turn volume with only a single approach lane.
- **US 26 and 362nd Drive** – More capacity is needed for the eastbound and westbound left and through movements at this intersection but green time for those movements is limited by the split phasing of the northbound and southbound approaches.
- **US 26 and Industrial Way** – The eastbound through movement and northbound approach are both over capacity at this intersection. The traffic signal split phasing of the northbound and southbound approaches limits the signal green time available to the US 26 movements.
- **362nd Drive and Industrial Way (north)** – High northbound and southbound volumes result in limited gaps for the Industrial Way approach at this two-way-stop-controlled intersection.
- **362nd Drive and Industrial Way (south)** – High traffic volumes at all approaches result in long delays for all movements at this all-way-stop-controlled intersection.

[4] Traffic counts were collected on October 22, 2020.

- **US 26 and Ruben Lane** - The eastbound through movement and southbound approach are both over capacity at this intersection. The split phasing of the northbound and southbound approaches also limits the green time available to the US 26 movements.
- **US 26 and Bluff Road** – The eastbound left and through, westbound left and through, and northbound left movements are all over capacity at this intersection.
- **OR 211 and Bornstedt Road** - High eastbound and westbound volumes result in limited gaps for the Bornstedt Road approach at this two-way-stop-controlled intersection.

TABLE 1: 2040 NO BUILD INTERSECTION OPERATIONS (PEAK HOUR)

STUDY INTERSECTION	CONTROL TYPE	JURISDICTION	MOBILITY TARGET	LEVEL OF SERVICE	DELAY (SECONDS)	V/C RATIO
US 26/ORIENT DRIVE	Signal	ODOT	0.80	F	134	**1.19**
US 26/362ND DRIVE	Signal	ODOT	0.80	F	121	**1.16**
US 26/INDUSTRIAL WAY	Signal[a]	ODOT	0.80	E	74	**1.10**
362ND DRIVE/ INDUSTRIAL WAY (NORTH)	TWSC[b]	City of Sandy	D	**B [F]**	11 [117]	0.49 [0.94]
362ND DRIVE/ INDUSTRIAL WAY (SOUTH)	AWSC	City of Sandy	D	**F**	214	1.43
US 26/RUBEN LANE	Signal[a]	ODOT	0.80	C	35	**0.97**
US 26/BLUFF ROAD	Signal	ODOT	0.85	F	112	**1.12**
BLUFF ROAD/BELL STREET	TWSC	City of Sandy	D	A [C]	9 [23]	0.29 [0.09]
PIONEER BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	C	30	0.81
PROCTOR BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	C	32	0.84
OR 211/ DUBARKO ROAD	Signal	City of Sandy	D	C	21	0.81
OR 211/BORNSTEDT ROAD	TWSC	City of Sandy	D	**A [F]**	10 [240]	0.35 [1.32]
US 26/TEN EYCK ROAD	Signal	ODOT	0.85	C	29	0.80
US 26/LANGENSAND ROAD	TWSC	ODOT	0.80	C [F]	16 [>300]	0.48 [0.91]
US 26/VISTA LOOP DRIVE W	Signal	ODOT	0.80	C	25	0.66
US 26/VISTA LOOP DRIVE E	TWSC	ODOT	0.80	B [F]	12 [117]	0.48 [0.25]

a. This signal reported using HCM 2000 due to non-standard characteristics.

b. Two-way Stop Controlled (TWSC) measures are reported as worst major [worst minor] approach for LOS and Delay and as worst movement for V/C.

FUTURE MOTOR VEHICLE NEEDS

Future improvement alternatives were previously developed and evaluated as part of the 2011 Sandy TSP[5] to enhance connectivity, provide access to developing lands, and address congestion in the US 26 corridor. The objective for each improvement alternative ranged from relying mainly on management and enhancement of the existing transportation system to large investments in new facilities to increase corridor capacity.

Two of the prior TSP alternatives were carried forward and incorporated into the Sandy Bypass Feasibility Reevaluation. The analysis conducted for the Sandy Bypass Feasibility Reevaluation forms the basis for the Sandy TSP update. The two alternatives evaluated include:

- Alternative #1 –local system enhancements and minor improvements
- Alternative #3 – Alternative #1 along with the proposed Sandy Bypass project

The addition of the Alternative #1 improvements would result in moderate changes to local travel patterns with better connectivity and intersection capacity. The 2040 No Build Alternative forecasts were refined to represent the 2040 Alternative #1 using growth rates available from the 2029 forecasts. The addition of the bypass would result in significant changes to regional travel patterns. Future 2040 Alternative #3 forecasts were developed using the Alternative #1 volumes, growth rates available from the 2029 forecasts, and current travel pattern data.

A travel pattern analysis was completed using StreetLight data which provided information on where vehicle trips are coming from through the city, how much delay these trips experience, and how long it takes them to make their trip. The data showed the proposed bypass would attract up to 28% of the total US 26 traffic during the peak hour. For a conservative analysis and for alignment with the 2011 Sandy TSP findings, the forecasting assumed 40% of the total US 26 traffic would divert to the bypass.

The 2040 Alternative #1 volumes were adjusted to account for use of the US 26 bypass to develop 2040 Alternative #3 volumes. US 26 is forecasted to serve approximately 3,800 vehicles during the peak hour under the 2040 No Build Alternative. Under the 2040 Alternative #3, US 26 is forecasted to serve approximately 2,300 vehicles and the bypass is forecasted to serve approximately 1,500 vehicles during the peak hour.

[5] Sandy TSP Update, Technical Memo #2: Transportation Alternatives and Improvement Strategies, DKS Associates, February 25, 2011.

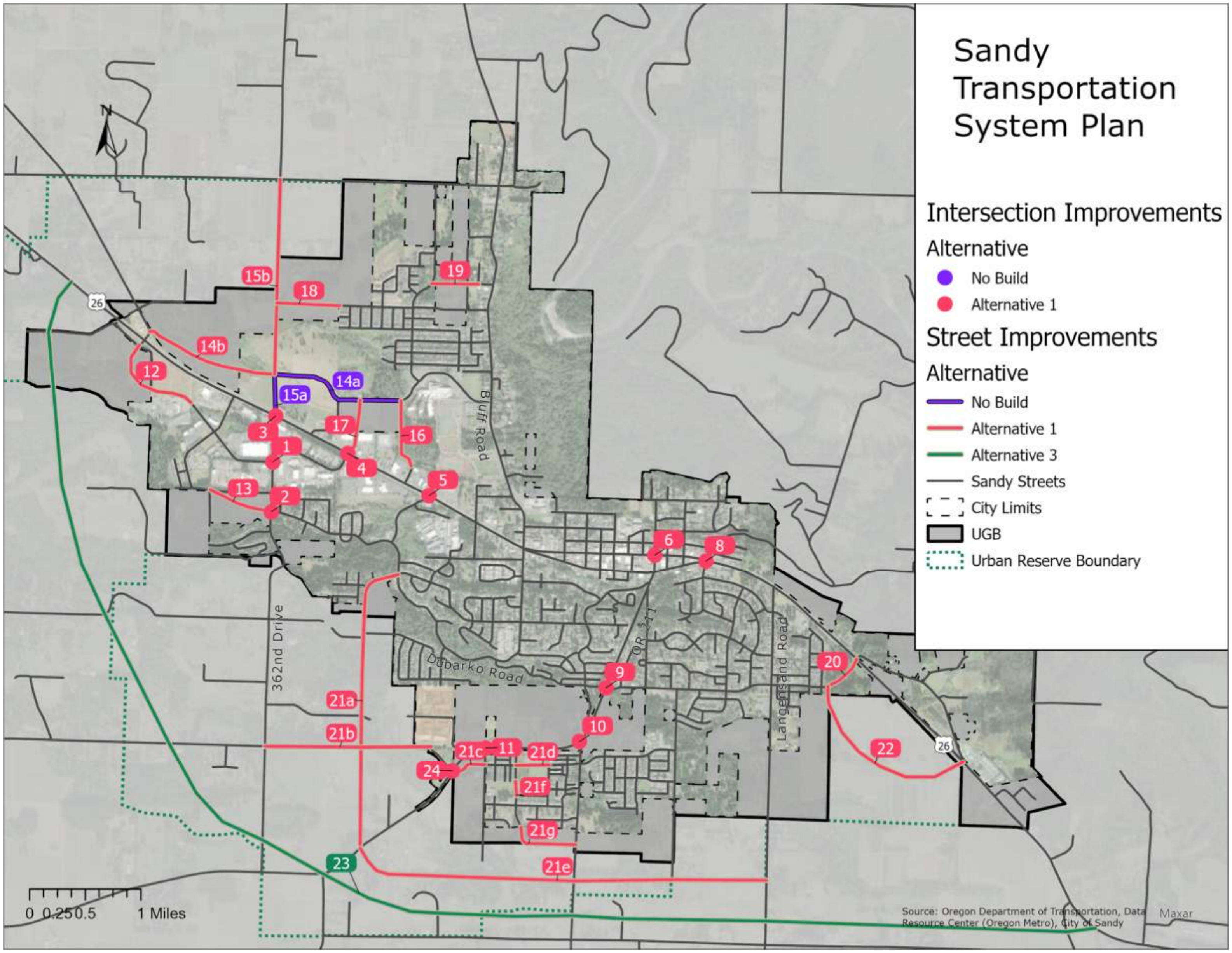

FIGURE 2: FUTURE STREET CONNECTIONS

ADDITIONAL MOTOR VEHICLE SYSTEM IMPROVEMENT STRATEGIES

NEIGHBORHOOD TRAFFIC MANAGEMENT (NTM)

Neighborhood traffic management strategies are commonly used to slow down or reduce automotive traffic with the intent of improving safety for pedestrians and bicyclists. Sandy currently has a neighborhood traffic management program that outlines the process for identifying, prioritizing, and mitigating problems related to traffic speeds and volumes on local streets.

TABLE 2: TRAFFIC CALMING DEVICES

Device	Benefits and Impacts				
	Safety	Speed Reduction	Traffic Diversion	Fuel Consumption, Pollution	Emergency Services
CHICANES	Possible Improvement	Possible	Possible	Small Increase	Possible Problems
CURB EXTENSIONS	Improve Pedestrian Crossing	Possible	No Effect	No Change	Possible Problems
DIVERTERS	Possible Improvement	Mixed Results	Yes	No Change	Possible Problems
ENTRANCE TREATMENTS	Possible Improvement	Unlikely	Mixed Results	No Change	Possible Problems
FORCED TURN CHANNELIZATION	Possible Improvement	No	Yes	Small Increase	Possible Problems
MEDIAN BARRIERS	Possible Improvement	No	Possible	No Change	Possible Problems
RUMBLE STRIPS	Possible Improvement	Possible	No Effect	No Change	No Effect
SPEED HUMPS	Possible Improvement	Yes	Possible	Small Increase	Possible Problems
TRAFFIC CIRCLES	Improved	Yes	Possible	No Change	Possible Problems

ADAPTIVE SIGNAL SYSTEMS

In corridors where traffic volumes fluctuate significantly between different days (e.g., weekdays vs. weekends), different times of day, and various seasons, as they do in Sandy with its high percentage of recreational traffic, it is difficult to design time of day plans that adequately respond to each of these unique time periods. Time of day plans (in place currently) are typically designed for average conditions. Therefore, the users of the system will experience times when signal timing does not seem to be reflective of actual needs.

Adaptive signal systems differ from time-of-day plans in that they measure congestion levels on every travel lane of every approach and continuously (every signal cycle) adjust signal timing at each intersection in the corridor to minimize delay for all users while maintaining the progression of vehicles on the major route. Under this type of control, there is no need to create customized timing plans to match changing flows for different times of day, week, or year. Users often experience far more responsive signal timing during off-peak hours and at times when traffic flows are atypical. In addition, adaptive signal systems are able to respond to changes in travel patterns resulting from inclement weather, incidents, construction, and recreational and holiday travel.

The City currently has an adaptive signal system planned for US 26 between Bluff Road and OR 211 to improve traffic flow through the downtown area. Extending the adaptive traffic signal system on US 26 to the west (between Bluff Road and Orient Drive) may be beneficial to reduce congestion and safety issues along a corridor.

TRANSPORTATION DEMAND MANAGEMENT (TDM)

Transportation Demand Management (TDM) is the general term used to describe any action that removes single occupant vehicle trips from the roadway network. As growth in the Sandy area occurs, the number of vehicle trips and travel demand in the area will also increase. The ability to change a user's travel behavior and provide alternative mode choices will help accommodate this growth and reduce impacts to the road system.

The most effective TDM measures for the City of Sandy may include strategies related to increased parking management in the downtown (parking time limits and pricing), carpools, and improved services for alternative modes of travel (walking, bicycling, and transit).

FUTURE BICYCLE SYSTEM NEEDS

Connectivity gaps on arterials and collectors are the biggest bicycle system need (see Figure 3). Locations directly adjacent to schools and major activity centers have good bicycle facilities but there are gaps in the system that restrict access from local neighborhoods. Local streets within Sandy have posted speeds of 25 mph and average daily traffic volumes less than 3,000 and can therefore operate effectively as shared roadways.

Collectors and arterials with significant bicycle facility gaps include:

- 362^{nd} Drive
- Dubarko Road
- Bluff Road
- Sandy Heights Street
- Tupper Road
- OR 211
- Bornstedt Road
- Meinig Road
- Langensand Road
- US 26
- Jacoby Road
- Vista Loop

Additionally, there is narrow parking along the south side of the US 26 couplet (Pioneer Blvd) through downtown Sandy. The narrow width results in all but the smallest vehicles partially blocking the bike lane when using the parking in this area. The condition forces people cyclists to shift into the vehicle travel lane or ride too close to parked vehicles that could open their door which result a significant safety issue along that route. Due to the existing lack of local street connections, the bike lanes along US 26 provide a critical connection in the bicycle network. Even in the future, with the expected extension of Dubarko Road to US 26 and the extension of Bell Street to 362^{nd} Drive, US 26 will continue to provide access to major destinations within the city. Providing an effective bicycle facility is important.

The 2021 City of Sandy Parks and Trails Master Plan Update concluded that the city is below the desired level of service for trails identified in the Statewide Comprehensive Outdoor Recreation Plan. To achieve the desired level of service for trails the city currently needs 7.5 miles of additional trails and will need 11 more miles in the future (to serve the new population). Other needs identified in the plan include improved trail connections throughout the city and safe pedestrian crossings along OR 211 and US 26.

Lack of secure, convenient bicycle parking is a deterrent to bicycle travel. Bicyclists need parking options that provide security against theft, vandalism, and weather. Like automobile parking, bicycle parking is most effective when located close to trip destinations, is easy to access, and is easy to find.

Sandy could benefit from improved bicycle parking facilities including long-term bicycle parking and other end-of-trip facilities. The City should consider establishing long-term parking requirements for large employment centers such as business parks and government buildings. Long-term bicycle parking facilities typically include bicycle lockers, attended facilities, and/or other secure provisions, while other end-of-trip facilities include showers and changing areas.

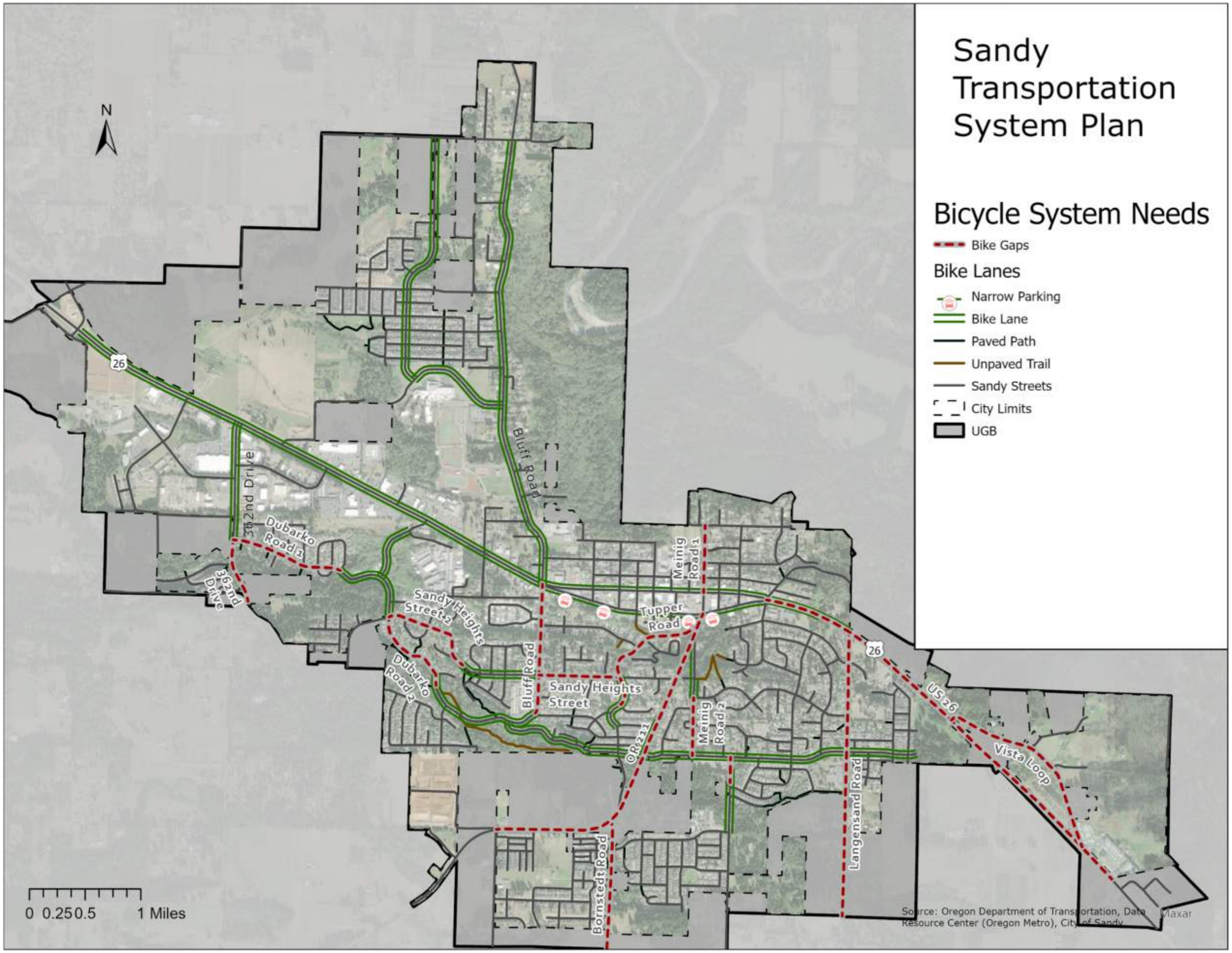

FIGURE 3: BICYCLE SYSTEM NEEDS

FUTURE PEDESTRIAN SYSTEM NEEDS

The following summarizes the critical needs for the pedestrian system in the City of Sandy. The needs are also shown in Figure 4.

CROSSWALKS

In general, the spacing between marked crosswalks is too long on collectors and arterials, creating a barrier for pedestrians that can result in attempts to cross at unprotected mid-block locations. Identified pedestrian crossing needs are summarized below.

- The Cedar Ridge Middle School and Sandy Grade School Safe Routes to School Plan identifies crossing improvement needs along Bluff Road and Pleasant Street in the vicinity of the two schools. Generally, these needs include increased visibility for people (including students) crossing the street and the need to slow traffic and increase awareness of drivers so that they expect to encounter pedestrians as they drive.
- The Sandy Transit Master Plan identifies crossing improvement needs in downtown Sandy to connect the Sandy Transit Center with points north and south of US 26. Also needed are improved crossings near the shopper shuttle route so that riders can safely access stops and allow the service to provide more direct connections to its destinations.
- Additional crossing needs are identified at major junctions in the pedestrian network and/or arterial crossings where pedestrians are likely to encounter higher traffic volumes. These locations include:
    - Bluff Road and Sandy Heights Street
    - Dubarko Road and OR 211
    - Dubarko Road and US 26 (when Dubarko Road connects to US 26)
    - OR 211 at Sandy Heights Street (pedestrian overcrossing)
- The Sandy Downtown Walkability Assessment identifies locations for specific crossing improvements.

SIDEWALKS

The pedestrian system has gaps on some higher volume corridors where mixed traffic results in a higher stress environment. There are also gaps near the schools and other activity generators resulting in higher stress connections to these locations that may dissuade people from walking. Most collectors and arterials in Sandy have at least partial sidewalk gaps which means there is a uniform need for filling sidewalk gaps throughout the city. The two most significant gaps from a connectivity perspective are OR 211 and Bluff Road north of US 26. With most of the growth in Sandy expected to occur off these two roads they provide, and will provide, the most direct routes from new development but cannot be effectively used by pedestrian today.

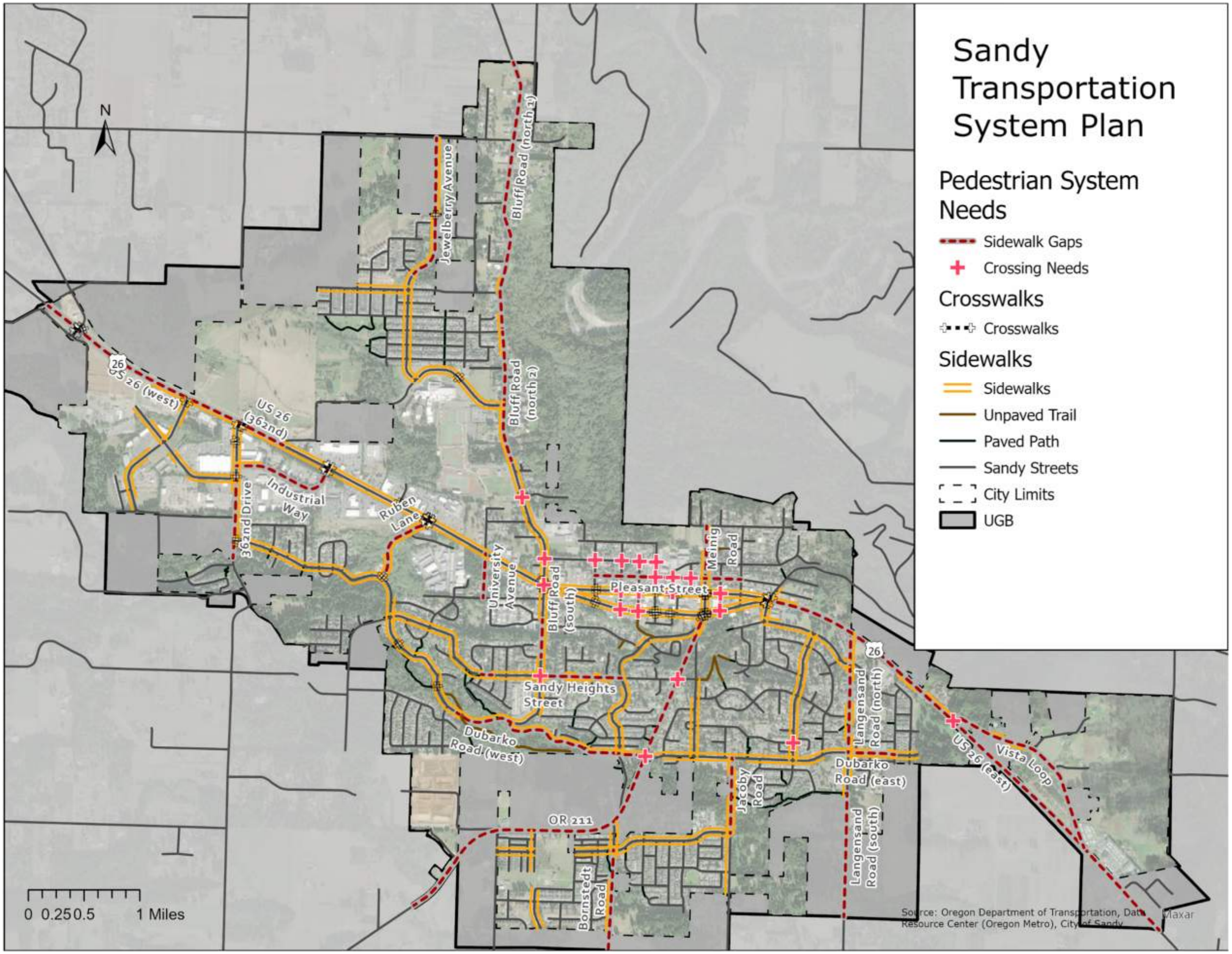

FIGURE 4: PEDESTRIAN SYSTEM NEEDS

OTHER PEDESTRIAN NEEDS

PEDESTRIAN REFUGE ISLANDS

Pedestrian refuge islands are raised concrete (typically) pads located in the center of a roadway separating opposing lanes of traffic. Their purpose is to provide shelter for pedestrians while crossing a single direction of traffic at a time. These crossing treatments are particularly suitable for wide streets with several lanes, such as US 26.

LEADING PEDESTRIAN INTERVAL

Including leading pedestrian intervals (LPIs) at signalized intersections with crossings provide pedestrians with a three to four-second head start into the intersection before parallel traffic is released by the green light. LPIs help ensure that pedestrians are well into the intersection and visible to drivers turning at the intersection prior to vehicles entering the crosswalk.

ACCESSIBLE PEDESTRIAN SIGNALS

Accessible pedestrian signals supplement pedestrian signal indications with audible and/or vibrotactile information. These treatments include directly-audible or transmitted tones, speech messages, talking signs, and/or vibrating surfaces. They are intended to make real-time pedestrian signal information accessible to visually-impaired pedestrians.

FUTURE TRANSIT SYSTEM NEEDS

The Sandy Transit Master Plan[6] includes an evaluation of existing transit service and provides a framework for service expansion. The Master Plan identified several needs for the transportation system:

- **Improved local service** - There is a severe need for transportation access between the Vista Apartments and the city. Many families who live there have only one car (if any), which is typically used by the working parent, and yet there is currently no sidewalk between Vista Loop and downtown, making walking or biking dangerous and nearly impossible.[7]
- **Manage flexible service capacity** – With free ADA qualifying rides the dial-a-ride system is expected to reach its capacity. Monitoring the capacity of the system is needed to ensure that ADA eligible riders are not denied service.
- **Expanded and enhanced regional service** – Growth in Clackamas County has increased demand for trips between Sandy and the urban areas of Clackamas County. A route linking Sandy and Clackamas would be in the interests of City of Sandy residents, workers and businesses, and would traverse many other jurisdictions.

[6] Transit Master Plan, April 2020

[7] An ODOT funded sidewalk infill project on the north side of US 26 from Ten Eyck Road to Vista Loop is expected to be completed in 2022.

- **Improved dispatch technology** - Currently, Sandy Transit uses an EZ Rider/Mobilitat software program to plan trips. However, if a dispatcher determines that a trip cannot be served or is not eligible, that trip is not loaded into the software at all. A consequence of this is that it is entered manually into a separate report. This makes capacity monitoring difficult and Sandy Transit cannot adequately track turn downs to determine the need for additional vehicle capacity to serve the general public or ADA paratransit customers.
- **Stop improvements** – Some moderate to high ridership stops lack adequate amenities for riders such as a shelter, bench, and/or lighting. The top two locations requiring improvements are at Gresham Transit Center and at 362nd Drive (westbound).
- **Pedestrian improvements** - The current Sandy Transit Center does not have adequate crosswalks north or south of Highway 26 causing pedestrians to cross a Highway on either side to access the Transit hub. At Evans Street Senior Apartments, traffic calming and other crossing improvements are needed. The Transit Center does not permit easy transfers between regional and local services (due to the one-way couplet on either side of it). The Gresham, Estacada and Mt. Hood Expresses connect there, but the local Shopper Shuttles cannot stop at or close to the Transit Center. This means that Sandy's fixed route services are not working as a network, providing for complete trips and the "last mile," is being provided by the more expensive dial-a-ride service.
- **Better street connectivity** - The lack of street connectivity requires that service is divided into more routes, with each route less frequent than it could be if fewer routes were necessary. The Dubarko Road extension and the Bell Street extension will significantly improve the street connectivity in Sandy.
- **On-Vehicle equipment and technology** – Automated passenger counters, upgrades to the real-time transit information, adoption of the latest Generalized Transit Feed Specification (GTFS) and other new onboard technology options such as efares would improve the experience of transit riders and increase the data available to SAM.

SAFETY NEEDS AND IMPROVEMENTS

There are four locations where the crash analysis demonstrates a need for safety related improvements. Other projects, such as bike lanes and sidewalk infill, also improve the safety for users of the transportation system by increasing the separation between vehicles and people.

- US 26 and 362nd Drive – This is a critical crash rate and SPIS location, most collisions at this intersection are rear end collisions caused by a failure to avoid a stopped vehicle and turning collisions caused by a driver not yielding.
- US 26 and Ruben Lane – This is a SPIS (Safety Priority Index System) location with three fatal crashes in the last five years. Most collisions at this intersection are turning collisions caused by a driver not yielding and rear end collisions caused by a failure to avoid a stopped vehicle or following too close.
- US 26 and Orient Drive – This is a SPIS location and the location of a serious pedestrian injury. Most collisions at this intersection are rear end collisions caused by a failure to avoid a stopped vehicle.
- OR 211 and Dubarko Road – This is a critical crash rate location. Most collisions at this location are turning collisions caused by a driver not yielding.

The three US 26 locations demonstrate crash causes that are attributable to high traffic volumes and urban traffic conditions. Implementing an adaptive traffic signal control plan along US 26 may reduce the frequency of these collisions because those systems typically reduce congestion and delay along a corridor.

The turning collisions at OR 211 and Dubarko Road will likely be reduced with the installation of a traffic signal or roundabout at that intersection. That improvement has been assumed for the future no build condition.

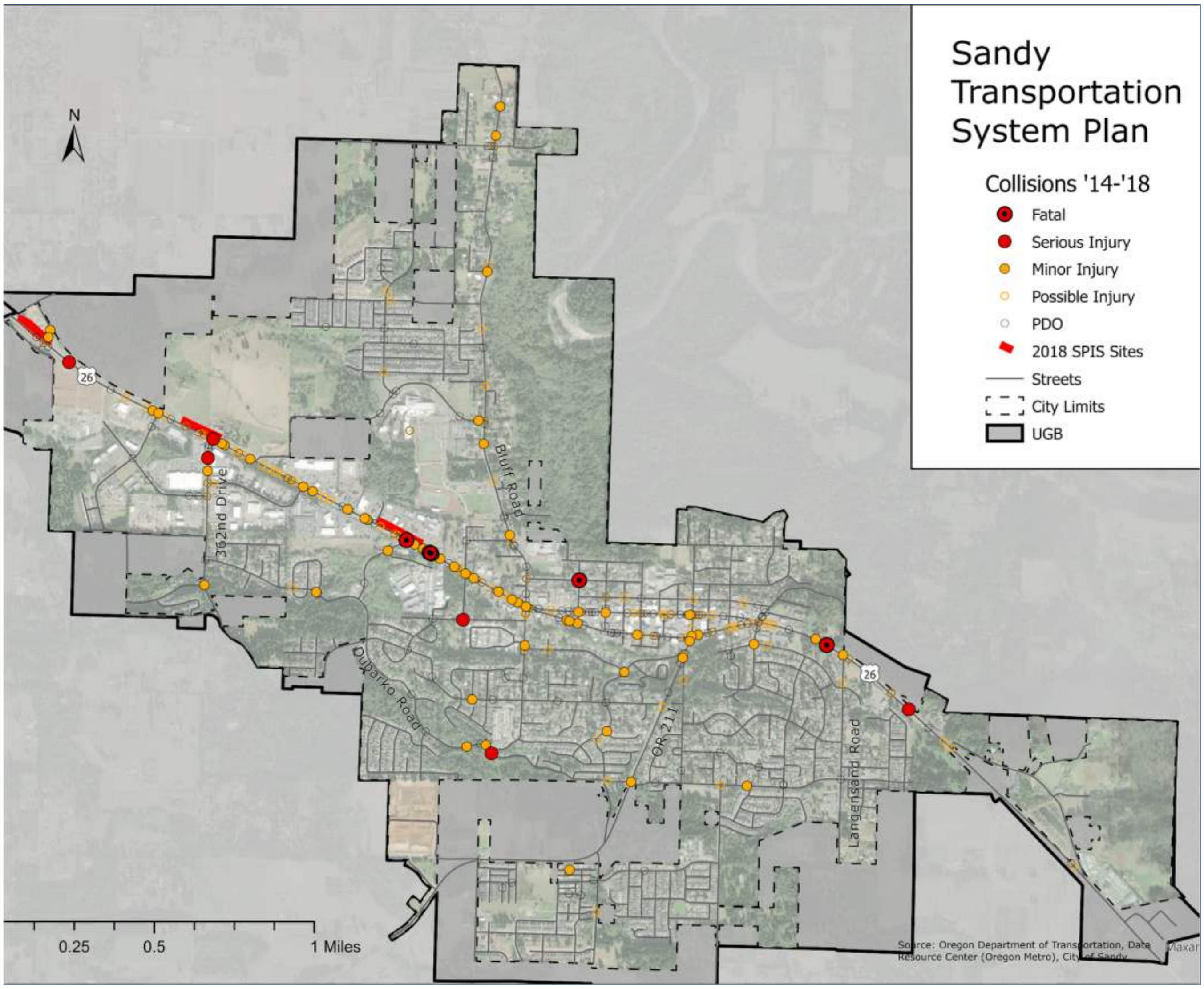

FIGURE 5: CITY OF SANDY SAFETY DATA SUMMARY

APPENDIX

CONTENTS

SECTION 1. FUTURE CONDITION HCM REPORTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	2520	5	10	1750	225	10	50	10	260	10	20
Future Volume (veh/h)	60	2520	5	10	1750	225	10	50	10	260	10	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	63	2653	5	11	1842	0	11	53	11	274	11	21
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	81	1907	850	65	1847		14	69	14	288	12	22
Arrive On Green	0.05	0.57	0.57	0.04	0.56	0.00	0.07	0.06	0.07	0.19	0.19	0.19
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	227	1096	227	1501	60	115
Grp Volume(v), veh/h	63	2653	5	11	1842	0	75	0	0	306	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1551	0	0	1676	0	0
Q Serve(g_s), s	4.2	65.0	0.2	0.7	63.6	0.0	5.5	0.0	0.0	20.7	0.0	0.0
Cycle Q Clear(g_c), s	4.2	65.0	0.2	0.7	63.6	0.0	5.5	0.0	0.0	20.7	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.15		0.15	0.90		0.07
Lane Grp Cap(c), veh/h	81	1907	850	65	1847		98	0	0	321	0	0
V/C Ratio(X)	0.78	1.39	0.01	0.17	1.00		0.76	0.00	0.00	0.95	0.00	0.00
Avail Cap(c_a), veh/h	81	1907	850	80	1847		101	0	0	321	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	54.0	24.9	10.8	53.3	25.3	0.0	52.8	0.0	0.0	45.9	0.0	0.0
Incr Delay (d2), s/veh	35.6	179.5	0.0	0.7	20.2	0.0	24.9	0.0	0.0	37.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	69.1	0.1	0.3	26.1	0.0	2.8	0.0	0.0	12.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	89.7	204.4	10.8	54.1	45.5	0.0	77.7	0.0	0.0	83.5	0.0	0.0
LnGrp LOS	F	F	B	D	D		E	A	A	F	A	A
Approach Vol, veh/h		2721			1853	A		75			306	
Approach Delay, s/veh		201.3			45.6			77.7			83.5	
Approach LOS		F			D			E			F	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.5	68.0		26.0	8.5	69.0		11.3
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5
Max Green Setting (Gmax), s	5.0	61.0		21.0	5.0	61.0		7.0
Max Q Clear Time (g_c+I1), s	6.2	65.6		22.7	2.7	67.0		7.5
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	0.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	133.9
HCM 6th LOS	F

Notes

User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	300	1600	420	265	1525	340	335	150	325	150	175	170
Future Volume (veh/h)	300	1600	420	265	1525	340	335	150	325	150	175	170
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772
Adj Flow Rate, veh/h	316	1684	442	279	1605	358	353	158	342	158	184	179
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2
Cap, veh/h	198	1243	884	258	1397	820	761	402	343	236	248	210
Arrive On Green	0.08	0.37	0.36	0.16	0.56	0.54	0.23	0.23	0.23	0.14	0.14	0.14
Sat Flow, veh/h	1688	3367	1502	1661	3313	1502	3300	1772	1512	1688	1772	1502
Grp Volume(v), veh/h	316	1684	442	279	1605	358	353	158	342	158	184	179
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1502	1650	1772	1512	1688	1772	1502
Q Serve(g_s), s	11.0	48.0	22.3	15.8	54.8	15.9	12.0	9.8	29.4	11.6	13.0	15.1
Cycle Q Clear(g_c), s	11.0	48.0	22.3	15.8	54.8	15.9	12.0	9.8	29.4	11.6	13.0	15.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	198	1243	884	258	1397	820	761	402	343	236	248	210
V/C Ratio(X)	1.59	1.35	0.50	1.08	1.15	0.44	0.46	0.39	1.00	0.67	0.74	0.85
Avail Cap(c_a), veh/h	198	1243	884	258	1397	820	761	402	343	376	395	335
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.20	0.20	0.20	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.3	41.0	15.6	52.8	28.5	13.2	43.1	42.7	50.2	53.1	53.7	54.6
Incr Delay (d2), s/veh	290.0	165.0	2.0	50.9	68.8	0.3	0.3	0.4	47.8	2.4	3.3	9.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	20.4	47.0	12.5	11.3	30.1	6.0	4.9	4.3	15.5	5.1	6.0	6.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	327.3	206.0	17.6	103.7	97.4	13.5	43.3	43.0	98.0	55.5	56.9	64.1
LnGrp LOS	F	F	B	F	F	B	D	D	F	E	E	E
Approach Vol, veh/h		2442			2242			853			521	
Approach Delay, s/veh		187.6			84.8			65.2			59.0	
Approach LOS		F			F			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	21.8	52.0		22.2	15.0	58.8		34.0
Change Period (Y+Rc), s	6.0	* 6		4.0	4.0	6.0		4.5
Max Green Setting (Gmax), s	7.0	* 46		29.0	11.0	42.0		29.5
Max Q Clear Time (g_c+I1), s	17.8	50.0		17.1	13.0	56.8		31.4
Green Ext Time (p_c), s	0.0	0.0		1.0	0.0	0.0		0.0

Intersection Summary			
HCM 6th Ctrl Delay			121.2
HCM 6th LOS			F

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	1945	5	25	1795	50	170	35	250	230	15	170
Future Volume (vph)	65	1945	5	25	1795	50	170	35	250	230	15	170
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0		4.0		4.0	4.0	4.0
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (prot)	1676	3316		1644	3358	1471		1620		1624	1638	1508
Flt Permitted	0.06	1.00		0.06	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (perm)	100	3316		101	3358	1471		1620		1624	1638	1508
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	66	1985	5	26	1832	51	173	36	255	235	15	173
RTOR Reduction (vph)	0	0	0	0	0	23	0	33	0	0	0	112
Lane Group Flow (vph)	66	1990	0	26	1832	28	0	431	0	125	125	61
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						4
Actuated Green, G (s)	74.3	70.3		71.1	68.7	68.7		22.6		17.3	17.3	17.3
Effective Green, g (s)	75.3	71.7		71.1	70.1	70.1		22.6		17.3	17.3	17.3
Actuated g/C Ratio	0.58	0.55		0.55	0.54	0.54		0.17		0.13	0.13	0.13
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4		3.0		2.3	2.3	2.3
Lane Grp Cap (vph)	112	1828		83	1810	793		281		216	217	200
v/s Ratio Prot	c0.02	c0.60		0.01	0.55			c0.27		c0.08	0.08	
v/s Ratio Perm	0.32			0.16		0.02						0.04
v/c Ratio	0.59	1.09		0.31	1.01	0.03		1.53		0.58	0.58	0.31
Uniform Delay, d1	56.5	29.1		59.7	30.0	14.1		53.7		52.9	52.9	50.9
Progression Factor	0.43	0.45		0.79	0.67	2.57		1.00		1.00	1.00	1.00
Incremental Delay, d2	2.8	45.0		0.8	19.5	0.0		257.3		2.8	2.7	0.5
Delay (s)	27.4	58.1		47.8	39.4	36.2		311.0		55.7	55.6	51.4
Level of Service	C	E		D	D	D		F		E	E	D
Approach Delay (s)		57.1			39.5			311.0			53.9	
Approach LOS		E			D			F			D	

Intersection Summary			
HCM 2000 Control Delay	74.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	102.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	175	2045	195	45	1650	100	120	35	40	270	35	135
Future Volume (vph)	175	2045	195	45	1650	100	120	35	40	270	35	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.94	1.00	1.00	*0.97	1.00		1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97		1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (prot)	1676	3318	1467	1644	3358	1432		1682	1461	1624	1646	1506
Flt Permitted	0.07	1.00	1.00	0.06	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (perm)	132	3318	1467	96	3358	1432		1682	1461	1624	1646	1506
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	177	2066	197	45	1667	101	121	35	40	273	35	136
RTOR Reduction (vph)	0	0	40	0	0	36	0	0	34	0	0	126
Lane Group Flow (vph)	177	2066	157	45	1667	65	0	156	6	153	155	10
Confl. Peds. (#/hr)			1			3	1		4	4		1
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6		6		8	8			4
Actuated Green, G (s)	81.5	80.1	80.1	75.5	75.5	75.5		19.3	19.3	10.0	10.0	10.0
Effective Green, g (s)	81.5	81.5	81.5	75.5	76.9	76.9		19.3	19.3	10.0	10.0	10.0
Actuated g/C Ratio	0.63	0.63	0.63	0.58	0.59	0.59		0.15	0.15	0.08	0.08	0.08
Clearance Time (s)	4.0	5.4	5.4	4.0	5.4	5.4		4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4	5.4	2.3	5.4	5.4		2.3	2.3	2.3	2.3	2.3
Lane Grp Cap (vph)	175	2080	919	93	1986	847		249	216	124	126	115
v/s Ratio Prot	0.06	c0.62		0.01	c0.50			c0.09		c0.09	0.09	
v/s Ratio Perm	c0.57		0.11	0.27		0.05			0.00			0.01
v/c Ratio	1.01	0.99	0.17	0.48	0.84	0.08		0.63	0.03	1.23	1.23	0.09
Uniform Delay, d1	42.5	24.0	10.1	30.2	21.5	11.4		52.0	47.3	60.0	60.0	55.8
Progression Factor	0.66	0.41	0.29	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	23.3	4.6	0.0	2.3	4.5	0.2		3.9	0.0	156.7	154.7	0.2
Delay (s)	51.1	14.5	2.9	32.5	26.0	11.5		55.9	47.4	216.7	214.7	56.0
Level of Service	D	B	A	C	C	B		E	D	F	F	E
Approach Delay (s)		16.2			25.4			54.2			166.8	
Approach LOS		B			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	34.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	90.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	285	1910	155	95	1430	245	145	55	120	155	45	255
Future Volume (veh/h)	285	1910	155	95	1430	245	145	55	120	155	45	255
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786
Adj Flow Rate, veh/h	291	1949	158	97	1459	250	148	56	122	158	46	260
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1
Cap, veh/h	247	1681	748	75	1150	572	139	78	170	250	53	299
Arrive On Green	0.15	0.50	0.50	0.05	0.39	0.39	0.08	0.16	0.16	0.15	0.23	0.23
Sat Flow, veh/h	1688	3367	1499	1647	2941	1464	1701	493	1075	1701	232	1313
Grp Volume(v), veh/h	291	1949	158	97	1459	250	148	0	178	158	0	306
Grp Sat Flow(s),veh/h/ln	1688	1683	1499	1647	1470	1464	1701	0	1569	1701	0	1546
Q Serve(g_s), s	16.1	54.9	6.5	5.0	43.0	13.8	9.0	0.0	11.8	9.6	0.0	20.9
Cycle Q Clear(g_c), s	16.1	54.9	6.5	5.0	43.0	13.8	9.0	0.0	11.8	9.6	0.0	20.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.69	1.00		0.85
Lane Grp Cap(c), veh/h	247	1681	748	75	1150	572	139	0	248	250	0	352
V/C Ratio(X)	1.18	1.16	0.21	1.30	1.27	0.44	1.06	0.00	0.72	0.63	0.00	0.87
Avail Cap(c_a), veh/h	247	1681	748	75	1150	572	139	0	428	250	0	422
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.13	0.13	0.13	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	46.9	27.5	15.4	52.5	33.5	24.6	50.5	0.0	43.8	44.1	0.0	40.7
Incr Delay (d2), s/veh	85.1	72.7	0.1	202.2	128.1	2.4	94.2	0.0	2.4	4.4	0.0	14.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.4	37.1	2.2	6.3	35.5	5.2	7.5	0.0	4.8	4.4	0.0	9.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	132.0	100.2	15.5	254.7	161.6	27.0	144.7	0.0	46.2	48.5	0.0	54.9
LnGrp LOS	F	F	B	F	F	C	F	A	D	D	A	D
Approach Vol, veh/h		2398			1806			326			464	
Approach Delay, s/veh		98.5			148.0			90.9			52.7	
Approach LOS		F			F			F			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	58.9	13.0	29.1	20.9	47.0	20.7	21.4
Change Period (Y+Rc), s	4.0	4.8	4.0	4.5	4.8	* 4	4.5	* 4.5
Max Green Setting (Gmax), s	5.0	49.2	9.0	29.5	12.0	* 43	9.0	* 30
Max Q Clear Time (g_c+I1), s	7.0	56.9	11.0	22.9	18.1	45.0	11.6	13.8
Green Ext Time (p_c), s	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.6

Intersection Summary	
HCM 6th Ctrl Delay	111.7
HCM 6th LOS	F

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	55	100	465	405	5
Future Vol, veh/h	5	55	100	465	405	5
Conflicting Peds, #/hr	1	1	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	180	0	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	4	1	1	3	3
Mvmt Flow	5	58	105	489	426	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1131	432	433	0	-	0
Stage 1	431	-	-	-	-	-
Stage 2	700	-	-	-	-	-
Critical Hdwy	6.44	6.24	4.11	-	-	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	2.209	-	-	-
Pot Cap-1 Maneuver	223	619	1132	-	-	-
Stage 1	651	-	-	-	-	-
Stage 2	489	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	201	617	1130	-	-	-
Mov Cap-2 Maneuver	201	-	-	-	-	-
Stage 1	589	-	-	-	-	-
Stage 2	488	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.4	1.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1130	-	201	617	-	-
HCM Lane V/C Ratio	0.093	-	0.026	0.094	-	-
HCM Control Delay (s)	8.5	0	23.4	11.4	-	-
HCM Lane LOS	A	A	C	B	-	-
HCM 95th %tile Q(veh)	0.3	-	0.1	0.3	-	-

Intersection	
Int Delay, s/veh	10.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	55	80	575	210	190	530
Future Vol, veh/h	55	80	575	210	190	530
Conflicting Peds, #/hr	0	2	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	125	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	4	1	1	3	3
Mvmt Flow	58	84	605	221	200	558

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1674	718	0	0	826	0
Stage 1	716	-	-	-	-	-
Stage 2	958	-	-	-	-	-
Critical Hdwy	6.44	6.24	-	-	4.13	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	-	-	2.227	-
Pot Cap-1 Maneuver	104	426	-	-	800	-
Stage 1	481	-	-	-	-	-
Stage 2	369	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	78	425	-	-	800	-
Mov Cap-2 Maneuver	78	-	-	-	-	-
Stage 1	481	-	-	-	-	-
Stage 2	277	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	116.9	0	2.9
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	151	800	-
HCM Lane V/C Ratio	-	-	0.941	0.25	-
HCM Control Delay (s)	-	-	116.9	11	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	6.8	1	-

Intersection	
Intersection Delay, s/veh	133.5
Intersection LOS	F

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	180	230	125	605	555	30
Future Vol, veh/h	180	230	125	605	555	30
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	189	242	132	637	584	32
Number of Lanes	1	0	0	1	1	0

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	1	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	1
HCM Control Delay	35.2	214.3	101.6
HCM LOS	E	F	F

Lane	NBLn1	EBLn1	SBLn1
Vol Left, %	17%	44%	0%
Vol Thru, %	83%	0%	95%
Vol Right, %	0%	56%	5%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	730	410	585
LT Vol	125	180	0
Through Vol	605	0	555
RT Vol	0	230	30
Lane Flow Rate	768	432	616
Geometry Grp	1	1	1
Degree of Util (X)	1.407	0.809	1.116
Departure Headway (Hd)	6.863	7.495	7.139
Convergence, Y/N	Yes	Yes	Yes
Cap	538	488	511
Service Time	4.863	5.495	5.139
HCM Lane V/C Ratio	1.428	0.885	1.205
HCM Control Delay	214.3	35.2	101.6
HCM Lane LOS	F	E	F
HCM 95th-tile Q	34.7	7.6	18.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	175	1375	15	270	45	0	0	65	40
Future Volume (veh/h)	0	0	0	175	1375	15	270	45	0	0	65	40
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772
Adj Flow Rate, veh/h				184	1447	16	284	47	0	0	68	42
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2
Cap, veh/h				205	1702	20	422	60	0	0	362	224
Arrive On Green				0.56	0.56	0.56	0.35	0.35	0.00	0.00	0.35	0.35
Sat Flow, veh/h				366	3034	35	1018	169	0	0	1022	631
Grp Volume(v), veh/h				861	0	786	331	0	0	0	0	110
Grp Sat Flow(s),veh/h/ln				1712	0	1723	1187	0	0	0	0	1653
Q Serve(g_s), s				48.9	0.0	40.5	24.4	0.0	0.0	0.0	0.0	5.1
Cycle Q Clear(g_c), s				48.9	0.0	40.5	29.4	0.0	0.0	0.0	0.0	5.1
Prop In Lane				0.21		0.02	0.86		0.00	0.00		0.38
Lane Grp Cap(c), veh/h				960	0	967	482	0	0	0	0	586
V/C Ratio(X)				0.90	0.00	0.81	0.69	0.00	0.00	0.00	0.00	0.19
Avail Cap(c_a), veh/h				980	0	987	482	0	0	0	0	586
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.79	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				21.3	0.0	19.5	34.7	0.0	0.0	0.0	0.0	24.5
Incr Delay (d2), s/veh				12.8	0.0	7.5	6.2	0.0	0.0	0.0	0.0	0.1
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				22.0	0.0	17.5	8.9	0.0	0.0	0.0	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				34.1	0.0	26.9	40.9	0.0	0.0	0.0	0.0	24.7
LnGrp LOS				C	A	C	D	A	A	A	A	C
Approach Vol, veh/h					1647			331			110	
Approach Delay, s/veh					30.7			40.9			24.7	
Approach LOS					C			D			C	
Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				43.0		65.7		43.0				
Change Period (Y+Rc), s				4.0		4.0		4.0				
Max Green Setting (Gmax), s				39.0		63.0		39.0				
Max Q Clear Time (g_c+I1), s				7.1		50.9		31.4				
Green Ext Time (p_c), s				0.3		10.8		0.9				
Intersection Summary												
HCM 6th Ctrl Delay			32.0									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	75	1535	555	0	0	0	0	240	245	40	210	0
Future Volume (veh/h)	75	1535	555	0	0	0	0	240	245	40	210	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772				0	1772	1772	1730	1730	0
Adj Flow Rate, veh/h	79	1616	0				0	253	258	42	221	0
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2				0	2	2	5	5	0
Cap, veh/h	97	2082					0	403	334	52	498	0
Arrive On Green	0.63	0.63	0.00				0.00	0.23	0.23	0.01	0.10	0.00
Sat Flow, veh/h	153	3294	1502				0	1772	1470	1647	1730	0
Grp Volume(v), veh/h	908	787	0				0	253	258	42	221	0
Grp Sat Flow(s),veh/h/ln	1764	1683	1502				0	1772	1470	1647	1730	0
Q Serve(g_s), s	42.9	35.5	0.0				0.0	14.2	18.1	2.8	13.3	0.0
Cycle Q Clear(g_c), s	42.9	35.5	0.0				0.0	14.2	18.1	2.8	13.3	0.0
Prop In Lane	0.09		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	1115	1064					0	403	334	52	498	0
V/C Ratio(X)	0.81	0.74					0.00	0.63	0.77	0.81	0.44	0.00
Avail Cap(c_a), veh/h	1115	1064					0	403	334	75	535	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	0.97	0.97	0.99	0.99	0.00
Uniform Delay (d), s/veh	15.3	14.0	0.0				0.0	38.3	39.8	54.1	41.5	0.0
Incr Delay (d2), s/veh	6.6	4.6	0.0				0.0	7.0	15.4	26.3	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	18.1	14.0	0.0				0.0	6.8	7.8	1.6	6.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.9	18.6	0.0				0.0	45.3	55.2	80.4	41.8	0.0
LnGrp LOS	C	B					A	D	E	F	D	A
Approach Vol, veh/h		1695	A					511			263	
Approach Delay, s/veh		20.4						50.3			48.0	
Approach LOS		C						D			D	
Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		73.5		36.5			7.5	29.0				
Change Period (Y+Rc), s		4.0		* 4.8			4.0	4.8				
Max Green Setting (Gmax), s		68.0		* 34			5.0	24.2				
Max Q Clear Time (g_c+I1), s		44.9		15.3			4.8	20.1				
Green Ext Time (p_c), s		19.7		0.5			0.0	0.7				
Intersection Summary												
HCM 6th Ctrl Delay			29.5									
HCM 6th LOS			C									

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	1450	125	10	1180	25	100	25	10	175	20	120
Future Volume (veh/h)	170	1450	125	10	1180	25	100	25	10	175	20	120
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758
Adj Flow Rate, veh/h	179	1526	132	11	1242	26	105	26	11	184	21	126
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	7	7	7	0	0	0	3	3	3
Cap, veh/h	343	2075	925	24	1398	623	272	64	23	258	24	142
Arrive On Green	0.20	0.62	0.62	0.01	0.43	0.43	0.25	0.26	0.24	0.25	0.26	0.24
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	842	250	92	812	96	558
Grp Volume(v), veh/h	179	1526	132	11	1242	26	142	0	0	331	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1500	1621	1617	1442	1185	0	0	1465	0	0
Q Serve(g_s), s	10.4	35.0	4.1	0.7	39.0	1.1	0.0	0.0	0.0	12.7	0.0	0.0
Cycle Q Clear(g_c), s	10.4	35.0	4.1	0.7	39.0	1.1	11.3	0.0	0.0	24.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.74		0.08	0.56		0.38
Lane Grp Cap(c), veh/h	343	2075	925	24	1398	623	354	0	0	418	0	0
V/C Ratio(X)	0.52	0.74	0.14	0.45	0.89	0.04	0.40	0.00	0.00	0.79	0.00	0.00
Avail Cap(c_a), veh/h	343	2075	925	66	1446	645	413	0	0	481	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	39.0	14.8	8.9	53.7	28.8	18.1	34.8	0.0	0.0	39.8	0.0	0.0
Incr Delay (d2), s/veh	1.0	2.4	0.3	7.9	8.8	0.1	0.5	0.0	0.0	7.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	13.4	1.4	0.3	15.8	0.4	3.3	0.0	0.0	9.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.0	17.2	9.2	61.7	37.5	18.2	35.3	0.0	0.0	47.1	0.0	0.0
LnGrp LOS	D	B	A	E	D	B	D	A	A	D	A	A
Approach Vol, veh/h		1837			1279			142			331	
Approach Delay, s/veh		18.8			37.4			35.3			47.1	
Approach LOS		B			D			D			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	72.3		32.1	26.4	51.5		32.1				
Change Period (Y+Rc), s	4.5	* 4.5		5.5	4.5	4.0		5.5				
Max Green Setting (Gmax), s	4.0	* 61		31.3	15.5	49.2		31.3				
Max Q Clear Time (g_c+I1), s	12.7	37.0		26.0	12.4	41.0		13.3				
Green Ext Time (p_c), s	0.0	19.6		0.5	0.1	6.6		0.4				

Intersection Summary		
HCM 6th Ctrl Delay		28.7
HCM 6th LOS		C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	3.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1535	90	30	1230	25	70
Future Vol, veh/h	1535	90	30	1230	25	70
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	300	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	6	6	0	0
Mvmt Flow	1616	95	32	1295	26	74

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1711	0	2328	808
Stage 1	-	-	-	-	1616	-
Stage 2	-	-	-	-	712	-
Critical Hdwy	-	-	4.22	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.26	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	350	-	32	328
Stage 1	-	-	-	-	151	-
Stage 2	-	-	-	-	453	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	350	-	29	328
Mov Cap-2 Maneuver	-	-	-	-	29	-
Stage 1	-	-	-	-	151	-
Stage 2	-	-	-	-	412	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	102.1
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	29	328	-	-	350	-
HCM Lane V/C Ratio	0.907	0.225	-	-	0.09	-
HCM Control Delay (s)	$ 334.4	19.1	-	-	16.3	-
HCM Lane LOS	F	C	-	-	C	-
HCM 95th %tile Q(veh)	3	0.8	-	-	0.3	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	1435	0	100	1140	0	5	5	100	5	0	120
Future Volume (veh/h)	170	1435	0	100	1140	0	5	5	100	5	0	120
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1758	1758	1723	1723	1716	1716	1723	1723	1723	1800	1723	1800
Adj Flow Rate, veh/h	179	1511	0	105	1200	0	5	5	105	5	0	126
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	2	2	6	6	2	2	2	0	2	0
Cap, veh/h	547	2609	1141	436	2509	0	74	0	3	74	0	3
Arrive On Green	0.07	0.78	0.00	0.06	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sat Flow, veh/h	1674	3340	1460	1641	3346	0	75	75	1569	66	0	1654
Grp Volume(v), veh/h	179	1511	0	105	1200	0	115	0	0	131	0	0
Grp Sat Flow(s),veh/h/ln	1674	1670	1460	1641	1630	0	1719	0	0	1719	0	0
Q Serve(g_s), s	1.2	9.2	0.0	0.7	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	1.2	9.2	0.0	0.7	6.8	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.04		0.91	0.04		0.96
Lane Grp Cap(c), veh/h	547	2609	1141	436	2509	0	77	0	0	77	0	0
V/C Ratio(X)	0.33	0.58	0.00	0.24	0.48	0.00	1.48	0.00	0.00	1.70	0.00	0.00
Avail Cap(c_a), veh/h	888	4942	2160	660	4566	0	855	0	0	851	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	1.8	2.2	0.0	2.2	2.1	0.0	25.4	0.0	0.0	25.4	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.4	0.0	0.2	0.3	0.0	228.6	0.0	0.0	323.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.0	0.0	0.1	0.0	5.8	0.0	0.0	7.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	2.1	2.7	0.0	2.4	2.4	0.0	254.0	0.0	0.0	348.6	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	F	A	A	F	A	A
Approach Vol, veh/h		1690			1305			115			131	
Approach Delay, s/veh		2.6			2.4			254.0			348.6	
Approach LOS		A			A			F			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.7	43.0		0.0	7.1	43.6		0.0				
Change Period (Y+Rc), s	4.0	6.0		4.0	4.0	6.0		4.0				
Max Green Setting (Gmax), s	14.0	69.0		23.0	10.0	73.0		23.0				
Max Q Clear Time (g_c+I1), s	3.2	8.8		0.0	2.7	11.2		0.0				
Green Ext Time (p_c), s	0.3	17.7		0.0	0.1	26.4		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			25.4									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	1535	1235	25	10	0
Future Vol, veh/h	5	1535	1235	25	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	1616	1300	26	11	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1326	0	-	0	2131	663
Stage 1	-	-	-	-	1313	-
Stage 2	-	-	-	-	818	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	517	-	-	-	42	404
Stage 1	-	-	-	-	216	-
Stage 2	-	-	-	-	394	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	517	-	-	-	42	404
Mov Cap-2 Maneuver	-	-	-	-	42	-
Stage 1	-	-	-	-	214	-
Stage 2	-	-	-	-	394	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	117.3
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	517	-	-	-	42
HCM Lane V/C Ratio	0.01	-	-	-	0.251
HCM Control Delay (s)	12	-	-	-	117.3
HCM Lane LOS	B	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	190	90	160	70	30	110	230	130	50	535	40
Future Volume (veh/h)	30	190	90	160	70	30	110	230	130	50	535	40
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1800	1772	1772	1772	1772	1772	1772	1758	1758	1758
Adj Flow Rate, veh/h	32	200	95	168	74	32	116	242	137	53	563	42
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	2	2	2	2	2	2	3	3	3
Cap, veh/h	429	238	113	317	327	141	294	748	631	494	704	594
Arrive On Green	0.03	0.21	0.21	0.10	0.28	0.28	0.06	0.42	0.42	0.04	0.40	0.40
Sat Flow, veh/h	1714	1152	547	1688	1173	507	1688	1772	1495	1674	1758	1482
Grp Volume(v), veh/h	32	0	295	168	0	106	116	242	137	53	563	42
Grp Sat Flow(s),veh/h/ln	1714	0	1700	1688	0	1680	1688	1772	1495	1674	1758	1482
Q Serve(g_s), s	1.0	0.0	11.3	5.0	0.0	3.3	2.8	6.2	4.0	1.3	19.2	1.2
Cycle Q Clear(g_c), s	1.0	0.0	11.3	5.0	0.0	3.3	2.8	6.2	4.0	1.3	19.2	1.2
Prop In Lane	1.00		0.32	1.00		0.30	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	429	0	351	317	0	468	294	748	631	494	704	594
V/C Ratio(X)	0.07	0.00	0.84	0.53	0.00	0.23	0.39	0.32	0.22	0.11	0.80	0.07
Avail Cap(c_a), veh/h	484	0	524	348	0	617	294	1067	900	530	1058	893
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.4	0.0	25.9	18.3	0.0	18.9	14.3	13.2	12.5	11.8	18.0	12.6
Incr Delay (d2), s/veh	0.1	0.0	6.6	1.0	0.0	0.2	0.6	0.5	0.4	0.1	4.8	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	5.0	1.9	0.0	1.2	0.9	2.2	1.3	0.4	7.6	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.5	0.0	32.5	19.3	0.0	19.1	14.9	13.7	12.9	11.8	22.8	12.7
LnGrp LOS	C	A	C	B	A	B	B	B	B	B	C	B
Approach Vol, veh/h		327			274			495			658	
Approach Delay, s/veh		31.4			19.2			13.8			21.3	
Approach LOS		C			B			B			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.5	32.8	10.8	18.1	8.0	31.3	5.8	23.0				
Change Period (Y+Rc), s	4.0	4.8	4.0	4.0	4.0	4.8	4.0	4.0				
Max Green Setting (Gmax), s	4.0	40.2	8.0	21.0	4.0	40.2	4.0	25.0				
Max Q Clear Time (g_c+I1), s	3.3	8.2	7.0	13.3	4.8	21.2	3.0	5.3				
Green Ext Time (p_c), s	0.0	3.5	0.0	0.6	0.0	5.3	0.0	0.2				
Intersection Summary												
HCM 6th Ctrl Delay			20.7									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	31

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	400	120	230	570	105	80
Future Vol, veh/h	400	120	230	570	105	80
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	1	1	1	1
Mvmt Flow	421	126	242	600	111	84

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	547	0	1568	484
Stage 1	-	-	-	-	484	-
Stage 2	-	-	-	-	1084	-
Critical Hdwy	-	-	4.11	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.209	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	1027	-	123	585
Stage 1	-	-	-	-	622	-
Stage 2	-	-	-	-	326	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1027	-	~ 94	585
Mov Cap-2 Maneuver	-	-	-	-	~ 94	-
Stage 1	-	-	-	-	622	-
Stage 2	-	-	-	-	249	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.8	239.8
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	148	-	-	1027	-
HCM Lane V/C Ratio	1.316	-	-	0.236	-
HCM Control Delay (s)	239.8	-	-	9.6	-
HCM Lane LOS	F	-	-	A	-
HCM 95th %tile Q(veh)	12	-	-	0.9	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

TM #6 Regulatory Solutions . . . . Section F

memo

to	Kelly O'Neill, Development Services Director, City of Sandy
from	Darci Rudzinski and Brandon Crawford, MIG | APG
re	City of Sandy TSP Regulatory Solutions
	Technical Memorandum #6 Phase II
date	4/5/23

Introduction

The City of Sandy is updating transportation-related development code requirements as part of the Transportation System Plan Update (TSP) project. As part of this work, City staff worked with the consultant team to identify where adopted ordinances needed to be updated for consistency with the Draft TSP recommendations and to better meet State transportation requirements (specifically the Transportation Planning Rule, or "TPR," OAR 660, Division 12).[1]

Table 1 summarizes the recommended changes to Sandy Development Code ordinances. Proposed ordinance amendments update transportation facility standards, enhance multi-modal connectivity requirements, and add notification requirements.

The City is preparing to adopt the draft TSP in mid-2023 and is revisiting implementing Code amendments.[2] In addition to the TSP update and associated Code amendments, the City has been working on the Sandy Clear and Objective Code Audit (Code Audit) project, which also entails updates to the Sandy Development Code (SDC). The focus of the Code Audit project is to provide clear and objective requirements for housing development. The TSP project team has been coordinating with the project team for the Code Audit project to ensure that there are no conflicting recommendations. Several SDC sections that have transportation-related recommendations also include clear and objective updates. This memorandum reflects proposed Code language related to the Code Audit project to the extent that there are also TSP code update recommendations in the same section. The intent of including the proposed clear and objective Code Audit project updates with this draft TSP is to ensure consistency between the concurrent projects and to avoid confusion for staff, Planning Commission, and City Council review. Reviewers of this memorandum are asked to consider the merits of transportation-related changes; housing-related changes will be considered at a later date as part of the Sandy Clear and Objective Code Audit project.

[1] An audit of the Sandy Development Code (SDC) for consistency with the TPR was conducted in 2021.
[2] Note that the City has adopted an update to the SDC in May 2022; some of the items identified in the earlier audit and 2021 recommendations were addressed in that update.

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The City intends on adopting the clear and objective modifications and the updated transportation-related Code sections as one package and through the same hearings and adoption process. Therefore, the TSP Code update recommendations will be adopted *after* the TSP is adopted in mid-2023. The complete Code update adoption is tentatively scheduled for late summer or early fall of 2023.

Table 1. Summary of Proposed Transportation-Related Code Amendments

Reference Number	Code Reference	Proposed Amendment	Implements
Sections 17.32 – 17.56 – Zoning Districts			
1.	Section 17.22.10 and 17.22.20	Add language to the Development Code procedures sections specifying the need to provide notice to public agencies providing transportation facilities and services, including ODOT and Sandy Area Metro (SAM), regarding proposals that are adjacent to transportation facilities or services.	Implements OAR 660-012-0045(2)(f)
Section 17.84 - Improvements Required with Development			
2.	Section 17.84.30 (B4)	Amend language to require pedestrian connections within new office parks and commercial developments. Currently the connections are “encouraged.” Also see Recommendation 9 for definitions of accessways, shared-use paths, pathways, walkways, and sidewalks.	Implements OAR 660-012-0045(3)(e)
3.	Section 17.84.30 and 17.84.40	Add development requirements related to transit improvements and pedestrian connections to transit, where consistent with the updated TSP Transit Plan and/or the adopted Sandy Transit Master Plan.	Implements OAR 660-012-0045(4)(b) and (f)
4.	Section 17.84.50	Add language that clarifies the City’s authority to apply conditions of approval related to needed transportation improvements.	Implements OAR 660-012-0045(2)(e)
5.	Section 17.84.50	Add language addressing nexus and rough proportionality for improvements required as a condition of development approval based on TIS findings, including off-site improvements concurrent with development.	Implements OAR 660-012-0045(3)(c)

Reference Number	Code Reference	Proposed Amendment	Implements
6.	Section 17.84.50	Add provisions that establish Traffic Letter criteria and requirements.	Implements OAR 660-012-0045(2)(e)
Section 17.98 – Parking, Loading, and Access Requirements			
7.	Section 17.98.20	Add language requiring bicycle parking facilities for transit transfer stations and park-and-ride lots.	Implements OAR 660-012-0045(3)(a)
8.	Section 17.98.80	The access spacing standards should be expanded to include access spacing tables from the TSP and give the City authority to require closing or consolidation of accesses.	Implements OAR 660-012-0045(2)(a)
Section 17.100 - Land Division			
9.	Section 17.100.110 and Section 17.10.30	Update definition of Streets in the definitions section to ensure consistency throughout the code. Move standards in definitions to Section 17.100.110 of the Development Code. Modify standards to ensure connectivity is maintained for cul-de-sacs and long blocks.	Implements OAR 660-012-0045(2)(a), OAR 660-012-0045 (6)
10.	Section 17.100.100	Update the Development Code to include specific acceptable alternatives to a street connection. Block length standards should be checked for consistency with TSP access standards.	Implements OAR 660-012-0045(3)(b)

Code amendments

The proposed code amendment language is presented in the order shown in Table 1. Recommended changes are in an adoption-ready format; text that is proposed to be added is shown as <u>underlined</u>, and text proposed to be removed is shown in ~~strikeout~~.

Recommendation 1

Recommendation: Add language to the Development Code procedures sections specifying the need to provide notice to public agencies providing transportation facilities and services, including ODOT and Sandy Area Metro (SAM), regarding proposals that are adjacent to, or that will have an impact on, transportation facilities or services.

Sec. 17.22.10. Type II quasi-judicial notice.

[Where a quasi-judicial hearing is required by this Code notice shall be mailed to the following:]

- *A. The applicant or authorized agent;*
- *B. Any person who owns property within 300 feet, of the development site;*
- *C. <u>ODOT, when the site is located within 200 feet of an ODOT facility, including right-of-way, and maintenance yards;</u>*
- *D. <u>Sandy Area Metro (SAM), when the site is located within 200 feet of a SAM facility.</u>*
- *<u>E</u>~~C~~. Any other person, agency, or organization that may be designated by the Code;*
- *<u>F</u>~~D~~. Interested parties, such as counties, state agencies, or public utility or service providers that may be affected by the specific development proposal shall receive notice of the scheduled public hearing;*
- *<u>G</u>~~E~~. Additional notices may also be mailed to other property owners or posted as determined appropriate by the Director and based on the impact of the proposed development.*

Sec. 17.22.20. Type III and Type IV quasi-judicial notice.

Where a quasi-judicial hearing is required by this Code notice shall be mailed to the following:

- *A. The applicant or authorized agent;*
- *B. Any person who owns property within 500 feet of the development site, except an application for annexation requires notice to the owner(s) of property that is within 1,000 feet of the subject property;*
- *<u>C. ODOT, when the site is located within 200 feet of an ODOT facility, including right-of-way, and maintenance yards;</u>*
- *<u>D.</u> <u>Sandy Area Metro (SAM), when the site is located within 200 feet of a SAM facility.</u>*
- *<u>E</u>~~C~~. Tenants of any existing manufactured-dwelling park for which a zoning district change is proposed;*
- *<u>F</u>~~D~~. Any other person, agency, or organization that has filed with the Director a request to receive notices of hearings and has paid a reasonable fee to cover the cost of providing notice;*
- *<u>G</u>~~E~~. Any other person, agency, or organization that may be designated by the Code;*
- *<u>H</u>~~F~~. Any other person, agency, or organization that may be designated by the City Council or its agencies;*

I~~G~~. Any other resident owner of property whom the Director determines is affected by the application;
J~~H~~. Any neighborhood or community organization recognized by the governing body and whose boundaries include the site;
K~~I~~. Interested parties, such as counties, state agencies, or public utility or service providers that may be affected by the specific development proposal shall receive notice of the scheduled public hearing;
L~~J~~. Additional notices may also be mailed to other property owners or posted as determined appropriate by the Director and based on the impact of the proposed development.

Recommendation 2

Recommendation: Amend language to require pedestrian connections within new office parks and commercial developments. Also see Recommendation 9 for definitions of accessways, pathways, and sidewalks.

Sec. 17.84.30. - Pedestrian and bicyclist requirements.

A. Sidewalks shall be required along both sides of all arterial, collector, and local streets, as follows:

1. *Sidewalks shall be a minimum of ~~five~~ six feet wide on local streets. The sidewalks shall be separated from curbs by a tree planting area that provides separation between sidewalk and curb, and that meets the dimensional standards of Subsection 17.92.10.D and of the 2023 City of Sandy Transportation System Plan Typical Street Cross Section Standards (TSP Figures 18-24 and TSP Table 4), unless modified in accordance with Subsection 3., below.*
2. *Sidewalks along arterial and collector streets shall be separated from curbs with a planting area ~~except as necessary~~ ~~continue an existing curb-tight sidewalk~~ unless modified in accordance with Subsection 3, below. The planting area shall be landscaped with trees and plant materials approved by the City. The sidewalks shall be a minimum of six feet wide.*
3. *Sidewalk improvements shall be made according to City standards. However, if the improvements are made as part of a discretionary review, the City standards may be modified if ~~, unless~~ the Director ~~City~~ determines that the public benefit in the particular case does not warrant imposing a severe adverse impact to a natural or other significant feature such as requiring removal of a ~~mature~~ tree with a trunk 11 inches DBH or greater, requiring undue grading, or requiring modification to an existing building. Any exceptions to the standards shall generally be in the following order.*
    a. *~~Narrow~~ Reduce width of landscape strips to no less than four feet in width measured from the interior edge of the curb to the sidewalk.*
    b. *~~Narrow~~ Reduce width of sidewalk or portion of sidewalk to no less than four feet in width.*
    c. *Eliminate landscape strips.*

d. ~~Narrow~~ Reduce width of on-street improvements by eliminating on-street parking.

e. Eliminate sidewalks.

[…]

5. Sidewalks shall be designed in conformance with Title 12 of the Sandy Municipal Code and with the City of Sandy Sidewalks Utility Standard Details.

B. Safe and convenient pedestrian and bicyclist facilities that ~~strive to~~ minimize travel distance to the extent practicable shall be provided ~~in conjunction with new development within and between new subdivisions, commercial developments, industrial areas, residential areas, public transit stops, school transit stops, and neighborhood activity centers such as schools and parks,~~ as follows:

1. New non-residential development shall provide safe and convenient bicycle and pedestrian facilities connecting to adjacent commercial developments, industrial areas, residential areas, public transit stops, and neighborhood activity centers such as schools and parks, as follows:

~~1.~~ a. For the purposes of this section, "safe and convenient" means pedestrian and bicyclist facilities that: are ~~reasonably~~ free from hazards ~~which~~ that would interfere with or discourage travel for short trips; provide a direct route of travel between destinations; and meet the travel needs of pedestrians and bicyclists considering destination and length of trip, and considering that the optimum trip length of pedestrians is 1/4 to 1/2 mile.

~~2.~~ b. To meet the intent of B., above, pedestrian rights-of-way connecting cul-de-sacs or passing through ~~unusually~~ ~~long or oddly shaped~~ blocks shall be a minimum of 15 feet wide with eight feet of pavement and seven feet of landscaping.

~~3.~~ c. Twelve foot ~~feet~~ wide pathways shall be provided where multiuse paths are planned in the TSP. ~~in areas with high bicycle volumes or multi-use by bicyclists, pedestrians, and joggers.~~

~~4.~~ d. ~~Pathways and sidewalks~~ Pedestrian connectivity shall be encouraged in new developments by clustering buildings or constructing convenient pedestrian ways. Pedestrian pathways/~~walkways~~ shall be provided in accordance with the following standards:

~~a.~~ i. The pedestrian circulation system shall be at least five feet in width and shall connect the sidewalk on each abutting street to the ~~main~~ primary entrance of the primary structure on the site to minimize out of direction pedestrian travel.

~~b.~~ ii. Pathways/~~walkways~~ at least five feet in width shall be provided to connect the pedestrian circulation system with existing or planned pedestrian facilities ~~which~~ that abut the site but are not adjacent to the streets abutting the site.

~~c.~~ iii. ~~Walkways shall be as direct as possible and avoid unnecessary meandering~~ Pathways shall be direct. A pathway is direct when it follows a route when the length is not more than 20 feet longer or 120 percent of the straight-line distance, whichever is less;

~~d.~~ iv. Pathway/ ~~Walkways~~/driveway crossings shall be minimized. Internal parking lot design shall comply with the standards in Section 17.98.60 to maintain ~~ease of~~ safe and comfortable access for pedestrians from abutting streets, pedestrian facilities, and transit stops.

~~e.~~ v. With the exception of pathway/~~walkways~~ /driveway crossings, pathways/~~walkways~~ shall be separated from vehicle parking or vehicle maneuvering areas by grade, different paving material, painted crosshatching, or landscaping. They shall be constructed in accordance with the sidewalk construction standards in the Utility Standard Details adopted by the City in 2004. (This provision does not require a separated ~~walkway~~ pathway system to collect drivers and passengers from cars that have parked on site unless an unusual parking lot hazard exists).

~~f.~~ vi. Pedestrian amenities such as covered pathways ~~walk-ways~~, awnings, visual corridors, and benches are encouraged. For every two benches provided, the minimum parking requirements shall ~~will~~ be reduced by one, up to a maximum ~~of four benches~~ reduction of two parking spaces per site. Benches shall have direct access to the pedestrian circulation system.

2. New multi-family development and residential subdivisions shall meet the following pedestrian standards:
    a. Internal connections. On sites larger than 10,000 square feet, an internal pedestrian connection system shall be provided. The system shall connect all main entrances (in the case of multi-family development) or lots (in the case of a subdivision) to the following onsite shared facilities: parking areas, bicycle parking, recreational areas, and outdoor areas; and to the following adjacent offsite improvements: public transit stops, schools, and parks.
    b. Public sidewalks shall be part of the pedestrian connection system for subdivisions and shall meet the standards in Section 17.100.270. Pedestrian and bicycle accessways, if required by Section 17.100.120.C, shall meet the minimum requirements of that section.
    c. On-site circulation systems required by the standards of this section shall be concrete or asphalt and shall meet the following minimum width requirements:
        i. The concrete or asphalt portion of the circulation system on sites with up to 20 residential units shall be at least 4 feet wide.
        ii. The concrete or asphalt portion of the circulation system on sites with more than 20 residential units shall be at least 5 feet wide.
3. Except as allowed in Subsection 4, below, where the system crosses driveways, parking areas, and loading areas, the system shall be clearly identifiable, through the use of elevation changes, speed bumps, a different paving material, or other similar methods approved as part of a discretionary review. Striping does not meet

<u>*this requirement. Elevation changes and speed bumps shall be at least 4 inches high.*</u>

4. <u>*Except as allowed in Subsection 4, below, where the system is parallel and adjacent to an auto travel lane, the system shall be a raised path or be separated from the auto travel lane by a raised curb, bollards, landscaping, or another physical barrier approved by the Director as part of a discretionary review. If a raised path is used it shall be at least 4 inches high and the ends of the raised portions shall be equipped with curb ramps. Bollard spacing shall be no further apart than 5 feet on center.*</u>
5. <u>*The pedestrian circulation system may be within an auto travel lane if the auto travel lane provides access to 16 or fewer parking spaces and the entire auto travel lane is surfaced with paving blocks or bricks.*</u>

C. *Where a development site is traversed by or adjacent to a future trail linkage identified <u>in</u> ~~within~~ the <u>2023</u> Transportation System Plan, <u>Figures 12</u>, improvement of the trail linkage shall occur concurrent with development. Dedication of the trail to the City shall be provided in accordance with <u>Subsection</u> 17.84.90.D.*

D. *~~To provide for orderly development of an effective pedestrian network, p~~ <u>Pedestrian</u> facilities installed concurrent with development of a site shall be extended through the site to the edge of adjacent property(ies).*

E. *To ensure improved access between a development site and an existing developed facility such as a commercial center, school, park, or trail system, <u>as part of a discretionary land use review,</u> the Planning Commission or Director ~~may~~ <u>shall</u> require off-site pedestrian facility improvements concurrent with development.*

Sec. 17.98.60. - Design, size and access.

All off-street parking facilities, vehicular maneuvering areas, driveways, loading facilities, accessways, and private streets shall conform to the standards set forth in this section.

A. *Parking Lot Design. All areas for required parking and maneuvering of vehicles shall have a ~~durable hard~~ surface ~~such as~~ <u>made of</u> concrete or asphalt.*

C. Aisle Width.

[…]

<u>*D. Pedestrian Circulation.*</u>

1. <u>*Pedestrian circulation shall be provided in the form of pathways in all new off-street parking lots. Pathways shall connect sidewalks adjacent to parking lots to the entrances of new buildings.*</u>
2. <u>*Crosswalks. Where a pathway crosses a parking area or driveway ("crosswalk"), it shall be clearly identified with pavement markings or contrasting paving materials (e.g., pavers, light-color concrete inlay between asphalt, or similar contrast). The crosswalk may be part of a speed table to improve driver-visibility of pedestrians.*</u>
3. <u>*Pathway Width and Surface. Pedestrian pathways shall be constructed in accordance with the sidewalk construction standards in the Utility Standard Details adopted by the City in 2004. Multi-use pathways (i.e., designed for shared use by bicyclists and pedestrians) shall be concrete or asphalt and shall conform to the Utility Standard Details.*</u>

Recommendation 3

Recommendation: Add development requirements related to transit improvements and pedestrian connections to transit, where consistent with the updated TSP, and/or the adopted Sandy Transit Master Plan.

Sec. 17.84.40. Transit ~~and school bus transit~~ requirements.

A. *Development sites located along existing or planned public transit routes, as indicated in the 2020 Sandy Transit Master Plan, shall~~, where appropriate,~~ incorporate bus pull-outs and/or shelters into the site design. A bus shelter and bench shall be required at each bus stop with 10 or more passenger boardings per day. These public transit stop improvements shall be installed in accordance with the guidelines and standards in the adopted 2009 Sandy Transit Master Plan, Appendix B~~. of the transit agency~~. ~~School bus pull-outs and/or shelters may also be required, where appropriate, as a condition of approval for a residential development of greater than 50 dwelling units where a school bus pick-up point is anticipated to serve a large number of children.~~*

B. *New developments at or near existing or planned transit ~~or school bus transit~~ stops shall design development sites to provide safe, convenient access to the transit system by meeting the following standards ~~as follows~~:*

1. *Commercial and civic use developments shall provide a prominent entrance oriented towards arterial and collector streets, with front setbacks reduced as much as possible to provide access for pedestrians, bicycles, and transit.*
2. *All developments within 300 feet of a transit stop (as measured in walking distance from the nearest property line) shall provide ~~safe, convenient~~ pedestrian walkways between the buildings and the transit stop, in accordance with the provisions of Subsection 17.84.30.B.*

Recommendation 4 and 5

Recommendation 4: Add language that clarifies the City's authority to apply conditions of approval related to needed transportation improvements.

Recommendation 5: Add language addressing nexus and rough proportionality for improvements required as a condition of development approval based on TIS findings, including off-site improvements concurrent with development.

Sec. 17.84.50. Street requirements.

A. *Transportation Impact Study (No Dwellings). For development applications that do not propose any dwelling units, the City may require a transportation impact study that evaluates the impact of the proposed development on the transportation system. Unless the City does not require a transportation impact study, the applicant shall prepare the study in accordance with the following:*

[…]

2. *If the study identifies ~~level-of-service~~ vehicle operating conditions less than the minimum mobility targets ~~standard~~ established in the development code or the 2023 City of Sandy Transportation System Plan, or fails to demonstrate that average daily traffic on existing or proposed streets will meet the ADT standards established in the development code, the applicant shall propose improvements and funding strategies for mitigating identified problems or deficiencies that will be implemented concurrent with the proposed development.*

B. *Transportation Impact Study (Dwellings). For development applications that propose dwelling units, an applicant must submit a transportation impact study unless the application is exempt from this requirement pursuant to S~~s~~ubsection B.~~6~~7., below. Failure to submit the study will result in an incomplete application. A traffic impact study shall bear the seal of a Professional Engineer licensed in the State of Oregon and qualified in traffic or civil engineering. The applicant shall prepare the study in accordance with the following:*

1. *The study area must include all existing and proposed site accesses and all existing and proposed streets and intersections where the development adds more than 20 vehicles during any peak hour as determined by using the ~~most recent edition of the~~ Institute of Transportation Engineers Trip Generation Manual (11th edition). The determination of peak hour vehicle addition shall include the cumulative impact of the proposed development and development on abutting properties that received a certificate of occupancy or recorded a plat within the past five years.*
2. *The study must analyze existing conditions and projected conditions upon completion of the proposed development.*
3. *The study must be performed for the weekday a.m. peak hour (one hour between 7:00 a.m. and 9:00 a.m.) and p.m. peak hour (one hour between 4:00 p.m. and 6:00 p.m.). Analysis of other time periods may be required for uses that generate their highest traffic volumes at other times of the day or on weekends.*

4. *The study must demonstrate that the transportation impacts from the proposed development will comply with the City's ~~level-of-service~~ mobility targets and average daily traffic standards and the Oregon Department of Transportation's mobility targets ~~standard~~.*
5. *If the study identifies ~~level-of-service~~ vehicle operating conditions less than the minimum mobility targets ~~standard~~ established in the ~~development code or the~~ 2023 City of Sandy Transportation System Plan, or fails to demonstrate that average daily traffic on existing or proposed streets will meet the ADT standards established in Chapter 17.10 of the development code or fails to meet the Oregon Department of Transportation's mobility targets ~~standard~~, the applicant shall propose improvements and funding strategies for mitigating identified problems or deficiencies that will be implemented concurrent with the proposed development.*
6. *If improvements and mitigation measures are necessary, pursuant to Subsection 5., above, the following criteria shall be met in order for the application to be approved:*
   a. *The improvements and funding strategies proposed as mitigation address the problems or deficiencies to the extent necessary to meet the City's mobility targets and average daily traffic standards and, if applicable, the Oregon Department of Transportation's (ODOT's) mobility target.*
   b. *If proposed mitigation requires improvements within City, County, or ODOT rights-of-way, the design has been approved by the City Engineer, Clackamas County, and ODOT when applicable.*

7~~6~~. A transportation impact study is not required under this section if:

   a. *The cumulative impact of the proposed development and development on abutting properties that received a certificate of occupancy or recorded a plat within the past five years will generate no more than 20 vehicle trips in any weekday a.m. or p.m. peak hour as determined by using the ~~most recent edition of the~~ Institute of Transportation Engineers Trip Generation Manual (11th Edition); or*
   […]

C. *Transportation Impact Study (Dwellings)—Discretionary Track. As an alternative to the process outlined in Section 17.84.50.B., an applicant may choose to follow the process in Section 17.84.50.A.*
[…]

E. *Street Requirements (Discretionary). For development applications that do not propose dwelling units, or for applications that include dwellings and that elect to use the discretionary track, the following standards shall be met.*
[…]

~~3~~ c. To ensure improved access to a development site consistent with policies on orderly urbanization and extension of public facilities the Planning Commission or Director may require off-site improvements concurrent with development. Off-

site improvement requirements upon the site developer shall be reasonably related to the anticipated impacts of the development.

i. *When necessary to meet transportation operations and safety standards, the City of Sandy, and ODOT where access to a state roadway is proposed, will identify conditions of approval consistent with the planned transportation system. The City may deny, approve, or approve the proposal with appropriate conditions based on the transportation standards in Section 17.100.110 and consistent with the City's adopted mobility targets, which requires a minimum level of service (LOS) D for signalized and unsignalized intersections and maximum volume to capacity ratio of 0.90 for roundabout intersections.*

ii. *Improvements required as a condition of development approval, when not voluntarily provided by the applicant, shall be roughly proportional to the impact of the development on transportation facilities. Findings supporting development approval shall indicate how the required improvements directly relate to and are roughly proportional to the impact of development.*

F. *Street Requirements (Dwellings/Clear and Objective Track). For development applications that propose dwelling units, all of the following standards shall be met, unless the applicant elects to use the discretionary standards under Subsection E., above.*

1. *Location of new arterial streets shall conform to the 2023 City of Sandy Transportation System Plan in accordance with the following:*
   a. *Arterial streets shall be spaced at minimum intervals of 5,280 feet and maximum intervals of 6,000 feet.*
   b. *Traffic signals shall not be spaced closer than 1,500 feet.*
2. *Local streets shall be designed to discourage through traffic. NOTE: for the purposes of this section, "through traffic" means the traffic traveling through an area that does not have a local origination or destination. To discourage through traffic and excessive vehicle speeds the following street design characteristics shall be considered, as well as other designs intended to discourage traffic:*
   a. *Straight segments of local streets shall be kept to less than a quarter mile in length.*
   b. *Local streets should typically intersect in "T" configurations rather than four-way intersections to minimize conflicts and discourage through traffic. Adjacent "T" intersections shall maintain a minimum of 150 feet between the nearest edges of the two rights-of-way.*
   c. *Cul-de-sacs shall not exceed 400 feet in length nor serve more than 20 dwelling units, unless a proposal is successfully processed through the procedures in Chapter 17.66 of the Sandy Development Code. If successfully processed through the procedures in Chapter 17.66, cul-de-sacs longer than 400 feet or developments with only one access point may be required to provide an alternative access for emergency vehicle use only, install fire*

prevention sprinklers, or provide other mitigating measures, determined by the City.

3. *Development sites shall be provided with access from a public street improved to City standards in accordance with the following:*
   a. *Where a development site abuts an existing public street not improved to City standards, the abutting street shall be improved to City standards along the full frontage of the property concurrent with development.*
   b. *Half-street improvements are considered the minimum required improvement. Three-quarter-street or full-street improvements shall be required where traffic volumes generated by the development are such that a half-street improvement would result in the street failing to meet the level of service standards in the 2023 City of Sandy Transportation System Plan.*
   c. *To ensure improved access to a development site and extension of public facilities, off-site improvements concurrent with development shall be required if the Transportation Impact Analysis indicates they are necessary to mitigate problems or deficiencies in off-site facilities, pursuant to Section 17.84.50.B. Off-site improvement requirements upon the site developer shall be reasonably related and roughly proportional to the anticipated impacts of the development.*
   d. *Reimbursement agreements for three-quarter-street improvements (i.e., curb face to curb face) may be requested by the developer per Chapter 12 of the SMC.*
   e. *A half-street improvement includes curb and pavement two feet beyond the center line of the right-of-way. A three-quarter-street improvement includes curbs on both sides of the side and full pavement between curb faces.*
4. *Public streets installed concurrent with development of a site shall be extended through the site to the edge of the adjacent property(ies) in accordance with the following:*
   a. *Wherever a proposed development abuts unplatted land or a future development with an approved tentative plat, street stubs shall be provided to allow access to future abutting developments and to extend the street system into the surrounding area. If the abutting land has an approved tentative plat, streets shall align with streets in the approved tentative plat.*
   b. *Where the stubbed street is over 100 feet long, street ends shall contain temporary turnarounds built to Oregon Fire Code standards and shall be designed to facilitate future extension in terms of grading, width, and temporary barricades, unless this requirement is waived by the Fire Marshal.*
   c. *In order to assure the eventual continuation or completion of the street, reserve strips shall be granted to the City of Sandy.*
5. *Public street improvements shall be required through a development site to provide for the logical extension of an existing street network or to connect a site with a nearby neighborhood activity center, such as a school or park. Where this street extension has the effect of dividing a parcel of land, a land partition shall be completed concurrent with the development.*

6. *Except for extensions of existing streets, no street names shall be used that will duplicate or be confused with names of existing streets. Street names and numbers shall conform to the established pattern in the surrounding area and be subject to approval of the Director.*
7. *Location, grades, alignment, and widths for all public streets shall be considered in relation to existing and planned streets, topographical conditions, public convenience and safety, and proposed land use in accordance with standards a. through f. below. Where topographical conditions present special circumstances, exceptions to these standards may be granted through the procedures in Chapter 17.66 of the Sandy Development Code, provided the City Engineer determines that the safety and capacity of the street network are not adversely affected.*
    a. *Location of streets in a development shall not preclude development of adjacent properties. Streets shall conform to planned street extensions identified in the 2023 City of Sandy Transportation System Plan, Figures 14 and 15, and/or provide for continuation of the existing street network in the surrounding area.*
    b. *Grades shall not exceed six percent on arterial streets and ten percent on collector streets and local streets.*
    c. *Arterial streets and collector streets shall be extended in alignment with existing streets by continuation of the street centerline. When staggered street alignments resulting in "T" intersections are unavoidable, they shall leave a minimum of 150 feet between the nearest edges of the two rights-of-way.*
    d. *Centerline radii of curves shall not be less than 500 feet on arterial streets, 300 feet on collector streets, and 100 feet on local streets.*
    e. *Streets shall be designed to intersect at right angles (i.e., 90 degrees or within three degrees of 90 degrees) and shall comply with the following:*
        i. *The intersection of an arterial or collector street with another arterial or collector street shall have a minimum of 100 feet of straight (tangent) alignment perpendicular to the intersection.*
        ii. *The intersection of a local street with another street shall have a minimum of 50 feet of straight (tangent) alignment perpendicular to the intersection.*
        iii. *Where right angle intersections are not possible, exceptions can be granted through the procedures in Chapter 17.66 of the Sandy Development Code, provided the alternative design is approved by the City Engineer and intersections not at right angles have a minimum corner radius of 20 feet along the right-of-way lines of the acute angle.*
        iv. *Intersections with arterial and collector streets shall have a minimum curb corner radius of 20 feet. All other intersections shall have a minimum curb corner radius of ten feet.*
    f. *Right-of-way and improvement widths shall be as specified by the 2023 City of Sandy Transportation System Plan, Figures 18 through 24 and Table 4. Exceptions to those specifications may be granted through the procedures*

in Chapter 17.66 of the Sandy Development Code, if approved by the City Engineer, to deal with specific unique physical constraints of the site.

8. *All public streets shall be designed in conformance with Title 12 of the Sandy Municipal Code and with the City of Sandy Utility Standard Details for Streets & Roads, Sidewalks, and Traffic Control Devices.*
9. *Private streets shall only be approved within a development site when all the following conditions are met:*
   a. *Extension of a public street through the development site is not needed for continuation of the existing street network or for future service to adjacent properties;*
   b. *The development site remains in one ownership, or adequate mechanisms are established (such as a homeowner's association invested with the authority to enforce payment) to ensure that a private street installed with a land division will be adequately maintained; and*
   c. *Where a private street is installed in connection with a land division, paving standards consistent with City standards for public streets shall be utilized to protect the interests of future homeowners.*

~~E~~G. Local streets shall be designed to discourage through traffic. NOTE: for the purposes of this section, "through traffic" means the traffic traveling through an area that does not have a local origination or destination. To discourage through traffic and excessive vehicle speeds the following street design characteristics shall be considered, as well as other designs intended to discourage traffic:

[…]

~~*3. Cul-de-sacs shall not exceed 400 feet in length nor serve more than 20 dwelling units, unless a proposal is successfully processed through the procedures in Chapter 17.66 of the Sandy Development Code.. Cul-de-sacs longer than 400 feet or developments with only one access point may be required to provide an alternative access for emergency vehicle use only, install fire prevention sprinklers, or provide other mitigating measures, determined by the City.*~~

Recommendation 6

Recommendation: Add new Traffic Letter requirements and standards.

Sec. 17.84.50. Street requirements.

[…]

D. *Traffic Letter (Dwellings). For development applications that propose dwelling units, an applicant must submit a traffic letter where the development adds 20 or fewer vehicles during any peak hour as determined by using the Institute of Transportation Engineers Trip Generation Manual (5th Edition). Failure to submit the traffic letter will result in an incomplete application. Development applications that add 2 or fewer vehicles during any peak hour as determined by using the Institute of Transportation Engineers Trip Generation Manual (5th Edition) are exempt from the traffic letter requirement.*

Recommendation 7

Recommendation: Add language requiring bicycle parking facilities for transit transfer stations and park-and-ride lots.

Sec. 17.98.20. - Off-Street Parking Requirements.

A. *Off-Street Parking Requirements. Off street parking shall conform to the following standards:*

[...]

9.

Community Service, Institutional and Semi-Public Uses	*Number of Parking Spaces*	*Number of Bicycle Spaces*
School—Senior High, Vocational or College	*6 per classroom, plus 1 per employee on the largest shift*	*5% or 2 whichever is greater*
Transit transfer stations and park-and-ride lots	*0*	*4*

Recommendation 8

Recommendation: The access spacing standards should be expanded to include access spacing tables from the TSP and give the City authority to require closing or consolidation of accesses.

Sec. 17.98.80. Access Management ~~to arterial and collector streets~~.

A. *Access Spacing. All proposed development shall have access to a public right-of-way. Spacing requirements for access points and intersections are shown in the City of Sandy 2023 Transportation System Plan Tables 5 and 6 and in the following table:*

Table 17.98.80.A.1: Minimum Access Spacing Standards for City Street Facilities

Cross-Section	*Major Arterial*	*Minor Arterial*	*Collector*	*Local Street*
Distance between public streets	*5,280 feet*	*5,280 feet*	*2,640 feet*	*400-600 feet*
Minimum driveway spacing (public street to driveway and driveway to driveway)	*See Table 17.98.80.A.2*	*400 feet or 200 with restricted right-in/right-out access*	*300 feet or 150 with restricted right-in/right-out access*	*20 feet*
Note: All distances measured from center to center of adjacent approaches.				

Table 17.98.80.A.2: Minimum Access Spacing Standards for US 26

Speed limit	*Urban Expressway*	*Urban*	*STA*[1]
> 55	*2,640 feet*	*1,320 feet*	*n/a*
50	*2,640 feet*	*1,100 feet*	*n/a*
40 & 45	*2,640 feet*	*800 feet*	*n/a*
30 & 35	*n/a*	*500*	*See footnote*
< 25	*n/a*	*350 feet*	*See footnote*

[1] Minimum access management spacing for public road approaches is the existing city block spacing or the city block spacing as identified in the local comprehensive plan. Public road connections are preferred over private driveways and in STAs driveways are discouraged. However, where driveways are allowed and where land use patterns permit, the minimum access management spacing for driveways is 175 feet (55 meters) or mid-block if the current city block is less than 350 feet (110 meters).

Note: All distances measured from center to center of adjacent approaches.

~~*Functional Classification*~~	~~*Distance between Private Accesses and other Private Access or Public Streets*~~
~~*Major Arterial**~~	~~*See Table 17.98.80.A.2*~~
~~*Minor Arterial*~~	~~*300 feet*~~
~~*Residential Minor Arterial and Collector*~~	~~*150 feet*~~
~~*Local Street*~~	

~~** Note: All major arterials in Sandy are ODOT facilities.*~~

B. ~~A.~~ Location and design of all accesses to and/or from arterials and collectors (as designated in the 2023 City of Sandy Transportation System Plan) are subject to review and approval by the City Transportation Engineer or Public Works Director. Where ~~practical~~ access spacing requirements on a collector or arterial cannot be met, access from a lower functional order street may be required. ~~Accesses to arterials or collectors shall be located a minimum of 150 feet from any other access or street intersection.~~ Exceptions may only be granted as part of a discretionary review, when approved by the City Engineer. Evaluations of exceptions shall consider posted speed of the street on which access is proposed, constraints due to lot patterns, and effects on safety and capacity of the adjacent public street, bicycle and pedestrian facilities.

C. ~~B~~. No development site shall be allowed more than one access point to any arterial or collector street (as designated in the 2023 City of Sandy Transportation System Plan) except as approved by the City Transportation Engineer or Public Works Director as part of a discretionary review. Evaluations of exceptions shall be based on a traffic impact analysis and parking and circulation plan and consider posted speed of street on which access is proposed, constraints due to lot patterns, and effects on safety and capacity of the adjacent public street, bicycle and pedestrian facilities.

D. ~~C.~~ When developed property is to be expanded or altered in a manner that significantly affects on-site parking or circulation (i.e., removes or changes the location of driveways, parking spaces, or drive aisles), both existing and proposed accesses shall be reviewed under

the standards in A and B above. As a part of an expansion or alteration approval, the City may require relocation and/or reconstruction of existing accesses not meeting those standards.
E. The City or other agency with access permit jurisdiction has the authority to require the closing or consolidation of existing curb cuts or other vehicle access points, recording of reciprocal access easements (i.e., for shared driveways), developing a frontage street, installing traffic control devices, and/or other mitigation as a condition of granting an access permit to ensure the safe and efficient operation of the street and highway system.

Recommendation 9

Recommendation: Update definition of Streets in the definitions section to ensure consistency throughout the Code. Move standards in definitions to Section 17.100.110 of the Development Code. Include reference to street specifications in the Bornstedt Village Overlay. Update standards for cul-de-sacs and blocks to ensure connectivity is maintained.

Sec. 17.10.30 Meaning of specific words

[…]
Accessway: A pathway, shared-use path, walkway, or pedestrian way connecting two rights-of-way to one another where no vehicle connection is made.
[…]
Public facility: Public facilities include, but are not limited to, sanitary sewer, water, storm drainage, street, communication, electrical and natural gas facilities necessary to support development. There are two types of public facilities: …
Public transit stops: A public transit stop is an existing or planned transit stop as shown in Figure 8 of the 2023 Sandy Transportation System Plan or the 2020 Sandy Transit Master Plan.
[…]

Sidewalk: A paved pedestrian way, pathway, or walkway within a public right-of-way that is generally located adjacent to and separated from the roadway by a curb, drainage facility (e.g., ditch or swale), or planter strip.
[…]

Street: Designated in the City of Sandy 2023 Transportation System Plan as follows:

A. *Arterial, principal ~~major~~: These roadways serve the highest volume of motor vehicle traffic and are primarily used for longer distance regional trips. The only roadway in the city classified as a principal arterial is US 26. ~~These consist of state highways, which carry nearly all vehicle trips entering, leaving, or passing through the Sandy area.~~*
B. *Arterial, minor: These interconnect and support the major arterial system and link major commercial, residential, industrial, and institutional areas. These roads have a typical capacity between 8,000 and 16,000 ADT.*
~~C.~~ *~~Residential minor arterial: A hybrid between minor arterial and collector street which allows moderate to high traffic volumes on streets where over 90 percent of the fronting lots are residential. Intended to provide some relief to the strained arterial system while ensuring a safe residential environment. Right-of-way width shall not be less than 62 feet~~*

~~*nor more than 82 feet (or 88 feet if it's a green street with swales on both sides), street shall be a minimum three-lane cross section, and may include on-street parking.*~~

D. *Collector streets: These provide both access and circulation within residential neighborhoods and commercial/industrial areas. These roads have a typical capacity between 2,000 and 6,000 ADT. Right-of-way width shall not be less than 44 feet nor more than 78 feet (or 82 feet if it's a green street with swales on both sides).*

E. *Local streets: The primary function is to provide access to immediately adjacent land. Service to through-traffic movement on local streets is discouraged. Right-of-way width shall be ~~50~~ 54 feet (or up to ~~56~~ 60 feet if it's a green street with swales on both sides). Average daily traffic (ADT) shall not exceed 1,000 vehicles/day. Proposed developments ~~projects~~ that result in more than 1,000 ADT on an existing or proposed local street shall be modified to not exceed the 1,000 ADT threshold on the local street or the proposal may be processed through the procedures in Chapter 17.66 of the Sandy Development Code. Proposed outright permitted projects in the C-1, Central Business District, are exempt from adherence to the ADT standards on local streets.*

F. *Cul-de-sac: A local street with only one outlet and having a bulb at the opposite end. A cul-de-sac shall not exceed 400 feet in length nor serve more than 20 dwelling units unless a proposal is successfully processed through the procedures in Chapter 17.66 of the Sandy Development Code.*

G. *Green street: A street with a water quality treatment and/or conveyance swale on either one or both sides. Swales shall be a minimum of eight feet wide. ADT standards and dimensional standards shall adhere to the standards of the ~~above classifications depending on the~~ street classification.*

H. *Complete street: A street with facilities to support multiple modes of transportation, including motor vehicles, bicycles, and pedestrians. Complete streets are designed to accommodate multiple users and abilities.*

[...]

Pathway: A paved public or private route separated from the street right-of-way that is intended to provide pedestrian or bicycle access to adjacent streets and properties. Pathways can serve both recreational and commuter needs Pathways may also be known as shared-use paths, walkways or pedestrian ways, and these terms may be used interchangeably throughout the SMC.

Pedestrian way: A paved public or private route separated from the street right-of-way that is intended to provide pedestrian or bicycle access to adjacent streets and properties. Pedestrian ways can serve both recreational and commuter needs Pedestrian ways may also be known as shared-use paths, walkways or pathways, and these terms may be used interchangeably throughout the SMC.

[…]

Shared-Use Path: A paved public or private route separated from the street right-of-way that is intended to provide pedestrian or bicycle access to adjacent streets and properties. Shared-use paths can serve both recreational and commuter needs. Shared-use paths may also be known as *walkways, pathways, or pedestrian ways, and these terms may be used interchangeably throughout the SMC.*

[...]

Walkway: A paved public or private route separated from the street right-of-way that is intended to provide pedestrian or bicycle access to adjacent streets and properties. Walkways can serve both recreational and commuter needs. Walkways may also be known as shared-use paths, pedestrian ways, or pathways, and these terms may be used interchangeably throughout the SMC.

Sec. 17.100.110. Street standards and classification.

Functional definitions of each street type are described in the ~~2011~~ 2023 Transportation System Plan as summarized below. The descriptions below are intended to incorporate and implement the functional classifications in the ~~2011~~ 2023 Transportation System Plan, Chapter 5~~3~~ and Figures 18 - 24~~6-13~~.

