CITY OF SILVERTON

TRANSPORTATION SYSTEM PLAN

VOLUME 2: APPENDIX

OCTOBER 2020

CONTENTS

SECTION A

MEMORANDUM 1

PUBLIC AND STAKEHOLDER INVOLVEMENT STRATEGY

MEMORANDUM #1

DATE: December 16, 2015

TO: Silverton TSP Project Management Team

FROM: Ray Delahanty, AICP, DKS Associates
Charles Tso, DKS Associates

SUBJECT: **Silverton Transportation System Plan**
Task 3 Public and Stakeholder Involvement Strategy P15215-000

The City of Silverton, located in Marion County, Oregon, has recognized that citizen involvement is necessary in making wise and legitimate decisions. The following strategy provides specific actions for engaging citizens and stakeholders in the Silverton Transportation System Plan (TSP) development process.

The City of Silverton will involve the public and stakeholders primarily through a series of committee meetings, public open houses, and work sessions with elected officials, in addition to the distribution of project information through a variety of media. The following sections describes each of these outreach mechanisms and a milestone schedule showing the public process is attached.

Key transportation planning objectives and issues identified for this TSP update include:

- Identify bicycle and pedestrian friendly routes and safe crossing improvements of railroads and highways to improve multimodal access to destinations through Silverton and the surrounding area. The intersection of 1st Street/ Jefferson Street is of particular concern.
- Develop a Safe Routes to School Action Plan in conjunction with Silver Falls School District to improve community health and safety and help manage traffic congestion before and after school hours.
- Evaluate downtown circulation patterns and the potential two-way conversion of Water Street and 1st Street, which currently operate as a one-way couplet through Downtown Silverton.
- Address railroad crossing safety

Project Advisory Committee

A project advisory committee will inform and guide the plan. The City will not advertise for it, but the PAC meetings will be open for public attendance.

Project Advisory Committee (PAC) – The primary function of the PAC will be to review draft deliverables and, acting as community representatives, provide insight into community perspectives and comment on technical and regulatory issues, as well as provide recommendations for the TSP. This committee will include local business and neighborhood representatives, emergency service providers, a school district representative, and agency staff members from the City of Silverton, Marion County, and the Oregon Department of Transportation. As possible, members will be selected who can serve as liaisons to various community groups and provide a local face to the TSP update process. It is expected that the group will meet four times over the course of the project. The City will coordinate formation of the PAC and work with the Consultant to plan the project meetings.

Project Advisory Committee (PAC)	
Name	Affiliation

The PAC is currently scoped to meet four times throughout the plan development process, and these meetings will include the following content:

- The first meeting will provide a project orientation and review findings from the existing conditions analysis.
- The second meeting will be a review and discussion of future transportation conditions, as well as the results of the Safe Routes to School audit..
- The third meeting will discuss draft transportation solutions and how much funding the county is expected to have through the planning horizon.
- The fourth and final meeting will review the Draft TSP as well as proposed code and comprehensive plan amendments.

Community Events

Three community forums or work sessions will be held during the project. The three events will follow PAC meetings 1, 2, and 3, respectively, and cover topics similar to the three PAC meetings. Advertisement of community events will be through the City's website and media notices and other outreach as determined by the City. The City may supplement advertising through the local radio station, and posters/flyers displayed in public areas or at other community events.

City Public Outreach

TBD.

Engaging Disadvantaged Populations

Implementation of this Public Involvement Plan meets requirements and guidance found in ODOT Title VI (1964 Civil Rights Act) Plan. Specifically, the Title VI Plan identifies measures to reach and solicit comments from disadvantaged populations within a community. The list of Title VI and Environmental Justice populations includes: race/color/national origin, age, gender, disabilities (mental and physical), limited English proficiency, minority races, and low-income. The community was analyzed by block groups, using data obtained for Marion County from the 2010-2014 American Community Survey.[1] The City of Silverton contains eight block groups, and data from these block groups were compared to the county and statewide averages. The block group boundaries can be seen in the Figure 1, below.

[1] United States Census Bureau. American Fact Finder. 2010-2014 American Community Survey 5-Year Estimates. Accessed December 2015. http://factfinder.census.gov/faces/nav/jsf/pages/download_center.xhtml

City of Silverton Census Block Group Boundaries

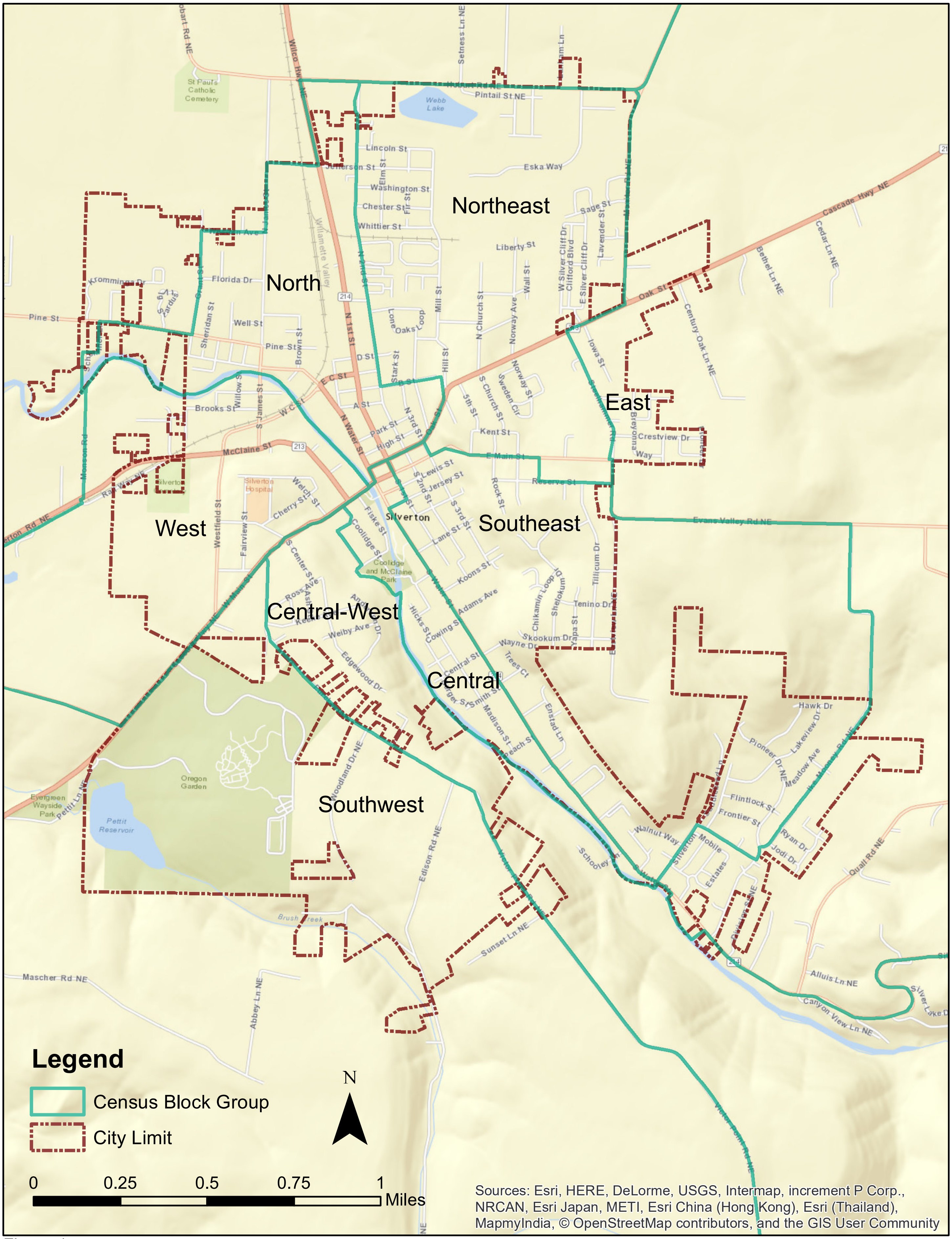

Figure 1

As shown in figure 3, compared to Marion County, Silverton's block groups are not as racially and ethnically diverse. However, northeast Silverton contains a greater percentage of ethnic minorities (16%) than the other seven block groups. This block group also has the highest percentage of Asian population (6%). Southwest Silverton has a higher concentration of limited English-speaking households (11%) than the County (5%). This block group also has the highest percentage of Hispanic or Latino population in Silverton. Three Silverton block groups have a higher percentage of senior citizens than the County average, which is 14%. Silverton exceeds the County and State average for households below poverty in the last 12 months in two of the eight block groups.

According to the 2010-2014 American Community Survey, 94% of the population in Silverton is identified as White Alone and 6% of the population is of Hispanic or Latino origin. In addition, 16% of individuals in Silverton were below the poverty between 2010 and 2014. The comparison is shown in the table below, with values above county or state averages appearing in bold.

	North-east	West	South-east	North	East	Central	South -west	Central -West	*Marion County*	*Oregon*
Total Population	3,069	708	2,857	790	1,764	816	2,331	1,190	320,448	3,900,343
Male	1,526	389	1,371	316	743	381	1,375	572	159,538	1,929,053
Female	1,543	319	1,486	474	1,021	435	956	618	160,910	1,971,290
Senior Citizen (>65)	13%	12%	10%	**16%**	**19%**	6%	**20%**	14%	14%	15%
White Alone	84%	97%	96%	95%	87%	99%	95%	100%	81%	85%
Black or African American Alone	0%	0%	0%	0%	0%	0%	1%	0%	1%	2%
American Indian and Alaska Native Alone	0%	0%	0%	0%	0%	0%	1%	0%	1%	1%
Asian Alone	**6%**	0%	0%	0%	0%	1%	0%	0%	2%	4%
Native Hawaiian and Other Pacific Islander Alone	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Some Other Race Alone	8%	3%	0%	3%	**12%**	0%	1%	0%	10%	4%
Two or More Races	2%	0%	4%	3%	1%	0%	2%	0%	5%	4%
Hispanic or Latino	10%	7%	4%	6%	2%	0%	11%	4%	25%	12%
Limited English Household	2%	2%	2%	0%	0%	0%	9%	0%	5%	3%
Households below Poverty Level in Last 12 Months	14%	**27%**	15%	**28%**	6%	15%	5%	4%	18%	16%
Population with Disability									14%	14%

Given the size of the Hispanic or Latino community in Silverton, written materials and translation service will be made available in Spanish upon request. In addition, the City will post project advertisements in locations where Hispanic or Latino community members are likely to see them.

To assist those that cannot drive, town hall meetings will be at locations accessible via transit, walking or biking when feasible given the meeting location. The county will provide downloadable materials on the project website. Hard copies of project documents will be available upon request for those without internet access.

To help engage senior citizens, the county will post project advertisements in locations where seniors will be likely to see them. Such locations may include drugstores, grocery stores, and retirement and assisted living communities.

Distribution and Review of Work Products

The City will email project work products directly to PAC members, and post them to the City's project website for access by the general public. PAC members will be able to comment directly through regular committee meetings. The general public will be able to comment during the public comment period at the end of PAC meetings, at community events, and through the City's website.

SECTION B

MEMORANDUM 2

REGULATORY EVALUATION

REGULATORY EVALUATION MEMORANDUM

DATE: March 28, 2016

TO: Silverton TSP Project Management Team

FROM: Shayna Rehberg, Angelo Planning Group
Matt Hastie, Angelo Planning Group

SUBJECT: Silverton Transportation System Plan Update
Task 5, Regulatory Evaluation Memorandum

Pursuant to Task 5, the purpose of this memorandum is to evaluate the City of Silverton Comprehensive Plan and Development Code for consistency with the Oregon Transportation Plan (OTP) and the Transportation Planning Rule (TPR). This evaluation is a preparatory step in developing amendments to the City Comprehensive Plan and Development Code that will be needed in order to reflect and implement the updated Transportation System Plan (TSP) and demonstrate compliance with the OTP and the TPR.

While the TPR evaluation featured in this memorandum is focused on potential amendments to the development code, as discussed in more detail below, the following project objectives and developments since adoption of the 2008 TSP will inform potential amendments to transportation policies in the comprehensive plan:

- Reflect the adopted West Side Land Use and Transportation Plan (2011)
- Incorporate direction and outcomes from the 2016 visioning and strategic planning process being conducted to establish a 10-year Strategic Plan for the city
- Include bike/pedestrian friendly travel routes
- Address pedestrian crossing safety, particularly with regard to safe routes to schools
- Prioritize needed sidewalk improvements
- Address railroad crossing safety

Oregon Transportation Plan (OTP)

The OTP is the State's comprehensive transportation plan. The planning horizon of the current plan extends through 2030. Its purpose is to establish goals, policies, strategies, and initiatives for long-range transportation planning in the state.

The OTP emphasizes maximizing the investment in the existing transportation system, integrating transportation and land use regulations, and integrating the transportation system across jurisdictions and modes. Key initiatives in the OTP are presented below and are reflected in the objectives of the Silverton TSP Update.

- Maintain the existing transportation system to maximize the value of the assets. If funds are not available to maintain the system, develop a triage method for investing available funds.
- Optimize system capacity and safety through information technology and other methods.
- Integrate transportation, land use, economic development and the environment.
- Integrate the transportation system across jurisdictions, ownerships and modes.
- Create a sustainable funding plan for Oregon transportation.
- Invest strategically in capacity enhancements.

OTP policy and investment strategies are translated into plans for specific transportation modes in order to implement statewide multimodal priorities. Modal plans, including the Oregon Highway Plan, have been reviewed for this project to ensure that the updated TSP will be consistent with policies, strategies, and design guidelines in the modal plans. Findings of consistency with these modal plans will be provided in the staff report prepared during the adoption phase of this project.

Transportation Planning Rule (TPR)

The Transportation Planning Rule (TPR) (OAR 660-012) implements Statewide Planning Goal 12 (Transportation), which is intended to promote the development of safe, convenient, and economic transportation systems that are designed to maximize the benefit of investment and reduce reliance on the automobile. The TPR includes direction for preparing, coordinating, and implementing TSPs. In particular, TPR Section -0045 (Implementation of the Transportation System Plan) requires local governments to amend their land use regulations to implement the TSP. It requires local governments to adopt land use and subdivision regulations to protect transportation facilities for their identified functions, including access control measures, standards to protect future operations of roads, and enhanced coordination of review procedures for land use applications.

TPR Section -0060 (Plan and Land Use Regulation Amendments) addresses amendments to plans and land use regulations. It specifies measures to be taken to ensure that allowed land uses are consistent with the identified function and capacity of existing and planned transportation facilities. Section -0060 establishes criteria for identifying the significant effects of plan or land use regulation amendments on transportation facilities, actions to be taken when a significant effect would occur, identification of planned facilities, and coordination with transportation facility providers.

Table A-1 in Attachment A provides a complete evaluation of the City of Silverton's Development Code (Title 18 of the Silverton Municipal Code) using Sections -0045 and -0060 of the TPR. The evaluation includes findings confirming whether existing development code language is consistent with applicable sections of the TPR. Because the current version of the development code is based on the State of Oregon Model Development Code for Small Cities, it is largely consistent with applicable sections of the TPR. However, there are some recommendations for amendments to establish or strengthen compliance of the Silverton Development Code with the TPR, in particular the most current version of the TPR. A summary of those recommendations is provided below.

- **Access management** – Review block (street spacing) standards for consistency with the recommendations in the updated TSP, and revised if necessary.
- **Standards to protect transportation facility operations** – Review existing transportation impact study (TIS) applicability thresholds for consistency with updated TSP, and consider adding TIS provisions for approval criteria, mitigation measures, and conditions of approval.
- **Agency coordination** – Add requirements for inviting affected transportation agencies to pre-application conferences, and call out transportation agencies specifically as potentially affected agencies requiring notice of hearings for Type IV applications.
- **Pedestrian and bicycle connections** – Add requirements for site connections to adjacent transit stops and adjacent community uses, ensure consistency between bikeway and sidewalk standards in the development code and in the updated TSP, and provide for exceptions to requiring accessways in constrained conditions.
- **Transit-related uses and amenities** – Create a new section of requirements for providing transit amenities, which should apply to sites adjacent to existing and planned transit stops regardless of zoning. Add provisions to existing parking area regulations that allow for parking areas to be used for park-and-rides and other transit-related uses, granted minimum parking requirements can still be met.
- **Carpool and vanpool parking** – Establish requirements for preferentially located carpool and vanpool parking, which can be narrowly applied to specified types of parking (e.g., employee) and parking areas of a specified size or number of spaces, and capped at a percentage.
- **Street design standards** – Determine whether to continue to duplicate street design standards (cross sections) from the TSP in the development code, and ensure that paved width options of 28 feet or less continue to be offered.
- **Plan and land use regulation amendments** – Either update development code provisions that already address compliance with TPR Section -0060 to reflect amendments made to the TPR, or simplify these provisions by replacing them with a reference to TPR Section -0060.

Additional development code amendments may be necessary to fully implement the recommendations of the updated TSP once a draft of the updated TSP has been completed. Examples include modifying street standards and other design standards related to transportation facilities. Further, because the TPR evaluation focuses on how the City implements its TSP through land use and development requirements, it does not include an evaluation of existing policy language. Project objectives, identified at the beginning of this memorandum, will inform potential changes to transportation policies in the comprehensive plan. The next memorandum, "Ordinance Amendments to the Comprehensive Plan and Development Code," will include all recommended amendments to development code and policy language.

ATTACHMENT A

Table A-1: TPR Evaluation of Silverton Development Code (SDC)

TPR Requirement	Development Code References and Recommendations
OAR 660-012-0045	
(1) Each local government shall amend its land use regulations to implement the TSP.	
(a) The following transportation facilities, services and improvements need not be subject to land use regulations except as necessary to implement the TSP and, under ordinary circumstances, do not have a significant impact on land use: (A) Operation, maintenance, and repair of existing transportation facilities identified in the TSP, such as road, bicycle, pedestrian, port, airport and rail facilities, and major regional pipelines and terminals; (B) Dedication of right-of-way, authorization of construction and the construction of facilities and improvements, where the improvements are consistent with clear and objective dimensional standards; (C) Uses permitted outright under ORS 215.213(1)(m) through (p) and 215.283(1)(k) through	All City of Silverton residential, commercial, and industrial districts permit transportation uses outright. Specifically, "Transportation facilities (operation, maintenance, preservation, and construction, per TSP)" are permitted in the districts, per Tables 2.2.110.A, 2.2.110.B, 2.3.110, and 2.4.110. Similarly, these transportation uses are permitted outright in the Public overlay district. **<u>Recommendation:</u> Existing code provisions address this TPR requirement. No changes to the development code are recommended.**

TPR Requirement	Development Code References and Recommendations
(n)[1], consistent with the provisions of 660-012-0065[2]; and (D) Changes in the frequency of transit, rail and airport services. (b) To the extent, if any, that a transportation facility, service, or improvement concerns the application of a comprehensive plan provision or land use regulation, it may be allowed without further land use review if it is permitted outright or if it is subject to standards that do not require interpretation or the exercise of factual, policy or legal judgment.	

[1] Transportation uses specified in ORS 215.213 and .283 include:

- Climbing and passing lanes within the right of way existing as of July 1, 1987.
- Reconstruction or modification of public roads and highways, including the placement of utility facilities overhead and in the subsurface of public roads and highways along the public right of way, but not including the addition of travel lanes, where no removal or displacement of buildings would occur, or no new land parcels result.
- Temporary public road and highway detours that will be abandoned and restored to original condition or use at such time as no longer needed.
- Minor betterment of existing public road and highway related facilities, such as maintenance yards, weigh stations and rest areas, within right of way existing as of July 1, 1987, and contiguous public-owned property utilized to support the operation and maintenance of public roads and highways.

[2] OAR 660-012-0065 (Transportation Improvements on Rural Lands); *(1) This rule identifies transportation facilities, services and improvements which may be permitted on rural lands consistent with Goals 3, 4, 11, and 14 without a goal exception.*

TPR Requirement	Development Code References and Recommendations
(c) In the event that a transportation facility, service or improvement is determined to have a significant impact on land use or requires interpretation or the exercise of factual, policy or legal judgment, the local government shall provide a review and approval process that is consistent with 660-012-0050. To facilitate implementation of the TSP, each local government shall amend regulations to provide for consolidated review of land use decisions required to permit a transportation project.	Referenced TPR Section -0050 addresses project development and implementation – how a transportation facility or improvement authorized in a TSP is designed and constructed. Project development may or may not require land use decision-making. The TPR directs that during project development, projects authorized in an acknowledged TSP will not be subject to further justification with regard to their need, mode, function, or general location. As stated in the previous response, transportation facilities in the TSP are permitted outright in all base zoning districts in Silverton. In terms of consolidated review, SDC Subsection 4.1.600(D)(2) requires that applications for more than one type of land use or development permit for the same site be consolidated for review and decision. **<u>Recommendation:</u> Existing code provisions address this TPR requirement. No changes to the development code are recommended.**
(2) Local governments shall 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. Such regulations shall include:	
(a) Access control measures, for example, driveway and public road spacing, median control and signal spacing standards, which are consistent with the functional classification of roads and consistent with limiting development on rural lands to rural uses and densities;	SDC Section 3.1.200 is dedicated to vehicular access and circulation, which applies to land divisions, partitions, lot consolidations, lot line adjustments, street vacations, development subject to land use review or design review; and changes proposed to existing regulations that will result in significant changes to access and circulation. Access to a designated state or county highway is subject to the provisions of this section as well as the requirements of the applicable roadway authority. The section establishes the following: that a traffic impact study (TIS) may be required by the Public Works Director related to access and circulation issues; that mitigation measures such as closing or consolidation of existing access points, reciprocal access easements for shared driveways, development of a frontage street, or installation of traffic control devices may be

TPR Requirement	Development Code References and Recommendations
	required as a condition of access permit approval; joint and cross-access requirements; that separation between street intersections and other street accesses shall be dictated by minimum spacing requirements in the TSP; and minimum spacing of 40, 60, and 80 feet of driveways from street intersection on local, collector, and arterial streets (the greater spacing being required when streets of two different functional classifications intersect). SDC Subsection 3.4.100(G) addresses street connectivity. The section establishes that access to arterial streets shall be minimized when the proposed development abuts an arterial street; and block lengths for subdivisions and site development of more than two acres in residential and commercial districts, which includes the following standards: ■ Residential districts: minimum of 100-foot block length and maximum 600-foot length with a desired block length of 500 feet; ■ Downtown commercial and downtown commercial fringe districts: block lengths shall be consistent with the existing town plat, as of November 5, 2008; and ■ General commercial district: minimum of 100-foot block length and maximum 600-foot length. **<u>Recommendation:</u> Existing code provisions address this TPR requirement. Block (street spacing) standards in SDC Subsection 3.4.100(G) will need to be reviewed for consistency with the recommendations in the updated TSP, and revised if necessary.**
(b) Standards to protect the future operations of roads, transitways and major transit corridors;	Traffic impact study (TIS) requirements are established in SDC Section 4.1.900. The provisions address when a TIS is required and how a TIS is to be prepared (e.g., by a professional engineer in accordance with applicable design standards and pursuant to a scope of work established by the Public Works Director). The requirements are referred to in the following sections:

TPR Requirement	Development Code References and Recommendations
	▪ SDC Section 3.1.200 – A TIS may be required to address access and circulation issues; ▪ Section 4.2.500 – A TIS may be required by the Community Development Director for Type III Design Review applications, pursuant to SDC 4.1.900; ▪ SDC 4.3.130 – A TIS may be required by the Community Development Director in a preliminary plat submission, pursuant to SCC 4.1.900; and ▪ SDC 4.7.600 – Requires comprehensive plan amendment and zoning change applications to determine significant effect in accordance with OAR 660-012-0060 and SDC 4.1.900. **<u>Recommendation:</u> Existing code provisions generally address this TPR requirement. It is recommended that the City review the existing threshold requirements for a TIS in the context of updated TSP recommendations and identify whether any amendments are needed. In addition, it is recommended that the addition of approval criteria (including reference to adopted safety, mobility, and other performance standards in the updated TSP or other adopted documents) and provisions explicitly regarding mitigation measures and conditions of approval be considered.**
(c) Measures to protect public use airports by controlling land uses within airport noise corridors and imaginary surfaces, and by limiting physical hazards to air navigation;	As stated in the 2008 TSP, there are no existing or planned public airports in Silverton. Therefore, this requirement is not applicable.
(d) A process for coordinated review of future land use decisions affecting transportation facilities, corridors or sites;	*See responses and recommendation for TPR Section -0045(1)(c) and -0045(2)(f).*
(e) A process to apply conditions to development proposals in order to minimize impacts and protect	Conditions of approval related to transportation are addressed in several sections of the SDC, including the following.

TPR Requirement	Development Code References and Recommendations
transportation facilities, corridors or sites;	▪ SDC 3.1.200 – As described in the response for TPR Section -0045(2)(a), access-related mitigation measures such as closing or consolidation of existing access points, reciprocal access easements for shared driveways, development of a frontage street, or installation of traffic control devices may be required as a condition of approval. ▪ SDC 4.1.300(C)(1) and SDC 4.1.400(C)(1) – For both Type II and Type III procedures, it is required that the City notify the road authority of facilities that are adjacent to or affected by a proposed development, so that the agency can review, comment on, and suggest conditions of approval for the application. ▪ SDC 4.4.400(C) – Conditional use provisions include specific examples of transportation-related conditions of approval that may be imposed, such as: access point size, location, and design; right-of-way dedication; improvement of streets, sidewalks, curbs, planting strips, pathways, or trails; and construction of, dedication of land for, or nonremonstrance agreements for pedestrian/bicycle pathways. ▪ SDC 1.5.300 – In the Definitions section of the development code, "access management" is defined as a type of measure that may be used as a condition of development approval, including measures identified in the Vehicular Access and Circulation section of the SDC but also including right-in-right-out-only approaches, medians, dedicated turn lanes, and provision for future mitigation opportunities by land dedication or easement. **Recommendation: Existing provisions in the SDC address this TPR requirement. It is recommended that a minor change be considered to add examples of potential conditions of approval currently included in the Definitions section to the Vehicular Access and Circulation section to better articulate potential access-related conditions of approval. Otherwise, no changes to the development code are needed or recommended.**

TPR Requirement	Development Code References and Recommendations
(f) Regulations to provide notice to public agencies providing transportation facilities and services, MPOs, and ODOT of: (A) Land use applications that require public hearings; (B) Subdivision and partition applications; (C)Other applications which affect private access to roads; and (D)Other applications within airport noise corridor and imaginary surfaces which affect airport operations.	Notice of applications and hearings is addressed by existing development code provisions in the following ways: ▪ SDC 4.1.300(C)(1) and SDC 4.1.400(C)(1) – For both Type II and Type III procedures, it is required that the City notify the road authority of facilities that are adjacent to or affected by a proposed development, so that the agency can review, comment on, and suggest conditions of approval for the application. [Question for City: Has notice to transportation agencies mailed at least 20 days before hearing for a Type III application been sufficient for the agencies to respond?] ▪ Section 4.1.500(D)(2) – For Type IV procedures, it is required that the City notify "any affected governmental agency" about the first hearing between 20 and 40 days before the hearing. **Recommendations: Existing provisions in the code address this TPR requirement. To strengthen agency coordination and compliance with this requirement, it is recommended that requirements for inviting affected transportation agencies, as well as any other relevant agencies, be added to pre-application conferences provisions in SDC 4.1.600(C); and that transportation agencies be called out as potentially affected governmental agencies requiring hearing notice for Type IV procedures in SDC 4.1.500.** **[Question for City: How well does notification/coordination work for Silverton now? APG can suggest any other development code changes accordingly.**
(g) Regulations assuring amendments to land use designations, densities, and design standards are consistent with the functions, capacities and	*See responses and recommendations related to TIS requirements, TPR Section -0045(2)(b), and to plan and land use regulation amendments, TPR Section -0060.*

TPR Requirement	Development Code References and Recommendations
performance standards of facilities identified in the TSP.	
(3) Local governments shall adopt land use or subdivision regulations for urban areas and rural communities as set forth below. The purposes of this section are to provide for safe and convenient pedestrian, bicycle and vehicular circulation consistent with access management standards and the function of affected streets, to ensure that new development provides on-site streets and accessways that provide reasonably direct routes for pedestrian and bicycle travel in areas where pedestrian and bicycle travel is likely if connections are provided, and which avoids wherever possible levels of automobile traffic which might interfere with or discourage pedestrian or bicycle travel.	
(a) Bicycle parking facilities as part of new multi-family residential developments of four units or more, new retail, office and institutional developments, and all transit transfer stations and park-and-ride lots.	Bicycle parking requirements are established in SDC 3.3.400 for all uses, other than single-family dwelling and duplexes, which are subject to land use or site design review. The requirements address the minimum number of required spaces, design options, location, visibility, security, lighting, and long-term spaces. Minimum space requirements are not specified for transit stations and park-and-ride lots; however, there are provisions for uses not specified ("other categories") that require the number of spaces to be determined through land use review, site design review, or conditional use review, as applicable. **<u>Recommendations:</u> Existing provisions in the development code address this TPR requirement. No code changes are recommended.**
(b) On-site facilities shall be provided which accommodate safe and convenient pedestrian and bicycle access from within new subdivisions, multi-family developments, planned developments, shopping centers, and commercial districts to adjacent residential areas and transit stops, and to neighborhood activity centers within one-half mile of the development. Single-family residential developments shall generally	Provisions of this TPR requirement are addressed in the following ways: ▪ **Connections between proposed development and adjacent development, transit stops, and community destinations** – SDC 3.1.300(A)(1) requires that an on-site walkway be provided "throughout the development site and connect to all future phases of development, and to existing or planned off-site adjacent trails, public parks, and open space areas to the greatest extent practicable." Connecting or stubbing walkway(s) to adjacent streets and to private property with a previously

TPR Requirement	Development Code References and Recommendations
include streets and accessways. Pedestrian circulation through parking lots should generally be provided in the form of accessways. (A) "Neighborhood activity centers" includes, but is not limited to, existing or planned schools, parks, shopping areas, transit stops or employment centers; (B) Bikeways shall be required along arterials and major collectors. Sidewalks shall be required along arterials, collectors and most local streets in urban areas except that sidewalks are not required along controlled access roadways, such as freeways; (C) Cul-de-sacs and other dead-end streets may be used as part of a development plan, consistent with the purposes set forth in this section; (D) Local governments shall establish their own standards or criteria for providing streets and accessways consistent with the purposes of this section. Such measures may include but are not limited to: standards for spacing of streets or accessways; and standards for excessive out-of-direction travel; (E) Streets and accessways need not be required where one or more of the following conditions exist: (i) Physical or topographic conditions make a street or accessway connection impracticable. Such conditions include but are not limited to freeways,	reserved public access easement may be required. Internal circulation is addressed in SDC 3.1.300(A)(3) such that walkways must connect entrances of all buildings, as well as to on-site parking areas, storage areas, recreational facilities, and common areas. Large parking areas must be broken up so that no contiguous parking area exceeds one acre or 150 spaces, and it may be required that parking areas be broken up with landscape areas and pedestrian connections including access ways (20-foot minimum total width), public streets, or "shopping streets" defined in the code. Walkway design and construction is addressed in SDC 3.1.300(B). ■ **Bikeways and sidewalks** – SDC 3.4.100(F) establishes that street rights-of-way and improvements must be developed consistent with standards in the TSP, and must use the low end of a range of standards unless unique conditions exist as determined by the reviewing body. Street design standards are established in the 2008 TSP (cross-sections in Figures 8-3 to 8-5) and are duplicated in SDC Figures 3.4.100(E)(1)-(3). The standards show bikeways on all arterials and collectors, except for Downtown District arterials and collectors, where it is expected that travel lanes will be shared between bicycle and vehicles, and for two-lane hillside or infill collectors with no on-street parking, where bike lanes are not required if average daily traffic is 5,000 or less or the posted speed is 25 mph or less. Sidewalks are included in all street design standards, except for alleys and on only one side for local streets on hillsides (constrained). ■ **Cul-de-sacs** – SDC 3.4.100(G)(5) provisions regarding pedestrian access ways state that the City may require an access way where a connection is needed between a cul-de-sac and another street.

TPR Requirement	Development Code References and Recommendations
railroads, steep slopes, wetlands or other bodies of water where a connection could not reasonably be provided; (ii) Buildings or other existing development on adjacent lands physically preclude a connection now or in the future considering the potential for redevelopment; or (iii) Where streets or accessways would violate provisions of leases, easements, covenants, restrictions or other agreements existing as of May 1, 1995, which preclude a required street or accessway connection.	■ **Street spacing standards** – *See response and recommendations related to street and access standards in TPR Section -0045(2)(a).* ■ **Exceptions for streets and accessways** – SDC 3.4.100(G)(5) calls for pedestrian access ways when it is impractical to make a street connection pursuant to standards in SDC 3.4.100(G)(4). **<u>Recommendations:</u> Existing SDC provisions generally address these TPR requirements. The following minor amendments are proposed to strengthen and ensure consistency with the requirements.** ■ **Connections between proposed development and adjacent development, transit stops, and community destinations – Add requirements for pedestrian connections to adjacent existing or planned transit stops and other adjacent community-oriented uses and services to SDC 3.1.300(A)(1).** ■ **Bikeways and sidewalks – Track treatment of bikeways and sidewalks in street design standards in the updated TSP. Determine whether to continue duplicating these street standards in the SDC. (Generally, it is not recommended to have the standards in both places – but rather refer to the standards in the TSP in the development code – to avoid the need to amend both documents when updates occur. However, it is also understood that having the standards in the development code provides ease of reference.) Ensure consistency between the updated TSP and SDC.** ■ **Exceptions for streets and accessways – Add exceptions for having to provide access ways in constrained situations in a new subsection, SDC 3.4.100(G)(6).**

TPR Requirement	Development Code References and Recommendations
	■ ***Note:*** **Amend a minor error in access way provisions, by changing "accessories" to "access ways" in the following passage in SDC 3.4.100(G)(5): "Such accessories shall conform to all of the following standards…"**
(c) Off-site road improvements are otherwise required as a condition of development approval, they shall include facilities accommodating convenient pedestrian and bicycle and pedestrian travel, including bicycle ways on arterials and major collectors	*See recommendations for traffic impact study provisions in TPR Section -0045(2)(b) and responses and recommendations related to conditions of approval in Section -0045(2)(e).*
(e) Internal pedestrian circulation within new office parks and commercial developments shall be provided through clustering of buildings, construction of accessways, walkways and similar techniques.	*See responses and recommendations related to on-site walkways in TPR Section -0045(3)(b).*
(4) To support transit in urban areas containing a population greater than 25,000, where the area is already served by a public transit system or where a determination has been made that a public transit system is feasible, local governments shall adopt land use and subdivision regulations as provided in (a)-(g) below:	
(a) Transit routes and transit facilities shall be designed to support transit use through provision of bus stops, pullouts and shelters, optimum road geometrics, on-road parking restrictions and similar facilities, as appropriate;	Salem-Keizer Transit (Cherriots) offers regional transit service called Chemeketa Area Regional Transportation System (CARTS), Monday through Friday. ■ CARTS Route 20, Silverton/Salem, serving Silverton and Mt. Angel ■ CARTS Route 25, North Marion, flex service serving Woodburn, Mt. Angel, and Silverton (flex service must be arranged 24 hours in advance and generally your origin and destination must be within 0.75 miles of a CARTS bus stop) Existing provisions for pedestrian amenities in commercial districts (GC and DC) allow new development and major remodels to provide a transit amenity, consistent with the transit

TPR Requirement	Development Code References and Recommendations
	service provider's standards, as one way to fulfill pedestrian amenity requirements (SDC 2.3.170(B)(1) and (2)). **<u>Recommendations:</u> Existing development code provisions partially address this TPR requirement in allowing for the provision of transit amenities but not requiring them and in addressing them only in commercial districts. It is recommended that requirements for transit amenities associated with existing and planned transit stops, regardless of zoning district and in coordination with the service provider, be established in a new subsection (Subsection U) under SDC 3.4.100 (Transportation Standards). Provisions for pull-outs and other street design standards related to transit service should be addressed in the updated TSP.**
(b) New retail, office and institutional buildings at or near major transit stops shall provide for convenient pedestrian access to transit through the measures listed in (A) and (B) below.	There are not "major transit stops"[3] in Silverton, according to definition provided in the TPR.

[3] Pursuant to the TPR:
"Major transit stop" means:
(a) Existing and planned light rail stations and transit transfer stations, except for temporary facilities;
(b) Other planned stops designated as major transit stops in a transportation system plan and existing stops which:
(A) Have or are planned for an above average frequency of scheduled, fixed-route service when compared to region wide service. In urban areas of 1,000,000 or more population major transit stops are generally located along routes that have or are planned for 20 minute service during the peak hour; and
(B) Are located in a transit oriented development or within 1/4 mile of an area planned and zoned for:
(i) Medium or high density residential development; or
(ii) Intensive commercial or institutional uses within 1/4 mile of subsection (i); or
(iii) Uses likely to generate a relatively high level of transit ridership.

TPR Requirement	Development Code References and Recommendations
(A) Walkways shall be provided connecting building entrances and streets adjoining the site; (B) Pedestrian connections to adjoining properties shall be provided except where such a connection is impracticable as provided for in OAR 660-012-0045(3)(b)(E). Pedestrian connections shall connect the on-site circulation system to existing or proposed streets, walkways, and driveways that abut the property. Where adjacent properties are undeveloped or have potential for redevelopment, streets, accessways and walkways on site shall be laid out or stubbed to allow for extension to the adjoining property; (C) In addition to (A) and (B) above, on sites at major transit stops provide the following: (i) Either locate buildings within 20 feet of the transit stop, a transit street or an intersecting street or provide a pedestrian plaza at the transit stop or a street intersection; (ii) A reasonably direct pedestrian connection between the transit stop and building entrances on the site; (iii) A transit passenger landing pad accessible to disabled persons;	*See the responses and recommendations related to on-site pedestrian circulation, pedestrian connections to adjacent sites, and pedestrian connections to transit stops in TPR Sections -0045(3)(b) and for transit amenities in TPR Section -0045(4)(a).*

TPR Requirement	Development Code References and Recommendations
(iv) An easement or dedication for a passenger shelter if requested by the transit provider; and (v) Lighting at the transit stop.	
(c) Local governments may implement (4)(b)(A) and (B) above through the designation of pedestrian districts and adoption of appropriate implementing measures regulating development within pedestrian districts. Pedestrian districts must comply with the requirement of (4)(b)(C) above;	The City is not proposing to designate a pedestrian district at this time. **Recommendation:** **No development code changes are needed or recommended.**
(d) Designated employee parking areas in new developments shall provide preferential parking for carpools and vanpools;	Existing development code language does not address this TPR requirement. **Recommendation:** **Create a new Subsection 6 under Subsection F (General Parking Standards) in Section 3.3.300 (Automobile Parking Standards) to address this requirement. The new subsection can be narrowly applied to employee parking and parking areas over a specified size (acres) or number of parking spaces, and the number of carpool/ vanpool spaces required can be calculated as a percentage of total off-street vehicle parking required.**
(e) Existing development shall be allowed to redevelop a portion of existing parking areas for transit-oriented uses, including bus stops and pullouts, bus shelters, park and ride stations, transit-oriented developments, and similar facilities, where appropriate;	Existing development code language does not address this TPR requirement. **Recommendation:** **Create a new Subsection 7 under Subsection F (General Parking Standards) in Section 3.3.300 (Automobile Parking Standards) to address this requirement. Allow existing development to redevelop a portion of existing parking areas for transit-related improvements identified in an adopted transit service provider plan, granted that minimum parking requirements can still be met.**

TPR Requirement	Development Code References and Recommendations
(f) Road systems for new development shall be provided that can be adequately served by transit, including provision of pedestrian access to existing and identified future transit routes. This shall include, where appropriate, separate accessways to minimize travel distances;	*See the responses and recommendations related to transit access in TPR Sections -0045(3)(b) and -0045(4)(a).*
(g) Along existing or planned transit routes, designation of types and densities of land uses adequate to support transit.	Existing CARTS stops include the following stops, in the following zoning districts: ■ Silverton Hospital (Center and Fairview Streets) – Public Overlay zone, surrounded by other Public Overlay zoning and residential zoning ■ Silverton City Hall (Jersey and Water Streets) – Downtown Commercial zone ■ Silverton Roth's (1st Street and Bow Tie Lane) – General Commercial zone, surrounded by other General Commercial zoning and low to high density residential zoning **<u>Recommendation:</u> Existing land use designations are adequate and development code or zoning district changes are not recommended at this time. The TSP update process will be coordinated with transit service provider plans.**
(6) In developing a bicycle and pedestrian circulation plan as required by 660-012-0020(2)(d), local governments shall identify improvements to facilitate bicycle and pedestrian trips to meet local travel needs in developed areas. Appropriate improvements should provide for more direct, convenient and safer bicycle or pedestrian travel within and between residential areas and neighborhood activity centers (i.e., schools, shopping, transit stops). Specific measures include, for	This requirement will be addressed by the TSP update planning process. The requirement can be met by adopting improvements in developed areas that meet the needs identified in the TSP's pedestrian and bicycle circulation elements. Specific measures identified in this TPR requirement are addressed by the development code in the following ways. ■ **Walkways between cul-de-sacs and adjacent roads** – *See responses and recommendations related to connections between cul-de-sacs and streets in TPR Section -0045(3)(b).* ■ **Walkways between buildings** – *See responses and recommendations related to on-site pedestrian circulation on-site in TPR Section -0045(3)(b).*

TPR Requirement	Development Code References and Recommendations
example, constructing walkways between cul-de-sacs and adjacent roads, providing walkways between buildings, and providing direct access between adjacent uses.	■ **Access between adjacent uses** – *See responses and recommendations related to connections to adjacent sites and community destinations in TPR Section -0045(3)(b).*
(7) Local governments shall establish standards for local streets and accessways that minimize pavement width and total ROW consistent with the operational needs of the facility. The intent of this requirement is that local governments consider and reduce excessive standards for local streets and accessways in order to reduce the cost of construction, provide for more efficient use of urban land, provide for emergency vehicle access while discouraging inappropriate traffic volumes and speeds, and which accommodate convenient pedestrian and bicycle circulation. Notwithstanding section (1) or (3) of this rule, local street standards adopted to meet this requirement need not be adopted as land use regulations.	Street design standards (cross sections) in the adopted TSP are duplicated in the Transportation Standards section of SDC in Figures 3.4.100(E)(1)-(3). Two cross sections (for low volume and hillside/constrained streets) feature28 feet of pavement and parking either on one side of the street or on neither side of the street. Alleys are included in the cross sections and feature no parking and 12-16 feet of pavement. **<u>Recommendation:</u> Existing development code provisions address this TPR requirement.** **It is recommended that street design standards be tracked in the updated TSP to ensure that options for paved street widths of 28 feet or less are retained.** **The question of whether to continue duplicating street standards from the TSP in the SDC is also raised, as addressed in the recommendations for TPR Section -0045(3)(b).**

TPR Requirement	Development Code References and Recommendations
OAR 660-12-0060 Amendments to functional plans, acknowledged comprehensive plans, and land use regulations that significantly affect an existing or planned transportation facility shall assure that allowed land uses are consistent with the identified function, capacity, and performance standards of the facility.	SDC 4.7.600 is a set of development code provisions dedicated to TPR, and specifically TPR Section -0060, compliance. The provisions reflect the version of the TPR that was in effect when SDC 4.7.600 was adopted. **Recommendation: Existing development code provisions generally address this TPR requirement. SDC 4.7.600 should be updated to reflect amendments made to TPR Section -0060 since the adoption of SDC 4.7.600. Alternately, the City may wish to simplify this code section by referencing the TPR, rather than including extensive language from the Rule.**

SECTION C

MEMORANDUM 3

ORDINANCE AMENDMENTS TO THE COMPREHENSIVE PLAN AND DEVELOPMENT CODE

MEMORANDUM

Comprehensive Plan and Development Code Amendments – Adoption Draft (Task 8)

Silverton Transportation System Plan Update

DATE	June 5, 2020
TO	Silverton Transportation System Plan Update PMT
FROM	Matt Hastie and Shayna Rehberg, Angelo Planning Group (APG)
CC	File

The purpose of this memorandum is to provide adoption-ready Comprehensive Plan and Development Code amendments to meet the objectives of the Transportation System Plan (TSP) update, as well as the requirements of the Transportation Planning Rule (OAR 660, Division 12). New language us provided in underline and deleted text in ~~strikeout~~ format.

COMPREHENSIVE PLAN AMENDMENTS

The existing Silverton Comprehensive Plan includes narrative, goals, policies and actions related to transportation in the *Transportation Element* of the Plan. To ensure consistency between the Comprehensive Plan and the Transportation System Plan (TSP) and to avoid the need for future significant amendments to the Comprehensive Plan as part of future updates to the TSP, the existing *Transportation Element* of the Comprehensive Plan will be replaced with the following reference to the updated TSP.

Goals, policies and all other information associated with transportation planning is found in the City of Silverton's Transportation System Plan, Volume 1, adopted August, 2020. The Transportation System Plan is adopted as a supporting, ancillary document to the Comprehensive Plan.

The updated transportation goals and policies found in the TSP were developed through a community engagement process associated with the update of the TSP. That process included a review of existing Comprehensive Plan goals and policies for consistency with the TSP and with current and projected future transportation conditions and project in Silverton. The updated goals and policies provide consistent, comprehensive policy direction and detail for building, maintaining and improving the City's transportation system in a way that supports all modes of travel and builds on previous community visioning, goal-setting and strategic planning efforts.

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SILVERTON DEVELOPMENT CODE (SDC) AMENDMENTS

Following are proposed amendments to the SDC (Title 18 of the Silverton Municipal Code) needed to implement the updated TSP and ensure compliance with the Oregon Transportation Planning Rule (TPR) as codified in Oregon Revised Statute (ORS) 660-012. The rationale for these amendments is described in previous project memos.

Proposed Amendments #1: Access-Oriented Conditions of Approval

Chapter 3.1 Access and Circulation
3.1.200 Vehicular access and circulation.
[…]
E. Conditions of Approval. The public works director or other road authority may require the closing or consolidation of existing curb cuts or other vehicle access points, recording of reciprocal access easements (i.e., for shared driveways), development of a frontage street, installation of traffic control devices, right-in-right-out-only approaches, medians, dedicated turn lanes, provision for future mitigation opportunities by land dedication or easement, 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.

Proposed Amendments #2: Driveway Spacing Standards

3.1.200 Vehicular access and circulation.
[…]
K. Access Connections and Driveway Design. All openings onto a public right-of-way (access connections) and driveways shall conform to all of the following design standards:

[…]

3. Driveways. Driveways shall meet the following standards, subject to review and approval by the public works director:

[…]

g. All driveways must be located the maximum distance which is practical from a street intersection. In no instance shall the distance from an intersection be closer than the following as measured from the near driveway edge, and the through curb line, as shown by the following illustration:

Arterial Street	~~80~~250 feet
Collector Street	~~60~~150 feet
Infill Collector Street	50 feet
Neighborhood/Local Street	~~40~~10 feet

Where streets of different functional classifications intersect, the distance required is that of the classification which requires the greatest distance between the access point and the intersection.

4. Driveway Construction…

Proposed Amendments #3: Pedestrian and Bicycle Connections

3.1.300 Pedestrian and bicycle access and circulation.
A. Site Layout and Design. To ensure safe, direct, and convenient pedestrian circulation, all developments, except single-family detached housing and duplex dwellings, shall provide a continuous pedestrian system. The pedestrian system shall be designed based on the criteria in subsections (A)(1) through (3) of this section:

1. Continuous Walkway System. The pedestrian walkway system shall extend throughout the development site and connect to all future phases of development, ~~and~~ to existing or planned off-site adjacent trails, public parks, and open space areas to the greatest extent practicable, and to adjacent existing or planned transit stops. The developer may also be required to connect or stub walkway(s) to adjacent streets and to private property with a previously reserved public access easement for this purpose in accordance with the provisions of SDC 3.1.200, Vehicular access and circulation, and SDC 3.4.100, Transportation standards.
2. Safe, Direct, and Convenient…
3. Connections within Developments…
4. Connections from Development. Off-site pedestrian and bicycle facilities that provide connections from the proposed development may be required consistent with findings from a traffic impact study. See SDC 4.1.900 for traffic impact study requirements.

Proposed Amendments #4: Carpool/Vanpool Parking

Chapter 3.3 Parking and Loading
3.3.300 Automobile parking standards.
F. General Parking Standards.

[…]
5. Screening of Parking Areas…
6. Carpool/Vanpool/Rideshare Parking. Parking areas that have designated employee parking and more than 20 vehicle parking spaces shall provide at least 10% of the employee parking spaces (minimum two spaces) as preferential carpool, vanpool, and rideshare parking spaces. Preferential carpool, vanpool, and rideshare parking spaces shall be closer to the employee entrance of the building than other parking spaces, with the exception of ADA accessible parking spaces.

Proposed Amendments #5: Transit-Related Redevelopment of Parking Areas

3.3.300 Automobile parking standards.
F. General Parking Standards.

[…]
5. Screening of Parking Areas…
6. Carpool/Vanpool/Rideshare Parking…
7. Transit-Related Facilities in Parking Areas. Parking spaces and portions of parking areas may be used for transit-related uses such as transit stops and park-and-ride or rideshare areas, provided the improvements are identified in an adopted transit or transportation plan and applicable requirements in this Section can still be met.

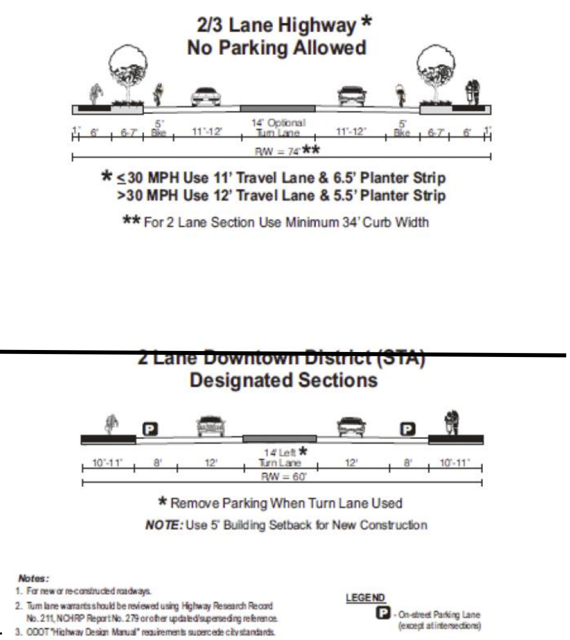
Proposed Amendments #6: Cross-Sections

3.4.100 Transportation standards.

[…]

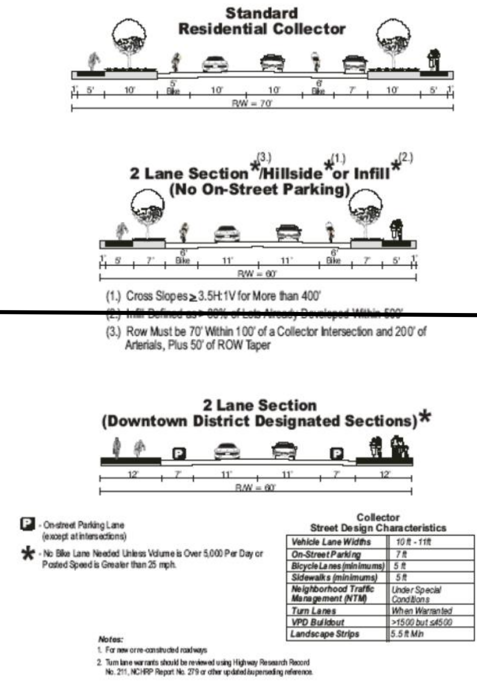
E. Street Location, Width, and Grade. The location, width and grade of all streets shall conform to ~~Figures 3.4.100(E)(1) through (3),~~ the transportation system plan~~,~~ and approved street plans or subdivision plats. Street location and design shall be determined in relation to existing and planned streets, topographic conditions, public convenience and safety, and in appropriate relation to the proposed use of the land to be served by such streets as follows:

1. Street grades shall be approved by the public works director in accordance with the design standards; and
2. Where the location of a street is not shown in an existing street plan, the location of streets in a development shall either:
    a. Provide for the continuation and connection of existing streets in the surrounding areas, conforming to the street standards of this section; or
    b. Conform to a street plan adopted by the city if it is impractical to connect with existing street patterns because of particular topographical or other existing conditions of the land. Such a plan shall be based on the type of land use to be served, the volume of traffic, the capacity of adjoining streets, and the need for public convenience and safety.

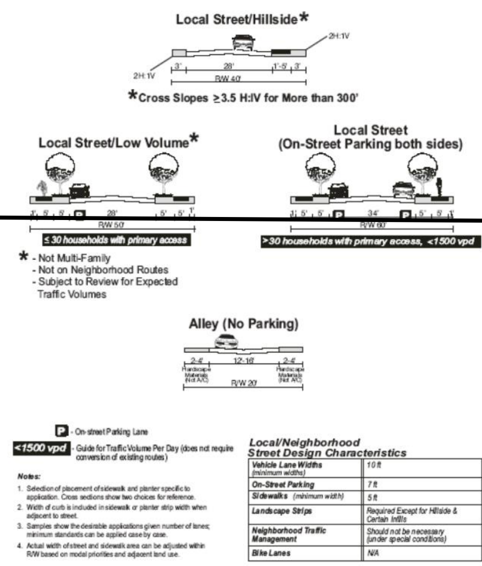


~~**Arterial Street Cross-Sections**~~

~~**Figure 3.4.100(E)(1)**~~



~~Collector Street Cross-Sections~~
~~Figure 3.4.100(E)(2)~~



~~Local/Neighborhood Street Cross-Sections~~
~~Figure 3.4.100(E)(3)~~

F. Minimum Rights-of-Way and Street Sections…

Proposed Amendments #7: Access Way Exceptions

3.4.100 Transportation standards.

G. Subdivision Street Connectivity. All subdivisions shall conform to all the following access and circulation design standards, as applicable:

[…]

5. Pedestrian Access Way Standards. Where it is impractical to make a street connection in conformance with the standards in subsection (G)(4) of this section, a pedestrian access way must be provided at or near the middle of a block in lieu of the street connection, as generally shown in Figure 3.4.100.G. The city may also require developers to provide an access way where a cul-de-sac or other street is planned and the access way would connect the streets or provide a connection to other developments. Such accessories shall conform to all of the following standards…

6. Pedestrian Access Way Exceptions. Access ways need not be required where one or more of the following conditions exist:

a. Physical or topographic conditions make a street or accessway connection impracticable. Such conditions include but are not limited to freeways, railroads, steep slopes, wetlands, or other bodies of water where a connection could not reasonably be provided;

b. Buildings or other existing development on adjacent lands physically preclude a connection now or in the future considering the potential for redevelopment; or

c. Where access ways would violate provisions of leases, easements, covenants, restrictions or other existing agreements, which preclude a required street or accessway connection.

Proposed Amendments #8: Transit Access and Transit-Supportive Improvements

3.4.100 Transportation standards.

T. Alley Standards…

U. Transit Access and Supportive Improvements. Development that is proposed adjacent to an existing or planned transit stop, as designated in an adopted transportation or transit plan, shall provide the following transit access and supportive improvements in coordination with the transit service provider:

1. Reasonably direct pedestrian connections between the transit stop and primary entrances of the buildings on site. For the purpose of this Section, "reasonably direct" means a route that does not deviate unnecessarily from a straight line or a route that does not involve a significant amount of out-of-direction travel for users.

2. The primary entrance of the building closest to the street where the transit stop is located is oriented to that street.

3. A transit passenger landing pad that is ADA accessible.

4. An easement or dedication for a passenger shelter or bench if such an improvement is identified in an adopted plan.

5. Lighting at the transit stop.

6. Other improvements identified in an adopted transportation or transit plan.

Proposed Amendments #9: Notification of Transit and Transportation Service Providers

Chapter 4.1 Types of Review Procedures

4.1.300 Type II procedure (limited land use decisions).

[…]

C. Notice of Application for Type II (Limited Land Use) Decision.

1. Before making a Type II limited land use decision, the community development director or designee shall mail notice to:
    a. All owners of record of real property and residents within a minimum of 500 feet of the subject site;
    b. All city-recognized neighborhood groups or associations whose boundaries include the site;
    c. Any person who submits a written request to receive a notice; and
    d. Any governmental agency that is entitled to notice under an intergovernmental agreement entered into with the city. The city may notify other affected agencies. The city shall notify the road authority and transit and transportation service providers when there is a proposed development abutting or affecting their transportation facility or service and allow the agency to review, comment on, and suggest conditions of approval for the application.
2. The purpose of the notice is to give nearby property owners and other interested people the opportunity to submit written comments about the application before the Type II decision is made. The goal of this notice is to invite people to participate early in the decision-making process.

4.1.400 Type III procedure (quasi-judicial).
[…]
C. Notice of Hearing.
1. Mailed Notice. The city shall mail the notice of the Type III hearing. The records of the county assessor's office are the official records for determining ownership. Notice of a Type III application hearing or Type II appeal hearing shall be given by the community development director or designee in the following manner:
    a. At least 20 days before the hearing date, notice shall be mailed to:
        i. The applicant and all owners or contract purchasers of record of the property that is the subject of the application;
        ii. All property owners of record and residents within 700 feet of the site;
        iii. Any governmental agency that is entitled to notice under an intergovernmental agreement entered into with the city. The city may notify other affected agencies. The city shall notify the road authority and transit and transportation service provider when there is a proposed development abutting or affecting their transportation facility or service and allow the agency to review, comment on, and suggest conditions of approval for the application;
        iv. Owners of airports in the vicinity shall be notified of a proposed zone change in accordance with ORS 227.175;
        v. Any neighborhood or community organization recognized by the city council and whose boundaries include the property proposed for development;
        vi. Any person who submits a written request to receive notice;
        vii. For appeals, the appellant and all persons who provided testimony in the original decision; and
        viii. For a zone change affecting a manufactured home or mobile home park, all mailing addresses within the park, in accordance with ORS 227.175.
    […]

4.1.500 Type IV procedure (legislative).
[…]
D. Notice of Hearing.
1. Required Hearings…
2. Notification Requirements. Notice of public hearings for the request shall be given by the community development director or designee in the following manner:
a. At least 20 days, but not more than 40 days, before the date of the first hearing on an ordinance that proposes to amend the comprehensive plan or any element thereof, or to adopt an ordinance that proposes to rezone property, a notice shall be prepared in conformance with ORS 227.186 and mailed to:
i. Each owner whose property would be rezoned in order to implement the ordinance (including owners of property subject to a comprehensive plan amendment) shall be notified if a zone change would be required to implement the proposed comprehensive plan amendment;
ii. All property owners and residents within 700 feet of the subject site;
iii. Any affected governmental agency, including road authorities and transportation service providers;
iv. Any person who requests notice in writing;
v. For a zone change affecting a manufactured home or mobile home park, all mailing addresses within the park, in accordance with ORS 227.175;
vi. Owners of airports shall be notified of a proposed zone change in accordance with ORS 227.175.
[…]
d. The Oregon Department of Land Conservation and Development (DLCD) shall be notified in writing of proposed comprehensive plan and development code amendments at least ~~45~~35 days before the first public hearing at which public testimony or new evidence will be received. The notice to DLCD shall include a DLCD certificate of mailing.
[…]

Proposed Amendments #10: Transportation Agencies at Pre-Application Conferences

4.1.600 General provisions applicable to all reviews – 120-day rule – Time computation – Pre-application conferences – Acceptance and review – Community development director's duties – Amended applications – Resubmittal – Appeals.
[…]
C. Pre-Application Conferences.
1. Applicant's Responsibility…
2. Information Provided...
3. Disclaimer…
4. Changes in the Law…
5. Agency Participation. The city shall invite agencies potentially affected by the proposal, including road authorities and transportation service providers, to participate in the pre-application conference, whether in person or in written comments.

Proposed Amendments #11: Traffic Impact Study Requirements

4.1.900 Traffic impact studies.
The purpose of this section is to assist in determining which road authorities participate in land use decisions, and to implement Section 660-012-0045(2)(e) of the State Transportation Planning Rule that requires the city to adopt a process to apply conditions to development proposals in order to minimize impacts and protect transportation facilities. This chapter establishes the standards for when a proposal must be reviewed for potential traffic impacts; when a traffic impact study must be submitted with a development application in order to determine whether conditions are needed to minimize impacts to and protect transportation facilities; what must be in a traffic impact study; and who is qualified to prepare the study.
A. When a Traffic Impact Study Is Required. The city or other road authority with jurisdiction may require a traffic impact study (TIS) as part of an application for development, a change in use, or a change in access. A TIS shall be required when a land use application involves one or more of the following actions:

1. A change in zoning or a plan amendment designation if required by the public works director;
2. Any proposed development or land use action resulting in an increase of 20 single-family dwellings or 200 average daily trips, whichever is less, per the Institute of Transportation Engineers (ITE) Trip Generation Manual;
3. Where a road authority states that it has operational or safety concerns with its facility(ies);
4. A change in land use that may cause an increase in use of adjacent streets by vehicles exceeding the 20,000 pound gross vehicle weights by 20 peak hour trips or more per day;
5. The location of the access driveway does not meet minimum sight distance requirements, or is located where vehicles entering or leaving the property are restricted, or such vehicles queue or hesitate on the state highway, creating a safety hazard;
6. A change in internal traffic patterns that may cause safety problems, such as backup onto a street or greater potential for traffic accidents.

B. Traffic Impact Study Preparation. A traffic impact study shall be prepared and certified by a professional engineer in accordance with the requirements of the road authority and public works design standards, with the specific scope of work to be determined by the public works director. The study shall account for nearby development and past traffic impact studies, as determined by the public works director. If the road authority is the Oregon Department of Transportation (ODOT), consult ODOT's regional development review planner and OAR 734-051-180. (Ord. 08-06 § 3, 2008)
C. Approval Criteria. The traffic impact study report shall be reviewed according to the following criteria:

1. The study complies with the content requirements set forth by the city and/or other road authorities as appropriate;
2. The study demonstrates that adequate transportation facilities exist to serve the proposed land use action or identifies mitigation measures that resolve identified traffic safety problems in a manner that is satisfactory to the road authority;
3. For affected city facilities, the study demonstrates that the project meets mobility and other applicable performance standards established in the adopted transportation system plan, and includes identification of multi-modal solutions used to meet these standards, as needed; and
4. Proposed design and construction of transportation improvements are in accordance with the design standards and the access spacing standards specified in the transportation system plan.

D. Conditions of Approval.

1. The city may deny, approve, or approve a proposal with conditions necessary to meet operational and safety standards; provide the necessary right-of-way for planned improvements; and require construction of improvements to ensure consistency with the future planned transportation system.

2. Construction of off-site improvements may be required to mitigate impacts resulting from development that relate to capacity deficiencies and public safety; and/or to upgrade or construct public facilities to city standards.

3. Where the existing transportation system is shown to be impacted by the proposed use, improvements such as paving; curbing; installation of or contribution to traffic signals; and/or construction of sidewalks, bikeways, access ways, paths, or streets that serve the proposed use may be required.

4. 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 in the development approval shall indicate how the required improvements directly relate to and are roughly proportional to the impact of development.

Proposed Amendments #12: Transportation Planning Rule Compliance

Chapter 4.7 Zoning Map and Development Code Text Amendments
4.7.600 Transportation planning rule compliance.
A. Review of Applications for Effect on Transportation Facilities. When a development application includes a proposed comprehensive plan amendment, development code amendment, or zoning change, the proposal shall demonstrate it is consistent with the adopted transportation system plan and the planned function, capacity, and performance standards of the impacted facility or facilities. Proposals shall be reviewed to determine whether they significantly affect a transportation facility pursuant to Oregon Administrative Rule (OAR) 660-012-0060 (Transportation Planning Rule - TPR) and in accordance with traffic impact study provisions in SDC 4.1.900. Where it is found that a proposed amendment would have a significant effect on a transportation facility in consultation with the applicable roadway authority, the city shall work with the roadway authority and applicant to modify the request or mitigate the impacts in accordance with the TPR and applicable law~~be reviewed to determine whether it significantly affects a transportation facility, in accordance with OAR 660-012-0060 (the transportation planning rule (TPR)) and the traffic impact study provisions of SDC 4.1.900~~. ~~"Significant" means the proposal would:~~

~~1. Change the functional classification of an existing or planned transportation facility (exclusive of correction of map errors). This would occur, for example, when a proposal causes future traffic to exceed the levels associated with a "collector" street classification, requiring a change in the classification to an "arterial" street, as identified by the city's transportation system plan (TSP); or~~

~~2. Change the standards implementing a functional classification system; or~~

~~3. As measured at the end of the planning period identified in the road authority's adopted TSP, allow types or levels of land use that would result in levels of travel or access that are inconsistent with the functional classification of an existing or planned transportation facility; or~~

~~4. Reduce the performance of an existing or planned transportation facility below the minimum acceptable performance standard identified in the road authority's TSP; or~~

~~5. Worsen the performance of an existing or planned transportation facility that is otherwise projected to perform below the minimum acceptable performance standard identified in the road authority's TSP.~~

~~B. Amendments That Affect Transportation Facilities. Except as provided in subsection (C) of this section, amendments to the comprehensive plan and land use regulations that significantly affect a transportation facility shall assure that allowed land uses are consistent with the function, capacity, and level of service of the facility identified in the TSP. This shall be accomplished by one of the following:~~

~~1. Adopting measures that demonstrate that allowed land uses are consistent with the planned function of the transportation facility; or~~

~~2. Amending the TSP to provide transportation facilities, improvements, or services adequate to support the proposed land uses; such amendments shall include a funding plan to ensure the facility, improvement, or service will be provided by the end of the planning period; or~~

~~3. Altering land use designations, densities, or design requirements to reduce demand for automobile travel and meet travel needs through other modes of transportation; or~~

~~4. Amending the planned function, capacity or performance standards of the transportation facility; or~~

~~5. Providing other measures as a condition of development or through a development agreement or similar funding method, specifying when such measures will be provided.~~

~~C. Exceptions. Amendments to the comprehensive plan or land use regulations with a significant effect on a transportation facility, where the facility is already performing below the minimum acceptable performance standard identified in the road authority's transportation system plan (TSP), may be approved when all of the following criteria are met:~~

~~1. The amendment does not include property located in an interchange area, as defined under applicable law;~~

~~2. The currently planned facilities, improvements or services are not adequate to achieve the standard;~~

~~3. Development resulting from the amendment will, at a minimum, mitigate the impacts of the amendment in a manner that avoids further degradation to the performance of the facility by the time of the development; and~~

~~4. The road authority provides a written statement that the proposed funding and timing for the proposed development mitigation are sufficient to avoid further degradation to the facility.~~
~~(Ord. 08-06 § 3, 2008)~~

SECTION D

MEMORANDUM 4

EXISTING CONDITIONS EVALUATION

Technical Memorandum

720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500
www.dksassociates.com

DATE: June 10, 2016

TO: Silverton TSP Update Project Management Team

FROM: Ray Delahanty, AICP
Lacy Brown, P.E.
Charles Tso

SUBJECT: Silverton Transportation System Plan Update
Existing Conditions Evaluation

This memorandum presents the findings of an evaluation of the existing transportation system in Silverton, Oregon. Questions addressed in this document include:

- What makes Silverton unique?
- Where do people want to go?
- How do people get there?
- What transportation infrastructure is available?
- How well does the system perform?

The following sections summarize the relevant findings for each of these key questions.

What makes Silverton unique?

The City of Silverton is located in the eastern plains of the mid-Willamette Valley, with access to larger metropolitan areas like Salem and Portland, but providing unique, historical small-town character. The city features a well-preserved, connected, and walkable downtown area situated close to Silver Creek, which runs through the heart of the city. The topography of the city is mostly flat in the north and west, with hills rising near Silver Creek in the southern part of the city. Close to 10,000 resident call Silverton home today, up from about 7,500 in 2000.

Silverton's location and amenities also make it attractive to visitors. In addition to its charming and vibrant historic downtown area, the city is home to the popular Oregon Garden, a unique destination that showcases the range of diverse botanical variety in the Willamette Valley. Silverton is also a primary gateway to Silver Falls State Park to the south, which draws over a million visitors a year.

Silverton sits at the junction of two state highways: OR 213 (Main Street and McClaine Street in the city), which connects the Portland and Salem metropolitan areas through Molalla and Mulino, and OR 214 (N 1st Street and S Water Street), which connects from Woodburn and I-5 through Silverton to Silver Falls State Park. This means Silverton has good accessibility to the employment, shopping, and cultural opportunities of the Willamette Valley's larger cities, but may also experience additional traffic from through trips, particularly between Salem and the eastern Portland metropolitan area.

Where do people want to go?

Local Attractions

There are many attractions in and around the City of Silverton. Within the City, the historic downtown area is a major attraction with a wide variety of shops and restaurants. There are also eight parks within the City, including a skate park, a dog park, and the Silverton Reservoir Marine Park just south of town. The closest attraction outside of the City limits is the Oregon Garden, an 80-acre botanical garden located on the southwest edge of the City. Adjacent to the Oregon Garden is the Frank Lloyd Wright Gordon House. Attractions further outside the city include Silver Falls State park to the south, the historic town of Mt. Angel to the north, and the Cascade mountain range to the east, as well as numerous farms and vineyards along the way. The largest employment centers in the area are the City of Salem to the west and the Portland Metropolitan Area to the north.

Travel To, From, and Through the City

Because Silverton is surrounded by commercial and recreational attractions, the traffic patterns in and around the city are unique. In the PM peak hour, approximately 75% of the traffic entering Silverton from outside origins has a destination within the City; the remaining 25% of traffic travels through the City to other outside destinations. Of the traffic generated within the City of Silverton in the PM peak hour, approximately 60% remains within the City while 40% travels to destinations outside of the City.

How do people get there?

People in Silverton use a variety of transportation modes to meet their daily needs within the city and to travel to destinations outside the city. The following sections summarize current travel-related activity in the city.

Existing Activity Levels

Pedestrian and bicycle activity at study intersections throughout Silverton was reviewed for the PM peak period (4:00 p.m. to 6:00 p.m.) on a typical weekday in November, 2015.[1] Motor vehicle activity was observed both in the PM peak period and over a 24-hour period. In summer months, activity levels are generally higher due to pleasant weather encouraging residents to go outside, especially by walking and bicycling. Although weekend activity levels were not measured, because of the potential for more shopping and recreational travel on weekends, pedestrian and bicycle activity would be expected to be higher.

Pedestrian Activity

Pedestrian activity was observed at 22 intersections during the weekday PM peak period (4:00 to 6:00 PM) and are shown in Table 1. Of all the study intersections reviewed, the N Water Street/W Main Street intersection had the most pedestrian activity (70 crossings during the evening peak hour). A single downtown city block, bounded by N Water Street, Oak Street, S First Street, and E Main Street, accounted for Silverton's four intersections with the highest pedestrian crossing activity (over 30 crossings at each intersection in the PM peak hour). Three crossing locations exceeded 20 pedestrian crossings in the PM peak hour:

- West leg of N Water Street/W Main Street (27 crossings)
- East leg of N Water Street/W Main Street (20 crossings)
- West leg of Oak Street/S 1st Street (23 crossings)

These high activity locations, which indicate high demand for north-south pedestrian travel, are near a great variety of commercial and retail establishments, such as restaurants, cafés and a movie theater, that facilitate active street life.

Bicycle Activity

Bicycle counts were conducted at the same 22 intersections during the weekday PM peak period (4:00 to 6:00 PM) and are shown in Table 1. The highest bicycle volume, with 9 people biking through the intersection, was observed at W C Street and S James Street. All the other intersections saw very few or zero bicycles during the evening peak period.

Note that because counts were taken in November, a colder weather month, less bicycle activity would be expected than for the majority of the year. Also, counts during the PM peak hour may not reflect peak bicycling activity. Bicycling is often a more common choice for non-commute-to-work purposes, such as shopping, going to school, or recreation. All these trips tend to occur outside the evening peak period.

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[1] Based on count data collected at study intersections on Thursday, November 19, 2015

Table 1 Pedestrian and Bicycle Activity at Study Intersections

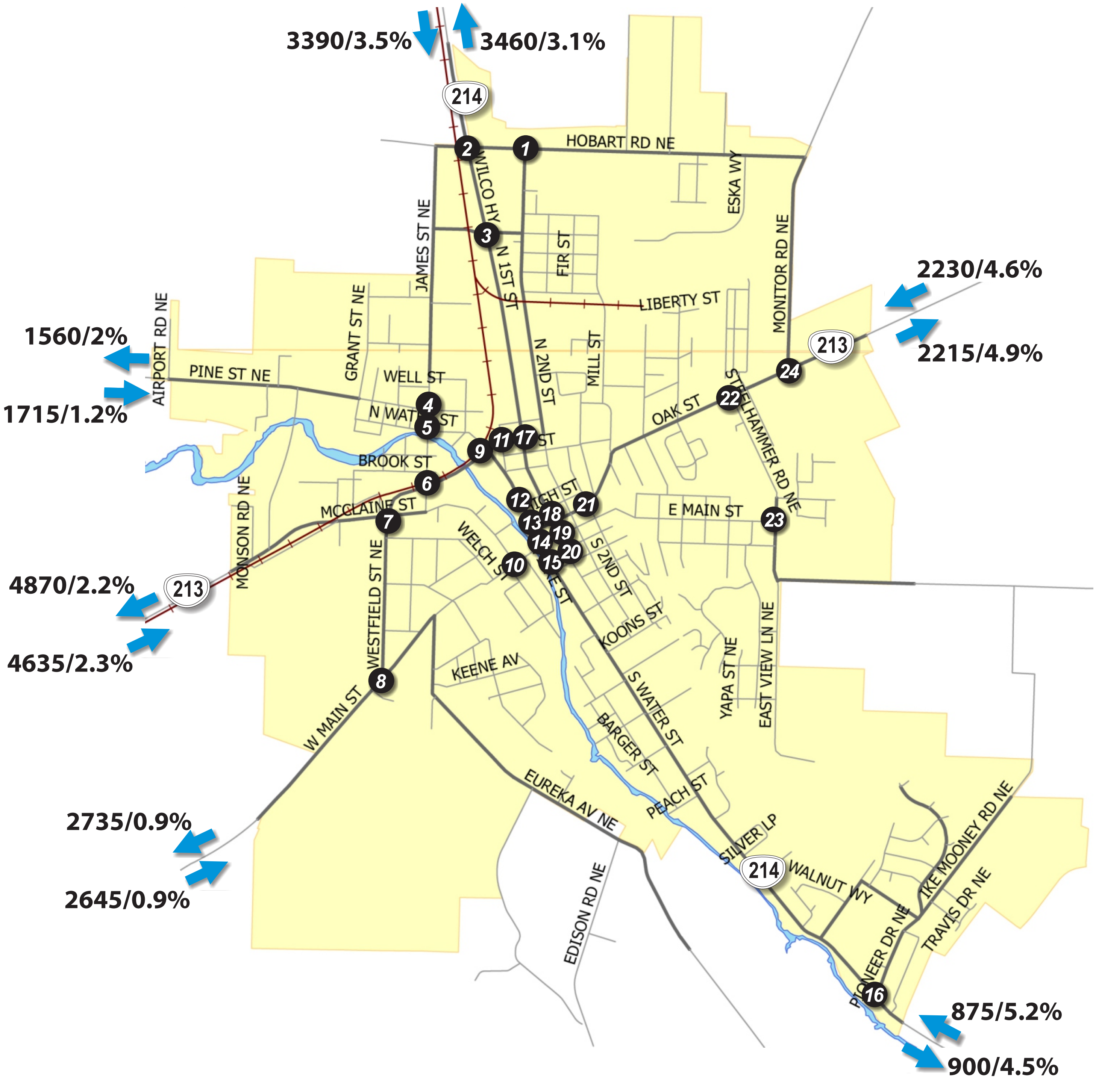
Intersection	Pedestrian Volume	Bicycle Volume
N Water / W Main St	70	0
Oak / N 1st St	56	0
S 1st St / E Main St	42	1
N Water / Oak St	32	0
N 1st / E C St	17	2
N Water St / Park St	13	2
McClaine St / W Main St	10	1
N 2nd St / Oak St	9	1
N James / N Water St	9	1
S Water St / Lewis St	9	0
S 1st St / Lewis St	8	1
N James St / Pine St	6	0
W C St / S James St	4	9
Monitor Rd / Oak St	2	0
N 1st / Jefferson St	2	0
W C St / McClaine St	2	0
Westfield St / W Main St	2	0
Front St / E C St	1	2
Hwy 214 / Hobart Rd NE	0	0
N 2nd St / Hobart Rd NE	0	0

Source: DKS Associates

Motor Vehicle

Daily traffic volume trends along the six gateway roadways into Silverton are consistent with typical urban area traffic patterns, with the highest volumes occurring during AM and PM peak hours (typically 7-9 a.m. and 4-6 p.m.). The directional traffic patterns at the northern and western gateways are representative of a "bedroom community" where the majority of home-to-work traffic is leaving Silverton during the a.m. peak hours and returning to Silverton during the p.m. peak hours, likely to and from Salem and Portland. Conversely, the directional traffic patterns at the eastern and southern gateways are relatively balanced during both peak hours as there is minimal commuter traffic traveling east and south of the City. Average daily traffic and heavy vehicle percentages for the key gateways into the City are shown in Figure 1, and daily traffic patterns on each of the six gateway roadways are shown on Figure 2 through Figure 7.

