FINAL DRAFT

City of Stayton
Transportation System Plan

Prepared for

City of Stayton

Prepared by

H. Lee & Associates

April 27, 2004

CITY OF STAYTON

FINAL DRAFT
TRANSPORTATION SYSTEM PLAN

Prepared for:

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Section 1.0
Executive Summary

The purpose of the Stayton Transportation System Plan is to determine the 2025 transportation needs of the city, develop a list of transportation improvements to be constructed through the year 2025, identify funding for the identified improvements, and update/revise the necessary municipal codes to implement the transportation system plan. This executive summary identifies the major findings of the transportation system plan.

A large scale map of the City of Stayton and its urban growth boundary is provided for additional reference in a pocket folder at the back of this report since the figures in this report do not contain all of the street names due to size and readability constraints.

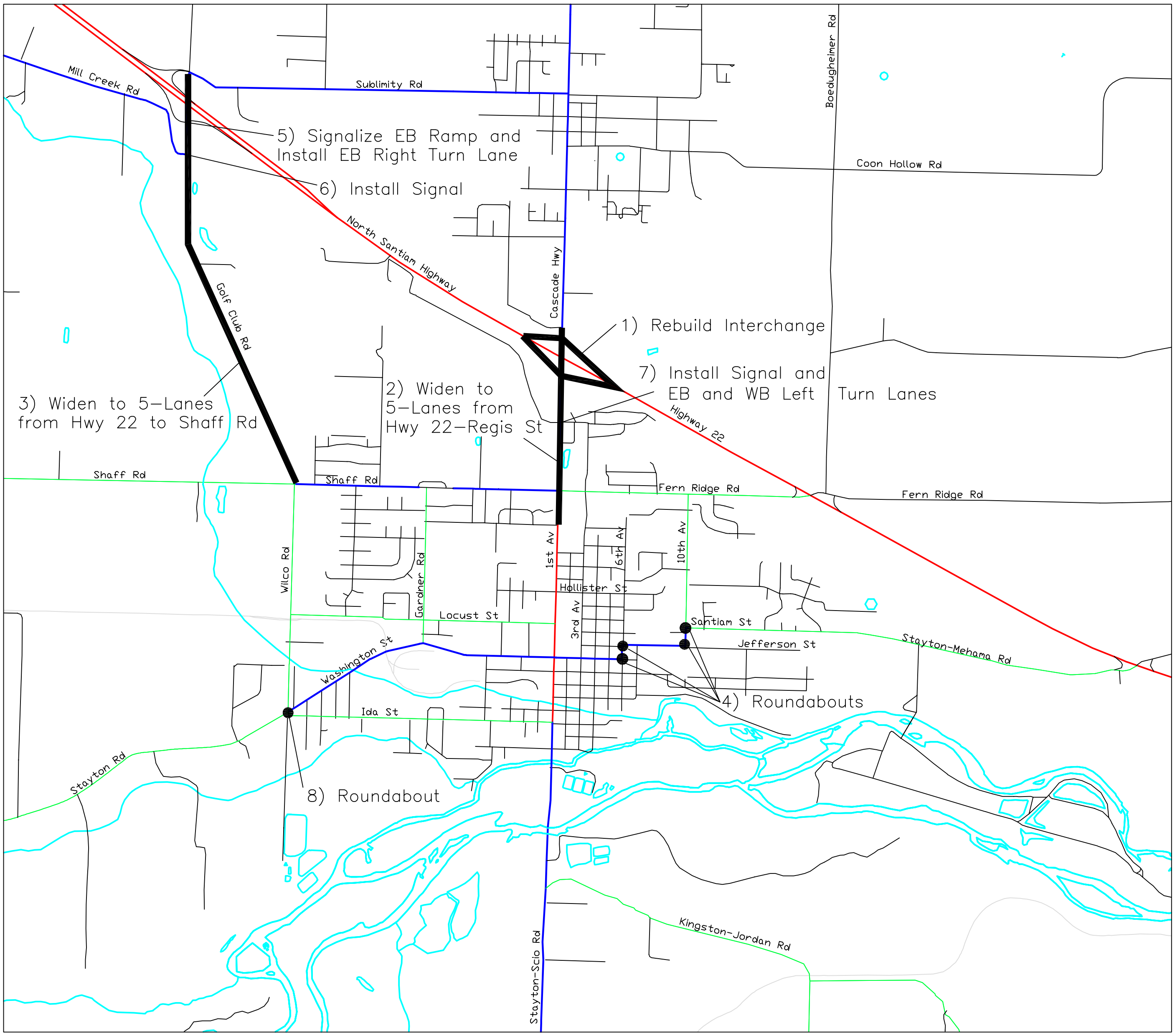
1.1. TRANSPORTATON SYSTEM ALTERNATIVES

Based on the existing conditions assessment, public input, and the 2025 traffic forecast, transportation deficiencies were defined. The major transportation deficiencies are anticipated to occur along the Cascade Highway/1st Avenue corridor and Golf Club Road south of Mill Creek Road. A need for future capacity along the north-south arterials was the most significant future transportation need. In addition, the Cascade Highway/Highway 22 Eastbound Ramp is anticipated to be a major area of future congestion.

To solve the anticipated congestion problems in the year 2025, four system alternatives were analyzed. These alternatives included:

1) widening Cascade Highway and 1st Avenue from three lanes to five lanes from Highway 22 to Ida Street;
2) creating a by-pass around Stayton utilizing Golf Club Road, Wilco Road, Jetters Way, and Stayton-Scio Road via a new Santiam River bridge crossing;
3) developing a couplet system between 1st Avenue and 3rd Avenue; and
4) widening Golf Club Road and Wilco Road to five lanes.

After careful evaluation of each alternative, it was determined that no single alternative would solve the majority of congestion problems anticipated in 2025. Therefore, a fifth alternative was developed that was a hybrid of the alternatives. This alternative involved widening Golf Club Road from Highway 22 to Shaff Road, widening Cascade Highway and 1st Avenue to five lanes from Highway 22 to Regis Street, rebuilding the Cascade Highway/Highway 22 interchange, and constructing roundabouts along the Washington Street-to-Santiam Street “S” curves and at Wilco Road and Washington Street. Although not part of the preferred alternative, a long term need outside the 2025 planning period was identified that involved another Santiam River crossing. Figure 1-1 shows the preferred alternative improvements.



Stayton Transportation System Plan

LEGEND

New Roadway Alignment

NOT TO SCALE

Figure 1-1
Preferred Alternative

1.2. FUTURE STREET NETWORK

A future street network plan was developed to assure that the future street network within the Stayton planning area would continue to develop as a grid system. The grid system assures that access, mobility, and traffic circulation will be achieved at a high level throughout the city. Figure 1-2 shows the future network plan. New local streets and collectors make up the future roadway network.

It is envisioned that developers as part of their development will build most of the new streets shown in Figure 1-2. System development charge credit would be given to developers for building the collectors but not the local streets.

1.3. NON-MOTORIZED IMPROVEMENTS

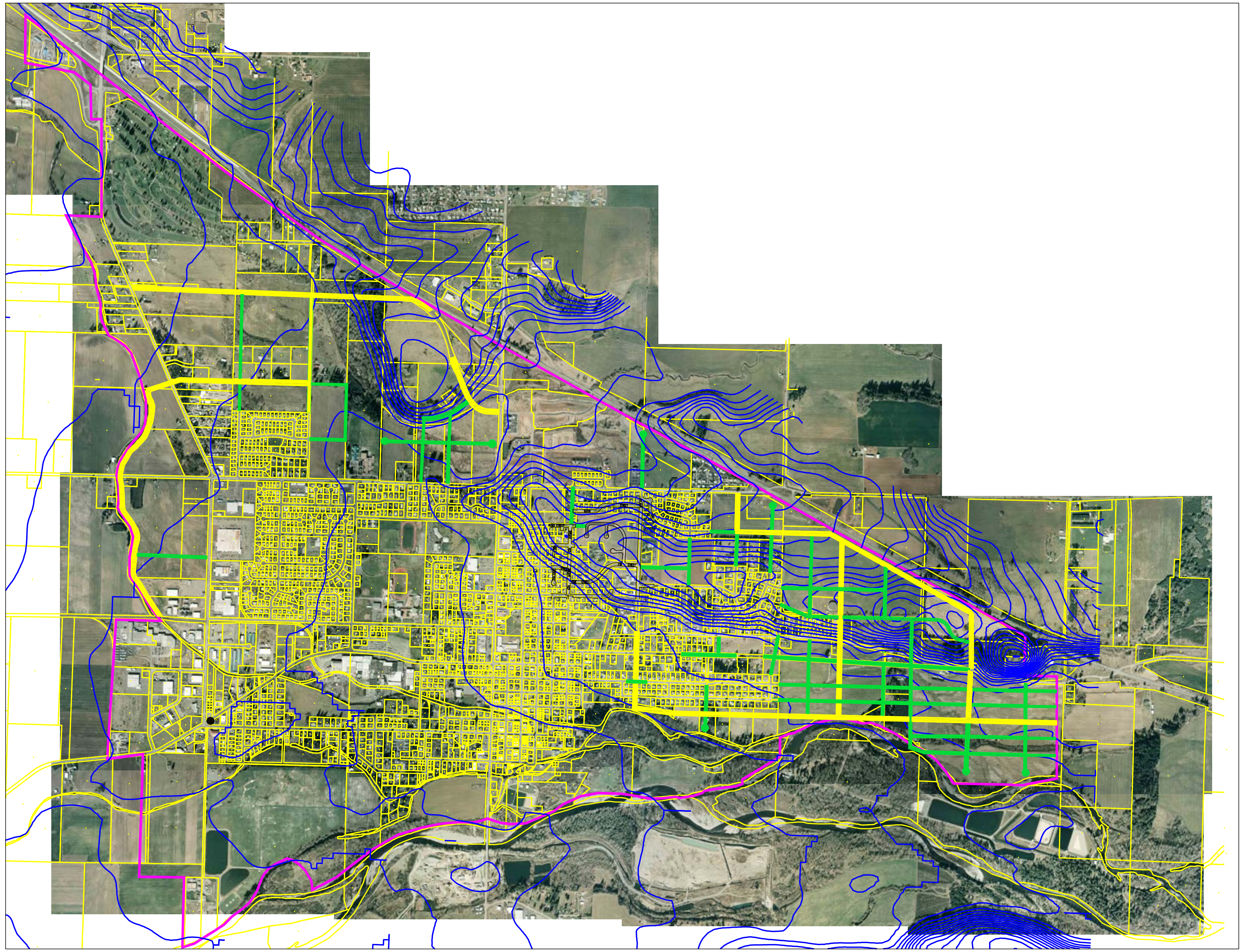
Future non-motorized improvements developed included sidewalks, bike lanes, and trails. The sidewalk and bike lane improvements are shown in Figure 1-3. Figure 1-4 shows the trails system.

Most of the future sidewalk improvements will be implemented with street widening projects. This will be the case for needed sidewalks along Golf Club Road, Wilco Road, Shaff Road, Fern Ridge Road, and Jefferson Road. Sidewalk improvements needed along streets without roadway improvement projects are as follows:

- Locust Street – intermittent sections along the north side between Wilco Road and Douglas Avenue
- Washington Street – intermittent sections along the north side between Wilco Road and Gardner Road
- Washington Street – south side from Wilco Road to Evergreen Avenue
- Ida Street – intermittent sections along the south side between Noble Avenue and Evergreen Avenue
- Santiam Street – intermittent sections along the north side from 10th Avenue to the eastern city limits
- Santiam Street – south side from 10th Avenue to the eastern city limits
- 10th Avenue – east side from Kathy Street to Jefferson Street
- 10th Avenue – west side from Pine Street to Santiam Street

The sidewalk improvements listed above are only for arterial and collector streets. Missing sidewalk sections along local streets are not part of this transportation system plan.

Bicycle lane improvements were focused on streets with future widening projects. At the time of widening and reconstruction, Golf Club Road, Wilco Road, Shaff Road, Fern Ridge Road, and Jefferson Road will be constructed with bike lanes. Other arterials and collectors such as Cascade Highway, Gardner Road, 10th Avenue, Locust Street, Washington Street and Ida Street will be designated bike routes in which motorists and bicyclists will share the roadway.



Stayton Transportation System Plan

Figure 1-2
Future Street Plan

LEGEND

Future Collector

Future Neighborhood Collector or Local Street

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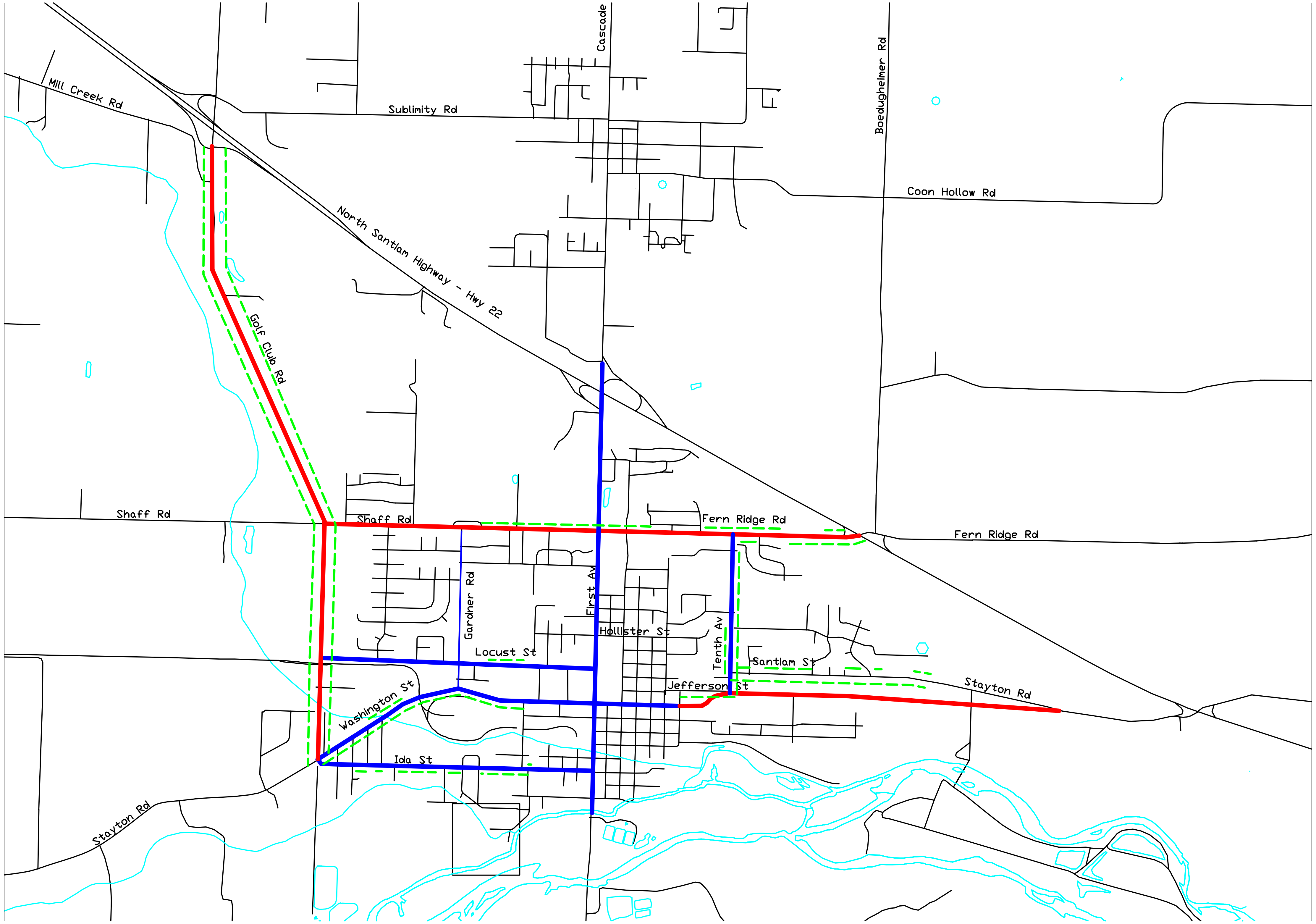