- *A. ~~Major~~ Principal arterials are designed to carry high volumes of through traffic, mixed with some unavoidable local traffic, through or around the city.*
- *B. Minor arterials are designed to collect and distribute traffic from major and minor arterials to neighborhood collectors and local streets, or directly to traffic destinations.*
- *~~C. Residential minor arterials are a hybrid between minor arterial and collector type streets that allow for moderate to high traffic volumes on streets where over 90 percent of the fronting lots are residential.~~*
- *D. Collector streets are designed to collect and distribute traffic from higher type arterial streets to local streets or directly to traffic destinations. Right-of-way width shall not be less than 44 feet nor more than 78 feet (or 82 feet if it's a green street with swales on both sides).*
- *E. Local streets provide direct access to abutting property and connect to collector streets. Local streets shall be spaced no less than eight (660 feet) and no more than ten streets per mile (520 feet). Right-of-way width shall be 54 feet (or up to 60 feet if it's a green street with swales on both sides). Local streets shall not exceed the ADT standards set forth in Chapter 17.10, except that the ADT standard for local streets shall not apply to outright permitted development within the C-1 zone.*
- *F. Development within the Bornstedt Village Overlay is subject to the roadway standards in Section 17.54.120.*
- *G. The City may approve deviations from the street spacing standards in Section 17.100.110.A. to E. through an adjustment or variance pursuant to Chapter 17.66.*
- *H. Cul-de-sacs and dead-end streets ~~are prohibited~~ shall only be used where the Director determines that street continuation is precluded by the following:*
  1. *Existing development.*
  2. *Areas in the Flood and Slope Hazard (FSH) Overlay District pursuant to SDC Chapter 17.60.*
  3. *The street continuation would connect a Local Street with an Arterial Street, as defined in the Sandy Transportation System Plan Table 4.*

I. *Where the Director determines that a cul-de-sac or dead-end street is allowed pursuant to Section 17.100.110(H), all of the following standards shall be met:*
   1. *The cul-de-sac shall be a minimum length of 200 feet and shall not exceed 400 feet, except where the Director through a Type II procedure determines that factors identified in Section 17.100.110(H) require a longer block length. The length of the block shall be measured along the centerline of the street from the near side of the intersecting street to the farthest point of the cul-de-sac.*
   2. *The cul-de-sac or dead-end street shall provide pedestrian and bicycle access to adjacent streets with installation of a pathway in accordance with the 2004 Utility Standard Details and SDC Section 17.84.30 – Pedestrian and Bicycle Requirements.*
   3. *The cul-de-sac shall terminate with a circular or hammer-head turnaround meeting the 2022 Oregon Fire Code.*
   4. *The cul-de-sac shall not provide access to more than 25 dwelling units.*

~~G~~ J. Alleys are designed to provide access to multiple dwellings in areas where lot frontages are narrow, driveway spacing requirements cannot be met, and lots abut transit streets.

…

Sec. 17.100.120. Blocks and accessways.

A. *Blocks. Blocks shall provide for two tiers of lots and shall provide minimum intersection spacing of 150 feet ~~at appropriate depths. However, exceptions to the block width shall be allowed for blocks that are adjacent to natural features~~.*
B. *Blocks in the Single-Family Residential zone, Low Density Residential zone, Medium Density Residential zone, High Density Residential zone, Central Business District zone, General Commercial zone, Village Commercial zone, and Industrial Park zone fronting local streets shall not exceed 400 feet in length, unless slopes in excess of 12 percent, perennial streams, or wetlands justify longer blocks.*
C. *Pedestrian and Bicycle Accessway Requirements. In any block in a residential or commercial district over ~~6~~400 feet in length, a pedestrian and bicycle accessway with a minimum improved surface of ten feet within a 15-foot right-of-way, tract, or easement shall be provided through the middle of the block. ~~To enhance public convenience and mobility, such accessways may be required to connect to cul-de-sacs, or between streets and other public or semipublic lands~~.*

Recommendation 10

Recommendation: Update the Development Code to include acceptable alternatives to a street connection.

Sec. 17.100.100. Streets generally.

No subdivision or partition shall be approved unless the subdivision lots or partition lots have frontage or approved access to an existing public street. In addition, all streets shall be graded and improved in conformance with the City's ~~adopted~~ construction standards and approved construction plans in Title 12 of the Sandy Municipal Code and the Utility Standard Details for Streets and Roads.

[...]

E. Exemptions.

1. *A future street plan is not required for partitions of residentially zoned land when none of the parcels may be redivided under existing minimum density standards.*
2. *When street connection standards are inconsistent with an adopted street spacing standard for arterials or collectors, a right turn in/right turn out only design including median control ~~may~~ shall be an acceptable alternative to a full intersection ~~approved~~. Where compliance with the standards would result in ~~unacceptable~~ sight distances that fall short of the current AASHTO Policy on Geometric Design of Highways and Streets, an accessway shall be an acceptable alternative to ~~may be approved in place of~~ a street connection.*

TM #7: TSP SOLUTIONS

DATE: December 8, 2022

TO: Project Management Team

FROM: Reah Flisakowski, Dock Rosenthal | DKS Associates

SUBJECT: Sandy Transportation System Plan Project #20020-001

This memo summarizes the preliminary transportation solutions identified for the Sandy Transportation System Plan (TSP) update. The recommended solutions respond to system performance needs identified through the prior technical analysis by the consultant team, and on-going feedback and reviews by the Project Management Team and the Project Advisory Committee. The system solutions identified include pedestrian and bicycle enhancements, safety improvements, and a review of the transit projects, along with minor roadway capacity improvements for motor vehicles. In addition, a more in-depth evaluation was made regarding a US 26 bypass to help understand the trade-offs, expected benefits and potential risks of implementation.

The projects documented in this memo are needed to develop a future, multimodal transportation system for Sandy with an understanding that adequate funding will not be available to construct all recommended capital improvements. Evaluation criteria were used to provide an initial prioritization of transportation improvements. These criteria are based on the project's goals and objectives that were identified in Technical Memorandum 2. The project scores, from the evaluation criteria, and project cost estimates will be used to develop a high priority, financially constrained project list as part of Technical Memorandum 8: Planned and Financially Constrained Transportation System. The projects presented in this memo are still preliminary and will be refined through public engagement prior to adoption of the TSP update. Furthermore, inclusion of a project in this memo does not commit the City of Sandy to its ultimate construction.

APPROACH TO DEVELOPING NETWORK IMPROVEMENTS

Sandy's proposed approach to developing transportation projects is based on three tiers of priorities that includes:

1. **High Priority** – Add vehicle capacity by widening, constructing major improvements to existing roadways, or extending existing roadways to create parallel routes to congested corridors. Improve existing facilities with minor enhancements, such as upgrading roads to standards, filling in important system gaps, and safety improvements to intersections and corridors.

2. **Moderate Priority** – Add cost-effective improvements such as better traffic signal operations, encouraging walking, biking and transit, and applying new policies and standards.

3. **Lowest Priority** – add vehicle capacity to the system by constructing new facilities.

This approach could allow the City to maximize use of available funds, minimize impacts to the natural and built environments, and balance investments across all modes of travel.

Measurable evaluation criteria were developed from the City's specific transportation goals and objectives (see Technical Memorandum #2: Goals and Objectives). These evaluation criteria were used to screen and prioritize potential transportation solutions in the next phase of the evaluation process, see graphic below. The prioritized solutions, consequently, will be consistent with the goals and objectives. The recommended evaluation criteria for each goal are summarized below in Table 1.

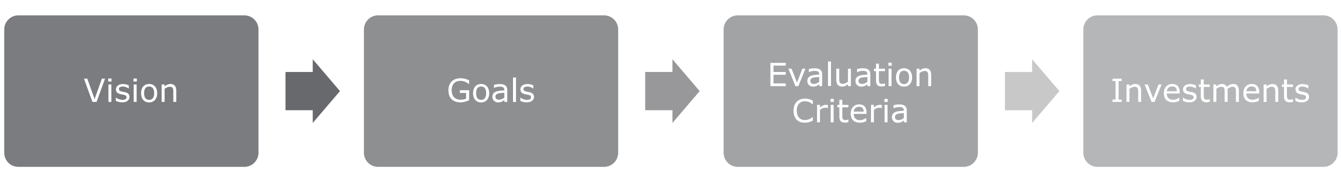


TABLE 1: RECOMMENDED EVALUATION CRITERIA

#	GOAL	DESCRIPTION	EVALUATION CRITERIA
1	MOBILITY & CONNECTIVITY	Provide a transportation system that prioritizes mobility and connectivity for all users.	(1) Project improves an existing facility or provides a new connection to existing local facilities. (2) Project addresses a critical system capacity need.
2	CAPITAL INVESTMENTS AND FUNDING	Promote cost effective investments to the transportation system.	(1) Project serves the needs of multiple system users. (2) Project extends the useful life of existing facilities.
3	COMMUNITY NEEDS	Provide a transportation system that supports specific community needs.	(1) Project improves access to natural features. (2) Project improves the human scale of US 26 and OR 211.
4	SYSTEM MANAGEMENT	Promote traffic management to achieve the efficient use of transportation infrastructure.	(1) Project reduces the local vehicle demand on US 26.
5	ENVIRONMENTAL	Minimize environmental impacts on natural resources and encourage carbon-neutral or efficient transportation alternatives.	(1) Project minimizes impact on natural resources. (2) Project reduces single occupant vehicle trips.
6	TRANSIT	Provide safe, efficient, high-quality transit service that gives Sandy residents, employees, employers, and visitors more freedom to meet their needs within the city, region, and state. Create a transit system that offers an alternative to private automobile use, supports efficient use of roadways, and reduces air pollution and energy use.	(1) Project improves the comfort and safety of existing transportation users. (2) Project improves the accessibility to transit for residents and visitors to Sandy.
7	SAFETY	Promote a safe transportation system for all users.	(1) Project addresses an identified safety need.
8	EQUITY	Support an equitable transportation system and provide transportation choices to all users.	(1) Project addresses the needs of a disadvantaged community.
9	HEALTH	Support options for exercise and healthy lifestyles to enhance the quality of life.	(1) Project promotes a healthy community.

TRANSPORTATION SOLUTIONS

The following sections summarize the evaluation of multimodal improvement options to provide early direction in developing recommended solutions. Sandy's high priority transportation solutions are generally cost-effective minor roadway improvements which include spot motor vehicle improvements, minor roadway extensions, enhancements to the pedestrian and bicycle network, and other programmatic improvements. The options consider the available right-of-way and environmental constraints to ease implementation. These identified solutions are preliminary and are subject to change. Community input and further technical analysis will ultimately lead to recommended solutions to be included in the TSP update.

UPDATE TO TSP PEDESTRIAN IMPROVEMENTS

Pedestrian enhancements throughout the city will be important to meet pedestrian mobility needs and to adequately connect to community destinations. The pedestrian projects in the 2011 TSP were reviewed and updated to identify future solutions. The recommended pedestrian system improvements are shown in Figure 1.

The existing sidewalk gaps were inventoried to identify priority corridors for sidewalk infill or shared use path projects. Beyond the evaluation criteria, priority corridors were identified based on their:

- Proximity to schools
- Proximity to major destinations
- The extent of existing gaps on a segment
- Lack of topographical constraints

Enhanced crossing locations were also identified, as needed, to facilitate safe crossing opportunities for US 26 and OR 211 based on the future sidewalk conditions for adjacent roadways. Several pedestrian crossing projects were carried forward from the Sandy Transit Master Plan[1] and local Safe Routes to School plans. Specific pedestrian improvements are identified in Tables 2 and 3.

[1] Sandy Transit Master Plan, April 2020.

FIGURE 1: PEDESTRIAN SYSTEM IMPROVEMENT

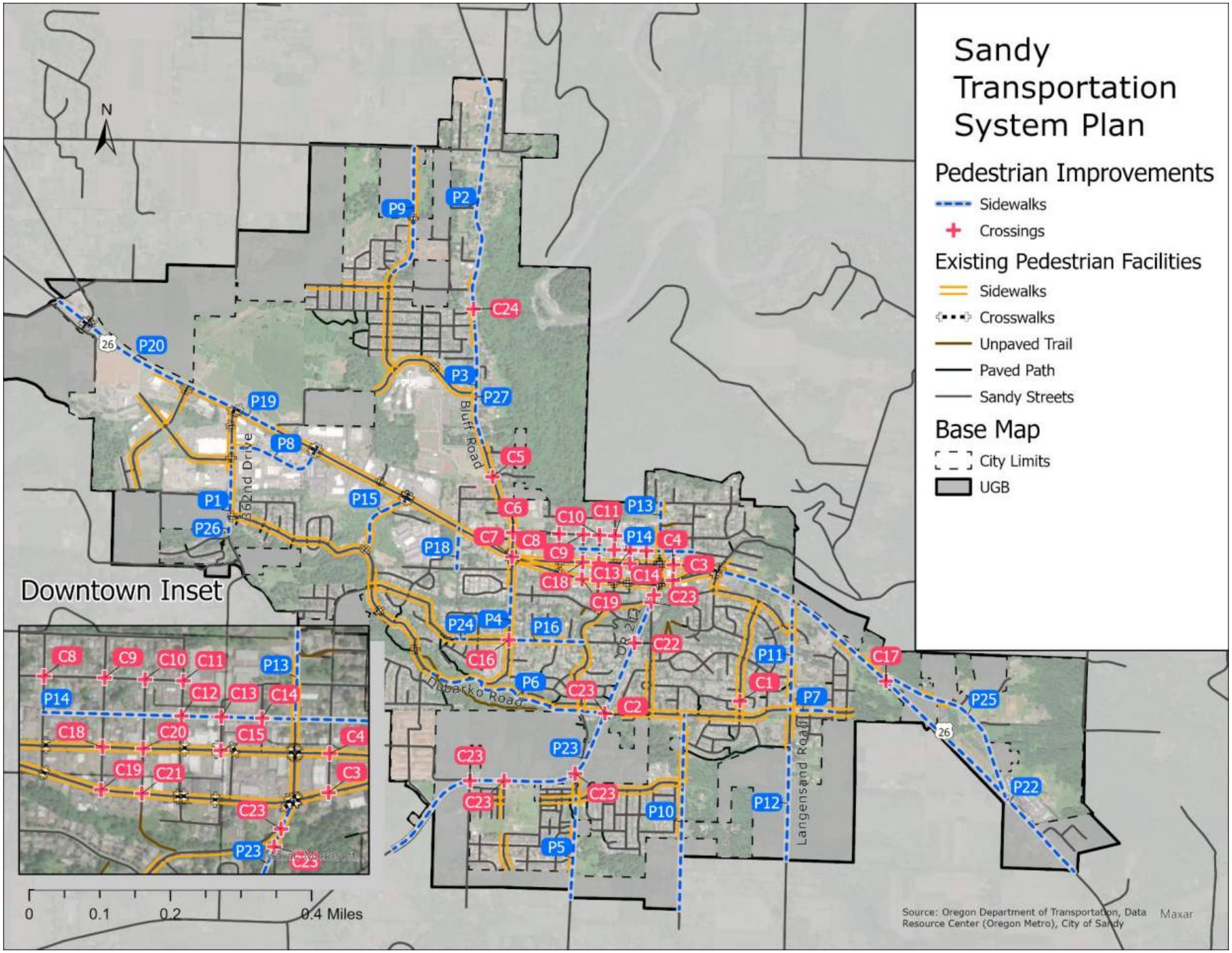


TABLE 2: PEDESTRIAN SYSTEM IMPROVEMENTS

ID	PROJECT	SEGMENT	DESCRIPTION	COST	PRIORITY
P1	362nd Drive	West Sidewalk of Chinook St. to Industrial Way	Infill sidewalk gaps	$1,000,000	FC
P2	Bluff Rd.	Green Mountain St. to Northern UGB	Infill sidewalk gaps	$900,000	Medium
P3	Bluff Rd	West sidewalk gap infill from Bell Street to 15931 SE Bluff Road	Infill sidewalk gaps, includes landscape buffer	$875,000	FC
P4	Bluff Rd	Strawbridge Pkwy to Nettie Connett Dr.	Infill sidewalk gaps	$650,000	Medium
P5	Bornstedt Rd.	Cascadia Village Dr to UGB	Infill sidewalk gaps	$1,750,000	Medium
P6	Dubarko Rd.	300 feet east of Melissa Ave. to 200 feet east OR 211	Infill sidewalk gaps	$3,950,000	Medium
P7	Dubarko Rd.	Langensand Rd. to Antler Ave.	Infill sidewalk gaps	$50,000	High
P8	Industrial Way	362nd Dr. to US 26	Infill sidewalk gaps	$2,200,000	Medium
P9	Jewelberry Rd.	Penny Ave. to Kelso Rd.	Infill sidewalk gaps	$250,000	Medium
P10	Jacoby Rd.	Dubarko Rd. to southern UGB	Infill sidewalk gaps/construct sidewalk	Included in B14	Medium
P11	Langensand Rd	Dubarko Rd. to US 26	Infill sidewalk gaps	$100,000	High
P12	Langensand Rd.	630 feet south of Dubarko Rd. to UGB	Infill sidewalk gaps	$1,150,000	Medium
P13	Meinig Avenue	Scenic St. to US 26	Infill sidewalk gaps	$150,000	Medium
P14	Pleasant St	Beers Ave. to Revenue Ave.	Infill sidewalk gaps	$250,000	High
P15	Ruben Ln	US 26 to Dubarko Rd.	Infill sidewalk gaps	$75,000	Medium
P16	Sandy Heights St	Bluff Rd. to Tupper Rd.	Infill sidewalk gaps	$225,000	High
P17	Downtown Core Pedestrian Improvements	Sidewalk infill side streets perpendicular to US 26	Infill sidewalk gaps	$350,000	High
P18	University Ave	Sunset St. to US 26	Construct sidewalk	$150,000	Medium
P19	US 26	Royal Ln to 362nd Dr.	Infill sidewalk	$550,000	Medium

ID	PROJECT	SEGMENT	DESCRIPTION	COST	PRIORITY
			gaps		
P20	US 26	362nd Dr. to West UGB	Infill sidewalk gaps	$1,200,000	Medium
P22	US 26A	Ten Eyck Rd. to East UGB	Infill sidewalk gaps	Included in B12	High
P23	OR 211	South UGB to US 26 – coordinate with D25	Construct sidewalk	Included in D25	Medium
P24	Sandy Heights St.	Nettie Connett Drive to Balken Ave	Construct sidewalk on northside	$125,000	Medium
P25	Vista Loop	Full extent	Construct sidewalk	Included in B15	Medium
P26	362nd Drive	East sidewalk infill from Chinook Street to Industrial Way	Infill sidewalk gaps	$625,000	Medium
P27	Bluff Road	East sidewalk infill mirroring west improvement	Infill sidewalk gaps, includes landscape buffer	$2,225,000	Medium

A. A project completing the gap on the northern side of US 26 from Ten Eyck to Vista Loop (west) is currently funded.

Many of the crossing improvements in Table 3 come from the Cedar Ridge Middle School and Sandy Grade School Safe Routes to School Plan (2020). The low cost of many of these improvements makes it likely that they would be grouped together and funded simultaneously. The cost of all improvements for each school is:

- Cedar Ridge Middle School (CRMS) – Improvements C5 through C10, $450,000.
- Sandy Grade School (SGS) Improvements C11 through C15, $875,000.

TABLE 3: ROADWAY CROSSING IMPROVEMENTS

ID	PROJECT	DESCRIPTION	COST	PRIORITY
C1	Sandy Shopper Crossing - Evans	Evans Street Senior Apartments, traffic calming, and other crossing improvements are needed. Project may include pedestrian crossing advisory signage, curb extensions, and marked crosswalks.	$25,000	High
C2	OR 211 Dubarko Crossing	Project may include pedestrian crossing advisory signage, curb extensions, marked crosswalks, and installation of RRFB. Coordinate with D9 and D20.	$125,000	High
C3	Sandy Transit Center - Pioneer	Project may include pedestrian crossing advisory signage, curb extensions, and marked crosswalks.	$125,000	Medium
C4	Sandy Transit Center - Proctor	Project may include pedestrian crossing advisory signage, curb extensions, and marked crosswalks.	$125,000	Medium

ID	PROJECT	DESCRIPTION	COST	PRIORITY
C5	CRMS - Bluff Road at Marcy	Install Rectangular Rapid Flashing Beacon (RRFB) with School Crossing Assembly (S1-1 and W16-7P), and high visibility crosswalks across the north and east sides of the intersection.	$125,000	FC
C6	CRMS - Bluff Road at Hood	Install a curb extension including perpendicular curb ramps and tactile domes at northeast corner of Hood St. Install a curb extension to provide clearance from existing pole, including perpendicular curb ramps and tactile domes, at southeast corner. Mark crosswalk and stop bar across the east leg of intersection.	$125,000	High
C7	CRMS - Bluff Road at US 26	Increase pedestrian signal crossing time. Reconfigure crossing to provide perpendicular curb ramps with tactile domes and reduce curb radius at all corners. Add pedestrian-scale lighting. Reallocate existing roadway space to provide buffered bike lanes along Highway 26 and consider the use of green pavement markings near Bluff Rd. Consider installing vertical delineators with buffered bike lanes contingent on city maintenance agreement or construct a fully grade-separated bicycle facility.	$125,000	FC
C8	CRMS - Hood Street at Beers	At Beers Ave, repaint stop bars on west and east sides of intersection. Consider installation of a 4 way stop at Beers Ave.	$25,000	FC
C9	CRMS - Hood Street at Scales	Install perpendicular curb ramps with tactile domes at northwest and southwest corners of the intersection of Hood St and Scales Ave. Install tactile domes at the northeast and southeast corners. Repaint stop bars.	$25,000	FC
C10	CRMS -Hood Street at Bruns	Install tactile dome at southwest corner of Bruns Ave and Hood St.	$25,000	FC
C11	SGS - Hood/Strauss	Relocate southbound school advance crossing assembly (S1-1 & W16-9P) and school speed limit assembly (S4-3P & R2-1) along Strauss Ave to approximately 100 ft and 175 ft north of intersection, respectively. Repair approximately 150 LF of degraded sidewalk along the east side of Strauss Ave at the intersection with Hood St and widen sidewalk at encroaching utility pole. Install a curb ramp on the east side of the south leg of the intersection of Strauss Ave at Hood St. Add tactile domes and a stop bar associated with the crosswalk across the west leg of the intersection.	$350,000	FC
C12	SGS - Pleasant/Strauss	Mark stop bars in advance of crosswalks. Consider revising the intersection of Pleasant St and Strauss Ave to be a four-way stop (currently STOP control north- and southbound only).	$25,000	FC
C13	SGS -	Mark stop bars in advance of crosswalks. Replace	$350,000	FC

ID	PROJECT	DESCRIPTION	COST	PRIORITY
	Pleasant/Alt	existing diagonal curb ramps at all four corners with perpendicular curb ramps with tactile domes. Construct a raised intersection at Pleasant St at Alt Ave.		
C14	SGS - Smith/Pleasant	Mark stop bars in advance of crosswalks. Relocate southbound school advance crossing assembly (S1-1 & W16-9P) and school speed limit assembly (S4-3P & R2-1) along Smith Ave to approximately 100 ft and 175 ft north of intersection, respectively.	$25,000	FC
C15	SGS - Alt/US 26	Increase pedestrian signal crossing time. Upgrade pedestrian pushbuttons to meet current standards with audible indications. Consolidate the two existing crosswalks across Highway 26 at Alt Ave with one high visibility continental crosswalk on the east side of the intersection including advance stop bar, bulb outs, curb ramps, and pedestrian scale lighting.	$125,000	FC
C16	Bluff/Sandy Heights	Install marked crosswalks on all four legs with tactile domes on the ramps.	$25,000	Medium
C17	Dubarko/US26	Install marked crosswalks on all four legs with tactile domes on the ramps, coordinate with D20, this project is not needed until the Dubarko Extension is complete.	$25,000	Medium
C18	Scales/Proctor	Install marked crosswalks on all four legs with tactile domes on the ramps.	$25,000	High
C19	Scales/Pioneer	Install marked crosswalks on all four legs with tactile domes on the ramps.	$25,000	High
C20	Bruns/Proctor	Install marked crosswalks on all four legs with tactile domes on the ramps.	$25,000	High
C21	Bruns/Pioneer	Install marked crosswalks on all four legs with tactile domes on the ramps.	$25,000	High
C22	OR 211	Pedestrian Overcrossing for Sandy Heights Street.	$6,000,000	Medium
C23	Hwy 211 Pedestrian Improvements	ADA Improvements along Highway 211	$500,000	FC Funded
C24	Green Mountain and Bluff Pedestrian Crossing	Construct curb extensions and mark crossing to Jonsrud Viewpoint	$75,000	High

Note: CRMS – Cedar Ridge Middle School and SGS – Sandy Grade School

UPDATE TO TSP BICYCLE IMPROVEMENTS

Sandy's existing bicycle facilities were inventoried and used as a starting point to develop future bicycle solutions. Bicycle enhancements throughout the city will be important to meet bicycle needs and provide an alternative to driving. The bicycle projects in the 2011 TSP were reviewed and updated to identify future solutions. The recommended bicycle system improvements are shown in Figure 2.

Beyond the evaluation criteria, corridors were included in the priority bicycle network based on:

- A comparison of the relative increase in the area accessible with the project
- Proximity to schools
- Proximity to major destinations
- Directness of route
- Ability to provide an off-highway connection

Recommended treatments included:

- Separated bike facilities – treatments could include a shared use path, separated bicycle lanes, or buffered bicycle lanes
- Bicycle lanes – treatments could include on-street bicycle lanes without a buffer

Specific bicycle improvements are identified below. The specific locations where system improvements were identified is shown in Table 3.

The proposed bicycle system enhancements are shown in Figure 2 and Table 4. The proposed off-road trail system improvements from the Sandy Parks and Trails Master Plan are shown in Table 5.

FIGURE 2: PROPOSED BICYCLE SYSTEM IMPROVEMENTS

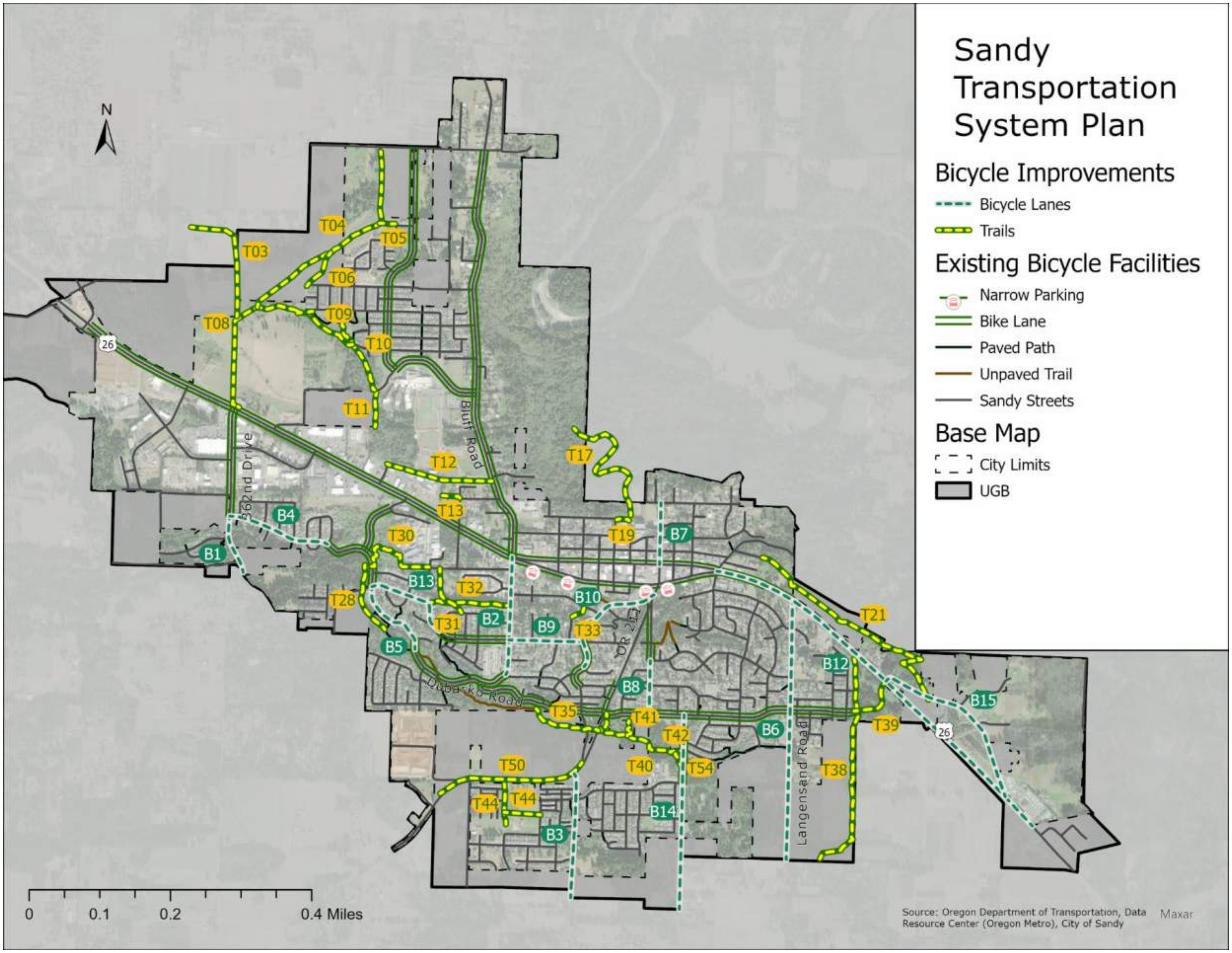


TABLE 4: BICYCLE SYSTEM IMPROVEMENTS

ID	PROJECT	SEGMENT	DESCRIPTION	COST	PRIORITY
B1	362nd Dr.	Dubarko Rd. to UGB	Widen shoulder to 6 feet minimum for bike access	$1,500,000	High
B2	Bluff Rd.*	US 26 to Miller Rd.	Re-stripe roadway to provide bike lanes	$50,000	High
B3	Bornstedt Rd	OR 211 to UGB	Widen roadway to provide bike lanes	$2,550,000	High
B4	Dubarko Rd.*	362nd Dr. to Eldridge Dr.	Re-stripe roadway to provide bike lanes	$50,000	High
B5	Dubarko Rd.*	Sandy Heights St. to Melissa Ave.	Re-stripe roadway to provide bike lanes	$50,000	High
B6	Langensand Rd.*	US 26 to UGB	Re-stripe roadway to provide bike lanes	$75,000	High
B7	Meinig Ave*	Scenic St. to US 26	Re-stripe roadway to provide bike lanes	$75,000	High
B8	Meinig Ave*	Barker Ct. to Dubarko Rd.	Re-stripe roadway to provide bike lanes	$25,000	High
B9	Sandy Heights St*	Bluff Rd. To Tupper Rd.	Re-stripe roadway to provide bike lanes	$50,000	High
B10	Tupper Rd.	Long Circle to OR 211	Widen roadway to provide bike lanes	$3,000,000	High
B12	US 26	Ten Eyck Road to UGB	Widen to provide a six-foot bike lane and sidewalk	$7,725,000	High
B13	Sandy Heights St	Dubarko Rd to Nettie Connett Dr	Re-stripe/widen Roadway to provide bike lanes	$2,275,000	Medium
B14	Jacoby Rd	Dubarko Rd to southern UGB	Re-stripe/widen Roadway to provide bike lanes and construct sidewalk	$3,925,000	Medium
B15	Vista Loop	Full extent	Re-stripe/widen Roadway to provide bike lanes and construct sidewalk	$2,075,000	Medium

*NOTE: REQUIRES THE ELMINATION OF ON STREET PARKING

TABLE 5: PROPOSED OFF-ROAD TRAIL IMPROVEMENTS (FROM SANDY PARKS AND TRAILS MASTER PLAN)[A]

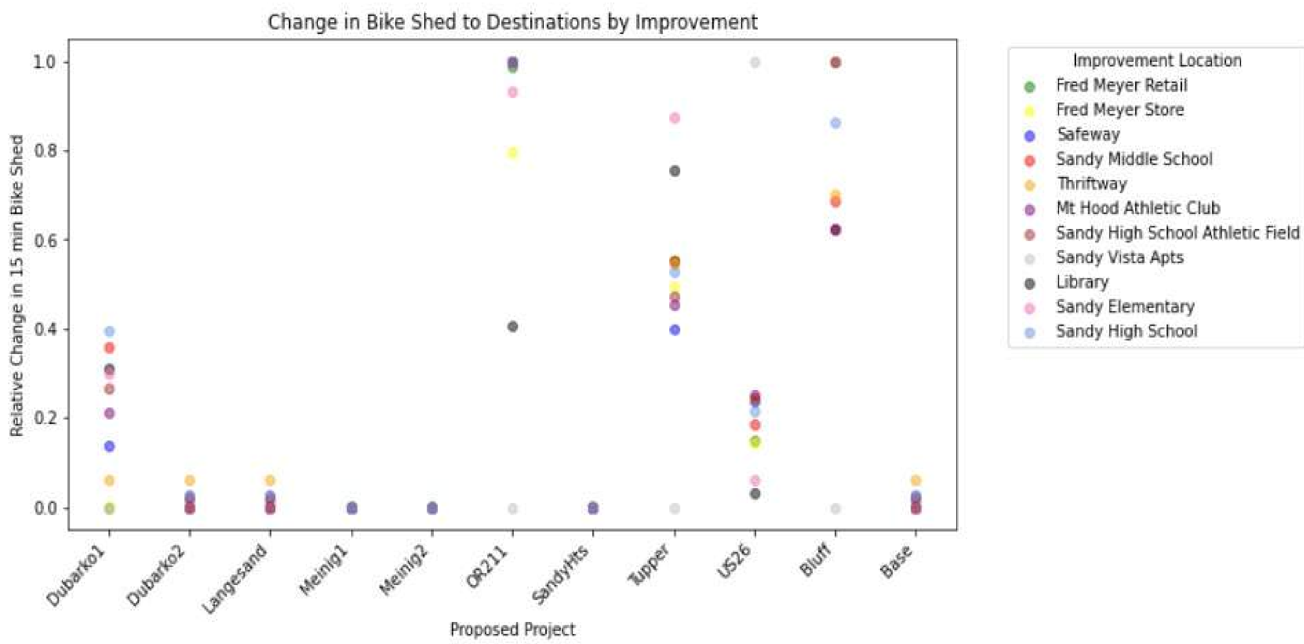
ID	PROJECT	DESCRIPTION	COST	PRIORIRTY
T03	362nd	6' - 8' wide gravel trail	$125,000	Medium
T04	Kelso to Powerline	6' - 8' wide gravel trail	$200,000	Medium
T05	Powerline	5' concrete path	$50,000	Medium
T06	Olson to Powerline	5' concrete path	$100,000	Medium
T08	Sandy Bluff Park to 362nd 3	6' - 8' wide gravel trail	150,000	Medium
T09	Sandy Bluff Park Pond Loop Trail 3	6' - 8' wide gravel trail	$50,000	Medium
T10	Bell Street to Sandy Bluff Park 3	6' - 8' wide gravel trail	$75,000	Medium
T11	Kate Schmidt to Bell Street 3	3' wide natural surface trail	$50,000	Medium
T12	SHS Trail Easement 1 3	3' wide natural surface trail	$100,000	Medium
T13	Meeker to MH Athletic Club	5' concrete path	$50,000	Medium
T17	Community Campus to Sandy River Trail	3' wide natural surface trail	$25,000	Medium
T19	Park Street to Community Campus	3' wide natural surface trail	$5,000	Medium
T21	Vista Loop to Hood Street	6' - 8' wide gravel trail	$50,000	Medium
T28	Tickle Creek Reroutes 3	6' - 8' wide gravel trail	$75,000	Medium
T30	Sunset Street to Tickle Creek	3' wide natural surface trail	$15,000	Medium
T31	Sunset Street to Nettie Connett Drive	5' wide concrete path	100,000	Medium
T32	Bluff Road to Sandy Heights	3' wide natural surface trail	$15,000	Medium
T33	Tupper Park to Gerilyn Court	5' concrete path	$50,000	Medium
T35	Tickle Creek Extension East to Dubarko Underpass	6' - 8' wide gravel trail	$75,000	Medium
T38	Tickle Creek to Deer Point Park	5' concrete path	450,000	Medium
T39	Dubarko Extension Road	8' wide asphalt trail	125,000	Medium
T40	Tickle Creek Extension Dubarko East to Jacoby	3 6' - 8' wide gravel trail	$100,000	Medium
T41	Alleyway to Tickle Creek Trail Connector	5' concrete path	$50,000	Medium

ID	PROJECT	DESCRIPTION	COST	PRIORIRTY
T42	Jacoby Road to Tickle Creek Connector	5' concrete path	$50,000	Medium
T44	Bornstedt Park	5' concrete path	$75,000	Medium
T50	Highway 211 Parkway		$400,000	Medium
T54	Cascadia to Tickle Creek	6' - 8' wide gravel trail	$30,000	Medium

A. The trail component of the existing Parks SDC is expected to fund these projects

The potential benefit of these bicycle projects on system connectivity was evaluated using a service area analysis tool in ArcGIS. This analysis measured the area accessible to people biking in 15 minutes from the key destinations in the city, including the commercial, educational, and cultural locations. The relative service area improvement of each bicycling system project was evaluated against the existing bicycle network. The results of this analysis are shown in Figure 3.

FIGURE 3: RELATIVE BENEFIT OF BICYCLE SYSTEM IMPROVEMENTS FOR KEY DESTINATIONS



Improvements to OR 211 (D25), Tupper Road (D10), and Bluff Road (B2) show the highest relative benefit to bicycle connectivity to most key destinations. The US 26 improvement (B12) is the only project that improves accessibility to the Sandy Vista Apartments.

TRANSIT SYSTEM IMPROVEMENTS

The projects in Table 6 were recommendations obtained from the Sandy Transit Master Plan[2] that can be referenced for more information about these specific projects. Most transit projects will be led by Sandy Area Metro and may require coordination with TriMet and the City of Gresham. TSP projects in other sections that were created to meet the needs of the transit improvements are noted.

TABLE 6: TRANSIT SYSTEM IMPROVEMENTS

PROJECT	DESCRIPTION
Local service improvements - Fixed routes	Add Saturday service, lengthening the service hours, adding an additional shuttle route that reaches the Vista Apartments.
Local service improvements - Flexible services	Add a bus and driver.
Local service improvements - Electric buses	Purchase one or more electric buses, a charging station, and the required maintenance equipment.
Additions to regional service - Gresham Express	Higher frequencies on Saturdays or Sundays, more night and morning service on Saturdays or Sundays, Occasional additional trips that go directly to important destinations.
Additions to regional service - New Clackamas Express	Coordinate with Clackamas County, the City of Boring and TriMet to plan and fund a route connecting these communities.
Additions to regional service - Improved bus stops	Coordinate with the City of Gresham and TriMet to invest in better stop amenities at the Gresham Transit Center.
Pedestrian Improvements - Transit Center	Improve access to the transit center by providing crossing treatments from every direction specifically at Proctor and Pioneer Blvd at Hoffman Ave. TSP projects include C3 & C4 – Hoffman Ave at Proctor and at Pioneer Crossing Improvement, these projects require coordination with ODOT.
Pedestrian Improvements - Evans St Crossing	Construct a crosswalk or traffic calming treatment on Evans St. TSP projects include C1 – Van Fleet Ave/Evans St Crossing Improvement, this project would be lead by SAM.

[2] Sandy Transit Master Plan, April 2020.

SAFETY IMPROVEMENTS

There are four locations where the historic crash analysis demonstrated a need for safety related improvements. The three locations on US 26 (362^{nd} Drive, Ruben Lane, and Orient Drive) demonstrated crash causes that are attributable to high traffic volumes and urban traffic conditions. Implementing an adaptive traffic signal control plan along US 26 may reduce the frequency of these collisions because those systems typically reduce congestion and delay along a corridor. The turning collisions at OR 211 and Dubarko Road will likely be reduced with the installation of a traffic signal at that intersection, project D8. That improvement also serves driving needs and is included in Table 8. Potential safety improvements are shown in Table 7.

TABLE 7: SAFETY SYSTEM IMPROVEMENTS

PROJECT ID	NAME	DESCRIPTION	COST	PRIORITY
S1	US 26 Adaptive Signal System[A]	Install an adaptive signal control system on US 26 between Orient Drive and Bluff Road	$200,000	High
S2	US 26 at Ten Eyck Road Study	Study improvements to business access at Ten Eyck Road and US 26	$50,000	High
S3	US 26 Speed Zone Study	Study speeds east of Ten Eyck Road/Wolf Drive along US 26	$75,000	High

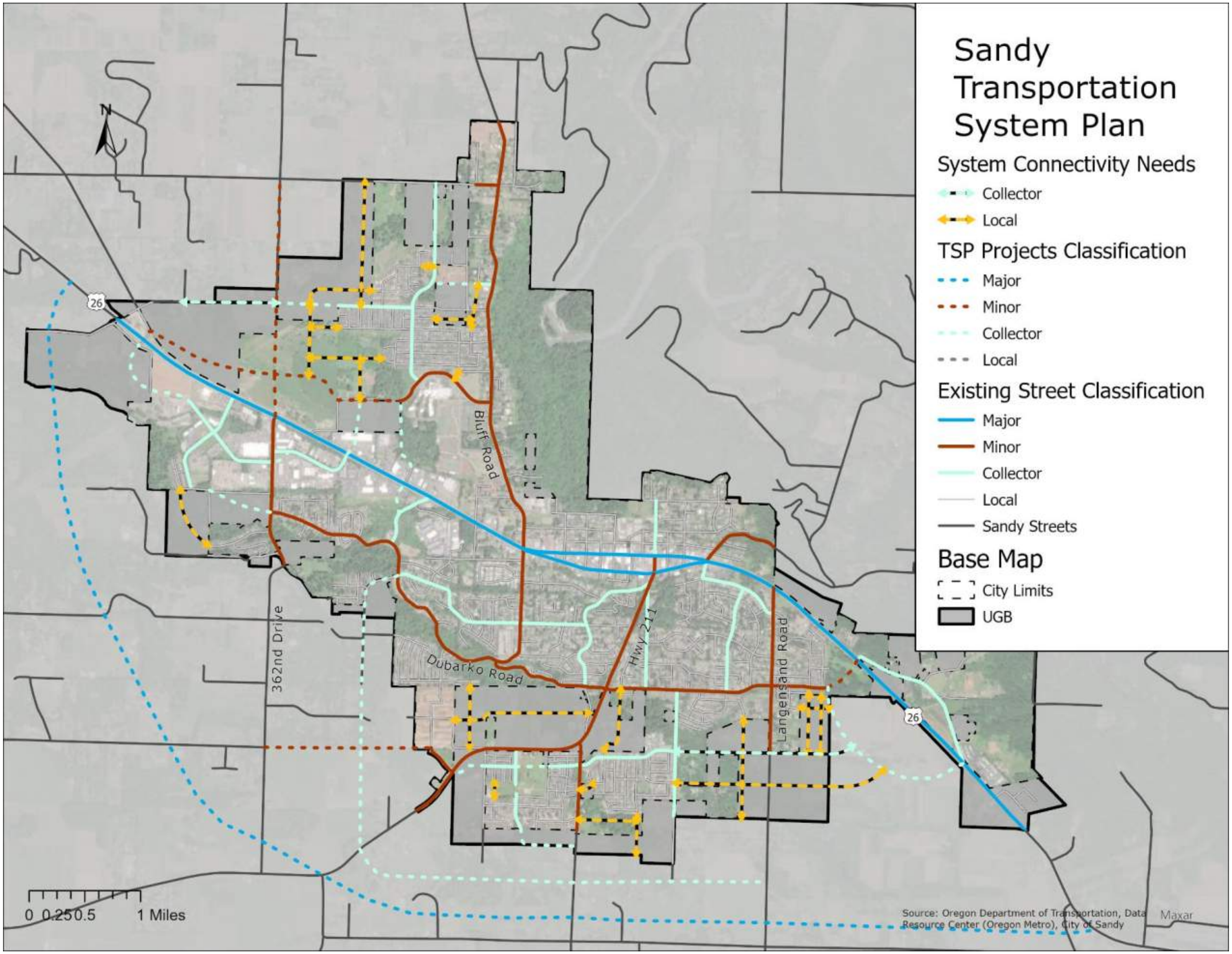
A. An adaptive signal system is currently in place between Bluff Road and Ten Eyck Road

UPDATE TO TSP SYSTEM CONNECTIVITY IMPROVEMENTS

By providing connectivity between neighborhoods, out-of-direction travel and vehicle miles traveled (VMT) can be reduced, the attractiveness of various travel modes enhanced, traffic levels can be balanced between various streets, and public safety response time is reduced. In the City of Sandy, several important new roadway connections will be needed within developed areas to reduce out of direction travel for vehicles, pedestrians, bicyclists, and transit services. New connections will be most critical in areas where a significant amount of new development is possible.

Figure 4 shows the Street Connectivity Plan for Sandy. In most cases, the connector alignments are not specific and are aimed at reducing potential neighborhood traffic impacts by balancing traffic flows on local streets. The arrows shown in the figures represent potential connections and the general direction for the placement of the connection. In each case, the specific alignments and design should be determined as part of development review, with consideration being given to the built environment, topography, and environmental conditions.

FIGURE 4: STREET CONNECTIVITY PLAN



Should new cul-de-sacs be created, bicycle and pedestrian accessways to provide a connection to the surrounding transportation system from the cul-de-sac shall be required per Section 17.100.120(D) of the SMC.

To protect existing neighborhoods from the potential traffic impacts caused by extending stub end streets, the City may require that appropriate traffic calming measures are incorporated into the design and construction of new street extensions. In addition, when a development constructs stub streets, the City may require the installation of signs indicating the potential for future connectivity to increase residents' awareness. Additionally, new developments that construct new streets or street extensions are required by Section 17.100.100(F) of the SMC to provide a proposed street map that:

- Provides full street connections with spacing of no more than 400 feet between connections except where prevented by barriers or access management standards on higher classified facilities.
- Provides bike and pedestrian accessways through the middle of the block when block lengths exceed 600 feet.
- Limits use of cul-de-sacs and other closed-end street systems to situations where existing barriers prevent full street connections.
- Includes no cul-de-sacs or close-end street longer than 400 feet. Those street segments longer than 400 feet, or developments with only one access point, may be required to provide an alternative access for emergency vehicle use only.
- Includes street cross-sections showing dimensions of right-of-way improvements, with streets designed for posted or expected speed limits which meet City design standards (or ODOT standards for state highways).

VEHICLE CAPACITY IMPROVEMENTS

Future improvement alternatives were previously developed and evaluated as part of the 2011 Sandy TSP[3] to enhance connectivity, provide access to developing lands, and address congestion in the US 26 corridor. The objective for each improvement alternative ranged from relying mainly on management and enhancement of the existing transportation system to large investments in new facilities to increase corridor capacity.

Two of the alternatives were carried forward into this plan. One alternative contains improvements to the street network that improve local connectivity for highway travel (Alternative #1) while the other alternative contains all the local connectivity projects in Alternative #1 and a US 26 bypass (Alternative #3). The phasing of projects based on the alternative is shown in Figure 5. Project descriptions can be found in Table 8.

[3] Sandy TSP Update, Technical Memo #2: Transportation Alternatives and Improvement Strategies, DKS Associates, February 25, 2011.

ALTERNATIVE #1

The improvements included in Alternative 1 were analyzed to assess operation benefits at the study intersections resulting from new system network and added capacity. Two intersections that did not meet mobility targets will do so with the improvements in Alternative #1.

- The intersection of US 26 and Industrial Way meets mobility targets with a reduction in demand at the eastbound, westbound, and northbound approaches.
- The intersection of OR 211 and Bornstedt Road meets mobility targets with the prohibition of the northbound left turn movement.

With the new local network connections north of US 26, particularly the Bell Street extension to Orient Drive, through volumes along US 26 are reduced in Alternative #1 which results in improvements to the operation of intersections along the highway.

Six intersections still fail to meet mobility targets under Alternative #1.

- **US 26 and Orient Drive** – There is a higher eastbound left traffic volume and lower eastbound through volume relative to the No Build condition however this reduction does not improve conditions enough for this intersection to meet mobility targets.
- **US 26 and 362nd Drive** – Lower traffic volumes for the eastbound and westbound approaches improve conditions at this intersection but it still fails to meet mobility targets.
- **362nd Drive and Industrial Way (north)** – With an additional southbound through lane that widens this intersection and increased traffic volumes, conditions remain LOS F for the Industrial Way approach.
- **362nd Drive and Industrial Way (south)** – The eastbound left turn lane improves conditions for that approach, but higher northbound and southbound volumes degrade conditions for the major approaches.
- **US 26 and Ruben Lane** – Lower traffic volumes for the eastbound and westbound approaches improve conditions at this intersection but it still fails to meet mobility targets.
- **US 26 and Bluff Road** – Lower traffic volumes for the eastbound left and through and westbound through movements improve conditions at this intersection but it still fails to meet mobility targets.

ALTERNATIVE #3 (US 26 BYPASS)

The improvements included in Alternative 1, combined with the bypass of the existing US 26 corridor, were analyzed to assess operation benefits at the study intersections. Because the impacts on the city street network will vary significantly with the locations and types of access allowed to the bypass, only the US 26 corridor intersections were evaluated to see how much the bypass could relieve congestion.

With the addition of a US 26 bypass only the intersection of US 26 and Orient Drive would exceed mobility targets. The eastbound through and southbound left movements at this intersection continue to compete for available green time in the cycle even with the addition of the bypass.

FIGURE 5: FUTURE STREET PROJECT IMPROVEMENTS

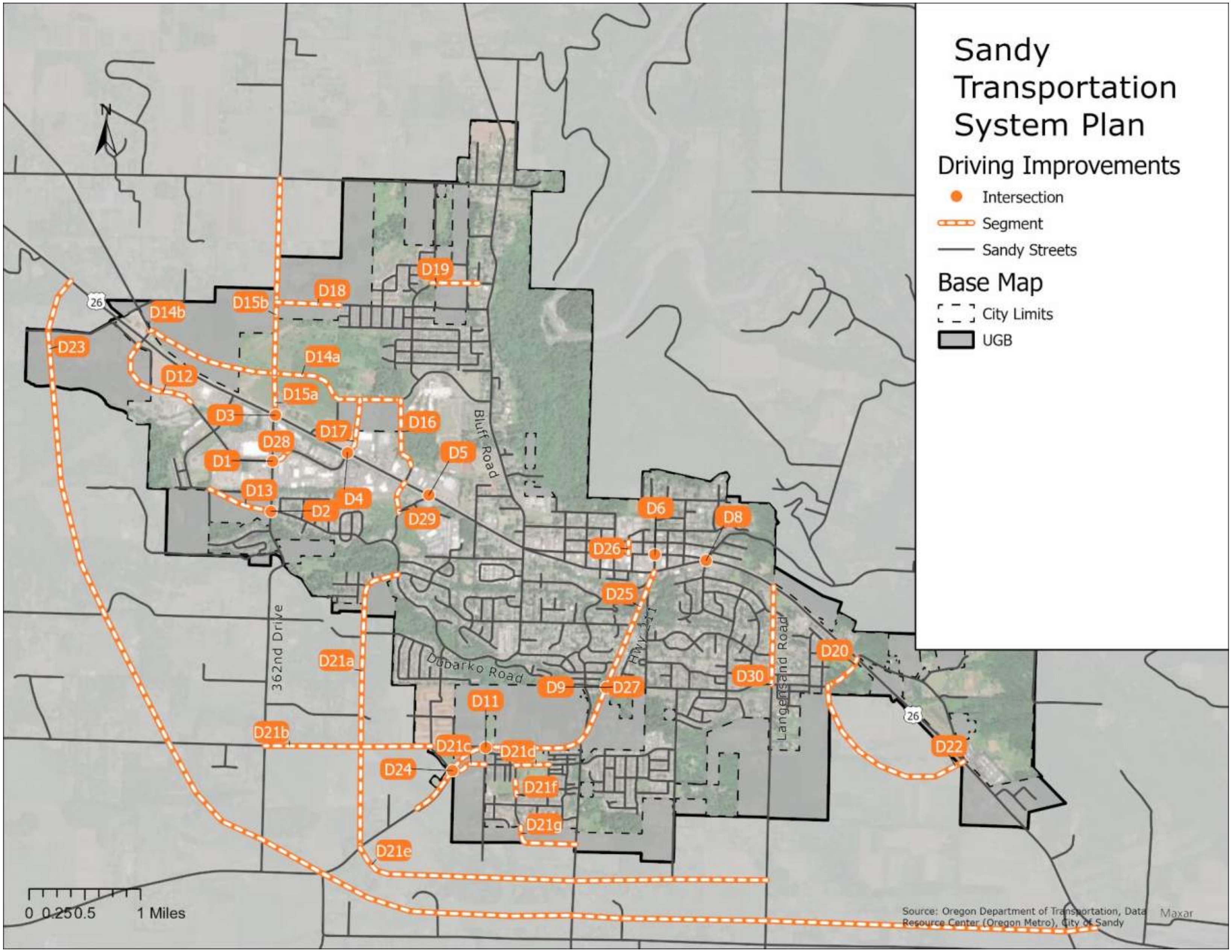


TABLE 8: STREET SYSTEM IMPROVEMENTS

PROJECT ID	NAME	DESCRIPTION	COST	PRIORITY
D1	362nd Drive & Industrial Way (south) Intersection Improvement	Reduce eastbound congestion. Project may include restriping to include an exclusive eastbound left turn lane and exclusive right turn lane.	$140,000	Medium
D2	362nd Drive & Dubarko Road Intersection Improvement	Reduce intersection congestion. Project may construct a traffic signal or roundabout.	$1,425,000	Medium
D3	US 26 & 362nd Drive Intersection Improvement	Reduce congestion for the westbound left turn and accommodate the 362nd Drive Extension 1. Project may include minor widening to accommodate a northbound through lane, construction of a three-lane southbound approach with a right turn lane, through lane, and left turn lane, and an eastbound left turn lane.	$6,525,000	FC - Funded
D4	US 26 & Industrial Way Intersection Improvement	Improve egress from commercial area and reduce northbound congestion. Project may include minor widening to accommodate a northbound left turn lane and restriping on the southbound approach to dual left turn lanes and a shared through/right turn lane.	$950,000	Low
D5	US 26 & Ruben Lane Intersection Improvement	Improve egress from commercial area and reduce northbound congestion. Project may include restriping southbound approach to dual left turns and a shared through/right lane and restriping the northbound approach to a left turn lane and shared through/right lane.	$950,000	Medium
D6	OR 211 & Proctor Boulevard Intersection Improvement	Reduce northbound congestion. Project may include restriping northbound approach to include an exclusive left turn lane and through/right lane.	$15,000	FC
D8	US 26 & Ten Eyck Road/Wolf Drive Intersection Improvement	Improve northbound and southbound approaches. Project may include striping left turn lanes on both minor street approaches.	$1,500,000	Low
D9	OR 211 & Dubarko Road Intersection Improvement	Reduce intersection congestion and improve safety. Project may include constructing a turn signal or roundabout. A traffic signal improvement may include minor widening for a northbound right turn lane, northbound left turn lane, and southbound left turn lane. Coordinate with C2 and D20.	$12,400,000	FC
D11	OR 211 & Arletha	Reduce northbound congestion. Project may	$3,150,000	Low

PROJECT ID	NAME	DESCRIPTION	COST	PRIORITY
	Court Intersection Improvement	include signage and approach modifications to prohibit left turns from the minor street approach.		
D12	Industrial Way Extension 1	Extend Industrial Way to Jarl Road/US 26 at Collector standards	$13,175,000	Low
D13	Dubarko Road Extension	Extend Dubarko Road to Champion Way at Collector standards	$7,450,000	Low
D14A	Bell Street Extension 1[A]	Extend Bell Street to 362nd Drive Extension 1 at Minor Arterial standards	$9,950,000	FC - Funded
D14B	Bell Street Extension 2	Extend Bell Street from 362ND Drive Extension 1 to Orient Drive at Minor Arterial standards	$9,900,000	Low
D15A	362nd Drive Extension 1[A]	Extend 362nd Drive to Bell Street Extension 1 at Minor Arterial standards	$3,000,000	FC - Funded
D15B	362nd Drive Extension 2	Extend 362nd Drive from Bell Street Extension 1 to Kelso Road at Minor Arterial standards	$14,000,000	Low
D16	Kate Schmidt Street Extension	Extend Kate Schmidt Street to Bell Street Extension 1 at Collector standards	$9,000,000	Medium
D17	Industrial Way Extension 2	Extend Industrial Way to Bell Street Extension 1 at Collector standards	$4,675,000	Medium
D18	Olson Road Extension	Extend Olson Road to 362nd Drive Extension 2 at Collector standards	$5,250,000	Low
D19	Agnes Street Extension	Extend Agnes Street to Bluff Road at Collector standards	$5,950,000	Low
D20	Dubarko Road Extension	Extend Dubarko Road to US 26/Vista Loop Road (west) at Minor Arterial standards, coordinate with D9 and C17	$3,900,000	FC
D21A	Sandy Heights Street/370th Avenue Extension	Extend Sandy Heights Street/370th Avenue to OR 211 at Collector standards	$24,350,000	Low
D21B	Gunderson Road Extension	Extend Gunderson Road from existing terminus near OR 211 to 362nd Drive at Collector standards	$13,750,000	Low
D21C	Cascadia Village Extension 1	Extend Cascadia Village from OR 211 to Arletha Court at Collector standards	$2,025,000	Low
D21D	Cascadia Village Extension 2	Extend Cascadia Village Drive from Village Boulevard to Pine Street at Collector standards	$2,175,000	Medium
D21E	New southern collector	Construct new a new road at Collector standards from OR 211 at the intersection with the Sandy Heights Street/370th Avenue	$33,550,000	Low

PROJECT ID	NAME	DESCRIPTION	COST	PRIORITY
		Extension to Langensand Road		
D21F	Village Boulevard Extension 1	Connect Village Boulevard at Collector standards between Cascadia Village Drive and Juniper Street	$875,000	FC
D21G	Village Boulevard Extension 2	Extend Village Boulevard at Collector standards from existing terminus south of Juniper Street to Bornstedt Road	$4,000,000	Low
D22	New eastern collector	Construct new a new road at Collector standards from Dubarko Road at the intersection with the Dubarko Road Extension to US 26/ Vista Loop Road (east)	$20,000,000	Low
D23	US 26 Bypass	Construct bypass from east of Orient Drive to Shorty's Corner (Firwood Road)	$390,000,000	Low
D24	OR 211 & Gunderson Road Intersection Improvement	Intersection improvement project includes a northbound left turn lane from OR 211 to Gunderson Road	$1,700,000	FC
D25	OR 211	Upgrade OR 211 to Minor Arterial standards from UGB to US 26, coordinate with P23	$22,000,000	Medium
D26	Alt Avenue	Reconstruct Alt Avenue from Proctor Blvd to Pleasant St to improve walkability and access to the Sandy Library	$11,000,000	High
D27	Hwy 211 & Dubarko Road Intersection Control Evaluation	Study intersection control and other options to improve safety and capacity	$50,000	FC
D28	Industrial Way Realignment	Realign Industrial Way (east of 362nd Drive) to connect with the intersection of Industrial Way (west of 362nd)	$4,150,000	Low
D29	Ruben Lane Realignment to Kate Schmitz	Realign Ruben Lane to the west to connect with Kate Schmitz Avenue and US 26	$3,700,000	Medium
D30	Langensand Road Truck Traffic Calming	Traffic calming measures along Langensand Road, potential treatments include bollards at the intersection of Langensand Road and US 26 and curb extensions along Langesand Road.	$175,000	Low
D31	Sandy Bypass Planning	Planning to support the proposed US 26 Sandy Bypass	$1,000,000	FC

A. This project is currently funded

FUNCTIONAL CLASSIFICATION

The motor vehicle classifications for streets help support the movement of vehicles by indicating the street's intended level of mobility, access, and use for vehicles. A city's street functional classification system is an important tool for managing the transportation system. It is based on a hierarchical system of roads in which streets of a higher classification, such as arterials, are designed for a higher level of mobility for through movements, while streets of a lower classification are designed to facilitate access to adjacent land uses. From highest to lowest intended use, the recommended classifications are Major Arterial, Minor Arterial, Neighborhood Arterial, Collector, and Local Streets. Streets with higher intended usage generally limit access to adjacent property in favor of more efficient motor vehicle traffic movement (i.e., mobility). Local roadways with lower intended usage have more driveway access and intersections, and generally accommodate shorter trips to nearby destinations.

In this TSP update, the Residential Minor Arterial functional classification has been removed with the following segments changed to Minor Arterial from Residential Minor Arterial:

- Dubarko Road
  - 362nd Drive to Eldrige Drive
  - Sandy Heights Street to Reich Court
  - Hwy 211 to Jacoby Road
- Langensand Road
  - Gary Street to McCormick Drive

The only other change in functional classification from the 2011 Sandy Transportation System Plan is OR 211 which is classified as a Minor Arterial (down from Major Arterial) due to the jurisdictional transfer from ODOT.

Major Arterial

Major arterials are typically three to five-lane highways that operate as two-way streets or as a one-way couplet. These roads are intended to handle high volumes of traffic, typically 16,000 ADT (Average Daily Traffic) or more. Major arterials provide greater regional mobility, are managed to favor through traffic capacity and safety over direct access and should generally be spaced approximately one mile apart. Private driveway access, on-street parking, and traffic calming measures are typically discouraged along major arterial routes and the provision of bike lanes or shoulders is required.

Minor Arterial

Minor arterials are high-volume, intra-city streets providing connectivity and parallel features, and should generally be spaced approximately one mile apart. These roads have a typical capacity between 8,000 and 16,000 ADT. Minor arterials are generally the most critical classification for circulation in the urban areas of Sandy and are intended to serve longer local trips. Private driveway access is discouraged where access to facilities of lower classification is available, and traffic calming measures and on-street parking should be avoided. The provision of bike lanes is required.

Collector

Collector streets provide both access and circulation within and between residential and commercial areas. These roads have a typical capacity between 2,000 and 6,000 ADT. Collectors differ from arterials in that they provide more of a citywide circulation function, do not require as extensive control of access (compared to arterials), and penetrate residential neighborhoods, distributing trips from the local street system to minor and major arterials. Collectors may provide on-street parking, may incorporate traffic calming measures, and should be spaced approximately one-half mile apart. The provision of bike lanes is required.

Local Street

Local streets have the sole function of providing immediate access to adjacent land. These streets have a typical capacity not exceeding 1,000 ADT. Service for through traffic movements on local streets is deliberately discouraged by design. All other City streets in the City of Sandy that are not designated as arterial streets or collector streets are local streets. Local streets may allow on-street parking and may incorporate traffic calming measures. Bike lanes are not required.

STREET CROSS SECTION STANDARDS

The design characteristics of Sandy's streets are defined in Section 17.100.110 of the SMC and were developed by the City to meet the function and demand for each facility type. Three updates to the design standards in the 2011 Sandy Transportation System Plan have been included in the design standards below. They are:

- A minimum bike lane width for Minor Arterials and Collectors of six feet.
- A minimum sidewalk width for Local streets of six feet. This makes sidewalk width consistent between functional class levels.
- Minimum local street travel lane width increased from 14 feet to 16 feet.
- Specific applications of the Blueprint for Urban Design along US 26 have been included for reference. The Blueprint for Urban Design controls the design of US 26 and the land use contexts below summarize conditions applicable to the City.

The actual design of a roadway can vary from segment to segment due to adjacent land uses, traffic demand, topography and/or resources. Some elements of a particular cross section design are necessary to provide for the unique needs of a class, but flexibility is also needed so that standards can be applied in a variety of circumstances. Minimum cross section dimensions are shown in Table 9.

Design standards for Major Arterials in Sandy (US 26) are controlled by the Blueprint for Urban Design in the Oregon Highway Design Manual and are not completely duplicated in the TSP. For reference, three land use contexts and highway design options are included in this discussion. Those contexts are:

- **Special Transportation Area (STA)** along Proctor Boulevard and Pioneer Boulevard between Bluff Road and Ten Eyck Road (Figure 6). In this urban context speeds are low, at or below 25 miles per hour, there are regular transit stops, and ample bicycle and pedestrian facilities to serve the expected higher volume of these users.

- **Commercial Corridor** west of Bluff Road (Figure 7). In this context speeds are moderate, typically between 30 and 35 miles per hour, there are regular transit stops and pedestrian and bicycle facilities should be buffered from the travel lanes.
- **Suburban Fringe** east of Ten Eyck Road (Figure 8). In this context speeds are higher, between 35 and 40 miles per hour. Pedestrian and bicycle facilities should be separated with a buffer and future uses of the surrounding land should be considered.

TABLE 9: STREET DIRECTIONAL CROSS SECTION DIMENTIONS[E]

CROSS SECTION	TOTAL ROW	SIDEWALK	PLANTER STRIP	PARKING	BIKE LANE	TRAVEL LANE	CENTER LANE[A]
MAJOR ARTERIAL - STA	58	7[CD]	-	8	6[A]	11	-
MAJOR ARTERIAL – COMMERCIAL CORRIDOR	102	6.5[C]	6.5[D]	-	7	12	14
MAJOR ARTERIAL – SUBURBAN FRINGE	94	10.5[CF]	8.5[D]	-	-	12	8
MINOR ARTERIAL – STANDARD	86	6.5[C]	5.5[D]	8	6	11	12
MINOR ARTERIAL – MINIMUM[B]	66	6.5[C]	5.5[D]	-	6	11	8
COLLECTOR - STANDARD	82	6.5[C]	5.5[D]	8	6	11	8
COLLECTOR – MINIMUM[B]	58	6.5[C]	5.5[D]	-	6	11	-
LOCAL	54	6.5[C]	5.5[D]	7	-	16[A]	-

A. Not directional, this element only appears once in the cross section

B. Minimum cross section designs can be applied per Section 17.66.00 SMC

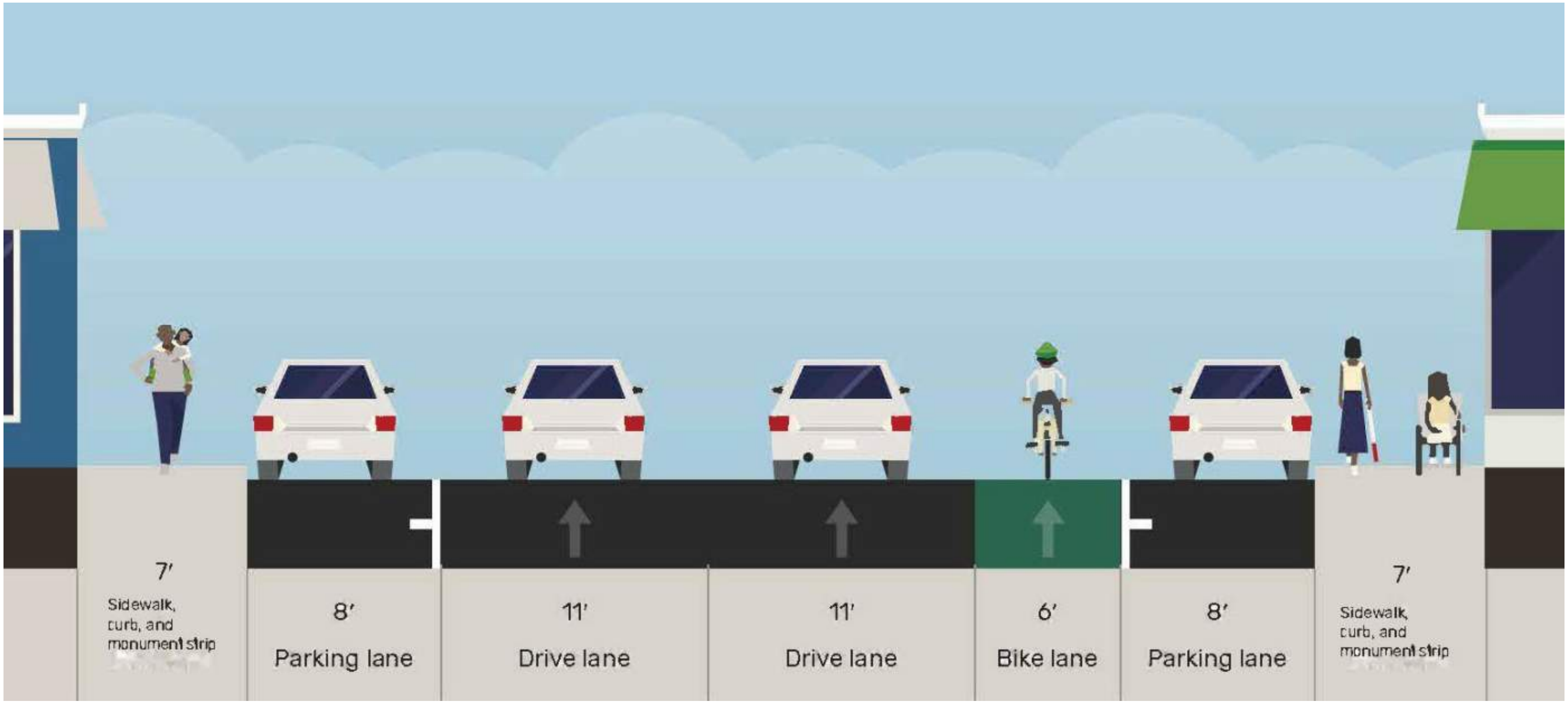
C. Includes 0.5' monument strip

D. Includes 0.5' curb

E. All dimensions in feet

F. As shared use path

FIGURE 6: US 26 SPECIAL TRANSPORTATION AREA[4]



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[4] Streetmix.net accessed 12/03/2021

FIGURE 7: US 26 COMMERCIAL CORRIDOR[5]

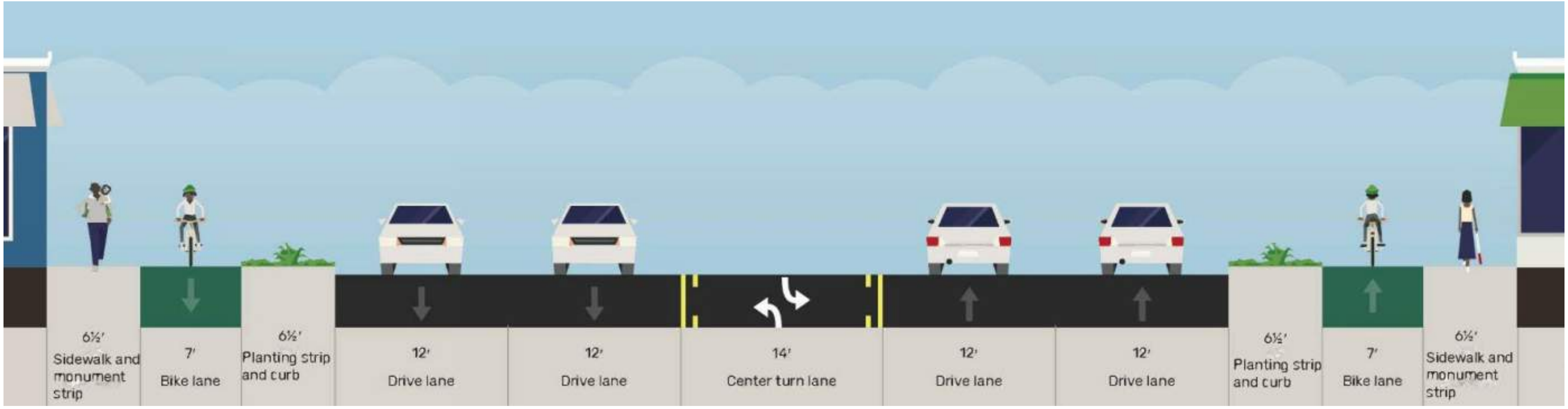
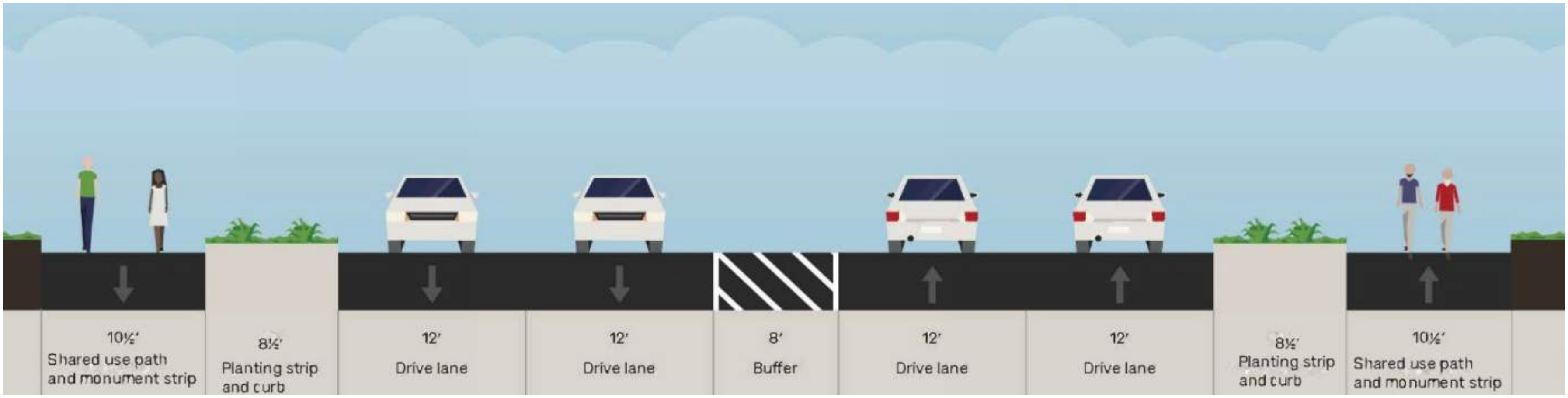


FIGURE 8: US 26 SUBURBAN FRINGE[6]



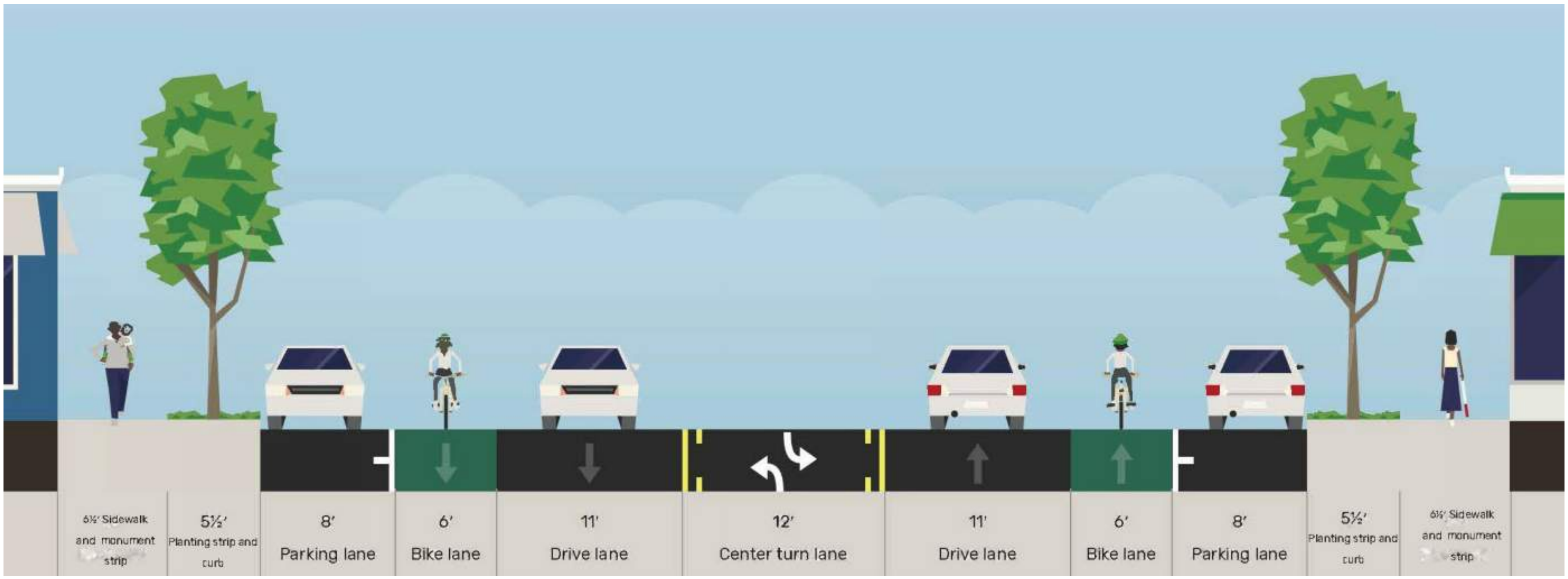
[5] Streetmix.net accessed 12/03/2021

[6] Streetmix.net accessed 12/03/2021

Minor Arterials

Some Minor arterials within Sandy include: 362nd Drive, Bluff Road, and OR 211. This street class should be spaced at 1-mile intervals which is approximately the distance between 362nd Drive and Bluff Road. The east-west and north-south spacing between most other minor arterials in Sandy is less than one mile. Design standards are shown in Figure 9.

FIGURE 9: MINOR ARTERIAL CROSS SECTION[7]

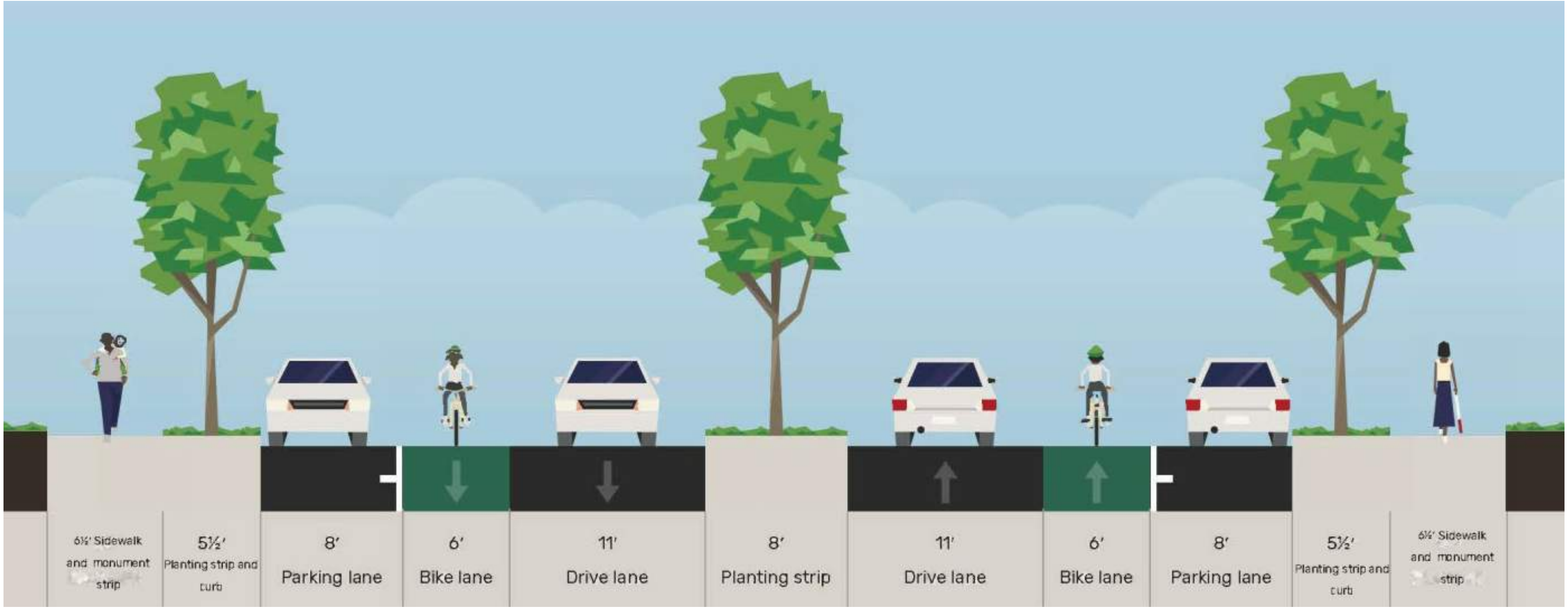


[7] Streetmix.net accessed 11/05/2021

Collectors

Some Collectors within Sandy include Industrial Way, Sandy Heights Street, and Jacoby Road. This street class should be spaced at half-mile intervals. Collector spacing in Sandy is currently less than half-mile intervals for all collectors (most are near 2000 feet). Design standards are show in Figure 10.

FIGURE 10: COLLECTOR CROSS SECTION[8]

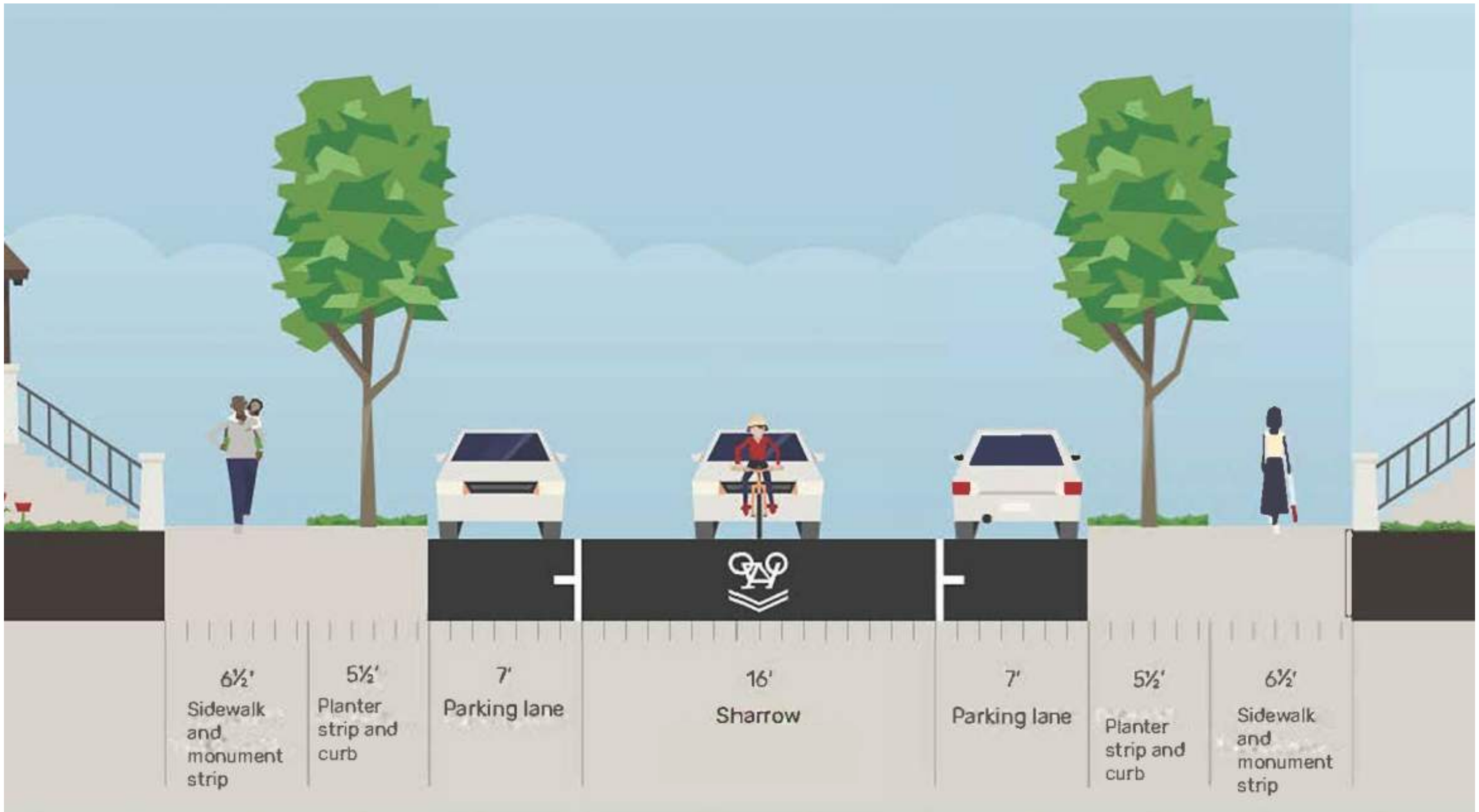


[8] Streetmix.net accessed 11/05/2021

Local Streets[9]

All streets not classified as Major Arterials, Minor/Residential Arterials, or Collectors are Local streets. Local streets should be spaced at 400 feet. Many local streets in Sandy are about 200 feet apart. Closer spacing of Local streets improves pedestrian connectivity but increases maintenance costs. Design standards are shown in Figures 11.

FIGURE 11: LOCAL STREET[10]



[9] The Junker Street Circulation Plan (2021) applies along Junker Street, Bruns Avenue, Strauss Avenue, and Pioneer Boulevard

[10] Streetmix.net accessed 11/05/2021

HIGH PRIORITY TRANSPORTATION IMPROVEMENTS

The preliminary list of high priority projects, shown in Table 9, addresses the multimodal needs previously identified based on the evaluation criteria. Community input and further technical analysis will further refine the recommended solutions to be included in the TSP update. The TSP planning process eliminates any project that may not be feasible for reasons other than financial (such as environmental or existing development limitations).

The full list includes 39 projects. Each project was assigned a primary source of funding for planning purposes (City or State) although such designations do not create any obligation for funding. The project design elements depicted are identified for the purpose of creating a reasonable cost estimate for planning purposes. The actual design elements for any project are subject to change and will ultimately be determined through a preliminary and final design process and are subject to City and/or ODOT approval.

TABLE 10: PRELIMINARY HIGH PRIORITY PROJECTS

PROJECT ID	NAME	DESCRIPTION	COST	PRIMARY FUNDING
		PEDESTRIAN IMPROVEMENTS		
P1	362nd Dr.	Sidewalk infill Chinook Dr. to Industrial Wy.	$1,500,600	City
P7	Dubarko Rd.	Sidewalk infill Langensand Rd. to Antler Ave.	$47,580	City
P11	Langensand Rd.	Sidewalk infill Dubarko Rd. to US 26	$100,040	City
P14	Pleasant St.	Sidewalk infill Beers Ave. to Revenue Ave.	$211,060	City
P16	Sandy Heights St.	Sidewalk infill Bluff Rd. to Tupper Rd.	$214,720	City
P17	Downtown Core Pedestrian	Sidewalk infill side streets perpendicular to US 26	$350,140	City
P22	US 26[A]	Sidewalk infill Ten Eyck Rd. to Vista Loop Dr. West	Included in B12	ODOT
		ROADWAY CROSSING IMPROVEMENTS		
C1	Sandy Shopper Crossing - Evans	Evans Street Senior Apartments, traffic calming and other crossing improvements are needed. Project may include pedestrian crossing advisory signage, curb extensions, and marked crosswalks.	$17,550	City
C2	OR 211 Dubarko	Project may include pedestrian crossing	$111,150	City

PROJECT ID	NAME	DESCRIPTION	COST	PRIMARY FUNDING
	Crossing	advisory signage, curb extensions, marked crosswalks, and installation of RRFB. Coordinate with D9.		
C5	CRMS - Bluff Road at Marcy	Intersection improvement project may include: a Rectangular Rapid Flashing Beacon (RRFB) with School Crossing Assembly (S1-1 and W16-7P), and high visibility crosswalks across the north and east sides of the intersection.	$111,150	City
C6	CRMS - Bluff Road at Hood	Intersection improvement project may include: Install a curb extension including perpendicular curb ramps and tactile domes at northeast corner of Hood St. Install a curb extension to provide clearance from existing pole, including perpendicular curb ramps and tactile domes, at southeast corner. Mark crosswalk and stop bar across the east leg of intersection.	$17,550	City
C7	CRMS - Bluff Road at US 26	Intersection improvement project may include: Increase pedestrian signal crossing time to be based on a walking rate of 3.0 feet per second. Reconfigure crossing to provide perpendicular curb ramps with tactile domes and reduce curb radius at all corners. Add pedestrian-scale lighting. Reallocate existing roadway space to provide buffered bike lanes along Highway 26 and consider the use of green pavement markings in the vicinity of Bluff Rd. Consider installing vertical delineators with buffered bike lanes contingent on city maintenance agreement or construct a fully grade-separated bicycle facility.	$111,150	ODOT
C8	CRMS - Hood Street at Beers	At Beers Ave, repaint stop bars on west and east sides of intersection. Consider installation of a 4 way stop at Beers Ave.	$17,550	City
C9	CRMS - Hood Street at Scales	Install perpendicular curb ramps with tactile domes at northwest and southwest corners of the intersection of Hood St and Scales Ave. Install tactile domes at the northeast and	$17,550	City

PROJECT ID	NAME	DESCRIPTION	COST	PRIMARY FUNDING
		southeast corners. Repaint stop bars.		
C10	CRMS -Hood Street at Bruns	Install tactile dome at southwest corner of Bruns Ave and Hood St.	$17,550	City
C11	SGS - Hood/Strauss	Intersection improvement project may include: Relocate southbound school advance crossing assembly (S1-1 & W16-9P) and school speed limit assembly (S4-3P & R2-1) along Strauss Ave to approximately 100 ft and 175 ft north of intersection, respectively. Repair approximately 150 LF of degraded sidewalk along the east side of Strauss Ave at the intersection with Hood St and widen sidewalk at encroaching utility pole or relocate pole. Install a curb ramp on the east side of the south leg of the intersection of Strauss Ave at Hood St. Add tactile domes and a stop bar associated with the crosswalk across the west leg of the intersection.	$351,000	City
C12	SGS - Pleasant/Strauss	Intersection improvement project may include: Mark stop bars in advance of crosswalks. Consider revising the intersection of Pleasant St and Strauss Ave to be a four-way stop (currently STOP control north- and southbound only).	$17,550	City
C13	SGS - Pleasant/Alt	Intersection improvement project may include: Mark stop bars in advance of crosswalks. Replace existing diagonal curb ramps at all four corners with perpendicular curb ramps with tactile domes. Construct a raised intersection at Pleasant St at Alt Ave.	$351,000	City
C14	SGS - Smith/Pleasant	Mark stop bars in advance of crosswalks. Relocate southbound school advance crossing assembly (S1-1 & W16-9P) and school speed limit assembly (S4-3P & R2-1) along Smith Ave to approximately 100 ft and 175 ft north of intersection, respectively.	$17,550	City
C15	SGS - Alt/US 26	Intersection improvement project may include: Increase pedestrian signal crossing time to be based on a walking rate of 3.0 feet per second. Upgrade pedestrian push-buttons	$111,150	ODOT

PROJECT ID	NAME	DESCRIPTION	COST	PRIMARY FUNDING
		to meet current standards with audible indications. Consolidate the two existing crosswalks across Highway 26 at Alt Ave with one high visibility continental crosswalk on the east side of the intersection including advance stop bar, bulbouts, curb ramps, and pedestrian scale lighting.		
C18	Scales/Proctor	Intersection improvement project may include: marked crosswalks on all four legs with tactile domes on the ramps	$17,550	ODOT
C19	Scales/Pioneer	Intersection improvement project may include: marked crosswalks on all four legs with tactile domes on the ramps	$17,550	ODOT
C20	Bruns/Proctor	Intersection improvement project may include: marked crosswalks on all four legs with tactile domes on the ramps	$17,550	ODOT
C21	Bruns/Pioneer	Intersection improvement project may include: marked crosswalks on all four legs with tactile domes on the ramps	$17,550	ODOT
		BICYCLE IMPROVEMENTS		
B1	362nd Dr.	Widen shoulder to 6 feet minimum for bike access from Dubarko Rd. to UGB	$1,500,600	City
B2	Bluff Rd.	Re-stripe roadway to provide bike lanes from US 26 to Miller Rd.	$48,800	City
B3	Bornstedt Rd.	Widen roadway to provide bike lanes from OR 211 to UGB	$2,533,050	City
B4	Dubarko Rd.	Re-stripe roadway to provide bike lanes from 362nd Dr. to Eldridge Dr.	$43,920	City
B5	Dubarko Rd.	Re-stripe roadway to provide bike lanes from Sandy Heights St. to Melissa Ave.	$43,920	City
B6	Langensand Rd.	Re-stripe roadway to provide bike lanes from US 26 to UGB	$74,664	City
B7	Meinig Ave.	Re-stripe roadway to provide bike lanes from Scenic St. to US 26	$74,420	City

PROJECT ID	NAME	DESCRIPTION	COST	PRIMARY FUNDING
B8	Meinig Ave.	Re-stripe roadway to provide bike lanes from Barker Ct. to Dubarko Rd.	$20,740	City
B9	Sandy Heights	Re-stripe roadway to provide bike lanes from Bluff Rd. to Tupper Rd.	$48,800	City
B10	Tupper Rd.	Widen roadway to provide bike lanes from Long Circle to OR 211	$2,990,000	City
B12	US 26	Widen to provide a six-foot bike lane and sidewalk from Ten Eyck to East UGB	$7,716,500	ODOT
SAFETY IMPROVEMENTS				
S1	US 26 Adaptive Signal System	Install an adaptive signal control system between Orient Drive and Ruben Lane	$200,000	ODOT
S2	US 26 at Ten Eyck Road Study	Study improvements to business access at Ten Eyck Road and US 26	$50,000	ODOT
S3	US 26 Speed Zone Study	Study speeds east of Ten Eyck Road/Wolf Drive along US 26	$75,000	ODOT
DRIVING IMPROVEMENTS				
D3	US 26 & 362nd Drive Intersection Improvement	Reduce congestion for the westbound left turn and accommodate the 362nd Drive Extension 1. Project may include minor widening to accommodate a northbound through lane, construction of a three-lane southbound approach with a right turn lane, through lane, and left turn lane, and an eastbound left turn lane.	Funded	ODOT
D14A	Extend Bell St. to 362nd Dr[B]	Extend Bell Street to 362nd Drive Extension 1 at Minor Arterial cross section standards	Funded	City
D15A	Extend 362nd Dr to Bell Street[B]	Extend 362nd Drive to Bell Street Extension 1 at Minor Arterial cross section standards	Funded	City
D20	Extend Dubarko Rd. to US 26 opposite Vista Loop Dr. (West)	Extend Dubarko Road to US 26/Vista Loop Road (west) at Minor Arterial cross section standards. Coordinate with D9 and C17.	$3,744,000	City

PROJECT ID	NAME	DESCRIPTION	COST	PRIMARY FUNDING
D21F	Village Blvd Ext 1	Connect Village Boulevard at Collector standards between Cascadia Village Drive and Juniper Street	$865,800	City
D24	OR 211 Turn Lane to Gunderson	Intersection improvement project includes a northbound left turn lane from OR 211 to Gunderson Road	$1,000,000	City
D26	Alt Avenue	Reconstruct Alt Avenue from Proctor Blvd to Pleasant St to improve walkability and access to the Sandy Library	$10,941,750	City
D27	Hwy 211 & Dubarko Road Intersection Control Evaluation	Study intersection control and other options to improve safety and capacity	$50,000	City
TOTAL COST			$42,067,554	

A. A project completing the gap on the northern side of US 26 is currently funded.

B. This project is currently funded

APPENDIX

CONTENTS

SECTION 1. HCM RESULTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	250	2205	15	10	1435	165	70	50	10	165	10	90
Future Volume (veh/h)	250	2205	15	10	1435	165	70	50	10	165	10	90
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	263	2321	16	11	1511	0	74	53	11	174	11	95
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	182	1735	774	73	1496		65	46	10	207	13	113
Arrive On Green	0.11	0.52	0.52	0.04	0.45	0.00	0.08	0.08	0.08	0.21	0.21	0.21
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	826	591	123	1008	64	550
Grp Volume(v), veh/h	263	2321	16	11	1511	0	138	0	0	280	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1540	0	0	1622	0	0
Q Serve(g_s), s	11.0	52.5	0.5	0.6	46.0	0.0	8.0	0.0	0.0	16.9	0.0	0.0
Cycle Q Clear(g_c), s	11.0	52.5	0.5	0.6	46.0	0.0	8.0	0.0	0.0	16.9	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.54		0.08	0.62		0.34
Lane Grp Cap(c), veh/h	182	1735	774	73	1496		121	0	0	333	0	0
V/C Ratio(X)	1.44	1.34	0.02	0.15	1.01		1.14	0.00	0.00	0.84	0.00	0.00
Avail Cap(c_a), veh/h	182	1735	774	73	1496		121	0	0	541	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	45.4	24.7	12.1	46.9	27.9	0.0	46.8	0.0	0.0	38.9	0.0	0.0
Incr Delay (d2), s/veh	227.8	156.2	0.0	0.6	25.8	0.0	124.9	0.0	0.0	6.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.9	55.0	0.2	0.3	21.0	0.0	7.3	0.0	0.0	7.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	273.3	180.9	12.1	47.4	53.8	0.0	171.7	0.0	0.0	45.3	0.0	0.0
LnGrp LOS	F	F	B	D	F		F	A	A	D	A	A
Approach Vol, veh/h		2600			1522	A		138			280	
Approach Delay, s/veh		189.2			53.7			171.7			45.3	
Approach LOS		F			D			F			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.0	50.0		24.9	8.5	56.5		12.0				
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5				
Max Green Setting (Gmax), s	10.5	43.0		33.0	4.0	49.5		7.5				
Max Q Clear Time (g_c+I1), s	13.0	48.0		18.9	2.6	54.5		10.0				
Green Ext Time (p_c), s	0.0	0.0		1.0	0.0	0.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		134.3
HCM 6th LOS		F

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	200	1355	450	225	1415	250	185	260	300	50	150	65
Future Volume (veh/h)	200	1355	450	225	1415	250	185	260	300	50	150	65
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772
Adj Flow Rate, veh/h	211	1426	474	237	1489	263	195	274	316	53	158	68
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2
Cap, veh/h	261	1450	1003	463	1725	851	745	393	336	104	109	92
Arrive On Green	0.07	0.43	0.43	0.29	1.00	1.00	0.23	0.22	0.22	0.06	0.06	0.06
Sat Flow, veh/h	1688	3367	1502	3222	3313	1502	3300	1772	1511	1688	1772	1502
Grp Volume(v), veh/h	211	1426	474	237	1489	263	195	274	316	53	158	68
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1611	1657	1502	1650	1772	1511	1688	1772	1502
Q Serve(g_s), s	9.0	54.4	19.9	8.0	0.0	0.0	6.3	18.5	26.7	4.0	8.0	5.8
Cycle Q Clear(g_c), s	9.0	54.4	19.9	8.0	0.0	0.0	6.3	18.5	26.7	4.0	8.0	5.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	261	1450	1003	463	1725	851	745	393	336	104	109	92
V/C Ratio(X)	0.81	0.98	0.47	0.51	0.86	0.31	0.26	0.70	0.94	0.51	1.45	0.74
Avail Cap(c_a), veh/h	261	1450	1003	463	1725	851	761	402	343	234	245	208
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.51	0.51	0.51	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.1	36.5	10.5	42.5	0.0	0.0	41.4	46.5	49.7	59.1	61.0	60.0
Incr Delay (d2), s/veh	16.5	20.0	1.6	0.3	3.2	0.5	0.1	4.5	33.1	2.9	223.6	8.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	24.5	11.9	2.8	0.8	0.1	2.6	8.6	13.1	1.8	10.3	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.5	56.5	12.1	42.8	3.2	0.5	41.5	51.1	82.9	62.0	284.6	68.2
LnGrp LOS	D	E	B	D	A	A	D	D	F	E	F	E
Approach Vol, veh/h		2111			1989			785			279	
Approach Delay, s/veh		45.5			7.6			61.5			189.6	
Approach LOS		D			A			E			F	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	24.7	60.0		12.0	13.0	71.7		33.4
Change Period (Y+Rc), s	6.0	* 6		4.0	4.0	6.0		4.5
Max Green Setting (Gmax), s	10.0	* 54		18.0	9.0	55.0		29.5
Max Q Clear Time (g_c+I1), s	11.0	56.4		7.8	11.0	2.0		28.7
Green Ext Time (p_c), s	0.0	0.0		0.2	0.0	51.5		0.1

Intersection Summary	
HCM 6th Ctrl Delay	41.1
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	1645	10	40	1595	50	170	25	100	220	45	135
Future Volume (vph)	50	1645	10	40	1595	50	170	25	100	220	45	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0	3.0	4.0		4.0	4.0	
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.88		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1676	3315		1644	3358	1471	1693	1569		3317	1580	
Flt Permitted	0.08	1.00		0.06	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	140	3315		102	3358	1471	1693	1569		3317	1580	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	51	1679	10	41	1628	51	173	26	102	224	46	138
RTOR Reduction (vph)	0	0	0	0	0	20	0	91	0	0	71	0
Lane Group Flow (vph)	51	1689	0	41	1628	31	173	37	0	224	113	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						
Actuated Green, G (s)	82.0	78.8		82.0	78.8	78.8	13.5	13.5		17.1	17.1	
Effective Green, g (s)	83.0	80.2		82.0	80.2	80.2	14.5	13.5		17.1	17.1	
Actuated g/C Ratio	0.64	0.62		0.63	0.62	0.62	0.11	0.10		0.13	0.13	
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4	3.0	3.0		2.3	2.3	
Lane Grp Cap (vph)	133	2045		102	2071	907	188	162		436	207	
v/s Ratio Prot	c0.01	c0.51		0.01	0.48		c0.10	0.02		0.07	c0.07	
v/s Ratio Perm	0.23			0.24		0.02						
v/c Ratio	0.38	0.83		0.40	0.79	0.03	0.92	0.23		0.51	0.54	
Uniform Delay, d1	35.2	19.4		40.6	18.5	9.7	57.2	53.5		52.6	52.8	
Progression Factor	0.38	0.21		0.47	0.46	0.50	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	2.4		1.0	2.1	0.0	43.5	0.7		0.6	2.0	
Delay (s)	14.1	6.4		20.1	10.6	4.9	100.7	54.2		53.2	54.8	
Level of Service	B	A		C	B	A	F	D		D	D	
Approach Delay (s)		6.6			10.7			80.9			53.9	
Approach LOS		A			B			F			D	

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	125	1625	210	55	1450	95	115	80	35	210	55	165
Future Volume (veh/h)	125	1625	210	55	1450	95	115	80	35	210	55	165
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1758	1758	1758	1800	1800	1800
Adj Flow Rate, veh/h	126	1641	0	56	1465	96	116	81	35	212	56	167
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	2	2	2	4	4	4	3	3	3	0	0	0
Cap, veh/h	420	2226		232	1638	713	184	118	51	256	30	90
Arrive On Green	0.41	1.00	0.00	0.03	0.48	0.48	0.11	0.10	0.10	0.08	0.08	0.08
Sat Flow, veh/h	1688	3331	1502	1661	3383	1473	1674	1160	501	3326	393	1173
Grp Volume(v), veh/h	126	1641	0	56	1465	96	116	0	116	212	0	223
Grp Sat Flow(s),veh/h/ln	1688	1666	1502	1661	1692	1473	1674	0	1661	1663	0	1567
Q Serve(g_s), s	0.0	0.0	0.0	2.5	51.2	4.7	8.6	0.0	8.8	8.2	0.0	10.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	2.5	51.2	4.7	8.6	0.0	8.8	8.2	0.0	10.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.30	1.00		0.75
Lane Grp Cap(c), veh/h	420	2226		232	1638	713	184	0	169	256	0	121
V/C Ratio(X)	0.30	0.74		0.24	0.89	0.13	0.63	0.00	0.69	0.83	0.00	1.85
Avail Cap(c_a), veh/h	420	2226		234	1639	714	476	0	460	256	0	121
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.53	0.53	0.00	0.46	0.46	0.46	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.0	0.0	0.0	19.8	30.5	18.5	55.4	0.0	56.4	59.2	0.0	60.0
Incr Delay (d2), s/veh	0.1	1.2	0.0	0.1	4.0	0.2	2.2	0.0	3.0	19.2	0.0	412.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	0.4	0.0	0.9	20.7	1.6	3.8	0.0	3.9	4.2	0.0	17.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.2	1.2	0.0	19.9	34.5	18.7	57.6	0.0	59.3	78.3	0.0	472.7
LnGrp LOS	C	A		B	C	B	E	A	E	E	A	F
Approach Vol, veh/h		1767	A		1617			232			435	
Approach Delay, s/veh		3.3			33.0			58.5			280.5	
Approach LOS		A			C			E			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.9	90.9		14.0	31.8	66.9		17.3				
Change Period (Y+Rc), s	4.0	* 5.4		4.0	* 5.4	* 5.4		4.0				
Max Green Setting (Gmax), s	4.0	* 63		10.0	* 5	* 62		36.0				
Max Q Clear Time (g_c+I1), s	4.5	2.0		12.0	2.0	53.2		10.8				
Green Ext Time (p_c), s	0.0	59.0		0.0	0.1	8.3		0.8				

Intersection Summary	
HCM 6th Ctrl Delay	48.1
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	1640	180	70	1370	295	90	5	25	265	145	85
Future Volume (veh/h)	80	1640	180	70	1370	295	90	5	25	265	145	85
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786
Adj Flow Rate, veh/h	82	1673	184	71	1398	301	92	5	26	270	148	87
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1
Cap, veh/h	127	1408	626	375	1675	834	115	30	155	216	191	112
Arrive On Green	0.04	0.42	0.42	0.19	0.57	0.57	0.07	0.12	0.13	0.13	0.18	0.19
Sat Flow, veh/h	1688	3367	1498	1647	2941	1465	1701	245	1275	1701	1053	619
Grp Volume(v), veh/h	82	1673	184	71	1398	301	92	0	31	270	0	235
Grp Sat Flow(s),veh/h/ln	1688	1683	1498	1647	1470	1465	1701	0	1520	1701	0	1672
Q Serve(g_s), s	3.4	46.0	6.6	0.0	42.9	12.3	5.9	0.0	2.0	14.0	0.0	14.7
Cycle Q Clear(g_c), s	3.4	46.0	6.6	0.0	42.9	12.3	5.9	0.0	2.0	14.0	0.0	14.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.84	1.00		0.37
Lane Grp Cap(c), veh/h	127	1408	626	375	1675	834	115	0	185	216	0	303
V/C Ratio(X)	0.65	1.19	0.29	0.19	0.83	0.36	0.80	0.00	0.17	1.25	0.00	0.78
Avail Cap(c_a), veh/h	127	1408	626	375	1675	834	186	0	414	216	0	486
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.55	0.55	0.55	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.3	32.0	11.4	36.3	19.4	12.8	50.6	0.0	43.1	48.0	0.0	42.8
Incr Delay (d2), s/veh	5.3	89.0	0.7	0.1	5.1	1.2	7.7	0.0	0.3	143.7	0.0	2.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	34.9	2.3	1.6	15.2	4.2	2.8	0.0	0.8	14.6	0.0	6.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.6	121.0	12.1	36.4	24.5	14.0	58.2	0.0	43.4	191.7	0.0	45.4
LnGrp LOS	C	F	B	D	C	B	E	A	D	F	A	D
Approach Vol, veh/h		1939			1770			123			505	
Approach Delay, s/veh		106.9			23.2			54.5			123.7	
Approach LOS		F			C			D			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	24.6	50.0	11.4	23.9	8.0	66.6	18.0	17.4
Change Period (Y+Rc), s	4.0	4.8	4.0	4.5	4.0	4.0	4.0	4.5
Max Green Setting (Gmax), s	4.0	45.2	12.0	31.5	4.0	46.0	14.0	29.5
Max Q Clear Time (g_c+I1), s	12.0	48.0	7.9	16.7	5.4	44.9	16.0	4.0
Green Ext Time (p_c), s	0.0	0.0	0.0	0.7	0.0	1.1	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	73.2
HCM 6th LOS	E

Notes

User approved pedestrian interval to be less than phase max green.