City of Silverton
Transportation System Plan



LEGEND

\# - Study Intersection

ADT/% Heavy Vehicles

(Heavy Vehicles = Buses & Trucks with 3 or More Axles)

0 0.5 miles

DKS

Figure 1

Average Daily Traffic (ADT) & Percentage of Heavy Vehicles

Data Collected on 11/17/2015

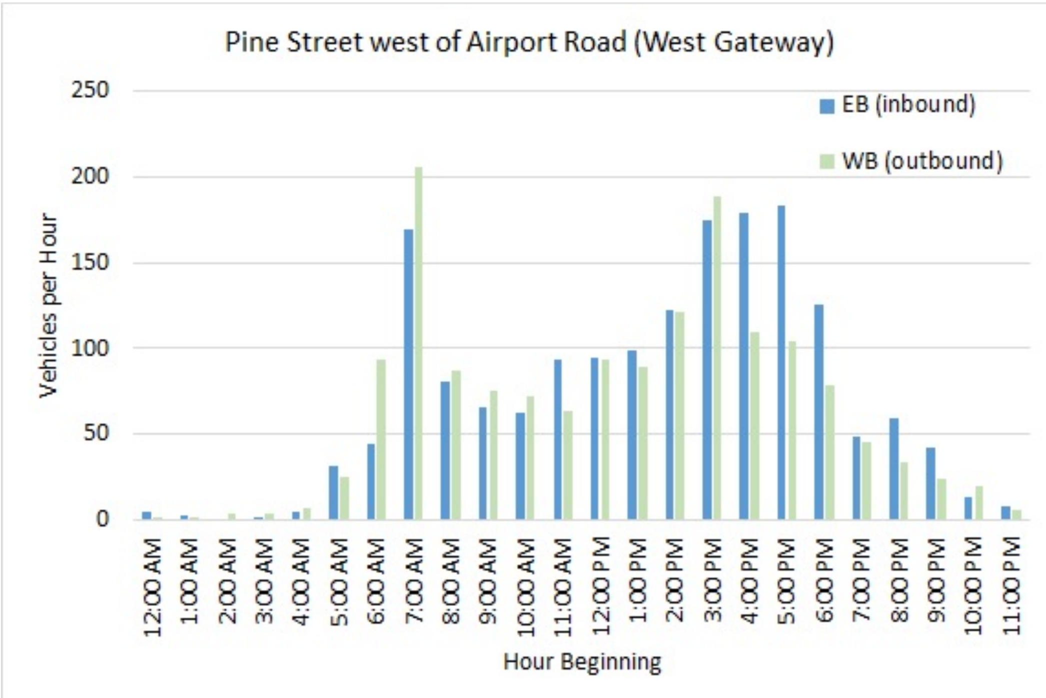


Figure 2. Daily Traffic Pattern on Pine Street west of Airport Road

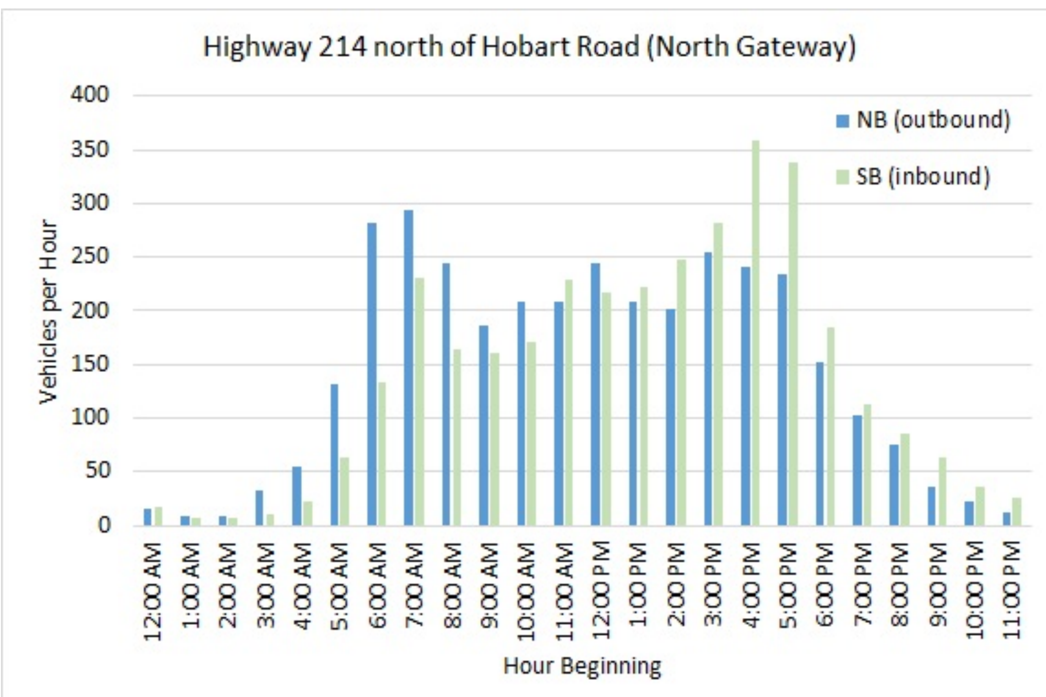


Figure 3. Daily Traffic Pattern on OR 214 north of Hobart Road

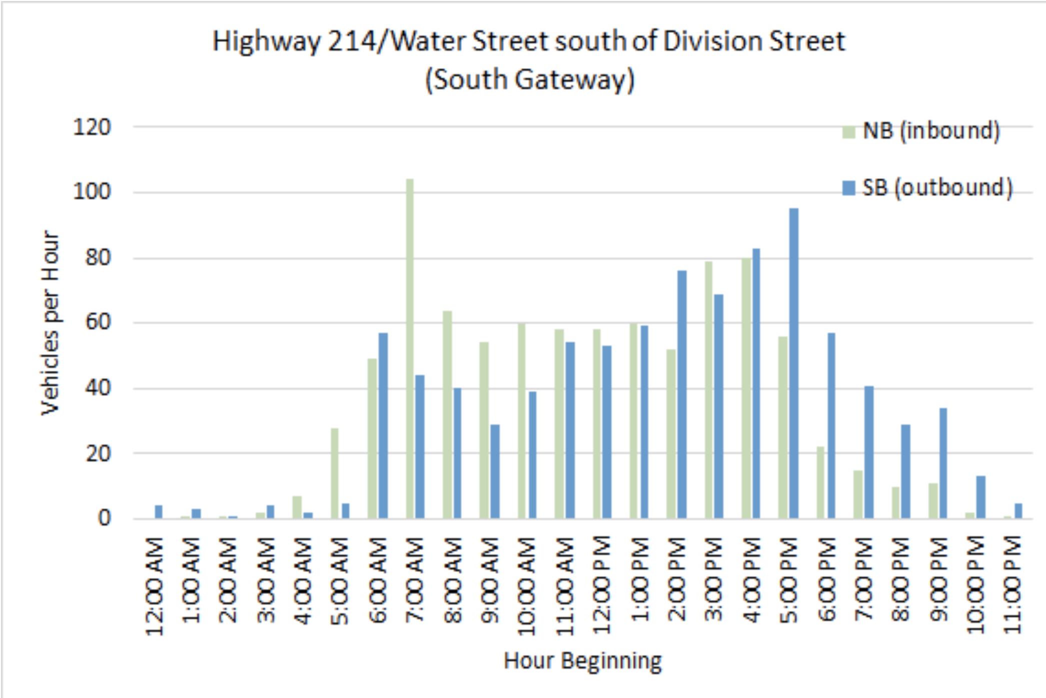


Figure 4. Daily Traffic Pattern on OR 214 south of Quall Road

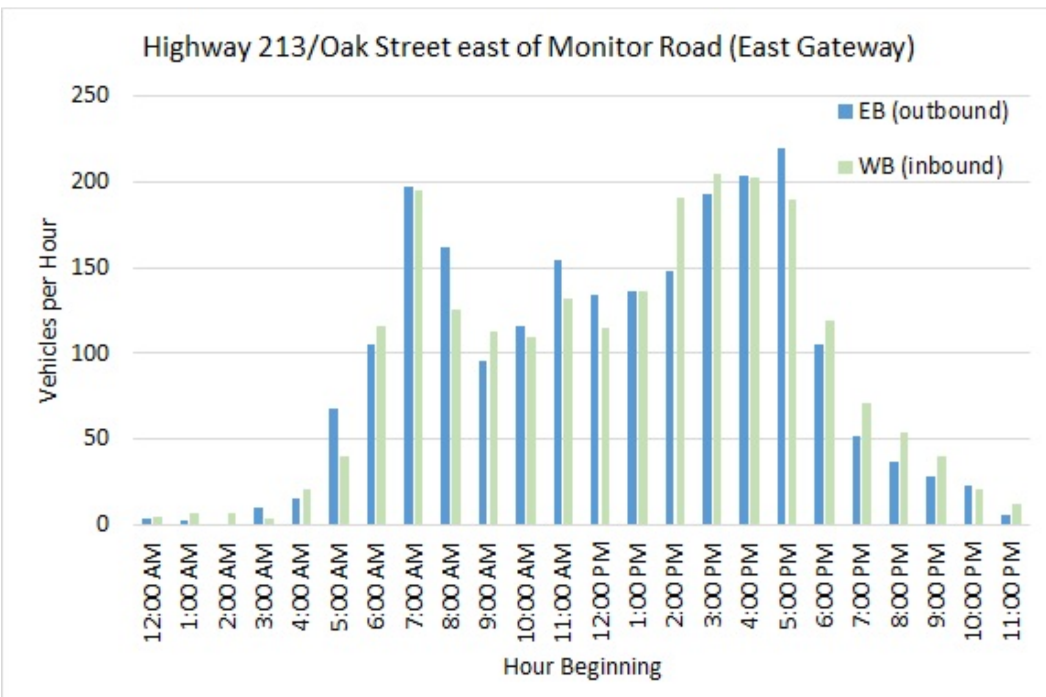


Figure 5. Daily Traffic Pattern on OR 213 east of Monitor Road

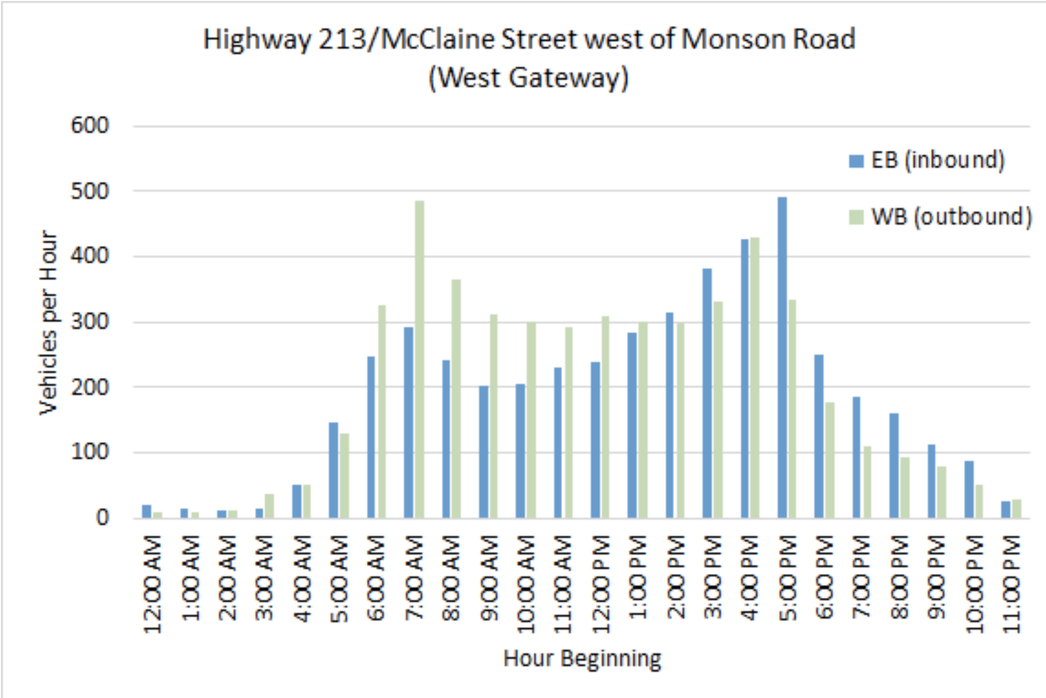


Figure 6. Daily Traffic Pattern on OR 213 west of Rogers Lane

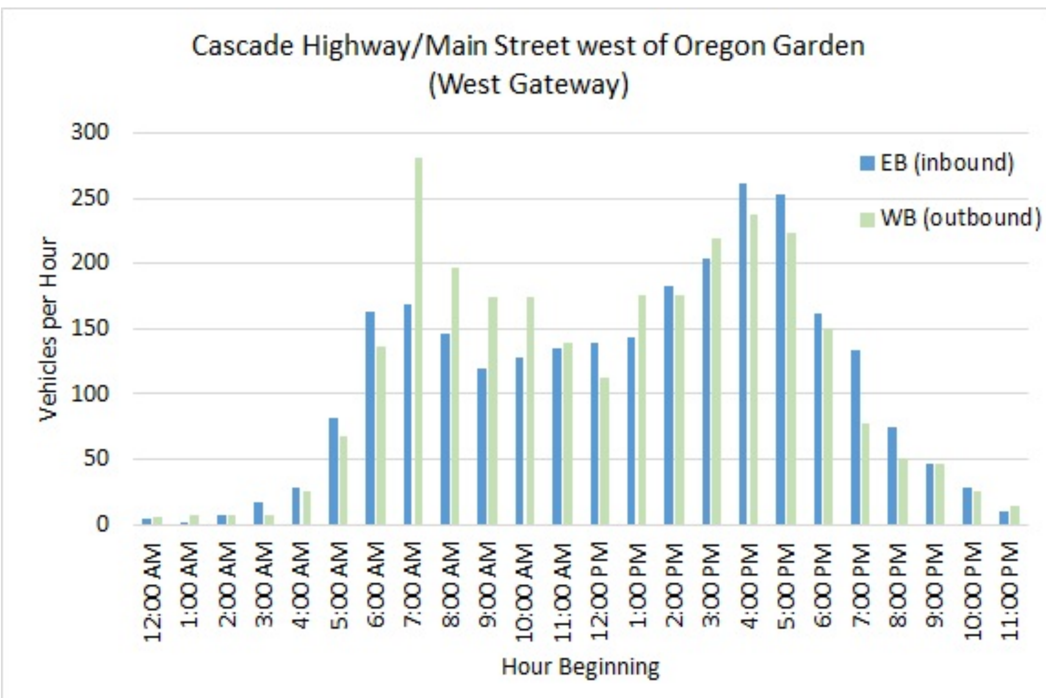


Figure 7. Daily Traffic Pattern on Cascade Highway west of Oregon Garden

Mode Choice Factors

Transportation is about getting to places and opportunities. People often weigh a variety of factors when deciding how to travel to their destinations. Whether the trip will be made by motor vehicle, walking, bicycle, or public transportation, the choice is often a balance between ease and convenience of travel, travel cost, and travel time. However, it is important to recognize that people make travel decisions based on the choices they are given so their current revealed preferences may not be what they actually prefer. Therefore, there must be a wide range of transportation choices accessible to everyone to allow travelers make transportation decisions that really match their needs and preferences.

Where are you going?

Whether you are going to work, school, shopping, or to a park, your trip destination, or trip purpose, often determines your mode of transportation. Those destined for a park or school generally have a higher likelihood to walk or bicycle than those going to work. The distance of that destination plays a role in mode choice. Trips that are shorter generally present a better opportunity to walk or bicycle; longer distance trips more often require transit or motor vehicle modes. Similarly, trips that have more flexible times (e.g. picking up dry cleaning) are more compatible with walking, biking, and public transit; trips that are time sensitive (e.g. going to work) generally are made by car.

Are there barriers to travel?

Issues related to available infrastructure and services, as well as demographics and distances from daily needs, can have a strong impact on how we choose to travel. The following are key potential barriers to multimodal travel in Silverton.

Lack of quality transportation infrastructure

The availability of sidewalks, curb ramps to provide wheelchair access, crosswalks, and protected bicycle lanes increases the comfort, access, and safety of walking, bicycling, and riding public transit. The lack or quality of these facilities, particularly on higher volume or higher speed roadways, discourages people from utilizing transit and non-motorized vehicle modes of transportation.

Distance between home and work place

Silverton residents who work outside of the city are likely to commute by motor vehicle due to travel distance and commute time. As seen in Table 2, slightly less than half of Silverton workers have a commute under ten miles. Over half of workers travel in excess of ten miles, including about 20% that travel over 25 miles from home to work. Long distance inter-city commute makes traveling via walking, bicycling, and public transit much more difficult, and in some cases, non-viable for travelers.

Table 2: Distance from Home to Work (2014)

Distance	Count	Share
Less than 10 miles	1,550	46%
10 to 24 miles	1,183	35%
25 to 50 miles	402	12%
Greater than 50 miles	240	7%

Source: LEHD[2] OnTheMap 2014

Public Transit Services and Access to Public Transit

Distance to bus stops, frequency of service, route coverage, connections to other transportation options, and amenities at stops are some of the factors that play a role in a user's decision to utilize public transportation. Research has shown that comfortable walking distance to public transit is no more than half a mile. For people who live more than half a mile away from a bus stop or transit station, using public transit is significantly more difficult. Low transit service frequency exacerbates this problem by making transit users spend much time waiting, sometimes in rain and cold. For those who cannot afford or are unable to drive, transit is may be the only viable option for making longer trips.

Age and Income

Demographic characteristics such as age and income will likely play a key role in determining mode of transportation. Silverton residents with lower incomes, as well as the youngest and oldest residents often account for more trips via walking, biking, and public transportation. About a third of residents living in the central and southeast parts of the City are school-aged children, while one in five residents in the east and southwest part of the City are above the retirement age. The northeast part of Silverton also has the lowest median household incomes (around $44,000), which is approximately $9,000 less than the median household income of the City, although only about $3,000 less than the countywide median.

[2] Longitudinal Employer-Household Dynamics, U.S. Census Bureau, http://onthemap.ces.census.gov/

The Commute to Work

Where people work has a strong impact on their travel patterns and preferred modes. A review of Census journey-to-work data shows that, out of about 4,100 working Silverton residents, 3,400 work outside of the city limits. About 2,400 workers from outside of Silverton come to the city for work. These inflows and outflows are shown in Figure 8.

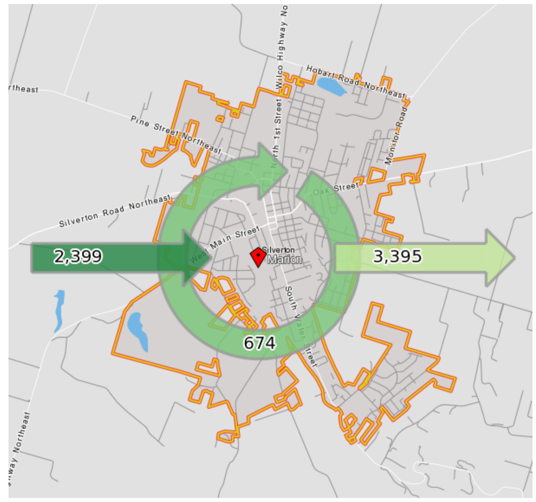


Figure 8: Commute Inflows and Outflows (Source: 2014 Census Journey to Work data)

Where do Silverton residents work?

Journey-to work data shown in Figure 9 indicates that the largest concentration of jobs for Silverton residents is in the city itself or the immediately surrounding area. Another key employment attraction, representing about 20% of employment destinations, is the Salem metropolitan area. Other employment destinations are dispersed throughout the Willamette Valley. Woodburn, Mount Angel, and Portland all represent employment destinations attracting over 50 workers from Silverton.

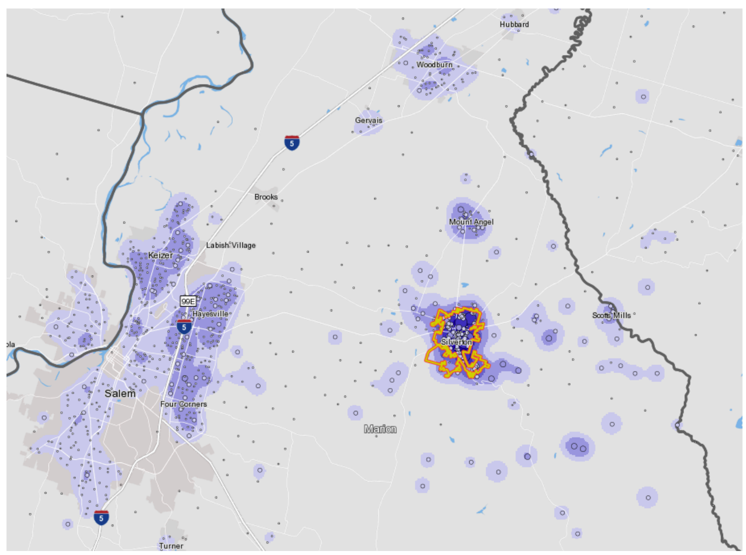


Figure 9: Job locations for Silverton workers (Source: 2014 Census Journey to Work data)

What transportation infrastructure is available?

The existence and condition of sidewalks, bike facilities, roadways, and other infrastructure is key to connecting Silverton residents to jobs, recreation, and daily needs. The following sections describe the current state of the transportation system.

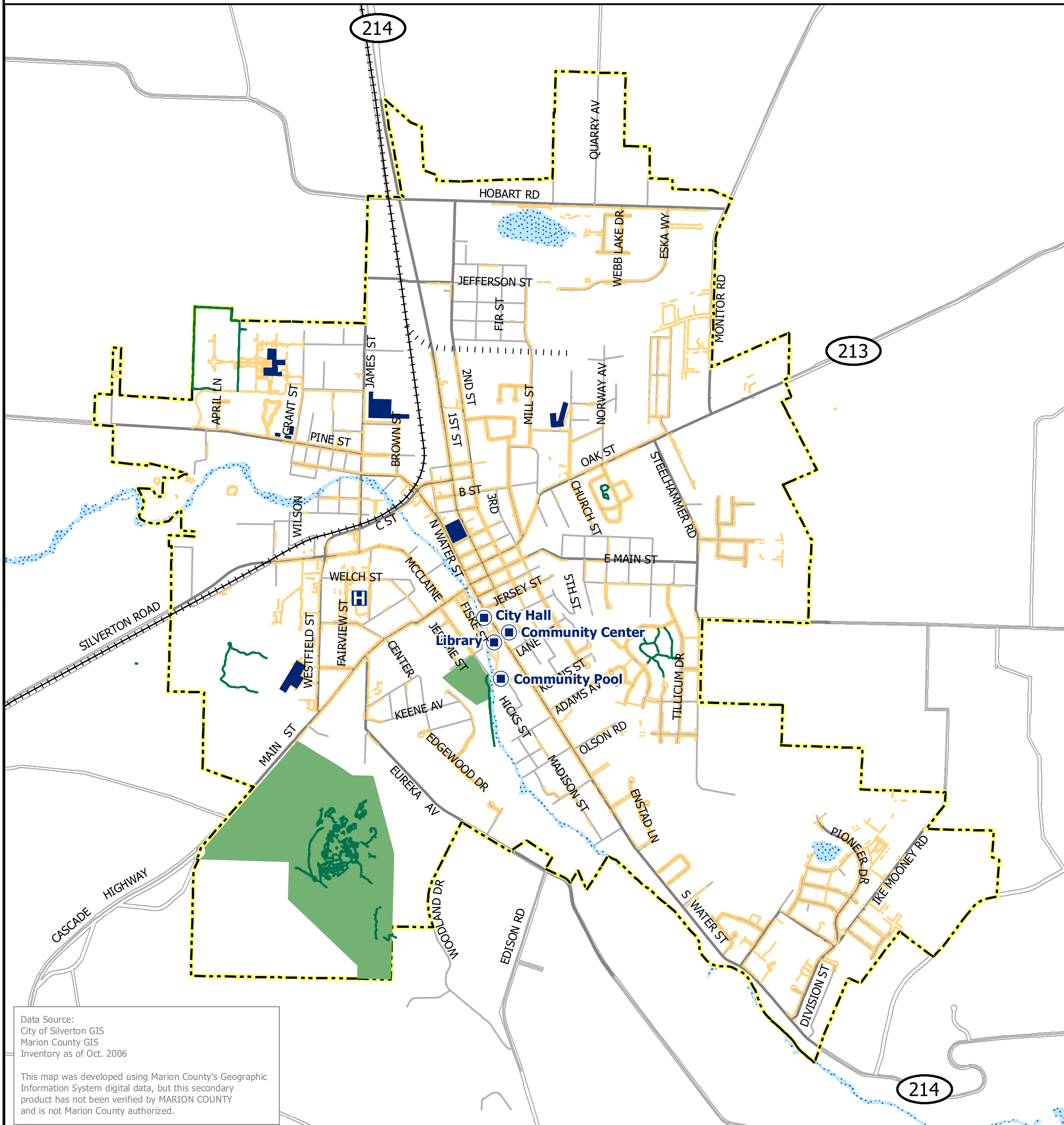
Pedestrian Facilities

A safe, convenient pedestrian system includes a variety of different components. Generally, interconnected and mobility device-accessible sidewalks on both sides of the street on all arterials and collectors is recommended. Adequate street lighting and enhanced pedestrian crossings also help to create safe and convenient connections to major pedestrian destinations, such as schools, parks, and retail centers. In addition, appropriately designed off-street pedestrian trails and share-use paths can also enhance the quality and connectivity of the pedestrian network.

The existing sidewalk inventory was obtained from existing data compiled by the City of Silverton combined with a limited field inventory. Sidewalks are generally present on both sides of the street in the central downtown area. However, notable sidewalk gaps in the downtown area are along N Third Street (between B Street and Oak Street), A Street (between Front Street and First Street), High Street, Park Street, and Lewis Street (between Second Street and Third Street), and Jersey Street (between First Street and Third Street).

Further from the city center, the sidewalk network generally becomes more intermittent. In many cases, sidewalks are provided on one side of the street only, preventing continuity and a convenient safe path to the pedestrian destinations within the City. The railroad and Silver Creek also present barriers to pedestrian connectivity from the areas north and west of downtown. Figure 10 shows the existing sidewalk inventory within the City of Silverton.

City of Silverton
Transportation System Plan



Data Source:
City of Silverton GIS
Marion County GIS
Inventory as of Oct. 2006

This map was developed using Marion County's Geographic Information System digital data, but this secondary product has not been verified by MARION COUNTY and is not Marion County authorized.

FIGURE 10
Pedestrian Facilities

0 0.25 0.5 Miles

Legend

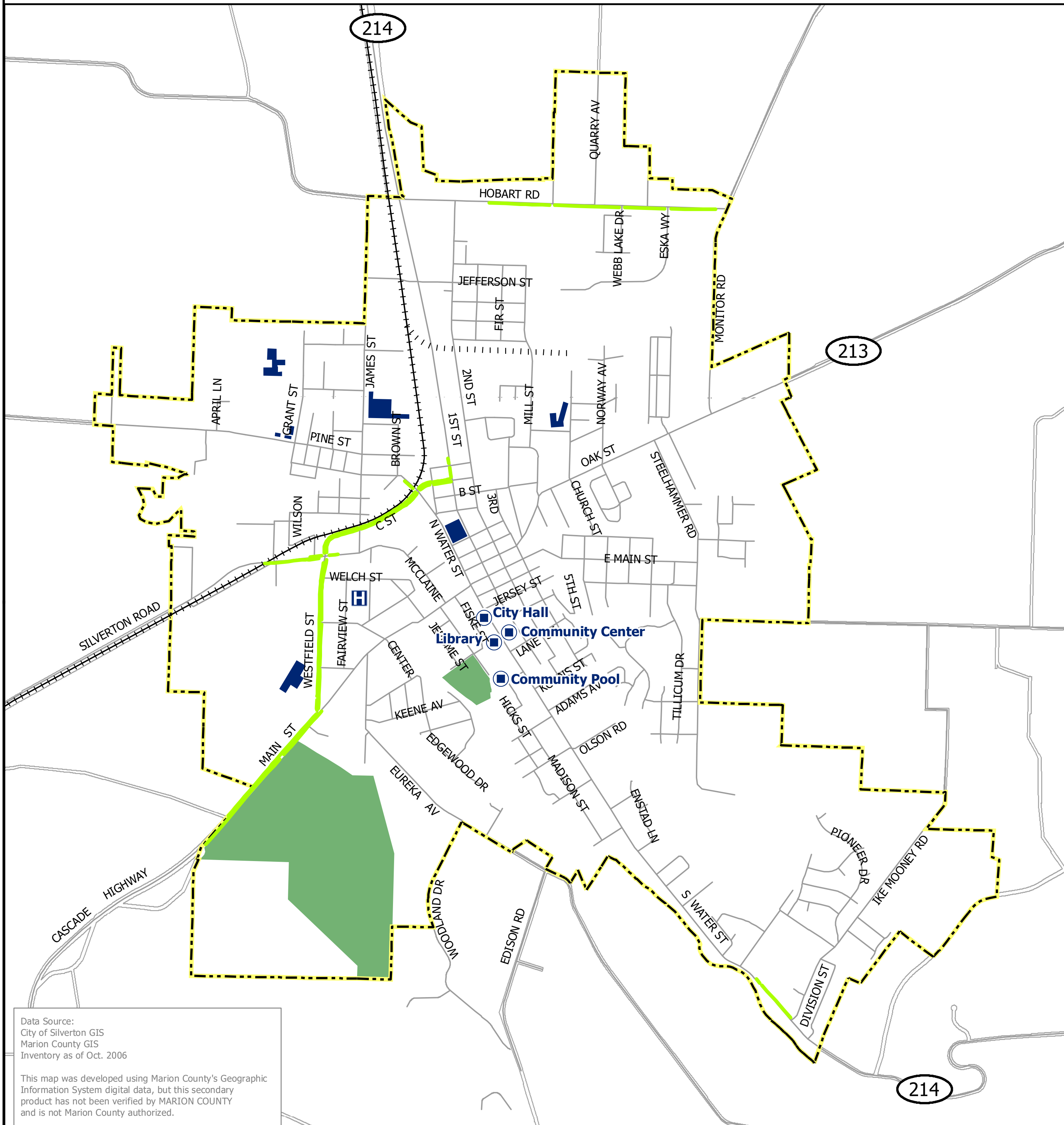
- Trails
- Sidewalk
- Urban Growth Boundary
- City Limit
- Hospital
- Civic/Government
- School
- Water
- Park
- Major Street
- Local Street
- County Roads
- Railroad
- Abandoned

Bicycle Facilities

Silverton's bicycle commute mode share is at 0.4% according to the 2014 American Community Survey 5-year Estimate. This number is lower than the state average of 2.6%. Although bicycling is not a mode that is commonly utilized in Silverton, it could become an affordable and healthy transportation option if bicycle facilities were improved. Currently, about 3.8 miles of marked bike lanes exist on a total of 65 miles of paved roads in Silverton; that means about 6% of the roads in Silverton have bike lanes. Striped bike lanes are currently present on Hobart Road Northeast, North First Street, East C Street, North Water Street, McClain Street, Westfield Street, West Main Street, and South Water Street

Signed/marked shared roadways are similarly uncommon in Silverton. Shared roadways include roadways where 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 per day or fewer). Signed shared roadways are shared roadways that are designated and signed as bicycle routes and serve to provide continuity to other bicycle facilities (e.g. bicycle lanes) or to designate a preferred route through the community. Figure 11 shows the existing bicycle facilities within the City of Silverton.

City of Silverton
Transportation System Plan



Data Source:
City of Silverton GIS
Marion County GIS
Inventory as of Oct. 2006

This map was developed using Marion County's Geographic Information System digital data, but this secondary product has not been verified by MARION COUNTY and is not Marion County authorized.

FIGURE 11

Bicycle Facilities

0 0.25 0.5 Miles

Legend

- Existing Bicycle Lanes
- Hospital
- Civic/Government
- School
- Urban Growth Boundary
- City Limit
- Park
- Water
- Roads
- Railroad
- Abandoned

Transit Facilities

The existing transit service within the City of Silverton is limited to one regional service provider and demand-responsive dial-a-ride services.

The Chemeketa Area Regional Transportation System (CARTS) provides a weekday fixed-route public transit service run between Downtown Silverton and Downtown Salem twice in the morning and twice in the afternoon. This route has three stops in Silverton (see Figure 13). The City currently does not have any local fixed-route bus or passenger rail service.

The Silver Trolley is managed and operated by the City of Silverton. The Trolley provides demand responsive service to citizens of the city, focusing on access to facilities and services for seniors, disabled persons, the special needs population, youth, and the general public.

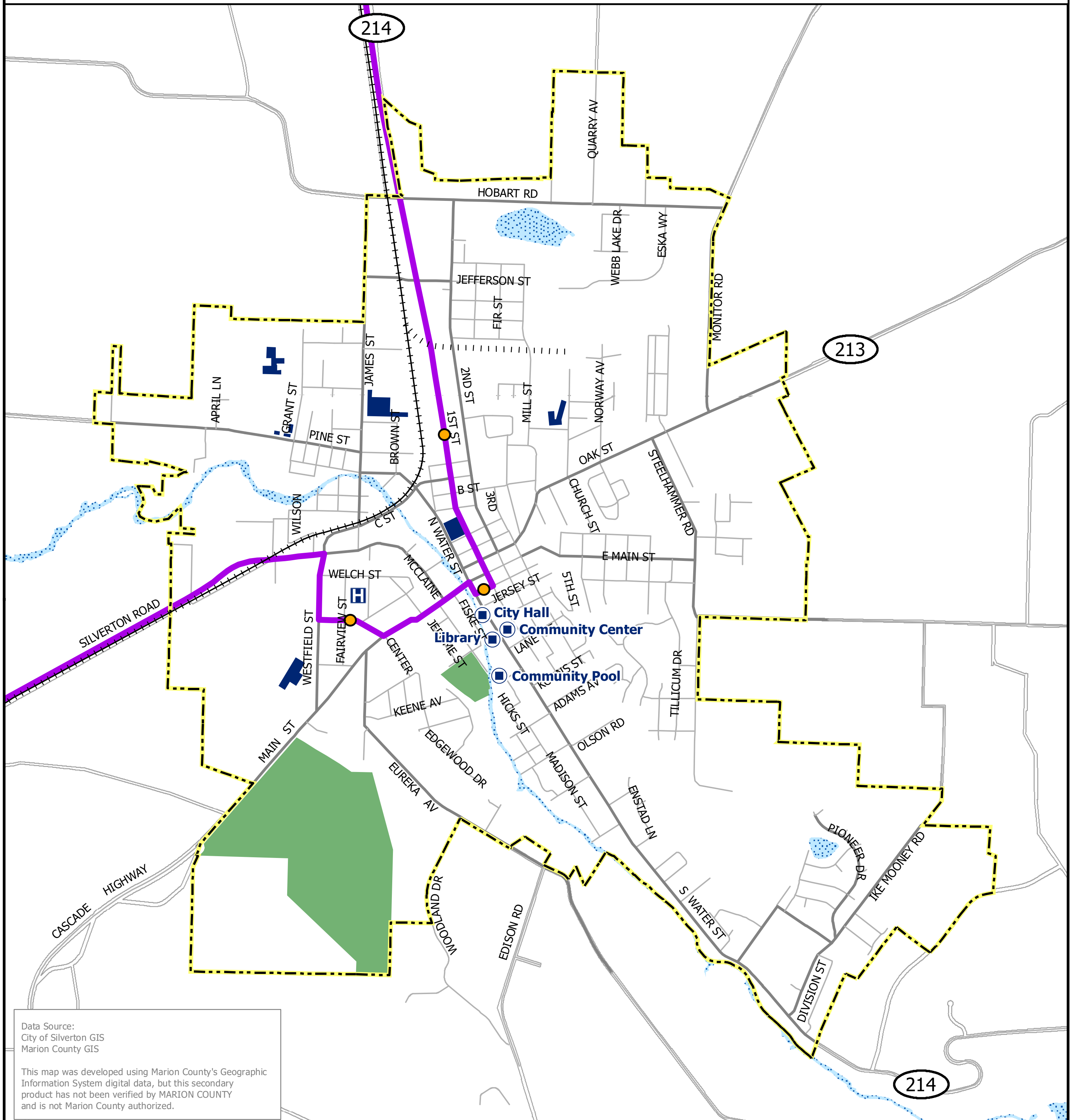
Wheels Community Transportation provides service for elderly citizens in need of transportation for medical appointments, employment, education purposes and nutritional shopping. Non-emergency medical transportation to Portland and other nearby communities is provided on a space available basis. Reservations for the dial-a-ride service must be made in advance; service is provided on weekdays from 7:00 AM to 5:30 PM.

Figure 12: CARTS Route 20 Bus Stop on the corner of Jersey Street/Water Street

The Silverton Hospital also provides medical transportation transit services for seniors over the age of 55 and disabled citizens. Seniors Plus is a service that provides medical transportation to Silverton Hospital and Silverton Hospital medical staff offices between the hours of 8:30 AM and 4:30 PM.

City of Silverton

Transportation System Plan



Data Source:
City of Silverton GIS
Marion County GIS

This map was developed using Marion County's Geographic Information System digital data, but this secondary product has not been verified by MARION COUNTY and is not Marion County authorized.

FIGURE 13

Transit Facilities

0 0.25 0.5 Miles

Legend

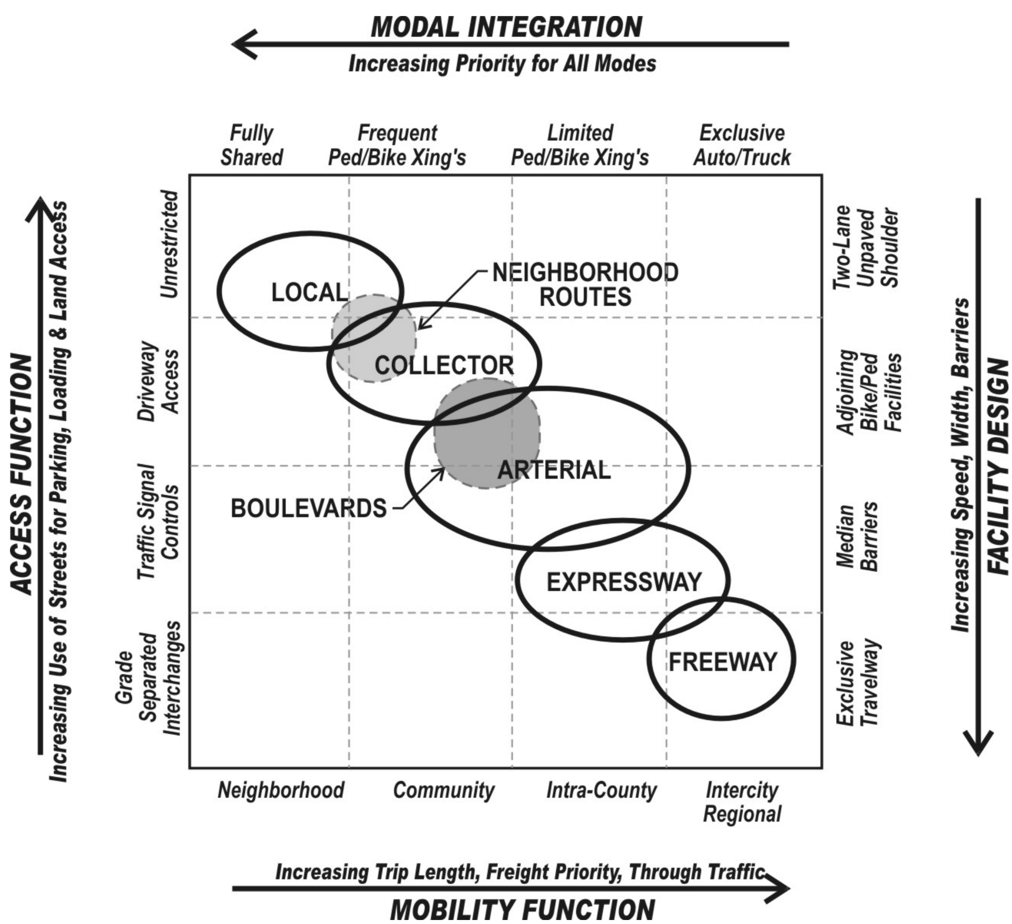
- CARTS Bus Stop
- CARTS Transit Route
- Urban Growth Boundary
- City Limit
- Hospital
- Civic/Government
- School
- Water
- Park
- Major Street
- Local Street
- County Roads
- Railroad
- Abandoned

Roadways

The roadway system within the City of Silverton includes city streets, county roadways, and state highways. The following section describes the current system and how it functions.

Functional Classification

Functional classification is the grouping of roadways based on the type of service they provide. The schematic diagram below shows the differing functional nature of roadway facilities as it relates to access, mobility, multi-modal transport, and facility design. The diagram is useful to understand how worthwhile objectives can have opposing effects. For example, as mobility is increased (bottom axis), the provision for non-motor vehicle modes (top axis) is decreased accordingly. Similarly, as access increases (left axis); the facility design (right axis) dictates slower speeds, narrower roadways, and non-exclusive facilities. The goal of selecting functional classes for particular roadways is to provide a suitable balance of these four competing objectives.



As street classes progress from local roadways to freeways, the following occurs:

- Mobility Increases – Longer trips between destinations, greater proportion of freight traffic movement, and a higher proportion of through traffic.
- Integration of Pedestrian and Bicycle Decreases – Provisions for sidewalks and bike facilities are required up through the arterial class, however, the frequency of intersection or mid-block crossings for non-motorized vehicles steadily decreases with higher functional classes. The expressway and freeway facilities typically do not allow pedestrian and bike facilities adjacent to the roadway and crossings are grade-separated to enhance mobility and safety.
- Access Decreases – The shared uses for parking, loading, and direct land access is reduced. This occurs through parking regulation, access control and spacing standards (see opposite axis).
- Facility Design Standards Increase – Roadway design standards require increasingly wider, faster facilities leading to exclusive travel ways for autos and trucks only. The opposite end of the scale is the most basic two-lane roadway with unpaved shoulders.

Two additional areas are noted on the diagram for **Neighborhood Routes** and **Boulevards** that span two conventional street classes.

The 2008 Silverton Transportation System Plan (TSP) identified the functional classifications for all Silverton area roadways (shown on Figure 3-4 of the 2008 TSP). The 2008 TSP included four classification categories, including: arterial roadways, collector streets, neighborhood collector streets, and local streets. The definition of each functional classification is presented below and the current functional classifications of study area roadways in and around the City of Silverton are shown in Figure 14.

Arterial Streets

Arterial streets serve to interconnect the City. These streets link major commercial, residential, industrial and institutional areas. Arterial streets are typically spaced about one mile apart to assure accessibility and reduce the incidence of traffic using collectors or local streets for through traffic in lieu of a well placed arterial street. The maximum interval for arterial spacing within the City is 3,000 feet. Access control is the key feature of an arterial route. Arterials are typically multiple miles in length.

Collector Streets

Collector streets provide both access and circulation within and between residential and commercial/industrial areas. 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 neighborhood and local street system. The maximum interval for collector roadways is 1,500 feet. Collectors are typically greater than 0.5 to 1.0 miles in length.

Neighborhood Routes

Neighborhood routes are usually long relative to local streets and provide connectivity to collectors or arterials. Because neighborhood routes have greater connectivity, they generally have more traffic than local streets and are used by residents in the area to get into and out of the neighborhood, but do not serve citywide/large area circulation. They are typically about a quarter to a half-mile in total length. Traffic from cul-de-sacs and other local streets may drain onto neighborhood routes to gain access to collectors or arterials. Because traffic needs are greater than a local street, certain measures should be considered to retain the neighborhood character and livability of these routes. Neighborhood traffic management measures are often appropriate (including devices such as speed humps, traffic circles and other devices - refer to later section in this chapter). However, it should not be construed that neighborhood routes automatically get speed humps or any other measures. While these routes have special needs, neighborhood traffic management is only one means of retaining neighborhood character and vitality.

Local Streets

Local streets have the sole function of providing access to immediate adjacent land. Service to "through traffic movement" on local streets is deliberately discouraged by design. All other city streets in Silverton not designated above as collector streets or neighborhood routes are considered to be local streets.

Roadway Jurisdiction

Roadway ownership and maintenance responsibilities of the various roads in the study area are identified in Figure 15. Generally, arterial and collector roadways on the outskirts of the Silverton city limits are under the jurisdiction of Marion County. The City is responsible for the remainder of the roads within the city limits with the exception of OR 213 and OR 214, which fall under the jurisdiction of the Oregon Department of Transportation (ODOT). Within the City there are also designated private roadways on which the owner has responsibility for roadway maintenance and improvement.

Roadways in Silverton also vary by posted speed. Higher classified roadways generally have higher posted speeds that reflect their mobility function. However, speed also affects driver stopping distance and severity of crashes. Posted speeds for Silverton roadways are shown in Figure 16.

City of Silverton
Transportation System Plan

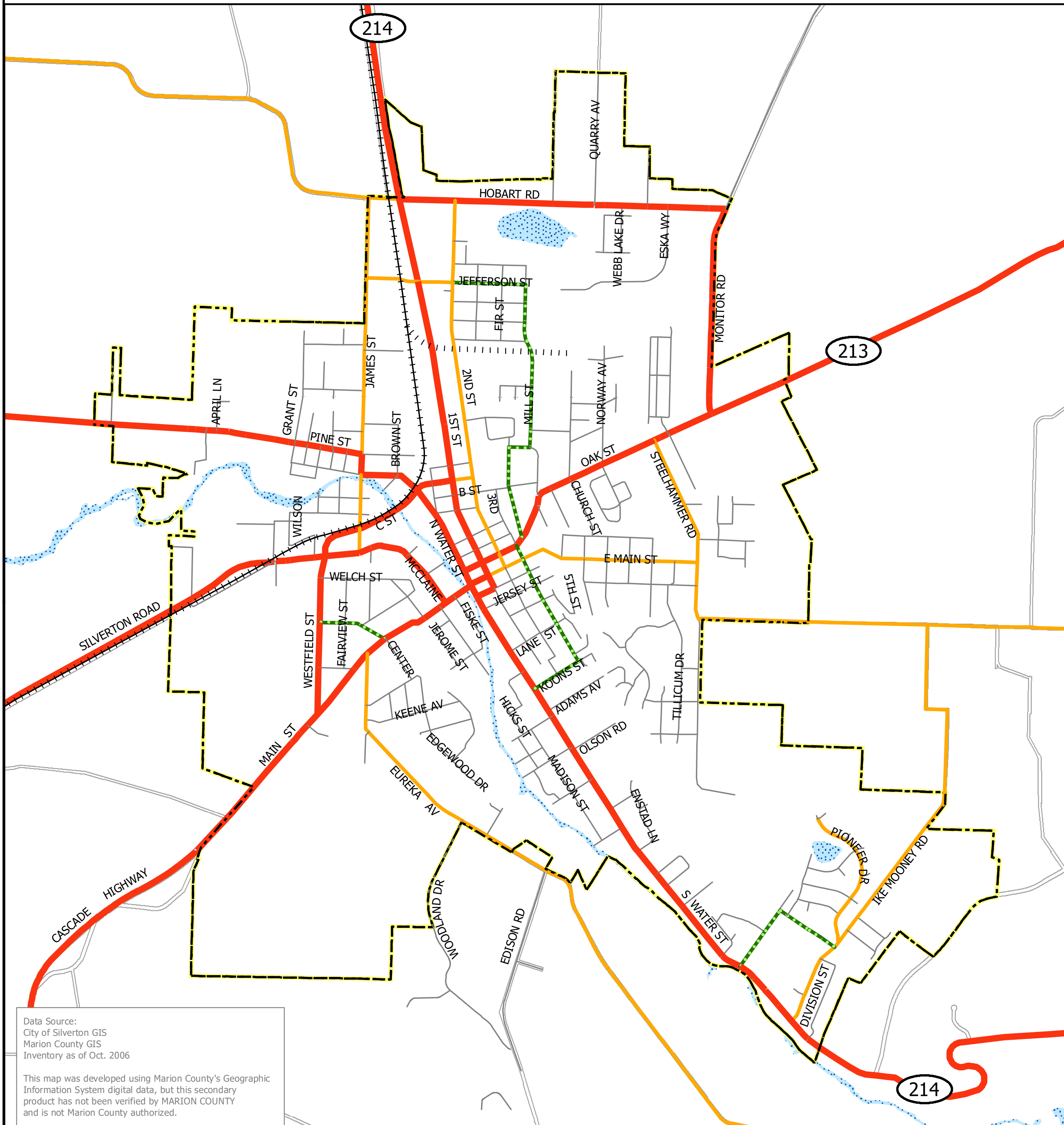


FIGURE 14

Roadway Functional Classification

0 0.25 0.5 Miles

Legend

- Arterial Street
- Collector Street
- Neighborhood Collector
- Local Street
- County Roads
- Urban Growth Boundary
- City Limit
- Water
- Railroad
- Abandoned

City of Silverton
Transportation System Plan

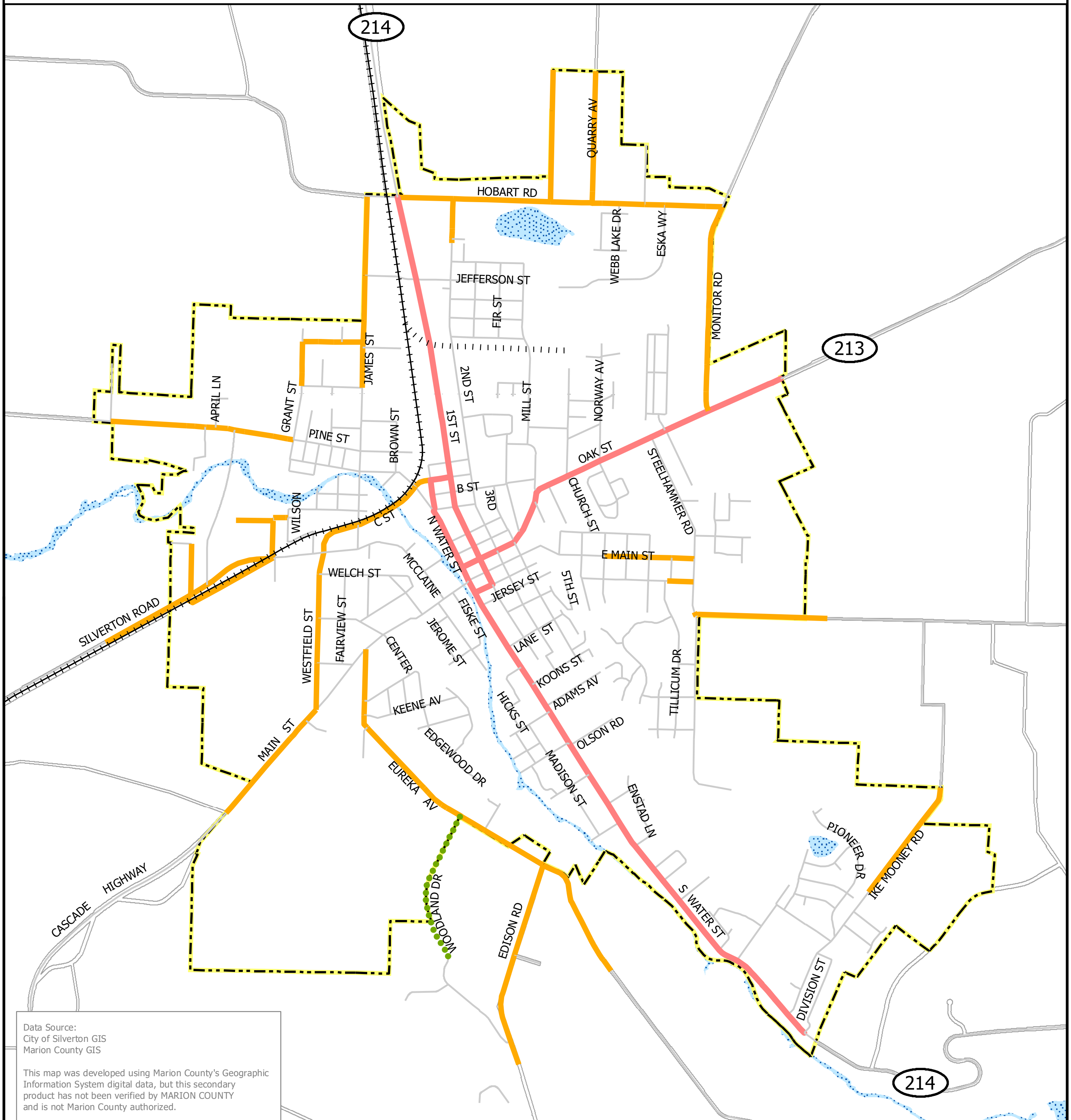


FIGURE 15

Roadway Jurisdiction

0 0.25 0.5 Miles

Legend

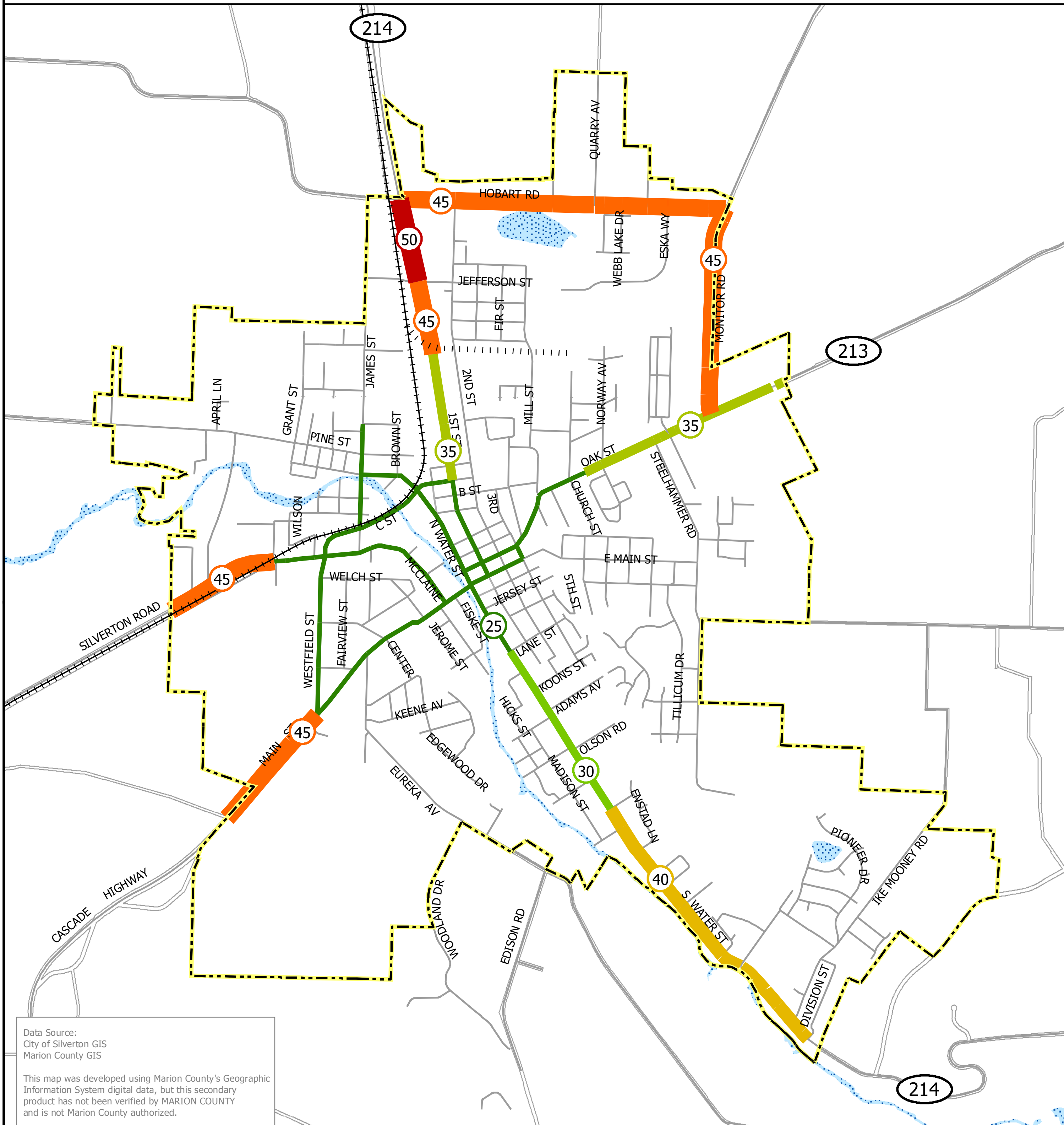
- Urban Growth Boundary
- City Limit

Roadway Jurisdiction

- private
- state
- county
- Roads
- Railroad
- Abandoned
- Water

City of Silverton

Transportation System Plan



Data Source:
City of Silverton GIS
Marion County GIS

This map was developed using Marion County's Geographic Information System digital data, but this secondary product has not been verified by MARION COUNTY and is not Marion County authorized.

FIGURE 16

Posted Speeds

0 0.25 0.5 Miles

Legend

Posted Speed Limit
- 25 mph
- 30 mph
- 35 mph
- 40 mph
- 45 mph
- 50 mph

- Urban Growth Boundary
- City Limit

- Roads
- Railroad
- Abandoned
- Water

Access Management Standards

Access management is a vital component of an efficient transportation system. Implementing access management strategies can improve traffic flow, improve safety, and reduce potential conflicts between vehicles, bicycles, and pedestrians. Access management standards vary by jurisdiction, as outlined below.

The ODOT access management standards, as defined in OAR 734-051, call for minimum distances between access points on the same side of District Highways. The standards vary depending on posted speed on the roadway, as shown in Table 3.

Table 3. ODOT Access Management Spacing Standards

Facility Type	Posted Speed (MPH)				
	≥ 55	50	40,45	30,35	≤ 25
	Minimum Access Spacing (feet)				
Regional & District Highways, ADT≤ 5000 vpd	650	425	360	250	150
District Highways, ADT > 5000 vpd	700	550	500	350	250

Source: Oregon Highway Plan 1999, Updated through Senate Bill 264 in 2011

Marion County also identified access management standards in the Marion County Transportation System Plan. The standards are outlined in Table 4.

Table 4. Marion County Access Management Standards

Functional Class	Access Spacing Requirements
Arterial	500' from any intersection with a state highway, arterial or major collector
	400' from any other intersection (including private access)
Major Collector	400' from any intersection with an arterial or state highway
	300' from any other intersection (including a private access)
Minor Collector	300' from any intersection with an arterial or state highway
	150' from any other intersection (including a private access)
Local Street	200' from any intersection with an arterial or state highway
	100' from any intersection with a major collector, minor collector, or local road
	50' from any intersection with a private access

Source: Marion County RTSP, 2005

The existing Silverton TSP (2008) includes recommended access spacing standards for City street facilities, which are shown in Table 5.

Table 5. City of Silverton Access Management Standards

Street Facility	Maximum spacing* of roadways	Minimum spacing* of roadways	Minimum spacing** of roadway to driveway***	Minimum Spacing* driveway to driveway***
Arterial	1,000 feet	500 feet	250 feet	250 feet or combine
Collector:	500 feet	250 feet	150 feet	150 feet or combine
Neighborhood/Local	500 feet	250 feet	10 feet	10 feet

Source: Silverton TSP, 2008
Notes:
*Measured centerline to centerline
**Measured near street curb to near driveway edge
***Private access to arterial and collector roadways shall only be granted through a requested variance of access spacing policies (which shall include an access management plan evaluation)

Railways

One rail line operates through the City of Silverton. The Willamette Valley Railroad currently provides branch line rail service for the shipment of commodities between Salem and Woodburn. The railroad is considered "active rail", although the track was damaged in the 2012 flooding and improvements are required before trains will be able to travel on the line. Prior to 2012, the freight line operated two trains per day through the study area with speeds of 10 miles per hour or less. This line connects to the rail line in Woodburn to the north and terminates in Stayton to the south.

There are six existing railroad/highway grade crossing within the City of Silverton:

- Fossholm Road, north of Silverton Road
- Hobart Road, west of OR 214
- James Street, north of C Street
- Jefferson Street, west of OR 214
- Silverton Road, west of C Street, and
- Water Street, north of C Street

Figure 17: Rail crossing at C Street/Water Street

Gates and flashers are provided at the rail crossings on Water Street and Silverton Road, while the other four crossings at Fossholm Road, Hobart Road, James Street and Jefferson

Street are only controlled by stop signs.

No passenger rail transportation directly serves the City of Silverton. AMTRAK service is available in Salem and Portland.

Existing Issues

The primary issue with rail service in the City of Silverton is related to the adequacy of rail crossings. Three of the rail crossings currently have crossing amenities including gates and flashing lights; enhancements (including pedestrian crossing enhancement) for the remaining crossings should be explored.

Freight Facilities

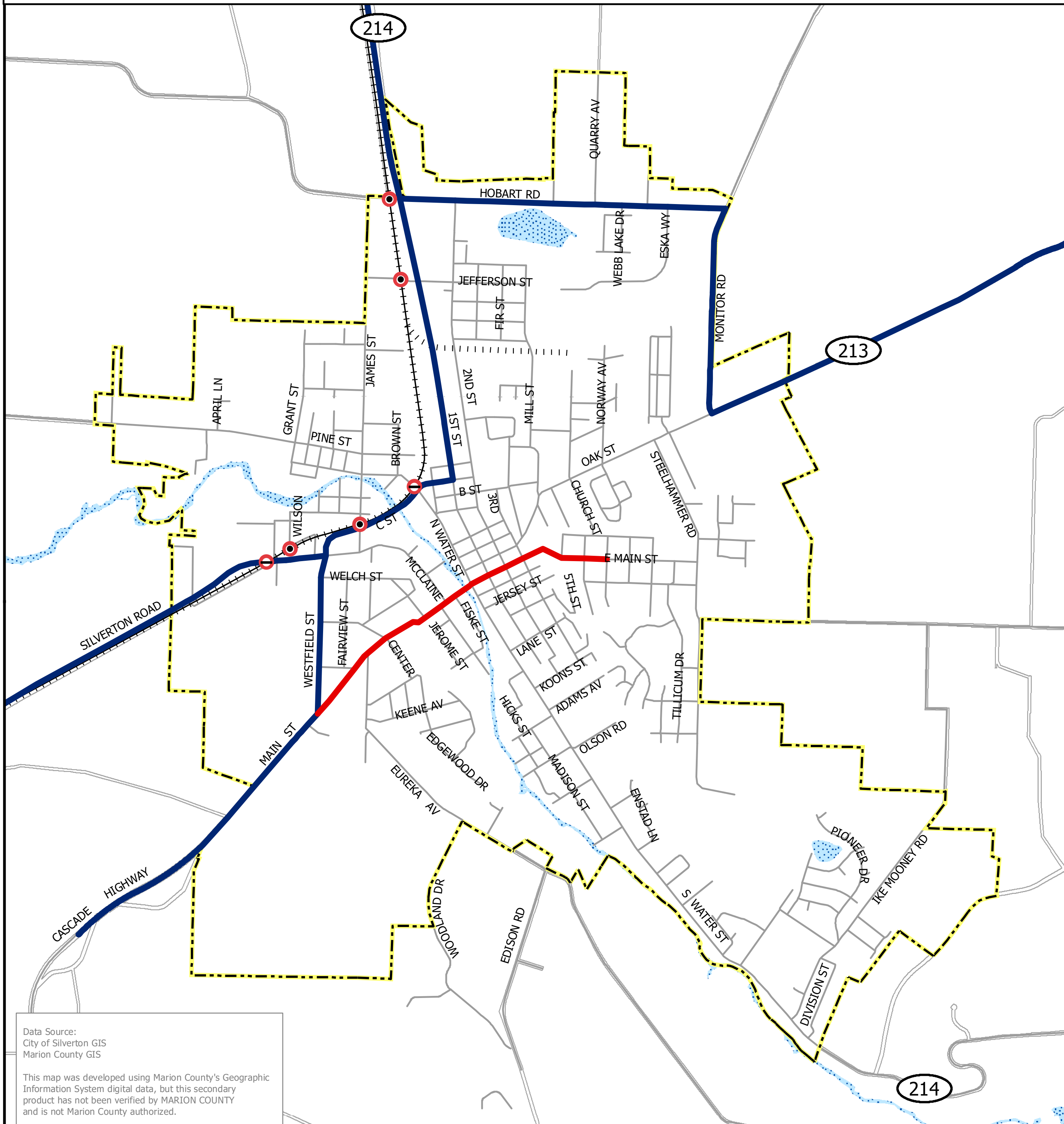
The City of Silverton is closely knit with its surrounding agricultural context. Nearby farming uses such as grass seed and Christmas trees mean that freight routes through and around Silverton are important to bringing these products to market.

The establishment of regional through truck routes facilitates freight movement while at the same time maintaining neighborhood livability and public safety, and minimizing maintenance costs of the roadway system. Marion County identifies a truck route on the north side of Silverton within the urban growth boundary and includes Hobart Road, Monitor Road and Mt. Angel Highway (see Figure 18). Additionally, the City of Silverton has designated freight routes along First Street, Silverton Road, Westfield Street and Cascade Highway.

ODOT[3] does not identify any freight routes within the City of Silverton. However, OR 214 north of OR 213 is an ODOT Reduction Review Route. This means that under ORS 366.125, vehicle-carrying capacity may not be reduced on the segment unless the Oregon Transportation Commission provides an exception. Trucks are prohibited on West Main Street, east of Westfield Street.

[3] *1999 Oregon Highway Plan*, Oregon Department of Transportation. May 1999.

City of Silverton
Transportation System Plan



Data Source:
City of Silverton GIS
Marion County GIS

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FIGURE 18

Freight Routes
Rail Facilities

0 0.25 0.5 Miles

Legend

Railroad Crossing
- Stop Controlled
- Gate Controlled
- Truck Route
- Trucks Prohibited
- Roads
- Urban Growth Boundary
- City Limit
- Water
- Railroad
- Abandoned

Air Facilities

One private airfield facility is located northwest of Silverton. There are currently no existing or planned public airports within the Silverton TSP study area. The Salem Airport-McNary Field is the closest public general aviation facility, approximately 20 miles west of Silverton. It is classified as a Category 2 airport in the Oregon Aviation Plan and serves corporate aviation activity, general aviation and commercial passenger service. Other passenger and freight air transportation is available in Portland at the Portland International Airport (PDX), located approximately 60 miles to the north.

Waterway Facilities

There are no commercial waterways within Silverton's Urban Growth Boundary. The Silverton Reservoir (located outside of the City limits) and the Pettit Reservoir are owned by the City and serves as recreation waterways. Silver Creek and surrounding park areas and trails are used for recreation and Silver Creek was identified as a potential location for a recreational trail. No plans were identified for waterway infrastructure expansion. As such, no policies or recommendations in this area of transportation are provided for Silverton.

Pipeline Facilities

All existing pipelines within and passing through Silverton are outside of the maintenance responsibilities of the City. As such, no policies or recommendations in this area of transportation are provided for Silverton.

How well does the transportation system perform?

This TSP Update includes new analysis of safety, traffic operations, and bicycle and pedestrian performance for the city's transportation system.

Safety Performance

The safety performance of a roadway network can be evaluated using historical crash data. For the City of Silverton, the most recent five years of crash data (2010-2014) provided the basis for the safety evaluation. This crash data was obtained from the ODOT Crash Data System for the entire City of Silverton, including state and local roadways.

General Crash Trends

Between 2010 and 2014, there were 254 reported crashes in the City of Silverton, of which 65% were property damage only (PDO) crashes and 35% were injury crashes. There were no fatal crashes during the study time period.

Of the 254 total reported crashes, 72% occurred in the vicinity of intersections, alleys, or driveways, which is a typical proportion in an urban area. The top three crash types are also consistent with an urban area and intersection-related crashes; 30% were rear-end crashes, 25% were turning crashes, and 15% were angle crashes. Other observed crash types include fixed-object (9%), pedestrian-involved (6%), parking-related (3%), and backing (3%).

Bicycle and Pedestrian Crash Trends

During the five-year study period, there were zero bicycle-related crashes in the City. Of the 15 reported crashes involving a pedestrian, all resulted in some level of injury (one incapacitating injury, six serious injuries, and eight possible injuries). Four of the pedestrian-related crashes occurred at the intersection of Oak Street at Water Street, and three occurred at the intersection of Main Street at Water Street. The remaining eight crashes were dispersed throughout the City.

Intersection Crash Trends

In urban areas, the majority of crashes tend to occur at intersections due to the inherent conflicts between vehicles making opposing maneuvers. As such, it is important to investigate the safety performance of individual intersections in addition to the overall network. Table 6 presents the 10 intersections with the highest crash frequency from 2010-2014 along with the highest crash severity of the reported crashes.

Table 6: 10 Intersections with Highest Crash Frequency

Intersection	Average Crashes per Year	Highest Crash Severity
C Street/ McClaine Street	3.2	Disabling Injury
Water Street/ Main Street	3.0	Disabling Injury
C Street/ James Street	2.6	Disabling Injury
1st Street/ Jefferson Street	2.6	Evident Injury
1st Street/ Hobart Road	2.4	Evident Injury
Oak Street/2nd Street	2.0	Possible Injury
Water Street/ Koons Street	1.6	Possible Injury
Oak Street/1st Street	1.4	Possible Injury
Oak Street/ Water Street	1.2	Disabling Injury
Main Street/ Westfield Street	1.2	Evident Injury

Source: DKS Associates

It is important to note that crash frequency and crash severity alone are not enough to identify safety performance issues. Without accounting for exposure (e.g., traffic volume) and intersection geometry, it is not valid to compare crash frequencies as a means of relative safety performance. A crash rate analysis can provide a better representation of the true intersection safety performance, which is described in the following section.

Critical Crash Rate Analysis

The intersection crash rate represents the average number of crashes per million entering vehicles (MEV) at a given intersection. The Highway Safety Manual (HSM)[4] includes a methodology for calculating a critical crash rate, which is the typical or expected crash rate for a similar facility (same traffic control, number of intersection legs, and general roadway characteristics). If the calculated intersection crash rate is above the critical crash rate, it is an indication of safety performance concerns at that location. Table 7 summarizes the crash rate comparisons for each of the 12 intersections analyzed.

[4] AASHTO Highway Safety Manual, 2010

Table 7: Comparison of Crash Rates and Critical Crash Rates

Intersection	Intersection Type	Total Crashes (2010-2014)	Daily Entering Volume	Crash Rate	Critical Crash Rate
James Street/Pine Street	4-leg Stop	1	5,470	0.108	0.782
Westfield Street/ Main Street	3-leg Stop	6	6,080	**0.580**	0.293
C Street/ McClaine Street	4-leg Signal	16	21,730	0.433	0.860
OR 213/ Steelhammer Road	3-leg Stop	1	9,540	0.062	0.293
Oak Street/1st Street	4-leg Stop	9	10,980	0.482	0.660
Water Street/Main Street	4-leg Stop	15	18,070	0.489	0.599
Oak Street/2nd Street	4-leg Stop	10	11,420	0.515	0.654
Front Street/C Street	4-leg Stop	0	13,980	0.000	0.628
Water Street/C Street	4-leg Signal	10	17,200	0.342	0.860
1st Street/Hobart Road	4-leg Stop	12	11,290	0.625	0.656
1st Street/ Jefferson Street	4-leg Stop	13	12,020	0.636	0.647
Water Street/Oak Street	3-leg Stop	6	8,570	**0.412**	0.293
James Street/C Street	4-leg Stop	13	12,840	0.596	0.638

Source: DKS Associates
Bold/red exceeds critical crash rate

As shown in Table 7, two intersections have crash rates higher than the critical crash rate: Westfield Street at Main Street and Water Street at Oak Street. Although both of these intersections have a relatively low crash frequency compared to other intersections within the City, they also have very low traffic volumes and are t-intersections (e.g., three-leg intersections), so the associated critical crash rates are also very low. The intersection of Water Street at Oak Street was also identified as a high-crash location in ODOT's 2013 Safety Priority Index System (SPIS). At the intersection of Westfield Street and Main Street, the most common crash types were rear-end crashes and turning crashes. At the intersection of Water Street and Oak Street, the most common crash type was pedestrian-related crashes, followed by turning crashes and rear-end crashes.

Operational Performance

Network traffic volumes were collected during afternoon peak hours in November 2015. The raw traffic counts were adjusted by a seasonal factor of 1.202 to account for seasonal fluctuations in traffic volume and adjust them to reflect the 30th highest hour of annual traffic. The seasonal factoring methodology is described in the appendix to this memorandum. The adjusted peak traffic volumes, existing lane geometry, and existing traffic control for the 24 study intersections are shown in Figure 19.

Mobility Targets

Mobility is an important consideration because it measures how freely vehicle traffic can move to its intended destination. In general, roadway systems have their highest degree of conflicts and associated congestion at intersections, and so the performance of a system is often defined by how well the intersections function.

There are two methods used to gauge these conditions – one is numeric, and one is a letter grade. ODOT prefers the numeric volume-to-capacity ratio method (see below) while the City uses a letter grade derived from the Level of Service (LOS) method. Marion County's mobility standards include both measures. Table 8 provides further description of these measures.

All intersections in Silverton must operate at or better than the adopted targets or mitigation is necessary to approve future growth. All intersections under State jurisdiction must comply with the v/c ratios in the Oregon Highway Plan (OHP), while intersections under Silverton and Marion County jurisdiction must meet those respective agencies' LOS standards. The adopted intersection performance targets vary by jurisdiction of the roadways. Performance targets by jurisdictions, some of which vary by roadway, are shown in Table 8.

Note that a designated Special Transportation Area (STA) exists on state facilities in the downtown area, bounded on the north and south by D Street and Lane Street, and on the west and east by Silver Creek and Mill Street. The City requires use of microsimulation to evaluate delay and LOS in the downtown area due to closely spaced all-way stops and potential for queue spillbacks which often yield significantly different results from Highway Capacity Manual deterministic (e.g., Synchro) methods.

An evaluation of existing traffic operations at the 24 study intersections revealed that the existing infrastructure is performing well under current traffic demands. Table 9 presents the existing p.m. peak hour operational analysis results for each of the study intersections. As shown, all 24 study intersections meet operating standards. Detailed analysis reports are included in Appendix A.

Table 8: Mobility Targets by Jurisdiction

Jurisdiction	Performance Method	Mobility Target
ODOT	**Volume-to-capacity (v/c) ratio** is a decimal representation (between 0.00 and 1.00) of the proportion of capacity that is being used (i.e., the saturation) at a turn movement, approach leg, or an intersection. It is determined by dividing the peak hour traffic volume by the hourly capacity of a given intersection or movement.	The OHP v/c threshold for OR 213 and OR 214 is 0.95 except for OR 213 at Jefferson Street and Hobart Road NE, where it is 0.90, and in the downtown STA (OR 214 between D Street and Lane Street), where it is 1.0.
	A lower ratio indicates smooth operations and minimal delays. As the ratio approaches 1.00, congestion increases and performance is reduced. If the ratio is greater than 1.00, the turn movement, approach leg, or intersection is oversaturated and usually results in excessive queues and long delays.	OR 213 and 214 are classified as District Highways with a posted speed of 35 m.p.h. or less, except for the north end of OR 213, which is posted at 45 and 50 m.p.h.[5]
City of Silverton and Marion County	**V/C and Level of service (LOS):** A "report card" rating (A through F) based on the average delay experienced by vehicles at the intersection.	Level of Service D and 0.85 v/c for signalized and all-way stop
	LOS A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand.	Level of Service D and 0.90 v/c for other unsignalized
	LOS D and E are progressively worse operating conditions.	Select downtown intersections must not exceed 55 seconds of delay
	LOS F represents conditions where average vehicle delay has become excessive and demand has exceeded capacity. This condition is typically evident in long queues and delays.	

[5] Oregon Highway Plan, Policy 1F, Table 6

City of Silverton
Transportation
System Plan

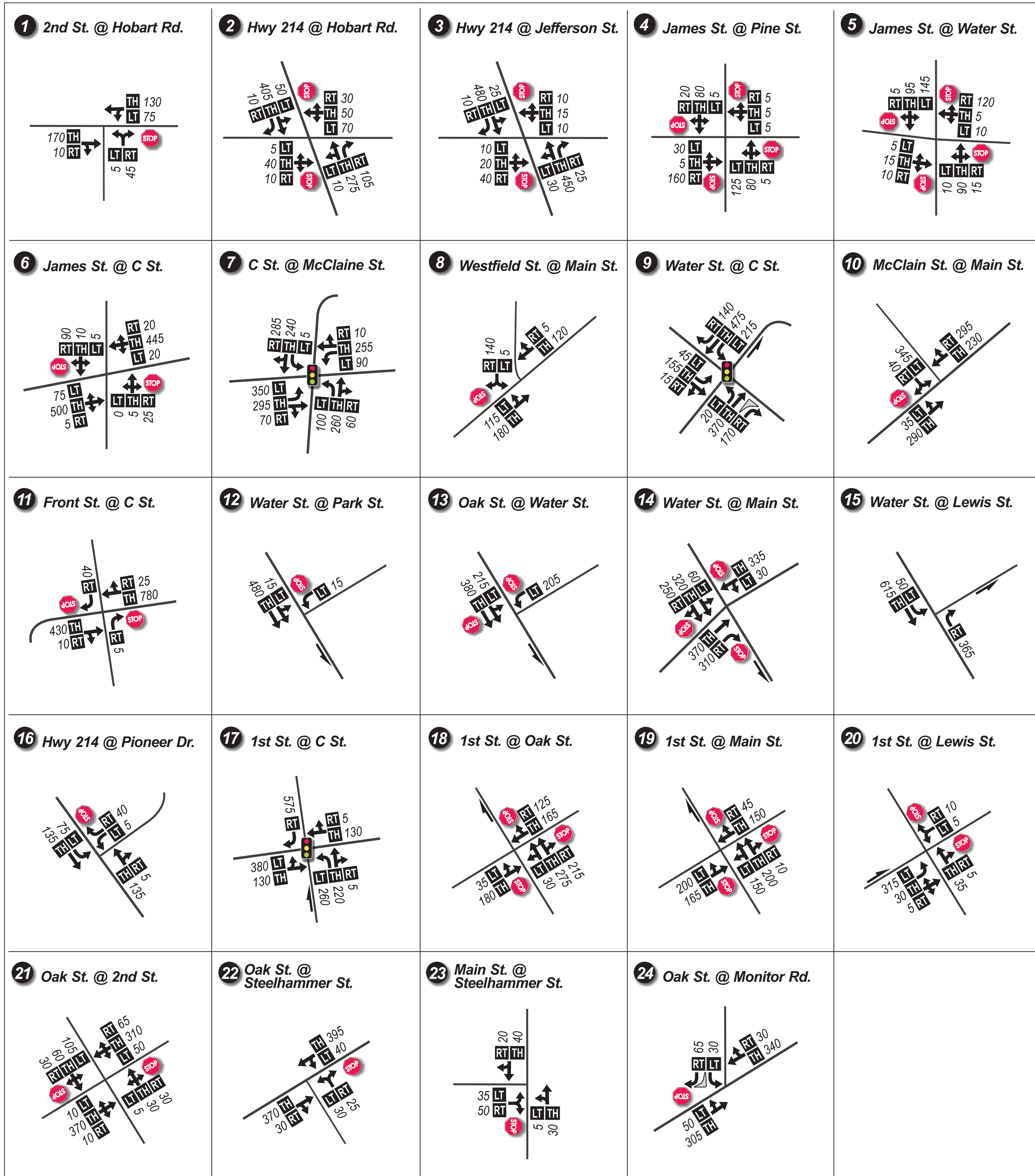
DKS

Figure 19

Existing 2015 Weekday PM Peak Traffic Volumes

LEGEND

- # - Study Intersection
- Traffic Signal
- Stop Sign
- Lane Configuration
- 000 - 30th Hour Traffic Volumes
- LT TH RT (Left•Thru•Right) - Volume Turn Movement



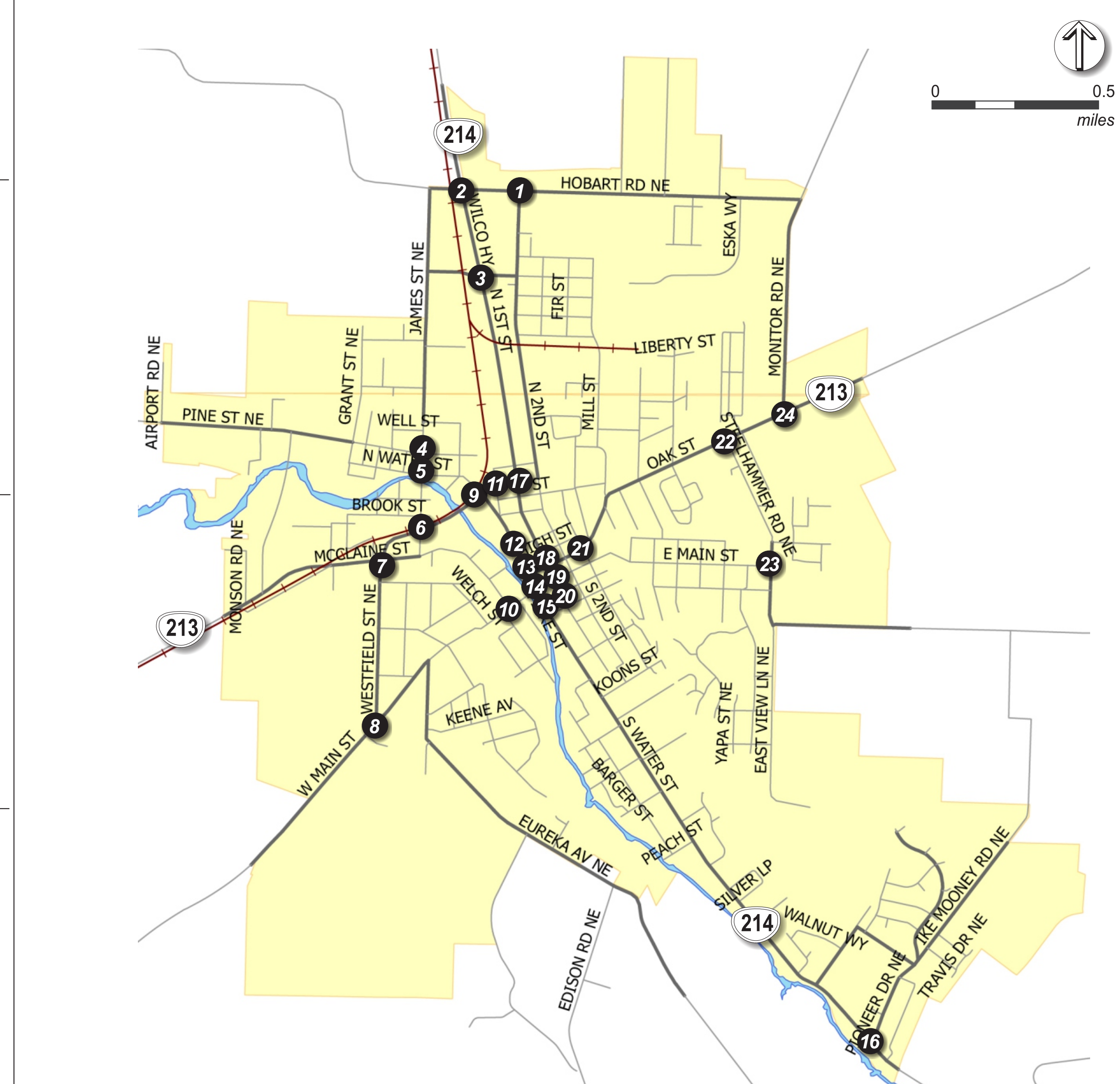


Table 9: Summary of Existing Peak Hour Intersection Operations

Intersection		Jurisdiction	Operating Standard		Existing PM Peak Hour Operations		
			v/c	LOS	v/c	Delay (s)	LOS
All-Way Stop-Controlled Intersections							
4	James St./Pine St.	City	0.85	D	0.33	10.0	A/A
5	James St./Water St.	City	0.85	D	0.38	10.5	A/B
10	Main St./McClaine St.	City	0.85	D	0.58	8.5 [a]	A
13	Water St./Oak St.	ODOT	1.00	-	0.46	25.5 [a]	D
14	Water St./Main St.	ODOT	1.00	-	0.65	16.8 [a]	C
18	1st St./Oak St.	ODOT	1.00	-	0.53	7.3 [a]	A
19	1st St./Main St.	ODOT	1.00	-	0.62	8.1 [a]	A
Other Unsignalized Intersections							
1	2nd St./Hobart Rd.	County	0.90	D	0.07	9.9	A/A
2	OR 214/ Hobart Rd.	ODOT	0.90	-	0.51	28.1	A/D
3	OR 214/Jefferson St.	ODOT	0.90	-	0.21	17.5	A/C
6	James St./C St.	County	0.85	D	0.24	15.3	A/C
8	Main St./Westfield St.	City	0.90	D	0.19	10.1	A/B
11	Front St./C St.	City	0.90	D	0.08	11.8	A/B
12	Water St./Park St.	ODOT	1.00	-	0.02 [b]	10.7 [b]	A/B [b]
15	Water St./Lewis St.	ODOT	1.00	-	0.70	2.8 [a]	A
16	OR 214/Pioneer Dr.	ODOT	0.90	-	0.01	12.1	A/B
20	1st St./Lewis St.	ODOT	1.00	-	0.02	6.6 [a]	A/A
21	2nd St./Oak St.	ODOT	1.00	-	0.55	14.2 [a]	A/B
22	Steelhammer Rd./Oak St.	ODOT	0.95	-	0.12	14.0	A/B
23	Steelhammer Rd./Main St.	County	0.90	D	0.11	9.2	A/A
24	OR 213/Monitor Rd.	ODOT	0.95	-	0.13	16.6	A/C
Signalized Intersections							
7	Westfield St./McClaine St.	City	1.00	-	0.82	27.5	C
9	Water St./C St.	ODOT	0.95	-	0.63	16.8	B
17	1st St./C St.	ODOT	1.00	-	0.78	18.4	B

Unsignalized Intersections:
LOS = Level of Service of major/minor streets
v/c = Volume-to-Capacity ratio of critical movement
Delay = Control delay of critical movement

Signalized Intersections:
LOS = Level of Service of intersection
v/c = Volume-to-Capacity ratio of intersection
Delay = Control delay of intersection

[a] Total intersection delay results from SimTraffic microsimulation analysis.
[b] Results from Synchro in-program operations. Due to unique geometry, HCM Report not available.