Stayton Transportation System Plan

Figure 1-3
Pedestrian and Bicycle Facility Plan

LEGEND
New Bike Lane
Signed Shared Bike Route
Sidewalk Improvement

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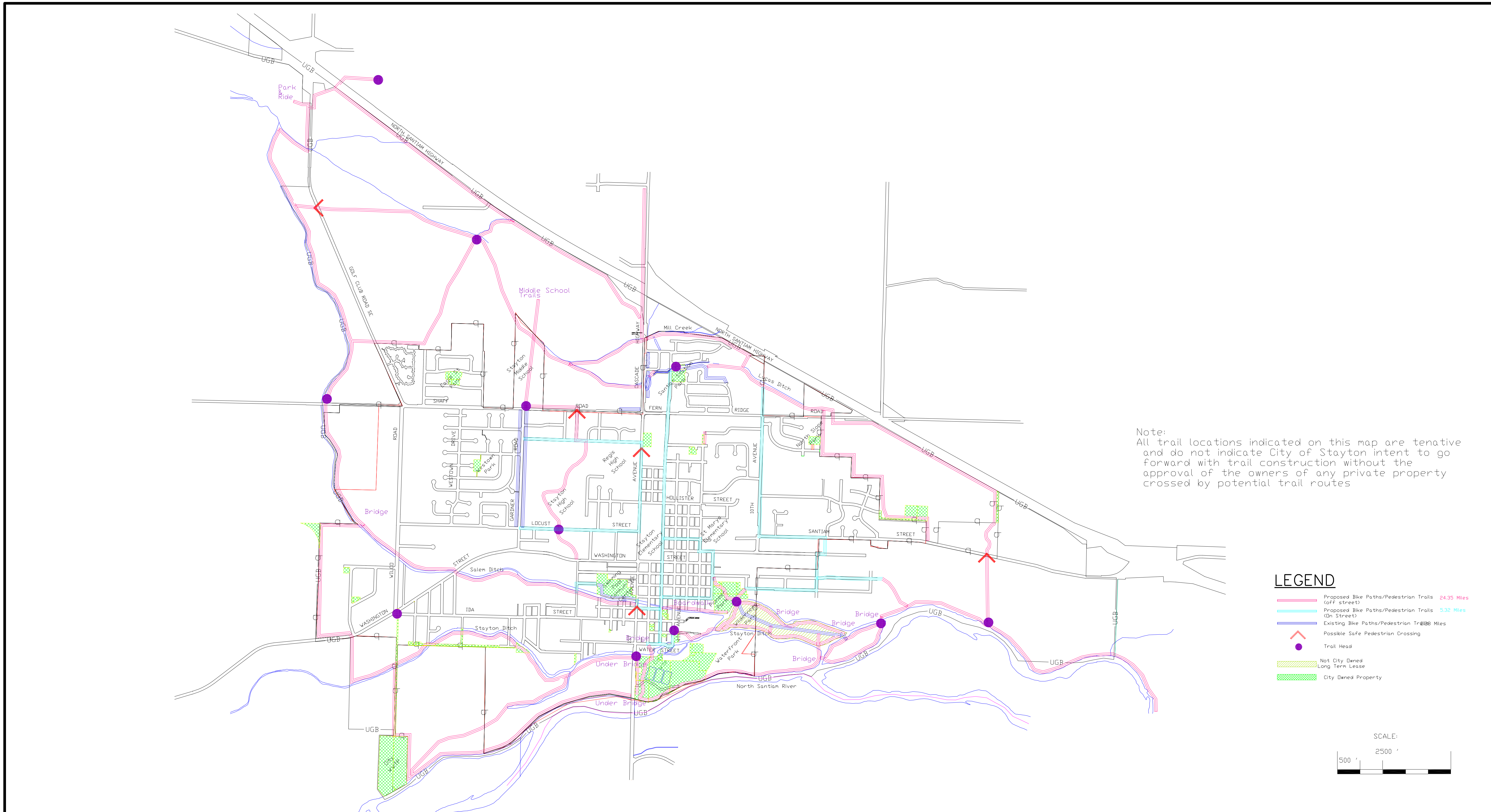


Stayton Transportation System Plan

Figure 1-4
Non-Motorized Trails Plan

NOT TO SCALE

The trail system plan is illustrated in Figure 1-4 and can be compared with Figure 1-3 to show the relationship between the trail system and the sidewalks and bike lanes. It should be noted that all trail locations indicated are tentative and do not indicate the City of Stayton's intent to go forward with trail construction without approval of the owners of any private property crossed by potential trail routes.

Section 2.0
Introduction

The Stayton Transportation System Plan (TSP) addresses the City's anticipated transportation needs through the year 2025. It has been prepared to meet state and federal regulations that require urban areas to conduct long-range planning. Specifically, the TSP was developed in compliance with requirements of the Transportation Equity Act for the 21st Century (TEA-21), Statewide Planning Goal 12, the Transportation Planning Rule (TPR – Oregon Administrative Rule (OAR) Chapter 660, Division 12), and Oregon Highway Plan (1999). The long-range planning is intended to serve as a guide for the City of Stayton in managing their existing transportation facilities and developing future transportation facilities.

2.1. REQUIREMENTS

The TEA-21, Statewide Planning Goal 12, the Transportation Planning Rule, and Oregon Highway Plan (OHP) requirements guiding the development of the Stayton TSP are discussed below.

2.1.1. TEA-21

TEA-21 is federal legislation that was passed in 1998. It specifies requirements for statewide and metropolitan area planning. Although TEA-21 does not specify requirements for areas less than a population of 50,000, it is still relevant to Stayton TSP planning since it defines how federal aid is dispersed for highway and transit projects. The planning requirements under TEA-21 parallel the requirements under the TPR.

2.1.2. Goal 12

Oregon adopted 19 Statewide Planning Goals in the mid-1970s. These goals were to be implemented in each local jurisdiction's comprehensive plan. Goal 12 of the statewide planning goals related to transportation. The intent of Goal 12 is to "provide and encourage a safe, convenient, and economic transportation system." It provides the following guidelines in creating a transportation element of a local jurisdiction's comprehensive plan:

> "A transportation plan shall (1) consider all modes of transportation including mass transit, air, water, pipeline, rail, highway, bicycle and pedestrians; (2) be based upon an inventory of local, regional and state transportation needs; (3) consider the differences in social consequences that would result from utilizing differing combinations of transportation modes; (4) avoid principal reliance upon any one mode of transportation; (5) minimize adverse social, economic and environmental impacts and costs; (6) conserve

energy; (7) meet the needs of the transportation disadvantaged by improving transportation services; (8) facilitate the flow of goods and services so as to strengthen the local and regional economy; and (9) conform to local and regional comprehensive land use plans."

2.1.3. Transportation Planning Rule (TPR)

The Transportation Planning Rule (TPR) was developed by the Department of Land Conservation and Development (DLCD) and Oregon Department of Transportation (ODOT). It was adopted originally in April 1991 to implement Goal 12 of the Statewide Planning Goals.

The TPR requires that cities, counties, Metropolitan Planning Organizations (MPOs), and state agencies prepare and adopt transportation system plans. A transportation system plan is defined in the TPR as: "a plan for one or more transportation facilities that are planned, developed, operated and maintained in a coordinated manner to supply continuity of movement between modes, and within and between geographic and jurisdictional areas." The TPR encourages multi-modal transportation systems to reduce the dependence on auto traffic.

The transportation system plan elements produced included the following:

- Street system plan for a network of arterials, collectors, and local streets
- Bicycle and pedestrian plan and integrate with the parks plan/dream trails map
- Public transportation plan
- Air, rail, water, and gas pipeline plan
- Policies and land use regulations for implementing the TSP
- Transportation system and demand management plan
- Transportation financing plan

2.1.4. Oregon Highway Plan (1999)

The 1999 Oregon Highway Plan (OHP) was adopted by the Oregon Transportation Commission on March 18, 1999. It applies the general directives specified in the 1992 Oregon Transportation Plan. The general directives of the 1992 Oregon Transportation Plan called for a transportation system marked by modal balance, efficiency, accessibility, environmental responsibility, connectivity among places, connectivity among modes and carriers, safety, and financial stability. The 1999 OHP applies the 1992 Oregon Transportation Plan general directives by emphasizing on:

- Efficient management of the system to increase safety, preserve the system and extend its capacity;
- Increased partnerships, particularly with regional and local governments;
- Links between land use and transportation;
- Access management;
- Links with other transportation modes; and

- Environmental and scenic resources

There are several policies within the 1999 OHP that local jurisdictions are required to be consistent within their transportation system plans. Specifically, the OHP states:

> "Local and regional jurisdictions must be consistent with Policies 1A, State Highway Classification System; 1B, Land Use and Transportation; 1C, State Highway Freight System; 1D, Scenic Byways; 1F, Highway Mobility Standards; 1G, Major Investments; 2G, Rail and Highway Compatibility; 3A-E, Access Management; 4A, Efficiency of Freight Movement; 4D, Transportation and Demand Management; and the Investment Policy in their local and regional plans when planning for state highway facilities within their jurisdiction."

2.1.5. Other State Plans

In addition to those specific requirements described above, coordination with other specific state plans is also required. These plans include:

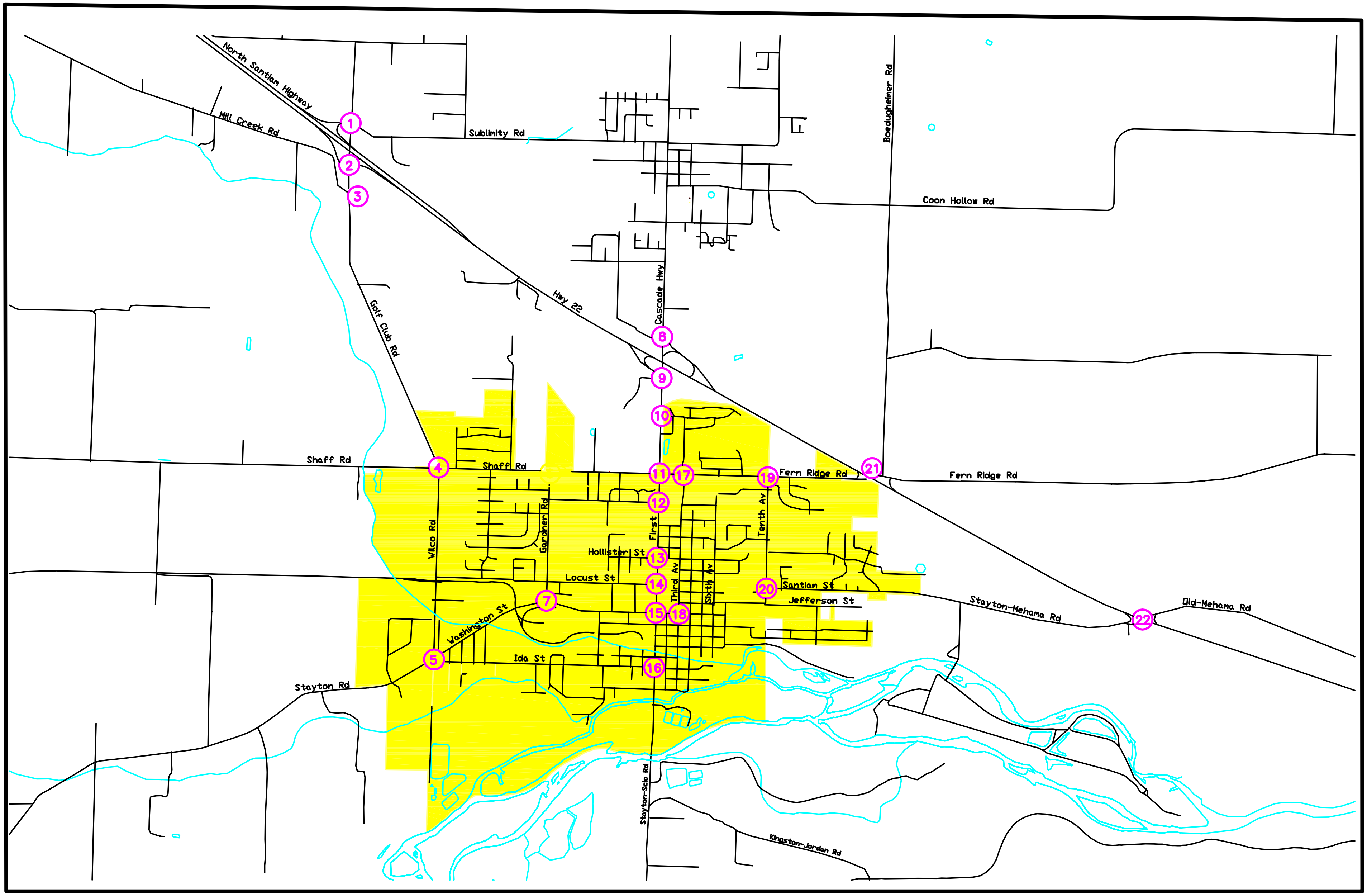
- Oregon Bicycle and Pedestrian Plan, ODOT, June14, 1995
- Oregon Rail Freight Plan, ODOT, August 17, 1994
- Oregon Rail Passenger Policy and Plan, ODOT, 1992
- Oregon's Mobility Needs, Final Report, June 1999
- 1997 Oregon Public Transportation Plan, ODOT
- Freight Moves the Oregon Economy, ODOT, July 1999
- Marion County Transportation System Plan

2.2. PLANNING AREA

2.2.1. Land Uses

The planning area for the City of Stayton Transportation System Plan is the existing urban growth boundary (UGB). This area is defined by Figure 2-1. Figure 2-1 also shows the city limits in relation to the UGB as well as the intersections analyzed. Figure 2-2, the City of Stayton's zoning map, is shown to depict the land use patterns of the study area.

The northern boundary of the UGB is Highway 22. The east boundary of the UGB is a north-south line from just west of the Highway 22/Stayton Road/Old Mehama Road intersection to the Santiam River. The Santiam River is the boundary for the south end of the UGB. The Salem Ditch just west of Golf Club Road is generally the western boundary of the UGB.



Stayton Transportation System Plan

Figure 2-1
Study Area Map

Legend
- Study Intersection
- UGB
- City Limits

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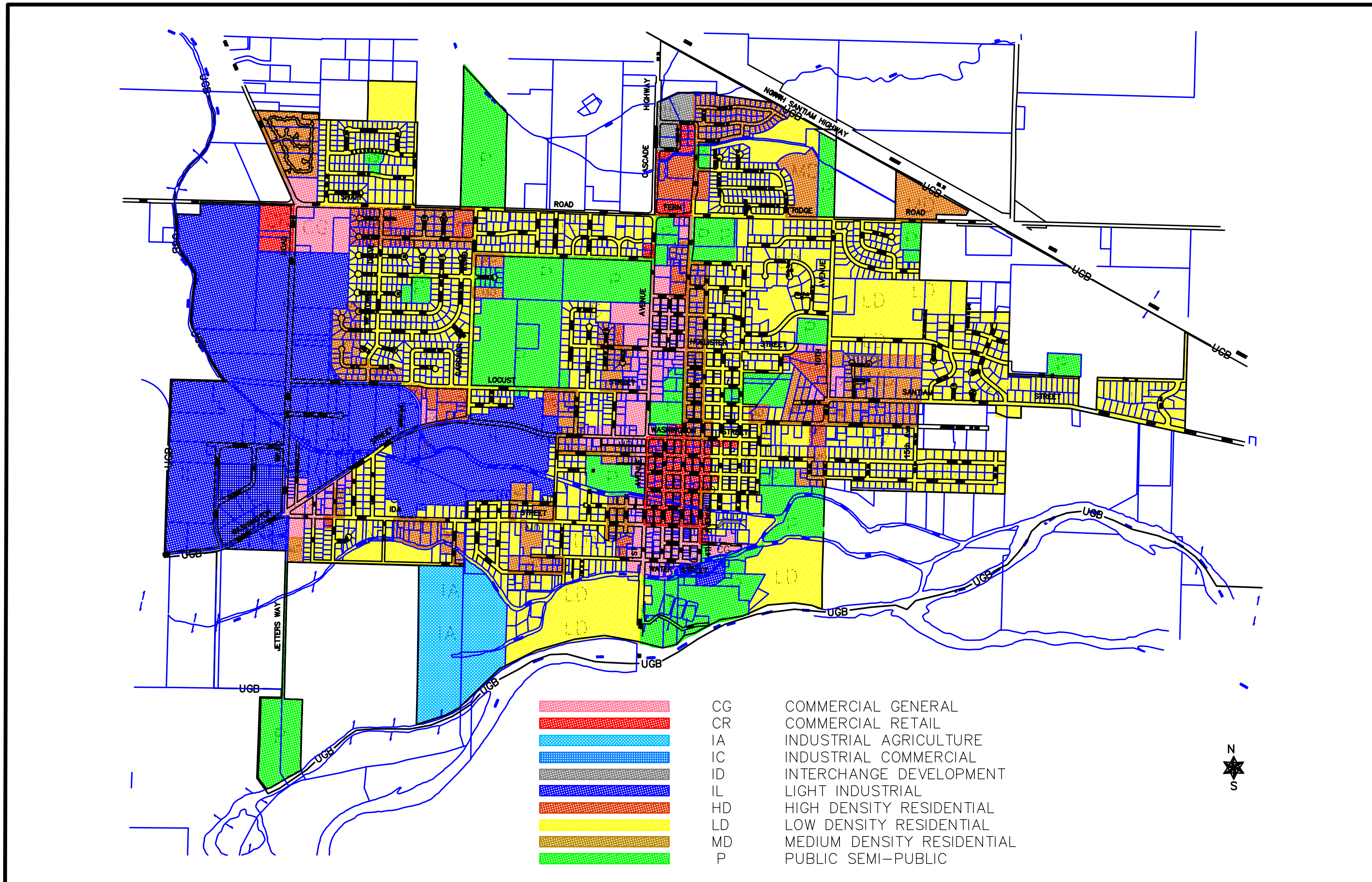


Stayton Transportation System Plan

Figure 2-2
Zoning Map

Stayton has four major types of land uses within its boundaries. These land uses are commercial, industrial, residential, and public uses. The commercial areas within Stayton are in four general areas. These areas are in the vicinity of the Golf Club Road/Wilco Road/Shaff Road intersection, south of Highway 22 along Cascade Highway, along the First Avenue corridor between Fern Ridge Road and Ida Street, and between 1st and 3rd Avenues between Water Street and Washington Street. The industrial area is primarily along Wilco Road between Shaff Road and Ida Street and Washington Street between Wilco Road and Evergreen Avenue. The remaining areas of the City of Stayton are comprised of residential and public uses.