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	60	15	395	380	5
Future Vol, veh/h	5	60	15	395	380	5
Conflicting Peds, #/hr	1	1	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	180	0	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	4	1	1	3	3
Mvmt Flow	5	63	16	416	400	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	854	406	407	0	-	0
Stage 1	405	-	-	-	-	-
Stage 2	449	-	-	-	-	-
Critical Hdwy	6.44	6.24	4.11	-	-	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	2.209	-	-	-
Pot Cap-1 Maneuver	326	641	1157	-	-	-
Stage 1	669	-	-	-	-	-
Stage 2	639	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	320	639	1155	-	-	-
Mov Cap-2 Maneuver	320	-	-	-	-	-
Stage 1	658	-	-	-	-	-
Stage 2	638	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.7	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1155	-	320	639	-	-
HCM Lane V/C Ratio	0.014	-	0.016	0.099	-	-
HCM Control Delay (s)	8.2	0	16.4	11.3	-	-
HCM Lane LOS	A	A	C	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	0.3	-	-

Intersection						
Int Delay, s/veh	17					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	185	85	505	245	15	670
Future Vol, veh/h	185	85	505	245	15	670
Conflicting Peds, #/hr	0	2	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	125	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	4	1	1	3	3
Mvmt Flow	195	89	532	258	16	705

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1046	663	0	0	790	0
Stage 1	661	-	-	-	-	-
Stage 2	385	-	-	-	-	-
Critical Hdwy	6.66	6.26	-	-	4.145	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.86	-	-	-	-	-
Follow-up Hdwy	3.538	3.338	-	-	2.2285	-
Pot Cap-1 Maneuver	235	456	-	-	822	-
Stage 1	508	-	-	-	-	-
Stage 2	653	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	231	455	-	-	822	-
Mov Cap-2 Maneuver	231	-	-	-	-	-
Stage 1	508	-	-	-	-	-
Stage 2	641	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	106.6	0	0.2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	273	822	-
HCM Lane V/C Ratio	-	-	1.041	0.019	-
HCM Control Delay (s)	-	-	106.6	9.5	-
HCM Lane LOS	-	-	F	A	-
HCM 95th %tile Q(veh)	-	-	11	0.1	-

Intersection	
Intersection Delay, s/veh	221.9
Intersection LOS	F

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	100	255	65	650	850	5
Future Vol, veh/h	100	255	65	650	850	5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	105	268	68	684	895	5
Number of Lanes	1	1	0	1	1	1

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	2	2	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	2
HCM Control Delay	18.1	203.4	322
HCM LOS	C	F	F

Lane	NBLn1	EBLn1	EBLn2	SBLn1	SBLn2
Vol Left, %	9%	100%	0%	0%	0%
Vol Thru, %	91%	0%	0%	100%	0%
Vol Right, %	0%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	715	100	255	850	5
LT Vol	65	100	0	0	0
Through Vol	650	0	0	850	0
RT Vol	0	0	255	0	5
Lane Flow Rate	753	105	268	895	5
Geometry Grp	4	7	7	7	7
Degree of Util (X)	1.376	0.237	0.514	1.66	0.009
Departure Headway (Hd)	7.422	9.469	8.203	7.144	6.423
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	497	382	443	519	561
Service Time	5.422	7.169	5.903	4.844	4.123
HCM Lane V/C Ratio	1.515	0.275	0.605	1.724	0.009
HCM Control Delay	203.4	15.1	19.3	323.8	9.2
HCM Lane LOS	F	C	C	F	A
HCM 95th-tile Q	30.9	0.9	2.9	48.1	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	55	1390	15	250	50	0	0	100	25
Future Volume (veh/h)	0	0	0	55	1390	15	250	50	0	0	100	25
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772
Adj Flow Rate, veh/h				58	1463	16	263	53	0	0	105	26
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2
Cap, veh/h				68	1811	21	441	612	0	0	473	117
Arrive On Green				0.55	0.55	0.55	0.58	0.58	0.00	0.00	0.35	0.35
Sat Flow, veh/h				124	3284	38	1289	1772	0	0	1369	339
Grp Volume(v), veh/h				805	0	732	263	53	0	0	0	131
Grp Sat Flow(s),veh/h/ln				1724	0	1723	1289	1772	0	0	0	1708
Q Serve(g_s), s				43.2	0.0	36.5	17.5	1.5	0.0	0.0	0.0	6.0
Cycle Q Clear(g_c), s				43.2	0.0	36.5	23.5	1.5	0.0	0.0	0.0	6.0
Prop In Lane				0.07		0.02	1.00		0.00	0.00		0.20
Lane Grp Cap(c), veh/h				950	0	950	441	612	0	0	0	590
V/C Ratio(X)				0.85	0.00	0.77	0.60	0.09	0.00	0.00	0.00	0.22
Avail Cap(c_a), veh/h				1003	0	1002	441	612	0	0	0	590
HCM Platoon Ratio				1.00	1.00	1.00	1.67	1.67	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.87	0.87	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				20.8	0.0	19.3	22.5	15.5	0.0	0.0	0.0	25.5
Incr Delay (d2), s/veh				9.2	0.0	6.0	5.1	0.2	0.0	0.0	0.0	0.1
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				19.1	0.0	15.7	5.1	0.6	0.0	0.0	0.0	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				30.0	0.0	25.3	27.6	15.8	0.0	0.0	0.0	25.7
LnGrp LOS				C	A	C	C	B	A	A	A	C
Approach Vol, veh/h					1537			316			131	
Approach Delay, s/veh					27.7			25.7			25.7	
Approach LOS					C			C			C	
Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				42.0		64.7		42.0				
Change Period (Y+Rc), s				4.0		4.0		4.0				
Max Green Setting (Gmax), s				38.0		64.0		38.0				
Max Q Clear Time (g_c+I1), s				8.0		45.2		25.5				
Green Ext Time (p_c), s				0.4		15.4		1.1				

Intersection Summary	
HCM 6th Ctrl Delay	27.3
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	1320	520	0	0	0	0	225	295	85	70	0
Future Volume (veh/h)	80	1320	520	0	0	0	0	225	295	85	70	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772				0	1772	1772	1730	1730	0
Adj Flow Rate, veh/h	84	1389	0				0	237	311	89	74	0
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2				0	2	2	5	5	0
Cap, veh/h	107	1853					0	451	375	111	620	0
Arrive On Green	0.57	0.57	0.00				0.00	0.25	0.25	0.02	0.12	0.00
Sat Flow, veh/h	188	3258	1502				0	1772	1473	1647	1730	0
Grp Volume(v), veh/h	789	684	0				0	237	311	89	74	0
Grp Sat Flow(s),veh/h/ln	1763	1683	1502				0	1772	1473	1647	1730	0
Q Serve(g_s), s	38.4	32.5	0.0				0.0	12.7	21.9	5.9	4.2	0.0
Cycle Q Clear(g_c), s	38.4	32.5	0.0				0.0	12.7	21.9	5.9	4.2	0.0
Prop In Lane	0.11		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	1002	957					0	451	375	111	620	0
V/C Ratio(X)	0.79	0.71					0.00	0.53	0.83	0.80	0.12	0.00
Avail Cap(c_a), veh/h	1002	957					0	451	375	165	676	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	0.93	0.93	0.98	0.98	0.00
Uniform Delay (d), s/veh	18.5	17.2	0.0				0.0	35.3	38.7	53.0	33.0	0.0
Incr Delay (d2), s/veh	6.2	4.6	0.0				0.0	4.0	17.6	11.3	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	16.7	13.3	0.0				0.0	5.8	9.5	2.9	1.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.7	21.8	0.0				0.0	39.3	56.4	64.3	33.0	0.0
LnGrp LOS	C	C					A	D	E	E	C	A
Approach Vol, veh/h		1473	A					548			163	
Approach Delay, s/veh		23.4						49.0			50.1	
Approach LOS		C						D			D	

Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		66.6		43.4			11.4	32.0				
Change Period (Y+Rc), s		4.0		4.0			4.0	4.8				
Max Green Setting (Gmax), s		59.0		43.0			11.0	27.2				
Max Q Clear Time (g_c+I1), s		40.4		6.2			7.9	23.9				
Green Ext Time (p_c), s		14.8		0.2			0.0	0.7				

Intersection Summary			
HCM 6th Ctrl Delay			31.8
HCM 6th LOS			C

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	1365	130	10	1175	20	90	25	10	135	20	150
Future Volume (veh/h)	155	1365	130	10	1175	20	90	25	10	135	20	150
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758
Adj Flow Rate, veh/h	163	1437	137	11	1237	21	95	26	11	142	21	158
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	7	7	7	0	0	0	3	3	3
Cap, veh/h	366	1887	841	192	1494	666	193	254	108	331	38	283
Arrive On Green	0.22	0.56	0.56	0.12	0.46	0.46	0.21	0.21	0.20	0.21	0.21	0.20
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	1259	1201	508	1399	178	1339
Grp Volume(v), veh/h	163	1437	137	11	1237	21	95	0	37	142	0	179
Grp Sat Flow(s),veh/h/ln	1688	1683	1500	1621	1617	1442	1259	0	1709	1399	0	1517
Q Serve(g_s), s	9.2	36.0	4.9	0.7	36.7	0.9	8.1	0.0	1.9	10.1	0.0	11.7
Cycle Q Clear(g_c), s	9.2	36.0	4.9	0.7	36.7	0.9	19.8	0.0	1.9	12.0	0.0	11.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.30	1.00		0.88
Lane Grp Cap(c), veh/h	366	1887	841	192	1494	666	193	0	362	331	0	321
V/C Ratio(X)	0.44	0.76	0.16	0.06	0.83	0.03	0.49	0.00	0.10	0.43	0.00	0.56
Avail Cap(c_a), veh/h	366	2121	945	192	1640	732	203	0	376	342	0	334
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	37.3	18.5	11.7	43.0	25.8	16.1	48.1	0.0	35.1	40.2	0.0	39.4
Incr Delay (d2), s/veh	0.5	3.0	0.4	0.1	5.4	0.1	1.5	0.0	0.1	0.7	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	14.3	1.7	0.3	14.3	0.3	2.6	0.0	0.8	3.5	0.0	4.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.8	21.5	12.1	43.1	31.2	16.2	49.5	0.0	35.2	40.9	0.0	40.9
LnGrp LOS	D	C	B	D	C	B	D	A	D	D	A	D
Approach Vol, veh/h		1737			1269			132			321	
Approach Delay, s/veh		22.3			31.0			45.5			40.9	
Approach LOS		C			C			D			D	

Timer - Assigned Phs	1	2	4	5	6	8
Phs Duration (G+Y+Rc), s	17.1	65.7	27.3	27.9	54.8	27.3
Change Period (Y+Rc), s	4.5	4.0	5.5	4.5	4.0	5.5
Max Green Setting (Gmax), s	4.0	69.3	22.7	17.5	55.8	22.7
Max Q Clear Time (g_c+I1), s	12.7	38.0	14.0	11.2	38.7	21.8
Green Ext Time (p_c), s	0.0	23.7	0.7	0.2	12.2	0.0

Intersection Summary	
HCM 6th Ctrl Delay	28.1
HCM 6th LOS	C

Intersection						
Int Delay, s/veh	5.3					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1390	100	110	1220	25	85
Future Vol, veh/h	1390	100	110	1220	25	85
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	300	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	6	6	0	0
Mvmt Flow	1463	105	116	1284	26	89

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1568	0	2337	732
Stage 1	-	-	-	-	1463	-
Stage 2	-	-	-	-	874	-
Critical Hdwy	-	-	4.22	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.26	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	398	-	32	368
Stage 1	-	-	-	-	183	-
Stage 2	-	-	-	-	373	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	398	-	~ 23	368
Mov Cap-2 Maneuver	-	-	-	-	~ 23	-
Stage 1	-	-	-	-	183	-
Stage 2	-	-	-	-	264	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	122.9
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	23	368	-	-	398	-
HCM Lane V/C Ratio	1.144	0.243	-	-	0.291	-
HCM Control Delay (s)	$ 479.7	17.9	-	-	17.7	-
HCM Lane LOS	F	C	-	-	C	-
HCM 95th %tile Q(veh)	3.4	0.9	-	-	1.2	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	130	1350	5	100	1240	0	5	5	100	5	0	100
Future Volume (veh/h)	130	1350	5	100	1240	0	5	5	100	5	0	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1758	1758	1772	1772	1716	1716	1772	1772	1772	1800	1723	1800
Adj Flow Rate, veh/h	137	1421	5	106	1305	0	5	5	105	5	0	105
Peak Hour Factor	0.95	0.95	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	2	2	6	6	2	2	2	0	2	0
Cap, veh/h	177	2488	1119	136	2347	0	82	0	4	82	0	4
Arrive On Green	0.11	0.75	0.75	0.08	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sat Flow, veh/h	1674	3340	1502	1688	3346	0	77	77	1614	78	0	1641
Grp Volume(v), veh/h	137	1421	5	106	1305	0	115	0	0	110	0	0
Grp Sat Flow(s),veh/h/ln	1674	1670	1502	1688	1630	0	1768	0	0	1719	0	0
Q Serve(g_s), s	3.7	8.7	0.0	2.8	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	3.7	8.7	0.0	2.8	8.6	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.04		0.91	0.05		0.95
Lane Grp Cap(c), veh/h	177	2488	1119	136	2347	0	86	0	0	86	0	0
V/C Ratio(X)	0.77	0.57	0.00	0.78	0.56	0.00	1.34	0.00	0.00	1.28	0.00	0.00
Avail Cap(c_a), veh/h	656	5089	2288	551	4754	0	969	0	0	938	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	20.0	2.6	1.5	20.7	3.0	0.0	23.0	0.0	0.0	23.0	0.0	0.0
Incr Delay (d2), s/veh	5.3	0.4	0.0	6.9	0.4	0.0	166.7	0.0	0.0	141.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.2	0.0	1.1	0.1	0.0	4.8	0.0	0.0	4.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.3	3.0	1.5	27.6	3.4	0.0	189.7	0.0	0.0	164.6	0.0	0.0
LnGrp LOS	C	A	A	C	A	A	F	A	A	F	A	A
Approach Vol, veh/h		1563			1411			115			110	
Approach Delay, s/veh		5.0			5.3			189.7			164.6	
Approach LOS		A			A			F			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.9	37.1		0.0	7.7	38.2		0.0				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	18.0	67.0		23.0	15.0	70.0		23.0				
Max Q Clear Time (g_c+I1), s	5.7	10.6		0.0	4.8	10.7		0.0				
Green Ext Time (p_c), s	0.2	20.0		0.0	0.2	23.6		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			17.2									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	21.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	1450	5	100	1335	25	5	5	100	10	0	0
Future Vol, veh/h	5	1450	5	100	1335	25	5	5	100	10	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	100	150	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	1526	5	105	1405	26	5	5	105	11	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1431	0	0	1531	0	0	2449	3177	763	2404	-	-
Stage 1	-	-	-	-	-	-	1536	1536	-	1628	-	-
Stage 2	-	-	-	-	-	-	913	1641	-	776	-	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	-	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	-	-
Pot Cap-1 Maneuver	471	-	-	431	-	-	16	10	347	17	0	0
Stage 1	-	-	-	-	-	-	121	176	-	106	0	0
Stage 2	-	-	-	-	-	-	294	156	-	356	0	0
Platoon blocked, %		-	-		-	-						-
Mov Cap-1 Maneuver	471	-	-	431	-	-	13	7	347	~ 4	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	13	7	-	~ 4	-	-
Stage 1	-	-	-	-	-	-	120	174	-	105	-	-
Stage 2	-	-	-	-	-	-	222	118	-	238	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.1	$ 357.9	$ 2367.8
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	79	471	-	-	431	-	-	4
HCM Lane V/C Ratio	1.466	0.011	-	-	0.244	-	-	2.632
HCM Control Delay (s)	$ 357.9	12.7	-	-	16	-	-	$ 2367.8
HCM Lane LOS	F	B	-	-	C	-	-	F
HCM 95th %tile Q(veh)	9.3	0	-	-	0.9	-	-	2.4

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	30	135	240	105	30	30	300	415	10	470	15
Future Volume (veh/h)	40	30	135	240	105	30	30	300	415	10	470	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1800	1772	1772	1772	1772	1772	1772	1758	1758	1758
Adj Flow Rate, veh/h	42	32	142	253	111	32	32	316	437	11	495	16
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	2	2	2	2	2	2	3	3	3
Cap, veh/h	378	43	193	436	355	102	302	728	614	337	693	584
Arrive On Green	0.03	0.15	0.15	0.15	0.27	0.27	0.03	0.41	0.41	0.01	0.39	0.39
Sat Flow, veh/h	1714	288	1277	1688	1322	381	1688	1772	1494	1674	1758	1482
Grp Volume(v), veh/h	42	0	174	253	0	143	32	316	437	11	495	16
Grp Sat Flow(s),veh/h/ln	1714	0	1565	1688	0	1703	1688	1772	1494	1674	1758	1482
Q Serve(g_s), s	1.2	0.0	6.2	6.8	0.0	3.9	0.7	7.4	14.2	0.2	13.8	0.4
Cycle Q Clear(g_c), s	1.2	0.0	6.2	6.8	0.0	3.9	0.7	7.4	14.2	0.2	13.8	0.4
Prop In Lane	1.00		0.82	1.00		0.22	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	378	0	236	436	0	458	302	728	614	337	693	584
V/C Ratio(X)	0.11	0.00	0.74	0.58	0.00	0.31	0.11	0.43	0.71	0.03	0.71	0.03
Avail Cap(c_a), veh/h	438	0	565	499	0	820	371	1158	977	434	1149	969
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.8	0.0	23.6	15.7	0.0	17.0	12.1	12.3	14.3	11.2	14.8	10.8
Incr Delay (d2), s/veh	0.1	0.0	3.3	1.0	0.0	0.3	0.1	0.9	3.3	0.0	2.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	2.3	2.4	0.0	1.4	0.2	2.5	4.6	0.1	5.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.9	0.0	26.9	16.7	0.0	17.3	12.2	13.1	17.5	11.2	17.8	10.8
LnGrp LOS	B	A	C	B	A	B	B	B	B	B	B	B
Approach Vol, veh/h		216			396			785			522	
Approach Delay, s/veh		25.5			16.9			15.5			17.4	
Approach LOS		C			B			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.7	27.9	12.8	12.8	5.6	26.9	6.0	19.6
Change Period (Y+Rc), s	4.0	4.8	4.0	4.0	4.0	4.8	4.0	4.0
Max Green Setting (Gmax), s	4.0	37.2	11.0	21.0	4.0	37.2	4.0	28.0
Max Q Clear Time (g_c+I1), s	2.2	16.2	8.8	8.2	2.7	15.8	3.2	5.9
Green Ext Time (p_c), s	0.0	6.9	0.2	0.4	0.0	4.5	0.0	0.4

Intersection Summary	
HCM 6th Ctrl Delay	17.5
HCM 6th LOS	B

Intersection						
Int Delay, s/veh	1.6					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	740	60	210	615	0	15
Future Vol, veh/h	740	60	210	615	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	1	1	1	1
Mvmt Flow	779	63	221	647	0	16

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	842	0	-	811
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.11	-	-	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.209	-	-	3.309
Pot Cap-1 Maneuver	-	-	798	-	0	381
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	798	-	-	381
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.9	14.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	381	-	-	798	-
HCM Lane V/C Ratio	0.041	-	-	0.277	-
HCM Control Delay (s)	14.9	-	-	11.2	-
HCM Lane LOS	B	-	-	B	-
HCM 95th %tile Q(veh)	0.1	-	-	1.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	100	1525	5	5	745	165	25	40	10	245	20	30
Future Volume (veh/h)	100	1525	5	5	745	165	25	40	10	245	20	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	105	1605	5	5	784	0	26	42	11	258	21	32
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	145	1750	780	73	1583		32	52	14	303	25	38
Arrive On Green	0.09	0.52	0.52	0.04	0.48	0.00	0.07	0.06	0.07	0.22	0.22	0.22
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	507	818	214	1387	113	172
Grp Volume(v), veh/h	105	1605	5	5	784	0	79	0	0	311	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1540	0	0	1672	0	0
Q Serve(g_s), s	6.2	45.1	0.2	0.3	16.7	0.0	5.2	0.0	0.0	18.4	0.0	0.0
Cycle Q Clear(g_c), s	6.2	45.1	0.2	0.3	16.7	0.0	5.2	0.0	0.0	18.4	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.33		0.14	0.83		0.10
Lane Grp Cap(c), veh/h	145	1750	780	73	1583		97	0	0	365	0	0
V/C Ratio(X)	0.73	0.92	0.01	0.07	0.50		0.81	0.00	0.00	0.85	0.00	0.00
Avail Cap(c_a), veh/h	229	1765	787	73	1583		97	0	0	552	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	45.9	22.7	11.9	47.2	18.4	0.0	47.5	0.0	0.0	38.7	0.0	0.0
Incr Delay (d2), s/veh	4.2	8.4	0.0	0.2	0.5	0.0	36.8	0.0	0.0	8.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	17.0	0.1	0.1	5.7	0.0	3.0	0.0	0.0	8.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.1	31.1	11.9	47.5	18.9	0.0	84.3	0.0	0.0	46.7	0.0	0.0
LnGrp LOS	D	C	B	D	B		F	A	A	D	A	A
Approach Vol, veh/h		1715			789	A		79			311	
Approach Delay, s/veh		32.2			19.1			84.3			46.7	
Approach LOS		C			B			F			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.8	53.2		26.5	8.5	57.5		10.5				
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5				
Max Green Setting (Gmax), s	13.5	41.5		33.0	4.0	51.0		6.0				
Max Q Clear Time (g_c+I1), s	8.2	18.7		20.4	2.3	47.1		7.2				
Green Ext Time (p_c), s	0.1	7.3		1.1	0.0	3.5		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			31.6									
HCM 6th LOS			C									

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	300	670	450	235	635	365	185	250	315	40	145	150
Future Volume (veh/h)	300	670	450	235	635	365	185	250	315	40	145	150
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772
Adj Flow Rate, veh/h	316	705	474	247	668	384	195	263	332	42	153	158
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2
Cap, veh/h	447	1461	1015	296	1306	750	761	402	343	203	214	181
Arrive On Green	0.13	0.43	0.43	0.18	0.79	0.76	0.23	0.23	0.23	0.12	0.12	0.12
Sat Flow, veh/h	1688	3367	1502	3222	3313	1502	3300	1772	1512	1688	1772	1502
Grp Volume(v), veh/h	316	705	474	247	668	384	195	263	332	42	153	158
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1611	1657	1502	1650	1772	1512	1688	1772	1502
Q Serve(g_s), s	14.2	19.5	19.4	9.6	9.3	13.3	6.3	17.5	28.3	2.9	10.8	13.4
Cycle Q Clear(g_c), s	14.2	19.5	19.4	9.6	9.3	13.3	6.3	17.5	28.3	2.9	10.8	13.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	447	1461	1015	296	1306	750	761	402	343	203	214	181
V/C Ratio(X)	0.71	0.48	0.47	0.83	0.51	0.51	0.26	0.65	0.97	0.21	0.72	0.87
Avail Cap(c_a), veh/h	614	1461	1015	397	1306	750	761	402	343	234	245	208
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.83	0.83	0.83	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.1	26.4	10.0	52.1	9.3	7.7	40.9	45.6	49.8	51.6	55.0	56.2
Incr Delay (d2), s/veh	1.8	1.1	1.5	8.0	1.2	2.1	0.1	3.3	39.8	0.4	7.4	27.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.3	7.6	11.8	3.8	2.5	3.5	2.6	8.0	14.3	1.3	5.3	6.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.9	27.5	11.5	60.1	10.5	9.7	41.0	48.9	89.6	51.9	62.4	83.7
LnGrp LOS	C	C	B	E	B	A	D	D	F	D	E	F
Approach Vol, veh/h		1495			1299			790			353	
Approach Delay, s/veh		21.0			19.7			64.1			70.7	
Approach LOS		C			B			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.9	60.4		19.7	21.1	55.2		34.0				
Change Period (Y+Rc), s	4.0	6.0		4.0	4.0	6.0		4.5				
Max Green Setting (Gmax), s	16.0	48.0		18.0	30.0	34.0		29.5				
Max Q Clear Time (g_c+I1), s	11.6	21.5		15.4	16.2	15.3		30.3				
Green Ext Time (p_c), s	0.3	15.5		0.2	0.9	15.8		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			33.7									
HCM 6th LOS			C									
Notes												

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	965	10	55	920	50	190	25	145	220	45	135
Future Volume (vph)	50	965	10	55	920	50	190	25	145	220	45	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0	3.0	4.0		4.0	4.0	
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.87		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1676	3313		1644	3358	1471	1693	1555		3317	1580	
Flt Permitted	0.24	1.00		0.21	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	422	3313		361	3358	1471	1693	1555		3317	1580	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	51	985	10	56	939	51	194	26	148	224	46	138
RTOR Reduction (vph)	0	0	0	0	0	22	0	126	0	0	98	0
Lane Group Flow (vph)	51	995	0	56	939	29	194	48	0	224	86	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						
Actuated Green, G (s)	77.3	72.6		76.1	72.0	72.0	19.2	19.2		16.7	16.7	
Effective Green, g (s)	78.3	74.0		76.1	73.4	73.4	20.2	19.2		16.7	16.7	
Actuated g/C Ratio	0.60	0.57		0.59	0.56	0.56	0.16	0.15		0.13	0.13	
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4	3.0	3.0		2.3	2.3	
Lane Grp Cap (vph)	304	1885		251	1895	830	263	229		426	202	
v/s Ratio Prot	0.01	c0.30		c0.01	0.28		c0.11	0.03		c0.07	0.05	
v/s Ratio Perm	0.09			0.12		0.02						
v/c Ratio	0.17	0.53		0.22	0.50	0.03	0.74	0.21		0.53	0.43	
Uniform Delay, d1	19.9	17.2		23.3	17.1	12.6	52.4	48.7		52.9	52.2	
Progression Factor	0.58	0.61		0.40	0.46	0.06	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.9		0.2	0.8	0.1	10.3	0.5		0.8	0.8	
Delay (s)	11.7	11.5		9.4	8.6	0.8	62.7	49.2		53.7	53.1	
Level of Service	B	B		A	A	A	E	D		D	D	
Approach Delay (s)		11.5			8.3			56.3			53.4	
Approach LOS		B			A			E			D	

Intersection Summary			
HCM 2000 Control Delay	22.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	130	1105	90	85	775	105	90	70	25	220	50	150
Future Volume (veh/h)	130	1105	90	85	775	105	90	70	25	220	50	150
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1758	1758	1758	1800	1800	1800
Adj Flow Rate, veh/h	131	1116	0	86	783	106	91	71	25	222	51	152
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	2	2	2	4	4	4	3	3	3	0	0	0
Cap, veh/h	634	2049		279	1248	543	163	111	39	409	49	145
Arrive On Green	0.57	1.00	0.00	0.05	0.37	0.37	0.10	0.09	0.09	0.12	0.12	0.12
Sat Flow, veh/h	1688	3331	1502	1661	3383	1472	1674	1237	436	3326	395	1179
Grp Volume(v), veh/h	131	1116	0	86	783	106	91	0	96	222	0	203
Grp Sat Flow(s),veh/h/ln	1688	1666	1502	1661	1692	1472	1674	0	1673	1663	0	1574
Q Serve(g_s), s	0.0	0.0	0.0	4.7	24.7	6.4	6.7	0.0	7.2	8.2	0.0	16.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	4.7	24.7	6.4	6.7	0.0	7.2	8.2	0.0	16.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.26	1.00		0.75
Lane Grp Cap(c), veh/h	634	2049		279	1248	543	163	0	150	409	0	194
V/C Ratio(X)	0.21	0.54		0.31	0.63	0.20	0.56	0.00	0.64	0.54	0.00	1.05
Avail Cap(c_a), veh/h	634	2049		300	1379	600	476	0	463	409	0	194
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.84	0.84	0.00	0.87	0.87	0.87	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.1	0.0	0.0	29.6	33.7	27.9	56.0	0.0	57.2	53.6	0.0	57.0
Incr Delay (d2), s/veh	0.1	0.9	0.0	0.3	2.1	0.7	1.8	0.0	2.8	1.1	0.0	77.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.3	0.0	1.9	10.3	2.3	3.0	0.0	3.2	3.5	0.0	10.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.2	0.9	0.0	30.0	35.8	28.6	57.8	0.0	59.9	54.6	0.0	134.8
LnGrp LOS	B	A		C	D	C	E	A	E	D	A	F
Approach Vol, veh/h		1247	A		975			187			425	
Approach Delay, s/veh		2.3			34.5			58.9			92.9	
Approach LOS		A			C			E			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.4	84.0		20.0	42.4	52.0		15.7				
Change Period (Y+Rc), s	4.0	* 5.4		4.0	* 5.4	* 5.4		4.0				
Max Green Setting (Gmax), s	8.0	* 53		16.0	* 9	* 52		36.0				
Max Q Clear Time (g_c+I1), s	6.7	2.0		18.0	2.0	26.7		9.2				
Green Ext Time (p_c), s	0.0	43.3		0.0	0.2	19.8		0.6				
Intersection Summary												
HCM 6th Ctrl Delay			30.7									
HCM 6th LOS			C									

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	75	1175	90	45	790	210	60	5	15	255	60	90
Future Volume (veh/h)	75	1175	90	45	790	210	60	5	15	255	60	90
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786
Adj Flow Rate, veh/h	77	1199	92	46	806	214	61	5	15	260	61	92
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1
Cap, veh/h	536	1282	570	425	1037	516	77	36	109	278	137	206
Arrive On Green	0.24	0.38	0.38	0.22	0.35	0.35	0.05	0.09	0.10	0.16	0.21	0.22
Sat Flow, veh/h	1688	3367	1498	1647	2941	1464	1701	384	1152	1701	641	967
Grp Volume(v), veh/h	77	1199	92	46	806	214	61	0	20	260	0	153
Grp Sat Flow(s),veh/h/ln	1688	1683	1498	1647	1470	1464	1701	0	1536	1701	0	1609
Q Serve(g_s), s	0.0	37.7	3.5	0.0	26.9	7.7	3.9	0.0	1.3	16.6	0.0	9.1
Cycle Q Clear(g_c), s	0.0	37.7	3.5	0.0	26.9	7.7	3.9	0.0	1.3	16.6	0.0	9.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.75	1.00		0.60
Lane Grp Cap(c), veh/h	536	1282	570	425	1037	516	77	0	146	278	0	342
V/C Ratio(X)	0.14	0.94	0.16	0.11	0.78	0.41	0.79	0.00	0.14	0.93	0.00	0.45
Avail Cap(c_a), veh/h	536	1285	572	425	1123	559	139	0	419	278	0	570
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.79	0.79	0.79	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.0	32.7	13.9	33.8	31.7	10.9	52.0	0.0	45.5	45.4	0.0	37.5
Incr Delay (d2), s/veh	0.1	11.5	0.5	0.1	5.7	2.4	10.3	0.0	0.3	36.4	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	16.6	1.6	1.0	10.3	2.8	1.9	0.0	0.5	9.8	0.0	3.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.0	44.2	14.3	33.9	37.5	13.3	62.3	0.0	45.8	81.9	0.0	38.1
LnGrp LOS	C	D	B	C	D	B	E	A	D	F	A	D
Approach Vol, veh/h		1368			1066			81			413	
Approach Delay, s/veh		41.3			32.5			58.2			65.6	
Approach LOS		D			C			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	37.7	45.9	9.0	27.4	30.8	42.8	22.0	14.4
Change Period (Y+Rc), s	4.0	4.8	4.0	4.5	4.0	4.0	4.0	4.5
Max Green Setting (Gmax), s	4.0	41.2	9.0	38.5	4.0	42.0	18.0	29.5
Max Q Clear Time (g_c+I1), s	2.0	39.7	5.9	11.1	2.0	28.9	18.6	3.3
Green Ext Time (p_c), s	0.0	1.4	0.0	0.6	0.0	9.9	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	42.0
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	280	705	15	395	50	0	0	35	5
Future Volume (veh/h)	0	0	0	280	705	15	395	50	0	0	35	5
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772
Adj Flow Rate, veh/h				295	742	16	416	53	0	0	37	5
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2
Cap, veh/h				357	956	21	734	870	0	0	750	101
Arrive On Green				0.39	0.39	0.39	0.82	0.82	0.00	0.00	0.49	0.49
Sat Flow, veh/h				910	2439	54	1398	1772	0	0	1527	206
Grp Volume(v), veh/h				546	0	507	416	53	0	0	0	42
Grp Sat Flow(s),veh/h/ln				1684	0	1719	1398	1772	0	0	0	1734
Q Serve(g_s), s				32.1	0.0	28.0	13.1	0.6	0.0	0.0	0.0	1.4
Cycle Q Clear(g_c), s				32.1	0.0	28.0	14.5	0.6	0.0	0.0	0.0	1.4
Prop In Lane				0.54		0.03	1.00		0.00	0.00		0.12
Lane Grp Cap(c), veh/h				660	0	674	734	870	0	0	0	851
V/C Ratio(X)				0.83	0.00	0.75	0.57	0.06	0.00	0.00	0.00	0.05
Avail Cap(c_a), veh/h				735	0	750	734	870	0	0	0	851
HCM Platoon Ratio				1.00	1.00	1.00	1.67	1.67	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.86	0.86	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				30.1	0.0	28.8	6.6	5.1	0.0	0.0	0.0	14.6
Incr Delay (d2), s/veh				11.4	0.0	7.6	2.7	0.1	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				14.9	0.0	12.9	2.7	0.3	0.0	0.0	0.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				41.5	0.0	36.4	9.4	5.2	0.0	0.0	0.0	14.6
LnGrp LOS				D	A	D	A	A	A	A	A	B
Approach Vol, veh/h					1053			469			42	
Approach Delay, s/veh					39.0			8.9			14.6	
Approach LOS					D			A			B	
Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				58.0		47.1		58.0				
Change Period (Y+Rc), s				4.0		4.0		4.0				
Max Green Setting (Gmax), s				54.0		48.0		54.0				
Max Q Clear Time (g_c+I1), s				3.4		34.1		16.5				
Green Ext Time (p_c), s				0.1		9.0		2.2				

Intersection Summary			
HCM 6th Ctrl Delay			29.3
HCM 6th LOS			C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	850	520	0	0	0	0	360	270	15	300	0
Future Volume (veh/h)	85	850	520	0	0	0	0	360	270	15	300	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772				0	1772	1772	1730	1730	0
Adj Flow Rate, veh/h	89	895	0				0	379	284	16	316	0
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2				0	2	2	5	5	0
Cap, veh/h	153	1613					0	644	539	23	716	0
Arrive On Green	0.51	0.51	0.00				0.00	0.36	0.36	0.00	0.14	0.00
Sat Flow, veh/h	297	3143	1502				0	1772	1482	1647	1730	0
Grp Volume(v), veh/h	526	458	0				0	379	284	16	316	0
Grp Sat Flow(s),veh/h/ln	1757	1683	1502				0	1772	1482	1647	1730	0
Q Serve(g_s), s	22.9	20.0	0.0				0.0	19.0	16.6	1.1	18.5	0.0
Cycle Q Clear(g_c), s	22.9	20.0	0.0				0.0	19.0	16.6	1.1	18.5	0.0
Prop In Lane	0.17		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	902	864					0	644	539	23	716	0
V/C Ratio(X)	0.58	0.53					0.00	0.59	0.53	0.69	0.44	0.00
Avail Cap(c_a), veh/h	902	864					0	644	539	60	755	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.6	17.9	0.0				0.0	28.3	27.6	54.5	35.8	0.0
Incr Delay (d2), s/veh	2.8	2.3	0.0				0.0	3.9	3.7	20.0	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.8	8.2	0.0				0.0	8.4	6.2	0.6	8.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.3	20.2	0.0				0.0	32.2	31.2	74.5	36.1	0.0
LnGrp LOS	C	C					A	C	C	E	D	A
Approach Vol, veh/h		984	A					663			332	
Approach Delay, s/veh		20.8						31.8			37.9	
Approach LOS		C						C			D	

Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		60.5		49.5			5.5	44.0				
Change Period (Y+Rc), s		4.0		4.0			4.0	4.8				
Max Green Setting (Gmax), s		54.0		48.0			4.0	39.2				
Max Q Clear Time (g_c+I1), s		24.9		20.5			3.1	21.0				
Green Ext Time (p_c), s		13.6		0.9			0.0	2.0				

Intersection Summary		
HCM 6th Ctrl Delay		27.4
HCM 6th LOS		C

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	190	850	150	10	750	20	100	25	10	50	20	150
Future Volume (veh/h)	190	850	150	10	750	20	100	25	10	50	20	150
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758
Adj Flow Rate, veh/h	200	895	158	11	789	21	105	26	11	53	21	158
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	7	7	7	0	0	0	3	3	3
Cap, veh/h	599	2196	979	24	1025	457	203	263	111	341	39	293
Arrive On Green	0.35	0.65	0.65	0.01	0.32	0.32	0.21	0.22	0.21	0.21	0.22	0.21
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	1259	1201	508	1399	178	1339
Grp Volume(v), veh/h	200	895	158	11	789	21	105	0	37	53	0	179
Grp Sat Flow(s),veh/h/ln	1688	1683	1500	1621	1617	1442	1259	0	1709	1399	0	1517
Q Serve(g_s), s	9.5	13.8	4.5	0.7	24.3	1.1	8.9	0.0	1.9	3.5	0.0	11.6
Cycle Q Clear(g_c), s	9.5	13.8	4.5	0.7	24.3	1.1	20.5	0.0	1.9	5.4	0.0	11.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.30	1.00		0.88
Lane Grp Cap(c), veh/h	599	2196	979	24	1025	457	203	0	374	341	0	332
V/C Ratio(X)	0.33	0.41	0.16	0.45	0.77	0.05	0.52	0.00	0.10	0.16	0.00	0.54
Avail Cap(c_a), veh/h	599	2196	979	74	1323	590	236	0	419	378	0	372
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	26.0	9.1	7.4	53.7	33.9	26.0	47.6	0.0	34.5	36.8	0.0	38.6
Incr Delay (d2), s/veh	0.2	0.6	0.4	7.9	5.6	0.2	1.5	0.0	0.1	0.2	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	5.0	1.5	0.3	10.0	0.4	2.9	0.0	0.8	1.2	0.0	4.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.2	9.6	7.8	61.7	39.5	26.2	49.1	0.0	34.5	37.0	0.0	39.7
LnGrp LOS	C	A	A	E	D	C	D	A	C	D	A	D
Approach Vol, veh/h		1253			821			142			232	
Approach Delay, s/veh		12.0			39.5			45.3			39.0	
Approach LOS		B			D			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.6	76.3		28.1	43.0	38.9		28.1
Change Period (Y+Rc), s	4.5	* 4.5		5.5	4.5	4.0		5.5
Max Green Setting (Gmax), s	4.5	* 66		25.5	25.5	45.0		25.5
Max Q Clear Time (g_c+I1), s	2.7	15.8		13.6	11.5	26.3		22.5
Green Ext Time (p_c), s	0.0	19.2		0.6	0.4	8.6		0.1

Intersection Summary	
HCM 6th Ctrl Delay	25.7
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	740	150	35	800	25	40
Future Vol, veh/h	740	150	35	800	25	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	300	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	6	6	0	0
Mvmt Flow	779	158	37	842	26	42

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	937	0	1274	390
Stage 1	-	-	-	-	779	-
Stage 2	-	-	-	-	495	-
Critical Hdwy	-	-	4.22	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.26	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	703	-	162	614
Stage 1	-	-	-	-	418	-
Stage 2	-	-	-	-	584	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	703	-	153	614
Mov Cap-2 Maneuver	-	-	-	-	153	-
Stage 1	-	-	-	-	418	-
Stage 2	-	-	-	-	553	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	19.8
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	153	614	-	-	703	-
HCM Lane V/C Ratio	0.172	0.069	-	-	0.052	-
HCM Control Delay (s)	33.4	11.3	-	-	10.4	-
HCM Lane LOS	D	B	-	-	B	-
HCM 95th %tile Q(veh)	0.6	0.2	-	-	0.2	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	145	630	5	100	745	5	5	5	5	25	0	110
Future Volume (veh/h)	145	630	5	100	745	5	5	5	5	25	0	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1758	1758	1772	1772	1716	1716	1772	1772	1772	1800	1723	1800
Adj Flow Rate, veh/h	153	663	5	106	784	5	5	5	5	26	0	116
Peak Hour Factor	0.95	0.95	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	2	2	6	6	2	2	2	0	2	0
Cap, veh/h	678	1754	789	704	1662	11	235	3	3	207	0	7
Arrive On Green	0.11	0.53	0.53	0.09	0.50	0.36	0.00	0.00	0.00	0.00	0.00	0.00
Sat Flow, veh/h	1674	3340	1502	1688	3321	21	581	581	581	313	0	1395
Grp Volume(v), veh/h	153	663	5	106	385	404	15	0	0	142	0	0
Grp Sat Flow(s),veh/h/ln	1674	1670	1502	1688	1630	1712	1743	0	0	1707	0	0
Q Serve(g_s), s	1.1	2.4	0.0	0.8	3.2	3.2	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	1.1	2.4	0.0	0.8	3.2	3.2	0.1	0.0	0.0	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.01	0.33		0.33	0.18		0.82
Lane Grp Cap(c), veh/h	678	1754	789	704	816	857	240	0	0	214	0	0
V/C Ratio(X)	0.23	0.38	0.01	0.15	0.47	0.47	0.06	0.00	0.00	0.66	0.00	0.00
Avail Cap(c_a), veh/h	2187	10812	4861	1697	4725	4963	2496	0	0	2385	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	3.5	2.9	2.3	3.5	3.4	3.4	10.4	0.0	0.0	10.4	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.1	0.0	0.1	0.3	0.3	0.1	0.0	0.0	2.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	3.7	3.0	2.3	3.6	3.7	3.7	10.5	0.0	0.0	13.0	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	B	A	A	B	A	A
Approach Vol, veh/h		821			895			15			142	
Approach Delay, s/veh		3.1			3.7			10.5			13.0	
Approach LOS		A			A			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.3	14.4		0.0	5.8	14.9		0.0				
Change Period (Y+Rc), s	4.0	7.0		4.0	4.0	7.0		4.0				
Max Green Setting (Gmax), s	21.0	57.0		27.0	14.0	64.0		27.0				
Max Q Clear Time (g_c+I1), s	3.1	5.2		0.0	2.8	4.4		0.0				
Green Ext Time (p_c), s	0.3	2.2		0.0	0.2	2.2		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			4.2									
HCM 6th LOS			A									

Intersection	
Int Delay, s/veh	1.4

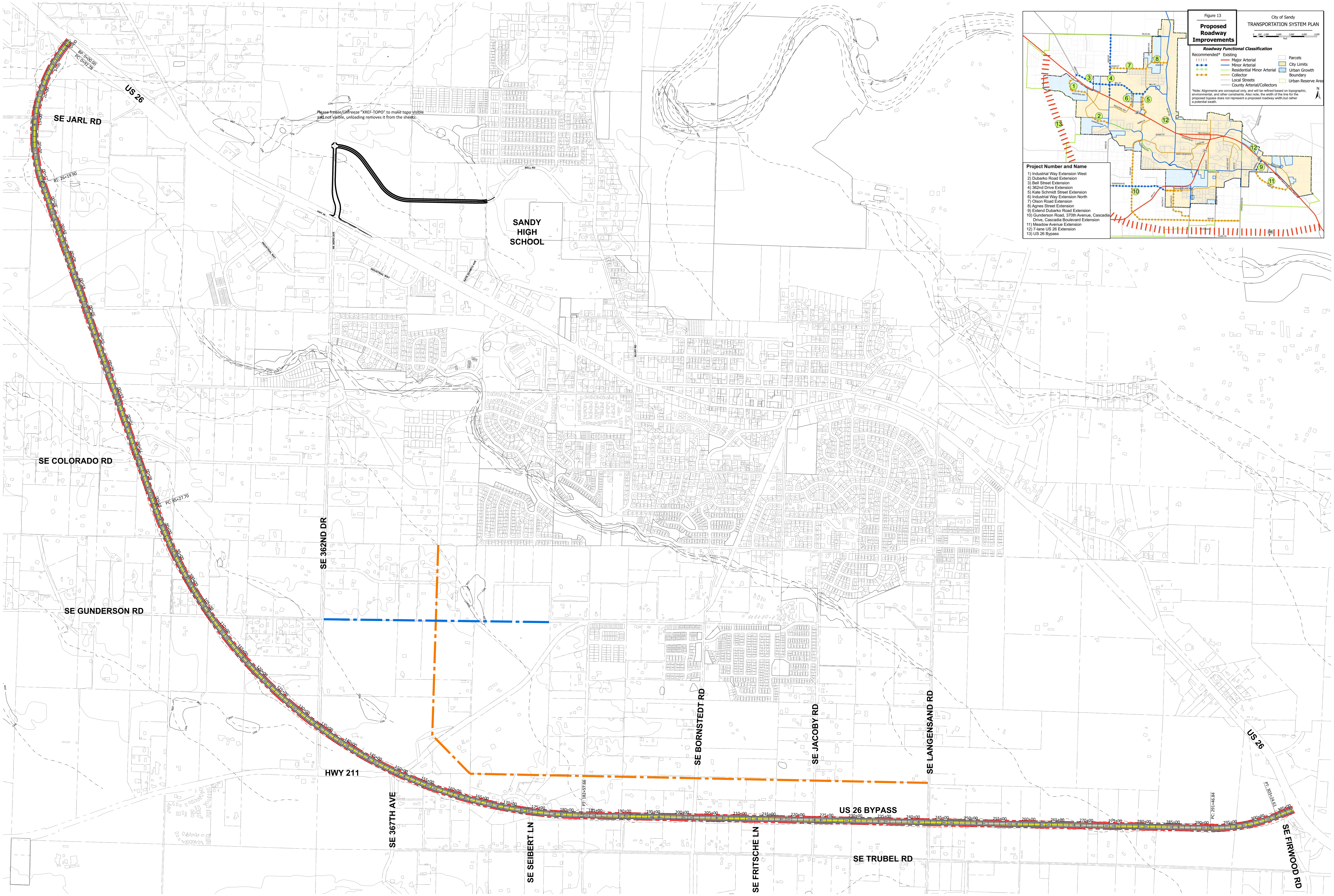
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	650	5	100	840	50	5	5	5	10	0	0
Future Vol, veh/h	5	650	5	100	840	50	5	5	5	10	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	100	150	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	684	5	105	884	53	5	5	5	11	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	937	0	0	689	0	0	1346	1841	342	1476	-	-
Stage 1	-	-	-	-	-	-	694	694	-	1121	-	-
Stage 2	-	-	-	-	-	-	652	1147	-	355	-	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	-	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	-	-
Pot Cap-1 Maneuver	727	-	-	901	-	-	110	74	654	88	0	0
Stage 1	-	-	-	-	-	-	399	442	-	220	0	0
Stage 2	-	-	-	-	-	-	423	272	-	635	0	0
Platoon blocked, %		-	-		-	-						-
Mov Cap-1 Maneuver	727	-	-	901	-	-	100	65	654	74	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	100	65	-	74	-	-
Stage 1	-	-	-	-	-	-	396	439	-	218	-	-
Stage 2	-	-	-	-	-	-	374	240	-	618	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1	42.7	61.6
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	111	727	-	-	901	-	-	74
HCM Lane V/C Ratio	0.142	0.007	-	-	0.117	-	-	0.142
HCM Control Delay (s)	42.7	10	-	-	9.5	-	-	61.6
HCM Lane LOS	E	A	-	-	A	-	-	F
HCM 95th %tile Q(veh)	0.5	0	-	-	0.4	-	-	0.5

SECTION 2. BYPASS PRELIMINARY DESIGN



Notes:

The ODOT Standard Freeway Section was used to determine property impacts, limits of grading and proposed ROW for this US 26 Bypass route.

The ODOT Standard Urban Freeway Section was used as an alternate for analysis but not shown on this map.

Recommended major arterial (from TSP, figure 13)

Recommended collector (from TSP, figure 13)

Recommended minor arterial (from TSP, figure 13)

US 26 Bypass - Alignment
Preliminary - Subject to Change
4/7/2021
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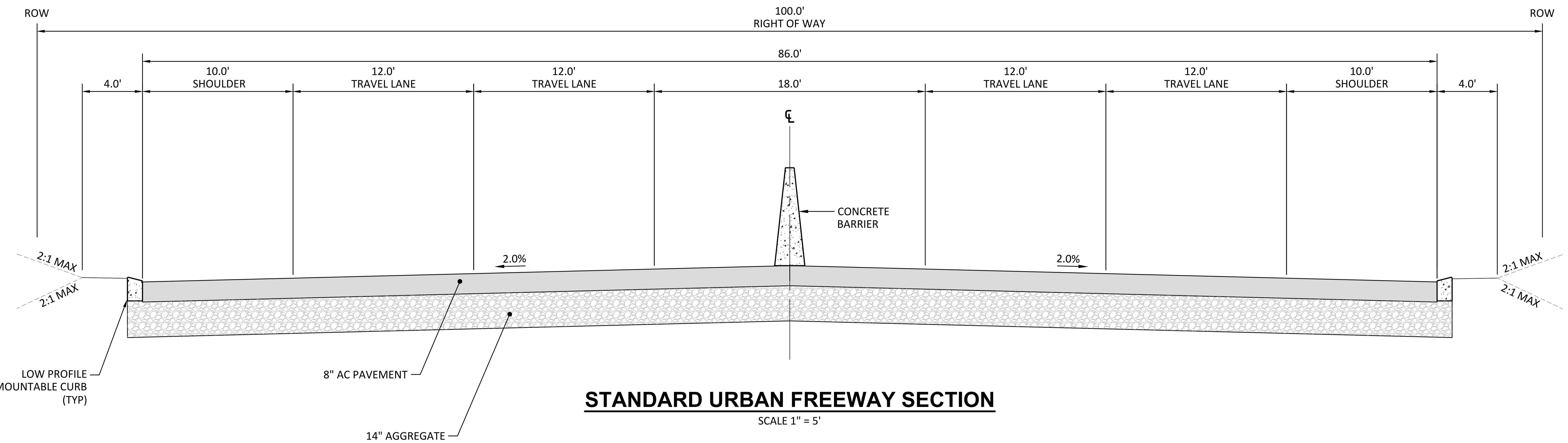
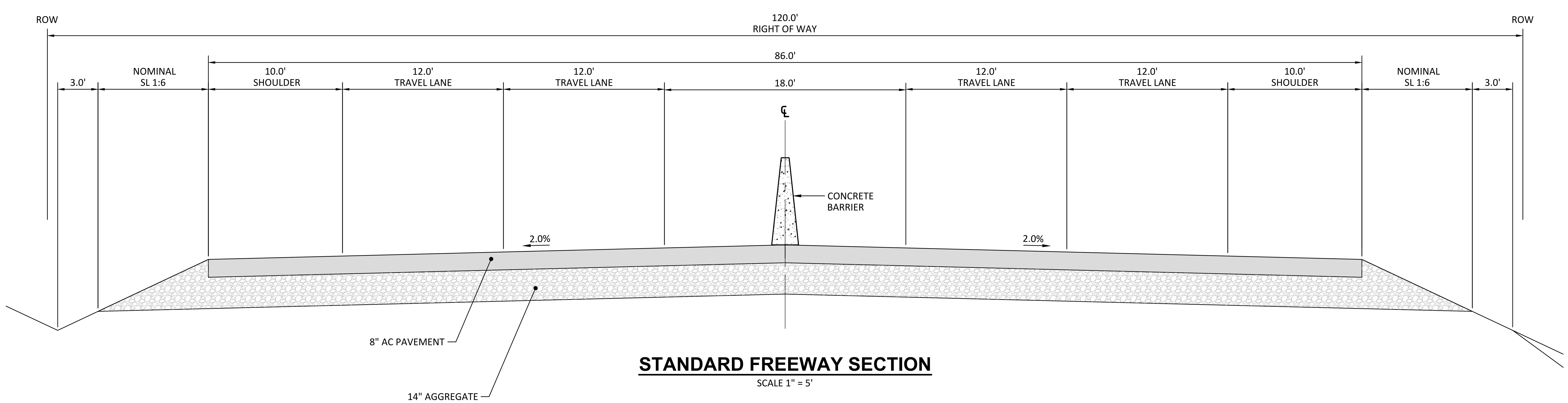
1 of 1



STANDARD URBAN FREEWAY SECTION

SCALE 1" = 5'



STANDARD FREEWAY SECTION

SCALE 1" = 5'

LEGEND

Proposed ROW

Proposed CL

Proposed limit of grading

Drainageway crossing with proposed
3 sided bridge or open bottom box culvert

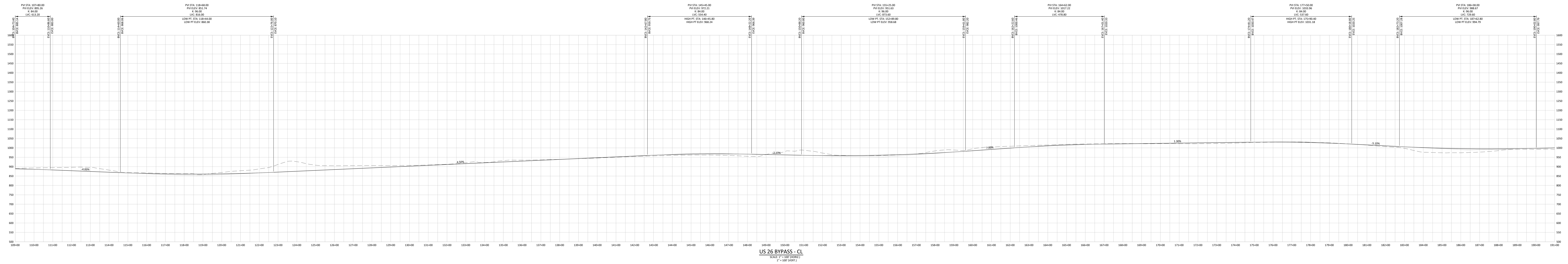
Notes:

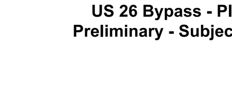
The ODOT Standard Freeway Section was used to determine property impacts, limits of grading and proposed ROW for this US 26 Bypass route.

The ODOT Standard Urban Freeway Section was used as an alternate for analysis but not shown on this map.

0 50 100 200
SCALE: 1" = 100'

US 26 Bypass - Plan & Profile
Preliminary - Subject to Change
5/4/2021
DKS-44
1 of 3





US 26 Bypass - Plan & Profile
Preliminary - Subject to Change
5/4/2021
DKS-44

US 26 Bypass - Plan & Profile
Preliminary - Subject to Change
5/4/2021
DKS-44
3 of 3

0 50 100 200

SCALE: 1" = 100'

US 26 Bypass - Freeway Section
Preliminary - Subject to Change
4/7/2021
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1 of 3

US 26 Bypass - Freeway Section
Preliminary - Subject to Change
4/7/2021
DKS-44

0 50 100 200
SCALE: 1" = 100'

US 26 Bypass - Freeway Section
Preliminary - Subject to Change
4/7/2021
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US 26 Bypass - Urban Freeway Section
Preliminary - Subject to Change
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US 26 Bypass - Urban Freeway Section
Preliminary - Subject to Change
4/7/2021
DKS-44
2 of 3

US 26 Bypass - Urban Freeway Section
Preliminary - Subject to Change
4/7/2021
DKS-44

TM 8: PLANNED AND FINANCIALLY CONSTRAINED SYSTEM

DATE: December 20, 2022

TO: Project Management Team

FROM: Reah Flisakowski, Dock Rosenthal | DKS

SUBJECT: Sandy TSP Update

Technical Memorandum #8: Planned and Financially Constrained System — Project #20020-001

This technical memorandum summarizes the financially constrained projects and their expected funding sources. Financially constrained projects are defined as projects that are anticipated to be funded and constructed within the planning horizon year (2042). The funding forecast for the next 20 years is $10.2 million. The financially constrained projects were selected from the larger list of future needs included in Technical Memorandum #7: TSP Solutions (December 2022). Twenty-four projects are included in the financially constrained list with three projects already under construction (D3, D14A, and D15A), one project funded (C23), and one project partially funded (D24). A map of the financially constrained projects is shown in Figure 1.

Projects that are not selected for the financially constrained list were included in the “Aspirational” list, which contains the remaining projects (included in the Appendix). An aspirational project may still be funded within the planning horizon year through grants, development fees, or other sources that provide additional revenue beyond the transportation funding forecast.

FINANCIALLY CONTRAINED SYSTEM

The list below describes each of the financially constrained projects, separated by project type. The project description includes TSP project number, location, planning level cost estimate, and potential funding source.

PEDESTRIAN IMPROVEMENTS (2 PROJECT)

- **P1** *362nd Drive:* This project constructs sidewalk to fill in existing gaps along the west side of 362nd Drive from Chinook Street to Industrial Way. By filling in sidewalk gaps along 362nd Drive this project improves the low-stress pedestrian network and access to the shopping center at 362nd Drive and US 26.
    - The $1,000,000 cost is expected to be primarily funded by developers as undeveloped parcels adjacent to 362nd Drive are developed, any remaining funds would come from System Development Charges (SDC).
- **P3** *Bluff Road:* This project constructs sidewalk to fill in existing gaps along the west side of Bluff Road from Bell Street to the parcel at 15931 SE Bluff Road. This project improves the low-

stress pedestrian network in the vicinity of Sandy High School, Jonsrud Viewpoint, and the residential area to the west of Bluff Road.

- The $875,000 cost is expected to be primarily funded through the road fund and System Development Charges (SDC).

CROSSING IMPROVEMENTS (12 PROJECTS)

- **C5** *CRMS - Bluff Road at Marcy Street*: This project improves the intersection crossing by constructing a Rectangular Rapid Flashing Beacon (RRFB) with School Crossing Assembly, and high visibility crosswalks across the north and east sides of the intersection.
  - The $125,000 cost is expected to be primarily funded through the road fund and urban renewal funds. Additional funding is expected to be available through a Safe Routes to School grant.
- **C6** *CRMS - Bluff Road at Hood Street:* This project improves the intersection by modernizing the crossing, particularly with curb extensions.
  - The $125,000 cost is expected to be primarily funded through the road fund and urban renewal funds. Additional funding is expected to be available through a Safe Routes to School grant.
- **C7** *CRMS - Bluff Road at US 26:* This project improves the intersection modernizing the crossing by reducing the curb radius at all corners, adding pedestrian-scale lighting and improvement of the bicycle network by providing buffered bike lanes along Highway 26 or construction of a fully grade-separated bicycle facility. Pending coordination with ODOT, the pedestrian signal crossing time may be increased, based on a slower walking speed.
  - The $125,000 cost, which does not assume a fully separated bike facility, is expected to be primarily funded by ODOT with additional funding expected from a Safe Routes to School grant and local funding from the road fund and urban renewal fund.
- **C8** *CRMS - Hood Street at Beers Avenue:* This project improves the intersection by repainting stop bars on Beers Avenue and improving the intersection control by installing stop signs for the Hood Street approaches, creating a 4-way stop intersection.
  - The $25,000 cost is expected to be primarily funded through the road fund and urban renewal funds. Additional funding is expected to be available through a Safe Routes to School grant.
- **C9** *CRMS - Hood Street at Scales Avenue:* This project improves the intersection by installing perpendicular curb ramps with tactile domes at the intersection of Hood St and Scales Ave and repainting stop bars.
  - The $25,000 cost is expected to be primarily funded through the road fund and urban renewal funds. Additional funding is expected to be available through a Safe Routes to School grant.
- **C10** *CRMS -Hood Street at Bruns Avenue:* This project improves the intersection by installing a tactile dome at the southwest corner of Bruns Ave and Hood St.
  - The $25,000 cost is expected to be primarily funded through the road fund and urban renewal funds. Additional funding is expected to be available through a Safe Routes to School grant.
- **C11** *SGS – Hood Street at Strauss Avenue:* This project improves the intersection by:
  - Relocating the southbound school advance crossing sign and school speed limit sign north of intersection.

- Repairing sidewalk along the east side of Strauss Avenue and mitigating the narrowing caused by a utility pole.
- Installing a curb ramp at the southeast corner of the intersection and adding tactile domes and a stop bar on the west leg of the intersection.
- The $350,000 cost is expected to be primarily funded through the road fund and urban renewal funds. Additional funding is expected to be available through a Safe Routes to School grant.

- **C12** *SGS – Pleasant Street at Strauss Avenue:* This project improves the intersection by marking stop bars in advance of crosswalks and potentially revising the control of the intersection to be all-way stop control.
  - The $25,000 cost is expected to be primarily funded through the road fund and urban renewal funds. Additional funding is expected to be available through a Safe Routes to School grant.
- **C13** *SGS – Pleasant Street at Alt Avenue:* This project improves the intersection by marking stop bars in advance of crosswalks, replace existing diagonal curb ramps with perpendicular curb ramps and tactile domes, and constructing a raised intersection.
  - The $350,000 cost is expected to be primarily funded through the road fund and urban renewal funds. Additional funding is expected to be available through a Safe Routes to School grant.
- **C14** *SGS – Smith Avenue at Pleasant Street:* This project improves the intersection by marking stop bars in advance of crosswalks, relocating the southbound school advance crossing sign and school speed limit sign north of the intersection.
  - The $25,000 cost is expected to be primarily funded through the road fund and urban renewal funds. Additional funding is expected to be available through a Safe Routes to School grant.
- **C15** *SGS – Alt Avenue at Proctor Boulevard (US 26):* This project improves the intersection by increasing the pedestrian crossing time based on a walking rate of 3.0 feet per second, upgrading the pedestrian pushbuttons to meet current standards with audible indications, and consolidating the two existing crosswalks with one high visibility continental crosswalk on the east side of the intersection including an advance stop bar, bulb outs, curb ramps, and pedestrian scale lighting.
  - The $125,000 cost is expected to be primarily funded through an ODOT grant. Additional funding is expected from the road fund, urban renewal fund, and potential grant funding.
- **C23** *Highway 211 Pedestrian Improvements:* These American with Disabilities Act related ramp improvements along Highway 211 are currently funded by $500,000 received from ODOT as part of the jurisdictional transfer of Highway 211 from ODOT to the City of Sandy.

SAFETY IMPROVEMENTS (3 PROJECTS)

- **S1** *US 26 Adaptive Signal System:* This project extends the adaptive signal system from Orient Drive to Ruben Lane. An adaptive signal system improves performance and monitoring of traffic signals by providing real-time adjustments and improved data collection.
  - The $200,000 cost is expected to be funded by ODOT.
- **S2** *US 26 at Ten Eyck Road Study:* This project studies improvements or mitigations related to traffic impacts from access for business adjacent to the Ten Eyck Road and US 26 intersection.
  - The $50,000 cost is expected to be funded by ODOT and the road fund.

- **S3** *US 26 Speed Zone Study:* This project studies speeds east of Ten Eyck Road/Wolf Drive along US 26 for consideration of a potential reduction. It should be coordinated with C17 (Dubarko pedestrian crossing improvements) and D20 (Dubarko Road extension) to consider if an intersection control modification is necessary.
    - The $75,000 cost is expected to be primarily funded by ODOT.

DRIVING IMPROVEMENTS (10 PROJECTS)

- **D3** *US 26 & 362nd Drive Intersection Improvement:* This project is expected to reduce congestion for the westbound left turn and accommodate the 362nd Drive Extension 1 (D15a). The project includes minor widening on the south leg to accommodate a northbound through lane, construction of a three-lane southbound approach with a right turn lane, through lane, and left turn lane, and an eastbound left turn lane.
    - This project is currently funded with local funds without an additional westbound left turning movement. The additional westbound left turn lane is dependent on the 362nd Drive and Industrial Way improvements (D1) that would extend the second southbound lane from the Fred Meyer driveway to the Industrial Way intersection. The second westbound left turn lane should be coordinated with project D1.
- **D6** *Highway 211 & Proctor Boulevard Northbound Approach Modification:* This project restripes the northbound approach to clearly indicate the set back stop bar and associated keep clear distance.
    - The $15,000 cost is expected to be funded through the road fund.
- **D9** *Highway 211 & Dubarko Road Multimodal Intersection Improvement:* This project improves safety and multimodal connectivity and should be coordinated with the recommendations in project D27 Highway 211 & Dubarko Road Intersection Control Evaluation and C23 ADA improvements along Highway 211.
    - The $270,000 cost is expected to be funded through the road fund and system development charges.
- **D14a** *Bell Street extension to 362nd Drive extension:* This project extends Bell Street to 362nd Drive extension (D15a) at Minor Arterial cross section standards. It improves connectivity by providing a parallel route to US 26 from 362nd Drive to Bluff Road.
    - This project is currently funded with local funds.
- **D15a** *362nd Drive extension to Bell Street extension:* This project extends 362nd Drive to Bell Street extension (D14a) at Minor Arterial cross section standards. It improves connectivity by providing a parallel route to US 26 from 362nd Drive to Bluff Road.
    - This project is currently funded with local funds.
- **D20** *Dubarko Road to US 26 opposite Vista Loop Drive (West)* This project extends Dubarko Road to US 26/Vista Loop Road (west) at Minor Arterial cross section standards. It should be coordinated with D9 (US 26 Dubarko Road intersection improvement) and C17 (US 26 Dubarko Road pedestrian crossing improvement).
    - This project is expected to be constructed by development, with partial SDC credits, with an expected cost of $3,900,000.
- **D21F** *Village Blvd Extension 1:* This project connects Village Boulevard between Cascadia Village Drive and Juniper Street at Collector standards providing additional north-south connectivity for the neighborhood south of Highway 211.
    - The $875,000 cost is expected to be funded by the city through system development charges and partially by development.

- **D24** *Highway 211 roundabout at Gunderson:* This project improves the intersection of Highway 211 at Gunderson Road by constructing a roundabout.
    - The $1,000,000 cost is partially funded by development with the remaining amount provided by the road fund and system development charges.
- **D27** *Highway 211 & Dubarko Road Intersection Control Evaluation:* This project studies the intersection control options for Highway 211 and Dubarko road given the strain of high traffic volumes and difficult topography. The resulting solutions should improve safety and capacity.
    - The $50,000 cost is expected to be funded through the road fund and system development charges.
- **D31** *US 26 Sandy Bypass Planning:* This project includes preparation of planning documents to evaluate alternatives and the environmental impact of a potential US 26 bypass. This project consists of planning work only, not directly resulting in any capital improvement, and is not included in the map.
    - The $1,000,000 is expected to be funded by the city.

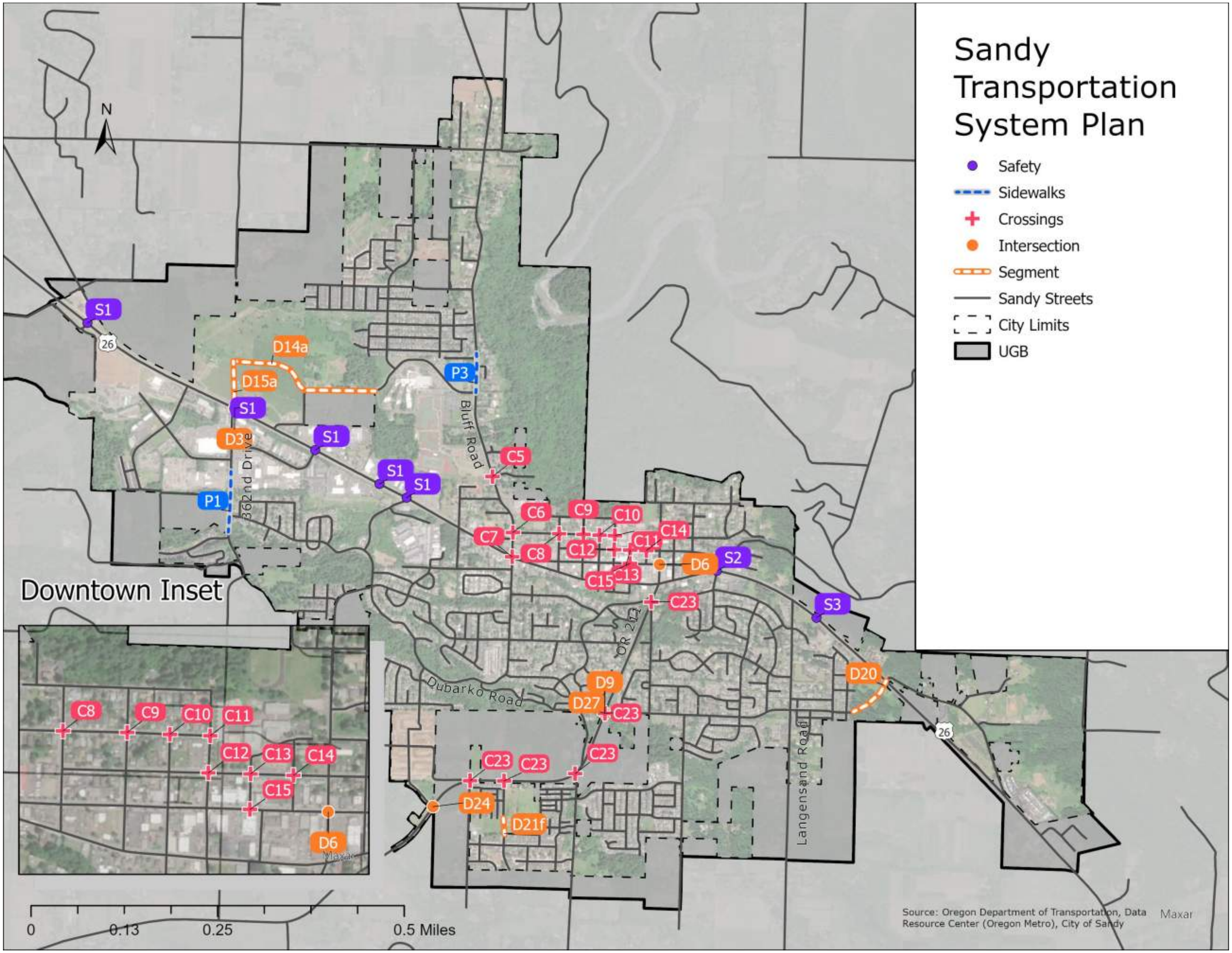

FIGURE 1: FINANCAILLY CONSTRAINED SYSTEM

SUMMARY

- 2 pedestrian projects at a cost of $1.9 million are expected to funded through a variety of sources including construction by development, the road fund, and system development charges (SDC).
- 11 crossing improvements at a cost of $1.3 million are expected to be primarily covered by the road fund and urban renewal funds with additional funding from a one-time Safe Routes to School grant administered by ODOT. Project C23 Highway 211 ADA improvements is already funded.
- 3 safety improvements at a cost of $325,000 are expected to be primarily covered by ODOT grants.
- 7 driving improvements at a cost of $7.3 million are expected to be covered by the local road fund and system development charges along with developer contributions.
- The total cost of the unfunded improvements is approximately $10.8 million.

APPENDIX

CONTENTS

SECTION 1. ASPIRATIONAL PROJECTS

Pedestrian System

ID	PROJECT	SEGMENT	DESCRIPTION	COST	PRIORITY
P2	Bluff Rd.	Green Mountain St. to Northern UGB	Infill sidewalk gaps	$900,000	Medium
P4	Bluff Rd	Strawbridge Pkwy to Nettie Connett Dr.	Infill sidewalk gaps	$650,000	Medium
P5	Bornstedt Rd.	Cascadia Village Dr to UGB	Infill sidewalk gaps	$1,750,000	Medium
P6	Dubarko Rd.	300 feet east of Melissa Ave. to 200 feet east OR 211	Infill sidewalk gaps	$3,950,000	Medium
P7	Dubarko Rd.	Langensand Rd. to Antler Ave.	Infill sidewalk gaps	$50,000	High
P8	Industrial Way	362nd Dr. to US 26	Infill sidewalk gaps	$2,200,000	Medium
P9	Jewelberry Rd.	Penny Ave. to Kelso Rd.	Infill sidewalk gaps	$250,000	Medium
P10	Jacoby Rd.	Dubarko Rd. to southern UGB	Infill sidewalk gaps/construct sidewalk	Included in B14	Medium
P11	Langensand Rd	Dubarko Rd. to US 26	Infill sidewalk gaps	$100,000	High
P12	Langensand Rd.	630 feet south of Dubarko Rd. to UGB	Infill sidewalk gaps	$1,150,000	Medium
P13	Meinig Avenue	Scenic St. to US 26	Infill sidewalk gaps	$150,000	Medium
P14	Pleasant St	Beers Ave. to Revenue Ave.	Infill sidewalk gaps	$250,000	High
P15	Ruben Ln	US 26 to Dubarko Rd.	Infill sidewalk gaps	$75,000	Medium
P16	Sandy Heights St	Bluff Rd. to Tupper Rd.	Infill sidewalk gaps	$225,000	High
P17	Downtown Core Pedestrian Improvements	Sidewalk infill side streets perpendicular to US 26	Infill sidewalk gaps	$350,000	High
P18	University Ave	Sunset St. to US 26	Construct sidewalk	$150,000	Medium
P19	US 26	Royal Ln to 362nd Dr.	Infill sidewalk gaps	$550,000	Medium
P20	US 26	362nd Dr. to West UGB	Infill sidewalk gaps	$1,200,000	Medium
P22	US 26A	Ten Eyck Rd. to East UGB	Infill sidewalk gaps	Included in B12	High

ID	PROJECT	SEGMENT	DESCRIPTION	COST	PRIORITY
P23	OR 211	South UGB to US 26 – coordinate with D25	Construct sidewalk	Included in D25	Medium
P24	Sandy Heights St.	Nettie Connett Drive to Balken Ave	Construct sidewalk on northside	$125,000	Medium
P25	Vista Loop	Full extent	Construct sidewalk	Included in B15	Medium
P26	362nd Drive	East sidewalk infill from Chinook Street to Industrial Way	Infill sidewalk gaps	$625,000	Medium
P27	Bluff Road	East sidewalk infill mirroring west improvement	Infill sidewalk gaps, includes landscape buffer	$2,225,000	Medium

Crossing Improvements

ID	PROJECT	DESCRIPTION	COST	PRIORITY
C1	Sandy Shopper Crossing - Evans	Evans Street Senior Apartments, traffic calming, and other crossing improvements are needed. Project may include pedestrian crossing advisory signage, curb extensions, and marked crosswalks.	$25,000	High
C2	OR 211 Dubarko Crossing	Project may include pedestrian crossing advisory signage, curb extensions, marked crosswalks, and installation of RRFB. Coordinate with D9 and D20.	$125,000	High
C3	Sandy Transit Center - Pioneer	Project may include pedestrian crossing advisory signage, curb extensions, and marked crosswalks.	$125,000	Medium
C4	Sandy Transit Center - Proctor	Project may include pedestrian crossing advisory signage, curb extensions, and marked crosswalks.	$125,000	Medium
C6	CRMS - Bluff Road at Hood	Install a curb extension including perpendicular curb ramps and tactile domes at northeast corner of Hood St. Install a curb extension to provide clearance from existing pole, including perpendicular curb ramps and tactile domes, at southeast corner. Mark crosswalk and stop bar across the east leg of intersection.	$125,000	High
C16	Bluff/Sandy Heights	Install marked crosswalks on all four legs with tactile domes on the ramps.	$25,000	Medium
C17	Dubarko/US26	Install marked crosswalks on all four legs with tactile domes on the ramps, coordinate with D20, this project is not needed until the Dubarko Extension is complete.	$25,000	Medium
C18	Scales/Proctor	Install marked crosswalks on all four legs with tactile domes on the ramps.	$25,000	High

ID	PROJECT	DESCRIPTION	COST	PRIORITY
C19	Scales/Pioneer	Install marked crosswalks on all four legs with tactile domes on the ramps.	$25,000	High
C20	Bruns/Proctor	Install marked crosswalks on all four legs with tactile domes on the ramps.	$25,000	High
C21	Bruns/Pioneer	Install marked crosswalks on all four legs with tactile domes on the ramps.	$25,000	High
C22	OR 211	Pedestrian Overcrossing for Sandy Heights Street.	$6,000,000	Medium
C24	Green Mountain and Bluff Pedestrian Crossing	Construct curb extensions and mark crossing to Jonsrud Viewpoint	$75,000	High

Note: CRMS – Cedar Ridge Middle School and SGS – Sandy Grade School

Bicycle System Improvements

ID	PROJECT	SEGMENT	DESCRIPTION	COST	PRIORITY
B1	362nd Dr.	Dubarko Rd. to UGB	Widen shoulder to 6 feet minimum for bike access	$1,500,000	High
B2	Bluff Rd.*	US 26 to Miller Rd.	Re-stripe roadway to provide bike lanes	$50,000	High
B3	Bornstedt Rd	OR 211 to UGB	Widen roadway to provide bike lanes	$2,550,000	High
B4	Dubarko Rd.*	362nd Dr. to Eldridge Dr.	Re-stripe roadway to provide bike lanes	$50,000	High
B5	Dubarko Rd.*	Sandy Heights St. to Melissa Ave.	Re-stripe roadway to provide bike lanes	$50,000	High
B6	Langensand Rd.*	US 26 to UGB	Re-stripe roadway to provide bike lanes	$75,000	High
B7	Meinig Ave*	Scenic St. to US 26	Re-stripe roadway to provide bike lanes	$75,000	High
B8	Meinig Ave*	Barker Ct. to Dubarko Rd.	Re-stripe roadway to provide bike lanes	$25,000	High
B9	Sandy Heights St*	Bluff Rd. To Tupper Rd.	Re-stripe roadway to provide bike lanes	$50,000	High
B10	Tupper Rd.	Long Circle to OR 211	Widen roadway to provide bike lanes	$3,000,000	High
B12	US 26	Ten Eyck Road to UGB	Widen to provide a six-foot bike lane and sidewalk	$7,725,000	High

B13	Sandy Heights St	Dubarko Rd to Nettie Connett Dr	Re-stripe/widen Roadway to provide bike lanes	$2,275,000	Medium
B14	Jacoby Rd	Dubarko Rd to southern UGB	Re-stripe/widen Roadway to provide bike lanes and construct sidewalk	$3,925,000	Medium
B15	Vista Loop	Full extent	Re-stripe/widen Roadway to provide bike lanes and construct sidewalk	$2,075,000	Medium

Trail Improvements

ID	PROJECT	DESCRIPTION	COST	PRIORIRTY
T03	362nd	6' - 8' wide gravel trail	$125,000	Medium
T04	Kelso to Powerline	6' - 8' wide gravel trail	$200,000	Medium
T05	Powerline	5' concrete path	$50,000	Medium
T06	Olson to Powerline	5' concrete path	$100,000	Medium
T08	Sandy Bluff Park to 362nd 3	6' - 8' wide gravel trail	150,000	Medium
T09	Sandy Bluff Park Pond Loop Trail 3	6' - 8' wide gravel trail	$50,000	Medium
T10	Bell Street to Sandy Bluff Park 3	6' - 8' wide gravel trail	$75,000	Medium
T11	Kate Schmidt to Bell Street 3	3' wide natural surface trail	$50,000	Medium
T12	SHS Trail Easement 1 3	3' wide natural surface trail	$100,000	Medium
T13	Meeker to MH Athletic Club	5' concrete path	$50,000	Medium
T17	Community Campus to Sandy River Trail	3' wide natural surface trail	$25,000	Medium
T19	Park Street to Community Campus	3' wide natural surface trail	$5,000	Medium
T21	Vista Loop to Hood Street	6' - 8' wide gravel trail	$50,000	Medium

ID	PROJECT	DESCRIPTION	COST	PRIORIRTY
T28	Tickle Creek Reroutes 3	6' - 8' wide gravel trail	$75,000	Medium
T30	Sunset Street to Tickle Creek	3' wide natural surface trail	$15,000	Medium
T31	Sunset Street to Nettie Connett Drive	5' wide concrete path	100,000	Medium
T32	Bluff Road to Sandy Heights	3' wide natural surface trail	$15,000	Medium
T33	Tupper Park to Gerilyn Court	5' concrete path	$50,000	Medium
T35	Tickle Creek Extension East to Dubarko Underpass	6' - 8' wide gravel trail	$75,000	Medium
T38	Tickle Creek to Deer Point Park	5' concrete path	450,000	Medium
T39	Dubarko Extension Road	8' wide asphalt trail	125,000	Medium
T40	Tickle Creek Extension Dubarko East to Jacoby	3 6' - 8' wide gravel trail	$100,000	Medium
T41	Alleyway to Tickle Creek Trail Connector	5' concrete path	$50,000	Medium
T42	Jacoby Road to Tickle Creek Connector	5' concrete path	$50,000	Medium
T44	Bornstedt Park	5' concrete path	$75,000	Medium
T50	Highway 211 Parkway		$400,000	Medium
T54	Cascadia to Tickle Creek	6' - 8' wide gravel trail	$30,000	Medium

Driving Improvements

PROJECT ID	NAME	DESCRIPTION	COST	PRIORITY
D1	362nd Drive & Industrial Way (south)	Reduce eastbound congestion. Project may include restriping to include an	$140,000	Medium

PROJECT ID	NAME	DESCRIPTION	COST	PRIORITY
	Intersection Improvement	exclusive eastbound left turn lane and exclusive right turn lane.		
D2	362nd Drive & Dubarko Road Intersection Improvement	Reduce intersection congestion. Project may construct a traffic signal or roundabout.	$1,425,000	Medium
D4	US 26 & Industrial Way Intersection Improvement	Improve egress from commercial area and reduce northbound congestion. Project may include minor widening to accommodate a northbound left turn lane and restriping on the southbound approach to dual left turn lanes and a shared through/right turn lane.	$950,000	Low
D5	US 26 & Ruben Lane Intersection Improvement	Improve egress from commercial area and reduce northbound congestion. Project may include restriping southbound approach to dual left turns and a shared through/right lane and restriping the northbound approach to a left turn lane and shared through/right lane.	$950,000	Medium
D8	US 26 & Ten Eyck Road/Wolf Drive Intersection Improvement	Improve northbound and southbound approaches. Project may include striping left turn lanes on both minor street approaches.	$1,500,000	Low
D11	OR 211 & Arletha Court Intersection Improvement	Reduce northbound congestion. Project may include signage and approach modifications to prohibit left turns from the minor street approach.	$3,150,000	Low
D12	Industrial Way Extension 1	Extend Industrial Way to Jarl Road/US 26 at Collector standards	$13,175,000	Low
D13	Dubarko Road Extension	Extend Dubarko Road to Champion Way at Collector standards	$7,450,000	Low
D14B	Bell Street Extension 2	Extend Bell Street from 362ND Drive Extension 1 to Orient Drive at Minor Arterial standards	$9,900,000	Low
D15B	362nd Drive Extension 2	Extend 362nd Drive from Bell Street Extension 1 to Kelso Road at Minor Arterial standards	$14,000,000	Low
D16	Kate Schmidt Street Extension	Extend Kate Schmidt Street to Bell Street Extension 1 at Collector standards	$9,000,000	Medium
D17	Industrial Way Extension 2	Extend Industrial Way to Bell Street Extension 1 at Collector standards	$4,675,000	Medium

PROJECT ID	NAME	DESCRIPTION	COST	PRIORITY
D18	Olson Road Extension	Extend Olson Road to 362nd Drive Extension 2 at Collector standards	$5,250,000	Low
D19	Agnes Street Extension	Extend Agnes Street to Bluff Road at Collector standards	$5,950,000	Low
D21A	Sandy Heights Street/370th Avenue Extension	Extend Sandy Heights Street/370th Avenue to OR 211 at Collector standards	$24,350,000	Low
D21B	Gunderson Road Extension	Extend Gunderson Road from existing terminus near OR 211 to 362nd Drive at Collector standards	$13,750,000	Low
D21C	Cascadia Village Extension 1	Extend Cascadia Village from OR 211 to Arletha Court at Collector standards	$2,025,000	Low
D21D	Cascadia Village Extension 2	Extend Cascadia Village Drive from Village Boulevard to Pine Street at Collector standards	$2,175,000	Medium
D21E	New southern collector	Construct new a new road at Collector standards from OR 211 at the intersection with the Sandy Heights Street/370th Avenue Extension to Langensand Road	$33,550,000	Low
D21G	Village Boulevard Extension 2	Extend Village Boulevard at Collector standards from existing terminus south of Juniper Street to Bornstedt Road	$4,000,000	Low
D22	New eastern collector	Construct new a new road at Collector standards from Dubarko Road at the intersection with the Dubarko Road Extension to US 26/ Vista Loop Road (east)	$20,000,000	Low
D23	US 26 Bypass	Construct bypass from east of Orient Drive to Shorty's Corner (Firwood Road)	$390,000,000	Low
D25	OR 211	Upgrade OR 211 to Minor Arterial standards from UGB to US 26, coordinate with P23	$22,000,000	Medium
D26	Alt Avenue	Reconstruct Alt Avenue from Proctor Blvd to Pleasant St to improve walkability and access to the Sandy Library	$11,000,000	High

PROJECT ID	NAME	DESCRIPTION	COST	PRIORITY
D28	Industrial Way Realignment	Realign Industrial Way (east of 362nd Drive) to connect with the intersection of Industrial Way (west of 362nd)	$4,150,000	Low
D29	Ruben Lane Realignment to Kate Schmitz	Realign Ruben Lane to the west to connect with Kate Schmitz Avenue and US 26	$3,700,000	Medium
D30	Langensand Road Truck Traffic Calming	Traffic calming measures along Langensand Road, potential treatments include bollards at the intersection of Langensand Road and US 26 and curb extensions along Langesand Road.	$175,000	Low

TM 9: ALTERNATIVE MOBILITY TARGETS

DATE: June 8, 2023

TO: Project Management Team

FROM: Reah Flisakowski, Dock Rosenthal| DKS

SUBJECT: Sandy TSP Update

Alternative Mobility Targets

Project #20020-001

This technical memorandum summarizes an evaluation of locations where alternate mobility targets are needed on the state highway system within Sandy. This memorandum follows the evaluation process outlined in the Planning Business Line Team Operational Notice PB-02[1]. Final review and approval of alternative mobility targets for state highway corridors will be an action of the Oregon Transportation Commission (OTC).

INTRODUCTION

The Oregon Highway Plan (OHP) identifies highway mobility targets for maintaining acceptable and reliable levels of mobility on the state highway system, consistent with expectations for each facility type, location, and functional objectives[2]. The adopted mobility targets are the initial tool for identifying deficiencies and considering solutions for vehicular mobility on the state system. However, consistent with OHP Policy 1F, the ability to meet OHP mobility targets may not be compatible with a community's adopted land use plan, financial capacity, or goals. In these cases, alternative mobility targets can be explored for a facility to adjust long-term roadway performance expectations. Alternative mobility targets are only applied to intersections under state jurisdiction (i.e., an intersection located on the state highway system). Mobility targets for intersections under city jurisdiction are identified in the transportation standards memo of this TSP update. Mobility targets for intersections under county jurisdiction (none of which are included in this TSP) can be found in the Clackamas County Transportation System Plan.

It is important for a TSP to identify a broad range of system projects and services to address the deficiencies that would exist at the end of a 20-year planning horizon if the community grows in accordance with its adopted land use plan. However, it is also important to realistically identify which transportation projects and services are reasonably likely to be implemented over the 20-year planning horizon, based on financial limitations or other constraints. This exercise enables the

[1] Planning Business Line Team Operational Notice PB-02, Oregon Department of Transportation, effective May 2, 2013.

[2] *1999 Oregon Highway Plan, as amended May 2015*, Policy 1F: Highway Mobility Policy, Oregon Department of Transportation

community and the state to establish realistic expectations for how that transportation system will likely operate at the end of the 20-year planning horizon.

Local and/or state intersections will not be able to meet local level-of-service (LOS)[3] targets or, in the case of ODOT, volume-to-capacity (v/c)[4] ratio-based mobility targets, at the end of the 20-year planning horizon if the community grows in accordance with its land use in Sandy. This deficiency is related to two factors, limited funding and network connectivity. Financial constraints that have been faced by state and local governments over the last 20 years and are expected to continue into the foreseeable future which limits the investment that can be made in the transportation system. Network connectivity in Sandy is an issue that results in more traffic using US 26 due to a lack of available parallel routes. Exceeding existing mobility targets is particularly common in larger communities or in those with roadways that experience higher travel demands. In these cases, it is appropriate to adjust roadway performance expectations, as expressed through local targets or state mobility targets, to match the performance that is forecasted to exist at the end of the 20-year planning horizon, through the adoption of alternative mobility targets.

In these situations, adopting alternative mobility targets means adjusting roadway performance expectations to match realistic expectations for how the roadways are forecasted to operate, considering financial limitations and other constraints. In addition to establishing realistic expectations for future system performance, this process will help reduce the need to include state and local investment projects that both parties acknowledge are unlikely to be achieved or that are counter to a community's adopted land use plan and goals.

ALTERNATIVE MOBILITY TARGET NEED

In Sandy, US 26 bisects the city and is the regional transportation route for recreational traffic traveling to-and-from Mount Hood and Central Oregon. US 26 is classified as Statewide Highway, which typically provide inter-urban and inter-regional mobility and provide connections to larger urban areas, ports and major recreation areas that are not directly served by Interstate Highways. US 26 is a designated freight route in the OHP.

There are very few parallel routes in the city, a situation that results in frequent interaction between local trips and regional through trips. The mobility targets that apply along US 26 are based on the characteristics above, such as its classification as a Statewide Highway, but are also intended to be broad enough to apply to every similarly classified highway in the state. In some cases, the mobility target criteria that apply are not a good fit in a particular city. This is the case in Sandy.

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[3] LOS targets are based on the delay experienced by drivers at a particular location where higher delay corresponds to worse levels of service.

[4] V/C ratios describe the ability of an intersection to handle additional traffic demands before experiencing excessive delay or long vehicle queues; v/c ratios that exceed 1.00 indicate that the vehicle demand exceeds the theoretical capacity.

Given the population and employment growth projected over the 20-year planning horizon, significant stretches of US 26 through Sandy are forecast to exceed ODOT's current mobility targets. Mobility targets are primarily used to evaluate development applications, along with other changes to the land use-transportation system that may result in an impact. When a particular intersection exceeds the established target prior to the evaluation of development impact it is referred to as an existing deficiency. It is not unusual for one or two intersections in a city to have existing deficiencies based on unique challenges where straightforward solutions are not available however, once a majority of the major intersections exceed the established mobility target, those targets are no longer serving the purpose of evaluating the impact of development on the system.

An evaluation of the disparity between the current targets and forecasted traffic operations confirmed the need for assessing alternative mobility targets to balance the community's vision established through the Sandy TSP goals and objectives. The findings of that evaluation are described below.

The purpose of alternate mobility targets is not to allow more congestion along US 26 in the city but to acknowledge the growth that has occurred, and is expected to occur in the future, based on an adopted comprehensive plan land use, and to provide a helpful metric to track the impact of that growth on the transportation system. Similarly, alternate mobility targets do not directly impact the likelihood of constructing a future Sandy Bypass. There are many factors and outcomes related to a future bypass, including mobility targets, but also including corridor travel time, funding availability, right-of-way, environmental impact, and infrastructure maintenance amongst others.

CURRENT MOBILITY TARGETS

All US 26 intersections in Sandy must comply with the volume-to-capacity (v/c) ratio targets presented in Table 6 of the OHP. ODOT v/c ratio mobility targets are based on highway classification, posted speed, and area type. Within Sandy, US 26 is classified as a Statewide Highway with a Special Transportation Area (STA) between Bluff Road and Ten Eyck Road/Wolf Drive. Therefore, the v/c target ranges from 0.80 to 0.90, as listed in Table 1 below.

The mobility targets in the OHP are based on conditions present during the 30th highest annual hour of traffic (30 HV), which in Sandy is estimated using the nearest ATR (Automatic Traffic Recorder) which indicates a seasonal peak month of August.

EXISTING AND FUTURE HIGHWAY OPERATIONS

A comparison of existing and future traffic operations along US 26 to adopted mobility targets during peak traffic conditions (30 HV) shows that most intersections meet targets today, with two intersections currently exceeding mobility targets. It is projected that traffic demand in the p.m. peak period at several intersections will exceed capacity by 2040.

Table 1 also demonstrates the results of doing nothing (retaining the system as it exists today) versus implementing the Financially Constrained projects and other likely funded projects included in the TSP by 2040. The table compares baseline operations to the Oregon Highway Plan (OHP) mobility targets.

TABLE 1: INTERSECTION OPERATIONS ON US 26 WITHOUT AND WITH REASONABLY LIKELY IMPROVEMENTS (2018 AND 2040 PM PEAK HOUR, 30 HV)

STUDY INTERSECTION	TRAFFIC CONTROL	MOBILITY TARGET	EXISTING V/C	2040 NO BUILD V/C	2040 FINANCIALLY CONSTRAINED V/C
ORIENT DR/US 26	Signal	0.80	**0.90**	**1.17**	**1.17**
362ND DR/US 26	Signal	0.80	**0.83**	**1.19**	**1.16**
INDUSTRIAL WAY/ US 26	Signal[A]	0.80	0.72	**1.13**	**1.10**
RUBEN LN/US 26	Signal[A]	0.80	0.73	**0.99**	**0.97**
BLUFF RD/US 26	Signal	0.85	0.79	**1.12**	**1.12**
PIONEER BOULEVARD (US 26)/ MEINIG AVENUE (OR 211)	Signal	0.90	0.68	0.88	0.81
PROCTOR BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	0.90	0.71	0.84	0.84
TEN EYCK RD/US 26	Signal	0.85	0.58	0.84	0.80
LANGENSAND RD/US 26	TWSC	0.80 [0.90]	0.32 [0.30]	0.51 **[1.2]**	0.48 **[0.91]**
VISTA LOOP DR W/US 26	TWSC	0.80 [0.90]	0.31 [0.09]	0.48 [0.62]	0.44 **[>2.0]**
VISTA LOOP DR E/US 26	TWSC	0.80 [0.90]	0 [0.05]	0.48 [0.25]	0.48 [0.25]

Bold and Red values indicate the adopted mobility target would not be met. At signalized study intersections the v/c, LOS and delay are reported as the intersection average and at unsignalized intersections the v/c, LOS and delay are reported for the worst highway approach/ worst side street approach.

A. This signal reported using HCM 2000 due to non-standard characteristics.

While many intersection projects along US 26 are identified in the TSP, they cannot solve the root cause of the intersection congestion during the p.m. period which is high eastbound through traffic. Exacerbating this condition further, the split phasing of the minor street approaches means that the local street connections onto US 26 cannot run simultaneously and therefore demand a higher proportion of the total cycle. The best short-term solution to solving intersection congestion along US 26 is better local street connectivity that would allow drivers to exit US 26 more quickly. Phase 2 of the Bell Street extension, from the 362nd Street extension to Orient Drive is the best connectivity improvement to facilitate some of this traffic volume shift, however, due to funding limitations it is not included in the financially constrained project list.

The planned Dubarko Extension project (D20) is expected to shift some traffic off US 26 and marginally improve traffic signal operations along the highway. While the current unsignalized assumptions show this location as significantly exceeding the mobility target for the minor approach, the US 26 speed study (S3), another financially constrained project, will analyze this segment.

FACTORS LIMITING THE ABILITY TO MEET EXISTING MOBILITY TARGETS

Several factors combine to make compliance with current mobility targets within Sandy difficult. They include the following:

PROJECTED MULTIMODAL TRAVEL NEEDS

The importance of US 26 to statewide, regional, and local travel creates significant multimodal demands for both short and long trips along the corridor. These users include:

- People driving on US 26 to make local trips to homes, work, and shopping destinations.
- People driving for regional trips between the Portland metro area, and other cities to the west, and Mount Hood and central Oregon.
- Freight traveling to and through Sandy (US 26 is a freight route).
- Transit traveling along the main state facility or turning at a local street.
- People biking and walking along and across US 26.

Balancing the needs of each of these various users is incorporated in the goals of the Sandy TSP and factored into identifying reasonably likely to be funded projects and programs for the Sandy TSP.

EXISTING AND PLANNED DEVELOPMENT PATTERNS

In many areas along US 26, adjacent existing development, existing physical constraints, and planned urban form promoting increased density and mixed land use constrain the ability to widen the highway right-of-way or provide parallel alternate routes. Meeting existing mobility targets would require increasing the width of US 26 and in these constrained areas obtaining needed right-of-way for highway widening would require acquisition and removal of existing buildings near the highway, which would be very expensive and counter to the goals and objectives of the community[5]. Furthermore, the City of Sandy is built around US 26 which often limits travel options to the highway for residents travelling between the east and west sections of the city (and in some cases north and south). In cases where available capacity is restricting traffic demand (a

[5] Sandy TSP Update TM #2 Goals, Objectives, and Criteria June 23, 2021

bottleneck), widening will likely reduce the duration of congestion but may not improve conditions within the peak hour due to the additional traffic volume demand that will use the new capacity.

FINANCIAL FACTORS

Funding available for future transportation capacity improvements is limited which requires agencies to prioritize investments to address critical needs. The Sandy TSP identifies a comprehensive set of transportation projects estimated to cost $10.8 million that are deemed reasonably likely to be funded in the 20-year planning horizon, including some projects on US 26. However, there will be future ODOT facility mobility target deficiencies that will not be addressed due to the funding constraints.

Future development may also fund improvements through System Development Charges (SDCs). An estimate of expected SDCs in the 20-year planning horizon is included in the forecasted $10.8 million in available funding.

OTHER STRATEGIES BEING APPLIED TO ENHANCED MOBILITY

In addition to funding capacity improvements, the Sandy TSP identifies funding for programs and policies to improve multimodal conditions and help reduce motor vehicle demand. This includes 91 active transportation projects including bike routes, sidewalk and crossing improvements, and shared-use paths. However, with only $10.8 million available for projects most of these are not likely to be funded by 2040.

ALTERNATIVE MOBILITY TARGET EVALUATION

Figure 1 shows ODOT's methodology for determining alternative mobility targets[6]. A summary of each step of the process is discussed below. Table 2 lists the results for each individual intersection.

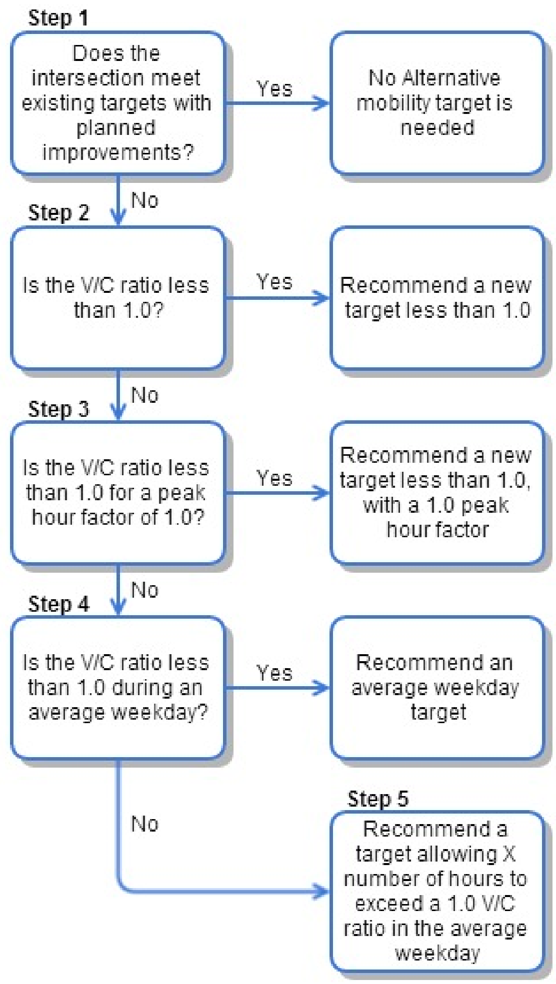

FIGURE 1: ALTERNATIVE MOBILITY TARGET METHODOLOGY

STEP 1: IMPLEMENT PLANNED IMPROVEMENTS

Prior to implementing alternative mobility targets, all feasible actions and improvements must be taken to meet the current targets. Even with the implementation of the Financially Constrained and Reasonably Likely Funded improvements in the City of Sandy's TSP, alternative mobility targets will be needed at the following study intersections:

- ORIENT DR/US 26
- 362ND DR/US 26
- INDUSTRIAL WAY/ US 26
- RUBEN LN/US 26
- BLUFF RD/US 26
- VISTA LP (WEST)/US 26

STEP 2: INCREASE V/C TARGETS, STAYING BELOW CAPACITY

In cases where the v/c is forecasted to be greater than the OHP mobility target but less than capacity (v/c = 1.0) during the 30 HV, establish the proposed alternative target consistent with the v/c values used in the OHP. This approach would work for one of the intersections needing alternative mobility targets, Ruben Lane and US 26.

STEP 3: REMOVE PEAKING WITHIN THE PEAK HOUR

In cases where v/c is forecasted to be greater than or equal to capacity during the 30 HV using the standard analysis procedures, evaluate the actual peak hour traffic volume for future year 30 HV

[6] Planning Business Line Team Operational Notice PB-02, Oregon Department of Transportation, effective May 2, 2013.

projections rather than expanding the peak 15 minutes to be the 30 HV. If the resulting v/c is less than 1.0, establish the proposed alternative target. Setting the Peak Hour Factor (PHF) for the 30 HV to 1.0 relaxes the peaking assumptions and allows for analysis of the peak hour volumes instead of the peak 15-minute volumes.

STEP 4: ANALYZE AVERAGE WEEKDAY CONDITIONS

In cases where v/c is forecasted to be greater than or equal to capacity during the design hour using the actual peak hour projection of traffic and in areas where design hours are affected by high seasonal traffic volumes, evaluate the annual average weekday (AWD) p.m. peak as the future year design hour rather than the 30 HV. If the resulting v/c is less than 1.0, establish the proposed alternative target. Analyzing average weekday conditions instead of the 30 HV gives a more accurate representation of typical conditions instead of peak seasonal conditions when there is an influx of recreational trips through Sandy.

STEP 5: HOURS OF CONGESTION

In cases where v/c is forecasted to be greater than or equal to 1.0 using the AWD p.m. peak as the future design hour, determine the duration of the period during which the future AWD p.m. peak hour will have a v/c greater than or equal to 1.0. Establish the proposed alternative target by increasing the number of hours that v/c can be greater than or equal to 1.0. An “hours of congestion” analysis assumes that traffic volumes that exceed capacity in the analysis hour are shifted to the “shoulder” hours, iteratively, until all traffic can be accommodated. The calculation of multi-hour conditions with peak spreading is fairly complex and it can be difficult to achieve consistent results. Also, because only the most congested intersections make it to Step 5 when considering alternative mobility targets, it is often found that over-capacity conditions would be present for several hours of the day making such a target fairly ineffective.