As shown in the table, all intersections meet performance targets under existing conditions. Two all-way stop intersections downtown, Water Street/Oak Street and Water Street/Main Street, exceed 15 seconds of average vehicle delay in SimTraffic analysis, meaning they operate at LOS C or worse. In both cases, the southbound movement experiences the highest delay. One two-way strop controlled intersection, OR 214/Hobart Road, operates at LOS D for the westbound movement.

Infrastructure Performance

This section includes discussion of the adequacy of the City's transportation facilities, including bicycle and pedestrian facilities and bridge conditions.

Bicycle Facilities

Bicycling conditions on collector and arterial streets is evaluated using the ODOT Bicycle Level of Stress Methodology[6]. This methodology measures traffic-based stress and quantifies perceived comfort levels for people bicycling on a given facility. The analysis documented in this memo considers factors such as presence of a bike lane and bike lane width and roadway characteristics such as number of through lanes, posted speed limit, the presence of a buffer zone and land use setting (i.e. rural, urban).

There are four classifications used to define bicycle level of stress (LTS) ranging from LTS 1 representing little traffic stress to LTS 4 representing high traffic stress. The summary of general characteristics associated with each stress level is the following:

- LTS 1 or 2: Fewer travel lanes, lower traffic speeds, bike lanes, separated paths, traffic signals, presence of medians (for refuge crossing a major roadway facility), etc.
- LTS 3 or 4: More travel lanes, higher traffic speeds, lack of crosswalks and bike lanes, right-turn lanes crossing bicycle routes, presence of parking lane, etc.

A segment is represented by its worst LTS value. ODOT's recommended level of stress for bicycling is no more than LTS 2, (which is the stress level that will be tolerated by the mainstream adult population) while school-area activity should use LTS 1 for elementary and no more than LTS 2 for middle/high schools.

For Silverton's collector and arterial streets, the bicycle LTS analysis evaluates streets with striped bike lanes[7] and streets for riding in mixed traffic[8]. See Table 10 and Table 11 for evaluation criteria for Silverton.

---

[6] *Analysis Procedures Manual Version 2*, Chapter 14, Oregon Department of Transportation, June 2015.

[7] Table 3, Low Stress Bicycling and Network Connectivity, Mineta Transportation Institute

[8] Table 4, Low Stress Bicycling and Network Connectivity, Mineta Transportation Institute

Table 10: Criteria for bike lanes not alongside a parking lane

	LTS ≥ 1	LTS ≥ 2	LTS ≥ 3	LTS ≥ 4
Street Width (through lanes per direction)	1	2	More than 2	(no effect)
Bike land width (includes marked buffer)	6 ft. or more	5.5 ft. or less	(no effect)	(no effect)
Speed limit	30 mph or less	(no effect)	35 mph	40 mph or more

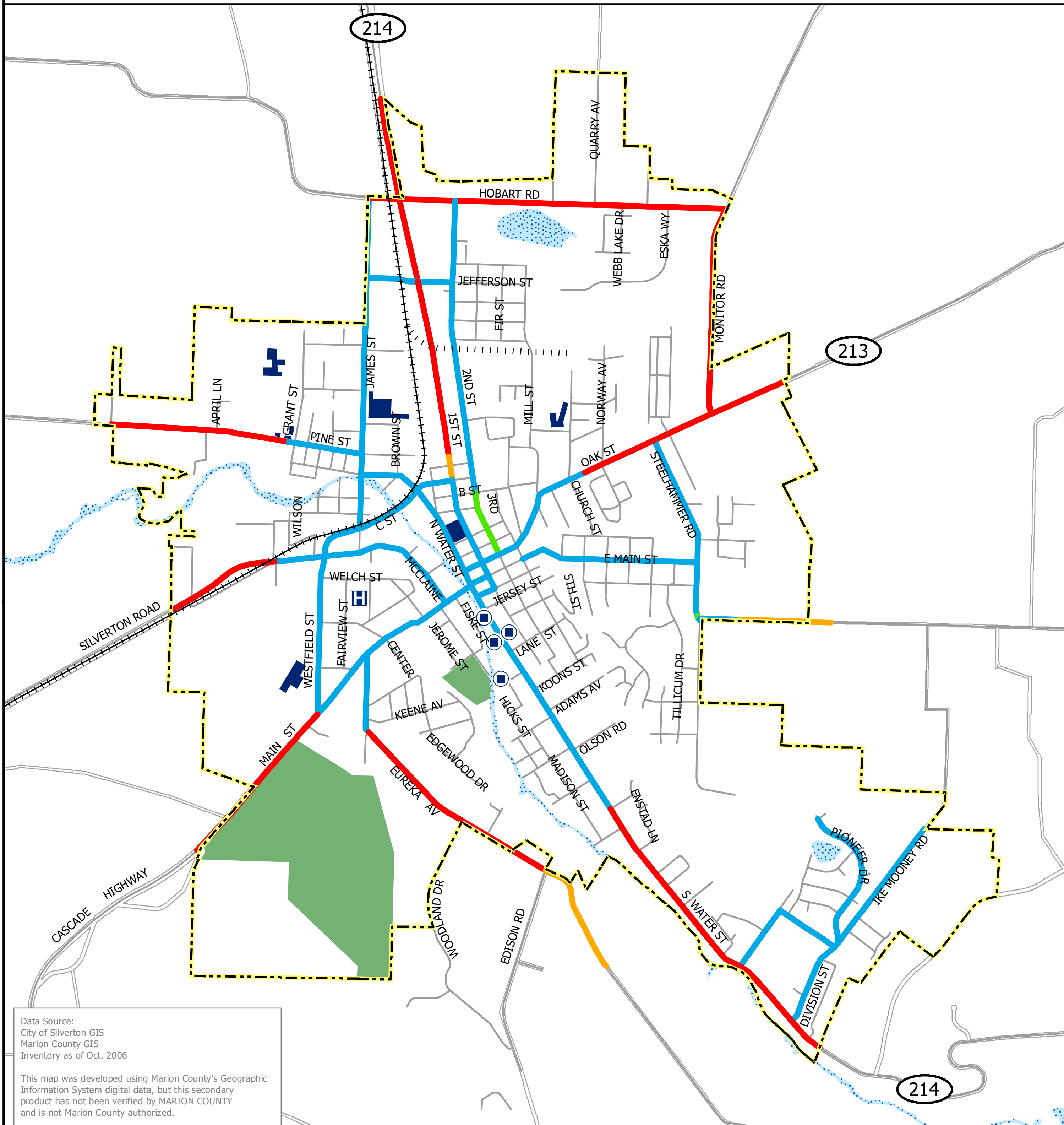
Table 11: Criteria for Level of Traffic Stress on Mixed Traffic

Speed Limit	Street Width		
	2-3 lanes	**4-5 lanes**	**6+ lanes**
≤ 25 mph	LTS 1[a] or 2[a]	LTS 3	LTS 4
30 mph	LTS 2[a] or 3[a]	LTS 4	LTS 4
≥ 35 mph	LTS 4	LTS 4	LTS 4
Note: [a] Use lower value for streets without marked centerlines or classified as residential and with fewer than 3 lanes; user higher value otherwise.			

The analysis, shown in Figure 20, shows that traffic stress is generally lower in the downtown and its adjacent area; particularly 2nd Street shows the lowest stress level of bicycling. On the other hand, arterial and collector streets near the edge of the city all display high level of traffic stress that is undesirable for bicycling.

City of Silverton

Transportation System Plan



Data Source:
City of Silverton GIS
Marion County GIS
Inventory as of Oct. 2006

This map was developed using Marion County's Geographic Information System digital data, but this secondary product has not been verified by MARION COUNTY and is not Marion County authorized.

FIGURE 20

Bicycle Level of Traffic Stress

0 0.25 0.5 Miles

Legend

Bicycle Level of Traffic Stress
- = 1
- = 2
- = 3
- = 4

- Hospital
- Civic/Government
- School
- Urban Growth Boundary
- City Limit
- Park
- Water
- Roads
- Railroad
- Abandoned

Pedestrian Facilities

Similarly, a qualitative assessment was conducted to evaluate the level of traffic stress for people walking on collector and arterial streets using the ODOT Pedestrian Level of Stress (LTS) Methodology[9]. Like the bicycle LTS, there are four classifications used to define pedestrian LTS ranging from LTS 1 to LTS 4, The summary of general characteristics associated with each stress level is the following:

- PLTS 1: Represents little to no traffic stress and requires little attention to the traffic situation. This is suitable for all users including children 10 years or younger, groups of people and people rolling, or using a wheeled mobility device. Pedestrians feel safe and comfortable on the pedestrian facility. Motor vehicles are either far from the pedestrian facility and/or traveling at a low speed and volume. All users are willing to use this facility.
- PLTS 2: Represents little traffic stress but requires more attention to the traffic situation than of which young children may be capable. This would be suitable for children over 10, teens and adults. All users should be able to use the facility but, some factors may limit people rolling. Sidewalk condition should be good with limited areas of fair condition. Roadways may have higher speeds and/or higher volumes. Most users are willing to use this facility.
- PLTS 3: Represents moderate stress and is suitable for adults. An able-bodied adult would feel uncomfortable but safe using this facility. This includes higher speed roadways with smaller buffers. Small areas in the facility may be impassable for a person rolling and/or requires the user to travel on the shoulder/bike lane/street. Some users are willing to use this facility.
- PLTS 4: Represents high traffic stress. Only able-bodied adults with limited route choices would use this facility. Traffic speeds are moderate to high with narrow or no pedestrian facilities provided. Typical locations include high speed, multilane roadways with narrow sidewalks and buffers. This also includes facilities with no sidewalk. This could include evident trails next to roads or 'cut through' trails. Only the most confident or trip-purpose driven users will use this facility.

The pedestrian LTS analysis for Silverton considers the following factors:

- Presence of sidewalk
- Sidewalk width
- Sidewalk conditions
- Presence of buffer

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[9] *Analysis Procedures Manual Version 2*, Chapter 14, Oregon Department of Transportation, June 2015.

- Buffer width
- Speed limit

Tables 12-14 show how different factors influence the pedestrian stress level of any given segment of street. Not only the presence of sidewalk is an important consideration but the condition of the sidewalk pavement, the speed of traffic, and the width of buffer between people walking and cars are all critical to a low stress walking environment. A given road segment's final rating is determined by the worst LTS level in any evaluation criteria.

Table 12: Sidewalk Condition Criteria

Actual/Effective Sidewalk Width (ft)[2]		**Sidewalk Condition**				
		Good	Fair	Poor	Very Poor	No Sidewalk
Actual	<4	PLTS 4	PLTS 4	PLTS 4	PLTS 4	PLTS 4
	≥4 to <5	PLTS 3	PLTS 3	PLTS 3	PLTS 4	PLTS 4
	≥5	PLTS 2	PLTS 2	PLTS 3	PLTS 4	PLTS 4
Effective	≥6	PLTS 1	PLTS 1	PLTS 2	PLTS 3	PLTS 4

Table 13: Buffer Type Criteria

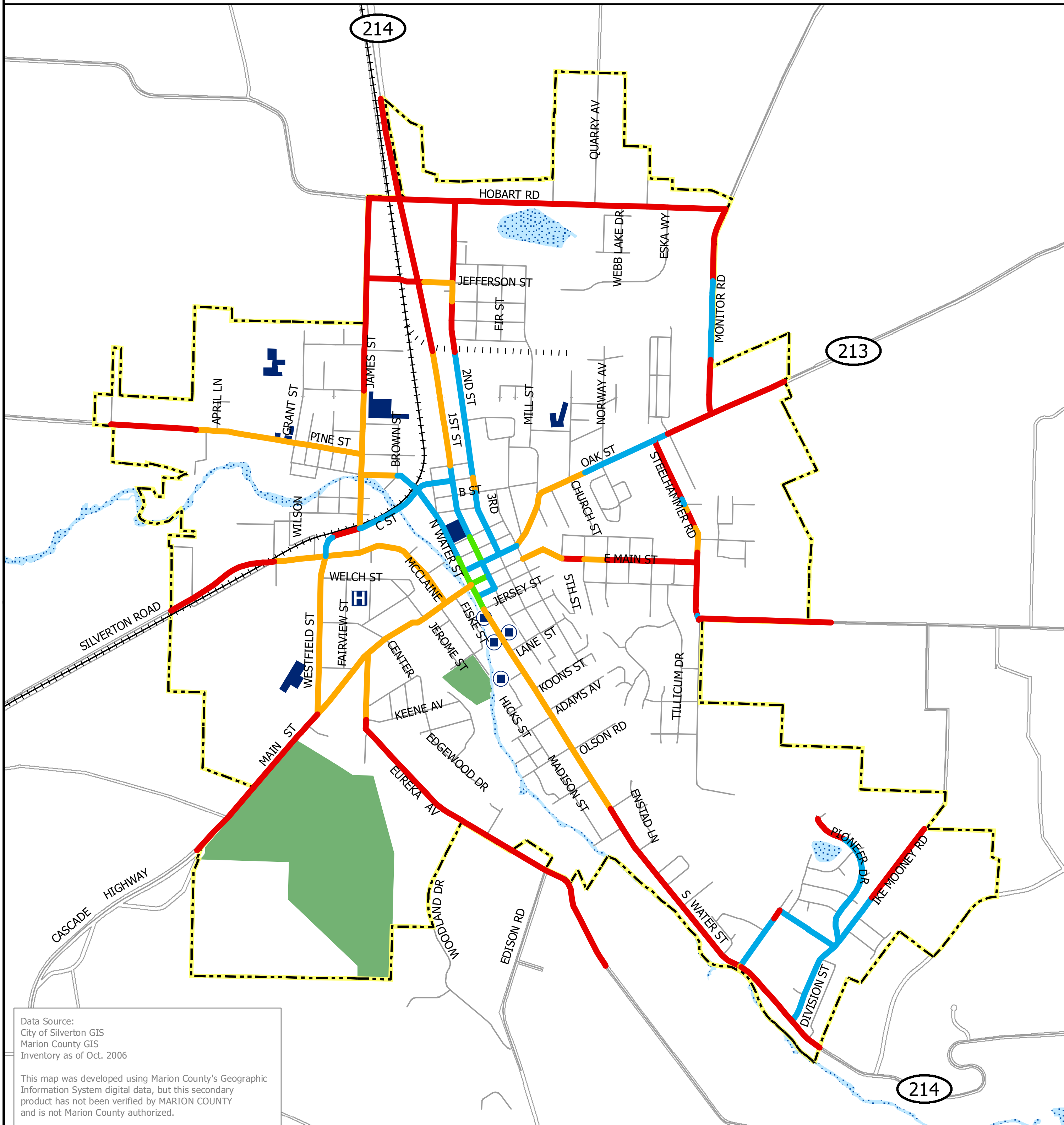
Physical Buffer Type				
Buffer Type	Prevailing or Posted Speed			
	≤25 MPH	30 MPH	35 MPH	≥40 MPH
No Buffer (curb tight)	PLTS 2	PLTS 3	PLTS 3	PLTS 4
Solid Surface	PLTS 2	PLTS 2	PLTS 2	PLTS 2
Landscaped	PLTS 1	PLTS 2	PLTS 2	PLTS 2

Table 14: Total Buffering Width Criteria

Total Number of Travel Lanes (both directions)	Total: Buffering Width (ft)[1]			
	<5	≥5 to <10	≥10 to <15	≥15 to <25
2	PLTS2	PLTS2	PLTS1	PLTS1

Results are shown in Figure 21. Most collector and arterial streets in downtown Silverton have low stress levels (LTS 1 and 2 depending on sidewalk condition) for people walking. Water Street and First Street are especially good streets for walking. In contrast, collector and arterial streets outside of downtown generally have high stress levels (LTS 3 and 4). The results are particularly concerning for streets near schools since high stress level discourages students from using active transportation modes, eliminates travel options for children, and may indicate higher risks of traffic injury and fatality.

City of Silverton
Transportation System Plan



Data Source:
City of Silverton GIS
Marion County GIS
Inventory as of Oct. 2006

This map was developed using Marion County's Geographic Information System digital data, but this secondary product has not been verified by MARION COUNTY and is not Marion County authorized.

FIGURE 21

Qualitative Pedestrian Stress Assessment

0 0.25 0.5 Miles

Legend

Pedestrian Level of Travel Stress
- = 1
- = 2
- = 3
- = 4

- Hospital
- Civic/Government
- School
- Urban Growth Boundary
- City Limit
- Park
- Water
- Roads
- Railroad
- Abandoned

Bridges

Existing bridge conditions and needs were analyzed based on data obtained from ODOT's TransGIS. The database contains information on all non-federal bridges in the state, with data from inspections conforming to the National Bridge Inventory (NBI) requirements.[10] Information includes general condition summaries, sufficiency ratings, structural conditions, and height and load restrictions for both ODOT and county bridges.

Within Silverton's urban growth boundary, there are 3 bridges on public road facilities.[11] . Table 15 summarizes the study area bridges by jurisdiction, condition, sufficiency rating, and federal funding status.

Table 15: Bridge Conditions and Sufficiency Ratings

Bridge Name	Bridge Condition	Owner Agency	Sufficiency Rating	FHWA Funding Status
Silver Creek, James Ave.	Functionally Obsolete	Marion County	34.4	Eligible for Replacement (Suff. Rating <= 50)
Silver Creek, C St.	Not Deficient	City of Silverton	97.5	Not Eligible (Suff. Rating > 80)
Silver Creek, Main St.	Functionally Obsolete	City of Silverton	78.9	Eligible for Rehabilitation (Suff. Rating > 50 - 80)

A "functionally obsolete" bridge is one that was built to standards that do not meet the minimum design clearance requirements for a new bridge. These bridges do not necessarily have structural deficiencies, and they are not inherently unsafe. Functionally obsolete bridges include those that have sub-standard geometric features such as narrow lanes, narrow shoulders, poor approach alignment or inadequate vertical under clearance.

The sufficiency rating for each bridge is determined by periodic inspections performed by ODOT, using procedures defined for the NBI. The rating is a numeric value indicative of the overall multiple criteria sufficiency of a bridge to remain in service. A score of 100% would represent an entirely sufficient bridge, while a score 0% would indicate a completely deficient bridge. The rating is calculated using a formula comprising the following factors:

- Structural adequacy and safety (maximum of 55%)
- Serviceability and functional obsolescence (maximum of 30%)

[10] Federal Highway Administration. Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges. 1995

[11] Excludes culverts and sign support structures.

- Essentiality for public use (maximum of 15%)
- Special reductions (maximum of -13%)

The Federal Highway Administration (FHWA) uses this index in evaluating the nation's bridges for funding distribution and eligibility. Those bridges with a sufficiency rating of 80 or less are eligible for rehabilitation. Bridges with a rating of 50 or less are eligible for replacement. Bridges lose their eligibility status for a period of ten years after a federal Highway Bridge Program project is completed.

Summary of Existing Issues

The analysis of existing conditions revealed that the Silverton transportation system operates well under current demands, however there are several notable issues that may warrant further consideration. The key findings related to operations, safety, and infrastructure performance are as follows.

Intersection Operational Performance

All of the study intersections currently have adequate capacity and acceptable levels of delay according to the mobility standards outlined by each jurisdiction (city, county, and state, as appropriate). There are no issues or items of concern related to the existing intersection operations within the City.

Network Safety Performance

Overall, there are very few safety concerns regarding the City of Silverton transportation system. There were no fatal crashes during the five years of crash data analyzed, and the frequency of crashes within the City is relatively low compared to similarly-sized cities in Oregon. A critical crash rate analysis indicated that two intersections a poorer safety performance than what is typically expected at intersections with similar configurations: Westfield Street at Main Street and Water Street at Oak Street. The intersection of Water Street at Oak Street was also identified as a high-crash location in ODOT's 2013 Safety Priority Index System (SPIS).

Infrastructure Performance

An evaluation of the infrastructure of the City of Silverton revealed the following infrastructure performance issues.

Bicycle and Pedestrian Facilities

Pedestrian traffic is relatively well served by the central downtown sidewalk network. Notable sidewalk gaps in the downtown area are along N Third Street (between B Street and Oak Street), A Street (between Front Street and First Street), High Street, Park Street, Lewis Street (between Second Street and Third Street), and Jersey Street (between First Street and Third Street). Further from the city center, the sidewalk network becomes more intermittent. The railroad and Silver Creek also present barriers to pedestrian connectivity from the areas north and west of downtown.

Currently, there are approximately 3.8 miles of marked bike lanes on a total of 65 miles of paved roads in Silverton, equating to marked bike lanes on 6% of the roads in Silverton. Marked bike lanes are currently present on Hobart Road Northeast, North First Street, East C Street, North Water Street, McClain Street, Westfield Street, West Main Street, and South Water Street.

Transit Facilities

Public transit service in the City of Silverton is limited to a single regional service and a demand-responsive dial-a-ride local service. There is a lack of regional connections to major employment areas as well as a lack of local service for citizens within the community. The elderly, disabled, and youth are often impacted the most when transit services are not available.

Roadways

The roadway system within the study area falls into three different jurisdictions – ODOT, Marion County, and the City of Silverton. Two district highways, OR 214 and OR 213, provide regional access to the City. Major arterials within the City include, 1st Street, C Street, McClaine Street, Oak Street, Pine Street, and Water Street. The existing roadway network serves the City well and no notable performance issues are present.

Bridges

There are three bridges within the City of Silverton that provide vehicle, pedestrian, and bicycle access across Silver Creek (James Avenue, Main Street, and C Street). The James Avenue and Main Street bridges have been classified by FHWA as "structurally obsolete", indicating that they were designed to standards that do not meet today's design code. However, neither bridge has any structural integrity issues and both are considered safe for use. The C Street bridge is classified as "not deficient", indicating no design or safety concerns have been identified.

Rail Crossings

Four at-grade rail crossings within the City of Silverton are controlled only by stop signs and do not include gates or other active warning systems: Fossholm Road, Hobart Road, James Street and Jefferson Street.

Appendix

Seasonal Factoring Methodology

HCM and SimTraffic Intersection Analysis

DKS

Seasonal Factoring Methodology

Seasonal Factors

ODOT's Analysis Procedures Manual (APM) calls for the adjustment of raw traffic counts to 30th highest hour volumes to account for seasonal variation throughout the year. Counts used in this analysis were collected in mid-November 2015. The APM presents three possible adjustment methods. The first method, the On-Site ATR method, is not applicable because the nearest ATR (03-013) is more than 6 miles outside of the study area. The second method, the ATR Characteristics Table Method, is also not applicable because the study roadways have characteristics (e.g., low traffic volumes) that were not represented in the ATR Characteristics Table. Therefore, the third method, the ATR Seasonal Trend Table Method, provided the basis for applying a seasonal factor adjustment to the Silverton Traffic Counts. Through conversations with ODOT staff, a combination Summer and Commuter trends was used for the state highways in Silverton. The seasonal adjustment factor calculations are shown in Table 1.

Table 1. Summary of Seasonal Factor Calculation

Seasonal Trend Category	2015 Peak Period Seasonal Factor	Count Date Seasonal Factor (Nov. 15th)	Adjustment Factor
Summer	0.835	1.0929	1.0929/0.835 = **1.309**
Commuter	0.9149	1.0016	1.0016/0.9149 = **1.095**
Average Summer-Commuter			***1.202***

An adjustment factor of 1.202 was applied to raw traffic counts on major roadways through Silverton (Highway 213, Highway 214, Cascade Highway, and Silverton Road). No adjustment factor was applied to local city streets, as they typically do not experience the same seasonal fluctuations in traffic volume.

DKS

HCM and SimTraffic Intersection Analysis

Intersection	
Intersection Delay, s/veh	2.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	171	10	73	128	5	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	5	0	3	15	0	2
Mvmt Flow	192	11	82	144	6	51

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	203	0	506	198
Stage 1	-	-	-	-	198	-
Stage 2	-	-	-	-	308	-
Follow-up Headway	-	-	2	-	4	3
Pot Capacity-1 Maneuver	-	-	1363	-	530	843
Stage 1	-	-	-	-	840	-
Stage 2	-	-	-	-	750	-
Time blocked-Platoon, %	-	-		-		
Mov Capacity-1 Maneuver	-	-	1363	-	496	843
Mov Capacity-2 Maneuver	-	-	-	-	496	-
Stage 1	-	-	-	-	840	-
Stage 2	-	-	-	-	701	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3	10

Minor Lane / Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	788	-	-	1363	-
HCM Lane V/C Ratio	0.071	-	-	0.06	-
HCM Control Delay (s)	9.9	-	-	7.81	0
HCM Lane LOS	A			A	A
HCM 95th %tile Q(veh)	0.23	-	-	0.192	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	40	8	68	48	30	9	229	104	48	337	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	100	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	0	5	0	26	2	7	0	4	9	2	5	0
Mvmt Flow	5	44	9	75	53	33	10	252	114	53	370	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	790	747	370	773	747	252	370	0	0	252	0	0
Stage 1	476	476	-	271	271	-	-	-	-	-	-	-
Stage 2	314	271	-	502	476	-	-	-	-	-	-	-
Follow-up Headway	4	4	3	4	4	3	2	-	-	2	-	-
Pot Capacity-1 Maneuver	310	338	680	289	341	775	1200	-	-	1313	-	-
Stage 1	574	552	-	685	685	-	-	-	-	-	-	-
Stage 2	701	680	-	509	557	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	247	317	680	243	320	775	1200	-	-	1313	-	-
Mov Capacity-2 Maneuver	247	317	-	243	320	-	-	-	-	-	-	-
Stage 1	568	524	-	677	677	-	-	-	-	-	-	-
Stage 2	612	673	-	437	529	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	18	28	0	1

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1200	-	-	335	312	1313	-	-
HCM Lane V/C Ratio	0.008	-	-	0.174	0.514	0.04	-	-
HCM Control Delay (s)	8.025	0	-	18	28.1	7.857	0	-
HCM Lane LOS	A	A		C	D	A	A	
HCM 95th %tile Q(veh)	0.025	-	-	0.62	2.771	0.125	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	9	18	42	9	13	9	30	372	25	23	400	12
Conflicting Peds, #/hr	0	0	2	2	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	100	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	11	0	0	11	0	0	40	4	0	0	8	75
Mvmt Flow	10	20	46	10	14	10	33	409	27	25	440	13

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	981	969	442	1002	969	411	442	0	0	411	0	0
Stage 1	492	492	-	477	477	-	-	-	-	-	-	-
Stage 2	489	477	-	525	492	-	-	-	-	-	-	-
Follow-up Headway	4	4	3	4	4	3	3	-	-	2	-	-
Pot Capacity-1 Maneuver	220	256	620	213	256	645	943	-	-	1159	-	-
Stage 1	542	551	-	552	559	-	-	-	-	-	-	-
Stage 2	544	559	-	520	551	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	195	236	619	174	236	644	943	-	-	1159	-	-
Mov Capacity-2 Maneuver	195	236	-	174	236	-	-	-	-	-	-	-
Stage 1	516	534	-	526	532	-	-	-	-	-	-	-
Stage 2	497	532	-	450	534	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	18	21	1	0

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	943	-	-	363	257	1159	-	-
HCM Lane V/C Ratio	0.035	-	-	0.209	0.133	0.022	-	-
HCM Control Delay (s)	8.956	0	-	17.5	21.1	8.175	0	-
HCM Lane LOS	A	A		C	C	A	A	
HCM 95th %tile Q(veh)	0.109	-	-	0.775	0.451	0.067	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	9.4
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	29	3	158	3	3	2	124	82	2	3	78	22
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	10	0	4	0	0	0	1	0	0	0	0	0
Mvmt Flow	35	4	188	4	4	2	148	98	2	4	93	26
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.3	8.1	10	8.5
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	60%	15%	38%	3%
Vol Thru, %	39%	2%	38%	76%
Vol Right, %	1%	83%	25%	21%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	208	190	8	103
LT Vol	82	3	3	78
Through Vol	2	158	2	22
RT Vol	124	29	3	3
Lane Flow Rate	248	226	10	123
Geometry Grp	1	1	1	1
Degree of Util (X)	0.324	0.282	0.013	0.157
Departure Headway (Hd)	4.717	4.484	4.983	4.618
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	760	801	714	774
Service Time	2.758	2.521	3.04	2.665
HCM Lane V/C Ratio	0.326	0.282	0.014	0.159
HCM Control Delay	10	9.3	8.1	8.5
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	1.4	1.2	0	0.6

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	9.5
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	1	14	11	11	6	121	9	91	14	144	97	1
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	0	14	9	0	33	1	0	0	0	3	2	0
Mvmt Flow	1	17	13	13	7	144	11	108	17	171	115	1
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.1	8.6	8.6	10.5
HCM LOS	A	A	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	8%	4%	8%	60%
Vol Thru, %	80%	54%	4%	40%
Vol Right, %	12%	42%	88%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	114	26	138	242
LT Vol	91	14	6	97
Through Vol	14	11	121	1
RT Vol	9	1	11	144
Lane Flow Rate	136	31	164	288
Geometry Grp	1	1	1	1
Degree of Util (X)	0.174	0.042	0.202	0.373
Departure Headway (Hd)	4.622	4.854	4.42	4.666
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	774	734	810	769
Service Time	2.667	2.907	2.46	2.706
HCM Lane V/C Ratio	0.176	0.042	0.202	0.375
HCM Control Delay	8.6	8.1	8.6	10.5
HCM Lane LOS	A	A	A	B
HCM 95th-tile Q	0.6	0.1	0.8	1.7

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	75	502	1	22	445	19	0	1	27	2	8	92
Conflicting Peds, #/hr	2	0	1	1	0	2	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	0	4	0	4	8	0	0	0	0	0	0	2
Mvmt Flow	79	528	1	23	468	20	0	1	28	2	8	97

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	489	0	0	530	0	0	1266	1224	532	1229	1214	481
Stage 1	-	-	-	-	-	-	688	688	-	526	526	-
Stage 2	-	-	-	-	-	-	578	536	-	703	688	-
Follow-up Headway	2	-	-	2	-	-	4	4	3	4	4	3
Pot Capacity-1 Maneuver	1085	-	-	1027	-	-	147	181	551	156	183	585
Stage 1	-	-	-	-	-	-	440	450	-	539	532	-
Stage 2	-	-	-	-	-	-	505	527	-	431	450	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1083	-	-	1025	-	-	106	157	550	132	159	584
Mov Capacity-2 Maneuver	-	-	-	-	-	-	106	157	-	132	159	-
Stage 1	-	-	-	-	-	-	394	403	-	483	515	-
Stage 2	-	-	-	-	-	-	401	510	-	365	403	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1	0	13	15

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	505	1083	-	-	1025	-	-	457
HCM Lane V/C Ratio	0.058	0.073	-	-	0.023	-	-	0.235
HCM Control Delay (s)	12.6	8.585	0	-	8.593	0	-	15.3
HCM Lane LOS	B	A	A		A	A		C
HCM 95th %tile Q(veh)	0.185	0.235	-	-	0.069	-	-	0.903

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	290	246	58	73	214	6	85	258	50	5	241	239
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.98		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1629	1694		1646	1677		1630	1639		1662	1513	
Flt Permitted	0.34	1.00		0.56	1.00		0.20	1.00		0.49	1.00	
Satd. Flow (perm)	575	1694		975	1677		350	1639		853	1513	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	312	265	62	78	230	6	91	277	54	5	259	257
RTOR Reduction (vph)	0	9	0	0	1	0	0	7	0	0	40	0
Lane Group Flow (vph)	312	318	0	78	235	0	91	324	0	5	476	0
Confl. Peds. (#/hr)	2					2						
Heavy Vehicles (%)	2%	0%	2%	1%	4%	0%	2%	5%	0%	0%	5%	9%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	35.1	27.4		20.5	17.3		36.6	33.3		31.4	30.7	
Effective Green, g (s)	35.1	27.4		20.5	17.3		36.6	33.3		31.4	30.7	
Actuated g/C Ratio	0.42	0.33		0.25	0.21		0.44	0.40		0.38	0.37	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	414	561		267	351		206	660		331	562	
v/s Ratio Prot	c0.12	0.19		0.01	0.14		c0.02	0.20		0.00	c0.31	
v/s Ratio Perm	c0.20			0.06			0.18			0.01		
v/c Ratio	0.75	0.57		0.29	0.67		0.44	0.49		0.02	0.85	
Uniform Delay, d1	17.7	22.7		24.5	30.0		16.0	18.3		16.0	23.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.6	1.3		0.6	5.0		1.5	0.6		0.0	11.4	
Delay (s)	25.3	24.0		25.1	35.0		17.5	18.9		16.0	35.2	
Level of Service	C	C		C	C		B	B		B	D	
Approach Delay (s)		24.7			32.5			18.6			35.0	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	27.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	82.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Intersection						
Intersection Delay, s/veh	4.2					
Movement	**EBL**	**EBT**	**WBT**	**WBR**	**SBL**	**SBR**
Vol, veh/h	116	182	120	6	5	142
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	120	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	11	1	5	0	0	8
Mvmt Flow	127	200	132	7	5	156
Major/Minor	**Major1**		**Major2**		**Minor2**	
Conflicting Flow All	138	0	-	0	590	135
Stage 1	-	-	-	-	135	-
Stage 2	-	-	-	-	455	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1392	-	-	-	474	898
Stage 1	-	-	-	-	896	-
Stage 2	-	-	-	-	643	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1392	-	-	-	431	898
Mov Capacity-2 Maneuver	-	-	-	-	431	-
Stage 1	-	-	-	-	896	-
Stage 2	-	-	-	-	584	-
Approach	**EB**		**WB**		**SB**	
HCM Control Delay, s	3		0		10	

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1392	-	-	-	866
HCM Lane V/C Ratio	0.092	-	-	-	0.187
HCM Control Delay (s)	7.847	-	-	-	10.1
HCM Lane LOS	A				B
HCM 95th %tile Q(veh)	0.302	-	-	-	0.683

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	18	368	169	215	474	141	0	0	0	46	153	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0	5.0	4.5	5.0	5.0				4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98				1.00	1.00	
Flpb, ped/bikes	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	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00				0.95	1.00	
Satd. Flow (prot)	1662	1716	1453	1662	1699	1442				1662	1707	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00				0.95	1.00	
Satd. Flow (perm)	1662	1716	1453	1662	1699	1442				1662	1707	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	20	404	186	236	521	155	0	0	0	51	168	16
RTOR Reduction (vph)	0	0	117	0	0	68	0	0	0	0	6	0
Lane Group Flow (vph)	20	404	69	236	521	87	0	0	0	51	178	0
Confl. Peds. (#/hr)			2	2			5		10	10		5
Confl. Bikes (#/hr)						1						2
Heavy Vehicles (%)	0%	2%	1%	0%	3%	1%	0%	0%	0%	0%	1%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm				Prot	NA	
Protected Phases	5	2		1	6					7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	0.9	22.0	22.0	12.0	33.1	33.1				11.1	11.1	
Effective Green, g (s)	0.9	22.0	22.0	12.0	33.1	33.1				11.1	11.1	
Actuated g/C Ratio	0.02	0.37	0.37	0.20	0.56	0.56				0.19	0.19	
Clearance Time (s)	4.5	5.0	5.0	4.5	5.0	5.0				4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0				3.0	3.0	
Lane Grp Cap (vph)	25	638	540	337	951	807				312	320	
v/s Ratio Prot	0.01	c0.24		c0.14	0.31					0.03	c0.10	
v/s Ratio Perm			0.05			0.06						
v/c Ratio	0.80	0.63	0.13	0.70	0.55	0.11				0.16	0.56	
Uniform Delay, d1	29.0	15.2	12.2	21.9	8.3	6.1				20.1	21.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	
Incremental Delay, d2	95.2	2.1	0.1	6.4	0.6	0.1				0.2	2.1	
Delay (s)	124.2	17.3	12.3	28.3	8.9	6.1				20.4	23.9	
Level of Service	F	B	B	C	A	A				C	C	
Approach Delay (s)		19.3			13.5			0.0			23.1	
Approach LOS		B			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	59.1	Sum of lost time (s)	14.0
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	14.9
Intersection LOS	B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	31	291	232	245	287	32
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	3	2	4	3	1	0
Mvmt Flow	33	310	247	261	305	34
Number of Lanes	0	1	1	1	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	2	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	1
HCM Control Delay	16.1	12.6	17.1
HCM LOS	C	B	C

Lane	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	10%	0%	0%	90%
Vol Thru, %	90%	100%	0%	0%
Vol Right, %	0%	0%	100%	10%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	322	232	245	319
LT Vol	291	232	0	0
Through Vol	0	0	245	32
RT Vol	31	0	0	287
Lane Flow Rate	343	247	261	339
Geometry Grp	5	7	7	2
Degree of Util (X)	0.558	0.424	0.395	0.574
Departure Headway (Hd)	5.859	6.184	5.455	6.089
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	613	580	657	590
Service Time	3.915	3.941	3.212	4.142
HCM Lane V/C Ratio	0.56	0.426	0.397	0.575
HCM Control Delay	16.1	13.5	11.8	17.1
HCM Lane LOS	C	B	B	C
HCM 95th-tile Q	3.4	2.1	1.9	3.6

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	431	12	0	782	26	0	0	7	0	0	42
Conflicting Peds, #/hr	0	0	1	1	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	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	5	0	0	6	0	0	0	0	0	0	0
Mvmt Flow	0	463	13	0	841	28	0	0	8	0	0	45

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	869	0	0	476	0	0	890	1339	471	1325	1331	435
Stage 1	-	-	-	-	-	-	470	470	-	855	855	-
Stage 2	-	-	-	-	-	-	420	869	-	470	476	-
Follow-up Headway	2	-	-	2	-	-	4	4	3	4	4	3
Pot Capacity-1 Maneuver	784	-	-	1097	-	-	253	154	597	125	156	575
Stage 1	-	-	-	-	-	-	578	563	-	323	378	-
Stage 2	-	-	-	-	-	-	587	372	-	578	560	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	783	-	-	1096	-	-	233	154	597	123	156	575
Mov Capacity-2 Maneuver	-	-	-	-	-	-	233	154	-	123	156	-
Stage 1	-	-	-	-	-	-	578	563	-	323	378	-
Stage 2	-	-	-	-	-	-	540	372	-	570	560	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	11	12

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	597	783	-	-	1096	-	-	575
HCM Lane V/C Ratio	0.013	-	-	-	-	-	-	0.079
HCM Control Delay (s)	11.1	0	-	-	0	-	-	11.8
HCM Lane LOS	B	A			A			B
HCM 95th %tile Q(veh)	0.038	0	-	-	0	-	-	0.255

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	14	0	0	0	16	480
Conflicting Peds, #/hr	2	4	0	7	7	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	0	0	2
Mvmt Flow	16	0	0	0	18	539

Major/Minor	Minor1				Major2	
Conflicting Flow All	310	11			4	0
Stage 1	4	-			-	-
Stage 2	306	-			-	-
Follow-up Headway	4	-			-	-
Pot Capacity-1 Maneuver	625	-			-	-
Stage 1	-	-			-	-
Stage 2	684	-			-	-
Time blocked-Platoon, %						-
Mov Capacity-1 Maneuver	623	-			-	-
Mov Capacity-2 Maneuver	623	-			-	-
Stage 1	-	-			-	-
Stage 2	684	-			-	-

Approach	WB	SB
HCM Control Delay, s	Error	0

Minor Lane / Major Mvmt	WBLn1	SBL	SBT
Capacity (veh/h)	Error	-	-
HCM Lane V/C Ratio	Error	-	-
HCM Control Delay (s)	Error	-	-
HCM Lane LOS	Error		
HCM 95th %tile Q(veh)	Error	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	11.5
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	203	0	0	0	178	316
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	3	0	0	0	2	2
Mvmt Flow	216	0	0	0	189	336
Number of Lanes	1	0	0	0	0	2

Approach	WB	SB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left		WB
Conflicting Lanes Left	0	1
Conflicting Approach Right	SB	
Conflicting Lanes Right	2	0
HCM Control Delay	10.9	11.7
HCM LOS	B	B

Lane	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	63%	0%
Vol Thru, %	0%	37%	100%
Vol Right, %	0%	0%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	203	283	211
LT Vol	0	105	211
Through Vol	0	0	0
RT Vol	203	178	0
Lane Flow Rate	216	301	224
Geometry Grp	2	7	7
Degree of Util (X)	0.32	0.455	0.319
Departure Headway (Hd)	5.337	5.437	5.121
Convergence, Y/N	Yes	Yes	Yes
Cap	674	660	699
Service Time	3.374	3.183	2.867
HCM Lane V/C Ratio	0.32	0.456	0.32
HCM Control Delay	10.9	12.7	10.3
HCM Lane LOS	B	B	B
HCM 95th-tile Q	1.4	2.4	1.4

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	18.2
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	307	259	27	278	0	0	0	0	51	267	209
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	0	2	2	0	5	0	0	0	0	0	2	3
Mvmt Flow	0	320	270	28	290	0	0	0	0	53	278	218
Number of Lanes	0	1	1	0	1	0	0	0	0	0	2	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	2
HCM Control Delay	16.9	20.4	18.4
HCM LOS	C	C	C

Lane	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	0%	0%	9%	28%	0%
Vol Thru, %	100%	0%	91%	72%	39%
Vol Right, %	0%	100%	0%	0%	61%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	307	259	305	185	343
LT Vol	307	0	278	134	134
Through Vol	0	259	0	0	209
RT Vol	0	0	27	51	0
Lane Flow Rate	320	270	318	192	357
Geometry Grp	7	7	6	7	7
Degree of Util (X)	0.603	0.455	0.611	0.378	0.649
Departure Headway (Hd)	6.783	6.068	6.92	7.086	6.545
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	531	591	521	505	549
Service Time	4.561	3.846	4.993	4.858	4.316
HCM Lane V/C Ratio	0.603	0.457	0.61	0.38	0.65
HCM Control Delay	19.4	13.9	20.4	14.1	20.7
HCM Lane LOS	C	B	C	B	C
HCM 95th-tile Q	4	2.4	4.1	1.7	4.6

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	9.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	0	0	0	304	43	512
Conflicting Peds, #/hr	0	3	0	6	6	0
Sign Control	Stop	Stop	Stop	Stop	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	0	0	5	5	1
Mvmt Flow	0	0	0	349	49	589

Major/Minor	Minor2		Major2	
Conflicting Flow All	693	595	0	0
Stage 1	693	-	-	-
Stage 2	0	-	-	-
Follow-up Headway	4	3	-	-
Pot Capacity-1 Maneuver	369	499	-	-
Stage 1	448	-	-	-
Stage 2	-	-	-	-
Time blocked-Platoon, %				-
Mov Capacity-1 Maneuver	0	497	-	-
Mov Capacity-2 Maneuver	0	-	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-

Approach	NB	SB
HCM Control Delay, s	28	0

Minor Lane / Major Mvmt	NBLn1	SBL	SBT
Capacity (veh/h)	497	-	-
HCM Lane V/C Ratio	0.703	-	-
HCM Control Delay (s)	27.6	-	-
HCM Lane LOS	D		
HCM 95th %tile Q(veh)	5.477	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	3	42	111	6	73	113
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	77	77	77	77	77	77
Heavy Vehicles, %	0	0	3	17	1	1
Mvmt Flow	4	55	144	8	95	147

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	484	148	0	0	152	0
Stage 1	148	-	-	-	-	-
Stage 2	336	-	-	-	-	-
Follow-up Headway	4	3	-	-	2	-
Pot Capacity-1 Maneuver	545	904	-	-	1435	-
Stage 1	884	-	-	-	-	-
Stage 2	728	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	509	904	-	-	1435	-
Mov Capacity-2 Maneuver	509	-	-	-	-	-
Stage 1	884	-	-	-	-	-
Stage 2	680	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	3

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	509	904	1435	-
HCM Lane V/C Ratio	-	-	0.008	0.06	0.066	-
HCM Control Delay (s)	-	-	12.1	9.2	7.686	-
HCM Lane LOS			B	A	A	
HCM 95th %tile Q(veh)	-	-	0.023	0.192	0.212	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	316	132	0	0	132	4	214	183	2	0	0	479
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		5.0			5.0		4.5	4.5				4.5
Lane Util. Factor		1.00			1.00		1.00	1.00				1.00
Frpb, ped/bikes		1.00			1.00		1.00	1.00				0.99
Flpb, ped/bikes		0.99			1.00		1.00	1.00				1.00
Frt		1.00			1.00		1.00	1.00				0.86
Flt Protected		0.97			1.00		0.95	1.00				1.00
Satd. Flow (prot)		1607			1677		1568	1619				1410
Flt Permitted		0.70			1.00		0.95	1.00				1.00
Satd. Flow (perm)		1169			1677		1568	1619				1410
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	333	139	0	0	139	4	225	193	2	0	0	504
RTOR Reduction (vph)	0	0	0	0	1	0	0	1	0	0	0	202
Lane Group Flow (vph)	0	472	0	0	142	0	225	194	0	0	0	302
Confl. Peds. (#/hr)	3		3	3		3	6		5	5		6
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	6%	1%	0%	0%	4%	0%	6%	8%	0%	0%	0%	6%
Turn Type	pm+pt	NA			NA		Split	NA				custom
Protected Phases	5	2			6		7	7				8
Permitted Phases	2											6
Actuated Green, G (s)		34.7			34.7		15.6	15.6				40.6
Effective Green, g (s)		34.7			34.7		15.6	15.6				40.6
Actuated g/C Ratio		0.49			0.49		0.22	0.22				0.58
Clearance Time (s)		5.0			5.0		4.5	4.5				4.5
Vehicle Extension (s)		3.0			3.0		3.0	3.0				3.0
Lane Grp Cap (vph)		577			828		348	359				815
v/s Ratio Prot					0.08		c0.14	0.12				c0.03
v/s Ratio Perm		c0.40										0.18
v/c Ratio		0.82			0.17		0.65	0.54				0.37
Uniform Delay, d1		15.1			9.8		24.8	24.1				7.9
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		8.8			0.1		4.1	1.7				0.3
Delay (s)		23.9			9.9		28.9	25.8				8.2
Level of Service		C			A		C	C				A
Approach Delay (s)		23.9			9.9			27.5			8.2	
Approach LOS		C			A			C			A	

Intersection Summary			
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	70.2	Sum of lost time (s)	18.0
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	12.7
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	28	151	0	0	163	105	31	273	177	0	0	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	0	4	0	0	4	3	0	5	4	0	0	0
Mvmt Flow	31	166	0	0	179	115	34	300	195	0	0	0
Number of Lanes	0	1	0	0	1	0	0	2	0	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	1
HCM Control Delay	11.3	12.6	13.3
HCM LOS	B	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1
Vol Left, %	19%	0%	16%	0%
Vol Thru, %	81%	44%	84%	61%
Vol Right, %	0%	56%	0%	39%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	168	314	179	268
LT Vol	137	137	151	163
Through Vol	0	177	0	105
RT Vol	31	0	28	0
Lane Flow Rate	184	345	197	295
Geometry Grp	7	7	2	2
Degree of Util (X)	0.304	0.53	0.312	0.439
Departure Headway (Hd)	5.946	5.539	5.706	5.364
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	606	651	629	671
Service Time	3.674	3.266	3.742	3.396
HCM Lane V/C Ratio	0.304	0.53	0.313	0.44
HCM Control Delay	11.3	14.4	11.3	12.6
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	1.3	3.1	1.3	2.2

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	15
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	202	166	0	0	152	44	149	201	11	0	0	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	2	1	0	0	3	7	3	6	0	0	0	0
Mvmt Flow	222	182	0	0	167	48	164	221	12	0	0	0
Number of Lanes	0	1	0	0	1	0	0	2	0	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	1
HCM Control Delay	17.5	11.6	14.2
HCM LOS	C	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1
Vol Left, %	60%	0%	55%	0%
Vol Thru, %	40%	90%	45%	78%
Vol Right, %	0%	10%	0%	22%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	250	112	368	196
LT Vol	101	101	166	152
Through Vol	0	11	0	44
RT Vol	149	0	202	0
Lane Flow Rate	274	123	404	215
Geometry Grp	7	7	2	2
Degree of Util (X)	0.5	0.212	0.625	0.337
Departure Headway (Hd)	6.559	6.237	5.56	5.639
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	548	576	647	635
Service Time	4.299	3.977	3.599	3.687
HCM Lane V/C Ratio	0.5	0.214	0.624	0.339
HCM Control Delay	15.7	10.7	17.5	11.6
HCM Lane LOS	C	B	C	B
HCM 95th-tile Q	2.8	0.8	4.4	1.5

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	316	32	6	2	0	11	0	33	2	0	0	0
Conflicting Peds, #/hr	2	0	1	1	0	2	4	0	1	1	0	4
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	4	6	0	0	0	0	0	9	0	0	0	0
Mvmt Flow	410	42	8	3	0	14	0	43	3	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	0	0	0	53	0	0	870	875	51
Stage 1	-	-	-	-	-	-	870	870	-
Stage 2	-	-	-	-	-	-	0	5	-
Follow-up Headway	-	-	-	2	-	-	4	4	3
Pot Capacity-1 Maneuver	-	-	-	1566	-	-	325	280	1023
Stage 1	-	-	-	-	-	-	413	359	-
Stage 2	-	-	-	-	-	-	-	-	-
Time blocked-Platoon, %		-	-		-	-			
Mov Capacity-1 Maneuver	-	-	-	1563	-	-	323	# 0	1018
Mov Capacity-2 Maneuver	-	-	-	-	-	-	323	# 0	-
Stage 1	-	-	-	-	-	-	412	# 0	-
Stage 2	-	-	-	-	-	-	-	# 0	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	Error

Minor Lane / Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	0	1018	-	-	-	1563	-	-
HCM Lane V/C Ratio	Error	0.024	-	-	-	0.002	-	-
HCM Control Delay (s)	Error	8.6	-	-	-	7.307	-	-
HCM Lane LOS	Error	A				A		
HCM 95th %tile Q(veh)	Error	0.072	-	-	-	0.005	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection						
Intersection Delay, s/veh	1.4					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	308	29	42	328	27	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	7	5	2	0	4
Mvmt Flow	331	31	45	353	29	27

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	362	0	790	347
Stage 1	-	-	-	-	347	-
Stage 2	-	-	-	-	443	-
Follow-up Headway	-	-	2	-	4	3
Pot Capacity-1 Maneuver	-	-	1180	-	362	692
Stage 1	-	-	-	-	720	-
Stage 2	-	-	-	-	651	-
Time blocked-Platoon, %	-	-		-		
Mov Capacity-1 Maneuver	-	-	1180	-	345	692
Mov Capacity-2 Maneuver	-	-	-	-	345	-
Stage 1	-	-	-	-	720	-
Stage 2	-	-	-	-	620	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	14

Minor Lane / Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	455	-	-	1180	-
HCM Lane V/C Ratio	0.123	-	-	0.038	-
HCM Control Delay (s)	14	-	-	8.172	0
HCM Lane LOS	B			A	A
HCM 95th %tile Q(veh)	0.417	-	-	0.119	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	6.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	9	307	8	40	256	52	1	32	23	86	61	24
Conflicting Peds, #/hr	3	0	0	0	0	3	6	0	0	0	0	6
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	0	3	0	8	3	0	0	3	0	2	5	0
Mvmt Flow	9	316	8	41	264	54	1	33	24	89	63	25

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	324	0	0	331	0	0	768	751	330	753	728	300
Stage 1	-	-	-	-	-	-	345	345	-	379	379	-
Stage 2	-	-	-	-	-	-	423	406	-	374	349	-
Follow-up Headway	2	-	-	2	-	-	4	4	3	4	4	3
Pot Capacity-1 Maneuver	1247	-	-	1196	-	-	321	338	716	326	347	744
Stage 1	-	-	-	-	-	-	675	634	-	643	609	-
Stage 2	-	-	-	-	-	-	613	596	-	647	628	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1244	-	-	1193	-	-	252	318	711	277	326	738
Mov Capacity-2 Maneuver	-	-	-	-	-	-	252	318	-	277	326	-
Stage 1	-	-	-	-	-	-	666	625	-	634	581	-
Stage 2	-	-	-	-	-	-	505	568	-	586	619	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1	15	29

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	409	1244	-	-	1193	-	-	323
HCM Lane V/C Ratio	0.141	0.007	-	-	0.035	-	-	0.546
HCM Control Delay (s)	15.2	7.916	0	-	8.126	0	-	28.8
HCM Lane LOS	C	A	A		A	A		D
HCM 95th %tile Q(veh)	0.488	0.023	-	-	0.107	-	-	3.086

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	35	0	52	0	0	0	1	32	0	0	42	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	0	0	0	0	0	0	100	3	0	0	0	11
Mvmt Flow	41	0	61	0	0	0	1	38	0	0	49	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	100	100	60	131	111	38	71	0	0	38	0	0
Stage 1	60	60	-	40	40	-	-	-	-	-	-	-
Stage 2	40	40	-	91	71	-	-	-	-	-	-	-
Follow-up Headway	4	4	3	4	4	3	3	-	-	2	-	-
Pot Capacity-1 Maneuver	886	794	1011	846	783	1040	1083	-	-	1585	-	-
Stage 1	957	849	-	980	866	-	-	-	-	-	-	-
Stage 2	980	866	-	921	840	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	885	793	1011	794	782	1040	1083	-	-	1585	-	-
Mov Capacity-2 Maneuver	885	793	-	794	782	-	-	-	-	-	-	-
Stage 1	956	849	-	979	865	-	-	-	-	-	-	-
Stage 2	979	865	-	865	840	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9	0	0	0

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1083	-	-	956	0	1585	-	-
HCM Lane V/C Ratio	0.001	-	-	0.107	Error	-	-	-
HCM Control Delay (s)	8.328	0	-	9.2	0	0	-	-
HCM Lane LOS	A	A		A	A	A		
HCM 95th %tile Q(veh)	0.003	-	-	0.358	Error	0	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	43	252	4	0	283	26	4	1	0	27	1	64
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	100	-	-	-	-	-	75
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	3	0	0	4	35	0	0	0	18	0	2
Mvmt Flow	48	280	4	0	314	29	4	1	0	30	1	71

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	316	0	0	286	0	0	697	696	284	696	698	316
Stage 1	-	-	-	-	-	-	380	380	-	316	316	-
Stage 2	-	-	-	-	-	-	317	316	-	380	382	-
Follow-up Headway	2	-	-	2	-	-	4	4	3	4	4	3
Pot Capacity-1 Maneuver	1244	-	-	1288	-	-	358	368	760	336	367	724
Stage 1	-	-	-	-	-	-	646	617	-	662	659	-
Stage 2	-	-	-	-	-	-	698	659	-	611	616	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1244	-	-	1288	-	-	310	350	759	323	349	723
Mov Capacity-2 Maneuver	-	-	-	-	-	-	310	350	-	323	349	-
Stage 1	-	-	-	-	-	-	615	588	-	630	658	-
Stage 2	-	-	-	-	-	-	628	658	-	582	587	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1	0	17	13

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	317	1244	-	-	1288	-	-	425	723
HCM Lane V/C Ratio	0.018	0.038	-	-	-	-	-	0.129	0.066
HCM Control Delay (s)	16.6	8.009	0	-	0	-	-	14.7	10.3
HCM Lane LOS	C	A	A		A			B	B
HCM 95th %tile Q(veh)	0.053	0.12	-	-	0	-	-	0.44	0.21

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:50	4:50	4:50	4:50	4:50	4:50
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	3	3	3	3	3	3
# of Recorded Intervals	2	2	2	2	2	2
Vehs Entered	2381	2368	2553	2397	2453	2429
Vehs Exited	2380	2380	2567	2404	2465	2438
Starting Vehs	47	59	56	59	60	54
Ending Vehs	48	47	42	52	48	47
Travel Distance (mi)	766	774	835	781	791	789
Travel Time (hr)	46.5	51.2	65.0	46.8	53.1	52.5
Total Delay (hr)	17.0	21.2	32.8	16.5	22.6	22.0
Total Stops	5507	5577	6171	5660	5701	5723
Fuel Used (gal)	35.2	36.2	41.2	35.5	37.2	37.1

Interval #0 Information Seeding

Start Time	4:50
End Time	5:00
Total Time (min)	10

Volumes adjusted by PHF, Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	5:00
End Time	5:15
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	1	2	3	4	5	Avg
Vehs Entered	681	642	699	669	707	680
Vehs Exited	671	643	676	665	695	672
Starting Vehs	47	59	56	59	60	54
Ending Vehs	57	58	79	63	72	64
Travel Distance (mi)	212	205	218	209	220	213
Travel Time (hr)	14.1	15.7	16.9	12.6	16.8	15.2
Total Delay (hr)	6.0	7.8	8.5	4.5	8.4	7.0
Total Stops	1507	1492	1607	1475	1538	1525
Fuel Used (gal)	10.0	10.1	10.7	9.7	10.8	10.3

Interval #2 Information Recording2

Start Time	5:15
End Time	6:00
Total Time (min)	45

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	1	2	3	4	5	Avg
Vehs Entered	1700	1726	1854	1728	1746	1747
Vehs Exited	1709	1737	1891	1739	1770	1768
Starting Vehs	57	58	79	63	72	64
Ending Vehs	48	47	42	52	48	47
Travel Distance (mi)	554	569	616	572	570	576
Travel Time (hr)	32.5	35.4	48.1	34.2	36.3	37.3
Total Delay (hr)	11.0	13.5	24.3	12.0	14.2	15.0
Total Stops	4000	4085	4564	4185	4163	4201
Fuel Used (gal)	25.2	26.2	30.5	25.8	26.4	26.8

1: Main Street & McClaine Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.4	0.4	0.0	0.0	0.4	0.4	0.2
Total Del/Veh (s)	8.3	8.7	9.1	8.1	8.4	8.4	8.5

12: Water Street & Park Street Performance by movement

Movement	WBL	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.3	0.2	0.2
Total Del/Veh (s)	6.9	2.2	1.0	1.2

13: Water Street & Oak Street Performance by movement

Movement	WBL	WBT	SBL	SBT	All
Denied Del/Veh (s)	0.5		0.0	0.9	0.6
Total Del/Veh (s)	21.5		12.5	34.6	25.5

14: Water Street/Hwy 214/Water Street & Main Street Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	1.4	4.3	0.9
Total Del/Veh (s)	13.0	9.7	15.5	16.2	8.3	25.3	23.2	16.8

15: Water Street/Hwy 214 & Lewis Street Performance by movement

Movement	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.3	0.0	0.0	0.1
Total Del/Veh (s)	5.0	1.4	1.7	2.8

18: 1st Street & Oak Street Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.8	8.2	8.2	5.9	7.9	7.8	5.8	7.3

19: 1st Street & Main Street Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.1
Total Del/Veh (s)	10.1	11.2	8.0	5.0	6.1	6.3	3.7	8.1

20: 1st Street & Lewis Street Performance by movement

Movement	EBL	EBT	EBR	WBL	WBR	NBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0
Total Del/Veh (s)	1.8	0.8	0.3	1.9	0.1	6.6	2.8	2.1

21: 2nd Street & Oak Street Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.3	0.4	0.3		0.2	0.2	0.3	0.3	0.2
Total Del/Veh (s)	3.7	1.7	1.6	3.8	1.5	0.7		10.2	5.8	13.7	14.2	8.0

21: 2nd Street & Oak Street Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	4.3

95: 2nd Street & Lewis Street Performance by movement

Movement	EBT	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	0.1	0.1

96: 2nd Street & Main Street Performance by movement

Movement	EBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	2.2	1.4	1.9

97: 1st Street & Park Street Performance by movement

Movement	EBT	NBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	0.1	1.8	1.7

Total Network Performance

Denied Del/Veh (s)	1.0
Total Del/Veh (s)	30.9

SECTION E

MEMORANDUM 5

TRAFFIC VOLUME FORECASTING

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Technical Memorandum

DATE: December 16, 2016

TO: Silverton TSP Update Project Management Team

FROM: Ray Delahanty, AICP
Lacy Brown, P.E.
Jasmine Pahukula

SUBJECT: Silverton Transportation System Plan Update

Traffic Volume Forecasting

Future forecasting is an important step in the transportation planning process and provides estimates of future travel demand. This memorandum documents the forecasting methodology and results associated with the small community model developed for the Silverton Transportation System Plan (TSP) Update. The small community model, in conjunction with post-processing, results in study intersection turn movement volumes for the 2037 TSP horizon year.

Introduction

The forecasting methodology associated with the small community model expands upon a cumulative analysis approach, as defined in the Oregon Department of Transportation (ODOT) Transportation Planning Analysis Unit's (TPAU's) *Analysis Procedures Manual*.[1] In the context of the traditional 4-step travel demand model approach, the typical cumulative analysis is used for trip generation and trip distribution purposes only. The result is a trip table (for growth increment only) that is used as an input into traffic assignment where analysis is completed by manually assigning the new trips to a street network and then adding them to existing traffic volumes to estimate future volumes.

[1] *Analysis Procedures Manual (APM)*, Oregon Department of Transportation (ODOT) Transportation Planning Analysis Unit (TPAU), Last Updated May, 2016.

The enhanced cumulative analysis tool uses the same trip generation and trip distribution methodology as the typical cumulative analysis, but it applies the methodology to all land uses within the city (i.e., both existing uses as well as any future development based on a land use inventory). The enhanced tool then uses VISUM modeling software[2] and incorporates intersection node delay to complete the equilibrium trip assignment. The result is an improved traffic volume forecasting tool that dynamically assigns both new and existing trips to the transportation network using an equilibrium assignment procedure that represents routing choice more accurately than manual assignment because it is responsive to varying levels of congestion and delay as traffic patterns change. This tool enables a more comprehensive analysis of future conditions and potential TSP alternatives.

The following sections of this memorandum detail each component of the travel forecast methodology associated with the small community model. These components include the roadway network, transportation analysis zones (TAZs), land use, and travel demand. The resulting 2037 future projected volumes are also provided.

Roadway Network

The roadway network included in the Silverton TSP VISUM forecast tool consists of all local, collector, and arterial streets within the Silverton Urban Growth Boundary (UGB). In addition, because there are TSP study intersections near the border of the Silverton UGB, the forecast tool includes the key roadways just outside Silverton that provide access to those study intersections.

An existing roadway network was built using NAVTEQ files as the initial base.[3] Then, details were added based on an existing conditions inventory that included posted speeds, traffic control, lane geometries, and number of travel lanes. Many of the elements of the existing conditions inventory are provided in the Existing Conditions technical memorandum for this project. The purpose of the existing conditions network was to configure the forecast tool and act as a base in the development of the future tool.

The 2037 future year baseline roadway network was then developed to represent the 2037 No-Build conditions. The City of Silverton has no plans for major capital improvements within the UGB, and as such the future 2037 roadway network is identical to the existing 2015 network. The 2037 future year network will be further refined as it is used to perform analysis of the various transportation alternatives and improvements to be analyzed for the Silverton TSP Update.

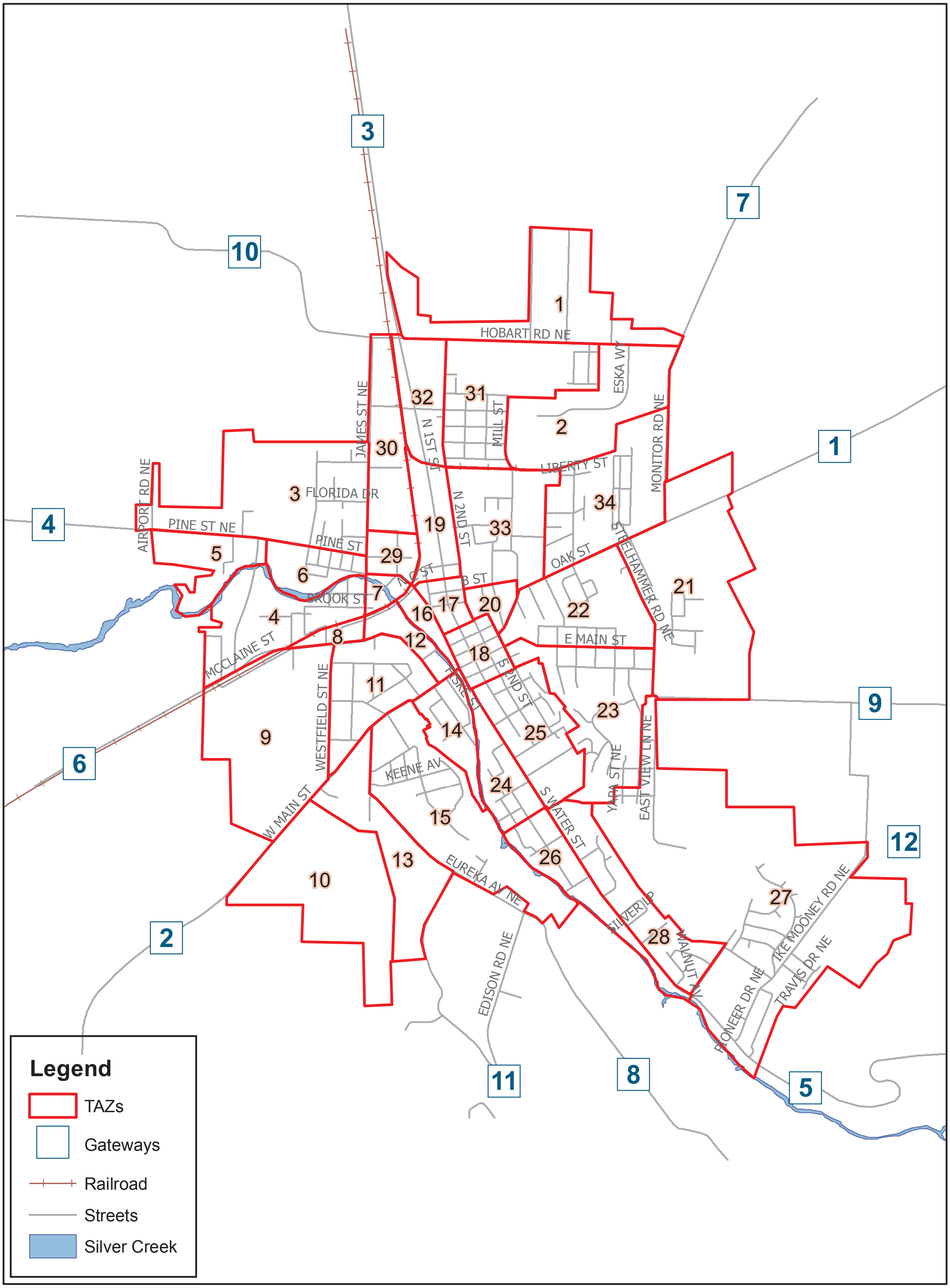
[2] VISUM is a transportation travel demand modeling software developed by PTV Vision.

[3] NAVTEQ is a company that provides detailed map data that is continuously updated.

Transportation Analysis Zones

For transportation forecasting purposes, the Silverton UGB was divided into 34 transportation analysis zones (TAZs), which represent the sources of vehicle trip generation within the city. These TAZ boundaries were determined based on geographical and physical features allowing the best representation of access for an area, along with maintaining homogenous land use types as much as possible (e.g. residential, commercial, etc.). Centroid connectors were located to best represent access to the street network and major parking facilities. The Silverton TSP VISUM network also includes 12 external TAZs at the key gateways into and out of the city to account for vehicle trips that enter and exit the Silverton UGB. The internal TAZs are shown in Figure 1. The next sections of this memorandum discuss the land use and trip generation estimates associated with each TAZ and with the city as a whole.

Figure 1: Forecast Tool TAZs



Land Use

Land use is a key factor affecting travel demands placed on Silverton's transportation system. The location, density, type, and mix of land uses have a direct impact on traffic levels and patterns. An existing 2015 land use inventory and future 2037 land use projection were performed for each TAZ in the Silverton UGB based on zoning and anticipated development patterns.

The housing and employment forecasts used for this TSP analysis relied heavily on two key sources of data. The Portland State University Population Research Center prepared the *2008 Population Forecasts for Marion County Oregon, its Cities and Unincorporated Area, 2010 to 2030,* which provided the housing forecast data. The *City of Silverton Economic Opportunities Analysis,* prepared by a consultant, provided employment data. Both of these forecasts were adopted (specifically the Medium Growth Forecast of the PSU study) by the City of Silverton.[4]

The base 2015 land use inventory approximated the number of households and the amount of retail employment, service employment, educational employment, and other employment that currently exist in each TAZ. Existing land uses within Silverton were obtained from tax assessor data, census data, and zoning data and compared with existing aerial photography. The existing land uses correspond to a population of 9,590 residents, which was estimated using Portland State University Population Research Center estimates.[5]

The future 2037 land use projection is an estimate of the amount of each land use (household and employment) that the TAZ could reasonably accommodate given market conditions and current build-out of vacant or underdeveloped lands assuming Comprehensive Plan zoning. The projected land uses correspond to a year 2037 population projection of approximately 14,486 residents.[6]

A summary of the existing land use estimates and future projections for the entire Silverton UGB is listed in Table 1.

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[4] Population forecast based on February 2008 Population Forecasts for Marion County Oregon, its Cities and Unincorporated Area 2010 to 2030, prepared by Portland State University (Medium Growth Forecast). Employment forecast based on City of Silverton Economic Opportunities Analysis, by Johnson Reid, 2011.

[5] Ibid. Interpolation between 2010 and 2015 data was used to determine base year 2015 data.

[6] Ibid.

Table 1: Silverton UGB Land Use Summary

Land Use	Existing 2015 Land Use	Total Growth 2015 to 2037	Future 2037 Land Use
Population	9,590	4,896 (+51%)	14,486
Households	3,572	1,824 (+51%)	5,396
Employees			
Retail	348	175 (+50%)	522
Service[1]	1,887	563 (+30%)	2,449
Education	394	118 (+30%)	513
Other	745	73 (+10%)	819
Total	3,374	828(+28%)	4,302

[1] *These service employment numbers reflect land use data provided in the sources below. The existing and future models include adjustments to the level of employment for the Oregon Garden and Silverton Hospital, as described on Page 10 of this memo. The land use summary table included in the Appendix reflects the final adjusted values used in the modeling process.*

Sources:

PSU – Portland State University Medium Growth Forecast from Population Forecasts for Marion County Oregon, its Cities and Unincorporated Area, 2010 to 2030, dated February 2008

EOA – City of Silverton Economic Opportunities Analysis (prepared by Johnson Reid, January 10, 2011)

Travel Demand

Travel demand on roadways and at intersections in Silverton was estimated using a methodology similar to that specified by the ODOT Procedures Manual for cumulative analysis models.[7] Adjustments made to the methodology include estimating all vehicle trips (not just growth increment), adjusting the trip distribution to reduce household-to-household trips, and using VISUM modeling software to perform the trip assignment. Travel forecasting was performed for the 30th highest hour conditions for both 2015 and 2037. The purpose of the 2015 forecast tool was to calibrate the network in preparation for developing the 2037 forecast tool network, which would then be used for the future analysis.

The travel forecasting analysis includes the translation of City land use information into motor vehicle trips. This was done for each of the Silverton TAZs based on the existing and projected land uses described previously in the Land Use section of this memorandum. Trips traveling to and from the external TAZs were also estimated for both the 2015 and 2037 analysis years. This section of the memorandum describes the methodology used to determine the different trip types and how the trips were distributed and assigned to the roadway network. Calibration analysis is also provided.

Trip Types

Travel forecast projections involve the determination of three distinct types of trips, which are categorized based on whether their origin and/or destination (i.e., the trip ends) are internal or external to the Silverton UGB. The three trip types and how they apply to Silverton are described in the list below.

External-External (E-E) Trips do not have an origin or destination in Silverton and either do not stop or only make a very minor stop while passing through the Silverton UGB. These trips are typically referred to as through traffic.

Internal-External (I-E) Trips originate in Silverton and are traveling to a location outside of the Silverton UGB and **External-Internal (E-I) Trips** originate outside of the Silverton UGB and are traveling to a location within Silverton.

Internal-Internal (I-I) Trips travel from one location within the Silverton UGB to another location within the UGB.

[7] *Analysis Procedures Manual (APM)*, Oregon Department of Transportation (ODOT) Transportation Planning Analysis Unit (TPAU), Last Updated May 2016.

External Trip Ends

External trip ends are the origin and/or destination of E-E, I-E, or E-I trips and were estimated for both 2015 and 2037 and for 30th highest hour conditions at each of the gateways shown in Figure 1. The number of 2015 external trip ends was based on existing traffic volumes at key gateways to the City, Bluetooth data (collected from electronic devices such as laptops or cell phones) collected at the six primary gateways to the City (OR 214, OR 213, Cascade Highway NE, and Pine Street), and estimates about through traffic at the remaining four minor gateways. The Bluetooth data was used to determine the amount of through traffic compared to the portion of traffic with either an origin or destination within Silverton. Observed existing Bluetooth data is summarized in Table 2.

Table 2: Bluetooth Data Summary at the Six Major Silverton Gateways (PM peak hour - averaged over three weekdays)

	% of Entering Traffic		% of Exiting Traffic	
Gateway	**with a Destination in Silverton**	**with an External Destination**	**With an Origin in Silverton**	**With an External Origin**
East: Cascade Hwy (OR-213) east of Bethel Lane	65%	35%	65%	35%
West: Cascade Hwy west of Pettit Lane	72%	28%	70%	30%
North: OR 214 north of Hobart Road	89%	11%	80%	20%
West: Pine Street west of Airport Road	93%	7%	88%	13%
South: S Water Street east of Quall Road	61%	39%	64%	36%
West: Silverton Road (OR 213) west of Rogers Lane	79%	21%	78%	22%
Average of All Gateways	76%	24%	74%	26%

Table 2 indicates that most external trips entering the City during the PM peak hour have a destination in Silverton. This phenomenon is likely related to the “bedroom community” nature of Silverton and represents people living in the City who are returning from jobs outside of Silverton. A similar trend is observed with external trips exiting the City during the PM peak hour, which indicates that a high proportion of employees who work in Silverton live outside the City. The external trip ends that have an internal pair are modeled to pair with the internal trip ends of corresponding land uses within the City (e.g., housing and employment). This modeling process is explained further in the “Trip Distribution” section on Page 10.

Growth estimates were applied to each gateway to determine 2037 external trip ends for through traffic. For OR 214 and Cascade Highway (OR 213), the ODOT Future Volume Tables provided data for estimating future growth. The annual growth rate for Silverton Road (OR 213) was based on the Marion County population growth estimates for Silverton. The annual growth rate on Pine Street was based on the average estimated growth on Cascade Highway and OR 213 (east), as they are similar facilities and growth patterns will likely be similar. For the remaining minor gateways, a low annual growth rate of 0.5% was used. The annual growth rates and associated growth factors for each external gateway are shown in Table 3.

Table 3. Summary of External Gateway Growth Assumptions

Gateway	Annual Growth Rate	Growth Factor (2015-2037)
East: Cascade Hwy (OR-213)	0.9%	1.21
West: Cascade Hwy	0.5%	1.12
North: OR 214	1.0%	1.23
West: Pine St	0.7%	1.16
South: S Water St	1.1%	1.28
West: Silverton Rd (OR 213)	1.8%	1.47
Northeast: Meridian Road	0.5%	1.12
Southwest: Victor Point Road	0.5%	1.12
Southeast: Evans Valley Road	0.5%	1.12
Northwest: Hobart Road	0.5%	1.12
Southwest: Edison Road	0.5%	1.12
Southeast: Quall Road	0.5%	1.12

As shown in Table 3, traffic volumes at external gateways are expected to grow by 12 to 47 percent between 2015 and 2037. The highest growth rates are expected north, south, and west of the City which is representative of the large proportion of Silverton residents and employees that are traveling to and from the surrounding communities.

Internal Trip Ends

The number of internal trip ends in Silverton was determined using a land use-based trip generation methodology, which translates land use quantities (number of dwelling units or number of employees) into vehicle trip ends (number of vehicles entering or leaving a TAZ) based empirically-derived trip generation rates. PM peak hour trip generation rates are listed in Table 4 for the applicable land uses. These rates were developed based on the Institute of Transportation Engineers *Trip Generation Manual* and existing and anticipated land use in Silverton.[8]

[8] The rates used national ITE data based on existing and planned land uses in Silverton.

Table 4: PM Peak Hour Trip Generation Rates by Land Use (Averages for each Land Use Category)

Land Use	Trips In	Trips Out	Total Trip Ends
Households (per dwelling unit)[a]	0.47	0.28	0.75
Retail (per employee)	2.04	1.96	4.00
Service (per employee)	0.28	0.68	0.96
Education (per employee)	0.89	0.86	1.75
Other (per employee)	0.21	0.38	0.59

[a] *The trip rate for households was reduced from 1.0 (per ITE) to 0.75 during model calibration to better represent the "bedroom community" nature of Silverton (residents return home later in the evening after commuting). This also helps capture the lower trip rate of multi-family dwelling units (e.g., apartments) within the community.*

By applying these trip generation rates to the TAZ land uses, the number of trips entering and exiting each TAZ in Silverton was estimated. Adjustments to two specific TAZs were made to more accurately estimate the number of trips generated. The number of employees reported for the Oregon Garden was reduced by half to account for seasonal and day-of-week fluctuations that are not represented in a typical "service" land use type. Also, the number of employees reported at the Silverton Hospital was reduced by two-thirds to account for the shift schedules not accounted for in service land uses. Internal trip estimates were obtained for both the existing 2015 land uses and the projected 2037 land uses, and the detailed results are provided in the appendix.

For the entire City of Silverton, existing land uses in 2015 are estimated to generate approximately 4,700 internal trip ends, and future land uses in 2037 are expected to generate approximately 6,500 internal trip ends. Therefore, Silverton is estimated to have traffic growth of approximately 1,800 internal trip ends between 2015 and 2037.

Trip Distribution

Trip distribution was performed to estimate how many trips travel between each of the internal and external TAZs. The external trips passing through Silverton were distributed based on the Bluetooth data discussed previously in the External Trip Ends section of this memorandum as well as estimates using traffic count data and engineering judgment for some the lower volume external gateways. Distribution for trips traveling to and from internal zones (i.e., trips having at least one internal trip end) was based on weighting the attractiveness of each zone, as measured by the number of trip ends generated by the zone.

The forecasting model is based on a trip table that describes the internal and external trip ends for each trip within the network. To develop this trip table, External-to-External (E-E) trips are matched based on the external trip probabilities. Next, all remaining external trips (I-E and E-I) are paired with appropriate internal trip ends. These trips represent the inbound and outbound commutes for a large portion of Silverton residents and employees, respectively. Finally, the Internal-Internal (I-I) trip pairs are determined based on the land uses within Silverton.

A detailed trip table showing the number of trips traveling between each of the internal and external zones is provided electronically as supplementary material to this memorandum.