Based on the City of Stayton's Buildable Lands Inventory of December 2002[1], there are three zoning designations for commercial property. These zoning designations are CG, Commercial General; CR, Commercial Retail; and ID, Interchange Development District. Of approximately 197 gross acres of commercial land within the city limits of Stayton, about 80 acres have been developed, excluding the downtown area. The remaining amount of commercial land available is 86.5 acres within the city limits and another 5 acres outside the city limits but within the UGB. Most of the commercial lands available are small parcels.

Three industrial zoning designations exist. These zoning designations are IL, Light Industrial; IA, Industrial Agricultural; and IC, Industrial Commercial. Of the 550 acres of industrial land within the Stayton UGB, over 70 percent is within the city limits. After taking land constraints and developed properties in consideration, Stayton has about 56 percent of its industrial land inventory available for future development including one large parcel of 40 acres.

Most of the land within the Stayton UGB is residential. There are three residential zoning classifications within Stayton. They are LD, Low Density; MD, Medium Density; and HD, High Density. The LD residential zoning allows up to 6 units per acre. The MD residential zoning allows up to 12 units per acre. The HD residential zoning allows a minimum of 13 units per acre with no limit on the maximum units allowed. Within the city limits, there is a total of 1038 net acres of residential land. Another 908 acres of existing residential land exists between the UGB and city limits. The residential lands within the city limits are mostly built out with only 22 percent (224 acres) of the land supply available for development. Between the UGB and city limits, approximately 67 percent (605 acres) are available for development.

The public use and semi-public uses lands within the Stayton UGB comprise of 436 acres. These uses include parks, schools, public works shop, city municipal buildings/offices, and vacant land.

There are two areas within the Stayton UGB where 100-year flood plains exist. The first area parallels Highway 22 on the south side and is along the Mill Creek corridor. The second area with a 100-year flood plain is the southern area of the UGB along the Santiam River.

[1] Buildable Lands Inventory , City of Stayton, April 30, 2002, pages 27-28.

There are several wetland areas within the Stayton UGB. Three of the largest wetland areas within the Stayton UGB are along Mill Creek south of Highway 22, in the vicinity of the Cascade Highway interchange with Highway 22, and along the Santiam River at the southern UGB boundary.

The Stayton UGB is relatively flat except for one steep slope area located in the northeast quadrant of the UGB, between Highway 22 and Santiam Street/Stayton Road.

2.2.2. Street System

The roadways within the TSP planning area fall under the jurisdiction of the City of Stayton, Marion County, or the Oregon Department of Transportation (ODOT). The roadways under Marion County's jurisdiction are Golf Club Road, Wilco Road, Cascade Highway/First Avenue, Shaff Road, Fern Ridge Road, Washington Street from 1st Avenue to 6th Avenue, 6th Avenue from Washington Street to Jefferson Street, Jefferson Street from 6th Avenue to 10th Avenue, 10th Avenue from Jefferson Street to Santiam Street, and Stayton-Mehama Road. Highway 22 is the only ODOT facility in the study area. The remaining roadways within the study area are the responsibility of the City of Stayton.

The street system within Stayton is a combination of a grid system of streets ranging from short blocks to a super block with few streets supporting access to the arterial/collector system. The grid system of streets within Stayton is primarily bounded by 1st Avenue, 6th Avenue, Fern Ridge Road and Water Street. East of 6th Avenue, the street system is limited to one north-south and east-west major collector. The local streets east of 6th Avenue are generally disjointed and form limited circulation with short streets and cul-de-sacs. The local street system west of 1st Avenue and south of Shaff Road is comprised of four east-west arterials and collectors which provide for significant east-west circulation. North-south circulation is more limited west of 1st Avenue with only Wilco Road bisecting the entire length of the study area. Gardner Road and Westown Drive provide north-south circulation only from Shaff Road to Washington Street. Local streets in this section of Stayton also provide poor circulation to the arterial system with limited access. Most of the local streets are short streets or cul-de-sacs that connect to one major local street. In the northern section of the Stayton UGB between Shaff Road/Fern Ridge Road and Highway 22, the street system is limited and has not been developed.

2.3. PLANNING PROCESS

The transportation system plan (TSP) was developed through a series of technical exercises and input from the public, citizen advisory committee, and technical advisory committee. The key elements of the process to develop the TSP are listed below.

- Define goals and objectives
- Review of existing plans and policies
- Solicit public involvement and input
- Conduct an existing inventory and condition analysis

- Project future traffic volumes
- Define deficiencies and needs
- Develop transportation improvement projects for all modes
- Define transportation facility standards and requirements
- Develop recommended policies and ordinances
- Develop modal plans for each mode of transportation
- Develop a finance plan

2.3.1. Define Transportation Policies and Implementing Strategies

Transportation policies and implementing strategies were developed based on input from City of Stayton staff, the technical advisory committee, community input, and requirements of the TPR. The transportation policies and implementing strategies were then used to guide the development of the transportation system plan, to make decisions regarding various transportation improvement projects, developing new standards and requirements, and to provide a direction for making transportation-related decisions for the city.

2.3.2. Review of Existing Plans and Policies

To begin the transportation planning process, all applicable City of Stayton transportation and land use plans and policies were reviewed. The purpose of this review was to develop an understanding of how the City of Stayton was managing its transportation infrastructure. Also, the plan and policy review defined where the city is compliant and where it is deficient in meeting the Transportation Planning Rule (TPR) requirements. Where deficiencies exist in meeting the TPR requirements, recommendations will be made that would comply with the TPR requirements.

2.3.3. Solicit Public Involvement and Input

Developing a plan that meets the values and needs of the community is an important component of the transportation system planning process. Several techniques were used to solicit public participation and input to the planning process. First, a public questionnaire and newsletter were circulated throughout the City of Stayton. Secondly, transportation stakeholder comments were collected through phone interviews. Also, several public open houses were conducted to present findings and to solicit input on improvement projects.

Two committees were formed to provide technical guidance and public input throughout the project. The first committee formed was a technical advisory committee (TAC) which was comprised of City of Stayton, Marion County, ODOT, and DLCD staff. The second committee formed was a citizen advisory committee (CAC) was which comprised of the Planning Commission, three City Councilors, and two citizens.

The supporting public involvement documentation is included in Appendix A. Appendix A includes a public involvement summary memorandum, three TSP newsletters, memorandums summarizing public input taken from the two public open houses, stakeholder interview memorandum, and public survey results memorandum.

2.3.4 Conduct an Existing Inventory and Condition Analysis

The purpose of the existing inventory and conditions analysis was to catalog all the existing transportation facilities and services to determine their operating condition. This information provides the baseline from which the plan can be developed.

2.3.5. Define Deficiencies and Needs

Based on the existing inventory and conditions analysis and public input, a transportation deficiencies list was developed. The inventory and existing conditions analysis forms the technical basis for the deficiencies list. The public input validates the technical work in defining the deficiencies and needs as well as adding local knowledge.

The future transportation deficiencies were identified from a future travel demand model projecting traffic to the year 2025. The traffic forecast was extracted from the model level of service and volume-to -capacity (v/c) ratio analysis were conducted to determine the locations of future traffic deficiencies. The combination of existing and future deficiencies defines the need to develop improvement alternatives.

2.3.6. Develop Transportation Improvements

Based on the deficiencies and needs list, a transportation improvement plan alternatives were developed . These improvement plan alternatives were developed in conjunction with the TAC using the transportation policies and strategies. Based on the input from the TAC and an evaluation process, a preferred alternative was selected and individual improvements were prioritized into high, medium, and low priorities.

2.3.7. Define Transportation Facility Standards and Requirements

Transportation facility standards were developed to guide the City of Stayton in managing its roadways as well as a guideline in developing new infrastructure. These standards include access management requirements, road standards for a variety of street classifications, sidewalk width standard, bicycle facility standards, bicycle parking requirements, access-way requirements, internal pedestrian connection requirements, and block and street spacing requirements. The various standards will be documented in the relevant modal plans.

2.3.8. Develop Recommended Policies and Ordinances

The City of Stayton requires that policies in the Comprehensive Plan support the development of the transportation system. Adopted ordinance(s) are necessary to ensure that transportation facilities are developed along with new development. This section evaluates the existing policies, standards, and requirements and makes recommendations to enhance policies, standards, and requirements that would support the further development of the transportation system within Stayton.

2.3.9. Develop a Modal Plan for Each Mode of Transportation

Modal plans for each mode of transportation within the City of Stayton were developed. The modal plans were developed from all of the sections described above. The intent of each modal plan was to develop improvement projects that meet the 2025 year need, establish and update standards and requirements complying with the Transportation Planning Rule, and creating and updating comprehensive plan policies that guide the development of the transportation system within the City of Stayton.

2.3.10. Develop a Finance Plan

A finance plan was developed to identify a strategy to fund all of the transportation improvement projects developed. The finance plan starts with existing transportation funding levels. The existing revenues were then compared with the costs of the proposed improvements. Based on a revenue shortfall for funding future projects, a series of funding options was discussed and a strategy proposed.

2.4. OTHER PLANNING CONSIDERATIONS

Environmental conditions have a potentially significant impact to the development of new transportation infrastructure. TPR requirement OAR 660-012-0035 (3) (c) states that “the transportation system shall minimize adverse economic, social, environmental and energy consequences.” In the development of transportation improvements, a cursory look at environmental impacts was conducted from existing sources and known environmental issues by the City of Stayton staff. The goal in the cursory environmental analysis was to minimize environmental impacts by any proposed transportation improvement.

Another consideration in the development of transportation improvement projects was to support the transportation policies and implementing strategies in guiding the development of alternative proposals.

Section 3.0
Transportation Goals and Policies

This section establishes broad policy objectives that provide the context to guide future transportation investment decisions and the development of the future transportation system within the City of Stayton urban growth boundary.

3.1. GOAL 1 – MOBILITY

It is the goal of the City of Stayton to provide a multi-modal transportation system that maximizes the mobility of Stayton residents and businesses.

The policies to be used to implement Goal 1 – Mobility are as follows:

1.1. Establish a transportation system that can accommodate a wide variety of travel modes and minimizes the reliance on any one single mode of travel.

1.2. Properly plan transportation infrastructure to meet the level of service set for each type of facility.

1.3. Maintain a minimum level of service standard of LOS D for signalized intersections. Maintain a minimum level of service standard of LOS D for all way stop controlled intersections and roundabouts. Maintain a minimum level of service standard of LOS E or F with a volume-to-capacity ratio of 0.95 or better for two-way stop controlled intersections.

For Oregon Department of Transportation (ODOT) facilities, the City of Stayton shall defer to ODOT mobility standards described in the most recent version of the *Oregon Highway Plan*.

1.4. Develop a local street plan to preserve future rights-of-way for future streets and to maintain adequate local circulation in a manner consistent with Stayton's existing street grid system.

1.5. Require developments to construct their accesses consistent with the local street plan.

1.6. Develop an access management policy for the local arterial system and direct commercial development access to local streets wherever possible.

1.7. Identify local traffic problems and recommend solutions.

1.8. Review and revise, if necessary, street cross section standards for local, collector, and arterial streets to enhance safety and mobility.

1.9. Develop and adhere to a capital improvement program implementing the improvement recommendations of the TSP as funding is identified.

3.2. GOAL 2 – EFFICIENCY

It is the goal of the City of Stayton to create and maintain a multi-modal transportation system with the greatest efficiency of movement possible for Stayton residents and businesses in terms of travel time, travel distance, and efficient management of the transportation system.

The policies to be used to implement Goal 2– Efficiency are as follows:

2.1. Develop the City of Stayton's transportation system with alternative parallel corridors to reduce reliance on any one corridor and improve local access through a local street plan that preserves future street rights-of-ways consistent with a grid pattern.

2.2. Plan and improve routes to facilitate the movement of goods and services.

2.3. Manage the City of Stayton's resources to improve the transportation system through an up-to-date Capital improvement program reflecting the transportation needs of the city.

2.4. Encourage development to occur near existing community centers where services are presently available to minimize the need for expanding services and to more efficiently utilize existing resources.

3.3. GOAL 3 – SAFETY

It is the goal of the City of Stayton to maintain and improve transportation system safety.

The policies to be used to implement Goal 3 – Safety are as follows:

3.1. Examine the need for speed reduction in specific areas such as adjacent to local schools.

3.2. Ensure that the multi-modal transportation system within Stayton is structurally and operationally safe.

3.3. Periodically review crash records in an effort to systematically identify and remedy unsafe intersection and roadway locations.

3.4. Develop a traffic calming program for implementation in areas with vehicle speeding issues.

3.5. Ensure adequate access for emergency services vehicles throughout the city's transportation system.

3.4. GOAL 4 – EQUITY

It is the goal of the City of Stayton to ensure the cost of transportation infrastructure and services are borne by those who benefit from them.

The policies to be used to implement Goal 4 - Equity are as follows:

4.1. System Development Charges (SDCs) shall be updated periodically to accurately reflect a nexus between the traffic impact of development and the fees assessed to the development.

4.2. The City of Stayton shall seek equitable funding mechanisms to maintain transportation infrastructure and services at an acceptable level.

4.3. Developments shall be responsible for mitigating their direct traffic impacts. These impacts shall be determined through an approved traffic study submitted to the City by the developer.

3.5. GOAL 5 – ENVIRONMENTAL

It is the goal of the City of Stayton to limit and mitigate adverse environmental impacts associated with traffic and transportation system development.

The policies to be used to implement Goal 5 – Environmental are as follows:

5.1. Transportation project related environmental impacts shall be identified at the earliest opportunity to ensure compliance with all federal and state environmental standards.

5.2. Transportation project environmental impacts shall be mitigated to state and federal standards as appropriate.

3.6. GOAL 6 – ALTERNATIVE MODES OF TRANSPORTATION

Increase the use of alternative modes of transportation (walking, bicycling, rideshare/carpooling, and transit) through improved access, safety, and service. Increasing the use of alternative transportation modes includes maximizing the level of

access to all social, work, and welfare resources for the transportation disadvantaged. The City of Stayton seeks for its transportation disadvantaged citizens the creation of a customer-oriented regionally coordinated public transit system that is efficient, effective, and founded on present and future needs of the community.

The policies to be used to implement Goal 6 – Alternative Modes of Transportation are as follows:

6.1. Develop a citywide pedestrian and bicycle plan providing for sidewalks, bikeways, and safe crossings.

6.2. Promote alternative modes and rideshare/carpool programs through community awareness and education.

6.3. Coordinate with regional transit service efforts.

6.4. Seek Transportation and Growth Management (TGM) and other funding for projects evaluating and improving the environment for alternative modes of transportation.

6.5. Seek improvements of mass transit services to the City of Stayton.

6.6. Transportation Disadvantaged

a. Continue to support programs for the transportation disadvantaged where such programs are needed and are economically feasible.

b. Increase all citizens' transportation choices.

c. Identify and retain community identity and autonomy.

d. Create a customer-oriented focus in the provision of transportation services.

e. Hold any regional system accountable for levels and quality of service.

f. Enhance public transportation sustainability.

g. Promote regional planning of transportation services.

h. Use innovative technology to maximize efficiency of operation, planning, and administration of public transportation.

i. Promote both inter-community and intra-community transportation services for the transportation disadvantaged.

3.7. GOAL 7 – MAINTAIN MULTI-JURISDICTION COORDINATION

Maintain coordination between the City of Stayton, Marion County, and the Oregon Department of Transportation (ODOT).

The policies to be used to implement Goal 7 – Maintain Multi-Jurisdictional Coordination are as follows:

7.1. Cooperate with ODOT in the implementation of the Statewide Transportation Improvement Program (STIP).

7.2. Encourage improvement of state highways, especially Highway 22 in the vicinity of Golf Club Road, Cascade Highway, Fern Ridge Road, and Stayton Road.

7.3. Work with Marion and Linn Counties ODOT, and the City of Sublimity in establishing cooperative road improvement programs and schedules.

7.4. Work to establish the right-of-way needed for new roads identified in the TSP.

7.5. Take advantage of federal and state highway funding programs.

7.6. Coordinate with ODOT to complete Phase 2 of the ORE 22, Joesph Street to Stayton project.

3.8. GOAL 8 – ROADWAY FUNCTIONAL CLASSIFICATION

It is the goal of the City of Stayton to properly plan and maintain its transportation system based on a roadway functional classification system. The street and access standards are based on this roadway functional classification system.

The policies to be used to implement Goal 8 – Roadway Functional Classification are as follows:

8.1. The transportation system plan (TSP) shall classify roadways throughout the city's transportation system. Both an arterial and local street classification shall be identified in the TSP.

8.2. The street and access standards shall employ the roadway functional classification system.

8.3. Encourage use of alternative methods, such as alleys, shared driveways, etc., i.e. smart development techniques, to provide property access.

8.4. The roadway functional classification system represents a continuum in which through traffic increases and access provisions decrease in the higher classification categories. The street and access standards shall reflect this principal.

3.9. GOAL 9 – TRUCK ROUTE

It is the goal of the City of Stayton to identify and designate a through truck route system utilizing arterial and major collector roads and to minimize impacts to residential areas.

The policies to be used to implement Goal 9 – Truck Route are as follows:

9.1. The City of Stayton shall designate a through truck route along its arterials and major collectors. The truck route shall be defined in the TSP.