TABLE 2: INTERSECTION OPERATIONS ON US 26 WHEN APPLYING THE ALTERNATIVE MOBILTY TARGET METHODOLOGY (2040 PM PEAK HOUR)

STUDY INTERSECTION	CONTROL	MOBILITY TARGET	STEP 1: FC	STEP 2: 30 HV, V/C 1.0	STEP 3: 30 HV, V/C 1.0, PHF = 1.0	STEP 4: AVERAGE WEEKDAY	STEP 5: SECOND HOUR WITH PEAK SPREADING
ORIENT DR/US 26	Signal	0.80	**1.17**	**1.17**	**1.11**	**1.04**	**1.14**
362ND DR/US 26	Signal	0.80	**1.16**	**1.16**	**1.10**	**1.03**	**1.03**
INDUSTRIAL WAY/ US 26	Signal[A]	0.80	**1.10**	**1.10**	**1.08**	**1.03**	**1.05**
RUBEN LN/US 26	Signal[A]	0.80	**0.97**	0.97	0.95	0.89	0.90
BLUFF RD/US 26	Signal	0.85	**1.12**	**1.12**	**1.09**	**1.02**	**1.12**
PIONEER BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	0.90	0.84	0.84	0.76	0.71	0.69
PROCTOR BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	0.90	0.81	0.81	0.80	0.74	0.69
TEN EYCK RD/US 26	Signal	0.85	0.80	0.80	0.76	0.72	0.72
LANGENSAND RD/US 26	TWSC	0.80 [0.90]	0.48 **[0.91]**	0.48 **[0.91]**	0.45 [0.71]	0.44 [0.69]	0.37 [0.45]
VISTA LOOP DR W/US 26	TWSC	0.80 [0.90]	0.44 **[>2.0]**	0.44 **[>2.0]**	0.42 **[1.93]**	0.42 **[1.75]**	0.36 [0.89]
VISTA LOOP DR E/US 26	TWSC	0.80 [0.90]	0.48 [0.25]	0.48 [0.25]	0.45 [0.20]	0.44 [0.20]	0.39 [0.17]

Bold and Red values indicate the adopted mobility target would not be met. At signalized study intersections the v/c, LOS and delay are reported as the intersection average and at unsignalized intersections the v/c, LOS and delay are reported for the worst highway approach/ worst side street approach.

A. This signal reported using HCM 2000 due to non-standard characteristics.

As shown in Table 2, the intersections of Pioneer Boulevard, Proctor Boulevard, Ten Eyck, and Vista Loop Drive East all continue to meet current mobility targets and therefore would not require alternative mobility targets.

As shown in Table 2, even in the second hour of the peak period, with the additional volume spreading from the first hour, a mobility target of 1.0 volume to capacity ratio is not met. The second hour volumes along US 26 do not drop enough, relative to the first hour, to serve the excess demand that spreads over from the first hour. An additional four-hour turning movement count was collected from 3 p.m. to 7 p.m. on May 10th 2023 at the intersection of US 26 and 362nd

Drive to understand the relative turning movement volumes over the longer peak period. The hourly volume profile is shown in Figure 2 below. This count showed that the p.m. peak period has a duration of three hours staring around 3 p.m. and continuing until 6 p.m. at which point traffic volumes start to decrease. Applying this profile to the forecasted 2040 p.m. peak hour counts results in the intersection operations analysis shown in Table 3 for those intersections that continue to not meet current mobility targets through Step 5.

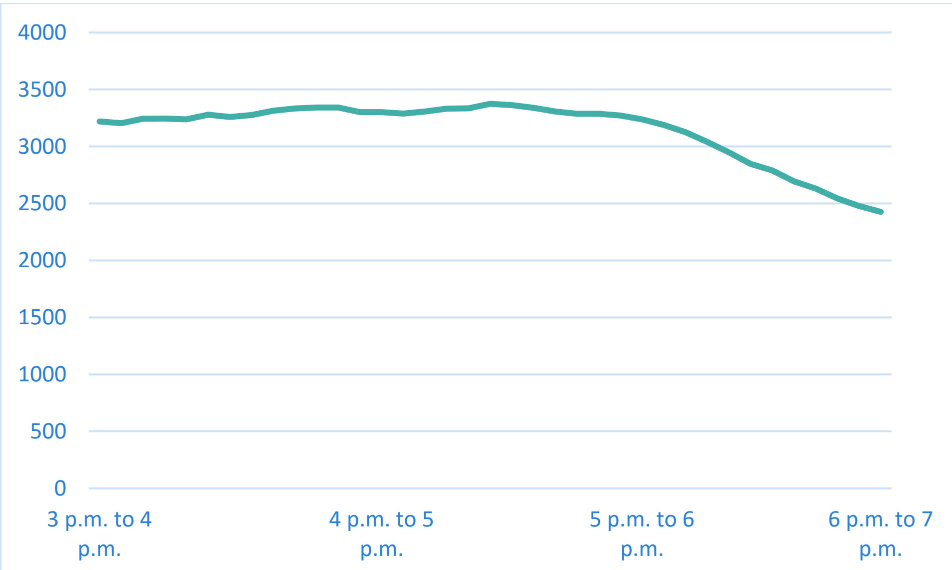

FIGURE 2: ROLLING HOUR VOLUMES AT US 26 & 362ND DRIVE

TABLE 3: AVERAGE WEEKDAY INTERSECTION OPERATIONS ON US 26 ACROSS THE PEAK PERIOD (INTERSECTIONS NOT MEETING TARGETS IN STEP 5)

STUDY INTERSECTION	CONTROL	MOBILITY TARGET	2040 3 P.M. TO 4 P.M.	2040 4 P.M. TO 5 P.M. (PEAK)	2040 5 P.M. TO 6 P.M.	2040 6 P.M. TO 7 P.M.
ORIENT DR/US 26	Signal	0.80	**1.01**	**1.04**	**1.03**	0.76
362ND DR/US 26	Signal	0.80	**1.01**	**1.03**	**1.02**	0.76
INDUSTRIAL WAY/ US 26	Signal[A]	0.80	**0.98**	**1.03**	**1.00**	0.73
RUBEN LN/US 26	Signal[A]	0.80	**0.87**	**0.89**	**0.88**	0.65
BLUFF RD/US 26	Signal	0.85	**1.00**	**1.02**	**1.01**	0.75

Bold and Red values indicate the adopted mobility target would not be met. At signalized study intersections the v/c, LOS and delay are reported as the intersection average and at unsignalized intersections the v/c, LOS and delay are reported for the worst highway approach/ worst side street approach.

A. This signal reported using HCM 2000 due to non-standard characteristics.

As shown above the average weekday intersection operations are consistent from 3 p.m. to 6 p.m. with slightly worse operations during the 4 to 5 p.m. peak hour. The intersections along US 26 from Orient Drive to Bluff Road are expected to exceed the existing mobility target for each of the individual hours during that period. At 6 p.m. the traffic volumes decrease to a level where the existing mobility targets are met. Based on these operations the proposed alternative mobility targets are described below.

RECOMMENDED ALTERNATIVE MOBILITY TARGETS

While the transportation investments identified as reasonably likely to be funded in the Sandy TSP will result in improved intersection performance on ODOT facilities by providing alternative routes off US 26, not all intersections will be able to meet state v/c mobility targets. There is a need to consider alternative mobility targets in select locations. Alternative mobility targets establish realistic expectations for future system performance and help the community continue to grow in accordance with its adopted land use plan. Table 4 shows the existing and proposed mobility targets.

TABLE 4: EXISTING AND PROPOSED MOBILITY TARGETS

INTERSECTION	CONTROL	EXISTING V/C MOBILITY TARGET [A]	PROPOSED MOBILITY TARGET[A]
ORIENT DR/US 26	Urban 4SG	0.80	Multi-hour from 3 p.m. to 6 p.m. at 1.05 v/c, PHF = 1.0, average weekday
362ND DR/US 26	Urban 4SG	0.80	Multi-hour from 3 p.m. to 6 p.m. at 1.05 v/c, PHF = 1.0, average weekday
INDUSTRIAL WAY/ US 26	Urban 4SG	0.80	Multi-hour from 3 p.m. to 6 p.m. at 1.05 v/c, PHF = 1.0, average weekday
RUBEN LN/US 26	Urban 4SG	0.80	Multi-hour from 3 p.m. to 6 p.m. 0.90 v/c, PHF = 1.0, average weekday
BLUFF RD/US 26	Urban 4SG	0.85	Multi-hour from 3 p.m. to 6 p.m. at 1.05 v/c, PHF =

INTERSECTION	CONTROL	EXISTING V/C MOBILITY TARGET [A]	PROPOSED MOBILITY TARGET[A]
			1.0, average weekday
PIONEER BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Urban 3SG	0.90	No Change
PROCTOR BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Urban 3SG	0.90	No Change
TEN EYCK RD/US 26	Urban 4SG	0.85	No Change
LANGENSAND RD/US 26	Urban 3ST	0.80 [0.90]	PHF = 1.0, Average weekday, 0.80 [0.90]
VISTA LOOP DR W/US 26	Urban 4ST	0.80 [0.90]	PHF = 1.0, Average weekday, 0.80 [1.80] [signal or lane warrant met]
VISTA LOOP DR E/US 26	Urban 3ST	0.80 [0.90]	No change

[A] For unsignalized intersections, the mobility target is listed for major approach (highway approach) [minor approach] (side street approach).

The proposed mobility targets in Table 4 result in the following changes to the existing mobility targets:

- Signalized intersections along US 26 from Orient Drive to Industrial Way and at Bluff Road will have a multi-hour volume to capacity ratio target of 1.05 from 3 p.m. to 6 p.m under average weekday conditions with a peak hour factor of 1.0.
- The signalized intersection of US 26 and Ruben Lane will have a multi-hour volume to capacity ratio target of 0.90 from 3 p.m. to 6 p.m under average weekday conditions with a peak hour factor of 1.0.
- The unsignalized intersection of US 26 and Langensand Road will continue with the current mobility target of 0.80 (0.90 for the minor approach/side street) under average weekday conditions with a peak hour factor of 1.0.
- The unsignalized intersection of US 26 and Vista Loop Drive West will be evaluated under average weekday conditions with a peak hour factor of 1.0. The major approach mobility target will remain at 0.80, the minor street target will be 1.80 while the minor approach traffic volumes do not meet one of the criteria of preliminary signal warrants (must evaluate all warrants) or turn lane warrants. If the minor approach does meet a signal warrant, the mobility target will be 0.80 for the intersection and will require the appropriate mitigation to bring operations to the target. If the minor approach does meet a lane warrant, the mobility target will be 0.90 for the minor approach and will require the appropriate mitigation bring operations to the target.

Since it is the through traffic volume along US 26 and a lack of parallel routes that result in many of the intersections exceeding the proposed target, development in the city, while increasing the vehicle demand in the transportation system, will also support the construction of new off-highway connections that can reduce the impact on US 26 and, if not improve, at least maintain the traffic operations at the intersections along the corridor.

The proposed targets provide a limitation on land use amendments within Sandy because many intersections are expected to just meet proposed targets with the expected amount of future development. Simultaneously, the proposed targets facilitate development within the existing land use plan by allowing for a higher utilization of the available capacity along US 26.

APPENDIX

CONTENTS

DKS

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SECTION 1. HCM REPORTS

FINANCIALLY CONSTRAINED

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	2520	5	10	1750	225	10	50	10	260	10	20
Future Volume (veh/h)	60	2520	5	10	1750	225	10	50	10	260	10	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	63	2653	5	11	1842	0	11	53	11	274	11	21
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	82	1922	857	66	1863		14	70	14	313	101	193
Arrive On Green	0.05	0.57	0.57	0.04	0.56	0.00	0.07	0.06	0.07	0.19	0.19	0.19
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	227	1096	227	1688	545	1040
Grp Volume(v), veh/h	63	2653	5	11	1842	0	75	0	0	274	0	32
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1551	0	0	1688	0	1585
Q Serve(g_s), s	4.2	65.0	0.2	0.7	62.4	0.0	5.4	0.0	0.0	18.0	0.0	1.9
Cycle Q Clear(g_c), s	4.2	65.0	0.2	0.7	62.4	0.0	5.4	0.0	0.0	18.0	0.0	1.9
Prop In Lane	1.00		1.00	1.00		1.00	0.15		0.15	1.00		0.66
Lane Grp Cap(c), veh/h	82	1922	857	66	1863		98	0	0	313	0	294
V/C Ratio(X)	0.77	1.38	0.01	0.17	0.99		0.76	0.00	0.00	0.88	0.00	0.11
Avail Cap(c_a), veh/h	82	1922	857	80	1863		102	0	0	326	0	306
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	53.6	24.4	10.5	52.9	24.6	0.0	52.4	0.0	0.0	45.1	0.0	38.5
Incr Delay (d2), s/veh	34.1	174.4	0.0	0.7	18.3	0.0	24.4	0.0	0.0	21.8	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	68.0	0.0	0.3	25.1	0.0	2.8	0.0	0.0	9.5	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	87.6	198.8	10.5	53.6	42.8	0.0	76.7	0.0	0.0	66.9	0.0	38.7
LnGrp LOS	F	F	B	D	D		E	A	A	E	A	D
Approach Vol, veh/h		2721			1853			75			306	
Approach Delay, s/veh		195.9			42.9			76.7			63.9	
Approach LOS		F			D			E			E	

Timer - Assigned Phs	1	2	4	5	6	8
Phs Duration (G+Y+Rc), s	9.5	68.0	25.1	8.5	69.0	11.2
Change Period (Y+Rc), s	4.5	7.0	5.0	4.5	7.0	4.5
Max Green Setting (Gmax), s	5.0	61.0	21.0	5.0	61.0	7.0
Max Q Clear Time (g_c+I1), s	6.2	64.4	20.0	2.7	67.0	7.4
Green Ext Time (p_c), s	0.0	0.0	0.1	0.0	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	128.7
HCM 6th LOS	F

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	300	1600	420	265	1525	340	335	150	325	150	175	170
Future Volume (veh/h)	300	1600	420	265	1525	340	335	150	325	150	175	170
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772
Adj Flow Rate, veh/h	316	1684	442	279	1605	358	353	158	342	158	184	179
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2
Cap, veh/h	198	1243	884	258	1397	820	761	402	343	236	248	210
Arrive On Green	0.08	0.37	0.36	0.16	0.56	0.54	0.23	0.23	0.23	0.14	0.14	0.14
Sat Flow, veh/h	1688	3367	1502	1661	3313	1502	3300	1772	1512	1688	1772	1502
Grp Volume(v), veh/h	316	1684	442	279	1605	358	353	158	342	158	184	179
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1502	1650	1772	1512	1688	1772	1502
Q Serve(g_s), s	11.0	48.0	22.3	15.8	54.8	15.9	12.0	9.8	29.4	11.6	13.0	15.1
Cycle Q Clear(g_c), s	11.0	48.0	22.3	15.8	54.8	15.9	12.0	9.8	29.4	11.6	13.0	15.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	198	1243	884	258	1397	820	761	402	343	236	248	210
V/C Ratio(X)	1.59	1.35	0.50	1.08	1.15	0.44	0.46	0.39	1.00	0.67	0.74	0.85
Avail Cap(c_a), veh/h	198	1243	884	258	1397	820	761	402	343	376	395	335
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.20	0.20	0.20	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.3	41.0	15.6	52.8	28.5	13.2	43.1	42.7	50.2	53.1	53.7	54.6
Incr Delay (d2), s/veh	290.0	165.0	2.0	50.9	68.8	0.3	0.3	0.4	47.8	2.4	3.3	9.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	20.4	47.0	12.5	11.3	30.1	6.0	4.9	4.3	15.5	5.1	6.0	6.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	327.3	206.0	17.6	103.7	97.4	13.5	43.3	43.0	98.0	55.5	56.9	64.1
LnGrp LOS	F	F	B	F	F	B	D	D	F	E	E	E
Approach Vol, veh/h		2442			2242			853			521	
Approach Delay, s/veh		187.6			84.8			65.2			59.0	
Approach LOS		F			F			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	21.8	52.0		22.2	15.0	58.8		34.0
Change Period (Y+Rc), s	6.0	* 6		4.0	4.0	6.0		4.5
Max Green Setting (Gmax), s	7.0	* 46		29.0	11.0	42.0		29.5
Max Q Clear Time (g_c+I1), s	17.8	50.0		17.1	13.0	56.8		31.4
Green Ext Time (p_c), s	0.0	0.0		1.0	0.0	0.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	121.2
HCM 6th LOS	F

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	1945	5	25	1795	50	170	35	250	230	15	170
Future Volume (vph)	65	1945	5	25	1795	50	170	35	250	230	15	170
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0		4.0		4.0	4.0	4.0
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (prot)	1676	3316		1644	3358	1471		1620		1624	1638	1508
Flt Permitted	0.06	1.00		0.06	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (perm)	100	3316		101	3358	1471		1620		1624	1638	1508
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	66	1985	5	26	1832	51	173	36	255	235	15	173
RTOR Reduction (vph)	0	0	0	0	0	23	0	33	0	0	0	112
Lane Group Flow (vph)	66	1990	0	26	1832	28	0	431	0	125	125	61
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						4
Actuated Green, G (s)	74.3	70.3		71.1	68.7	68.7		22.6		17.3	17.3	17.3
Effective Green, g (s)	75.3	71.7		71.1	70.1	70.1		22.6		17.3	17.3	17.3
Actuated g/C Ratio	0.58	0.55		0.55	0.54	0.54		0.17		0.13	0.13	0.13
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4		3.0		2.3	2.3	2.3
Lane Grp Cap (vph)	112	1828		83	1810	793		281		216	217	200
v/s Ratio Prot	c0.02	c0.60		0.01	0.55			c0.27		c0.08	0.08	
v/s Ratio Perm	0.32			0.16		0.02						0.04
v/c Ratio	0.59	1.09		0.31	1.01	0.03		1.53		0.58	0.58	0.31
Uniform Delay, d1	56.5	29.1		59.7	30.0	14.1		53.7		52.9	52.9	50.9
Progression Factor	0.43	0.45		0.79	0.67	2.57		1.00		1.00	1.00	1.00
Incremental Delay, d2	2.8	45.0		0.8	19.5	0.0		257.3		2.8	2.7	0.5
Delay (s)	27.4	58.1		47.8	39.4	36.2		311.0		55.7	55.6	51.4
Level of Service	C	E		D	D	D		F		E	E	D
Approach Delay (s)		57.1			39.5			311.0			53.9	
Approach LOS		E			D			F			D	

Intersection Summary			
HCM 2000 Control Delay	74.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	102.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	175	2045	195	45	1650	100	120	35	40	270	35	135
Future Volume (vph)	175	2045	195	45	1650	100	120	35	40	270	35	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.94	1.00	1.00	*0.97	1.00		1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97		1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (prot)	1676	3318	1467	1644	3358	1432		1682	1461	1624	1646	1506
Flt Permitted	0.07	1.00	1.00	0.06	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (perm)	132	3318	1467	96	3358	1432		1682	1461	1624	1646	1506
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	177	2066	197	45	1667	101	121	35	40	273	35	136
RTOR Reduction (vph)	0	0	40	0	0	36	0	0	34	0	0	126
Lane Group Flow (vph)	177	2066	157	45	1667	65	0	156	6	153	155	10
Confl. Peds. (#/hr)			1			3	1		4	4		1
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6		6		8	8			4
Actuated Green, G (s)	81.5	80.1	80.1	75.5	75.5	75.5		19.3	19.3	10.0	10.0	10.0
Effective Green, g (s)	81.5	81.5	81.5	75.5	76.9	76.9		19.3	19.3	10.0	10.0	10.0
Actuated g/C Ratio	0.63	0.63	0.63	0.58	0.59	0.59		0.15	0.15	0.08	0.08	0.08
Clearance Time (s)	4.0	5.4	5.4	4.0	5.4	5.4		4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4	5.4	2.3	5.4	5.4		2.3	2.3	2.3	2.3	2.3
Lane Grp Cap (vph)	175	2080	919	93	1986	847		249	216	124	126	115
v/s Ratio Prot	0.06	c0.62		0.01	c0.50			c0.09		c0.09	0.09	
v/s Ratio Perm	c0.57		0.11	0.27		0.05			0.00			0.01
v/c Ratio	1.01	0.99	0.17	0.48	0.84	0.08		0.63	0.03	1.23	1.23	0.09
Uniform Delay, d1	42.5	24.0	10.1	30.2	21.5	11.4		52.0	47.3	60.0	60.0	55.8
Progression Factor	0.66	0.41	0.29	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	23.3	4.6	0.0	2.3	4.5	0.2		3.9	0.0	156.7	154.7	0.2
Delay (s)	51.1	14.5	2.9	32.5	26.0	11.5		55.9	47.4	216.7	214.7	56.0
Level of Service	D	B	A	C	C	B		E	D	F	F	E
Approach Delay (s)		16.2			25.4			54.2			166.8	
Approach LOS		B			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	34.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	90.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	285	1910	155	95	1430	245	145	55	120	155	45	255
Future Volume (veh/h)	285	1910	155	95	1430	245	145	55	120	155	45	255
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786
Adj Flow Rate, veh/h	291	1949	158	97	1459	250	148	56	122	158	46	260
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1
Cap, veh/h	247	1681	748	75	1150	572	139	78	170	250	53	299
Arrive On Green	0.15	0.50	0.50	0.05	0.39	0.39	0.08	0.16	0.16	0.15	0.23	0.23
Sat Flow, veh/h	1688	3367	1499	1647	2941	1464	1701	493	1075	1701	232	1313
Grp Volume(v), veh/h	291	1949	158	97	1459	250	148	0	178	158	0	306
Grp Sat Flow(s),veh/h/ln	1688	1683	1499	1647	1470	1464	1701	0	1569	1701	0	1546
Q Serve(g_s), s	16.1	54.9	6.5	5.0	43.0	13.8	9.0	0.0	11.8	9.6	0.0	20.9
Cycle Q Clear(g_c), s	16.1	54.9	6.5	5.0	43.0	13.8	9.0	0.0	11.8	9.6	0.0	20.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.69	1.00		0.85
Lane Grp Cap(c), veh/h	247	1681	748	75	1150	572	139	0	248	250	0	352
V/C Ratio(X)	1.18	1.16	0.21	1.30	1.27	0.44	1.06	0.00	0.72	0.63	0.00	0.87
Avail Cap(c_a), veh/h	247	1681	748	75	1150	572	139	0	428	250	0	422
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.13	0.13	0.13	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	46.9	27.5	15.4	52.5	33.5	24.6	50.5	0.0	43.8	44.1	0.0	40.7
Incr Delay (d2), s/veh	85.1	72.7	0.1	202.2	128.1	2.4	94.2	0.0	2.4	4.4	0.0	14.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.4	37.1	2.2	6.3	35.5	5.2	7.5	0.0	4.8	4.4	0.0	9.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	132.0	100.2	15.5	254.7	161.6	27.0	144.7	0.0	46.2	48.5	0.0	54.9
LnGrp LOS	F	F	B	F	F	C	F	A	D	D	A	D
Approach Vol, veh/h		2398			1806			326			464	
Approach Delay, s/veh		98.5			148.0			90.9			52.7	
Approach LOS		F			F			F			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	58.9	13.0	29.1	20.9	47.0	20.7	21.4
Change Period (Y+Rc), s	4.0	4.8	4.0	4.5	4.8	* 4	4.5	* 4.5
Max Green Setting (Gmax), s	5.0	49.2	9.0	29.5	12.0	* 43	9.0	* 30
Max Q Clear Time (g_c+I1), s	7.0	56.9	11.0	22.9	18.1	45.0	11.6	13.8
Green Ext Time (p_c), s	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.6

Intersection Summary	
HCM 6th Ctrl Delay	111.7
HCM 6th LOS	F

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	175	1375	15	270	45	0	0	65	40
Future Volume (veh/h)	0	0	0	175	1375	15	270	45	0	0	65	40
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772
Adj Flow Rate, veh/h				184	1447	16	284	47	0	0	68	42
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2
Cap, veh/h				205	1702	20	422	60	0	0	362	224
Arrive On Green				0.56	0.56	0.56	0.35	0.35	0.00	0.00	0.35	0.35
Sat Flow, veh/h				366	3034	35	1018	169	0	0	1022	631
Grp Volume(v), veh/h				861	0	786	331	0	0	0	0	110
Grp Sat Flow(s),veh/h/ln				1712	0	1723	1187	0	0	0	0	1653
Q Serve(g_s), s				48.9	0.0	40.5	24.4	0.0	0.0	0.0	0.0	5.1
Cycle Q Clear(g_c), s				48.9	0.0	40.5	29.4	0.0	0.0	0.0	0.0	5.1
Prop In Lane				0.21		0.02	0.86		0.00	0.00		0.38
Lane Grp Cap(c), veh/h				960	0	967	482	0	0	0	0	586
V/C Ratio(X)				0.90	0.00	0.81	0.69	0.00	0.00	0.00	0.00	0.19
Avail Cap(c_a), veh/h				980	0	987	482	0	0	0	0	586
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.79	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				21.3	0.0	19.5	34.7	0.0	0.0	0.0	0.0	24.5
Incr Delay (d2), s/veh				12.8	0.0	7.5	6.2	0.0	0.0	0.0	0.0	0.1
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				22.0	0.0	17.5	8.9	0.0	0.0	0.0	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				34.1	0.0	26.9	40.9	0.0	0.0	0.0	0.0	24.7
LnGrp LOS				C	A	C	D	A	A	A	A	C
Approach Vol, veh/h					1647			331			110	
Approach Delay, s/veh					30.7			40.9			24.7	
Approach LOS					C			D			C	
Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				43.0		65.7		43.0				
Change Period (Y+Rc), s				4.0		4.0		4.0				
Max Green Setting (Gmax), s				39.0		63.0		39.0				
Max Q Clear Time (g_c+I1), s				7.1		50.9		31.4				
Green Ext Time (p_c), s				0.3		10.8		0.9				
Intersection Summary												
HCM 6th Ctrl Delay			32.0									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	75	1535	555	0	0	0	0	240	245	40	210	0
Future Volume (veh/h)	75	1535	555	0	0	0	0	240	245	40	210	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772				0	1772	1772	1730	1730	0
Adj Flow Rate, veh/h	79	1616	0				0	253	258	42	221	0
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2				0	2	2	5	5	0
Cap, veh/h	97	2082					0	403	334	52	498	0
Arrive On Green	0.63	0.63	0.00				0.00	0.23	0.23	0.01	0.10	0.00
Sat Flow, veh/h	153	3294	1502				0	1772	1470	1647	1730	0
Grp Volume(v), veh/h	908	787	0				0	253	258	42	221	0
Grp Sat Flow(s),veh/h/ln	1764	1683	1502				0	1772	1470	1647	1730	0
Q Serve(g_s), s	42.9	35.5	0.0				0.0	14.2	18.1	2.8	13.3	0.0
Cycle Q Clear(g_c), s	42.9	35.5	0.0				0.0	14.2	18.1	2.8	13.3	0.0
Prop In Lane	0.09		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	1115	1064					0	403	334	52	498	0
V/C Ratio(X)	0.81	0.74					0.00	0.63	0.77	0.81	0.44	0.00
Avail Cap(c_a), veh/h	1115	1064					0	403	334	75	535	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	0.97	0.97	0.99	0.99	0.00
Uniform Delay (d), s/veh	15.3	14.0	0.0				0.0	38.3	39.8	54.1	41.5	0.0
Incr Delay (d2), s/veh	6.6	4.6	0.0				0.0	7.0	15.4	26.3	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	18.1	14.0	0.0				0.0	6.8	7.8	1.6	6.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.9	18.6	0.0				0.0	45.3	55.2	80.4	41.8	0.0
LnGrp LOS	C	B					A	D	E	F	D	A
Approach Vol, veh/h		1695						511			263	
Approach Delay, s/veh		20.4						50.3			48.0	
Approach LOS		C						D			D	

Timer - Assigned Phs		2		4			7	8
Phs Duration (G+Y+Rc), s		73.5		36.5			7.5	29.0
Change Period (Y+Rc), s		4.0		* 4.8			4.0	4.8
Max Green Setting (Gmax), s		68.0		* 34			5.0	24.2
Max Q Clear Time (g_c+I1), s		44.9		15.3			4.8	20.1
Green Ext Time (p_c), s		19.7		0.5			0.0	0.7

Intersection Summary	
HCM 6th Ctrl Delay	29.5
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	1450	125	10	1180	25	100	25	10	175	20	120
Future Volume (veh/h)	170	1450	125	10	1180	25	100	25	10	175	20	120
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758
Adj Flow Rate, veh/h	179	1526	132	11	1242	26	105	26	11	184	21	126
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	7	7	7	0	0	0	3	3	3
Cap, veh/h	343	2075	925	24	1398	623	272	64	23	258	24	142
Arrive On Green	0.20	0.62	0.62	0.01	0.43	0.43	0.25	0.26	0.24	0.25	0.26	0.24
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	842	250	92	812	96	558
Grp Volume(v), veh/h	179	1526	132	11	1242	26	142	0	0	331	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1500	1621	1617	1442	1185	0	0	1465	0	0
Q Serve(g_s), s	10.4	35.0	4.1	0.7	39.0	1.1	0.0	0.0	0.0	12.7	0.0	0.0
Cycle Q Clear(g_c), s	10.4	35.0	4.1	0.7	39.0	1.1	11.3	0.0	0.0	24.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.74		0.08	0.56		0.38
Lane Grp Cap(c), veh/h	343	2075	925	24	1398	623	354	0	0	418	0	0
V/C Ratio(X)	0.52	0.74	0.14	0.45	0.89	0.04	0.40	0.00	0.00	0.79	0.00	0.00
Avail Cap(c_a), veh/h	343	2075	925	66	1446	645	413	0	0	481	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	39.0	14.8	8.9	53.7	28.8	18.1	34.8	0.0	0.0	39.8	0.0	0.0
Incr Delay (d2), s/veh	1.0	2.4	0.3	7.9	8.8	0.1	0.5	0.0	0.0	7.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	13.4	1.4	0.3	15.8	0.4	3.3	0.0	0.0	9.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.0	17.2	9.2	61.7	37.5	18.2	35.3	0.0	0.0	47.1	0.0	0.0
LnGrp LOS	D	B	A	E	D	B	D	A	A	D	A	A
Approach Vol, veh/h		1837			1279			142			331	
Approach Delay, s/veh		18.8			37.4			35.3			47.1	
Approach LOS		B			D			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	72.3		32.1	26.4	51.5		32.1				
Change Period (Y+Rc), s	4.5	* 4.5		5.5	4.5	4.0		5.5				
Max Green Setting (Gmax), s	4.0	* 61		31.3	15.5	49.2		31.3				
Max Q Clear Time (g_c+I1), s	12.4	37.0		26.0	12.4	41.0		13.3				
Green Ext Time (p_c), s	0.0	19.6		0.5	0.1	6.6		0.4				

Intersection Summary	
HCM 6th Ctrl Delay	28.7
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	3.4					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱	↰	↑↑	↰	↱
Traffic Vol, veh/h	1535	90	30	1230	25	70
Future Vol, veh/h	1535	90	30	1230	25	70
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	300	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	6	6	0	0
Mvmt Flow	1616	95	32	1295	26	74

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1711	0	2328	808
Stage 1	-	-	-	-	1616	-
Stage 2	-	-	-	-	712	-
Critical Hdwy	-	-	4.22	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.26	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	350	-	32	328
Stage 1	-	-	-	-	151	-
Stage 2	-	-	-	-	453	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	350	-	29	328
Mov Cap-2 Maneuver	-	-	-	-	29	-
Stage 1	-	-	-	-	151	-
Stage 2	-	-	-	-	412	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	102.1
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	29	328	-	-	350	-
HCM Lane V/C Ratio	0.907	0.225	-	-	0.09	-
HCM Control Delay (s)	$ 334.4	19.1	-	-	16.3	-
HCM Lane LOS	F	C	-	-	C	-
HCM 95th %tile Q(veh)	3	0.8	-	-	0.3	-

Intersection	
Int Delay, s/veh	30.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	170	1435	0	100	1140	0	5	5	100	5	0	120
Future Vol, veh/h	170	1435	0	100	1140	0	5	5	100	5	0	120
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	100	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	3	3	2	2	6	6	2	2	2	0	2	0
Mvmt Flow	179	1511	0	105	1200	0	5	5	105	5	0	126

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1200	0	0	1511	0	0	2679	3279	756	2526	3279	600
Stage 1	-	-	-	-	-	-	1869	1869	-	1410	1410	-
Stage 2	-	-	-	-	-	-	810	1410	-	1116	1869	-
Critical Hdwy	4.16	-	-	4.14	-	-	7.54	6.54	6.94	7.5	6.54	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.5	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.5	5.54	-
Follow-up Hdwy	2.23	-	-	2.22	-	-	3.52	4.02	3.32	3.5	4.02	3.3
Pot Cap-1 Maneuver	572	-	-	439	-	-	11	9	351	14	9	449
Stage 1	-	-	-	-	-	-	75	120	-	148	203	-
Stage 2	-	-	-	-	-	-	340	203	-	225	120	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	572	-	-	439	-	-	~ 5	~ 5	351	-	5	449
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 5	~ 5	-	-	5	-
Stage 1	-	-	-	-	-	-	52	82	-	102	154	-
Stage 2	-	-	-	-	-	-	186	154	-	101	82	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.5	1.3	$ 824.8	
HCM LOS			F	-

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	48	572	-	-	439	-	-	-
HCM Lane V/C Ratio	2.412	0.313	-	-	0.24	-	-	-
HCM Control Delay (s)	$ 824.8	14.1	-	-	15.8	-	-	-
HCM Lane LOS	F	B	-	-	C	-	-	-
HCM 95th %tile Q(veh)	12.1	1.3	-	-	0.9	-	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection						
Int Delay, s/veh	0.4					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	1535	1235	25	10	0
Future Vol, veh/h	5	1535	1235	25	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	1616	1300	26	11	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1326	0	-	0	2131	663
Stage 1	-	-	-	-	1313	-
Stage 2	-	-	-	-	818	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	517	-	-	-	42	404
Stage 1	-	-	-	-	216	-
Stage 2	-	-	-	-	394	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	517	-	-	-	42	404
Mov Cap-2 Maneuver	-	-	-	-	42	-
Stage 1	-	-	-	-	214	-
Stage 2	-	-	-	-	394	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	117.3
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	517	-	-	-	42
HCM Lane V/C Ratio	0.01	-	-	-	0.251
HCM Control Delay (s)	12	-	-	-	117.3
HCM Lane LOS	B	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	0.8

SECTION 2. HCM REPORTS

FINANCIALLY CONSTRAINED WITHOUT PEAKING

HCM 6th Signalized Intersection Summary
1: SE Jarl Road/SE Orient Drive & US 26

01/03/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	2520	5	10	1750	225	10	50	10	260	10	20
Future Volume (veh/h)	60	2520	5	10	1750	225	10	50	10	260	10	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	60	2520	5	10	1750	0	10	50	10	260	10	20
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	83	1945	868	67	1884		13	66	13	302	94	189
Arrive On Green	0.05	0.58	0.58	0.04	0.57	0.00	0.06	0.06	0.06	0.18	0.18	0.18
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	222	1109	222	1688	527	1055
Grp Volume(v), veh/h	60	2520	5	10	1750	0	70	0	0	260	0	30
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1552	0	0	1688	0	1582
Q Serve(g_s), s	3.9	64.5	0.2	0.6	53.9	0.0	5.0	0.0	0.0	16.7	0.0	1.8
Cycle Q Clear(g_c), s	3.9	64.5	0.2	0.6	53.9	0.0	5.0	0.0	0.0	16.7	0.0	1.8
Prop In Lane	1.00		1.00	1.00		1.00	0.14		0.14	1.00		0.67
Lane Grp Cap(c), veh/h	83	1945	868	67	1884		93	0	0	302	0	283
V/C Ratio(X)	0.72	1.30	0.01	0.15	0.93		0.76	0.00	0.00	0.86	0.00	0.11
Avail Cap(c_a), veh/h	83	1945	868	82	1900		104	0	0	333	0	312
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	52.3	23.6	10.0	51.7	22.0	0.0	51.6	0.0	0.0	44.5	0.0	38.3
Incr Delay (d2), s/veh	24.3	137.0	0.0	0.6	8.9	0.0	20.1	0.0	0.0	18.7	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	58.0	0.0	0.3	19.7	0.0	2.5	0.0	0.0	8.6	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.5	160.5	10.0	52.3	30.9	0.0	71.6	0.0	0.0	63.2	0.0	38.5
LnGrp LOS	E	F	A	D	C		E	A	A	E	A	D
Approach Vol, veh/h		2585			1760			70			290	
Approach Delay, s/veh		158.3			31.0			71.6			60.6	
Approach LOS		F			C			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.5	67.5		24.0	8.5	68.5		10.7				
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5				
Max Green Setting (Gmax), s	5.0	61.0		21.0	5.0	61.0		7.0				
Max Q Clear Time (g_c+I1), s	5.9	55.9		18.7	2.6	66.5		7.0				
Green Ext Time (p_c), s	0.0	4.6		0.3	0.0	0.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		103.4
HCM 6th LOS		F

Notes
User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	300	1600	420	265	1525	340	335	150	325	150	175	170
Future Volume (veh/h)	300	1600	420	265	1525	340	335	150	325	150	175	170
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772
Adj Flow Rate, veh/h	300	1600	420	265	1525	340	335	150	325	150	175	170
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2
Cap, veh/h	198	1243	884	268	1418	820	761	402	343	226	237	201
Arrive On Green	0.08	0.37	0.36	0.26	0.86	0.82	0.23	0.23	0.23	0.13	0.13	0.13
Sat Flow, veh/h	1688	3367	1502	1661	3313	1502	3300	1772	1512	1688	1772	1502
Grp Volume(v), veh/h	300	1600	420	265	1525	340	335	150	325	150	175	170
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1502	1650	1772	1512	1688	1772	1502
Q Serve(g_s), s	11.0	48.0	20.8	16.3	55.6	7.3	11.3	9.3	27.5	11.0	12.3	14.4
Cycle Q Clear(g_c), s	11.0	48.0	20.8	16.3	55.6	7.3	11.3	9.3	27.5	11.0	12.3	14.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	198	1243	884	268	1418	820	761	402	343	226	237	201
V/C Ratio(X)	1.51	1.29	0.48	0.99	1.08	0.41	0.44	0.37	0.95	0.66	0.74	0.85
Avail Cap(c_a), veh/h	198	1243	884	268	1418	820	761	402	343	376	395	335
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.25	0.25	0.25	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.3	41.0	15.3	46.6	9.4	4.5	42.8	42.4	49.5	53.5	54.1	55.0
Incr Delay (d2), s/veh	255.4	135.4	1.8	24.9	38.1	0.4	0.2	0.4	34.8	2.5	3.3	7.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	18.5	41.9	11.6	8.7	10.8	2.0	4.6	4.1	13.6	4.8	5.7	5.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	292.7	176.4	17.1	71.5	47.5	4.9	43.1	42.8	84.3	56.0	57.5	62.7
LnGrp LOS	F	F	B	E	F	A	D	D	F	E	E	E
Approach Vol, veh/h		2320			2130			810			495	
Approach Delay, s/veh		162.6			43.7			59.6			58.8	
Approach LOS		F			D			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	22.6	52.0		21.4	15.0	59.6		34.0				
Change Period (Y+Rc), s	6.0	* 6		4.0	4.0	6.0		4.5				
Max Green Setting (Gmax), s	7.0	* 46		29.0	11.0	42.0		29.5				
Max Q Clear Time (g_c+I1), s	13.0	50.0		16.4	13.0	57.6		29.5				
Green Ext Time (p_c), s	0.0	0.0		1.0	0.0	0.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			95.2									
HCM 6th LOS			F									

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	1945	5	25	1795	50	170	35	250	230	15	170
Future Volume (vph)	65	1945	5	25	1795	50	170	35	250	230	15	170
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0		4.0		4.0	4.0	4.0
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (prot)	1676	3316		1644	3358	1471		1620		1624	1638	1508
Flt Permitted	0.06	1.00		0.06	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (perm)	99	3316		100	3358	1471		1620		1624	1638	1508
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	65	1945	5	25	1795	50	170	35	250	230	15	170
RTOR Reduction (vph)	0	0	0	0	0	23	0	33	0	0	0	114
Lane Group Flow (vph)	65	1950	0	25	1795	27	0	422	0	122	123	56
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						4
Actuated Green, G (s)	74.5	70.5		71.3	68.9	68.9		22.6		17.1	17.1	17.1
Effective Green, g (s)	75.5	71.9		71.3	70.3	70.3		22.6		17.1	17.1	17.1
Actuated g/C Ratio	0.58	0.55		0.55	0.54	0.54		0.17		0.13	0.13	0.13
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4		3.0		2.3	2.3	2.3
Lane Grp Cap (vph)	112	1834		83	1815	795		281		213	215	198
v/s Ratio Prot	c0.02	c0.59		0.01	0.53			c0.26		c0.08	0.08	
v/s Ratio Perm	0.32			0.16		0.02						0.04
v/c Ratio	0.58	1.06		0.30	0.99	0.03		1.50		0.57	0.57	0.28
Uniform Delay, d1	54.9	29.0		59.6	29.5	14.0		53.7		53.0	53.0	50.9
Progression Factor	0.45	0.48		0.78	0.67	2.58		1.00		1.00	1.00	1.00
Incremental Delay, d2	3.2	35.8		0.7	14.1	0.0		243.5		2.7	2.7	0.5
Delay (s)	28.2	49.8		47.3	33.9	36.0		297.2		55.8	55.7	51.4
Level of Service	C	D		D	C	D		F		E	E	D
Approach Delay (s)		49.1			34.1			297.2			54.0	
Approach LOS		D			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	67.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	102.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	175	2045	195	45	1650	100	120	35	40	270	35	135
Future Volume (vph)	175	2045	195	45	1650	100	120	35	40	270	35	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.94	1.00	1.00	*0.97	1.00		1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97		1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (prot)	1676	3318	1467	1644	3358	1432		1682	1461	1624	1646	1506
Flt Permitted	0.08	1.00	1.00	0.06	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (perm)	138	3318	1467	96	3358	1432		1682	1461	1624	1646	1506
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	175	2045	195	45	1650	100	120	35	40	270	35	135
RTOR Reduction (vph)	0	0	40	0	0	35	0	0	34	0	0	125
Lane Group Flow (vph)	175	2045	155	45	1650	65	0	155	6	151	154	10
Confl. Peds. (#/hr)			1			3	1		4	4		1
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6		6		8	8			4
Actuated Green, G (s)	81.6	80.2	80.2	75.6	75.6	75.6		19.2	19.2	10.0	10.0	10.0
Effective Green, g (s)	81.6	81.6	81.6	75.6	77.0	77.0		19.2	19.2	10.0	10.0	10.0
Actuated g/C Ratio	0.63	0.63	0.63	0.58	0.59	0.59		0.15	0.15	0.08	0.08	0.08
Clearance Time (s)	4.0	5.4	5.4	4.0	5.4	5.4		4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4	5.4	2.3	5.4	5.4		2.3	2.3	2.3	2.3	2.3
Lane Grp Cap (vph)	178	2082	920	93	1988	848		248	215	124	126	115
v/s Ratio Prot	0.06	c0.62		0.01	c0.49			c0.09		0.09	c0.09	
v/s Ratio Perm	0.55		0.11	0.27		0.05			0.00			0.01
v/c Ratio	0.98	0.98	0.17	0.48	0.83	0.08		0.62	0.03	1.22	1.22	0.09
Uniform Delay, d1	41.8	23.5	10.1	30.2	21.3	11.3		52.0	47.4	60.0	60.0	55.8
Progression Factor	0.66	0.42	0.28	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.3	3.1	0.0	2.3	4.2	0.2		3.9	0.0	150.8	151.8	0.2
Delay (s)	43.7	12.9	2.9	32.5	25.4	11.5		55.9	47.4	210.8	211.8	56.0
Level of Service	D	B	A	C	C	B		E	D	F	F	E
Approach Delay (s)		14.3			24.8			54.2			163.6	
Approach LOS		B			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	33.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	90.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	285	1910	155	95	1430	245	145	55	120	155	45	255
Future Volume (veh/h)	285	1910	155	95	1430	245	145	55	120	155	45	255
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786
Adj Flow Rate, veh/h	285	1910	155	95	1430	245	145	55	120	155	45	255
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1
Cap, veh/h	253	1692	753	75	1150	572	139	77	168	247	52	295
Arrive On Green	0.15	0.50	0.50	0.05	0.39	0.39	0.08	0.16	0.16	0.15	0.22	0.23
Sat Flow, veh/h	1688	3367	1499	1647	2941	1464	1701	493	1075	1701	232	1314
Grp Volume(v), veh/h	285	1910	155	95	1430	245	145	0	175	155	0	300
Grp Sat Flow(s),veh/h/ln	1688	1683	1499	1647	1470	1464	1701	0	1568	1701	0	1545
Q Serve(g_s), s	16.5	55.3	6.3	5.0	43.0	13.5	9.0	0.0	11.6	9.4	0.0	20.5
Cycle Q Clear(g_c), s	16.5	55.3	6.3	5.0	43.0	13.5	9.0	0.0	11.6	9.4	0.0	20.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.69	1.00		0.85
Lane Grp Cap(c), veh/h	253	1692	753	75	1150	572	139	0	246	247	0	347
V/C Ratio(X)	1.13	1.13	0.21	1.27	1.24	0.43	1.04	0.00	0.71	0.63	0.00	0.86
Avail Cap(c_a), veh/h	253	1692	753	75	1150	572	139	0	428	247	0	421
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.15	0.15	0.15	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	46.8	27.4	15.2	52.5	33.5	24.5	50.5	0.0	43.9	44.2	0.0	40.8
Incr Delay (d2), s/veh	65.8	59.5	0.1	192.3	117.3	2.3	87.9	0.0	2.4	4.2	0.0	13.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	11.3	34.2	2.2	6.1	33.8	5.1	7.2	0.0	4.7	4.3	0.0	9.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	112.5	86.8	15.3	244.8	150.8	26.8	138.4	0.0	46.2	48.4	0.0	54.2
LnGrp LOS	F	F	B	F	F	C	F	A	D	D	A	D
Approach Vol, veh/h		2350			1770			320			455	
Approach Delay, s/veh		85.2			138.7			88.0			52.2	
Approach LOS		F			F			F			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	59.3	13.0	28.7	21.3	47.0	20.5	21.2
Change Period (Y+Rc), s	4.0	4.8	4.0	4.5	4.8	* 4	4.5	* 4.5
Max Green Setting (Gmax), s	5.0	49.2	9.0	29.5	12.0	* 43	9.0	* 30
Max Q Clear Time (g_c+I1), s	7.0	57.3	11.0	22.5	18.5	45.0	11.4	13.6
Green Ext Time (p_c), s	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.6

Intersection Summary	
HCM 6th Ctrl Delay	101.7
HCM 6th LOS	F

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	175	1375	15	270	45	0	0	65	40
Future Volume (veh/h)	0	0	0	175	1375	15	270	45	0	0	65	40
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772
Adj Flow Rate, veh/h				175	1375	15	270	45	0	0	65	40
Peak Hour Factor				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2
Cap, veh/h				202	1672	19	426	61	0	0	363	223
Arrive On Green				0.55	0.55	0.55	0.35	0.35	0.00	0.00	0.35	0.35
Sat Flow, veh/h				366	3034	35	1029	172	0	0	1024	630
Grp Volume(v), veh/h				818	0	747	315	0	0	0	0	105
Grp Sat Flow(s),veh/h/ln				1711	0	1723	1201	0	0	0	0	1653
Q Serve(g_s), s				45.2	0.0	37.8	22.6	0.0	0.0	0.0	0.0	4.8
Cycle Q Clear(g_c), s				45.2	0.0	37.8	27.5	0.0	0.0	0.0	0.0	4.8
Prop In Lane				0.21		0.02	0.86		0.00	0.00		0.38
Lane Grp Cap(c), veh/h				943	0	950	486	0	0	0	0	586
V/C Ratio(X)				0.87	0.00	0.79	0.65	0.00	0.00	0.00	0.00	0.18
Avail Cap(c_a), veh/h				980	0	987	486	0	0	0	0	586
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.83	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				21.2	0.0	19.6	33.9	0.0	0.0	0.0	0.0	24.5
Incr Delay (d2), s/veh				10.6	0.0	6.6	5.5	0.0	0.0	0.0	0.0	0.1
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				20.1	0.0	16.3	8.3	0.0	0.0	0.0	0.0	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				31.8	0.0	26.1	39.4	0.0	0.0	0.0	0.0	24.6
LnGrp LOS				C	A	C	D	A	A	A	A	C
Approach Vol, veh/h					1565			315			105	
Approach Delay, s/veh					29.1			39.4			24.6	
Approach LOS					C			D			C	
Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				43.0		64.6		43.0				
Change Period (Y+Rc), s				4.0		4.0		4.0				
Max Green Setting (Gmax), s				39.0		63.0		39.0				
Max Q Clear Time (g_c+I1), s				6.8		47.2		29.5				
Green Ext Time (p_c), s				0.3		13.4		1.0				

Intersection Summary			
HCM 6th Ctrl Delay			30.5
HCM 6th LOS			C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	75	1535	555	0	0	0	0	240	245	40	210	0
Future Volume (veh/h)	75	1535	555	0	0	0	0	240	245	40	210	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772				0	1772	1772	1730	1730	0
Adj Flow Rate, veh/h	75	1535	0				0	240	245	40	210	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	5	5	0
Cap, veh/h	97	2088					0	403	334	49	495	0
Arrive On Green	0.63	0.63	0.00				0.00	0.23	0.23	0.01	0.09	0.00
Sat Flow, veh/h	153	3294	1502				0	1772	1470	1647	1730	0
Grp Volume(v), veh/h	863	747	0				0	240	245	40	210	0
Grp Sat Flow(s),veh/h/ln	1764	1683	1502				0	1772	1470	1647	1730	0
Q Serve(g_s), s	38.5	32.2	0.0				0.0	13.3	17.0	2.7	12.6	0.0
Cycle Q Clear(g_c), s	38.5	32.2	0.0				0.0	13.3	17.0	2.7	12.6	0.0
Prop In Lane	0.09		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	1118	1067					0	403	334	49	495	0
V/C Ratio(X)	0.77	0.70					0.00	0.60	0.73	0.81	0.42	0.00
Avail Cap(c_a), veh/h	1118	1067					0	403	334	75	535	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	0.97	0.97	0.99	0.99	0.00
Uniform Delay (d), s/veh	14.4	13.3	0.0				0.0	38.0	39.4	54.1	41.2	0.0
Incr Delay (d2), s/veh	5.2	3.8	0.0				0.0	6.2	13.0	23.3	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	16.0	12.6	0.0				0.0	6.3	7.2	1.4	5.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.6	17.1	0.0				0.0	44.2	52.4	77.5	41.6	0.0
LnGrp LOS	B	B					A	D	D	E	D	A
Approach Vol, veh/h		1610						485			250	
Approach Delay, s/veh		18.5						48.3			47.3	
Approach LOS		B						D			D	

Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		73.7		36.3			7.3	29.0				
Change Period (Y+Rc), s		4.0		* 4.8			4.0	4.8				
Max Green Setting (Gmax), s		68.0		* 34			5.0	24.2				
Max Q Clear Time (g_c+I1), s		40.5		14.6			4.7	19.0				
Green Ext Time (p_c), s		22.0		0.5			0.0	0.8				

Intersection Summary		
HCM 6th Ctrl Delay		27.7
HCM 6th LOS		C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱		✣			✣	
Traffic Volume (veh/h)	170	1450	125	10	1180	25	100	25	10	175	20	120
Future Volume (veh/h)	170	1450	125	10	1180	25	100	25	10	175	20	120
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758
Adj Flow Rate, veh/h	170	1450	125	10	1180	25	100	25	10	175	20	120
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	7	7	7	0	0	0	3	3	3
Cap, veh/h	377	2114	942	23	1367	610	264	62	22	249	24	137
Arrive On Green	0.22	0.63	0.63	0.01	0.42	0.42	0.24	0.24	0.23	0.24	0.24	0.23
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	845	255	88	811	98	559
Grp Volume(v), veh/h	170	1450	125	10	1180	25	135	0	0	315	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1500	1621	1617	1442	1188	0	0	1469	0	0
Q Serve(g_s), s	9.6	31.0	3.7	0.7	36.5	1.1	0.0	0.0	0.0	12.0	0.0	0.0
Cycle Q Clear(g_c), s	9.6	31.0	3.7	0.7	36.5	1.1	10.8	0.0	0.0	22.8	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.74		0.07	0.56		0.38
Lane Grp Cap(c), veh/h	377	2114	942	23	1367	610	342	0	0	403	0	0
V/C Ratio(X)	0.45	0.69	0.13	0.44	0.86	0.04	0.39	0.00	0.00	0.78	0.00	0.00
Avail Cap(c_a), veh/h	377	2114	942	66	1446	645	417	0	0	481	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	36.9	13.4	8.3	53.8	28.9	18.6	35.5	0.0	0.0	40.4	0.0	0.0
Incr Delay (d2), s/veh	0.5	1.8	0.3	7.8	7.4	0.1	0.5	0.0	0.0	6.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.0	11.6	1.3	0.3	14.7	0.4	3.2	0.0	0.0	8.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.4	15.2	8.6	61.6	36.3	18.8	36.1	0.0	0.0	46.6	0.0	0.0
LnGrp LOS	D	B	A	E	D	B	D	A	A	D	A	A
Approach Vol, veh/h		1745			1215			135			315	
Approach Delay, s/veh		16.9			36.1			36.1			46.6	
Approach LOS		B			D			D			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	73.6		30.9	28.6	50.5		30.9				
Change Period (Y+Rc), s	4.5	* 4.5		5.5	4.5	4.0		5.5				
Max Green Setting (Gmax), s	4.0	* 61		31.3	15.5	49.2		31.3				
Max Q Clear Time (g_c+I1), s	2.7	33.0		24.8	11.6	38.5		12.8				
Green Ext Time (p_c), s	0.0	21.5		0.6	0.2	8.0		0.4				

Intersection Summary		
HCM 6th Ctrl Delay		27.3
HCM 6th LOS		C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	2.6					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱	↰	↑↑	↰	↱
Traffic Vol, veh/h	1535	90	30	1230	25	70
Future Vol, veh/h	1535	90	30	1230	25	70
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	300	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	6	6	0	0
Mvmt Flow	1535	90	30	1230	25	70

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1625	0	2210	768
Stage 1	-	-	-	-	1535	-
Stage 2	-	-	-	-	675	-
Critical Hdwy	-	-	4.22	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.26	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	378	-	38	349
Stage 1	-	-	-	-	167	-
Stage 2	-	-	-	-	473	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	378	-	35	349
Mov Cap-2 Maneuver	-	-	-	-	35	-
Stage 1	-	-	-	-	167	-
Stage 2	-	-	-	-	436	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	75.4
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	35	349	-	-	378	-
HCM Lane V/C Ratio	0.714	0.201	-	-	0.079	-
HCM Control Delay (s)	236.4	17.9	-	-	15.3	-
HCM Lane LOS	F	C	-	-	C	-
HCM 95th %tile Q(veh)	2.5	0.7	-	-	0.3	-

Intersection	
Int Delay, s/veh	45.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	170	1435	0	100	1140	0	5	5	100	5	0	120
Future Vol, veh/h	170	1435	0	100	1140	0	5	5	100	5	0	120
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	100	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	3	3	2	2	6	6	2	2	2	0	2	0
Mvmt Flow	170	1435	0	100	1140	0	5	5	100	5	0	120

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1140	0	0	1435	0	0	2545	3115	718	2400	3115	570
Stage 1	-	-	-	-	-	-	1775	1775	-	1340	1340	-
Stage 2	-	-	-	-	-	-	770	1340	-	1060	1775	-
Critical Hdwy	4.16	-	-	4.14	-	-	7.54	6.54	6.94	7.5	6.54	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.5	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.5	5.54	-
Follow-up Hdwy	2.23	-	-	2.22	-	-	3.52	4.02	3.32	3.5	4.02	3.3
Pot Cap-1 Maneuver	603	-	-	469	-	-	13	11	371	18	11	470
Stage 1	-	-	-	-	-	-	86	134	-	164	220	-
Stage 2	-	-	-	-	-	-	359	220	-	243	134	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	603	-	-	469	-	-	6	6	371	~ 3	6	470
Mov Cap-2 Maneuver	-	-	-	-	-	-	6	6	-	~ 3	6	-
Stage 1	-	-	-	-	-	-	62	96	-	118	173	-
Stage 2	-	-	-	-	-	-	210	173	-	121	96	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	1.2	$ 591.4	$ 569.8
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	57	603	-	-	469	-	-	65
HCM Lane V/C Ratio	1.93	0.282	-	-	0.213	-	-	1.923
HCM Control Delay (s)	$ 591.4	13.3	-	-	14.7	-	-	$ 569.8
HCM Lane LOS	F	B	-	-	B	-	-	F
HCM 95th %tile Q(veh)	10.5	1.2	-	-	0.8	-	-	11.6

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	0.3					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	1535	1235	25	10	0
Future Vol, veh/h	5	1535	1235	25	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	1535	1235	25	10	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1260	0	-	0	2026	630
Stage 1	-	-	-	-	1248	-
Stage 2	-	-	-	-	778	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	548	-	-	-	50	424
Stage 1	-	-	-	-	234	-
Stage 2	-	-	-	-	413	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	548	-	-	-	50	424
Mov Cap-2 Maneuver	-	-	-	-	50	-
Stage 1	-	-	-	-	232	-
Stage 2	-	-	-	-	413	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	94.2
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	548	-	-	-	50
HCM Lane V/C Ratio	0.009	-	-	-	0.2
HCM Control Delay (s)	11.6	-	-	-	94.2
HCM Lane LOS	B	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	0.7

SECTION 3. HCM REPORTS

AVERAGE WEEKDAY

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	2350	5	10	1635	210	10	45	10	245	10	20
Future Volume (veh/h)	55	2350	5	10	1635	210	10	45	10	245	10	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	58	2474	5	11	1721	0	11	47	11	258	11	21
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	84	1946	868	67	1885		15	62	15	301	97	185
Arrive On Green	0.05	0.58	0.58	0.04	0.57	0.00	0.06	0.06	0.06	0.18	0.18	0.18
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	247	1054	247	1688	545	1040
Grp Volume(v), veh/h	58	2474	5	11	1721	0	69	0	0	258	0	32
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1547	0	0	1688	0	1585
Q Serve(g_s), s	3.7	64.1	0.2	0.7	51.7	0.0	4.9	0.0	0.0	16.4	0.0	1.9
Cycle Q Clear(g_c), s	3.7	64.1	0.2	0.7	51.7	0.0	4.9	0.0	0.0	16.4	0.0	1.9
Prop In Lane	1.00		1.00	1.00		1.00	0.16		0.16	1.00		0.66
Lane Grp Cap(c), veh/h	84	1946	868	67	1885		91	0	0	301	0	282
V/C Ratio(X)	0.69	1.27	0.01	0.16	0.91		0.76	0.00	0.00	0.86	0.00	0.11
Avail Cap(c_a), veh/h	84	1946	868	82	1913		105	0	0	335	0	314
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	51.8	23.4	9.9	51.4	21.4	0.0	51.3	0.0	0.0	44.2	0.0	38.2
Incr Delay (d2), s/veh	19.8	126.4	0.0	0.7	7.5	0.0	19.3	0.0	0.0	18.1	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	54.9	0.0	0.3	18.6	0.0	2.4	0.0	0.0	8.4	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	71.6	149.8	9.9	52.0	29.0	0.0	70.6	0.0	0.0	62.3	0.0	38.4
LnGrp LOS	E	F	A	D	C		E	A	A	E	A	D
Approach Vol, veh/h		2537			1732			69			290	
Approach Delay, s/veh		147.8			29.1			70.6			59.6	
Approach LOS		F			C			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.5	67.1		23.7	8.5	68.1		10.5				
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5				
Max Green Setting (Gmax), s	5.0	61.0		21.0	5.0	61.0		7.0				
Max Q Clear Time (g_c+I1), s	5.7	53.7		18.4	2.7	66.1		6.9				
Green Ext Time (p_c), s	0.0	6.4		0.3	0.0	0.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			96.7									
HCM 6th LOS			F									

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	280	1495	390	245	1425	315	315	140	305	140	165	160
Future Volume (veh/h)	280	1495	390	245	1425	315	315	140	305	140	165	160
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772
Adj Flow Rate, veh/h	295	1574	411	258	1500	332	332	147	321	147	174	168
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2
Cap, veh/h	198	1243	881	273	1429	823	755	399	340	223	234	199
Arrive On Green	0.08	0.37	0.36	0.26	0.86	0.83	0.23	0.23	0.23	0.13	0.13	0.13
Sat Flow, veh/h	1688	3367	1502	1661	3313	1502	3300	1772	1512	1688	1772	1502
Grp Volume(v), veh/h	295	1574	411	258	1500	332	332	147	321	147	174	168
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1502	1650	1772	1512	1688	1772	1502
Q Serve(g_s), s	11.0	48.0	20.3	15.3	56.0	6.7	11.2	9.1	27.2	10.8	12.3	14.2
Cycle Q Clear(g_c), s	11.0	48.0	20.3	15.3	56.0	6.7	11.2	9.1	27.2	10.8	12.3	14.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	198	1243	881	273	1429	823	755	399	340	223	234	199
V/C Ratio(X)	1.49	1.27	0.47	0.94	1.05	0.40	0.44	0.37	0.94	0.66	0.74	0.85
Avail Cap(c_a), veh/h	198	1243	881	273	1429	823	761	402	343	376	395	335
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.35	0.35	0.35	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.3	41.0	15.3	45.7	8.9	4.3	43.0	42.6	49.6	53.6	54.3	55.1
Incr Delay (d2), s/veh	244.7	126.3	1.8	19.8	29.6	0.5	0.2	0.3	33.8	2.5	3.4	7.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	17.9	40.3	11.3	8.1	9.1	1.9	4.6	4.0	13.3	4.7	5.7	5.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	282.0	167.3	17.1	65.4	38.5	4.8	43.2	42.9	83.4	56.1	57.7	62.4
LnGrp LOS	F	F	B	E	F	A	D	D	F	E	E	E
Approach Vol, veh/h		2280			2090			800			489	
Approach Delay, s/veh		155.1			36.5			59.3			58.8	
Approach LOS		F			D			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	23.1	52.0		21.2	15.0	60.1		33.8
Change Period (Y+Rc), s	6.0	* 6		4.0	4.0	6.0		4.5
Max Green Setting (Gmax), s	7.0	* 46		29.0	11.0	42.0		29.5
Max Q Clear Time (g_c+I1), s	17.3	50.0		16.2	13.0	58.0		29.2
Green Ext Time (p_c), s	0.0	0.0		1.0	0.0	0.0		0.1

Intersection Summary	
HCM 6th Ctrl Delay	89.4
HCM 6th LOS	F

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	1815	5	25	1675	45	160	35	235	215	15	160
Future Volume (vph)	60	1815	5	25	1675	45	160	35	235	215	15	160
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0		4.0		4.0	4.0	4.0
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (prot)	1676	3316		1644	3358	1471		1621		1624	1638	1508
Flt Permitted	0.06	1.00		0.06	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (perm)	99	3316		100	3358	1471		1621		1624	1638	1508
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	61	1852	5	26	1709	46	163	36	240	219	15	163
RTOR Reduction (vph)	0	0	0	0	0	21	0	33	0	0	0	118
Lane Group Flow (vph)	61	1857	0	26	1709	25	0	406	0	116	118	45
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						4
Actuated Green, G (s)	74.8	70.8		71.6	69.2	69.2		22.6		16.8	16.8	16.8
Effective Green, g (s)	75.8	72.2		71.6	70.6	70.6		22.6		16.8	16.8	16.8
Actuated g/C Ratio	0.58	0.56		0.55	0.54	0.54		0.17		0.13	0.13	0.13
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4		3.0		2.3	2.3	2.3
Lane Grp Cap (vph)	112	1841		83	1823	798		281		209	211	194
v/s Ratio Prot	c0.02	c0.56		0.01	0.51			c0.25		0.07	c0.07	
v/s Ratio Perm	0.30			0.17		0.02						0.03
v/c Ratio	0.54	1.01		0.31	0.94	0.03		1.44		0.56	0.56	0.23
Uniform Delay, d1	51.8	28.9		59.7	27.6	13.8		53.7		53.1	53.1	50.8
Progression Factor	0.45	0.47		0.77	0.66	2.84		1.00		1.00	1.00	1.00
Incremental Delay, d2	2.2	18.2		0.9	7.8	0.0		219.1		2.3	2.3	0.4
Delay (s)	25.3	31.9		46.7	25.9	39.3		272.8		55.3	55.4	51.1
Level of Service	C	C		D	C	D		F		E	E	D
Approach Delay (s)		31.7			26.6			272.8			53.6	
Approach LOS		C			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	54.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	97.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	165	1910	180	40	1540	95	110	35	35	250	35	125
Future Volume (vph)	165	1910	180	40	1540	95	110	35	35	250	35	125
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.94	1.00	1.00	*0.97	1.00		1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97		1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (prot)	1676	3318	1467	1644	3358	1432		1684	1461	1624	1648	1506
Flt Permitted	0.10	1.00	1.00	0.05	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (perm)	174	3318	1467	95	3358	1432		1684	1461	1624	1648	1506
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	167	1929	182	40	1556	96	111	35	35	253	35	126
RTOR Reduction (vph)	0	0	39	0	0	35	0	0	30	0	0	116
Lane Group Flow (vph)	167	1929	143	40	1556	61	0	146	5	144	144	10
Confl. Peds. (#/hr)			1			3	1		4	4		1
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6		6		8	8			4
Actuated Green, G (s)	82.1	80.7	80.7	76.1	76.1	76.1		18.7	18.7	10.0	10.0	10.0
Effective Green, g (s)	82.1	82.1	82.1	76.1	77.5	77.5		18.7	18.7	10.0	10.0	10.0
Actuated g/C Ratio	0.63	0.63	0.63	0.59	0.60	0.60		0.14	0.14	0.08	0.08	0.08
Clearance Time (s)	4.0	5.4	5.4	4.0	5.4	5.4		4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4	5.4	2.3	5.4	5.4		2.3	2.3	2.3	2.3	2.3
Lane Grp Cap (vph)	200	2095	926	93	2001	853		242	210	124	126	115
v/s Ratio Prot	0.05	c0.58		0.01	c0.46			c0.09		c0.09	0.09	
v/s Ratio Perm	0.48		0.10	0.24		0.04			0.00			0.01
v/c Ratio	0.83	0.92	0.15	0.43	0.78	0.07		0.60	0.02	1.16	1.14	0.08
Uniform Delay, d1	38.1	21.1	9.8	27.9	19.8	11.1		52.2	47.8	60.0	60.0	55.7
Progression Factor	0.61	0.40	0.27	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.7	2.8	0.1	1.9	3.1	0.2		3.3	0.0	130.6	123.7	0.2
Delay (s)	32.0	11.2	2.7	29.7	22.8	11.2		55.5	47.8	190.6	183.7	55.9
Level of Service	C	B	A	C	C	B		E	D	F	F	E
Approach Delay (s)		12.0			22.3			54.0			147.2	
Approach LOS		B			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	29.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	265	1780	145	90	1335	230	135	50	110	145	40	240
Future Volume (veh/h)	265	1780	145	90	1335	230	135	50	110	145	40	240
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786
Adj Flow Rate, veh/h	270	1816	148	92	1362	235	138	51	112	148	41	245
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1
Cap, veh/h	265	1716	764	75	1150	572	139	74	162	246	48	288
Arrive On Green	0.16	0.51	0.51	0.05	0.39	0.39	0.08	0.15	0.15	0.14	0.22	0.22
Sat Flow, veh/h	1688	3367	1499	1647	2941	1464	1701	490	1077	1701	221	1322
Grp Volume(v), veh/h	270	1816	148	92	1362	235	138	0	163	148	0	286
Grp Sat Flow(s),veh/h/ln	1688	1683	1499	1647	1470	1464	1701	0	1567	1701	0	1544
Q Serve(g_s), s	17.3	56.1	5.9	5.0	43.0	12.8	8.9	0.0	10.8	9.0	0.0	19.6
Cycle Q Clear(g_c), s	17.3	56.1	5.9	5.0	43.0	12.8	8.9	0.0	10.8	9.0	0.0	19.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.69	1.00		0.86
Lane Grp Cap(c), veh/h	265	1716	764	75	1150	572	139	0	236	246	0	336
V/C Ratio(X)	1.02	1.06	0.19	1.23	1.18	0.41	0.99	0.00	0.69	0.60	0.00	0.85
Avail Cap(c_a), veh/h	265	1716	764	75	1150	572	139	0	427	246	0	421
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.28	0.28	0.28	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	46.4	27.0	14.7	52.5	33.5	24.3	50.5	0.0	44.1	44.1	0.0	41.1
Incr Delay (d2), s/veh	34.3	30.8	0.2	177.7	92.2	2.2	73.6	0.0	2.2	3.4	0.0	11.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.6	27.7	0.0	5.8	29.8	4.8	6.7	0.0	4.4	4.0	0.0	8.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	80.7	57.8	14.8	230.2	125.7	26.5	124.0	0.0	46.4	47.4	0.0	52.7
LnGrp LOS	F	F	B	F	F	C	F	A	D	D	A	D
Approach Vol, veh/h		2234			1689			301			434	
Approach Delay, s/veh		57.7			117.6			82.0			50.9	
Approach LOS		E			F			F			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	60.1	13.0	27.9	22.1	47.0	20.4	20.5
Change Period (Y+Rc), s	4.0	4.8	4.0	4.5	4.8	* 4	4.5	* 4.5
Max Green Setting (Gmax), s	5.0	49.2	9.0	29.5	12.0	* 43	9.0	* 30
Max Q Clear Time (g_c+I1), s	7.0	58.1	10.9	21.6	19.3	45.0	11.0	12.8
Green Ext Time (p_c), s	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.5

Intersection Summary	
HCM 6th Ctrl Delay	80.4
HCM 6th LOS	F

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	165	1285	15	250	40	0	0	60	35
Future Volume (veh/h)	0	0	0	165	1285	15	250	40	0	0	60	35
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772
Adj Flow Rate, veh/h				174	1353	16	263	42	0	0	63	37
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2
Cap, veh/h				202	1659	20	432	59	0	0	370	217
Arrive On Green				0.55	0.55	0.55	0.35	0.35	0.00	0.00	0.35	0.35
Sat Flow, veh/h				369	3027	37	1046	167	0	0	1044	613
Grp Volume(v), veh/h				806	0	737	305	0	0	0	0	100
Grp Sat Flow(s),veh/h/ln				1711	0	1723	1213	0	0	0	0	1657
Q Serve(g_s), s				44.3	0.0	37.2	21.6	0.0	0.0	0.0	0.0	4.6
Cycle Q Clear(g_c), s				44.3	0.0	37.2	26.1	0.0	0.0	0.0	0.0	4.6
Prop In Lane				0.22		0.02	0.86		0.00	0.00		0.37
Lane Grp Cap(c), veh/h				938	0	944	491	0	0	0	0	587
V/C Ratio(X)				0.86	0.00	0.78	0.62	0.00	0.00	0.00	0.00	0.17
Avail Cap(c_a), veh/h				980	0	987	491	0	0	0	0	587
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.86	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				21.2	0.0	19.6	33.4	0.0	0.0	0.0	0.0	24.4
Incr Delay (d2), s/veh				10.1	0.0	6.4	5.0	0.0	0.0	0.0	0.0	0.1
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				19.7	0.0	16.0	7.9	0.0	0.0	0.0	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				31.4	0.0	26.0	38.4	0.0	0.0	0.0	0.0	24.5
LnGrp LOS				C	A	C	D	A	A	A	A	C
Approach Vol, veh/h					1543			305			100	
Approach Delay, s/veh					28.8			38.4			24.5	
Approach LOS					C			D			C	
Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				43.0		64.3		43.0				
Change Period (Y+Rc), s				4.0		4.0		4.0				
Max Green Setting (Gmax), s				39.0		63.0		39.0				
Max Q Clear Time (g_c+I1), s				6.6		46.3		28.1				
Green Ext Time (p_c), s				0.3		14.0		1.0				
Intersection Summary												
HCM 6th Ctrl Delay			30.1									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	1430	520	0	0	0	0	225	230	35	195	0
Future Volume (veh/h)	70	1430	520	0	0	0	0	225	230	35	195	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772				0	1772	1772	1730	1730	0
Adj Flow Rate, veh/h	74	1505	0				0	237	242	37	205	0
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2				0	2	2	5	5	0
Cap, veh/h	98	2095					0	403	334	45	491	0
Arrive On Green	0.64	0.64	0.00				0.00	0.23	0.23	0.01	0.09	0.00
Sat Flow, veh/h	154	3293	1502				0	1772	1470	1647	1730	0
Grp Volume(v), veh/h	846	733	0				0	237	242	37	205	0
Grp Sat Flow(s),veh/h/ln	1764	1683	1502				0	1772	1470	1647	1730	0
Q Serve(g_s), s	36.9	30.9	0.0				0.0	13.1	16.8	2.5	12.3	0.0
Cycle Q Clear(g_c), s	36.9	30.9	0.0				0.0	13.1	16.8	2.5	12.3	0.0
Prop In Lane	0.09		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	1122	1071					0	403	334	45	491	0
V/C Ratio(X)	0.75	0.68					0.00	0.59	0.72	0.82	0.42	0.00
Avail Cap(c_a), veh/h	1122	1071					0	403	334	75	535	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	0.98	0.98	0.99	0.99	0.00
Uniform Delay (d), s/veh	14.0	12.9	0.0				0.0	37.9	39.3	54.2	41.3	0.0
Incr Delay (d2), s/veh	4.7	3.6	0.0				0.0	6.1	12.6	18.8	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.2	12.1	0.0				0.0	6.2	7.0	1.3	5.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.7	16.5	0.0				0.0	44.0	51.9	73.0	41.6	0.0
LnGrp LOS	B	B					A	D	D	E	D	A
Approach Vol, veh/h		1579						479			242	
Approach Delay, s/veh		17.7						48.0			46.4	
Approach LOS		B						D			D	

Timer - Assigned Phs		2		4			7	8
Phs Duration (G+Y+Rc), s		74.0		36.0			7.0	29.0
Change Period (Y+Rc), s		4.0		* 4.8			4.0	4.8
Max Green Setting (Gmax), s		68.0		* 34			5.0	24.2
Max Q Clear Time (g_c+I1), s		38.9		14.3			4.5	18.8
Green Ext Time (p_c), s		22.7		0.5			0.0	0.8

Intersection Summary	
HCM 6th Ctrl Delay	27.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	160	1355	115	10	1100	25	95	25	10	165	20	110
Future Volume (veh/h)	160	1355	115	10	1100	25	95	25	10	165	20	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758
Adj Flow Rate, veh/h	168	1426	121	11	1158	26	100	26	11	174	21	116
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	7	7	7	0	0	0	3	3	3
Cap, veh/h	387	2117	943	24	1355	604	260	64	23	248	25	132
Arrive On Green	0.23	0.63	0.63	0.01	0.42	0.42	0.24	0.24	0.23	0.24	0.24	0.23
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	840	265	96	813	104	546
Grp Volume(v), veh/h	168	1426	121	11	1158	26	137	0	0	311	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1500	1621	1617	1442	1201	0	0	1463	0	0
Q Serve(g_s), s	9.4	30.0	3.6	0.7	35.7	1.2	0.0	0.0	0.0	11.7	0.0	0.0
Cycle Q Clear(g_c), s	9.4	30.0	3.6	0.7	35.7	1.2	10.9	0.0	0.0	22.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.73		0.08	0.56		0.37
Lane Grp Cap(c), veh/h	387	2117	943	24	1355	604	343	0	0	399	0	0
V/C Ratio(X)	0.43	0.67	0.13	0.45	0.85	0.04	0.40	0.00	0.00	0.78	0.00	0.00
Avail Cap(c_a), veh/h	387	2117	943	66	1446	645	420	0	0	480	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	36.3	13.1	8.2	53.7	28.9	18.9	35.7	0.0	0.0	40.5	0.0	0.0
Incr Delay (d2), s/veh	0.5	1.7	0.3	7.9	7.0	0.1	0.6	0.0	0.0	6.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	11.2	1.2	0.3	14.3	0.4	3.2	0.0	0.0	8.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.8	14.9	8.5	61.7	36.0	19.0	36.3	0.0	0.0	46.6	0.0	0.0
LnGrp LOS	D	B	A	E	D	B	D	A	A	D	A	A
Approach Vol, veh/h		1715			1195			137			311	
Approach Delay, s/veh		16.6			35.8			36.3			46.6	
Approach LOS		B			D			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.6	73.7		30.7	29.2	50.1		30.7
Change Period (Y+Rc), s	4.5	* 4.5		5.5	4.5	4.0		5.5
Max Green Setting (Gmax), s	4.0	* 61		31.3	15.5	49.2		31.3
Max Q Clear Time (g_c+I1), s	2.7	32.0		24.6	11.4	37.7		12.9
Green Ext Time (p_c), s	0.0	21.8		0.6	0.2	8.4		0.4

Intersection Summary	
HCM 6th Ctrl Delay	27.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	2.5					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1430	85	30	1150	25	65
Future Vol, veh/h	1430	85	30	1150	25	65
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	300	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	6	6	0	0
Mvmt Flow	1505	89	32	1211	26	68

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1594	0	2175	753
Stage 1	-	-	-	-	1505	-
Stage 2	-	-	-	-	670	-
Critical Hdwy	-	-	4.22	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.26	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	389	-	41	357
Stage 1	-	-	-	-	173	-
Stage 2	-	-	-	-	476	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	389	-	38	357
Mov Cap-2 Maneuver	-	-	-	-	38	-
Stage 1	-	-	-	-	173	-
Stage 2	-	-	-	-	437	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	72.6
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	38	357	-	-	389	-
HCM Lane V/C Ratio	0.693	0.192	-	-	0.081	-
HCM Control Delay (s)	215.8	17.5	-	-	15.1	-
HCM Lane LOS	F	C	-	-	C	-
HCM 95th %tile Q(veh)	2.5	0.7	-	-	0.3	-

Intersection	
Int Delay, s/veh	35.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	160	1340	0	95	1065	0	5	5	95	5	0	110
Future Vol, veh/h	160	1340	0	95	1065	0	5	5	95	5	0	110
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	100	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	3	3	2	2	6	6	2	2	2	0	2	0
Mvmt Flow	168	1411	0	100	1121	0	5	5	100	5	0	116

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1121	0	0	1411	0	0	2508	3068	706	2365	3068	561
Stage 1	-	-	-	-	-	-	1747	1747	-	1321	1321	-
Stage 2	-	-	-	-	-	-	761	1321	-	1044	1747	-
Critical Hdwy	4.16	-	-	4.14	-	-	7.54	6.54	6.94	7.5	6.54	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.5	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.5	5.54	-
Follow-up Hdwy	2.23	-	-	2.22	-	-	3.52	4.02	3.32	3.5	4.02	3.3
Pot Cap-1 Maneuver	613	-	-	479	-	-	14	12	378	19	12	476
Stage 1	-	-	-	-	-	-	89	138	-	168	224	-
Stage 2	-	-	-	-	-	-	364	224	-	249	138	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	613	-	-	479	-	-	7	7	378	~ 4	7	476
Mov Cap-2 Maneuver	-	-	-	-	-	-	7	7	-	~ 4	7	-
Stage 1	-	-	-	-	-	-	65	100	-	122	177	-
Stage 2	-	-	-	-	-	-	218	177	-	126	100	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	1.2	$ 503.8	$ 393.6
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	63	613	-	-	479	-	-	78
HCM Lane V/C Ratio	1.754	0.275	-	-	0.209	-	-	1.552
HCM Control Delay (s)	$ 503.8	13.1	-	-	14.5	-	-	$ 393.6
HCM Lane LOS	F	B	-	-	B	-	-	F
HCM 95th %tile Q(veh)	10.1	1.1	-	-	0.8	-	-	9.9

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	1430	1150	25	10	0
Future Vol, veh/h	5	1430	1150	25	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	1505	1211	26	11	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1237	0	-	0	1987	619
Stage 1	-	-	-	-	1224	-
Stage 2	-	-	-	-	763	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	559	-	-	-	53	432
Stage 1	-	-	-	-	241	-
Stage 2	-	-	-	-	421	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	559	-	-	-	53	432
Mov Cap-2 Maneuver	-	-	-	-	53	-
Stage 1	-	-	-	-	239	-
Stage 2	-	-	-	-	421	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	89
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	559	-	-	-	53
HCM Lane V/C Ratio	0.009	-	-	-	0.199
HCM Control Delay (s)	11.5	-	-	-	89
HCM Lane LOS	B	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	0.7

SECTION 4. HCM REPORTS

AVERAGE WEEKDAY SECOND HOUR WITH SPREADING

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	2570	10	30	1670	215	10	0	10	235	0	10
Future Volume (veh/h)	40	2570	10	30	1670	215	10	0	10	235	0	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	42	2705	11	32	1758	0	11	0	11	247	0	11
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	81	2027	904	70	1977		23	0	23	293	0	260
Arrive On Green	0.05	0.60	0.60	0.04	0.60	0.00	0.04	0.00	0.04	0.17	0.00	0.17
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	719	0	719	1688	0	1502
Grp Volume(v), veh/h	42	2705	11	32	1758	0	22	0	0	247	0	11
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1438	0	0	1688	0	1502
Q Serve(g_s), s	2.6	64.0	0.3	2.0	48.5	0.0	1.6	0.0	0.0	15.1	0.0	0.6
Cycle Q Clear(g_c), s	2.6	64.0	0.3	2.0	48.5	0.0	1.6	0.0	0.0	15.1	0.0	0.6
Prop In Lane	1.00		1.00	1.00		1.00	0.50		0.50	1.00		1.00
Lane Grp Cap(c), veh/h	81	2027	904	70	1977		46	0	0	293	0	260
V/C Ratio(X)	0.52	1.33	0.01	0.45	0.89		0.48	0.00	0.00	0.84	0.00	0.04
Avail Cap(c_a), veh/h	87	2027	904	86	1995		101	0	0	349	0	311
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	49.4	21.2	8.5	49.7	18.4	0.0	50.4	0.0	0.0	42.5	0.0	36.6
Incr Delay (d2), s/veh	3.1	154.0	0.0	2.8	5.7	0.0	2.9	0.0	0.0	14.9	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	63.1	0.1	0.8	16.4	0.0	0.6	0.0	0.0	7.5	0.0	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	52.6	175.2	8.5	52.5	24.2	0.0	53.3	0.0	0.0	57.4	0.0	36.7
LnGrp LOS	D	F	A	D	C		D	A	A	E	A	D
Approach Vol, veh/h		2758			1790			22			258	
Approach Delay, s/veh		172.6			24.7			53.3			56.5	
Approach LOS		F			C			D			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.1	67.4		22.4	8.5	68.0		7.4
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5
Max Green Setting (Gmax), s	5.0	61.0		21.0	5.0	61.0		7.0
Max Q Clear Time (g_c+I1), s	4.6	50.5		17.1	4.0	66.0		3.6
Green Ext Time (p_c), s	0.0	9.0		0.4	0.0	0.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	111.0
HCM 6th LOS	F

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1760	335	225	1490	0	300	0	305	0	0	0
Future Volume (veh/h)	0	1760	335	225	1490	0	300	0	305	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772
Adj Flow Rate, veh/h	0	1853	353	237	1568	0	316	0	321	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2
Cap, veh/h	176	1243	881	544	2351	996	755	399	340	1	1	1
Arrive On Green	0.00	0.37	0.36	0.59	1.00	0.00	0.23	0.00	0.23	0.00	0.00	0.00
Sat Flow, veh/h	1688	3367	1502	1661	3313	1502	3300	1772	1512	1688	1772	1502
Grp Volume(v), veh/h	0	1853	353	237	1568	0	316	0	321	0	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1502	1650	1772	1512	1688	1772	1502
Q Serve(g_s), s	0.0	48.0	16.5	4.6	0.0	0.0	10.6	0.0	27.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	48.0	16.5	4.6	0.0	0.0	10.6	0.0	27.2	0.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	176	1243	881	544	2351	996	755	399	340	1	1	1
V/C Ratio(X)	0.00	1.49	0.40	0.44	0.67	0.00	0.42	0.00	0.94	0.00	0.00	0.00
Avail Cap(c_a), veh/h	317	1243	881	544	2351	996	761	402	343	376	395	335
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.43	0.43	0.00	1.00	0.00	1.00	0.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	41.0	14.5	19.3	0.0	0.0	42.7	0.0	49.6	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	225.1	1.4	0.1	0.7	0.0	0.2	0.0	33.8	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	57.4	9.2	3.1	0.2	0.0	4.3	0.0	13.3	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	266.1	15.9	19.4	0.7	0.0	43.0	0.0	83.3	0.0	0.0	0.0
LnGrp LOS	A	F	B	B	A	A	D	A	F	A	A	A
Approach Vol, veh/h		2206			1805			637			0	
Approach Delay, s/veh		226.1			3.1			63.3			0.0	
Approach LOS		F			A			E				
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.2	52.0		0.0	0.0	96.2		33.8				
Change Period (Y+Rc), s	6.0	* 6		4.0	4.0	6.0		4.5				
Max Green Setting (Gmax), s	7.0	* 46		29.0	11.0	42.0		29.5				
Max Q Clear Time (g_c+I1), s	6.6	50.0		0.0	0.0	2.0		29.2				
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	39.0		0.1				

Intersection Summary	
HCM 6th Ctrl Delay	117.2
HCM 6th LOS	F

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	1730	5	25	1580	55	215	35	240	235	15	145
Future Volume (vph)	80	1730	5	25	1580	55	215	35	240	235	15	145
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0		4.0		4.0	4.0	4.0
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (prot)	1676	3316		1644	3358	1471		1629		1624	1638	1508
Flt Permitted	0.06	1.00		0.06	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (perm)	98	3316		101	3358	1471		1629		1624	1638	1508
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	82	1765	5	26	1612	56	219	36	245	240	15	148
RTOR Reduction (vph)	0	0	0	0	0	26	0	27	0	0	0	94
Lane Group Flow (vph)	82	1770	0	26	1612	30	0	473	0	127	128	54
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						4
Actuated Green, G (s)	77.4	71.8		71.0	68.6	68.6		21.0		17.4	17.4	17.4
Effective Green, g (s)	78.4	73.2		71.0	70.0	70.0		21.0		17.4	17.4	17.4
Actuated g/C Ratio	0.60	0.56		0.55	0.54	0.54		0.16		0.13	0.13	0.13
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4		3.0		2.3	2.3	2.3
Lane Grp Cap (vph)	133	1867		83	1808	792		263		217	219	201
v/s Ratio Prot	c0.03	c0.53		0.01	0.48			c0.29		c0.08	0.08	
v/s Ratio Perm	0.34			0.16		0.02						0.04
v/c Ratio	0.62	0.95		0.31	0.89	0.04		1.80		0.59	0.58	0.27
Uniform Delay, d1	47.6	26.6		55.0	26.6	14.1		54.5		52.9	52.9	50.6
Progression Factor	0.66	0.57		0.75	0.65	2.03		1.00		1.00	1.00	1.00
Incremental Delay, d2	4.4	8.5		0.9	5.1	0.1		374.4		3.0	3.0	0.4
Delay (s)	35.7	23.8		42.0	22.4	28.7		428.9		55.9	55.9	51.0
Level of Service	D	C		D	C	C		F		E	E	D
Approach Delay (s)		24.3			22.9			428.9			54.1	
Approach LOS		C			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	72.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	100.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	1790	140	35	1420	75	145	45	40	310	40	110
Future Volume (vph)	125	1790	140	35	1420	75	145	45	40	310	40	110
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.94	1.00	1.00	*0.97	1.00		1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97		1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (prot)	1676	3318	1467	1644	3358	1432		1683	1461	1624	1646	1506
Flt Permitted	0.11	1.00	1.00	0.06	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (perm)	190	3318	1467	102	3358	1432		1683	1461	1624	1646	1506
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	126	1808	141	35	1434	76	146	45	40	313	40	111
RTOR Reduction (vph)	0	0	34	0	0	34	0	0	33	0	0	102
Lane Group Flow (vph)	126	1808	107	35	1434	42	0	191	7	175	178	9
Confl. Peds. (#/hr)			1			3	1		4	4		1
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6		6		8	8			4
Actuated Green, G (s)	80.3	78.9	78.9	70.3	70.3	70.3		21.3	21.3	10.0	10.0	10.0
Effective Green, g (s)	80.3	80.3	80.3	70.3	71.7	71.7		21.3	21.3	10.0	10.0	10.0
Actuated g/C Ratio	0.62	0.62	0.62	0.54	0.55	0.55		0.16	0.16	0.08	0.08	0.08
Clearance Time (s)	4.0	5.4	5.4	4.0	5.4	5.4		4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4	5.4	2.3	5.4	5.4		2.3	2.3	2.3	2.3	2.3
Lane Grp Cap (vph)	243	2049	906	83	1852	789		275	239	124	126	115
v/s Ratio Prot	0.04	c0.54		0.01	c0.43			c0.11		0.11	c0.11	
v/s Ratio Perm	0.28		0.07	0.22		0.03			0.00			0.01
v/c Ratio	0.52	0.88	0.12	0.42	0.77	0.05		0.69	0.03	1.41	1.41	0.07
Uniform Delay, d1	36.8	20.9	10.3	27.2	22.8	13.5		51.3	45.7	60.0	60.0	55.7
Progression Factor	0.58	0.44	0.29	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	2.1	0.1	2.0	3.2	0.1		6.5	0.0	225.9	225.9	0.2
Delay (s)	21.7	11.3	3.0	29.2	26.0	13.6		57.8	45.7	285.9	285.9	55.9
Level of Service	C	B	A	C	C	B		E	D	F	F	E
Approach Delay (s)		11.4			25.5			55.7			230.9	
Approach LOS		B			C			E			F	

Intersection Summary			
HCM 2000 Control Delay	42.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	310	1720	145	80	1470	170	135	60	100	140	40	235
Future Volume (veh/h)	310	1720	145	80	1470	170	135	60	100	140	40	235
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786
Adj Flow Rate, veh/h	316	1755	148	82	1500	173	138	61	102	143	41	240
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1
Cap, veh/h	269	1725	768	75	1150	572	139	89	148	243	48	283
Arrive On Green	0.16	0.51	0.51	0.05	0.39	0.39	0.08	0.15	0.15	0.14	0.21	0.22
Sat Flow, veh/h	1688	3367	1499	1647	2941	1464	1701	593	991	1701	225	1319
Grp Volume(v), veh/h	316	1755	148	82	1500	173	138	0	163	143	0	281
Grp Sat Flow(s),veh/h/ln	1688	1683	1499	1647	1470	1464	1701	0	1584	1701	0	1544
Q Serve(g_s), s	17.6	56.4	5.9	5.0	43.0	9.0	8.9	0.0	10.7	8.7	0.0	19.2
Cycle Q Clear(g_c), s	17.6	56.4	5.9	5.0	43.0	9.0	8.9	0.0	10.7	8.7	0.0	19.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.63	1.00		0.85
Lane Grp Cap(c), veh/h	269	1725	768	75	1150	572	139	0	237	243	0	332
V/C Ratio(X)	1.17	1.02	0.19	1.10	1.30	0.30	0.99	0.00	0.69	0.59	0.00	0.85
Avail Cap(c_a), veh/h	269	1725	768	75	1150	572	139	0	432	243	0	421
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.32	0.32	0.32	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	46.2	26.8	14.5	52.5	33.5	23.1	50.5	0.0	44.2	44.1	0.0	41.2
Incr Delay (d2), s/veh	90.4	16.9	0.2	132.3	143.6	1.4	73.6	0.0	2.2	3.0	0.0	10.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	18.9	24.5	0.0	4.8	38.0	3.3	6.7	0.0	4.4	3.9	0.0	8.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	136.6	43.7	14.7	184.8	177.1	24.5	124.0	0.0	46.4	47.1	0.0	52.1
LnGrp LOS	F	F	B	F	F	C	F	A	D	D	A	D
Approach Vol, veh/h		2219			1755			301			424	
Approach Delay, s/veh		55.0			162.4			82.0			50.4	
Approach LOS		E			F			F			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.0	60.4	13.0	27.6	22.4	47.0	20.2	20.4				
Change Period (Y+Rc), s	4.0	4.8	4.0	4.5	4.8	* 4	4.5	* 4.5				
Max Green Setting (Gmax), s	5.0	49.2	9.0	29.5	12.0	* 43	9.0	* 30				
Max Q Clear Time (g_c+I1), s	7.0	58.4	10.9	21.2	19.6	45.0	10.7	12.7				
Green Ext Time (p_c), s	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.5				
Intersection Summary												
HCM 6th Ctrl Delay			96.4									
HCM 6th LOS			F									

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	115	1200	10	225	35	0	0	55	25
Future Volume (veh/h)	0	0	0	115	1200	10	225	35	0	0	55	25
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.99	0.99		1.00	1.00		0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772
Adj Flow Rate, veh/h				121	1263	11	237	37	0	0	58	26
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2
Cap, veh/h				148	1629	15	446	60	0	0	410	184
Arrive On Green				0.52	0.52	0.52	0.35	0.35	0.00	0.00	0.35	0.35
Sat Flow, veh/h				285	3127	28	1087	170	0	0	1156	518
Grp Volume(v), veh/h				729	0	666	274	0	0	0	0	84
Grp Sat Flow(s),veh/h/ln				1716	0	1724	1256	0	0	0	0	1674
Q Serve(g_s), s				38.9	0.0	33.2	18.4	0.0	0.0	0.0	0.0	3.7
Cycle Q Clear(g_c), s				38.9	0.0	33.2	22.1	0.0	0.0	0.0	0.0	3.7
Prop In Lane				0.17		0.02	0.86		0.00	0.00		0.31
Lane Grp Cap(c), veh/h				894	0	898	506	0	0	0	0	594
V/C Ratio(X)				0.82	0.00	0.74	0.54	0.00	0.00	0.00	0.00	0.14
Avail Cap(c_a), veh/h				983	0	988	506	0	0	0	0	594
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.90	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				21.9	0.0	20.6	31.6	0.0	0.0	0.0	0.0	24.1
Incr Delay (d2), s/veh				8.1	0.0	5.5	3.7	0.0	0.0	0.0	0.0	0.1
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				17.2	0.0	14.4	6.7	0.0	0.0	0.0	0.0	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				30.1	0.0	26.1	35.3	0.0	0.0	0.0	0.0	24.2
LnGrp LOS				C	A	C	D	A	A	A	A	C
Approach Vol, veh/h					1395			274			84	
Approach Delay, s/veh					28.1			35.3			24.2	
Approach LOS					C			D			C	
Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				43.0		61.3		43.0				
Change Period (Y+Rc), s				4.0		4.0		4.0				
Max Green Setting (Gmax), s				39.0		63.0		39.0				
Max Q Clear Time (g_c+I1), s				5.7		40.9		24.1				
Green Ext Time (p_c), s				0.2		16.4		1.0				
Intersection Summary												
HCM 6th Ctrl Delay			29.1									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	1320	495	0	0	0	0	215	225	30	150	0
Future Volume (veh/h)	50	1320	495	0	0	0	0	215	225	30	150	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772				0	1772	1772	1730	1730	0
Adj Flow Rate, veh/h	53	1389	0				0	226	237	32	158	0
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2				0	2	2	5	5	0
Cap, veh/h	78	2131					0	403	334	39	484	0
Arrive On Green	0.64	0.64	0.00				0.00	0.23	0.23	0.01	0.09	0.00
Sat Flow, veh/h	121	3328	1502				0	1772	1470	1647	1730	0
Grp Volume(v), veh/h	772	670	0				0	226	237	32	158	0
Grp Sat Flow(s),veh/h/ln	1766	1683	1502				0	1772	1470	1647	1730	0
Q Serve(g_s), s	30.8	26.1	0.0				0.0	12.4	16.3	2.1	9.4	0.0
Cycle Q Clear(g_c), s	30.8	26.1	0.0				0.0	12.4	16.3	2.1	9.4	0.0
Prop In Lane	0.07		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	1130	1078					0	403	334	39	484	0
V/C Ratio(X)	0.68	0.62					0.00	0.56	0.71	0.83	0.33	0.00
Avail Cap(c_a), veh/h	1130	1078					0	403	334	75	535	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	0.96	0.96	1.00	1.00	0.00
Uniform Delay (d), s/veh	12.7	11.8	0.0				0.0	37.6	39.2	54.4	40.2	0.0
Incr Delay (d2), s/veh	3.4	2.7	0.0				0.0	5.3	11.6	22.8	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.5	10.1	0.0				0.0	5.8	6.8	1.1	4.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.0	14.5	0.0				0.0	43.0	50.8	77.2	40.5	0.0
LnGrp LOS	B	B					A	D	D	E	D	A
Approach Vol, veh/h		1442						463			190	
Approach Delay, s/veh		15.3						47.0			46.6	
Approach LOS		B						D			D	

Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		74.4		35.6			6.6	29.0				
Change Period (Y+Rc), s		4.0		* 4.8			4.0	4.8				
Max Green Setting (Gmax), s		68.0		* 34			5.0	24.2				
Max Q Clear Time (g_c+I1), s		32.8		11.4			4.1	18.3				
Green Ext Time (p_c), s		24.0		0.4			0.0	0.8				

Intersection Summary			
HCM 6th Ctrl Delay			25.2
HCM 6th LOS			C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	180	1190	135	0	1035	30	90	25	5	155	15	95
Future Volume (veh/h)	180	1190	135	0	1035	30	90	25	5	155	15	95
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758
Adj Flow Rate, veh/h	189	1253	142	0	1089	32	95	26	5	163	16	100
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	7	7	7	0	0	0	3	3	3
Cap, veh/h	447	2365	1054	1	1313	586	254	64	11	240	20	116
Arrive On Green	0.26	0.70	0.70	0.00	0.41	0.41	0.22	0.22	0.21	0.22	0.22	0.21
Sat Flow, veh/h	1688	3367	1501	1621	3233	1442	892	291	49	854	90	528
Grp Volume(v), veh/h	189	1253	142	0	1089	32	126	0	0	279	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1501	1621	1617	1442	1233	0	0	1472	0	0
Q Serve(g_s), s	10.2	19.4	3.4	0.0	33.2	1.5	0.0	0.0	0.0	10.2	0.0	0.0
Cycle Q Clear(g_c), s	10.2	19.4	3.4	0.0	33.2	1.5	9.9	0.0	0.0	20.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.75		0.04	0.58		0.36
Lane Grp Cap(c), veh/h	447	2365	1054	1	1313	586	323	0	0	369	0	0
V/C Ratio(X)	0.42	0.53	0.13	0.00	0.83	0.05	0.39	0.00	0.00	0.76	0.00	0.00
Avail Cap(c_a), veh/h	447	2365	1054	66	1446	645	434	0	0	483	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	33.5	7.8	5.4	0.0	29.3	19.8	37.4	0.0	0.0	41.6	0.0	0.0
Incr Delay (d2), s/veh	0.4	0.9	0.3	0.0	6.2	0.2	0.6	0.0	0.0	4.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.3	6.7	1.1	0.0	13.3	0.5	3.0	0.0	0.0	7.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.9	8.6	5.6	0.0	35.4	20.0	37.9	0.0	0.0	45.8	0.0	0.0
LnGrp LOS	C	A	A	A	D	C	D	A	A	D	A	A
Approach Vol, veh/h		1584			1121			126			279	
Approach Delay, s/veh		11.4			35.0			37.9			45.8	
Approach LOS		B			C			D			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	0.0	81.8		28.2	33.1	48.7		28.2				
Change Period (Y+Rc), s	4.5	* 4.5		5.5	4.5	4.0		5.5				
Max Green Setting (Gmax), s	4.0	* 61		31.3	15.5	49.2		31.3				
Max Q Clear Time (g_c+I1), s	0.0	21.4		22.1	12.2	35.2		11.9				
Green Ext Time (p_c), s	0.0	24.7		0.6	0.2	9.5		0.3				

Intersection Summary			
HCM 6th Ctrl Delay			24.0
HCM 6th LOS			C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1210	90	30	1055	25	105
Future Vol, veh/h	1210	90	30	1055	25	105
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	300	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	6	6	0	0
Mvmt Flow	1274	95	32	1111	26	111

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1369	0	1894	637
Stage 1	-	-	-	-	1274	-
Stage 2	-	-	-	-	620	-
Critical Hdwy	-	-	4.22	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.26	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	477	-	63	425
Stage 1	-	-	-	-	230	-
Stage 2	-	-	-	-	504	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	477	-	59	425
Mov Cap-2 Maneuver	-	-	-	-	59	-
Stage 1	-	-	-	-	230	-
Stage 2	-	-	-	-	470	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		0.4		34	
HCM LOS					D	

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	59	425	-	-	477	-
HCM Lane V/C Ratio	0.446	0.26	-	-	0.066	-
HCM Control Delay (s)	108.1	16.4	-	-	13.1	-
HCM Lane LOS	F	C	-	-	B	-
HCM 95th %tile Q(veh)	1.7	1	-	-	0.2	-

Intersection												
Int Delay, s/veh	10.1											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	100	1170	0	75	960	0	5	5	70	5	5	120
Future Vol, veh/h	100	1170	0	75	960	0	5	5	70	5	5	120
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	100	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	3	3	2	2	6	6	2	2	2	0	2	0
Mvmt Flow	105	1232	0	79	1011	0	5	5	74	5	5	126

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1011	0	0	1232	0	0	2108	2611	616	1998	2611	506
Stage 1	-	-	-	-	-	-	1442	1442	-	1169	1169	-
Stage 2	-	-	-	-	-	-	666	1169	-	829	1442	-
Critical Hdwy	4.16	-	-	4.14	-	-	7.54	6.54	6.94	7.5	6.54	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.5	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.5	5.54	-
Follow-up Hdwy	2.23	-	-	2.22	-	-	3.52	4.02	3.32	3.5	4.02	3.3
Pot Cap-1 Maneuver	675	-	-	561	-	-	29	24	433	36	24	517
Stage 1	-	-	-	-	-	-	139	196	-	209	265	-
Stage 2	-	-	-	-	-	-	415	265	-	335	196	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	675	-	-	561	-	-	13	17	433	18	17	517
Mov Cap-2 Maneuver	-	-	-	-	-	-	13	17	-	18	17	-
Stage 1	-	-	-	-	-	-	117	165	-	176	228	-
Stage 2	-	-	-	-	-	-	263	228	-	227	165	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0.9	142.9	90.6
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	95	675	-	-	561	-	-	162
HCM Lane V/C Ratio	0.886	0.156	-	-	0.141	-	-	0.845
HCM Control Delay (s)	142.9	11.3	-	-	12.5	-	-	90.6
HCM Lane LOS	F	B	-	-	B	-	-	F
HCM 95th %tile Q(veh)	5	0.6	-	-	0.5	-	-	5.8

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	1245	1150	15	10	0
Future Vol, veh/h	0	1245	1150	15	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1311	1211	16	11	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1227	0	-	0	1875	614
Stage 1	-	-	-	-	1219	-
Stage 2	-	-	-	-	656	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	564	-	-	-	63	435
Stage 1	-	-	-	-	242	-
Stage 2	-	-	-	-	478	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	564	-	-	-	63	435
Mov Cap-2 Maneuver	-	-	-	-	63	-
Stage 1	-	-	-	-	242	-
Stage 2	-	-	-	-	478	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	73.3
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	564	-	-	-	63
HCM Lane V/C Ratio	-	-	-	-	0.167
HCM Control Delay (s)	0	-	-	-	73.3
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	0.6

SECTION 5. HCM REPORTS

3 PM TO 4 PM WITH PROFILE

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	2290	5	10	1595	205	10	45	10	240	10	20
Future Volume (veh/h)	55	2290	5	10	1595	205	10	45	10	240	10	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	55	2290	5	10	1595	0	10	45	10	240	10	20
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	85	1976	882	69	1915		13	60	13	285	89	178
Arrive On Green	0.05	0.59	0.59	0.04	0.58	0.00	0.06	0.06	0.06	0.17	0.17	0.17
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	238	1072	238	1688	527	1055
Grp Volume(v), veh/h	55	2290	5	10	1595	0	65	0	0	240	0	30
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1549	0	0	1688	0	1582
Q Serve(g_s), s	3.5	64.0	0.2	0.6	42.7	0.0	4.5	0.0	0.0	15.0	0.0	1.8
Cycle Q Clear(g_c), s	3.5	64.0	0.2	0.6	42.7	0.0	4.5	0.0	0.0	15.0	0.0	1.8
Prop In Lane	1.00		1.00	1.00		1.00	0.15		0.15	1.00		0.67
Lane Grp Cap(c), veh/h	85	1976	882	69	1915		87	0	0	285	0	267
V/C Ratio(X)	0.65	1.16	0.01	0.15	0.83		0.75	0.00	0.00	0.84	0.00	0.11
Avail Cap(c_a), veh/h	85	1976	882	84	1945		107	0	0	341	0	319
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	50.8	22.5	9.3	50.4	18.7	0.0	50.6	0.0	0.0	43.9	0.0	38.4
Incr Delay (d2), s/veh	13.7	77.5	0.0	0.6	3.6	0.0	15.5	0.0	0.0	14.9	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	41.7	0.0	0.3	14.5	0.0	2.1	0.0	0.0	7.5	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	64.5	100.0	9.3	51.0	22.3	0.0	66.1	0.0	0.0	58.8	0.0	38.6
LnGrp LOS	E	F	A	D	C		E	A	A	E	A	D
Approach Vol, veh/h		2350			1605			65			270	
Approach Delay, s/veh		99.0			22.5			66.1			56.6	
Approach LOS		F			C			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.5	67.0		22.4	8.5	68.0		10.1				
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5				
Max Green Setting (Gmax), s	5.0	61.0		21.0	5.0	61.0		7.0				
Max Q Clear Time (g_c+I1), s	5.5	44.7		17.0	2.6	66.0		6.5				
Green Ext Time (p_c), s	0.0	12.3		0.4	0.0	0.0		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	67.2
HCM 6th LOS	E