Trip Assignment

Trip assignment involves the determination of the specific travel routes taken by all of the trips within the transportation network. This step was performed using VISUM modeling software. Forecast tool inputs included the transportation network (i.e., road and intersection locations and characteristics, as determined from maps and field inventories) and a trip distribution table (described above). Iterated equilibrium assignment was then performed using estimated travel times along roadways and delays at intersection movements.[9] The path choice for each trip was based on minimal travel times between locations. Forecast tool outputs include traffic volumes on roadway segments and at intersections.

Calibration

Calibration was performed on the 2015 base year forecast tools by comparing forecast tool volumes at the Silverton TSP study intersections with existing 2015 traffic volumes. A plot comparing the existing traffic volumes and the base year forecast tool volumes for all study intersection turn movements were analyzed to evaluate the accuracy of each forecast tool, as shown on Figure 2.

[9] Roadway travel times were calculated based on distance and travel speed. Intersection movement delays were calculated using Highway Capacity Manual (HCM 2000) methodology for signalized and unsignalized intersections. Detailed lane geometry, traffic control, roadway cross-section, and roadway travel speed information is required for model accuracy.

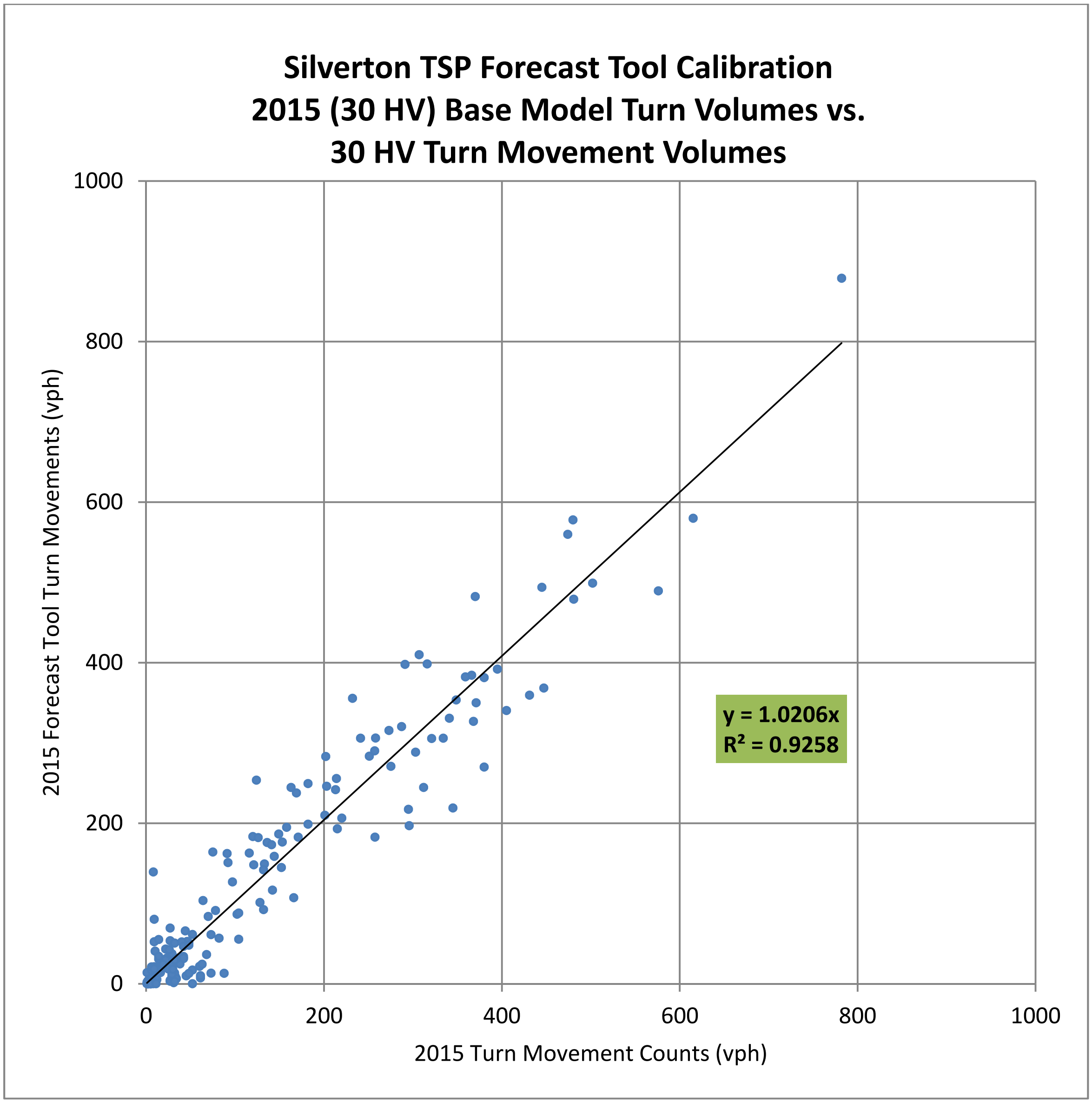


Figure 2. 2015 30 HV Forecast vs. 2015 30 HV Turn Movements with Linear Trendline

The slope of the fitted curve is 1.02, indicating that the forecast tool volumes differ from the existing counts by three percent or less and that the trip generation rates are appropriate. Furthermore, the R^2 value is 0.93, indicating that the forecast tool volumes are consistent with the existing volumes.

The calibration analysis for both of the 2015 base year forecast tools indicates that the forecast tools reasonably predict trip patterns and volumes. Therefore, the 2037 future year forecast tools are expected to reasonably forecast future year traffic volumes for the following reasons:

- The 2037 future year forecast tools were created using the 2015 base year forecast tools as a starting point.
- There are no expected roadway network changes or improvements that would significantly alter travel patterns.
- Future land use projections for the year 2037 were prepared using methodology consistent with the 2015 base year land use estimates.

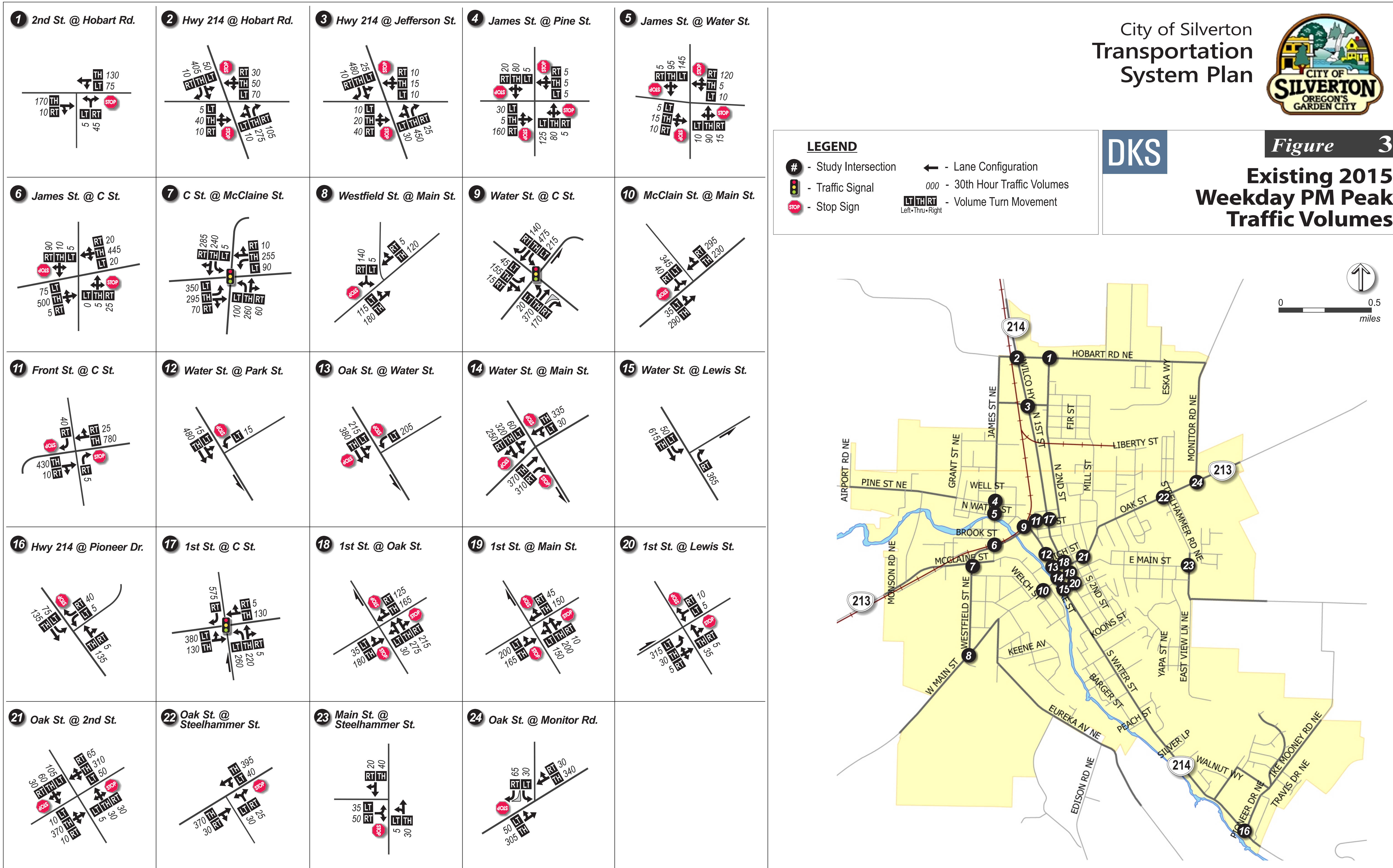
Forecast Tool Volumes

Forecast tool output volume plots (2015 base year, 2037 future year and the increment of traffic growth between 2015 and 2037 volumes) for the design hour forecast tool are included in the Appendix.

Post-Processing

While the travel demand forecast tools were calibrated to local conditions and volumes, raw volumes from the tools were not used for capacity analysis. Rather, motor vehicle turn movement volume forecasts were developed using post-processing methods consistent with the ODOT Procedures Manual. This approach is derived from methodologies outlined in the National Cooperative Highway Research Program (NCHRP) Report 255, *Highway Traffic Data for Urbanized Area Project Planning and Design*.

The post-processing methodology involves estimating trip growth (i.e., volume differences between base and future forecast tools), scaling the growth by the number of forecast years (i.e., forecast years divided by difference in forecast tool years), and adding these volumes to existing traffic counts. Engineering judgment is used as part of the post-processing methodology, with the routing decisions identified by the forecasting tool serving as a helpful starting point in making volume adjustments. The results of this process are future year forecasts derived from the Silverton enhanced cumulative analysis forecasting tool that are calibrated to observed data. The existing year 2015 traffic volumes are shown in Figure 3. The year 2037 traffic volume forecasts and growth (from 2015) are shown in Figure 4 and will serve as a future base volume forecast.



City of Silverton
Transportation System Plan
CITY OF SILVERTON OREGON'S GARDEN CITY
DKS
Figure 3
Existing 2015 Weekday PM Peak Traffic Volumes
LEGEND
- Study Intersection
- Traffic Signal
- Stop Sign
- Lane Configuration
000 - 30th Hour Traffic Volumes
LT TH RT Left•Thru•Right - Volume Turn Movement
1 2nd St. @ Hobart Rd.
2 Hwy 214 @ Hobart Rd.
3 Hwy 214 @ Jefferson St.
4 James St. @ Pine St.
5 James St. @ Water St.
6 James St. @ C St.
7 C St. @ McClaine St.
8 Westfield St. @ Main St.
9 Water St. @ C St.
10 McClain St. @ Main St.
11 Front St. @ C St.
12 Water St. @ Park St.
13 Oak St. @ Water St.
14 Water St. @ Main St.
15 Water St. @ Lewis St.
16 Hwy 214 @ Pioneer Dr.
17 1st St. @ C St.
18 1st St. @ Oak St.
19 1st St. @ Main St.
20 1st St. @ Lewis St.
21 Oak St. @ 2nd St.
22 Oak St. @ Steelhammer St.
23 Main St. @ Steelhammer St.
24 Oak St. @ Monitor Rd.
0 0.5 miles
214
213
HOBART RD NE
ESKA WY
JAMES ST NE
N 1ST ST
FIR ST
LIBERTY ST
MONITOR RD NE
GRANT ST NE
N 2ND ST
MILL ST
AIRPORT RD NE
PINE ST NE
WELL ST
OAK ST
STEELHAMMER RD NE
BROOK ST
MCCLAINE ST
E MAIN ST
MONSON RD NE
WESTFIELD ST NE
WELCH ST
S 2ND ST
KOONS ST
KEENE AV
W MAIN ST
S WATER ST
YAPA ST NE
EAST VIEW LN NE
BARGER ST
PEACH ST
EUREKA AV NE
SILVER LP
WALNUT WY
EDISON RD NE
PIONEER DR NE
TRAVIS DR NE

City of Silverton
Transportation System Plan

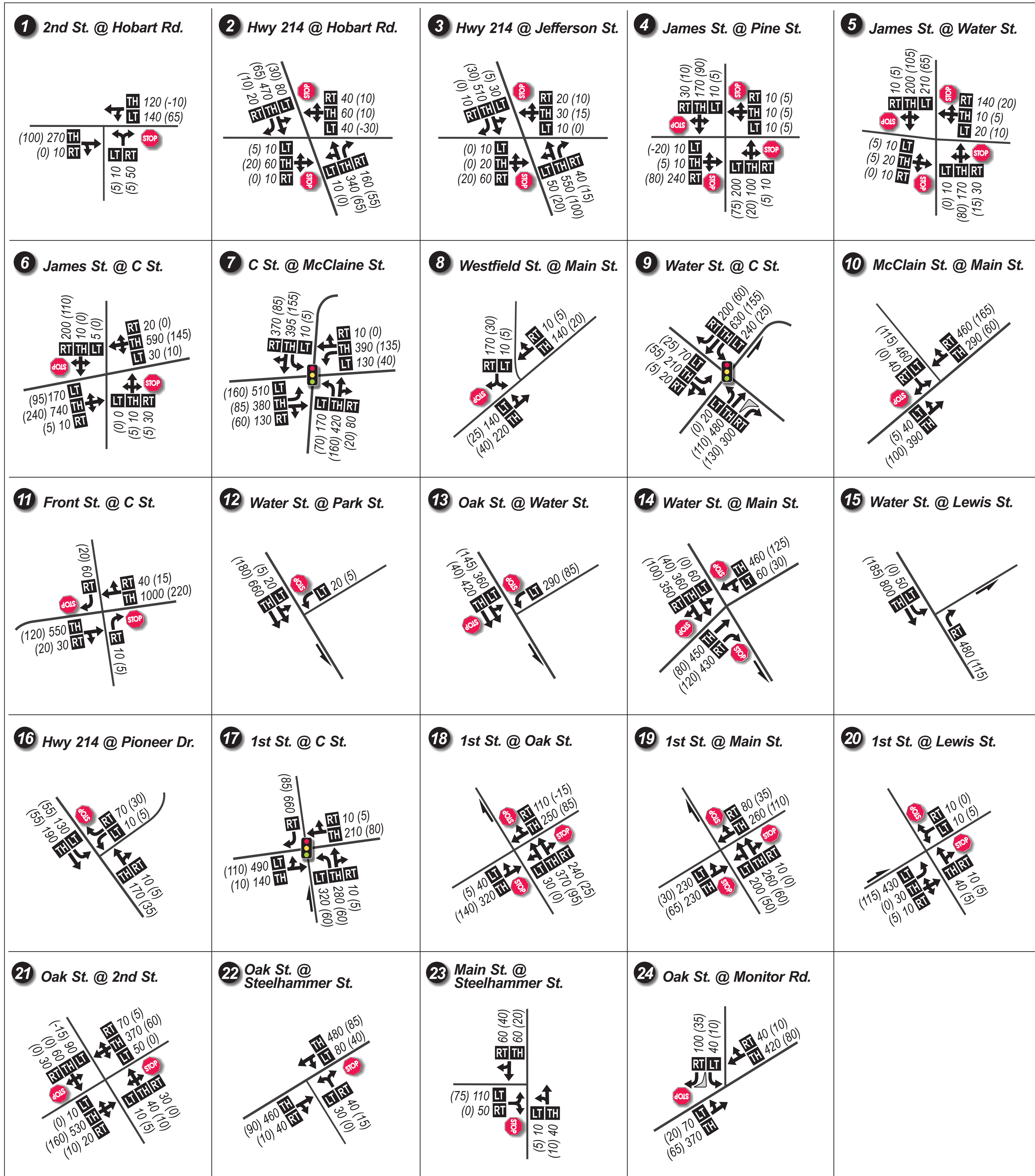
DKS

Figure 4

Future 2037 Weekday PM Peak Traffic Volumes

LEGEND

- # - Study Intersection
- Traffic Signal
- Stop Sign
- Lane Configuration
- 000 (000) - 30th Hour Traffic Volumes (2015-2037 Growth)
- LT TH RT (Left•Thru•Right) - Volume Turn Movement



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Appendix

Forecast Tool Network

VISUM Network

Land Use Data

Land Use Summary by TAZ

Household Land Use Growth

Retail Employment Land Use Growth

Service Employment Land Use Growth

Educational Employment Land Use Growth

Other Employment Land Use Growth

Trip Table Summary (Trip Generation by TAZ)

30 HV Trip Generation by TAZ

Forecast Volumes

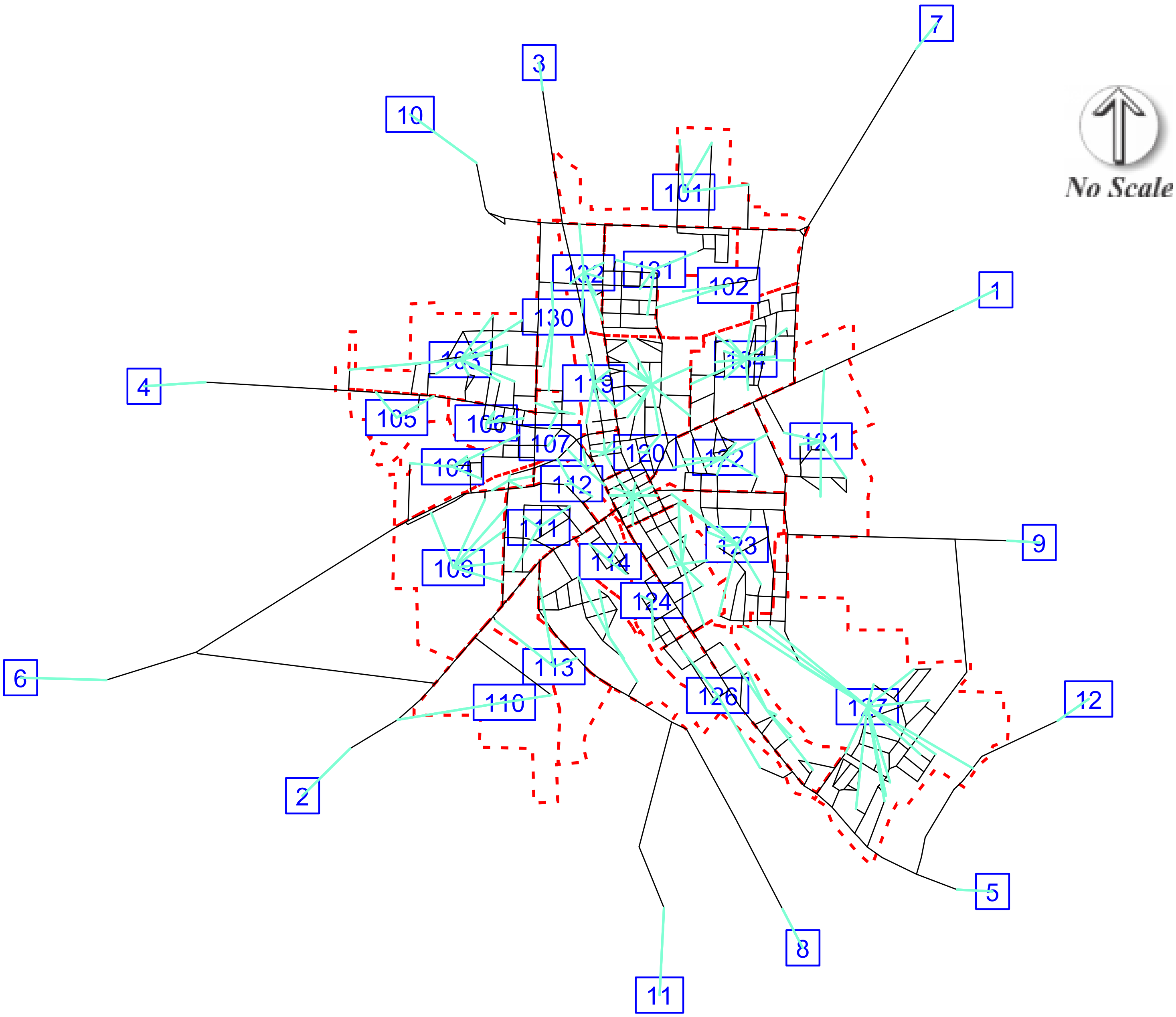
2015 Base Year Design Hour Volume Plot

2037 Future Year Design Hour Volume Plot

Design Hour Volume Difference (2015 to 2037 growth)

Forecast Tool Network

VISUM Network



Created on: 10.11.2016		
Silverton TSP Network		DKS Associates

Land Use Data

Land Use Summary by TAZ

Household Land Use Growth

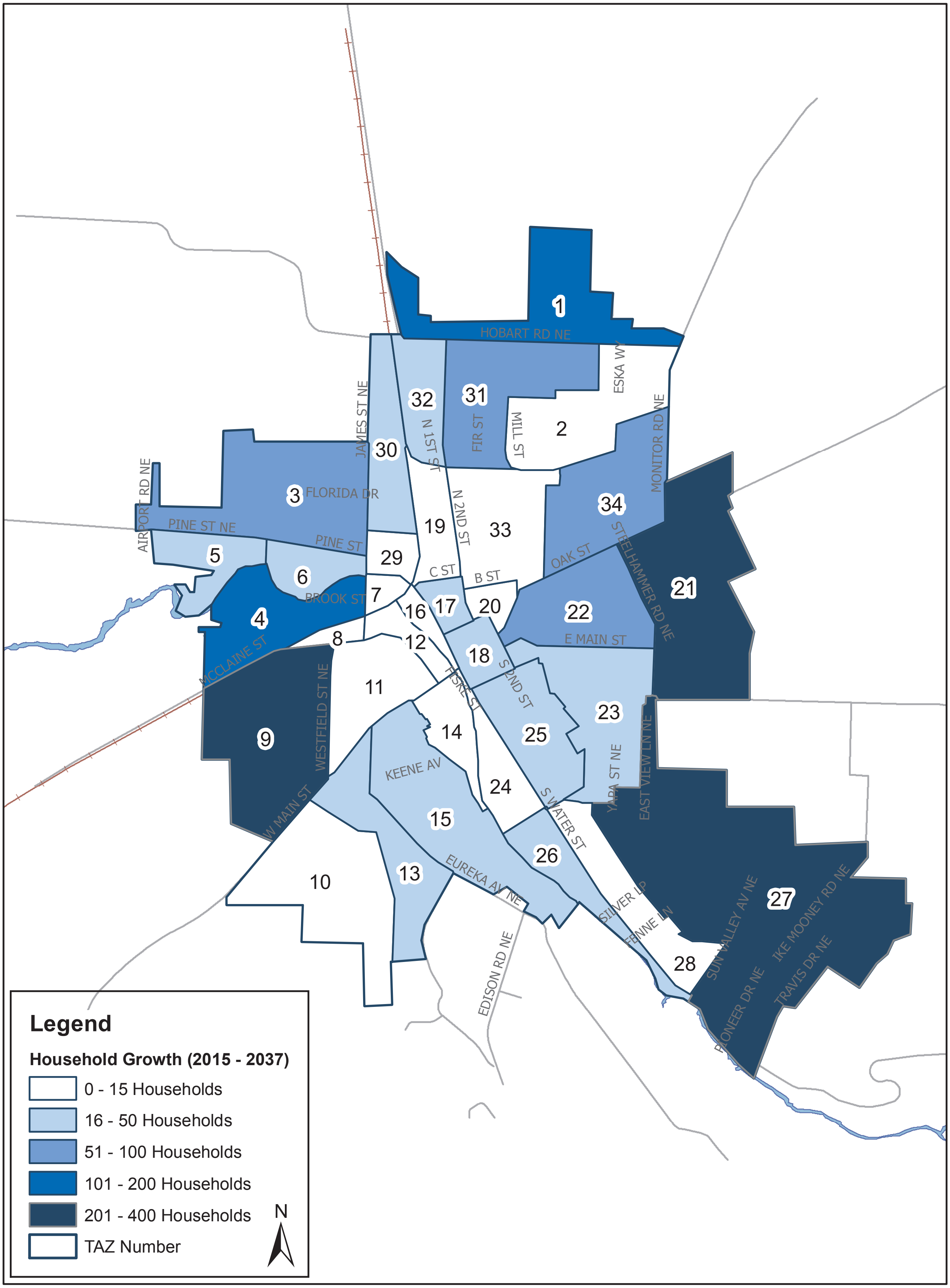
Retail Employment Land Use Growth

Service Employment Land Use Growth

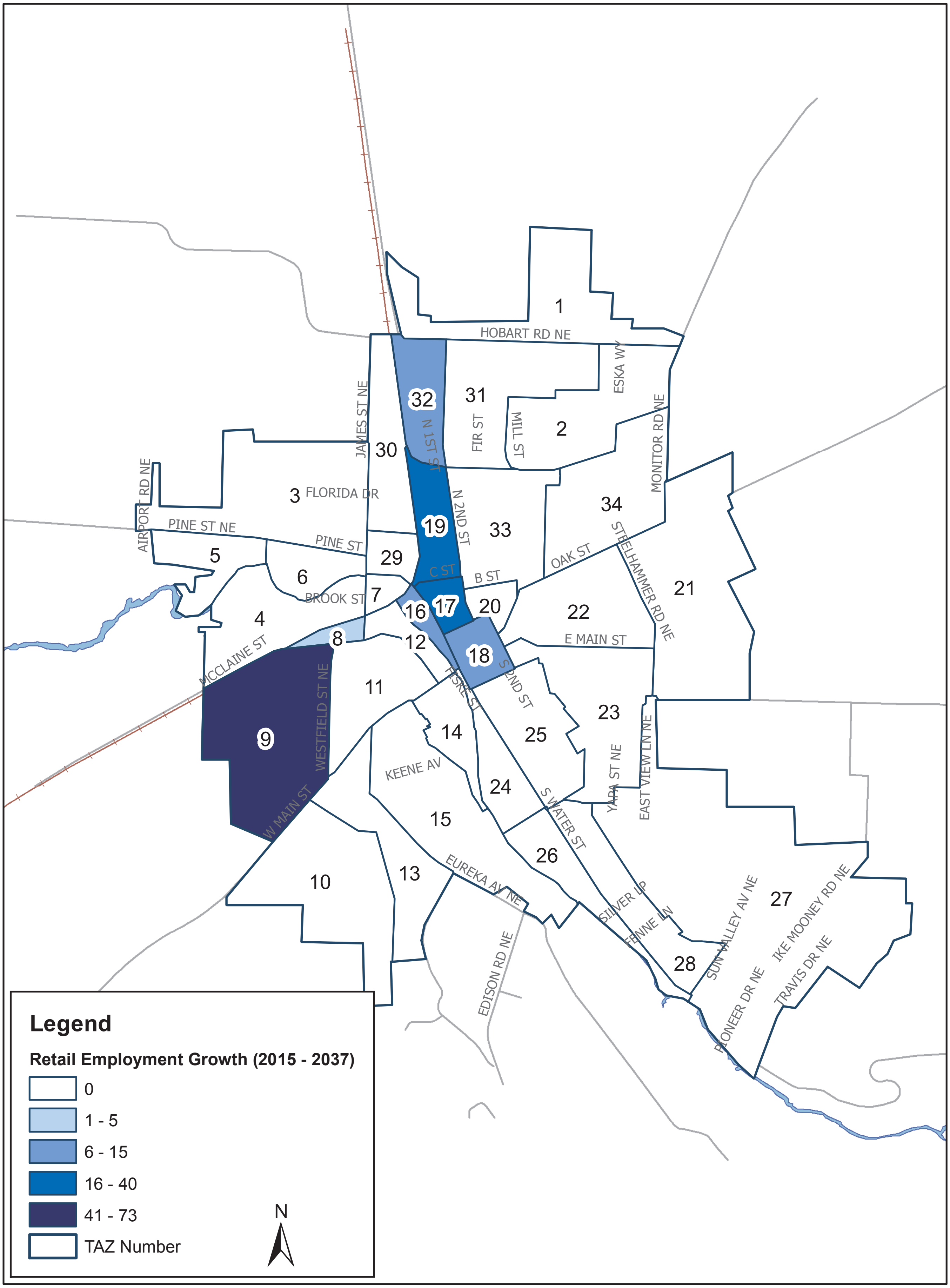
Educational Employment Land Use Growth

Other Employment Land Use Growth

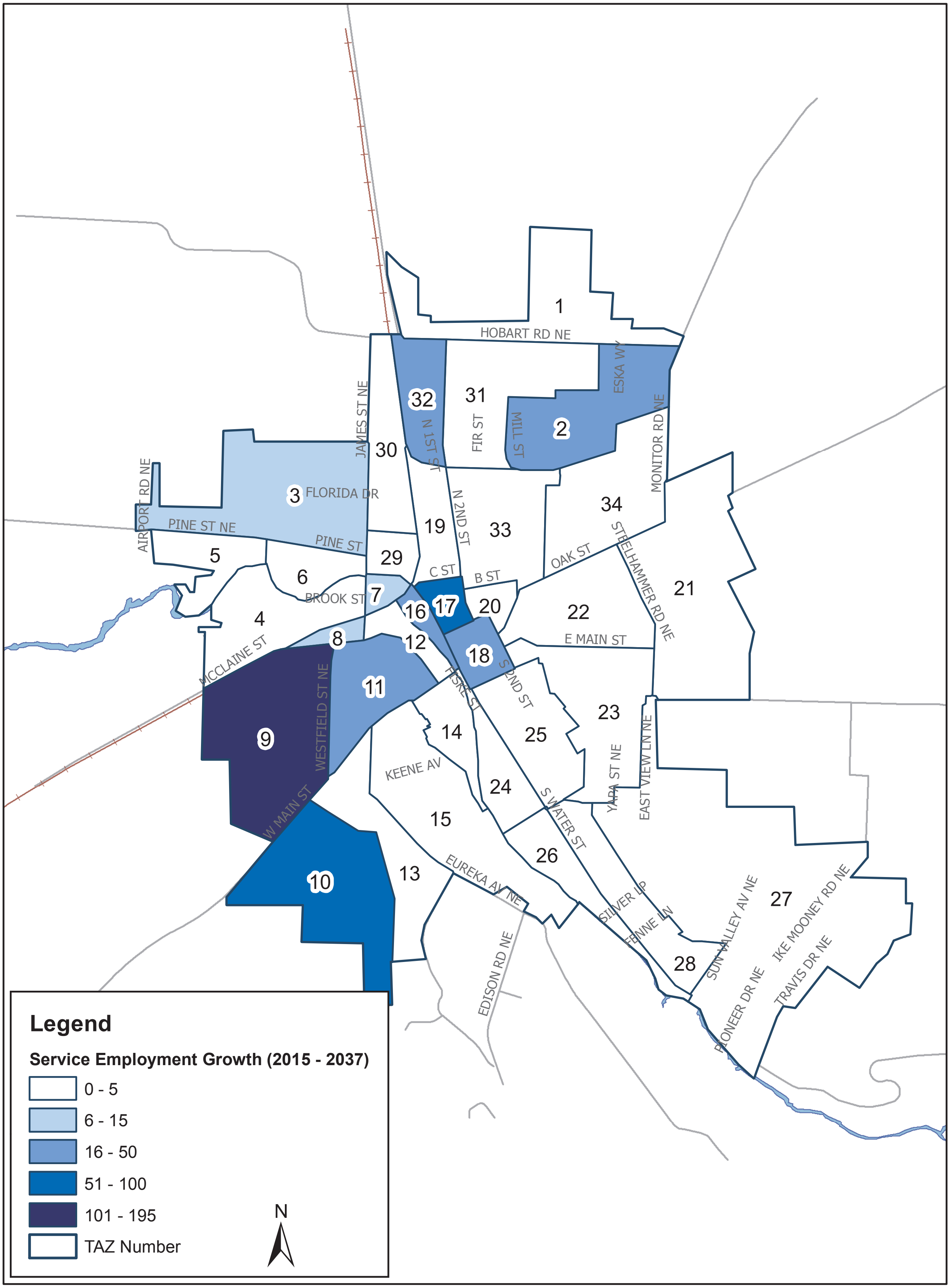
Silverton Household Growth (2015-2037) by TAZ



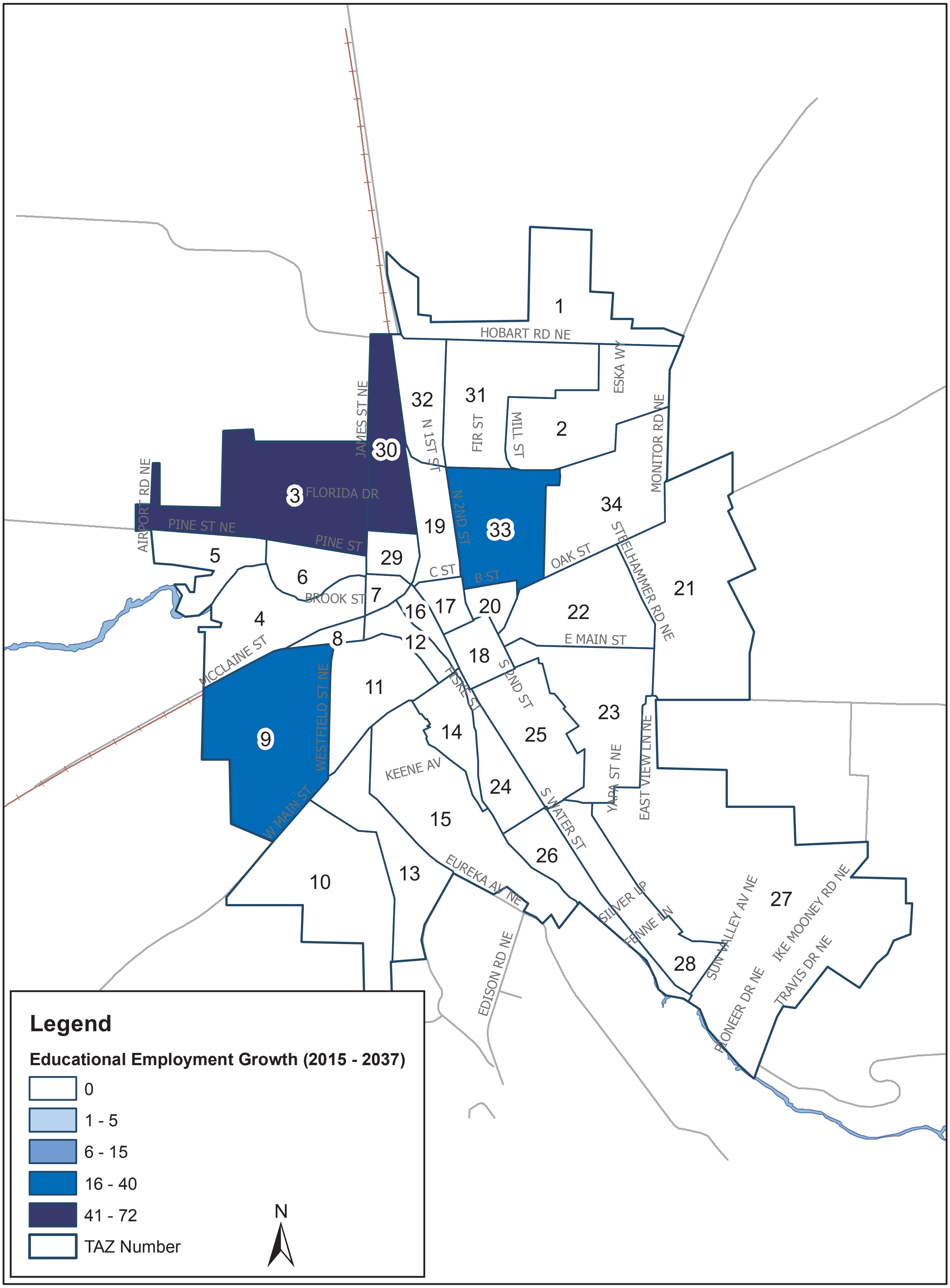
Silverton Retail Employment Growth (2015-2037) by TAZ



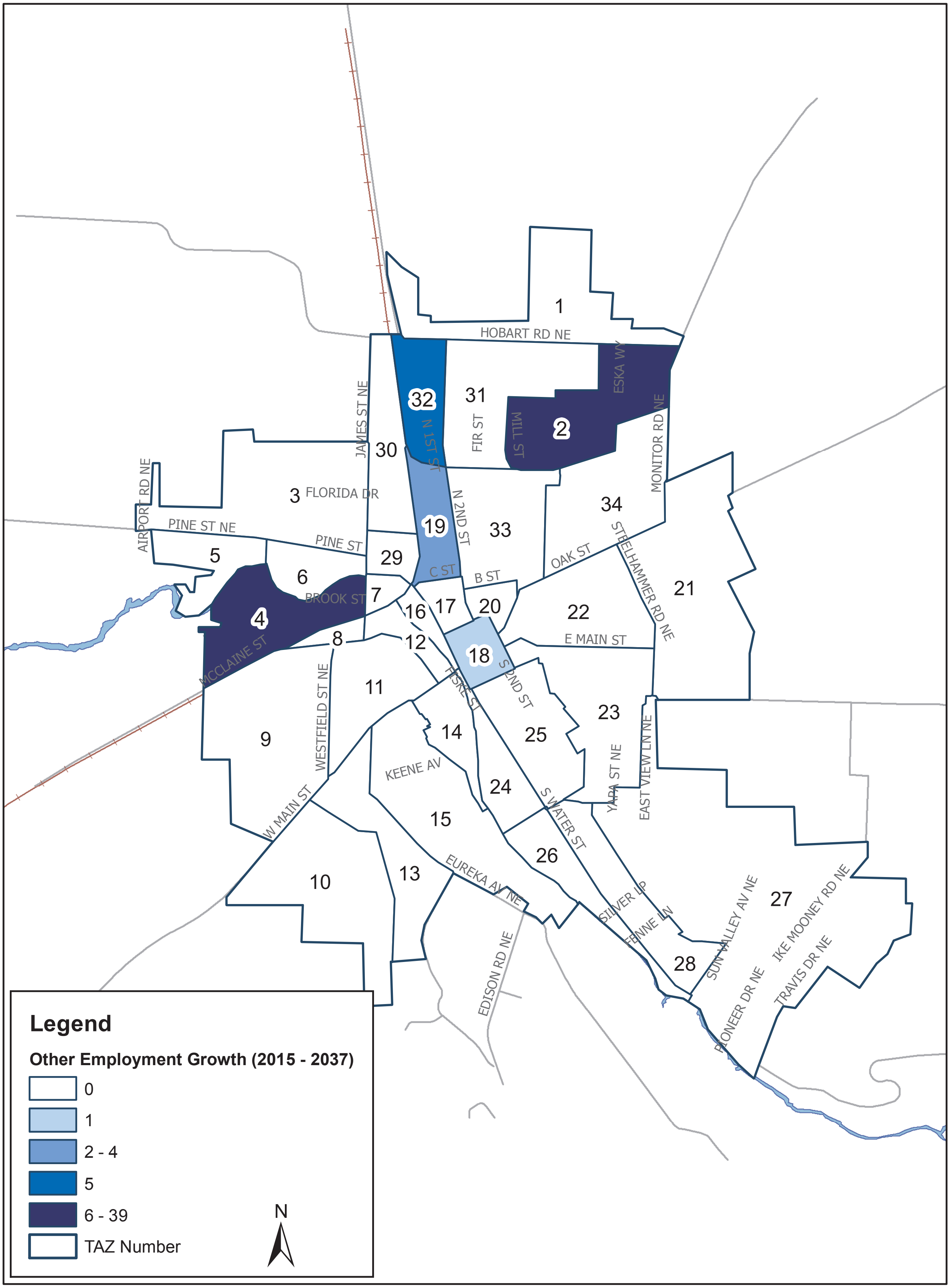
Silverton Service Employment Growth (2015-2037) by TAZ



Silverton Educational Employment Growth (2015-2037) by TAZ



Silverton Other Employment Growth (2015-2037) by TAZ



Trip Table Summary (Trip Generation by TAZ)

30 HV Trip Generation by TAZ

Trip Generation by TAZ - 30HV

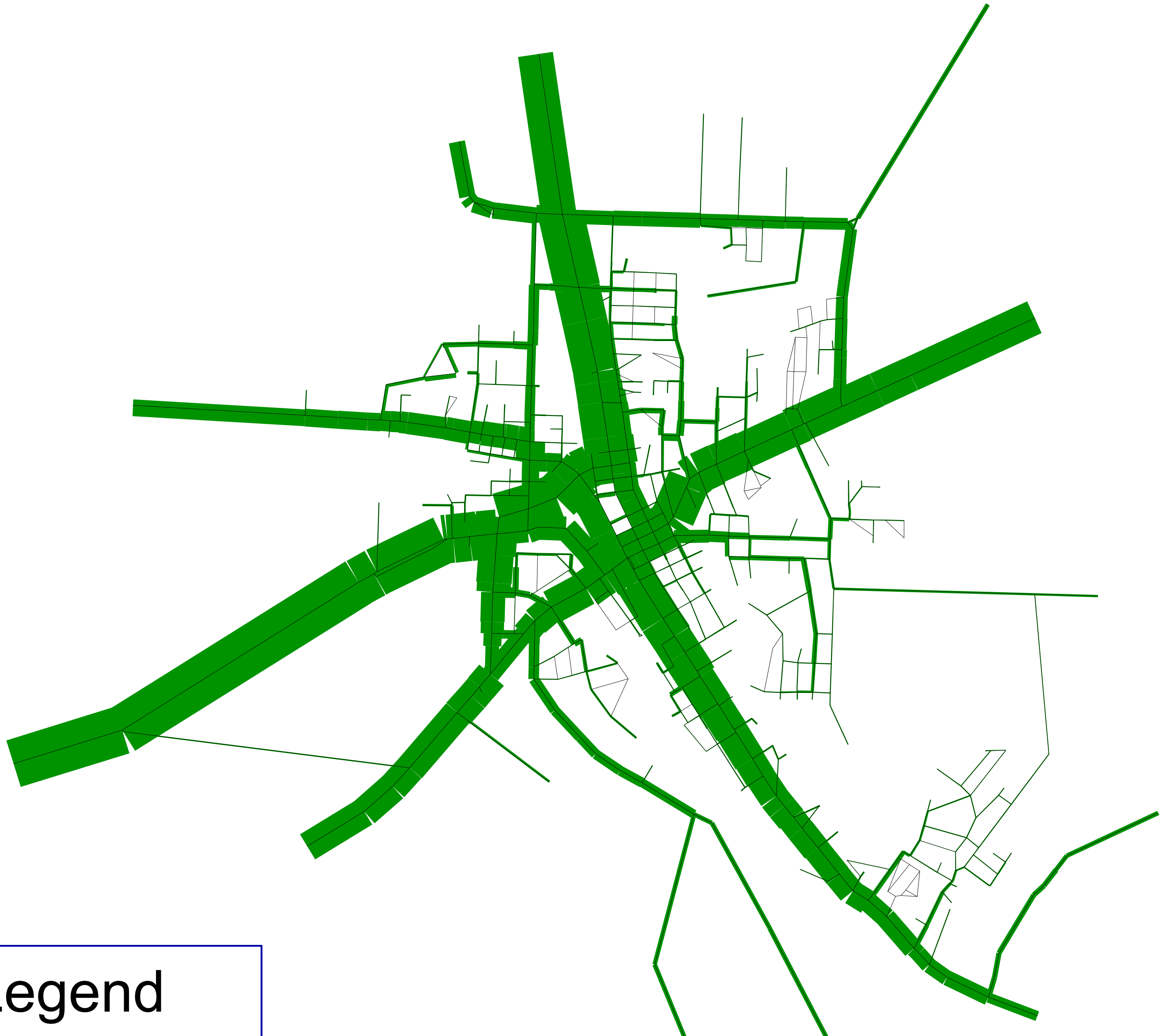
TAZ	2015		2037		2015 - 2037		
	Trips In	Trips Out	Trips In	Trips Out	Trips In Growth	Trips Out Growth	Total Trip Growth
101	20	12	87	51	67	39	106
102	63	114	79	150	16	36	52
103	231	198	323	283	92	85	177
104	63	58	93	64	30	6	36
105	13	8	22	14	9	6	15
106	23	14	38	23	15	9	24
107	51	57	54	63	3	6	9
108	33	45	47	65	14	20	34
109	294	320	643	694	349	374	723
110	20	49	32	79	12	30	42
111	145	203	152	215	7	12	19
112	180	193	191	203	11	10	21
113	19	12	42	25	23	13	36
114	49	44	49	44	0	0	0
115	86	72	101	80	15	8	23
116	34	59	58	92	24	33	57
117	86	114	120	166	34	52	86
118	153	250	201	309	48	59	107
119	271	348	361	439	90	91	181
120	21	18	24	19	3	1	4
121	64	39	212	126	148	87	235
122	108	82	139	100	31	18	49
123	88	56	113	76	25	20	45
124	83	80	83	80	0	0	0
125	114	90	129	99	15	9	24
126	51	33	59	37	8	4	12
127	201	127	390	238	189	111	300
128	119	76	126	80	7	4	11
129	27	17	31	19	4	2	6
130	62	66	134	130	72	64	136
131	138	88	164	104	26	16	42
132	28	35	62	83	34	48	82
133	204	152	226	171	22	19	41
134	144	92	175	110	31	18	49
Total	**3286**	**3221**	**4760**	**4531**	**1474**	**1310**	**2784**

Forecast Volumes

2015 Base Year Design Hour Volume Plot

2037 Future Year Design Hour Volume Plot

Design Hour Volume Difference (2015 to 2037 growth)



Legend

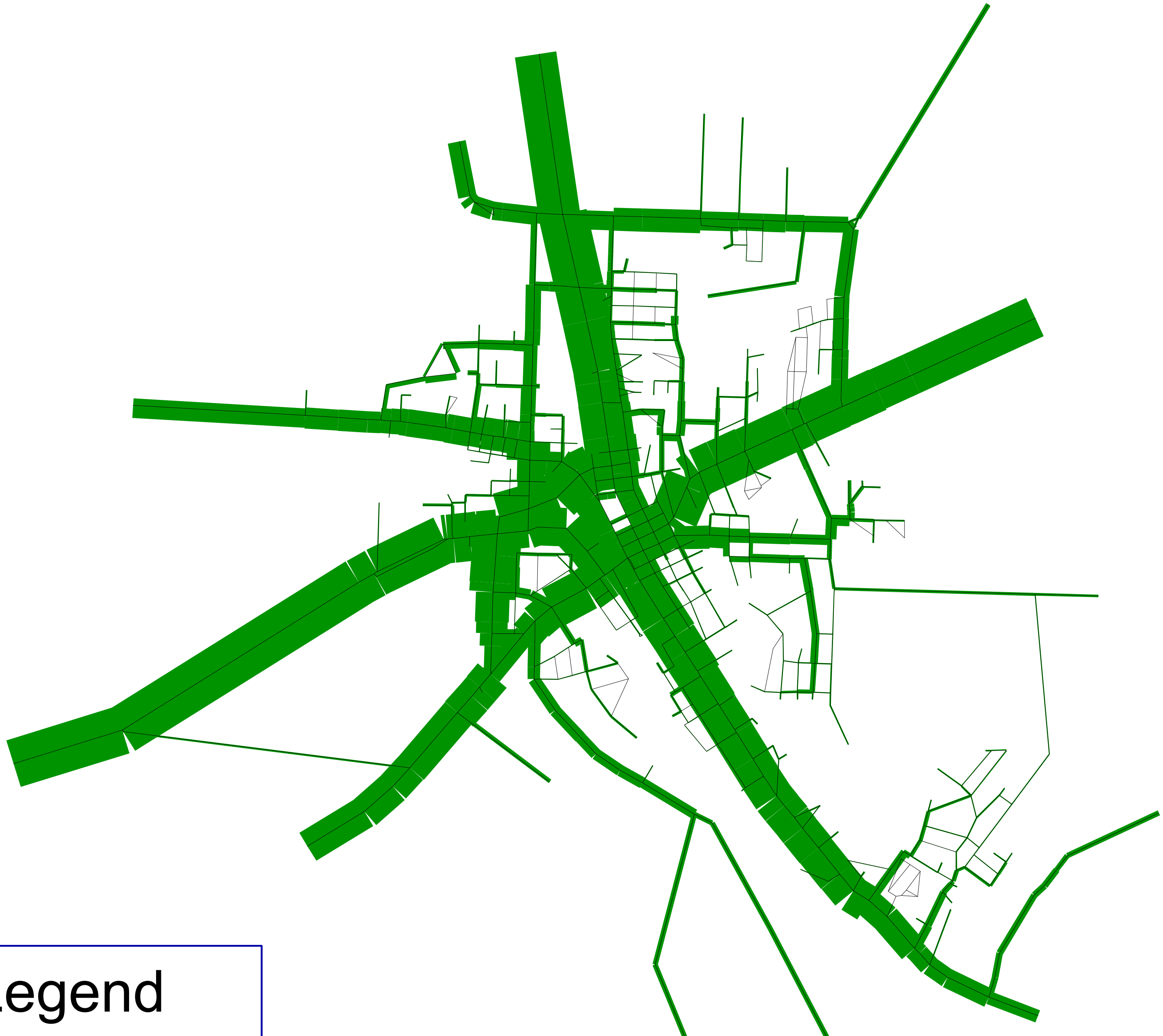
Streets

Volume PrT [veh] (AP)

Volume capacity ratio PrT (AP)

(green)	<= 0.80
(yellow)	0.81- 0.90
(orange)	0.91- 1.00
(red)	> 1.00

Created on: 07.11.2016	2015 30 HV - Base Year	1:33004
Silverton TSP	PM Peak Hour Link Volumes and V/C	DKS Associates



Legend

Streets

Volume PrT [veh] (AP)

Volume capacity ratio PrT (AP)

- <= 0.80
- 0.81- 0.90
- 0.91- 1.00
- > 1.00

Created on: 07.11.2016	2037 30 HV	1:33004
Silverton TSP	PM Peak Hour Link Volumes and V/C	DKS Associates

Legend

Streets

Volume PrT [veh] - Base Year (AP)

Growth

Created on: 07.11.2016	Growth (2015 - 2035) 30 HV	1:31740
Silverton TSP	PM Peak Hour Link Volumes and V/C	DKS Associates

SECTION F

MEMORANDUM 6

FUTURE TRANSPORTATION CONDITIONS AND NEEDS

720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500
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Technical Memorandum

DATE: February 7, 2017

TO: Silverton TSP Update Project Management Team

FROM: Ray Delahanty, AICP
Lacy Brown, P.E.
Rachel Vogt

SUBJECT: Silverton Transportation System Plan Update
Future Traffic Conditions and Needs

This memorandum summarizes the findings of the future transportation conditions analysis and any identified system deficiencies. The detailed forecasting methodology for estimating the 2037 future traffic volumes within the City of Silverton was presented in a previous technical memorandum[1]. The following sections present the estimated future 2037 traffic volumes, 2037 no-build (existing infrastructure) intersection operational performance, and a summary of any identified operational deficiencies.

Future (2037) Traffic Volume Forecasts

A travel demand forecasting tool (also called a small-community model) was developed and calibrated to local conditions for the City of Silverton. Motor vehicle turn movement volume forecasts were developed using post-processing methods consistent with the ODOT Transportation Planning Analysis Unit's Analysis Procedures Manual[2]. This approach is derived from methodologies outlined in the National Cooperative Highway Research Program (NCHRP) Report 255, *Highway Traffic Data for Urbanized Area Project Planning and Design*. These forecasts are shown in Figure 1 and will serve as a future base volume forecast.

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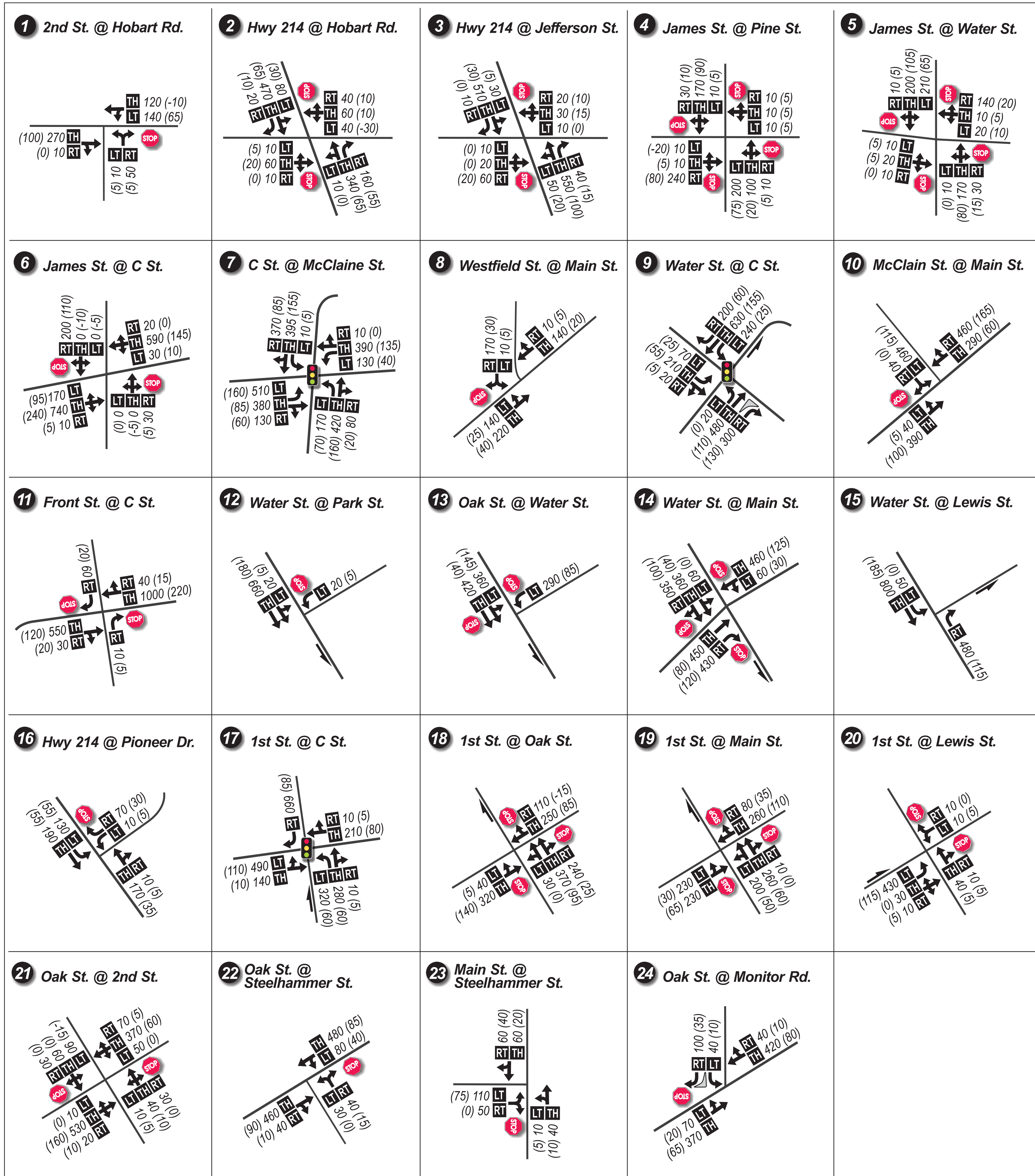
[1] Traffic Volume Forecasting Memorandum. Draft dated November 11, 2016.

[2] *Analysis Procedures Manual*, Oregon Department of Transportation, Transportation Planning Analysis Unit, last update August 2016.



City of Silverton
Transportation System Plan

LEGEND

- # - Study Intersection
- Traffic Signal
- Stop Sign
- ← - Lane Configuration
- 000 (000) - 30th Hour Traffic Volumes (2015-2037 Growth)
- LT TH RT (Left•Thru•Right) - Volume Turn Movement

DKS

Figure 1

Future 2037 Weekday PM Peak Traffic Volumes

Volume Adjustments

Minor volume adjustments were made at the James Street/C Street intersection. This intersection prohibits left turn and through movements from the minor street (James Street), but because a small number of these movements were counted during base year data collection, they were retained in the base future forecast. After further review, these counts were removed before performing the future analysis. This is because retaining the counts could lead to identifying future operational deficiencies where the deficient movement is an illegal one.

Intersection Operations

Intersection performance was evaluated using Synchro and SimTraffic software. Synchro implements Highway Capacity Manual 2010[3] methodology for estimating utilization and average delay. SimTraffic provides a visual simulation of transportation system performance and allows for more nuanced estimates of delay and other measures based on impacts from upstream and downstream intersections.

Mobility Targets

All intersections in Silverton must operate at or better than the adopted targets or improvements could be necessary to approve future growth. All intersections under State jurisdiction must comply with the volume-to-capacity (v/c) ratios in the Oregon Highway Plan (OHP), while intersections under Silverton and Marion County jurisdiction must meet those respective agencies' level of service (LOS) or other standards for vehicle delay. The adopted performance targets depend on a variety of designations, such as functional class, posted speed, and urban context. More information on applicable mobility targets is available in the Existing Conditions memorandum for the TSP update.

No-Build (2037) Scenario

The analysis for the forecasted 2037 conditions assumes a no-build roadway infrastructure scenario. Results reflect existing geometric and capacity conditions under future forecasted traffic volumes. Table 1 displays the results of this analysis.

[3] Highway Capacity Manual. Washington, D.C. :Transportation Research Board, 2010.

Table 1. Comparison of Existing (2015) and Future (2037) No-Build Intersection Operations

Intersection and Jurisdiction			Operating Standard		2015 PM Peak Hour			2037 No-Build PM Peak Hour		
			v/c	LOS/ Delay	v/c	LOS	Delay	v/c	LOS	Delay
All-Way Stop-Controlled Intersections										
4	James St./Pine St.	City	0.85	D	0.33	A	10	0.55	B	15
5	James St./Water St.	City	0.85	D	0.38	B	11	0.71	C	20
10	Main St./McClaine St.	City	0.85	55s	0.58	A	9[a]	**1.04**	F	**71[a]**
13	Water St./Oak St.	ODOT	1.00	55s	0.46	D	26[a]	0.86	D	48[a]
14	Water St./Main St.	ODOT	1.00	55s	0.65	C	17[a]	**1.12**	F	**77[a]**
18	1st St./Oak St.	ODOT	1.00	55s	0.53	A	7[a]	0.85	A[a]	21[a]
19	1st St./Main St.	ODOT	1.00	55s	0.62	A	8[a]	0.89	B[a]	52[a]
Other Unsignalized Intersections										
1	2nd St./Hobart Rd.	County	0.90	D	0.07	A/A	10	0.13	A/B	12
2	OR 214/ Hobart Rd.	ODOT	0.90	-	0.51	A/D	28	0.83	A/F	79
3	OR 214/Jefferson St.	ODOT	0.90	-	0.21	A/C	18	0.45	A/E	45
6	James St./C St.	County	0.85	D	0.24	A/C	15	0.47	A/C	19
8	Main St./Westfield St.	City	0.90	D	0.19	A/B	10	0.25	A/B	11
11	Front St./C St.	City	0.90	D	0.08	A/B	12	0.14	A/B	14
12	Water St./Park St.	ODOT	1.00	-	0.02[b]	A/B[b]	11[b]	0.29	A/B[b]	12[b]
15	Water St./Lewis St.	ODOT	1.00	55s	0.35[b]	A[a]	3[a]	0.54	A	11[a]
16	OR 214/Pioneer Dr.	ODOT	0.90	-	0.01	A/B	12	0.13	A/C	17
20	1st St./Lewis St.	ODOT	1.00	55s	0.02	A[a]	7[a]	0.04	A[a]	44[a]
21	2nd St./Oak St.	ODOT	1.00	55s	0.55	B[a]	14[a]	**1.11**	C[a]	**60[a]**
22	Steelhammer Rd./Oak St.	ODOT	0.95	-	0.12	A/B	14	0.26	A/C	21
23	Steelhammer Rd./Main St.	County	0.90	D	0.11	A/A	9	0.23	A/B	11
24	OR 213/Monitor Rd.	ODOT	0.95	-	0.13	A/C	17	0.25	A/D	31
Signalized Intersections										
7	Westfield St./McClaine St.	City	1.00	-	0.82	C	28	**1.48**	F	157
9	Water St./C St.	ODOT	1.00	-	0.63	B	17	0.75	C	22
17	1st St./C St.	ODOT	1.00	-	0.78	B	18	**1.10**	E	58

[a] Delay results for the downtown core area are based on the vehicle delay reported in SimTraffic for the worst approach, consistent with City of Silverton standards for designated downtown intersections.
[b] Results from Synchro in-program operations. Due to unique geometry, HCM Report not available.
Note: **Bold/Shaded** text indicates failure to meet agency mobility target.

As shown in Table 1, five of the study area intersections fail to meet the operational standards for the future year (2037). These intersections are located on the major roadways through the City that are forecasted to experience the most significant growth in traffic. Of the five failing intersections, three are stop-controlled and two are signalized. Further discussion of operation issues is included in the Identified System Deficiencies section of this memorandum.

Identified System Deficiencies

Intersection Operations

Several deficiencies have been identified as part of the analysis of the future (2037) transportation network within the City of Silverton. The following five intersections will fail to meet operating standards without capacity improvements:

- **Main Street/McClaine Street.** This all-way stop controlled intersection just west of the Main Street Bridge does not have adequate capacity to meet future demand with the existing geometry and control type. The southbound traffic on McClaine Street is the most impacted, and simulation showed over 70 seconds of average delay for this approach. HCM analysis also showed that this was the worst approach, with a v/c over 1.0 and LOS F. This is a single-lane approach shared by southbound left and right turning movements.
- **Water Street (OR 214)/Main Street.** This intersection at the east end of the Main Street bridge is currently all-way stop controlled, and does not provide adequate capacity to meet forecast 2037 traffic demand. The westbound (Main Street) approach experiences over 75 seconds of average delay in simulation, exceeding the City standard for downtown intersections. HCM analysis shows that all approaches experience LOS E or worse, and the right lane southbound operates with a v/c over 1.0 due to the heavy southbound right turn movements toward the bridge and heavy though movements headed toward OR 214 southbound. The heavy combined through/right utilization of the southbound right lane may be contributing to operations deficiencies.
- **2nd Street/Oak Street.** The southbound approach on 2nd Street averages about 60 seconds of delay in simulation, exceeding the City standard. This is a stop-controlled minor approach, and available gaps in traffic on the major street, Oak Street, are infrequent. A review of the small community model shows that some traffic originating from the north (1st Street/OR 214) and headed toward the east (Oak Street/OR 213) will use 2nd Street, Mill Street, and others to access Oak Street. Vehicles will route through these streets rather than experiencing delay at signals and downtown intersections by using Water Street southbound.
- **Westfield Street/McClaine Street.** This signalized intersection is significantly over capacity (1.48 v/c) under forecast 2037 conditions, with the eastbound left turn from McClaine Street experiencing the most delay.
- **1st Street (OR 214)/C Street.** This signalized intersection also operates over capacity (1.10 v/c) in 2037, with the eastbound left/through and northbound left movements

experiencing the most delay. The lack of a dedicated left turn lane and associated protected signal phase may contribute to the operational deficiency.

Traffic control improvements and/or capacity improvements at these intersections will be necessary to accommodate future traffic demands and meet operating standards. In addition, the **1st Street (Oregon 214)/Hobart Road** intersection meets the ODOT v/c-based standard, but experiences high delay. This intersection operates at LOS F with nearly 80 seconds of average delay for the westbound approach lane.

Bicycle and Pedestrian Network

As motor vehicle traffic increases in the future, existing deficiencies in the bicycle and pedestrian system may be exacerbated further by increased stress from the level of adjacent traffic volume, noise, difficulty of crossing major roads, and potential for more traffic conflicts. Some of the major corridors forecast to experience significant traffic growth are also corridors without dedicated bicycle or pedestrian facilities. These include:

- Silverton Road west of Fosholm
- 1st Street (OR 214) north of the rail spur
- Oak Street (OR 213) east of Iowa Street
- Water Street (OR 214) south of Peach Street

The following gaps and deficiencies, identified in the bicycle and pedestrian section of this project's Existing Conditions study, are likely to remain or worsen in the future:

Pedestrian

- Notable sidewalk gaps exist in the downtown area are along N 3rd Street (between B Street and Oak Street), A Street (between Front Street and 1st Street), High Street, Park Street, and Lewis Street (between 2nd Street and 3rd Street), and Jersey Street (between 1st Street and 3rd Street).
- The railroad and Silver Creek also present barriers to pedestrian connectivity from the areas north and west of downtown.
- The highest number of pedestrian crashes in the City occurred at two intersections: Oak Street/Water Street and Main Street/Water Street.
- While the sidewalk network in and around downtown is well developed, several streets in the outlying neighborhoods were identified as higher stress facilities, including:
    - James Street, 1st Street, 2nd Street, Jefferson Street, and Hobart Road north of the abandoned rail spur;
    - Monitor Road, Oak Street, Steelhammer Road, and Main Street to the east;
    - Water Street south of Peach Street, Eureka Avenue south of Keene Avenue to the south;
    - Main Street south of Westfield Street, Silverton Road west of Fosholm Road, and Pine Street west of Silverton High School

Bicycle

- The City currently features about 3.8 miles of marked bike facilities, but lacks a designated, bicycle network that connects entrance portals, downtown destinations, schools, and other key trip attractors.
- Collector and higher-level facilities tend to provide the best the most direct network connections, but several of these were identified as higher stress facilities, including 1st Street (OR 214) north of C Street, Oak Street (OR 213) east of Church Street, Water Street south of Peach Street, and Main Street near the Oregon Garden.

The TSP process also includes a Safe Routes to School (SRTS) component. The SRTS component included walking audits around schools within the City, helping to identify additional gaps and deficiencies, many of which are relevant to system planning. The following key deficiencies were identified through walk audits:

Multiple Schools

- The lack of pedestrian crossing treatment on 1st Street (OR 214) at Jefferson Street was identified as a crucial safety and connectivity issue for Silverton High, Silverton Middle, and Mark Twain Elementary

Silverton Middle School

- Incomplete sidewalks on James Street between Jefferson Street and C Street
- No bike facilities on James Street Bridge over Silver Creek
- Lack of bicycle/pedestrian crossing treatment on James Street at the railroad crossing (just north of C Street)
- Incomplete sidewalk on east side of Brown Street between Schlador Street and Water Street
- Lack of pedestrian crossing treatment on Schlador Street at Brown Street
- Lack of bicycle treatment on Brown Street south of the school

Mark Twain Elementary School

- Robinson Street in front of the school has poor sidewalk conditions on the north side and no sidewalk on the south side
- Lack of pedestrian crossing treatment on Robinson Street at Mill Street
- No sidewalk on east side of Church Street north of Bartlett Street
- No sidewalks on either side of Bartlett Street between Church Street and Norway Street

Silverton High School

- Sidewalk gap on the south side of Western Avenue between James Street and Grant Street
- Lack of pedestrian crossing treatment on Western Avenue at Grant Street

- Sidewalk gap on the west side of Grant Street between Western Avenue and the school driveway
- Sidewalk gap on James Street between Western Avenue and Jefferson Street

Robert Frost Elementary

- No sidewalk on east side of Westfield Street
- Lack of pedestrian crossing treatment on Westfield Street at Center Street

Appendix

2037 Future Year No-Build Synchro HCM Reports

2037 Future Year No-Build SimTraffic Delay Reports

Intersection	
Int Delay, s/veh	3.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	270	10	140	120	10	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	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	5	0	3	15	0	2
Mvmt Flow	303	11	157	135	11	56

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	315	0	758	309
Stage 1	-	-	-	-	309	-
Stage 2	-	-	-	-	449	-
Critical Hdwy	-	-	4.13	-	6.4	6.22
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.227	-	3.5	3.318
Pot Cap-1 Maneuver	-	-	1240	-	378	731
Stage 1	-	-	-	-	749	-
Stage 2	-	-	-	-	647	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1240	-	326	731
Mov Cap-2 Maneuver	-	-	-	-	326	-
Stage 1	-	-	-	-	749	-
Stage 2	-	-	-	-	558	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.5	11.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	606	-	-	1240	-
HCM Lane V/C Ratio	0.111	-	-	0.127	-
HCM Control Delay (s)	11.7	-	-	8.3	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.4	-

Intersection	
Int Delay, s/veh	11.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	60	10	40	60	40	10	340	160	80	470	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	100	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	0	5	0	26	2	7	0	4	9	2	5	0
Mvmt Flow	11	66	11	44	66	44	11	374	176	88	516	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1143	1088	516	1127	1088	374	516	0	0	374	0	0
Stage 1	692	692	-	396	396	-	-	-	-	-	-	-
Stage 2	451	396	-	731	692	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.55	6.2	7.36	6.52	6.27	4.1	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.55	-	6.36	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.55	-	6.36	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.045	3.3	3.734	4.018	3.363	2.2	-	-	2.218	-	-
Pot Cap-1 Maneuver	179	213	563	163	216	661	1060	-	-	1184	-	-
Stage 1	437	441	-	584	604	-	-	-	-	-	-	-
Stage 2	592	599	-	378	445	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	112	188	563	106	190	661	1060	-	-	1184	-	-
Mov Cap-2 Maneuver	112	188	-	106	190	-	-	-	-	-	-	-
Stage 1	430	394	-	575	595	-	-	-	-	-	-	-
Stage 2	484	590	-	276	398	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	39.9	78.8	0.2	1.2
HCM LOS	E	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1060	-	-	188	186	1184	-	-
HCM Lane V/C Ratio	0.01	-	-	0.468	0.827	0.074	-	-
HCM Control Delay (s)	8.4	0	-	39.9	78.8	8.3	0	-
HCM Lane LOS	A	A	-	E	F	A	A	-
HCM 95th %tile Q(veh)	0	-	-	2.2	5.8	0.2	-	-

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	20	60	10	30	25	50	550	40	30	510	10
Conflicting Peds, #/hr	0	0	2	2	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	100	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	11	0	0	11	0	0	40	4	0	0	8	75
Mvmt Flow	11	22	66	11	33	27	55	604	44	33	560	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1375	1344	562	1388	1344	606	562	0	0	606	0	0
Stage 1	628	628	-	716	716	-	-	-	-	-	-	-
Stage 2	747	716	-	672	628	-	-	-	-	-	-	-
Critical Hdwy	7.21	6.5	6.2	7.21	6.5	6.2	4.5	-	-	4.1	-	-
Critical Hdwy Stg 1	6.21	5.5	-	6.21	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.21	5.5	-	6.21	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.599	4	3.3	3.599	4	3.3	2.56	-	-	2.2	-	-
Pot Cap-1 Maneuver	117	153	530	115	153	501	845	-	-	982	-	-
Stage 1	456	479	-	407	437	-	-	-	-	-	-	-
Stage 2	391	437	-	431	479	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	79	130	529	78	130	500	845	-	-	982	-	-
Mov Cap-2 Maneuver	79	130	-	78	130	-	-	-	-	-	-	-
Stage 1	408	455	-	364	391	-	-	-	-	-	-	-
Stage 2	304	391	-	341	455	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	32.2	44.9	0.7	0.5
HCM LOS	D	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	845	-	-	229	159	982	-	-
HCM Lane V/C Ratio	0.065	-	-	0.432	0.449	0.034	-	-
HCM Control Delay (s)	9.6	0	-	32.2	44.9	8.8	0	-
HCM Lane LOS	A	A	-	D	E	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	2	2.1	0.1	-	-

Intersection	
Intersection Delay, s/veh	13
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	10	10	240	0	10	10	10	0	200	100	10
Peak Hour Factor	0.92	0.84	0.84	0.84	0.92	0.84	0.84	0.84	0.92	0.84	0.84	0.84
Heavy Vehicles, %	2	10	0	4	2	0	0	0	2	1	0	0
Mvmt Flow	0	12	12	286	0	12	12	12	0	238	119	12
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	12.5	9.5	14.8
HCM LOS	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	65%	4%	33%	5%
Vol Thru, %	32%	4%	33%	81%
Vol Right, %	3%	92%	33%	14%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	310	260	30	210
LT Vol	200	10	10	10
Through Vol	100	10	10	170
RT Vol	10	240	10	30
Lane Flow Rate	369	310	36	250
Geometry Grp	1	1	1	1
Degree of Util (X)	0.55	0.449	0.06	0.372
Departure Headway (Hd)	5.37	5.224	6.006	5.353
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	672	687	594	670
Service Time	3.409	3.269	4.072	3.396
HCM Lane V/C Ratio	0.549	0.451	0.061	0.373
HCM Control Delay	14.8	12.5	9.5	11.6
HCM Lane LOS	B	B	A	B
HCM 95th-tile Q	3.4	2.3	0.2	1.7

Intersection				
Intersection Delay, s/veh				
Intersection LOS				

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	10	170	30
Peak Hour Factor	0.92	0.84	0.84	0.84
Heavy Vehicles, %	2	0	0	0
Mvmt Flow	0	12	202	36
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	11.6
HCM LOS	B

Lane

Intersection	
Intersection Delay, s/veh	15.4
Intersection LOS	C

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Vol, veh/h	0	10	20	10	0	20	10	140	0	10	170	30	0	210	200	10
Peak Hour Factor	0.92	0.84	0.84	0.84	0.92	0.84	0.84	0.84	0.92	0.84	0.84	0.84	0.92	0.84	0.84	0.84
Heavy Vehicles, %	2	0	14	9	2	0	33	1	2	0	0	0	2	3	2	0
Mvmt Flow	0	12	24	12	0	24	12	167	0	12	202	36	0	250	238	12
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.7	10.9	11.3	19.8
HCM LOS	A	B	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	25%	12%	50%
Vol Thru, %	81%	50%	6%	48%
Vol Right, %	14%	25%	82%	2%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	210	40	170	420
LT Vol	10	10	20	210
Through Vol	170	20	10	200
RT Vol	30	10	140	10
Lane Flow Rate	250	48	202	500
Geometry Grp	1	1	1	1
Degree of Util (X)	0.365	0.081	0.305	0.711
Departure Headway (Hd)	5.252	6.139	5.429	5.121
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	685	581	660	705
Service Time	3.291	4.201	3.476	3.152
HCM Lane V/C Ratio	0.365	0.083	0.306	0.709
HCM Control Delay	11.3	9.7	10.9	19.8
HCM Lane LOS	B	A	B	C
HCM 95th-tile Q	1.7	0.3	1.3	6

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	170	740	10	30	590	20	0	0	40	0	0	215
Conflicting Peds, #/hr	2	0	1	1	0	2	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	0	4	0	4	8	0	0	0	0	0	0	2
Mvmt Flow	179	779	11	32	621	21	0	0	42	0	0	226

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	643	0	0	790	0	0	1952	1849	787	1860	1844	635
Stage 1	-	-	-	-	-	-	1143	1143	-	696	696	-
Stage 2	-	-	-	-	-	-	809	706	-	1164	1148	-
Critical Hdwy	4.1	-	-	4.14	-	-	7.1	6.5	6.2	7.1	6.5	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.236	-	-	3.5	4	3.3	3.5	4	3.318
Pot Cap-1 Maneuver	951	-	-	821	-	-	49	75	395	57	76	478
Stage 1	-	-	-	-	-	-	246	277	-	435	446	-
Stage 2	-	-	-	-	-	-	377	442	-	239	276	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	949	-	-	820	-	-	18	47	394	36	47	477
Mov Cap-2 Maneuver	-	-	-	-	-	-	18	47	-	36	47	-
Stage 1	-	-	-	-	-	-	163	183	-	288	418	-
Stage 2	-	-	-	-	-	-	186	415	-	141	183	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.8	0.4	15.2	19.2
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	394	949	-	-	820	-	-	477
HCM Lane V/C Ratio	0.107	0.189	-	-	0.039	-	-	0.474
HCM Control Delay (s)	15.2	9.7	0	-	9.6	0	-	19.2
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.4	0.7	-	-	0.1	-	-	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	510	380	130	130	390	10	170	420	80	10	395	370
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	1.00		1.00	0.98		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1630	1675		1646	1677		1630	1639		1662	1518	
Flt Permitted	0.13	1.00		0.15	1.00		0.07	1.00		0.30	1.00	
Satd. Flow (perm)	221	1675		262	1677		128	1639		531	1518	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	548	409	140	140	419	11	183	452	86	11	425	398
RTOR Reduction (vph)	0	10	0	0	1	0	0	5	0	0	27	0
Lane Group Flow (vph)	548	539	0	140	429	0	183	533	0	11	796	0
Confl. Peds. (#/hr)	2					2						
Heavy Vehicles (%)	2%	0%	2%	1%	4%	0%	2%	5%	0%	0%	5%	9%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	52.5	39.1		35.4	26.5		62.1	56.3		50.4	49.1	
Effective Green, g (s)	52.5	39.1		35.4	26.5		62.1	56.3		50.4	49.1	
Actuated g/C Ratio	0.42	0.32		0.29	0.21		0.50	0.46		0.41	0.40	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	338	529		174	359		167	746		228	603	
v/s Ratio Prot	c0.28	0.32		0.06	0.26		c0.08	0.33		0.00	c0.52	
v/s Ratio Perm	c0.40			0.17			0.47			0.02		
v/c Ratio	1.62	1.02		0.80	1.20		1.10	0.71		0.05	1.32	
Uniform Delay, d1	37.2	42.2		36.3	48.5		35.0	27.2		23.0	37.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	292.9	43.9		23.0	112.1		97.6	3.3		0.1	155.4	
Delay (s)	330.1	86.1		59.2	160.6		132.6	30.4		23.1	192.6	
Level of Service	F	F		E	F		F	C		C	F	
Approach Delay (s)		208.0			135.7			56.4			190.4	
Approach LOS		F			F			E			F	

Intersection Summary			
HCM 2000 Control Delay	156.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.48		
Actuated Cycle Length (s)	123.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	126.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	140	220	140	10	10	170
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	120	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	11	1	5	0	0	8
Mvmt Flow	154	242	154	11	11	187

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	165	0	-	0	708	159
Stage 1	-	-	-	-	159	-
Stage 2	-	-	-	-	549	-
Critical Hdwy	4.21	-	-	-	6.4	6.28
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.299	-	-	-	3.5	3.372
Pot Cap-1 Maneuver	1360	-	-	-	404	871
Stage 1	-	-	-	-	875	-
Stage 2	-	-	-	-	583	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1360	-	-	-	358	871
Mov Cap-2 Maneuver	-	-	-	-	358	-
Stage 1	-	-	-	-	875	-
Stage 2	-	-	-	-	517	-

Approach	EB	WB	SB
HCM Control Delay, s	3.1	0	10.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1360	-	-	-	807
HCM Lane V/C Ratio	0.113	-	-	-	0.245
HCM Control Delay (s)	8	-	-	-	10.9
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.4	-	-	-	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	480	300	240	630	200	0	0	0	70	210	20
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0	5.0	4.5	5.0	5.0				4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98				1.00	1.00	
Flpb, ped/bikes	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	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00				0.95	1.00	
Satd. Flow (prot)	1662	1716	1452	1662	1699	1442				1662	1707	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00				0.95	1.00	
Satd. Flow (perm)	1662	1716	1452	1662	1699	1442				1662	1707	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	22	527	330	264	692	220	0	0	0	77	231	22
RTOR Reduction (vph)	0	0	161	0	0	79	0	0	0	0	5	0
Lane Group Flow (vph)	22	527	169	264	692	141	0	0	0	77	248	0
Confl. Peds. (#/hr)			2	2			5		10	10		5
Confl. Bikes (#/hr)						1						2
Heavy Vehicles (%)	0%	2%	1%	0%	3%	1%	0%	0%	0%	0%	1%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm				Prot	NA	
Protected Phases	5	2		1	6					7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	1.8	31.0	31.0	15.7	44.9	44.9				16.2	16.2	
Effective Green, g (s)	1.8	31.0	31.0	15.7	44.9	44.9				16.2	16.2	
Actuated g/C Ratio	0.02	0.40	0.40	0.20	0.58	0.58				0.21	0.21	
Clearance Time (s)	4.5	5.0	5.0	4.5	5.0	5.0				4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0				3.0	3.0	
Lane Grp Cap (vph)	38	691	585	339	992	841				350	359	
v/s Ratio Prot	0.01	c0.31		c0.16	0.41					0.05	c0.15	
v/s Ratio Perm			0.12			0.10						
v/c Ratio	0.58	0.76	0.29	0.78	0.70	0.17				0.22	0.69	
Uniform Delay, d1	37.2	19.8	15.5	29.0	11.2	7.4				25.1	28.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	
Incremental Delay, d2	19.6	5.0	0.3	10.8	2.2	0.1				0.3	5.7	
Delay (s)	56.8	24.8	15.8	39.7	13.4	7.5				25.4	33.7	
Level of Service	E	C	B	D	B	A				C	C	
Approach Delay (s)		22.2			18.2			0.0			31.8	
Approach LOS		C			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	21.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	76.9	Sum of lost time (s)	14.0
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	550	30	0	1000	40	0	0	10	0	0	60
Conflicting Peds, #/hr	0	0	1	1	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	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	5	0	0	6	0	0	0	0	0	0	0
Mvmt Flow	0	591	32	0	1075	43	0	0	11	0	0	65