9.2. Minimize use of other city roadways by truck traffic except by truck traffic for local deliveries and pickups.

3.10. GOAL 10 – TRANSPORTATION FINANCING

It is the goal of the City of Stayton to seek adequate financial revenues to fund its Capital Improvement Program and maintenance needs.

The policies to be used to implement Goal 10 – Transportation Financing are as follows:

10.1. The City of Stayton shall aggressively seek state and federal funding for relevant transportation projects.

10.2. The City of Stayton shall proactively seek new local and regional funding sources for its Capital Improvement Program.

Section 4.0
Existing Conditions

4.1. INTRODUCTION

This section of the Stayton Transportation System Plan describes existing conditions in the City of Stayton related to its transportation system. The section reviews past plans and studies and inventories existing transportation conditions. This will be used as a foundation for identifying short-term transportation improvement needs and developing and evaluating longer-term transportation system alternatives.

4.2. STUDY AREA

The planning area for the City of Stayton Transportation System Plan is the urban growth boundary (UGB). This area is defined by Figure 4-1 and is outlined in red. The city limits are also shown in Figure 4-1 and are denoted by a beige fill pattern.

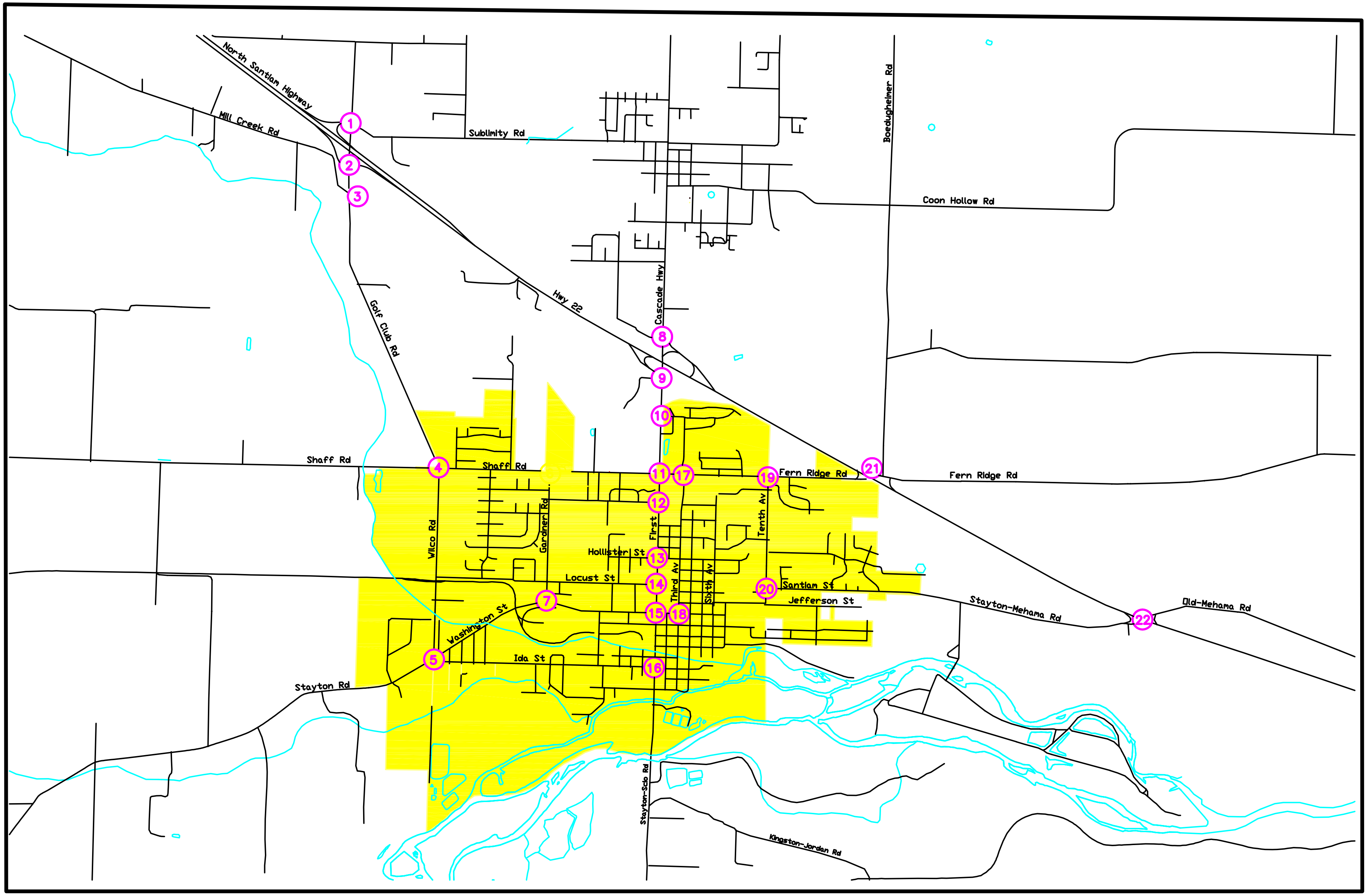
The northern boundary of the UGB is Highway 22, North Santiam Highway. The east boundary of the Stayton UGB is roughly at the intersection of Stayton-Mehama Road with Highway 22. The southern UGB boundary is bounded by the Santiam River. The western UGB boundary is just west of Wilco Road and Golf Club Road.

The Stayton urban growth boundary has natural environmental constraints in the form of a river, a creek, a canal, wetlands, flood plain, and steep slopes. These natural environmental constraints are depicted in Figure 4-2. As shown in Figure 4-2, a 100-year flood plain from the Santiam River drainage encroach the southern UGB boundary. Another 100-year flood plain from the Mill Creek drainage parallels the southern side of Highway 22. The Salem Ditch, a canal, runs through Stayton. The most significant pocket of wetlands in Stayton exists between Highway 22 and Shaff Road on the west side of Cascade Highway. The majority of Stayton is relatively flat. However, there are some steep slopes in the northeast area of the Stayton UGB.

Historic landmarks and building sites are other constraints that exist in Stayton. Based on information collected from the Oregon State Historic Preservation Office (SHPO), Figure 4-3 shows the locations of these historic buildings and landmarks in the downtown Stayton area. As shown in Figure 4-3, there are 11 historic sites within Stayton. Table 4-1 identifies these historic buildings and landmarks by the numbers in Figure 4-3.

4.3. ROAD CLASSIFICATION

The roadway functional classifications were obtained from ODOT's Oregon Transportation Map for the City of Stayton. This map is typically coordinated between the State of Oregon, Marion County, and the City of Stayton to coordinate classifications of roadways between jurisdictions.

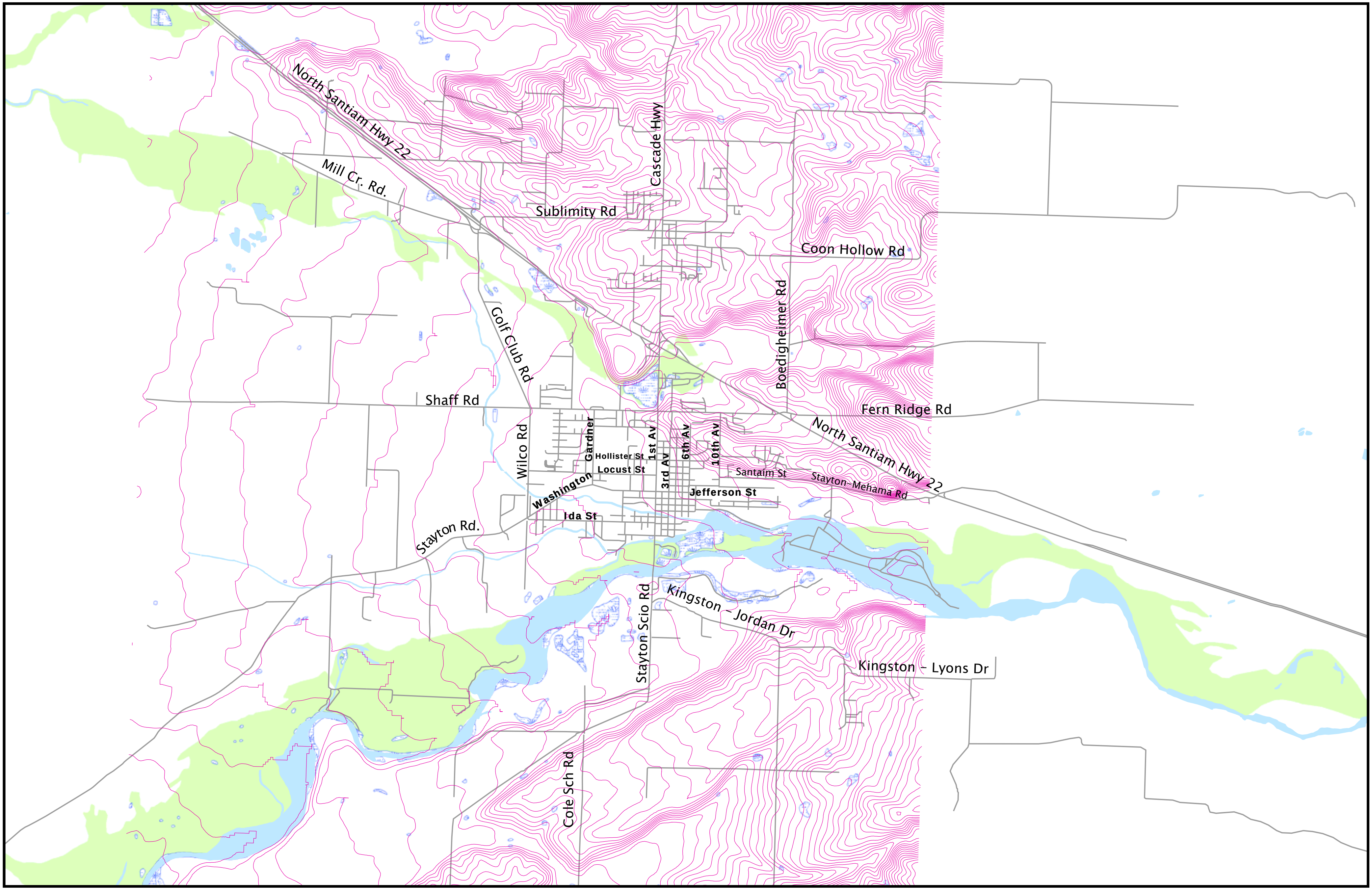


Stayton Transportation System Plan

Figure 4-1
Study Area Map

Legend
Study Intersection
UGB
City Limits

NOT TO SCALE



Stayton Transportation System Plan

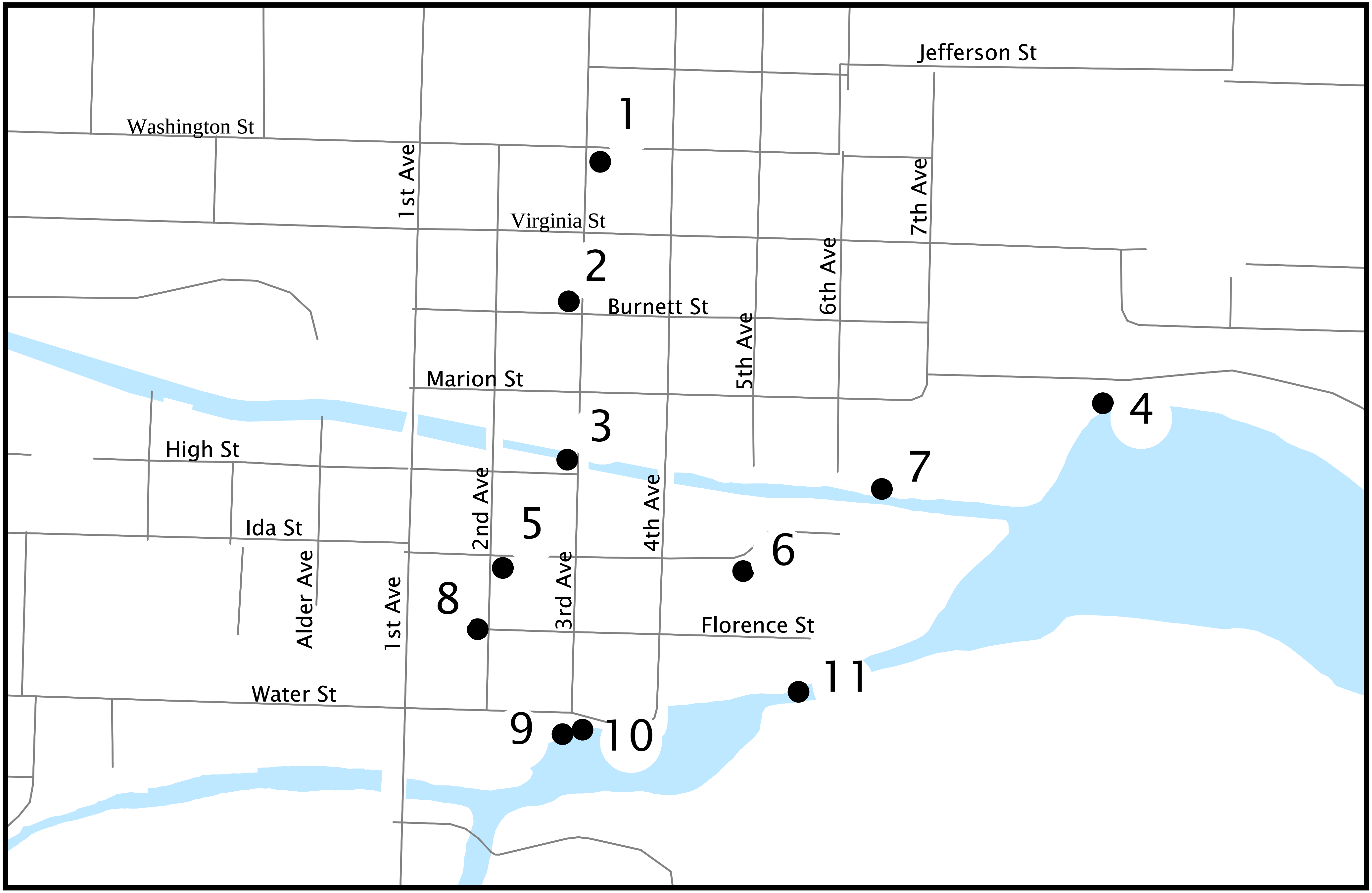
Figure 4-2

Existing Environmental Constraints

Legend

- Roadway
- 10 ft Elevation Contour
- Hydro
- Wetlands
- 100 yr Flood Plain

N



Stayton Transportation System Plan

Figure 4-3

Existing Historic Building Locations

Table 4-1. Historic Landmarks and Building Sites

Building Number in Figure 4-3	Historic Building Description
1	Charles Stayton House
2	Ad Gardner House
3	Stayton Mercantile (Burmester Building)
4	Thomas Y Covered Bridge (Jordan Bridge)
5	Women's Club Building
6	Buster House
7	Salem Ditch
8	Gehlen/Sims Building
9	Mountain States Hydroelectric Project
10	Stayton Paint Shop
11	Stayton Power Canal

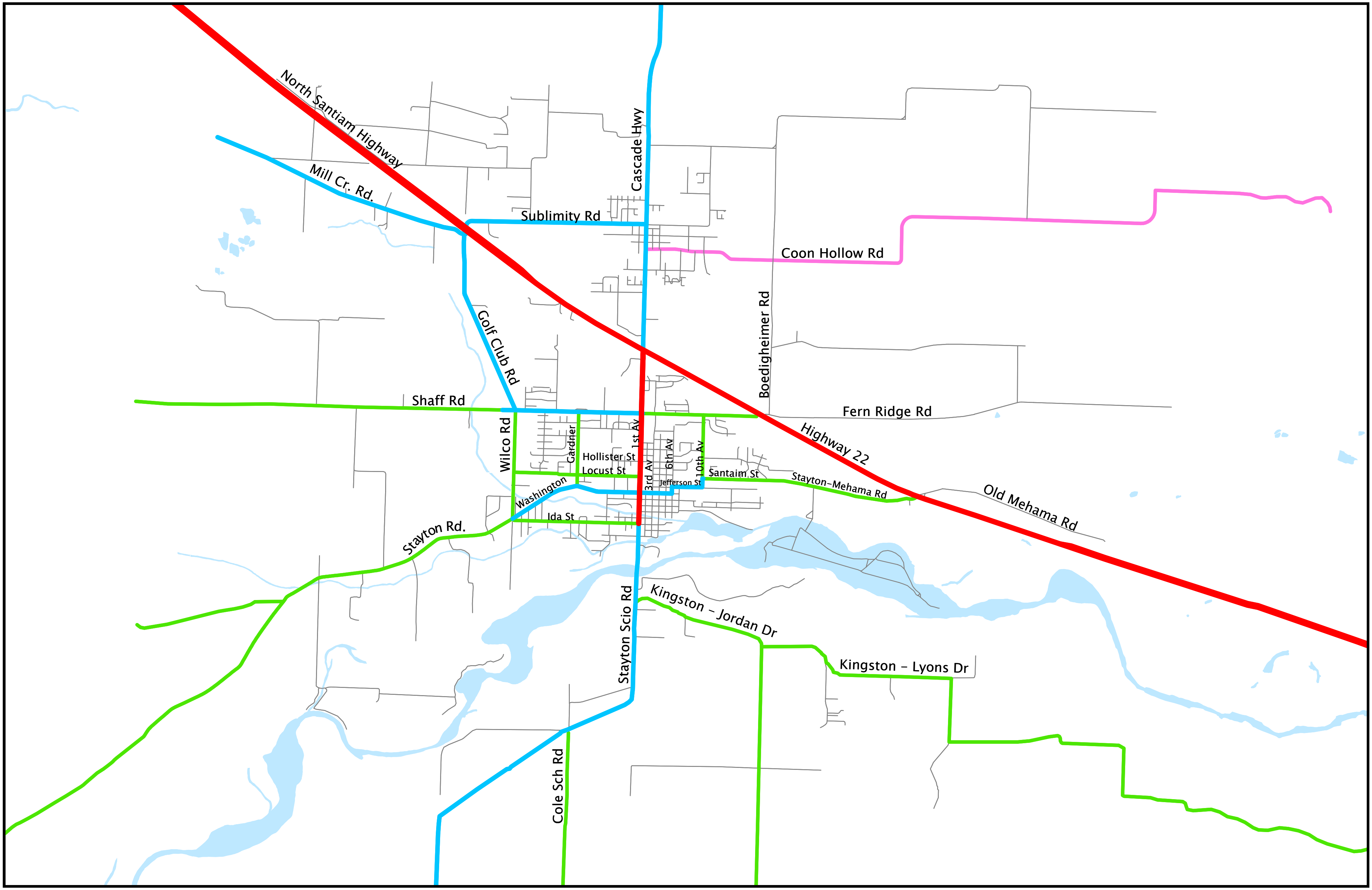
The map was last updated in June 2002 and reflects current coordinated roadway classification efforts between ODOT, Marion County, and the City of Stayton. This roadway functional classification is shown in Figure 4-4.