Notes

User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	275	1460	380	240	1390	305	305	135	300	135	160	155
Future Volume (veh/h)	275	1460	380	240	1390	305	305	135	300	135	160	155
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772
Adj Flow Rate, veh/h	275	1460	380	240	1390	305	305	135	300	135	160	155
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2
Cap, veh/h	198	1243	864	307	1495	840	718	379	323	208	219	185
Arrive On Green	0.08	0.37	0.36	0.30	0.90	0.87	0.22	0.21	0.21	0.12	0.12	0.12
Sat Flow, veh/h	1688	3367	1502	1661	3313	1502	3300	1772	1511	1688	1772	1502
Grp Volume(v), veh/h	275	1460	380	240	1390	305	305	135	300	135	160	155
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1502	1650	1772	1511	1688	1772	1502
Q Serve(g_s), s	11.0	48.0	18.7	12.3	33.0	4.5	10.4	8.4	25.3	9.9	11.3	13.1
Cycle Q Clear(g_c), s	11.0	48.0	18.7	12.3	33.0	4.5	10.4	8.4	25.3	9.9	11.3	13.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	198	1243	864	307	1495	840	718	379	323	208	219	185
V/C Ratio(X)	1.39	1.17	0.44	0.78	0.93	0.36	0.42	0.36	0.93	0.65	0.73	0.84
Avail Cap(c_a), veh/h	198	1243	864	307	1495	840	761	402	343	376	395	335
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.43	0.43	0.43	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.3	41.0	15.7	41.3	5.1	3.1	43.8	43.5	50.1	54.3	54.9	55.7
Incr Delay (d2), s/veh	202.5	87.3	1.6	5.4	5.8	0.5	0.2	0.3	29.5	2.5	3.5	7.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.6	33.6	10.1	6.1	3.3	1.3	4.3	3.7	12.1	4.4	5.3	5.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	239.7	128.3	17.3	46.7	10.8	3.6	44.1	43.8	79.7	56.8	58.4	63.0
LnGrp LOS	F	F	B	D	B	A	D	D	E	E	E	E
Approach Vol, veh/h		2115			1935			740			450	
Approach Delay, s/veh		122.8			14.2			58.5			59.5	
Approach LOS		F			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	25.7	52.0		20.0	15.0	62.7		32.3				
Change Period (Y+Rc), s	6.0	* 6		4.0	4.0	6.0		4.5				
Max Green Setting (Gmax), s	7.0	* 46		29.0	11.0	42.0		29.5				
Max Q Clear Time (g_c+I1), s	14.3	50.0		15.1	13.0	35.0		27.3				
Green Ext Time (p_c), s	0.0	0.0		0.9	0.0	7.0		0.5				

Intersection Summary		
HCM 6th Ctrl Delay		68.2
HCM 6th LOS		E

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	1770	5	25	1635	45	155	35	230	210	15	155
Future Volume (vph)	60	1770	5	25	1635	45	155	35	230	210	15	155
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0		4.0		4.0	4.0	4.0
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (prot)	1676	3316		1644	3358	1471		1621		1624	1639	1508
Flt Permitted	0.06	1.00		0.06	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (perm)	99	3316		100	3358	1471		1621		1624	1639	1508
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	60	1770	5	25	1635	45	155	35	230	210	15	155
RTOR Reduction (vph)	0	0	0	0	0	20	0	33	0	0	0	125
Lane Group Flow (vph)	60	1775	0	25	1635	25	0	387	0	111	114	30
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						4
Actuated Green, G (s)	75.0	71.0		71.8	69.4	69.4		22.6		16.6	16.6	16.6
Effective Green, g (s)	76.0	72.4		71.8	70.8	70.8		22.6		16.6	16.6	16.6
Actuated g/C Ratio	0.58	0.56		0.55	0.54	0.54		0.17		0.13	0.13	0.13
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4		3.0		2.3	2.3	2.3
Lane Grp Cap (vph)	112	1846		83	1828	801		281		207	209	192
v/s Ratio Prot	c0.02	c0.54		0.01	0.49			c0.24		0.07	c0.07	
v/s Ratio Perm	0.29			0.16		0.02						0.02
v/c Ratio	0.54	0.96		0.30	0.89	0.03		1.38		0.54	0.55	0.16
Uniform Delay, d1	49.4	27.5		55.3	26.3	13.7		53.7		53.1	53.2	50.5
Progression Factor	0.49	0.47		0.76	0.65	3.05		1.00		1.00	1.00	1.00
Incremental Delay, d2	2.2	10.4		0.8	5.2	0.0		190.5		1.8	2.0	0.2
Delay (s)	26.4	23.4		42.9	22.3	41.9		244.2		54.9	55.2	50.7
Level of Service	C	C		D	C	D		F		D	E	D
Approach Delay (s)		23.5			23.1			244.2			53.3	
Approach LOS		C			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	47.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	95.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	1865	175	40	1500	95	105	35	35	245	35	120
Future Volume (vph)	160	1865	175	40	1500	95	105	35	35	245	35	120
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.94	1.00	1.00	*0.97	1.00		1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97		1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (prot)	1676	3318	1467	1644	3358	1432		1684	1461	1624	1648	1506
Flt Permitted	0.11	1.00	1.00	0.06	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (perm)	190	3318	1467	96	3358	1432		1684	1461	1624	1648	1506
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	160	1865	175	40	1500	95	105	35	35	245	35	120
RTOR Reduction (vph)	0	0	39	0	0	36	0	0	30	0	0	111
Lane Group Flow (vph)	160	1865	136	40	1500	59	0	140	5	140	140	9
Confl. Peds. (#/hr)			1			3	1		4	4		1
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6		6		8	8			4
Actuated Green, G (s)	82.5	81.1	81.1	75.1	75.1	75.1		18.3	18.3	10.0	10.0	10.0
Effective Green, g (s)	82.5	82.5	82.5	75.1	76.5	76.5		18.3	18.3	10.0	10.0	10.0
Actuated g/C Ratio	0.63	0.63	0.63	0.58	0.59	0.59		0.14	0.14	0.08	0.08	0.08
Clearance Time (s)	4.0	5.4	5.4	4.0	5.4	5.4		4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4	5.4	2.3	5.4	5.4		2.3	2.3	2.3	2.3	2.3
Lane Grp Cap (vph)	225	2105	930	93	1976	842		237	205	124	126	115
v/s Ratio Prot	0.05	c0.56		0.01	c0.45			c0.08		c0.09	0.08	
v/s Ratio Perm	0.40		0.09	0.24		0.04			0.00			0.01
v/c Ratio	0.71	0.89	0.15	0.43	0.76	0.07		0.59	0.02	1.13	1.11	0.08
Uniform Delay, d1	36.2	19.8	9.6	26.1	19.9	11.5		52.3	48.2	60.0	60.0	55.7
Progression Factor	0.59	0.39	0.26	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.6	2.4	0.1	1.9	2.8	0.2		3.0	0.0	119.7	113.1	0.2
Delay (s)	25.0	10.2	2.6	27.9	22.7	11.6		55.4	48.2	179.7	173.1	55.9
Level of Service	C	B	A	C	C	B		E	D	F	F	E
Approach Delay (s)		10.7			22.2			53.9			140.3	
Approach LOS		B			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	28.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	84.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	260	1735	140	90	1300	225	130	50	105	140	40	235
Future Volume (veh/h)	260	1735	140	90	1300	225	130	50	105	140	40	235
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786
Adj Flow Rate, veh/h	260	1735	140	90	1300	225	130	50	105	140	40	235
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1
Cap, veh/h	275	1736	773	75	1150	572	139	74	155	243	48	279
Arrive On Green	0.16	0.52	0.52	0.05	0.39	0.39	0.08	0.15	0.15	0.14	0.21	0.22
Sat Flow, veh/h	1688	3367	1499	1647	2941	1464	1701	506	1063	1701	225	1320
Grp Volume(v), veh/h	260	1735	140	90	1300	225	130	0	155	140	0	275
Grp Sat Flow(s),veh/h/ln	1688	1683	1499	1647	1470	1464	1701	0	1569	1701	0	1544
Q Serve(g_s), s	16.8	56.7	5.5	5.0	43.0	12.2	8.4	0.0	10.3	8.5	0.0	18.8
Cycle Q Clear(g_c), s	16.8	56.7	5.5	5.0	43.0	12.2	8.4	0.0	10.3	8.5	0.0	18.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.68	1.00		0.85
Lane Grp Cap(c), veh/h	275	1736	773	75	1150	572	139	0	229	243	0	327
V/C Ratio(X)	0.95	1.00	0.18	1.20	1.13	0.39	0.93	0.00	0.68	0.58	0.00	0.84
Avail Cap(c_a), veh/h	275	1736	773	75	1150	572	139	0	428	243	0	421
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.35	0.35	0.35	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	45.6	26.6	14.2	52.5	33.5	24.1	50.2	0.0	44.3	44.0	0.0	41.4
Incr Delay (d2), s/veh	20.1	12.7	0.2	168.2	70.2	2.0	56.1	0.0	2.1	2.6	0.0	10.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.4	23.6	1.9	5.6	26.3	4.6	5.7	0.0	4.2	3.8	0.0	8.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	65.6	39.3	14.4	220.7	103.7	26.1	106.3	0.0	46.5	46.6	0.0	51.5
LnGrp LOS	E	D	B	F	F	C	F	A	D	D	A	D
Approach Vol, veh/h		2135			1615			285			415	
Approach Delay, s/veh		40.9			99.4			73.8			49.9	
Approach LOS		D			F			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	60.7	13.0	27.3	22.7	47.0	20.2	20.1
Change Period (Y+Rc), s	4.0	4.8	4.0	4.5	4.8	* 4	4.5	* 4.5
Max Green Setting (Gmax), s	5.0	49.2	9.0	29.5	12.0	* 43	9.0	* 30
Max Q Clear Time (g_c+I1), s	7.0	58.7	10.4	20.8	18.8	45.0	10.5	12.3
Green Ext Time (p_c), s	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.5

Intersection Summary	
HCM 6th Ctrl Delay	65.1
HCM 6th LOS	E

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	160	1255	15	245	40	0	0	60	35
Future Volume (veh/h)	0	0	0	160	1255	15	245	40	0	0	60	35
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772
Adj Flow Rate, veh/h				160	1255	15	245	40	0	0	60	35
Peak Hour Factor				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2
Cap, veh/h				194	1601	20	435	61	0	0	371	216
Arrive On Green				0.53	0.53	0.53	0.35	0.35	0.00	0.00	0.35	0.35
Sat Flow, veh/h				367	3029	38	1055	172	0	0	1047	611
Grp Volume(v), veh/h				747	0	683	285	0	0	0	0	95
Grp Sat Flow(s),veh/h/ln				1711	0	1722	1227	0	0	0	0	1657
Q Serve(g_s), s				40.2	0.0	34.1	19.6	0.0	0.0	0.0	0.0	4.3
Cycle Q Clear(g_c), s				40.2	0.0	34.1	23.9	0.0	0.0	0.0	0.0	4.3
Prop In Lane				0.21		0.02	0.86		0.00	0.00		0.37
Lane Grp Cap(c), veh/h				905	0	910	496	0	0	0	0	588
V/C Ratio(X)				0.83	0.00	0.75	0.57	0.00	0.00	0.00	0.00	0.16
Avail Cap(c_a), veh/h				980	0	987	496	0	0	0	0	588
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.90	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				21.7	0.0	20.3	32.5	0.0	0.0	0.0	0.0	24.3
Incr Delay (d2), s/veh				8.5	0.0	5.7	4.3	0.0	0.0	0.0	0.0	0.1
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				17.7	0.0	14.7	7.2	0.0	0.0	0.0	0.0	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				30.2	0.0	25.9	36.8	0.0	0.0	0.0	0.0	24.4
LnGrp LOS				C	A	C	D	A	A	A	A	C
Approach Vol, veh/h					1430			285			95	
Approach Delay, s/veh					28.2			36.8			24.4	
Approach LOS					C			D			C	
Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				43.0		62.1		43.0				
Change Period (Y+Rc), s				4.0		4.0		4.0				
Max Green Setting (Gmax), s				39.0		63.0		39.0				
Max Q Clear Time (g_c+I1), s				6.3		42.2		25.9				
Green Ext Time (p_c), s				0.3		16.0		1.0				
Intersection Summary												
HCM 6th Ctrl Delay			29.3									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	1395	505	0	0	0	0	220	225	35	190	0
Future Volume (veh/h)	70	1395	505	0	0	0	0	220	225	35	190	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772				0	1772	1772	1730	1730	0
Adj Flow Rate, veh/h	70	1395	0				0	220	225	35	190	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	5	5	0
Cap, veh/h	100	2098					0	403	334	43	488	0
Arrive On Green	0.64	0.64	0.00				0.00	0.23	0.23	0.01	0.09	0.00
Sat Flow, veh/h	157	3290	1502				0	1772	1470	1647	1730	0
Grp Volume(v), veh/h	785	680	0				0	220	225	35	190	0
Grp Sat Flow(s),veh/h/ln	1764	1683	1502				0	1772	1470	1647	1730	0
Q Serve(g_s), s	31.9	27.0	0.0				0.0	12.0	15.4	2.3	11.4	0.0
Cycle Q Clear(g_c), s	31.9	27.0	0.0				0.0	12.0	15.4	2.3	11.4	0.0
Prop In Lane	0.09		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	1125	1074					0	403	334	43	488	0
V/C Ratio(X)	0.70	0.63					0.00	0.55	0.67	0.82	0.39	0.00
Avail Cap(c_a), veh/h	1125	1074					0	403	334	75	535	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	0.98	0.98	0.99	0.99	0.00
Uniform Delay (d), s/veh	13.0	12.1	0.0				0.0	37.5	38.8	54.3	41.0	0.0
Incr Delay (d2), s/veh	3.6	2.9	0.0				0.0	5.1	10.2	20.2	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	18.0	10.5	0.0				0.0	5.7	6.3	1.2	5.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.6	15.0	0.0				0.0	42.6	49.0	74.5	41.3	0.0
LnGrp LOS	B	B					A	D	D	E	D	A
Approach Vol, veh/h		1465						445			225	
Approach Delay, s/veh		15.8						45.8			46.4	
Approach LOS		B						D			D	

Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		74.2		35.8			6.8	29.0				
Change Period (Y+Rc), s		4.0		* 4.8			4.0	4.8				
Max Green Setting (Gmax), s		68.0		* 34			5.0	24.2				
Max Q Clear Time (g_c+I1), s		33.9		13.4			4.3	17.4				
Green Ext Time (p_c), s		23.8		0.5			0.0	0.8				

Intersection Summary			
HCM 6th Ctrl Delay			25.3
HCM 6th LOS			C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	1320	110	10	1075	25	95	25	10	160	20	105
Future Volume (veh/h)	155	1320	110	10	1075	25	95	25	10	160	20	105
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758
Adj Flow Rate, veh/h	155	1320	110	10	1075	25	95	25	10	160	20	105
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	7	7	7	0	0	0	3	3	3
Cap, veh/h	444	2179	971	23	1302	581	247	61	21	234	25	122
Arrive On Green	0.26	0.65	0.65	0.01	0.40	0.40	0.22	0.23	0.21	0.22	0.23	0.21
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	847	273	93	814	113	540
Grp Volume(v), veh/h	155	1320	110	10	1075	25	130	0	0	285	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1500	1621	1617	1442	1212	0	0	1467	0	0
Q Serve(g_s), s	8.2	25.0	3.1	0.7	32.7	1.2	0.0	0.0	0.0	10.2	0.0	0.0
Cycle Q Clear(g_c), s	8.2	25.0	3.1	0.7	32.7	1.2	10.4	0.0	0.0	20.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.73		0.08	0.56		0.37
Lane Grp Cap(c), veh/h	444	2179	971	23	1302	581	324	0	0	375	0	0
V/C Ratio(X)	0.35	0.61	0.11	0.44	0.83	0.04	0.40	0.00	0.00	0.76	0.00	0.00
Avail Cap(c_a), veh/h	444	2179	971	66	1446	645	427	0	0	481	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	32.9	11.3	7.4	53.8	29.4	20.0	37.1	0.0	0.0	41.4	0.0	0.0
Incr Delay (d2), s/veh	0.3	1.3	0.2	7.8	6.1	0.1	0.6	0.0	0.0	4.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.4	9.2	1.0	0.3	13.1	0.4	3.1	0.0	0.0	8.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.2	12.5	7.6	61.6	35.5	20.1	37.7	0.0	0.0	46.0	0.0	0.0
LnGrp LOS	C	B	A	E	D	C	D	A	A	D	A	A
Approach Vol, veh/h		1585			1110			130			285	
Approach Delay, s/veh		14.2			35.4			37.7			46.0	
Approach LOS		B			D			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.6	75.7		28.8	32.9	48.3		28.8
Change Period (Y+Rc), s	4.5	* 4.5		5.5	4.5	4.0		5.5
Max Green Setting (Gmax), s	4.0	* 61		31.3	15.5	49.2		31.3
Max Q Clear Time (g_c+I1), s	2.7	27.0		22.6	10.2	34.7		12.4
Green Ext Time (p_c), s	0.0	22.9		0.6	0.2	9.6		0.3

Intersection Summary		
HCM 6th Ctrl Delay		25.6
HCM 6th LOS		C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1395	85	30	1120	25	65
Future Vol, veh/h	1395	85	30	1120	25	65
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	300	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	6	6	0	0
Mvmt Flow	1395	85	30	1120	25	65

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1480	0	2015	698
Stage 1	-	-	-	-	1395	-
Stage 2	-	-	-	-	620	-
Critical Hdwy	-	-	4.22	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.26	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	432	-	52	388
Stage 1	-	-	-	-	199	-
Stage 2	-	-	-	-	504	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	432	-	48	388
Mov Cap-2 Maneuver	-	-	-	-	48	-
Stage 1	-	-	-	-	199	-
Stage 2	-	-	-	-	469	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	51.4
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	48	388	-	-	432	-
HCM Lane V/C Ratio	0.521	0.168	-	-	0.069	-
HCM Control Delay (s)	143.1	16.1	-	-	14	-
HCM Lane LOS	F	C	-	-	B	-
HCM 95th %tile Q(veh)	1.9	0.6	-	-	0.2	-

Intersection	
Int Delay, s/veh	12.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	155	1305	0	95	1040	0	5	5	95	5	0	105
Future Vol, veh/h	155	1305	0	95	1040	0	5	5	95	5	0	105
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	100	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	3	3	2	2	6	6	2	2	2	0	2	0
Mvmt Flow	155	1305	0	95	1040	0	5	5	95	5	0	105

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1040	0	0	1305	0	0	2325	2845	653	2195	2845	520
Stage 1	-	-	-	-	-	-	1615	1615	-	1230	1230	-
Stage 2	-	-	-	-	-	-	710	1230	-	965	1615	-
Critical Hdwy	4.16	-	-	4.14	-	-	7.54	6.54	6.94	7.5	6.54	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.5	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.5	5.54	-
Follow-up Hdwy	2.23	-	-	2.22	-	-	3.52	4.02	3.32	3.5	4.02	3.3
Pot Cap-1 Maneuver	658	-	-	526	-	-	20	17	410	26	17	506
Stage 1	-	-	-	-	-	-	108	161	-	191	248	-
Stage 2	-	-	-	-	-	-	391	248	-	278	161	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	658	-	-	526	-	-	11	11	410	9	11	506
Mov Cap-2 Maneuver	-	-	-	-	-	-	11	11	-	9	11	-
Stage 1	-	-	-	-	-	-	83	123	-	146	203	-
Stage 2	-	-	-	-	-	-	254	203	-	157	123	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.3	1.1	221.2	83.7
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	92	658	-	-	526	-	-	144
HCM Lane V/C Ratio	1.141	0.236	-	-	0.181	-	-	0.764
HCM Control Delay (s)	221.2	12.1	-	-	13.3	-	-	83.7
HCM Lane LOS	F	B	-	-	B	-	-	F
HCM 95th %tile Q(veh)	7.1	0.9	-	-	0.7	-	-	4.6

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	1395	1120	25	10	0
Future Vol, veh/h	5	1395	1120	25	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	1395	1120	25	10	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1145	0	-	0	1841	573
Stage 1	-	-	-	-	1133	-
Stage 2	-	-	-	-	708	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	606	-	-	-	67	463
Stage 1	-	-	-	-	269	-
Stage 2	-	-	-	-	449	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	606	-	-	-	66	463
Mov Cap-2 Maneuver	-	-	-	-	66	-
Stage 1	-	-	-	-	267	-
Stage 2	-	-	-	-	449	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	69
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	606	-	-	-	66
HCM Lane V/C Ratio	0.008	-	-	-	0.152
HCM Control Delay (s)	11	-	-	-	69
HCM Lane LOS	B	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	0.5

SECTION 6. HCM REPORTS

5 PM TO 6 PM WITH PROFILE

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	2330	5	10	1620	210	10	45	10	245	10	20
Future Volume (veh/h)	55	2330	5	10	1620	210	10	45	10	245	10	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	55	2330	5	10	1620	0	10	45	10	245	10	20
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	85	1970	879	68	1908		13	60	13	290	90	181
Arrive On Green	0.05	0.59	0.59	0.04	0.58	0.00	0.06	0.06	0.06	0.17	0.17	0.17
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	238	1072	238	1688	527	1055
Grp Volume(v), veh/h	55	2330	5	10	1620	0	65	0	0	245	0	30
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1549	0	0	1688	0	1582
Q Serve(g_s), s	3.5	64.0	0.2	0.6	44.4	0.0	4.5	0.0	0.0	15.4	0.0	1.8
Cycle Q Clear(g_c), s	3.5	64.0	0.2	0.6	44.4	0.0	4.5	0.0	0.0	15.4	0.0	1.8
Prop In Lane	1.00		1.00	1.00		1.00	0.15		0.15	1.00		0.67
Lane Grp Cap(c), veh/h	85	1970	879	68	1908		87	0	0	290	0	271
V/C Ratio(X)	0.65	1.18	0.01	0.15	0.85		0.75	0.00	0.00	0.85	0.00	0.11
Avail Cap(c_a), veh/h	85	1970	879	84	1939		106	0	0	339	0	318
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	51.0	22.7	9.4	50.6	19.2	0.0	50.8	0.0	0.0	43.9	0.0	38.3
Incr Delay (d2), s/veh	14.0	87.8	0.0	0.6	4.1	0.0	15.7	0.0	0.0	15.7	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	44.5	0.0	0.3	15.2	0.0	2.1	0.0	0.0	7.7	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	65.0	110.5	9.5	51.2	23.4	0.0	66.5	0.0	0.0	59.6	0.0	38.4
LnGrp LOS	E	F	A	D	C		E	A	A	E	A	D
Approach Vol, veh/h		2390			1630			65			275	
Approach Delay, s/veh		109.3			23.5			66.5			57.3	
Approach LOS		F			C			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.5	67.0		22.8	8.5	68.0		10.1				
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5				
Max Green Setting (Gmax), s	5.0	61.0		21.0	5.0	61.0		7.0				
Max Q Clear Time (g_c+I1), s	5.5	46.4		17.4	2.6	66.0		6.5				
Green Ext Time (p_c), s	0.0	11.4		0.4	0.0	0.0		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	73.3
HCM 6th LOS	E

Notes
User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	275	1480	385	245	1410	310	310	140	300	140	165	160
Future Volume (veh/h)	275	1480	385	245	1410	310	310	140	300	140	165	160
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772
Adj Flow Rate, veh/h	275	1480	385	245	1410	310	310	140	300	140	165	160
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2
Cap, veh/h	198	1243	864	301	1484	840	718	379	323	214	225	190
Arrive On Green	0.08	0.37	0.36	0.30	0.90	0.86	0.22	0.21	0.21	0.13	0.13	0.13
Sat Flow, veh/h	1688	3367	1502	1661	3313	1502	3300	1772	1511	1688	1772	1502
Grp Volume(v), veh/h	275	1480	385	245	1410	310	310	140	300	140	165	160
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1502	1650	1772	1511	1688	1772	1502
Q Serve(g_s), s	11.0	48.0	19.0	13.0	38.7	4.8	10.5	8.8	25.3	10.3	11.7	13.5
Cycle Q Clear(g_c), s	11.0	48.0	19.0	13.0	38.7	4.8	10.5	8.8	25.3	10.3	11.7	13.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	198	1243	864	301	1484	840	718	379	323	214	225	190
V/C Ratio(X)	1.39	1.19	0.45	0.81	0.95	0.37	0.43	0.37	0.93	0.65	0.73	0.84
Avail Cap(c_a), veh/h	198	1243	864	301	1484	840	761	402	343	376	395	335
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.40	0.40	0.40	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.3	41.0	15.8	42.1	5.8	3.3	43.9	43.6	50.1	54.0	54.6	55.5
Incr Delay (d2), s/veh	202.5	94.0	1.7	6.6	7.0	0.5	0.3	0.4	29.5	2.5	3.4	7.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.6	34.7	10.3	6.4	3.8	1.4	4.3	3.9	12.1	4.5	5.4	5.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	239.7	135.0	17.4	48.7	12.8	3.8	44.2	44.0	79.6	56.6	58.1	62.7
LnGrp LOS	F	F	B	D	B	A	D	D	E	E	E	E
Approach Vol, veh/h		2140			1965			750			465	
Approach Delay, s/veh		127.3			15.9			58.3			59.2	
Approach LOS		F			B			E			E	

Timer - Assigned Phs	1	2	4	5	6	8
Phs Duration (G+Y+Rc), s	25.2	52.0	20.5	15.0	62.2	32.3
Change Period (Y+Rc), s	6.0	* 6	4.0	4.0	6.0	4.5
Max Green Setting (Gmax), s	7.0	* 46	29.0	11.0	42.0	29.5
Max Q Clear Time (g_c+I1), s	15.0	50.0	15.5	13.0	40.7	27.3
Green Ext Time (p_c), s	0.0	0.0	0.9	0.0	1.3	0.5

Intersection Summary	
HCM 6th Ctrl Delay	70.5
HCM 6th LOS	E

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	1800	5	25	1660	45	160	35	235	215	15	160
Future Volume (vph)	60	1800	5	25	1660	45	160	35	235	215	15	160
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0		4.0		4.0	4.0	4.0
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (prot)	1676	3316		1644	3358	1471		1621		1624	1639	1508
Flt Permitted	0.06	1.00		0.06	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (perm)	99	3316		100	3358	1471		1621		1624	1639	1508
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	60	1800	5	25	1660	45	160	35	235	215	15	160
RTOR Reduction (vph)	0	0	0	0	0	21	0	33	0	0	0	121
Lane Group Flow (vph)	60	1805	0	25	1660	24	0	397	0	114	116	39
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						4
Actuated Green, G (s)	74.9	70.9		71.7	69.3	69.3		22.6		16.7	16.7	16.7
Effective Green, g (s)	75.9	72.3		71.7	70.7	70.7		22.6		16.7	16.7	16.7
Actuated g/C Ratio	0.58	0.56		0.55	0.54	0.54		0.17		0.13	0.13	0.13
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4		3.0		2.3	2.3	2.3
Lane Grp Cap (vph)	112	1844		83	1826	799		281		208	210	193
v/s Ratio Prot	c0.02	c0.54		0.01	0.49			c0.24		0.07	c0.07	
v/s Ratio Perm	0.29			0.16		0.02						0.03
v/c Ratio	0.54	0.98		0.30	0.91	0.03		1.41		0.55	0.55	0.20
Uniform Delay, d1	50.2	28.1		57.1	26.8	13.8		53.7		53.1	53.1	50.7
Progression Factor	0.46	0.45		0.77	0.66	3.03		1.00		1.00	1.00	1.00
Incremental Delay, d2	2.2	12.8		0.8	5.9	0.0		205.5		2.0	2.2	0.3
Delay (s)	25.3	25.4		44.6	23.5	41.7		259.2		55.1	55.4	51.0
Level of Service	C	C		D	C	D		F		E	E	D
Approach Delay (s)		25.4			24.3			259.2			53.5	
Approach LOS		C			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	50.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	96.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	165	1890	180	40	1525	95	110	35	35	250	35	125
Future Volume (vph)	165	1890	180	40	1525	95	110	35	35	250	35	125
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.94	1.00	1.00	*0.97	1.00		1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97		1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (prot)	1676	3318	1467	1644	3358	1432		1684	1461	1624	1648	1506
Flt Permitted	0.10	1.00	1.00	0.06	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (perm)	184	3318	1467	95	3358	1432		1684	1461	1624	1648	1506
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	165	1890	180	40	1525	95	110	35	35	250	35	125
RTOR Reduction (vph)	0	0	39	0	0	35	0	0	30	0	0	115
Lane Group Flow (vph)	165	1890	141	40	1525	60	0	145	5	142	143	10
Confl. Peds. (#/hr)			1			3	1		4	4		1
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6		6		8	8			4
Actuated Green, G (s)	82.2	80.8	80.8	75.7	75.7	75.7		18.6	18.6	10.0	10.0	10.0
Effective Green, g (s)	82.2	82.2	82.2	75.7	77.1	77.1		18.6	18.6	10.0	10.0	10.0
Actuated g/C Ratio	0.63	0.63	0.63	0.58	0.59	0.59		0.14	0.14	0.08	0.08	0.08
Clearance Time (s)	4.0	5.4	5.4	4.0	5.4	5.4		4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4	5.4	2.3	5.4	5.4		2.3	2.3	2.3	2.3	2.3
Lane Grp Cap (vph)	211	2097	927	93	1991	849		240	209	124	126	115
v/s Ratio Prot	0.05	c0.57		0.01	c0.45			c0.09		c0.09	0.09	
v/s Ratio Perm	0.44		0.10	0.24		0.04			0.00			0.01
v/c Ratio	0.78	0.90	0.15	0.43	0.77	0.07		0.60	0.02	1.15	1.13	0.08
Uniform Delay, d1	37.2	20.4	9.7	26.7	19.7	11.2		52.2	47.9	60.0	60.0	55.7
Progression Factor	0.60	0.39	0.26	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.3	2.6	0.1	1.9	2.9	0.2		3.3	0.0	125.1	121.0	0.2
Delay (s)	28.7	10.6	2.7	28.6	22.6	11.4		55.6	47.9	185.1	181.0	55.9
Level of Service	C	B	A	C	C	B		E	D	F	F	E
Approach Delay (s)		11.3			22.1			54.1			144.3	
Approach LOS		B			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	29.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	265	1765	145	90	1320	230	135	50	110	145	40	240
Future Volume (veh/h)	265	1765	145	90	1320	230	135	50	110	145	40	240
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786
Adj Flow Rate, veh/h	265	1765	145	90	1320	230	135	50	110	145	40	240
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1
Cap, veh/h	270	1726	769	75	1150	572	139	73	160	243	47	284
Arrive On Green	0.16	0.51	0.51	0.05	0.39	0.39	0.08	0.15	0.15	0.14	0.21	0.22
Sat Flow, veh/h	1688	3367	1499	1647	2941	1464	1701	490	1077	1701	221	1323
Grp Volume(v), veh/h	265	1765	145	90	1320	230	135	0	160	145	0	280
Grp Sat Flow(s),veh/h/ln	1688	1683	1499	1647	1470	1464	1701	0	1567	1701	0	1544
Q Serve(g_s), s	17.2	56.4	5.7	5.0	43.0	12.5	8.7	0.0	10.6	8.8	0.0	19.1
Cycle Q Clear(g_c), s	17.2	56.4	5.7	5.0	43.0	12.5	8.7	0.0	10.6	8.8	0.0	19.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.69	1.00		0.86
Lane Grp Cap(c), veh/h	270	1726	769	75	1150	572	139	0	233	243	0	331
V/C Ratio(X)	0.98	1.02	0.19	1.20	1.15	0.40	0.97	0.00	0.69	0.60	0.00	0.85
Avail Cap(c_a), veh/h	270	1726	769	75	1150	572	139	0	427	243	0	421
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.32	0.32	0.32	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	46.0	26.8	14.5	52.5	33.5	24.2	50.4	0.0	44.2	44.2	0.0	41.2
Incr Delay (d2), s/veh	26.2	18.4	0.2	168.2	77.2	2.1	66.7	0.0	2.2	3.2	0.0	10.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.0	24.8	2.0	5.6	27.4	4.7	6.3	0.0	4.3	3.9	0.0	8.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	72.2	45.2	14.6	220.7	110.7	26.3	117.1	0.0	46.4	47.4	0.0	52.1
LnGrp LOS	E	F	B	F	F	C	F	A	D	D	A	D
Approach Vol, veh/h		2175			1640			295			425	
Approach Delay, s/veh		46.4			104.9			78.8			50.5	
Approach LOS		D			F			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	60.4	13.0	27.6	22.4	47.0	20.2	20.4
Change Period (Y+Rc), s	4.0	4.8	4.0	4.5	4.8	* 4	4.5	* 4.5
Max Green Setting (Gmax), s	5.0	49.2	9.0	29.5	12.0	* 43	9.0	* 30
Max Q Clear Time (g_c+I1), s	7.0	58.4	10.7	21.1	19.2	45.0	10.8	12.6
Green Ext Time (p_c), s	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.5

Intersection Summary	
HCM 6th Ctrl Delay	70.1
HCM 6th LOS	E

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	165	1275	15	250	40	0	0	60	35
Future Volume (veh/h)	0	0	0	165	1275	15	250	40	0	0	60	35
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772
Adj Flow Rate, veh/h				165	1275	15	250	40	0	0	60	35
Peak Hour Factor				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2
Cap, veh/h				198	1613	20	436	60	0	0	371	216
Arrive On Green				0.53	0.53	0.53	0.35	0.35	0.00	0.00	0.35	0.35
Sat Flow, veh/h				372	3025	37	1057	169	0	0	1047	611
Grp Volume(v), veh/h				760	0	695	290	0	0	0	0	95
Grp Sat Flow(s),veh/h/ln				1711	0	1723	1226	0	0	0	0	1657
Q Serve(g_s), s				41.0	0.0	34.7	20.1	0.0	0.0	0.0	0.0	4.3
Cycle Q Clear(g_c), s				41.0	0.0	34.7	24.4	0.0	0.0	0.0	0.0	4.3
Prop In Lane				0.22		0.02	0.86		0.00	0.00		0.37
Lane Grp Cap(c), veh/h				913	0	919	496	0	0	0	0	588
V/C Ratio(X)				0.83	0.00	0.76	0.59	0.00	0.00	0.00	0.00	0.16
Avail Cap(c_a), veh/h				980	0	987	496	0	0	0	0	588
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.89	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				21.6	0.0	20.1	32.7	0.0	0.0	0.0	0.0	24.3
Incr Delay (d2), s/veh				8.8	0.0	5.8	4.5	0.0	0.0	0.0	0.0	0.1
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				18.1	0.0	15.0	7.3	0.0	0.0	0.0	0.0	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				30.3	0.0	25.9	37.1	0.0	0.0	0.0	0.0	24.4
LnGrp LOS				C	A	C	D	A	A	A	A	C
Approach Vol, veh/h					1455			290			95	
Approach Delay, s/veh					28.2			37.1			24.4	
Approach LOS					C			D			C	
Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				43.0		62.7		43.0				
Change Period (Y+Rc), s				4.0		4.0		4.0				
Max Green Setting (Gmax), s				39.0		63.0		39.0				
Max Q Clear Time (g_c+I1), s				6.3		43.0		26.4				
Green Ext Time (p_c), s				0.3		15.6		1.0				
Intersection Summary												
HCM 6th Ctrl Delay			29.4									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	1415	515	0	0	0	0	225	230	35	195	0
Future Volume (veh/h)	70	1415	515	0	0	0	0	225	230	35	195	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772				0	1772	1772	1730	1730	0
Adj Flow Rate, veh/h	70	1415	0				0	225	230	35	195	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	5	5	0
Cap, veh/h	99	2100					0	403	334	43	488	0
Arrive On Green	0.64	0.64	0.00				0.00	0.23	0.23	0.01	0.09	0.00
Sat Flow, veh/h	155	3292	1502				0	1772	1470	1647	1730	0
Grp Volume(v), veh/h	795	690	0				0	225	230	35	195	0
Grp Sat Flow(s),veh/h/ln	1764	1683	1502				0	1772	1470	1647	1730	0
Q Serve(g_s), s	32.7	27.7	0.0				0.0	12.4	15.8	2.3	11.7	0.0
Cycle Q Clear(g_c), s	32.7	27.7	0.0				0.0	12.4	15.8	2.3	11.7	0.0
Prop In Lane	0.09		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	1125	1074					0	403	334	43	488	0
V/C Ratio(X)	0.71	0.64					0.00	0.56	0.69	0.82	0.40	0.00
Avail Cap(c_a), veh/h	1125	1074					0	403	334	75	535	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	0.98	0.98	0.99	0.99	0.00
Uniform Delay (d), s/veh	13.1	12.2	0.0				0.0	37.6	38.9	54.3	41.1	0.0
Incr Delay (d2), s/veh	3.8	3.0	0.0				0.0	5.4	10.8	20.2	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.3	10.7	0.0				0.0	5.8	6.5	1.2	5.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.9	15.2	0.0				0.0	43.0	49.8	74.5	41.4	0.0
LnGrp LOS	B	B					A	D	D	E	D	A
Approach Vol, veh/h		1485						455			230	
Approach Delay, s/veh		16.1						46.4			46.4	
Approach LOS		B						D			D	

Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		74.2		35.8			6.8	29.0				
Change Period (Y+Rc), s		4.0		* 4.8			4.0	4.8				
Max Green Setting (Gmax), s		68.0		* 34			5.0	24.2				
Max Q Clear Time (g_c+I1), s		34.7		13.7			4.3	17.8				
Green Ext Time (p_c), s		23.8		0.5			0.0	0.8				

Intersection Summary			
HCM 6th Ctrl Delay			25.7
HCM 6th LOS			C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	160	1340	115	10	1090	25	95	25	10	165	20	110
Future Volume (veh/h)	160	1340	115	10	1090	25	95	25	10	165	20	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758
Adj Flow Rate, veh/h	160	1340	115	10	1090	25	95	25	10	165	20	110
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	7	7	7	0	0	0	3	3	3
Cap, veh/h	427	2156	961	23	1312	585	252	63	21	239	25	127
Arrive On Green	0.25	0.64	0.64	0.01	0.41	0.41	0.23	0.23	0.22	0.23	0.23	0.22
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	843	270	93	812	108	547
Grp Volume(v), veh/h	160	1340	115	10	1090	25	130	0	0	295	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1500	1621	1617	1442	1206	0	0	1466	0	0
Q Serve(g_s), s	8.6	26.1	3.3	0.7	33.2	1.2	0.0	0.0	0.0	11.0	0.0	0.0
Cycle Q Clear(g_c), s	8.6	26.1	3.3	0.7	33.2	1.2	10.4	0.0	0.0	21.4	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.73		0.08	0.56		0.37
Lane Grp Cap(c), veh/h	427	2156	961	23	1312	585	331	0	0	384	0	0
V/C Ratio(X)	0.37	0.62	0.12	0.44	0.83	0.04	0.39	0.00	0.00	0.77	0.00	0.00
Avail Cap(c_a), veh/h	427	2156	961	66	1446	645	424	0	0	481	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	33.9	11.8	7.7	53.8	29.3	19.8	36.5	0.0	0.0	41.0	0.0	0.0
Incr Delay (d2), s/veh	0.3	1.4	0.3	7.8	6.2	0.1	0.6	0.0	0.0	5.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	9.7	1.1	0.3	13.3	0.4	3.1	0.0	0.0	8.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.2	13.2	8.0	61.6	35.5	19.9	37.1	0.0	0.0	46.2	0.0	0.0
LnGrp LOS	C	B	A	E	D	B	D	A	A	D	A	A
Approach Vol, veh/h		1615			1125			130			295	
Approach Delay, s/veh		14.9			35.4			37.1			46.2	
Approach LOS		B			D			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.6	75.0		29.5	31.9	48.7		29.5
Change Period (Y+Rc), s	4.5	* 4.5		5.5	4.5	4.0		5.5
Max Green Setting (Gmax), s	4.0	* 61		31.3	15.5	49.2		31.3
Max Q Clear Time (g_c+I1), s	2.7	28.1		23.4	10.6	35.2		12.4
Green Ext Time (p_c), s	0.0	22.8		0.6	0.2	9.4		0.3

Intersection Summary		
HCM 6th Ctrl Delay		26.0
HCM 6th LOS		C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1415	85	30	1140	25	65
Future Vol, veh/h	1415	85	30	1140	25	65
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	300	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	6	6	0	0
Mvmt Flow	1415	85	30	1140	25	65

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1500	0	2045	708
Stage 1	-	-	-	-	1415	-
Stage 2	-	-	-	-	630	-
Critical Hdwy	-	-	4.22	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.26	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	424	-	50	382
Stage 1	-	-	-	-	194	-
Stage 2	-	-	-	-	498	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	424	-	46	382
Mov Cap-2 Maneuver	-	-	-	-	46	-
Stage 1	-	-	-	-	194	-
Stage 2	-	-	-	-	463	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	54.2
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	46	382	-	-	424	-
HCM Lane V/C Ratio	0.543	0.17	-	-	0.071	-
HCM Control Delay (s)	152.9	16.3	-	-	14.1	-
HCM Lane LOS	F	C	-	-	B	-
HCM 95th %tile Q(veh)	2	0.6	-	-	0.2	-

Intersection	
Int Delay, s/veh	14.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	160	1325	0	95	1055	0	5	5	95	5	0	110
Future Vol, veh/h	160	1325	0	95	1055	0	5	5	95	5	0	110
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	100	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	3	3	2	2	6	6	2	2	2	0	2	0
Mvmt Flow	160	1325	0	95	1055	0	5	5	95	5	0	110

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1055	0	0	1325	0	0	2363	2890	663	2230	2890	528
Stage 1	-	-	-	-	-	-	1645	1645	-	1245	1245	-
Stage 2	-	-	-	-	-	-	718	1245	-	985	1645	-
Critical Hdwy	4.16	-	-	4.14	-	-	7.54	6.54	6.94	7.5	6.54	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.5	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.5	5.54	-
Follow-up Hdwy	2.23	-	-	2.22	-	-	3.52	4.02	3.32	3.5	4.02	3.3
Pot Cap-1 Maneuver	650	-	-	517	-	-	19	16	404	24	16	500
Stage 1	-	-	-	-	-	-	104	156	-	187	244	-
Stage 2	-	-	-	-	-	-	386	244	-	270	156	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	650	-	-	517	-	-	10	10	404	8	10	500
Mov Cap-2 Maneuver	-	-	-	-	-	-	10	10	-	8	10	-
Stage 1	-	-	-	-	-	-	78	118	-	141	199	-
Stage 2	-	-	-	-	-	-	246	199	-	149	118	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.3	1.1	262.6	102.9
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	85	650	-	-	517	-	-	136
HCM Lane V/C Ratio	1.235	0.246	-	-	0.184	-	-	0.846
HCM Control Delay (s)	262.6	12.3	-	-	13.5	-	-	102.9
HCM Lane LOS	F	B	-	-	B	-	-	F
HCM 95th %tile Q(veh)	7.6	1	-	-	0.7	-	-	5.4

Intersection						
Int Delay, s/veh	0.3					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	1415	1140	25	10	0
Future Vol, veh/h	5	1415	1140	25	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	1415	1140	25	10	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1165	0	-	0	1871	583
Stage 1	-	-	-	-	1153	-
Stage 2	-	-	-	-	718	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	595	-	-	-	64	456
Stage 1	-	-	-	-	263	-
Stage 2	-	-	-	-	444	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	595	-	-	-	63	456
Mov Cap-2 Maneuver	-	-	-	-	63	-
Stage 1	-	-	-	-	261	-
Stage 2	-	-	-	-	444	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	72.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	595	-	-	-	63
HCM Lane V/C Ratio	0.008	-	-	-	0.159
HCM Control Delay (s)	11.1	-	-	-	72.6
HCM Lane LOS	B	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	0.5

SECTION 7. HCM REPORTS

6 PM TO 7 PM WITH PROFILE

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	1730	5	5	1205	155	5	35	5	180	5	15
Future Volume (veh/h)	40	1730	5	5	1205	155	5	35	5	180	5	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	40	1730	5	5	1205	0	5	35	5	180	5	15
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	82	2046	913	75	2004		8	58	8	232	54	161
Arrive On Green	0.05	0.61	0.61	0.05	0.60	0.00	0.05	0.05	0.05	0.14	0.14	0.14
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	174	1216	174	1688	390	1171
Grp Volume(v), veh/h	40	1730	5	5	1205	0	45	0	0	180	0	20
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1563	0	0	1688	0	1561
Q Serve(g_s), s	2.3	41.1	0.1	0.3	22.4	0.0	2.8	0.0	0.0	10.2	0.0	1.1
Cycle Q Clear(g_c), s	2.3	41.1	0.1	0.3	22.4	0.0	2.8	0.0	0.0	10.2	0.0	1.1
Prop In Lane	1.00		1.00	1.00		1.00	0.11		0.11	1.00		0.75
Lane Grp Cap(c), veh/h	82	2046	913	75	2004		75	0	0	232	0	215
V/C Ratio(X)	0.49	0.85	0.01	0.07	0.60		0.60	0.00	0.00	0.78	0.00	0.09
Avail Cap(c_a), veh/h	94	2173	969	92	2138		118	0	0	374	0	346
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	46.0	15.7	7.7	45.3	12.2	0.0	46.2	0.0	0.0	41.3	0.0	37.4
Incr Delay (d2), s/veh	2.8	3.6	0.0	0.2	0.7	0.0	2.8	0.0	0.0	5.5	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	13.2	0.0	0.1	6.7	0.0	1.2	0.0	0.0	4.6	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	48.8	19.3	7.7	45.5	12.9	0.0	49.0	0.0	0.0	46.8	0.0	37.5
LnGrp LOS	D	B	A	D	B		D	A	A	D	A	D
Approach Vol, veh/h		1775			1210			45			200	
Approach Delay, s/veh		19.9			13.0			49.0			45.8	
Approach LOS		B			B			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.8	64.0		17.6	8.5	64.3		8.8				
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5				
Max Green Setting (Gmax), s	5.0	61.0		21.0	5.0	61.0		7.0				
Max Q Clear Time (g_c+I1), s	4.3	24.4		12.2	2.3	43.1		4.8				
Green Ext Time (p_c), s	0.0	15.2		0.5	0.0	14.1		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			19.3									
HCM 6th LOS			B									

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	205	1100	285	180	1050	230	230	105	225	105	120	120
Future Volume (veh/h)	205	1100	285	180	1050	230	230	105	225	105	120	120
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772
Adj Flow Rate, veh/h	205	1100	285	180	1050	230	230	105	225	105	120	120
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2
Cap, veh/h	304	1238	793	437	1727	909	567	298	254	168	176	149
Arrive On Green	0.08	0.37	0.36	0.45	1.00	1.00	0.17	0.17	0.17	0.10	0.10	0.10
Sat Flow, veh/h	1688	3367	1502	1661	3313	1502	3300	1772	1511	1688	1772	1502
Grp Volume(v), veh/h	205	1100	285	180	1050	230	230	105	225	105	120	120
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1502	1650	1772	1511	1688	1772	1502
Q Serve(g_s), s	11.0	39.9	14.4	3.2	0.0	0.0	8.1	6.8	18.9	7.8	8.5	10.2
Cycle Q Clear(g_c), s	11.0	39.9	14.4	3.2	0.0	0.0	8.1	6.8	18.9	7.8	8.5	10.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	304	1238	793	437	1727	909	567	298	254	168	176	149
V/C Ratio(X)	0.68	0.89	0.36	0.41	0.61	0.25	0.41	0.35	0.89	0.63	0.68	0.80
Avail Cap(c_a), veh/h	304	1243	795	437	1727	909	761	402	343	376	395	335
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.70	0.70	0.70	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.9	38.6	17.9	28.2	0.0	0.0	47.9	47.8	52.9	56.2	56.6	57.3
Incr Delay (d2), s/veh	5.4	9.7	1.3	0.3	1.1	0.5	0.3	0.4	16.8	2.8	3.4	7.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.1	17.1	7.0	3.2	0.3	0.1	3.3	3.0	8.3	3.4	4.0	4.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.3	48.3	19.1	28.5	1.1	0.5	48.2	48.3	69.7	59.1	60.0	64.7
LnGrp LOS	D	D	B	C	A	A	D	D	E	E	E	E
Approach Vol, veh/h		1590			1460			560			345	
Approach Delay, s/veh		41.8			4.4			56.9			61.4	
Approach LOS		D			A			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	34.9	51.8		16.9	15.0	71.8		26.3				
Change Period (Y+Rc), s	6.0	* 6		4.0	4.0	6.0		4.5				
Max Green Setting (Gmax), s	7.0	* 46		29.0	11.0	42.0		29.5				
Max Q Clear Time (g_c+I1), s	15.2	41.9		12.2	13.0	2.0		20.9				
Green Ext Time (p_c), s	0.1	3.9		0.7	0.0	35.7		0.8				
Intersection Summary												
HCM 6th Ctrl Delay			31.8									
HCM 6th LOS			C									

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	1335	5	20	1230	35	120	25	175	160	10	120
Future Volume (vph)	45	1335	5	20	1230	35	120	25	175	160	10	120
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0		4.0		4.0	4.0	4.0
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (prot)	1676	3316		1644	3358	1471		1620		1624	1638	1508
Flt Permitted	0.13	1.00		0.09	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (perm)	235	3316		163	3358	1471		1620		1624	1638	1508
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	45	1335	5	20	1230	35	120	25	175	160	10	120
RTOR Reduction (vph)	0	0	0	0	0	17	0	32	0	0	0	106
Lane Group Flow (vph)	45	1340	0	20	1230	18	0	288	0	85	85	14
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						4
Actuated Green, G (s)	73.9	68.9		68.7	66.3	66.3		26.4		14.9	14.9	14.9
Effective Green, g (s)	74.9	70.3		68.7	67.7	67.7		26.4		14.9	14.9	14.9
Actuated g/C Ratio	0.58	0.54		0.53	0.52	0.52		0.20		0.11	0.11	0.11
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4		3.0		2.3	2.3	2.3
Lane Grp Cap (vph)	196	1793		113	1748	766		328		186	187	172
v/s Ratio Prot	c0.01	c0.40		0.00	0.37			c0.18		c0.05	0.05	
v/s Ratio Perm	0.12			0.09		0.01						0.01
v/c Ratio	0.23	0.75		0.18	0.70	0.02		0.88		0.46	0.45	0.08
Uniform Delay, d1	31.2	23.0		38.0	23.6	15.1		50.2		53.8	53.8	51.4
Progression Factor	0.32	0.41		0.68	0.66	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	0.3	2.5		0.4	2.1	0.0		22.3		1.0	1.0	0.1
Delay (s)	10.1	11.8		26.1	17.7	15.2		72.6		54.8	54.8	51.5
Level of Service	B	B		C	B	B		E		D	D	D
Approach Delay (s)		11.7			17.8			72.6			53.4	
Approach LOS		B			B			E			D	

Intersection Summary			
HCM 2000 Control Delay	23.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1405	130	30	1135	70	80	25	25	185	25	90
Future Volume (vph)	120	1405	130	30	1135	70	80	25	25	185	25	90
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.94	1.00	1.00	*0.97	1.00		1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97		1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (prot)	1676	3318	1467	1644	3358	1432		1683	1461	1624	1647	1506
Flt Permitted	0.20	1.00	1.00	0.11	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (perm)	359	3318	1467	184	3358	1432		1683	1461	1624	1647	1506
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	120	1405	130	30	1135	70	80	25	25	185	25	90
RTOR Reduction (vph)	0	0	36	0	0	29	0	0	22	0	0	83
Lane Group Flow (vph)	120	1405	94	30	1135	41	0	105	3	104	106	7
Confl. Peds. (#/hr)			1			3	1		4	4		1
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6		6		8	8			4
Actuated Green, G (s)	85.5	84.1	84.1	75.2	75.2	75.2		16.3	16.3	9.8	9.8	9.8
Effective Green, g (s)	85.5	85.5	85.5	75.2	76.6	76.6		16.3	16.3	9.8	9.8	9.8
Actuated g/C Ratio	0.66	0.66	0.66	0.58	0.59	0.59		0.13	0.13	0.08	0.08	0.08
Clearance Time (s)	4.0	5.4	5.4	4.0	5.4	5.4		4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4	5.4	2.3	5.4	5.4		2.3	2.3	2.3	2.3	2.3
Lane Grp Cap (vph)	350	2182	964	133	1978	843		211	183	122	124	113
v/s Ratio Prot	0.03	c0.42		0.00	c0.34			c0.06		0.06	c0.06	
v/s Ratio Perm	0.20		0.06	0.13		0.03			0.00			0.00
v/c Ratio	0.34	0.64	0.10	0.23	0.57	0.05		0.50	0.02	0.85	0.85	0.06
Uniform Delay, d1	18.7	13.2	8.1	16.0	16.6	11.3		53.0	49.8	59.4	59.4	55.8
Progression Factor	0.45	0.42	0.21	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	1.0	0.1	0.5	1.2	0.1		1.1	0.0	39.6	39.5	0.1
Delay (s)	8.7	6.6	1.9	16.5	17.8	11.4		54.1	49.9	99.0	98.9	56.0
Level of Service	A	A	A	B	B	B		D	D	F	F	E
Approach Delay (s)		6.4			17.4			53.3			86.1	
Approach LOS		A			B			D			F	

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	195	1310	105	65	980	170	100	35	80	105	30	175
Future Volume (veh/h)	195	1310	105	65	980	170	100	35	80	105	30	175
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786
Adj Flow Rate, veh/h	195	1310	105	65	980	170	100	35	80	105	30	175
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1
Cap, veh/h	368	1893	843	75	1124	560	123	59	136	200	39	230
Arrive On Green	0.22	0.56	0.56	0.05	0.38	0.38	0.07	0.13	0.13	0.12	0.17	0.18
Sat Flow, veh/h	1688	3367	1499	1647	2941	1464	1701	475	1085	1701	226	1318
Grp Volume(v), veh/h	195	1310	105	65	980	170	100	0	115	105	0	205
Grp Sat Flow(s),veh/h/ln	1688	1683	1499	1647	1470	1464	1701	0	1560	1701	0	1544
Q Serve(g_s), s	11.2	30.7	3.6	4.3	34.0	8.9	6.4	0.0	7.6	6.4	0.0	13.9
Cycle Q Clear(g_c), s	11.2	30.7	3.6	4.3	34.0	8.9	6.4	0.0	7.6	6.4	0.0	13.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.70	1.00		0.85
Lane Grp Cap(c), veh/h	368	1893	843	75	1124	560	123	0	195	200	0	269
V/C Ratio(X)	0.53	0.69	0.12	0.87	0.87	0.30	0.81	0.00	0.59	0.53	0.00	0.76
Avail Cap(c_a), veh/h	368	1893	843	75	1150	572	139	0	426	200	0	421
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.73	0.73	0.73	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	38.0	17.3	11.3	52.2	31.5	23.8	50.3	0.0	45.3	45.7	0.0	43.0
Incr Delay (d2), s/veh	0.7	1.5	0.2	60.4	9.4	1.4	24.7	0.0	1.7	1.8	0.0	2.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	11.2	1.3	3.0	13.4	3.3	3.6	0.0	3.1	2.8	0.0	5.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.7	18.8	11.6	112.6	40.9	25.1	74.9	0.0	47.0	47.4	0.0	45.8
LnGrp LOS	D	B	B	F	D	C	E	A	D	D	A	D
Approach Vol, veh/h		1610			1215			215			310	
Approach Delay, s/veh		20.7			42.5			60.0			46.3	
Approach LOS		C			D			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	65.8	12.0	23.2	28.8	46.0	17.4	17.8
Change Period (Y+Rc), s	4.0	4.8	4.0	4.5	4.8	* 4	4.5	* 4.5
Max Green Setting (Gmax), s	5.0	49.2	9.0	29.5	12.0	* 43	9.0	* 30
Max Q Clear Time (g_c+I1), s	6.3	32.7	8.4	15.9	13.2	36.0	8.4	9.6
Green Ext Time (p_c), s	0.0	14.4	0.0	0.7	0.0	6.1	0.0	0.4

Intersection Summary		
HCM 6th Ctrl Delay		33.5
HCM 6th LOS		C

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	120	945	10	185	30	0	0	45	25
Future Volume (veh/h)	0	0	0	120	945	10	185	30	0	0	45	25
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.99	0.99		1.00	1.00		0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772
Adj Flow Rate, veh/h				120	945	10	185	30	0	0	45	25
Peak Hour Factor				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2
Cap, veh/h				159	1321	15	456	69	0	0	378	210
Arrive On Green				0.44	0.44	0.44	0.35	0.35	0.00	0.00	0.35	0.35
Sat Flow, veh/h				366	3035	34	1114	195	0	0	1067	593
Grp Volume(v), veh/h				561	0	514	215	0	0	0	0	70
Grp Sat Flow(s),veh/h/ln				1711	0	1723	1309	0	0	0	0	1660
Q Serve(g_s), s				30.3	0.0	26.4	12.9	0.0	0.0	0.0	0.0	3.1
Cycle Q Clear(g_c), s				30.3	0.0	26.4	16.0	0.0	0.0	0.0	0.0	3.1
Prop In Lane				0.21		0.02	0.86		0.00	0.00		0.36
Lane Grp Cap(c), veh/h				745	0	750	525	0	0	0	0	589
V/C Ratio(X)				0.75	0.00	0.69	0.41	0.00	0.00	0.00	0.00	0.12
Avail Cap(c_a), veh/h				980	0	987	525	0	0	0	0	589
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.98	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				26.1	0.0	25.0	29.1	0.0	0.0	0.0	0.0	23.9
Incr Delay (d2), s/veh				6.9	0.0	5.0	2.3	0.0	0.0	0.0	0.0	0.1
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				13.6	0.0	11.7	4.9	0.0	0.0	0.0	0.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				33.0	0.0	30.0	31.4	0.0	0.0	0.0	0.0	24.0
LnGrp LOS				C	A	C	C	A	A	A	A	C
Approach Vol, veh/h					1075			215			70	
Approach Delay, s/veh					31.6			31.4			24.0	
Approach LOS					C			C			C	
Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				43.0		51.9		43.0				
Change Period (Y+Rc), s				4.0		4.0		4.0				
Max Green Setting (Gmax), s				39.0		63.0		39.0				
Max Q Clear Time (g_c+I1), s				5.1		32.3		18.0				
Green Ext Time (p_c), s				0.2		15.6		0.8				
Intersection Summary												
HCM 6th Ctrl Delay			31.2									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	1050	380	0	0	0	0	165	170	25	145	0
Future Volume (veh/h)	50	1050	380	0	0	0	0	165	170	25	145	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772				0	1772	1772	1730	1730	0
Adj Flow Rate, veh/h	50	1050	0				0	165	170	25	145	0
Peak Hour Factor	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2				0	2	2	5	5	0
Cap, veh/h	97	2125					0	403	334	32	477	0
Arrive On Green	0.64	0.64	0.00				0.00	0.23	0.23	0.01	0.09	0.00
Sat Flow, veh/h	150	3298	1502				0	1772	1470	1647	1730	0
Grp Volume(v), veh/h	589	511	0				0	165	170	25	145	0
Grp Sat Flow(s),veh/h/ln	1764	1683	1502				0	1772	1470	1647	1730	0
Q Serve(g_s), s	19.6	17.1	0.0				0.0	8.7	11.1	1.7	8.6	0.0
Cycle Q Clear(g_c), s	19.6	17.1	0.0				0.0	8.7	11.1	1.7	8.6	0.0
Prop In Lane	0.08		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	1137	1084					0	403	334	32	477	0
V/C Ratio(X)	0.52	0.47					0.00	0.41	0.51	0.78	0.30	0.00
Avail Cap(c_a), veh/h	1137	1084					0	403	334	75	535	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	1.00	0.00				0.00	0.98	0.98	1.00	1.00	0.00
Uniform Delay (d), s/veh	10.4	10.0	0.0				0.0	36.2	37.1	54.4	40.1	0.0
Incr Delay (d2), s/veh	1.7	1.5	0.0				0.0	3.0	5.3	21.7	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.8	6.5	0.0				0.0	4.0	4.4	0.9	4.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.1	11.5	0.0				0.0	39.2	42.5	76.1	40.3	0.0
LnGrp LOS	B	B					A	D	D	E	D	A
Approach Vol, veh/h		1100						335			170	
Approach Delay, s/veh		11.8						40.9			45.6	
Approach LOS		B						D			D	

Timer - Assigned Phs	2	4	7	8
Phs Duration (G+Y+Rc), s	74.9	35.1	6.1	29.0
Change Period (Y+Rc), s	4.0	* 4.8	4.0	4.8
Max Green Setting (Gmax), s	68.0	* 34	5.0	24.2
Max Q Clear Time (g_c+I1), s	21.6	10.6	3.7	13.1
Green Ext Time (p_c), s	19.5	0.3	0.0	0.8

Intersection Summary	
HCM 6th Ctrl Delay	21.5
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	995	85	5	810	20	70	20	5	120	15	80
Future Volume (veh/h)	120	995	85	5	810	20	70	20	5	120	15	80
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758
Adj Flow Rate, veh/h	120	995	85	5	810	20	70	20	5	120	15	80
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	7	7	7	0	0	0	3	3	3
Cap, veh/h	649	2361	1052	16	1071	478	209	55	12	193	23	98
Arrive On Green	0.38	0.70	0.70	0.01	0.33	0.33	0.17	0.18	0.16	0.17	0.18	0.16
Sat Flow, veh/h	1688	3367	1501	1621	3233	1442	869	312	66	808	131	556
Grp Volume(v), veh/h	120	995	85	5	810	20	95	0	0	215	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1501	1621	1617	1442	1247	0	0	1495	0	0
Q Serve(g_s), s	5.2	13.8	2.0	0.3	24.6	1.0	0.0	0.0	0.0	7.6	0.0	0.0
Cycle Q Clear(g_c), s	5.2	13.8	2.0	0.3	24.6	1.0	7.6	0.0	0.0	15.2	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.74		0.05	0.56		0.37
Lane Grp Cap(c), veh/h	649	2361	1052	16	1071	478	270	0	0	306	0	0
V/C Ratio(X)	0.18	0.42	0.08	0.32	0.76	0.04	0.35	0.00	0.00	0.70	0.00	0.00
Avail Cap(c_a), veh/h	649	2361	1052	66	1446	645	447	0	0	486	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	22.4	7.0	5.2	54.1	32.8	24.9	40.6	0.0	0.0	44.0	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.6	0.2	6.9	5.0	0.2	0.6	0.0	0.0	2.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	4.7	0.6	0.2	10.0	0.4	2.4	0.0	0.0	5.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.5	7.5	5.3	61.0	37.8	25.1	41.2	0.0	0.0	46.2	0.0	0.0
LnGrp LOS	C	A	A	E	D	C	D	A	A	D	A	A
Approach Vol, veh/h		1200			835			95			215	
Approach Delay, s/veh		8.9			37.7			41.2			46.2	
Approach LOS		A			D			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.1	81.7		23.3	46.3	40.4		23.3
Change Period (Y+Rc), s	4.5	* 4.5		5.5	4.5	4.0		5.5
Max Green Setting (Gmax), s	4.0	* 61		31.3	15.5	49.2		31.3
Max Q Clear Time (g_c+I1), s	2.3	15.8		17.2	7.2	26.6		9.6
Green Ext Time (p_c), s	0.0	19.4		0.5	0.2	9.8		0.2

Intersection Summary			
HCM 6th Ctrl Delay			23.8
HCM 6th LOS			C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	0.9					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1050	65	20	845	20	50
Future Vol, veh/h	1050	65	20	845	20	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	300	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	6	6	0	0
Mvmt Flow	1050	65	20	845	20	50

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1115	0	1513	525
Stage 1	-	-	-	-	1050	-
Stage 2	-	-	-	-	463	-
Critical Hdwy	-	-	4.22	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.26	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	599	-	113	502
Stage 1	-	-	-	-	302	-
Stage 2	-	-	-	-	606	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	599	-	109	502
Mov Cap-2 Maneuver	-	-	-	-	109	-
Stage 1	-	-	-	-	302	-
Stage 2	-	-	-	-	586	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	22.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	109	502	-	-	599	-
HCM Lane V/C Ratio	0.183	0.1	-	-	0.033	-
HCM Control Delay (s)	45.3	13	-	-	11.2	-
HCM Lane LOS	E	B	-	-	B	-
HCM 95th %tile Q(veh)	0.6	0.3	-	-	0.1	-

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	120	985	0	70	785	0	5	5	70	5	0	80
Future Vol, veh/h	120	985	0	70	785	0	5	5	70	5	0	80
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	100	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	3	3	2	2	6	6	2	2	2	0	2	0
Mvmt Flow	120	985	0	70	785	0	5	5	70	5	0	80

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	785	0	0	985	0	0	1758	2150	493	1660	2150	393
Stage 1	-	-	-	-	-	-	1225	1225	-	925	925	-
Stage 2	-	-	-	-	-	-	533	925	-	735	1225	-
Critical Hdwy	4.16	-	-	4.14	-	-	7.54	6.54	6.94	7.5	6.54	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.5	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.5	5.54	-
Follow-up Hdwy	2.23	-	-	2.22	-	-	3.52	4.02	3.32	3.5	4.02	3.3
Pot Cap-1 Maneuver	823	-	-	697	-	-	54	48	522	65	48	612
Stage 1	-	-	-	-	-	-	190	249	-	294	346	-
Stage 2	-	-	-	-	-	-	498	346	-	382	249	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	823	-	-	697	-	-	39	37	522	42	37	612
Mov Cap-2 Maneuver	-	-	-	-	-	-	39	37	-	42	37	-
Stage 1	-	-	-	-	-	-	162	213	-	251	311	-
Stage 2	-	-	-	-	-	-	389	311	-	276	213	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.9	34.3	19.1
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	201	823	-	-	697	-	-	340
HCM Lane V/C Ratio	0.398	0.146	-	-	0.1	-	-	0.25
HCM Control Delay (s)	34.3	10.1	-	-	10.7	-	-	19.1
HCM Lane LOS	D	B	-	-	B	-	-	C
HCM 95th %tile Q(veh)	1.8	0.5	-	-	0.3	-	-	1

Intersection						
Int Delay, s/veh	0.1					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	1050	845	20	5	0
Future Vol, veh/h	5	1050	845	20	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	1050	845	20	5	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	865	0	-	0	1390	433
Stage 1	-	-	-	-	855	-
Stage 2	-	-	-	-	535	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	774	-	-	-	133	571
Stage 1	-	-	-	-	377	-
Stage 2	-	-	-	-	551	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	774	-	-	-	132	571
Mov Cap-2 Maneuver	-	-	-	-	132	-
Stage 1	-	-	-	-	375	-
Stage 2	-	-	-	-	551	-

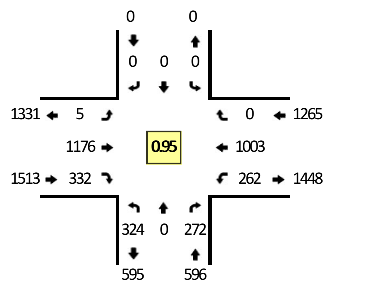
Approach	EB	WB	SB
HCM Control Delay, s	0	0	33.3
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	774	-	-	-	132
HCM Lane V/C Ratio	0.006	-	-	-	0.038
HCM Control Delay (s)	9.7	-	-	-	33.3
HCM Lane LOS	A	-	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.1

SECTION 8. US 26 AND 362ND TRAFFIC COUNT

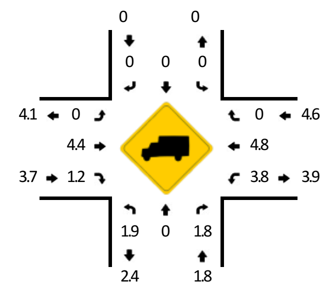
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

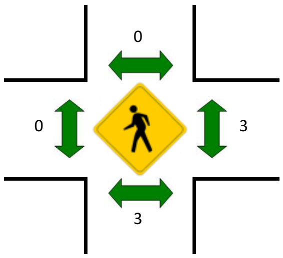
LOCATION: 362nd Dr -- US 26 | **QC JOB #:** 16204201
CITY/STATE: Sandy, OR | **DATE:** Wed, May 10 2023

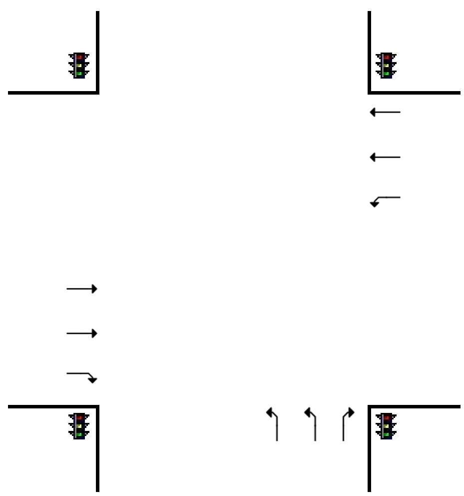


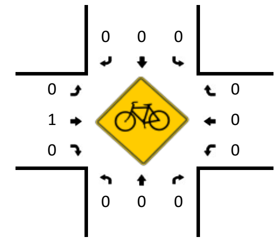
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

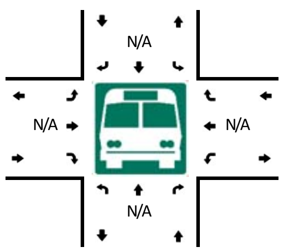
Quality Counts
DATA THAT DRIVES COMMUNITIES

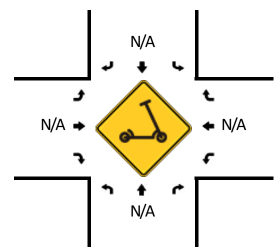












5-Min Count Period Beginning At	362nd Dr (Northbound)				362nd Dr (Southbound)				US 26 (Eastbound)				US 26 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	16	0	13	0	0	0	0	0	0	109	21	1	23	96	0	0	279	
3:05 PM	17	0	15	0	0	0	0	0	0	90	24	0	14	78	0	0	238	
3:10 PM	22	0	24	0	0	0	0	0	0	97	21	0	24	96	0	0	284	
3:15 PM	25	0	28	0	0	0	0	0	0	102	36	1	14	75	0	0	281	
3:20 PM	23	0	26	0	0	0	0	0	0	80	24	1	15	67	0	0	236	
3:25 PM	30	0	27	0	0	0	0	0	0	65	24	1	26	113	0	0	286	
3:30 PM	14	0	23	0	0	0	0	0	0	112	20	0	22	63	0	0	254	
3:35 PM	27	0	26	0	0	0	0	0	0	96	28	0	17	80	0	0	274	
3:40 PM	32	0	23	0	0	0	0	0	0	77	20	0	30	88	0	0	270	
3:45 PM	15	0	17	0	0	0	0	0	0	100	22	0	21	92	0	0	267	
3:50 PM	16	0	17	0	0	0	0	0	0	124	21	0	17	64	0	0	259	
3:55 PM	28	0	25	0	0	0	0	0	0	90	35	0	25	89	0	0	292	3220
4:00 PM	21	0	22	0	0	0	0	0	0	99	28	0	23	70	0	0	263	3204
4:05 PM	28	0	20	0	0	0	0	0	0	105	29	1	23	71	0	0	277	3243
4:10 PM	30	0	39	0	0	0	0	0	0	99	32	0	12	73	0	0	285	3244
4:15 PM	24	0	27	0	0	0	0	0	0	99	35	0	14	76	0	0	275	3238
4:20 PM	29	0	18	0	0	0	0	0	0	90	29	1	18	91	0	0	276	3278
4:25 PM	42	0	26	0	0	0	0	0	0	86	26	0	11	76	0	0	267	3259
4:30 PM	35	0	19	0	0	0	0	0	0	82	26	0	35	73	0	0	270	3275
4:35 PM	30	0	22	0	0	0	0	0	0	122	32	0	22	84	0	0	312	3313
4:40 PM	37	0	23	1	0	0	0	0	0	85	30	1	23	90	0	0	290	3333
4:45 PM	33	0	25	0	0	0	0	0	0	85	20	0	28	84	0	0	275	3341
4:50 PM	19	0	26	0	0	0	0	0	0	111	29	0	16	58	0	0	259	3341
4:55 PM	17	0	12	0	0	0	0	0	0	101	22	0	16	84	0	0	252	3301
5:00 PM	37	0	28	0	0	0	0	0	0	91	18	0	19	70	0	0	263	3301
5:05 PM	25	0	15	0	0	0	0	0	0	84	30	0	14	96	0	0	264	3288
5:10 PM	20	0	25	0	0	0	0	0	0	114	31	0	20	94	0	0	304	3307
5:15 PM	32	0	24	0	0	0	0	0	0	103	34	0	18	89	0	0	300	3332
5:20 PM	19	0	27	0	0	0	0	0	0	97	27	2	27	79	0	0	278	3334
5:25 PM	19	0	26	0	0	0	0	0	0	101	33	2	24	102	0	0	307	3374
5:30 PM	24	0	17	0	0	0	0	0	0	95	26	0	21	75	0	0	258	3362
5:35 PM	20	0	15	0	0	0	0	0	0	97	25	0	35	97	0	0	289	3339
5:40 PM	15	0	31	0	0	0	0	0	0	110	27	0	14	60	0	1	258	3307
5:45 PM	21	0	26	0	0	0	0	0	0	83	23	0	16	86	0	0	255	3287
5:50 PM	22	0	32	0	0	0	0	0	0	81	27	0	27	70	0	0	259	3287
5:55 PM	21	0	23	0	0	0	0	0	0	94	31	0	15	52	0	0	236	3271
6:00 PM	20	0	18	0	0	0	0	0	0	82	22	0	20	68	0	0	230	3238
6:05 PM	23	0	23	0	0	0	0	0	0	78	21	0	19	51	0	0	215	3189

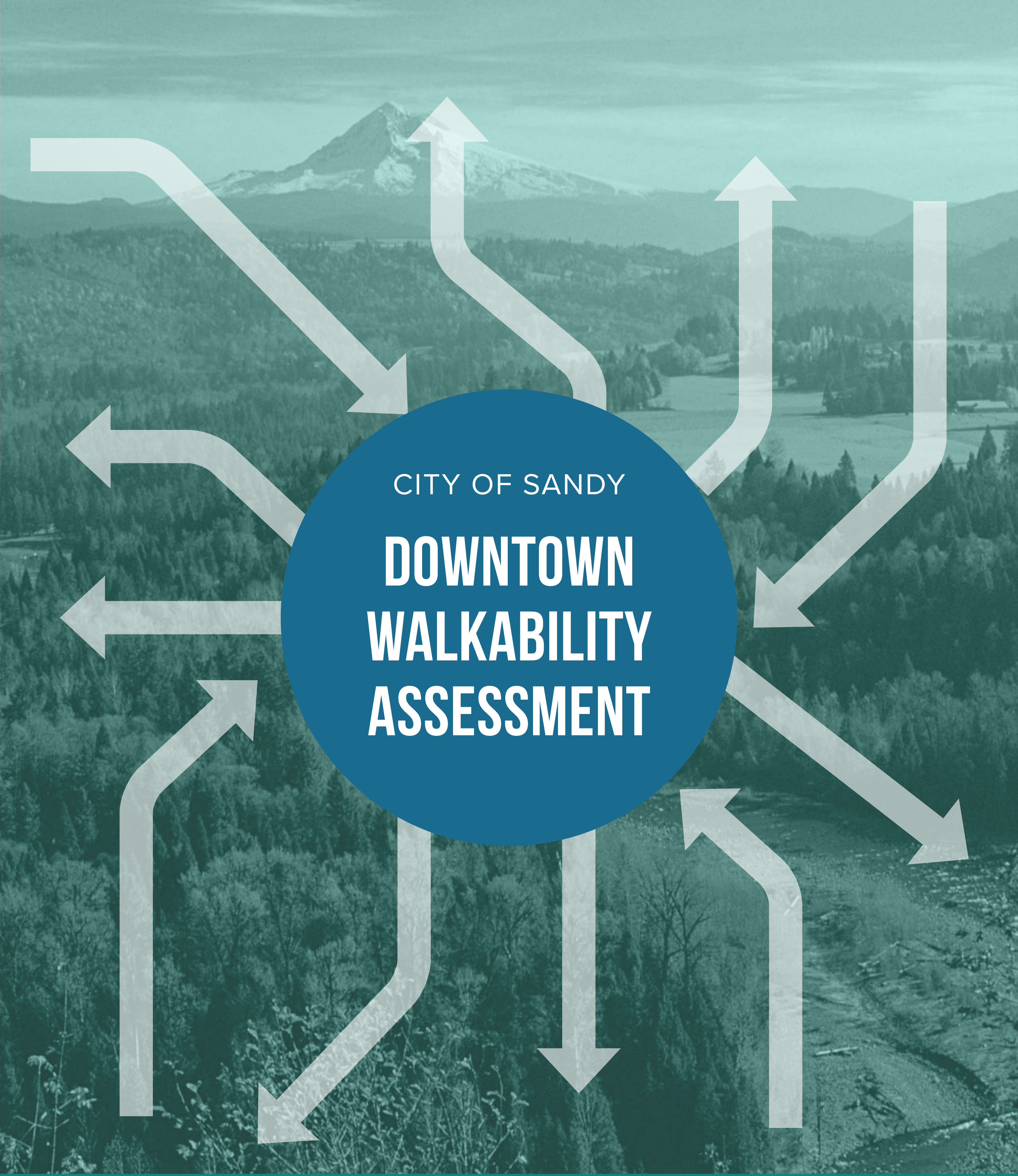
5-Min Count Period Beginning At	362nd Dr (Northbound)				362nd Dr (Southbound)				US 26 (Eastbound)				US 26 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:10 PM	11	0	18	0	0	0	0	0	0	98	17	0	16	80	0	0	240	3125
6:15 PM	19	0	23	0	0	0	0	0	0	90	18	0	14	50	0	0	214	3039
6:20 PM	21	0	20	0	0	0	0	0	0	61	15	1	14	55	0	0	187	2948
6:25 PM	25	0	17	0	0	0	0	0	0	75	14	0	19	56	0	0	206	2847
6:30 PM	13	0	19	0	0	0	0	0	0	91	27	0	12	39	0	0	201	2790
6:35 PM	12	0	29	0	0	0	0	0	0	71	23	0	8	50	0	0	193	2694
6:40 PM	19	0	16	0	0	0	0	0	0	77	17	0	13	53	0	0	195	2631
6:45 PM	15	0	18	0	0	0	0	0	0	63	12	0	7	52	0	0	167	2543
6:50 PM	19	0	19	0	0	0	0	0	0	67	22	0	15	52	0	0	194	2478
6:55 PM	16	0	16	0	0	0	0	0	0	62	20	0	18	52	0	0	184	2426

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	280	0	308	0	0	0	0	0	0	1204	376	16	276	1080	0	0	3540
Heavy Trucks	8	0	4		0	0	0		0	56	4		8	32	0		112
Buses																	
Pedestrians		4				0				0				8			12
Bicycles	0	0	0		0	0	0		0	4	0		0	0	0		4
Scooters																	

Comments:

Report generated on 5/18/2023 10:23 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212



CITY OF SANDY

DOWNTOWN WALKABILITY ASSESSMENT

SANDY

ACKNOWLEDGMENTS

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LIST OF FIGURES & TABLES

FIGURES

TABLES

EXECUTIVE SUMMARY

The purpose of the Downtown Walkability Assessment (DWA) is to evaluate the existing pedestrian conditions in downtown Sandy, understand barriers from the community, and create recommendations for improvements.

The purpose of the Downtown Walkability Assessment (DWA) is to evaluate the existing pedestrian conditions in downtown Sandy, understand barriers from the community, and create recommendations for improvements. A walkable and rollable downtown Sandy has benefits for Sandy residents, visitors, and local businesses, including but not limited to improvements in health, safety, accessibility, equity, economic vitality, and reductions in greenhouse gas emissions. Completion of the recommendations as contained in this document will create a more vibrant city center.

Information for the assessment was primarily gathered through a public engagement process with a technical assessment of conditions completed by city staff. The public process consisted of a survey, pop-up mapping activity, and community walking audit. Collectively, over 200 members of the community provided feedback on walkability. The technical assessment of walkability conditions was completed using a modified version of the Pedestrian Environment Quality Index (PEQI), a scoring method that assesses numerous walkability factors and designates scores to intersections and street segments based upon the presence or absence of existing amenities. The information gathered from both the public process and assessment of existing conditions were the primary factors in creating a prioritized list of twenty-five recommendations. The recommendations are based on various factors including but not limited to existing conditions, cost, pedestrian demand, proximity to attractions, and proximity to services. With adequate funding, the recommendations within this assessment can likely be completed within ten years.

WHAT MAKES A CITY WALKABLE?

Walkability refers to how safe, welcome, and mobile pedestrians feel in a built environment. Higher walkability is associated with better health, higher economic prosperity, and a greener environment.

INTRODUCTION

As the City of Sandy continues to experience population growth, a vibrant city center will help build community and enhance quality of life for all Sandy residents.

Historically, the City of Sandy's downtown has centered around the Highway 26 couplet of Pioneer and Proctor Boulevards. Pioneer and Proctor Boulevards, from Bluff Road to Ten Eyck Road, are home to local businesses as well as civic and community spaces. Both Pioneer Boulevard and Proctor Boulevard route travelers to Sandy River, Mount Hood, and Central Oregon. Sandy's downtown is essential to residents and visitors alike, yet it also poses challenges as a high-volume vehicle and truck route. The DWA identifies existing barriers in downtown Sandy and provides solutions benefiting Sandy residents, visitors, and local businesses.

PURPOSE AND OBJECTIVES

The DWA assesses the current pedestrian environment of downtown Sandy and its connectivity to surrounding residential and parkland or open space areas. The DWA identifies several goals and objectives that drive the assessment. The goals for this assessment were created with the following guiding values related to walkability and the idea of creating a more vibrant downtown:

- **Livability**: Provide a high quality of life by providing alternative transportation options to a mix of amenities.
- **Safety and Health**: Enable people to safely walk, run, or roll (i.e., wheelchairs) around and to/from downtown.
- **Accessibility**: Provide pedestrian conditions that are suitable for individuals of all mobility levels, including people with visual, hearing, and mobility impairments.
- **Feasibility**: Use resources efficiently to make improvements.
- **Economic Vitality**: Encourage visitors and residents to invest in local businesses within the downtown.
- **Community**: Encourage community engagement and socializing through walking and rolling.

Overall, the recommendations are categorized into three main goals.

GOALS

1. IMPROVE PEDESTRIAN **SAFETY AND COMFORT** IN DOWNTOWN
2. IMPROVE PEDESTRIAN **ACCESSIBILITY** IN DOWNTOWN
3. IMPROVE PEDESTRIAN **CONNECTIVITY** IN DOWNTOWN

In order to achieve these goals, the City has identified three key objectives for this project:

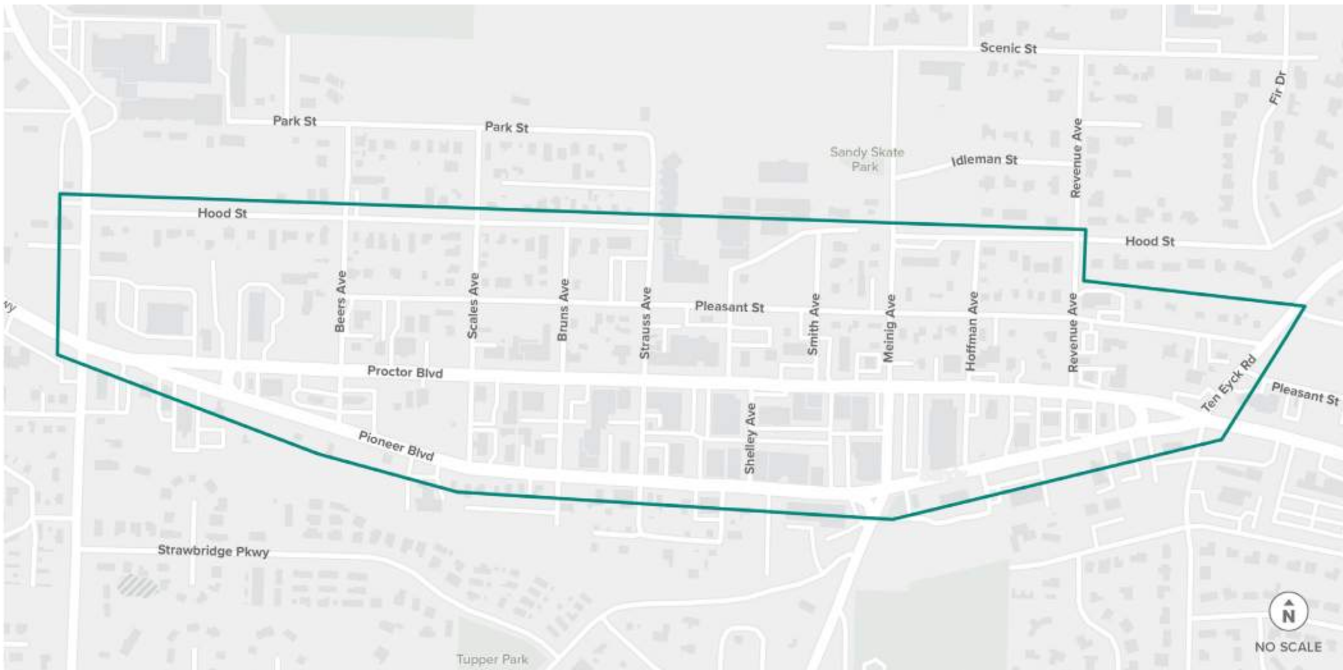
OBJECTIVES

1. IDENTIFY **WALKABILITY AND ROLLABILITY BARRIERS** IN DOWNTOWN SANDY
2. IDENTIFY **WALKABILITY IMPROVEMENTS THAT ARE REALISTIC AND FEASIBLE** FOR DOWNTOWN SANDY
3. IDENTIFY **PRIORITY AREAS** FOR WALKABILITY IMPROVEMENTS BASED ON AREAS OF HIGH PEDESTRIAN TRAFFIC AND PROXIMITY TO FACILITIES AND/OR ATTRACTIONS

PROJECT BOUNDARY

The boundary of the Downtown Walkability Assessment (DWA) is defined in Figure 1 below. The study area is bounded to the north by Hood Street, to the south by Pioneer Boulevard, to the east by Ten Eyck Road, and to the west by Bluff Road.

FIGURE 1. MAP OF DOWNTOWN WALKABILITY ASSESSMENT BOUNDARY



NEED FOR ASSESSMENT

Realizing the potential for a downtown core to serve a growing population, the City of Sandy started the urban renewal district in 1998 to implement goals and objectives of the Comprehensive Plan and to implement downtown development strategies. Several Comprehensive Plan policies were used for guidance in the urban renewal plan including connecting developments with safe and direct sidewalks, improving bicycle and pedestrian travel between residential areas and the downtown, and achieving a pedestrian-oriented city center. It was believed that enhancing public safety, providing for a more productive use of land in the urban renewal area, and making improvements to infrastructure would assist in creating a vibrant city center.

Since the adoption of the Urban Renewal Plan in 1998, the City has adopted design standards for street right-of-way infrastructure, design standards for buildings, installed wayfinding signage, and created a parking district to assist businesses with parking availability. Other projects have also been completed, such as the undergrounding of transmission and communication lines, remodeling of public buildings, and the implementation of the SandyNet fiber system to provide the community with increased Internet speeds.

Another significant service introduction in Sandy was the Sandy Area Metro (SAM) transit department in 2000, decreasing vehicle trips and providing an alternative mode of transportation. SAM provides access to downtown Sandy as well as connections to Gresham, Estacada, and Mount Hood. The Sandy Transit Center is located in downtown Sandy next to the Sandy Historical Society.

In 2015, the City of Sandy's City Council set goals for the 2015-2017 biennium. The City Council set several goals relevant to, and serving as a catalyst for, the Downtown Walkability Assessment, including the following:

- Conduct sidewalk inventories each year to improve pedestrian safety.
- Expand City Hall frontage and include upgrades to security and accessibility.
- Explore solutions to traffic problems at the crosswalk by the Sandy library.
- Work with ODOT to improve signal timing on Highway 26.
- Continue installation of signs per the downtown wayfinding plan.
- Continue the Urban Renewal "façade" program.
- Maintain and build on downtown community events.

Similarly, Clackamas County's Transportation System Plan (TSP), completed in 2013, acknowledges challenges specific to Clackamas County and sets goals relevant to the Downtown Walkability Assessment. The TSP for Clackamas County addresses congestion, traffic crash fatalities, environmental impacts of motor vehicles, economic growth and tourism, and equity and access within the transportation system. Goals relevant to the DWA include:

GOAL 1 Provide a transportation system that optimizes benefits to the environment, the economy, and the community.

GOAL 2 Plan the transportation system to create a prosperous and adaptable economy and further the economic well-being of businesses and residents of the County.

GOAL 3 Promote a transportation system that maintains or improves our safety, health, and security.

GOAL 4 Provide an equitable transportation system.

In 2015, the County added the Clackamas County Active Transportation Plan (ATP) to the TSP. The ATP solidified the County's commitment to pedestrian and bicycle facilities. The ATP also determined bicycle routes in the County to increase bicycle access, as well as to spur tourism and economic development. The DWA complements the TSP as it promotes safety, health, and economic development efforts in the City of Sandy.

The Cedar Ridge Middle School and Sandy Grade School Safe Routes to School Plan was completed and published in 2020. The plan's vision stated "the Oregon Trail School District community envisions a future where children and their families safely, comfortably, and conveniently walk and bicycle as part of the daily school commute and a healthy lifestyle." The plan identified barriers to walking and rolling to Cedar Ridge Middle School and Sandy Grade School, and provided recommendations based on safety assessments, observations made at student drop-off and pick-up, and community meetings. The plan prioritized ensuring students could walk and bike to and from campus within a quarter mile of the schools – a distance that would include the City of Sandy's downtown area.

Two other projects are currently underway in Sandy: the Pleasant Street Master Plan and the Sandy Community Campus. The Pleasant Street Master Plan will define a vision for an expanded downtown Sandy north of Proctor Boulevard focusing on a pedestrian-centric commercial corridor. The Pleasant Street commercial corridor will give pedestrians an option in downtown that is not located on a high-volume trucking route. The development of the Sandy Community Campus (formerly owned and operated by the Oregon Trail School District as the former location of the Cedar Ridge Middle School) to the north of Pleasant Street will eventually transform the property into a multi-generational community/aquatic facility. This facility located in the downtown and within close walking distance of schools and the library will benefit the community for decades into the future.

In addition to City of Sandy goals and objectives, the evolving concerns around increases in obesity, decreases in physical activity, especially among youth, and environmental impacts caused by petroleum-based transportation have Planning Division staff concerned. Creating a walkability assessment that defines obstacles and creates recommendations to implement safe walking routes will hopefully encourage more active lifestyles through walking, reduce the use of petroleum-based vehicles, provide additional civic and community spaces, and create more opportunities for local businesses and residents.

Following several downtown developments and programs as well as City of Sandy and Clackamas County planning goals, the Downtown Walkability Assessment was initiated in 2017. The completion of the assessment took a two-year hiatus between planning internships due to staff workloads. The Downtown Walkability Assessment was primarily created through input from the community. Community input was collected through a walking audit, pop-up public mapping sessions, a community survey, and a stakeholder committee. Technical analysis of existing walkability conditions and needs in Sandy's downtown aligned with community outreach efforts to create the DWA.

BENEFITS OF WALKABILITY

There are numerous benefits to creating and enhancing walkable environments. The benefits of walkability to communities can be broken into the following categories:[1]

- HEALTH
- EQUITY & ACCESSIBILITY
- ECONOMIC
- COMMUNITY
- CLIMATE

HEALTH

The health benefits for walkability can be separated into three main categories – reductions in cardiovascular issues, weight loss, and reductions in vehicular crashes. Walkable neighborhoods lower rates of traffic fatalities, reduce pollution from vehicles, and improve physical health by increasing opportunities for physical activity.

When discussing health benefits correlated to walkability, it is important to note there are benefits beyond improving physical health, such as helping people maintain or improve mental health.

EQUITY AND ACCESSIBILITY

Creating and enhancing walkable and rollable environments benefits all people, but particularly benefits vulnerable populations such as older adults, youth, people with visual and/or mobility impairments, low-income communities, and communities of color.[2] For example, as adults age, they may lose the ability or desire to drive a motor vehicle and are more likely to have visual and/or mobility impairments. Building a connected walkable and rollable network helps older adults and/or visually- and mobility-impaired populations to access services and resources, and maintain a sense of independence. Sidewalk and intersection improvements especially benefit those with mobility impairments. Similarly, youth without access to a driver's license rely on a connected walkable street network to access educational facilities, for example the Sandy Public Library, AntFarm, and Sandy Grade School.

ECONOMIC

A pedestrian-friendly environment is an important component of, or contributor to, a thriving downtown. The compact nature of infrastructure and customer-oriented businesses in downtowns create a great setting for walkability. "A bustling downtown flourishes when people get out of their vehicles and browse through shops, stop to have a bite to eat, and interact with their fellow community members."[3] Foot traffic provides more exposure for local downtown businesses, which can significantly help the profitability of business.

1 Speck, Jeff. "Walkable City Rules: 101 Steps to Making Better Places." 2018. Island Press.

2 Speck, Jeff. "Walkable City Rules" pp 8-9.

3 https://extension.ucdavis.edu/sites/default/files/walkability.pdf

When accessibility and safety increase in the city center, a higher concentration of businesses is more likely. A more compact urban environment creates an ideal destination for walking from business to business, rather than necessitating driving to multiple destinations. Multiple small businesses in a downtown are also more likely entrepreneurial 'mom and pop' businesses that help create a sense of place and enable existing residents to become independent business owners. Having business owners who are invested in the community is valuable to the long-term success of Sandy and the vibrancy of the downtown.

WALK SCORE

Walk Score uses a patented methodology based on state-of-the-art research and analysis of hundreds of walking routes to nearby amenities in cities all over the country. Points are given according to the walking distance to amenities. Walk Score also analyzes variables such as block length and intersection density.

Real estate values also benefit from increases in walkability. Walk Score is a website that calculates neighborhood walkability, giving point values primarily based on vicinity to amenities while also factoring in population density and road metrics.[1] One study found an increase in real estate values of approximately $500 to $3,000 per one Walk Score point.[2] According to Redfin, research has shown that one point of Walk Score is worth $3,250 in home value.[3] Additionally, owning and operating vehicles are large expenses for most Americans. The average household cost to own and operate one car in the U.S. is $9,000 per year.[4]

COMMUNITY

Increasing the vibrancy of walkable environments can also help increase the number of social interactions, creating more connections and relationships amongst communities and neighborhoods.[5] In fact, a University of New Hampshire study found that residents living in more walkable neighborhoods trusted their neighbors more, and volunteered and participated in community projects more often than residents living in less walkable neighborhoods.[6] When communities connect parks, schools, libraries, and commercial areas, residents socialize and build community ties. Enhancing the pedestrian environment in downtown Sandy encourages a strengthened sense of community and identity.

CLIMATE

There are also significant environmental benefits associated with more walking, as has been published for decades by major environmental advocacy groups. Since transportation is responsible for one-third of all U.S. greenhouse gas emissions, walking would help decrease the amount of vehicle usage, and thus, lead to less smog and less traffic.[7] Reducing greenhouse gas emissions in Sandy should be an altruistic goal for decades to come.

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1 "Walk Score Methodology." Walk Score. Web. <http://www.walkscore.com/methodology.shtml>.

2 Cortright, Joe. "Walking the Walk How Walkability Raises Home Values in U.S. Cities." Walk Score Blog. CEOs for Cities, Aug 2009. Web. <http://blog.walkscore.com/wp-content/uploads/2009/08/WalkingTheWalk_CEOsforCities.pdf>.

3 Bokhari, Sheharyar . "How Much is a Point of Walk Score Worth?." Redfin. 3 Aug 2016. Web. <https://www.redfin.com/blog/2016/08/how-much-is-a-point-of-walk-score-worth.html>.

4 Sam Schwartz Engineering , and America Walks. "Benefits of Walking." America Walks . Web. <http://americawalks.org/learning-center/benefits-of-walking-2/>.

5 Zhou, Xuemei, Zhipeng Lu, Chia-Yuan Yu, Chanam Lee and George Mann. "Health Impacts of a Walkable Community." Active Living Research. Mar 2014. Web. <http://activelivingresearch.org/sites/default/files/2014_WalkableCommunities_Zhu-Lee.pdf>.

6 Shannon H. Rogers et al., "Examining Walkability and Social Capital as Indicators of Quality of Life at the Municipal and Neighborhood Scales," Journal of Applied Research in Quality of Life 6, no. 2 (2011): 2013.

7 Sam Schwartz Engineering , and America Walks. "Benefits of Walking." America Walks . Web. <http://americawalks.org/learning-center/benefits-of-walking-2/>.

EXISTING CONDITIONS

The walkability of the existing conditions in downtown Sandy were evaluated through a technical walking audit that assessed pedestrian conditions across multiple factors and criteria.

TECHNICAL WALKING AUDIT – PEDESTRIAN ENVIRONMENTAL QUALITY INDEX (PEQI) ANALYSIS

BACKGROUND

To evaluate the existing walkability conditions in downtown Sandy, staff conducted a technical walking audit. While there are various toolkits to choose from when conducting a walking score audit, the Planning Division used the Pedestrian Environmental Quality Index (PEQI) walkability measurement system, developed by the San Francisco Department of Public Health (SFDPH). The PEQI assessment was chosen for its level of detail in assessing pedestrian conditions, evaluating thirty factors of walkability with separate criteria for intersections and street segments. The final product of the PEQI assessment provides scores to intersections and street segments on a 0 to 100 scale with 0 being the lowest score possible and 100 the highest score possible. For this audit, 30 intersections and 53 street segments were assessed within the project boundaries.

MEASUREMENT SYSTEM

To measure walkability conditions, the PEQI method designated scores for various factors of walkability. The creators of the PEQI, developed a list of different factors, referred to as 'indicators' in the PEQI assessment, for street segments and intersections associated with pedestrian environment and safety. The indicators were further divided into five categories, referred to as 'domains'. The domains include intersection safety, traffic, street design, land use, and perceived safety.

According to the SFDPH, the list of factors was created "based on a review of transportation, planning and public health literature, including existing pedestrian quality or 'walkability' indices and level-of-service metrics, design guidelines, and factors associated with increased walking and improved pedestrian safety in empirical research."[1] The table below includes the full list of walkability factors included in the PEQI method.

PEQI TERMS AND FORMULAS

TERMS:

- **Indicators**: factors of walkability
- **Indicator Response Category**: measurement of factors
- **Domain**: categories of walkability factors

FORMULAS:

- **Indicator Response Category Score Weighed** = (indicator score) x (indicator response category score)
- **Adjusted Score** = (unadjusted score - minimum score) x (100/maximum score - minimum score)

1 "The Pedestrian Environmental Quality Index (PEQI): An assessment of the physical condition of streets and intersections." Sustainable Technology & Policy Program (STPP) UCLA. San Francisco Department of Public Health, Fall 2008. Web. <http://stpp.ucla.edu/sites/default/files/SF%20PEQI%20Methods.pdf>.

TABLE 1. PEQI TABLE OF INDICATORS (ORIGINAL)

INTERSECTION	STREET INTERSECTION			
INTERSECTION SAFETY	**TRAFFIC**	**STREET DESIGN**	**LAND USE**	**PERCEIVED SAFETY**
Crosswalks	Number of lanes	Sidewalk width	Storefronts/retail use	Pedestrian scale lighting
Ladder crosswalks	Two-way traffic	Sidewalk impediments	Public art/ historical sites	Graffiti
Pedestrian signal	Vehicle speed limit	Sidewalk obstructions		Litter
Traffic signal	Traffic volume	Presence of curb		Construction sites
Crossing speed	Traffic calming features	Driveway cuts		Abandoned buildings
Crosswalk scramble		Trees		
No turn on red signals		Presence of buffers		
Additional signs for pedestrians		Planters/gardens		
Traffic calming features		Public seating		

Once the factors of walkability were chosen, referred to as “indicators” for scoring, they were given scores by the SFDPH. The three sections of the PEQI scoring system were as follows: indicators, indicator response categories, and domain weight. All intersections and street sections were given scores based on a survey SFDPH conducted. The survey consulted national experts (i.e., city and transportation planners and consultants, and pedestrian advocates) on the importance of each indicator to the pedestrian walking experience. Based on the survey responses to each indicator, a response category was given a score, and domain weights were decided. The final score used for calculations was the ‘indicator response category score weighted,’ which was equal to the indicator score times the indicator response category. For the full scores original PEQI see Appendix A.

MODIFICATIONS

Since its creation, the PEQI scoring system has continued to evolve. Indicators for the PEQI performed in Sandy were chosen from several versions of the PEQI method. Some factors used in the San Francisco PEQI assessment were omitted from the Sandy PEQI and other factors were added or given different weights to better evaluate the conditions and needs in downtown Sandy. It was important that the modifications were not extreme so comparisons of walkability to other geographic locations could still be made. Adjustments included omissions and additions of indicators, changes to scores of indicator responses, and changes to domain weights. See Table 2 for an overview of the modifications. Score changes were evaluated to fit within the existing value range and correctly reflect relative importance to the other indicator and indicator response scores. In total, there were 9 indicators for intersections and 21 indicators for street segments assessed in Sandy with the modified system, resulting in one additional indicator for intersections.

TABLE 2. MODIFICATIONS TO PEQI INDICATORS FOR SANDY TECHNICAL ADULT

INTERSECTION	STREET INTERSECTION			
INTERSECTION SAFETY	**TRAFFIC**	**STREET DESIGN**	**LAND USE**	**PERCEIVED SAFETY**
Crosswalks	Number of lanes	Continuous sidewalk		Pedestrian scale lighting
High visibility crosswalks	Two-way traffic	Sidewalk width	Consumer-focused businesses and public spaces	Graffiti
Intersection lighting	Vehicle speed limit	Width of throughway		
Pedestrian signal & countdown		Sidewalk impediments		
Traffic control	Transportation Systems Plan classification	Sidewalk obstructions		Vacant lots
Pedestrian engineering countermeasures	Traffic calming features	Driveway cuts, trees, presence of buffers, planters/gardens, public seating/ public art		Derelict/vacant buildings
Intersection calming features				
Unprotected crossing distance				

DATA COLLECTION, ENTRY, AND MAPPING

Using the original PEQI audit form as a template, an audit form was created with modifications reflecting the indicators chosen for the Sandy PEQI Technical Walking Audit. The audit form listed all potential response options to all indicators for intersections and street segments, with separate response areas for different sides of street segments (i.e., north and south sides, or west and east sides). See form in Appendix A.

The audit forms were completed by walking the areas of the assessment and gathering the data through visual evaluation. There were a few factors not determined by walking and, therefore, they were omitted from the audit form. The factors not included on the audit form were unprotected crossing distance measured in Google Earth, and Transportation System Plan classifications. A total of 30 intersections and 53 street segments were audited, with separate evaluations for each side of the street segments. See Figure 2 below for a map identifying locations of all street segments and intersections included in the PEQI assessment.

Once the information was gathered for all the intersection and street segments in the assessment, data entry and analysis followed. Scores were determined by the responses to each of the indicator response categories to determine the individual score for each factor. The indicator response category weight was calculated by multiplying the domain weight by the indicator category response score. Then all the weighted scores for every factor in an intersection or street segment were added together to give a final score for the individual intersection or street segment. Once all individual intersections and street segment scores were calculated they were adjusted to fit the 0 to 100 scale, which required a preliminary calculation of the highest possible score and lowest possible score of intersections and street segments. The minimum and maximum scores for this audit are contained in Table 3.

FIGURE 2. MAP OF INTERSECTIONS AND STREET SEGMENTS ASSESSED FOR PEQI

TABLE 3. POSSIBLE SCORES: INTERSECTIONS AND STREET SEGMENTS

	MAXIMUM SCORE	MINIMUM SCORE
INTERSECTION	175	65
STREET SEGMENT	348	118

Once the maximum and minimum scores were calculated, the scores were adjusted. The adjustment to the scores was completed using the following equation:

Adjusted score = **(unadjusted score – minimum score)** * **(100/maximum score – min score)**

Once the scores were adjusted, they could be compared to the scale of walkability created by SFDPH.