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1118	0	0	624	0	0	1146	1726	609	1705	1721	560
Stage 1	-	-	-	-	-	-	608	608	-	1097	1097	-
Stage 2	-	-	-	-	-	-	538	1118	-	608	624	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.3	6.5	6.2	7.3	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	632	-	-	967	-	-	167	90	499	66	90	477
Stage 1	-	-	-	-	-	-	486	489	-	231	291	-
Stage 2	-	-	-	-	-	-	500	285	-	486	481	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	631	-	-	966	-	-	144	90	499	65	90	477
Mov Cap-2 Maneuver	-	-	-	-	-	-	144	90	-	65	90	-
Stage 1	-	-	-	-	-	-	486	489	-	231	291	-
Stage 2	-	-	-	-	-	-	432	285	-	475	481	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	12.4	13.7
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	499	631	-	-	966	-	-	477
HCM Lane V/C Ratio	0.022	-	-	-	-	-	-	0.135
HCM Control Delay (s)	12.4	0	-	-	0	-	-	13.7
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	20	0	0	0	20	660
Conflicting Peds, #/hr	2	4	0	7	7	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	0	0	2
Mvmt Flow	22	0	0	0	22	742

Major/Minor	Minor1		Major2	
Conflicting Flow All	420	11	4	0
Stage 1	4	-	-	-
Stage 2	416	-	-	-
Critical Hdwy	7.5	-	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	6.5	-	-	-
Follow-up Hdwy	3.5	-	-	-
Pot Cap-1 Maneuver	522	-	-	-
Stage 1	-	-	-	-
Stage 2	590	-	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	520	-	-	-
Mov Cap-2 Maneuver	520	-	-	-
Stage 1	-	-	-	-
Stage 2	590	-	-	-

Approach	WB	SB
HCM Control Delay, s		
HCM LOS	-	

Minor Lane/Major Mvmt	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	-	-
HCM Lane LOS	-	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection	
Int Delay, s/veh	3.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	10	70	170	10	130	190
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	77	77	77	77	77	77
Heavy Vehicles, %	0	0	3	17	1	1
Mvmt Flow	13	91	221	13	169	247

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	811	227	0	0	234	0
Stage 1	227	-	-	-	-	-
Stage 2	584	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.11	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209	-
Pot Cap-1 Maneuver	352	817	-	-	1339	-
Stage 1	815	-	-	-	-	-
Stage 2	561	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	308	817	-	-	1339	-
Mov Cap-2 Maneuver	308	-	-	-	-	-
Stage 1	815	-	-	-	-	-
Stage 2	490	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	3.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	308	817	1339	-
HCM Lane V/C Ratio	-	-	0.042	0.111	0.126	-
HCM Control Delay (s)	-	-	17.2	10	8.1	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.4	0.4	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	490	140	0	0	210	10	320	280	10	0	0	660
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		5.0			5.0		4.5	4.5				4.5
Lane Util. Factor		1.00			1.00		1.00	1.00				1.00
Frpb, ped/bikes		1.00			1.00		1.00	1.00				0.99
Flpb, ped/bikes		0.99			1.00		1.00	1.00				1.00
Frt		1.00			0.99		1.00	0.99				0.86
Flt Protected		0.96			1.00		0.95	1.00				1.00
Satd. Flow (prot)		1592			1673		1568	1614				1410
Flt Permitted		0.61			1.00		0.95	1.00				1.00
Satd. Flow (perm)		1009			1673		1568	1614				1410
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	516	147	0	0	221	11	337	295	11	0	0	695
RTOR Reduction (vph)	0	0	0	0	1	0	0	1	0	0	0	91
Lane Group Flow (vph)	0	663	0	0	231	0	337	305	0	0	0	604
Confl. Peds. (#/hr)	3		3	3		3	6		5	5		6
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	6%	1%	0%	0%	4%	0%	6%	8%	0%	0%	0%	6%
Turn Type	pm+pt	NA			NA		Split	NA				custom
Protected Phases	5	2			6		7	7				8
Permitted Phases	2											6
Actuated Green, G (s)		64.5			64.5		25.0	25.0				73.2
Effective Green, g (s)		64.5			64.5		25.0	25.0				73.2
Actuated g/C Ratio		0.57			0.57		0.22	0.22				0.65
Clearance Time (s)		5.0			5.0		4.5	4.5				4.5
Vehicle Extension (s)		3.0			3.0		3.0	3.0				3.0
Lane Grp Cap (vph)		580			961		349	359				919
v/s Ratio Prot					0.14		c0.21	0.19				c0.05
v/s Ratio Perm		c0.66										0.38
v/c Ratio		1.14			0.24		0.97	0.85				0.66
Uniform Delay, d1		23.9			11.8		43.2	41.8				11.9
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		83.5			0.1		38.7	17.2				1.7
Delay (s)		107.4			11.9		81.9	59.0				13.6
Level of Service		F			B		F	E				B
Approach Delay (s)		107.4			11.9			71.0			13.6	
Approach LOS		F			B			E			B	

Intersection Summary			
HCM 2000 Control Delay	57.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	112.2	Sum of lost time (s)	18.0
Intersection Capacity Utilization	88.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	460	40	80	480	30	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	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	7	5	2	0	4
Mvmt Flow	495	43	86	516	32	43

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	538	0	1204	516
Stage 1	-	-	-	-	516	-
Stage 2	-	-	-	-	688	-
Critical Hdwy	-	-	4.15	-	6.4	6.24
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.245	-	3.5	3.336
Pot Cap-1 Maneuver	-	-	1015	-	205	555
Stage 1	-	-	-	-	603	-
Stage 2	-	-	-	-	503	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1015	-	181	555
Mov Cap-2 Maneuver	-	-	-	-	181	-
Stage 1	-	-	-	-	603	-
Stage 2	-	-	-	-	443	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	21.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	294	-	-	1015	-
HCM Lane V/C Ratio	0.256	-	-	0.085	-
HCM Control Delay (s)	21.4	-	-	8.9	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1	-	-	0.3	-

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	110	0	50	0	0	0	10	40	0	0	60	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	0	0	0	0	0	0	100	3	0	0	0	11
Mvmt Flow	129	0	59	0	0	0	12	47	0	0	71	71

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	177	177	106	206	212	47	141	0	0	47	0	0
Stage 1	106	106	-	71	71	-	-	-	-	-	-	-
Stage 2	71	71	-	135	141	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	5.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	3.1	-	-	2.2	-	-
Pot Cap-1 Maneuver	790	720	954	756	689	1028	1010	-	-	1573	-	-
Stage 1	905	811	-	944	840	-	-	-	-	-	-	-
Stage 2	944	840	-	873	784	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	783	711	954	703	681	1028	1010	-	-	1573	-	-
Mov Cap-2 Maneuver	783	711	-	703	681	-	-	-	-	-	-	-
Stage 1	894	811	-	933	830	-	-	-	-	-	-	-
Stage 2	933	830	-	819	784	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.6	0	1.7	0
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1010	-	-	829	-	1573	-	-
HCM Lane V/C Ratio	0.012	-	-	0.227	-	-	-	-
HCM Control Delay (s)	8.6	0	-	10.6	0	0	-	-
HCM Lane LOS	A	A	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.9	-	0	-	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	70	370	0	0	420	40	0	0	0	40	0	100
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	100	-	-	-	-	-	75
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	3	0	0	4	35	0	0	0	18	0	2
Mvmt Flow	78	411	0	0	467	44	0	0	0	44	0	111

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	469	0	0	413	0	0	1038	1038	413	1038	1038	469
Stage 1	-	-	-	-	-	-	569	569	-	469	469	-
Stage 2	-	-	-	-	-	-	469	469	-	569	569	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.1	6.5	6.2	7.28	6.5	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.28	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.28	5.5	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4	3.3	3.662	4	3.318
Pot Cap-1 Maneuver	1093	-	-	1157	-	0	211	233	643	195	233	594
Stage 1	-	-	-	-	-	0	511	509	-	545	564	-
Stage 2	-	-	-	-	-	0	579	564	-	480	509	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1093	-	-	1157	-	-	159	211	642	181	211	593
Mov Cap-2 Maneuver	-	-	-	-	-	-	159	211	-	181	211	-
Stage 1	-	-	-	-	-	-	463	461	-	494	563	-
Stage 2	-	-	-	-	-	-	471	563	-	436	461	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	0	0	17.8
HCM LOS			A	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	1093	-	-	1157	-	181	593
HCM Lane V/C Ratio	-	0.071	-	-	-	-	0.246	0.187
HCM Control Delay (s)	0	8.5	0	-	0	-	31.2	12.5
HCM Lane LOS	A	A	A	-	A	-	D	B
HCM 95th %tile Q(veh)	-	0.2	-	-	0	-	0.9	0.7

Intersection	
Intersection Delay, s/veh	50.4
Intersection LOS	F

Movement	EBU	EBL	EBT	WBU	WBT	WBR	SBU	SBL	SBR
Vol, veh/h	0	40	390	0	290	460	0	460	40
Peak Hour Factor	0.92	0.94	0.94	0.92	0.94	0.94	0.92	0.94	0.94
Heavy Vehicles, %	2	3	2	2	4	3	2	1	0
Mvmt Flow	0	43	415	0	309	489	0	489	43
Number of Lanes	0	0	1	0	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	2	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	1
HCM Control Delay	49.2	40.1	66.9
HCM LOS	E	E	F

Lane	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	9%	0%	0%	92%
Vol Thru, %	91%	100%	0%	0%
Vol Right, %	0%	0%	100%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	430	290	460	500
LT Vol	40	0	0	460
Through Vol	390	290	0	0
RT Vol	0	0	460	40
Lane Flow Rate	457	309	489	532
Geometry Grp	5	7	7	2
Degree of Util (X)	0.919	0.653	0.935	1
Departure Headway (Hd)	7.233	7.618	6.879	7.147
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	512	481	533	511
Service Time	5.138	5.271	4.554	5.147
HCM Lane V/C Ratio	0.893	0.642	0.917	1.041
HCM Control Delay	49.2	23.4	50.6	66.9
HCM Lane LOS	E	C	F	F
HCM 95th-tile Q	10.9	4.6	11.6	13.7

Intersection	
Intersection Delay, s/veh	23.2
Intersection LOS	C

Movement	WBU	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Vol, veh/h	0	290	0	0	0	0	0	360	420
Peak Hour Factor	0.92	0.94	0.94	0.92	0.94	0.94	0.92	0.94	0.94
Heavy Vehicles, %	2	3	0	2	0	0	2	2	2
Mvmt Flow	0	309	0	0	0	0	0	383	447
Number of Lanes	0	1	0	0	0	0	0	0	2

Approach	WB	SB
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left		WB
Conflicting Lanes Left	0	1
Conflicting Approach Right	SB	
Conflicting Lanes Right	2	0
HCM Control Delay	14.8	26.3
HCM LOS	B	D

Lane	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	72%	0%
Vol Thru, %	0%	28%	100%
Vol Right, %	0%	0%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	290	500	280
LT Vol	290	360	0
Through Vol	0	140	280
RT Vol	0	0	0
Lane Flow Rate	309	532	298
Geometry Grp	2	7	7
Degree of Util (X)	0.503	0.857	0.45
Departure Headway (Hd)	5.873	5.802	5.439
Convergence, Y/N	Yes	Yes	Yes
Cap	611	617	655
Service Time	3.942	3.592	3.228
HCM Lane V/C Ratio	0.506	0.862	0.455
HCM Control Delay	14.8	33.9	12.7
HCM Lane LOS	B	D	B
HCM 95th-tile Q	2.8	9.6	2.3

Intersection	
Intersection Delay, s/veh	57.8
Intersection LOS	F

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Vol, veh/h	0	0	450	430	0	60	460	0	0	0	0	0	0	60	360	350
Peak Hour Factor	0.92	0.96	0.96	0.96	0.92	0.96	0.96	0.96	0.92	0.96	0.96	0.96	0.92	0.96	0.96	0.96
Heavy Vehicles, %	2	0	2	2	2	0	5	0	2	0	0	0	2	0	2	3
Mvmt Flow	0	0	469	448	0	63	479	0	0	0	0	0	0	63	375	365
Number of Lanes	0	0	1	1	0	0	1	0	0	0	0	0	0	0	2	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	2
HCM Control Delay	55.7	69.1	52.6
HCM LOS	F	F	F

Lane	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	0%	0%	12%	25%	0%
Vol Thru, %	100%	0%	88%	75%	34%
Vol Right, %	0%	100%	0%	0%	66%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	450	430	520	240	530
LT Vol	0	0	60	60	0
Through Vol	450	0	460	180	180
RT Vol	0	430	0	0	350
Lane Flow Rate	469	448	542	250	552
Geometry Grp	7	7	6	7	7
Degree of Util (X)	1	0.876	1	0.547	1
Departure Headway (Hd)	7.76	7.037	7.64	7.877	7.307
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	473	520	482	460	497
Service Time	5.437	4.738	5.611	5.594	5.041
HCM Lane V/C Ratio	0.992	0.862	1.124	0.543	1.111
HCM Control Delay	69.4	41.4	69.1	19.7	67.5
HCM Lane LOS	F	E	F	C	F
HCM 95th-tile Q	13.2	9.6	13.3	3.2	13.6

Intersection	
Intersection Delay, s/veh	26.1
Intersection LOS	D

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Vol, veh/h	0	40	320	0	0	0	250	110	0	30	370	240	0	0	0	0
Peak Hour Factor	0.92	0.91	0.91	0.91	0.92	0.91	0.91	0.91	0.92	0.91	0.91	0.91	0.92	0.91	0.91	0.91
Heavy Vehicles, %	2	0	4	0	2	0	4	3	2	0	5	4	2	0	0	0
Mvmt Flow	0	44	352	0	0	0	275	121	0	33	407	264	0	0	0	0
Number of Lanes	0	0	1	0	0	0	1	0	0	0	2	0	0	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	1
HCM Control Delay	24.3	23.1	28.8
HCM LOS	C	C	D

Lane	NBLn1	NBLn2	EBLn1	WBLn1
Vol Left, %	14%	0%	11%	0%
Vol Thru, %	86%	44%	89%	69%
Vol Right, %	0%	56%	0%	31%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	215	425	360	360
LT Vol	30	0	40	0
Through Vol	185	185	320	250
RT Vol	0	240	0	110
Lane Flow Rate	236	467	396	396
Geometry Grp	7	7	2	2
Degree of Util (X)	0.454	0.846	0.713	0.699
Departure Headway (Hd)	6.914	6.525	6.488	6.363
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	517	551	554	562
Service Time	4.702	4.313	4.579	4.456
HCM Lane V/C Ratio	0.456	0.848	0.715	0.705
HCM Control Delay	15.4	35.6	24.3	23.1
HCM Lane LOS	C	E	C	C
HCM 95th-tile Q	2.3	8.9	5.8	5.5

Intersection	
Intersection Delay, s/veh	30.9
Intersection LOS	D

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Vol, veh/h	0	230	230	0	0	0	260	80	0	200	260	10	0	0	0	0
Peak Hour Factor	0.92	0.91	0.91	0.91	0.92	0.91	0.91	0.91	0.92	0.91	0.91	0.91	0.92	0.91	0.91	0.91
Heavy Vehicles, %	2	2	1	0	2	0	3	7	2	3	6	0	2	0	0	0
Mvmt Flow	0	253	253	0	0	0	286	88	0	220	286	11	0	0	0	0
Number of Lanes	0	0	1	0	0	0	1	0	0	0	2	0	0	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	1
HCM Control Delay	43.5	21.9	25
HCM LOS	E	C	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1
Vol Left, %	61%	0%	50%	0%
Vol Thru, %	39%	93%	50%	76%
Vol Right, %	0%	7%	0%	24%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	330	140	460	340
LT Vol	200	0	230	0
Through Vol	130	130	230	260
RT Vol	0	10	0	80
Lane Flow Rate	363	154	505	374
Geometry Grp	7	7	2	2
Degree of Util (X)	0.756	0.307	0.904	0.673
Departure Headway (Hd)	7.504	7.195	6.437	6.484
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	482	500	566	557
Service Time	5.241	4.932	4.47	4.519
HCM Lane V/C Ratio	0.753	0.308	0.892	0.671
HCM Control Delay	30	13.1	43.5	21.9
HCM Lane LOS	D	B	E	C
HCM 95th-tile Q	6.4	1.3	10.8	5

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	430	30	10	10	0	10	0	40	10	0	0	0
Conflicting Peds, #/hr	2	0	1	1	0	2	4	0	1	1	0	4
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	4	6	0	0	0	0	0	9	0	0	0	0
Mvmt Flow	558	39	13	13	0	13	0	52	13	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	0	0	0	56	0	0	1166	1192	51
Stage 1	-	-	-	-	-	-	1166	1166	-
Stage 2	-	-	-	-	-	-	0	26	-
Critical Hdwy	-	-	-	4.1	-	-	6.4	6.59	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.59	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	2.2	-	-	3.5	4.081	3.3
Pot Cap-1 Maneuver	-	-	-	1562	-	-	216	181	1023
Stage 1	-	-	-	-	-	-	299	260	-
Stage 2	-	-	-	-	-	-	-	-	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	-	-	-	1559	-	-	213	0	1018
Mov Cap-2 Maneuver	-	-	-	-	-	-	213	0	-
Stage 1	-	-	-	-	-	-	298	0	-
Stage 2	-	-	-	-	-	-	-	0	-

Approach	EB	WB	NB
HCM Control Delay, s		3.7	
HCM LOS			-

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	-	1018	-	-	-	1559	-	-
HCM Lane V/C Ratio	-	0.038	-	-	-	0.008	-	-
HCM Control Delay (s)	-	8.7	-	-	-	7.3	-	-
HCM Lane LOS	-	A	-	-	-	A	-	-
HCM 95th %tile Q(veh)	-	0.1	-	-	-	0	-	-

Intersection	
Int Delay, s/veh	24

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	530	20	50	370	70	10	40	30	90	60	30
Conflicting Peds, #/hr	3	0	0	0	0	3	6	0	0	0	0	6
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	0	3	0	8	3	0	0	3	0	2	5	0
Mvmt Flow	10	546	21	52	381	72	10	41	31	93	62	31

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	460	0	0	573	0	0	1156	1146	566	1146	1121	427
Stage 1	-	-	-	-	-	-	583	583	-	527	527	-
Stage 2	-	-	-	-	-	-	573	563	-	619	594	-
Critical Hdwy	4.1	-	-	4.18	-	-	7.1	6.53	6.2	7.12	6.55	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.53	-	6.12	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.53	-	6.12	5.55	-
Follow-up Hdwy	2.2	-	-	2.272	-	-	3.5	4.027	3.3	3.518	4.045	3.3
Pot Cap-1 Maneuver	1112	-	-	971	-	-	175	198	528	176	204	632
Stage 1	-	-	-	-	-	-	502	497	-	535	523	-
Stage 2	-	-	-	-	-	-	508	507	-	476	488	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1109	-	-	969	-	-	115	179	524	127	185	627
Mov Cap-2 Maneuver	-	-	-	-	-	-	115	179	-	127	185	-
Stage 1	-	-	-	-	-	-	493	488	-	525	482	-
Stage 2	-	-	-	-	-	-	389	468	-	404	479	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.9	31.2	158.4
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	218	1109	-	-	969	-	-	167
HCM Lane V/C Ratio	0.378	0.009	-	-	0.053	-	-	1.111
HCM Control Delay (s)	31.2	8.3	0	-	8.9	0	-	158.4
HCM Lane LOS	D	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	1.7	0	-	-	0.2	-	-	9.6

Summary of All Intervals

Run Number	1	3	6	8	Avg
Start Time	4:45	4:45	4:45	4:45	4:45
End Time	6:00	6:00	6:00	6:00	6:00
Total Time (min)	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60
# of Intervals	3	3	3	3	3
# of Recorded Intervals	2	2	2	2	2
Vehs Entered	3463	3443	3192	3557	3411
Vehs Exited	3407	3414	2788	3561	3291
Starting Vehs	104	147	113	157	131
Ending Vehs	160	176	517	153	251
Travel Distance (mi)	2034	2051	1674	2082	1960
Travel Time (hr)	228.9	262.7	235.9	278.2	251.4
Total Delay (hr)	155.0	188.1	175.2	202.6	180.2
Total Stops	7671	7766	6333	7779	7387
Fuel Used (gal)	103.4	111.8	96.3	116.2	106.9

Interval #0 Information Seeding

Start Time	4:45
End Time	5:00
Total Time (min)	15

No data recorded this interval.

Interval #1 Information Recording

Start Time	5:00
End Time	5:15
Total Time (min)	15

Run Number	1	3	6	8	Avg
Vehs Entered	846	872	832	888	860
Vehs Exited	820	885	853	856	855
Starting Vehs	104	147	113	157	131
Ending Vehs	130	134	92	189	133
Travel Distance (mi)	492	522	489	511	504
Travel Time (hr)	36.8	44.4	34.2	52.1	41.9
Total Delay (hr)	18.8	25.5	16.4	33.6	23.6
Total Stops	1876	1909	1841	2004	1909
Fuel Used (gal)	20.8	23.4	20.5	25.0	22.4

Interval #2 Information Recording2

Start Time	5:15
End Time	6:00
Total Time (min)	45

Run Number	1	3	6	8	Avg
Vehs Entered	2617	2571	2360	2669	2552
Vehs Exited	2587	2529	1935	2705	2439
Starting Vehs	130	134	92	189	133
Ending Vehs	160	176	517	153	251
Travel Distance (mi)	1542	1529	1184	1571	1456
Travel Time (hr)	192.1	218.3	201.6	226.1	209.5
Total Delay (hr)	136.2	162.6	158.8	169.0	156.7
Total Stops	5795	5857	4492	5775	5479
Fuel Used (gal)	82.6	88.4	75.8	91.3	84.5

10: Main Street & McClaine Street Performance by approach

Approach	EB	WB	SB	All
Denied Del/Veh (s)	0.6	0.0	3.6	1.3
Total Del/Veh (s)	49.9	10.5	70.9	39.9

13: Water Street & Oak Street Performance by approach

Approach	WB	SB	All
Denied Del/Veh (s)	3.8	14.9	12.0
Total Del/Veh (s)	47.5	47.9	47.8

14: Water Street/Hwy 214/Water Street & Main Street Performance by approach

Approach	EB	WB	SB	All
Denied Del/Veh (s)	10.2	309.8	68.8	100.4
Total Del/Veh (s)	48.5	76.5	37.3	50.3

15: Water Street/Hwy 214 & Lewis Street Performance by approach

Approach	NB	SB	All
Denied Del/Veh (s)	0.4	0.0	0.1
Total Del/Veh (s)	10.6	2.4	5.5

18: 1st Street & Oak Street Performance by approach

Approach	EB	WB	NB	All
Denied Del/Veh (s)	0.0	0.2	0.1	0.1
Total Del/Veh (s)	12.1	20.8	10.1	13.7

19: 1st Street & Main Street Performance by approach

Approach	EB	WB	NB	All
Denied Del/Veh (s)	0.0	284.3	0.0	75.8
Total Del/Veh (s)	18.6	52.0	26.7	29.3

20: 1st Street & Lewis Street Performance by approach

Approach	EB	WB	NB	All
Denied Del/Veh (s)	0.0	0.1	0.1	0.0
Total Del/Veh (s)	12.1	3.9	44.3	14.7

21: 2nd Street & Oak Street Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	1.6	28.8	8.3	3.5
Total Del/Veh (s)	2.5	24.0	31.8	60.2	20.5

96: 2nd Street & Main Street Performance by approach

Approach	EB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	2.4	1.5	2.0

Total Zone Performance

Denied Del/Veh (s)	108.9
Total Del/Veh (s)	397.6

SECTION G

MEMORANDUM 7

SOLUTIONS EVALUATION

720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500

MEMORANDUM

DATE: January 15, 2018

TO: Silverton TSP Update Project Management Team

FROM Ray Delahanty, AICP
Lacy Brown, PhD, PE

SUBJECT: **Silverton Transportation System Plan Update Solutions Evaluation**

The purpose of this memorandum is to present potential transportation system projects and evaluate the solutions using predetermined evaluation criteria. These projects are intended to improve the City of Silverton's transportation system for all users based on system deficiencies identified throughout the development of this TSP.

Solutions Identification Process

The list of recommended projects outlined in the 2008 Silverton TSP served as the basis for the updated project list. Projects that have been completed since 2008 were removed from the list. Additional new projects were identified based on the existing and future system deficiencies analysis (addressing safety, operations, and infrastructure needs), as well as community feedback, the Safe Routes to School audit findings, and local planning documents (e.g., the West Side Plan).

Planned but Unconstructed Projects

Transportation projects that were previously identified in the 2008 TSP but have not yet been constructed were reviewed to identify overlap with known gaps and deficiencies of the transportation system. The previously planned projects that would complement the goals and policies of the Silverton TSP Update were carried forward into the final project list, while other projects were modified to better complement the updated goals.

Potential Projects

The following sections summarize a set of potential transportation improvement projects identified through the existing and future deficiencies analysis, local planning documents, feedback from the community and stakeholders, and the 2008 TSP project list.

Motor Vehicle Projects

The existing conditions and future needs analysis identified motor vehicle system deficiencies within Silverton that include insufficient capacity and safety concerns at several locations. Mitigations for these deficiencies have been evaluated and recommended improvements have been included in the motor vehicle project list, presented in Table 1 and Figure 1 on the following page. Projects listed in bold in Table 1 address safety or operational deficiencies identified as part of this TSP update. Additional details on those projects are presented in Table 2.

Table 1. Motor Vehicle Project List

Number	Description	Location	Need Addressed
MV-01	Install a Roundabout or Traffic Signal	James Street/Pine Street	Mobility
MV-02*	Install a Roundabout or Traffic Signal	1st Street (OR 214)/Hobart Road	Mobility, Safety
MV-03*	Install a Roundabout or Traffic Signal	1st Street (OR 214)/Jefferson Street	Safety
MV-04	Bridge Crossing over Silver Creek	Connection between Water Street and Brook Street	Connectivity
MV-05	**Install a Roundabout**	**Westfield Street/Main Street**	**Mobility, Safety**
MV-06	**Install a Traffic Signal**	**Main Street/McClaine Street**	**Mobility**
MV-07	Install Center Two-Way Left-Turn Lane (TWLTL) on C Street	C Street between Silver Creek Bridge and James Street	Mobility
MV-08*	Improve Sight Distance and Crossing Safety	Oak Street (OR 213)/Mill Street	Safety
MV-09*	Disconnect Fossholm Road from McClaine Street and apply traffic calming strategies on Brook Street	Fossholm Road/McClaine Street	Safety
MV-10	**Add Southbound Right Turn Lane**	**C Street and McClaine Street between James Street and Westfield Street**	**Mobility**
MV-11*	**Close East Leg of Intersection**	**1st Street (OR 214)/C Street**	**Mobility**
MV-12*	**Install a Traffic Signal and add Southbound Right Turn Lane**	**Main Street/Water Street (OR 214)**	**Mobility**
MV-13*	Install a Traffic Signal and add Eastbound Left Turn Lane	Main Street/1st Street (OR 214)	Mobility
MV-14*	Install a Traffic Signal	Oak Street (OR 213)/Water Street (OR 214)	Mobility
MV-15*	Westside North-South Connector #2	Silverton Road (OR 213) to Main Street	Connectivity
MV-16	Westside North-South Connector #3	Main Street to Water Street (OR 214)	Connectivity
MV-17	Eastside North-South Connector #4	Monitor Road to Pioneer Drive	Connectivity
MV-18	Bridge Crossing over Silver Creek Connector #6	High Street	Connectivity
MV-19*	Install a Traffic Signal	Oak Street (OR 213)/1st Street (OR 214)	Mobility
MV-20*	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Highway 213/Steelhammer Road	Calming/Gateway
MV-21*	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Pioneer Drive/Evans Valley Road	Calming/Gateway
MV-22*	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Highway 213/Monitor Road	Calming/Gateway
MV-23*	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Highway 214/Pioneer Drive	Calming/Gateway
MV-24*	Restrict Turning Movements on Northbound and Southbound Approaches	Silverton Road (OR 213)/Fossholm Road	Calming, Safety

Note: Projects in **bold** address deficiencies identified in the existing and future conditions analysis as part of this TSP update.
* Asterisk denotes projects that will require coordination with ODOT or Marion County.

City of Silverton
Transportation System Plan

DKS

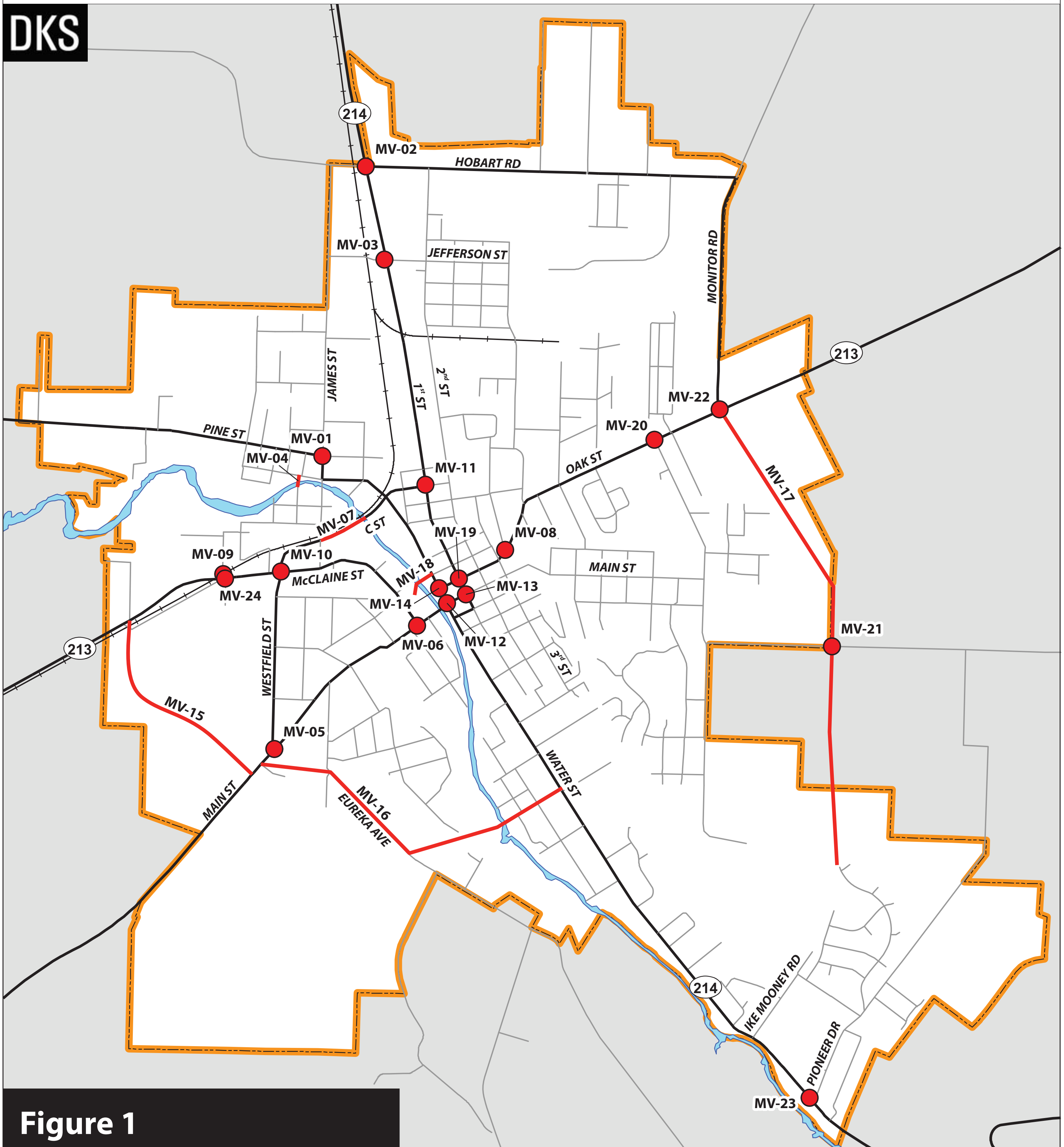


Figure 1

Motor Vehicle Projects

Legend

- Urban Growth Boundary
- Major Aterials
- Collectors and Local
- Motor Vehicle Intersection Project
- Motor Vehicle Segment Project
- Water
- Railroad

Table 2. Additional Detail on Motor Vehicle Projects

Number	Location	Description
MV-05	Westfield Street/Main Street	Installation of a roundabout would mitigate the high frequency of rear-end and turning crashes at this intersection. A roundabout would also reduce vehicle speeds to reduce crash severity and allow for safer pedestrian crossings.
MV-06	Main Street/McClaine Street	Installation of a roundabout or traffic signal would increase the intersection capacity sufficiently to handle future traffic demands, particularly for southbound traffic.
MV-10	C Street and McClaine Street between James Street and Westfield Street	The signalized intersection of C Street/McClaine Street/Westfield Street does not provide enough capacity to meet future traffic demands, and the addition of through or turn lanes would significantly impact adjacent land uses. This improvement is assumed to be a southbound right turn lane and closure/prohibition of the southbound left turn, which has very low volume (fewer than 10 vehicles in the PM peak hour)
MV-11	1st Street (OR 214)/C Street	Closing the intersection to westbound traffic – by converting the segment of C Street between 1st Street (OR 214) and 2nd Street to one-way eastbound -- would provide the other three approaches with enough signal capacity to adequately handle future traffic demands.
MV-12	Main Street/Water Street (OR 214)	Installation of a traffic signal at this all-way stop-controlled intersection would provide sufficient capacity to serve future traffic demands. The adjacent bridge over Silver Creek and surrounding development limit options for adding capacity. MV-15, MV-16, and MV 24 would need to be built at the same time to provide coordinated operation on the downtown grid.

Pedestrian Projects

The existing conditions and future needs analysis identified pedestrian system issues within Silverton that include an incomplete arterial/collector sidewalk system, significant barriers to the pedestrian network (e.g. railroad and creek), and the need for enhanced crossing locations in downtown Silverton. These needs correspond with those identified in the 2008 TSP.

All projects related to pedestrian-specific facilities are presented in Table 3 and

Table 4, and shown graphically on Figure 2. These projects were developed using the 2008 TSP project list, the Safe Routes to School audit, the existing conditions analysis, and community feedback. The projects include both sidewalk infill and crossing enhancements. Crossing enhancements should be designed to fit the context of each location and may include the following measures to help define the crossing area and improve driver yielding behavior:

- Delineation of the crossing area: this can be accomplished with improved visibility striping, pavement texturing, or brick inlay
- Curb extensions
- Pedestrian crossing signing at mid-block crossing locations
- Pedestrian level lighting at crossing location

Table 3. Sidewalk Infill Project List

Number	Description	Start	End
SW-01	Sidewalk Infill on Oak Street (OR 213)	Steelhammer Rd	City limits
SW-02	Sidewalk Infill on Pine Street	Grant Street	City limits
SW-03	Sidewalk Infill on South Water Street (OR 214)	Peach Street	City limits
SW-04	Sidewalk Infill on Main Street	3rd Street	Steelhammer Road
SW-05	Sidewalk Infill on C Street	McClaine Street	James Street
SW-06	Sidewalk Infill on C Street	Front Street	2nd Street
SW-07	Sidewalk Infill on Westfield Street	Main Street	Existing section
SW-08	Sidewalk Infill on North Water Street	James Street	C Street
SW-09	Sidewalk Infill on Oak Street (OR 213)	Mill Street	Steelhammer Road
SW-10	Sidewalk Infill on 1st Street (OR 214)	Hobart Street	Existing section
SW-11	Sidewalk Infill on Jefferson Street	Mill Street	James Street
SW-12	Sidewalk Infill on C Street	James Street	N Water Street
SW-13	Sidewalk Infill on McClaine Street	Craig Street	Phelpe Street
SW-14	Sidewalk Infill on James Street	C Street	N Water Street (OR 214)
SW-15	Sidewalk Infill on West Main Street	Westfield Street	City limits
SW-16	Sidewalk Infill on James Street	Florida Drive	City limits
SW-17	Sidewalk Infill on Steelhammer Road	Oak Street (OR 213)	City limits
SW-18	Sidewalk Infill on Keene Avenue	Eureka Avenue	Coolidge Street
SW-19	Sidewalk Infill on Ike Mooney Road	South Water Street (OR 214)	Existing section
SW-20	Sidewalk Infill on Ike Mooney Road	Existing section	City limits
SW-21	Sidewalk Infill on 2nd Street	Whittier Street	Hobart Street
SW-22	Sidewalk Infill on North Water Street (OR 214)	C Street	A Street
SW-23	Sidewalk Infill on Fiske Street	Main Street	Charles Avenue
SW-24	Sidewalk Infill on Eureka Avenue	Main Street	south City limits
SW-25	Sidewalk Infill on Monitor Road	Hobart Street	Oak Street (OR 213)
SW-26	Sidewalk Infill on Hobart Street	1st Street (OR 214)	Monitor Road
SW-27	Sidewalk Infill on Kromminga Drive	Pine Street	High School
SW-28	Sidewalk Infill on Western Avenue	Grant Street	James Street
SW-29	Sidewalk Infill on Brown Street	Water Street	480' North of Water
SW-30	Sidewalk Infill on James Street	Jefferson Street	C Street
SW-31	Sidewalk Infill and Repair on Robinson Street	Mill Street	Mark Twain Elementary
SW-32	Sidewalk Infill on Church Street	Bartlett St	North to Dead End
SW-33	Sidewalk Infill on Bartlett Street, Norway Street	Church Street	Oak Street (OR 213)
SW-34	Sidewalk Infill on Grant Street	Western Avenue	High School Driveway

Table 4. Pedestrian Crossing Enhancement Project List

Number	Description	Location
EC-01	Pedestrian Crossing Enhancements	South leg of Water Street (OR 214)/Park Street
EC-02	Pedestrian Crossing Enhancements	South leg of Water Street (OR 214)/High Street
EC-03	Pedestrian Crossing Enhancements	North/South legs of 1st Street (OR 214)/B Street
EC-04	Pedestrian Crossing Enhancements	North leg of 1st Street (OR 214)/A Street
EC-05	Pedestrian Crossing Enhancements	North leg of Water Street (OR 214)/A Street
EC-06	Pedestrian Crossing Enhancements	1st Street (OR 214)/Bow Tie Lane
EC-07	Pedestrian Crossing Enhancements	Water Street (OR 214)/Wesley Street
EC-08	Pedestrian Crossing Enhancements and Sidewalk Connections	1st Street (OR 214)/Jefferson Street
EC-09	Pedestrian Crossing Enhancements and Sight Distance Improvements	Oak Street (OR 213)/Mill Street
EC-10	Pedestrian Crossing Enhancements (RRFB)	James Street/C Street
EC-11	Pedestrian Crossing Enhancements	Oak Street (OR 213)/Church Street
EC-12	Pedestrian Crossing Enhancements	S Water Street (OR 214)/Adams
EC-13	Pedestrian Crossing Enhancements	S Water Street/ (OR 214) Peach
EC-14	Close Crosswalk	West Leg of 1st Street (OR 214)/Lewis Street
EC-15	Install Median Refuge Island to Reduce Crossing Distance	Water Street (OR 214)/Lewis Street
EC-16	Pedestrian Crossing Enhancements	Midblock (one side) 1st Street (OR 214) between Park Street and A Street
EC-17	Improve Lighting at Existing Crossing	Water Street (OR 214)/Jersey Street
EC-18	Install Curb Ramps for Existing Crosswalk	Brown Street/Schlador Street
EC-19	Install Curb Ramps for Existing Crosswalk	NW Corner of Mill Street/Robinson Street
EC-20	Install Curb Ramps for Existing Crosswalk	NW and SE Corners of Robinson Street/Church Street
EC-21	Install Crosswalk	East Leg of Mill Street/Robinson Street
EC-22	Install Crosswalk	South Leg of Western Avenue/Grant Street
EC-23	Install Crossing Warning Signs and Pavement Markings	Grant Street/Florida Street
EC-24	Install Street Lighting	Western Avenue (entire segment)

City of Silverton
Transportation System Plan

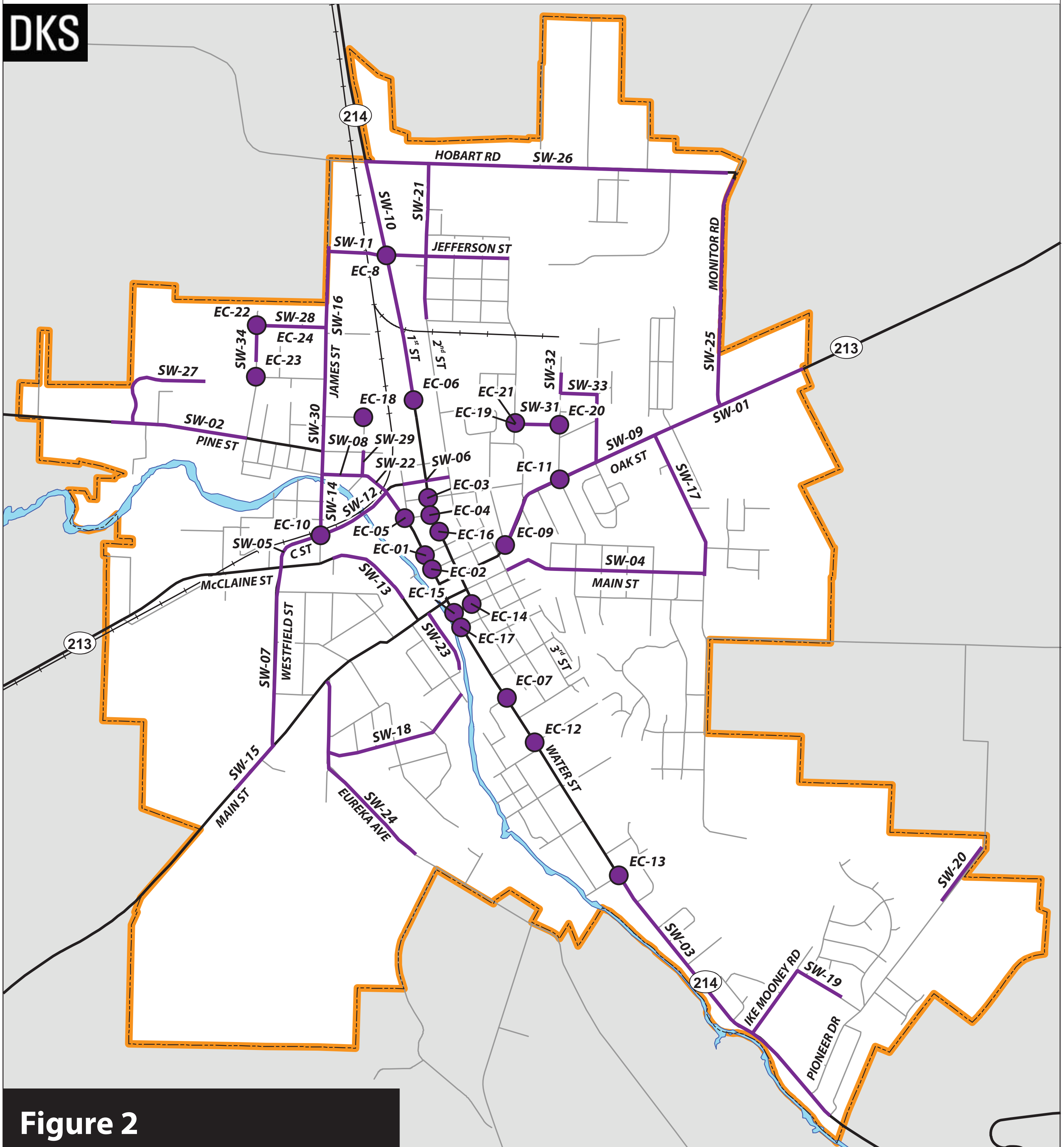


Figure 2

Pedestrian Projects

Legend

- Urban Growth Boundary
- Major Aterials
- Collectors and Local
- Pedestrian Intersection Project
- Pedestrian Segment Project
- Water
- Railroad

Bicycle Projects

The existing conditions and future needs analysis identified several gaps in the bicycle network system within Silverton, as well as many high-stress bicycling environments, particularly outside roadways near the city limits. This section summarizes the dedicated bicycle projects, including bicycle lanes, shared-lanes (marked with sharrows), cycle tracks, and other bicycle facilities (e.g., route signing and bicycle parking). Combined bicycle and pedestrian projects (e.g., shared-use paths) are described in the following section.

The bicycle project list, developed using the 2008 TSP project list, the Safe Routes to School audit, the existing conditions analysis, and community feedback, is presented in Table 5 and on Figure 3.

Table 5. Bicycle Project List

Number	Description	Start	End
BP-01	Bicycle Facilities on 1st Street (OR 214)	Hobart Road	B Street
BP-02	Bicycle Facilities on Oak Street (OR 213)	Steelhammer	East City Limits
BP-03	Bicycle Facilities on North Water Street	James Street	C Street
BP-04	Bicycle Facilities on South Water Street (OR 214)	Lewis Street	Pioneer Drive
BP-05	Bicycle Facilities on Silverton Road (OR 213)	West City Limits	Existing sections
BP-06	Bicycle Facilities on Pine Street	West City Limits	James Ave
BP-07	Bicycle Facilities on Oak Street (OR 213)	Church Street	Steelhammer Road
BP-08	Bicycle Facilities on Eureka Avenue	Main Street	South City Limits
BP-09	Bicycle Facilities on Ike Mooney Road	Pioneer Drive	East City Limits
BP-10	Bicycle Facilities on Evans Valley Road	Steelhammer Road	East City Limits
BP-11	Bicycle Facilities on Steelhammer Road	Oak Street (OR 213)	Evans Valley Road
BP-12	Bicycle Facilities on Main Street	Westfield Street	Water Street (OR 214)
BP-13	Bicycle Facilities on Oak Street (OR 213)	3rd Street	Church Street
BP-14	Bicycle Facilities on Pioneer Drive	South Water Street (OR 214)	Ike Mooney Road
BP-15	Bicycle Facilities on McClaine Street	C Street	Main Street
BP-16	Bicycle Facilities on James Avenue	Hobart Road	C Street
BP-17	Bicycle Facilities on Monitor Road	Oak Street (OR 213)	Hobart Road
BP-18	Bicycle Facilities on Hobart Road	James Street	Monitor Road
BP-19	Bicycle Facilities on Main Street*	3rd Street	Steelhammer Road
BP-20	Bicycle Facilities on Kromminga Dr, Western St, Jefferson St	Pine Street	Mill Street
BP-21	Bicycle Facilities on Grant St, Water St, James St, Silver St, Alder Ave, Brook St, Wilson St, Short St	Western Street	Fossholm Road
BP-22	Bicycle Facilities on Peach St, Madison St, Cowing St, Coolidge St	S Water Street (OR 214)	Main Street
BP-23	Bicycle Facilities on James Street	McClaine Street	C Street
BP-24	Bicycle Facilities on Center Street	Westfield Street	Ross Avenue
BP-25	Bicycle Facilities on 2nd Street, Koons St	Jersey Street	S Water Street (OR 214)
BP-26	Bicycle Facilities on Church St, Kent St, Ames St, Reserve St	Robinson Street	Tillicum Street
BP-27	Bicycle Facilities on Ike Mooney Rd, Sun Valley Dr, Frontier St, Pioneer Dr	S Water Street (OR 214)	OS-15 Alignment
BP-28	Two-Way Raised Cycle Path on Westfield Street	Robert Frost Elementary	Center Street
BP-29	Regional Bikeway Connection	Silverton City Limits	Stayton
BP-30	Regional Bikeway Connection	Silverton City Limits	Salem
BP-31	Regional Bikeway Connection	Silverton City Limits	Mt. Angel
BP-32	Bicycle Route Signing (shared facilities) and Bicycle Parking	Downtown Silverton	
BP-33	Bicycle Route Signing (shared facility)	Brown Street	
BP-34	Bicycle Boulevard with Traffic Calming on 2nd Street and Diverters (Northbound Through and Southbound Through Prohibited) at B Street	Jefferson Street	Jersey Street

City of Silverton
Transportation System Plan

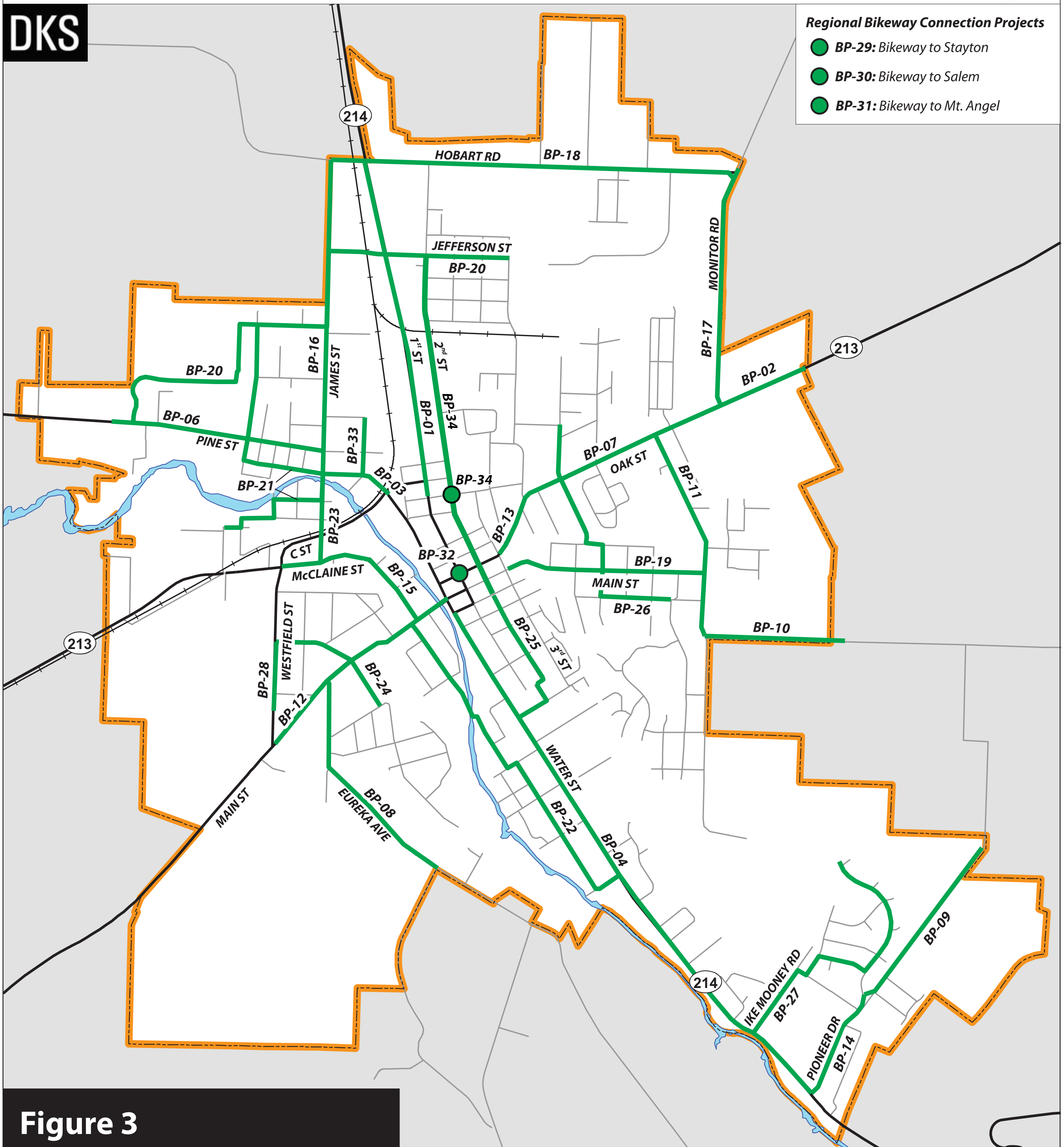


Figure 3

Bicycle Projects

Legend

- Urban Growth Boundary
- Major Aterials
- Collectors and Local
- Bicycle Intersection Project
- Bicycle Segment Project
- Water
- Railroad

Shared-Use Path Projects

This section presents all of the shared bicycle-pedestrian projects, comprised of shared-use paths and pedestrian bridges, as shown in Table 6 and on Figure 4. These projects help address gaps and deficiencies in both the bicycle and pedestrian networks.

Table 6. Shared-Use Path Project List

Number	Description	Start	End
OS-01	Shared-Use Path #1	Charles Avenue	Peach Street
OS-02	Pedestrian Bridge	Peach Street	
OS-03	Shared-Use Path #2 (Creek trail)	C Street	Silver Falls Library
OS-04	Pedestrian Bridge	Cowing Street	
OS-05	Pedestrian Stairway Connection	Coolidge Park	Anderson Drive
OS-06	Shared-Use Path #3	C Street	Off-Street Connection #10 Alignment
OS-07	Shared-Use Path #4	Existing rail line alignment	Church Street extension
OS-08	Shared-Use Path #5	Eska Way	Existing Church Street alignment
OS-09	Shared-Use Path #6 (2nd Street)	Hobart Road	Oak Street (OR 213)
OS-10	Shared-Use Path #7	Jefferson Street	Eska Way
OS-11	Shared-Use Path #8	Lincoln Street	east side of Webb Lake
OS-12	Salamander Footbridge Connection	Coolidge McClaine Park	
OS-13	Shared-Use Path #9	Pettit Reservoir	Silverton Road (OR 213)
OS-14	Shared-Use Path #10 (rail alignment)	Monson Road	Hobart Road
OS-15	Shared-Use Path #11	Westfield Street	Path #9 Alignment
OS-16	Shared-Use Path #12	Coolidge Street	Anderson Drive
OS-17	Shared-Use Path #13	Mallard Street	Sage Street
OS-18	Shared-Use Path #14	Mill Street	Sage Street
OS-19	Shared-Use Path #15	Pioneer Drive	Main Street
OS-20	Shared-Use Path #16	Eastview Lane	Path #15 Alignment
OS-21	Shared-Use Path #17	Pine Street	Monson Road
OS-22	Shared-Use Path #18	Oak Street (OR 213)	Path #14 Alignment

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Transportation System Plan

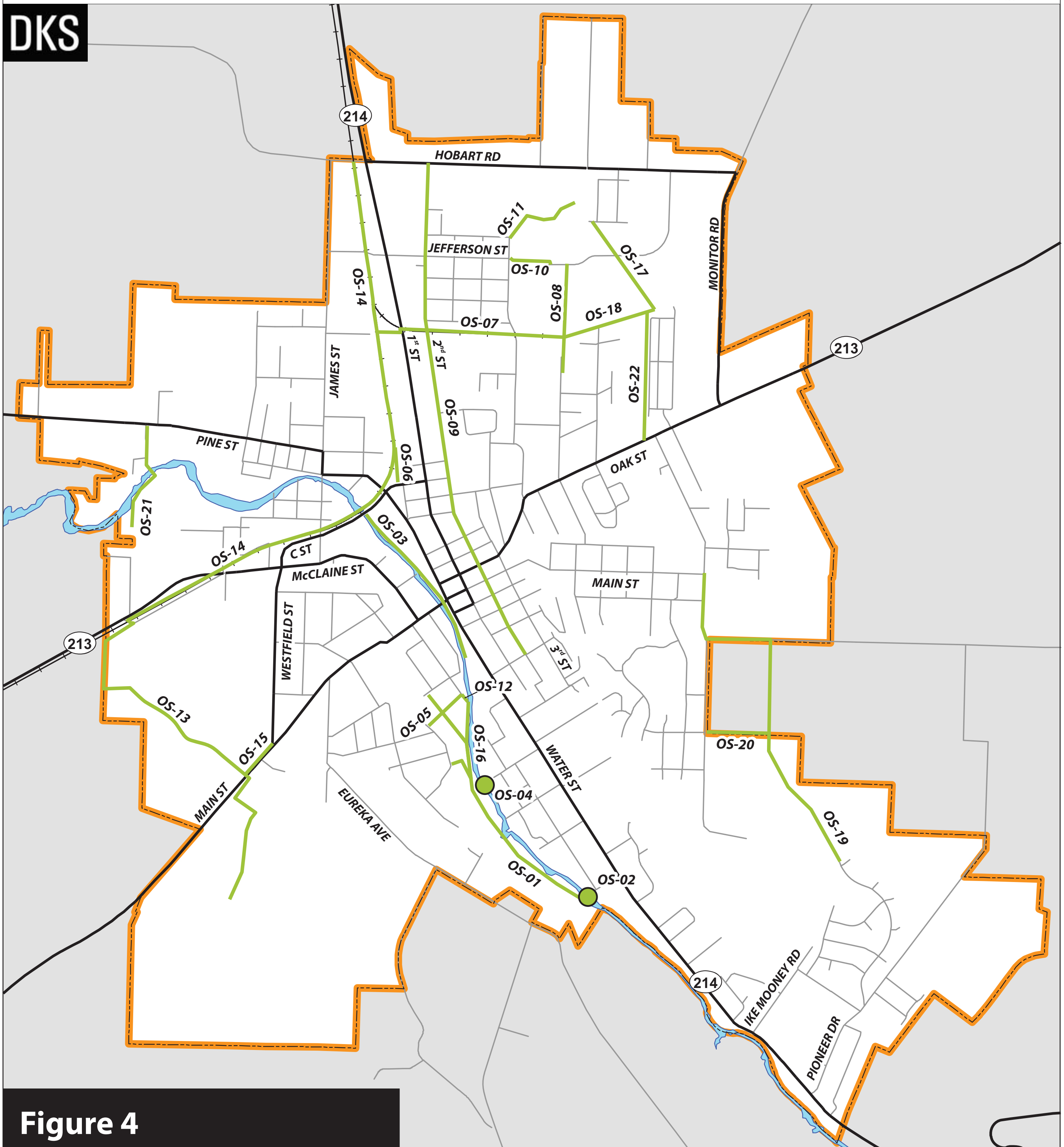


Figure 4

Shared-Use Path Projects

Legend

- Urban Growth Boundary
- Major Aterials
- Collectors and Local
- Off-Street Path Crossing Project
- Off-Street Path Segment Project
- Water
- Railroad

Transit Projects

Transit service in Silverton is limited and there are several options for improving the community's access to public transportation, including commuter transit services, park-and-ride lots, and a fixed-route city service. The potential projects are shown in Table 7 and on Figure 5.

Table 7. Transit Project List

Number	Project Name	Description
TS-01	Commuter Connection to Salem	Develop a commuter transit connection to Salem. Install a transit stop downtown.
TS-02	Park-and-Ride Lot	Develop a park-and-ride facility on the west side of Silverton
TS-03	Enhance Dial-a-Ride services	Provide service enhancements to the existing dial-a-ride services, including increased hours of operation and ease of scheduling
TS-04	Local Fixed Route Transit Feasibility Study	Conduct feasibility study for the implementation of fixed-route transit service
TS-05	Park-and-Ride Lot and Increased Transit Service	Develop a park-and-ride facility on the east side of Silverton (in the industrial area between Mill Street and Monitor Road) and provide transit service (bus stops, shelters, lighting, etc.)

Rail Projects

The existing conditions analysis highlighted the rail line as a barrier to bicycle and pedestrian travel and a limiting factor for roadway improvements. Several of the at-grade rail crossings were identified as deficiencies in the system safety performance evaluation, as outlined in Table 8 and on Figure 6.

Table 8. Railroad Project List

Number	Project Name	Description
RR-01	Rail/Highway Grade Crossing Improvements on Fossholm Road near Highway 213	This grade crossing is located in close proximity to Highway 213 and there is limited sight distance for vehicles turning onto Fossholm Road from Highway 213/McClaine Street. Consider disconnecting Fosshom Road from Highway 213 once the Westside Plan is developed and other connections are provided.
RR-02	Rail/Highway Grade Crossing Improvements on Hobart Road near Highway 214	Upgrade to an active warning system including standard signs, pavement markings, and gates.
RR-03	Rail/Highway Grade Crossing Improvements on Jefferson Street near Highway 214/1st Street (OR 214)	Upgrade to an active warning system including standard signs, pavement markings, and gates. Provide accessible pedestrian facilities across tracks.
RR-04	Rail/Highway Grade Crossing Improvements on James Street near C Street	Upgrade to an active warning system including standard signs, pavement markings, and gates. Provide accessible pedestrian facilities across tracks.

City of Silverton
Transportation System Plan

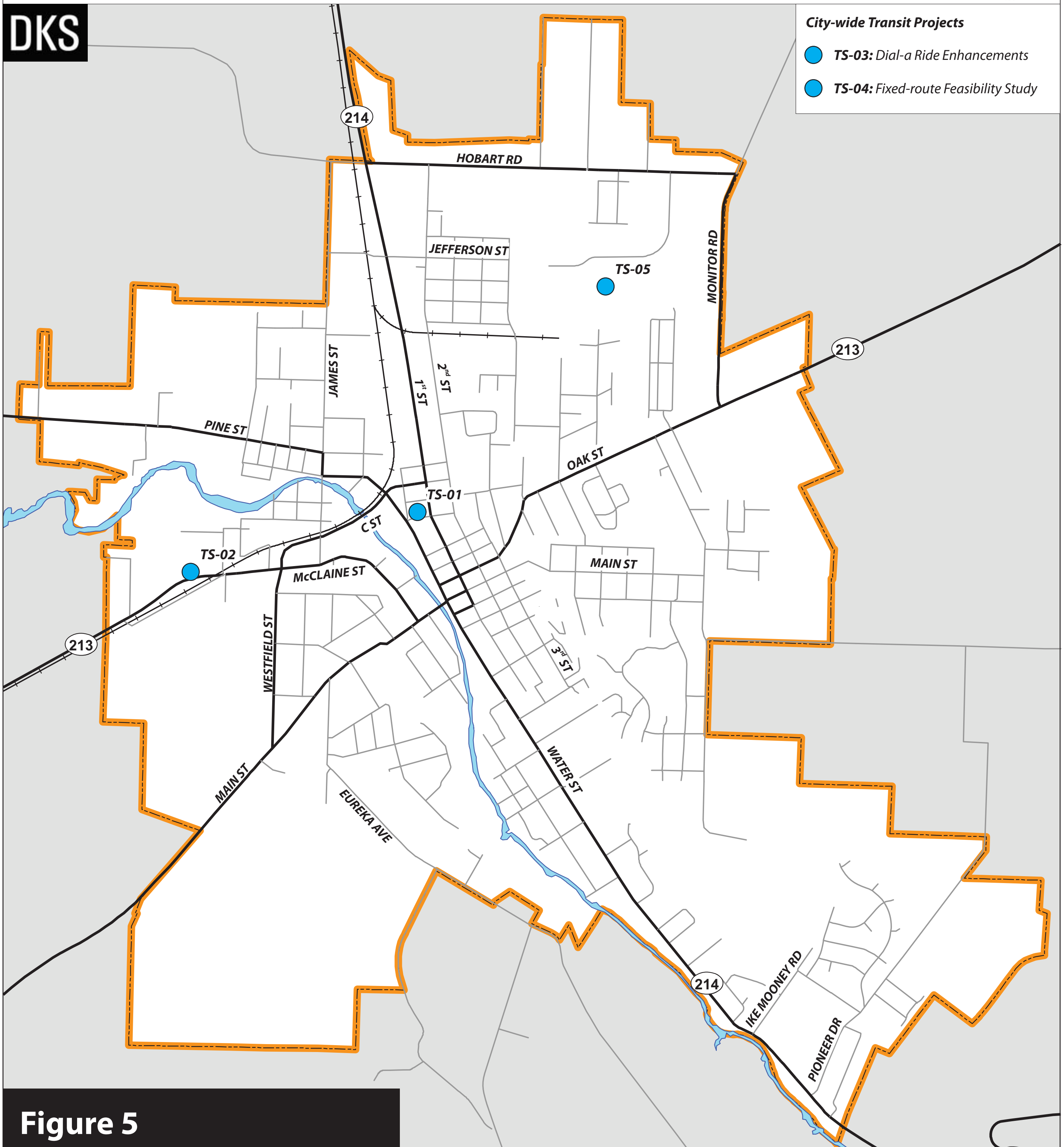


Figure 5

Transit Projects

Legend

- Urban Growth Boundary
- Major Aterials
- Collectors and Local
- Transit Improvement Project
- Water
- Railroad

City of Silverton
Transportation System Plan

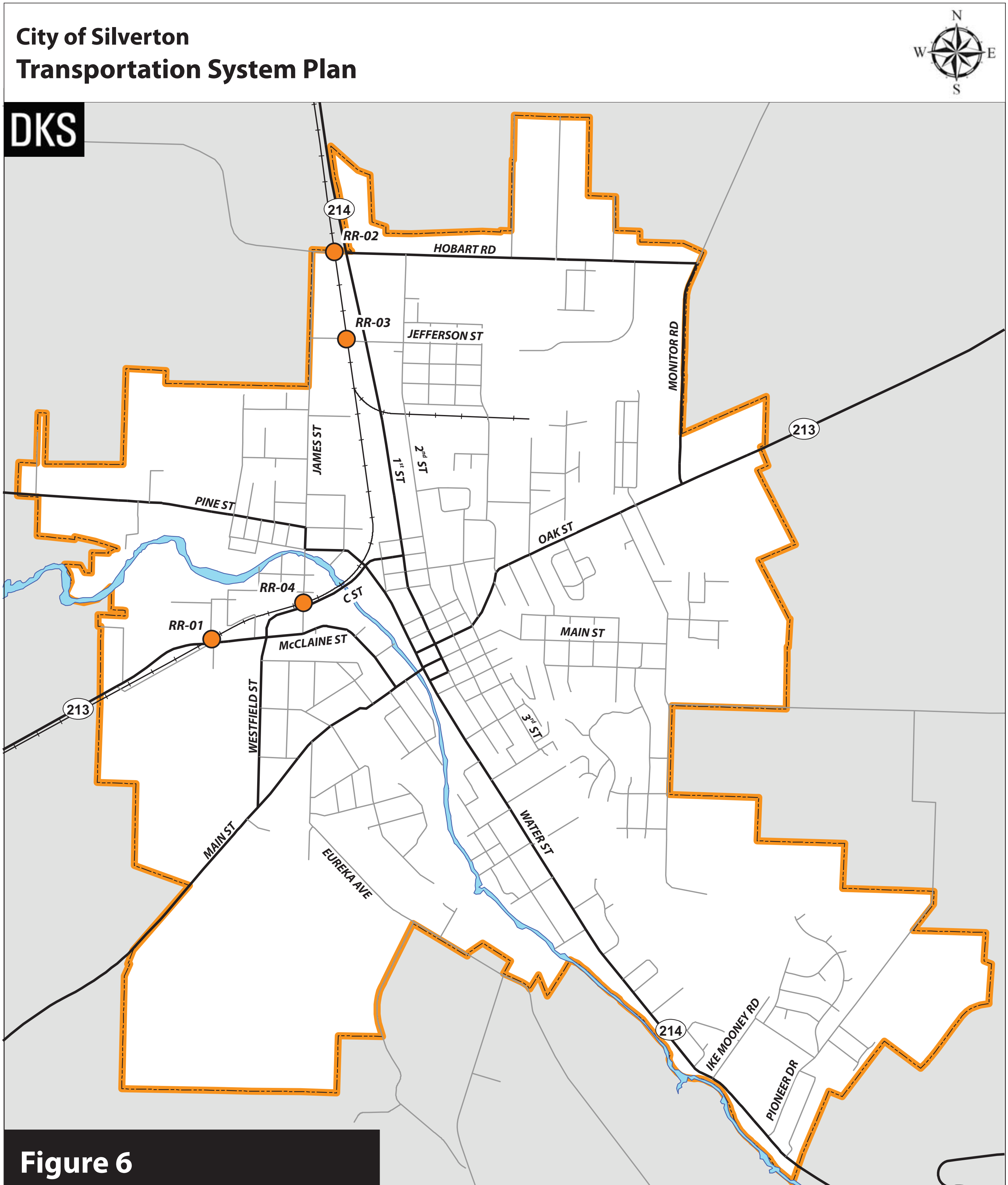


Figure 6

Rail Projects

Legend

- Urban Growth Boundary
- Major Aterials
- Collectors and Local
- Railroad Improvement Project
- Water
- Railroad

Project Evaluation and Prioritization

Transportation concepts and project alternatives developed through this TSP update were evaluated by applying criteria that are based on the TSP's goals and objectives. These project level criteria provided a point-based technical rating method that was used to evaluate how well proposed design alternatives meet the objectives of the TSP.

Scoring Methodology

Project alternatives were ranked by summing (and weighting) the scores for each evaluation criterion. Scores for each criterion were based on a five-point scale, from +2 to -2, with +2 generally representing a clear positive impact relative to the criterion, and -2 representing a clear negative impact relative to the criterion. A score of 0 typically represents no impact on the criterion, and +1 and -1 represent minor positive and negative impacts.

Table 9: Evaluation Criteria and Scoring Methodology Example

Evaluation Criteria	Evaluation Score	
3: Improve Safety Performance	+2	Improves safety for all modes
	+1	Improves safety for some or all modes, but does not decrease safety for any mode
	0	Has no net effect on safety performance
	-1	Has a negative safety impact for one or more modes
	-2	Has a negative safety impact for all modes

The criteria and related scoring parameters generate an aggregate score that reflects each project's effectiveness in addressing the TSP's goal areas. The eight TSP goals and associated criteria are summarized below along with weighting factors that represent the relative importance of each goal to the community (based on feedback from the first project PAC meeting).

- Goal 1: Enhance livability through proper multi-modal design (weight: 4.6)
- Goal 2: Create a balanced system that promotes active transportation (weight: 3.5)
- Goal 3: Improve safety performance (weight: 4.3)
- Goal 4: Develop a system that can efficiently handle traffic demands of the future (weight: 3.9)
- Goal 5: Provide a system that is accessible to all users (weight: 4.1)
- Goal 6: Provide a system that allows for efficient freight movement (weight: 4.3)
- Goal 7: Identify potential projects that can be feasibly funded (weight: 4.4)
- Goal 8: Maintain consistency with local, regional, and statewide plans and policies (weight: 3.9)

Evaluation and Prioritization Results

Each of the projects listed in the previous sections were scored and ranked according to the evaluation criteria described above. The following tables summarize the preliminary project rankings based on evaluation scoring.

Table 10. Motor Vehicle Project Ranking

Number	Description	Location	Rank
MV-02*	Install a Roundabout or Traffic Signal	1st Street (OR 214)/Hobart Road	1
MV-06	Install a Traffic Signal	Main Street/McClaine Street	1
MV-05	Install a Roundabout	Westfield Street/Main Street	3
MV-12*	Install a Traffic Signal and add Southbound Right Turn Lane	Main Street/Water Street (OR 214)	3
MV-13*	Install a Traffic Signal and add Eastbound Left Turn Lane	Main Street/1st Street (OR 214)	3
MV-14*	Install a Traffic Signal	Oak Street (OR 213)/Water Street (OR 214)	3
MV-19*	Install a Traffic Signal	Oak Street (OR 213)/1st Street (OR 214)	3
MV-09*	Disconnect Fossholm Road from McClaine Street and apply traffic calming strategies on Brook Street	Fossholm Road/McClaine Street	3
MV-01	Install a Roundabout or Traffic Signal	James Street/Pine Street	9
MV-03*	Install a Roundabout or Traffic Signal	1st Street (OR 214)/Jefferson Street	9
MV-20*	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Highway 213/Steelhammer Road	9
MV-21*	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Pioneer Drive/Evans Valley Road	9
MV-22*	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Highway 213/Monitor Road	9
MV-23*	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Highway 214/Pioneer Drive	9
MV-10	Add Southbound Right Turn Lane, Prohibit Southbound Left Turn	C Street and McClaine Street between James Street and Westfield Street	9
MV-08*	Improve Sight Distance and Crossing Safety	Oak Street (OR 213)/Mill Street	16
MV-11*	Close East Leg of Intersection	1st Street (OR 214)/C Street	17
MV-15*	Westside North-South Connector #2	Silverton Road (OR 213)/Main Street	18
MV-16	Westside North-South Connector #3	Main Street/South Water Street (OR 214)	18
MV-17	Eastside North-South Connector #4	Monitor Road/Oak Street (OR 213)/Pioneer Drive	18
MV-18	Bridge Crossing over Silver Creek Connector #6	High Street	21
MV-04	Bridge Crossing over Silver Creek	Connection between Water Street and Brook Street	22
MV-24*	Restrict Turning Movements on Northbound and Southbound Approaches	Silverton Road (OR 213)/Fossholm Road	23
MV-07	Install Center Two-Way Left-Turn Lane (TWLTL) on C Street	C Street between Silver Creek Bridge and James Street	24
Note: * Asterisk denotes projects that will require coordination with ODOT or Marion County.			

Table 11. Pedestrian Project Ranking

Number	Description	Start	End	Rank
EC-08	Pedestrian Crossing Enhancements and Sidewalk Connections	1st Street (OR 214)/Jefferson Street		1
SW-28	Sidewalk Infill on Western Avenue	Grant Street	James Street	1
SW-30	Sidewalk Infill on James Street	Jefferson Street	C Street	1
EC-24	Install Street Lighting	Western Avenue (entire segment)		1
EC-10	Pedestrian Crossing Enhancements (RRFB)	James Street/C Street		1
EC-11	Pedestrian Crossing Enhancements	Oak Street (OR 213)/Church Street		1
SW-04	Sidewalk Infill on Main Street	3rd Street	Steelhammer Road	1
SW-03	Sidewalk Infill on South Water Street (OR 214)	Peach Street	City limits	1
EC-18	Install Curb Ramps for Existing Crosswalk	Brown Street/Schlador Street		1
SW-11	Sidewalk Infill on Jefferson Street	Mill Street	James Street	1
EC-21	Install Crosswalk	East Leg of Mill Street/Robinson Street		1
EC-22	Install Crosswalk	South Leg of Western Avenue/Grant Street		1
SW-31	Sidewalk Infill and Repair on Robinson Street	Mill Street	Mark Twain Elementary	1
SW-33	Sidewalk Infill on Bartlett Street, Norway Street	Church Street	Oak Street (OR 213)	1
SW-21	Sidewalk Infill on 2nd Street	Whittier Street	Hobart Street	1
EC-19	Install Curb Ramps for Existing Crosswalk	NW Corner of Mill Street/Robinson Street		16
EC-20	Install Curb Ramps for Existing Crosswalk	NW and SE Corners of Robinson Street/Church Street		16
EC-23	Install Crossing Warning Signs and Pavement Markings	Grant Street/Florida Street		16
SW-05	Sidewalk Infill on C Street	McClaine Street	James Street	16
SW-10	Sidewalk Infill on 1st Street (OR 214)	Hobart Street	Existing section	16
SW-17	Sidewalk Infill on Steelhammer Road	Oak Street (OR 213)	City limits	16
SW-18	Sidewalk Infill on Keene Avenue	Eureka Avenue	Coolidge Street	16
SW-01	Sidewalk Infill on Oak Street (OR 213)	Steelhammer Rd	City limits	23
SW-29	Sidewalk Infill on Brown Street	Water Street	480' North of Water	23
SW-32	Sidewalk Infill on Church Street	Bartlett St	North to Dead End	23
SW-34	Sidewalk Infill on Grant Street	Western Avenue	High School Driveway	23
EC-01	Pedestrian Crossing Enhancements	South leg of Water Street (OR 214)/Park Street		23
EC-02	Pedestrian Crossing Enhancements	South leg of Water Street (OR 214)/High Street		23
EC-03	Pedestrian Crossing Enhancements	North/South legs of 1st Street (OR 214)/B Street		23
EC-04	Pedestrian Crossing Enhancements	North leg of 1st Street (OR 214)/A Street		23
EC-05	Pedestrian Crossing Enhancements	North leg of Water Street (OR 214)/A Street		23
EC-06	Pedestrian Crossing Enhancements	1st Street (OR 214)/Bow Tie Lane		23
EC-07	Pedestrian Crossing Enhancements	Water Street (OR 214)/Wesley Street		23
EC-09	Pedestrian Crossing Enhancements and Sight Distance Improvements	Oak Street (OR 213)/Mill Street		23
EC-12	Pedestrian Crossing Enhancements	S Water Street (OR 214)/Adams		23
EC-13	Pedestrian Crossing Enhancements	S Water Street (OR 214)/Peach		23
EC-14	Close Crosswalk	West Leg of 1st Street (OR 214)/Lewis Street		23
EC-15	Install Median Refuge Island to Reduce Crossing Distance	Water Street (OR 214)/Lewis Street		23
EC-16	Pedestrian Crossing Enhancements	Midblock 1st Street (OR 214) between Park Street and A Street		23
SW-02	Sidewalk Infill on Pine Street	Grant Street	City limits	23
SW-07	Sidewalk Infill on Westfield Street	Main Street	Existing section	23
SW-14	Sidewalk Infill on James Street	C Street	N Water Street	23
EC-17	Improve Lighting at Existing Crossing	Water Street (OR 214)/Jersey Street		43
SW-06	Sidewalk Infill on C Street	Front Street	2nd Street	43
SW-08	Sidewalk Infill on North Water Street	James Street	C Street	43
SW-09	Sidewalk Infill on Oak Street (OR 213)	Mill Street	Steelhammer Road	43
SW-12	Sidewalk Infill on C Street	James Street	N Water Street	43

Number	Description	Start	End	Rank
SW-13	Sidewalk Infill on McClaine Street	Craig Street	Phelpe Street	43
SW-15	Sidewalk Infill on West Main Street	Westfield Street	City limits	43
SW-16	Sidewalk Infill on James Street	Florida Drive	City limits	43
SW-19	Sidewalk Infill on Ike Mooney Road	South Water Street (OR 214)	Existing section	43
SW-20	Sidewalk Infill on Ike Mooney Road	Existing section	City limits	43
SW-22	Sidewalk Infill on North Water Street (OR 214)	C Street	A Street	43
SW-23	Sidewalk Infill on Fiske Street	Main Street	Charles Avenue	43
SW-24	Sidewalk Infill on Eureka Avenue	Main Street	south City limits	43
SW-25	Sidewalk Infill on Monitor Road	Hobart Street	Oak Street (OR 213)	43
SW-26	Sidewalk Infill on Hobart Street	1st Street (OR 214)	Monitor Road	43
SW-27	Sidewalk Infill on Kromminga Drive	Pine Street	High School	43

Table 12. Bicycle Project Ranking

Number	Description	Start	End	Rank
BP-34	Bicycle Boulevard with Traffic Calming on 2nd Street and Diverters at B Street	Jefferson Street	Jersey Street	1
BP-25	Bicycle Lanes on 2nd Street, Koons St	Oak Street (OR 213)	S Water Street (OR 214)	2
BP-01	Bicycle Lanes on 1st Street (OR 214)	Hobart Road	B Street	3
BP-04	Bicycle Lanes on South Water Street (OR 214)	Lewis Street	Pioneer Drive	3
BP-26	Bicycle Lanes on Church St, Kent St, Ames St, Reserve St	Robinson Street	Tillicum Street	3
BP-19	Bicycle Lanes on Main Street	3rd Street	Steelhammer Road	6
BP-07	Bicycle Facilities on Oak Street (OR 213)	Church Street	Steelhammer Road	6
BP-12	Bicycle Lanes on Main Street	Westfield Street	Water Street (OR 214)	6
BP-13	Bicycle Lanes on Oak Street (OR 213)	3rd Street	Church Street	6
BP-15	Bicycle Lanes on McClaine Street	C Street	Main Street	6
BP-16	Bicycle Lanes on James Avenue	Hobart Road	C Street	6
BP-20	Bicycle Lanes on Kromminga Dr, Western St, Jefferson St	Pine Street	Mill Street	6
BP-03	Bicycle Lanes on North Water Street	James Street	C Street	6
BP-02	Bicycle Lanes on Oak Street (OR 213)	Steelhammer	East City Limits	14
BP-06	Bicycle Lanes on Pine Street	West City Limits	James Ave	14
BP-28	Two-Way Raised Cycle Path on Westfield Street	Robert Frost Elementary	Center Street	14
BP-22	Bicycle Lanes on Peach St, Madison St, Cowing St, Coolidge St	S Water Street (OR 214)	Main Street	17
BP-05	Bicycle Lanes on Silverton Road (OR 213)	West City Limits	Existing sections	17
BP-09	Bicycle Lanes on Ike Mooney Road	Pioneer Drive	East City Limits	17
BP-11	Bicycle Lanes on Steelhammer Road	Oak Street (OR 213)	Evans Valley Road	17
BP-14	Bicycle Lanes on Pioneer Drive	South Water Street (OR 214)	Ike Mooney Road	17
BP-18	Bicycle Lanes on Hobart Road	James Street	Monitor Road	17
BP-08	Bicycle Lanes on Eureka Avenue	Main Street	South City Limits	23
BP-10	Bicycle Lanes on Evans Valley Road	Steelhammer Road	East City Limits	23
BP-17	Bicycle Lanes on Monitor Road	Oak Street (OR 213)	Hobart Road	23
BP-21	Bicycle Lanes on Grant St, Water St, James St, Silver St, Alder Ave, Brook St, Wilson St, Short St	Western Street	Fossholm Road	23
BP-23	Bicycle Lanes on James Street	McClaine Street	C Street	23
BP-24	Bicycle Lanes on Center Street	Westfield Street	Ross Avenue	23
BP-27	Bicycle Lanes on Ike Mooney Rd, Sun Valley Dr, Frontier St, Pioneer Dr	S Water Street (OR 214)	OS-15 Alignment	23
BP-32	Bicycle Route Signing (shared facilities) and Bicycle Parking	Downtown Silverton		30
BP-33	Bicycle Route Signing (shared facility)	Brown Street		30
BP-29	Regional Bikeway Connection	Silverton City Limits	Stayton	32
BP-30	Regional Bikeway Connection	Silverton City Limits	Salem	32
BP-31	Regional Bikeway Connection	Silverton City Limits	Mt. Angel	32

Table 13. Shared-Use Path Project Ranking

Number	Description	Start	End	Rank
OS-09	Off-Street path #6	Hobart Road	Oak Street (OR 213)	1
OS-18	Off-Street Path Connection #14	Mill Street	Sage Street	1
OS-11	Off-Street path #8	Lincoln Street	East side of Webb Lake	3
OS-16	Off-Street Path Connection #12	Coolidge Street	Anderson Drive	4
OS-02	Pedestrian Bridge	Peach Street		5
OS-04	Pedestrian Bridge	Cowing Street		5
OS-17	Off-Street Path Connection #13	Mallard Street	Sage Street	5
OS-21	Off-Street Path Connection #17	Pine Street	Monson Road	8
OS-03	Off-Street path #2	C Street	Silver Falls Library	9
OS-14	Off-Street Path Connection #10	Monson Road	Hobart Road	9
OS-01	Off-Street path #1	Charles Avenue	Peach Street	11
OS-06	Off-Street path #3	C Street	Off-Street Connection #10 Alignment	11
OS-07	Off-Street path #4	Existing rail line alignment	Church Street extension	11
OS-08	Off-Street path #5	Eska Way	Existing Church Street alignment	11
OS-10	Off-Street path #7	Jefferson Street	Eska Way	11
OS-12	Salamander Footbridge Connection	Coolidge McClaine Park		11
OS-13	Off-Street Path Connection #9	Pettit Reservoir	Silverton Road (OR 213)	11
OS-19	Off-Street Path Connection #15	Pioneer Drive	Main Street	11
OS-22	Off-Street Path Connection #18	Oak Street (OR 213)	Connection #14 Alignment	11
OS-15	Off-Street Path Connection #11	Westfield Street	Connection #9 Alignment	20
OS-20	Off-Street Path Connection #16	Eastview Lane	Connection #15 Alignment	20
OS-05	Pedestrian Stairway Connection	Coolidge Park	Anderson Drive	22

Table 14. Transit Project Ranking

Number	Project Name	Description	Rank
TS-01	Commuter Connection to Salem	Develop a commuter transit connection to Salem. Install a transit stop downtown.	1
TS-04	Local Fixed Route Transit Feasibility Study	Conduct feasibility study for the implementation of fixed-route transit service	2
TS-02	Park-and-Ride Lot	Develop a park-and-ride facility on the west side of Silverton	3
TS-05	Park-and-Ride Lot and Increased Transit Service	Develop a park-and-ride facility on the east side of Silverton (in the industrial area between Mill Street and Monitor Road) and provide transit service (bus stops, shelters, lighting, etc.)	3
TS-03	Enhance Dial-a-Ride services	Provide service enhancements to the existing dial-a-ride services, including increased hours of operation and ease of scheduling	5

Table 15. Rail Project Ranking

Number	Project Name	Description	Rank
RR-03	Rail/Highway Grade Crossing Improvements on Jefferson Street near Highway 214/1st Street (OR 214)	Upgrade to an active warning system including standard signs, pavement markings, and gates. Provide accessible pedestrian facilities across tracks.	1
RR-04	Rail/Highway Grade Crossing Improvements on James Street near C Street	Upgrade to an active warning system including standard signs, pavement markings, and gates. Provide accessible pedestrian facilities across tracks.	2
RR-01	Rail/Highway Grade Crossing Improvements on Fossholm Road near Highway 213	This grade crossing is located in close proximity to Highway 213 and there is limited sight distance for vehicles turning onto Fossholm Road from Highway 213/McClaine Street. Consider disconnecting Fosshom Road from Highway 213 once the Westside Plan is developed and other connections are provided.	3
RR-02	Rail/Highway Grade Crossing Improvements on Hobart Road near Highway 214	Upgrade to an active warning system including standard signs, pavement markings, and gates.	4

Mitigated Scenario System Performance

Projects that performed well under the above evaluation and were expected to impact traffic operations were packaged together for further analysis. The projects included are shown in Table 16.