As shown on Figure 4-4, the roadway functional classification is made up of the following five classifications:

- principal arterial,
- minor arterial,
- major collector,
- minor collector, and
- local street.

Of these five roadway functional classifications, four exists in the Stayton UGB. The only roadway functional classification that does not exist in Stayton is the minor collector, which is typically reserved for rural county roadways.

Typically, a principal/minor arterial is designated as a road which carries the highest volume of traffic within a city. It is primarily intended to provide access across town or out of town, rather than provide access to abutting properties. A collector street typically provides access between arterials, to abutting properties, and from neighborhoods onto arterials. A local street is intended to solely serve abutting properties.



Stayton Transportation System Plan

Figure 4-4

Existing Roadway Classification

4.3.1. Highway 22

The North Santiam Highway (State Route 22) is the major east-west highway in Marion County and carries most of the traffic to and from the Stayton area. Highway 22 is designated a statewide NHS Freight route in the 1999 Oregon Highway Plan (OHP). The highway functions well with respect to the present needs of the area. Four main points of access are provided to Stayton along the highway at Golf Club Road, Cascade Highway, Fern Ridge Road, and Santiam Street. Golf Club Road and Cascade Highway have interchanges with Highway 22 while Fern Ridge Road and Santiam Street are two-way stop controlled.

4.3.2. Arterials

The existing designated principal/minor arterials in Stayton are Cascade Highway/First Avenue, Shaff Road between Golf Club Road and Cascade Highway, Washington Street between Wilco Road and 6th Avenue, 6th Avenue from Washington Street to Jefferson Street, Jefferson Street from 6th Avenue to 10th Avenue, and 10th Avenue from Jefferson Street to Santiam Street. All arterials within Stayton are under Marion County jurisdiction with the exception of Washington Street between Wilco Road and 1st Avenue.

Cascade Highway/1st Avenue: 1st Avenue is a major north-south arterial that provides the primary access to Stayton from both Highway 22 and Linn County. Conflicts along 1st Avenue exist among through traffic, local traffic, and pedestrians. A continuous left turn lane now exists all along 1st Avenue through Stayton.

Washington Street/Jefferson Street/Santiam Street: Washington Street is an east-west minor arterial that extends from the western city limits through downtown to Sixth Avenue. The east-west minor arterial turns at a right angle north for one block along 6th Avenue before turning at another right angle east to Jefferson Street. At 10th Avenue, this east-west minor arterial makes another right angle turn to the north for one block then turns at a right angle east along Santiam Street. At Santiam Street, this east-west arterial ends and turns into a collector along Santiam Street eastward toward the eastern Stayton UGB boundary.

Shaff Road: Shaff Road provides an east-west bypass north of the central Stayton area and helps relieve through traffic congestion. East of Cascade Highway/First Avenue, Shaff Road becomes Fern Ridge Road, which is a collector.

4.3.3. Collectors

The collectors within the Stayton UGB are described below:

Golf Club Road/Wilco Road: Golf Club Road runs from Highway 22 to Shaff Road. South of Shaff Road the same street is called Wilco Road within the city. This is the collector that serves the industrial area on the west side of Stayton.

Gardner Avenue: This street runs north-south between Washington Street and Shaff Road. Extension of this street further south to Ida Street is blocked by NORPAC Foods. Extension to the north is blocked by the Stayton Middle School.

Locust Street: This street runs east-west between 1st Avenue and Wilco Road and provides access to Stayton Union High School.

10th Avenue: This street runs north-south from Fern Ridge Road to East Jefferson Street, and serves Santiam Memorial Hospital.

Ida Street: This street runs east-west from the intersection of Wilco Road and Washington Street to downtown. Ida Street now carries a significant amount of through traffic, but for the long-term might function as a collector.

Santiam Street: This street runs east-west and is an extension of the minor arterial corridor comprised of Washington Street and Jefferson Street.

Fern Ridge Road: This street runs east-west and provides access to Highway 22. West of Cascade Highway/1st Avenue, Fern Ridge Road becomes Shaff Road.

4.3.4. Truck Routes

Figure 4-5 shows the truck routes that are currently used in the City of Stayton. The truck routes serve the industrial area on the west side of town, Norpac in the central part of Stayton, and Morse Bros, Inc. to the south of Stayton. The truck routes encompass the following roadways:

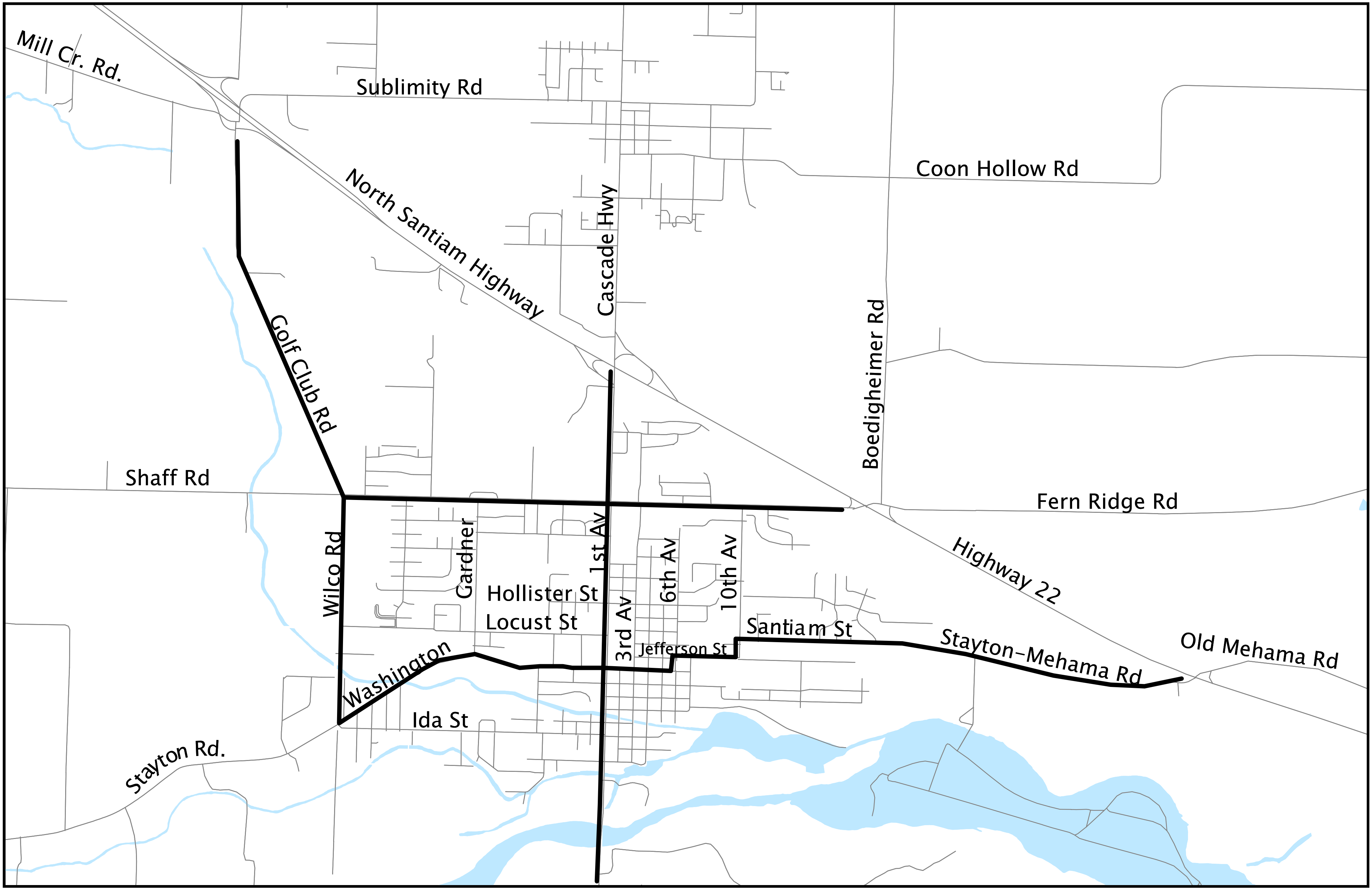
- Golf Club Road-Wilco Road between Washington Street and Highway 22,
- 1st Avenue-Cascade Highway between Santiam River and Highway 22,
- Washington Street-East Santiam Street-Stayton-Mehama Road between Wilco Road and Highway 22,
- Shaff Road-Fern Ridge Road between Wilco Road and Highway 22, and
- Short sections of Jefferson Street, 6th Avenue, and 10th Avenue.

4.4. ROADWAY PHYSICAL CHARACTERISTICS

4.4.1. Pavement Condition

The City of Stayton is currently working with Marion County in updating their pavement management system. Current pavement ratings have identified several areas needing roadway reconstruction. These locations are shown in Figure 4-6. Figure 4-6 depicts the actual type of existing pavement, type of maintenance procedure, and those streets that need reconstruction.

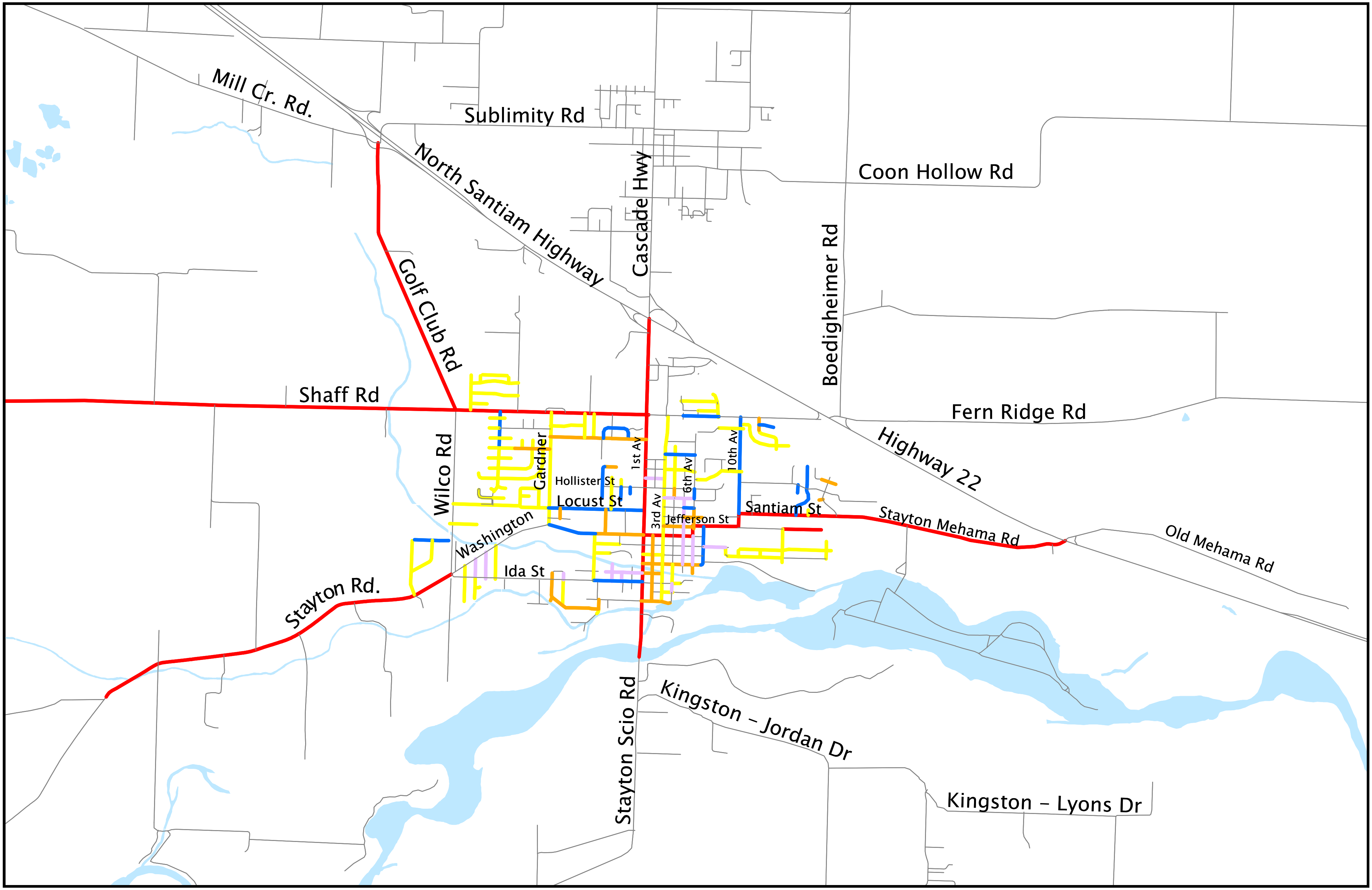
The only arterial/collector identified needing reconstruction is Washington Street from Douglas Avenue to 1st Avenue. All other streets needing reconstruction are local streets.



Stayton Transportation System Plan

Figure 4-5

Existing Truck Routes



Stayton Transportation System Plan

Figure 4-6

Existing Pavement Conditions

Legend

- Roadway
- Slurry Seal
- Reconstruct
- Medium Overlay
- County Road
- Unimproved (Reconstruct)

A street inventory from the City of Stayton's pavement management system was obtained. The street inventory from the pavement management system contained functional classification, date of construction, length of roadway segment, pavement width, pavement area, surface type, and number of lanes. This information was supplemented by H. Lee & Associates with speed limit, right-of-way width, on-street parking, and sidewalk locations and can be referenced in Appendix B. Information for only the arterial and collector streets were collected for the supplemental information provided by H. Lee & Associates.