TABLE 4. DESCRIPTION OF PEQI SCORES

INTERSECTION AND STREET SEGMENT SCORE RANGE	PEDESTRIAN CONDITIONS
0 - 20	Environment not suitable for pedestrians; pedestrian conditions absent
21 - 40	Poor pedestrian conditions exist
41 - 60	Basic pedestrian conditions exist, but room for improvement
61 - 80	Reasonable pedestrian conditions exist; some important pedestrian conditions present
81 - 100	Ideal pedestrian conditions exist; many important pedestrian conditions present

RESULTS AND ANALYSIS

In this section, street segment refers to individual sides of each street segment; that is, the north/south or east/west side of 53 street segments (blocks) were assessed but there were 106 street segment scores (one for each side of the road on each segment).

The average intersection score (see Table 5) was 45 and the average street segment score (see Table 6) was 51. Both of these scores fell in the middle scoring category with corresponding pedestrian conditions of 'basic pedestrian conditions exist, but room for improvement.' For intersections, the most common scores were in the 21 to 40 range, which reflected that 'poor pedestrian conditions exist' at half of all intersections. For the street segments, the most common scoring category was 41 to 60 range, where 'basic pedestrian conditions exist, but there is room for improvement.'

TABLE 5. INTERSECTION PEQI SCORES BY RANGE

SCORE RANGE	NUMBER OF INTERSECTIONS IN RANGE	PERCENTAGE OF INTERSECTIONS IN RANGE
0 - 20	1	3%
21 - 40	15	50%
41 - 60	7	23%
61 - 80	6	20%
81 - 100	1	3%

TABLE 6. STREET SEGMENTS PEQI SCORES BY RANGE

SCORE RANGE	NUMBER OF STREET SEGMENTS IN RANGE	PERCENTAGE OF STREET SEGMENTS IN RANGE
0 - 20	0	0%
21 - 40	20	19%
41 - 60	67	63%
61 - 80	19	18%
81 - 100	0	0%

FIGURE 3. PEQI SCORES FINAL MAP

SIDEWALKS

When assessing the street segments with the lowest scores – those between 21 to 40 – almost all had pavement gaps in the sidewalks. Note that for this assessment, the "not continuous sidewalks" determination means there is not consistent sidewalk infrastructure throughout the street segment, which can range from large portions of no sidewalk infrastructure to areas where asphalt in driveway or parking lot entryways act as the sidewalks.

The existing sidewalks within the assessment boundary were of fair width; a majority fell between five to eight feet. A few sidewalk segments were very narrow, with a width of less than five feet.

In comparison to sidewalk width, sidewalk clearpath widths were much narrower in most sidewalk sections, with most less than four feet or four to six feet. The primary reason is the presence of obstructions. Throughout the study area there were numerous types of sidewalk obstructions, temporary and permanent, including but not limited to utility poles, sign poles, mailboxes, flower pots, utility boxes, parked cars, and more. Seventy-five percent of the street segments with continuous sidewalks had temporary and/or permanent obstructions. Impediments were also a sidewalk walkability concern in the study area. Impediment conditions included uneven sidewalks, and crumbling concrete sidewalks. All the conditions listed above are important when addressing walkability and accessibility. Having continuous sidewalk infrastructure in good condition is the foundation of a pedestrian-friendly environment. Furthermore, connected, sizable, and smooth sidewalk infrastructure is more accessible.

FIGURE 4. MISSING SIDEWALKS

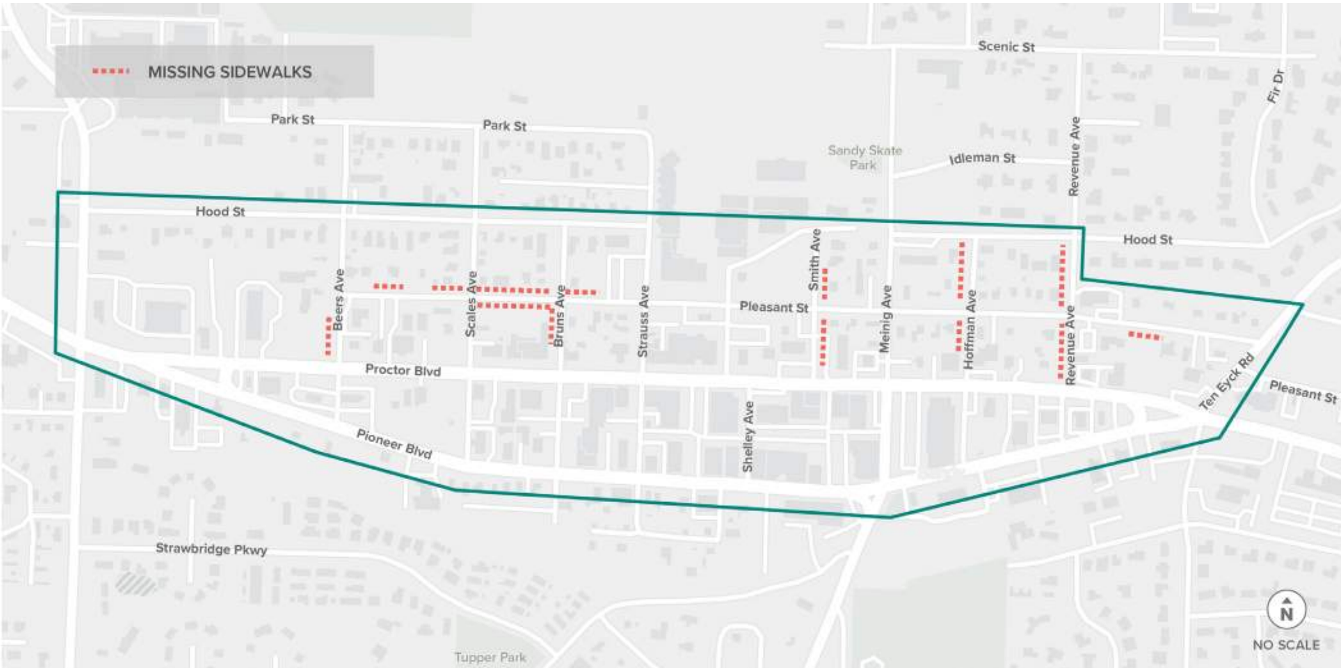


FIGURE 5. SIDEWALK IMPEDIMENTS AND NARROW SIDEWALKS

COMFORT AND AMENITIES

Driveway cuts are an important part of comfort for pedestrians. Forty-two percent (45 of 106) of street side segments had more than three driveway cuts for their block. Less than one percent of street segments had no driveway cuts. Twenty-seven percent of street segments had street trees. The trees assessed were limited to street trees between the clearpath pedestrian zone and the curb. Buffers between pedestrian areas and traffic existed on almost every street segment; buffers included on-street parking and bike lanes. Almost every street segment had buffers between the pedestrian areas and traffic (travel lanes). Parallel parking was present along almost every street in the study area. Also, the south side of Pioneer Boulevard and the north side of Proctor Boulevard both include existing bike lanes.

Planters were found throughout the downtown, predominantly located on Proctor Boulevard and on almost every street segment between Beers Avenue and Ten Eyck Road. Planters were found on 24.5 percent of sides of street segments. Public seating and public art were amenities that were less prevalent throughout the study area. Only four segments contained public art, which consisted of murals and sculptures. Public seating was found along ten street segments, again most heavily concentrated along Proctor Boulevard and the couplet area west of Meinig Avenue.

Within the couplet – Pioneer Boulevard, Proctor Boulevard, and their connecting roads – there are an abundance of customer-focused businesses and entities. Along Pleasant Street a few customer-focused businesses exist, but the main public amenities are Sandy Grade School and the Sandy Aquatics Center.

Outdoor public spaces beyond sidewalk infrastructure were scarce in the assessment boundaries, with Memorial Plaza across from City Hall as the major public space in the downtown.

SAFETY

Numerous derelict and/or vacant buildings and vacant lots were found throughout the study area. Their presence can reduce the comfort and aesthetic of the pedestrian environment. There was no graffiti of significant size found within the project area. Intersection lighting was found throughout the assessment area and every intersection had at least one light, except for Alt Avenue/Shelley Avenue/ Proctor Boulevard, which had several pedestrian scale lights around the intersection. Only nine percent of street segments had pedestrian scale lighting.

Data pulled from the Sandy Police Department's crash reports from 2006 to 2016 showed that in that time period, there were a total of 26 motor vehicle crashes involving pedestrians within the city limits. Of those, six were located within the DWA project boundary.

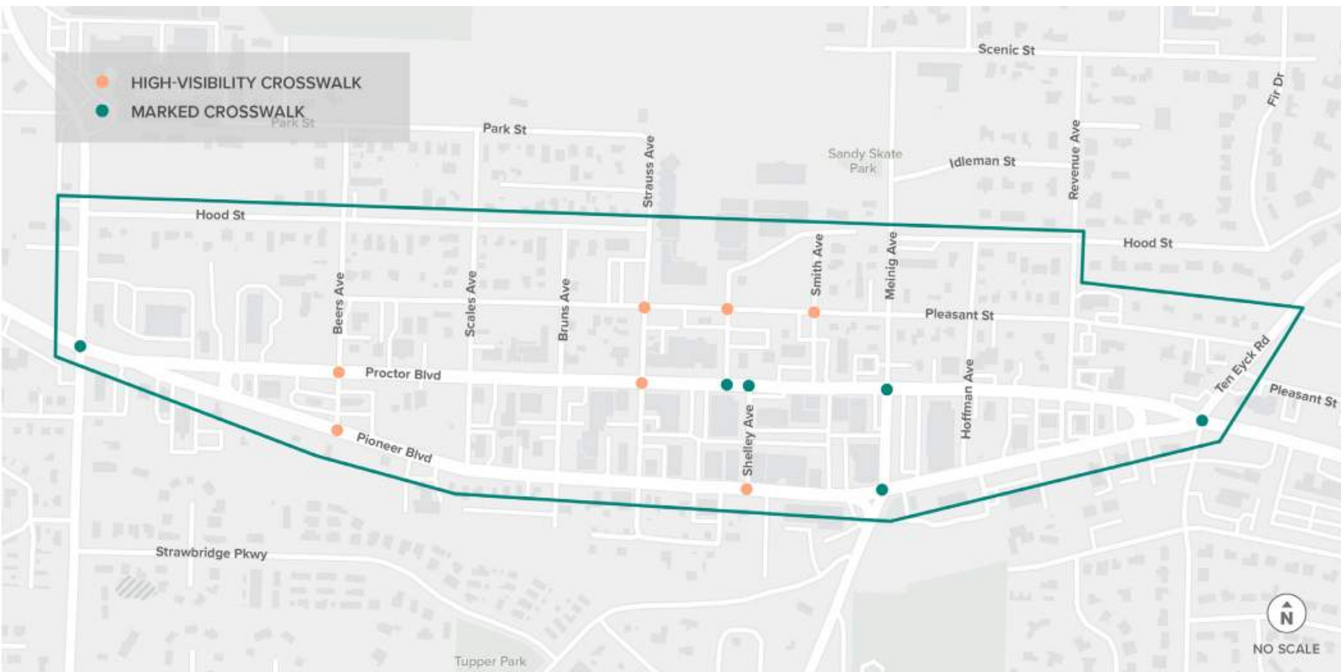
For more detail on motor vehicle crashes involving pedestrians, see Appendix A. To see mapped locations on incidents within the project boundary see, Appendix A.

INTERSECTIONS

Almost all the intersections within the assessment area had the basic intersection elements assessed in the PEQI, which included traffic control, intersection lighting, and curb ramps. The only intersection without lighting was Proctor Boulevard at Revenue Avenue. This intersection was also the lowest scoring – the only one to score under 20, due to the lack of intersection lighting, marked crosswalks, and traffic control devices (traffic lights, stop signs, etc.). Only seven of the intersections had high visibility markings. All of the marked intersections in the project area are shown in Figure 6. All the intersections had at least one curb ramp, many with truncated domes. Intersections were not assessed for full ADA compliance; they were simply assessed for the existence of curb ramps and truncated domes.

Many of the curb ramps on Pioneer Boulevard and Proctor Boulevard were oriented to encourage east/west crossing but not to encourage crossing the boulevards, unless there was a marked intersection. Only a few intersections contained intersection calming features or pedestrian engineering countermeasures, such as bulb-outs and additional signage. More intersection calming features and/or pedestrian engineering countermeasures could be beneficial for improving perceived safety of pedestrian crossings across Pioneer Boulevard and Proctor Boulevard.

FIGURE 6. MARKED INTERSECTIONS



ACCESSIBILITY AND CONNECTIVITY

In addition to PEQI assessments conducted by staff, existing conditions were evaluated by reviewing accessibility standards.

The information in Table 7 on the following page was provided by the Oregon Department of Transportation (ODOT). The information provided insight into some conditions of accessibility in downtown, specifically addressing pedestrian crossing times, pedestrian push buttons, and curb ramps. In the Sandy area there were several training and service centers for those with disabilities, such as Guide Dogs for the Blind and Oral Hull Center for the Blind and Low Vision, that used downtown Sandy as a training area, making it even more important that downtown is accessible for all users. The accessibility information addressed in this assessment was informed by comments related to accessibility expressed by the public.

Table 7 shows the crossing times at all signalized intersections in downtown. The total walk time shown in the table was calculated by totaling the "Walk" time (in seconds) plus the flashing "Don't Walk" time. The timing for pedestrian signals was determined by ODOT, which uses the Manual on Uniform Traffic Control Devices (MUTCD) as a guide.

There is potential to allow longer cross times for those with disabilities, providing a comfortable window to cross busy downtown streets, particularly along Highway 26. These suggestions were responses to concerns expressed by the public.

ACCESSIBILITY COMPLIANCE OF CURB RAMPS AND PUSH BUTTONS

The *Oregon Department of Transportation Americans with Disabilities Act Transition Plan* (2017) details information on curb ramps. In 2011, ODOT evaluated curb ramps at approximately 7,000 street intersections on all state highways, within incorporated cities, and other developed areas. A "Good-Fair-Poor" rating was developed to determine the physical conditions of these ramps, as defined further in the design recommendations in *Public Right-of-Way Accessibility Guidelines*. A "Good" rating indicated curb ramps met the ADA guidelines and the ramp was usable by most, if not all, people with disabilities. A "Fair" rating indicated that curb ramps met ADA guidelines but lacked a detectable warning, such as a truncated dome. A "Poor" rating described curb ramps that did not meet one or more ADA guidelines, making the ramp a barrier for all people with disabilities.

ODOT provides signals at numerous street intersections that control pedestrian traffic as well as vehicular traffic. ODOT has an inventory of these signal-controlled intersections and will refine this inventory to better evaluate pedestrian signals for full accessibility based on current standards. This refinement will improve the inventory of accessibility features at curb ramp locations where a traffic signal push-button is required to activate a street crossing signal.

ACCESSIBILITY ANALYSIS

ADA accessibility conditions in downtown Sandy currently meet some standards, but are not adequate for people with certain disabilities. Some efforts and evaluations have been made but further analysis is needed. Additionally, while certain conditions are deemed compliant or up to standards by governing agencies, the community has expressed that an extra step should be taken to ensure safety and accessibility.

TABLE 7. PEDESTRIAN CROSSING SIGNALS TIMING

INTERSECTION	CROSSING	PHASE #	WALK (SECONDS)	FLASHING DON'T WALK (SECONDS)	TOTAL TIME OF PED. SIGNAL (SECONDS)
Hwy 26 @ Bluff Rd	North across Bluff Rd	6	8	20	**28**
	East across Pioneer/Proctor	8	10	29	**39**
	South across Bluff Rd	2	7	18	**25**
	West across Hwy 26	4	8	29	**37**
Pioneer Blvd @ Strauss Ave	North across Strauss Ave	2	7	10	**17**
	East across Pioneer Blvd	4	7	10	**17**
	South across Strauss Ave	2	7	10	**17**
	West across Pioneer Blvd	4	7	10	**17**
Proctor Blvd @ Alt Ave/ Shelley Ave	North across Alt Ave	6	7	10	**17**
	East across Proctor Blvd	8	7	12	**19**
	South across Shelley Ave	6	7	12	**19**
	West across Proctor Blvd	4	7	12	**19**
Pioneer Blvd @ Meinig Ave	North across Meinig Ave	2	7	13	**20**
	East across Pioneer Blvd	8	7	14	**21**
	South across Meinig Ave	2	7	13	**20**
	West across Pioneer Blvd	4	7	10	**17**
Proctor Blvd @ Meinig Ave	North across Meinig Ave	6	7	12	**19**
	East across Proctor Blvd	8	7	15	**22**
	South across Meinig Ave	6	7	12	**19**
	West across Proctor Blvd	4	7	15	**22**
Hwy 26 @ Ten Eyck Rd	North across Ten Eyck Rd	6	7	19	**26**
	South across Ten Eyck Rd	2	7	15	**22**
	West across Pioneer Blvd	5	7	15	**22**
	West across Proctor Blvd	4	7	11	**18**

FIGURE 7. CURB RAMP AND PUSH BUTTON ACCESSIBILITY CONDITIONS

Source: Oregon Department of Transportation

CONNECTIVITY

Walkable connections, via sidewalks and paths, to Sandy's downtown are also vital to creating a pedestrian network. To encourage walking in the downtown, it is also important to provide easy ways to walk into the downtown.

The following streets are the major connections from neighborhoods to downtown. The Community Walking Audit Checklist was used to evaluate the condition of each connecting street, and the evaluations were completed in October and November of 2019.

1. **Ten Eyck Road**
   Condition: The sidewalks could use improvement as there is no sidewalk on the east side and the sidewalk ends at Hood Court. A curb ramp is also missing when crossing Pleasant Street on Ten Eyck Road.

2. **Pathways throughout Meinig Park**
   Condition: While the pathways throughout Meinig Park are well-marked and developed, there is a significant amount of debris from plants making it slippery for walking and rolling. The lighting on the pathways is also not sufficient for pedestrians.

3. **Bluff Road north of Highway 26**
   Condition: There is adequate sidewalk infrastructure on Bluff Road north of Highway 26, but some overgrown vegetation makes it difficult to walk. There is a vehicle blind spot at Bluff Road and Hood Road, which presents a dangerous crossing for pedestrians.

4. **Bluff Road south of Highway 26**
   Condition: There is adequate sidewalk infrastructure on Bluff Road south of Highway 26, but it is not very wide. Furthermore, the Bluff Road and Highway 26 intersection has a quick pedestrian signal, presenting a challenge to mobility-impaired pedestrians.

5. **Wolf Drive**
   Condition: There are sidewalks on both sides of Wolf Drive from Kimberly Drive to Pioneer Boulevard. However, some street signs are missing and others are hard to see, which can present distractions for drivers. Wolf Drive also could use ADA improvements as there are several missing curb ramps.

6. **Strawbridge Parkway**
   Condition: Strawbridge Parkway has adequate pedestrian infrastructure.

7. **Tupper Road**
   Condition: There is only one sidewalk on the south side of the street, and pedestrians walking and rolling may have a difficult time due to tree debris on the sidewalk.

WALKABILITY IMPROVEMENTS FROM 2000-PRESENT

Other previous City of Sandy improvements to walkability and alternative transportation over the last twenty years or so, include but are not limited to:

- Undergrounding utilities on Proctor Boulevard
- Construction of sidewalks north of downtown
  - » North side of Pleasant Street from Meinig Avenue to Revenue Avenue
  - » Bruns Avenue, both sides, from Pleasant Street to Hood Street
  - » Beers Avenue, both sides, from Pleasant Street to Hood Street
- Creation of the Tickle Creek Trail and Sandy River Trail
- Street furniture upgrades
- Implementation of the downtown flower basket program

PUBLIC ENGAGEMENT

In assessing the conditions of the downtown pedestrian environment, it was important to engage the community to understand their perception of walkability.

Engaging the community to understand their perception of walkability was crucial in assessing the conditions of the downtown pedestrian environment – understanding reasons they do or do not walk, barriers to walkability, and their concerns about the current pedestrian conditions. The community engagement and feedback process consisted of three different outreach techniques – a survey, a pop-up mapping activity, and a community walking audit. This chapter details each of the public outreach techniques and summarizes the feedback received from the participants.

ADVISORY COMMITTEE

The Downtown Walkability Assessment Advisory Committee consisted of interested citizens, elected officials, and representatives from agencies/departments (see Acknowledgments). The advisory committee met three times throughout the course of the study and provided feedback on various aspects of the assessment.

SURVEY

BACKGROUND

DOWNTOWN WALKABILITY ASSESSMENT

- Survey conducted to receive **public feedback** on a range of walkability factors and existing conditions
- Consisted of **27 questions**
- Most surveys were completed online through **Survey Monkey**, an online survey platform
- Total of **150 surveys** were completed
- Majority of survey respondents were **Sandy residents** and **local business patrons**

* THE FULL SURVEY CAN BE FOUND IN APPENDIX B.

SURVEY DISTRIBUTION

The survey was primarily distributed and completed online through SurveyMonkey. There were e-blasts sent by the Sandy Chamber network and several postings on the City of Sandy's Facebook page. There was also a Sandy Post Article, published on February 14, 2018, that informed and encouraged community members to complete the survey. A notice was also included with the monthly City of Sandy utility bill. Additionally, there was a session at the Senior Center where senior attendees were provided background information on the assessment and had the opportunity to complete paper versions of the survey.

SURVEY ANALYSIS

A summarized analysis of the responses to the Downtown Walkability Assessment survey is shown in the following section. To see detailed full survey responses, see Appendix B.

DEMOGRAPHICS

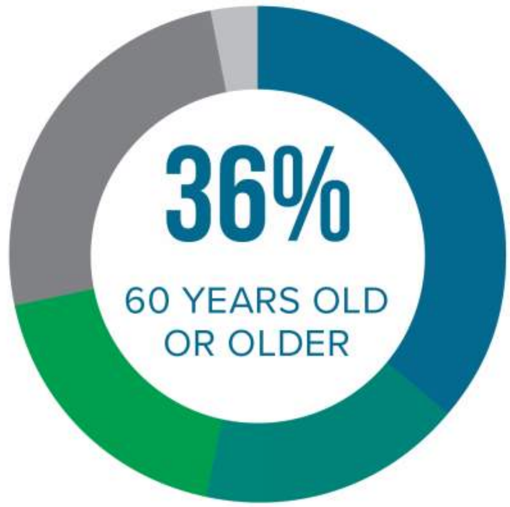
Of the 150 people who participated in the survey:

WHERE THEY LIVE

15% LIVE BETWEEN 1-2 MILES

30% LIVE OVER 2 MILES

AGE



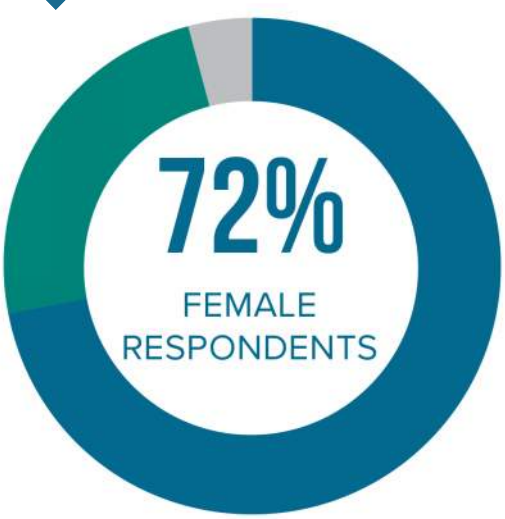
17% 50-59

18% 40-49

15% 30-39

30% UNDER 30

GENDER



24% MALE RESPONDENTS

4% DID NOT RESPOND

TIME LIVING IN SANDY

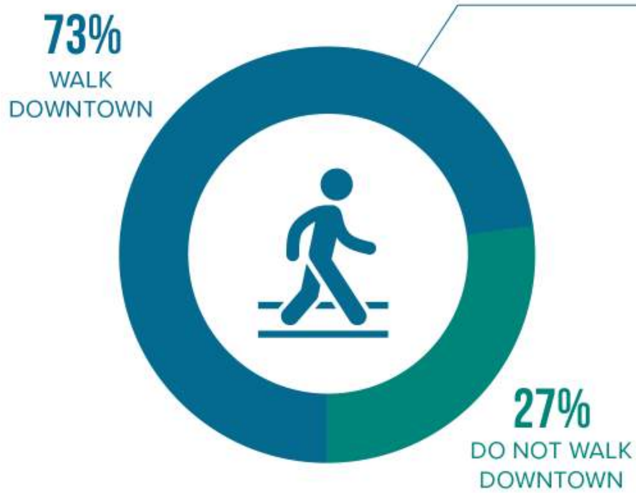
10 YEARS

MAJORITY OF SURVEY RESPONDENTS HAVE LIVED IN SANDY FOR OVER **10 YEARS**

19 YEARS

AVERAGE NUMBER OF YEARS LIVING IN SANDY FOR SURVEY RESPONDENTS IS **19 YEARS**

PEDESTRIAN BEHAVIORS



OF THOSE WHO DO WALK DOWNTOWN, RESPONDENTS TYPICALLY WALK:

- < 1/2 MILE: 25%
- 1/2 MILE - 1 MILE: 30%
- 1 - 2 MILES: 30%
- > 2 MILES: 12%

MOST RESPONDENTS WALK DOWNTOWN:

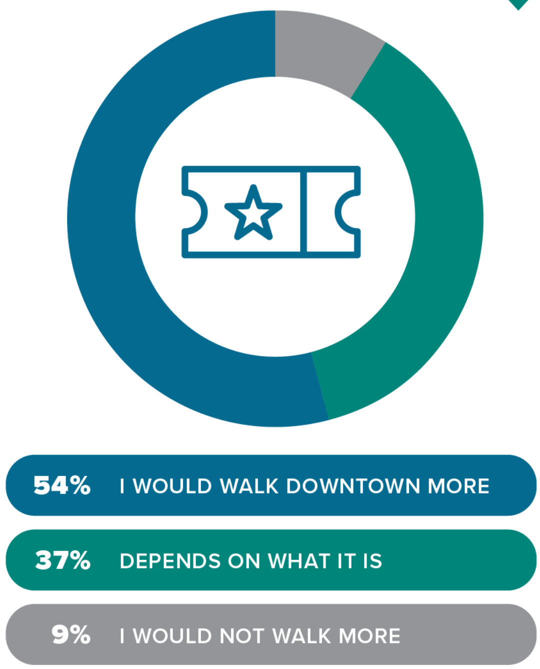
- EVERY FEW MONTHS: 21%
- FEW TIMES A MONTH: 25%
- FEW TIMES A WEEK: 29%
- EVERY DAY: 12%

MOST POPULAR WALKING DESTINATIONS:

- 64% RESTAURANTS AND OTHER FOOD SERVICES
- 54% SANDY PUBLIC LIBRARY
- 34% RETAIL SHOPPING
- 34% MEINIG PARK
- 8% SCHOOL
- 7% TRANSIT

Some essential service destinations such as transit and school were less popular than other destinations, with much lower response rates of seven percent and eight percent, respectively. It is important to note that the Oregon Trail School District's system of student-to-school pairing does not necessarily correlate to location of school. For example, a student that lives on Pleasant Street may not attend Sandy Grade School although it is the closest elementary school to their residence. The proximity of school to home combined with the small percentage of people under 30 years of age responding to this survey provided some indication as to why a low percentage of survey respondents walk to school. Other destinations listed included trails, banks, work, and the Olin Bignall Aquatic Center. Several comments also noted that the purpose of walking was not to reach a destination, but rather for exercising.

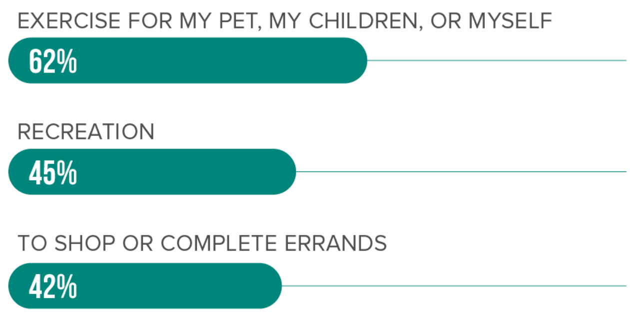
"IF THERE WERE MORE EVENTS, ATTRACTIONS, OR DESTINATIONS..."



Planning staff wanted to understand if having more attractions and destinations in the downtown would influence pedestrian walking behaviors. The study found that 54 percent of survey respondents said they would walk downtown more often if there were more events, attractions, or destinations to walk to in the downtown. Meanwhile, 37 percent said 'maybe, depends on what it is' and nine percent said that additional attractions and destinations would not increase their desire to walk downtown. Throughout the survey, various comments stated that some community members thought there were not enough destinations downtown. When asked what events, attractions, and/or destinations would encourage people to walk downtown the suggestions included events similar to First Fridays, better restaurants, family-friendly events, more retail stores, and more festivals (i.e., Mountain Festival).

Understanding the reasons pedestrians walk in downtown Sandy is important for identifying barriers and helping prioritize improvements. The majority of survey respondents, 62 percent, said they walk downtown 'for exercise for my pet, my children, or myself,' followed by 45 percent of respondents doing so for recreation, and 42 percent of respondents saying they walk to shop or complete errands. Several respondents stated they walk during breaks at work and because it is more efficient than driving around downtown. One survey respondent commented "the street layout wastes gas and time. Walking is faster. Really! This is because of how the streets are laid out and the signals work."

TOP REASONS RESPONDENTS WALK DOWNTOWN:



To understand connectivity and walkability barriers, survey respondents were asked if they typically take the fastest route when walking to the downtown. Sixty percent of survey respondents said they do take the fastest route and 26 percent said they do not use the fastest route. There was an assortment of reasons people chose to forgo the fastest route, with 38 percent of survey respondents doing so for recreation purposes, 35 percent choosing routes that feel safest, and 31 percent saying they opt for the most aesthetically-pleasing route. Two written comments included, "I take the safest route, which means routing longer based on sidewalk consistency and availability," and "I try and use pathways, side streets, anywhere away from Pioneer Boulevard and Proctor Boulevard."

FACTORS AFFECTING WALKABILITY

Determining safety of the downtown walking environment is important in defining barriers that must be overcome. Survey respondents were asked about traffic safety concerns as a pedestrian downtown. Respondents' answers included:

SAFETY CONCERNS:

NOT CONCERNED ABOUT TRAFFIC DANGERS
54%

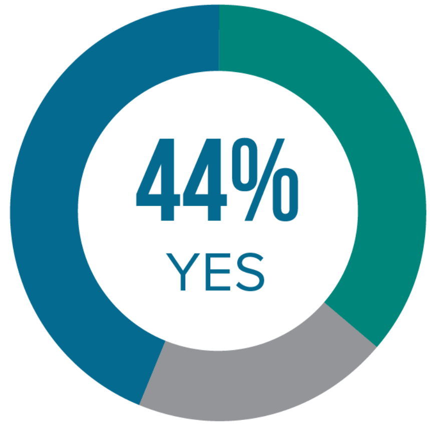
FEEL SAFE AND SATISFIED WALKING DOWNTOWN
35%

CONCERNED ABOUT THE CONDITIONS OF SIDEWALKS (UNEVEN, CRACKED, OBSTRUCTIONS, ETC.)
27%

Other safety concerns that were mentioned included pollution from traffic, congestion, traffic volume, driver blind spots of pedestrian areas, poor lighting at night, and long crossing distances. Following safety rules is important for pedestrian safety, but some conditions can lead to impatience, such as long wait times at pedestrian crossing signals. Forty-seven percent of respondents stated, 'I always cross at crosswalks, wait for pedestrian signal to walk, and follow pedestrian rules,' 40 percent said they typically follow pedestrian rules, ten percent said they sometimes follow the rules, and two percent said they do not follow any pedestrian safety rules because they are inconvenient.

Comfort in surroundings is an important aspect of walkability and while improving safety contributes to a positive pedestrian environment, amenities are extremely important in cultivating desirable pedestrian environments. Survey respondents were asked if they find walking downtown to be a pleasant experience. Forty-four percent said yes, 36 percent said maybe, and 20 percent said no.

"DO YOU FIND WALKING DOWNTOWN A PLEASANT EXPERIENCE?"



36% MAYBE

20% NO

Those respondents who did not find walking downtown to be a pleasant experience were asked why. They had the following responses:

NOT ENOUGH LIGHTING AT NIGHT
32%

NOT ENOUGH SEPARATION FROM TRAFFIC
30%

DIFFICULT AND TIME CONSUMING TO CROSS THE STREET
30%

Other comments regarding the unpleasant environment in downtown included poor weather conditions, lack of bus availability, pollution, not enough appealing destinations, vacant storefronts, and cars that stop too quickly or do not stop at all when they are attempting to cross streets.

When asked about the condition of pedestrian amenities downtown, 37 percent of respondents said they felt there were already enough pedestrian amenities downtown, 47 percent said maybe, and 15 percent said there were not enough amenities. Written comments about pedestrian amenities included installation of more landscaping, more lighting, and reducing the number of overflowing trash receptacles. Additionally, several respondents noted that Pioneer Boulevard and Proctor Boulevard were popular pedestrian areas, yet they may not be the best locations for certain amenities such as benches. One respondent said, "It seems ridiculous to have benches alongside Proctor and Pioneer, where traffic is nearly nonstop; it's better to place them in areas away from traffic."

To understand negative impacts on walkability, survey respondents were asked to identify the factors having the largest impact on their decision to walk downtown and to scale the impact. The most popular responses (strong impact, small impact, no impact) for each factor are depicted in Table 8.

TABLE 8. SURVEY RESPONSES TO WALKABILITY FACTORS

STRONG IMPACT	SMALL IMPACT	NO IMPACT
Automobile volume	Visually unappealing surroundings	I do not like to walk
Automobile speed	Bad weather	Travel with small children
Personal safety	Automobile noise	Difficult terrain (hills)
No sidewalks	Sidewalks in poor condition	Too many stops to make
Lack of continuous sidewalks along the same side of the road		Too much to carry
Lack of driver awareness for pedestrians		I do not have time
		Destinations are too far away
		Too many sidewalk obstructions (utility boxes, light poles, etc.)
		Crosswalk signals are too long

Based on the responses to the question about automobile behaviors, the survey respondents believed that traffic volume, speed, and lack of driver awareness had the strongest negative impact on walkability. Additionally, lack of sidewalks or continuous sidewalks on the same side of the street were also very popular choices for causing a strong negative impact. Other factors that had less impact or no impact are listed in the second and third columns of the table. Other written comments regarding negative impacts on walkability included poorly-timed crosswalk signals that did not provide enough time to cross the street, exhaust and pollution from vehicles, and lack of destinations to stop at in downtown Sandy.

WALKABILITY IMPROVEMENTS

Survey respondents were asked what they believed were the most important walkability improvements with the most popular level of importance for each improvement listed below.

TABLE 9. SURVEY RESPONSES TO IMPROVEMENTS

VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT IMPORTANT
More sidewalks	Better street lighting	Walking groups
Improved sidewalks	Education/enforcement for motorists, pedestrians, and bicyclists	
Better intersections (pedestrian signals, crosswalks, etc.)	Beautification of surroundings	
More separation from vehicle traffic		
Reduced vehicle speed		
More downtown events (art fairs, music, etc.)		
Increase sidewalk connectivity between residential neighborhoods and downtown		

Survey respondents felt that infrastructure improvements were the most important factor but added that more events in downtown would encourage an increase in walking. Written comments included suggestions such as providing better parking and increasing the number of places to shop. One suggestion was to add more visible signalized intersections for pedestrians, such as the flashing light signage installed on Powell Boulevard at Roberts Avenue in Gresham.

Survey respondents were then asked to list their top three walkability improvements including a first, second, and third improvement from a list of potential improvements. The responses to each category were factored into a weighted average, with the lowest average number being the highest priority (see Table 10 on the following page).

TABLE 10. WEIGHTED AVERAGE OF SURVEY RESPONSES TO PRIORITY OF WALKABILITY IMPROVEMENTS

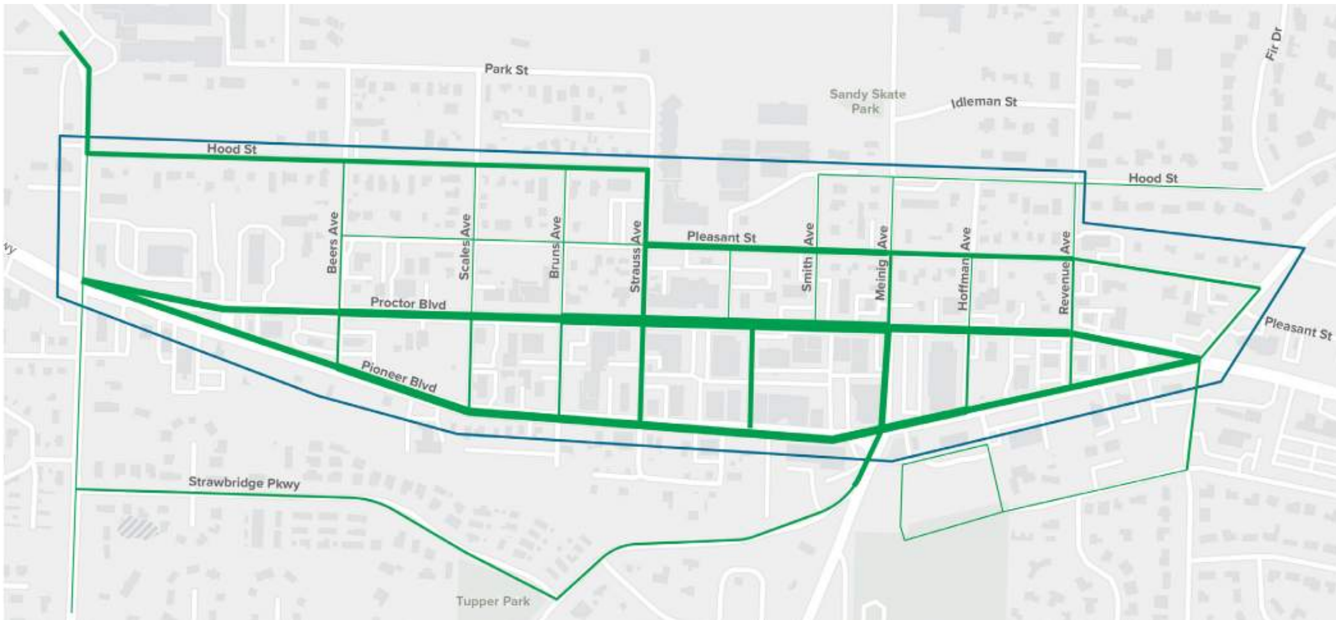
IMPROVEMENT CATEGORY	WEIGHTED AVERAGE	
Education / enforcement of motorists, pedestrians and bicyclists	**1.59**	HIGHEST PRIORITY
More separation from vehicle traffic	**1.72**	
Reduce vehicle traffic	**1.72**	
More sidewalks	**1.92**	
More downtown events	**1.96**	
Better street lighting	**1.97**	
Better intersections	**2.00**	
More connecting sidewalks between residential neighborhoods and downtown	**2.02**	
Improved sidewalks	**2.14**	
Beautification of surroundings	**2.21**	
Walking programs	**2.22**	LOWEST PRIORITY

Note: A lower number denotes a higher priority

The top priority improvements were related to improving traffic conditions in the downtown, followed by recommendations for improving basic pedestrian features such as sidewalks, street lighting, and intersection crossings. Respondents also stated that holding more downtown events should remain a high priority.

POP-UP MAPPING

FIGURE 8. POP-UP MAPPING ACTIVITY RESULTS



BACKGROUND

The purpose of the pop-up mapping activity was to determine popular pedestrian routes and prioritize improvements for highly used pedestrian routes. The pop-up mapping activity included placing blank maps at several popular host locations throughout downtown. Community members visiting the host locations could choose to participate in the activity by drawing routes they typically walked downtown. The host locations included Mountain Moka, AntFarm, the Sandy Public Library, and Sandy City Hall. The activity was available at the above locations from May 7, 2018 to May 18, 2018. Additionally, there was a booth that included the activity at the Mount Hood Farmers Market, located in downtown Sandy, on May 11, 2018. To see the activity page and example, refer to Appendix B.

RESULTS

A total of 68 participants completed the pop-up mapping activity. It is important to note that the library was the most popular location for participation in the pop-up mapping activity. The number of responses per street segment were compiled, calculated, and mapped (Figure 8). As informed by the responses to the activity, thicker line widths indicate a higher propensity of pedestrian traffic on that street segment.

The most popular pedestrian routes were unsurprisingly Pioneer Boulevard and Proctor Boulevard. Of those streets, the most popular blocks were concentrated towards the middle of the couplet between Scales Avenue and Smith Avenue on Proctor Boulevard.

The most common comments noted by respondents pertained to safety concerns at the intersection directly in front of the Sandy Public Library, currently being addressed with the redesign of Alt Avenue in the Pleasant Street Master Plan. Another common concern was the poor condition of sidewalks and/ or lack of sidewalks in the downtown area. Sidewalk connection into the downtown was also a concern for numerous respondents. A full list of comments from the activity can be found in Appendix B.

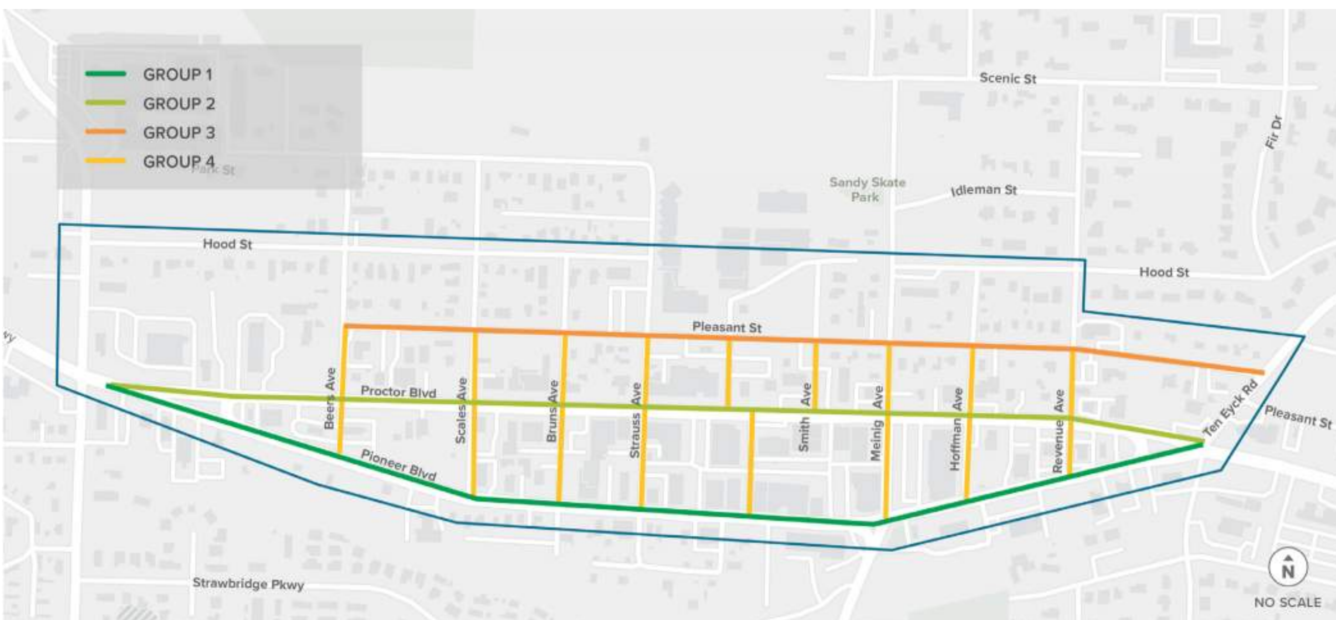
COMMUNITY WALKING AUDIT

INTRODUCTION

The intention of the Community Walking Audit event was to get community members involved to better understand the community perception of walkability and to identify pedestrian access barriers. In contrast to the technical walking audit, the Community Walking Audit focused primarily on addressing big picture concerns. The template for the Community Walking Audit was adapted from the *Safe Routes to School Handbook Audit Toolkit* template. The original template from the handbook and the revised version used for the Community Walking Audit can be found in Appendix B.

The Community Walking Audit was hosted on May 16, 2018. Eighteen community volunteers participated in the event, with individuals of varying mobility levels. Two volunteers with mobility impairments were able to inform staff of inadequate conditions and accessibility concerns for people with disabilities. The community volunteers who participated included interested citizens, elected officials, and city staff. Volunteers were divided into four groups, covering different sections of downtown. Figure 9 details the areas assessed. Furthermore, participants completed an exit survey listing their top concerns and priorities for pedestrian improvements.

FIGURE 9. COMMUNITY WALKING AUDIT GROUP ROUTES



SUMMARY OF RESPONSES

For purposes of assessing the Community Walking Audit, it is important to note that audit groups consisted of four to five people, with each person wearing a high visibility safety vest. It is likely that motorists were more aware and responsive to audit groups due to the high visibility vests and walking in small groups, as compared to typical pedestrians.

All four audit groups had recurring checklist items representing various walkability issues, including the following:

- Poorly marked crosswalks
- Lack of pedestrian-activated signals
- Parked cars blocking the view of vehicles approaching intersections
- Motorists speeding
- Motorists not looking for pedestrians
- A lack of trees and landscaping
- Trip hazards and sidewalk obstructions
- Presence of vacant or derelict buildings

Other comments were about specific areas, such as short pedestrian crosswalk timing at the signalized intersections of Meinig Avenue and Highway 26, and Ten Eyck Road and Highway 26, as well as the poor condition of the sidewalk in front of Two Brothers Mexican Restaurant (38786 Pioneer Boulevard). (Note: Since the audit, this sidewalk has been repaired.) See Appendix B for a full summary of audit responses and comments from each audit group.

The primary benefit of having two individuals with mobility impairments participating in the audit was to identify accessibility issues throughout downtown. Some of the key accessibility concerns identified during the audit were the following:

- Curb ramps are often too steep.
- Pedestrian signals downtown require push-button activation, which can be a difficult task for some individuals. A more accessible alternative would be to have an automatic pedestrian cycle at intersections with signals.
- Navigating mailboxes on the sidewalk is difficult for low-vision individuals using canes. The City should remove mailboxes no longer in use.
- The voice command at the Alt Avenue crosswalk could be misunderstood to be saying “Halt” in stead of “Alt.” A clearer alternative may be to fully state “Alt Avenue” and increase the volume of the voice command.
- Ten Eyck Road and Highway 26 intersection is missing an audible signal.
- Absence of a pedestrian signal between the pedestrian island and the sidewalk on the southwest side of the Meinig Avenue and Pioneer Boulevard intersection.

EXIT SURVEY RESPONSES

The exit survey provided after the audit asked for the top concerns in each of the following categories: sidewalk concerns, intersection and street crossing concerns, comfort concerns, overall concerns, and top improvements needed. The most common responses in each category are listed below.

Sidewalk Concerns:

- Narrow sidewalks
- Sidewalk obstructions of all types (utility poles, mailboxes, etc.)

Intersection & Street Crossing Concerns:

- Motorists having difficulty seeing pedestrians
- Motorists not stopping at crosswalks
- Needing more signage and markings at intersections
- Lack of marked crosswalks

Comfort Concerns:

- Vehicle speeds
- Noise pollution
- Lack of trees and landscaping

Overall Concerns:

- Traffic – too fast and noisy
- Crosswalk safety
- More signage and markings needed
- Lack of adequate lighting

Top Improvements Needed:

- Flashing light crosswalks
- More planter strips and trees
- Improving and repairing sidewalks

To see the full list of exit survey responses, see Appendix B.

SUMMARY OF COMMON WALKABILITY CONCERNS

Throughout the public engagement process for the Downtown Walkability Audit, the community expressed reoccurring concerns, including:

- Lack of crosswalks and unsafe crosswalks on Pioneer Boulevard and Proctor Boulevard (especially the crosswalk in front of the library at the intersection of Proctor Boulevard and Alt Avenue)
- Noise and speed of traffic on Pioneer Boulevard and Proctor Boulevard
- High traffic volume on Pioneer Boulevard and Proctor Boulevard
- Connectivity issues, including but not limited to:
    - » Missing sidewalks
    - » Not enough marked crosswalks on Pioneer Boulevard and Proctor Boulevard
    - » Missing pedestrian connections from surrounding neighborhoods to downtown
- Lack of destinations and/or attractions to walk to in downtown
- Accessibility (ADA) issues
- Poor lighting
- Sidewalk obstructions (old mailboxes, utility poles, etc.)
- Lack of amenities – no recycling, few and full trash receptacles, more landscaping needed
- Lack of pedestrian signals or signage
- Poor sidewalk conditions, including but not limited to:
    - » Uneven, crumbling sidewalks
    - » Narrow sidewalks
- Obstructed sight lines from parked cars

RECOMMENDATIONS

A list of recommended actions was created based on the results from the PEQI audit, existing conditions report, and the information gathered through the public process for the DWA.

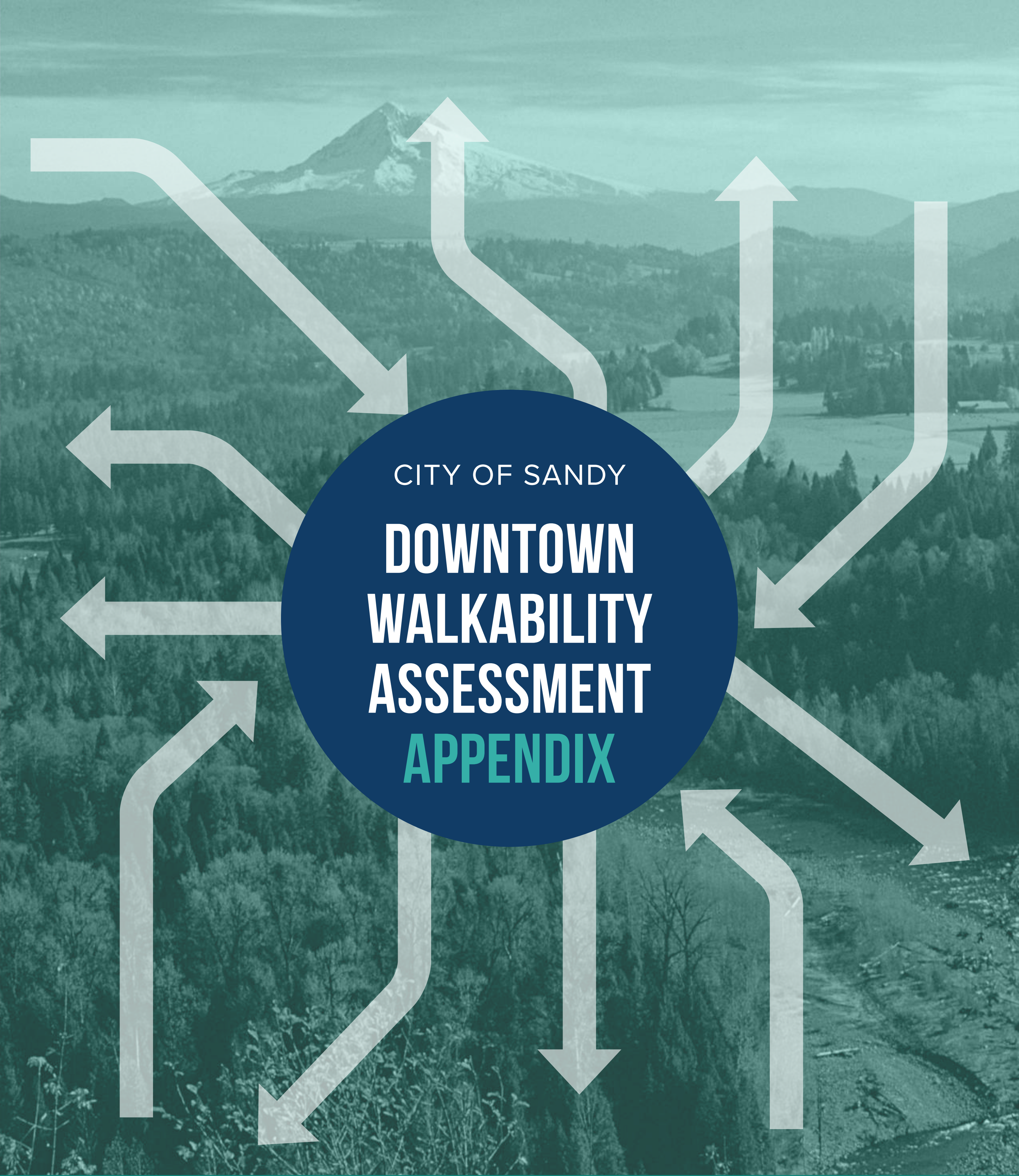
Based on the results from the PEQI audit, existing conditions report, and the information gathered through the public process for the Downtown Walkability Audit, a list of recommendations has been created. The recommendations are grouped based on the related DWA goals.

The partner(s) listed are the agencies and/or departments which the City of Sandy's Planning Division will need to partner with to achieve the goals as identified within this assessment. A single circle indicates a shorter timeline to implement the action while two circles indicate a longer timeline for implementation.

TABLE 11. RECOMMENDATIONS BY RELEVANT GOAL

GOAL	RECOMMENDED ACTION	PARTNER(S)	TIMELINE ESTIMATE
PEDESTRIAN SAFETY AND COMFORT	A. Reduce speed limits in downtown	ODOT	●
	B. Enforce speed limits in downtown	Sandy Police Department	●
	C. Reduce speed on Hwy 26 east of downtown to provide for a better transition to reduced speeds in the downtown (reduction of 40 mph current speed limit)	ODOT	●
	D. Create traffic calming measures, such as rumble strips	ODOT, Public Works	● ●
	E. Plant additional landscaping and street trees on high volume streets	Urban Renewal Agency (URA), local businesses, local community groups	●
	F. Improve sight lines for pedestrian visibility by ensuring parking and street trees are placed in safe locations to intersections	Public Works	●
	G. Increase the number of marked crosswalks on Highway 26 in the downtown couplet	ODOT, Public Works	●
	H. Transition all marked crosswalks on Pioneer Blvd. and Proctor Blvd. to high visibility crosswalk paint	ODOT, Public Works	●
	I. Increase signage and/or install signalized flashing beacons at marked crosswalks	ODOT, Public Works	●
	J. Increase the number of pedestrian bulb-outs at intersections	ODOT, Public Works, URA	● ●
	K. Increase the number of pedestrian scale streetlights on street segments in the downtown	Public Works, URA, PGE	●

GOAL	RECOMMENDED ACTION	PARTNER(S)	TIMELINE ESTIMATE
PEDESTRIAN ACCESSIBILITY	A. Construct missing sidewalks within project boundaries	Public Works, URA	● ●
	B. Create a sidewalk maintenance plan to provide continuation of pedestrian enhancements	Public Works, URA	● ●
	C. Increase pedestrian walk signal timings at the intersections at the edges of downtown (Bluff Rd. and Ten Eyck Rd.) and at major intersections within the downtown couplet	ODOT, Public Works	●
	D. Widen narrow sidewalks within the project boundaries	Public Works, ODOT, URA, local businesses	● ●
	E. Improve sidewalks with major impediments and in poor condition	Public Works, URA, local businesses	●
	F. Improve and prioritize ADA accessibility along sidewalks and pedestrian crossings in downtown	ODOT, Public Works	● ●
	F1. Increase the number of audible crosswalk signals	ODOT, Public Works	●
	F2. Increase the number of truncated domes at curb cuts	ODOT, Public Works, URA	●
	F3. Transition to automated pedestrian signals	ODOT, Public Works	●
PEDESTRIAN CONNECTIVITY	A. Install wayfinding signage for pedestrians detailing distance from certain locations to the downtown via walking/rolling	Public Works, URA	●
	B. Construct sidewalks on connecting streets with missing sidewalks (see connectivity)	Public Works	● ●
	C. Complete and widen sidewalks on Pleasant St. (for more information reference Pleasant Street Master Plan) to create a more pedestrian friendly environment on Pleasant St.	Public Works, Oregon Trail School District, URA and businesses	● ●
	D. Reconfigure the crosswalk at the intersection of Alt Ave. and Proctor Blvd. in accordance with the Pleasant Street Master Plan to safely connect Pleasant St. to the south side of Proctor Blvd.	ODOT, Public Works, URA	● ●
	E. Encourage more events in the downtown with instructions on pedestrian access from neighboring areas	Economic Development, local businesses and institutions	●



CITY OF SANDY

DOWNTOWN WALKABILITY ASSESSMENT

APPENDIX

SANDY

APPENDIX CONTENTS

APPENDIX A: EXISTING CONDITIONS

Appendix A: Pedestrian Environmental Quality Index (PEQI Original)

Pedestrian Environmental Quality Index (PEQI)

Street & Intersection Audit Form

Date entered into database: ___/___/___

Project: **Survey Date:**

Auditor(s):

INTERSECTION

This is the intersection of: (Primary) **and:** (Secondary)

(The street you plan to walk down) **(The street you will cross)**

Intersection *CNN:*______________

Are these two lane or one lane streets and alleys? **Yes** ☐ **No** ☐ Street type ____________

	All ways	1 missing	2 missing	3 missing	None
1. Crosswalks	☐	☐	☐	☐	☐
2. High visibility crosswalks	☐	☐	☐	☐	☐

	4+ streetlights	3 streetlights	2 streetlights	1 streetlight	None
3. Intersection lighting	☐	☐	☐	☐	☐

	4 Way Stop/ Traffic Light	2 Way Stop	Yield (no roundabout)	Roundabout	Uncontrolled
4. Traffic Control	☐	☐	☐	☐	☐

ons 5-8 unless there is a traffic signal

	All ways	Some ways	None
5a. Is there a signal for pedestrians?	☐	☐	☐
5b. If YES does the signal count down?	☐	☐	☐

10. Curb ramps

☐ Missing one or more ramp ☐ All corners ramped

☐ Missing one or more both (ramp & td) ☐ Missing one or more truncated dome

11. Intersection traffic calming features

Y / N

☐ *a) Raised crosswalks* ☐ *e) Diagonal diverter*

☐ *b) Pavement treatments* ☐ *f) Partial closure*

☐ *c) Bike lane thru intersection* ☐ *g) Traffic calming circle*

☐ *d) Bulb-outs* ☐ *h) Mini-circle*

12. Pedestrian Engineering Countermeasures

Y / N

☐ *d) Crosswalk scramble*

☐ *a) Flashing beacon* ☐ *e) Red visibility curb*

☐ *b) No Turn on Red Signs* ☐ *f) Advanced stop/yield lines*

☐ *c) Additional signs* ☐ *g) Pedestrian leading interval*

STREET SEGMENT

This street is: (Primary) **between:** (Street #1) **and:** (Street #2)

Side A *CNN:*______________ *Side B* *CNN:*______________ *Street type :*____________

13. Number of lanes: ☐ Shared / pedestrian only street ☐ 1 ☐ 2 ☐ 3 ☐ 4+

14. Posted speed limit: ☐ 25 mph / none posted ☐ Under 25 mph ☐ Over 25 mph ☐ School Zone

15. Street traffic calming features

Y / N

☐ *a) Trees in median* ☐ *c) Speed enforcement*

☐ *b) Speed hump / bump* ☐ *d) Protected bike lane*

☐ *e) Chicane*

Please indicate whether Side A and Side B are North, South, East, or West relative to the street centerline.

	SIDE A N / S / E / W	SIDE B N / S / E / W
*For questions 16-22 you will select one answer for **each** side of the street*		
16. Continuous sidewalk	No ☐ Yes ☐	Yes ☐ No ☐
17. Width of sidewalk ______ *(if no sidewalk, skip #17-20, this side)*	Less than 5 ft ☐ 5 ft to 8 ft ☐ 8 ft to 12 ft ☐ 12 ft or more ☐	☐ Less than 5 ft ☐ 5 ft to 8 ft ☐ 8 ft to 12 ft ______ ☐ 12 ft or more
18. Width of throughway ______ *The throughway is the part without furniture, signs, plantings, newspaper or utility boxes*	Less than 4 ft ☐ 4 ft to 6 ft ☐ 6 ft to 8 ft ☐ 8 ft or more ☐	☐ Less than 4 ft ☐ 4 ft to 6 ft ☐ 6 ft to 8 ft ______ ☐ 8 ft or more
19. Large sidewalk <u>obstructions</u>: *An obstruction is any object in the throughway.*	None ☐ Temporary ☐ Permanent ☐	☐ None ☐ Temporary ☐ Permanent
20. Sidewalk impediments: *Anything that poses a tripping hazard.*	None ☐ Minor ☐ Significant ☐	☐ None ☐ Minor ☐ Significant
21. Trees	None ☐ Sporadically lined ☐ Continuously lined ☐	☐ None ☐ Sporadically lined ☐ Continuously lined
22. Driveway cuts C - Y/N	Total ft of driveway ___	___ Total ft of driveway C - Y/N
For questions 23-26, check Yes or No on each side:	Yes No	Yes No
23. Presence of buffers *Check all that apply.*	☐ ☐ Time restricted parallel parking ☐ Parallel parking ☐ Bike lane ☐	☐ ☐ ☐ Time restricted parallel parking ☐ Parallel parking (& angled parking) ☐ Bike lane
24. Planters and gardens	☐ ☐	☐ ☐
25. Public seating	☐ ☐	☐ ☐
26. Public art	☐ ☐	☐ ☐
For questions 27-28, select one answer for each side of the street:		
27. Retail use and public places *Retail that covers an entire block counts as three or more.*	None ☐ 1 or 2 ☐ 3 or more ☐	☐ None ☐ 1 or 2 ☐ 3 or more
28. Pedestrian-scale lighting	None ☐ Sporadic ☐ Continuous ☐	☐ None ☐ Sporadic ☐ Continuous (every 30 ft.)
For questions 29-31, check Yes or No on each side:	Yes No	Yes No
29. Illegal graffiti *Select NO if there is only a little*	☐ ☐	☐ ☐
30. Derelict/Vacant Buildings	☐ ☐	☐ ☐
31 Vacant Lots	☐ ☐	☐ ☐

Notes:

____

____

____

____

Notes:

____

____

____

____

Table 2. The Pedestrian Environmental Quality Index (PEQI): Indicator, Domain, a Overall Street Segment Score Values Based on Expert Survey Findings (n= 20)

Intersection or Street Segment Assessment	Domain (Domain Score Weight[a])	Indicator	Indicator Score	Indicator Response Category	Indicator Response Category Score	Indicator Response Category Score, Weighted[a]
Intersections	**Intersection Safety (1.05)**					
		Crosswalks	2.10	4 Directions	10.00	21
				3 Directions	8.62	18
				2 Directions	6.96	15
				1 Direction	5.30	11
				None	3.64	8
		Ladder Crosswalk	2.40	4 Directions	10.00	24
				3 Directions	8.40	20
				2 Directions	6.55	16
				1 Direction	4.72	11
				None	3.18	8
		Countdown in Signal	2.40	4 Directions/w countdown	8.20	21
				4 Directions/wo countdown		19
				3 Directions/w countdown	6.20	17
				3 Directions/wo countdown		15
				2 Directions/w countdown	4.10	13
				2 Directions/wo countdown		11
				1 Direction/w countdown		9
				1 Direction/wo countdown		7
				None	2.70	5
		Crossing Speed	2.40	Slower than 3.5 ft/sec	8.18	20
				Faster than 3.5 ft/sec	3.64	9
		Crosswalk Scramble	2.40	Yes	8.00	19
				No	2.00	5
		No Turn on Red	2.40	4	8.00	19
				3		15
				2		11
				1		8
				No	2.00	5
		Traffic Calming Features (TCFs)	2.40	5 or more TCFs	8.18	20
				3 - 4 TCFs	7.27	17
				1 - 2 TCFs	6.36	15
				0 TFCs	3.64	9
		Additional Signs for Pedestrians	2.40	Yes	7.00	17
				No	3.00	7
Street Segment	***Traffic (0.76)***					
		Number of Lanes	2.40	No Lanes	10.0	24
				1	9.1	22
				2	7.7	19
				3	3.6	9
				4+	1.8	4
		Two Way Traffic	1.80	Yes	5.5	10
				No (One-way Traffic)	3.6	7
		Vehicle Speed	2.70	Less than 20 mph	10.0	27
				20-30 mph	7.3	22
				30-40 mph	4.5	12
				More than 40 mph	0.9	2
		Traffic Volume	2.40	Less than 1,000	9.1	22
				1000 - 5000	7.3	17
				5000 - 10,000	4.5	11
				More than 10,000	2.7	7
		TCFs	2.40	Yes	8.2	20
				No	2.7	7
Street Segment	***Street Design (1.10)***					
		Width of Sidewalk	2.40	Greater than 12ft	9.09	22
				8 -12 ft	7.73	19
				5 - 8 ft	5.45	13
				Less Than 5 ft	2.73	7
				No Sidewalk	0.61	1
		Sidewalk Impediments	2.40	None	10.00	24
				Few	5.45	13
				Not Applicable	5.00	12
				Significant	0.91	2
		Large SW Obstructions	2.10	No	7.27	15
				Yes, Temporary		10
				Yes, Permanent		9
				Yes, Permanent & Temporary	3.64	8
				Not Applicable	5.00	5
		Presence of Curb	2.10	Continuous Curb	8.18	17
				No Curb	3.18	7
		Driveway Cuts	1.80	More than 5	8.18	15
				Few (less than 5)	5.45	10
				None	2.73	5
		Trees	1.80	Continuously Lined	9.09	16
				Sporadically Lined	6.36	11
				None	3.64	7
		Planters/Gardens	1.20	Yes	7.73	9
				No	3.18	4
		Public Seating	1.80	Yes	7.27	13
				No	3.64	7
		Presence of a Buffer	2.10	Bike Lane and Paralle Parking	10.00	21
				Bike Lane and Time Restricted Paralle Parking		19
				Bike Lane	7.00	15
				Paralle Parking	6.00	13
				Time Resticted Parallel Parking	6.00	11
				None	2.00	4
Street Segment	***Land Use (0.18)***					
		Public Art/ Historic Sites	1.80	Yes	7.7	14
				No	3.2	6
		Restaurant and Retail Use	2.10	More than 2	9.1	19
				1 or 2	6.4	13
				None	4.1	9
Street Segment	***Perceived Safety (0.43)***					
		Illegal Graffiti	1.40	Little to None	6.36	9
				Yes	3.64	5
		Litter	1.80	Little to None	6.82	10
				Yes- A Lot	2.73	5
		Lighting	2.40	Yes - Public & Private		25
				Yes - Public	8.18	20
				Yes - Private		15
				No	2.73	7
		Construction Sites	1.80	No	7.27	13
				Yes	3.64	7
		Abandoned Buildings	1.80	No	8.18	15
				Yes	2.73	5
Street Segment	***Overall [c] 2.47***					

a The Domain Score Weight is used to obtain Domain Scores for each of the 5 PEQI Domains. The Domain Score is calculated by adding together all the Weighted Indicator Category Scores in the Domain, and then multiplying by the Domain Score Weight for a maximum Domain Score of 100 in each Domain.

b Indicator Category scores are weighted by the Indicator Scores by multiplying the two values.

c Combines the four *Street Segment* Domains to create an overall Street Segment PEQI Score.

Appendix A; PEQI Indicator Scores Values (Revised)

Intersection Segment

Indicator	Domain Weight	Indicator Category Response	Indicator Response Category Score	Indicator Score Weighted
Crosswalks	2.1	4	10.00	21
		3	8.62	18
		2	6.96	15
		1	5.30	11
		None	3.64	8
High Visibility Crosswalks	2.4	4	10.00	24
		3	8.40	20
		2	6.55	16
		1	4.72	11
		None	3.18	8
Intersection Lighting	2.1	2 or more	8.18	17
(# of streetlights)		1	6.36	13
		None	2.70	6
Traffic Control	2.4	Traffic signal/ 4 way stop	10.00	24
		2 way stop	7.70	18
		Yield	6.36	15
		Uncontrolled	2.73	7
Pedestrian Signal & Countdown	2.4	4 w/ countdown	8.92	21
		4 w/o countdown	8.12	19
		3 w/ countdown	7.20	17
		3 w/o countdown	6.41	15
		2 w/ countdown	5.32	13
		2 w/o countdown	4.52	11
		1 w/ countdown	3.77	9
		1 w/o countdown	2.97	7
		None	2.12	5
Unprotected Crossing Distance	2.1	Equal to or less than 55 ft.	8.18	17
		Greater than 55 ft.	3.64	8
Curb Ramps	2.1	All corners ramped and truncated	8.62	18
		One or more ramps with truncated domes	7.27	15
		One or more ramps	6.36	13
		No ramps	3.64	8
Intersection Calming Feature	2.4	Yes	3.64	20
		No	6.36	9
Pedestrian Engineering Counter Measures	2.1	5+	8.62	18
		3 to 4	7.27	15
		1 to 2	6.36	13
		0	3.64	8

Street Segment

Indicator	Domain Weight	Indicator Response Category	Indicator Response Category Score	Indicator Score Weighted
Number of Lanes	2.4	No Lanes	10.00	24
		1 Lane	9.15	22
		2 Lanes	7.78	19
		3 Lanes	3.69	9
		4 Lanes	1.81	4
Two-way traffic	1.8	Yes (Two way)	5.52	10
		No (One - way)	3.57	6
Vehicle Speed	2.7	Under 25	10.00	27
		25 or Not Posted	7.39	20
		Over 25	4.55	12
TSP Classification	2.4	Major arterial	9.12	22
Transportation System Plan (TSP)		Minor arterial	7.35	18
		Collector	4.55	11
		Local streets	2.42	6
Traffic Calming Features (TCFs)	2.4	5 TCFs	8.18	20
		3 to 4 TCFs	7.27	17
		1 to 2 TCFs	6.36	15
		0 TCFs	3.64	9
Continuous Sidewalk	2.1	Yes	8.18	17
		No	3.18	7
Width of Sidewalk	2.4	Greater than 8 ft.	9.09	22
		7 ft. - 8 ft.	7.73	19
		4 ft. -6 ft.	5.45	13
		Less than 4 ft.	2.73	7
		None	0.61	1
Width of Throughway	2.4	Greater than 8 ft.	9.09	22
*** numbers based off the narrowest point of the sidewalk		6 ft. - 8 ft.	7.73	19
		4 ft. - 6 ft.	5.45	13
		Less than 4 ft.	2.73	7
		None	0.61	1
Large Sidewalk Obstructions	2.1	None	7.27	15
		Temporary	4.90	10
		Permanent	4.15	9
		Temp & permanent	3.64	8
		No sidewalk	2.50	5
Sidewalk Impediments	2.4	None	10.00	24
		Minor	5.45	13
		No sidewalk	5.18	12
		Significant	0.91	2

Indicator	Domain Weight	Indicator Response Category	Indicator Response Category Score	Indicator Score Weighted
Trees	1.8	Continuously lined (every 30 ft. per code)	9.09	16
		Sporadically lined	6.36	11
		None	3.64	7
Driveway Cuts	1.8	None	8.18	15
		Equal to or less than 3	5.45	10
		More than 3	2.73	5
Presence of buffers	2.1	BL & PP	10.00	21
BL - Bike Lane		BL & TRPP	9.09	19
PP - Parallel Parking (& angled parking)		BL	7.22	15
TRPP - Time Restricted Parallel Parking		PP	6.31	13
		TRPP	5.27	11
		None	2.00	4
Presence Planters & Gardens	1.2	Yes	7.73	9
		No	3.18	4
Public seating	1.8	Yes	7.27	13
		No	3.64	7
Public art	1.8	Yes	7.73	14
		None	3.20	6
Consumer businesses and public places	2.1	3 or more	9.10	19
		1 or 2	6.41	13
		None	4.13	9
Ped Scale lighting	2.1	Continuous	9.10	19
		Sporadic	6.42	13
		None	3.64	8
Graffiti	1.4	No	6.36	9
		Yes	3.64	5
Vacant Lots	1.8	No	6.82	12
		Yes	2.73	5
Derelict/ Vacant Buildings	1.8	No	6.82	12
		Yes	2.73	5

Appendix C: Sandy Police Department Recorded Motor Vehicle Crashes Involving Pedestrians from 2006 - 2016

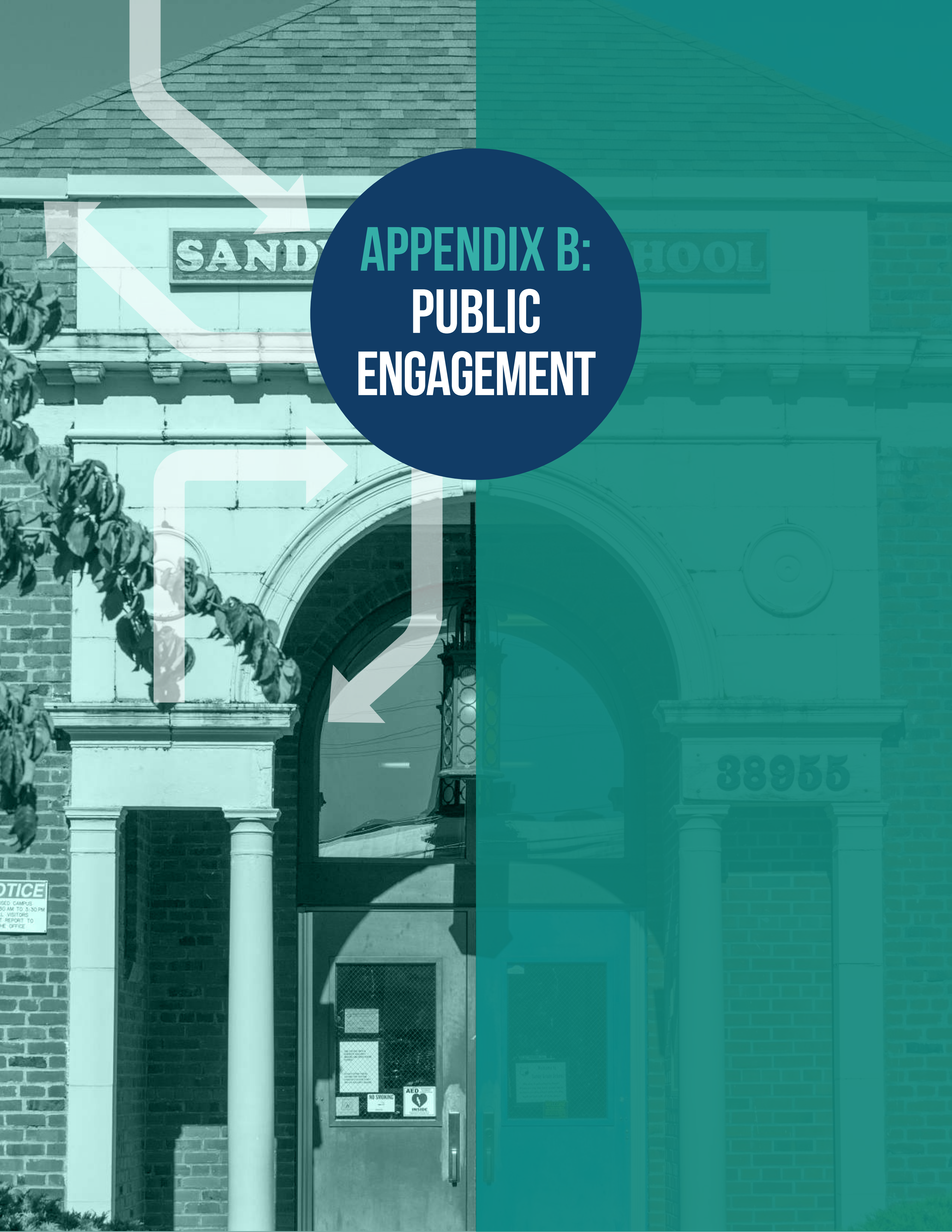
Report Number	Address	Crash Date	Map Icon
10-1325	Bluff Rd & SE Marcy St	8/25/2010 0:56	
10-1879	**Proctor Blvd & Meinig Ave**	**12/10/2010 17:00**	**A**
11-0056	Bluff Rd & Hood St	1/10/2011 7:14	
11-0785	Gary St & Barker Ct	5/21/2011 16:35	
11-0858	**Proctor Blvd & Strauss Ave**	**6/2/2011 12:04**	**B**
11-1011	US-26 & Ruben Ln	6/28/2011 21:45	
11-1123	US-26 & Ruben Ln	7/20/2011 8:33	
11-1902_	Mt Hood Hwy & University Ave	11/30/2011 19:19	
12-1008	**Proctor Blvd & Beers Ave**	**7/14/2012 22:30**	**C**
12-1402	SE Langensand Rd & Dubarko Dr	10/5/2012 13:30	
13-0040	HWY 26 / Kate Schmitz Ave	1/8/2013 18:05	
13-0387	US-26 & Ruben Ln	4/1/2013 14:00	
13-0474	**Proctor Blvd & Meinig Ave**	**4/20/2013 14:09**	**D**
13-1289	**Meinig Ave & Pioneer Blvd**	**8/30/2013 19:45**	**E**
14-0104	**Beers Ave & Hood St**	**1/17/2014 23:28**	**F**
14-1316	Long Circle & Tupper Rd	7/14/2014 23:40	
14-1668	35744 Mount Hood & Southeast 362nd	9/13/2014 21:52	
14-1881	149 Northeast 6th & North Broadway	10/17/2014 7:35	
15-0635	36900 Mount Hood & Kate Schmitz	5/1/2015 22:14	
15-1216	37699 Mount Hood & Ruben	8/15/2015 20:47	
15-1579	38499 Hood & Southeast Bluff	10/16/2015 7:20	
16-1250	Mount Hood & Industrial	7/22/2016 10:39	
16-1337	37495 Mount Hood & Ruben	8/5/2016 5:00	
16-1747	Clackamas & Southwest Beech	10/12/2016 9:37	
16-1976	17898 Southeast Langensand & Mount Hood	11/18/2016 18:40	
16-2016	Hwy 26 / 362nd	11/25/2016 19:30	

Note: Highlighted sections are recorded crashes within the DWA project boundary.

Source: Sandy Police Department Records


Legend
DWA Boundary
Ped Crash 1
Ped Crash 2
Ped Crash 2
Ped Crash 3
Ped Crash 5
Ped Crash 6
Scenic St
Mc Elroy St
Idleman St
Park St
Hood St
Pleasant St
U.S. Hwy 26
26
Beers Ave
Scales Ave
Bruns Ave
Strauss Ave
Alt Ave
Smith Ave
SE Meinig Ave
Hoffman Ave
Revenue Ave
SE Ten Eyck Rd
Shelley Ave
Junker St
Circle Dr
Koch Ct
Strawbridge Pkwy
Tupper Rd
211
McCormick Dr
Davis St
Google Earth
N

APPENDIX B:
PUBLIC ENGAGEMENT



Appendix B: Downtown Walkability Assessment Survey

The City of Sandy Planning Department is conducting a Downtown Walkability Assessment. The purpose of the study is to assess the current walkable environment of downtown Sandy and its connectivity to surrounding residential areas. The study will identify the existing barriers and generate recommendations to create a more pedestrian-friendly environment in downtown Sandy. This survey will help City staff gather data from the public on walkability to understand the walkability needs of downtown Sandy better.
This survey will take approximately 10 minutes.

* 1. Approximately how far do you live from downtown Sandy?

- ○ 0.5 miles
- ○ 1 mile
- ○ 1.5 miles
- ○ 2 miles
- ○ Over 2 miles
- ○ I don't know

* 2. What is your relationship to downtown Sandy? (Choose all that apply)

- ☐ Downtown Resident
- ☐ Downtown Employee
- ☐ Downtown Property and/or Business Owner
- ☐ Local Business Supporter (shop downtown)
- ☐ Sandy Resident
- ☐ Oregon Trail School District Student
- ☐ Other (please specify)

* 3. Do you walk to and/or around downtown Sandy?

- ◯ Yes
- ◯ No

* 4. How often do you walk to or around downtown?

- ◯ Everyday
- ◯ A few times a week
- ◯ A few times a month
- ◯ Every few months
- ◯ Once or twice a year
- ◯ Never

5. Where do you walk to? (Choose all that apply)

- ☐ School
- ☐ Library
- ☐ Retail shopping
- ☐ Restaurants or other food services
- ☐ Transportation
- ☐ Meinig Park
- ☐ Other (please specify)

6. How far do you usually walk?

- ◯ Less than 0.5 mi
- ◯ 0.5 mi – 1 mi
- ◯ 1 mi – 1.5 mi
- ◯ 1.5 – 2 mi
- ◯ More than 2 mi
- ◯ I don't know

* 7. Why do you walk? (Choose all that apply)

- [ ] Exercise for myself, my pet or my children
- [ ] To get to work
- [ ] To access public transit
- [ ] To get myself or my children to school
- [ ] To do shopping or errands
- [ ] For recreation
- [ ] For environmental considerations
- [ ] To meet neighbors and get to know my community better
- [ ] Other (please specify)

8. Which of the following factors have a negative impact on your decision to walk downtown? For those that do have an impact, how much of an impact do they have?

	Strong impact	Small impact	No impact
No sidewalks	○	○	○
Sidewalks in poor condition	○	○	○
Lack of consistent sidewalks along same side of the road	○	○	○
Crosswalk signals are too long	○	○	○
Too many sidewalk obstructions (utility boxes, light poles, etc.)	○	○	○
Lack of driver awareness for pedestrians	○	○	○
Automobile noise	○	○	○
Automobile speed	○	○	○
Automobile volume	○	○	○
Personal safety	○	○	○
Visually unappealing surroundings	○	○	○
I do not have time	○	○	○
Destinations are too far away	○	○	○
Bad weather	○	○	○
Travel with small children	○	○	○
Too much to carry	○	○	○
Too many stops to make	○	○	○
I do not like to walk	○	○	○
Difficult terrain (hills)	○	○	○
Other (specify below)	○	○	○

Other (please specify)

9. What safety concerns do you have about walking downtown? (Choose all that apply)

- [ ] None, I feel safe and satisfied walking downtown
- [ ] I am concerned about potential criminal activity
- [ ] I am concerned about traffic dangers
- [ ] I am concerned about conditions of sidewalks (uneven, cracked, obstructions, etc.)
- [ ] I am concerned about conditions of crosswalks
- [ ] Other (please specify)

10. Do you obey pedestrian safety rules?

- ○ I always cross at crosswalks, wait for pedestrian signal to walk, and follow other pedestrian rules
- ○ I typically cross at crosswalks, wait for pedestrian signal to walk, and follow other pedestrian rules
- ○ I sometimes cross at crosswalks, wait for pedestrian signal to walk, and follow other pedestrian rules
- ○ No, it is too inconvenient for me to follow pedestrian safety rules
- ○ I do not have a good understanding on pedestrian safety rules

11. Do you find walking downtown as a pleasant experience?

- ○ Yes
- ○ Maybe
- ○ No

12. If no, why? (Choose all that apply)

- [ ] Too loud
- [ ] Not enough separation from traffic
- [ ] Not visually appealing
- [ ] Often not sure where to go/ lack of pedestrian wayfinding signs
- [ ] Not enough lighting at night
- [ ] Difficult and time consuming to cross streets
- [ ] Other (please specify)

13. Do you feel there are enough pedestrian amenities downtown (benches, trash receptacles, lighting, landscaping, etc.)

- ○ Yes
- ○ Maybe, it’s okay needs some improvement
- ○ No, in serious need of improvement

Suggestions for other pedestrian amenities.

14. Do you usually take the fastest route when walking to/from your residence to downtown or around downtown?

- ○ Yes
- ○ No
- ○ Not sure

Comments

15. What are the reasons you take alternative/longer routes? (Choose all that apply)

- [ ] Feels safer
- [ ] Prettier
- [ ] Recreational purposes
- [ ] Easier terrain (less hills)
- [ ] Sidewalks and crosswalks in better condition
- [ ] Other (please specify)

16. Would you walk downtown if there were more events, attractions, or destinations downtown to walk to?

- ○ Yes
- ○ Maybe, depends on what it is.
- ○ No

17. What are the attractions/events/destinations that would encourage you to walk to and/or around downtown?

18. Would you participate in walking programs?

- ○ Yes
- ○ Maybe
- ○ No

19. How important do you think the following improvements would be in supporting walking in downtown Sandy?

	Very important	Somewhat important	Not important	Not sure
More sidewalks	○	○	○	○
Improved sidewalks	○	○	○	○
More connecting sidewalks (along same side of the road) between residential neighborhoods and downtown	○	○	○	○
Better intersections (pedestrian signals, crosswalks)	○	○	○	○
Better street lighting	○	○	○	○
More separation from vehicle traffic	○	○	○	○
Reduced vehicle speed	○	○	○	○
Education/ enforcement for motorists, pedestrians, and bicyclists	○	○	○	○
More downtown events (art fairs, music, etc.)	○	○	○	○
Walking groups	○	○	○	○
Beautification of surroundings	○	○	○	○
Other (specify below)	○	○	○	○

Other/ Comments

20. Choose your top 3 priorities for walkability improvements.

	1st Priority	2nd Priority	3rd Priority
More sidewalks	○	○	○
Improved sidewalks	○	○	○
More connecting sidewalks (along same side of the road) between residential neighborhoods and downtown	○	○	○
Better intersections	○	○	○
Better street lighting	○	○	○
More separation from vehicle traffic	○	○	○
Reduced vehicle traffic	○	○	○
Education/enforcement for motorists, pedestrians, & bicyclists	○	○	○
More downtown events	○	○	○
Walking programs	○	○	○
Beautification of surroundings	○	○	○
Other (specify below)	○	○	○

Other/ Comments

21. Do you have any other comments you would like to share related to downtown walkability?

22. What is your age?

- ◯ 17 or younger
- ◯ 18-20
- ◯ 21-29
- ◯ 30-39
- ◯ 40-49
- ◯ 50-59
- ◯ 60 or older

23. What is your gender?

- ◯ Female
- ◯ Male
- ◯ I choose not to answer.

24. Please describe your race/ethnicity.

25. About how long have you lived in Sandy?

Years

26. Please provide your email below if you would like to receive email updates on the Downtown Walkability Assessment.

27. If the City of Sandy was to create a bicycle plan would you be interested in participating?

- ◯ Yes
- ◯ Maybe
- ◯ No

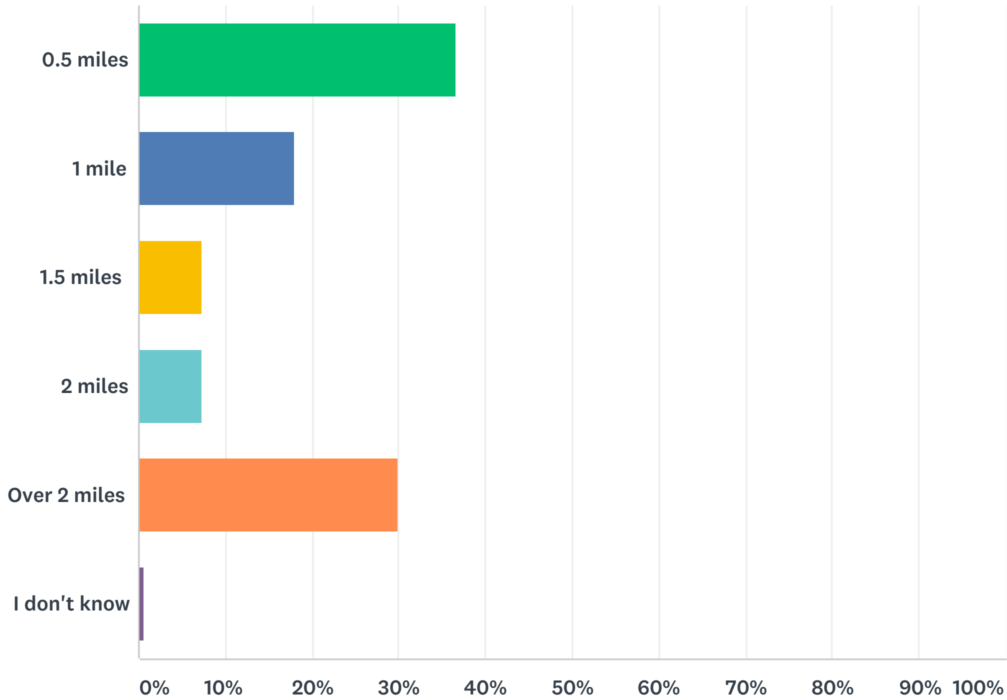
Comments

Use this link to be directed to the Pleasant Street Master Plan Survey - https://www.surveymonkey.com/r/pleasantstmp

Appendix B: Downtown Walkability Survey Responses

Q1 Approximately how far do you live from downtown Sandy?

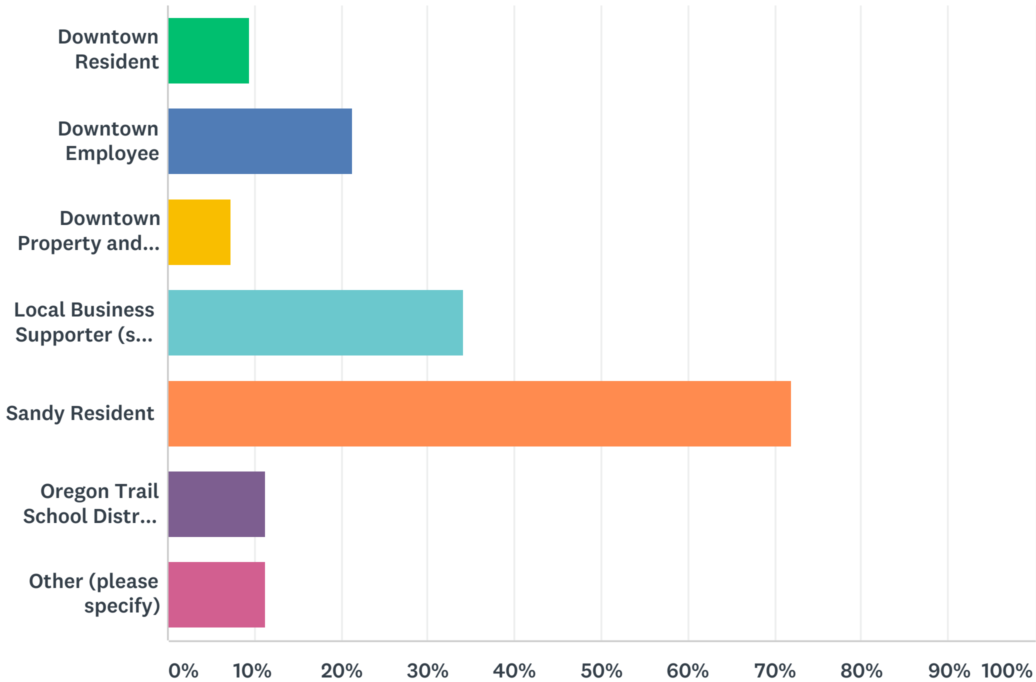
Answered: 150 Skipped: 0



ANSWER CHOICES	RESPONSES	
0.5 miles	36.67%	55
1 mile	18.00%	27
1.5 miles	7.33%	11
2 miles	7.33%	11
Over 2 miles	30.00%	45
I don't know	0.67%	1
TOTAL		150

Q2 What is your relationship to downtown Sandy? (Choose all that apply)

Answered: 150 Skipped: 0



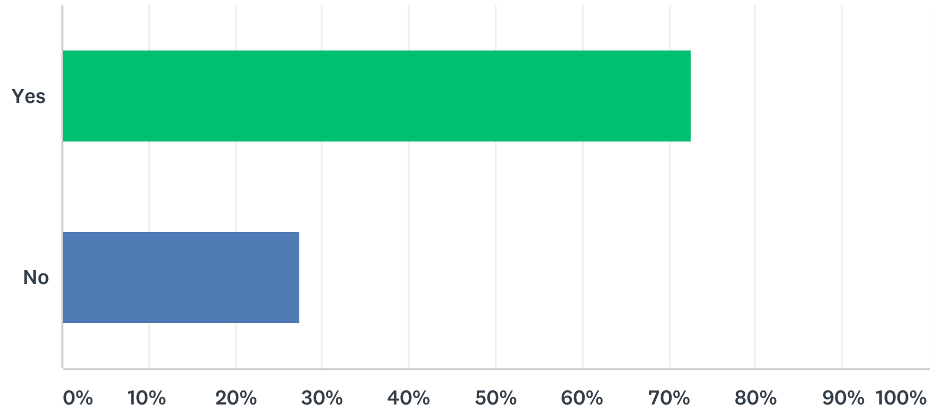
ANSWER CHOICES	RESPONSES	
Downtown Resident	9.33%	14
Downtown Employee	21.33%	32
Downtown Property and/or Business Owner	7.33%	11
Local Business Supporter (shop downtown)	34.00%	51
Sandy Resident	72.00%	108
Oregon Trail School District Student	11.33%	17
Other (please specify)	11.33%	17
Total Respondents: 150		

#	OTHER (PLEASE SPECIFY)	DATE
1	Builder	3/13/2018 10:28 AM
2	son lives there	2/27/2018 2:01 PM
3	Small business owner	2/23/2018 9:57 AM
4	City employee	2/8/2018 5:06 PM
5	City of Sandy Transit Employee	2/8/2018 10:28 AM
6	Former business owner.	2/6/2018 7:50 PM
7	Sandy Fire District No. 72	2/6/2018 6:22 PM
8	visit often	2/6/2018 5:37 PM
9	Parent of OTSD students	2/6/2018 4:50 PM

10	Rent room in house, landlord-roommate is property owner	2/6/2018 4:28 PM
11	Local Realtor for over 15 years , Chamber pres 2010, Main Street Sandy involved	2/5/2018 12:24 PM
12	Swim at the Maverick Aquatics	2/4/2018 5:03 PM
13	The pool aerobics, shopping, stopping for coffe	2/4/2018 9:32 AM
14	Wife works downtown Sandy, we live in the wider Sandy area	2/4/2018 9:15 AM
15	Greater sandy area	2/1/2018 9:04 PM
16	Frequent customer and community member	2/1/2018 8:20 PM
17	Live in Boring, teach at SHS	1/29/2018 1:05 PM

Q3 Do you walk to and/or around downtown Sandy?

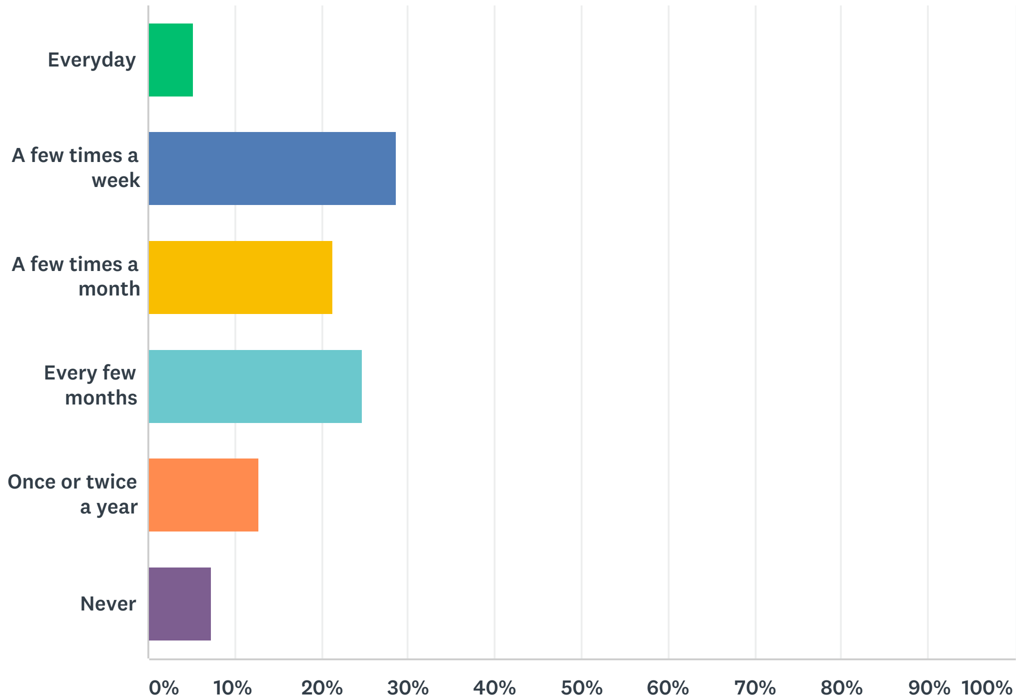
Answered: 150 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	72.67%	109
No	27.33%	41
TOTAL		150

Q4 How often do you walk to or around downtown?

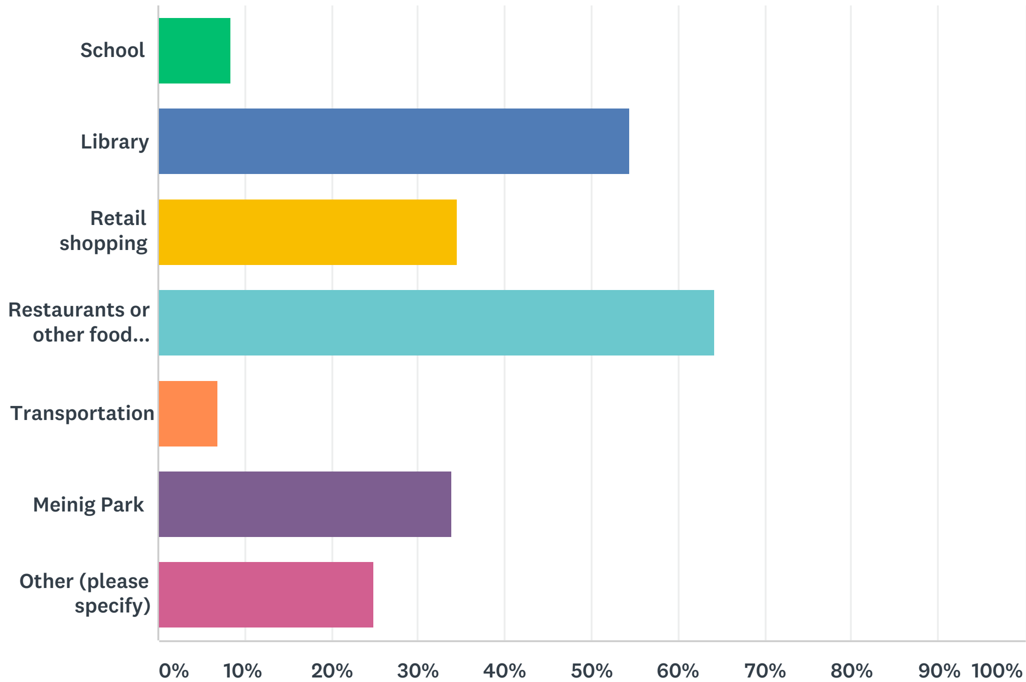
Answered: 150 Skipped: 0



ANSWER CHOICES	RESPONSES	
Everyday	5.33%	8
A few times a week	28.67%	43
A few times a month	21.33%	32
Every few months	24.67%	37
Once or twice a year	12.67%	19
Never	7.33%	11
TOTAL		150

Q5 Where do you walk to? (Choose all that apply)

Answered: 145 Skipped: 5



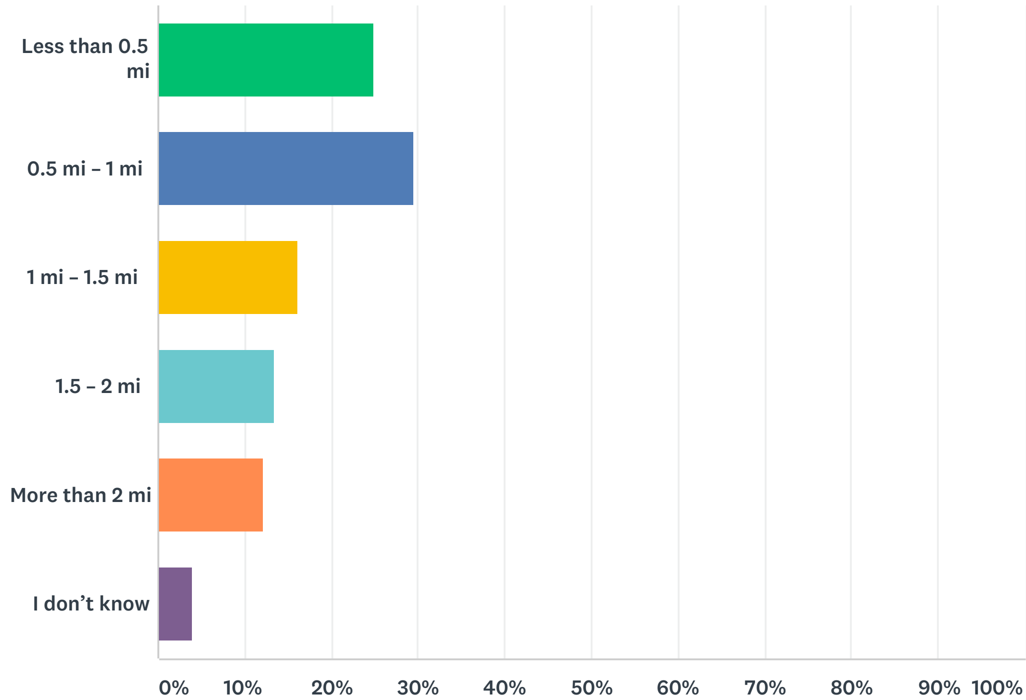
ANSWER CHOICES	RESPONSES	
School	8.28%	12
Library	54.48%	79
Retail shopping	34.48%	50
Restaurants or other food services	64.14%	93
Transportation	6.90%	10
Meinig Park	33.79%	49
Other (please specify)	24.83%	36
Total Respondents: 145		

#	OTHER (PLEASE SPECIFY)	DATE
1	n	3/27/2018 11:27 AM
2	sandy aqautic center & sandy community center	3/27/2018 11:26 AM
3	senior center/action center/ st. Michael's church	3/27/2018 11:20 AM
4	Tickles Creek Trail	3/27/2018 11:19 AM
5	occasionally First Friday	3/19/2018 1:17 PM
6	I use the trail to run on	3/13/2018 10:28 AM
7	trails	2/27/2018 2:01 PM
8	Banks	2/27/2018 10:52 AM
9	work	2/23/2018 9:57 AM

10	Work	2/22/2018 10:38 AM
11	parade and festival	2/22/2018 10:07 AM
12	US Bank	2/21/2018 12:14 PM
13	Other businesses, work	2/19/2018 5:23 AM
14	Neighborhood exercize	2/15/2018 12:58 PM
15	Only Mountain Days.	2/14/2018 12:55 PM
16	Dont walk in town	2/11/2018 9:48 PM
17	Sandy Pool	2/8/2018 6:43 PM
18	bank	2/8/2018 12:44 PM
19	Walking for exercise	2/8/2018 10:28 AM
20	Run around town	2/8/2018 5:15 AM
21	I walk from home into town sometimes, but I don't like the area of the highway, I generally stay to the north of 26 and then turn around.	2/7/2018 7:10 PM
22	site visits for work	2/7/2018 9:55 AM
23	Walk dogs daily	2/7/2018 8:58 AM
24	Walk to exercise	2/6/2018 10:28 PM
25	Daily walk -exercise	2/6/2018 8:20 PM
26	Walk perimeter with my dog for exercise	2/6/2018 7:45 PM
27	None	2/6/2018 5:47 PM
28	Really aren't that many great eating establishments or interesting shops.	2/6/2018 5:40 PM
29	Tickle creek trail and surrounding parks	2/6/2018 5:35 PM
30	Work, and just going for walks on breaks	2/6/2018 4:50 PM
31	Live outside city limits	2/4/2018 5:03 PM
32	Counseling	2/4/2018 3:59 PM
33	Offices	2/2/2018 11:46 AM
34	exercise	2/1/2018 9:24 PM
35	Within the older part of downtown. Fire station to museum if the sun shines.	2/1/2018 5:57 PM
36	I’m a runner, so mostly run through and around town	2/1/2018 5:41 PM

Q6 How far do you usually walk?