Table 16. Projects Included in Mitigated Scenario

Number	Project	Location
MV-02	Install a Roundabout or Signal	1st Street (OR 214)/Hobart Road
MV-05	Install a Roundabout or Signal	Westfield Street/Main Street
MV-06	Install a Roundabout or Signal	Main Street/McClaine Street
MV-09, MV 11	Disconnect Fossholm Road from McClaine Street, Extend Industrial Way to Monson Road, Traffic Calming on Brook Street	Fossholm Street/McClaine Street
MV-12	Add Southbound Right Turn Lane, Prohibit Southbound Left Turn	C Street/McClaine Street
MV-13	Convert C Street to One-Way Eastbound Operation	Between 1st Street (OR 214) and 2nd Street
MV-14	Install Traffic Signal	Main Street/Water Street (OR 214)
MV-15	Install Traffic Signal	Main Street/1st Street (OR 214)
MV-16	Install Traffic Signal	Oak Street (OR 213)/Water Street (OR 214)
MV-24	Install Traffic Signal	Oak Street (OR 213)/1st Street (OR 214)
BP-34	Bicycle Boulevard with Traffic Calming on 2nd Street and Diverters (Northbound Through and Southbound Through Prohibited) at B Street	2nd Street Between Jefferson Street and Jersey Street

The 2037 future year network for the Silverton small community model was modified to include the above package of projects, and the model was run to produce an updated volume set. Model volumes were post-processed, using the same methodology as was used in the "no-build" forecast, in order to develop new intersection turning movement volumes for operational analysis.

The results of the intersection operational analysis are shown in Table 17 on the following page.

Table 17: Intersection Operations Comparison (2037 PM Peak Hour)

Intersection and Jurisdiction			Operating Standard		2037 No-Build PM Peak Hour			2037 Build PM Peak Hour		
			v/c	LOS/ Delay	v/c	LOS	Delay	v/c	LOS	Delay
All-Way Stop-Controlled (AWSC) Intersections										
4	James St./Pine St.	City	0.85	D	0.55	B	15	0.54	B	15
5	James St./Water St.	City	0.85	D	0.71	C	20	0.68	C	18
Other Unsignalized Intersections										
1	2nd St./Hobart Rd.	County	0.90	D	0.13	A/B	12	0.11	A/B	11
3	OR 214/Jefferson St.	ODOT	0.90	-	0.45	A/E	45	0.73	A/F	112
6	James St./C St.	County	0.85	D	0.47	A/C	19	0.44	A/C	18
11	Front St./C St.	City	0.90	D	0.14	A/B	14	0.14	B/B	14
12	Water St. (OR 214)/Park St.	ODOT	1.00	-	0.29	A/B[b]	12[b]	0.02	A/A[b]	1[b]
15	Water St. (OR 214)/Lewis St.	ODOT	1.00	55s	0.54	A	11[a]	0.54	A	5[a]
16	OR 214/Pioneer Dr.	ODOT	0.90	-	0.13	A/C	17	0.13	A/C	17
20	1st St. (OR 214)/Lewis St.	ODOT	1.00	55s	0.04	A[a]	44[a]	0.04	A[a]	37[a]
21	2nd St./Oak St. (OR 213)	ODOT	1.00	55s	**1.11**	C[a]	**60[a]**	0.99	C[a]	44[a]
22	Steelhammer Rd./Oak St. (OR 213)	ODOT	0.95	-	0.26	A/C	21	0.28	A/C	21
23	Steelhammer Rd./Main St.	County	0.90	D	0.23	A/B	11	0.22	A/B	10
24	OR 213/Monitor Rd.	ODOT	0.95	-	0.25	A/D	31	0.27	A/D	34
Signalized Intersections										
2	OR 214/ Hobart Rd.	ODOT	0.90	-	0.83	A/F	79	0.71	B	11
7	Westfield St./McClaine St.	City	0.85	D	**1.48**	**F**	157	**0.97**	D	47
8	Main St./Westfield St.	City	0.85	D	0.25	A/B	11	0.22	A	7
9	Water St. (OR 214)/C St.	ODOT	1.00	-	0.75	C	22	0.76	C	22
10	Main St./McClaine St.	City	0.85	55s	**1.04**	F	**71[a]**	0.68	E[a]	36[a]
13	Water St. (OR 214)/Oak St. (OR 213)	ODOT	1.00	55s	0.86	D	48[a]	0.52	C[a]	16[a]
14	Water St. (OR 214)/Main St.	ODOT	1.00	55s	**1.12**	F	**77[a]**	0.63	B[a]	22[a]
17	1st St. (OR 214)/C St.	ODOT	1.00	-	**1.10**	E	58	0.98	D	45
18	1st St. (OR 214)/Oak St. (OR 213)	ODOT	1.00	55s	0.85	A[a]	21[a]	0.55	B[a]	13[a]
19	1st St. (OR 214) /Main St.	ODOT	1.00	55s	0.89	B[a]	52[a]	0.73	C[a]	20[a]

[a] Delay results for the downtown core area are based on the vehicle delay reported in SimTraffic for the worst approach, consistent with City of Silverton standards for designated downtown intersections.

[b] Results from Synchro in-program operations. Due to unique geometry, HCM Report not available.

Note: **Bold/Shaded** text indicates failure to meet agency mobility target.

Mitigations in the "Build" package of improvements allow all study intersections to meet operating standards with one exception. The Westfield Street/McClaine Street intersection operates at a v/c ratio of 0.97, which is under capacity, but above the City's standard for signalized intersections (0.85). Further mitigations, such as additional turn lanes and receiving lanes, could help the intersection meet standard, but would have significant right-of-way impact. Construction of project MV-15, a new collector street through the west side area between Main Street and Silverton Road (OR 213), may also help reduce volume at this intersection. For now, the recommended approach is to amend the City's v/c standard for this intersection upward to 1.00.

Next Steps

The projects identified in this memorandum address the needs of community in terms of safety, mobility, and livability. The next steps involve identifying, securing, and allocating funding to implement these projects. The City of Silverton can utilize the project rankings developed and presented in this memorandum to establish priorities for funding and implementation for short-term and long-term planning horizons.

Appendix

Evaluation Criteria and Scoring Matrix

2037 Future Year Build Scenario Synchro HCM Reports

2037 Future Year Build Scenario SimTraffic Delay Reports

Appendix

Evaluation Criteria and Scoring Matrix

2037 Future Year Build Scenario Synchro HCM Reports

2037 Future Year Build Scenario SimTraffic Delay Reports

Silverton TSP Update-Motor Vehicle Project Scoring

New Project Number	Project Name	Start	End	Goal 1: Enhance livability with proper multi-modal design	Goal 2: Create a balanced system that promotes active transportation	Goal 3: Improve safety performance	Goal 4: Develop a system that can efficiently handle traffic demands of the future	Goal 5: Provide a system that is accessible to all users	Goal 6: Provide a system that allows for efficient freight movement	Goal 7: Identify potential projects that can be feasibly funded	Goal 8: Maintain consistency with local, regional, and state plans and policies	Score	Rank
MV-02	Install a Roundabout or Traffic Signal	1st Street (OR 214)	Hobart Road	1	0	2	2	1	1	2	2	46.0	1
MV-06	Install a Traffic Signal	Main Street	McClaine Street	1	0	2	2	1	1	2	2	46.0	1
MV-09	Disconnect Fossholm Road from McClaine Street, extend Industrial Way to Monson Road, and apply traffic calming strategies on Brook Street	McClaine Street	Fossholm Road	1	1	2	2	1	1	1	2	45.1	3
MV-05	Install a Roundabout	Westfield Street	Main Street	1	1	2	2	1	1	1	2	45.1	3
MV-12	Install a Traffic Signal and add Southbound Right Turn Lane	Main Street	Water Street (OR 214	1	1	2	2	1	1	1	2	45.1	3
MV-13	Install a Traffic Signal and add Eastbound Left Turn Lane	Main Street	1st Street (OR 214)	1	1	2	2	1	1	1	2	45.1	3
MV-14	Install a Traffic Signal	Oak Street (OR 213)	Water Street (OR 214	1	1	2	2	1	1	1	2	45.1	3
MV-19	Install a Traffic Signal	Oak Street (OR 213)	1st Street (OR 214)	1	1	2	2	1	1	1	2	45.1	3
MV-01	Install a Roundabout or Traffic Signal	James Street	Pine Street	1	0	2	2	1	1	2	1	42.1	9
MV-03	Install a Roundabout or Traffic Signal	1st Street (OR 214)	Jefferson Street	1	0	2	2	1	1	2	1	42.1	9
MV-20	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Highway 213	Steelhammer Road	1	0	2	2	1	1	2	1	42.1	9
MV-21	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Pioneer Drive	Evans Valley Road	1	0	2	2	1	1	2	1	42.1	9
MV-22	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Highway 213	Monitor Road	1	0	2	2	1	1	2	1	42.1	9
MV-23	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Highway 214	Pioneer Drive	1	0	2	2	1	1	2	1	42.1	9
MV-10	Add Southbound Right Turn Lane, Prohibit Southbound Left Turn	McClaine Street	C Street	1	0	1	2	1	2	2	1	42.1	9
MV-08	Improve Sight Distance and Crossing Safety	Oak Street (OR 213)	Mill Street	1	1	2	1	1	0	2	0	33.5	16
MV-11	Close East Leg of Intersection	1st Street (OR 214)	C Street	2	1	2	1	1	-1	1	1	33.3	17
MV-15	Westside North-South Connector #2	Silverton Road	Main Street	1	0	0	2	1	2	0	2	32.9	18
MV-16	Westside North-South Connector #3	Main Street	South Water Street	1	0	0	2	1	2	0	2	32.9	18
MV-17	Eastside North-South Connector #4	Monitor Road/Oak Street	Pioneer Drive	1	0	0	2	1	2	0	2	32.9	18
MV-18	Bridge Crossing over Silver Creek Connector #6	High Street		1	1	0	1	1	1	0	2	28.2	21
MV-04	Bridge Crossing over Silver Creek	Water Street	Brook Street	1	2	0	2	1	0	0	1	27.4	22
MV-24	Restrict Turning Movements on Northbound and Southbound Approaches	Silverton Road	Fossholm Road	1	1	2	0	0	0	0	1	20.6	23
MV-07	Install Center Two-Way Left-Turn Lane (TWLTL) on C Street	Silver Creek Bridge	James Street	0	0	1	1	0	1	0	0	12.5	24

Silverton TSP Update-Pedestrian Project Scoring

New Project Number	Project Name	Start	End	Goal 1: Enhance livability with proper multi-modal design	Goal 2: Create a balanced system that promotes active transportation	Goal 3: Improve safety performance	Goal 4: Develop a system that can efficiently handle traffic demands of the future	Goal 5: Provide a system that is accessible to all users	Goal 6: Provide a system that allows for efficient freight movement	Goal 7: Identify potential projects that can be feasibly funded	Goal 8: Maintain consistency with local, regional, and state plans and policies	Score	Rank
EC-08	Pedestrian Crossing Enhancements and Sidewalk Connections	1st Street (OR 214)/Jefferson Street		2	2	2	0	1	0	2	1	41.6	1
SW-28	Sidewalk Infill on Western Avenue	Grant Street	James Street	2	2	2	0	1	0	2	1	41.6	1
SW-30	Sidewalk Infill and Bike Lanes on James Street	Jefferson Street	C Street	2	2	2	0	1	0	2	1	41.6	1
EC-24	Install Street Lighting	Western Avenue (entire segment)		2	2	2	0	1	0	2	1	41.6	1
EC-10	Pedestrian Crossing Enhancements (RRFB)	James Street/C Street		2	2	2	0	1	0	2	1	41.6	1
EC-11	Pedestrian Crossing Enhancements	Oak Street (OR 213)/Church Street		2	2	2	0	1	0	2	1	41.6	1
SW-04	Sidewalk Infill on Main Street	3rd Street	Steelhammer Road	2	2	2	0	1	0	2	1	41.6	1
SW-03	Sidewalk Infill on South Water Street (OR 214)	Peach Street	City limits	2	2	2	0	1	0	2	1	41.6	1
EC-18	Install Curb Ramps for Existing Crosswalk	Brown Street/Schlador Street		2	2	2	0	1	0	2	1	41.6	1
SW-11	Sidewalk Infill on Jefferson Street	Mill Street	James Street	2	2	2	0	1	0	2	1	41.6	1
EC-21	Install Crosswalk	East Leg of Mill Street/Robinson Street		2	2	2	0	1	0	2	1	41.6	1
EC-22	Install Crosswalk	South Leg of Western Avenue/Grant Street		2	2	2	0	1	0	2	1	41.6	1
SW-31	Sidewalk Infill and Repair on Robinson Street	Mill Street	Mark Twain Elementary	2	2	2	0	1	0	2	1	41.6	1
SW-33	Sidewalk Infill on Bartlett Street, Norway Street	Church Street	Oak Street (OR 213)	2	2	2	0	1	0	2	1	41.6	1
EC-19	Install Curb Ramps for Existing Crosswalk	NW Corner of Mill Street/Robinson Street		2	2	1	0	1	0	2	1	37.3	16
EC-20	Install Curb Ramps for Existing Crosswalk	NW and SE Corners of Robinson Street/Church Street		2	2	1	0	1	0	2	1	37.3	16
EC-23	Install Crossing Warning Signs and Pavement Markings	Grant Street/Florida Street		2	2	1	0	1	0	2	1	37.3	16
SW-05	Sidewalk Infill on C Street	McClaine Street	James Street	2	2	1	0	1	0	2	1	37.3	16
SW-10	Sidewalk Infill on 1st Street (OR 214)	Hobart Street	Existing section	2	2	1	0	1	0	2	1	37.3	16
SW-17	Sidewalk Infill on Steelhammer Road	Oak Street (OR 213)	City limits	2	2	1	0	1	0	2	1	37.3	16
SW-18	Sidewalk Infill on Keene Avenue	Eureka Avenue	Coolidge Street	2	2	1	0	1	0	2	1	37.3	16
SW-21	Sidewalk Infill on 2nd Street	Whittier Street	Hobart Street	2	2	2	0	1	0	2	1	41.6	1
SW-01	Sidewalk Infill on Oak Street (OR 213)	Steelhammer Rd	City limits	2	2	2	0	1	0	1	1	37.2	23
SW-29	Sidewalk Infill on Brown Street	Water Street	480' North of Water	2	2	2	0	1	0	1	1	37.2	23
SW-32	Sidewalk Infill on Church Street	Bartlett St	North to Dead End	2	2	2	0	1	0	1	1	37.2	23
SW-34	Sidewalk Infill on Grant Street	Western Avenue	High School Driveway	2	2	2	0	1	0	1	1	37.2	23
EC-01	Pedestrian Crossing Enhancements	South leg of Water Street (OR 214)/Park Street		2	2	2	0	1	0	1	1	37.2	23
EC-02	Pedestrian Crossing Enhancements	South leg of Water Street (OR 214)/High Street		2	2	2	0	1	0	1	1	37.2	23
EC-03	Pedestrian Crossing Enhancements	North/South legs of 1st Street (OR 214)/B Street		2	2	2	0	1	0	1	1	37.2	23
EC-04	Pedestrian Crossing Enhancements	North leg of 1st Street (OR 214)/A Street		2	2	2	0	1	0	1	1	37.2	23
EC-05	Pedestrian Crossing Enhancements	North leg of Water Street (OR 214)/A Street		2	2	2	0	1	0	1	1	37.2	23
EC-06	Pedestrian Crossing Enhancements	1st Street (OR 214)/Bow Tie Lane		2	2	2	0	1	0	1	1	37.2	23
EC-07	Pedestrian Crossing Enhancements	Water Street (OR 214)/Wesley Street		2	2	2	0	1	0	1	1	37.2	23
EC-09	Pedestrian Crossing Enhancements and Sight Distance Improvements	Oak Street (OR 213)/Mill Street		2	2	2	0	1	0	1	1	37.2	23
EC-12	Pedestrian Crossing Enhancements	S Water Street (OR 214)/Adams		2	2	2	0	1	0	1	1	37.2	23
EC-13	Pedestrian Crossing Enhancements	S Water Street (OR 214)/Peach		2	2	2	0	1	0	1	1	37.2	23
EC-14	Close Crosswalk	West Leg of 1st Street (OR 214)/Lewis Street		2	2	2	0	1	0	1	1	37.2	23
EC-15	Install Median Refuge Island to Reduce Crossing Distance	Water Street (OR 214)/Lewis Street		2	2	2	0	1	0	1	1	37.2	23
EC-16	Pedestrian Crossing Enhancements	Midblock (one side) 1st Street (OR 214) between Park Street and A Street		2	2	2	0	1	0	1	1	37.2	23

Silverton TSP Update-Pedestrian Project Scoring

New Project Number	Project Name	Start	End	Goal 1: Enhance livability with proper multi-modal design	Goal 2: Create a balanced system that promotes active transportation	Goal 3: Improve safety performance	Goal 4: Develop a system that can efficiently handle traffic demands of the future	Goal 5: Provide a system that is accessible to all users	Goal 6: Provide a system that allows for efficient freight movement	Goal 7: Identify potential projects that can be feasibly funded	Goal 8: Maintain consistency with local, regional, and state plans and policies	Score	Rank
SW-02	Sidewalk Infill on Pine Street	Grant Street	City limits	2	2	2	0	1	0	1	1	37.2	23
SW-07	Sidewalk Infill on Westfield Street	Main Street	Existing section	2	2	2	0	1	0	1	1	37.2	23
SW-14	Sidewalk Infill on James Street	C Street	N Water Street (OR 214)	2	2	2	0	1	0	1	1	37.2	23
EC-17	Improve Lighting at Existing Crossing	Water Street/Jersey Street		2	2	1	0	1	0	1	1	32.9	43
SW-06	Sidewalk Infill on C Street	Front Street	2nd Street	2	2	1	0	1	0	1	1	32.9	43
SW-08	Sidewalk Infill on North Water Street	James Street	C Street	2	2	1	0	1	0	1	1	32.9	43
SW-09	Sidewalk Infill on Oak Street	Mill Street	Steelhammer Road	2	2	1	0	1	0	1	1	32.9	43
SW-12	Sidewalk Infill on C Street	James Street	N Water Street	2	2	1	0	1	0	1	1	32.9	43
SW-13	Sidewalk Infill on McClaine Street	Craig Street	Phelpe Street	2	2	1	0	1	0	1	1	32.9	43
SW-15	Sidewalk Infill on West Main Street	Westfield Street	City limits	2	2	1	0	1	0	1	1	32.9	43
SW-16	Sidewalk Infill on James Street	Florida Drive	City limits	2	2	1	0	1	0	1	1	32.9	43
SW-19	Sidewalk Infill on Ike Mooney Road	South Water Street	Existing section	2	2	1	0	1	0	1	1	32.9	43
SW-20	Sidewalk Infill on Ike Mooney Road	Existing section	City limits	2	2	1	0	1	0	1	1	32.9	43
SW-22	Sidewalk Infill on North Water Street	C Street	A Street	2	2	1	0	1	0	1	1	32.9	43
SW-23	Sidewalk Infill on Fiske Street	Main Street	Charles Avenue	2	2	1	0	1	0	1	1	32.9	43
SW-24	Sidewalk Infill on Eureka Avenue	Main Street	south City limits	2	2	1	0	1	0	1	1	32.9	43
SW-25	Sidewalk Infill on Monitor Road	Hobart Street	Oak Street	2	2	1	0	1	0	1	1	32.9	43
SW-26	Sidewalk Infill on Hobart Street	1st Street	Monitor Road	2	2	1	0	1	0	1	1	32.9	43
SW-27	Sidewalk Infill on Kromminga Drive	Pine Street	High School	2	2	1	0	1	0	1	1	32.9	43

Silverton TSP Update-Bicycle Project Scoring

New Project Number	Project Name	Start	End	Goal 1: Enhance livability with proper multi-modal design	Goal 2: Create a balanced system that promotes active transportation	Goal 3: Improve safety performance	Goal 4: Develop a system that can efficiently handle traffic demands of the future	Goal 5: Provide a system that is accessible to all users	Goal 6: Provide a system that allows for efficient freight movement	Goal 7: Identify potential projects that can be feasibly funded	Goal 8: Maintain consistency with local, regional, and state plans and policies	Score	Rank
BP-34	Bicycle Boulevard with Traffic Calming on 2nd Street and Diverters at B Street	Jefferson Street	Jersey Street	2	2	2	0	2	0	2	1	45.7	1
BP-25	Bicycle Lanes on 2nd Street, Koons St	Oak Street (OR 213)	S Water Street (OR 214)	2	2	1	0	2	0	2	1	41.40	2
BP-01	Bicycle Lanes on 1st Street	Hobart Road	B Street	2	2	2	0	2	0	1	1	41.30	3
BP-04	Bicycle Lanes on South Water Street (OR 214)	Lewis Street	Pioneer Drive	2	2	2	0	2	0	1	1	41.30	3
BP-26	Bicycle Lanes on Church St, Kent St, Ames St, Reserve St	Robinson Street	Tillicum Street	2	2	2	0	2	0	1	1	41.30	3
BP-07	Bicycle Lanes on Oak Street (OR 213)	Norway Street	Steelhammer Road	2	2	1	0	2	0	1	1	37.00	6
BP-12	Bicycle Lanes on Main Street	Westfield Street	Water Street (OR 214)	2	2	1	0	2	0	1	1	37.00	6
BP-13	Bicycle Lanes on Oak Street (OR 213)	3rd Street	Church Street	2	2	1	0	2	0	1	1	37.00	6
BP-15	Bicycle Lanes on McClaine Street	C Street	Main Street	2	2	1	0	2	0	1	1	37.00	6
BP-16	Bicycle Lanes on James Avenue	Hobart Road	C Street	2	2	1	0	2	0	1	1	37.00	6
BP-19	Bicycle Lanes on Main Street*	3rd Street	Steelhammer Road	2	2	1	0	2	0	1	1	37.00	6
BP-20	Bicycle Lanes on Kromminga Dr, Western St, Jefferson St	Pine Street	Mill Street	2	2	1	0	2	0	1	1	37.00	6
BP-03	Bicycle Lanes on North Water Street (OR 214)	James Street	C Street	2	2	1	0	2	0	1	1	37.00	6
BP-02	Bicycle Lanes on Oak Street (OR 213)	Steelhammer	East City Limits	2	1	2	0	1	0	1	1	33.70	14
BP-06	Bicycle Lanes on Pine Street	West City Limits	James Ave	2	1	2	0	1	0	1	1	33.70	14
BP-28	Two-Way Raised Cycle Path on Westfield Street	Robert Frost Elementary	Center Street	2	1	2	0	1	0	1	1	33.70	14
BP-22	Bicycle Lanes on Peach St, Madison St, Cowing St, Coolidge St	S Water Street	Main Street	2	2	1	0	1	0	1	1	32.90	17
BP-05	Bicycle Lanes on Silverton road	West City Limits	Existing sections	2	2	1	0	1	0	1	1	32.90	17
BP-09	Bicycle Lanes on Ike Mooney Road	Pioneer Drive	East City Limits	2	2	1	0	1	0	1	1	32.90	17
BP-11	Bicycle Lanes on Steelhammer Road	Oak Street	Evans Valley Road	2	2	1	0	1	0	1	1	32.90	17
BP-14	Bicycle Lanes on Pioneer Drive	South Water Street	Ike Mooney Road	2	2	1	0	1	0	1	1	32.90	17
BP-18	Bicycle Lanes on Hobart Road	James Street	Monitor Road	2	2	1	0	1	0	1	1	32.90	17
BP-08	Bicycle Lanes on Eureka Avenue	Main Street	South City Limits	1	2	1	0	1	0	1	1	28.30	23
BP-10	Bicycle Lanes on Evans Valley Road	Steelhammer Road	East City Limits	1	2	1	0	1	0	1	1	28.30	23
BP-17	Bicycle Lanes on Monitor Road	Oak Street	Hobart Road	1	2	1	0	1	0	1	1	28.30	23
BP-21	Bicycle Lanes on Grant St, Water St, James St, Silver St, Alder Ave, Brook St, Wilson St,	Western Street	Fossholm Road	1	2	1	0	1	0	1	1	28.30	23
BP-23	Bicycle Lanes on James Street	McClaine Street	C Street	1	2	1	0	1	0	1	1	28.30	23
BP-24	Bicycle Lanes on Center Street	Westfield Street	Ross Avenue	1	2	1	0	1	0	1	1	28.30	23
BP-27	Bicycle Lanes on Ike Mooney Rd, Sun Valley Dr, Frontier St, Pioneer Dr	S Water Street	OS-15 Alignment	1	2	1	0	1	0	1	1	28.30	23
BP-32	Bicycle Route Signing (shared facilities) and Bicycle Parking	Downtown Silverton		1	1	0	0	0	0	1	0	12.50	30
BP-33	Bicycle Route Signing (shared facility)	Brown Street		1	1	0	0	0	0	1	0	12.50	30
BP-29	Regional Bikeway Connection	Silverton City Limits	Stayton	1	1	0	0	1	0	0	0	12.20	32
BP-30	Regional Bikeway Connection	Silverton City Limits	Salem	1	1	0	0	1	0	0	0	12.20	32
BP-31	Regional Bikeway Connection	Silverton City Limits	Mt. Angel	1	1	0	0	1	0	0	0	12.20	32

Silverton TSP Update- Bike/Ped Path Project Scoring

New Project Number	Project Name	Start	End	Goal 1: Enhance livability with proper multi-modal design	Goal 2: Create a balanced system that promotes active transportation	Goal 3: Improve safety performance	Goal 4: Develop a system that can efficiently handle traffic demands of the future	Goal 5: Provide a system that is accessible to all users	Goal 6: Provide a system that allows for efficient freight movement	Goal 7: Identify potential projects that can be feasibly funded	Goal 8: Maintain consistency with local, regional, and state plans and policies	Score	Rank
OS-09	Off-Street path #6 (2nd Street)	Hobart Road	Oak Street (OR 213)	2	2	1	1	2	0	0	1	36.50	1
OS-11	Off-Street path #8	Lincoln Street	east side of Webb Lake	2	2	1	0	2	0	0	1	32.60	3
OS-18	Off-Street Path Connection #14	Mill Street	Sage Street	2	2	1	1	2	0	0	1	36.50	1
OS-16	Off-Street Path Connection #12	Coolidge Street	Anderson Drive	2	1	1	0	2	0	0	1	29.10	4
OS-02	Pedestrian Bridge	Peach Street		2	2	1	0	1	0	0	1	28.50	5
OS-04	Pedestrian Bridge	Cowing Street		2	2	1	0	1	0	0	1	28.50	5
OS-17	Off-Street Path Connection #13	Mallard Street	Sage Street	2	2	1	0	1	0	0	1	28.50	5
OS-21	Off-Street Path Connection #17	Pine Street	Monson Road	1	2	2	0	1	0	0	1	28.20	8
OS-03	Off-Street path #2 (Creek trail)	C Street	Silver Falls Library	2	1	1	0	1	0	0	1	25.00	9
OS-14	Off-Street Path Connection #10 (rail alignment)	Monson Road	Hobart Road	2	1	1	0	1	0	0	1	25.00	9
OS-01	Off-Street path #1	Charles Avenue	Peach Street	1	2	1	0	1	0	0	1	23.90	11
OS-06	Off-Street path #3	C Street	Off-Street Connection #10 Alignment	1	2	1	0	1	0	0	1	23.90	11
OS-07	Off-Street path #4	Existing rail line alignment	Church Street extension	1	2	1	0	1	0	0	1	23.90	11
OS-08	Off-Street path #5	Eska Way	Existing Church Street alignment	1	2	1	0	1	0	0	1	23.90	11
OS-10	Off-Street path #7	Jefferson Street	Eska Way	1	2	1	0	1	0	0	1	23.90	11
OS-12	Salamander Footbridge Connection	Coolidge McClaine Park		1	2	1	0	1	0	0	1	23.90	11
OS-13	Off-Street Path Connection #9	Pettit Reservoir	Silverton Road	1	2	1	0	1	0	0	1	23.90	11
OS-19	Off-Street Path Connection #15	Pioneer Drive	Main Street	1	2	1	0	1	0	0	1	23.90	11
OS-22	Off-Street Path Connection #18	Oak Street	Connection #14 Alignment	1	2	1	0	1	0	0	1	23.90	11
OS-15	Off-Street Path Connection #11	Westfield Street	Connection #9 Alignment	1	1	1	0	1	0	0	1	20.40	20
OS-20	Off-Street Path Connection #16	Eastview Lane	Connection #15 Alignment	1	1	1	0	1	0	0	1	20.40	20
OS-05	Pedestrian Stairway Connection	Coolidge Park	Anderson Drive	1	2	1	0	0	0	0	1	19.80	22

Silverton TSP Update-Transit Project Scoring

Project Number	Project Name	Description	Goal 1: Enhance livability with proper multi-modal design	Goal 2: Create a balanced system that promotes active transportation	Goal 3: Improve safety performance	Goal 4: Develop a system that can efficiently handle traffic demands of the future	Goal 5: Provide a system that is accessible to all users	Goal 6: Provide a system that allows for efficient freight movement	Goal 7: Identify potential projects that can be feasibly funded	Goal 8: Maintain consistency with local, regional, and state plans and policies	Score	Rank
TS-01	Commuter Connection to Salem	Develop a commuter transit connection to Salem. Install a transit stop downtown.	2	2	1	1	2	0	0	1	36.50	1
TS-04	Local Fixed Route Transit Feasibility Study	Conduct feasibility study for the implementation of fixed-route transit service	1	2	1	1	2	0	0	1	31.90	2
TS-02	Park-and-Ride Lot	Develop a park-and-ride facility on the west side of Silverton	2	2	1	1	0	0	0	0	24.40	3
TS-05	Park-and-Ride Lot and Increased Transit Service	Develop a park-and-ride facility on the east side of Silverton (in the industrial area between Mill Street and Monitor Road) and provide transit service (bus stops, shelters, lighting, etc.)	2	2	1	1	0	0	0	0	24.40	3
TS-03	Enhance Dial-a-Ride services	Provide service enhancements to the existing dial-a-ride services, including increased hours of operation and ease of scheduling	1	0	0	0	2	0	0	0	12.80	5

Silverton TSP Update-Rail Project Scoring

Project Number	Project Name	Start	End	Goal 1: Enhance livability with proper multi-modal design	Goal 2: Create a balanced system that promotes active transportation	Goal 3: Improve safety performance	Goal 4: Develop a system that can efficiently handle traffic demands of the future	Goal 5: Provide a system that is accessible to all users	Goal 6: Provide a system that allows for efficient freight movement	Goal 7: Ensure potential projects can be feasibly funded	Goal 8: Maintain consistency with local, regional, and state plans and policies	Score	Rank
RR-03	Rail/Highway Grade Crossing Improvements	1st Street	Jefferson Street	2	1	2	0	1	1	0	0	29.7	1
RR-04	Rail/Highway Grade Crossing Improvements	James Street	C Street	2	1	2	0	0	1	0	0	25.6	2
RR-01	Address RR Crossing Safety/Ops Issues	McClaine Street	Fossholm Road	1	1	2	0	0	1	0	1	24.9	3
RR-02	Rail/Highway Grade Crossing Improvements on Hobart Road	1st Street	Hobart Road	1	1	2	0	0	1	0	0	21.0	4

Intersection	
Int Delay, s/veh	2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	270	10	70	210	10	50
Future Vol, veh/h	270	10	70	210	10	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	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	5	0	3	15	0	2
Mvmt Flow	303	11	79	236	11	56

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	315	0	702	309
Stage 1	-	-	-	-	309	-
Stage 2	-	-	-	-	393	-
Critical Hdwy	-	-	4.13	-	6.4	6.22
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.227	-	3.5	3.318
Pot Cap-1 Maneuver	-	-	1240	-	407	731
Stage 1	-	-	-	-	749	-
Stage 2	-	-	-	-	686	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1240	-	377	731
Mov Cap-2 Maneuver	-	-	-	-	377	-
Stage 1	-	-	-	-	749	-
Stage 2	-	-	-	-	636	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2	11.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	632	-	-	1240	-
HCM Lane V/C Ratio	0.107	-	-	0.063	-
HCM Control Delay (s)	11.4	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.2	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	90	10	100	90	50	0	300	130	70	470	20
Future Volume (vph)	30	90	10	100	90	50	0	300	130	70	470	20
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0	4.0		4.0	4.0
Lane Util. Factor		1.00			1.00			1.00	1.00		1.00	1.00
Frt		0.99			0.97			1.00	0.85		1.00	0.85
Flt Protected		0.99			0.98			1.00	1.00		0.99	1.00
Satd. Flow (prot)		1655			1474			1683	1365		1662	1488
Flt Permitted		0.90			0.84			1.00	1.00		0.92	1.00
Satd. Flow (perm)		1511			1262			1683	1365		1539	1488
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	33	99	11	110	99	55	0	330	143	77	516	22
RTOR Reduction (vph)	0	5	0	0	16	0	0	0	67	0	0	10
Lane Group Flow (vph)	0	138	0	0	248	0	0	330	76	0	593	12
Heavy Vehicles (%)	0%	5%	0%	26%	2%	7%	0%	4%	9%	2%	5%	0%
Turn Type	Perm	NA		Perm	NA			NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)		13.3			13.3			24.1	24.1		24.1	24.1
Effective Green, g (s)		13.3			13.3			24.1	24.1		24.1	24.1
Actuated g/C Ratio		0.29			0.29			0.53	0.53		0.53	0.53
Clearance Time (s)		4.0			4.0			4.0	4.0		4.0	4.0
Vehicle Extension (s)		2.5			2.5			2.5	2.5		2.5	2.5
Lane Grp Cap (vph)		442			369			893	724		816	789
v/s Ratio Prot								0.20				
v/s Ratio Perm		0.09			c0.20				0.06		c0.39	0.01
v/c Ratio		0.31			0.67			0.37	0.10		0.73	0.01
Uniform Delay, d1		12.5			14.1			6.2	5.3		8.1	5.0
Progression Factor		1.00			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		0.3			4.3			0.2	0.0		3.0	0.0
Delay (s)		12.8			18.4			6.4	5.3		11.2	5.0
Level of Service		B			B			A	A		B	A
Approach Delay (s)		12.8			18.4			6.1			11.0	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	45.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	20	70	30	20	10	70	500	70	30	570	20
Future Vol, veh/h	0	20	70	30	20	10	70	500	70	30	570	20
Conflicting Peds, #/hr	0	0	2	2	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	100	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	11	0	0	11	0	0	40	4	0	0	8	75
Mvmt Flow	0	22	77	33	22	11	77	549	77	33	626	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1412	1395	628	1447	1395	549	626	0	0	549	0	0
Stage 1	692	692	-	703	703	-	-	-	-	-	-	-
Stage 2	720	703	-	744	692	-	-	-	-	-	-	-
Critical Hdwy	7.21	6.5	6.2	7.21	6.5	6.2	4.5	-	-	4.1	-	-
Critical Hdwy Stg 1	6.21	5.5	-	6.21	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.21	5.5	-	6.21	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.599	4	3.3	3.599	4	3.3	2.56	-	-	2.2	-	-
Pot Cap-1 Maneuver	110	143	487	104	143	539	797	-	-	1031	-	-
Stage 1	420	448	-	414	443	-	-	-	-	-	-	-
Stage 2	405	443	-	393	448	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	79	115	486	64	115	539	796	-	-	1031	-	-
Mov Cap-2 Maneuver	79	115	-	64	115	-	-	-	-	-	-	-
Stage 1	357	426	-	352	377	-	-	-	-	-	-	-
Stage 2	318	377	-	298	426	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.4	112	1.1	0.4
HCM LOS	C	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	796	-	-	283	91	1031	-	-
HCM Lane V/C Ratio	0.097	-	-	0.349	0.725	0.032	-	-
HCM Control Delay (s)	10	0	-	24.4	112	8.6	0	-
HCM Lane LOS	B	A	-	C	F	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	1.5	3.6	0.1	-	-

Intersection	
Intersection Delay, s/veh	12.8
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	10	10	230	0	10	10	10	0	180	120	10
Future Vol, veh/h	0	10	10	230	0	10	10	10	0	180	120	10
Peak Hour Factor	0.92	0.84	0.84	0.84	0.92	0.84	0.84	0.84	0.92	0.84	0.84	0.84
Heavy Vehicles, %	2	10	0	4	2	0	0	0	2	1	0	0
Mvmt Flow	0	12	12	274	0	12	12	12	0	214	143	12
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	12.2	9.4	14.6
HCM LOS	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	58%	4%	33%	5%
Vol Thru, %	39%	4%	33%	76%
Vol Right, %	3%	92%	33%	19%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	310	250	30	210
LT Vol	180	10	10	10
Through Vol	120	10	10	160
RT Vol	10	230	10	40
Lane Flow Rate	369	298	36	250
Geometry Grp	1	1	1	1
Degree of Util (X)	0.545	0.431	0.059	0.366
Departure Headway (Hd)	5.313	5.21	5.962	5.277
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	679	690	598	680
Service Time	3.35	3.252	4.024	3.32
HCM Lane V/C Ratio	0.543	0.432	0.06	0.368
HCM Control Delay	14.6	12.2	9.4	11.4
HCM Lane LOS	B	B	A	B
HCM 95th-tile Q	3.3	2.2	0.2	1.7

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations			✣	
Traffic Vol, veh/h	0	10	160	40
Future Vol, veh/h	0	10	160	40
Peak Hour Factor	0.92	0.84	0.84	0.84
Heavy Vehicles, %	2	0	0	0
Mvmt Flow	0	12	190	48
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	11.4
HCM LOS	B

Intersection	
Intersection Delay, s/veh	14.6
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			✥				✥				✥	
Traffic Vol, veh/h	0	10	10	10	0	40	10	120	0	10	190	30
Future Vol, veh/h	0	10	10	10	0	40	10	120	0	10	190	30
Peak Hour Factor	0.92	0.84	0.84	0.84	0.92	0.84	0.84	0.84	0.92	0.84	0.84	0.84
Heavy Vehicles, %	2	0	14	9	2	0	33	1	2	0	0	0
Mvmt Flow	0	12	12	12	0	48	12	143	0	12	226	36
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	9.6	11	11.6
HCM LOS	A	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	4%	33%	24%	53%
Vol Thru, %	83%	33%	6%	45%
Vol Right, %	13%	33%	71%	3%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	230	30	170	400
LT Vol	10	10	40	210
Through Vol	190	10	10	180
RT Vol	30	10	120	10
Lane Flow Rate	274	36	202	476
Geometry Grp	1	1	1	1
Degree of Util (X)	0.395	0.061	0.308	0.678
Departure Headway (Hd)	5.19	6.104	5.485	5.123
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	693	585	654	705
Service Time	3.226	4.162	3.53	3.152
HCM Lane V/C Ratio	0.395	0.062	0.309	0.675
HCM Control Delay	11.6	9.6	11	18.3
HCM Lane LOS	B	A	B	C
HCM 95th-tile Q	1.9	0.2	1.3	5.3

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations			✥	
Traffic Vol, veh/h	0	210	180	10
Future Vol, veh/h	0	210	180	10
Peak Hour Factor	0.92	0.84	0.84	0.84
Heavy Vehicles, %	2	3	2	0
Mvmt Flow	0	250	214	12
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	18.3
HCM LOS	C

Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	220	690	10	60	580	20	0	0	40	0	0	200
Future Vol, veh/h	220	690	10	60	580	20	0	0	40	0	0	200
Conflicting Peds, #/hr	2	0	1	1	0	2	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	0	4	0	4	8	0	0	0	0	0	0	2
Mvmt Flow	232	726	11	63	611	21	0	0	42	0	0	211

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	634	0	0	738	0	0	2050	1956	733	1965	1950	624
Stage 1	-	-	-	-	-	-	1196	1196	-	749	749	-
Stage 2	-	-	-	-	-	-	854	760	-	1216	1201	-
Critical Hdwy	4.1	-	-	4.14	-	-	7.1	6.5	6.2	7.1	6.5	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.236	-	-	3.5	4	3.3	3.5	4	3.318
Pot Cap-1 Maneuver	959	-	-	859	-	-	42	65	424	48	65	485
Stage 1	-	-	-	-	-	-	229	262	-	407	422	-
Stage 2	-	-	-	-	-	-	356	417	-	223	260	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	958	-	-	859	-	-	15	34	424	27	34	484
Mov Cap-2 Maneuver	-	-	-	-	-	-	15	34	-	27	34	-
Stage 1	-	-	-	-	-	-	135	154	-	239	374	-
Stage 2	-	-	-	-	-	-	178	369	-	118	153	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.4	0.9	14.4	18
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	424	958	-	-	859	-	-	484
HCM Lane V/C Ratio	0.099	0.242	-	-	0.074	-	-	0.435
HCM Control Delay (s)	14.4	10	0	-	9.5	0	-	18
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.3	0.9	-	-	0.2	-	-	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	520	390	130	120	350	20	150	410	80	0	345	410
Future Volume (vph)	520	390	130	120	350	20	150	410	80	0	345	410
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.96		1.00	0.99		1.00	0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1630	1676		1646	1670		1630	1638			1667	1365
Flt Permitted	0.14	1.00		0.47	1.00		0.18	1.00			1.00	1.00
Satd. Flow (perm)	249	1676		808	1670		314	1638			1667	1365
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)	531	398	133	122	357	20	153	418	82	0	352	418
RTOR Reduction (vph)	0	10	0	0	2	0	0	6	0	0	0	317
Lane Group Flow (vph)	531	521	0	122	375	0	153	494	0	0	352	101
Confl. Peds. (#/hr)	2					2						
Heavy Vehicles (%)	2%	0%	2%	1%	4%	0%	2%	5%	0%	0%	5%	9%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA			NA	Perm
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4			8			2					6
Actuated Green, G (s)	67.5	54.5		36.7	27.7		39.6	39.6			27.8	27.8
Effective Green, g (s)	67.5	54.5		36.7	27.7		39.6	39.6			27.8	27.8
Actuated g/C Ratio	0.59	0.47		0.32	0.24		0.34	0.34			0.24	0.24
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	575	793		323	401		197	563			402	329
v/s Ratio Prot	c0.29	0.31		0.03	0.22		0.05	c0.30			0.21	
v/s Ratio Perm	c0.25			0.09			0.21					0.07
v/c Ratio	0.92	0.66		0.38	0.94		0.78	0.88			0.88	0.31
Uniform Delay, d1	29.3	23.2		28.8	42.8		29.7	35.5			42.0	35.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	20.6	2.0		0.7	29.1		17.3	14.4			18.7	0.5
Delay (s)	50.0	25.1		29.6	71.9		47.0	49.9			60.7	36.3
Level of Service	D	C		C	E		D	D			E	D
Approach Delay (s)		37.5			61.6			49.2			47.4	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	46.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	115.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	150	210	140	10	10	170
Future Volume (vph)	150	210	140	10	10	170
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.99		0.87	
Flt Protected	0.95	1.00	1.00		1.00	
Satd. Flow (prot)	1498	1733	1657		1416	
Flt Permitted	0.65	1.00	1.00		1.00	
Satd. Flow (perm)	1029	1733	1657		1416	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	165	231	154	11	11	187
RTOR Reduction (vph)	0	0	2	0	161	0
Lane Group Flow (vph)	165	231	163	0	37	0
Heavy Vehicles (%)	11%	1%	5%	0%	0%	8%
Turn Type	Perm	NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases	4					
Actuated Green, G (s)	33.2	33.2	33.2		6.7	
Effective Green, g (s)	33.2	33.2	33.2		6.7	
Actuated g/C Ratio	0.69	0.69	0.69		0.14	
Clearance Time (s)	4.0	4.0	4.0		4.0	
Vehicle Extension (s)	2.5	2.5	2.5		2.5	
Lane Grp Cap (vph)	713	1201	1148		198	
v/s Ratio Prot		0.13	0.10		c0.03	
v/s Ratio Perm	c0.16					
v/c Ratio	0.23	0.19	0.14		0.19	
Uniform Delay, d1	2.7	2.6	2.5		18.2	
Progression Factor	1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.1	0.1	0.3		0.3	
Delay (s)	2.8	2.7	2.8		18.5	
Level of Service	A	A	A		B	
Approach Delay (s)		2.7	2.8		18.5	
Approach LOS		A	A		B	

Intersection Summary			
HCM 2000 Control Delay	6.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	47.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	39.7%	ICU Level of Service	A
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)	20	470	260	250	630	190	0	0	0	60	220	20
Future Volume (vph)	20	470	260	250	630	190	0	0	0	60	220	20
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0	5.0	4.5	5.0	5.0				4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98				1.00	1.00	
Flpb, ped/bikes	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	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00				0.95	1.00	
Satd. Flow (prot)	1662	1716	1452	1662	1699	1442				1662	1708	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00				0.95	1.00	
Satd. Flow (perm)	1662	1716	1452	1662	1699	1442				1662	1708	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	22	516	286	275	692	209	0	0	0	66	242	22
RTOR Reduction (vph)	0	0	144	0	0	76	0	0	0	0	4	0
Lane Group Flow (vph)	22	516	142	275	692	133	0	0	0	66	260	0
Confl. Peds. (#/hr)			2	2			5		10	10		5
Confl. Bikes (#/hr)						1						2
Heavy Vehicles (%)	0%	2%	1%	0%	3%	1%	0%	0%	0%	0%	1%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm				Prot	NA	
Protected Phases	5	2		1	6					7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	1.8	30.7	30.7	16.0	44.9	44.9				16.8	16.8	
Effective Green, g (s)	1.8	30.7	30.7	16.0	44.9	44.9				16.8	16.8	
Actuated g/C Ratio	0.02	0.40	0.40	0.21	0.58	0.58				0.22	0.22	
Clearance Time (s)	4.5	5.0	5.0	4.5	5.0	5.0				4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0				3.0	3.0	
Lane Grp Cap (vph)	38	679	575	343	984	835				360	370	
v/s Ratio Prot	0.01	0.30		c0.17	c0.41					0.04	c0.15	
v/s Ratio Perm			0.10			0.09						
v/c Ratio	0.58	0.76	0.25	0.80	0.70	0.16				0.18	0.70	
Uniform Delay, d1	37.5	20.2	15.7	29.2	11.6	7.6				24.8	28.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	
Incremental Delay, d2	19.6	4.9	0.2	12.6	2.3	0.1				0.2	6.0	
Delay (s)	57.1	25.1	15.9	41.9	13.9	7.6				25.0	34.0	
Level of Service	E	C	B	D	B	A				C	C	
Approach Delay (s)		22.8			19.3			0.0			32.2	
Approach LOS		C			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	22.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	77.5	Sum of lost time (s)	14.0
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	50	410	330	410	450	70
Future Volume (vph)	50	410	330	410	450	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00	
Frpb, ped/bikes		1.00	1.00	0.98	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	
Frt		1.00	1.00	0.85	0.98	
Flt Protected		0.99	1.00	1.00	0.96	
Satd. Flow (prot)		1850	1827	1531	1768	
Flt Permitted		0.93	1.00	1.00	0.96	
Satd. Flow (perm)		1738	1827	1531	1768	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	53	436	351	436	479	74
RTOR Reduction (vph)	0	0	0	219	10	0
Lane Group Flow (vph)	0	489	351	217	543	0
Confl. Peds. (#/hr)	2			2	2	
Confl. Bikes (#/hr)						1
Heavy Vehicles (%)	3%	2%	4%	3%	1%	0%
Turn Type	Perm	NA	NA	Perm	Prot	
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)		29.8	29.8	29.8	22.2	
Effective Green, g (s)		29.8	29.8	29.8	22.2	
Actuated g/C Ratio		0.50	0.50	0.50	0.37	
Clearance Time (s)		4.0	4.0	4.0	4.0	
Vehicle Extension (s)		2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)		863	907	760	654	
v/s Ratio Prot			0.19		c0.31	
v/s Ratio Perm		c0.28		0.14		
v/c Ratio		0.57	0.39	0.28	0.83	
Uniform Delay, d1		10.6	9.4	8.9	17.2	
Progression Factor		1.00	0.71	0.64	1.00	
Incremental Delay, d2		2.7	0.2	0.1	8.6	
Delay (s)		13.3	6.9	5.8	25.8	
Level of Service		B	A	A	C	
Approach Delay (s)		13.3	6.3		25.8	
Approach LOS		B	A		C	

Intersection Summary			
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑↑				↱			↱
Traffic Vol, veh/h	0	550	20	0	1010	40	0	0	20	0	0	60
Future Vol, veh/h	0	550	20	0	1010	40	0	0	20	0	0	60
Conflicting Peds, #/hr	0	0	1	1	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	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	5	0	0	6	0	0	0	0	0	0	0
Mvmt Flow	0	591	22	0	1086	43	0	0	22	0	0	65

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	603	-	-	565
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.2	-	-	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.3	-	-	3.3
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	503	0	0	473
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	503	-	-	473
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	12.5	13.8
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	503	-	-	-	-	473
HCM Lane V/C Ratio	0.043	-	-	-	-	0.136
HCM Control Delay (s)	12.5	-	-	-	-	13.8
HCM Lane LOS	B	-	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	-	0.5

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	0	0	30	710
Future Vol, veh/h	0	0	0	0	30	710
Conflicting Peds, #/hr	2	4	0	7	7	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	0	0	2
Mvmt Flow	0	0	0	0	34	798

Major/Minor	Minor1		Major2	
Conflicting Flow All	475	-	7	0
Stage 1	7	-	-	-
Stage 2	468	-	-	-
Critical Hdwy	6.8	-	4.1	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-
Follow-up Hdwy	3.5	-	2.2	-
Pot Cap-1 Maneuver	524	0	1627	-
Stage 1	-	0	-	-
Stage 2	602	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	501	-	1627	-
Mov Cap-2 Maneuver	501	-	-	-
Stage 1	-	-	-	-
Stage 2	579	-	-	-

Approach	WB	SB
HCM Control Delay, s	0	0.4
HCM LOS	A	

Minor Lane/Major Mvmt	WBLn1	SBL	SBT
Capacity (veh/h)	-	1627	-
HCM Lane V/C Ratio	-	0.021	-
HCM Control Delay (s)	0	7.3	0.1
HCM Lane LOS	A	A	A
HCM 95th %tile Q(veh)	-	0.1	-

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	280	0	0	0	350	450
Future Volume (vph)	280	0	0	0	350	450
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0					4.0
Lane Util. Factor	1.00					0.95
Frpb, ped/bikes	1.00					1.00
Flpb, ped/bikes	1.00					0.99
Frt	1.00					1.00
Flt Protected	0.95					0.98
Satd. Flow (prot)	1752					3443
Flt Permitted	0.95					0.98
Satd. Flow (perm)	1752					3443
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	298	0	0	0	372	479
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	298	0	0	0	0	851
Confl. Peds. (#/hr)	9	15		8	8	
Heavy Vehicles (%)	3%	0%	0%	0%	2%	2%
Turn Type	Prot				Perm	NA
Protected Phases	8					6
Permitted Phases					6	
Actuated Green, G (s)	15.0					37.0
Effective Green, g (s)	15.0					37.0
Actuated g/C Ratio	0.25					0.62
Clearance Time (s)	4.0					4.0
Vehicle Extension (s)	2.5					2.5
Lane Grp Cap (vph)	438					2123
v/s Ratio Prot	c0.17					
v/s Ratio Perm						0.25
v/c Ratio	0.68					0.40
Uniform Delay, d1	20.3					5.9
Progression Factor	0.48					1.00
Incremental Delay, d2	3.5					0.6
Delay (s)	13.3					6.4
Level of Service	B					A
Approach Delay (s)	13.3		0.0			6.4
Approach LOS	B		A			A

Intersection Summary			
HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.2%	ICU Level of Service	A
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)	0	450	440	30	480	0	0	0	0	60	390	320
Future Volume (vph)	0	450	440	30	480	0	0	0	0	60	390	320
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0						4.0	
Lane Util. Factor		1.00	1.00		1.00						0.95	
Frpb, ped/bikes		1.00	0.98		1.00						0.97	
Flpb, ped/bikes		1.00	1.00		1.00						1.00	
Frt		1.00	0.85		1.00						0.94	
Flt Protected		1.00	1.00		1.00						1.00	
Satd. Flow (prot)		1863	1549		1809						3201	
Flt Permitted		1.00	1.00		0.96						1.00	
Satd. Flow (perm)		1863	1549		1741						3201	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	469	458	31	500	0	0	0	0	62	406	333
RTOR Reduction (vph)	0	0	118	0	0	0	0	0	0	0	154	0
Lane Group Flow (vph)	0	469	340	0	531	0	0	0	0	0	648	0
Confl. Peds. (#/hr)	13		10	10		13	27		20	20		27
Heavy Vehicles (%)	0%	2%	2%	0%	5%	0%	0%	0%	0%	0%	2%	3%
Turn Type		NA	Perm	Perm	NA					Perm	NA	
Protected Phases		4			8						6	
Permitted Phases			4	8						6		
Actuated Green, G (s)		23.8	23.8		23.8						28.2	
Effective Green, g (s)		23.8	23.8		23.8						28.2	
Actuated g/C Ratio		0.40	0.40		0.40						0.47	
Clearance Time (s)		4.0	4.0		4.0						4.0	
Vehicle Extension (s)		2.5	2.5		2.5						2.5	
Lane Grp Cap (vph)		738	614		690						1504	
v/s Ratio Prot		0.25										
v/s Ratio Perm			0.22		c0.30						0.20	
v/c Ratio		0.64	0.55		0.77						0.43	
Uniform Delay, d1		14.6	14.0		15.7						10.6	
Progression Factor		0.80	0.75		0.94						0.51	
Incremental Delay, d2		1.2	0.7		4.8						0.8	
Delay (s)		13.0	11.2		19.6						6.2	
Level of Service		B	B		B						A	
Approach Delay (s)		12.1			19.6			0.0			6.2	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	3.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	70	170	10	130	190
Future Vol, veh/h	10	70	170	10	130	190
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	77	77	77	77	77	77
Heavy Vehicles, %	0	0	3	17	1	1
Mvmt Flow	13	91	221	13	169	247

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	811	227	0	0	234	0
Stage 1	227	-	-	-	-	-
Stage 2	584	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.11	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209	-
Pot Cap-1 Maneuver	352	817	-	-	1339	-
Stage 1	815	-	-	-	-	-
Stage 2	561	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	308	817	-	-	1339	-
Mov Cap-2 Maneuver	308	-	-	-	-	-
Stage 1	815	-	-	-	-	-
Stage 2	490	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	3.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	308	817	1339	-
HCM Lane V/C Ratio	-	-	0.042	0.111	0.126	-
HCM Control Delay (s)	-	-	17.2	10	8.1	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.4	0.4	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	510	130	0	0	0	0	390	290	10	0	0	820
Future Volume (vph)	510	130	0	0	0	0	390	290	10	0	0	820
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5					4.0	4.0				4.0
Lane Util. Factor		1.00					1.00	1.00				1.00
Frpb, ped/bikes		1.00					1.00	1.00				0.99
Flpb, ped/bikes		1.00					1.00	1.00				1.00
Frt		1.00					1.00	0.99				0.86
Flt Protected		0.96					0.95	1.00				1.00
Satd. Flow (prot)		1599					1568	1614				1412
Flt Permitted		0.96					0.95	1.00				1.00
Satd. Flow (perm)		1599					1568	1614				1412
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	537	137	0	0	0	0	411	305	11	0	0	863
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	0	82
Lane Group Flow (vph)	0	674	0	0	0	0	411	315	0	0	0	781
Confl. Peds. (#/hr)	3		3	3		3	6		5	5		6
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	6%	1%	0%	0%	4%	0%	6%	8%	0%	0%	0%	6%
Turn Type	pm+pt	NA					Split	NA				custom
Protected Phases	5	2					7	7				8
Permitted Phases	2											6
Actuated Green, G (s)		48.3					25.9	25.9				64.3
Effective Green, g (s)		48.3					25.9	25.9				64.3
Actuated g/C Ratio		0.47					0.25	0.25				0.63
Clearance Time (s)		4.5					4.0	4.0				4.0
Vehicle Extension (s)		3.0					3.0	3.0				3.0
Lane Grp Cap (vph)		752					395	407				884
v/s Ratio Prot							c0.26	0.20				c0.14
v/s Ratio Perm		0.42										0.42
v/c Ratio		0.90					1.04	0.77				0.88
Uniform Delay, d1		24.9					38.4	35.7				16.1
Progression Factor		1.00					1.00	1.00				1.00
Incremental Delay, d2		13.3					56.2	8.9				10.4
Delay (s)		38.2					94.6	44.6				26.4
Level of Service		D					F	D				C
Approach Delay (s)		38.2			0.0			72.9			26.4	
Approach LOS		D			A			E			C	

Intersection Summary			
HCM 2000 Control Delay	44.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	102.7	Sum of lost time (s)	16.5
Intersection Capacity Utilization	85.9%	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 (vph)	40	320	0	0	240	180	30	350	230	0	0	0
Future Volume (vph)	40	320	0	0	240	180	30	350	230	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0				
Lane Util. Factor		1.00			1.00			0.95				
Frpb, ped/bikes		1.00			0.99			0.99				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.94			0.94				
Flt Protected		0.99			1.00			1.00				
Satd. Flow (prot)		1823			1706			3208				
Flt Permitted		0.72			1.00			1.00				
Satd. Flow (perm)		1316			1706			3208				
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	44	352	0	0	264	198	33	385	253	0	0	0
RTOR Reduction (vph)	0	0	0	0	59	0	0	113	0	0	0	0
Lane Group Flow (vph)	0	396	0	0	403	0	0	558	0	0	0	0
Confl. Peds. (#/hr)	18		7	7		18	23		8	8		23
Heavy Vehicles (%)	0%	4%	0%	0%	4%	3%	0%	5%	4%	0%	0%	0%
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4						2					
Actuated Green, G (s)		19.5			19.5			32.5				
Effective Green, g (s)		19.5			19.5			32.5				
Actuated g/C Ratio		0.32			0.32			0.54				
Clearance Time (s)		4.0			4.0			4.0				
Vehicle Extension (s)		2.5			2.5			2.5				
Lane Grp Cap (vph)		427			554			1737				
v/s Ratio Prot					0.24							
v/s Ratio Perm		c0.30						0.17				
v/c Ratio		0.93			0.73			0.32				
Uniform Delay, d1		19.6			17.9			7.6				
Progression Factor		0.94			1.00			0.55				
Incremental Delay, d2		25.1			4.5			0.4				
Delay (s)		43.5			22.4			4.6				
Level of Service		D			C			A				
Approach Delay (s)		43.5			22.4			4.6			0.0	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	20.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
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)	220	240	0	0	230	60	210	260	10	0	0	0
Future Volume (vph)	220	240	0	0	230	60	210	260	10	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0				
Lane Util. Factor		1.00			1.00			0.95				
Frpb, ped/bikes		1.00			0.99			1.00				
Flpb, ped/bikes		1.00			1.00			0.99				
Frt		1.00			0.97			1.00				
Flt Protected		0.98			1.00			0.98				
Satd. Flow (prot)		1821			1769			3348				
Flt Permitted		0.63			1.00			0.98				
Satd. Flow (perm)		1176			1769			3348				
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	242	264	0	0	253	66	231	286	11	0	0	0
RTOR Reduction (vph)	0	0	0	0	19	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	506	0	0	300	0	0	526	0	0	0	0
Confl. Peds. (#/hr)	15		10	10		15	7		10	10		7
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	2%	1%	0%	0%	3%	7%	3%	6%	0%	0%	0%	0%
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4						2					
Actuated Green, G (s)		29.0			29.0			23.0				
Effective Green, g (s)		29.0			29.0			23.0				
Actuated g/C Ratio		0.48			0.48			0.38				
Clearance Time (s)		4.0			4.0			4.0				
Vehicle Extension (s)		2.5			2.5			2.5				
Lane Grp Cap (vph)		568			855			1283				
v/s Ratio Prot					0.17							
v/s Ratio Perm		c0.43						0.16				
v/c Ratio		0.89			0.35			0.41				
Uniform Delay, d1		14.1			9.6			13.5				
Progression Factor		0.36			1.00			1.00				
Incremental Delay, d2		14.5			0.2			1.0				
Delay (s)		19.7			9.8			14.5				
Level of Service		B			A			B				
Approach Delay (s)		19.7			9.8			14.5			0.0	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Intersection												
Int Delay, s/veh	6.6											
Movement	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
Lane Configurations												
Traffic Vol, veh/h	420	30	10	10	0	20	0	50	10	0	0	0
Future Vol, veh/h	420	30	10	10	0	20	0	50	10	0	0	0
Conflicting Peds, #/hr	2	0	1	1	0	2	4	0	1	1	0	4
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	4	6	0	0	0	0	0	9	0	0	0	0
Mvmt Flow	545	39	13	13	0	26	0	65	13	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	2	0	0	53	0	-	-	1165	47
Stage 1	-	-	-	-	-	-	-	1137	-
Stage 2	-	-	-	-	-	-	-	28	-
Critical Hdwy	4.14	-	-	4.1	-	-	-	6.59	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	-	5.59	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	2.236	-	-	2.2	-	-	-	4.081	3.3
Pot Cap-1 Maneuver	1607	-	-	1566	0	-	0	188	1028
Stage 1	-	-	-	-	0	-	0	269	-
Stage 2	-	-	-	-	0	-	0	-	-
Platoon blocked, %		-	-			-			
Mov Cap-1 Maneuver	1607	-	-	1565	-	-	-	0	1026
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	0	-
Stage 1	-	-	-	-	-	-	-	0	-
Stage 2	-	-	-	-	-	-	-	0	-

Approach	EB	WB	NB
HCM Control Delay, s	7.7	2.4	
HCM LOS			-

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBR
Capacity (veh/h)	-	1026	1607	-	-	1565	-
HCM Lane V/C Ratio	-	0.044	0.339	-	-	0.008	-
HCM Control Delay (s)	-	8.7	8.4	0	-	7.3	-
HCM Lane LOS	-	A	A	A	-	A	-
HCM 95th %tile Q(veh)	-	0.1	1.5	-	-	0	-

Intersection	
Int Delay, s/veh	16.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	510	20	80	420	50	0	20	50	70	50	30
Future Vol, veh/h	10	510	20	80	420	50	0	20	50	70	50	30
Conflicting Peds, #/hr	3	0	0	0	0	3	6	0	0	0	0	6
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	0	3	0	8	3	0	0	3	0	2	5	0
Mvmt Flow	10	526	21	82	433	52	0	21	52	72	52	31

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	488	0	0	546	0	0	1228	1209	536	1220	1194	468
Stage 1	-	-	-	-	-	-	557	557	-	627	627	-
Stage 2	-	-	-	-	-	-	671	652	-	593	567	-
Critical Hdwy	4.1	-	-	4.18	-	-	7.1	6.53	6.2	7.12	6.55	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.53	-	6.12	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.53	-	6.12	5.55	-
Follow-up Hdwy	2.2	-	-	2.272	-	-	3.5	4.027	3.3	3.518	4.045	3.3
Pot Cap-1 Maneuver	1086	-	-	994	-	-	156	182	549	157	184	599
Stage 1	-	-	-	-	-	-	518	511	-	471	472	-
Stage 2	-	-	-	-	-	-	449	463	-	492	502	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1081	-	-	994	-	-	101	159	549	116	161	595
Mov Cap-2 Maneuver	-	-	-	-	-	-	101	159	-	116	161	-
Stage 1	-	-	-	-	-	-	511	504	-	464	417	-
Stage 2	-	-	-	-	-	-	329	409	-	422	495	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	1.3	19.3	127.6
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	323	1081	-	-	994	-	-	156
HCM Lane V/C Ratio	0.223	0.01	-	-	0.083	-	-	0.991
HCM Control Delay (s)	19.3	8.4	0	-	8.9	0	-	127.6
HCM Lane LOS	C	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.8	0	-	-	0.3	-	-	7.5

Intersection	
Int Delay, s/veh	2.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	470	40	80	470	30	50
Future Vol, veh/h	470	40	80	470	30	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	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	7	5	2	0	4
Mvmt Flow	505	43	86	505	32	54

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	548	0	1204	527
Stage 1	-	-	-	-	527	-
Stage 2	-	-	-	-	677	-
Critical Hdwy	-	-	4.15	-	6.4	6.24
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.245	-	3.5	3.336
Pot Cap-1 Maneuver	-	-	1007	-	205	547
Stage 1	-	-	-	-	596	-
Stage 2	-	-	-	-	509	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1007	-	181	547
Mov Cap-2 Maneuver	-	-	-	-	181	-
Stage 1	-	-	-	-	596	-
Stage 2	-	-	-	-	448	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	20.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	311	-	-	1007	-
HCM Lane V/C Ratio	0.277	-	-	0.085	-
HCM Control Delay (s)	20.9	-	-	8.9	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1.1	-	-	0.3	-

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	110	0	50	0	0	0	0	40	0	0	60	60
Future Vol, veh/h	110	0	50	0	0	0	0	40	0	0	60	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	0	0	0	0	0	0	100	3	0	0	0	11
Mvmt Flow	129	0	59	0	0	0	0	47	0	0	71	71

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	153	153	106	182	188	47	141	0	0	47	0	0
Stage 1	106	106	-	47	47	-	-	-	-	-	-	-
Stage 2	47	47	-	135	141	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	5.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	3.1	-	-	2.2	-	-
Pot Cap-1 Maneuver	819	742	954	784	710	1028	1010	-	-	1573	-	-
Stage 1	905	811	-	972	860	-	-	-	-	-	-	-
Stage 2	972	860	-	873	784	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	819	742	954	736	710	1028	1010	-	-	1573	-	-
Mov Cap-2 Maneuver	819	742	-	736	710	-	-	-	-	-	-	-
Stage 1	905	811	-	972	860	-	-	-	-	-	-	-
Stage 2	972	860	-	819	784	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.4	0	0	0
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1010	-	-	857	-	1573	-	-
HCM Lane V/C Ratio	-	-	-	0.22	-	-	-	-
HCM Control Delay (s)	0	-	-	10.4	0	0	-	-
HCM Lane LOS	A	-	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.8	-	0	-	-

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	90	380	0	0	410	50	0	0	0	40	0	100
Future Vol, veh/h	90	380	0	0	410	50	0	0	0	40	0	100
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	100	-	-	-	-	-	75
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	3	0	0	4	35	0	0	0	18	0	2
Mvmt Flow	100	422	0	0	456	56	0	0	0	44	0	111

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	456	0	0	422	0	0	1080	1078	422	1078	1078	458
Stage 1	-	-	-	-	-	-	622	622	-	456	456	-
Stage 2	-	-	-	-	-	-	458	456	-	622	622	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.1	6.5	6.2	7.28	6.5	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.28	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.28	5.5	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4	3.3	3.662	4	3.318
Pot Cap-1 Maneuver	1105	-	-	1148	-	0	197	220	636	183	220	603
Stage 1	-	-	-	-	-	0	478	482	-	555	572	-
Stage 2	-	-	-	-	-	0	587	572	-	448	482	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1103	-	-	1148	-	-	146	194	636	166	194	602
Mov Cap-2 Maneuver	-	-	-	-	-	-	146	194	-	166	194	-
Stage 1	-	-	-	-	-	-	422	425	-	490	572	-
Stage 2	-	-	-	-	-	-	478	572	-	395	425	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.6	0	0	18.6
HCM LOS			A	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	1103	-	-	1148	-	166	602
HCM Lane V/C Ratio	-	0.091	-	-	-	-	0.268	0.185
HCM Control Delay (s)	0	8.6	0	-	0	-	34.4	12.3
HCM Lane LOS	A	A	A	-	A	-	D	B
HCM 95th %tile Q(veh)	-	0.3	-	-	0	-	1	0.7

Summary of All Intervals

Run Number	2	3	5	7	8	9	Avg
Start Time	4:50	4:50	4:50	4:50	4:50	4:50	4:50
End Time	5:30	5:30	5:30	5:30	5:30	5:30	5:30
Total Time (min)	40	40	40	40	40	40	40
Time Recorded (min)	30	30	30	30	30	30	30
# of Intervals	3	3	3	3	3	3	3
# of Recorded Intervals	2	2	2	2	2	2	2
Vehs Entered	1889	1855	1953	1932	1896	1874	1898
Vehs Exited	1889	1880	1962	1952	1910	1914	1917
Starting Vehs	108	143	124	142	145	168	138
Ending Vehs	108	118	115	122	131	128	120
Travel Distance (mi)	903	889	917	928	904	908	908
Travel Time (hr)	66.0	63.3	64.3	67.5	63.8	69.2	65.7
Total Delay (hr)	30.5	28.2	28.3	31.1	28.1	33.6	30.0
Total Stops	3395	3255	3239	3512	3360	3469	3369
Fuel Used (gal)	38.2	37.5	38.3	39.4	37.7	39.4	38.4

Interval #0 Information Seeding

Start Time	4:50
End Time	5:00
Total Time (min)	10

Volumes adjusted by PHF, Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	5:00
End Time	5:15
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	2	3	5	7	8	9	Avg
Vehs Entered	1035	954	1029	980	994	959	992
Vehs Exited	998	966	1003	989	1004	993	993
Starting Vehs	108	143	124	142	145	168	138
Ending Vehs	145	131	150	133	135	134	135
Travel Distance (mi)	484	464	473	475	477	471	474
Travel Time (hr)	35.6	33.2	32.9	34.8	33.2	38.8	34.8
Total Delay (hr)	16.6	15.0	14.3	16.2	14.5	20.4	16.2
Total Stops	1936	1749	1636	1831	1748	1900	1799
Fuel Used (gal)	20.5	19.6	19.7	20.2	19.7	21.2	20.2

Interval #2 Information Recording2

Start Time	5:15
End Time	5:30
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	2	3	5	7	8	9	Avg
Vehs Entered	854	901	924	952	902	915	906
Vehs Exited	891	914	959	963	906	921	923
Starting Vehs	145	131	150	133	135	134	135
Ending Vehs	108	118	115	122	131	128	120
Travel Distance (mi)	419	426	444	453	428	437	434
Travel Time (hr)	30.3	30.0	31.4	32.7	30.5	30.4	30.9
Total Delay (hr)	13.9	13.3	14.0	14.8	13.6	13.2	13.8
Total Stops	1459	1506	1603	1681	1612	1569	1568
Fuel Used (gal)	17.7	17.9	18.6	19.1	18.0	18.2	18.3

10: Main Street & McClaine Street Performance by approach

Approach	EB	WB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.4	0.0	0.5	0.2
Total Delay (hr)	3.7	2.7	3.2	9.6
Total Del/Veh (s)	53.2	23.5	39.9	36.2
Stop Delay (hr)	3.1	2.2	2.5	7.8
Stop Del/Veh (s)	45.1	19.0	30.9	29.4

12: Water Street & Park Street Performance by approach

Approach	SB	All
Denied Delay (hr)	0.0	0.0
Denied Del/Veh (s)	0.2	0.2
Total Delay (hr)	0.2	0.2
Total Del/Veh (s)	1.4	1.4
Stop Delay (hr)	0.0	0.0
Stop Del/Veh (s)	0.0	0.0

13: Water Street & Oak Street Performance by approach

Approach	WB	SB	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.0	0.1
Total Delay (hr)	1.1	1.3	2.4
Total Del/Veh (s)	26.3	11.6	15.6
Stop Delay (hr)	1.0	0.9	1.8
Stop Del/Veh (s)	22.7	7.8	11.8

14: Water Street/Hwy 214/Water Street & Main Street Performance by approach

Approach	EB	WB	SB	All
Denied Delay (hr)	0.0	0.4	0.0	0.5
Denied Del/Veh (s)	0.0	5.7	0.4	1.5
Total Delay (hr)	1.8	2.6	2.4	6.9
Total Del/Veh (s)	13.9	35.7	22.1	21.9
Stop Delay (hr)	1.2	2.2	2.1	5.5
Stop Del/Veh (s)	9.1	30.1	18.6	17.3

15: Water Street/Hwy 214 & Lewis Street Performance by approach

Approach	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.4	0.1	0.2
Total Delay (hr)	0.3	0.2	0.5
Total Del/Veh (s)	4.7	1.7	2.7
Stop Delay (hr)	0.1	0.1	0.2
Stop Del/Veh (s)	1.9	0.6	1.0

18: 1st Street & Oak Street Performance by approach

Approach	EB	WB	NB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.3	0.1
Total Delay (hr)	0.9	0.9	0.8	2.6
Total Del/Veh (s)	16.4	14.2	9.0	12.6
Stop Delay (hr)	0.8	0.8	0.7	2.2
Stop Del/Veh (s)	14.6	11.9	7.7	10.8

19: 1st Street & Main Street Performance by approach

Approach	EB	WB	NB	All
Denied Delay (hr)	0.0	0.1	0.0	0.1
Denied Del/Veh (s)	0.0	2.8	0.3	0.7
Total Delay (hr)	1.5	0.7	1.8	3.9
Total Del/Veh (s)	19.7	15.5	22.6	19.9
Stop Delay (hr)	1.3	0.6	1.7	3.5
Stop Del/Veh (s)	16.8	13.2	21.2	17.8

20: 1st Street & Lewis Street Performance by approach

Approach	EB	WB	NB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.1	0.1	0.0
Total Delay (hr)	0.5	0.0	0.4	0.9
Total Del/Veh (s)	6.8	2.4	36.7	9.9
Stop Delay (hr)	0.4	0.0	0.3	0.7
Stop Del/Veh (s)	5.1	2.0	33.6	8.1

21: 2nd Street & Oak Street Performance by approach

Approach	EB	WB	NB	SB	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.0	0.5	1.2	0.2	0.3
Total Delay (hr)	0.1	0.4	0.1	0.9	1.5
Total Del/Veh (s)	1.6	4.7	13.7	44.3	8.2
Stop Delay (hr)	0.0	0.1	0.1	0.9	1.2
Stop Del/Veh (s)	0.4	1.5	13.3	44.2	6.4

95: 2nd Street & Lewis Street Performance by approach

Approach	EB	All
Denied Delay (hr)	0.0	0.0
Denied Del/Veh (s)	0.0	0.0
Total Delay (hr)	0.0	0.0
Total Del/Veh (s)	0.1	0.1
Stop Delay (hr)	0.0	0.0
Stop Del/Veh (s)	0.0	0.0

96: 2nd Street & Main Street Performance by approach

Approach	EB	SB	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0
Total Delay (hr)	0.0	0.0	0.0
Total Del/Veh (s)	0.6	0.8	0.6
Stop Delay (hr)	0.0	0.0	0.0
Stop Del/Veh (s)	0.1	0.4	0.2

97: 1st Street & Park Street Performance by approach

Approach	EB	NB	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0
Total Delay (hr)	0.0	0.0	0.0
Total Del/Veh (s)	0.0	0.5	0.5
Stop Delay (hr)	0.0	0.0	0.0
Stop Del/Veh (s)	0.0	0.2	0.2

Total Network Performance

Denied Delay (hr)	0.8
Denied Del/Veh (s)	1.6
Total Delay (hr)	29.1
Total Del/Veh (s)	51.5
Stop Delay (hr)	23.0
Stop Del/Veh (s)	40.7