4.4.2. Pavement Width Deficiency

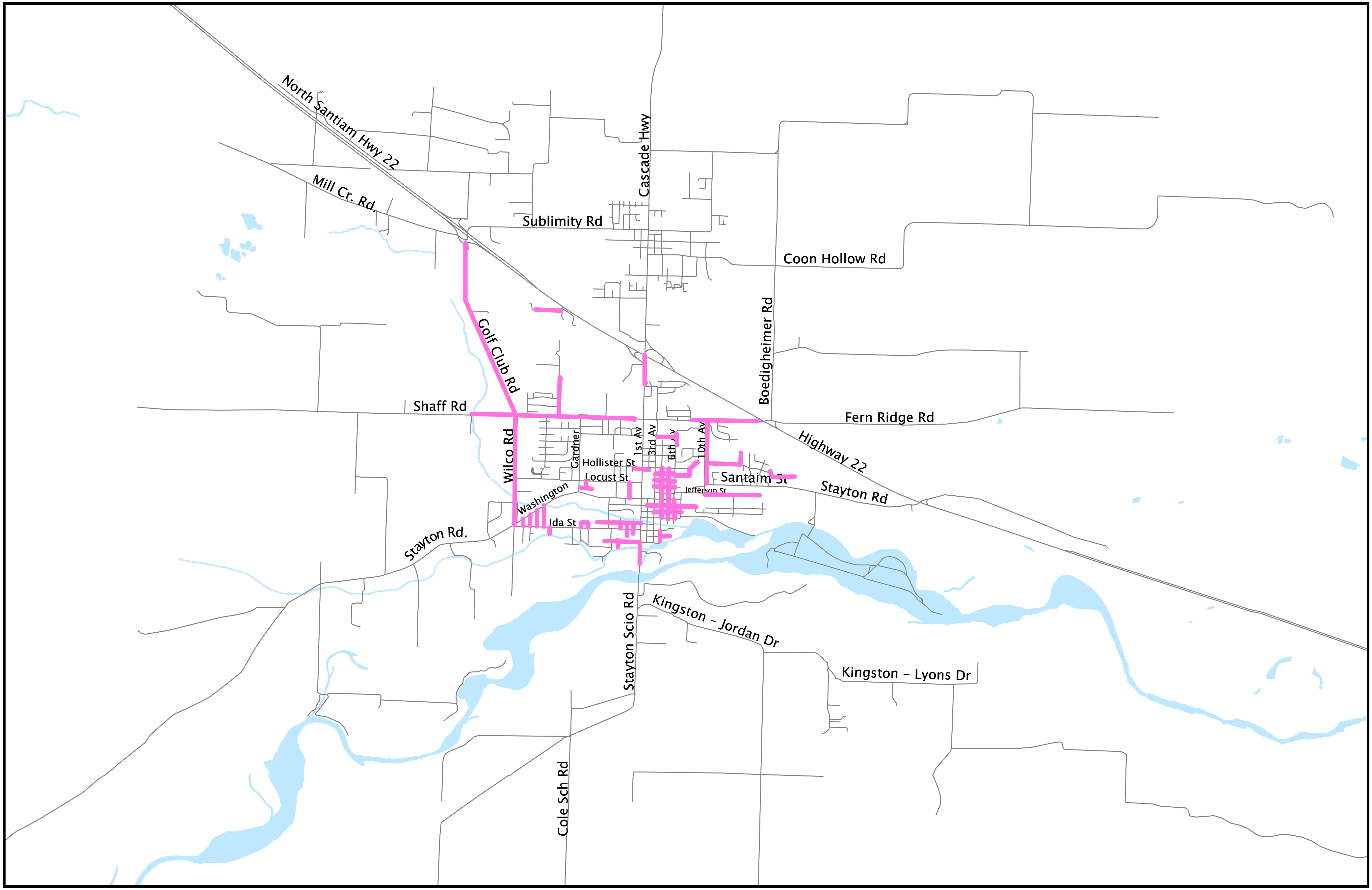
Figure 4-7 shows those streets in Stayton whose pavement width is less than the current city design standard for the particular roadway classification. Table 4-2 indicates the City of Stayton roadway width standards for arterial streets, collectors, and local streets, including cul-de-sacs. The arterial and collectors with pavement width less than the street standard, 40 feet, are as follows:

- Golf Club Road from Mill Creek Road to Shaff Road
- Wilco Road from Shaff Road to Ida Street
- Shaff Road from western UGB boundary to west of Cascade Highway
- Fern Ridge Road from west of 10th Avenue to Highway 22
- 10th Avenue from Fern Ridge Road to Santiam Street
- Cascade Highway south of Highway 22 Eastbound Ramps to Whitney Street
- Stayton-Scio Road from north of the Santiam River bridge to south UGB boundary

The arterials and collectors not listed above all meet the Stayton street width standard of 40 feet and are wide enough to accommodate on-street parking on both sides of the roadway, two travel lanes, and shared travel lanes with bicycle traffic. The only arterials and collectors within the Stayton UGB that accommodate on-street parking are Washington Street from Wilco Road to 7th Avenue, Locust Street from Wilco Road to 1st Avenue, Jefferson Street from 6th Avenue to 10th Avenue, and Ida Street from Wilco Road to 1st Avenue. The arterials and collectors listed above do not have adequate width based on the Stayton street standards and may not be able to accommodate safe bicycle travel depending on whether there are shoulders or not. It is anticipated that arterials and collectors with deficient widths will have proposed street widening improvements in Section 6, Transportation System Alternatives Analysis. For reference, the attached appendix has the street inventory in tabular form including pavement width as well as shoulder conditions, speed limits, and number of travel lanes.

There are many local streets that also have less than the street standard width of 34 feet. These streets are also shown in Figure 4-7. As can be seen from Figure 4-7, many of the substandard local streets are in central Stayton, which is an older part of town that was initially developed outside the downtown area.

In total, 5.7 miles (20.7%) of city streets have less than their design standard pavement width.



Stayton Transportation System Plan

Figure 4-7

Existing Roadway Width Deficiency

Legend

Roadway

Deficient Roadway

Table 4-2. Stayton Street Width Standards

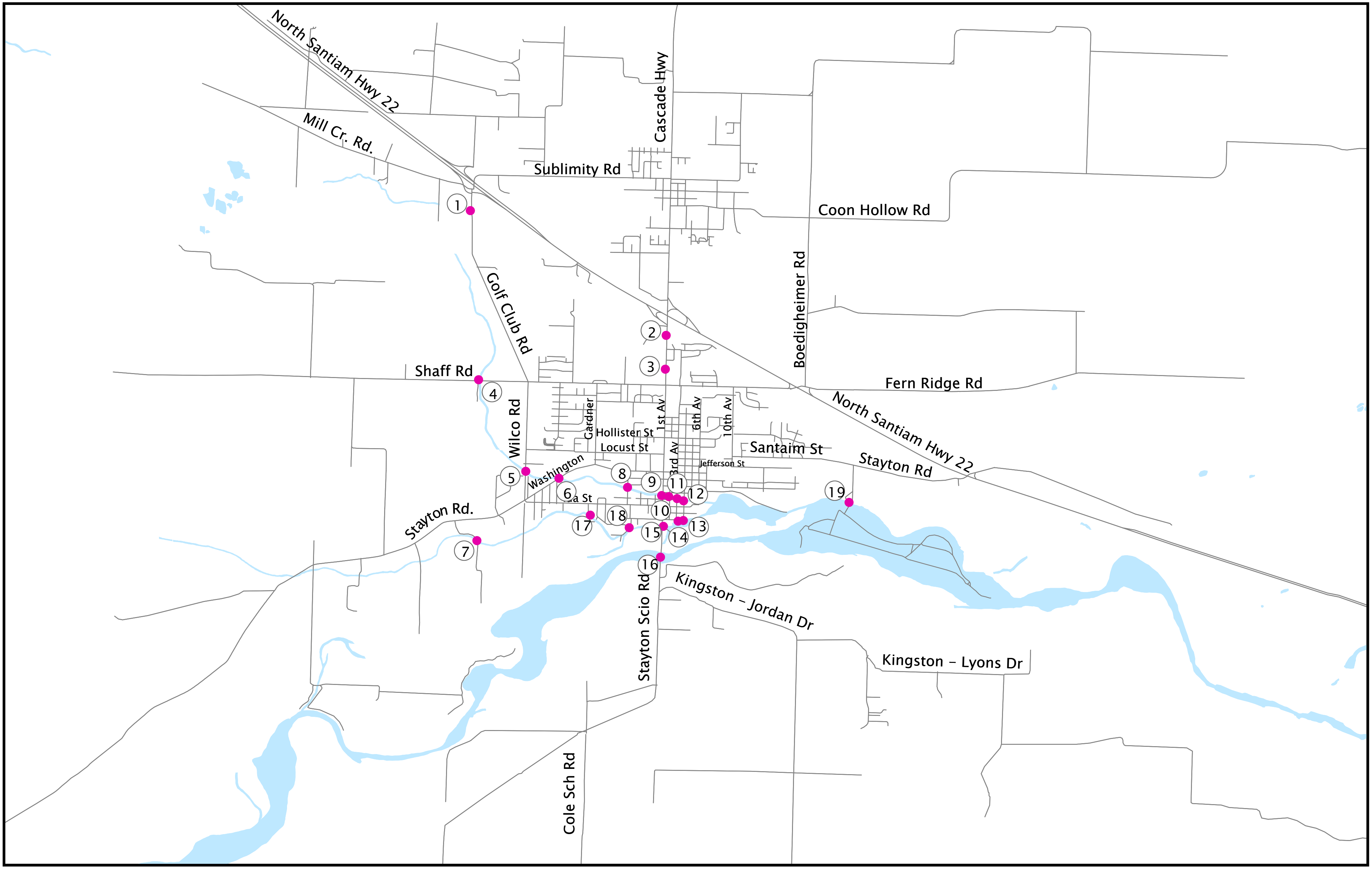
	Required Widths	
	Right-of-Way	Pavement (Curb to Curb)
Arterial	100 feet	40 feet
Collector	80 feet	40 feet
Local Street	60 feet	34 feet
Cul-de-sac	50 feet	30 feet

4.5. BRIDGES

The Oregon Department of Transportation maintains an up to date inventory and appraisal of Oregon bridges. Part of this inventory involves the evaluation of three mutually exclusive elements of bridges. One element identifies which bridges are structurally deficient. This is determined based on the condition rating for the deck, superstructure, substructure, or culvert and retaining walls. It may also be based on the appraisal rating of the structural condition or waterway adequacy. Another element identifies which bridges are functionally obsolete. This element is determined based on the appraisal rating for the deck geometry, underclearances, approach roadway alignment, structural condition, or waterway adequacy. The third element summarizes the sufficiency ratings for all bridges. The sufficiency rating is a complex formula which takes into account four separate factors to obtain a numeric value rating the ability of a bridge to service demand. The scale ranges from 0 to 100 with higher ratings indicating optimal conditions and lower ratings indicating insufficiency. Bridges with ratings under 55 may be nearing a structurally deficient condition. In more general terms, a rating under 55 may indicate that significant maintenance is needed or that replacement should be planned. The exception to this are bridges that were built to a much older standard that are in good condition but do not meet today’s design standards. These types of bridges can rate fairly low and under 55. The important factor here is that there are no structural integrity issues or loading problems that limit the type of vehicle and weight that can cross the structure.

There are 19 bridges within the City of Stayton urban growth area (see Figure 4-8). The City has maintenance responsibility for nine bridges, with Marion County being responsible for the other bridges.

Table 4-3 summarizes the inventory of bridges within the Stayton UGB, waterway it crosses, maintenance responsibility, and sufficiency rating. As shown in Table 4-3, all of the bridges rated by ODOT had a sufficiency rating greater than 55.



Stayton Transportation System Plan

Figure 4-8

Existing Roadway Bridges

Table 4-3. Stayton Bridges

Map No.	Street	Waterway/Roadway Crossed	Maintenance Responsibility	ODOT Sufficiency Rating
1	Golf Club Road	Mill Creek	Marion County	NA
2	Cascade Highway	Mill Creek	Marion County	NA
3	Cascade Highway	Lucas Ditch	Marion County	NA
4	Shaff Road	Salem Ditch	Marion County	NA
5	Wilco Road	Salem Ditch	Marion County	NA
6	Washington Street	Salem Ditch	Stayton	85.80
7	Seter's Way	Stayton Ditch	Stayton	72.60
8	Evergreen Street	Salem Ditch	Stayton	NA
9	1st Avenue	Salem Ditch	Marion County	96.10
10	2nd Avenue	Salem Ditch	Stayton	58.90
11	3rd Avenue	Salem Ditch	Stayton	97.70
12	4th Avenue	Salem Ditch	Stayton	NA
13	4th Avenue	Power Canal	Stayton	80.00
14	Water Street	Power Canal	Stayton	91.50
15	1st Avenue	Power Canal	Marion County	NA
16	1st Avenue	Santiam River	Marion/Linn Co.	NA
17	Holly Avenue	Stayton Ditch	Stayton	91.40
18	Danielson Way	Power Canal	Marion County	NA
19	Salem WTP	Santiam River	Marion County	NA

4.6. INTERSECTION TRAFFIC CONTROL AND LANE CHANNELIZATION

Figure 4-9 shows the existing intersection traffic control and lane geometry for the major intersections within the study area. Of the study area intersections, only the Cascade Highway/1st Avenue/Shaff Road/Fern Ridge Road and Washington Street/First Avenue intersections are controlled with a traffic signal. The intersections of Shaff Road/Golf Club Road; Wilco Road/Washington Street/Ida Street; and Ida Street/1st Avenue are all-way stop controlled.

Stayton Transportation System Plan

Figure 4-9
Existing Intersection Traffic Control and Channelization

LEGEND
Lane Usage
Traffic Signal
Stop Sign

NOT TO SCALE

4.7. TRAFFIC VOLUMES

4.7.1. Daily Traffic Volumes

Figure 4-10 shows the current daily (24-hour) traffic volumes on arterial, collector, and local streets in the greater Stayton area. These volumes were identified from traffic counts obtained in September, October, November, and December 2002 by H. Lee & Associates and adjusted seasonally based on factors available from the ODOT traffic count program. The seasonal factors used to adjust the traffic volumes are documented in Appendix C. As shown in this map, traffic volumes in the City of Stayton are highest on Cascade Highway south of Highway 22 (11,100 vehicles per day), First Avenue south of Shaff Road/Fern Ridge Road (10,400 vehicles per day), First Avenue south of Locust Street (9,800 vehicles per day), Golf Club Road south of Mill Creek Road (9,700 vehicles per day), and Wilco Road south of Shaff Road (7,100 vehicles per day). Traffic volumes are also relatively high on Shaff Road west of Cascade Highway (6,800 vehicles per day) and Wilco Road south of Locust Street (6,700 vehicles per day).

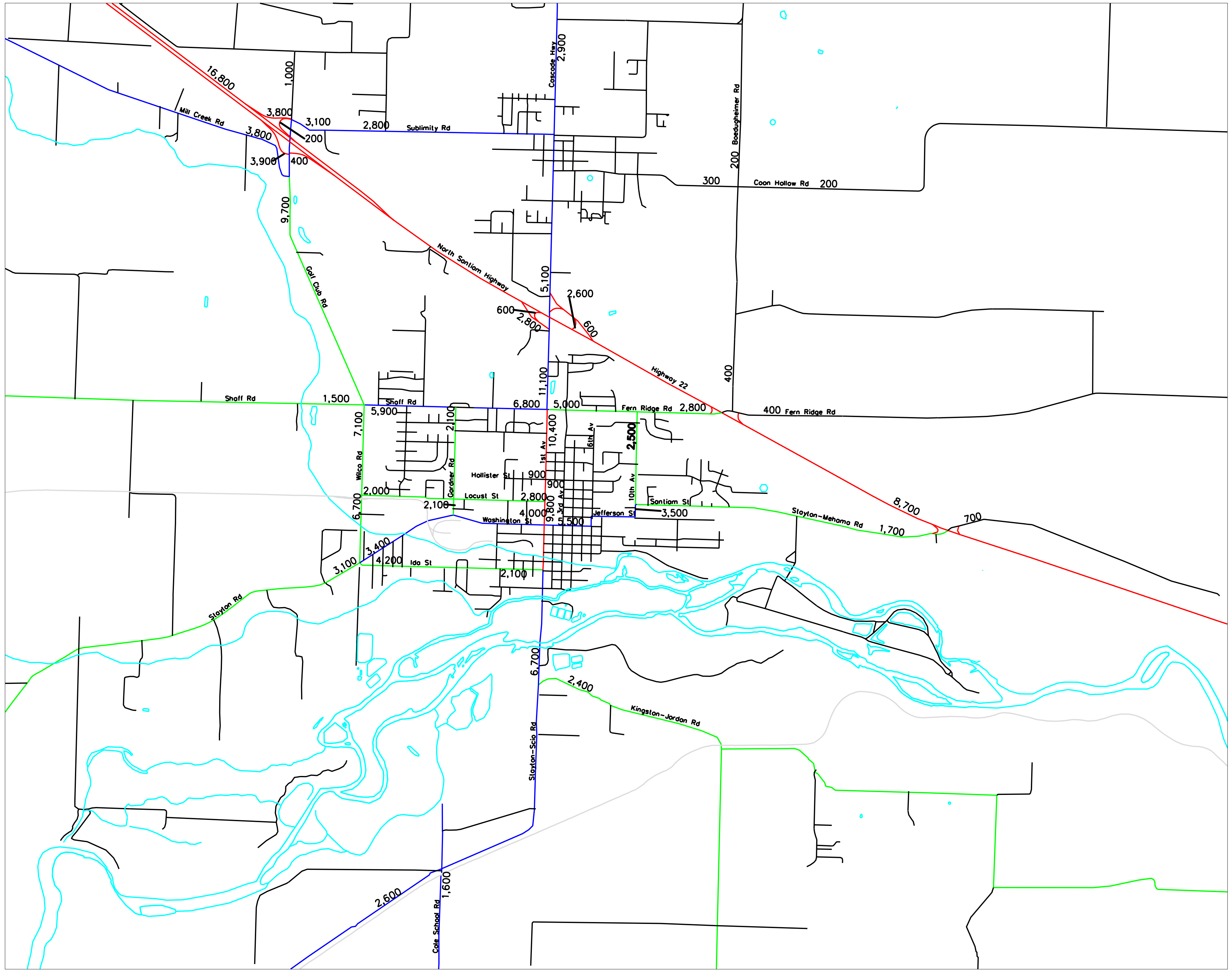
4.7.2. Intersection P.M. Peak Hour Traffic Volumes

Turning movement counts at five of the 17 study intersections were updated from traffic counts obtained by ODOT in 2002. Based on a comparison of these 2002 traffic counts with the traffic counts in the 1997 Draft Stayton TSP, a short term historical growth rate was derived of one percent per year to update the historical counts to a common 2003 base year. The updated P.M. peak hour turning movement counts are summarized in Figure 4-11. This data was used in conjunction with intersection traffic control and lane channelization information to calculate weekday P.M. peak hour traffic level of service and v/c ratios at these intersections. It should be noted that the turning movement counts were adjusted seasonally based on factors available from the ODOT traffic count program.

4.7.3. Truck Traffic Volumes

Truck traffic volumes were collected with the average daily traffic counts along the truck route through Stayton. These truck volumes are summarized in Table 4-4. Table 4-4 contains total number of daily number of trucks, total daily traffic volume, daily truck percentage, P.M. peak hour number of trucks, total P.M. peak hour traffic volume, and P.M. peak hour truck percentage.