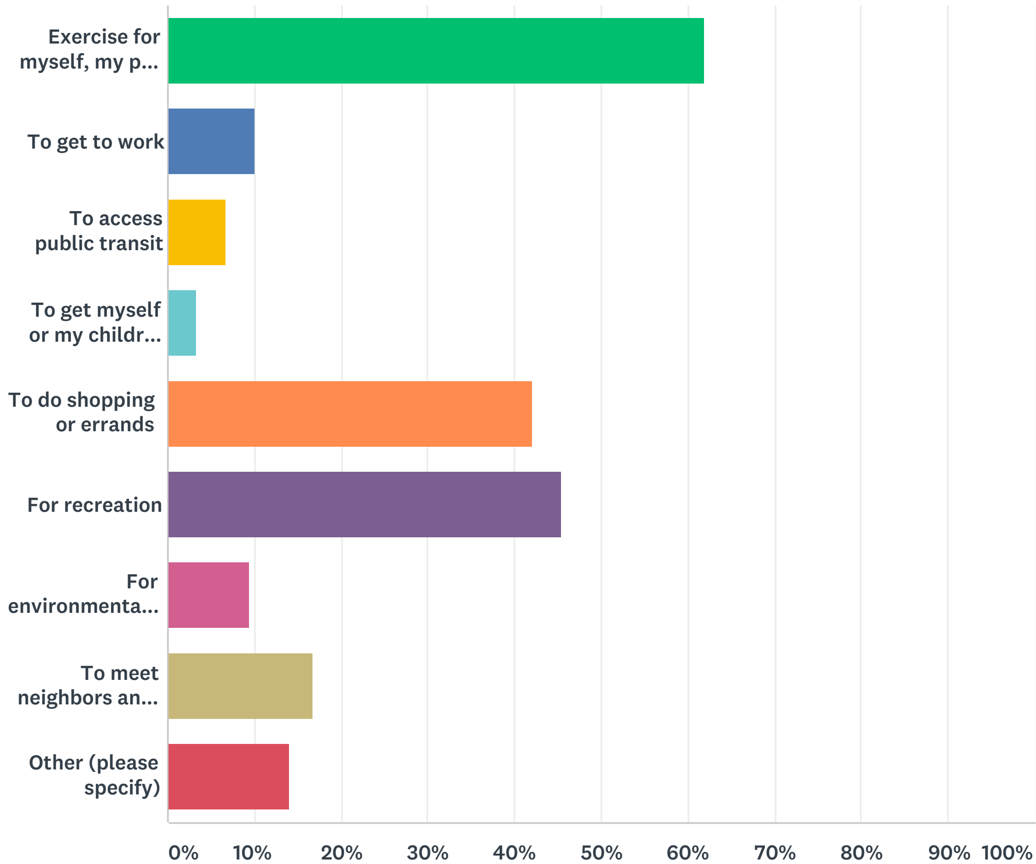
Answered: 149 Skipped: 1



ANSWER CHOICES	RESPONSES	
Less than 0.5 mi	24.83%	37
0.5 mi – 1 mi	29.53%	44
1 mi – 1.5 mi	16.11%	24
1.5 – 2 mi	13.42%	20
More than 2 mi	12.08%	18
I don't know	4.03%	6
TOTAL		149

Q7 Why do you walk? (Choose all that apply)

Answered: 150 Skipped: 0



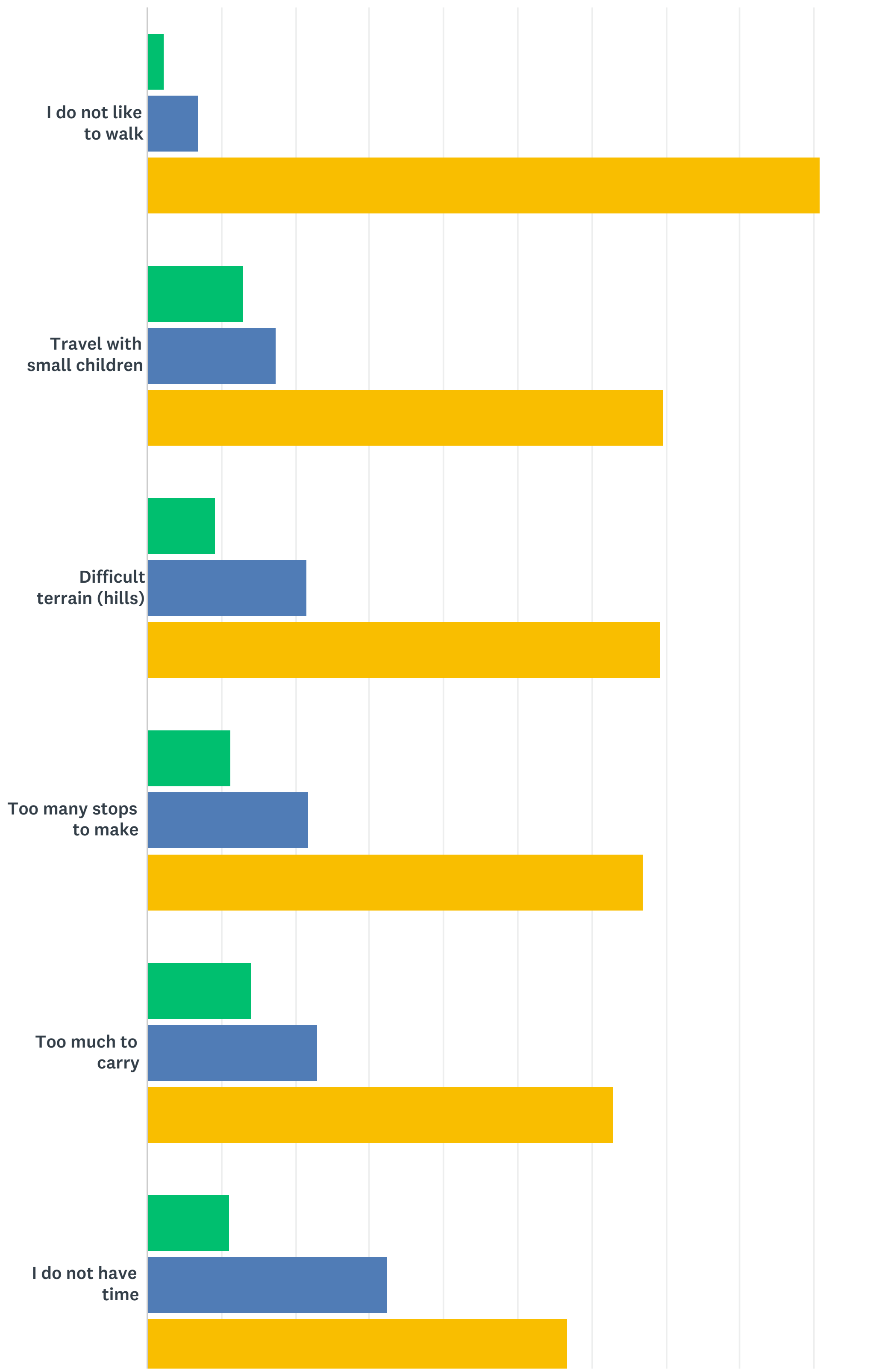
ANSWER CHOICES	RESPONSES	
Exercise for myself, my pet or my children	62.00%	93
To get to work	10.00%	15
To access public transit	6.67%	10
To get myself or my children to school	3.33%	5
To do shopping or errands	42.00%	63
For recreation	45.33%	68
For environmental considerations	9.33%	14
To meet neighbors and get to know my community better	16.67%	25
Other (please specify)	14.00%	21
Total Respondents: 150		

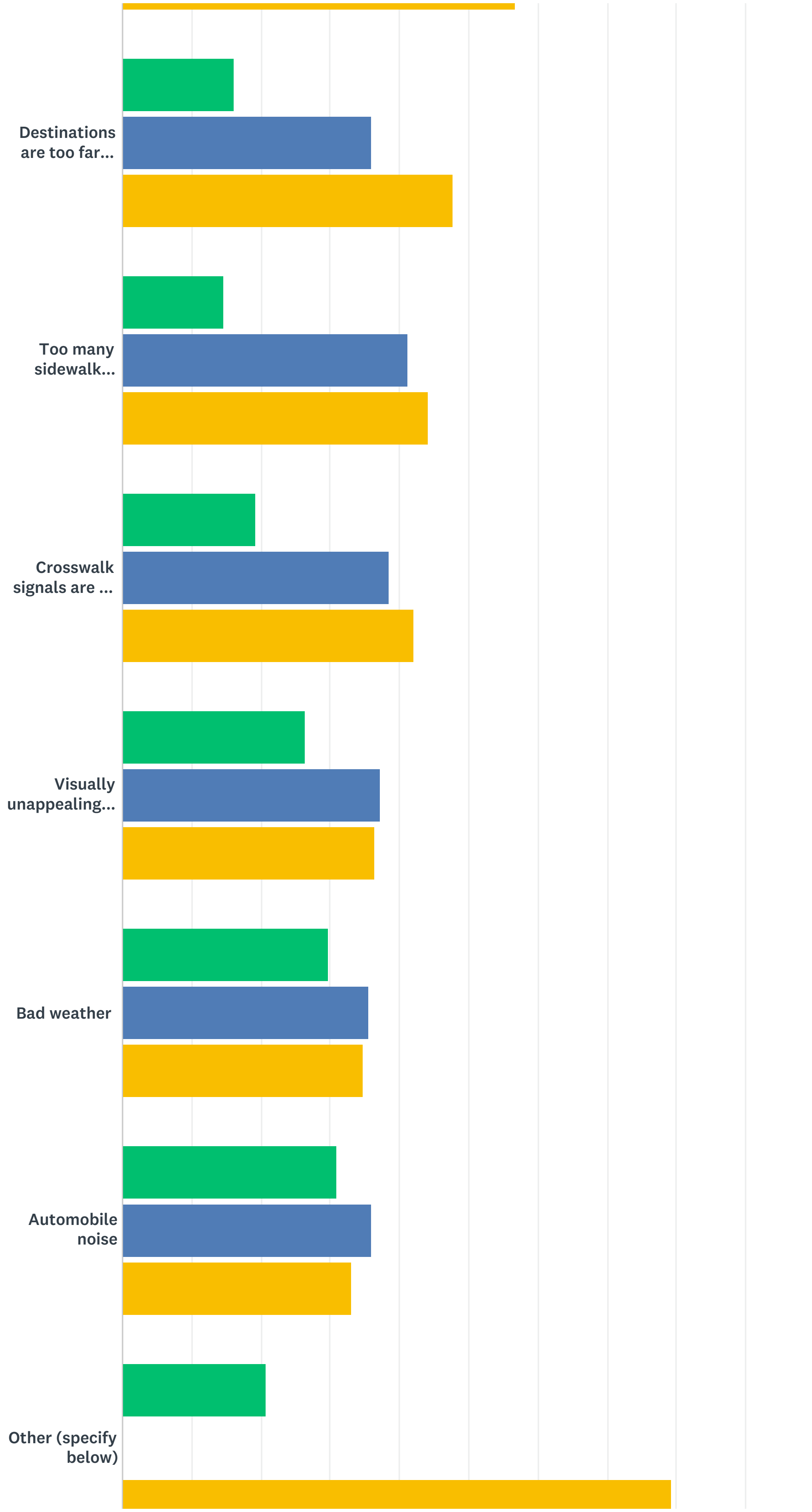
#	OTHER (PLEASE SPECIFY)	DATE
1	na	3/27/2018 11:26 AM
2	n/a	3/27/2018 11:23 AM

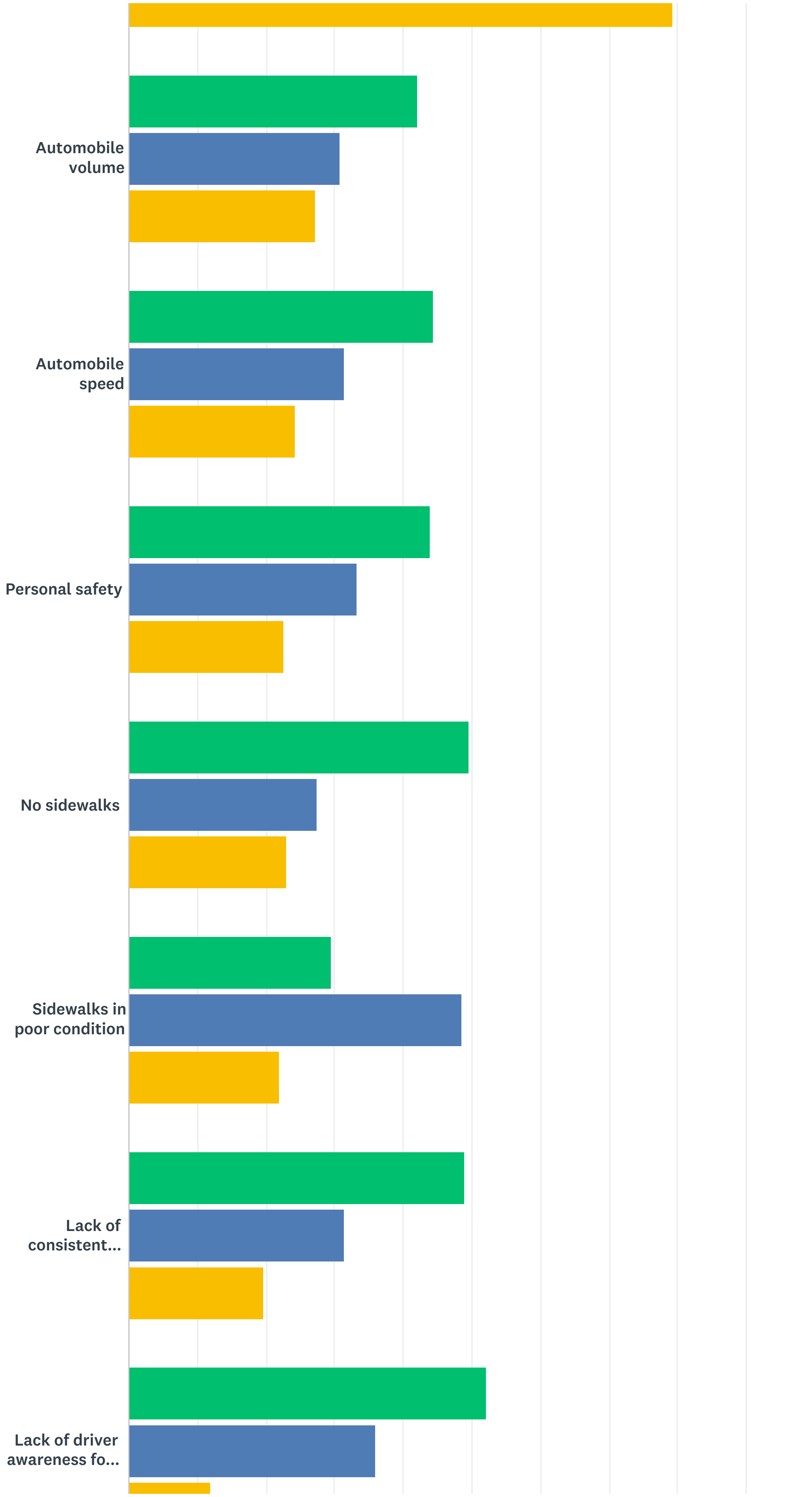
3	interacting w/ downtown businesses is a part of my job	3/27/2018 11:14 AM
4	special events	3/19/2018 1:17 PM
5	See the awesome beauty of the creek!	3/13/2018 10:28 AM
6	special events	2/22/2018 10:07 AM
7	the street layout wastes gas and time. Walking is faster. Really! This is because of how the streets are laid out and the signals work.	2/16/2018 7:15 AM
8	Only during Mountain Days, downtown is not walk friendly with 26 through the middle.	2/14/2018 12:55 PM
9	I walk from where I park to the store or establishment I am going to, i.e. Beer Den, Library, CCB, etc.	2/12/2018 3:29 PM
10	HAVE LUNCH DURING WORK	2/11/2018 9:11 PM
11	for lunch	2/8/2018 12:44 PM
12	Events	2/8/2018 5:15 AM
13	lunch break, get out of the office	2/7/2018 8:56 AM
14	Get lunch	2/6/2018 7:57 PM
15	Food!	2/6/2018 4:28 PM
16	First Friday	2/5/2018 4:08 PM
17	I don't walk downtown	2/2/2018 4:42 PM
18	To get food at lunch	2/2/2018 2:24 PM
19	easier than trying to find parking	2/2/2018 7:34 AM
20	Sometimes it's the most logical choice.	2/1/2018 8:20 PM
21	Store to store	1/29/2018 1:05 PM

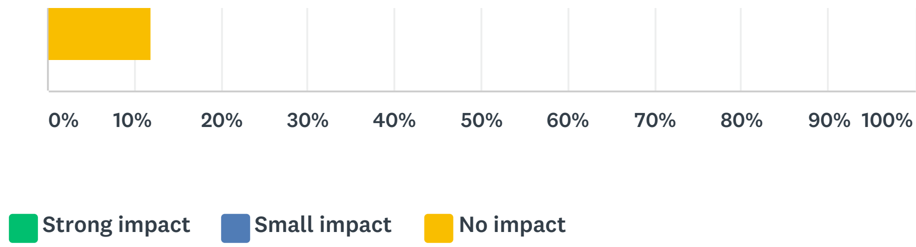
Q8 Which of the following factors have a negative impact on your decision to walk downtown? For those that do have an impact, how much of an impact do they have?

Answered: 147 Skipped: 3




Destinations are too far...
Too many sidewalk...
Crosswalk signals are ...
Visually unappealing...
Bad weather
Automobile noise
Other (specify below)


Automobile volume
Automobile speed
Personal safety
No sidewalks
Sidewalks in poor condition
Lack of consistent...
Lack of driver awareness fo...

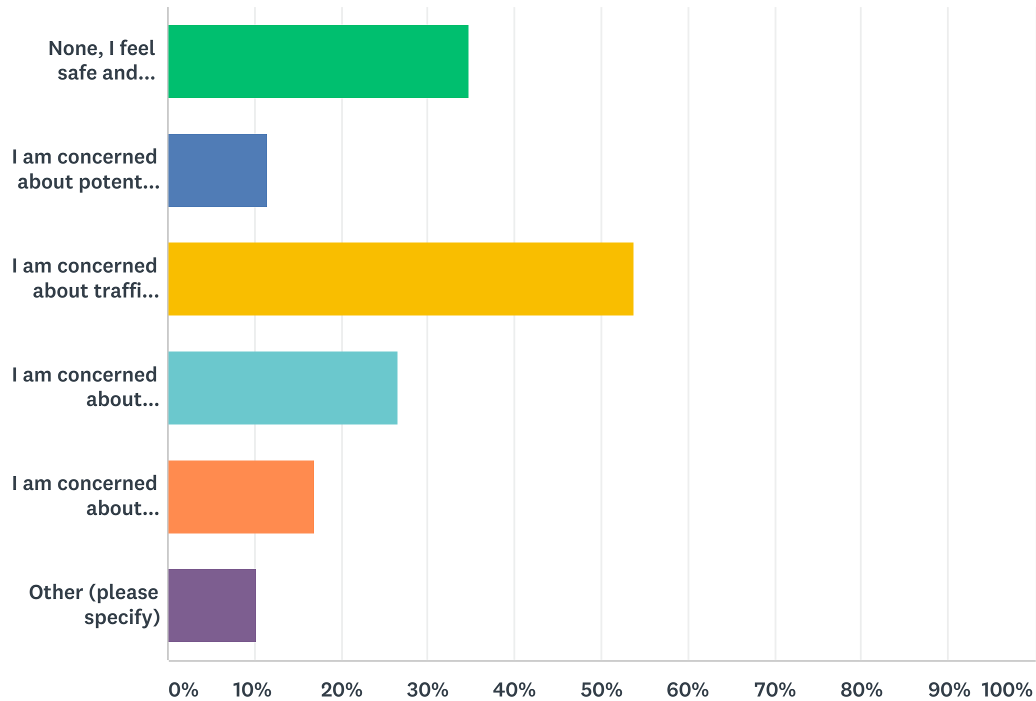


	STRONG IMPACT	SMALL IMPACT	NO IMPACT	TOTAL
I do not like to walk	2.29% 3	6.87% 9	90.84% 119	131
Travel with small children	12.88% 17	17.42% 23	69.70% 92	132
Difficult terrain (hills)	9.23% 12	21.54% 28	69.23% 90	130
Too many stops to make	11.28% 15	21.80% 29	66.92% 89	133
Too much to carry	14.07% 19	22.96% 31	62.96% 85	135
I do not have time	11.03% 15	32.35% 44	56.62% 77	136
Destinations are too far away	16.18% 22	36.03% 49	47.79% 65	136
Too many sidewalk obstructions (utility boxes, light poles, etc.)	14.71% 20	41.18% 56	44.12% 60	136
Crosswalk signals are too long	19.29% 27	38.57% 54	42.14% 59	140
Visually unappealing surroundings	26.28% 36	37.23% 51	36.50% 50	137
Bad weather	29.71% 41	35.51% 49	34.78% 48	138
Automobile noise	30.99% 44	35.92% 51	33.10% 47	142
Other (specify below)	20.75% 11	0.00% 0	79.25% 42	53
Automobile volume	42.14% 59	30.71% 43	27.14% 38	140
Automobile speed	44.29% 62	31.43% 44	24.29% 34	140
Personal safety	43.97% 62	33.33% 47	22.70% 32	141
No sidewalks	49.63% 67	27.41% 37	22.96% 31	135
Sidewalks in poor condition	29.41% 40	48.53% 66	22.06% 30	136
Lack of consistent sidewalks along same side of the road	48.91% 67	31.39% 43	19.71% 27	137
Lack of driver awareness for pedestrians	52.11% 74	35.92% 51	11.97% 17	142

#	OTHER (PLEASE SPECIFY)	DATE
1	lack of sidewalks between my neighborhood and downtown sandy	3/27/2018 11:14 AM
2	lack of appealing destinations	3/19/2018 1:17 PM
3	I don't not walk sandy to do any shopping because it is too spread out, I live out of town. But I come in to run the trail and up around to Fred Meyer then through the business/commercial side street then up beside ford/check car dealers, the business road does not have sidewalks all the way through frustrating for me and CrossFit people that use that road and neither does Ruben road	3/13/2018 10:28 AM
4	Crosswalk signals don't give enough time	2/23/2018 11:26 AM
5	there really aren't enough places to stop and walk to, the ones that I'd want to walk to aren't close together	2/22/2018 10:07 AM
6	I would like to see a consistent and safe sidewalk down 211 from Sandy to Arletha Ct with all the new homes.	2/14/2018 12:55 PM
7	I walk in Sandy but not in town	2/11/2018 9:48 PM
8	Exhaust and other pollution from vehicles, especially diesel fumes.	2/10/2018 6:12 PM
9	Cross walks are a pain	2/9/2018 5:07 PM
10	snow and Ice is an issue in the winter	2/8/2018 4:48 PM
11	Sandy need to outlaw EXHAUST brakes in the City Limits. We like 2000 feet from H26 and we hear them when we are inside of our house. This is one simple action the City Council can take. Exhaust brakes are not allowed in all of Mult. County so why no in a town like Sandy?	2/8/2018 12:46 PM
12	parking along both pioneer and proctor obstructs sight of oncoming traffic. The highway itself is a giant negative	2/8/2018 10:04 AM
13	Poor sidewalk and street lighting!	2/7/2018 8:36 PM
14	I grew up in the country and have walked all kinds of environments and terrain	2/7/2018 8:58 AM
15	You risk your life walking in Sandy!	2/7/2018 5:46 AM
16	Our own police department does not follow the pedestrian laws why should others. When we contacted them about enforcement we we're told there is no money in the budget. Just because there is no money to enforce it doesn't mean our own force can't follow it.	2/6/2018 5:47 PM
17	compared to alot of palces Sandy is very walkable..it's not parkable as in poor parking for cars and business	2/6/2018 5:37 PM
18	There isn't much downtown	2/6/2018 5:23 PM
19	distance between the stores/restaurants	2/5/2018 12:24 PM
20	I am unable to walk a long distance.	2/4/2018 10:20 AM
21	I have no reason to walk downtown. The places I would go are not in close proximity to one another.	2/2/2018 4:42 PM
22	Drivers cant see when there is a pedestiran waiting. we neeed those flsing pedestrian lights at the cross walks.	2/2/2018 11:46 AM
23	Rusty mailboxes that clearly aren't used. Ever. And unlit sidewalks that are super uneven.	2/1/2018 9:45 PM
24	Retail and food spread too far	2/1/2018 9:04 PM
25	not enough courtyards, green spaces, outdoor eaterys	2/1/2018 6:37 PM
26	If you walk from east to west it's not bad, however I have to walk back 2% grade	2/1/2018 5:57 PM

Q9 What safety concerns do you have about walking downtown? (Choose all that apply)

Answered: 147 Skipped: 3



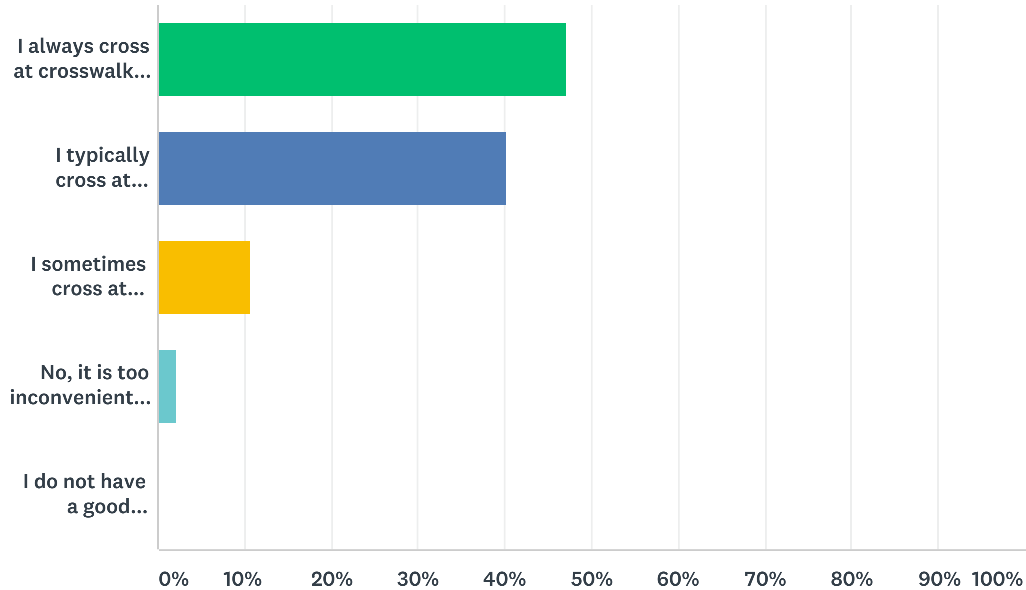
ANSWER CHOICES	RESPONSES	
None, I feel safe and satisfied walking downtown	34.69%	51
I am concerned about potential criminal activity	11.56%	17
I am concerned about traffic dangers	53.74%	79
I am concerned about conditions of sidewalks (uneven, cracked, obstructions, etc.)	26.53%	39
I am concerned about conditions of crosswalks	17.01%	25
Other (please specify)	10.20%	15
Total Respondents: 147		

#	OTHER (PLEASE SPECIFY)	DATE
1	Just having sidewalks, it would be great to have a sidewalk from dubarko to the donut shop on 211. People walk that almost every day and it’s scary sometimes.	3/13/2018 10:28 AM
2	There are many, many more cars now. They speed and disobey our laws. You cannot pull out onto the main roadways without waiting for a red light to stop the massive flow of cars. THANKS for the changes!	2/23/2018 9:57 AM
3	Signals at library create pedestrian and vehicle danger. Flashing pedestrian signal preferred.	2/15/2018 12:58 PM
4	Pollution and noise.	2/10/2018 6:12 PM
5	congestion and traffic volume blind spots and speed	2/8/2018 4:48 PM
6	poor lighting at night, too far between crosswalks	2/8/2018 12:44 PM

7	Lack of consistent sidewalks is HUGE! As well as obstructions/ overgrowth. Have a stroller. Makes it very challenging	2/8/2018 5:15 AM
8	Traffic dangers only, I feel very safe walking in Sandy.	2/7/2018 7:10 PM
9	criminal activity, traffic dangers, sidewalk conditions and crosswalk conditions	2/7/2018 8:56 AM
10	Traffic NOISE and speed is most unpleasant. Breathing the fumes is gross.	2/7/2018 5:46 AM
11	The traffic speed needs to be addressed. It is very rare to see cars actually travelling the speed limit of 25 mph	2/7/2018 3:28 AM
12	The homeless are starting to make their way here.	2/6/2018 7:39 PM
13	Nothing attracts me to walk there	2/6/2018 5:35 PM
14	They cant see when we are waitng to walk.	2/2/2018 11:46 AM
15	Auto speed and running red lights	2/2/2018 8:05 AM

Q10 Do you obey pedestrian safety rules?

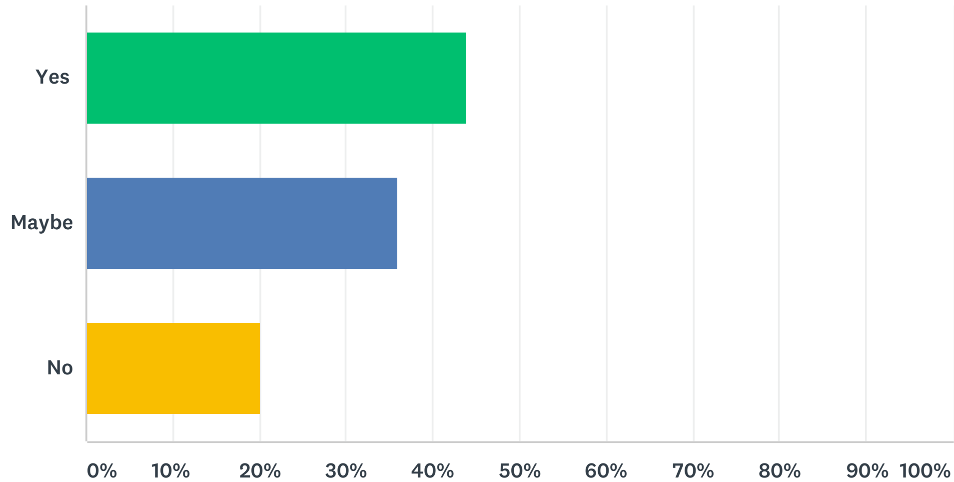
Answered: 149 Skipped: 1



ANSWER CHOICES	RESPONSES	
I always cross at crosswalks, wait for pedestrian signal to walk, and follow other pedestrian rules	46.98%	70
I typically cross at crosswalks, wait for pedestrian signal to walk, and follow other pedestrian rules	40.27%	60
I sometimes cross at crosswalks, wait for pedestrian signal to walk, and follow other pedestrian rules	10.74%	16
No, it is too inconvenient for me to follow pedestrian safety rules	2.01%	3
I do not have a good understanding on pedestrian safety rules	0.00%	0
TOTAL		149

Q11 Do you find walking downtown as a pleasant experience?

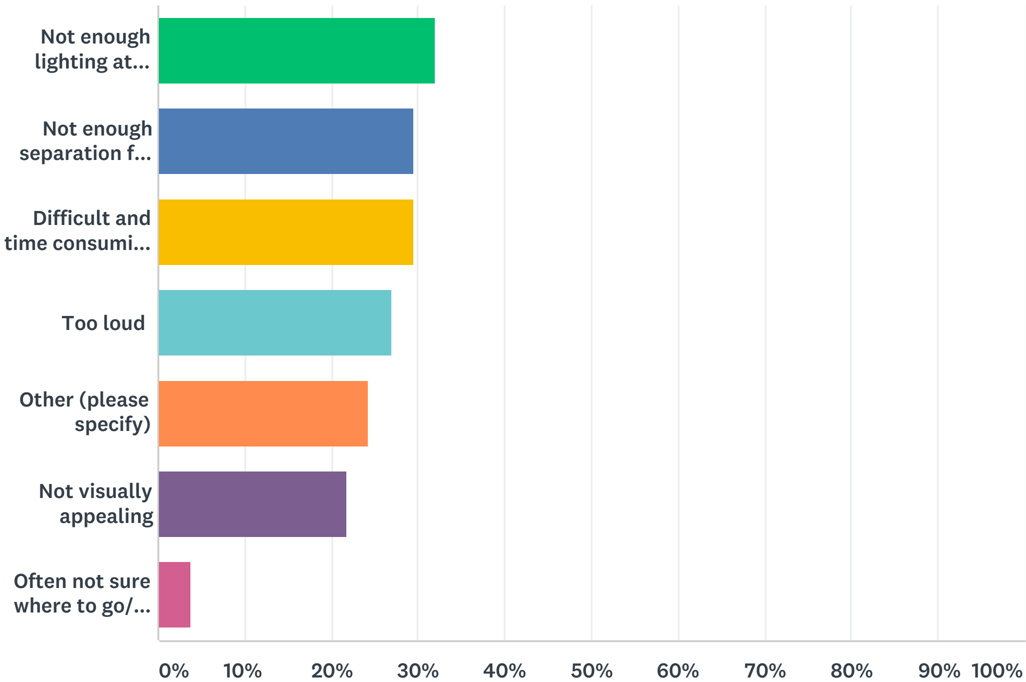
Answered: 150 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	44.00%	66
Maybe	36.00%	54
No	20.00%	30
TOTAL		150

Q12 If no, why? (Choose all that apply)

Answered: 78 Skipped: 72



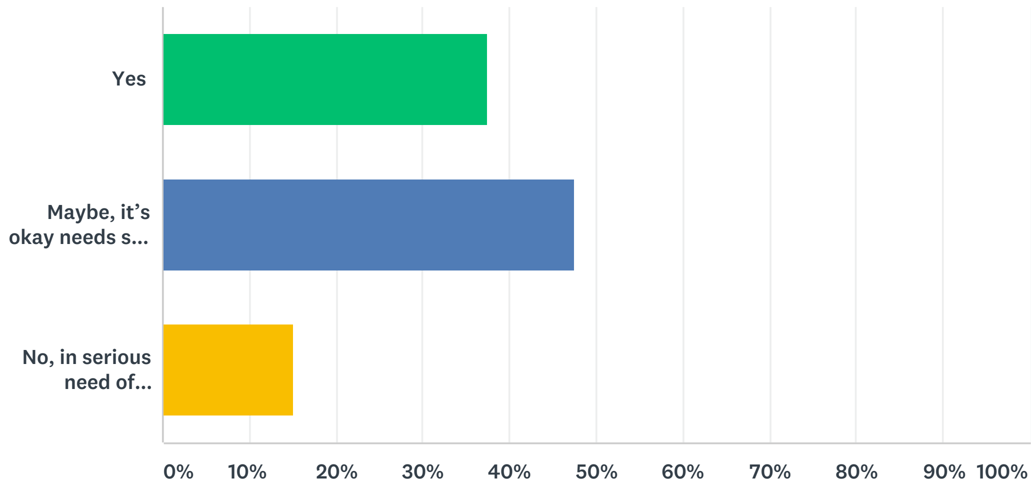
ANSWER CHOICES	RESPONSES	
Not enough lighting at night	32.05%	25
Not enough separation from traffic	29.49%	23
Difficult and time consuming to cross streets	29.49%	23
Too loud	26.92%	21
Other (please specify)	24.36%	19
Not visually appealing	21.79%	17
Often not sure where to go/ lack of pedestrian wayfinding signs	3.85%	3
Total Respondents: 78		

#	OTHER (PLEASE SPECIFY)	DATE
1	weather conditions, bus availability	3/27/2018 11:20 AM
2	Walking to Downtown is fine until I get here - then it's loud and fast	2/22/2018 12:42 PM
3	Traffic comes too fast! Drivers are in a hurry too many times.	2/16/2018 7:19 AM
4	walk away from town	2/11/2018 9:50 PM
5	Pollution from vehicles	2/10/2018 6:16 PM
6	Let's face it... there really isn't THAT much in downtown Sandy worth walking all around for. There are those 1 or 2 spots you go to and that is it...	2/8/2018 9:55 PM
7	I can’t see the question so I can’t answer this	2/8/2018 7:09 PM
8	None	2/8/2018 12:48 PM

9	Consistent sidewalks/ obstructions using stroller	2/8/2018 5:15 AM
10	NA	2/7/2018 10:26 AM
11	I haven't really walked at night, but while driving the lighting seems a little sparse, but I'd have to really pay attn for proper input	2/7/2018 9:01 AM
12	No Lighting on Pioneer Blvd. like has been installed on Proctor Blvd.	2/6/2018 6:26 PM
13	No problems	2/6/2018 5:12 PM
14	No family friendly destinations other than library. Too many bars and head shops.	2/6/2018 4:51 PM
15	Why what? I don't understand the question.	2/6/2018 4:29 PM
16	The main roads have stores that are closed and not being used as store fronts	2/5/2018 12:35 PM
17	I am physically unable to walk very far.	2/4/2018 10:22 AM
18	Cars stoop fast or dont stop when your trying to cross.	2/2/2018 11:47 AM
19	Not enough appealing destinations.	2/1/2018 10:23 PM

Q13 Do you feel there are enough pedestrian amenities downtown (benches, trash receptacles, lighting, landscaping, etc.)

Answered: 139 Skipped: 11



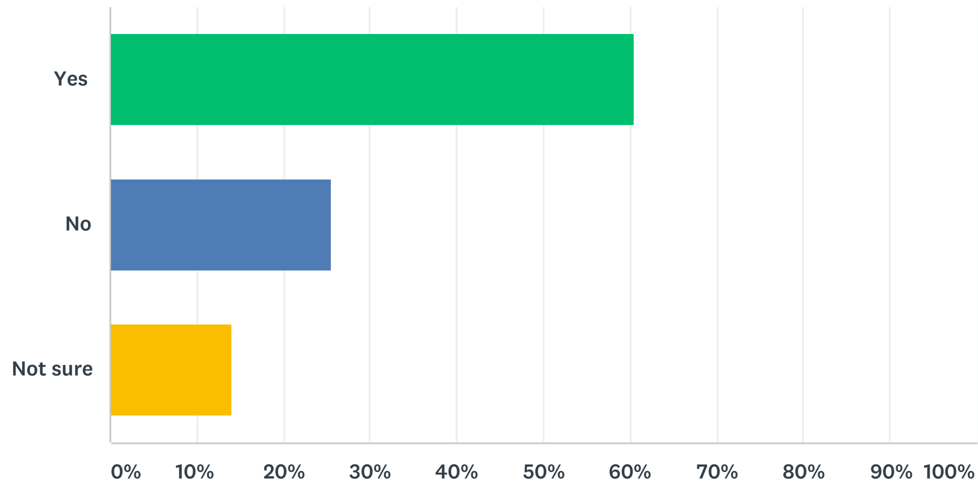
ANSWER CHOICES	RESPONSES	
Yes	37.41%	52
Maybe, it's okay needs some improvement	47.48%	66
No, in serious need of improvement	15.11%	21
TOTAL		139

#	SUGGESTIONS FOR OTHER PEDESTRIAN AMENITIES.	DATE
1	Replace bench in bus shelter by senior center	3/27/2018 11:20 AM
2	garbage cans that get emptied regularly	2/28/2018 5:34 PM
3	More trash cans by the Library (often overflowing)	2/27/2018 2:22 PM
4	Need more benches and trash recepticles	2/23/2018 11:26 AM
5	Extending trash receptacles along Proctor east and west from where they are now would be nice, but not urgent The biggest issues is lighting. Frankly, after the sun goes down, especially in the wet, dreary months Sandy looks like a bad Hollywoord stereotype of a deserted city. The lighting even on Proctor isn't very bright, and is more brown than anything, which just makes it seem darker and more deserted. More, brighter, and "whiter" lighting would help a lot I spent a lot of time walking along Proctor after dark, especially in the winter months since the sun goes down so early, and it is noticeable	2/19/2018 5:29 AM
6	Permanently close the street between Clackamas County Bank and Leathers. It serves no purpose and is out of alignment. Cheaper to just close this street!	2/16/2018 7:19 AM
7	Landscaping between sidewalks and traffic. maybe some art, and more trash cans. Some of the sidewalks are in rough shape as well.	2/15/2018 12:57 PM
8	It seems ridiculous to have benches alongside Proctor or Pioneer, where traffic is nearly nonstop. Better to place them in areas away from traffic.	2/10/2018 6:16 PM
9	needs blinking cross walks indicators need more/some green spaces	2/8/2018 4:50 PM
10	lighting, crosswalks, benches are good, love the flower pots and hanging baskets in the summer	2/8/2018 12:46 PM
11	More trash cans	2/7/2018 11:59 PM

12	More trash cans if they get emptied regularly.	2/7/2018 7:11 PM
13	More recycling options	2/7/2018 6:47 PM
14	Needs much more landscaping, benches that don't face Highway 26, leave the Christmas lights up longer, incorporate more art or other visually appealing street furniture, potted plants, etc.	2/7/2018 9:57 AM
15	Maybe more trash receptacles.... ppl who litter REALLY upset me, I grew up here and find myself picking up garbage.. not sure if it would help, but hopefully it would because ppl are just lazy and disrespectful nowadays. It's sad	2/7/2018 9:01 AM
16	There is lots of this but no one would want to use these due to the unpleasant and unhealthy traffic thundering past, you will notice these things go unused and could be reused in a nicer location away from the highway.	2/7/2018 5:50 AM
17	There should be more benches	2/7/2018 3:29 AM
18	Better lighting and emergency call boxes would be nice	2/6/2018 5:48 PM
19	Lighting	2/6/2018 5:36 PM
20	Love the flowers every year and the banners	2/5/2018 12:35 PM
21	lighting is poor, obstructions, trash is overflowing in many cans. No recycling options.	2/1/2018 9:25 PM
22	Trash cans sometimes are overflowing. Would be nice to have more trees and natural plantings, and downtown parks.	2/1/2018 6:27 PM

Q14 Do you usually take the fastest route when walking to/from your residence to downtown or around downtown?

Answered: 129 Skipped: 21



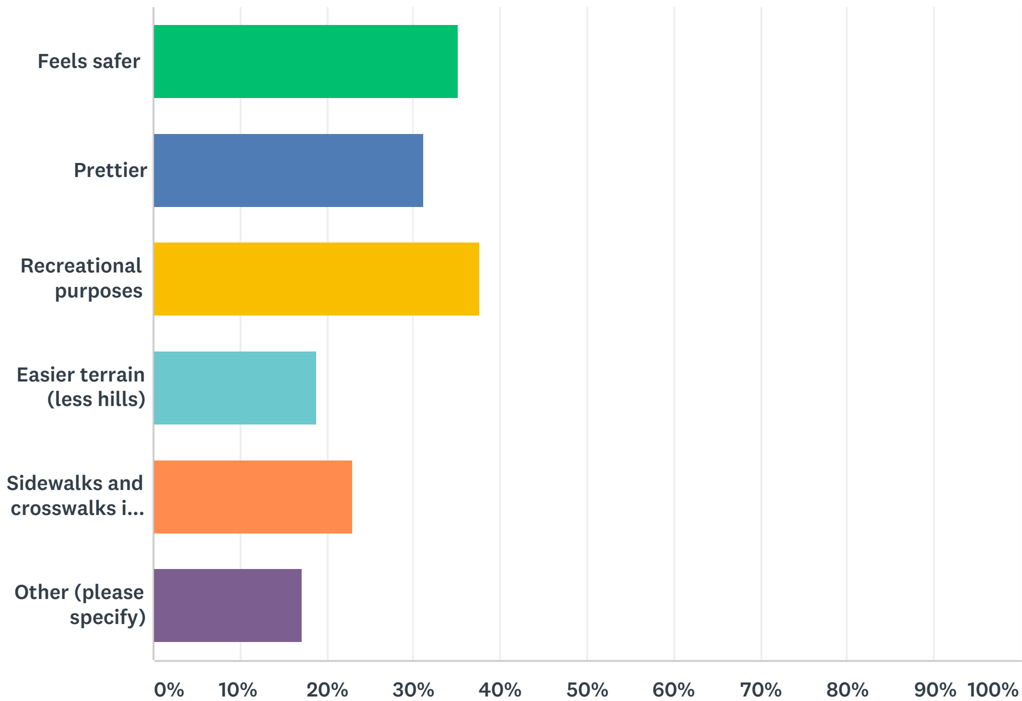
ANSWER CHOICES	RESPONSES	
Yes	60.47%	78
No	25.58%	33
Not sure	13.95%	18
TOTAL		129

#	COMMENTS	DATE
1	i live far away, dont walk downtown	3/27/2018 11:37 AM
2	Most times, yes	2/23/2018 9:57 AM
3	N/A	2/22/2018 10:08 AM
4	Fastest, or at least most direct	2/19/2018 5:29 AM
5	I walk through Meining Park since it's a time saver. I wish the park had more lighting though.	2/16/2018 7:19 AM
6	I take the safest route which means routing longer based on sidewalk consistency and availability.	2/14/2018 12:56 PM
7	I don't walk to downtown from my home.	2/12/2018 3:30 PM
8	Try to use pathways, side streets, anywhere away from Proctor and Pioneer.	2/10/2018 6:16 PM
9	I have not spent relaxing time in downtown for many years	2/8/2018 4:50 PM
10	WE take the most direct which may not be the fastest.	2/8/2018 12:48 PM
11	N/A	2/8/2018 12:46 PM
12	Not always. Depends on other factors.	2/7/2018 8:39 PM
13	If I'm tracking mileage I take the long road. If I'm short on time, the short road.	2/7/2018 7:11 PM
14	I would like to take the fastest route from my residence to downtown but there are no sidewalks (on 211), too narrow of a shoulder, and too many speeding cars	2/7/2018 9:57 AM
15	NO, I can not walk in to town even though it is one mile, it would be TOO DANGEROUS. I live on Vista Loop, forty years ago I used to walk in now there is too much and faster highway traffic. Where are our sidewalks to Vista Loop BY THE WAY???	2/7/2018 5:50 AM

16	I don't walk from my home, only from work.	2/6/2018 7:58 PM
17	I also walk for exercise	2/6/2018 4:29 PM
18	Live outside city limits	2/4/2018 5:04 PM
19	I take the safest.	2/1/2018 10:23 PM
20	Sometimes	2/1/2018 7:33 PM

Q15 What are the reasons you take alternative/longer routes? (Choose all that apply)

Answered: 122 Skipped: 28



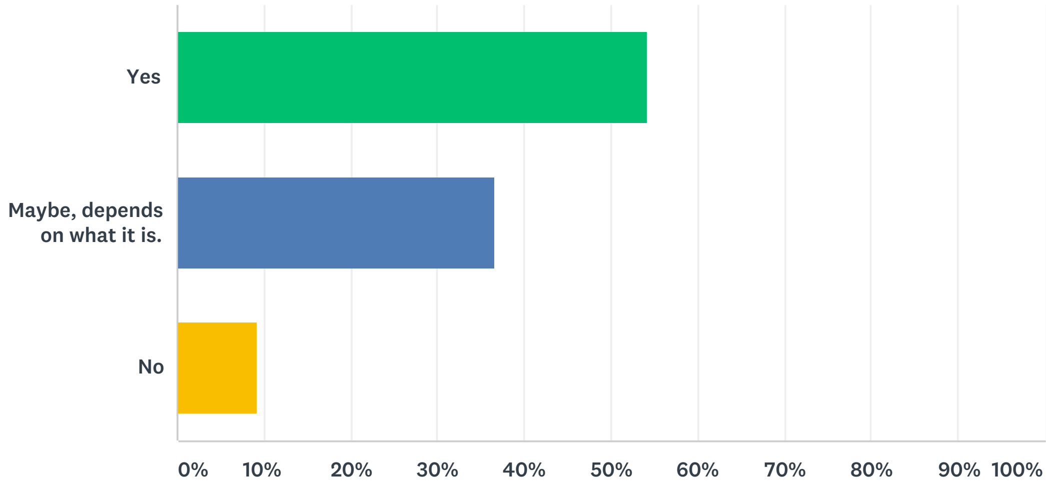
ANSWER CHOICES	RESPONSES	
Feels safer	35.25%	43
Prettier	31.15%	38
Recreational purposes	37.70%	46
Easier terrain (less hills)	18.85%	23
Sidewalks and crosswalks in better condition	22.95%	28
Other (please specify)	17.21%	21
Total Respondents: 122		

#	OTHER (PLEASE SPECIFY)	DATE
1	Running training	3/13/2018 10:29 AM
2	good for health	2/27/2018 2:03 PM
3	N/A	2/22/2018 10:08 AM
4	My wife and I enjoy going through Meinig Park.	2/19/2018 10:10 AM
5	I don't really do this. It's my nature to take a route that is some combination of the fastest or most direct. I'm walking to get somewhere, not walking just to walk	2/19/2018 5:29 AM
6	There is no longer route that is prettier. Walking through Meining Park is prettier than the longer route! Although better lighting in the park will make it feel safer.	2/16/2018 7:19 AM
7	Prefer to walk other than downtown	2/11/2018 9:50 PM

8	Less air pollution, hopefully!!	2/10/2018 6:16 PM
9	Less traffic	2/8/2018 5:48 PM
10	Variety	2/8/2018 12:48 PM
11	quieter, quicker than waiting for crosswalk signals	2/8/2018 12:46 PM
12	Less trash and debris in certain areas going by businesses.	2/7/2018 8:39 PM
13	I would just to change scenery and get in a longer walk	2/7/2018 9:01 AM
14	I would like to walk in Sandy. I used to quite a lot. That was before the traffic became so heavy and fast. The speed of traffic really needs to be addressed!!!	2/7/2018 5:50 AM
15	I take my car. No need to walk for one stop along a very busy very loud highway	2/6/2018 5:37 PM
16	shops and restaurants	2/6/2018 5:02 PM
17	Don't take longer routes.	2/2/2018 2:26 PM
18	Depends if I am with my kids. I would make it easier and safer for them.	2/2/2018 11:33 AM
19	Sometimes Sandy is a parking lot due ro traffic signals and volume taking side roads slow, but sometimes you need to go south to go east!	2/2/2018 8:13 AM
20	Avoid traffic	2/1/2018 9:05 PM
21	I run early in the morning when it’s dark- I stick to the better lit streets	2/1/2018 5:42 PM

Q16 Would you walk downtown if there were more events, attractions, or destinations downtown to walk to?

Answered: 142 Skipped: 8



ANSWER CHOICES	RESPONSES	
Yes	54.23%	77
Maybe, depends on what it is.	36.62%	52
No	9.15%	13
TOTAL		142

Q17 What are the attractions/events/destinations that would encourage you to walk to and/or around downtown?

Answered: 81 Skipped: 69

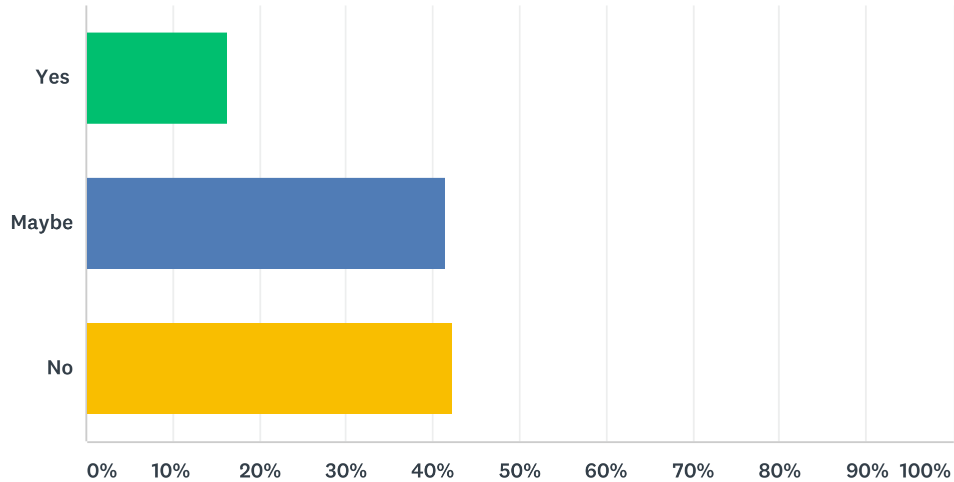
#	RESPONSES	DATE
1	stores, coffee shop, book store	3/27/2018 11:31 AM
2	Sandy Festivals/ entertainment/ amusement park setup	3/27/2018 11:20 AM
3	a new recreation center, more retail & res	3/27/2018 11:15 AM
4	Better restaurants!!!music venue	3/19/2018 1:23 PM
5	having a street that is more pedestrian friendly.	3/3/2018 3:48 PM
6	recreation/ parks	2/27/2018 6:06 PM
7	Open markets	2/27/2018 2:25 PM
8	trails, resturants, parks,etc.	2/27/2018 2:09 PM
9	Farmers market	2/27/2018 10:57 AM
10	walk for exercise	2/23/2018 11:34 AM
11	More retail shops, music	2/23/2018 10:13 AM
12	Anything on the norht side of the highway. Like Pleasant St.	2/22/2018 12:45 PM
13	Saturday Market, city-wide events where most of the downtown businesses participate.	2/22/2018 11:17 AM
14	Restaurants, festivals, events	2/22/2018 10:44 AM
15	Brewpubs	2/22/2018 10:40 AM
16	Not Sure	2/22/2018 10:15 AM
17	antique shows art shows	2/21/2018 12:23 PM
18	Shops, restaurants	2/20/2018 4:35 PM
19	Concerts, lectures or plays	2/19/2018 10:15 AM
20	I pretty much live downtown. Anywhere I go I usually end up walking through downtown anyway	2/19/2018 5:35 AM
21	Library events; Ant Farm events; First Friday; Mt Hood Market, etc. etc.	2/16/2018 7:26 AM
22	Restaurants, Parks	2/14/2018 1:00 PM
23	There just aren't that many options	2/12/2018 3:39 PM
24	music events	2/11/2018 9:56 PM
25	I used to walk to the grocery on Meinig, but there isn't a market in downtown anymore.	2/10/2018 11:23 PM
26	I enjoy First Fridays, Farmers Market, Ant Farm	2/10/2018 6:25 PM
27	Not really a lot of space to do decent events that would be attractive...	2/8/2018 10:00 PM
28	Festivals etc	2/8/2018 7:11 PM
29	street fairs, artists, music, dance	2/8/2018 5:09 PM
30	art, green space, events	2/8/2018 4:57 PM
31	First Friday types of events	2/8/2018 12:51 PM
32	easier to get to the event ie mt festival is hard b/c parking is so challenging; bazaars, gardening things	2/8/2018 12:51 PM
33	Better restaurants, and outdoor venues	2/8/2018 12:40 PM

34	Festivals, markets, music, beer garden, more shopping options.	2/8/2018 10:34 AM
35	Food and beverage events if we had better restaurants and breweries.	2/8/2018 10:27 AM
36	More parks, greater pedestrian paths - room, family/ pet- friendly events	2/8/2018 5:19 AM
37	music, retail,	2/7/2018 9:46 PM
38	Music events, performances, street fairs	2/7/2018 9:09 PM
39	A park on Pleasant St that I dind't have to cross the highway to get to.	2/7/2018 7:14 PM
40	Playgrounds or pretty scenery	2/7/2018 6:49 PM
41	Shopping	2/7/2018 6:09 PM
42	Clothing shops	2/7/2018 11:58 AM
43	Music, art, fun family events	2/7/2018 10:29 AM
44	rock climbing gym, events like The Moth, art gallery open houses, bigger farmer's market, better restaurants, a co-op grocery store - though the actual decision to walk to these events has more to do with the safety of the walk than the types of events	2/7/2018 10:18 AM
45	Community building, networking of the people	2/7/2018 9:07 AM
46	more, creative fun retail and food places	2/7/2018 8:59 AM
47	Local events	2/7/2018 8:38 AM
48	More farmer's markets/craft bazaars, etc.	2/7/2018 3:31 AM
49	More shopping and Restaurants	2/6/2018 9:06 PM
50	More dining options	2/6/2018 8:03 PM
51	Retail	2/6/2018 7:56 PM
52	Farmers markets type things	2/6/2018 7:50 PM
53	Music events and family events.	2/6/2018 7:43 PM
54	More family friendly events	2/6/2018 5:52 PM
55	Movie theater in downtown Sandy... Better restaurants. Disappointed that the new firehouse is right in the center of town. Would have preferred nice eating establishments and quaint little shops and art galeries.	2/6/2018 5:44 PM
56	Family events	2/6/2018 5:42 PM
57	arts & craft fairs, diffrent theme shopping pop-ups	2/6/2018 5:41 PM
58	Markets, concerts, a real slash pad	2/6/2018 5:40 PM
59	wine/beer festivals	2/6/2018 5:06 PM
60	Anything family friendly, sidewalk cafes, concerts, toy or antique stores etc.	2/6/2018 4:54 PM
61	Brewfest/community food festivals	2/6/2018 4:36 PM
62	Food carts and restaurants	2/6/2018 4:32 PM
63	More afternoon and evening events like First Friday	2/6/2018 4:30 PM
64	More hints like first Friday	2/5/2018 4:12 PM
65	Sales, stores (antiques, clothes & supplies stores, coffee, food, restaurants, bread stores, etc)	2/5/2018 12:46 PM
66	Music, art exhibits, sporting events, etc.	2/4/2018 5:09 PM
67	First Friday type events. Art shows	2/4/2018 10:24 AM
68	First Fridays are nice.	2/3/2018 11:08 PM
69	boutiques, restaurants	2/2/2018 4:45 PM
70	Shoping!!	2/2/2018 11:55 AM
71	Kids events: Art walks, bike events.	2/2/2018 11:39 AM

72	Family events (No Adult Beverages)	2/2/2018 8:33 AM
73	outdoor concert in summer/fall; art celebration	2/2/2018 8:20 AM
74	Expanded farmers market, better shops and restaurants	2/1/2018 10:26 PM
75	Sandy mt days. Recreational running.	2/1/2018 9:49 PM
76	Large public events that encourage community, like "x-fest". Brew-fest, art-fest, kid-fest, bikes, etc.	2/1/2018 8:26 PM
77	I’m attracted to Downtown Gresham and Downtown Old Troutdale. Appealing shops and restaurants. Bring that to Sandy and we would have so much more desire for hanging out and shopping in our community. We have nothing to draw us in. And not to mention, public parking is not convenient.	2/1/2018 8:12 PM
78	Parade	2/1/2018 7:36 PM
79	Mt Days, wine/pub events, farmer markets	2/1/2018 6:41 PM
80	festivals or community events?	2/1/2018 6:30 PM
81	Mt festival and library events	1/29/2018 1:10 PM

Q18 Would you participate in walking programs?

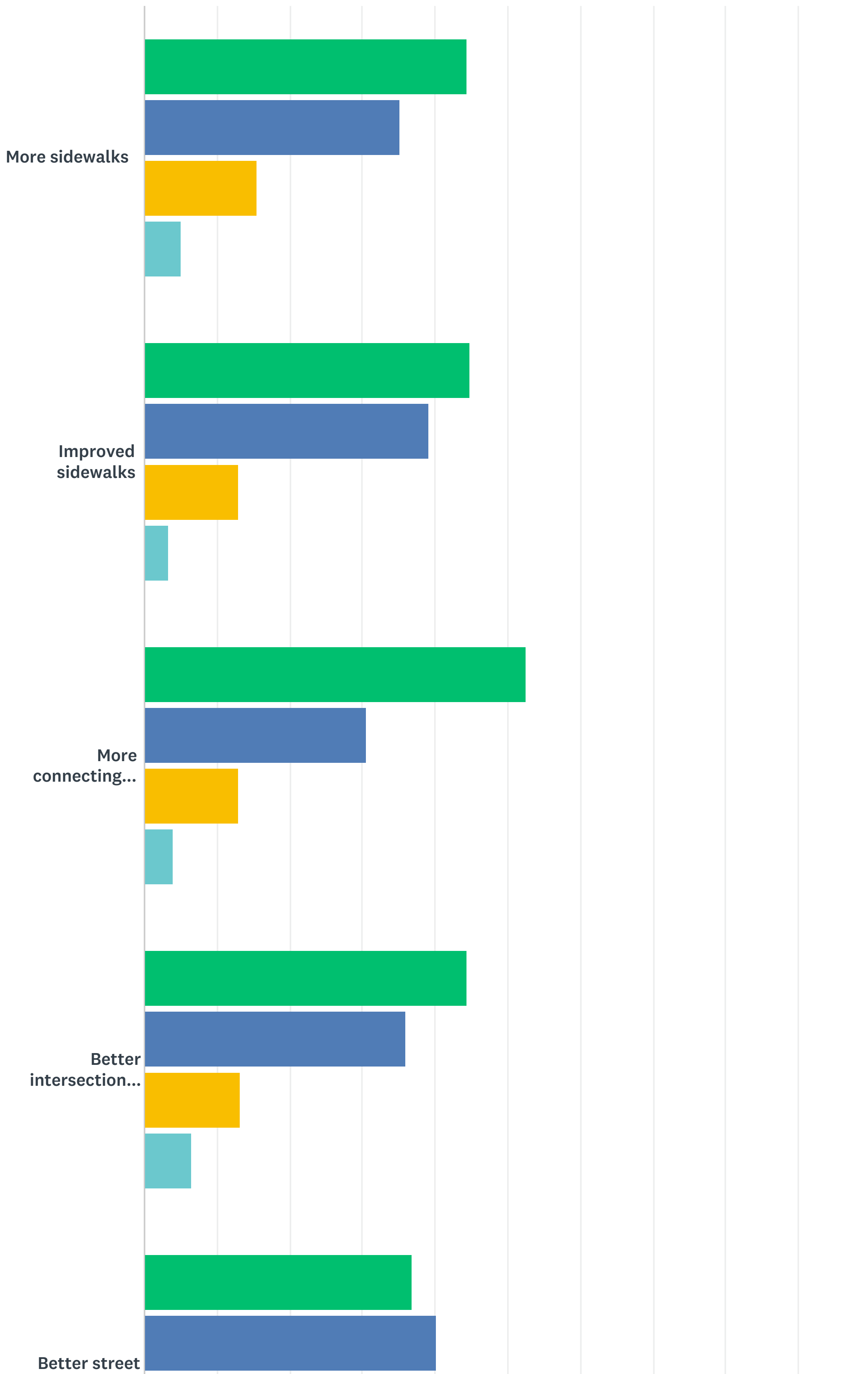
Answered: 128 Skipped: 22

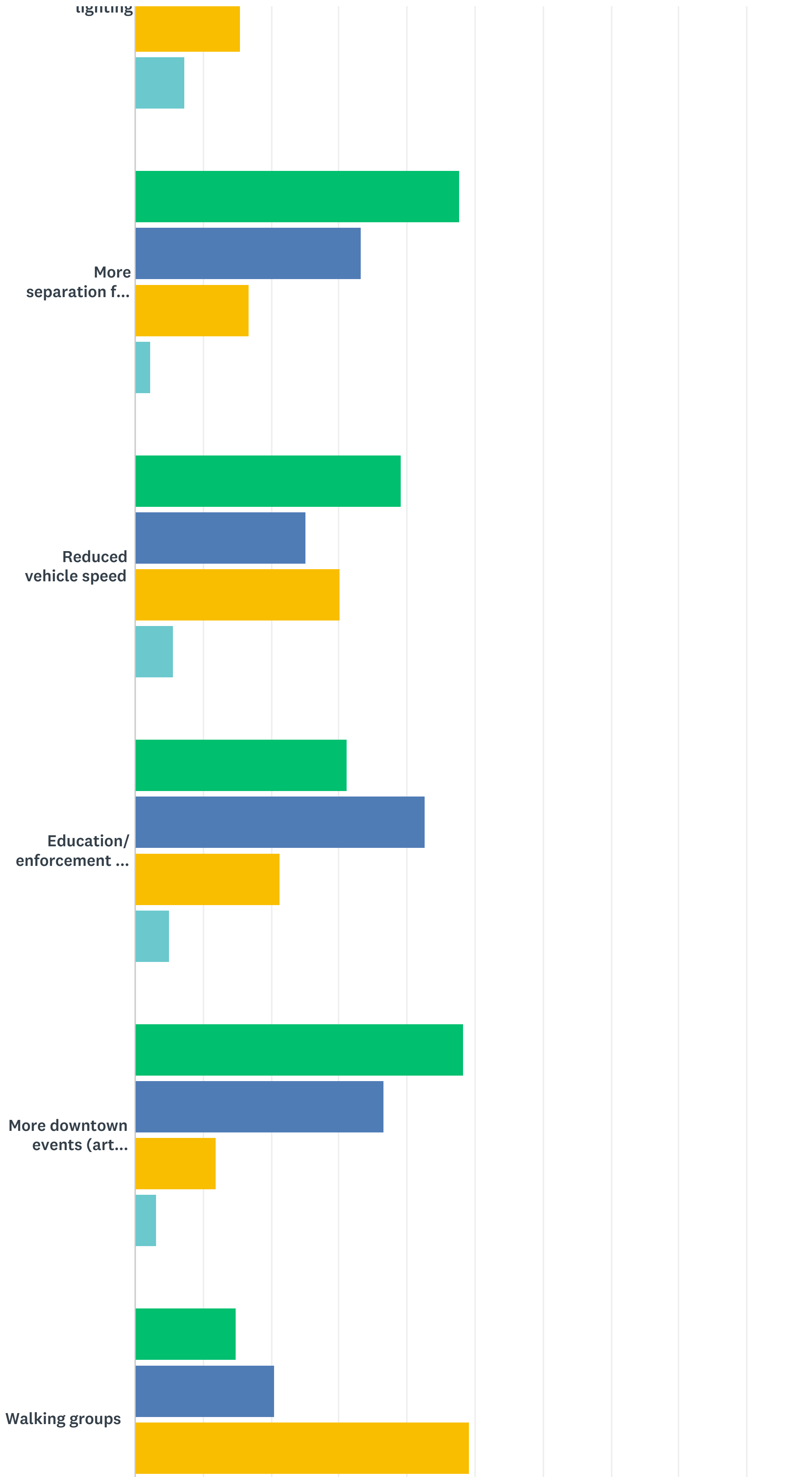


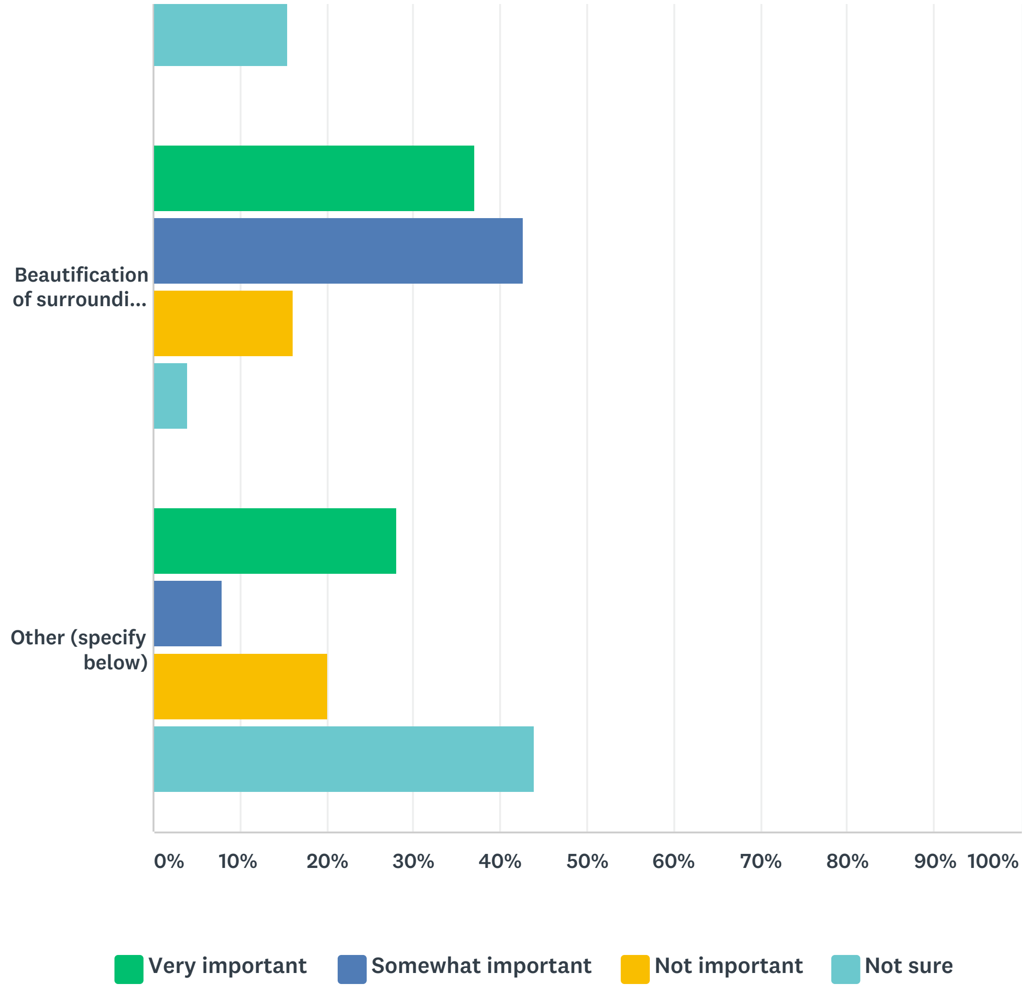
ANSWER CHOICES	RESPONSES	
Yes	16.41%	21
Maybe	41.41%	53
No	42.19%	54
TOTAL		128

Q19 How important do you think the following improvements would be in supporting walking in downtown Sandy?

Answered: 127 Skipped: 23




lighting
More
separation f...
Reduced
vehicle speed
Education/
enforcement ...
More downtown
events (art...
Walking groups



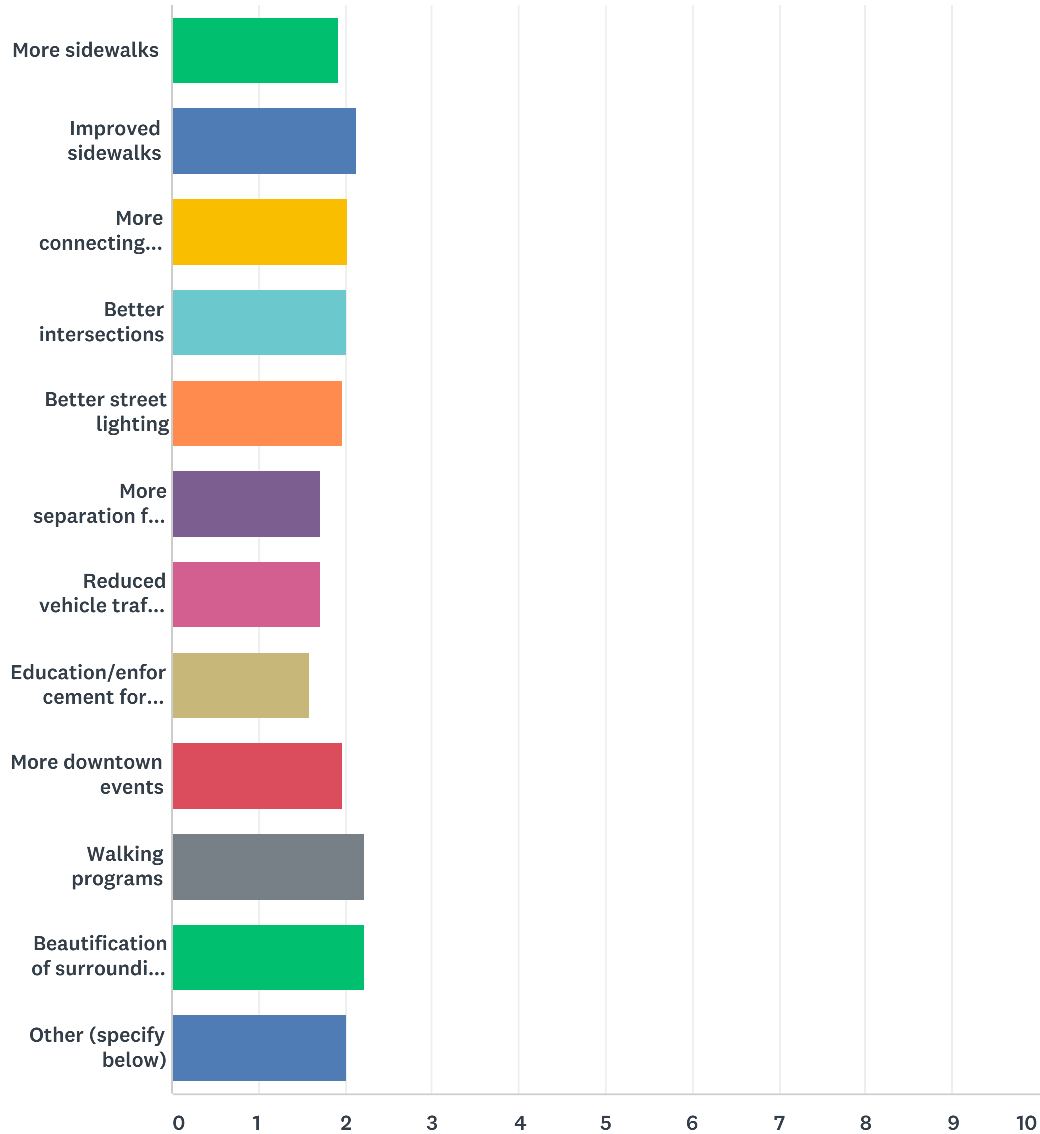
	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT IMPORTANT	NOT SURE	TOTAL
More sidewalks	44.26% 54	35.25% 43	15.57% 19	4.92% 6	122
Improved sidewalks	44.72% 55	39.02% 48	13.01% 16	3.25% 4	123
More connecting sidewalks (along same side of the road) between residential neighborhoods and downtown	52.42% 65	30.65% 38	12.90% 16	4.03% 5	124
Better intersections (pedestrian signals, crosswalks)	44.26% 54	36.07% 44	13.11% 16	6.56% 8	122
Better street lighting	36.89% 45	40.16% 49	15.57% 19	7.38% 9	122
More separation from vehicle traffic	47.62% 60	33.33% 42	16.67% 21	2.38% 3	126
Reduced vehicle speed	39.02% 48	25.20% 31	30.08% 37	5.69% 7	123
Education/ enforcement for motorists, pedestrians, and bicyclists	31.15% 38	42.62% 52	21.31% 26	4.92% 6	122
More downtown events (art fairs, music, etc.)	48.41% 61	36.51% 46	11.90% 15	3.17% 4	126
Walking groups	14.75% 18	20.49% 25	49.18% 60	15.57% 19	122

Beautification of surroundings	37.10% 46	42.74% 53	16.13% 20	4.03% 5	124
Other (specify below)	28.00% 7	8.00% 2	20.00% 5	44.00% 11	25

#	OTHER/ COMMENTS	DATE
1	Leave it alone. We don't need more people, we don't need to have intersections changed, save our money and ASK THE PEOPLE WHO HAVE LIVED HERE FOR TEN YEARS OR MORE AND NOT THE CITY PLANNERS WHO ARE NOT FROM THE AREA..................	2/23/2018 10:03 AM
2	I don't like the working on a few questions..."too inconvenient" to use crosswalks, etc? There are plenty of other reasons for that kind of walking behavior. Safety and walkability starts with education and enforcement for *drivers*, not pedestrians.	2/22/2018 10:44 AM
3	better parking for those who don't live within walking distance of downtown and more places to shop (if there aren't places to go, why would I walk through town?)	2/22/2018 10:15 AM
4	Close some streets. Provide visible crossing lights for pedestrians like lights on the streets. Make safety number 1 priority because drivers go way too fast through downtown Sandy, esp during peak times.	2/16/2018 7:26 AM
5	Only intersection that could use work (other than Alt by the library, but you know about that already) is the one not in downtown, but on University and 26 -- really poor lighting, wish ODOT would put one of those flashing pedestrian light things there - they said not enough people have died to warrant putting one of those in... and they said it was up to the city to put better lighting there... even though it is ODOT ROW...	2/8/2018 10:00 PM
6	Continued prevention of transient/criminal activity.	2/8/2018 10:34 AM
7	Pet friendly events	2/8/2018 5:19 AM
8	25 mph speed limit should be ok if it was enforced and/or if the street was actually designed for that speed, and there was a vegetation buffer between traffic lanes and sidewalk, more bulb-outs, striped crosswalks, etc.	2/7/2018 10:18 AM
9	Traffic calming is your priority. The speed of traffic and the noise is so unpleasant. Whoever is making these plans and reading this survey I dare you to walk around Sandy, especially on a weekend. Be careful though.	2/7/2018 5:59 AM
10	An electric radar, posting current speed and speed limit. Not many people see the 25mph signs coming into town. Seems to me it would be very effective and cheap to put into place	2/6/2018 5:06 PM
11	Bypass the town, make the highway go around the town then residents will be able to walk without fear, and enjoy the town they live in, instead of just pass through.	2/6/2018 4:54 PM
12	The store owners need to be taught to clean up the outside of their stores (boom swept, wash window sills, make the stores attractive and eye catching.	2/5/2018 12:46 PM
13	Sandy downtown is not a walking town and not what most residents in the area come to downtown Sandy for.	2/4/2018 9:20 AM
14	People and heavy traffic just don't mix. Quit trying to mix pedestrian traffic with Hwy 26. It just won't work. Move pedestrian related activities north of south of Hwy 26	2/3/2018 11:48 AM
15	I honestly think that if we had more pedestrian signals cars would stop and it would be fine. the ones with the flashing light when someone wants to cross, I see them on Division st in Gresham. Then the pedestrian needs to wait for cars to stop! not just hit the light a walk!!	2/2/2018 11:55 AM
16	Sandy needs to increase the size of the Police Force so that ENFORCING Speeders, Red Light Runners and also DUI Check points. Due to Traffic and Special Events over the years to be an increase of Police presence	2/2/2018 8:33 AM
17	crosswalks with in-ground flashing lights; huge fines for ignoring ppl in crosswalks;	2/2/2018 8:20 AM
18	Education wouldn't work, it's mostly the out of towners zipping through town. Enforcement might work.	2/1/2018 9:28 PM

Q20 Choose your top 3 priorities for walkability improvements.

Answered: 124 Skipped: 26



	1ST PRIORITY	2ND PRIORITY	3RD PRIORITY	TOTAL	WEIGHTED AVERAGE
More sidewalks	34.62% 9	38.46% 10	26.92% 7	26	1.92
Improved sidewalks	27.91% 12	30.23% 13	41.86% 18	43	2.14
More connecting sidewalks (along same side of the road) between residential neighborhoods and downtown	34.09% 15	29.55% 13	36.36% 16	44	2.02
Better intersections	25.00% 6	50.00% 12	25.00% 6	24	2.00
Better street lighting	26.67% 8	50.00% 15	23.33% 7	30	1.97

More separation from vehicle traffic	50.00% 19	28.95% 11	21.05% 8	38	1.71
Reduced vehicle traffic	44.00% 11	40.00% 10	16.00% 4	25	1.72
Education/enforcement for motorists, pedestrians, & bicyclists	59.09% 13	22.73% 5	18.18% 4	22	1.59
More downtown events	39.13% 18	26.09% 12	34.78% 16	46	1.96
Walking programs	0.00% 0	77.78% 7	22.22% 2	9	2.22
Beautification of surroundings	26.32% 10	26.32% 10	47.37% 18	38	2.21
Other (specify below)	50.00% 3	0.00% 0	50.00% 3	6	2.00

#	OTHER/ COMMENTS	DATE
1	More places to draw people into shopping and walking downtown	2/22/2018 10:15 AM
2	My dream is to either funnel traffic through an underground tunnel from the east side of town to the west end, or to build several tunnels for pedestrians to get from north to south side of Sandy, the bisected city.	2/10/2018 6:25 PM
3	Need the ease and places to walk then can add the walking programs.	2/8/2018 12:51 PM
4	3- pet friendly events	2/8/2018 5:19 AM
5	The lack of sidewalks on 211 is a major issue, but, aside from that one road, I would focus my improvement priorities on better intersections (striping, bulb-outs, flashy pedestrian crossing lights, etc.) and more separation from vehicle traffic (wider sidewalks, landscaping buffer)	2/7/2018 10:18 AM
6	speed of traffic needs to be reduced... enforcement is key	2/7/2018 3:31 AM
7	More money for our police force and not wasted on any of this	2/7/2018 1:14 AM
8	Walkabality is not one of my priorites.	2/4/2018 9:20 AM
9	Pedestrian signals. This will help cars see that someone wants to walk when the pedestrian is hidden behind a parked car we have to stop fast!	2/2/2018 11:55 AM
10	Removal of rusty mailboxes that clearly aren’t being used.	2/1/2018 9:49 PM
11	Good weather, lol.	2/1/2018 6:30 PM

Q21 Do you have any other comments you would like to share related to downtown walkability?

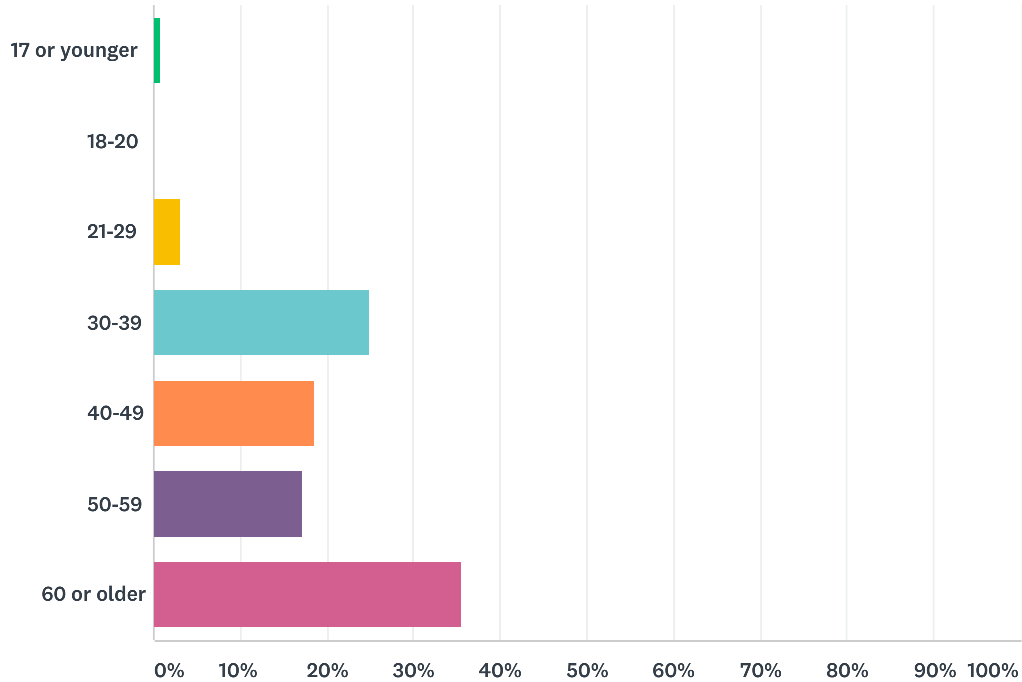
Answered: 32 Skipped: 118

#	RESPONSES	DATE
1	bicycles should be licensed like cars	3/27/2018 11:42 AM
2	need more parking	3/27/2018 11:31 AM
3	Most things are accessible. New businesses attract more people.	3/27/2018 11:20 AM
4	we enjoy the walking it makes for quality family time, talking etc.	2/27/2018 2:09 PM
5	I don't like crossing both streets to get from my neighborhood to Meinig for summer music,.	2/22/2018 12:45 PM
6	I think downtown is perfectly fine for walking, it's just that there isn't a draw to do so.	2/22/2018 10:15 AM
7	Big trucks using air brakes should be prohibited from Shorty's Corner on. The air brakes echo against the hills north of the highway. Quite unpleasant at all hours.	2/21/2018 12:23 PM
8	Nothing comes to mind	2/19/2018 10:15 AM
9	It's a great town to walk in, but especially at night in winter it feels like a dreary deserted place	2/19/2018 5:35 AM
10	Need a sidewalk down 211 from Downtown to Arletha Ct. Reduced speed on 211 in this area to 35 or possibly less. What happened to 26B Plan?	2/14/2018 1:00 PM
11	Sandy does not offer the topography or layout to promote increased walkability. Tighter road, two way traffic rather than two lanes, more establishments that would invite someone to make more stops than just the place they are going to.	2/12/2018 3:39 PM
12	Connectivity is high priority -- having pathways, trails, alleyways where pedestrians and maybe bicycles can commute across	2/10/2018 6:25 PM
13	Move the hwy traffic out of downtown. If not that then find ways to calm traffic and reduce noise (noise barriers, alternative crossing designs, more inside places to talk/Walk)	2/8/2018 4:57 PM
14	No	2/8/2018 12:51 PM
15	We would love to see the walkability of downtown Sandy improved. We moved here just over a year ago and one of our most talked about goals is to take advantage of being able to walk and enjoy the downtown area.	2/8/2018 10:34 AM
16	The residential sidewalks need ATTENTION as well. Awful!	2/8/2018 5:19 AM
17	I think putting in attractions on our side of the highway would be nice, generally when I get past Cedar Ridge there's nothing really to go to unless I cross. So I walk the neighborhoods.	2/7/2018 7:14 PM
18	Fix the signal problem by the library. Too confusing for some drivers that dont know the law about controlled crosswalks. Too many cars stopping and letting people cross aginst the lights	2/7/2018 12:52 PM
19	Some people dont want to walk around that much or dont have time, there needs to be more parking available downtown besides the street parking. No one likes parking on the street where ypur car can be hit or scraped.	2/7/2018 11:58 AM
20	I heard that pervious paving can help reduce traffic noise. Might be something to look into.	2/7/2018 10:18 AM
21	Pedestrians should be just as respectful of the rules of people/cars as drivers. There are a tremendous amt of ambivalent young people that could cause a problem.	2/7/2018 9:07 AM
22	More people would walk if the parking wasn't such a mess. We have been avoiding Sandy because it is impossible to park especially when those busses are running. Offering the bus up the mountain and to Portland is great but no one planned a "park and ride" place so where do you think all those cars are???Crowding out locals that would have been shopping and walking in Sandy. I sure we are not the only ones. Sandy has become so crowded that it is unpleasant for locals who would be the 'walkers' you are trying to attract. I used to shop in downtown Sandy. Not now.Look at the big picture.	2/7/2018 5:59 AM

23	See above	2/7/2018 1:14 AM
24	It is ridiculous to have a major highway running thru this town	2/6/2018 9:06 PM
25	More efforts need to be spent on reducing speed downtown and enforcing it. I have to cross Pioneer to get from our parking lot to work and numerous times a week the crosswalks are ignored by drivers and the red lights are constantly being run.	2/6/2018 8:03 PM
26	People do not follow the speed limit coming downtown, and I have yet to see any improvements on this	2/6/2018 5:06 PM
27	Ensure drivers know to actually stop for pedestrians. Sandy police, CCSO, and City of Sandy vehicles have all blown past me while waiting at marked crosswalks, with a stroller nonetheless.	2/6/2018 4:30 PM
28	Build more places that folks can go and enjoy an outdoor experience - the vacant area on Pioneer & Junker - that old decaying building in back of the Red Boot - should be torn down (unsafe). And build something there that has potential for new businesses to go in! It's in a perfect walkable part. Obviousely the parking lot behind AEC and the library and shopping center in the center of town are the keys to the most opportunities... but don't let a gas station or some non-small store building go in there... there were some plans for living spaces with a business storefront... that'd be great. Flower shop is in poor condition and looks bad too. It could be so much more. There's a cute project in Happy Valley on Sunnyside - and 132nd... a dress shop, a pub, and hair & insurance - and a little garden area with seating areas for folks that want to enjoy grass and grab a table. I'd love to see something like that there in that location! If you are at the library... or are a business in town in AEC's building - where do you go to eat? Subway, Pizza, Ritas. Ant Farm is now the main restaurant of choice in Sandy. ?? Look at downtown Gresham's model. It's a great mix of restaurants and stores. I love Sandy and would love to see it grow positive.	2/5/2018 12:46 PM
29	None	2/4/2018 5:09 PM
30	The intersection of HWY 26 and Bluff where Senior/ Community Center is ndds readjusting; it is just too crazy	2/2/2018 8:20 AM
31	Better lighting would be amazing. Not to mention better keeping up with the brush over growing into the sidewalk.	2/1/2018 9:49 PM
32	The crosswalk/light at Shelly/library is a mess. Because of how it's offset, pedestrians wait for their light, but so often motorists drive through their green light, then stop at the offset crosswalk and wave pedestrians across, which is so dangerous. I've seen the school kids standing there so confused because their light says don't walk, but cars have stopped and are impatiently waving them across. I'm not sure the solution, but it's a strange place for a stoplight anyway.	2/1/2018 5:47 PM

Q22 What is your age?

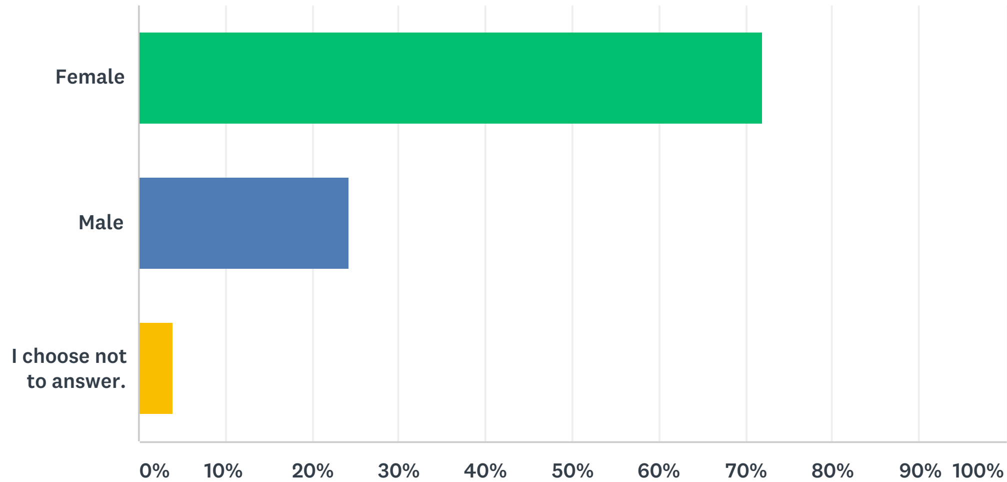
Answered: 129 Skipped: 21



ANSWER CHOICES	RESPONSES	
17 or younger	0.78%	1
18-20	0.00%	0
21-29	3.10%	4
30-39	24.81%	32
40-49	18.60%	24
50-59	17.05%	22
60 or older	35.66%	46
TOTAL		129

Q23 What is your gender?

Answered: 128 Skipped: 22



ANSWER CHOICES	RESPONSES	
Female	71.88%	92
Male	24.22%	31
I choose not to answer.	3.91%	5
TOTAL		128

Q24 Please describe your race/ethnicity.

Answered: 91 Skipped: 59

#	RESPONSES	DATE
1	white	3/27/2018 11:33 AM
2	white	3/27/2018 11:31 AM
3	white	3/27/2018 11:24 AM
4	white	3/27/2018 11:20 AM
5	White	3/27/2018 11:20 AM
6	Caucasian	3/27/2018 11:15 AM
7	white	3/19/2018 1:23 PM
8	Caucasian	3/13/2018 10:32 AM
9	Caucasion	3/3/2018 3:48 PM
10	white	2/28/2018 5:36 PM
11	White	2/27/2018 2:25 PM
12	White	2/27/2018 10:57 AM
13	white	2/23/2018 11:34 AM
14	white	2/23/2018 11:29 AM
15	white	2/23/2018 11:23 AM
16	White	2/23/2018 11:21 AM
17	Caucasian	2/23/2018 10:13 AM
18	NATIVE AMERICAN INDIAN	2/23/2018 10:03 AM
19	white	2/22/2018 12:45 PM
20	White	2/22/2018 11:17 AM
21	Bright White	2/22/2018 10:40 AM
22	white	2/22/2018 10:15 AM
23	Human	2/21/2018 12:23 PM
24	White	2/20/2018 4:35 PM
25	white	2/19/2018 10:15 AM
26	American .... just American	2/19/2018 5:35 AM
27	White	2/16/2018 7:26 AM
28	N/A	2/14/2018 1:00 PM
29	white	2/12/2018 3:39 PM
30	OTHER	2/11/2018 9:14 PM
31	Caucasian	2/10/2018 11:23 PM
32	white anglosaxon	2/10/2018 6:25 PM
33	Sandy. I mean, white, er, caucasian.	2/8/2018 10:00 PM
34	caucasian	2/8/2018 5:09 PM
35	White	2/8/2018 4:57 PM

36	White	2/8/2018 12:51 PM
37	caucasian	2/8/2018 12:51 PM
38	White	2/8/2018 12:40 PM
39	White	2/8/2018 10:34 AM
40	White	2/8/2018 10:27 AM
41	Caucasian	2/8/2018 10:11 AM
42	Caucasian	2/8/2018 12:38 AM
43	white	2/8/2018 12:37 AM
44	Caucasian	2/8/2018 12:01 AM
45	caucasian	2/7/2018 9:46 PM
46	white	2/7/2018 9:22 PM
47	White	2/7/2018 9:09 PM
48	white	2/7/2018 7:14 PM
49	White	2/7/2018 6:49 PM
50	White	2/7/2018 6:09 PM
51	White	2/7/2018 1:32 PM
52	Na	2/7/2018 12:52 PM
53	No.	2/7/2018 11:58 AM
54	Native American	2/7/2018 10:29 AM
55	white	2/7/2018 10:18 AM
56	Caucasian	2/7/2018 9:07 AM
57	American	2/7/2018 8:38 AM
58	opinionated old white woman	2/7/2018 5:59 AM
59	Doesn’t matter	2/7/2018 1:14 AM
60	White	2/6/2018 9:06 PM
61	human	2/6/2018 8:20 PM
62	caucasion	2/6/2018 7:56 PM
63	White	2/6/2018 6:29 PM
64	White	2/6/2018 5:52 PM
65	Caucasian	2/6/2018 5:44 PM
66	White	2/6/2018 5:42 PM
67	Color blind because its not supposed to matter right?	2/6/2018 5:40 PM
68	White	2/6/2018 5:15 PM
69	white	2/6/2018 5:06 PM
70	White	2/6/2018 4:54 PM
71	White	2/6/2018 4:36 PM
72	Why?	2/6/2018 4:35 PM
73	White	2/6/2018 4:32 PM
74	White	2/6/2018 4:30 PM
75	White	2/5/2018 4:12 PM
76	Caucasian	2/5/2018 12:46 PM

77	AngloAmerican	2/4/2018 5:09 PM
78	human	2/4/2018 4:04 PM
79	Caucasian	2/3/2018 11:08 PM
80	White	2/2/2018 2:29 PM
81	White	2/2/2018 11:55 AM
82	White	2/2/2018 11:39 AM
83	White	2/2/2018 8:33 AM
84	white	2/2/2018 8:20 AM
85	White	2/1/2018 9:49 PM
86	white	2/1/2018 9:28 PM
87	Caucasian	2/1/2018 8:26 PM
88	White	2/1/2018 7:36 PM
89	human	2/1/2018 6:30 PM
90	Caucasian	2/1/2018 5:47 PM
91	white	1/29/2018 1:10 PM

Q25 About how long have you lived in Sandy?

Answered: 122 Skipped: 28

ANSWER CHOICES	RESPONSES	
Years	100.00%	122

#	YEARS	DATE
1	12	3/27/2018 11:38 AM
2	12	3/27/2018 11:33 AM
3	12	3/27/2018 11:31 AM
4	28	3/27/2018 11:26 AM
5	30	3/27/2018 11:24 AM
6	12	3/27/2018 11:20 AM
7	28	3/27/2018 11:20 AM
8	6	3/27/2018 11:15 AM
9	9	3/19/2018 1:23 PM
10	20	3/13/2018 10:32 AM
11	2	3/3/2018 3:48 PM
12	3	2/27/2018 6:06 PM
13	32	2/27/2018 2:25 PM
14	7	2/27/2018 2:09 PM
15	35	2/27/2018 10:57 AM
16	45	2/23/2018 11:34 AM
17	12	2/23/2018 11:32 AM
18	88	2/23/2018 11:29 AM
19	20	2/23/2018 11:23 AM
20	0	2/23/2018 11:21 AM
21	0	2/23/2018 10:13 AM
22	10	2/23/2018 10:03 AM
23	20	2/22/2018 12:45 PM
24	2	2/22/2018 11:17 AM
25	4	2/22/2018 10:44 AM
26	14	2/22/2018 10:40 AM
27	36	2/22/2018 10:15 AM
28	14	2/21/2018 12:23 PM
29	5	2/20/2018 4:35 PM
30	14	2/19/2018 10:15 AM
31	29	2/19/2018 9:36 AM
32	3	2/19/2018 5:35 AM
33	13	2/16/2018 3:24 PM

34	17	2/16/2018 7:26 AM
35	3	2/15/2018 1:00 PM
36	30	2/14/2018 1:00 PM
37	10	2/12/2018 3:39 PM
38	5	2/11/2018 9:14 PM
39	27	2/10/2018 11:23 PM
40	40	2/10/2018 6:25 PM
41	28	2/8/2018 10:00 PM
42	15	2/8/2018 9:38 PM
43	10	2/8/2018 7:11 PM
44	29	2/8/2018 6:46 PM
45	0	2/8/2018 5:09 PM
46	15	2/8/2018 4:57 PM
47	13	2/8/2018 12:51 PM
48	57	2/8/2018 12:51 PM
49	4	2/8/2018 12:40 PM
50	1	2/8/2018 10:34 AM
51	7	2/8/2018 10:27 AM
52	2	2/8/2018 10:11 AM
53	5	2/8/2018 5:19 AM
54	45	2/8/2018 12:38 AM
55	5	2/8/2018 12:37 AM
56	7	2/8/2018 12:01 AM
57	3	2/7/2018 9:46 PM
58	28	2/7/2018 9:22 PM
59	17	2/7/2018 9:09 PM
60	20	2/7/2018 7:14 PM
61	3	2/7/2018 6:49 PM
62	8	2/7/2018 6:09 PM
63	43	2/7/2018 1:32 PM
64	50	2/7/2018 12:52 PM
65	3	2/7/2018 11:58 AM
66	12	2/7/2018 10:29 AM
67	1	2/7/2018 10:18 AM
68	30	2/7/2018 9:42 AM
69	35	2/7/2018 9:07 AM
70	30	2/7/2018 8:59 AM
71	2	2/7/2018 8:38 AM
72	2	2/7/2018 7:54 AM
73	40	2/7/2018 5:59 AM
74	12	2/7/2018 3:31 AM

75	10	2/7/2018 1:14 AM
76	2	2/6/2018 10:37 PM
77	35	2/6/2018 9:06 PM
78	6	2/6/2018 8:20 PM
79	10	2/6/2018 7:56 PM
80	25	2/6/2018 7:56 PM
81	26	2/6/2018 7:50 PM
82	7	2/6/2018 7:43 PM
83	58	2/6/2018 6:29 PM
84	8	2/6/2018 6:03 PM
85	47	2/6/2018 5:52 PM
86	7	2/6/2018 5:44 PM
87	35	2/6/2018 5:42 PM
88	15	2/6/2018 5:41 PM
89	16	2/6/2018 5:40 PM
90	35	2/6/2018 5:15 PM
91	3	2/6/2018 5:06 PM
92	25	2/6/2018 4:54 PM
93	1	2/6/2018 4:36 PM
94	25	2/6/2018 4:35 PM
95	2	2/6/2018 4:32 PM
96	5	2/6/2018 4:30 PM
97	10	2/5/2018 4:12 PM
98	13	2/5/2018 12:46 PM
99	0	2/4/2018 5:09 PM
100	28	2/4/2018 4:04 PM
101	8	2/4/2018 10:24 AM
102	50	2/4/2018 9:38 AM
103	12	2/4/2018 9:20 AM
104	31	2/3/2018 11:08 PM
105	15	2/3/2018 11:48 AM
106	40	2/2/2018 4:45 PM
107	41	2/2/2018 2:29 PM
108	29	2/2/2018 11:55 AM
109	12	2/2/2018 11:39 AM
110	13	2/2/2018 8:33 AM
111	65	2/2/2018 8:20 AM
112	14	2/1/2018 10:26 PM
113	10	2/1/2018 9:49 PM
114	15	2/1/2018 9:28 PM
115	13	2/1/2018 8:26 PM

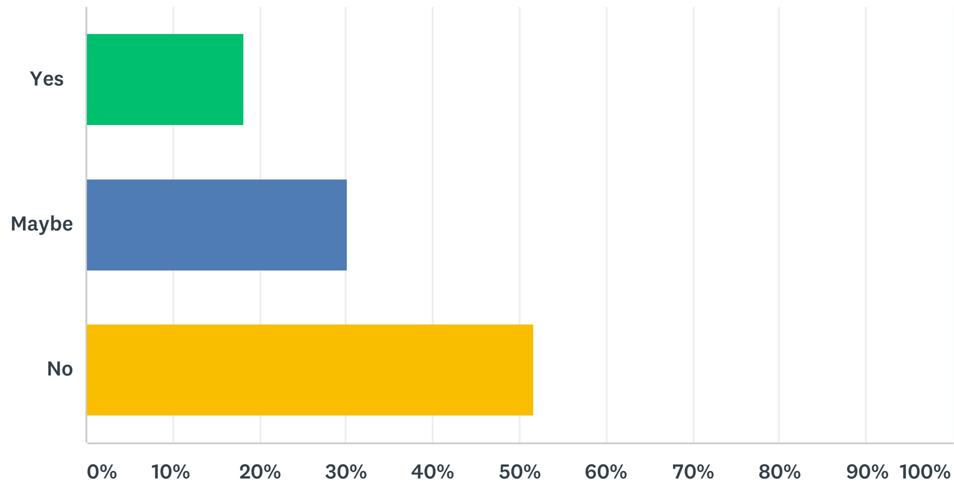
116	13	2/1/2018 8:12 PM
117	17	2/1/2018 7:36 PM
118	30	2/1/2018 6:41 PM
119	14	2/1/2018 6:30 PM
120	50	2/1/2018 6:00 PM
121	9	2/1/2018 5:47 PM
122	30	1/29/2018 1:10 PM

Q26 Please provide your email below if you would like to receive email updates on the Downtown Walkability Assessment.

Answered: 33 Skipped: 117

Q27 If the City of Sandy was to create a bicycle plan would you be interested in participating?

Answered: 126 Skipped: 24

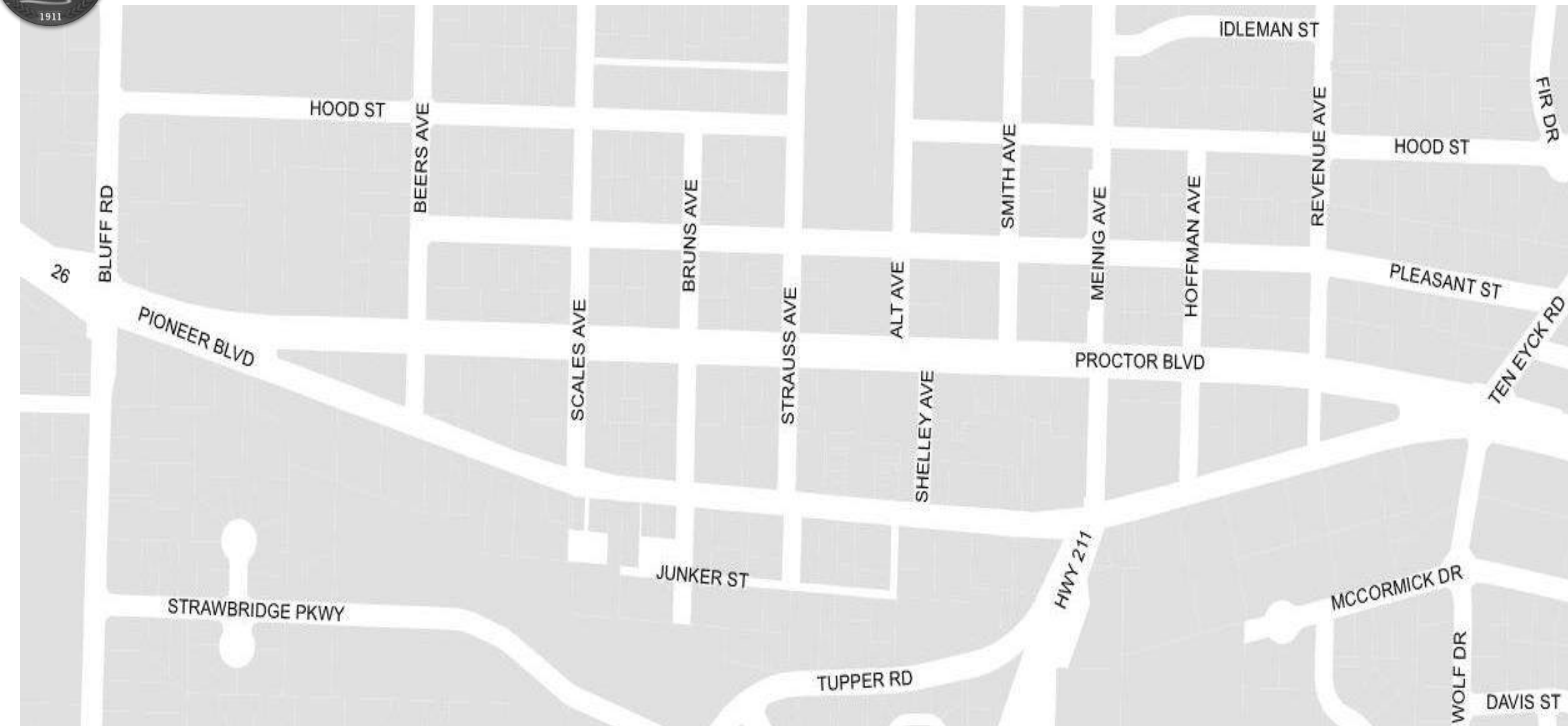


ANSWER CHOICES	RESPONSES	
Yes	18.25%	23
Maybe	30.16%	38
No	51.59%	65
TOTAL		126

#	COMMENTS	DATE
1	Yes please	3/27/2018 11:15 AM
2	There are already so many bikes in the roadway out by Dodge Park who don't get out of the way for cars, buses, tractors or horse trailers. Tell them to ride in their own neighborhoods for safety's sake. There are not even fog lines and we have 5-abreast bicyclists jamming up the roads. Why is it that they can never be considerate of the cars and drivers who actually PAY for the roadways through taxes???? I know I sound bitter, I'm sick of the bicyclists and so are all of my neighbors. Move over or GET OFF THE ROAD!	2/23/2018 10:03 AM
3	Definitely!	2/22/2018 10:44 AM
4	It would be great to have some bicycle paths to connect us to Boring and the Springwater trail!	2/22/2018 10:15 AM
5	Please make bicycle/pedestrian paths SEPARATE from traffic. On the side of the road is not acceptable anymore due to too many drivers texting (they do it anyway!) or having to swerve to avoid an accident or having a distracted moment for whatever reason. There needs to be a buffer zone between the road and the path.	2/16/2018 7:26 AM
6	I am really not into the whole bicycle movement, and would probably advocate more for better ped and auto uses rather than bikes.	2/15/2018 1:00 PM
7	When the main road is a state highway, and, almost everywhere else is hills, it doesn't really invite a bike friendly layout.	2/12/2018 3:39 PM
8	not likely but it would be good for younger people and families	2/8/2018 12:51 PM
9	I do not ride a bike but may in the future.	2/8/2018 10:34 AM
10	Hell no.	2/7/2018 11:58 AM

11	Not on your life! This is even more dangerous that trying to walk or drive in our city. Wondering if the real problem of TRAFFIC is eluding you?	2/7/2018 5:59 AM
12	I would really like to see better cycling connections.	2/6/2018 8:20 PM
13	we don't need a bicycle plan (really)	2/6/2018 5:41 PM
14	Less Portland please!!!!	2/6/2018 5:40 PM
15	I am an avid bicycler yet am involved in a lot of other civic activities and probably would not have a huge amount of time to take part, yet very interested in bicycle access issues. Thanks! :-)	1/29/2018 1:10 PM

DOWNTOWN MAPPING ACTIVITY



Tell us where you walk!