SECTION H

REFINED PROJECT PRIORITIZATION

Pedestrian				
Rank	Number	Project	Start	Stop
2	SW-30	Sidewalk Infill on James Street	Jefferson Street	C Street
2	SW-03	Sidewalk Infill on South Water Street	Peach Street	City limits
5	SW-28	Sidewalk Infill on Western Avenue	Grant Streetjs	James Street
5	SW-31	Sidewalk Infill and Repair on Robinson Street	Mill Streetmte	Mark Twain Elementary
5	EC-08	Pedestrian Crossing Enhancements and Sidewalk Connections	1st Street/Jefferson Street	
7	SW-11	Sidewalk Infill on Jefferson Street	Mill Streetj	James Street
7	SW-34	Sidewalk Infill on Grant Street	Western Avenue	High School Driveway
8	SW-12	Sidewalk Infill on C Street	James Streetnws	N Water Street
9	EC-10	Pedestrian Crossing Enhancements (RRFB)	James Street/C Street	
10	SW-33	Sidewalk Infill on Bartlett Street, Norway Street	Church Street	Oak Street
11	SW-21	Sidewalk Infill on 2nd Street	Whittier Street	Hobart Street
13	SW-04	Sidewalk Infill on Main Street	3rd Street	Steelhammer Road
13	SW-18	Sidewalk Infill on Keene Avenue	Eureka Avenue	Coolidge Street
17	SW-16	Sidewalk Infill on James Street	Florida Drive	City limits
17	SW-10	Sidewalk Infill on 1st Street	Hobart Streetes	Existing section
17	SW-05	Sidewalk Infill on C Street	McClaine Street	James Street
17	SW-29	Sidewalk Infill on Brown Street	Water Street	480' North of Water
19	EC-18	Install Curb Ramps for Existing Crosswalk	Brown Street/Schlador Street	
19	SW-17	Sidewalk Infill on Steelhammer Road	Oak Street	City limits
20	SW-02	Sidewalk Infill on Pine Street	Grant Streetcl	City limits
21	EC-21	Install Crosswalk	East Leg of Mill Street/Robinson Street	
23	SW-32	Sidewalk Infill on Church Street	Bartlett St	North to Dead End
23	EC-19	Install Curb Ramps for Existing Crosswalk	NW Corner of Mill Street/Robinson Street	
25	EC-24	Install Street Lighting	Western Avenue (entire segment)	
25	EC-11	Pedestrian Crossing Enhancements	Oak Street/Church Street	
28	SW-13	Sidewalk Infill on McClaine Street	Craig Street	Phelpe Street
28	SW-01	Sidewalk Infill on Oak Street	Steelhammer Rd	City limits
28	EC-22	Install Crosswalk	South Leg of Western Avenue/Grant Street	
29	EC-15	Install Median Refuge Island to Reduce Crossing Distance	Water Street/Lewis Street	
31	EC-23	Install Crossing Warning Signs and Pavement Markings	Grant Street/Florida Street	
31	EC-09	Pedestrian Crossing Enhancements and Sight Distance Improvements	Oak Street/Mill Street	
32	SW-14	Sidewalk Infill on James Street	C Street nw	N Water Street
33	SW-19	Sidewalk Infill on Ike Mooney Road	South Water Street	Existing section
37	EC-02	Pedestrian Crossing Enhancements	South leg of Water Street/High Street	
37	SW-07	Sidewalk Infill on Westfield Street	Main Streetes	Existing section
37	EC-06	Pedestrian Crossing Enhancements	1st Street/Bow Tie Lane	
37	EC-17	Improve Lighting at Existing Crossing	Water Street/Jersey Street	
41	EC-04	Pedestrian Crossing Enhancements	North leg of 1st Street/A Street	
41	EC-03	Pedestrian Crossing Enhancements	North/South legs of 1st Street/B Street	
41	EC-01	Pedestrian Crossing Enhancements	South leg of Water Street/Park Street	
41	SW-08	Sidewalk Infill on North Water Street	James Streetcs	C Street
44	SW-06	Sidewalk Infill on C Street	Front Street	2nd Street
44	EC-20	Install Curb Ramps for Existing Crosswalk	NW and SE Corners of Robinson Street/Church Street	
44	EC-07	Pedestrian Crossing Enhancements	Water Street/Wesley Street	
45	SW-26	Sidewalk Infill on Hobart Street	1st Street	Monitor Road
48	SW-24	Sidewalk Infill on Eureka Avenue	Main Streetscl	south City limits
48	SW-27	Sidewalk Infill on Kromminga Drive	Pine Street	High School
48	EC-05	Pedestrian Crossing Enhancements	North leg of Water Street/A Street	
50	EC-13	Pedestrian Crossing Enhancements	S Water Street/Peach	
50	SW-09	Sidewalk Infill on Oak Street	Mill Street	Steelhammer Road
52	SW-15	Sidewalk Infill on West Main Street	Westfield Street	City limits
52	SW-23	Sidewalk Infill on Fiske Street	Main Streetca	Charles Avenue
56	EC-14	Close Crosswalk	West Leg of 1st Street/Lewis Street	
56	SW-22	Sidewalk Infill on North Water Street	C Streeta	A Street
56	SW-20	Sidewalk Infill on Ike Mooney Road	Existing section	City limits
56	EC-12	Pedestrian Crossing Enhancements	S Water Street/Adams	
57	SW-25	Sidewalk Infill on Monitor Road	Hobart Streetos	Oak Street
58	EC-16	Pedestrian Crossing Enhancements	Midblock (one side) 1st Street between Park Street and A Street	

Bicycle

Rank	Number	Project	Start	Stop
1	BP-34	Bicycle Boulevard with Traffic Calming on 2nd Street and Diverters at B Street	Jefferson Street	Jersey Street
2	BP-16	Bicycle Lanes on James Avenue	Hobart Road	C Street
3	BP-04	Bicycle Lanes on South Water Street	Lewis Street	Pioneer Drive
4	BP-15	Bicycle Lanes on McClaine Street	C Street	Main Street
5	BP-19	Bicycle Lanes on Main Street*	3rd Street	Steelhammer Road
6	BP-03	Bicycle Lanes on North Water Street	James Street	C Street
7	BP-07	Bicycle Lanes on Oak Streetn	Norway Street	Steelhammer Road
8	BP-28	Two-Way Raised Cycle Path on Westfield Street	Robert Frost Elementary	Center Street
9	BP-32	Bicycle Route Signing (shared facilities) and Bicycle Parking	Downtown Silverton	
10	BP-05	Bicycle Lanes on Silverton road	West City Limits	Existing sections
13	BP-25	Bicycle Lanes on 2nd Street, Koons St	Oak Street	S Water Street
13	BP-23	Bicycle Lanes on James Street	McClaine Street	C Street
13	BP-12	Bicycle Lanes on Main Street	Westfield Street	Water Street
14	BP-26	Bicycle Lanes on Church St, Kent St, Ames St, Reserve St	Robinson Street	Tillicum Street
15	BP-33	Bicycle Route Signing (shared facility)	Brown Street	
17	BP-01	Bicycle Lanes on 1st Street	Hobart Road	B Street
17	BP-06	Bicycle Lanes on Pine Street	West City Limits	James Ave
18	BP-02	Bicycle Lanes on Oak Streets	Steelhammer	East City Limits
19	BP-13	Bicycle Lanes on Oak Street3	3rd Street	Church Street
21	BP-18	Bicycle Lanes on Hobart Road	James Street	Monitor Road
21	BP-20	Bicycle Lanes on Kromminga Dr, Western St, Jefferson St	Pine Street	Mill Street
22	BP-27	Bicycle Lanes on Ike Mooney Rd, Sun Valley Dr, Frontier St, Pioneer Dr	S Water Street	OS-15 Alignment
23	BP-09	Bicycle Lanes on Ike Mooney Road	Pioneer Drive	East City Limits
25	BP-21	Bicycle Lanes on Grant St, Water St, James St, Silver St, Alder Ave, Brook St, W	Western Street	Fossholm Road
25	BP-11	Bicycle Lanes on Steelhammer Road	Oak Street	Evans Valley Road
27	BP-14	Bicycle Lanes on Pioneer Drive	South Water Street	Ike Mooney Road
27	BP-22	Bicycle Lanes on Peach St, Madison St, Cowing St, Coolidge St	S Water Street	Main Street
28	BP-24	Bicycle Lanes on Center Street	Westfield Street	Ross Avenue
31	BP-31	Regional Bikeway Connectionmt	Silverton City Limits	Mt. Angel
31	BP-30	Regional Bikeway Connectionsa	Silverton City Limits	Salem
31	BP-29	Regional Bikeway Connectionst	Silverton City Limits	Stayton
32	BP-08	Bicycle Lanes on Eureka Avenue	Main Street	South City Limits
33	BP-17	Bicycle Lanes on Monitor Road	Oak Street	Hobart Road
34	BP-10	Bicycle Lanes on Evans Valley Road	Steelhammer Road	East City Limits

Off-Street

Rank	Number	Project	Start	Stop
1	OS-09	Off-Street path #6 (2nd Street)	Hobart Road	Oak Street
2	OS-03	Off-Street path #2 (Creek trail)	C Street	Silver Falls Library
3	OS-15	Off-Street Path Connection #10 (rail alignment)	Monson Road	Hobart Road
4	OS-07	Off-Street path #4	Existing rail line alignment	Church Street extension
5	OS-04	Pedestrian Bridgec	Cowing Street	
6	OS-19	Off-Street Path Connection #14	Mill Street	Sage Street
7	OS-16	Off-Street Path Connection #11	Westfield Street	Connection #9 Alignment
9	OS-17	Off-Street Path Connection #12	Coolidge Street	Anderson Drive
9	OS-22	Off-Street Path Connection #18	Oak Street	Connection #14 Alignment
10	OS-18	Off-Street Path Connection #13	Mallard Street	Sage Street
12	OS-11	Off-Street path #8	Lincoln Street	east side of Webb Lake
12	OS-20	Off-Street Path Connection #15	Pioneer Drive	Main Street
14	OS-01	Off-Street path #1	Charles Avenue	Peach Street
14	OS-05	Pedestrian Stairway Connection	Coolidge Park	Anderson Drive
16	OS-21	Off-Street Path Connection #16	Eastview Lane	Connection #15 Alignment
16	OS-14	Off-Street Path Connection #9	Pettit Reservoir	Silverton Road
18	OS-10	Off-Street path #7	Jefferson Street	Eska Way
18	OS-23	Off-Street Path Connection #17	Pine Street	Monson Road
19	OS-02	Pedestrian Bridgep	Peach Street	
20	OS-08	Off-Street path #5	Eska Way	Existing Church Street alignment
21	OS-12	Salamander Footbridge Connection	Coolidge McClaine Park	
22	OS-06	Off-Street path #3	C Street	Off-Street Connection #10 Alignment

Motor Vehicle

Rank	Number	Project	Start	Stop
1	MV-03	Install a Roundabout or Traffic Signal1jef	1st Street	Jefferson Street
2	MV-08	Improve Sight Distance and Crossing Safety	Oak Street	Mill Street
4	MV-10	Add Southbound Right Turn Lane, Prohibit Southbound Left Turn	McClaine Street	C Street
4	MV-22	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment213mon	Highway 213	Monitor Road
6	MV-17	Eastside North-South Connector #4	Monitor Road/Oak Street	Pioneer Drive
6	MV-02	Install a Roundabout or Traffic Signal1stHo	1st Street	Hobart Road
7	MV-20	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment213steel	Highway 213	Steelhamer Road
8	MV-06	Install a Traffic SignalMainMc	Main Street	McClaine Street
9	MV-12	Install a Traffic Signal and add Southbound Right Turn Lane	Main Street	Water Street
11	MV-13	Install a Traffic Signal and add Eastbound Left Turn Lane	Main Street	1st Street
11	MV-07	Install Center Two-Way Left-Turn Lane (TWLTL) on C Street	Silver Creek Bridge	James Street
12	MV-14	Install a Traffic Signaloakwa	Oak Street	Water Street
13	MV-15	Westside North-South Connector #2	Silverton Road	Main Street
14	MV-23	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment214pi	Highway 214	Pioneer Drive
16	MV-05	Install a Roundaboutwesmain	Westfield Street	Main Street
16	MV-16	Westside North-South Connector #3	Main Street	South Water Street
18	MV-21	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatmentpion	Pioneer Drive	Evans Valley Road
18	MV-19	Install a Traffic Signaloak1	Oak Street	1st Street
19	MV-11	Close East Leg of Intersection	1st Street	C Street
20	MV-04	Bridge Crossing over Silver Creek	Water Street	Brook Street
23	MV-01	Install a Roundabout or Traffic Signaljampi	James Street	Pine Street
23	MV-24	Restrict Turning Movements on Northbound and Southbound Approaches	Silverton Road	Fossholm Road
23	MV-09	Disconnect Fossholm Road from McClaine Street, extend Industrial Way to Monson Road, and apply t	McClaine Street	Fossholm Road
24	MV-18	Bridge Crossing over Silver Creek Connector #6	High Street	

Transit

Rank	Name	Description		
1	Commuter C	Develop a commuter transit connection to Salem. Install a transit stop downtown.		
2	Enhance Dia	Provide service enhancements to the existing dial-a-ride services, including increased hours of operation and ease of scheduling		
3	Local Fixed I	Conduct feasibility study for the implementation of fixed-route transit service		
4	Park-and-Ric	Develop a park-and-ride facility on the west side of Silverton		
5	Park-and-Ric	Develop a park-and-ride facility on the east side of Silverton (in the industrial area between Mill Street and Monitor Road) and provide transit service (bus stops, shelters, lighting, etc.)		

Rail

Rank	Number	Project	Start	Stop
1	RR-03	Rail/Highway Grade Crossing Improvements1jeff	1st Street	Jefferson Street
2	RR-04	Rail/Highway Grade Crossing ImprovementsJamC	James Street	C Street
3	RR-02	Rail/Highway Grade Crossing Improvements on Hobart Road	1st Street	Hobart Road
4	RR-01	Address RR Crossing Safety/Ops Issues	McClaine Street	Fossholm Road

Avg Order by Mode	AvgScore	Number	project
1	16634	MV-03	Install a Roundabout or Traffic Signal1jef
2	15146	SW-30	Sidewalk Infill on James Street
2	14955	SW-03	Sidewalk Infill on South Water Street
5	14765	SW-28	Sidewalk Infill on Western Avenue
5	14574	SW-31	Sidewalk Infill and Repair on Robinson Street
5	14384	EC-08	Pedestrian Crossing Enhancements and Sidewalk Connections
2	14222	MV-08	Improve Sight Distance and Crossing Safety
7	14193	SW-11	Sidewalk Infill on Jefferson Street
1	14162	RR-03	Rail/Highway Grade Crossing Improvements1jeff
7	14002	SW-34	Sidewalk Infill on Grant Street
1	13985	BP-34	Bicycle Boulevard with Traffic Calming on 2nd Street and Diverters at B Street
4	13896	MV-10	Add Southbound Right Turn Lane, Prohibit Southbound Left Turn
2	13824	BP-16	Bicycle Lanes on James Avenue
8	13812	SW-12	Sidewalk Infill on C Street
3	13662	BP-04	Bicycle Lanes on South Water Street
9	13621	EC-10	Pedestrian Crossing Enhancements (RRFB)
4	13570	MV-22	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment213mon
1	13568	OS-09	Off-Street path #6 (2nd Street)
4	13501	BP-15	Bicycle Lanes on McClaine Street
10	13431	SW-33	Sidewalk Infill on Bartlett Street, Norway Street
5	13340	BP-19	Bicycle Lanes on Main Street*
1	13309	T	Commuter Connection to Salem
6	13244	MV-17	Eastside North-South Connector #4
11	13240	SW-21	Sidewalk Infill on 2nd Street
2	13230	OS-03	Off-Street path #2 (Creek trail)
6	13179	BP-03	Bicycle Lanes on North Water Street
13	13049	SW-04	Sidewalk Infill on Main Street
7	13017	BP-07	Bicycle Lanes on Oak Streetn
6	12918	MV-02	Install a Roundabout or Traffic Signal1stHo
3	12891	OS-15	Off-Street Path Connection #10 (rail alignment)
13	12859	SW-18	Sidewalk Infill on Keene Avenue
8	12856	BP-28	Two-Way Raised Cycle Path on Westfield Street
9	12695	BP-32	Bicycle Route Signing (shared facilities) and Bicycle Parking
17	12668	SW-16	Sidewalk Infill on James Street
7	12592	MV-20	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment213steel
4	12553	OS-07	Off-Street path #4
10	12533	BP-05	Bicycle Lanes on Silverton road
17	12478	SW-10	Sidewalk Infill on 1st Street
2	12457	T	Enhance Dial-a-Ride services
13	12372	BP-25	Bicycle Lanes on 2nd Street, Koons St
17	12287	SW-05	Sidewalk Infill on C Street
8	12266	MV-06	Install a Traffic SignalMainMc
5	12214	OS-04	Pedestrian Bridgec
13	12211	BP-23	Bicycle Lanes on James Street
17	12096	SW-29	Sidewalk Infill on Brown Street
13	12049	BP-12	Bicycle Lanes on Main Street
9	11940	MV-12	Install a Traffic Signal and add Southbound Right Turn Lane
19	11906	EC-18	Install Curb Ramps for Existing Crosswalk
14	11888	BP-26	Bicycle Lanes on Church St, Kent St, Ames St, Reserve St
6	11876	OS-19	Off-Street Path Connection #14
15	11727	BP-33	Bicycle Route Signing (shared facility)
19	11715	SW-17	Sidewalk Infill on Steelhammer Road
2	11657	RR-04	Rail/Highway Grade Crossing ImprovementsJamC
11	11614	MV-13	Install a Traffic Signal and add Eastbound Left Turn Lane
3	11605	T	Local Fixed Route Transit Feasibility Study
17	11566	BP-01	Bicycle Lanes on 1st Street
7	11538	OS-16	Off-Street Path Connection #11
20	11525	SW-02	Sidewalk Infill on Pine Street
17	11404	BP-06	Bicycle Lanes on Pine Street
21	11334	EC-21	Install Crosswalk
11	11288	MV-07	Install Center Two-Way Left-Turn Lane (TWLTL) on C Street
18	11243	BP-02	Bicycle Lanes on Oak Streets
9	11199	OS-17	Off-Street Path Connection #12
23	11143	SW-32	Sidewalk Infill on Church Street
19	11082	BP-13	Bicycle Lanes on Oak Street3
12	10962	MV-14	Install a Traffic Signaloakwa
23	10953	EC-19	Install Curb Ramps for Existing Crosswalk
21	10920	BP-18	Bicycle Lanes on Hobart Road
9	10861	OS-22	Off-Street Path Connection #18
25	10762	EC-24	Install Street Lighting
21	10759	BP-20	Bicycle Lanes on Kromminga Dr, Western St, Jefferson St
4	10753	T	Park-and-Ride Lot
13	10636	MV-15	Westside North-South Connector #2
22	10598	BP-27	Bicycle Lanes on Ike Mooney Rd, Sun Valley Dr, Frontier St, Pioneer Dr

25	10572	EC-11	Pedestrian Crossing Enhancements
10	10522	OS-18	Off-Street Path Connection #13
23	10436	BP-09	Bicycle Lanes on Ike Mooney Road
28	10381	SW-13	Sidewalk Infill on McClaine Street
14	10310	MV-23	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment214pi
25	10275	BP-21	Bicycle Lanes on Grant St, Water St, James St, Silver St, Alder Ave, Brook St, Wilson St, Short St
28	10190	SW-01	Sidewalk Infill on Oak Street
12	10184	OS-11	Off-Street path #8
25	10114	BP-11	Bicycle Lanes on Steelhammer Road
28	10000	EC-22	Install Crosswalk
16	9984	MV-05	Install a Roundaboutwesmain
27	9953	BP-14	Bicycle Lanes on Pioneer Drive
5	9901	T	Park-and-Ride Lot and Increased Transit Service
12	9846	OS-20	Off-Street Path Connection #15
29	9809	EC-15	Install Median Refuge Island to Reduce Crossing Distance
27	9791	BP-22	Bicycle Lanes on Peach St, Madison St, Cowing St, Coolidge St
16	9658	MV-16	Westside North-South Connector #3
28	9630	BP-24	Bicycle Lanes on Center Street
31	9619	EC-23	Install Crossing Warning Signs and Pavement Markings
14	9507	OS-01	Off-Street path #1
31	9469	BP-31	Regional Bikeway Connectionmt
31	9428	EC-09	Pedestrian Crossing Enhancements and Sight Distance Improvements
18	9332	MV-21	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatmentpion
31	9307	BP-30	Regional Bikeway Connectionsa
32	9237	SW-14	Sidewalk Infill on James Street
14	9169	OS-05	Pedestrian Stairway Connection
3	9152	RR-02	Rail/Highway Grade Crossing Improvements on Hobart Road
31	9146	BP-29	Regional Bikeway Connectionst
33	9047	SW-19	Sidewalk Infill on Ike Mooney Road
18	9006	MV-19	Install a Traffic Signaloak1
32	8985	BP-08	Bicycle Lanes on Eureka Avenue
37	8856	EC-02	Pedestrian Crossing Enhancements
16	8830	OS-21	Off-Street Path Connection #16
33	8823	BP-17	Bicycle Lanes on Monitor Road
19	8680	MV-11	Close East Leg of Intersection
37	8666	SW-07	Sidewalk Infill on Westfield Street
34	8662	BP-10	Bicycle Lanes on Evans Valley Road
16	8492	OS-14	Off-Street Path Connection #9
37	8475	EC-06	Pedestrian Crossing Enhancements
20	8354	MV-04	Bridge Crossing over Silver Creek
37	8284	EC-17	Improve Lighting at Existing Crossing
18	8154	OS-10	Off-Street path #7
41	8094	EC-04	Pedestrian Crossing Enhancements
23	8028	MV-01	Install a Roundabout or Traffic Signaljampi
41	7903	EC-03	Pedestrian Crossing Enhancements
18	7815	OS-23	Off-Street Path Connection #17
41	7713	EC-01	Pedestrian Crossing Enhancements
23	7702	MV-24	Restrict Turning Movements on Northbound and Southbound Approaches
41	7522	SW-08	Sidewalk Infill on North Water Street
19	7477	OS-02	Pedestrian Bridgep
23	7376	MV-09	Disconnect Fossholm Road from McClaine St, ext Industrial Way to Monson Road, traffic calming on Brook Street
44	7331	SW-06	Sidewalk Infill on C Street
44	7141	EC-20	Install Curb Ramps for Existing Crosswalk
20	7138	OS-08	Off-Street path #5
24	7050	MV-18	Bridge Crossing over Silver Creek Connector #6
44	6950	EC-07	Pedestrian Crossing Enhancements
21	6800	OS-12	Salamander Footbridge Connection
45	6760	SW-26	Sidewalk Infill on Hobart Street
4	6647	RR-01	Address RR Crossing Safety/Ops Issues
48	6569	SW-24	Sidewalk Infill on Eureka Avenue
22	6462	OS-06	Off-Street path #3
48	6378	SW-27	Sidewalk Infill on Kromminga Drive
48	6188	EC-05	Pedestrian Crossing Enhancements
50	5997	EC-13	Pedestrian Crossing Enhancements
50	5807	SW-09	Sidewalk Infill on Oak Street
52	5616	SW-15	Sidewalk Infill on West Main Street
52	5425	SW-23	Sidewalk Infill on Fiske Street
56	5235	EC-14	Close Crosswalk
56	5044	SW-22	Sidewalk Infill on North Water Street
56	4854	SW-20	Sidewalk Infill on Ike Mooney Road
56	4663	EC-12	Pedestrian Crossing Enhancements
57	4472	SW-25	Sidewalk Infill on Monitor Road
58	4282	EC-16	Pedestrian Crossing Enhancements

SECTION I

MEMORANDUM 8

FINANCE PROGRAM

Technical Memorandum

DATE: January 15, 2018

TO: Silverton TSP Update Project Management Team

FROM: Ray Delahanty, AICP
Kamilah Buker, E.I.T.

SUBJECT: **Silverton Transportation System Plan Update**
Finance Program

The purpose of this memorandum is to present the transportation funding that is expected to be available through 2037, as well as the potential investments and associated costs identified in the solutions phase of the Transportation System plan (TSP) process. The funding assumptions will help prioritize the investments the City can make in the transportation system, and will be utilized to develop a set of transportation improvements that will likely be funded to meet identified needs through 2037.

Current City Funding Sources

Four general funding sources are utilized by the City for transportation, Fees and Permits, a System Develop Charge (SDC), Local Motor Vehicle Fuel Tax, and the State Highway Apportionment. In addition to City-funded projects, new private development will lead some of the proposed transportation projects in Silverton.

Fees and Permits include inspection fees, plan review fees, and permits for driveways and sidewalks. The City has adopted a local, 2 cents per gallon gas tax for transportation improvements.

State funds through the State Highway Apportionment come from state motor vehicle fuel tax, vehicle registration fees, and truck weight-mile fees, and are distributed on a per capita basis. Furthermore, House Bill 2017 introduced or increased several taxes and fees such as the state gas tax and vehicle registration fees that provides new revenue to earmarked projects. Cities and counties receive a share of State Highway Trust Fund monies. By statute, the money may be used for any road-related purpose, including walking, biking, bridge, street, signal, and safety improvements.

The state gas tax funds have previously failed to keep up with cost increases and inflation. With increased fuel efficiency of vehicles and the State's emphasis on reducing vehicle miles traveled, the real revenue collected has gradually eroded over time. The gas tax in Oregon increased on

January 1, 2011 by six cents, to 30 cents per gallon. This was the first increase in the state gas tax since 1993.

Revenue: Current revenue sources are expected to provide about $33 million through 2037. Over the past five years, Silverton averaged $226,000 in Fees and Permits, $545,000 in State Highway Fund shared revenue, and $297,000 in SDCs per year. As a conservative estimate,[1] the same levels ($226,000 and $545,000) were assumed for Fees/Permits and State Highway Fund revenue in the future. House Bill 2017 is expected to contribute an additional $225,000 annually. It is expected that Local Motor Vehicle Fuel Tax will generate roughly $173,000 annually. Forecast estimated SDC revenue was based, instead, on the current rate per PM peak hour used in the City's SDC methodology (about $4,000 per trip end) and the number of new PM peak trip ends in the city expected over the planning period (about 1,800 trips). This calculation yields an estimate of $7,200,000 over the planning horizon.

Expenditures: Current expenditures are expected to be around $10 million through 2037, based on revenue and expenditures over the past five years. Over the past five years, the City averaged about $170,000 in personnel costs, $100,000 in materials and services, $250,000 in capital costs related to operations and maintenance, and $260,000 in transfers (ongoing debt service).

Revenue and expenditures are summarized in Table 1.

ODOT All Road Transportation Safety Project (ARTS) Funding

ODOT All Roads Transportation Safety Program (ARTS) is used to address safety challenges on all public roads. ODOT may increase the amount of funding available for safety projects on local roads. Safety funding will be distributed to each ODOT region, which will collaborate with local governments to select projects that can reduce fatalities and serious injuries, regardless of whether they lie on a local road or a state highway.

Projects will be built into the 2021-2024 STIP timeframe. An application must be submitted to obtain ARTS funding for local roads. In addition, the funds must make use of ODOT-approved countermeasures directed towards decreasing fatal and serious injury crashes. It is expected that ODOT will allocate about $2.2 million for improvements in Silverton over the planning horizon.

[1] The population growth rate in Silverton was assumed to be roughly the same as the cost inflation rate, therefore, existing revenues were maintained through 2037.

Summary of Funds for Transportation Improvements: About $17 million in City funds and $2.2 million in additional ODOT ARTS funds are expected to be available for street improvement needs after accounting for estimated expenditures through 2037. These funds can potentially be spent on transportation improvement needs.

Table 1: Silverton Transportation Funding (2017 Dollars)

Revenue Source	Average Annual Amount	Estimated Amount Through 2037
State Highway Apportionment	$545,000	$10,900,000
House Bill 2017	$225,000	$4,500,000
System Development Charges[1]	$297,000	$7,200,000
Local Motor Vehicle Fuel Tax	$173,000	$3,460,000
Fees and Permits	$226,000	$4,520,000
Miscellaneous Revenue	$114,000	$2,290,000
Total Revenues (5-year average)	**$1,580,000**	**$32,870,000**
Expenditures	**Average Annual Amount**	**Estimated Amount Through 2035**
Personnel Services	$172,000	$3,440,000
Materials and Services	$102,000	$2,040,000
Capital Operations/Maintenance	$248,000	$4,960,000
Transfers	$263,000	$5,260,000
Total Expenditures (5-year average)	**$785,000**	**$15,700,000**
Revenue Over Expenditures	**$795,000**	**$17,170,000**
ODOT ARTS Funding		$2,200,000
Total Estimated Funding		**$19,370,000**

[1] Estimated SDCs were based on forecast future trip-ends rather than historical averages

Project Investments

Taking the network approach to transportation system improvements, the projects in this plan fall within one of several categories:

- **Motor Vehicle** projects to improve connectivity, safety and capacity throughout the City. Silverton identified 24 driving projects that will cost an estimated $28.4 million to complete.
- **Pedestrian** projects for sidewalk infill and crossing enhancements, providing seamless connections for pedestrians on major routes throughout the City. Sidewalk infill on local roads will be addressed through city code changes and these projects are expected to be financed by developers or property owners. Silverton identified 58 walking projects on collector roadways that will cost an estimated $13.5 million to complete.
- **Biking** projects including an integrated network of bicycle lanes and shared roadways to facilitate convenient travel citywide. Silverton identified 34 biking projects that will cost an estimated $30 million to complete.
- **Shared-Use Path** projects providing local off-street travel for walkers and cyclists. The citywide shared-use path vision includes 22 projects totaling an estimated $6.4 million.
- **Transit** projects to enhance the quality and convenience for passengers. Silverton identified five transit projects totaling an estimated $750,000.

Overall, Silverton identified 147 individual transportation solutions and a downtown connectivity solution, totaling an estimated $81 million worth of investments. Some of the projects identified in the TSP may be funded through other sources and led by development or funding partners such as Marion County or ODOT. Based on current funding levels, the City is expected to have funding shortfall of approximately $62 million to fund the projects included in the TSP. The City may wish to consider expanding its funding options in order to provide a reasonable funding strategy so improvements can be constructed in a timely manner. Potential additional funding sources are included in the next section.

Potential Additional Funding Sources

Transportation funding options include assessments and charges, and state and federal appropriations, grants, and loans. All of these resources can be constrained based on a variety of factors, including the willingness of local leadership and the electorate to burden citizens and businesses; the availability of local funds to be dedicated or diverted to transportation issues from other competing City programs; and the availability of state and federal funds. Nonetheless, it is important for the City to consider all opportunities for providing, or enhancing, funding for the transportation improvements included in the TSP.

The following sources have been used by cities to fund the capital and maintenance aspects of their transportation programs. There may be means to begin to or further utilize these sources, as described below, to address existing or new needs identified in the TSP.

Transportation Utility Fee

A transportation utility fee is a recurring monthly charge that is paid by all residences and businesses within the City. The fee can be based on the number of trips a particular land use generates or as a flat fee per unit. It can be collected through the City's regular utility billing. Existing law places no express restrictions on the use of transportation utility fee funds, other than the restrictions that normally apply to the use of government funds.[2] Some cities utilize the revenue for any transportation related project, including construction, improvements and repairs. However, many cities choose to place self-imposed restrictions or parameters on the use of the funds.

Assuming a flat fee of $10.00 per month per water meter for both residential and commercial uses in the City (similar to the fee charged in Bay City, Oregon), the City could collect approximately an additional $15 million for transportation related expenses through 2037.

Safe Routes to School

The Oregon Safe Routes to School (SRTS) Program has money allocated for projects at schools that were defined through the SRTS school audits done as part of the TSP update. Potential grant funds are distributed as a reimbursement program through an open and competitive process. Funding is available through this program for pedestrian and bicycle infrastructure projects within two miles of schools. These funds should be pursued to implement key pedestrian and bicycle projects identified through the SRTS process.

General Fund Revenues

At the discretion of the City Council, the City can allocate General Fund revenues to pay for its Transportation program (General Fund revenues primarily include property taxes, use taxes, and any other miscellaneous taxes and fees imposed by the City). This allocation is completed as a part of the City's annual budget process, but the funding potential of this approach is

[2] Implementing Transportation Utility Fees, League of Oregon Cities

constrained by competing community priorities set by the City Council. General Fund resources can fund any aspect of the program, from capital improvements to operations, maintenance, and administration. Additional revenues available from this source are only available to the extent that either General Fund revenues are increased or City Council directs and diverts funding from other City programs.

Urban Renewal District

An Urban Renewal District (URD) would be a tax-funded district within the City. The URD would be funded with the 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. Use of the funding includes, but is not limited to, transportation. Improvements are funded by the incremental taxes, rather than fees.

Local Improvement Districts

Local Improvement Districts (LIDs) can be formed to fund capital transportation projects. LIDs provide a means for funding specific improvements that benefit a specific group of property owners. LIDs require owner/voter approval and a specific project definition. Assessments are placed against benefiting properties to pay for improvements. LIDs can be matched against other funds where a project has system wide benefit beyond benefiting the adjacent properties. LIDs are often used for sidewalks and pedestrian amenities that provide local benefit to residents along the subject street.

Debt Financing

While not a direct funding source, debt financing can be used to mitigate the immediate impacts of significant capital improvement projects and spread costs over the useful life of a project. This has been successful recently in Oregon communities such as Bend and McMinnville, where general obligation (GO) bond measures were passed. Key to the measures' success was that the increased property taxes were earmarked toward a defined set of projects with strong public support.

Though interest costs are incurred, the use of debt financing can serve not only as a practical means of funding major improvements, but is also viewed as an equitable funding strategy, spreading the burden of repayment over existing and future customers who will benefit from the projects. The obvious caution in relying on debt service is that a funding source must still be identified to fulfill annual repayment obligations.

Developing the Plan

Silverton must make investment decisions to develop a set of transportation improvements that will likely be funded to meet identified needs through 2037. The City is expected to have approximately $19 million to cover project costs identified for the highest priority projects. Unless the City expands its funding options, most of the transportation solutions identified for the City are not reasonably likely to be funded through 2037. For this reason, the transportation solutions will be split into three categories. Those reasonably expected to be funded by 2037 were included in the Likely Funded Transportation System, those that may be funded if additional funding sources are identified are included in the Possibly Funded Transportation System, and the projects that are not expected to be funded by 2037 were included in the Aspirational Transportation System.

Likely Funded Transportation System

The Likely Funded Plan identifies the transportation solutions reasonably expected to be funded by 2037 and have the highest priority for implementation. Using the nine goals (see Technical Memorandum #3- Goals, Objectives and Evaluation Criteria), the transportation solutions were evaluated and compared to one another. Greater value was placed on the projects stakeholders felt were most important to the community. About $19 million worth of investments, shown in Table 2, are included in the Likely Funded Transportation System.

Table 2: Likely Funded Projects

Project No.	Description	Start	End	Total ($1000)
MV-02	Install a Roundabout or Traffic Signal	1st Street (OR 214)	Hobart Road	$840
MV-06	Install a Traffic Signal	Main Street	McClaine Street	$790
MV-09	Disconnect Fossholm Road from McClaine Street, extend Industrial Way to Monson Road, and apply traffic calming strategies on Brook Street	McClaine Street	Fossholm Road	$660
MV-05	Install a Roundabout	Westfield Street	Main Street	$330
MV-12	Install a Traffic Signal and add Southbound Right Turn Lane	Main Street	Water Street (OR 214)	$1,200
MV-13	Install a Traffic Signal and add Eastbound Left Turn Lane	Main Street	1st Street (OR 214)	$1,200
MV-14	Install a Traffic Signal	Oak Street (OR 213)	Water Street (OR 214)	$840
MV-19	Install a Traffic Signal	Oak Street (OR 213)	1st Street (OR 214)	$840
MV-01	Install a Roundabout or Traffic Signal	James Street	Pine Street	$330
MV-03	Install a Roundabout or Traffic Signal	1st Street (OR 214)	Jefferson Street	$840
MV-20	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Highway 213	Steelhammer Road	$1,000
MV-21	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Pioneer Drive	Evans Valley Road	$330

Project No.	Description	Start	End	Total ($1000)
MV-23	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Highway 214	Pioneer Drive	$1,000
MV-10	Add Southbound Right Turn Lane, Prohibit Southbound Left Turn	McClaine Street	C Street	$330
MV-08	Improve Sight Distance and Crossing Safety	Oak Street (OR 213)	Mill Street	$10
MV-11	Close East Leg of Intersection	1st Street (OR 214)	C Street	$10
BP-34	Bicycle Boulevard with Traffic Calming on 2nd Street and Diverters at B Street	Jefferson Street	Jersey Street	$1050
EC-08	Pedestrian Crossing Enhancements and Sidewalk Connections	1st Street (OR 214)/ Jefferson Street		$50
SW-28	Sidewalk Infill on Western Avenue	Grant Street	James Street	$50
SW-30	Sidewalk Infill and Bike Lanes on James Street	Jefferson Street	C Street	$2,200
EC-24	Install Street Lighting	Western Avenue (entire segment)		$90
EC-10	Pedestrian Crossing Enhancements (RRFB)	James Street/C Street		$50
EC-11	Pedestrian Crossing Enhancements	Oak Street (OR 213)/ Church Street		$20
SW-04	Sidewalk Infill on Main Street	3rd Street	Steelhammer Road	$750
EC-18	Install Curb Ramps for Existing Crosswalk	Brown Street/Schlador Street		$10
SW-11	Sidewalk Infill on Jefferson Street	Mill Street	James Street	$280
EC-21	Install Crosswalk	East Leg of Mill Street/Robinson Street		$10
EC-22	Install Crosswalk	South Leg of Western Avenue/Grant Street		$10
SW-31	Sidewalk Infill and Repair on Robinson Street	Mill Street	Mark Twain Elementary	$20
SW-33	Sidewalk Infill on Bartlett Street, Norway Street	Church Street	Oak Street (OR 213)	$40
SW-03	Sidewalk Infill on South Water Street (OR 214)	Peach Street	City limits	$1,250
SW-21	Sidewalk Infill on 2nd Street	Whittier Street	Hobart Street	$640
BP-25	Bicycle Facilities on 2nd Street, Koons St	Jersey Street	S Water Street (OR 214)	$500
OS-17	Shared-Use Path #14	Mill Street	Sage Street	$400
TS-01	Commuter Connection to Salem	Downtown Silverton	Salem	$140
RR-03	Rail/Highway Grade Crossing Improvements on Jefferson Street near Highway 214/1st Street (OR 214)			$480
			TOTAL	**$18,600**

* Denotes projects that will require coordination with ODOT or Marion County.

Possibly Funded Transportation System

The Possibly Funded Plan identifies additional transportation solutions that could be funded if the City develops new revenue sources. If the new funding sources do not become viable options, these projects would not be funded. The assumed possible new sources are summarized in Table 3:

Table 3: Potential New Funding Sources

Potential Revenue Source	Estimated Amount Through 2037
Transportation Utility Fee	$15,000,000
Total New Revenue	**$15,000,000**

Using these potential new funding sources, the additional projects in Table 4 could be funded. More projects could be funded through other sources, such as development, state or federal funding, urban renewal districts, local improvement districts, and reallocating general fund and lodging tax revenues to transportation projects. The Possibly Funded Transportation System includes about $15 million in transportation investments.

Table 4: Possibly Funded Projects

Project No.	Description	Start	End	Total ($1000)
MV-15	Westside North-South Connector #2	Silverton Road	Main Street	$5,950
EC-19	Install Curb Ramps for Existing Crosswalk	NW Corner of Mill Street/Robinson Street		$10
EC-20	Install Curb Ramps for Existing Crosswalk	NW and SE Corners of Robinson Street/Church Street		$10
EC-23	Install Crossing Warning Signs and Pavement Markings	Grant Street/Florida Street		$10
SW-05	Sidewalk Infill on C Street	McClaine Street	James Street	$210
SW-10	Sidewalk Infill on 1st Street (OR 214)	Hobart Street	Existing section	$640
SW-17	Sidewalk Infill on Steelhammer Road	Oak Street (OR 213)	City limits	$500
SW-18	Sidewalk Infill on Keene Avenue	Eureka Avenue	Coolidge Street	$420
SW-01	Sidewalk Infill on Oak Street (OR 213)	Steelhammer Rd	City limits	$480
SW-29	Sidewalk Infill on Brown Street	Water Street	480' North of Water Street	$20
SW-32	Sidewalk Infill on Church Street	Bartlett St	North to Dead End	$10
SW-34	Sidewalk Infill on Grant Street	Western Avenue	High School Driveway	$20

Project No.	Description	Start	End	Total ($1000)
EC-01	Pedestrian Crossing Enhancements	South leg of Water Street (OR 214)/ Park Street		$20
EC-02	Pedestrian Crossing Enhancements	South leg of Water Street (OR 214)/ High Street		$20
EC-03	Pedestrian Crossing Enhancements	North/South legs of 1st Street (OR 214)/ B Street		$30
EC-04	Pedestrian Crossing Enhancements	North leg of 1st Street (OR 214)/ A Street		$20
EC-05	Pedestrian Crossing Enhancements	North leg of Water Street (OR 214)/ A Street		$20
EC-06	Pedestrian Crossing Enhancements	1st Street (OR 214)/ Bow Tie Lane		$20
EC-07	Pedestrian Crossing Enhancements	Water Street (OR 214)/Wesley Street		$20
EC-09	Pedestrian Crossing Enhancements and Sight Distance Improvements	Oak Street (OR 213)/Mill Street		$30
EC-12	Pedestrian Crossing Enhancements	S Water Street (OR 214)/Adams		$20
EC-13	Pedestrian Crossing Enhancements	S Water Street (OR 214)/Peach		$20
EC-14	Close Crosswalk	West Leg of 1st Street (OR 214)/ Lewis Street		$10
EC-15	Install Median Refuge Island to Reduce Crossing Distance	Water Street (OR 214)/Lewis Street		$10
EC-16	Pedestrian Crossing Enhancements	Midblock (one side) 1st Street (OR 214) between Park Street and A Street		$20
SW-07	Sidewalk Infill on Westfield Street	Main Street	Existing section	$30
SW-14	Sidewalk Infill on James Street	C Street	N Water Street (OR 214)	$70
BP-01	Bicycle Lanes on 1st Street (OR 214)	Hobart Road	B Street	$90
BP-04	Bicycle Lanes on South Water Street (OR 214)	Lewis Street	Pioneer Drive	$10
BP-26	Bicycle Lanes on Church St, Kent St, Ames St, Reserve St	Robinson Street	Tillicum Street	$730
BP-07	Bicycle Lanes on Oak Street (OR 213)	Norway Street	Steelhammer Road	$20
BP-12	Bicycle Lanes on Main Street	Westfield Street	Water Street (OR 214)	$70
BP-13	Bicycle Lanes on Oak Street (OR 213)	3rd Street	Church Street	$260

Project No.	Description	Start	End	Total ($1000)
BP-15	Bicycle Lanes on McClaine Street	C Street	Main Street	$50
BP-16	Bicycle Lanes on James Avenue	Hobart Road	C Street	$1,000
BP-19	Bicycle Lanes on Main Street*	3rd Street	Steelhammer Road	$560
BP-20	Bicycle Lanes on Kromminga Dr, Western St, Jefferson St	Pine Street	Mill Street	$1,530
BP-03	Bicycle Lanes on North Water Street	James Street	C Street	$190
BP-02	Bicycle Lanes on Oak Street (OR 213)	Steelhammer	East City Limits	$340
BP-06	Bicycle Lanes on Pine Street	West City Limits	James Ave	$460
OS-09	Off-Street path #6 (2nd Street)	Hobart Road	Oak Street (OR 213)	$180
OS-11	Off-Street path #8	Lincoln Street	east side of Webb Lake	$190
TS-04	Local Fixed Route Transit Feasibility Study			$70
RR-04	Rail/Highway Grade Crossing Improvements on James Street near C Street			$480
			TOTAL	**$14,870**

* Denotes projects that will require coordination with ODOT or Marion County.

Aspirational Transportation System

The projects and actions outlined within the Likely Funded System and Possibly Funded System will significantly improve Silverton's transportation system. If the City is able to implement a majority of the Likely Funded System and Possibly Funded System, nearly two decades from now Silverton residents will have access to a safer, more balanced multimodal transportation network.

The Aspirational Transportation System identifies those transportation solutions that are not reasonably expected to be funded by 2037, but many of which are critically important to the transportation system. Some of the projects will require funding and resources beyond what is available in the time frame of this plan. Others are contingent upon redevelopment that makes it possible to create currently missing infrastructure, such as sidewalk connections.

The Aspirational Transportation System, shown in Table 5, includes about $48 million worth of investments.

Table 5: Aspirational Projects

Project No.	Description	Start	End	Total ($1000)
SW-02	Sidewalk Infill on Pine Street	Grant Street	City limits	$215
EC-17	Improve Lighting at Existing Crossing	Water Street (OR 214)	Jersey Street	$10
SW-06	Sidewalk Infill on C Street	Front Street	2nd Street	$35
SW-08	Sidewalk Infill on North Water Street	James Street	C Street	$300
SW-09	Sidewalk Infill on Oak Street (OR 213)	Mill Street	Steelhammer Road	$375
SW-12	Sidewalk Infill on C Street	James Street	N Water Street	$260
SW-13	Sidewalk Infill on McClaine Street	Craig Street	Phelpe Street	$25
SW-15	Sidewalk Infill on West Main Street	Westfield Street	City limits	$125
SW-16	Sidewalk Infill on James Street	Florida Drive	City limits	$215
SW-19	Sidewalk Infill on Ike Mooney Road	South Water Street (OR 214)	Existing section	$400
SW-20	Sidewalk Infill on Ike Mooney Road	Existing section	City limits	$230
SW-22	Sidewalk Infill on North Water Street (OR 214)	C Street	A Street	$55
SW-23	Sidewalk Infill on Fiske Street	Main Street	Charles Avenue	$265
SW-24	Sidewalk Infill on Eureka Avenue	Main Street	south City limits	$695
SW-25	Sidewalk Infill on Monitor Road	Hobart Street	Oak Street (OR 213)	$890
SW-26	Sidewalk Infill on Hobart Street	1st Street (OR 214)	Monitor Road	$765
SW-27	Sidewalk Infill on Kromminga Drive	Pine Street	High School	$430
BP-28	Two-Way Raised Cycle Path on Westfield Street	Robert Frost Elementary	Center Street	$500
BP-05	Bicycle Lanes on Silverton road (OR 213)	West City Limits	Existing sections	$350
BP-09	Bicycle Lanes on Ike Mooney Road	Pioneer Drive	East City Limits	$45
BP-11	Bicycle Lanes on Steelhammer Road	Oak Street (OR 213)	Evans Valley Road	$555
BP-14	Bicycle Lanes on Pioneer Drive	South Water Street (OR 214)	Ike Mooney Road	$50
BP-18	Bicycle Lanes on Hobart Road	James Street	Monitor Road	$1,100
BP-22	Bicycle Lanes on Peach St, Madison St, Cowing St, Coolidge St	S Water Street (OR 214)	Main Street	$795
BP-08	Bicycle Lanes on Eureka Avenue	Main Street	South City Limits	$855
BP-10	Bicycle Lanes on Evans Valley Road	Steelhammer Road	East City Limits	$360
BP-17	Bicycle Lanes on Monitor Road	Oak Street (OR 213)	Hobart Road	$635
BP-21	Bicycle Lanes on Grant St, Water St, James St, Silver St, Alder Ave, Brook St, Wilson St, Short St	Western Street	Fossholm Road	$780

Project No.	Description	Start	End	Total ($1000)
BP-23	Bicycle Lanes on James Street	McClaine Street	C Street	$75
BP-24	Bicycle Lanes on Center Street	Westfield Street	Ross Avenue	$370
BP-27	Bicycle Lanes on Ike Mooney Rd, Sun Valley Dr, Frontier St, Pioneer Dr	S Water Street (OR 214)	OS-15 Alignment	$600
BP-32	Bicycle Route Signing (shared facilities) and Bicycle Parking	Downtown Silverton		$30
BP-33	Bicycle Route Signing (shared facility)	Brown Street		$1
BP-29	Regional Bikeway Connection	Silverton City Limits	Stayton	$8,000
BP-30	Regional Bikeway Connection	Silverton City Limits	Salem	$5,000
BP-31	Regional Bikeway Connection	Silverton City Limits	Mt. Angel	$3,300
OS-03	Off-Street path #2 (Creek trail)	C Street	Silver Falls Library	$150
OS-06	Off-Street path #3	C Street	Off-Street Connection #10 Alignment	$450
OS-07	Off-Street path #4	Existing rail line alignment	Church Street extension	$250
OS-01	Off-Street path #1	Charles Avenue	Peach Street	$350
OS-02	Pedestrian Bridge	Peach Street		$105
OS-04	Pedestrian Bridge	Cowing Street		$105
OS-08	Off-Street path #5	Eska Way	Existing Church Street alignment	$230
OS-14	Off-Street Path Connection #10 (rail alignment)	Monson Road	Hobart Road	$805
OS-21	Off-Street Path Connection #17	Pine Street	Monson Road	$415
OS-10	Off-Street path #7	Jefferson Street	Eska Way	$65
OS-12	Salamander Footbridge Connection	Coolidge McClaine Park		$100
OS-13	Off-Street Path Connection #9	Pettit Reservoir	Silverton Road (OR 213)	$475
OS-18	Off-Street Path Connection #14	Mill Street	Sage Street	$320
OS-19	Off-Street Path Connection #15	Pioneer Drive	Main Street	$415
OS-22	Off-Street Path Connection #18	Oak Street (OR 213)	Connection #14 Alignment	$350
OS-15	Off-Street Path Connection #11	Westfield Street	Connection #9 Alignment	$300
OS-16	Off-Street Path Connection #12	Coolidge Street	Anderson Drive	$260
OS-20	Off-Street Path Connection #16	Eastview Lane	Connection #15 Alignment	$400
OS-05	Pedestrian Stairway Connection	Coolidge Park	Anderson Drive	$80
MV-22	Install a Roundabout, Landscaped Median, or other Calming/Gateway Treatment	Highway 213	Monitor Road	$1,000

Project No.	Description	Start	End	Total ($1000)
MV-16	Westside North-South Connector #3	Main Street	South Water Street (OR 214)	$0
MV-17	Eastside North-South Connector #4	Monitor Road/Oak Street	Pioneer Drive	$11,000
MV-18	Bridge Crossing over Silver Creek Connector #6	High Street		$0
MV-04	Bridge Crossing over Silver Creek	Water Street	Brook Street	$0
MV-24	Restrict Turning Movements on Northbound and Southbound Approaches	Silverton Road (OR 213)	Fossholm Road	$10
MV-07	Install Center Two-Way Left-Turn Lane (TWLTL) on C Street	Silver Creek Bridge	James Street	$10
TS-02	Park-and-Ride Lot			$465
TS-05	Park-and-Ride Lot and Increased Transit Service			$0
TS-03	Enhance Dial-a-Ride services			$70
RR-01	Address RR Crossing Safety/Ops Issues	McClaine Street	Fossholm Road	$480
RR-02	Rail/Highway Grade Crossing Improvements on Hobart Road	1st Street (OR 214)	Hobart Road	$480
			TOTAL	**$47,900**

SECTION J

SAFE ROUTES TO SCHOOL WALKING AUDIT REPORTS

1 Silverton Middle School Report

Principal:	Nancy Griffith	**Grades:**	6-8
Enrollment:	450	**Address:**	714 Schlador Street
First bell:	7:55 a.m.		Silverton, OR 97381
Last bell:	2:55 p.m.		

This report summarizes existing conditions, observations, and recommended improvements and programs for Silverton Middle School resulting from the Safe Routes to School (SRTS) walk audit conducted on October 4, 2016. A summary map illustrates the audit location, area characteristics and locations of infrastructure recommendations.

This effort supports the greater Silverton Transportation System Plan (TSP) update, in which the City plans for its future transportation needs.

What is Safe Routes to School (SRTS)?

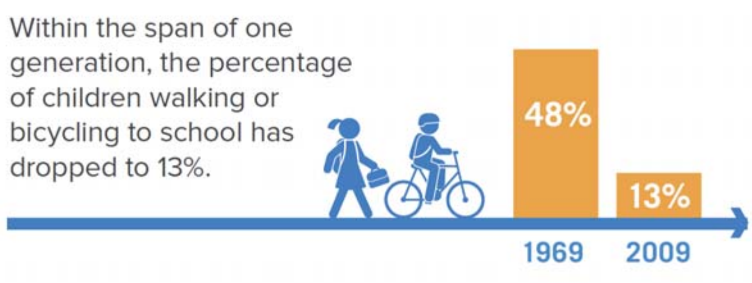
SRTS is a comprehensive program to **make school communities safer** by combining engineering tools and enforcement with education about safety and activities to enable and encourage students to **walk and bicycle to school**. SRTS programs typically involve partnerships among municipalities, school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

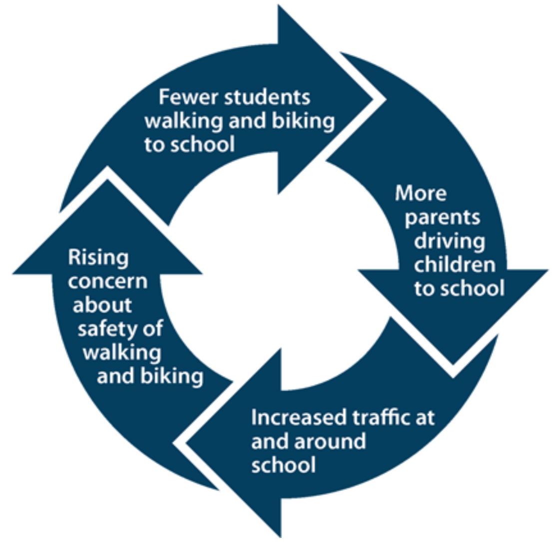
Although most students in the United States walked or biked to school before the 1980s, the number of students walking or bicycling to school since has sharply declined.

The benefits of implementing a SRTS plan are far-reaching and include improving safety, encouraging physical activity, and reducing traffic congestion and motor vehicle emissions near schools. Implementing SRTS programs and projects benefit adjacent neighborhoods as well as students and their families.

More information and resources for implementing SRTS activities are available at:
http://oregonsaferoutes.org/

Why Safe Routes to School for Silverton?



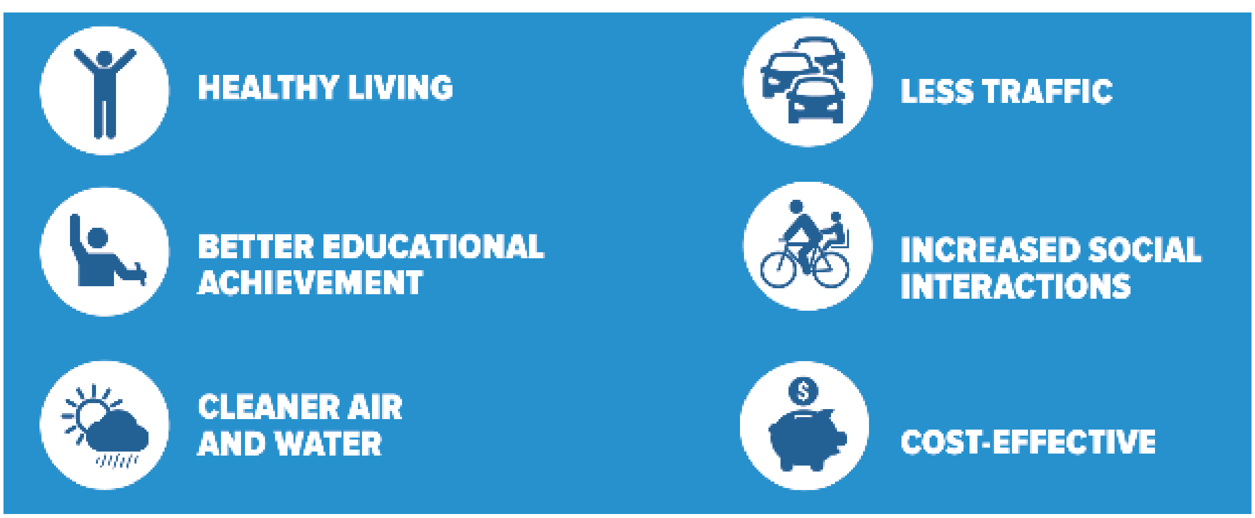


This movement away from active transportation is a self-perpetuating cycle.

SRTS education & encouragement programs can result in a **25% increase** in walking and biking over 5 years.

A comprehensive SRTS program addresses reductions in walking and biking through a multi-pronged approach that uses education, encouragement, engineering and enforcement efforts to develop attitudes, behaviors, and physical infrastructure that improve the walking and biking environment.

SRTS programs provide many benefits for communities



Walk Audit Summary

Walk Audit Date: October 4, 2016
Day of Week: Tuesday
Meeting Time: 7:15 a.m., morning drop-off
Weather: Rainy and overcast

Attendees:
Hannah Day-Kapell, *Alta Planning + Design*
Ray Delahanty, *DKS*
Mike Sellinger, *Alta Planning + Design*
Andy Bellando, *Silver Falls School District*

Existing Conditions

School Layout

Silverton Middle is located along Schlador Street, adjacent to the Silver Falls School District offices and the vacant previous high school building. Sports fields to the north of the school serve the entire community and provide overflow parking for high school students.

Students enter and are dismissed through the main door on the south side of the school building, although special education students enter via a side door on James Street.

Students access Silverton Middle School via Schlador Street.

Site Circulation

Vehicles: Student loading primarily occurs in the parking lot east of Schlador and Brown Streets. Parents primarily travel northbound on Brown, drive through the parking lot, drop their students at the new north curb, and exit the lot either traveling westbound on Schlador or turning left on Brown. A smaller number of students were observed exiting vehicles along Schlador, Brown, and James streets.

School Busses: Busses load and unload students along Schlador Street, directly in front of the school. The loading area is well-marked and no vehicles blocked access.

Pedestrians: Crossing guards are located along Brown Street at the west leg of the intersection with Schlador Street, and along Brown Street at the parking lot egress.

Student walkers primarily came from the south, walking along Brown Street.

Bicyclists: The bike corral is located east of the school entrance, at the north end of Brown Street. Bicyclists were observed riding along Brown and James Streets, primarily in the road but sometimes on the sidewalks.

Walk Audit Observations and Infrastructure Recommendations

Key locations are described below, including issues identified during audit observations and discussions. Project numbering refers to the Improvements Map provided on page 7. The party responsible for implementing each recommendation is provided in parentheses (i.e. City of Silverton or Silver Falls School District).

School Parking Lot and Grounds

The circulation on school grounds currently operates well, with the existing crossing guard assistance and newly-developed curb area in the parking lot. During the audit, the parking lot was mostly empty, although a vehicle arrived during drop-off and parked in the north row, slightly impeding traffic in the loop. The bike parking is new and well-designed, but it is not fenced in, and students' bicycles may be vulnerable to theft.

Students are dropped off on a new curb extension in the north end of the school parking lot.

Recommendations (1)

a. Use paint to prohibit parking along the north row of stalls in the parking lot (District).
b. Build a fence with a lockable gate around the bike parking to provide additional security (District).

Brown Street

The main traffic flow occurs at Brown and Schlador Streets, where vehicles turn into the school parking lot, most pedestrians cross Schlador, and bicyclists access the bike parking. The main crosswalk lacks ADA-compliant curb ramps, which are important for people with bicycles, strollers, and mobility assistive devices. In addition, Brown Street is quite narrow, with queued cars in the northbound lane, parked cars along the east side of the street, and bicyclists in the roadway. Further from the school, a shrub partially blocks the east side sidewalk, and the east side sidewalk ends approximately 380 feet from the school.

Recommendations (2)

a. Construct curb ramps for crosswalk along Brown Street at Schlador Street (City).
b. Sign restricted parking during school hours along the east side of Brown Street (City).
c. Mark Brown Street as bike route with shared lane markings (City).
d. Trim vegetation to improve visibility and maintain clear sidewalk (City).

The main school crosswalk across Schlador Street and Brown Street lacks ADA-compliant curb ramps on both ends.

e. Construct sidewalk on east side of Brown Street to Water Street, approx. 480 feet (City).
f. Continue promoting one-way traffic loop to parents (District).
g. Provide bicycle accommodations on any future changes to Brown Street (City).

James Street

James Street is narrow and lacks bicycle facilities as well as sidewalks north of the school.

Adjacent to school grounds, James Street has sidewalks on the east side and no parking on either side. Several students were observed crossing James Street at Florida Drive, to access both Silverton Middle and High Schools. The crosswalk lacks ADA-compliant curb ramps, and the west side lacks a curb and landing. While audit participants report witnessing speeding along James Street, drivers were observed to yield to students in the crosswalk. James Street lacks a sidewalk north of the school. The Silver Falls School District has granted a future easement for the City to construct a complete cross-section, with sidewalks and bike lanes on both sides of the street, which will substantially improve the walking and bicycling environment.

At the James Street bridge over Silver Creek, the sidewalks are narrow, end abruptly, and no bicycle facilities exist. Also, where James Street crosses the railroad tracks, no sidewalks or bicycle facilities are currently provided. These improvements are particularly critical to serve the planned multi-family residential development south of the creek.

Recommendations (3)

a. Develop James Street with sidewalks and bike lanes from Jefferson Street to C Street (City).
b. Support future bicycle/pedestrian improvements to the James Street bridge over Silver Creek (District).
c. Support future bicycle/pedestrian improvements to the James Street railroad crossing (District).

Jefferson Street and Highway 214

Throughout the City of Silverton, Highway 214/1st Street is a challenge for pedestrians and bicyclists to cross. North of Silverton Middle School, the crossing of Highway 214 and Jefferson Street is a considerable challenge for students. No legs of the intersection provide sidewalks, bicycle facilities, or crossing treatments and the speed limit is 45 mph. Highway 214 is owned by the Oregon Department of Transportation (ODOT), who will responsible for developing a proposed redesign of the crossing.

Recommendations (4)

a. Support the City and ODOT in redesigning the crossing of Jefferson Street and Highway 214 to accommodate student pedestrians and bicyclists (District).

Railroad Crossings

Traffic circulation to Silverton Middle School is impeded by the lack of connectivity across the railroad tracks. A concept for a future overpass, which would cross the railroad tracks and Highway 214, would provide this much-needed connectivity.

Recommendations (5)

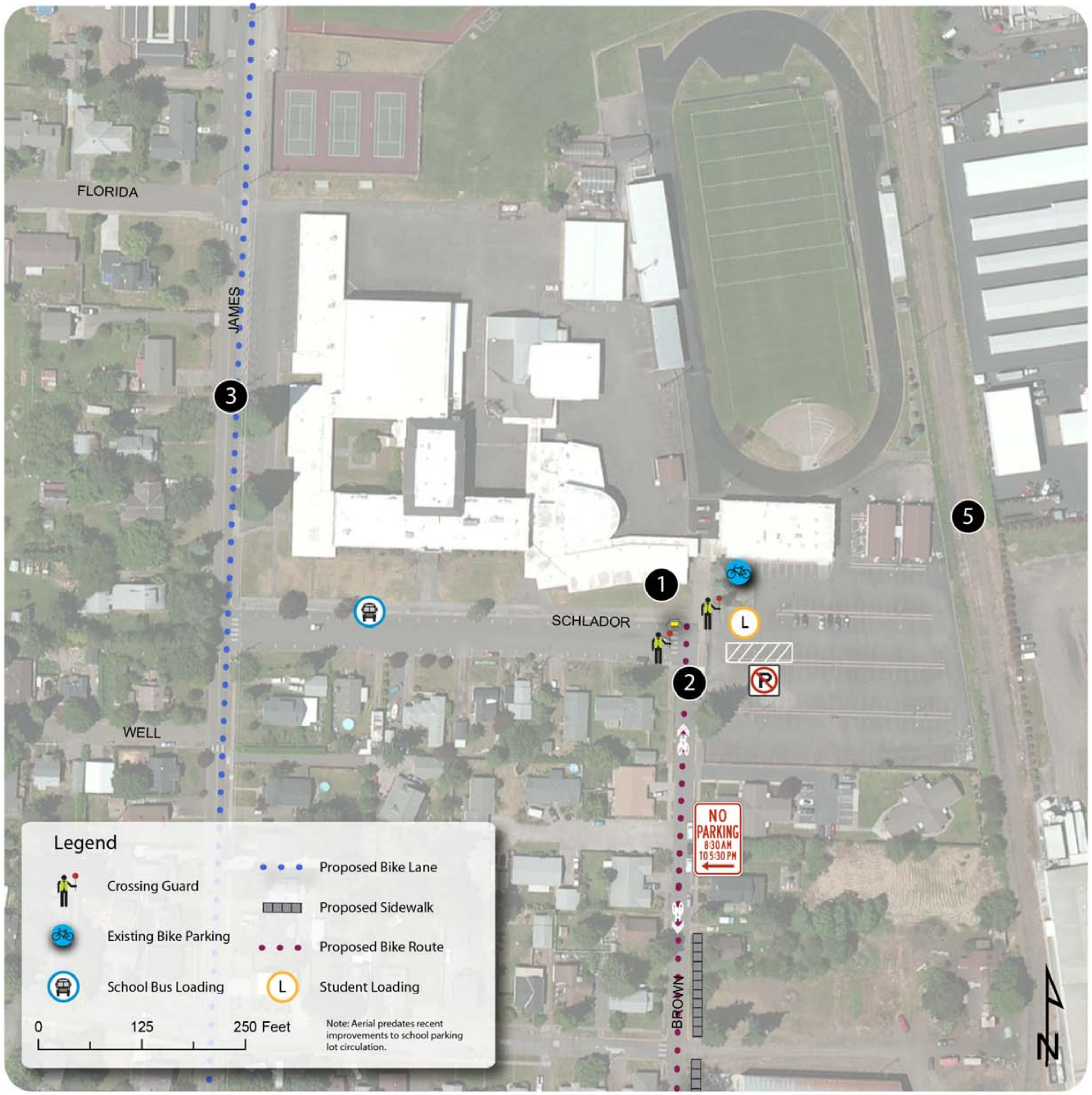
a. Support the City in pursuing additional feasibility planning for railroad acquisition and an overpass across the railroad and Highway 214 (District).

Cost Estimates

Table 1 summarizes recommendations for Silverton Middle School, provides order-of-magnitude cost estimates, and places the projects in priority tiers.

Table 1. Silverton Middle School Recommended Improvements

Recommendations	Lead Agency	Cost ($, $$, $$$)	Priority
1. School Parking Lot and Grounds			
a. Use paint to restrict parking along the north row of stalls in the parking lot.	District	$	High
b. Build fence around bike parking to provide additional security.	District	$	Medium
2. Brown Street			
a. Construct curb ramps for crosswalk along Brown Street at Schlador Street.	City	$	High
b. Sign restricted parking during school hours along east side of Brown Street.	City	$	High
c. Mark Brown Street as bike route with shared lane markings.	City	$	Medium
d. Trim vegetation to improve visibility and maintain clear sidewalk.	City	$	High
e. Construct sidewalk on east side of Brown Street to Water Street (approx.. 480').	City	$$	Medium
f. Continue promoting one-way traffic loop to parents.	District	$	High
g. Provide bicycle accommodations on any future changes to Brown Street.	City	TBD	Medium
3. James Street			
a. Develop James Street with sidewalks and bike lanes from Jefferson Street to C Street.	City	$$	Medium
b. Support future bicycle and pedestrian improvements to the James Street bridge over Silver Creek.	District	$$	Low
c. Support future bicycle and pedestrian improvements to the James Street railroad crossing.	District	$$	Low
4. Jefferson Street and Highway 214			
a. Support the City and ODOT in redesigning the crossing of Jefferson Street and Highway 214 to accommodate student pedestrians and bicyclists.	District	$$$	Low
5. Railroad Crossings			
a. Support the City in pursuing additional feasibility planning for an overpass over the railroad and Highway 214.	District	$$$	Low



Silverton Middle School

Improvement Recommendations

1. School Parking Lot and Grounds
   a. Use paint to restrict parking along the north row of stalls in the parking lot.
   b. Build fence around bike parking to provide additional security.
2. Brown Street
   a. Construct curb ramps for crosswalk along Brown Street at Schlador Street.
   b. Sign restricted parking during school hours along east side of Brown Street.
   c. Mark Brown Street as bike route with shared lane markings.
   d. Trim vegetation to improve visibility and maintain clear sidewalk.
   e. Construct sidewalk on east side of Brown Street to Water Street (approx.. 480').
   f. Continue promoting one-way traffic loop to parents.
   g. Provide bicycle accommodations on any future changes to Brown Street.
3. James Street
   a. Develop James Street with sidewalks and bike lanes from Jefferson Street to C Street.
   b. Support future bicycle and pedestrian improvements to the James Street bridge over Silver Creek.
   c. Support future bicycle and pedestrian improvements to the James Street railroad crossing.
4. Jefferson Street and Highway 214
   a. Support the City and ODOT in redesigning the crossing of Jefferson Street and Highway 214 to accommodate student pedestrians and bicyclists.
5. Railroad Crossings
   a. Support the City in pursuing additional feasibility planning for railroad acquisiton and an overpass across the railroad and Highway 214.

Figure 1. Silverton Middle School Improvements Map

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Programmatic Recommendations

Programmatic activities and events complement infrastructure improvements by empowering students and their families to try walking and bicycling, and by making it safer for them to do so.

Silverton Middle School currently promotes transportation safety by sending information to parents about student drop-off and pick-up patterns as well as reminders about driving safely. The school promotes walking and bicycling through an annual bike rodeo with the Silverton Police Department.

The Oregon Department of Transportation (ODOT) encourages school to complete Action Plans, which require community evaluation of issues and opportunities to implement SRTS improvements. ODOT-approved Action Plans are required for schools competing for state funding. More information and an Action Plan template is available online at: www.oregon.gov/ODOT/TS/Pages/saferoutes.aspx#Action_Plan_Template.

The activities below are recommended for Silverton Middle to improve and promote safe walking and bicycling to and from school and in the community. They can be implemented by school administrators, teachers, parents or even school clubs, to promote walking and bicycling safely to and from school.

Oregon's SRTS program offers resources, outreach, and technical assistance to assist in the development of local SRTS programs. See the website at http://www.oregonsaferoutes.org/ for more information about these resources.

Education Programs

Bicycle and Pedestrian Safety Education

Pedestrian and bicycle safety education teaches students basic traffic laws and safety rules. Getting middle school students excited about Safe Routes to School activities and events can build momentum for walking and bicycling, since solder students can have more independence to get to school on their own or together. The National Center for SRTS provides Tips for Engaging Middle School Students, which will help SRTS practitioners recognize and build off of the typical attributes of middle school students.

Resources and best practice programs for middle school students include:

- Oregon SRTS provides classes and train-the-trainer programs. Oregon-based service providers are listed at: www.oregonsaferoutes.org/bike-ed-service-providers
- The National Highway Traffic Safety Administration offers a child pedestrian safety curriculum and the Cycling Skills Clinic Guide to help organizations plan bike safety skills events.
- The Oregon Bicycle Transportation Alliance developed SRTS Curriculum, which includes a flexible in-class and on-bike curriculum and pedestrian safety lesson plans.
- Curriculum specific for middle school students include Marin SRTS's Advanced Bike Safety, Bike Colorado's Middle School Curriculum, and Shape America's Bike Safety Curriculum.

- The Girls in Gear curriculum is a girls-specific, bicycling program designed to empower adolescent girls. GIG is designed to create self-reliance and build confidence. It is also the first program to creatively integrate STEM— Science, Technology, Engineering and Mathematics—activities, physical exercise and nutrition education by way of the bicycle.
- SRTS Michigan: Make Trax lessons and activities complement community Safe Routes to School planning efforts. Make Trax provides lessons on learn about data collection, mapping software, and presentation skills.

Parent Education and Outreach

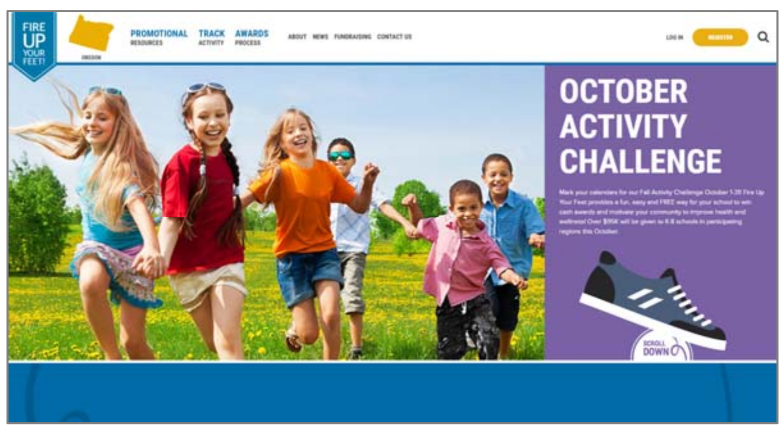
Parents are the primary decision-makers about how their children get to school. Informing parents about their options for walking and bicycling, as well as communicating the benefits of active transportation, can encourage more families to walk and bike. This can occur through school e-news or announcements, and through informational resources. Suggested route maps can show parents the best walking or biking route to the school, overcoming concerns about barriers.

Resources and best practice programs:

- Oregon SRTS provides materials, handouts, and theme ideas for Monthly Walk and Bike events as well as Back to School messages.
- The National Center for SRTS has several tip sheets for parents on safe walking and bicycling behaviors.

Encouragement Programs

Fire Up Your Feet



Fire Up Your Feet is a national campaign aimed at increasing physical activity. The website provides outreach materials and educational resources for the Fire Up Your Feet campaign that occurs over one month in the spring and the fall. The website helps classrooms track the number of times they walk, bike, carpool or take transit to school. Students and classrooms with the highest percentage of students walking, biking or carpooling compete for prizes.

Resources and best practice programs:

- Oregon's Fire Up Your Feet program includes promotional resources and an activity tracker, funded through the Kaiser Permanente and the National PTA. Schools in Oregon can win cash prizes and are eligible for national awards.

Walk + Bike Challenge

The Oregon Walk + Bike to School Challenge celebrates students walking and bicycling to school. International Walk to School Day is held the first Wednesday in October and Bike to School day takes place the second week in May. Parents can set up a table on the event day to provide refreshments and small rewards for families who participate, as well as maps, lights, and safety information to encourage more students and families to join in the fun.

Even families who live too far from school to walk and bike can participate by driving to a designed central location and walking together from there. Coffee and breakfast can be provided, and students can dress up or hold posters to make a fun, parent-supervised parade to school.

Resources and best practices:

- Schools in Oregon can order incentives to support and promote Walk + Bike Challenge Day and Month.
- Walk Bike to School suggests event ideas and planning resources for encouraging active transportation at schools.
- The National Center for SRTS maintains a national database of walk and bike to school day events as well as event ideas and planning resources.

Student Clubs and Youth Leadership Programs

Clubs and leadership programs allow older students to form groups to support the causes they care about most. Middle school student clubs can host Walk + Bike Challenge events or middle school specific events, organize a competition, or work with their peers to promote walking and bicycling. Student clubs can offer excellent ideas, provide exceptional energy and drive to get things done.

Resources and best practice programs:

- Marin County SRTS's Teens Go Green program partners with teens interested in the environment to bring reduced CO2 and healthy lifestyles to their schools.
- Create a Cycling League or club, Leagues can introduce student riders to the sport of mountain biking or road racing, with a focus on skills, fun, fitness, and responsibility.

Middle School Events

While many of the recommended programs are targeted towards elementary school students, programs for middle school students share the basic framework, with a few key differences: raffles can be more effective than small giveaways such as stickers and pencils; a single bicycle, pair of sneakers, or ipad can be an effective reward for participation. Middle school students should also be given leadership opportunities, such as organizing a school-wide walk to school day or presenting to a City council.

Resources and best practice programs:

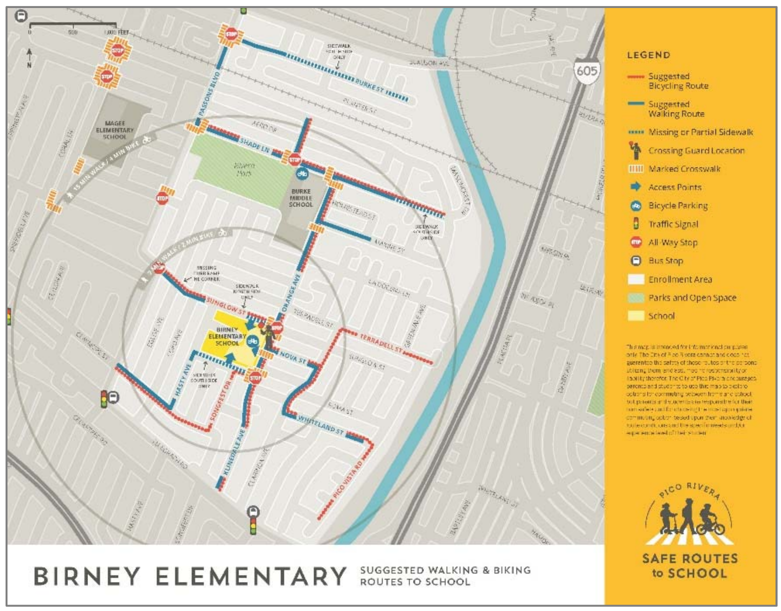
- Biking for Cocoa is a fun morning treat for students who bike or walk to school. The program can be combined with a hashtag/instagram/social media campaign such as #CoacaforBikes.
- Themed Bike Rides can correspond with other school events, like earth day, or can be a standalone event.
- Local celebrities or passionate advocates can make great bike ride captains.
- BMX School Assembly programs are action packed, but can also provide education and encouragement.

Student Valets

Student Valet programs have middle school students assisting at elementary school drop-off. Parents pull into the curb near the school and valets help younger students out of their vehicles, enabling parents to stay in their vehicles and greatly reducing student loading time.

Suggested Route Maps

Suggested Route Maps identify the best routes for getting to school and includes safe walking, biking, and driving suggestions. Suggested route maps also show locations of crossing guards, stop signs, crosswalks, signals, bike lanes, bike paths, and bike parking. Due to the older age of Silverton Middle School students, the map can include a larger catchment area and highlight suggested biking routes only. The maps can be shared with parents at orientation and in advance of events such as the Walk + Bike Challenge.



The back of the map could include information and tips for middle school students walking and biking. In particular, it could address concerns about students using lights when riding in the dark and for students carrying instruments while biking.

- The Institute of Transportation Engineers (ITE) has a white paper on School Route Maps.
- Pico Rivera, CA developed user-friendly Suggested School Route Maps that include walking times and location of bicycle parking.
- Davis, CA developed user-friendly Suggested Route Maps that include walking times and bicycle parking.

Enforcement Programs

AAA School Safety Patrol

Elementary and middle school aged volunteers can sign-up to become a certified AAA School Safety Patroller. With support and leadership from school faculty and parents, student patrollers help fellow students develop a better understanding of pedestrian and vehicular traffic hazards.

Resources and best practice programs:

- AAA has School Safety Patrol membership information and description of student, teacher, and parent roles.

Evaluation Programs

Student Hand Tallies

Hand tallies are a standard way of tracking school commute mode split for SRTS programs. Students are asked how they got to and from school over a 2-3 day period. Students raise their hand when the mode they took is called out, and the teacher or a volunteer records this. Hand tallies are often required of state and federal SRTS grant recipients.

Resources and best practice programs:

- The Oregon SRTS website provides evaluation resources online.
- The National Center for SRTS provides forms, data collection guidelines, data center, and automatically-generated reports.

Parent Surveys

Parents are asked how their children got to and from school via a paper or online survey. Parent surveys also ask questions about the barriers to walking or biking to/from school, health information, or perception of crime and other social behaviors.

Resources and best practice programs:

- The Oregon SRTS website provides evaluation resources online.
- The National Center for SRTS provides forms, data collection guidelines, and data center.

2 Mark Twain Elementary School Report

Principal:	Greg Kaatz	**Grades:**	K-2
Enrollment:	323	**Address:**	425 N. Church Street
First bell:	8:10 a.m.		Silverton, OR 97381
Last bell:	2:30 p.m.	**Free & Reduced Lunch:**	43%

This report summarizes existing conditions, observations, and recommended improvements and programs for Mark Twain Elementary School resulting from the Safe Routes to School (SRTS) walk audit conducted on October 4, 2016. A summary map illustrates the audit location, area characteristics and locations of infrastructure recommendations.

This effort supports the greater Silverton Transportation System Plan (TSP) update, in which the City plans for its future transportation needs.

What is Safe Routes to School (SRTS)?

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.

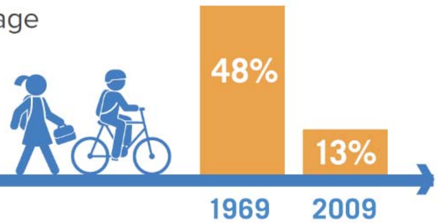
Although most students in the United States walked or biked to school before the 1980s, the number of students walking or bicycling to school since has sharply declined.