As shown in Table 4-4, the daily truck percentage along the city's truck route ranges from 6.3 percent to 15.0 percent. The lowest location of daily percentage of trucks was along Cascade Highway north of Fern Ridge Road/Shaff Road. The highest location of daily percentage of trucks was along 1st Avenue south of Locust Street. It appears that the City of Stayton has a high percentage of trucks flowing through it. It should be cautioned however that the daily traffic counters may have over counted the truck volumes due to the inherent error in the process of machine traffic counting. This may be the case since when compared with the manual traffic counts, the truck counts ranged from two to six percent with four percent being the average.



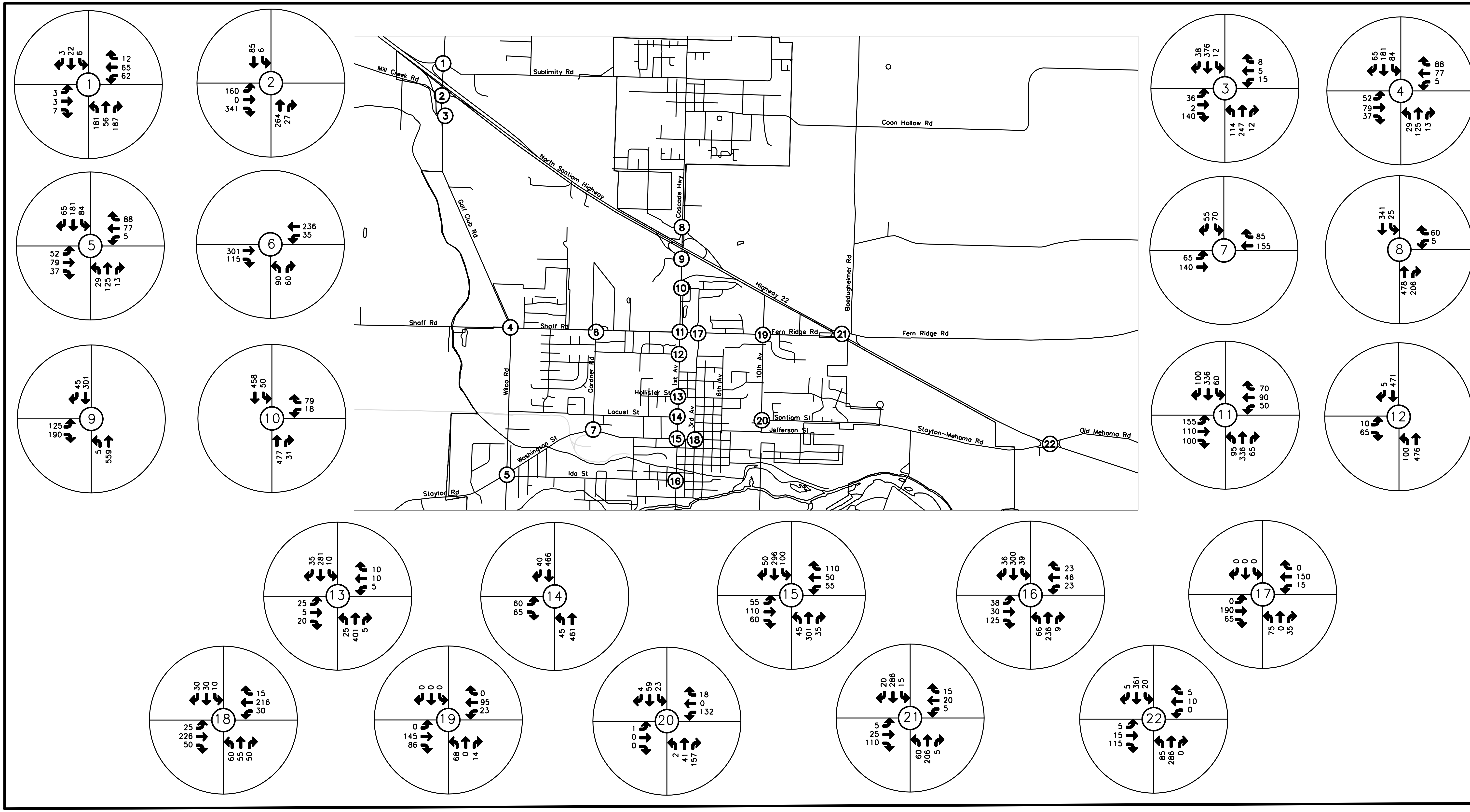
Stayton Transportation System Plan

Figure 4-10
Existing Weekday 24-Hour Traffic Volumes

LEGEND

12,500 Bi-Directional Daily Traffic Volume

NOT TO SCALE



Stayton Transportation System Plan

Figure 4-11
Existing Weekday P.M. Peak Hour Traffic Volumes

LEGEND
125 P.M. Peak Hour Traffic Volume

NOT TO SCALE

Table 4-4. Truck Volume Summary Along Truck Route

Location	Daily Number of Trucks	Daily Traffic Volume	Daily Truck Percentage	P.M. Peak Hour Number of Trucks	P.M. Peak Hour Traffic Volume	P.M. Peak Hour Truck Percentage
Golf Club Rd s/o Mill Creek Rd	1,161	9,677	12.0%	78	803	9.7%
Wilco Rd s/o Locust St	929	6,735	13.8%	64	567	11.3%
Cascade Hwy n/o Fern Ridge Rd	698	11,140	6.3%	70	911	7.7%
1st Av s/o Locust St	1,469	9,814	15.0%	120	765	15.7%
1st Av s/o Santiam River	602	6,719	9.0%	51	613	8.3%
Shaff Rd e/o Golf Club Rd	698	5,860	11.9%	57	487	11.7%
Shaff Rd w/o Cascade Hwy	124	1,506	8.2%	9	121	7.4%
Fern Ridge Rd s/o Hwy 22	259	2,750	9.4%	16	249	6.4%
Washington St e/o Wilco Rd	454	3,368	13.5%	25	225	9.8%
Stayton-Mehama Rd w/o Hwy 22	153	1,660	9.2%	10	135	7.4%

Table 4-4 also summarizes the P.M. peak hour truck volumes. The P.M. peak hour truck percentage along the city's truck route ranged from 6.4 percent to 15.7 percent. These P.M. peak hour truck percentages are very high. It is likely as stated previously that the inherent error in the machine traffic counting process may be over counting the trucks. This conclusion is based on comparing these percentages with the P.M. peak hour manual traffic counts which counted a range of two to six percent of truck traffic.

4.8. INTERSECTION LEVELS OF SERVICE AND V/C RATIO ANALYSIS

Intersection capacity was measured by the following two methodologies: level of service (LOS) and volume to capacity (v/c) ratio. Level of service to measure the performance at an intersection is the standard practice in the transportation planning and traffic engineering profession. This concept was developed by the Transportation Research Board (TRB). The *2000 Highway Capacity Manual*[1] documents the level of service analysis methodology. The Highway Capacity Manual measures level of service on a scale of LOS A to LOS F. LOS A means that drivers experience no delay or relatively low amounts of delay while traveling through an intersection;

[1] *2000 Highway Capacity Manual*; Transportation Research Board, National Research Council; Washington, D.C. 2000.

while LOS F means that drivers experience a great deal of delay while traveling through an intersection. Typically, most jurisdictions set their level of service standard at LOS D since LOS E denotes that the intersection capacity is being met and LOS F means that conditions beyond the existing intersection capacity are occurring. When LOS F conditions occur, they indicate that it would take motorists multiple signal cycles or a great deal of delay to travel through an intersection. In Section 3, Transportation Goals and Policies, the level of service standard for the City of Stayton has been set at LOS D for signalized intersections and LOS E for unsignalized intersections if the intersection does not meet traffic signal warrants.

The Oregon Department of Transportation bases its traffic operation standards based on volume to capacity (v/c) ratio and not level of service. For ODOT facilities, each type of facility has its own standard. Table 4-5 summarizes the v/c standard by ODOT facility type. The standard documented in Table 4-5 is from the *1999 Oregon Highway Plan*.[2]

Table 4-5
Maximum Volume-to-Capacity Ratios for Peak Hour Operating Conditions Through a Planning Horizon for State Highway Sections Located Outside the Portland Metropolitan Area Urban Growth Boundary

	Land Use Type/Speed Limits					
	Inside Urban Growth Boundary				Outside Urban Growth Boundary	
Highway	STAs	MPO	Non-MPO outside of STAs where non-freeway speed limit <45 mph	Non-MPO where non-freeway speed limit >=45 mph	Unincorporated Communities	Rural Lands
Interstate Highways and Statewide (NHS) Expressways	N/A	0.80	0.70	0.70	0.70	0.70
Statewide (NHS) Freight Routes	0.85	0.80	0.75	0.70	0.70	0.70
Statewide (NHS) Non-Freight Routes and Regional or District Expressways	0.90	0.85	0.80	0.75	0.75	0.70
Regional Highways	0.95	0.85	0.80	0.75	0.75	0.70
District/Local Interest Roads	0.95	0.90	0.85	0.80	0.80	0.75

Source: 1999 Oregon Highway Plan (OHP)
Interstates and Expressways shall not be identified as Special Transportation Areas (STAs)
For the purpose of this mobility policy of volume-to-capacity ratio standards, the peak hour shall be the 30th highest annual hour. This approximates weekday peak hour traffic in larger urban areas.

---

[2] *1999 Oregon Highway Plan*, Oregon Department of Transportation – Transportation Development Division, Planning Section, March 1999.

The v/c ratio is a measure of the percentage of used capacity on the roadway. A value of 0.00 indicates no traffic on the roadway, and a value of 1.00 indicates that the entire capacity of the roadway is being utilized. The *1999 Oregon Highway Plan* indicates that for state highways on the NHS Freight route such as the North Santiam Highway Number 162 (Highway 22), the maximum acceptable v/c is 0.75 within the urban growth boundary for state highway facilities with a speed limit less than 45 mph. For state facilities with a speed limit greater than 45 mph, the maximum acceptable v/c ratio is 0.70.

For unsignalized intersections, the *1999 OHP* sets the following standard:

> At unsignalized intersections and road approaches, the volume-to-capacity ratios in Table 4-5 shall not be exceeded for either of the state highway approaches that are not stopped. Approaches at which traffic must stop, or otherwise yield the right-of-way, shall be operated to maintain safe operation of the intersection and all of its approaches and shall not exceed the volume-to-capacity ratios for District/Local Interest Roads standard inside of urban growth boundaries.[3]

The only unsignalized intersections within ODOT's jurisdiction are intersections of Highway 22/Fern Ridge Road and Highway 22/Stayton-Mehama Road/Old Mehama Road. The stopped local approaches would have a maximum v/c ratio standard of 0.85 while the unstopped Highway 22 approaches would have a maximum v/c ratio standard of 0.70.

For signalized intersections, the *1999 OHP* sets the following standard:

> At signalized intersections other than crossroads of freeway ramps, the total volume-to-capacity ratio for the intersection considering all critical movements shall not exceed the volume-to-capacity ratios in Table 4-5. Where two state highways of different classifications intersect, the lower of the volume-to-capacity ratios in the table shall apply. Where a state highway intersects with a local road or street, the volume to capacity ratio for the state highway shall apply.[4]

There are no signalized intersections within ODOT's jurisdiction in the Stayton urban growth boundary (UGB).

The interchange ramps with Highway 22 at Golf Club Road and Cascade Highway would fall under the following *1999 OHP* standard:

> ...The primary cause of traffic queuing at freeway off-ramps is inadequate capacity at the intersections of the freeway ramps with the crossroad. These intersections are referred to as ramp terminals. In many instances where ramp terminals connect with another state highway, the volume to capacity standard for the connecting highway will generally be

[3] *1999 Oregon Highway Plan*, Oregon Department of Transportation – Transportation Development Division, Planning Section, March 1999, page 68.

[4] *1999 Oregon Highway Plan*, Oregon Department of Transportation – Transportation Development Division, Planning Section, March 1999, page 68.

adequate to avoid traffic backups onto the freeway. However, in some instances where the crossroad is another state highway or a local road, the standards will not be sufficient to avoid this problem. Therefore, the maximum volume to capacity ratio for the ramp terminals of interchange ramps shall be the smaller of the values of the volume to capacity ratio for the crossroad, or 0.85.[5]

Based on the ramp terminal standard above, the interchange ramp intersections at Golf Club Road and Cascade Highway have a maximum v/c standard of 0.85 for all intersection approaches.

The 1999 OHP specifies that the v/c ratio mobility standards shall be used for the following:

- Identifying state highway mobility performance expectations for planning and plan implementation.

- Evaluating the impacts on state highways of amendments to transportation plans, acknowledged comprehensive plans and land use regulations pursuant to the Transportation Planning Rule (OAR 660-12-060); and

- Guiding operations decisions such as managing access and traffic control systems to maintain acceptable highway performance.

The level of service and v/c analysis performed for this study for the typical weekday p.m. peak hour revealed that traffic operations at the major intersections in Stayton are generally acceptable. Table 4-6 summarizes the level of service at the study area intersections. The level of service table summary is sectioned into three categories: signalized intersections, ODOT unsignalized intersections, and city unsignalized intersections. Each of these categories of intersections have a different performance standard. The levels of service and v/c calculation worksheets are contained in the appendix.

The two signalized intersections are operating at LOS C or better. This meets the level of service standard of LOS D or better set by Transportation Policy 1.3.

The ODOT unsignalized intersections all operate better than the maximum v/c ratio standard of 0.85. However, there are two approaches that operate almost at the maximum allowed v/c ratio. The eastbound approach at the Highway 22 Eastbound Ramps/Cascade Highway and the Highway 22 Eastbound Ramps/SE Golf Club Road intersections operate at v/c ratios of 0.84 and 0.81 respectively. The approaches with the high v/c ratio are unsignalized and the stopped approaches of the respective intersections. The poor v/c ratio at these intersections are likely due to high through traffic volumes on the main approaches conflicting with the stopped approaches at the freeway ramps.

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[5] *1999 Oregon Highway Plan*, Oregon Department of Transportation – Transportation Development Division, Planning Section, March 1999, page 68.

Table 4-6. Existing Levels of Service

	PM Peak Hour		
Signalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Cascade Highway/Shaff Road	C	32.4	0.63
N 1st Avenue/Washington Street	C	29.4	0.55
ODOT Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Hwy 22 Westbound Ramps/Cascade Highway			
Westbound Approach	C	15.8	0.18
Southbound Left	A	9.6	0.04
Hwy 22 Eastbound Ramps/Cascade Highway			
Eastbound Approach	E	47.1	0.84
Northbound Left	A	8.2	0.01
Hwy 22 Westbound Ramps/SE Golf Club Road			
Eastbound Left	C	18.0	0.01
Eastbound Through-Right	B	11.1	0.02
Westbound Left	C	15.5	0.17
Westbound Through-Right	C	15.2	0.20
Northbound Left	A	7.6	0.13
Southbound Left	A	7.8	0.01
Hwy 22 Eastbound Ramps/SE Golf Club Road			
Eastbound Approach	D	26.1	0.81
Northbound Left	A	7.9	0.01
Hwy 22/Fern Ridge Road			
Eastbound Left	A	7.8	0.01
Westbound Left	A	8.3	0.06
Northbound Approach	B	14.3	0.30
Southbound Approach	C	16.1	0.12
Hwy 22/Stayton-Mehama Road			
Eastbound Left	A	8.1	0.02
Westbound Left	A	8.6	0.09
Northbound Approach	C	15.8	0.32
Southbound Approach	C	19.1	0.06

Table 4-6. Existing Levels of Service Continued

City Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
SE Golf Club Road/Shaff Road			
Eastbound Approach	B	10.8	0.28
Westbound Approach	B	11.7	0.28
Northbound Approach	B	11.0	0.28
Southbound Approach	B	12.8	0.44
Shaff Road/N Gardner Road			
Westbound Left	A	8.5	0.04
Northbound Approach	C	19.4	0.41
Fern Ridge Road/N 3rd Avenue			
Eastbound Left	A	7.7	0.02
Westbound Left	A	7.9	0.01
Northbound Approach	B	14.1	0.25
Southbound Approach	B	12.3	0.05
Fern Ridge Road/N 10th Avenue			
Westbound Left	A	7.9	0.02
Northbound Approach	B	11.7	0.15
N 1st Avenue/Regis Street			
Eastbound Approach	C	16.5	0.22
Northbound Left	A	9.1	0.12
N 1st Avenue/Holister Street			
Eastbound Approach	C	17.0	0.16
Westbound Approach	C	16.8	0.08
Northbound Left	A	8.2	0.02
Southbound Left	A	8.4	0.01
N 1st Avenue/Locust Street			
Eastbound Approach	D	28.2	0.48
Northbound Left	A	8.9	0.05
SE Stayton Road/Washington Street/Wilco Road			
Eastbound Approach	B	11.5	0.44
Westbound Approach	B	11.3	0.44
Northbound Approach	B	12.0	0.28
Southbound Approach	B	13.5	0.44

Table 4-6. Existing Levels of Service Continued

City Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
W Washington Street/N Gardner Road			
Eastbound Left	A	8.0	0.06
Southbound Left	B	13.7	0.17
Southbound Right	A	9.6	0.07
N 3rd Avenue/Washington Street			
Eastbound Left	A	7.9	0.02
Westbound Left	A	8.0	0.03
Northbound Approach	C	24.1	0.51
Southbound Approach	C	15.8	0.20
N 10th Avenue/E Santiam Street			
Eastbound Approach	A	8.1	0.01
Westbound Approach	A	9.5	0.41
Northbound Approach	A	8.4	0.32
Southbound Approach	A	8.5	0.29
N 1st Avenue/Ida Street			
Eastbound Approach	B	12.8	0.47
Westbound Approach	B	11.3	0.30
Northbound Approach	B	14.5	0.42
Southbound Approach	C	19.8	0.51
SE Golf Club Road/Mill Creek Road			
Eastbound Approach	C	19.9	0.46
Westbound Approach	D	28.6	0.21
Northbound Left	A	8.7	0.11
Southbound Left	A	7.8	0.01
Cascade Highway/Whitney Street			
Westbound Approach	C	15.9	0.25
Southbound Left	A	8.5	0.07

All of the city unsignalized intersections are calculated to operate at LOS D or better. So, all of the city unsignalized intersections operate within the maximum level of service standard established by Transportation Policy 1.3 of LOS E or better.