As a part of the City of Sandy's Downtown Walkability Assessment we would like to see where community members frequently walk downtown to help prioritize locations for walkability improvements.

Instructions:

On the map above draw what streets or pathways you typically walk in downtown Sandy.

Comments on Walkability:

____

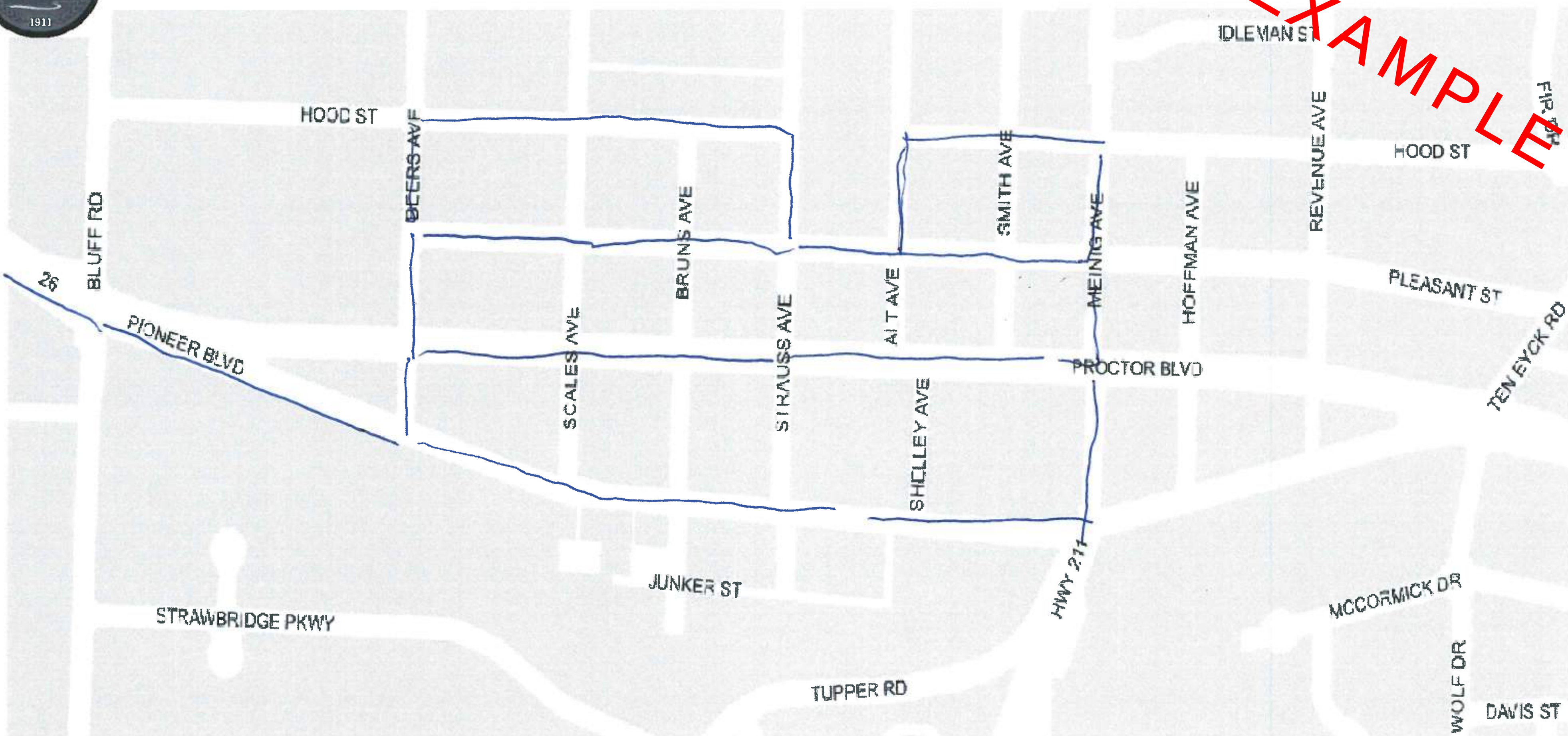
____

____

____

For more information about the Downtown Walkability Assessment visit https://www.ci.sandy.or.us/downtown-planning orcontact Emma Porricolo at eporricolo@ci.sandy.or.us or (503) 783 – 2586.

DOWNTOWN MAPPING ACTIVITY



Tell us where you walk!
As a part of the City of Sandy's Downtown Walkability Assessment we would like to see where community members frequently walk downtown to help prioritize locations for walkability improvements.

Instructions:
On the map above draw what streets or pathways you typically walk in downtown Sandy.

Comments on Walkability:
As a pedestrian - always have to look out for cars paying attention to me! They move fast!

For more information about the Downtown Walkability Assessment visit https://www.ci.sandy.or.us/downtown-planning orcontact Emma Porricolo at eporricolo@ci.sandy.or.us or (503) 783 – 2586.

POP-UP MAPPING ACTIVITY COMMENTS

- Love walking in town. The crosswalk at the library is very dangerous since some cars think they should stop while others don't. If it was closer to the light it would be betters
- I love to walk up for my morning coffee although I don't feel as safe as I used to ever since the bus station is located where it is at.
- Fun fun fun, sidewalks all the ways
- Generally pretty good. I get nervous about crossing the crossroads and driveways
- Good, but highway is a problem, don't have answers. Low income housing is in the wrong place. Need to be near grocery stores, etc. Too many people with families walk along the highway.
- The intersection of library/ Leathers/ CCB is TERRIBLE. Why no alignment? Traffic on Pioneer and Proctor is awful – many drivers SPEED! One time I was nearly hit by a car that the driver obviously wasn't paying attention. Sandy is not walk friendly because of HWY 26 traffic.
- Fun, keeps growing!
- Lots of car exhaust but we like to walk to local spots sometimes it's hard to get across the one-ways
- Bluff Rd lacks sidewalks on both sides. South of high school sidewalks is on the east side, but switches to the west side without a crosswalk. Motorists do not typically know that all intersections are unmarked crosswalks.
- I walk to the library from the HS part of town. Better sidewalks in town would be nice, but I never feel unsafe.
- Traffic lights on Shelley and Proctor are very confusing for pedestrians to cross Proctor
- I usually park in one spot and walk all over town rather than move my car. Hard to cross Proctor and Pioneer expect at light or well marked crosswalk. Not enough sidewalks cleared of snow and ice in winter. Drivers wrongfully stop at crosswalk in front of library even when the signal indicated don't walk.
- Love to see the flowers and peak in the windows of the store…
- I love to walk but City of Sandy is not very walker friendly – too noisy, too much traffic, not enough safe places to cross the road. A path for walkers, anywhere, would be appreciated.
- Better crosswalks – old ones worked better at the library, that one is lame. But keep up ped development
- Solid 10/10 sidewalks are very sidewalk but about 6/5 on people, they almost hit me 2 times a day.
- The area in front of the library is a danger to pedestrian and vehicles alike. With the stopping point so far away from the crosswalk there is confusion if cars should wait there or continue to the crosswalk. Needs reconfiguring.
- Very hard and dangerous to use bad intersection at Alt/Shelley and Proctor. Very hard to get across Pioneer from city parking lots behind Otto's to attend the farmers market.
- The light on Shelley Ave for walkers and the one at the library create a lot of confusion
- Safest town to walk in
- Don't walk down Ten Eyck Rd as it is too dangerous! Need sidewalks to Vista View Apartments!
- Need a crosswalk by Shell Gas station
- Shelley Ave and Proctor Blvd intersection confusing for cars and crossers
- I avoid walking along the highway. I walk from Bluff Road to the library/ AntFarm. But I hate that light by the library. I avoid it and make sure to cross at different intersections.
- Something absolutely must be done about this. I witness a preschool class cross against the light because a truck stopped for them. What if the other lane mowed them down?

- The light in front of the library is so dangerous.
- Nice route. Path on 211 would be nice
- I mostly walk on sidewalks – those behind CCD are cracked and raised – have had major faceplant there :(.
- Crosswalk in front of library – worst, most dangerous crosswalk in Sandy. Ask library staff if want details. Need crosswalk at Scales and Pioneer
- I walk to the library but I DREAD that light in front. It's a terrible idea.
- I walk everywhere I never usually ride in a car or truck. I'm either biking, walking or skating.
- I walk some places of Sandy by myself or with my parents everyday
- Crosswalk at Bruns Ave and Pioneer Blvd. – difficult to get walker or wheelchair through and around utility boxes
- Cars should not stop at crosswalk for library. They should stop at previous crosswalk.
- Crossing Pioneer to City parking is hard. Crosswalk at Farmers Market to parking would be good
- Crossing Pioneer and Proctor is really difficult. Cars don't stop and the signalized intersections are slow to response to the pedestrian push button.
- Would really like to be able to walk on a sidewalk along 211.
- As a pedestrian always have to look out for cars paying attention to me! They move fast!
- Trucks speed through town even though this is supposed to be a "Safety Corridor". Don't like this
    - Note from staff – Downtown roads are not an official safety corridor. The safety corridor stops directly before downtown on the east side.
- Crossing Proctor or Pioneer can be taking your life into your hands.
- Would like to see more connectivity to neighborhoods south of downtown.
- Long wait for crossing at Pioneer Blvd./Meinig Ave intersection and Proctor Blvd./Meinig Ave. intersection.
- I walk a lot but it is extremely loud and unpleasant with traffic noise.
- I actually walk every street. ☺

Appendix B: Sample General Walk Audit Checklist

Taken from Safe Routes to School Let's Go For a Walk: A Toolkit for Planning and Conducting a Walk Audit.

Directions: Please fill out the following checklist to note problems in the walking environment. You may use the checklist either for each block you walk, or for your entire route.

1. Sidewalks:

- ☐ No sidewalks or paths
- ☐ Sidewalks are broken, cracked, or have trip hazards
- ☐ Sidewalks are blocked by overgrown landscaping, poles, signs, plants, vehicles, etc.
- ☐ Sidewalk is not continuous
- ☐ Sidewalk is not wide enough (two people cannot easily walk together side by side)
- ☐ Sidewalk has nothing separating it from the street (grass, trees, parked cars)
- ☐ Other problems: ______________________________________
  ____

Overall, the quality and safety of sidewalks is:

2. Street Crossings and Intersections:

- ☐ The road is too wide to cross easily
- ☐ Traffic signals do not give enough time to cross the street
- ☐ The crossing does not have a pedestrian-activated button
- ☐ There is no crosswalk or it is poorly marked
- ☐ I have to walk too far to find a safe, marked crosswalk
- ☐ Intersection does not have a curb ramp for carts, wheelchairs, strollers, walkers, etc.
- ☐ Traffic signal made us wait too long
- ☐ Parked cars blocked our view of traffic
- ☐ Other problems: ______________________________________
  ____

Overall, the quality and safety of street crossings and intersections is:

3. Driver Behavior:

- ☐ Drivers do not stop at stop signs or stop behind the crosswalk
- ☐ Drivers appear to be speeding
- ☐ Drivers do not yield to people walking
- ☐ Drivers are distracted (on the phone, texting, paying attention to passengers rather than road)
- ☐ Drivers aren't looking out for people walking, make unexpected turns, seem hostile, or pull out of driveways without looking
- ☐ Other problems: ______________________________________
  ____

Overall, the quality and safety of driver behavior is:

4. Safety:

- ☐ Car speeds are too fast
- ☐ There's too much traffic
- ☐ Street lights and/or crosswalks are few or not present
- ☐ There are people on the street who seem threatening
- ☐ Unleashed dogs or other loose intimidating animals are present
- ☐ Other problems: ______________________________________

____

Overall, the feeling of safety in this area is:

5. Comfort:

- ☐ There is not enough shade from canopies, awnings, or trees
- ☐ There are few or no street trees or other landscaping
- ☐ There are vacant lots or rundown buildings
- ☐ The street needs benches and places to rest
- ☐ Other problems: ______________________________________

____

Overall, the comfort and appeal in this area is:

Additional Comments:

____

____

____

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Survey adapted in part from the Microscale Audit of Pedestrian Streetscapes and the AARP Walk Audit Tookit.

Downtown Sandy Walkability Assessment:
Community Walk Audit Checklist

Block # ________________

Directions: Please fill out the following checklist to note problems in the walking environment and note any concerns not listed in the checklist. Fill out one form for each designated block.

1) Sidewalks:

- ☐ No sidewalks or paths
- ☐ Sidewalks are broken, cracked, or have trip hazards
- ☐ Sidewalks are blocked by overgrown landscaping, poles, signs, plants, vehicles, etc.
- ☐ Sidewalk is not continuous
- ☐ Sidewalk is not wide enough (two people cannot easily walk together side by side)
- ☐ Sidewalk has nothing separating it from the street (landscaping, street trees, parked cars)
- ☐ Other concerns:

____

____

Overall, the quality and safety of the sidewalk is:

2) Street Crossings and Intersections:

- ☐ The road is too wide to cross easily
- ☐ Traffic signals do not give enough time to cross the street
- ☐ The crossing does not have a pedestrian-activated button
- ☐ There is no crosswalk or it is poorly marked
- ☐ I have to walk too far to find a safe, marked crosswalk
- ☐ Intersection does not have a curb ramp for wheelchairs, strollers, walkers, etc.
- ☐ Parked cars blocking view of vehicles approaching intersection
- ☐ Other concerns:

____

____

Overall, the quality and safety of street crossings and intersections is:

3) Driver Behavior:

☐ Drivers do not stop at stop signs or behind the crosswalk

☐ Drivers appear to be speeding

☐ Drivers do not yield to pedestrians

☐ Drivers are distracted (on the phone, texting, paying attention to passengers rather than the road)

☐ Drivers aren't looking out for people walking, make unexpected turns, seem hostile, or pull out of driveways without looking

☐ Other concerns:

____

____

Overall, the quality and safety of driver behavior is:

4) Safety:

☐ There are too few street lights or they are not present

☐ Vehicle speeds are too fast

☐ There's too much traffic

☐ There are people on the street who seem threatening

☐ Unleashed dogs or other loose intimidating animals are present

☐ Other concerns:

____

____

Overall, the feeling of safety in this area is:

5) Comfort:

☐ There is not enough shade from canopies, awnings, or trees

☐ There are few or not street trees and other landscaping

☐ There are vacant lots or rundown buildings

☐ More benches and places to rest are needed

☐ Other concerns:

____

____

Overall, the comfort and appeal in this area is:

Additional Comments:

____

____

Appendix B: Community Walk Audit Group Responses

GROUP 1

Downtown Sandy Walkability Assessment:
Community Walk Audit Checklist

Block # 1 – 9 (Pioneer Blvd.)

Directions: Please fill out the following checklist to note problems in the walking environment and note any concerns not listed in the checklist. Fill out one form for each designated block.

1) Sidewalks:

☒ No sidewalks or paths

☒ Sidewalks are broken, cracked, or have trip hazards

☒ Sidewalks are blocked by overgrown landscaping, poles, signs, plants, vehicles, etc.

☐ Sidewalk is not continuous

☒ Sidewalk is not wide enough (two people cannot easily walk together side by side)

☐ Sidewalk has nothing separating it from the street (landscaping, street trees, parked cars)

Other concerns:

See notes in additional comments

Overall, the quality and safety of the sidewalk is:

2) Street Crossings and Intersections:

☐ The road is too wide to cross easily

☐ Traffic signals do not give enough time to cross the street

☒ The crossing does not have a pedestrian-activated button

☒ There is no crosswalk or it is poorly marked

☒ I have to walk too far to find a safe, marked crosswalk

☐ Intersection does not have a curb ramp for wheelchairs, strollers, walkers, etc.

☒ Parked cars blocking view of vehicles approaching intersection

Other concerns:

See notes in additional comments

Overall, the quality and safety of street crossings and intersections is:

3) Driver Behavior:

- ☒ Drivers do not stop at stop signs or behind the crosswalk
- ☒ Drivers appear to be speeding
- ☐ Drivers do not yield to pedestrians
- ☐ Drivers are distracted (on the phone, texting, paying attention to passengers rather than the road)
- ☒ Drivers aren't looking out for people walking, make unexpected turns, seem hostile, or pull out of driveways without looking

Other concerns:

See notes in additional comments

Overall, the quality and safety of driver behavior is:

4) Safety:

- ☐ There are too few street lights or they are not present
- ☒ Vehicle speeds are too fast
- ☒ There's too much traffic
- ☐ There are people on the street who seem threatening
- ☐ Unleashed dogs or other loose intimidating animals are present

Other concerns:

See notes in additional comments

Overall, the feeling of safety in this area is:

5) Comfort:

- ☒ There is not enough shade from canopies, awnings, or trees
- ☒ There are few or not street trees and other landscaping
- ☒ There are vacant lots or rundown buildings
- ☒ More benches and places to rest are needed

Other concerns:

See notes in additional comments

Overall, the comfort and appeal in this area is:

Additional Comments: See next page

Additional Comments from Group 1:

1) Sidewalks
   - No protection from noise and exhaust
   - Foliage needs trimming
   - Too loud for conversation
   - Sidewalks in front of Two Brothers is in bad shape
   - 5 utility covers in 1 block – uneven sidewalks
   - Cracks in sidewalk by Arco
   - Sidewalks and curb changes = tripping hazards
   - Need signal for walking at Arco
   - Restricted room on sidewalks across from Shell Gas Station → fire hydrant, mailboxes,
   - No crosswalk by Sandlandia (food carts), would be a good place to have a one
   - Sidewalk not wide enough by Mtn Moka, Double Dragon, Shelley intersection West
   - Trip hazards – Strauss intersection and by Sandy Action Center
   - No sidewalks west past Shell Gas Station

2) Street Crossings and Intersections
   - Parked cars blocking view of vehicles when exiting Taco Time and DQ
   - Strauss intersections not wheelchair accessible
   - Meinig St potholes
   - 26 to 211 horrible crossings
   - Lots of food cart traffic → congestion
   - No button at 211/ Pioneer crosswalk from west side of pedestrian island

3) Driver Behavior
   - Some drivers have tinted windows, its hard to see/make eye contact with drivers
   - Group was wearing vests – makes them most visible pedestrians, therefore difficult to determine typical driver behavior

4) Safety
   - Graffiti
   - Low hanging branches

5) Comfort
   - Nice landscaping on island at Hwy 26/ Ten Eyck Rd
   - No Bench at bus stop

Downtown Sandy Walkability Assessment: **GROUP 2**

Community Walk Audit Checklist Block # 10 – 19 (Proctor Blvd.)

Directions: Please fill out the following checklist to note problems in the walking environment and note any concerns not listed in the checklist. Fill out one form for each designated block.

1) Sidewalks:

☐ No sidewalks or paths

☒ Sidewalks are broken, cracked, or have trip hazards

☒ Sidewalks are blocked by overgrown landscaping, poles, signs, plants, vehicles, etc.

☒ Sidewalk is not continuous

☐ Sidewalk is not wide enough (two people cannot easily walk together side by side)

☐ Sidewalk has nothing separating it from the street (landscaping, street trees, parked cars)

Other concerns:

See notes in additional comments

Overall, the quality and safety of the sidewalk is:

2) Street Crossings and Intersections:

☐ The road is too wide to cross easily

☐ Traffic signals do not give enough time to cross the street

☒ The crossing does not have a pedestrian-activated button

☒ There is no crosswalk or it is poorly marked

☐ I have to walk too far to find a safe, marked crosswalk

☐ Intersection does not have a curb ramp for wheelchairs, strollers, walkers, etc.

☐ Parked cars blocking view of vehicles approaching intersection

Other concerns:

See notes in additional comments

Overall, the quality and safety of street crossings and intersections is:

3) Driver Behavior:

☐ Drivers do not stop at stop signs or behind the crosswalk

☒ Drivers appear to be speeding

☐ Drivers do not yield to pedestrians

☒ Drivers are distracted (**on the phone**, texting, paying attention to passengers rather than the road)

☒ Drivers aren't looking out for people walking, make unexpected turns, seem hostile, or pull out of driveways without looking

Overall, the quality and safety of driver behavior is:

Other concerns:

__See notes in additional comments____

4) Safety:

☐ There are too few street lights or they are not present

☒ Vehicle speeds are too fast

☐ There's too much traffic

☐ There are people on the street who seem threatening

☐ Unleashed dogs or other loose intimidating animals are present

Overall, the feeling of safety in this area is:

Other concerns:

__See notes in additional comments____

5) Comfort:

☐ There is not enough shade from canopies, awnings, or trees

☐ There are few or not street trees and other landscaping

☐ There are vacant lots or rundown buildings

☐ More benches and places to rest are needed

Overall, the comfort and appeal in this area is:

Other concerns:

__See notes in additional comments____

Additional Comments: __See next page____

Additional Comments from Group 2:

Block #10

- Sidewalks wide enough on N sides
- Missing sidewalk in front of Funtime RV
- Flashing crosswalk signage would be helpful on Beers Ave intersection
- Light seems to be timed well on Bluff

Block #11

- Would be good to have painted crosswalk
- No street parking by DQ or Big Apple

Block #12

- Does utility box need to be on sidewalks
- Needs pruning/ weeding

Block #13

- Vehicle obstruction by cleaners
- Parking signs are inconsistent
- Have to walk around parked cars near Mt. Hood Cleaners

Block #14

- Bank takes good care of block
- People are conditioned to only stop at lights, if you don't make eye contact they won't stop
- Should have crossing flags @ Alt/Proctor and DQ intersection
- Saw someone speeding out of library parking lot

Block #15

- Trip hazard in Shelley/Proctor intersection
- Nice landscaping by the library

Block #16

- Brick issue by Meinig on south side of Proctor

Block #17

- Proximity to light makes it better to cross
- No curb cuts to cross N/S but encourages people to cross at light at Meinig
- No buffer from traffic
- Driveway cuts are poor
- Traffic is a little faster

Block #18

- North side is better
- Monster pole in sidewalk
- Hard to get to Police Station from Library on south side (sidewalk disappears)
- A frame sign and flower pots → hard to navigate

Downtown Sandy Walkability Assessment: **GROUP 3**

Community Walk Audit Checklist Block # _20 – 29 (Pleasant St.)_

Directions: Please fill out the following checklist to note problems in the walking environment and note any concerns not listed in the checklist. Fill out one form for each designated block.

1) Sidewalks:

☒ No sidewalks or paths

☒ Sidewalks are broken, cracked, or have trip hazards

☒ Sidewalks are blocked by overgrown landscaping, poles, signs, plants, vehicles, etc.

☒ Sidewalk is not continuous

☒ Sidewalk is not wide enough (two people cannot easily walk together side by side)

☒ Sidewalk has nothing separating it from the street (landscaping, street trees, parked cars)

Other concerns:

__See notes in additional comments_______________________________________

Overall, the quality and safety of the sidewalk is:

2) Street Crossings and Intersections:

☐ The road is too wide to cross easily

☐ Traffic signals do not give enough time to cross the street

☒ The crossing does not have a pedestrian-activated button

☒ There is no crosswalk or it is poorly marked

☐ I have to walk too far to find a safe, marked crosswalk

☒ Intersection does not have a curb ramp for wheelchairs, strollers, walkers, etc.

☐ Parked cars blocking view of vehicles approaching intersection

Other concerns:

_See notes in additional comments_______________________________________

Overall, the quality and safety of street crossings and intersections is:

3) Driver Behavior:

☒ Drivers do not stop at stop signs or behind the crosswalk

☒ Drivers appear to be speeding

☒ Drivers do not yield to pedestrians

☐ Drivers are distracted (on the phone, texting, paying attention to passengers rather than the road)

☐ Drivers aren't looking out for people walking, make unexpected turns, seem hostile, or pull out of driveways without looking

Other concerns:

__See notes in additional comments______________________________________

Overall, the quality and safety of driver behavior is:

4) Safety:

☒ There are too few street lights or they are not present

☒ Vehicle speeds are too fast

☐ There's too much traffic

☐ There are people on the street who seem threatening

☐ Unleashed dogs or other loose intimidating animals are present

Other concerns:

__See notes in additional comments______________________________________

Overall, the feeling of safety in this area is:

5) Comfort:

☒ There is not enough shade from canopies, awnings, or trees

☒ There are few or not street trees and other landscaping

☒ There are vacant lots or rundown buildings

☐ More benches and places to rest are needed

Other concerns:

__See notes in additional comments______________________________________

Overall, the comfort and appeal in this area is:

Additional Comments: __________See next page____

Additional Comments from Group 3:

Block #20

- Parked cars across sidewalks
- Crumbling sidewalk
- No weld covers, slippery when wet

Block #21

- More traffic at intersection
- No sidewalk.. gravel
- Were friendly drivers, not fast

Block #22

- Curb crumble
- No sidewalks for ½ of north side

Block #23

- Unsafe with jagged uneven surfaces
- Water peter protrudes
- Crumbling
- La Bamba access bad for accessibility

Block #24

- Driveways deep so cars pull out real far
- Load vehicles and more traffic
- No sign at proctor

Block #25

- Poor ADA Conditions
- Driveways making sidewalk uneven
- Visibility notes @ intersection

Block #26

- Pot hole in crossing

Block # 27

- storm grate odd
- Tripping hazard (small old pole, not shaven down)
- Varying curb heights
- 1” curb

Block #28

- Narrow, vacant driveways are not safe for disability can and chair tend to get off track
- Foliage overgrown narrowing sidewalk area
- Mailbox base same as top for canes
- No lighting
- Sidewalk section missing

Block #29

- No sidewalks
- Sidewalk narrow – 3’
- Slanted
- Pole obstruction
- Electric box in walkway
- ADA put out into road rather than into the intersection rather than in direction not on diagonal, slope should go straight across
- St sign 1’ within curb
- Crosswalk needed

Downtown Sandy Walkability Assessment: **GROUP 4**

Community Walk Audit Checklist Block # 30 – 38 (side streets)

Directions: Please fill out the following checklist to note problems in the walking environment and note any concerns not listed in the checklist. Fill out one form for each designated block.

1) Sidewalks:

☒ No sidewalks or paths

☒ Sidewalks are broken, cracked, or have trip hazards

☒ Sidewalks are blocked by overgrown landscaping, poles, signs, plants, vehicles, etc.

☒ Sidewalk is not continuous

☒ Sidewalk is not wide enough (two people cannot easily walk together side by side)

☒ Sidewalk has nothing separating it from the street (landscaping, street trees, parked cars)

Other concerns:

See notes in additional comments

Overall, the quality and safety of the sidewalk is:

2) Street Crossings and Intersections:

☐ The road is too wide to cross easily

☐ Traffic signals do not give enough time to cross the street

☐ The crossing does not have a pedestrian-activated button

☒ There is no crosswalk or it is poorly marked

☒ I have to walk too far to find a safe, marked crosswalk

☐ Intersection does not have a curb ramp for wheelchairs, strollers, walkers, etc.

☒ Parked cars blocking view of vehicles approaching intersection

Other concerns:

See notes in additional comments

Overall, the quality and safety of street crossings and intersections is:

3) Driver Behavior:

☒ Drivers do not stop at stop signs or behind the crosswalk

☒ Drivers appear to be speeding

☒ Drivers do not yield to pedestrians

☐ Drivers are distracted (on the phone, texting, paying attention to passengers rather than the road)

☒ Drivers aren't looking out for people walking, make unexpected turns, seem hostile, or pull out of driveways without looking

Other concerns:

See notes in additional comments

Overall, the quality and safety of driver behavior is:

4) Safety:

☒ There are too few street lights or they are not present

☒ Vehicle speeds are too fast

☒ There's too much traffic

☐ There are people on the street who seem threatening

☐ Unleashed dogs or other loose intimidating animals are present

Other concerns:

See notes in additional comments

Overall, the feeling of safety in this area is:

5) Comfort:

☒ There is not enough shade from canopies, awnings, or trees

☒ There are few or not street trees and other landscaping

☒ There are vacant lots or rundown buildings

☐ More benches and places to rest are needed

Other concerns:

See notes in additional comments

Overall, the comfort and appeal in this area is:

Additional Comments: See next page

Additional Comments from Group 4:

1) Sidewalks:
   - Sidewalks not wide enough
   - Missing sidewalks
   - No crossing at Smith, no curb cuts
   - At intersection of Strauss/ Pioneer ADA accessible path requires to go into street to get around obstacles and uneven sidewalks
   - Curb ramp drop off is too steep
   - No parking, curb paint needs to be redone
   - Crosswalks need to be repainted
   - Street trees are a good barrier from traffic
   - Crosswalks would have poor visibility at night
   - Meinig/ 211 need to have push to activate walk signal between pedestrian island and sidewalk.

2) Street Crossings and Intersections:
   - Street trees and cars blocking visibility for cars pulling out from side streets
   - Need more crosswalk signage
   - Not all crosswalks are high visibility crosswalks
   - Some steep crosswalk entrances
   - Cars pull out past crosswalks for better visibility before turning
   - Mt Hood Cleaners trucks often parked on Proctor → create visibility issues
   - Road cracked and uneven on Smith Ave

3) Driver Behavior
   - Cars are speeding
   - Better visibility for pedestrians and other vehicles depending on where cars are allowed to park

All groups discussion summary:

- Utility covers needed
- Conditions of roads to sidewalk and entrances
- Tickets to slow down
- Lack of marked crosswalks between Pioneer and Proctor
- Strauss & Pioneer utility boxes
- Lights on Shelley and Alt
- Quicker pedestrian response times
- Crosswalk verbalization add “Avenue” to Alt Ave crosswalk so it doesn’t sound like ‘halt’
- Lighting crosswalks button to show gesture (if no audible indication)
- Short light at Meinig could use better timing
- Short light to cross at Hwy 26 and Ten Eyck and needs audible signals
- Sidewalk in front of Two Brothers in very bad condition
- Repaint curbs to indicate no parking -- @ library and Joe’s Donuts
- NW corner of Strauss and Proctor intersection is not ADA accessible, too many obstructions and impediments to have enough space to meet ADA standards

Surveyor #	Sidewalks			Intersections & Street Crossings			Comfort & Appeal			Overall			Top Improvements		
	Concern 1	Concern 2	Concern 3	Concern 1	Concern 2	Concern 3	Concern 1	Concern 2	Concern 3	Concern 1	Concern 2	Concern 3	Improvement 1	Improvement 2	Improvement 3
1	sidewalks too narrow, obstructions too often (light pole, fire dyrants, lock room)	block I - no sidewalk at all	211 turn missing walk button 0 almost got hit by cars	intersections cracked/uneven - trip hazards	missing cross button		noise!	few benches (facing bad directions if present (view traffic not waterfall for example)	inconsistent street trees/ lack canopy	noise and traffic - deterance	accessability - too narrow too often	congestions of cars - cannot enjoy walk	add trees and flowers/ trim what is present to try to detract from noise	improve and repair cracks in sidewalks	more benches and trash bings - add to Pleasant Street, better appeal
2	no sidewalk in front of Hathaway			library crosswalk	speeding	crossing when one lane stops but you can't see the other lane	speeding	drivers on phones		library crosswalk					
3	roguh pavement areas (inconsistent), some new	sidewalks have many difference obstacles, off and on		bluff across hwy 26 has 30 sec (for pedestrians) but cars may not see 'WALK"	Hwy 26 east turning right onto 211 - nothing for pedestrians		Noise, exhuast from vehicles	landscaping by gas stations is lovely		inconsistency of sidweaks - good, bad, so-so	cannot see whether drivers are watching when windows are hgihly tinted		something seperating pedestrians from traffic (small shrubs)	keep crosswalk paint bright and current	slow traffic to speed limit?
4				Strauss			need trash cans			paint and mark crosswalks					
5	lack of furnishing zone/planter strip buffer	not wide enough and/or too many obstacles	curmbling or missing in places	way too few safe crossings - need more high visiblity crossings, flashy lights, or signalized corssings	cars don't stop at marked intersection	pedestrian walk signal button is all but nonresponsive	lots of weeds	lack of buffer between pedestrians through zone and vehicle traffic	cars are way too fast and noisy - lets switch to all driverless eletric cars	safe intersection crossings	protective barrier between sidewalk and traffic lanes	speed and noise of traffic on Proctor and Pioneer	high visiblity (flashing ligh intersection every 2 to 3 blocks)	wider sidewalks with planter strip/ vegetation buffer btw sidewalk and traffic	driverless vehicles that are programmed to drive the speed limit and yeild to pedestrians and are quieter
6	sidewalks narrowed in many places from poles, etc.	lots of obstacles	cracks, crumbling	speeding traffic	not enough crosswalks	low visibility for cars seeing pedestrians at some intersections	speeding traffic	noise	exhaust fumes & places to rest (benches not right on street facing traffic)	speeding traffic	obstacles	limited places to safely cross	walk signals that make noise and flashing lights to alert pedestrians and cars when ppl corss	underground utilities (for narrow spots)	repair crumbling sidewalks
7	sidewalk obsturctions - too narrow	no sidewalk at entrance to town on N side of Pleasant	sidewalks disintegrating	non-responsive crosswalks - take too long to activita walk	from bluff to beers - no crosswalk	no pedestrian buttons	drivers not looking for pedestrians	not enough shade/trees	vehicle noise/pollution	non-reponsive crosswalks	drivers not looking for pedestrians	sidewalk obstructions	underground utilities	plant shade trees	reduce speed. Ticket fast drivers
8	sidewalk obstructions	sidewalks are too narrow	no bicycle lane, cars parked	bluff and 26 cars don't stop	pedestrian buttons are unclear		vehicle speed	unsafe crossing, parking lot		speed	lack of visibility for crossing business entrances	obstructions in the middle of the sidewalks	underground utilities	better crosswalk signals	sidewalk access from Shell to Bluff
9	too many sidewalk obstructions	lack of maintainence	power poles in sidewalk and PGE meter also	more painted crosswalks	crosswalk warning lights added		vehicles too fast	vehicles reckless behavior	weeds						
10	too many telephone poles	missing sidewalks - too many	deteriorating conrete (Two bros, sandy grade, etc.)	cars don't stop at crosswalks	no pedestrian signal button at Pioneer/211 interschange, west side of street	inadequate signage	not enough street trees (Pioneer)	vehicles traveling too fast	no street furniture (Pioneer)	underground the utility poles	speed and crosswalk enforcement	add sidewalks where they currently don't exist			
11	incomplete/missin g sidewalks	steep curb cutouts	cracks/trees in sidewalks	cars can not see pedestrians	not marked at every crosswalk	not enough lights around crosswalks	vehicles travel too fast	parked cars block view	nothing protecting pedestrians from cars	crosswalks not marked well (reflective stripes)	need ped lights at all crosswalks	speed too high	wider sidewalks	clearly mark all crosswalks	more lights along all sidewalks
12	incomplete/ missing sidewalks	extremely narrow sidewalks	(non ADA) - with curb cut steepness	unsafe crosswalks	timeing for crosswalks	parked cars block sight	not enough benches	note enough street trees	parked cars haning over sidewalks/street poles/trees in sidewalk	auto cross signals would be more ADA accessible with beeps/ voice for all disabilities	slow speed through town	clearly mark all pedestrian corssings	see previous answers		
13	mailboxes blocking sidewalks	sidealks not wide enough					turn down lots/buildings	no trash recepticles - recycling too		no lighting on Pleasant	low lighting on Proctor/Pioneer				
14	unclearly makred no parking areas	sidewalks too narrow	missing sidewalks	lack of marked crossawlks	ramps not ADA compliant	width of side streets with street parking	too few public seating areas	lack of public art - to make consistent style	lack of greenery	lack of clearly marked crosswalks	lack of sidewalks	Alt confustions (light, cross)	uneven sidewalks	narrow sidewalks	lack of sidewalks

Surveyor #	Sidewalks			Intersections & Street Crossings			Comfort & Appeal			Overall			Top Improvements		
	Concern 1	**Concern 2**	**Concern 3**	**Concern 1**	**Concern 2**	**Concern 3**	**Concern 1**	**Concern 2**	**Concern 3**	**Concern 1**	**Concern 2**	**Concern 3**	**Improvement 1**	**Improvement 2**	**Improvement 3**
15	lack of sidewalk between Pioneer and Proctor			steep roads into 2b on wolf (steep, icy)			too many cars on Pioneer/ Procotor			getting across Pioneer/proctor as a pedestrian			flashing yellow for pedestrians	underpass at Alt ($$)	
16	sidewalks not continuous - missing	narrow sidewalks	sidewalks obstructions would not allow wheelchair passage	not enough pedestrian corssings, marked	diffiuclt for pedestrians to see around parked cars at intersections	cars not aware of pedestrians due to not clear sight lines	noise and air pollution	run down buildings or vacant lots		cars not aware of ped b/c of unclear sight lines	noise and air pollution	sidewalks not continuous - missing			
17	sidewalks too narrow	don’t use diagonal wheelchair ramps, ever and replace those that exist. It messes with orientation for those w/ low vision and blindness	angle of driveways ae too steep. Make sure there is an edge no more than 1', no less than 1/2'	cars have to creep into crosswalk to know if perpedendicular traffic is coming - poor visibility	cars should not be allow to park on the sidealks area off driveways		no lights on street	no trash cans	mailboxes hang into sidewalks and becomes unknown obstacle for white can users	Alt Street Audible Pedestrian signal should say 'Alt AVE' and begning phrase is inaudible and muffled due to high traffic volume	lack of sidewalks in some places				

Junker Street Circulation Plan . . . . Section K

MEMORANDUM

DATE: March 19, 2021

TO: Kelly O'Neil Jr., Development Services Director | City of Sandy

FROM: Reah Flisakowski, PE and Kamilah Buker

SUBJECT: Sandy Junker Street Circulation Plan

Project #20189-000

The purpose of this memorandum is to develop a circulation plan and conceptual cross-sections for Junker Street, Strauss Avenue, and Bruns Avenue south of Pioneer Boulevard (US 26) in Sandy, Oregon. The circulation plan and conceptual cross-section will be used by city staff to guide future fronting improvements to the facilities.

EXISTING CONDITIONS

This section summarizes the existing transportation conditions in the study area including roadway network, traffic control, traffic volume characteristics, conditions for walking and biking, and driveway locations.

STUDY AREA

The study area focused on the segments of Junker Street, Strauss Avenue and Bruns Avenue south of Pioneer Boulevard, as shown in Figure 1. The area is located in the south portion of downtown Sandy and serves both commercial and residential land uses. In general, the east-west portion of Junker Street runs parallel to Pioneer Boulevard, and the north-south portion of Junker Street parallel to Strauss Avenue. Bruns Avenue and Junker Street are short blocks that connect to Pioneer Boulevard. Bruns Avenue does not connect to Junker Street. Bruns Avenue and the east-west portion of Junker Street terminate at a public parking lot (Pioneer Parking Lot) south of Pioneer Boulevard. The Pioneer Boulevard/Strauss Avenue intersection is controlled by a traffic signal. The Pioneer Boulevard intersections at Bruns Avenue and Junker Street are controlled by stop signs on the local street approaches.

FIGURE 1: STUDY AREA MAP

All of the study roadway segments are classified as Local Streets. Table 1 summarizes the characteristics of the study area streets, including pavement width, existing right-of-way, and cross-section elements. Bruns Avenue has urban improvements including curbs, sidewalks, and on-street parking on both sides of the facility. The remaining roadways have limited urban improvements and mostly provide a paved roadway with gravel shoulders. Strauss Avenue provides a curb extension and marked crosswalk on the south leg of the Strauss Avenue/Pioneer Boulevard intersection. Photos of the study roadways are shown in Figures 2 through 5.

TABLE 1: EXISTING ROADWAY CHARACTERISTICS

FACILITY	PAVEMENT WIDTH (FEET)	EXISTING ROW (FEET)	TRAVEL LANES	SIDEWALKS	ON-STREET PARKING	LANDSCAPE STRIP
BRUNS AVENUE	35	50	2	Yes Both sides	Yes Both sides	No
STRAUSS AVENUE	25	50	1	Yes (Partial)	No	No
JUNKER STREET (EAST-WEST)	20	20	1	No	No	No
JUNKER STREET (NORTH-SOUTH)	20	20	2	No	No	No

FIGURE 2: STRAUSS AVENUE LOOKING SOUTH FROM PIONEER BOULEVARD

FIGURE 3: JUNKER STREET LOOKING EAST FROM STRAUSS AVENUE

FIGURE 4: JUNKER STREET LOOKING SOUTH FROM PIONEER BOULEVARD

FIGURE 5: JUNKER STREET "DRIVEWAY" LOOKING WEST FROM STRAUSS AVENUE

FIGURE 6: BRUNS AVENUE LOOKING NORTH FROM PIONEER PARKING LOT

The current traffic circulation in the study area is shown with green arrows on Figure 7.

- Strauss Avenue operates with one-way traffic in the southbound direction.
- Bruns Avenue operates with two-way traffic.
- On the east-west segment, Junker Street operates with one-way traffic in the eastbound direction.
- On the north-south segment, Junker Street operates with two-way traffic.
- Junker Street has right-of-way between Bruns Avenue and Strauss Avenue but the roadway has not been constructed. There is a gravel driveway in the right of way connecting several parcels to the Strauss Avenue/Junker Street intersection.

FIGURE 7: EXISTING CIRCULATION AND DRIVEWAYS

The current driveway locations along the roadway segments are also shown in Figure 7. In general, each developed parcel has one driveway on the fronting local street. It is expected that future development on vacant parcels will be granted a single driveway.

TRAFFIC VOLUMES

Traffic volumes were recently collected in October 2020 for the Sandy Transportation System Plan Update. Data collected at the nearby Pioneer Boulevard/OR 211 intersection showed Pioneer Boulevard carries approximately 2,900 vehicles during the evening peak hour. Count data is not available for the local streets in the study area. It is assumed they serve low traffic volumes due to the adjacent developments and observed traffic operations.

CIRCULATION ASSESSMENT

The existing local street circulation patterns were reviewed to determine if any changes would be beneficial. The circulation assessment considered the existing roadway network, traffic flow, pavement and right-of-way widths, fronting land uses, potential development/redevelopment, out of direction travel, driver expectations/consistency, and safety for all users. The recommended circulation plan is shown in Figure 8.

Access to all the parcels on Strauss Avenue and Junker Street could be provided by one-way or two-way traffic flow. One-way traffic would require out of direction travel for some trips. The study roadway segments are short (less than 300 feet) and out of direction travel would be an acceptable trade-off for other multimodal benefits.

The circulation assessment determined the constrained 20-foot right-of-way on Junker Street significantly limits the opportunity to provide sidewalks in the study area. Due to the downtown location of the study area, it is important to accommodate walking trips. If the circulation on the north-south segment of Junker Street was modified to one-way traffic with a single vehicle travel lane, the remaining right-of-way could provide continuous sidewalks. With two-way traffic circulation on Junker Street, the right-of-way could only serve vehicles with two 10-foot lanes and no sidewalks.

Junker Street between Bruns Avenue and Strauss Avenue has the same constrained 20-foot right-of-way. When this roadway is constructed, it would benefit from one-way traffic circulation to provide right-of-way for sidewalks. As shown in Figure 8, the recommended circulation is one-way eastbound on Junker Street and a counter-clockwise loop on Strauss Avenue and Junker Street.

The option to provide one-way circulation on Junker Street in the westbound direction and a clockwise loop on Junker Street and Strauss Avenue would have several challenges. The existing signal at the Strauss Avenue/Pioneer Boulevard intersection currently does not accommodate the northbound approach because traffic flows southbound only on Strauss Avenue. Clockwise circulation would require a modification to the existing signal, adding a pole, mast arm and signal heads to northbound approach. The available sight distance from the Strauss Avenue/Pioneer

Boulevard intersection northbound approach is limited by the building on the southwest corner and could create safety issues for drivers and crossing pedestrians.

With Junker Street operating with one-way traffic, it is recommended to also modify Strauss Avenue to create a one-way loop for consistency and clarity to drivers. This would create an additional benefit by providing right-of-way for potential on-street parking and wider sidewalks.

Bruns Avenue currently operates as a dead-end street and requires two-way traffic. Since Bruns Avenue provides a direct connection between Pioneer Boulevard and a large public parking lot, retaining two-way traffic is recommended after construction of Junker Street between Bruns Avenue and Strauss Avenue.

FIGURE 8: RECOMMENDED CIRCULATION PLAN

CROSS-SECTION CONCEPT ANALYSIS

Roadway cross-section concepts were developed for the unimproved segments of Strauss Avenue and Junker Street. Cross-section options were evaluated for each street segment to support the recommended one-way circulation and determine how best to use the remaining right-of-way.

Both of these roadways are classified as Local Streets. The Local Street cross-section standard is shown in Figure 9. It requires a 50-foot right-of-way to provide a 14-foot drive lane for two-way traffic, 7-foot on-street parking lanes, 5.5-foot planter strips (includes 0.5-foot curb), 5-foot sidewalks and 0.5-foot signage/monumentation strips on the outside edges. The section does not include designated bike facilities. Cyclists can safely share the vehicle lanes due to low vehicle speeds and volumes.

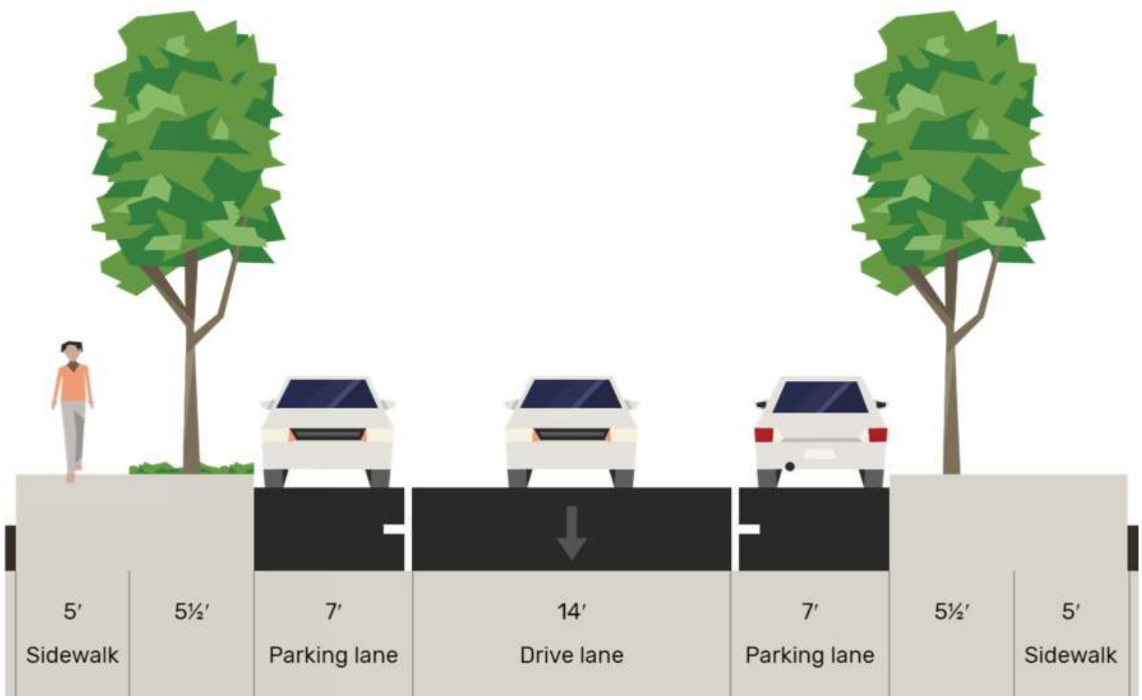

FIGURE 9: LOCAL STANDARD CROSS-SECTION

STRAUSS AVENUE

Strass Avenue has a 50-foot right-of-way and could accommodate the Local Street standard for most of the roadway. The cross-section is limited just south of Pioneer Boulevard by an existing curb extension that provides approximately 25-feet of pavement width. With the recommendation to retain the existing one-way circulation, Strauss Avenue would only need to accommodate a single southbound vehicle lane. The standard cross-section could be applied with a 14-foot travel lane designated as a single lane only. A 14-foot travel lane is wider than typical but would provide flexibility in the future if the need for two-way traffic on Strauss Avenue was triggered.

The recommended cross-section for Strauss Avenue (shown in Figure 10) would provide one 14-foot travel lane, 7-foot on-street parking lanes, 5.5-foot planter strips (includes 0.5-foot curb), 5-foot sidewalks and 0.5-foot signage/monumentation strips on the outside edge. The sidewalk and planer strip could be combined to provide a 10.5-foot sidewalk with tree wells which is preferred in urban areas to accommodate a higher volume of pedestrian trips.

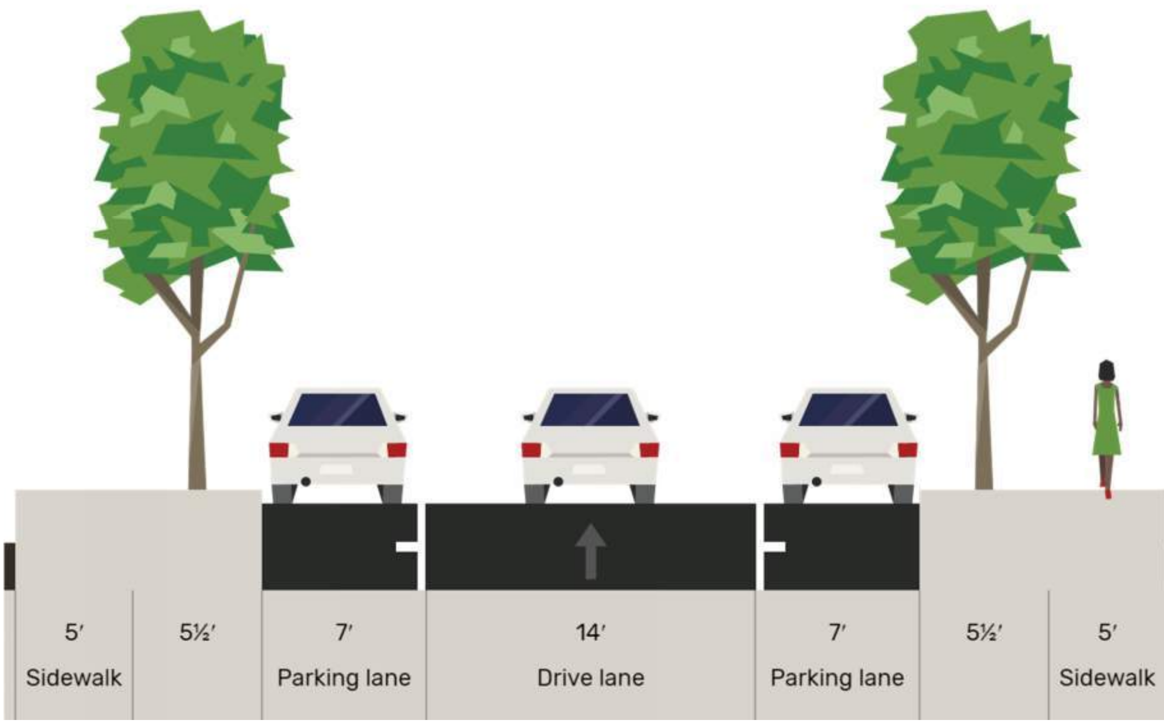

FIGURE 10: STRAUSS AVENUE CROSS-SECTION

On-street parking on the east side of the roadway would compliment the existing curb extension at Pioneer Boulevard. Providing parking on both sides of Strauss Avenue will be important to accommodate overall downtown parking demands and the needs of nearby residents and businesses.

JUNKER STREET

Junker Street has an existing 20-foot right-of-way and can only accommodate a portion of the local street standard cross-section (Figure 9). With the recommended one-way traffic, Junker Street would only need to accommodate a single vehicle lane. Two cross-section alternatives were developed, Alternative A which would fit within the existing right-of-way and Alternative B which would require additional right-of-way or an easement to provide on-street parking. The alternatives are presented below.

Alternative A - The 20-foot cross-section using the existing right-of-way would provide one 13-foot travel lane, 5.5-foot sidewalk (includes 0.5-foot curb), 0.5-foot curb and two 0.5-foot signage/monumentation strips on the outside edges. The sidewalk could be constructed on the north and west sides of Junker Street to create a continuous sidewalk loop with sidewalks on Strauss Avenue and connecting to Bruns Avenue to the west. Currently, there is not existing right-of-way to provide on-street parking or landscaping. Figure 10 shows the cross-section for Junker Street without additional right-of-way or easement.

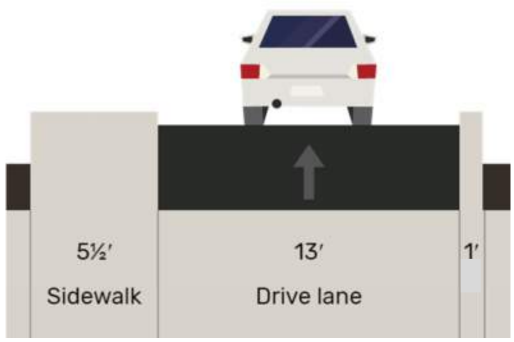

FIGURE 10: JUNKER STREET CROSS-SECTION WITH EXISTING RIGHT-OF-WAY

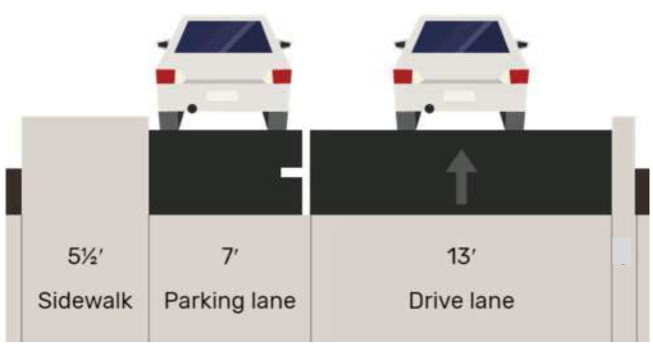

FIGURE 11: JUNKER STREET CROSS-SECTION WITH PARKING

Alternative B – If a 7-foot right-of-way dedication or easement could be obtained, on-street parking could be added to Alternative A. The 27-foot Alternative B section would provide one 13-foot travel lane, 5.5-foot sidewalk (includes 0.5-foot curb), 7-foot on-street parking lane adjacent to the sidewalk, 0.5-foot curb and two 0.5-foot signage/monumentation strips on the outside edges.

The recommended characteristics of the study area streets are shown in Table 2, including pavement width, existing right-of-way, and cross-section elements.

TABLE 2: RECOMMENDED ROADWAY CHARACTERISTICS

FACILITY	ROW (FEET)	TRAVEL LANES	SIDEWALKS	ON-STREET PARKING	LANDSCAPE STRIP
BRUNS AVENUE	50	2	Yes Both sides	Yes Both sides	No
STRAUSS AVENUE	50	1	Yes Both sides	Yes Both sides	Yes Both sides
JUNKER STREET ALTERNATIVE A	20	1	Yes One side	No	No
JUNKER STREET ALTERNATIVE B	27	1	Yes One side	Yes One Side	No

TECHNICAL MEMORANDUM

DATE: October 27, 2022

TO: Kelly O'Neill | City of Sandy

FROM: Reah Flisakowski | DKS

SUBJECT: Highway 211/Dubarko Road Proportionate Share Funding Plan

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TABLE 1: PROPORTIONATE SHARE FEE ANALYSIS RESULTS

PROPORTIONATE SHARE METHOD	SHORT-TERM (5 YEARS)
PROPOSED IMPROVEMENT	Traffic signal + turn lanes
PROJECT COST	$12,383,000
YEAR 2020 ENTERING VOLUME	907
YEAR 2040 ENTERING VOLUME	1,665
NET GROWTH IN TRIPS ACCOMMODATED	758
COST FOR DEVELOPMENT	$16,336 per PM peak hour trip

NOTE: VOLUMES REPRESENT PM PEAK HOUR

EXHIBIT C

Ordinance No. 2023-24
2023 Sandy Transportation System Plan Adoption

FINDINGS OF COMPLIANCE

The City is proposing to adopt an update of the Sandy Transportation System Plan (TSP) and associated policies and development requirements. The following findings demonstrate that the adoption of the 2023 Sandy TSP is consistent with relevant Statewide Land Use Planning Goals, Oregon Transportation Plan policies, Oregon Highway Plan policies, Oregon Administrative Rules, Sandy Comprehensive Plan policies, and Sandy Development Code regulations.

I. Consistency with Statewide Planning Goals

Goal 1: Citizen Involvement

Goal 1 requires the development of a citizen involvement program that is widespread, allows two-way communication, provides for citizen involvement through all planning phases, and is understandable, responsive, and funded.

Findings: The TSP development process included robust community engagement to ensure the transportation needs and desires of the community are reflected in the TSP update. TSP engagement included the following activities:

- The TSP project team worked closely with a Community Advisory Committee (CAC), which included representatives from the Sandy City Council and Planning Commission, Oregon Department of Transportation (ODOT), Clackamas County, Sandy Area Metro (SAM), Sandy Fire District, Sandy Chamber of Commerce and neighborhoods. The CAC met a total of three times at key points in the process and provided input on current transportation needs and proposed recommendations and system updates.
- Three public open house events were held (two online, one in-person) to gather community input regarding transportation goals, concerns, and needs related to multimodal transportation options and community priorities for future investments. The events were held in September and October of 2021, and September 2022.
- The City's acknowledged land use regulations implement Goal 1 by providing for a community participation process to inform land use decisions. The City requires Comprehensive Plan amendments to be reviewed first through a public hearing process before the Planning Commission. The Planning Commission makes a recommendation to the City Council on the proposal, followed by a public hearing before the City Council. The City Council makes the final decision regarding the

Comprehensive Plan amendment. This legislative process requires public notice and public hearings with the opportunity for written and oral testimony.

In addition to the extensive community engagement activities that guided TSP development, Draft TSP Policy 8.3 requires the City to "(p)rovide multi-faceted and inclusive public engagement process that provides all community members an opportunity to provide input on transportation system decisions."

Based on the findings discussed above, Goal 1 is satisfied.

Goal 2: Land Use Planning
This goal requires that a land use planning process and policy framework be established as a basis for all decisions and actions relating to the use of land. All local governments and state agencies involved in the land use action must coordinate with each other. City, county, state and federal agency and special districts plans and actions related to land use must be consistent with the comprehensive plans of cities and counties and regional plans adopted under Oregon Revised Statues (ORS) Chapter 268.

<u>Findings:</u> The City has an established land use planning process and a policy framework that serves as a basis for the decision on this request. The policy framework is found in the City's acknowledged Comprehensive Plan, which includes policies and goals relevant to the decision. An analysis of how the Draft 2023 TSP is consistent with this policy framework is presented below, as required for the requested Comprehensive Plan amendments.

- Amendments to the City's Comprehensive Plan become part of the policy framework that serves as the basis for decisions and actions related to the use of land. The proposal is to replace the currently adopted 2011 TSP with the Draft 2023 TSP, to be adopted and incorporated by reference as an element of the Comprehensive Plan.
- Existing state, regional, and local plans, policies, and regulations relevant to the Draft 2023 TSP were reviewed and summarized in order to guide the development of the TSP. See Section A of the TSP Appendix (TM #1 Policy Framework and Code Review).
- Coordination between state, regional, and local agencies was accomplished through both the Project Management Team (PMT), which included key City staff members, and the CAC. Members of the CAC that provided guidance on the development of the TSP included representatives from multiple agencies and organizations, including those listed below.
  - Sandy Area Metro
  - ODOT
  - Department of Land Conservation and Development (DLCD)
  - City of Sandy
  - Sandy Fire District

- Sandy Chamber of Commerce
- Sandy Planning Commission
- Sandy City Council
- Sandy residents

Based on the findings discussed above, Goal 2 is satisfied.

Goal 5: Natural Resources, Scenic and Historic Areas, and Open Spaces
To protect natural resources and conserve scenic and historic areas and open spaces. Local governments shall adopt programs that will protect natural resources and conserve scenic, historic, and open space resources for present and future generations. These resources promote a healthy environment and natural landscape that contributes to Oregon's livability.

Findings: Goal 5 of the Draft 2023 TSP is to "(m)inimize environmental impacts on natural resources and encourage carbon-neutral or efficient transportation alternatives." This Goal includes three policies that support Statewide Planning Goal 5:

- Policy 5.1: *Avoid or mitigate transportation project impacts to environmental resources including creeks and wetlands, cultural resources, and wildlife corridors.*
- Policy 5.3: *Encourage transportation facility construction methods that reduce environmental impacts.*
- Policy 5.4: *Minimize street cross-sections to protect and preserve open space and reduce impervious surface.*

Goal 3 of the Draft 2023 TSP includes the following policies to protect scenic and historic resources as they relate to the City's transportation system:

- Policy 3.1: *Protect the scenic resources in Sandy.*
- Policy 3.2: *Preserve the historic character of Sandy.*
- Policy 3.3: *Identify gateway and beautification treatments for Hwy 211.*
- Policy 3.4: *Support Mt. Hood Scenic Byway Enhancements.*

Based on the findings discussed above, Goal 5 is satisfied.

Goal 6: Air, Water and Land Resources Quality
To maintain and improve the quality of the air, water and land resources of the state. All waste and process discharges from future development, when combined with such discharges from existing developments shall not threaten to violate, or violate applicable state or federal environmental quality statutes, rules and standards.

Findings: Goal 5 of the Draft 2023 TSP is to "(m)inimize environmental impacts on natural resources and encourage carbon-neutral or efficient transportation alternatives." This Goal includes three policies that support Statewide Planning Goal 6:

- Policy 5.1: *Avoid or mitigate transportation project impacts to environmental resources including creeks and wetlands, cultural resources, and wildlife corridors.*
- Policy 5.2: *Support energy conservation by supporting public transit, transportation demand management, transportation system management and a multi-modal transportation system.*
- Policy 5.4: *Minimize street cross-sections to protect and preserve open space and reduce impervious surface.*

The Draft 2023 TSP also includes goals, policies, and projects that promote pedestrian, bicycle, and transit mobility, which will help mitigate transportation-related impacts and emissions in the community. Proposed goals and policies include:

- Policy 3.6: *Identify walking and biking needs in the urban growth boundary expansion area.*
- Goal 6: *Provide safe, efficient, high-quality transit service that gives Sandy residents, employees, employers, and visitors more freedom to meet their needs within the city, region and state. Create a transit system that offers an alternative to private automobile use, supports efficient use of roadways and reduces air pollution and energy use.*
- Policy 7.3: *Provide safe pedestrian and bicycle routes between residential areas, schools, and public facilities.*
- Policy 7.5: *Provide enhanced pedestrians and bicyclists crossings where needed.*
- Policy 9.1: *Develop recreational walking and biking routes to access employment, schools, shopping, and transit routes.*

The Draft 2023 TSP identifies 91 pedestrian and bicycle projects, which will help improve the City's multimodal network, providing more travel options, and reducing vehicular transportation-related impacts on air resources. The Draft TSP also includes eight transit projects. These projects are identified in Draft TSP Table 2 and Figures 12 and 13. The projects include the following categories:

- Infill sidewalk gaps and construct new sidewalks (Draft TSP projects P1 – P27)
- Pedestrian crossings, crosswalk installations, and traffic calming improvements (Draft TSP projects C1 – C24)
- ADA improvements (Draft TSP project C23)
- Shoulder widening for bike access and bike lane improvements (Draft TSP projects B1 – B15)
- Trail construction projects (Draft TSP projects T03 – T54)
- Transit service and facility improvements (no project numbers assigned)

Based on the findings discussed above, Goal 6 is satisfied.

Goal 7: Areas Subject to Natural Hazards
To protect people and property from natural hazards. Local governments shall adopt comprehensive plans (inventories, policies and implementing measures) to reduce risk to people and property from natural hazards.

Findings: Planning for Sandy's transportation needs included a solid knowledge of existing environmental constraints (See Appendix Section D – TM #4 Existing Conditions) and estimating project costs to account for avoidance and mitigation. Proposed TSP improvements and projects respect the natural environment, avoiding impacts where possible and providing project solutions where necessary. The Draft TSP supports a multimodal system that is more resilient to natural disasters or disruptive events and plans for connectivity, providing multiple ways to move people away from hazardous areas. See the findings for Goal 5 for more details.

Based on the findings discussed above, Goal 7 is satisfied.

Goal 9: Economic Development
This goal requires that local comprehensive plans and policies contribute to a stable and healthy economy in all regions of the state.

Findings: Draft TSP Policies 4.2 and 9.1 promote a transportation system that serves the employment needs of the community, stating the following:

- Policy 4.2: *Plan for a transportation system that supports projected population and employment growth and maximize travel options by providing efficient routes for all modes of transportation.*
- Policy 9.1: *Develop recreational walking and biking routes to access employment, schools, shopping, and transit routes.*

The Draft TSP also includes policies that support freight movement by ensuring the function and efficiency of US 26, which is the City's primary freight route. This includes the following policies:

- Policy 1.5: *Emphasize local street connections, in an effort to reduce reliance on US 26 and Hwy 211 for local trips.*
- Policy 4.1: *Balance local access to US 26 with the need to serve regional and statewide traffic, while supporting adjacent land uses.*

Most projects recommended in the TSP support economic development in the city directly or indirectly given that they more efficiently use existing facilities and make transportation options more viable. Key examples from the Financially Constrained Project List ("project list") include the following:

- New collector streets (Draft TSP projects D21E and D22).

- Several road extensions (Draft TSP projects D20, D21B, D21F, and D23, among others).
- 27 sidewalk infill, improvement, or construction projects (Draft TSP Table 2 and Figure 12).
- Bike facility improvements/construction and trails (Draft TSP projects B1-B15 and T03-T54, and Draft TSP Figures 12 and 13).
- Several transit projects, including adding Saturday service and extending service hours on fixed routes, adding a new bus and driver, new service to Clackamas County and Boring, and other transit facility improvements.

Based on the findings discussed above, Goal 9 is satisfied.

Goal 10: Housing
This goal requires the City plans provide for the appropriate type, location and phasing of public facilities and services sufficient to support housing development in areas presently developed or undergoing development or redevelopment.

<u>Findings</u>: Several Draft TSP policies and projects promote a transportation system that can adequately support housing development and future travel demand. Draft TSP policies that address appropriate service for residential areas, population growth and travel demand needs include:

- Policy 1.4: *Ensure sufficient capacity to accommodate future travel demand (transit, bicycle, pedestrian, etc.) to, within, and through the City of Sandy.*
- Policy 4.2: *Plan for a transportation system that supports projected population and employment growth and maximize travel options by providing efficient routes for all modes of transportation.*
- Policy 7.3: *Provide safe pedestrian and bicycle routes between residential areas, schools, and public facilities.*

Travel demand analysis conducted through the TSP process estimates total traffic will increase by over 30 percent by 2040. Many of the identified Draft TSP projects are intended to increase travel capacity among various modes to accommodate future demand. Transportation improvements that accommodate traffic increases over the next 20 years will also help the City meet future housing needs. Many other projects are intended to complete the transportation network and options within existing residential areas. Examples of projects that support increased housing capacity and other transportation improvements that serve existing residential areas include:

- Cascadia Village Drive Extensions 1-3 (Draft TSP projects D21C, D21B, and D32)
- Village Boulevard Extensions 1 and 2 (Draft TSP projects D21F and D21G)
- Agnes Street Extension (Draft TSP project D19)
- Olson Street Extensions 1 and 2 (Draft TSP projects D18 and D33)

- Several sidewalk infill or construction projects in residential areas (TSP projects P1-P24)
- Several bicycle improvements and trail projects (Draft TSP projects B1-B15 and T03-T54)

Based on the findings discussed above, Goal 10 is satisfied.

Goal 11: Public Facilities and Services

Goal 11 requires cities and counties to plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development. The goal requires that urban and rural development be "guided and supported by types and levels of urban and rural public facilities and services appropriate for, but limited to, the needs and requirements of the urban, urbanizable and rural areas to be served."

<u>Findings:</u> Transportation facilities, including roadways, bikeways, sidewalks, and multi-use paths are a primary type of public facility and, in Sandy, are managed by public agencies including the City, Clackamas County, and ODOT. The Draft 2023 TSP documents existing conditions and future needs for Sandy's transportation system based on the existing and planned land uses – see TM #4 and TM #5 in Draft TSP Appendix Sections D and F, respectively. The Draft TSP projects (listed in Draft TSP Tables 1 and 2) and the Financially Constrained Projects (Draft TSP Table 3) are tailored to meet identified existing and future needs and address project goals and objectives. In addition, changes to the City's Typical Street Cross-Section Standards are intended to support future transportation needs by updating the dimension and modal standards for these transportation facilities (Draft TSP Figures 18-24 and Table 4).

Based on the findings discussed above, Goal 11 is satisfied.

Goal 12: Transportation

Goal 12 requires cities, counties, metropolitan planning organizations, and ODOT to provide and encourage a "safe, convenient and economic transportation system." This is accomplished through development of Transportation System Plans based on inventories of local, regional and state transportation needs. Goal 12 is implemented through OAR 660, Division 12, also known as the Transportation Planning Rule ("TPR"). The TPR contains numerous requirements governing transportation planning and project development. (See the "OAR 660, Division 12" section of this document for findings of compliance with the TPR.)

<u>Findings:</u> Project goals and priorities that address mobility and connectivity, capital investments/funding, community needs, system management, environment, transit, safety, equity, and health guided the development of the Draft 2023 TSP. Existing conditions and future transportation needs were analyzed with respect to these goals and objectives. Elements of the Draft 2023 TSP – including existing conditions and

future needs, as well as transportation system standards, implementation strategies, and recommended transportation system improvements – are consistent with TPR Section -0020 requirements.

The inventory and analysis of existing and future conditions identified opportunities, by mode, to improve the transportation system. See Section D and E (Existing Conditions and Needs Analysis) in the Draft 2023 TSP Appendix. These needs were identified in the existing conditions and needs analysis; by project team members, advisory committee members, and other community members; and through analysis using projected future traffic volumes and patterns, consistent with TPR Section -0030 requirements.

Evaluation criteria, developed in accordance with TPR Section -0035 and based on the TSP goals and objectives, were used to evaluate improvement alternatives that would address identified needs. Evaluation criteria is detailed in the Draft TSP Appendix Section B (TM #2 Goals Objectives and Evaluation Criteria). The criteria were presented to and refined during discussions with the CAC during their scheduled meetings and with community members at public meetings.

The regulatory basis for proposed transportation policies and development code amendments – in particular, TPR requirements – is outlined in the Draft TSP Appendix Sections A and F (TM #1 Policy Framework and Code Review, and TM #6 Regulatory Solutions). This coordination of land use and transportation planning is consistent with both the general purpose and specific requirements in the TPR, including Section -0045 (Implementation of the Transportation System Plan).

The Draft 2023 TSP will be adopted as the Transportation Element of the City's Comprehensive Plan. TSP adoption will be accomplished through a legislative amendment process consistent with City procedures and requirements.

Based on the findings discussed above, Goal 12 is satisfied.

Goal 13: Energy Conservation
To conserve energy. Land and uses developed on the land shall be managed and controlled so as to maximize the conservation of all forms of energy, based upon sound economic principles.

<u>Findings:</u> Draft 2023 TSP Policy 5.3 is to "Support energy conservation by supporting public transit, transportation demand management, transportation system management, and multi-modal transportation system." In addition, Draft TSP Goal 6 is Transit. Draft Goal 6 calls for the City to "(s)upport efficient use of roadways and reduces air pollution and energy use." The Draft TSP also identifies 8 transit projects.

The Draft 2023 TSP includes policies and projects that are intended to promote pedestrian and bicycle mobility, which supports energy conservation for the City's transportation system. The following Draft TSP policies support the City's pedestrian and bicycle mobility goals:

- Policy 1.3: Improve vehicular/pedestrian interface along all arterial and collector streets.
- Policy 1.4: Ensure sufficient capacity to accommodate future travel demand (transit, bicycle, pedestrian, etc.) to, within, and through the City of Sandy.
- Policy 3.6: Identify walking and biking needs in the urban growth boundary expansion area.
- Policy 6.3: Improve accessibility to transit services for people arriving by foot, by bicycle, or with a mobility device.
- Policy 7.3: Provide safe pedestrian and bicycle routes between residential areas, schools, and public facilities.
- Policy 7.5: Provide enhanced pedestrian and bicycle crossings where needed.
- Policy 8.2: Ensure the pedestrian and bike facilities are designed clear of obstacles and obstructions (e.g., utility poles, grates) and meet ADA requirements.
- Policy 9.1: Develop recreational walking and biking routes to access employment, schools, shopping, and transit routes.
- Policy 9.2: Provide walking facilities that are physically separated from auto traffic on all arterials and collectors.

The Draft TSP also identifies 91 pedestrian and bicycle projects, which are detailed in Draft TSP Table 2 and illustrated in Draft TSP Figures 12 and 13.

Based on the findings discussed above, Goal 13 is satisfied.

Goal 14: Urbanization
To provide for an orderly and efficient transition from rural to urban land use, to accommodate urban population and urban employment inside urban growth boundaries, to ensure efficient use of land, and to provide for livable communities.

<u>Findings:</u> The Draft 2023 TSP includes a number of policies and projects that are intended to accommodate future housing and employment growth forecasted out to 2040, as described in findings for Statewide Planning Goals 9 (Economy) and 10 (Housing). Specifically Draft TSP Policy 4.3 calls for the City to "Plan for a transportation system that supports projected population and employment growth and maximize travel options by providing efficient routes for all modes of transportation." See findings to Goal 9 and 10 for more details on how specific Draft TSP policies and projects are intended to respond to a growing community.

Based on the findings discussed above, Goal 14 is satisfied.

II. Consistency with Oregon Transportation Plan

The Oregon Transportation Plan (OTP) is the state's long-range, multimodal transportation plan. The OTP is the overarching policy document for a series of modal and topic plans that together form the state's TSP. A local TSP must be consistent with applicable OTP goals and policies. Findings of compatibility will be part of the basis for TSP approval. While the Draft TSP meets all OTP goals and policies, the following policy list details how the Draft TSP meets the most notable policies. The following demonstrates how the Draft 2023 Sandy TSP complies with state transportation policy:

Policy 1.1 – Development of an Integrated Multimodal System
It is the policy of the State of Oregon to plan and develop a balanced, integrated transportation system with modal choices for the movement of people and goods.

<u>Findings:</u> The Draft 2023 TSP includes a number of policies and projects that are intended to support a multimodal transportation system. Some of the policies that promote a multimodal system include:

- Policy 3.6: Identify walking and biking needs in the urban growth boundary expansion area.
- Policy 5.2: Support energy conservation by supporting public transit, transportation demand management, transportation system management and a multi-modal transportation system.
- Policy 6.3: Improve accessibility to transit services for people arriving by foot, by bicycle or with a mobility device.
- Policy 7.3: Provide safe pedestrian and bicycle routes between residential areas, schools, and public facilities.
- Policy 7.5: Provide enhanced pedestrians and bicyclists crossings where needed.
- Policy 9.1: Develop recreational walking and biking routes to access employment, schools, shopping, and transit routes.
- Policy 9.2: Provide walking facilities that are physically separated from auto traffic on all arterials and collectors.

The TSP process identified numerous projects that cover a range of mobility options, including:

- 39 projects to improve motor vehicle mobility (Draft TSP Table 1 and Figure 11)
- 91 pedestrian and bicycle projects (Draft TSP Table 2 and Figures 12 and 13)
- 8 transit projects (Page 41 of the Draft TSP)

The Draft TSP divides the projects into "improvement packages" based on community priority and funding availability. Proposed Package 1 "financially constrained" projects are more likely to secure funding within the planning horizon (by 2040). Package 2 includes “aspirational” projects that are unlikely to secure funding before 2040. Most of the projects identified in the Draft TSP are in Package 2. The following Motor Vehicle projects are in Package 1:

- Project D3: US 26 and 362nd Drive Intersection Improvement
- Project D6: OR 211 & Proctor Boulevard Intersection Improvement
- Project D9: Highway 211 & Dubarko Road Multimodal Improvement
- Project D14A: Bell Street Extension 1A
- Project D15A: 362nd Drive Extension 1A
- Project D20: Dubarko Road Extension
- Project D21B: Gunderson Road Extension
- Project D21D: Cascadia Village Extension 2
- Project D21F : Village Boulevard Extension 1
- Project D24: Highway 211 & Gunderson Road Intersection Improvement
- Project D27: Highway 211 & Dubarko Road Intersection Control Evaluation
- Project D31: Sandy Bypass Planning

Bicycle and Pedestrian projects in Package 1, including the following:

- Project P1: 362nd Drive – West sidewalk of Chinook Street to Industrial Way.
- Project P3: Bluff Road - West sidewalk gap infill from Bell Street to 15931 Bluff Road
- Projects C5 to C15: Pedestrian crossing improvements along Bluff Road, US 26, Hood Street, and Pleasant Avenue.
- Project C23: ADA improvements along Highway 211.

The Draft TSP includes updates to the City’s roadway functional classifications that are designed to accommodate anticipated level of access for all travel modes. This includes bike lane requirements and design standards for arterials and collectors and sidewalk standards for each functional classification. The TSP also includes new standards for shared-use paths, as shown in TSP Figure 25. The functional classifications include principal arterials, minor arterials, collectors, and local streets, which are depicted in TSP Figures 18-24 and TSP Table 4.

Based on the findings discussed above, OTP Policy 1.1 is satisfied.

Policy 1.2 – Equity, Efficiency and Travel Choices
It is the policy of the State of Oregon to promote a transportation system with multiple travel choices that are easy to use, reliable, cost-effective and accessible to all potential users, including the transportation disadvantaged.

<u>Findings:</u> Draft TSP Goal 8 is Equity, which establishes the goal for Sandy to “Support an equitable transportation system and provide transportation choices to all users.” Goal 8 includes the following three policies:

- Policy 8.1: Ensure the transportation system provides equitable access to underserved, disadvantaged, and vulnerable populations and is easy to use and accommodating to travelers of all ages.
- Policy 8.2: Ensure the pedestrian and bike facilities are designed clear of obstacles and obstructions (e.g., utility poles, grates) and meet ADA requirements.
- Policy 8.3: Provide multi-faceted and inclusive public engagement process that provides all community members an opportunity to provide input on transportation system decisions.

Multiple Draft TSP goals and policies address efficiency, cost effectiveness, accessibility, travel choices, and reliability, including the following:

- Policy 1.1: Maintain the livability of Sandy through well-connected transportation facilities.
- Policy 1.2: Improve the safety and accessibility of transit facilities.
- Policy 1.4: Ensure sufficient capacity to accommodate future travel demand (transit, bicycle, pedestrian, etc.) to, within, and through the City of Sandy.
- Policy 2.1: Optimize the use, performance, and value of existing facilities while planning for future infrastructure.
- Policy 3.6: Identify walking and biking needs in the urban growth boundary expansion area.
- Policy 6.3: Improve accessibility to transit services for people arriving by foot, by bicycle or with a mobility device.
- Policy 7.3: Provide safe pedestrian and bicycle routes between residential areas, schools, and public facilities.

The Draft TSP also includes 91 pedestrian and bicycle projects (Draft TSP Table 2, Figure 12, and Figure 13), and 8 transit projects. Fourteen of the projects are in Package 1, meaning funding priority is high and they will likely be constructed before 2040. This includes a project to construct ADA improvements along Highway 211 (Project C23).

The Draft TSP includes updates to the City's roadway functional classifications, which are designed to accommodate anticipated level of access for all travel modes. The functional classifications include principal arterials, minor arterials, collectors, and local streets, which are depicted in TSP Figures 18-24 and TSP Table 4.

Based on the findings discussed above, OTP Policy 1.2 is satisfied.

Policy 2.1 – Capacity and Operational Efficiency
It is the policy of the State of Oregon to manage the transportation system to improve its capacity and operational efficiency for the long term benefit of people and goods movement.

Policy 2.2 – Management of Assets
It is the policy of the State of Oregon to manage transportation assets to extend their life and reduce maintenance costs.

Findings: Draft TSP Policy 1.4 is to “Ensure sufficient capacity to accommodate future travel demand (transit, bicycle, pedestrian, etc.) to, within, and through the City of Sandy.” In addition, Draft TSP Policy 2.1 is to “Optimize the use, performance, and value of existing facilities while planning for existing infrastructure.” Likewise, Draft TSP Goal 4 – System Management – is to “Promote traffic management to achieve the efficient use of transportation infrastructure.” Goal 4 includes Policy 4.2, which is for the City to “Plan for transportation system that supports projected population and employment growth and maximize travel options by providing efficient routes for all modes of transportation.”

The TSP process included a mobility target analysis to provide a metric for assessing the impact of new development on the existing transportation system and for identifying needed capacity improvements. The Alternative Mobility Standards analysis is included in the TSP Appendix Section I. The analysis found that existing mobility targets are unlikely to be met due to funding constraints for capital projects, however the City will continue working with ODOT to establish an alternative mobility target specifically for US 26. Draft TSP Policy 4.3 is to “Support Oregon Transportation Commission adoption of an alternate mobility target for US 26 that allows for increased congestion on the highway corridor, especially during peak seasonal and continued planned growth travel periods.”

The TSP process included an Existing Conditions and Needs Analysis which are included in the TSP Appendix Sections D and E. These analyses evaluated system capacity and identified needs based on current and future conditions. The identified needs informed many of the proposed projects identified in TSP Table 1. Many of the projects include intersection improvements intended to improve capacity at signalized intersections along US 26, including Project D3 – US 26 & 362nd intersection improvements. Project 23 is intended to reduce congestion by adding turn lanes and providing minor widening. Projects D1 to D11 are all intended to reduce intersection congestion, three of which are Package 1 projects with project D3 having already secured funding.

The Draft TSP includes updates to the City’s roadway functional classifications. The classification system determines the level of mobility for all travel modes for anticipated level of access and usage. Each functional classification is also designed to meet the City’s roadway capacity needs. The functional classifications include principal arterials, minor arterials, collectors, and local streets, which are depicted in TSP Figures 18-24 and TSP Table 4.

The Draft TSP updated the street and access spacing standards, which require a minimum distance between public streets and minimum driveway spacing distances. The updated access spacing standards are intended to help reduce congestion and accident risk on the city's roadways. Appropriate access spacing will also help reduce the need for construction of additional roadway capacity. The updated access spacing standards are shown in Draft TSP Table 5.

The TSP process also identified updates to the City's Transportation Impact Analysis (TIA) guidelines, which are intended to apply conditions to land use development to minimize impacts on transportation facilities. TIA requirements apply to developments that are anticipated to have moderate to significant affects on the transportation system. They are intended to protect and extend the longevity of transportation facilities. The TIA guidelines are included in Appendix Section F of the Draft TSP.

Based on the findings discussed above, OTP Policy 2.1 and 2.2 are satisfied.

Policy 3.1 – An Integrated and Efficient Freight System
It is the policy of the State of Oregon to promote an integrated, efficient and reliable freight system involving air, barges, pipelines, rail, ships and trucks to provide Oregon a competitive advantage by moving goods faster and more reliably to regional, national and international markets.

<u>Findings</u>: Policy 4.1 of the Draft TSP is to "Balance local access to US 26 with the need to serve regional and statewide traffic, while supporting adjacent land uses." This goal recognizes the importance of US 26 as a regional and statewide transportation route, including for freight moving between the Greater Portland Metropolitan Area and Central Oregon. US 26 Bypass Planning (Project D28) and US Adaptive Signal System (Project S1) would create a more efficient freight system.

Based on the findings discussed above, OTP Policy 3.1 is satisfied.

Policy 3.2 – Moving People to Support Economic Vitality
It is the policy of the State of Oregon to develop an integrated system of transportation facilities, services and information so that intrastate, interstate and international travelers can travel easily for business and recreation.

<u>Findings:</u> US 26 serves as the primary arterial and connector between Sandy and the rest of the state. Several policies and projects are intended to improve mobility and maintain functional operations of the arterial/highway in Sandy, including the following:

- Policy 1.5: Emphasize local street connections, in an effort to reduce reliance on US 26 and Hwy 211 for local trips.
- Major Arterial – Commercial Corridor Cross-Section Standards (TSP Table 4)
- US 26 Access Spacing Standards (TSP Table 6)
- Intersection improvements along US 26 (Project D3, D4, and D8)

- US 26 Bypass Planning (Project D28)
- US 26 Safety Projects (Projects S1-S3)

Other policies and projects support the City's recreational travel needs, including:

- Policy 2.1: Protect the scenic resources in Sandy.
- Policy 2.2: Preserve the historic character of Sandy.
- Policy 2.3: Identify gateway and beautification treatments for Hwy 211.
- Policy 2.4: Support Mt. Hood Scenic Byway Enhancements.
- Policy 6.4: Increase public awareness of Sandy Transit (SAM) and its connectivity to other transit systems and transportation modes.

Based on the findings discussed above, OTP Policy 3.2 is satisfied.

Policy 4.1 – Environmentally Responsible Transportation System
It is the policy of the State of Oregon to provide a transportation system that is environmentally responsible and encourages conservation and protection of natural resources.

Findings: Draft TSP Goal 5 is Environmental, which calls for the City to "Minimize environmental impacts on natural resources and encourage carbon-neutral or efficient transportation alternatives." This goal includes the following four policies:

- Policy 5.1: Avoid or mitigate transportation project impacts to environmental resources including creeks and wetlands, cultural resources, and wildlife corridors.
- Policy 5.2: Support energy conservation by supporting public transit, transportation demand management, transportation system management and a multi-modal transportation system.
- Policy 5.3: Encourage transportation facility construction methods that reduce environmental impacts.
- Policy 5.4: Minimize street cross-sections to protect and preserve open space and reduce impervious surface.

The updated functional classification cross-section standards in the Draft TSP are intended to minimize right-of-way and pavement width, which will help minimize impervious surfaces and pavement and reduce impacts on adjacent natural areas. Further, the cross-section standards include requirements for planter strips, bike lanes, and sidewalks, all of which will help support lower-impact, environmentally sensitive travel transportation facilities, and mobility options. The cross-sections are shown in TSP Figures 18-24 and summarized in TSP Table 4.

In addition to the Environmental Goal, Draft TSP Goal 6 – Transit – includes four policies that are intended to promote transit service in the City and coordination with other regional services. Several other policies and projects promote pedestrian and bike travel, as discussed in findings for other OTP policies and Statewide Planning Goals.

Based on the findings discussed above, OTP Policy 4.1 is satisfied.

Policy 5.1 – Safety
It is the policy of the State of Oregon to continually improve the safety and security of all modes and transportation facilities for system users including operators, passengers, pedestrians, recipients of goods and services, and property owners.

<u>Findings:</u> Draft TSP Goal 7 is to “Promote a safe transportation system for all users.” This Goal includes the following policies:

- Policy 7.1: Encourage traffic safety through education, enforcement, and engineering.
- Policy 7.2: Identify high accident locations and implement specific counter measures to reduce their occurrence.
- Policy 7.3: Provide safe pedestrian and bicycle routes between residential areas, schools, and public facilities.
- Policy 7.4: Provide transportation design standards that encourage appropriate traffic volumes, speeds, and pedestrian safety.
- Policy 7.5: Provide enhanced pedestrians and bicyclists crossings where needed.
- Policy 7.6: Improve emergency service response time and evacuation routes through connectivity.
- Policy 7.7: Develop street design standards that support emergency service vehicle needs.

Several proposed policies promote a safe transportation system, such as Draft TSP Policy 1.2, which calls for the City to “Improve the safety and accessibility of transit facilities.” And Draft Policy 6.1 to “Provide service that is safe, comfortable, and useful to many different kinds of people.”

Several Draft TSP projects are intended to improve pedestrian safety, including several Package 1 projects (priority funding that will likely be complete by 2040). Package 1 pedestrian safety Projects C5-C15 include crosswalk, signal, curb ramp, curb extensions, and mark stop bars to improve safety conditions at intersections. In addition, the following projects are specifically intended to improve safety on US 26:

- Project S1: US 26 Adaptive Signal System.
- Project S2: US 26 at Ten Eyck Road Study – Study improvements to business access at Ten Eyck Road and US 26.
- Project S3: US 26 Speed Zone Study.

Based on the findings discussed above, OTP Policy 5.1 is satisfied.

Policy 7.1 – A Coordinated Transportation System
It is the policy of the State of Oregon to work collaboratively with other jurisdictions and agencies with the objective of removing barriers so the transportation system can function as one system.

Findings: Multiple Draft TSP policies promote collaboration with other jurisdictions and the state to support an integrated and coordinated local, regional, and statewide transportation system. TSP policies and projects that support interjurisdictional coordination include:

- Policy 2.3: Maximize the use of state and federal funds for transportation capital, operating, service, and demand improvements.
- Policy 6.2: Collaborate with other transportation agencies and support user-friendly connections between transit system.
- Policy 6.4: Increase public awareness of Sandy Transit (SAM) and its connectivity to other transit systems and transportation modes.
- Several ODOT led projects for intersection and sidewalk improvements on US 26 – TSP Tables 1 and 2.
- Sandy Transit Center – Projects C3 and C4 (ODOT led).
- Several transit projects to add or improve service with neighboring jurisdictions and transit agencies, including Boring, Clackamas County, TriMet, and Gresham. See the Draft Transit Projects Table (TSP page 39) for more details.

Based on the findings discussed above, OTP Policy 7.1 is satisfied.

Policy 7.3 – Public Involvement and Consultation
It is the policy of the State of Oregon to involve Oregonians to the fullest practical extent in transportation planning and implementation in order to deliver a transportation system that meets the diverse needs of the state.

Findings: As discussed in the findings for Statewide Planning Goal 1, the TSP development process included work and coordination with the CAC, three public open house events, and public noticing for meetings, events, and public adoption hearings. All of these activities are intended to solicit feedback on transportation needs and proposed improvements from the community as well as inform residents about the project and the City's planning process. In addition, Draft TSP Policy 8.3 calls for the City to "Provide multi-faceted and inclusive public engagement process that provides all community members an opportunity to provide input on transportation system decisions." See findings for Statewide Planning Goal 1 for more details on the TSP's engagement process and policies.

Based on the findings discussed above, OTP Policy 7.3 is satisfied.

Policy 7.4 – Environmental Justice
It is the policy of the State of Oregon to provide all Oregonians, regardless of race, culture or income, equal access to transportation decision-making so all Oregonians may fairly share in benefits and burdens and enjoy the same degree of protection from disproportionate adverse impacts.

<u>Findings:</u> Several Draft TSP policies and projects will help minimize environmental impacts on the community while supporting equitable transportation solutions. The following policies and projects are aligned with the OTP Environmental Justice policy:

- Policy 1.2: Improve the safety and accessibility of transit facilities.
- Policy 5.1: Avoid or mitigate transportation project impacts to environmental resources including creeks and wetlands, cultural resources, and wildlife corridors.
- Policy 6.1: Provide transit service that is safe, comfortable, and useful to many different kinds of people.
- Policy 6.3: Improve accessibility to transit services for people arriving by foot, by bicycle or with a mobility device.
- Policy 7.3: Provide safe pedestrian and bicycle routes between residential areas, schools, and public facilities.
- Policy 8.2: Ensure the pedestrian and bike facilities are designed clear of obstacles and obstructions (e.g., utility poles, grates) and meet ADA requirements.
- Policy 9.1: Develop recreational walking and biking routes to access employment, schools, shopping, and transit routes.
- Project C23: ADA improvements along Highway 211.

Based on the findings discussed above, OTP Policy 7.4 is satisfied.

III. Consistency with Oregon Highway Plan

The 1999 Oregon Highway Plan (OHP – updated through January 2023) establishes policies and investment strategies for Oregon's Statewide Highway System over a 20-year period and refines the goals and policies found in the OTP. Policies in the OHP emphasize the efficient management of the highway system to increase safety and to extend highway capacity, partnerships with other agencies and local governments, and the use of new techniques to improve road safety and capacity. These policies also link land use and transportation, set standards for highway performance and access management, and emphasize the relationship between state highways and local road, bicycle, pedestrian, transit, rail, and air systems. While the Draft TSP meets all OHP policies, the following policy list details how the Draft TSP meets the most notable policies. The Draft 2023 Sandy TSP meets the state's policies as follows:

Policy 1A – Highway Classification
Defines the function of state highways to serve different types of traffic that should be incorporated into and specified through IAMPs.

Policy 1C – State Highway Freight System
States the need to balance the movement of goods and services with other uses.

Findings: OHP Policy 1A classifies US 26 as a Statewide Highway. Policy 1A further designates the segment of US 26 between Powell Valley Road in Gresham to Orient Drive in Sandy as an expressway. In addition, US 26 has been designated as a Freight Route through the entire city of Sandy by ODOT.

As discussed in the findings for OTP Policy 3.2, several policies and projects are intended to maintain the function and capacity of US 26 to facilitate efficient and functional movement through the City by reducing congestion and improving capacity. See OTP Policy 3.2 findings for more details.

Based on the findings discussed above, OHP Policies 1A and 1C are satisfied.

Policy 1B – Land Use and Transportation
Recognizes the need for coordination between state and local jurisdictions.

Findings: Policy 1B recognizes that state highways serve as main streets in many communities. Several policies and projects support coordination with ODOT for operations and land use coordination along US 26. Several intersection and sidewalk improvement projects on US 26 include coordination with ODOT which are summarized in TSP Tables 1 and 2. Findings for OTP Policy 7.1 detail other Draft TSP policies and projects that support coordination with the state.

Based on the findings discussed above, OHP Policy 1B is satisfied.

Policy 1D – Scenic Byways
Preserve and enhance designated Scenic Byways, and consider aesthetic and design elements along with safety and performance considerations on designated Byways.

Findings: US 26 is designated as a National Scenic Byway from Bluff Road to the junction with OR 35 – this portion of US 26 is known as the “Mt. Hood Scenic Byway.” Draft TSP Policy 3.4 calls for the City to “Support Mt. Hood Scenic Byway Enhancements.” The findings for OTP Policies 2.1, 2.2, and 3.2 discuss several projects and policies that will help manage congestion and improve capacity along US 26, which will help US 26 maintain its scenic qualities.

Based on the findings discussed above, OHP Policy 1D is satisfied.

Policy 1F – Highway Mobility Standards
Sets mobility standards for ensuring a reliable and acceptable level of mobility on the highway system by identifying necessary improvements that would allow the highway to function in a manner consistent with OHP mobility standards.

Findings: The City will continue working with ODOT to establish an alternative mobility target specifically for US 26. Draft TSP Policy 4.3 is to "Support Oregon Transportation Commission adoption of an alternate mobility target for US 26 that allows for increased congestion on the highway corridor, especially during peak seasonal and continued planned growth travel periods."

Based on the findings discussed above, OHP Policy 1F is satisfied.

Policy 1G – Major Improvements
Requires maintaining performance and improving safety by improving efficiency and management before adding capacity. ODOT works with regional and local governments to address highway performance and safety.

Findings: The City will coordinate with ODOT on projects, many of which are Package 1 (priority funding) projects for intersection and sidewalk improvements along US 26 (see TSP Tables 1 and 2). ODOT was actively involved in creation of the Draft TSP and has worked closely with the City on projects that will benefit the City and also US 26.

Based on the findings discussed above, OHP Policy 1G is satisfied.

Policy 1H – Bypass Policy
Effectively serve state and regional traffic trips and to build bypasses to provide safe, efficient passage for through travelers and commerce.

Findings: The City has been exploring the feasibility of a bypass to US 26. The Draft TSP identifies a long term project (Project C23) to construct a bypass from east of Orient Drive to Shorty's Corner (Firwood Road), which is a Package 2 project. Draft TSP projects D28 and D31 include planning and feasibility studies for the US 26 Sandy Bypass.

Based on the findings discussed above, OHP Policy 1H is satisfied.

Policy 2B – Off-System Improvements
Helps local jurisdictions adopt land use and access management policies.

Findings: As mentioned in findings for OTP Policy 2.2, the Draft TSP proposes updates to the City's street and access spacing standards, which require a minimum distance between public streets and minimum driveway spacing distances. The updated access spacing standards are intended to help reduce congestion and accident risk on the city's roadways. Appropriate access spacing will also help reduce the need for construction of additional roadway capacity. The updated access spacing standards for US 26 are shown in Draft TSP Table 6.

The access management standards will be coordinated with land use regulations in the SMC. Code amendments were drafted to incorporate the new access spacing standards – see Draft TSP Appendix Section F. The drafted SMC amendments will be adopted separately from the TSP at a later date, most likely in 2023.

Based on the findings discussed above, OHP Policy 2B is satisfied.

Policy 2F – Traffic Safety
Improves the safety of the highway system.

Findings: Several Draft TSP projects are intended to improve pedestrian safety, including several Package 1 projects (priority funding that will likely be complete by 2040). In addition, the following projects are specifically intended to improve safety on US 26:

- Project S1: US 26 Adaptive Signal System.
- Project S2: US 26 at Ten Eyck Road Study – Study improvements to business access at Ten Eyck Road and US 26.
- Project S3: US 26 Speed Zone Study.

Access management updates and other intersection improvement projects along US 26 (see findings for OHP Policy 1G) will also improve the highway by improving traffic and congestion management along the corridor. In addition, Draft TSP Policy 1.6 is to "Minimize access along the City's arterials and consolidate or relocate access points when possible."

Based on the findings discussed above, OHP Policy 2F is satisfied.

Policy 3A - Classification and Spacing Standards
Sets access spacing standards for driveways and approaches to the state highway system.

Findings: As mentioned in findings for OTP Policy 2.2 and OHP Policy 2B, the Draft TSP proposes updates to the City's street and access spacing standards. Draft Street and Access Spacing standards will be consistent with ODOT spacing standards for US

26, as shown in Draft TSP Table 6. See findings for OTP Policy 2.2 and OHP Policy 2B for more information.

Based on the findings discussed above, OHP Policy 3A is satisfied.

Policy 4A – Efficiency of Freight Movement
It is the policy of the State of Oregon to maintain and improve the efficiency of freight movement on the state highway system and access to intermodal connections. The State shall seek to balance the needs of long distance and through freight movements with local transportation needs on highway facilities in both urban areas and rural communities.

<u>Findings:</u> US 26 has been designated as a Freight Route through the entire city of Sandy by ODOT. As discussed in the findings for OTP Policy 3.2, several policies and projects are intended to maintain the function and capacity of US 26 to facilitate efficient and functional movement through the City by reducing congestion and improving capacity. See OTP Policy 3.2 and OHP Policy 1.3 findings for more details.

Based on the findings discussed above, OHP Policy 4A is satisfied.

Policy 4B – Alternative Passenger Modes
It is the policy of the State of Oregon to advance and support alternative passenger transportation systems where travel demand, land use, and other factors indicate the potential for successful and effective development of alternative passenger modes.

<u>Findings:</u> Several Draft TSP policies and projects support multimodal transportation options (i.e., alternative modes), many of which apply to US 26. TSP projects include re-striping or widening to accommodate bike lanes and sidewalks along US 26 and Highway 211. See Draft TSP Table 2 for a complete list of alternative transportation projects along US 26 and Highway 211 and see findings for OTP Policies 1.1 and 1.2 for more information on policies that promote alternative transportation modes.

Based on the findings discussed above, OHP Policy 4B is satisfied.

Policy 4D – Transportation Demand Management
Support the efficient use of the state transportation system through investment in transportation demand management strategies.

<u>Findings:</u> The following Draft TSP policies promote transportation demand management strategies:

- Policy 5.2: Support energy conservation by supporting public transit, transportation demand management, transportation system management and a multi-modal transportation system.

- Policy 6.3: Improve accessibility to transit services for people arriving by foot, by bicycle or with a mobility device.
- Policy 6.4: Increase public awareness of Sandy Transit (SAM) and its connectivity to other transit systems and transportation modes.

Based on the findings discussed above, OHP Policy 4D is satisfied.

IV. Consistency with OAR 660 Division 12 Transportation Planning Rule (TPR)

The Transportation Planning Rule (TPR) “(i)mplements Statewide Planning Goal 12 (Transportation) to provide and encourage a safe, convenient, and economic transportation system. This division also implements provisions of other statewide planning goals related to transportation planning in order to plan and develop transportation facilities and services in close coordination with urban and rural development.” A major purpose of the TPR is to promote more careful coordination of land use and transportation planning, and to ensure that planned land uses are supported by and consistent with planned transportation facilities and improvements.

The TPR contains policies for preparing and implementing a transportation system plan.

<u>Findings:</u> The TSP Planning process included an evaluation of the City’s compliance with the TPR. The project team drafted amendments for the Sandy Development Code (SDC) to ensure the City’s land use requirements and standards comply with the TPR and are consistent with the Draft TSP. The draft amendments are summarized in TSP Appendix Section F – Regulatory Solutions. The proposed SDC amendments will be considered subsequent to TSP adoption, as part of a more comprehensive package of code amendments.

The City is currently engaged in the Sandy Clear and Objective Code Audit (Code Audit) project, which is focused on ensuring the City has clear and objective requirements for housing development. The TSP project team has been coordinating with the Code Audit project team to ensure that recommended modifications are consistent and not conflicting. Several SDC sections that have transportation-related recommendations also include clear and objective updates. For efficiency and to avoid confusion later, the City intends on adopting the updated transportation-related Code sections along with the clear and objective modifications as one package and through the same hearings and adoption process. The complete Code update adoption is tentatively scheduled for later in 2023.

Based on the findings discussed above, OAR 660-012 (TPR) is satisfied.

V. Consistency with OAR 734, Division 51

OAR 734-051 governs the permitting, management, and standards of approaches to state highways to ensure safe and efficient operation of state highways. OAR 734-051 policies address the following:

A. How to bring existing and future approaches into compliance with access spacing standards, and ensure the safe and efficient operation of the highway;
B. The purpose and components of an access management plan; and
C. Requirements regarding mitigation, modification, and closure of existing approaches as part of project development.

Findings: The Draft TSP includes access management standards for US 26, as shown in TSP Table 6. The access spacing standards for US 26 are consistent with rules for state highways (OAR 734-051 – Oregon Access Management Rule).

VI. Consistency with the Sandy Comprehensive Plan

The City's Comprehensive Plan is designed to guide land development within the city limits. The plan also establishes the goals, policies, and strategies to guide the city's future growth. Plan goals and policies are implemented through subsequent measures, such as zoning and development ordinances, that provide decision-making criteria and standards by which proposals can be evaluated.

The Comprehensive Plan goals reflect the first 14 Statewide Planning Goals.

Findings: The City of Sandy is currently undergoing a Comprehensive Plan update.[1] The Draft TSP will serve as the transportation element of the Comprehensive Plan. The Draft TSP is consistent with the current Comprehensive Plan, which is consistent with the Statewide Planning Goals. Relevant findings are found in the Consistency with Statewide Planning Goals section of this document.

VII. Consistency with the Sandy Municipal Code

Findings: The Sandy Development Code (SDC) is Title 17 of the Sandy Municipal Code. The SDC implements the land use goals and policies of the Sandy Comprehensive Plan, and therefore the SDC must be consistent with the Comprehensive Plan. Upon adoption, the Draft 2023 TSP will be the transportation element of the Comprehensive Plan. The TSP update process included draft amendments to the SDC to implement the transportation element of the Comprehensive Plan (i.e., the TSP), as well as to ensure consistency with OAR 660-012 (TPR). The draft transportation-related amendments (TSP Appendix Section F – Regulatory Solutions) will be considered for adoption as part of a larger package of code amendments to be considered later in 2023.

[1] https://www.ci.sandy.or.us/development-services/page/city-sandy-comprehensive-plan-update

VIII. Consistency with Sandy Municipal Code 17.12.40 Type IV Actions

Type IV (Legislative) procedures apply to legislative matters. Legislative matters involve the creation, revision, or large-scale implementation of public policy (e.g., adoption of land use regulations, zone changes, and comprehensive plan amendments that apply to entire districts, not just one property). Type IV matters are considered first by the Planning Commission with final decisions made by the City Council.

Applications processed under a Type IV procedure involve a public hearing pursuant to the requirements of Chapter 17.20. Notification of this public hearing shall be noticed according to the requirements of Chapter 17.22 with appeal of a Type IV decision made to the state Land Use Board of Appeals according to the provisions of Chapter 17.28.

D. Types of Applications:
2.Comprehensive Plan text or map amendment.

Findings: The Draft TSP is the transportation element of the Comprehensive Plan, and therefore the TSP update is considered a Comprehensive Plan amendment. The adoption procedures for the TSP update were followed for the Planning Commission public hearing that was held on May 22, 2023, and the City Council public hearing on June 20, 2023.