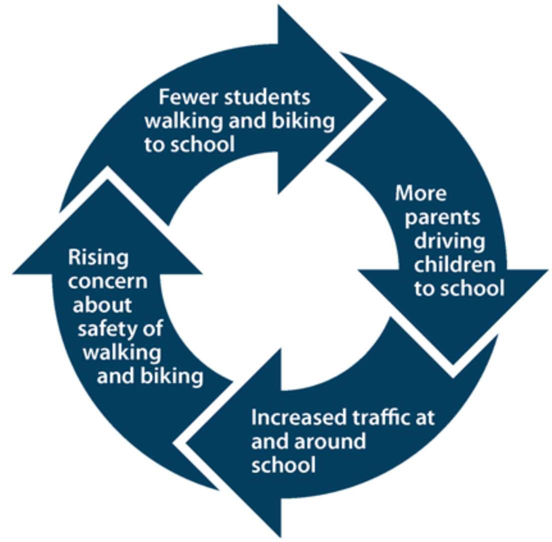
The benefits of implementing a SRTS plan are far-reaching and include improving safety, encouraging physical activity, and reducing traffic congestion and motor vehicle emissions near schools. Implementing SRTS programs and projects benefit adjacent neighborhoods as well as students and their families.

More information and resources for implementing SRTS activities are available at: http://oregonsaferoutes.org/

Why Safe Routes to School for Silverton?

Within the span of one generation, the percentage of children walking or bicycling to school has dropped to 13%.



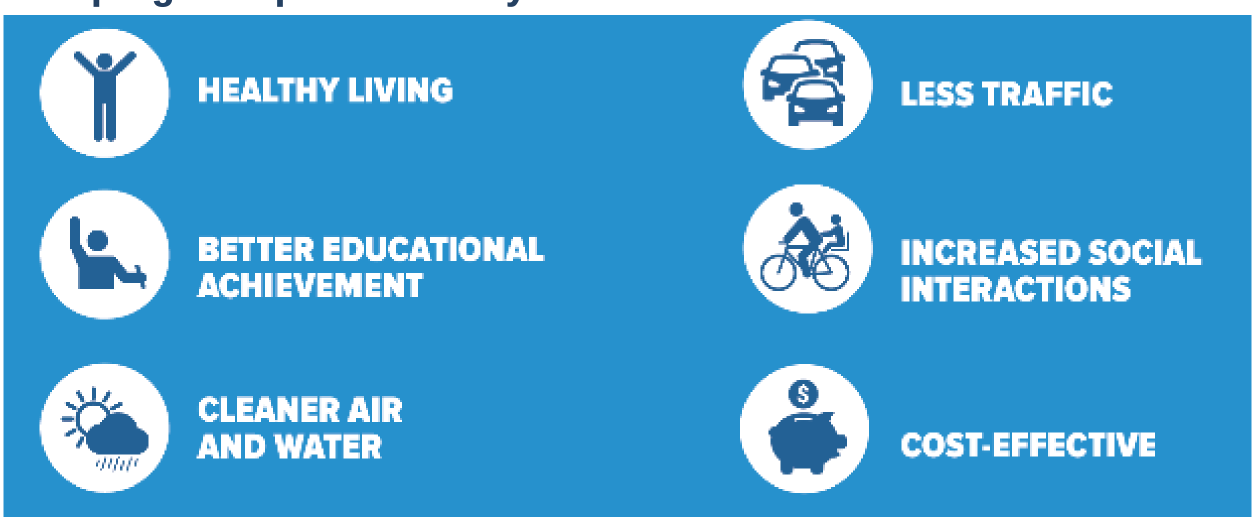


This movement away from active transportation is a self-perpetuating cycle.

SRTS education & encouragement programs can result in a **25% increase** in walking and biking over 5 years.

A comprehensive SRTS program addresses reductions in walking and biking through a multi-pronged approach that uses education, encouragement, engineering and enforcement efforts to develop attitudes, behaviors, and physical infrastructure that improve the walking and biking environment.

SRTS programs provide many benefits for communities



Walk Audit Summary

Walk Audit Date: October 4, 2016
Day of Week: Tuesday
Meeting Time: 2:10 p.m. afternoon drop-off
Weather: Overcast

Attendees:

Hannah Day-Kapell, *Alta Planning + Design*
Ray Delehanty, *DKS*
Greg Kaatz, *Principal Mark Twain Elementary*
Jazmin Arias, *Parent*
Kathleen McCann
Mike Sellinger, *Alta Planning + Design*
Andy Bellando, *Silver Falls School District*
Kirstin Jargens, *Parent*
Cindy Zapata, *Parent*
Mike Murphy, *Silverton Bike Alliance*

Existing Conditions

School Layout

Mark Twain Elementary is located along Church Street and Robinson Street. Students enter and are dismissed through different building entrances depending on their mode of travel and at pick-up or drop-off, as described below.

Teachers help student walkers leave campus safely.

Site Circulation

Vehicles: Most of the parking for the morning drop-off occurs in the gravel lot west of the school. In the afternoon, parents use the eastern entrance to pick up their children. Most parents parked along Church Street, or in the gravel parking lot north of the school where Church Street dead-ends north of Bartlett Street. Parents also make use of the parking lot on the east side of the school.

School Busses: In the morning, busses drop students in the horseshoe drive through directly south of the school. A well-marked path leads into the southern entrance of the school. In the afternoon, busses pick up students in a lot just west of the school with an entrance off Robinson Street. Special education students load and unload students in a small loop driveway to the south of the school.

Pedestrians: Student walkers were dismissed from either the north or south entrances and led by staff (mobile valet) and helped across Church Street. Crossing guards are stationed in front of the gravel lot on Robinson Street.

Bicyclists: There were no bicyclists or bike parking provided on the school campus due to the age of the children (the oldest students are in 2nd grade).

Walk Audit Observations and Infrastructure Recommendations

Key locations are described below, including issues identified during audit observations and discussions. Project numbering refers to the Improvements Map provided on page 7. The party responsible for implementing each recommendation is provided in parentheses (i.e. City of Silverton or Silver Falls School District).

Vehicle partially blocking sidewalk at northern entrance of the east parking lot.

School Parking Lot and Grounds

During the audit, circulation on the school grounds operated well. There were a few concerns, however. Multiple vehicles were parked on the sidewalk on northern end of the parking lot east of the school. Without a sidewalk connecting the school to Robinson or Church Street, pedestrians used the southeast lawn to leave campus. In addition, students were observed accessing the southwest gravel parking lot by walking down the hill on school property.

Students walking down grassy hill to get picked up at the southwest parking lot.

Recommendations (1)

a. Use paint and signage to restrict parking along main drive through (District).
b. Build sidewalk on egress drive aisle connecting to existing sidewalk on Robinson (District).
c. Improve gravel lot on southwest corner of school. Short term: Place wheel stops to designate parking stalls. Long term: Pave the lot, also alleviating storm water and ice issues, and install bike parking (District).

The north sidewalk on Robinson Street has deteriorated and is in poor condition.

Robinson Street

Robinson Street runs along the south side of the school. It has a sidewalk along its north side, but sections of it are in poor condition and it lacks curb ramps on key student walking routes. At the intersection with Mill Street, Robinson Street has curb ramps, but lacks a marked crosswalk. There is a marked crosswalk across Mill Street, but no curb ramp on the west side of the crosswalk. Curb ramps are also missing at two of the corners at the intersection of Robinson Street and Church Street.

Recommendations (2)

a. Improve the sidewalk along Robinson Street on both sides of the gravel parking lot, and install curb ramps (City).
b. Install crosswalk across Robinson Street on the east side of Mill Street (City).
c. Construct curb ramp at northwest corner of Mill Street and Robinson Street (City).
d. Construct curb ramps at northwest and southeast corners of Robinson Street and Church Street (City).

Church Street

Church Street provides access to the parking lots on the east side of the school. North of Bartlett Street, Church Street is an unimproved gravel road that turns into a gravel parking lot to the north of the school. Vehicles were parked irregularly in the parking lot and no entrance or egress is marked. During the audit, vehicles were observed driving over the sidewalk to cross Church Street to Bartlett Street.

The sidewalk ends at the north school parking lot on Church Street, and vehicles enter, exit, and park in the lot irregularly, causing conflicts with people walking.

Along the campus, parking is allowed on the east side of the street, except in front of the main school drive through where northbound drivers have to veer right to make the tight left turn into the driveway. The street is narrow, and parked cars often create a bottleneck with two-way traffic.

Recommendations (3)

a. Mark no parking on both sides of Church Street during school hours (City).
b. Reconfigure Church Street parking lot to clarify pedestrian space and auto ingress/egress (City/District).
c. Construct sidewalk on east side of Church Street, north of Bartlett Street (City).

Bartlett Street

Bartlett Street runs east-west and connects to the northeastern side of the campus. It is a narrow street without sidewalks on either side, requiring students to walk in the street. Most of the observed students walked on the south side of the Street.

Bartlett Street lacks sidewalks and is a difficult route for students walking away from school.

Recommendations (4)

a. Construct sidewalks on both sides of Bartlett Street from Church Street to Norway Street (City).
b. Advertise counterclockwise driving route from Norway Street to Bartlett Street to Church Street via parent newsletters and back to school outreach (District).

Jefferson Street and Highway 214

Throughout the City of Silverton, Highway 214/1st Street is a challenge for pedestrians and bicyclists to cross. Approximately, one-half mile west of Mark Twain Elementary, Highway 214 and Jefferson Street create a considerable barrier for students. No legs of the intersection provide sidewalks, bicycle facilities, or crossing treatments and the speed limit is 45 mph. Highway 214 is owned by the Oregon Department of Transportation (ODOT), who will be critical in developing a proposed redesign of the crossing.

Recommendations (5)

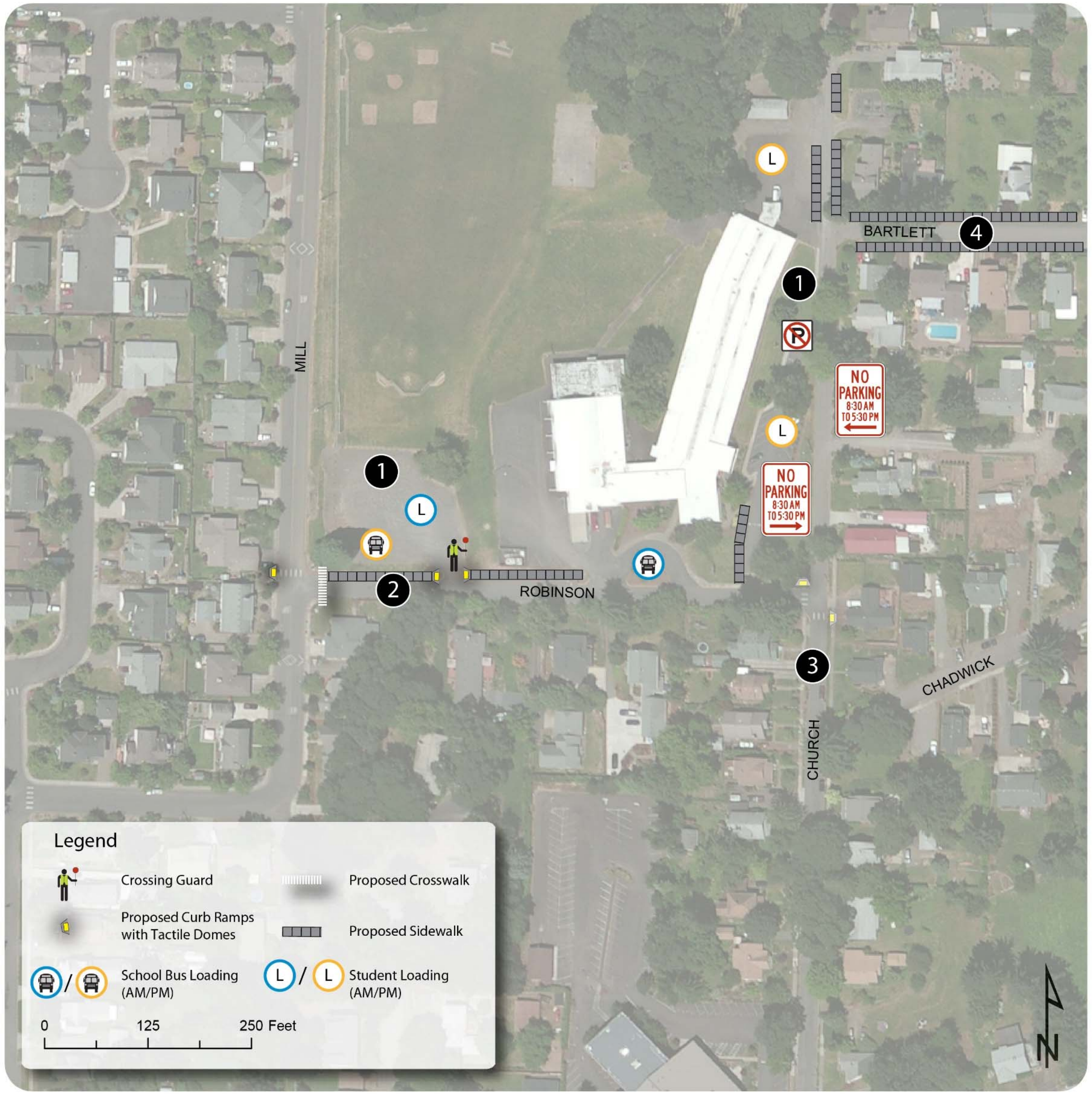
a. Support the City and ODOT in redesigning the crossing of Jefferson Street and Highway 214 to accommodate student pedestrians and bicyclists (District).

Cost Estimates

Table 1 summarizes recommendations for Mark Twain Elementary, provides order-of-magnitude cost estimates, and places the projects in priority tiers.

Table 1. Mark Twain Elementary School Recommended Improvements

Recommendations	Lead Agency	Cost	Priority
1. School Parking Lot and Grounds			
a. Use paint and signage to restrict parking along main drive through.	District	$	High
b. Build sidewalk on egress drive aisle connecting to existing sidewalk on Robinson.	District	$$	Medium
c. Improve gravel lot on southwest corner of school. Short term: Place wheel stops to designate parking stalls. Long term: Pave the lot, also alleviating storm water and ice issues, and install bike parking.	District	$ - $$$	Medium
2. Robinson Street			
a. Improve sidewalk along Robinson Street on both sides of the gravel parking lot, and install curb ramps.	City	$$	High
b. Install crosswalk across Robinson Street on east side of Mill Street.	City	$	High
c. Construct curb ramp at northwest corner of Mill Street and Robinson Street.	City	$	High
d. Construct curb ramps at northwest and southeast corners of Robinson Street and Church Street.	City	$	Medium
3. Church Street			
a. Mark no parking on both sides of Church Street during school hours.	City	$	High
b. Reconfigure Church Street parking lot to clarify pedestrian space and auto ingress/egress.	District/ City	$	Medium
c. Construct sidewalk on east side of Church, north of Bartlett Street.	City	$$	Medium
4. Bartlett Street			
a. Construct sidewalks on both sides of Bartlett Street from Church Street to Norway Street.	City	$$	Medium
b. Advertise counterclockwise driving route from Norway Street to Bartlett Street to Church Street via parent newsletters and back to school outreach.	District	$	High
5. Jefferson Street and Highway 214			
a. Support the City and ODOT in redesigning the crossing of Jefferson Street and Highway 214 to accommodate student pedestrians and bicyclists.	District	$$$	Low



Mark Twain School

Improvement Recommendations

1. School Parking Lot and Grounds
   a. Use paint and signage to restrict parking along main drive through.
   b. Build sidewalk on egress drive aisle connecting to existing sidewalk on Robinson Street.
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   a. Improve sidewalk along Robinson Street on both sides of the gravel parking lot and install curb ramps.
   b. Install crosswalk across Robinson Street on east side of Mill Street.
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4. Bartlett Street
   a. Construct sidewalks on both sides of Bartlett Street from Church Street to Norway Street.
   b. Advertise counterclockwise driving route from Norway Street to Bartlett Street to Church Street via parent newsletters and back to school outreach.
5. Jefferson Street and Highway 214
   a. Support the City and ODOT in redesigning the crossing of Jefferson Street and Highway 214 to accommodate student pedestrians and bicyclists.

Figure 1. Mark Twain Elementary School Improvements Map

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Programmatic Recommendations

Programmatic activities and events complement infrastructure improvements by empowering students and their families to try walking and bicycling, and by making it safer for them to do so.

Mark Twain Elementary School currently promotes transportation safety by sending information to parents about student drop-off and pick-up patterns as well as reminders about driving safely. At the beginning of the school year, the school hosts a "round-up" with students, having them practice their drop-off and pick-up procedures, including safety tips for walkers. With a young student population, Mark Twain Elementary does not have many student bikers, but the previous campus at Eugene Field Elementary, they hosted an annual bike rodeo with the Silverton Police Department.

The Oregon Department of Transportation (ODOT) encourages school to complete Action Plans, which require community evaluation of issues and opportunities to implement SRTS improvements. ODOT-approved Action Plans are required for schools competing for state funding. More information and an Action Plan template is available online at: www.oregon.gov/ODOT/TS/Pages/saferoutes.aspx#Action_Plan_Template.

The activities below are recommended for Mark Twain Elementary to improve and promote safe walking and bicycling to and from school and in the community. They can be implemented by school administrators, teachers, parents or even school clubs, to promote walking and bicycling safely to and from school.

Oregon's SRTS program offers resources, outreach, and technical assistance to assist in the development of local SRTS programs. See the website at http://www.oregonsaferoutes.org/ for more information about these resources.

Education Programs

Pedestrian Safety Education

Pedestrian safety education teaches students basic traffic laws and safety rules, including basic traffic safety rules, sign identification and decision-making tools. Safety lessons should be taught by trained safety professionals, as part of an assembly, physical education curriculum, or other classes.

Resources and best practice programs for elementary school students include:

- Oregon SRTS provides classes and train-the-trainer programs. Oregon-based service providers are listed at: www.oregonsaferoutes.org/bike-ed-service-providers
- The National Highway Traffic Safety Administration offers a child pedestrian safety curriculum.
- The Oregon Bicycle Transportation Alliance developed SRTS Curriculum, which the Neighborhood Navigators pedestrian safety lesson plans.

Parent Education and Outreach

Parents are the primary decision-makers about how their children get to school. Informing parents about their options for walking and bicycling, as well as communicating the benefits of active transportation, can encourage more families to walk and bike. This can occur through school e-news or announcements, and through informational resources. Suggested route maps can show parents the best walking or biking route to the school, overcoming concerns about barriers.

Resources and best practice programs:

- Oregon SRTS provides materials, handouts, and theme ideas for Monthly Walk and Bike events as well as Back to School messages.
- The National Center for SRTS has several tip sheets for parents on safe walking and bicycling behaviors.

Encouragement Programs

Fire Up Your Feet

Fire Up Your Feet is a national campaign aimed at increasing physical activity. The website provides outreach materials and educational resources for the Fire Up Your Feet campaign that occurs over one month in the spring and the fall. The website helps classrooms track the number of times they walk, bike, carpool or take transit to school. Students and classrooms with the highest percentage of students walking, biking or carpooling compete for prizes.

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Even families who live too far from school to walk and bike can participate by driving to a designed central location and walking together from there. Coffee and breakfast can be provided, and students can dress up or hold posters to make a fun, parent-supervised parade to school.

Resources and best practices:

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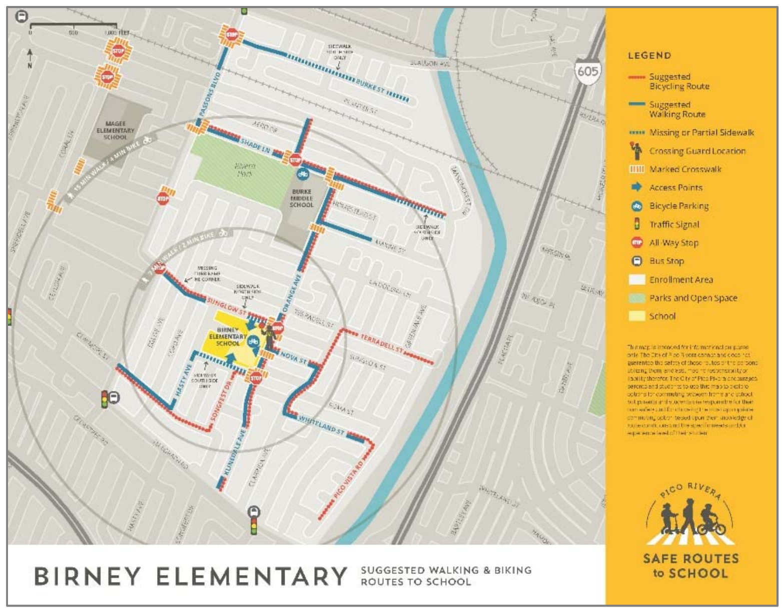
- Walk Bike to School suggests event ideas and planning resources for encouraging active transportation at schools.
- The National Center for SRTS maintains a national database of walk and bike to school day events as well as event ideas and planning resources.

Develop Suggested Route Maps

Suggested Route Maps identify the best routes for getting to school and includes safe walking, biking, and driving suggestions. Suggested route maps also show locations of crossing guards, stop signs, crosswalks, signals, bike lanes, bike paths, and bike parking. The maps can be shared with parents at orientation and in advance of events such as the Walk + Bike Challenge.



The back of the map could include information and tips for students walking and biking.

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Resources and best practice programs:

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3 Silverton High School Report

Principal:	Justin Lieuallen	**Grades:**	9-12
Enrollment:	1,277	**Address:**	1456 Pine Street Silverton, OR 97381
First bell:	7:55 a.m.		
Last bell:	3:05 p.m.	**Free & Reduced Lunch:**	36%

This report summarizes existing conditions, observations, and recommended improvements and programs for Silverton High School resulting from the Safe Routes to School (SRTS) walk audit conducted on October 6, 2016. A summary map illustrates the audit location, area characteristics and locations of infrastructure recommendations.

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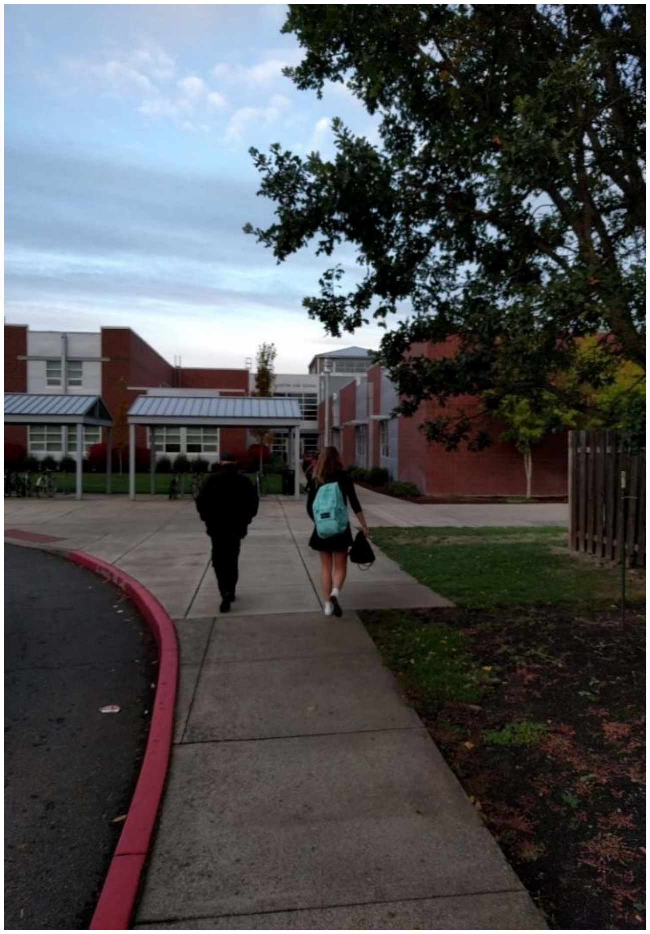

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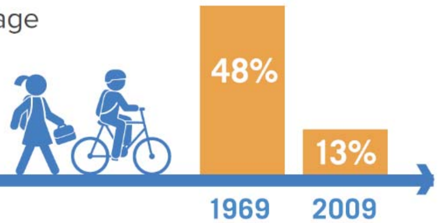
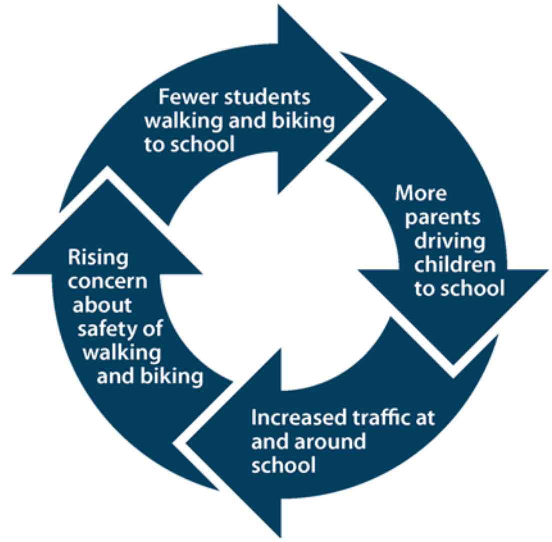
The benefits of implementing a SRTS plan are far-reaching and include improving safety, encouraging physical activity, and reducing traffic congestion and motor vehicle emissions near schools. Implementing SRTS programs and projects benefit adjacent neighborhoods as well as students and their families.

More information and resources for implementing SRTS activities are available at:
http://oregonsaferoutes.org/

Why Safe Routes to School for Silverton?

Within the span of one generation, the percentage of children walking or bicycling to school has dropped to 13%.





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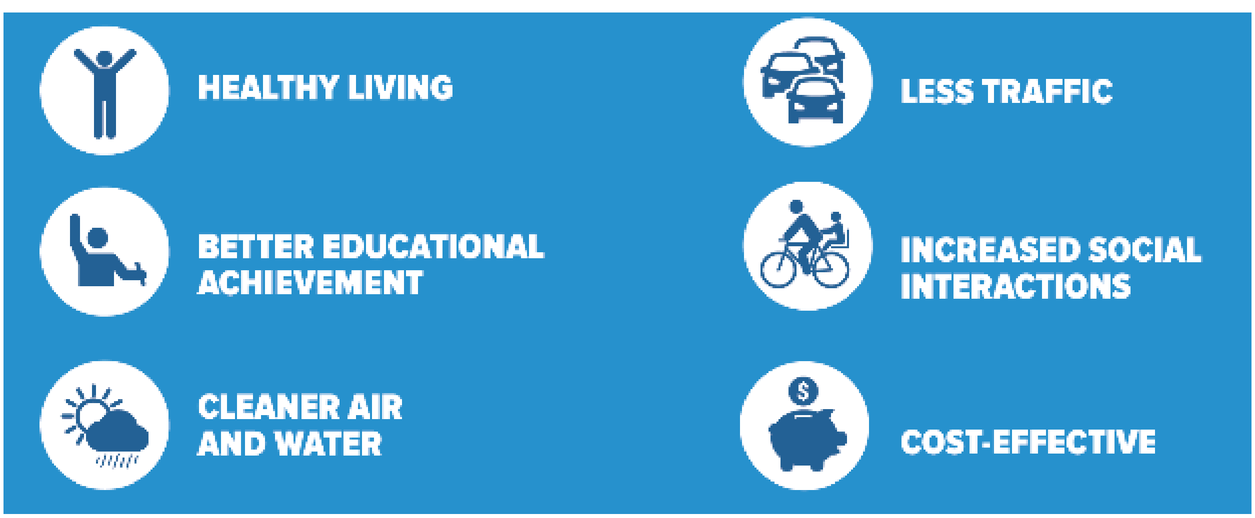
SRTS programs provide many benefits for communities



Walk Audit Summary

Walk Audit Date:	October 6, 2016	**Meeting Time:**	7:15 p.m. morning pick-up
Day of Week:	Thursday	**Weather:**	Overcast

Attendees:

Hannah Day-Kapell, *Alta Planning + Design*
Lacy Brown, *DKS*
Creighton Helms, *Silverton High School*
Dan Magee, *Silverton High School*
Justin Lieuallen, *Silverton High School*
Mike Sellinger, *Alta Planning + Design*
Andy Bellando, *Silver Falls School District*
Jodi Drescher, *Silverton High School*
Michiel Nankman, *Silverton High School*

Existing Conditions

School Layout

Silverton High School is located in the northwest corner of Silverton. The campus has entrances on Grant Street, Western Avenue, and Kromminga Drive (off of Pine Street).

Site Circulation

Vehicles: There is a large parking lot on the west side of the school. The northern half is mostly reserved for staff parking and the southern half for students. The official drop-off zone is in a circle on the east side of the school on Grant Street. Many students are also dropped off in the parking lot on the west side of school. Some student loading was observed along Western Avenue.

School Busses: Busses use the large circular drive-through at the southwest corner of the campus.

Pedestrians: Nearly all pedestrians walk from east of the school, either on Western Avenue or Florida Drive. Few pedestrians access the school from the main driveway on Kromminga Drive. Overflow parking is located on the east side of James Street, north of Silverton Middle School. High school students walk along Western Avenue to access the school via the northeast entrance.

Bicyclists: Bike parking is located on both the east and west sides of the school, for a total of approximately 50 bike racks. Bicyclists typically approach the school on Western Avenue or Florida Drive.

Walk Audit Observations and Infrastructure Recommendations

Key locations are described below, including issues identified during audit observations and discussions. Project numbering refers to the Improvements Map provided on page 7. The party responsible for implementing each recommendation is provided in parentheses (i.e. City of Silverton or Silver Falls School District).

School Parking Lot and Grounds

Circulation during the morning drop-off operated efficiently. There was ample space for both parent and bus drop-off. Staff noted that there is poor compliance at the stop sign separating the two halves of the main parking lot, as well as occasional speeding in and out of the parking lot. No pedestrians were observed entering the school from Kromminga Drive.

Recommendations (1)

a. Install stop lines and pavement markings at the stop sign in the main parking lot (District).

b. Sign the north side of the school for no drop-off (District).

c. Consider speed limit and/or speed bumps in parking lot (District).

Western Avenue

Western Avenue provides direct access to the north side of campus, and staff and student parking. The street lacks sidewalks and there are no marked crosswalks leading into the campus at Grant Street, forcing students to walk in the roadway. A significant numbers of vehicles were observed queuing along Western Avenue to enter the school campus through the northeast entrance.

Recommendations (2)

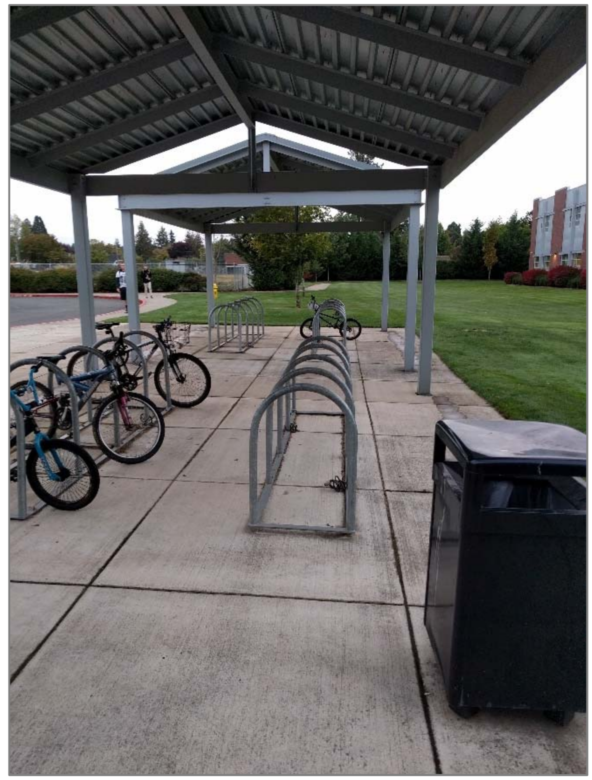
a. Construct a sidewalk on the south side of Western Avenue from James Street to Grant Street (City).

b. Install a crosswalk on the south side of Western Avenue at Grant Street (City).

c. Install street lighting along Western Avenue (City).

Grant Street

Grant Street runs north-south to the east of the campus. There are partial sidewalks along the west side of the street, but a gap exists between Western Avenue and the entrance to the parent drop-off drive through. There is a ditch on the east side of the street, just south of Western Avenue. The street would benefit from restricting parking during school



Bicycle parking is covered and is well-designed.

Western Avenue is an imporant connection to the overflow student parking lot, but it lacks sidewalks.

Grant Avenue lacks sidewalks on both sides and vehicles are regularly parked on the shoulder, forcing pedestrians to walk in the street.

commute hours, which would provide more room for vehicles to pass each other while avoiding pedestrians and bicyclists.

Recommendations (3)

a. Construct a sidewalk on the west side of Grant Street from Western Avenue to the school driveway (City).
b. Post parking restriction signs on the east side of Grant Street during school commute hours (City).
c. Install advance stop markings and signs at crosswalk on Grant Street and Florida Street (City).

James Street

James Street, which runs along Silverton Middle School, provides a connection to Jefferson Street. James Street lacks a sidewalk north of the school. The Silver Falls School District has granted a future easement for the City to construct a complete cross-section, with sidewalks and bike lanes on both sides of the street, which will substantially improve the walking and bicycling environment.

Recommendations (4)

a. Construct sidewalk on the west side of James Street from Western Avenue to Jefferson Street (City).

Jefferson Street and Highway 214

Throughout the City of Silverton, Highway 214/1st Street is a challenge for pedestrians and bicyclists to cross. North of Silverton Middle School, the crossing of Highway 214 and Jefferson Street is a considerable challenge for students. No legs of the intersection provide sidewalks, bicycle facilities, or crossing treatments and the speed limit is 45 mph. Highway 214 is owned by the Oregon Department of Transportation (ODOT), which will be critical in developing a proposed redesign of the crossing.

Recommendations (5)

a. Support the City and ODOT in redesigning the crossing of Jefferson Street and Highway 214 to accommodate student pedestrians and bicyclists (District).

Railroad Crossings

Traffic circulation to Silverton High School is impeded by the lack of connectivity across the railroad tracks. A concept for a future overpass, which would cross the railroad tracks and Highway 214, would provide this much-needed connectivity.

Recommendations (6)

Support the City in pursuing additional feasibility planning for an overpass across the railroad and Highway 214 (District).

Cost Estimates

Table 1 summarizes recommendations for Silverton High School, provides order-of-magnitude cost estimates, and places the projects in priority tiers.

Table 1. Silverton High School Recommended Improvements

Recommendations	Lead Agency	Cost	Priority
1. School Parking Lot and Grounds			
a. Install stop lines and pavement markings at the stop sign in the main parking lot.	District	$	Medium
b. Sign north side of the school for no drop-off.	District	$	High
c. Consider speed limit and/or speed bumps in parking lot.	District	$	Medium
2. Western Avenue			
a. Construct a sidewalk on the south side Western Avenue from James Street to Grant Street.	City	$$	Medium
b. Install a crosswalk on the south side of Western Avenue at Grant Street.	City	$	High
c. Install street lighting along Western Avenue.	City	$$	Medium
3. Grant Street			
a. Construct sidewalk on the west side of Grant Street from Western Avenue to the school driveway.	City	$$	Medium
b. Post parking restriction on the east side of Grant Street during school commute hours.	City	$	High
c. Install advance stop markings and signs at crosswalk on Grant St and Florida Street.	City	$	High
4. James Street			
a. Construct sidewalk on the west side of James Street from Western Avenue to Jefferson Street.	City	$$	Medium
5. Jefferson Street and Highway 214			
a. Support the City and ODOT in redesigning the crossing of Jefferson Street and Highway 214 to accommodate student pedestrians and bicyclists.	District	$$$	High
6. Railroad Crossings			
a. Support the City in pursuing additional feasibility planning for an overpass over the railroad and Highway 214.	District	$$$	High

Silverton High School

Improvement Recommendations

1. School Parking Lot and Grounds
   a. Install stop lines and pavement markings at the stop sign in the in the main parking lot.
   b. Sign north side of the school for no drop-off
   c. Consider speed limit and/or speed bumps in parking lot.
2. Western Avenue
   a. Construct sidewalk on the south side of Western Avenue from James Street to Grant Street.
   b. Install a crosswalk on the south side of Western Avenue at Grant Street.
   c. Install street lighting along Western Avenue.
3. Grant Street
   a. Construct sidewalk on the west side of Grant Street from Western Avenue to the school driveway.
   b. Post parking restriction on the east side of Grant Street during school commute hours.
   c. Install advance stop markings and signs at crosswalk on Grant St and Florida Street.
4. James Street
   a. Construct sidewalk on the west side of James Street from Western Avenue to Jefferson Street.
5. Jefferson Street and Highway 214
   a. Support the City and ODOT in redesigning the crossing of Jefferson Street and Highway 214 to accommodate student pedestrians and bicyclists.
6. Railroad Crossings
   a. Support the City in pursuing additional feasibility planning for an overpass across the railroad and Highway 214.

Figure 1. Silverton High School Improvements Map

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Programmatic Recommendations

Programmatic activities and events complement infrastructure improvements by empowering students and their families to try walking and bicycling, and by making it safer for them to do so. High school students can make their own transportation decisions and are full of new ideas to share with peers. Developing teen interest in the environment is a great way to promote sustainable transportation and develop new materials to promote the program to younger grades.

Silverton High School currently promotes transportation safety through a Public Safety Announcement focused on bicycle and pedestrian safety, as well as through ScanTV. Students participated in a Walk & Roll week for the past two years and worked with younger students at Eugene Field Elementary.

The Oregon Department of Transportation (ODOT) encourages school to complete Action Plans, which require community evaluation of issues and opportunities to implement SRTS improvements. ODOT-approved Action Plans are required for schools competing for state funding. More information and an Action Plan template is available online at:
www.oregon.gov/ODOT/TS/Pages/saferoutes.aspx#Action_Plan_Template.

The activities below are recommended for Silverton High to improve and promote safe walking and bicycling to and from school and in the community. They can be implemented by school administrators, teachers, parents or even school clubs, to promote walking and bicycling safely to and from school.

Oregon's SRTS program offers resources, outreach, and technical assistance to assist in the development of local SRTS programs. See the website at http://www.oregonsaferoutes.org/ for more information about these resources.

Education Programs

Bicycle and Pedestrian Safety Tips and Reminders

High school youth can benefit from reminders about how to walk and bike safely, as well as reminders about driving safely and watching for walkers and bikers. Teens communicate using new and cutting edge methods. Students are more likely to use their phone than their computers and communicate via text message or mobile app. Students frequently switch to the latest social media platforms and therefore any Youth Leadership program should determine which platform is currently in use but also be prepared for students to switch again quickly.

Social media can be used to promote clubs, events, and activities that focus on green transportation choices. Students, clubs, and schools may have a Facebook page, Twitter account, or Instagram for photos. It is beneficial to have a broad social media presence since not all teens will use all of these sites. Most (all) sites will enable Cross-posting to reduce time spent updating statuses.

- The ECO2school program has a classroom curriculum linked to California State Standards in a variety of subject areas, including Math, Science, Language Arts, and Social Studies.

Encouragement Programs

Walk + Bike Challenge

The Oregon Walk + Bike to School Challenge celebrates students walking and bicycling to school. International Walk to School Day is held the first Wednesday in October and Bike to School day takes place the second week in May. Parents can set up a table on the event day to provide refreshments and small rewards for families who participate, as well as maps, lights, and safety information to encourage more students and families to join in the fun.

Even families who live too far from school to walk and bike can participate by driving to a designed central location and walking together from there. Coffee and breakfast can be provided, and students can dress up or hold posters to make a fun, parent-supervised parade to school.

Resources and best practices:

- Schools in Oregon can order incentives to support and promote Walk + Bike Challenge Day and Month.
- Walk Bike to School suggests event ideas and planning resources for encouraging active transportation at schools.
- The National Center for SRTS maintains a national database of walk and bike to school day events as well as event ideas and planning resources.

Student Clubs and Youth Leadership Programs

Clubs and leadership programs allow older students to form groups to support the causes they care about most. High school student clubs can host Walk + Bike Challenge days or high school specific events, organize a competition, or work with their peers to promote walking and bicycling. Student clubs can offer excellent ideas, provide exceptional energy and drive to get things done.

Resources and best practice programs:

- Marin County SRTS's Teens go Green program partners with teens interested in the environment to bring reduced CO_2 and healthy lifestyles to their schools.
- A Cycling League or club can introduce student riders to the sport of mountain biking or road racing, with a focus on skills, fun, fitness, and responsibility.
- The San Francisco Bay Area's Spare the Air Youth program provides Ideas for Activities and Events for Green clubs.

Green Day/No Cars on Campus

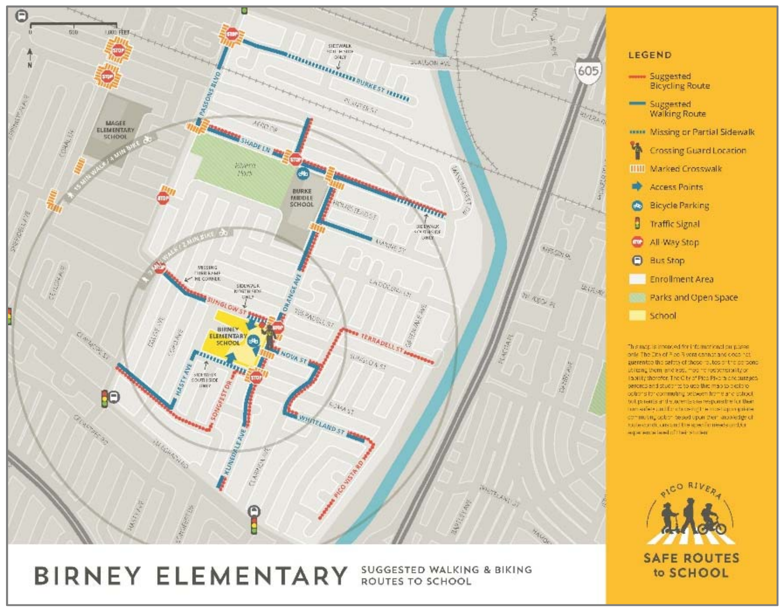
No Cars on Campus events focus on everything but cars. These events help promote transit use, and other active modes such as skateboarding. By encouraging everything but car use, teens think about how transportation impacts the environment and their health. Students can host lunch time activities or special presentations in the empty parking lot.

Cocoa for Carpools

Cocoa for Carpools offers carpooling high school students free hot cocoa in the winter. Organized and promoted by student leaders, this event fosters important partnerships between schools and local businesses and promotes the many benefits of carpooling such as traffic and pollution reduction.

Suggested Route Maps

Suggested Route Maps identify the best routes for getting to school and includes safe walking, biking, and driving suggestions. Suggested route maps also show locations of crossing guards, stop signs, crosswalks, signals, bike lanes, bike paths, and bike parking. Due to the older age of Silverton High School students, the map can include a larger catchment area and highlight suggested biking routes only. The maps can be shared with parents at orientation and in advance of events such as the Walk + Bike Challenge.



The back of the map could include information and tips for high school students walking and biking. In particular, it could address concerns about students using lights when riding in the dark and for students carrying instruments while biking.

- The Institute of Transportation Engineers (ITE) has a white paper on School Route Maps.
- Pico Rivera, CA developed user-friendly Suggested School Route Maps that include walking times and location of bicycle parking.

Evaluation Programs

Student Hand Tallies

Hand tallies are a standard way of tracking school commute mode split for SRTS programs. Students are asked how they got to and from school over a 2-3 day period. Students raise their hand when the mode they took is called out, and the teacher or a volunteer records this. Hand tallies are often required of state and federal SRTS grant recipients.

Resources and best practice programs:

- The Oregon SRTS website provides evaluation resources online.

- The National Center for SRTS provides forms, data collection guidelines, data center, and automatically-generated reports.

Parent Surveys

Parents are asked how their children got to and from school via a paper or online survey. Parent surveys also ask questions about the barriers to walking or biking to/from school, health information, or perception of crime and other social behaviors.

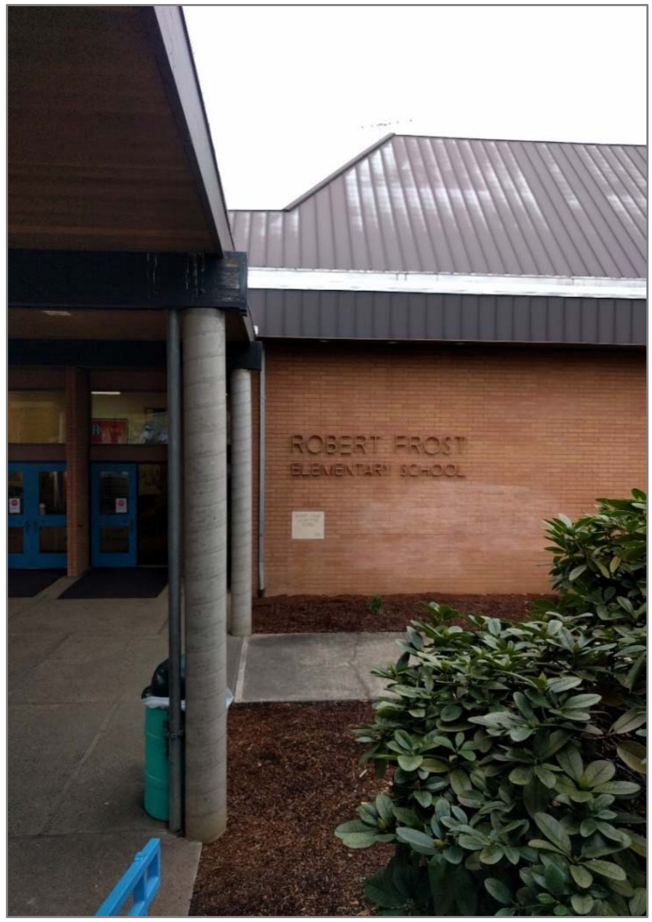
Resources and best practice programs:

- The Oregon SRTS website provides evaluation resources online.
- The National Center for SRTS provides forms, data collection guidelines, and data center.

4 Robert Frost School Report

Principal:	Leslie Roache	**Grades:**	3-5
Enrollment:	412	**Address:**	201 Westfield Street
First bell:	8:15 a.m.		Silverton, OR 97381
Last bell:	3:00 p.m.	**Free & Reduced Lunch:**	43%

This report summarizes existing conditions, observations, and recommended improvements and programs for Robert Frost School resulting from the Safe Routes to School (SRTS) walk audit conducted on October 6, 2016. A summary map illustrates the audit location, area characteristics and locations of infrastructure recommendations.



This effort supports the greater Silverton Transportation System Plan (TSP) update, in which the City plans for its future transportation needs.

What is Safe Routes to School (SRTS)?

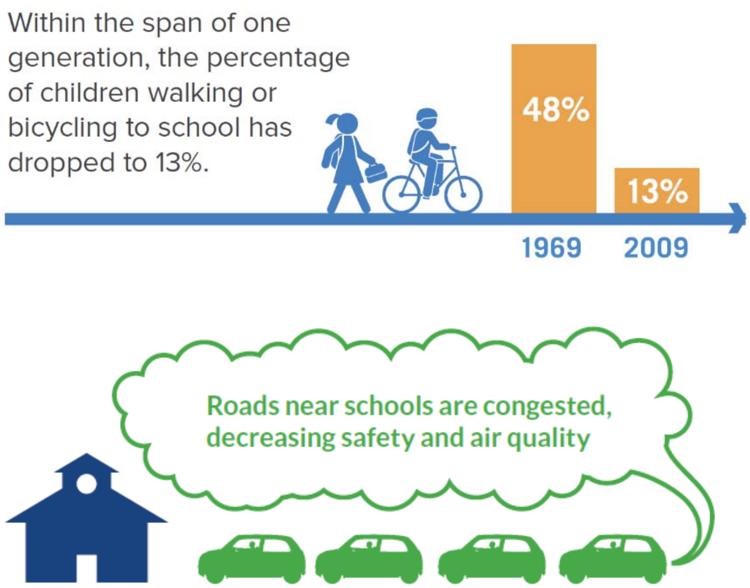
SRTS is a comprehensive program to **make school communities safer** by combining engineering tools and enforcement with education about safety and activities to enable and encourage students to **walk and bicycle to school**. SRTS programs typically involve partnerships among municipalities, school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

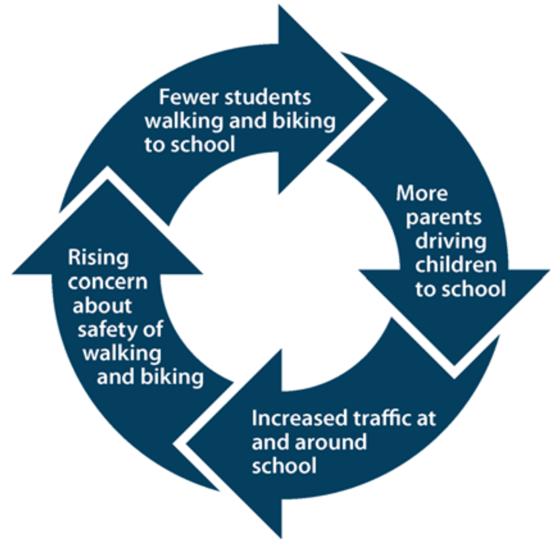
Although most students in the United States walked or biked to school before the 1980s, the number of students walking or bicycling to school since has sharply declined.

The benefits of implementing a SRTS plan are far-reaching and include improving safety, encouraging physical activity, and reducing traffic congestion and motor vehicle emissions near schools. Implementing SRTS programs and projects benefit adjacent neighborhoods as well as students and their families.

More information and resources for implementing SRTS activities are available at:
http://oregonsaferoutes.org/

Why Safe Routes to School for Silverton?



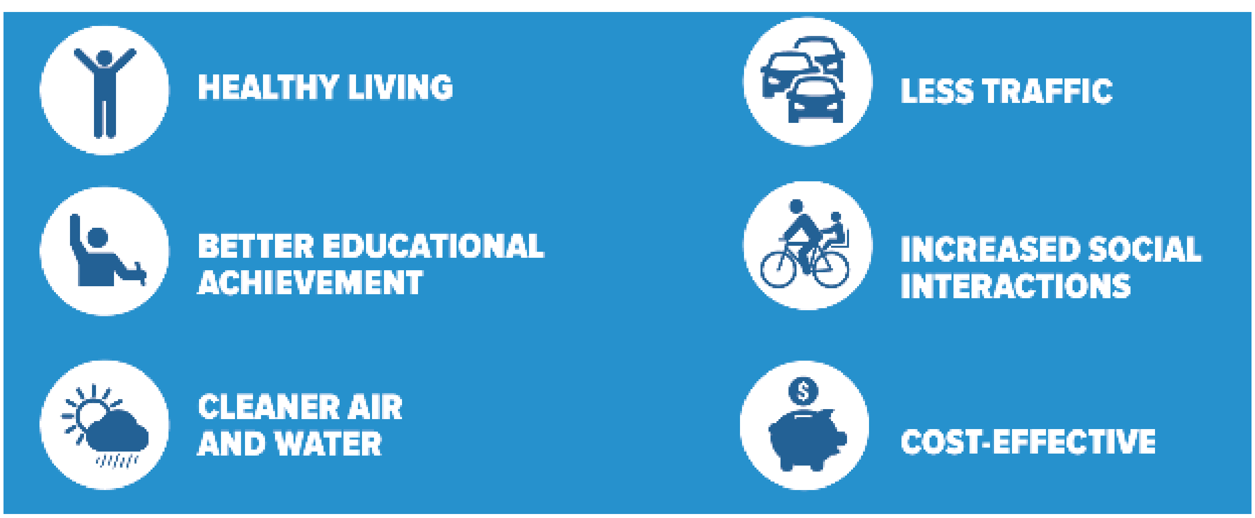


This movement away from active transportation is a self-perpetuating cycle.

SRTS education & encouragement programs can result in a **25% increase** in walking and biking over 5 years.

A comprehensive SRTS program addresses reductions in walking and biking through a multi-pronged approach that uses education, encouragement, engineering and enforcement efforts to develop attitudes, behaviors, and physical infrastructure that improve the walking and biking environment.

SRTS programs provide many benefits for communities



Walk Audit Summary

Walk Audit Date:	October 6, 2016	**Meeting Time:**	2:40 p.m. afternoon drop-off
Day of Week:	Thursday	**Weather:**	Overcast

Attendees:

Hannah Day-Kapell, *Alta Planning + Design*
Lacy Brown, *DKS*
Leslie Roache, Robert Frost School
Mike Sellinger, *Alta Planning + Design*
Andy Bellando, *Silver Falls School District*
Paul Eckley, *City of Silverton Public Works Director*

Existing Conditions

School Layout

Robert Frost School is located on Westfield Street in southwest Silverton. The entrance to the school is just north of South Street, and the entrance is shared for the school's main drive through and for the parking lot, located to the north of the school.

Westfield Street is a county-owned road with one lane in each direction and bike lanes. A school flashing beacon is located adjacent to school grounds, with School Crossing pavement markings, School Zone 20 mph speed signs, and School Crossing Ahead advance warning signs.

Students cross Westfield Street with assistance from a crossing guard and a flashing beacon during school hours.

Site Circulation

Vehicles: Vehicles use the parking lot on the north end of the campus for both pick-up and drop-off. The adjoining parking lot for the First Baptist Church is also available for parents to use.

School Busses: Busses use the drive-through right in front of the main entrance to the school, and have ample space for safe and efficient student drop-off and pick up.

Pedestrians: Most student walkers were escorted across Westfield Street by staff and then continued on their own.

Bicyclists: Bike parking is located on the north end of the school. All of the observed bicyclists either crossed Westfield Street and headed east or south on Westfield. A few of the student bikers used the western Westfield Street bike lane headed the wrong direction.

Walk Audit Observations and Infrastructure Recommendations

Key locations are described below, including issues identified during audit observations and discussions. Project numbering refers to the Improvements Map provided on page 7. The party responsible for implementing each recommendation is provided in parentheses (i.e. City of Silverton or Silver Falls School District).

School Parking Lot and Grounds

Bicycle parking is relatively well-used but is an older "toaster" style of rack, which does not support the bicycle securely while it is being locked up.

Student pick-up operated well throughout the audit. Busses and cars were well separated and no conflicts were observed. Students waited with staff north of the school until they were able to identify their parent or chaperone in the north parking lot.

The existing bike parking is located on the north side of the school. It seems to provide sufficient racks to accommodate all bicycles, but staff should regularly check on the area to determine whether additional parking is necessary. When racks are replaced, new racks should comply with the Association for Bicycle and Pedestrian Professional's Bicycle Parking Guidelines. Racks should enable the bicycle frame and at least one wheel to be locked to the rack and support the bicycle in a stable position without damage to wheels, frame or components (such as U-racks on a concrete pad). Each bicycle should have a 2 ft. by 6 ft. space that is easy to access.

Recommendations (1)

a. Replace bike parking along north side of school with modern racks (District).

Westfield Street

Several students were observed riding northbound on Westfield Street's west sidewalk and crossing at Center Street, without crossing treatments.

Westfield Street provides the only access to Robert Frost School. In front of the school, Westfield Street has one lane in each direction, as well as standard bike lanes.

Students walking or bicycling north from the campus were observed heading alongside the First Baptist Church parking lot and then using the Church driveway to get to Westfield Street.

Between South Street and McClaine Street, there are no marked crossings and there is no sidewalk on the eastern side. There is also no good path from the bicycle parking to the main school crosswalk on South Street. All of the observed student bikers remained on the west side of Westfield Street, either on the sidewalk or riding the wrong way in the bike lane.

North of Center Street, there is a busy driveway on the west side of Westfield Street to enter the Safeway shopping complex. Students walking north from the school typically cross this driveway since there is no sidewalk on the east side of Westfield Street. There is poor visibility exiting the driveway, making it difficult for drivers to see students walking and biking along Westfield Street.


Student bicycling on Westfield Street were observed riding wrong-way in the bikeway or on the sidewalk, to avoid crossing Westfield near the school.

Recommendations (2)

a. Trim vegetation at intersection of Westfield Street and South Street to improve visibility (City).

b. Study widening west side sidewalk on Westfield Street, between First Baptist Church driveway and Center Street, potentially elevating southbound bike lane and designating a two-way cycle track (City).

c. Move the stop line at the shopping center driveway further back from the intersection and install crosswalk across driveway (City/Property Owners).

d. Install sidewalks on east side of Westfield from South Street north to existing sidewalk (City).

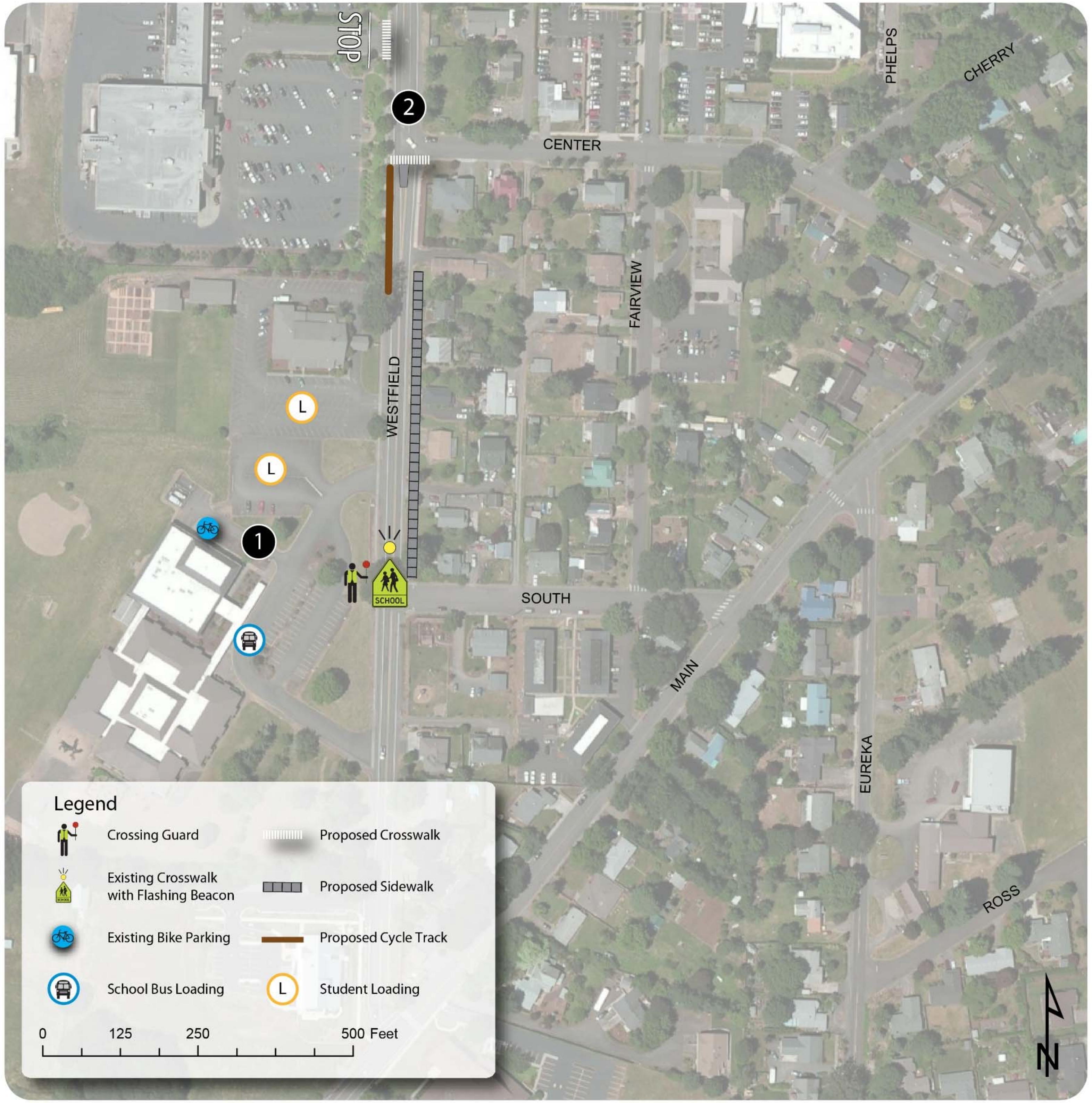
e. Study feasibility of installing crosswalk with pedestrian refuge island and curb ramps on Westfield Street at Center Street (City).

Cost Estimates

Table 1 summarizes recommendations for Robert Frost School, provides order-of-magnitude cost estimates, and places the projects in priority tiers.

Table 1. Robert Frost Recommended Improvements

Recommendations	Lead Agency	Cost	Priority
1. School Parking Lot and Grounds			
a. Replace bike parking along north side of school with modern racks.	District	$	Medium
2. Westfield Street			
a. Trim vegetation at intersection of Westfield Street and South Street to improve visibility.	City	$	High
b. Study widening west side sidewalk on Westfield Street, between First Baptist Church driveway and Center Street, potentially elevating southbound bike lane and designating a two-way cycle track.	City	$$-$$$	Medium
c. Move the stop line at the shopping center driveway further back from the intersection and install crosswalk across driveway.	City/ Property Owners	$	High
d. Install sidewalks on east side of Westfield from South Street north to existing sidewalk.	City	$$	Medium
e. Study feasibility of installing crosswalk with pedestrian refuge island and curb ramps on Westfield Street at Center Street.	City	$$	Medium



Robert Frost School

Improvement Recommendations

1. School Parking Lot and Grounds
   a. Replace bike parking along north side of school with modern racks.
2. Westfield Street
   a. Trim vegetation at intersection of Westfield Street and South Street to improve visibility.
   b. Study widening west side sidewalk on Westfield Street, between First Baptist Church driveway and Center Street, potentially elevating southbound bike lane and designating a two-way cycle track.
   c. Move the stop line at the shopping center driveway further back from the intersection and install crosswalk across driveway.
   d. Install sidewalks on east side of Westfield from South Street north to existing sidewalk.
   e. Study feasibility of installing crosswalk with pedestrian refuge island and curb ramps on Westfield Street at Center Street.
   Street.

Figure 1. Robert Frost School Improvements Map

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Programmatic Recommendations

Programmatic activities and events complement infrastructure improvements by empowering students and their families to try walking and bicycling, and by making it safer for them to do so.

Robert Frost Elementary School currently promotes transportation safety by sending information to parents about student drop-off and pick-up patterns as well as reminders about driving safely. At the beginning of the school year, the school holds pedestrian education with students to practice their drop-off and pick-up procedures. Robert Frost Elementary hosted an annual bike rodeo with the Silverton Police Department.

The Oregon Department of Transportation (ODOT) encourages school to complete Action Plans, which require community evaluation of issues and opportunities to implement SRTS improvements. ODOT-approved Action Plans are required for schools competing for state funding. More information and an Action Plan template is available online at: www.oregon.gov/ODOT/TS/Pages/saferoutes.aspx#Action_Plan_Template.

The activities below are recommended for Robert Frost Elementary to improve and promote safe walking and bicycling to and from school and in the community. They can be implemented by school administrators, teachers, parents or even school clubs, to promote walking and bicycling safely to and from school.

Oregon's SRTS program offers resources, outreach, and technical assistance to assist in the development of local SRTS programs. See the website at http://www.oregonsaferoutes.org/ for more information about these resources.

Education Programs

Bicycle and Pedestrian Safety Education

Pedestrian safety education teaches students basic traffic laws and safety rules, including basic traffic safety rules, sign identification and decision-making tools. Safety lessons should be taught by trained safety professionals, as part of an assembly, physical education curriculum, or other classes.

Resources and best practice programs for elementary school students include:

- Oregon SRTS provides classes and train-the-trainer programs. Oregon-based service providers are listed at: www.oregonsaferoutes.org/bike-ed-service-providers
- The National Highway Traffic Safety Administration offers a child pedestrian safety curriculum.
- The Oregon Bicycle Transportation Alliance developed SRTS Curriculum, which the Neighborhood Navigators pedestrian safety lesson plans.

Parent Education and Outreach

Parents are the primary decision-makers about how their children get to school. Informing parents about their options for walking and bicycling, as well as communicating the benefits of active transportation, can encourage more families to walk and bike. This can occur through school e-news or announcements, and through informational resources. Suggested route maps can show parents the best walking or biking route to the school, overcoming concerns about barriers.

Resources and best practice programs:

- Oregon SRTS provides materials, handouts, and theme ideas for Monthly Walk and Bike events as well as Back to School messages.
- The National Center for SRTS has several tip sheets for parents on safe walking and bicycling behaviors.

Encouragement Programs

Fire Up Your Feet

Fire Up Your Feet is a national campaign aimed at increasing physical activity. The website provides outreach materials and educational resources for the Fire Up Your Feet campaign that occurs over one month in the spring and the fall. The website helps classrooms track the number of times they walk, bike, carpool or take transit to school. Students and classrooms with the highest percentage of students walking, biking or carpooling compete for prizes.

Resources and best practice programs:

- Oregon's Fire Up Your Feet program includes promotional resources and an activity tracker, funded through the Kaiser Permanente and the National PTA. Schools in Oregon can win cash prizes and are eligible for national awards.

Walk + Bike Challenge

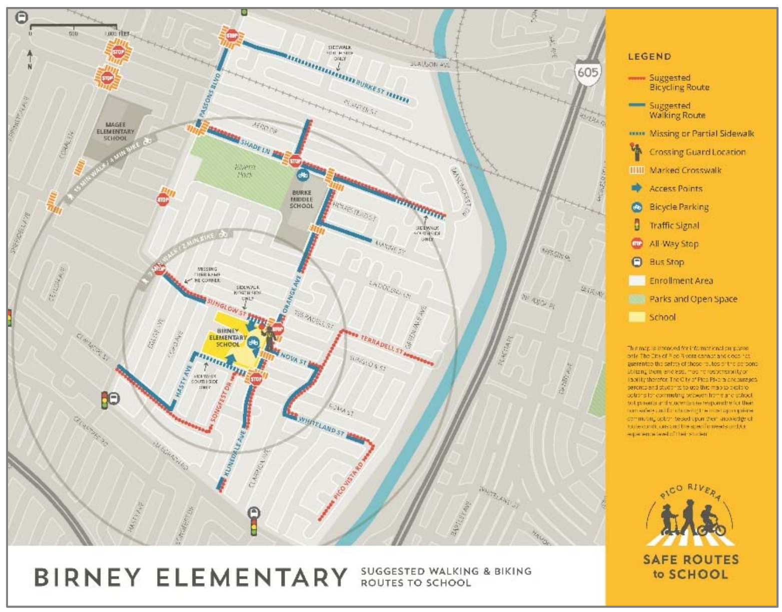
The Oregon Walk + Bike to School Challenge celebrates students walking and bicycling to school. International Walk to School Day is held the first Wednesday in October and Bike to School day takes place the second week in May. Parents can set up a table on the event day to provide refreshments and small rewards for families who participate, as well as maps, lights, and safety information to encourage more students and families to join in the fun.

Even families who live too far from school to walk and bike can participate by driving to a designed central location and walking together from there. Coffee and breakfast can be provided, and students can dress up or hold posters to make a fun, parent-supervised parade to school.

Resources and best practices:

- Schools in Oregon can order incentives to support and promote Walk + Bike Challenge Day and Month.
- Walk Bike to School suggests event ideas and planning resources for encouraging active transportation at schools.
- The National Center for SRTS maintains a national database of walk and bike to school day events as well as event ideas and planning resources.

Develop Suggested Route Maps



Suggested Route Maps identify the best routes for getting to school and includes safe walking, biking, and driving suggestions. Suggested route maps also show locations of crossing guards, stop signs, crosswalks, signals, bike lanes, bike paths, and bike parking. The maps can be shared with parents at orientation and in advance of events such as the Walk + Bike Challenge.

The back of the map could include information and tips for students walking and biking.

- The Institute of Transportation Engineers (ITE) has a white paper on School Route Maps.
- Pico Rivera, CA developed user-friendly Suggested School Route Maps that include walking times and location of bicycle parking.

Evaluation Programs

Student Hand Tallies

Hand tallies are a standard way of tracking school commute mode split for SRTS programs. Students are asked how they got to and from school over a 2-3 day period. Students raise their hand when the mode they took is called out, and the teacher or a volunteer records this. Hand tallies are often required of state and federal SRTS grant recipients.

Resources and best practice programs:

- The Oregon SRTS website provides evaluation resources online.
- The National Center for SRTS provides forms, data collection guidelines, data center, and automatically-generated reports.

Parent Surveys

Parents are asked how their children got to and from school via a paper or online survey. Parent surveys also ask questions about the barriers to walking or biking to/from school, health information, or perception of crime and other social behaviors.

Resources and best practice programs:

- The Oregon SRTS website provides evaluation resources online.
- The National Center for SRTS provides forms, data collection guidelines, and data center.

SECTION K

MEETING SUMMARY 1

PUBLIC ADVISORY COMMITTEE (PAC) MEETING #1

SILVERTON TRANSPORTATION SYSTEM PLAN PROJECT ADVISORY COMMITTEE (PAC) MEETING #1 SUMMARY

DKS

Date: Thursday, June 30, 2016

Time: 6:00 PM to 7:30 PM

Location: City Council Chambers, 421 South Water Street, Silverton OR, 97381

Purpose: The purpose of this meeting is to provide an orientation to the TSP project, discuss project Goals and Objectives, and present highlights of Existing Conditions for transportation in Silverton.

1. Sign-in, Agenda Overview, and Introductions

Paul Eckley introduced Ray Delahanty from DKS Associates, the transportation planning consultant for the Silverton TSP Update project. Ray began introductions for the PAC, which included:

- Ray Delahanty, DKS Associates
- Jim Sears, City Councilor
- Naomi Zwerdling, ODOT
- Charles Baldwin, Silverton Bicycle Alliance
- Sarah Reiff, citizen
- Andy Bellando, Silver Falls School District
- Rich Piatkowsi, Silverton Planning Commission
- Ron Harvard, Silverton Fire Department
- Jason Gottgetreu, Silverton Community Development Director
- Julia Ravitch, Marion County
- Paul Eckley, Silverton Public Works Director
- Jeff Fossholm, Silverton Police Chief
- Stacy Palmer, Silverton Chamber of Commerce

2. Project Orientation

Ray Delahanty gave an overview of transportation system planning. A transportation system plan (TSP) is required by the state Transportation Planning Rule (TPR) OAR 660-012-0015. It provides long range direction for development of transportation facilities and services for all modes, and ensures the planned systems are adequate to meet the needs of planned land uses.

A TSP must provide consistency with state and regional plans, establish an efficient network of arterials/collectors, develop standards for layout, spacing, and connectivity of local streets, protect facilities and corridors for intended uses, provide public transportation services to meet basic needs, and develop a network of sidewalks and bikeways linking residential areas to activity centers, a finance program that is reasonably likely, and implementing code and ordinances.

Ray gave an overview of common elements of a TSP, which include Motor Vehicle Plan, Pedestrian Plan, Bicycle Plan, Transit Plan, Other Modal Plans (i.e.: Water, Air), Financing, and Implementing Codes and Ordinances. During discussion of each mode, PAC members were prompted to provide comment on issues they thought could be addressed in the TSP. These included:

- Making the pedestrian and bicycle network more complete. This probably means looking further than ¼ mile from key activity generators, particularly for schools.
- Ray clarified that there's a separate but parallel Safe Routes to School task happening as part of the TSP. Safe Routes to School will likely look at complete routes for students in each school's attendance area.

A set of goals, objectives, and evaluation criteria are used to develop and rank alternatives for each modal plan. Ray went over the public involvement process that includes the Project Advisory Committee (PAC), a project website, and public open houses.

3. Transportation Goals and Objectives

The following draft goals were presented to the PAC group, and an online instant poll was used to assess the group's relative support for each goal and to promote discussion of the draft goals and goal statements. The poll prompted PAC members to rate each goal from 1 (relatively unimportant) to 5 (very important). The polling results and discussion for each goal are as follows:

- **Goal 1: Livability (Average poll rating: 4.6).** This goal area scored the highest. In general the group saw a strong connection between livability, quality of life, and economic vibrancy.
- **Goal 2: Balanced System (Average poll rating: 3.5).** One PAC member pointed out that this goal area could be split into two goals: one focused on balancing the system among modes, and one focused on reducing reliance on the single-occupant vehicle. Another PAC member wanted to see the focus on system balance to be on fun and recreation rather than impacting motor vehicle mode split.
- **Goal 3: Safety (Average poll rating: 4.3).** The group rated the Safety goal area as having high importance. The group discussed appropriate measures for safety success, such as whether reducing crash rates below expected critical rates was sufficient, or whether a "vision zero" approach made sense.
- **Goal 4: Efficiency (Average poll rating: 3.9).**
- **Goal 5: Accessibility (Average poll rating: 4.1).**
- **Goal 6: Freight Movement (Average poll rating: 3.3).** PAC members mentioned that Christmas tree movement is important, and the existing freight route is not well-signed or intuitive.
- **Goal 7: Funding (Average poll rating: 4.4).** Funding was the group's second-highest scoring goal. The group feels that it's important to develop a list of projects that can be funded, and carefully prioritize the most important projects.

- **Goal 8: Consistency (Average poll rating: 3.9).**

4. Existing Conditions Review

Ray reviewed areas of the Existing Conditions memo that are new or significantly updated since the last TSP, including updated commuting patterns, crash analysis, motor vehicle operations, and analysis of the bicycle and pedestrian networks. The following are a sample of comments from PAC members:

- Motor vehicle operations at the Water Street/Main Street intersection tend to be made worse by the volume of pedestrian crossings, and the problem will likely worsen in the future. Ray confirmed that the existing TSP has a future signal project at this intersection, which would address the performance issue.
- Questions about the bicycle level of stress analysis: much of 1st Street (OR 214) north of downtown has a wide shoulder, so should perform better than LTS 4, and downtown bicycle operations (shared lane environment with motor vehicles) seems to rate too well (LTS 2).
- Be sure to include trails as part of the overall analysis of bicycle and pedestrian facilities as appropriate.

5. Next Steps

The next PAC meeting is not expected until fall of 2016. In the meantime, the consultant staff will be continuing work on future forecasting and future conditions.

SECTION L

MEETING SUMMARY 2

PUBLIC ADVISORY COMMITTEE (PAC) MEETING #2

SILVERTON TRANSPORTATION SYSTEM PLAN PROJECT ADVISORY COMMITTEE (PAC) MEETING #2 SUMMARY

Date: Thursday, February 23, 2017

Time: 6:00 PM to 7:45 PM

Location: City Council Chambers, 421 South Water Street, Silverton OR, 97381

Purpose: The purpose of this meeting was to review existing and future transportation needs in Silverton and brainstorm solutions for addressing identified needs.

1. Sign-in, Agenda Overview, and Introductions

Ray Delahanty from DKS Associates, the transportation planning consultant for the Silverton TSP Update project, began introductions for the PAC, which included:

- Ray Delahanty, DKS Associates
- Chris Maciejewski, DKS Associates
- Jim Sears, City Councilor
- Naomi Zwerdling, ODOT
- Charles Baldwin, Silverton Bicycle Alliance
- Sarah Reif, citizen
- Andy Bellando, Silver Falls School District
- Rich Piatkowsi, Silverton Planning Commission
- Ron Parvin, Silverton Fire Department
- Jason Gottgetreu, Silverton Community Development Director
- Christian Saxe, Silverton Public Works Director
- Jeff Fossholm, Silverton Police Chief
- Stacy Palmer, Silverton Chamber of Commerce
- Angela Carnahan, DLCD

2. Goals, Objectives, and Existing Conditions Review

Ray Delahanty reviewed materials that were presented at the first PAC meeting that was held in June 2016. At that meeting, PAC members participated in an exercise to determine the priority of goals that had already been identified in the adopted TSP. The following four goal areas received the highest ratings from the PAC:

- **Livability.** Transportation is integrated with Silverton's quality of life and vibrancy.
- **Funding**. Develop a project list that can be funded and prioritize the most important projects.

- **Safety.** TSP projects should contribute to overall safety for Silverton transportation system users.
- **Accessibility.** The transportation system should be accessible to all citizens, regardless of age or ability.

Ray reviewed existing conditions as well. Two intersections were flagged as having higher than expected crash rates: Water Street/Oak Street and Westfield Street/Main Street. All study intersections met operational standards (delay and/or volume-to-capacity ratio) under existing PM peak hour conditions. Several street segments leading into downtown were flagged as being deficient for pedestrian and bicycle travel, including N 1st Street, S Water Street, Oak Street, and W Main Street.

3. Future Conditions Review

Ray reviewed findings from the Future Forecasting and Future Conditions memorandums. Future forecasting depended on base and future year traffic models that generate and distribute traffic based on the location of different types and intensities of land use. The highest levels of growth across all land uses are expected in the West Side area (between Silverton Road, Westfield Street, and Main Street).

Future conditions analysis revealed the following deficiencies:

- Intersections exceeding delay and/or volume-to-capacity standards: Main Street/McClaine Street, Water Street/Main Street, 2nd Street/Oak Street, Westfield Street/McClaine Street, 1st Street/C Street.
- 1st/Hobart also experiences significant delay at the westbound approach. This is a significant movement for heavy trucks.
- Pedestrian and bicycle deficiencies identified under existing conditions are expected to worsen as traffic volumes increase in the future.

4. Small Groups: Solutions Development

The committee broke into three groups to brainstorm solutions for needs that were identified in existing and future conditions. Committee members marked up maps and filled out checklists to document solutions that can be carried forward into further analysis. Completed maps and checklists were collected at the end of the small group session, and will be compiled as part of the TSP's Solutions Identification memorandum later in the project.

Highlights were reported out at the end of the small group session, including:

- A rapid rectangular flashing beacon (RRFB) or other enhanced pedestrian crossing of N 1st Avenue at Jefferson Street
- 2nd Street bike boulevard downtown
- A comprehensive bicycle system that connects key city destinations to low-stress routes (developed by the Silverton Bicycle Alliance; map shapefiles forwarded to consultant)
- Southbound right turn lane at Westfield/McClaine to address future congestion
- Increased illumination downtown to help improve safety
- Investigate opportunities for rails-to-trails conversions

SECTION M

MEETING SUMMARY 3

OPEN HOUSE #1

SILVERTON TRANSPORTATION SYSTEM PLAN COMMUNITY EVENT #1 SUMMARY

DKS

Date: Thursday, July 21, 2016

Time: 6:00 PM to 8:00 PM

Location: City Council Chambers, 421 South Water Street, Silverton OR, 97381

Agenda

The open house followed a self-guided format with stations set up to:

- Introduce attendees to the Transportation System Plan Update Process
- Contribute to existing needs assessment

Five citizens attended the event.

Stations

The event provided stations where different aspects of the TSP and its work to date were presented. Consultant and City staff were available to discuss issues and how they might be addressed in the TSP process. The stations and comments received regarding each are documented below.

Driving Network Conditions

- Victor Madge brought some street design concepts that he thought could be considered as potential street standards as part of the TSP process. Concepts Victor showed included bioswales, shared bicycle and pedestrian paths, and traffic calming features such as speed tables at intersections.
- The driving network around James Street, Pine Street, Brown Street, and Water Street tends to be impacted by high school-related vehicle traffic.
- At 1st Street and C Street it's unclear whether right turn is allowed on a red arrow. If allowed, then signage could help clarify this and make the intersection more efficient.

Walking Network Conditions

- Traffic calming strategies should be explored to help make the walking environment safer and more comfortable on the streets that have higher speeds.
- The abandoned east-west rail spur right-of-way between 1st and Mill could be a useful bike/ped connection.
- TSP should coordinate with Oregon Garden on nonmotorized path through the Monet lily ponds down to the lake (Pettit reservoir). Can be an important part of the city's overall walk/bike amenities.

Biking Network Conditions

- Need more signage advising people driving and biking when there's a shared roadway situation ("Bikes may use full lane," etc.).

- Need more signage indicating bike routes.
- Need designated bike routes through downtown.
- What does Silverton need to do to promote itself as a bicycle-friendly city?
- Charles Baldwin brought information on physically protected bikeways and asked whether this is the type of treatment you would need to make certain roadways comfortable as bike routes.
- Another priority would be a scenic bicycle route loop around the city, with connections to downtown. Pioneer, Steelhammer, Eska, Jefferson are good candidate streets, and potentially a nonmotorized crossing of Silver Creek where the existing TSP had a new motorized crossing, near the Westside area.
- 2nd Street is indicated as a "good" bicycle facility in the existing conditions report, but the speeds seem too high today to make it a good shared roadway.
- Water Street/C Street is an important intersection for bikes as well as cars, but the intersection doesn't do a god job of keeping the modes separate.
- The uphill grade on Main Street from McClaine to Eureka creates speed differential conflicts for bikes and cars – this is a section that needs a bike treatment.
- The grade on East Main Street between Steelhammer and 3rd creates speed differential issues between cars and bikes – this is a section that needs a bike treatment.