4.9. HIGH CRASH LOCATIONS

Crash data was obtained from the City of Stayton, Marion County, and Oregon Department of Transportation for the period between January 1999 and June 30, 2002. The crash data summarized are only reported crashes and there may be other crashes that occurred that were not reported. The data available includes total crashes, crashes by severity (i.e. fatal, injury or property damage only), and accident collision type. The intersection crash data is summarized in Table 4-7 and the mid-block crash data is summarized in Table 4.8. These tables only contain crashes by severity type, crashes per year, and crash rates (crashes per million vehicle miles traveled and crashes per million entering vehicles). Since the crash data is given as an average over a three and a half year period, the data is shown in fractions of a crash to the nearest hundredth. Crash collision type is available in Appendix D.

To evaluate intersection crashes, two factors were considered. First, an acceptable intersection crash rate standard is typically 1.00 crashes per million entering vehicles. However, the crashes per year should also be considered as secondary criteria for a high crash location in conjunction with this crash rate standard because the crash rate does not always indicate that there is a crash issue. The crash rate can be skewed by low traffic volumes where one crash is weighted highly in the crash rate formula. Therefore, a secondary measure of five crashes per year was also used in evaluating intersection locations for high crashes. The five crashes per year secondary threshold was used because it is the threshold for one of the traffic signal warrants. If an unsignalized intersection has five or more crashes per year, the Manual on Uniform Traffic Control Devices (MUTCD),[6] allows the intersection for consideration of signalization. Based on the criteria above and shown in Table 4-7, six intersection locations have crash rates over 1.00 crashes per million entering vehicles. However, all of these intersections have two or fewer crashes per year occurring. Therefore, none of the intersection locations can be considered as high crash locations.

The criteria typically used for high mid-block crash locations are the state average. Based on ODOT's most recent statewide crash report,[7] the 2000 average statewide crash rate for urban non-freeway state facilities is 2.90 crashes per million vehicle miles traveled. Since the mid-block crash rate can be skewed high by a short mid-block section and low traffic volumes, a secondary measure was also used to evaluate for high mid-block crash locations. As with the intersection crash analysis, five crashes per year was used as a secondary threshold. As shown in Table 4-8, seven mid-block locations have crash rates greater than the state-wide average for urban, non-freeway state facilities. However, all of these mid-block locations have fewer than 2 crashes per year occurring. Therefore, none of the mid-block locations can be considered as high crash locations.

Since there are no high crash locations within the Stayton UGB, further analysis was not conducted with crash collision type. Although not used in this crash analysis, the crash collision type information is available in Appendix D.

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[6] Manual on Uniform Traffic Control Devices (MUTCD), U.S. Department of Transportation, Federal Highway Administration, 1988 Edition, page 4C-6.

[7] 2000 State Highway Crash Rate Tables, ODOT, Transportation Development Division, October 2001.

Table 4-7. Intersection Crash Summary

Intersection/Roadway Section	Average Annual Accidents				Crashes per million entering vehicles
	Property Damage Only	Injury	Fatal	Total	
Cascade Hwy/Hwy 22	1.14	0.29	0.00	1.43	0.26
Cascade Hwy/NE Triumph Rd	0.29	0.00	0.00	0.29	0.24
Cascade Hwy/Shaff Rd	0.57	0.00	0.00	0.57	0.09
Cascade Hwy/Sublimity Blvd	0.00	0.57	0.00	0.57	0.45
E Burnett St/N 5th Ave	0.29	0.00	0.00	0.29	1.06
E Fir St/N 3rd Ave	0.29	0.29	0.00	0.58	1.59
E High St/N 2nd Ave	0.29	0.00	0.00	0.29	0.79
E Ida St/N 2nd Ave	0.29	0.00	0.00	0.29	0.45
E Ida St/N 3rd Ave	0.29	0.00	0.00	0.29	0.48
E Ida St/N 4th Ave	0.29	0.00	0.00	0.29	0.53
E Jefferson St/N 10th Ave	0.29	0.00	0.00	0.29	0.18
E Jefferson St/N 4th Ave	0.29	0.00	0.00	0.29	0.17
E Jefferson St/N 6th Ave	0.29	0.00	0.00	0.29	0.18
E Jefferson St/N 7th Ave	0.00	0.00	0.29	0.29	0.18
E Marion St/N 7th Ave	0.29	0.00	0.00	0.29	0.77
E Virginia St/N 4th Ave	0.29	0.00	0.00	0.29	0.77
E Washington St/N 2nd Ave	0.29	0.00	0.00	0.29	0.31
E Washington St/N 3rd Ave	0.29	0.00	0.00	0.29	0.35
E Washington St/N 4th Ave	0.29	0.00	0.00	0.29	0.39
N 1st Ave/E Burnett St	0.29	0.00	0.00	0.29	0.08
N 1st Ave/E Marion Dr	0.29	0.29	0.00	0.58	0.16
N 1st Ave/E Pine St	0.29	0.00	0.00	0.29	0.08
N 1st Ave/W High St.	0.00	0.29	0.00	0.29	0.08
N 1st Ave/W Hollister St	0.57	0.00	0.00	0.57	0.16
N 1st Ave/W Washington St	1.43	0.00	0.00	1.43	0.28
N Gardner Rd/Western Ave	0.57	0.00	0.00	0.57	0.78
S 1st Av/W Ida St	0.29	0.00	0.00	0.29	0.07
S 1st Av/W Water St	0.29	0.00	0.00	0.29	0.21
SE Fern Ridge Rd/Hwy 22	0.00	0.29	0.00	0.29	0.09
SE Fern Ridge Rd/N 10th Ave	0.29	0.00	0.00	0.29	0.16
SE Fern Ridge Rd/N 3rd Ave	0.57	0.00	0.00	0.57	0.35
SE Fern Ridge Rd/SE Boedigheimer Rd	0.86	0.00	0.00	0.86	0.62
SE Golf Club Rd/Hwy 22	2.00	0.00	0.00	2.00	0.92
SE Golf Club Rd/SE Mill Creek Rd	2.57	0.57	0.00	3.14	0.62
SE Golf Club Rd/SE Sublimity Rd	1.14	0.57	0.00	1.71	1.20
SE Golf Club Rd/Shaff Rd	1.14	0.57	0.00	1.71	0.37
SE Old Mehama Rd/Hwy 22	0.29	0.00	0.00	0.29	0.09
Shaff Rd/Kindle Wy	0.29	0.00	0.00	0.29	0.13
Shaff Rd/N Douglas Ave	0.29	0.00	0.00	0.29	0.13
Shaff Rd/N Gardner Rd	0.29	0.00	0.00	0.29	0.14
Shaff Rd/Westown Dr	0.29	0.00	0.00	0.29	0.14
W Burnett St/N Evergreen Ave	0.57	0.00	0.00	0.57	1.56

Table 4-7. Intersection Crash Summary Continued

Intersection/Roadway Section	Average Annual Accidents				Crashes per million entering vehicles
	Property Damage Only	Injury	Fatal	Total	
W Ida St/N Alder Ave	0.29	0.00	0.00	0.29	0.26
W Locust St/N Douglas Ave	0.29	0.00	0.00	0.29	0.30
W Locust St/N Fern Ave	0.29	0.00	0.00	0.29	0.32
W Locust St/N Gardner Rd	0.29	0.00	0.00	0.29	0.35
W Locust St/Wilco Rd	0.29	0.29	0.00	0.58	0.76
W Washington St/N Gardner Ave	0.57	0.00	0.00	0.57	0.16
W Washington St/Wilco Rd	0.29	0.00	0.00	0.29	0.15
Westown Dr/Westfield Pl	0.29	0.00	0.00	0.29	1.06

Table 4-8. Mid-Block Crash Summary

Roadway Section	Average Annual Accidents				Crashes per million vehicle miles
	Property Damage Only	Injury	Fatal	Total	
Cedar St - 1st Ave to6th Ave	0.00	0.29	0.00	0.29	12.22
Pine St - Regis St to Washington St	0.29	0.00	0.00	0.29	6.36
Santiam St - 10th Ave to Hwy 22	0.29	0.00	0.00	0.29	0.13
Washington St - 1st Ave to 7th Ave	0.57	0.00	0.00	0.57	0.86
Fern Ridge Rd - 10th Ave to Hwy 22	0.29	0.00	0.00	0.29	0.48
Jetters Wy - South Ida St	0.29	0.00	0.00	0.29	14.45
10th Av - Fern Ridge Rd to Jefferson St	0.29	0.00	0.00	0.29	0.45
Cascade Hwy - Sublimity Rd to Hwy22	1.14	0.29	0.00	1.43	0.76
Cascade Hwy - Hwy22 to Shaff Rd	0.86	0.29	0.00	1.15	0.57
1st Ave - Shaff Rd to Locust St	4.86	0.00	0.00	4.86	2.47
1st Ave - Locust St to Washington St	1.14	0.00	0.00	1.14	2.82
1st Ave - Washington St to Ida St	0.00	0.00	0.00	0.00	0.00
1st Ave - Ida St to Kingston-Jordan Rd	0.00	0.00	0.00	0.00	0.00
3rd Av - Shaff Rd to Washington St	0.57	0.00	0.00	0.57	4.73
6th Av - Regis St to Washington St	0.29	0.00	0.00	0.29	2.89
Boedigheimer Rd - Triumph Rd to Fern Ridge Rd	0.57	0.00	0.00	0.57	1.79
Golf Club Rd - Mill Creek Rd to Shaff Rd	2.86	1.43	0.00	4.29	0.79
Mill Creek Rd - Bishop Rd to Golf Course Rd	2.00	0.00	0.00	2.00	0.89
Old Mehama Rd - Minton Rd to North of Hwy 22	1.14	0.00	0.00	1.14	1.47
Stayton Rd - West of Rouge Ave to Wilco Rd	0.57	0.00	0.00	0.57	1.61
Shaff Rd - West of Golf Course Rd	1.14	0.29	0.00	1.43	4.22
Shaff Rd - Golf Course Rd to Cascade Hwy	1.43	0.00	0.00	1.43	0.56
Ida St - Wilco Rd to 1st Ave	0.86	0.00	0.00	0.86	0.73
Locust St - Gardner Ave to 1st Ave	0.86	0.00	0.00	0.86	1.72
Washington St - Wilco Rd to Gardner Ave	0.29	0.29	0.00	0.58	0.59
Washington St - Gardner Ave to 1st Ave	1.43	0.00	0.00	1.43	2.41
High St - West of 1st Ave	0.29	0.00	0.00	0.29	17.66
Westhaven Pl - West of Westown Dr	0.29	0.00	0.00	0.29	31.78

As a side note, from January 1999 to June 30, 2002 only one fatality occurred in Stayton. This fatality occurred at E. Jefferson Street and N. 7th Avenue and involved a vehicle hitting a fixed object. No pedestrian accidents occurred in the analysis period. Two bicycle accidents occurred in the analysis period. The bicycle accidents occurred at Old Mehama Road at Highway 22 and 1st Avenue at Washington Street. Both bicycle accidents were classified as property damage only accidents with no injuries.

Figure 4-12 summarizes the locations that have the highest crashes in the Stayton UGB. It should be noted that these locations may have the highest number of accidents per year but are not indicative of high accident locations as discussed above.

4.10. PUBLIC PARKING

Most public parking in Stayton is in the downtown area, that area bounded by 1st Avenue on the west, 4th Avenue on the east, Burnett Street on the north, and Water Street on the south. Figure 4-13 shows existing on and off-street public parking locations in the downtown area. In a 17 block area there are a total of 274 on-street striped parking spaces, and three public parking lots (41 spaces). None of the public parking spaces are metered. The only spaces with a time restriction are the four spaces in the City Hall lot on the east side of 3rd Avenue at High Street.

A parking utilization survey was conducted during the 4-5 p.m. period on Friday, September 27, 1996 and during the 10:30-11:30 a.m. period on Thursday, October 3, 1996. The survey results are shown in Figure 4-13. Of the two periods surveyed, the 10:30-11:30 a.m. period had the greater overall parking demand, with 56% of all spaces occupied (58% of on-street spaces, and 39% of off-street spaces.)

Additional on-street parking information is available from the street inventory tabular summary in the appendix. Generally, on-street parking is available on city streets where the street width equals or exceeds the street width standards.

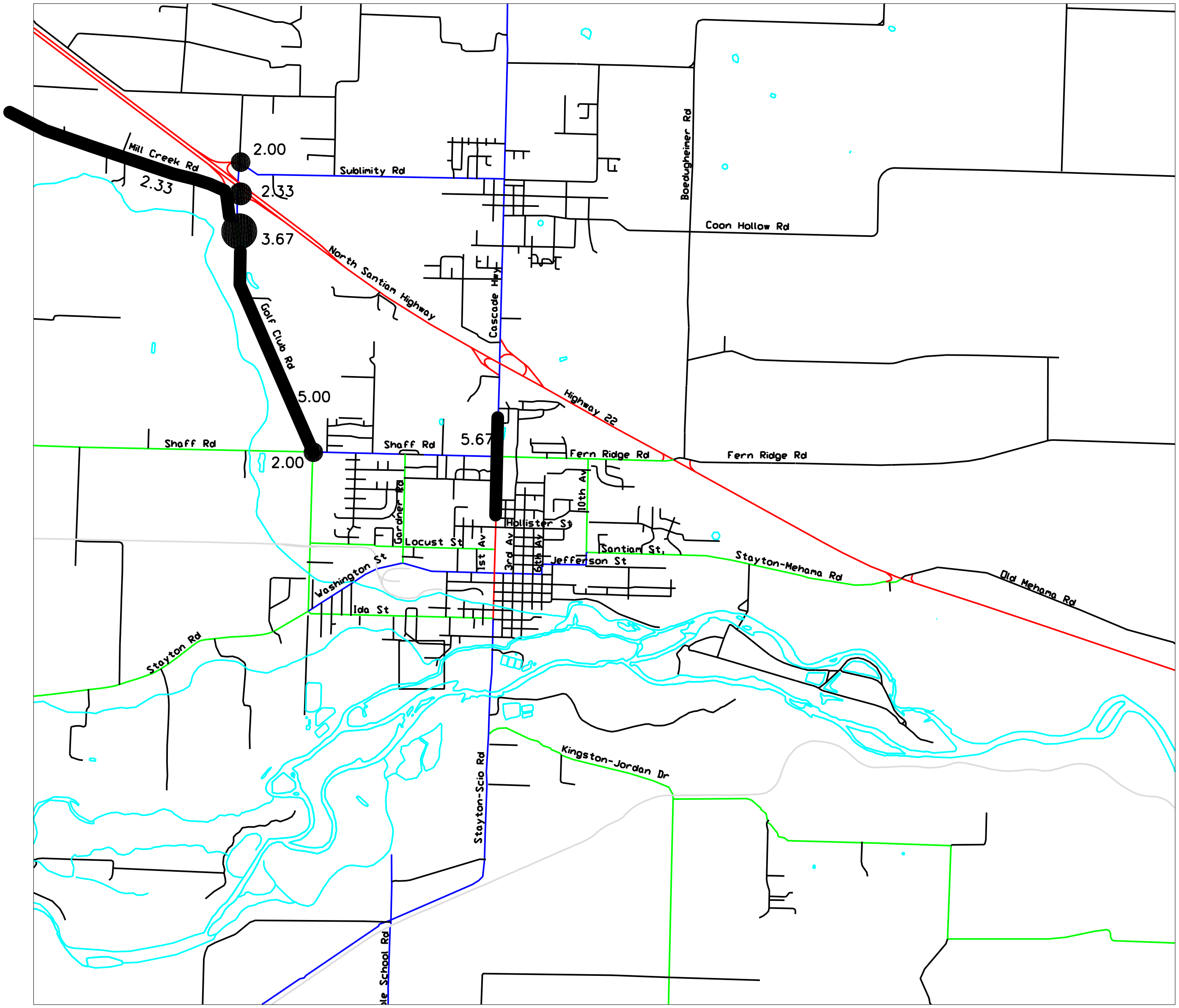
4.11. PEDESTRIAN AND BICYCLE FACILITIES

Figure 4-14 shows the location of existing sidewalks within the City of Stayton. The bicycle lanes within the City of Stayton are shown in Figure 4-15.

4.11.1. Sidewalks

Sidewalks are provided in Stayton throughout most of the residential areas, as well as through the downtown area. Notable arterial and collector street sections without sidewalks include:

- Shaff Road-Fern Ridge Road,
- Santiam Street,
- Washington Street,
- Golf Club Road,



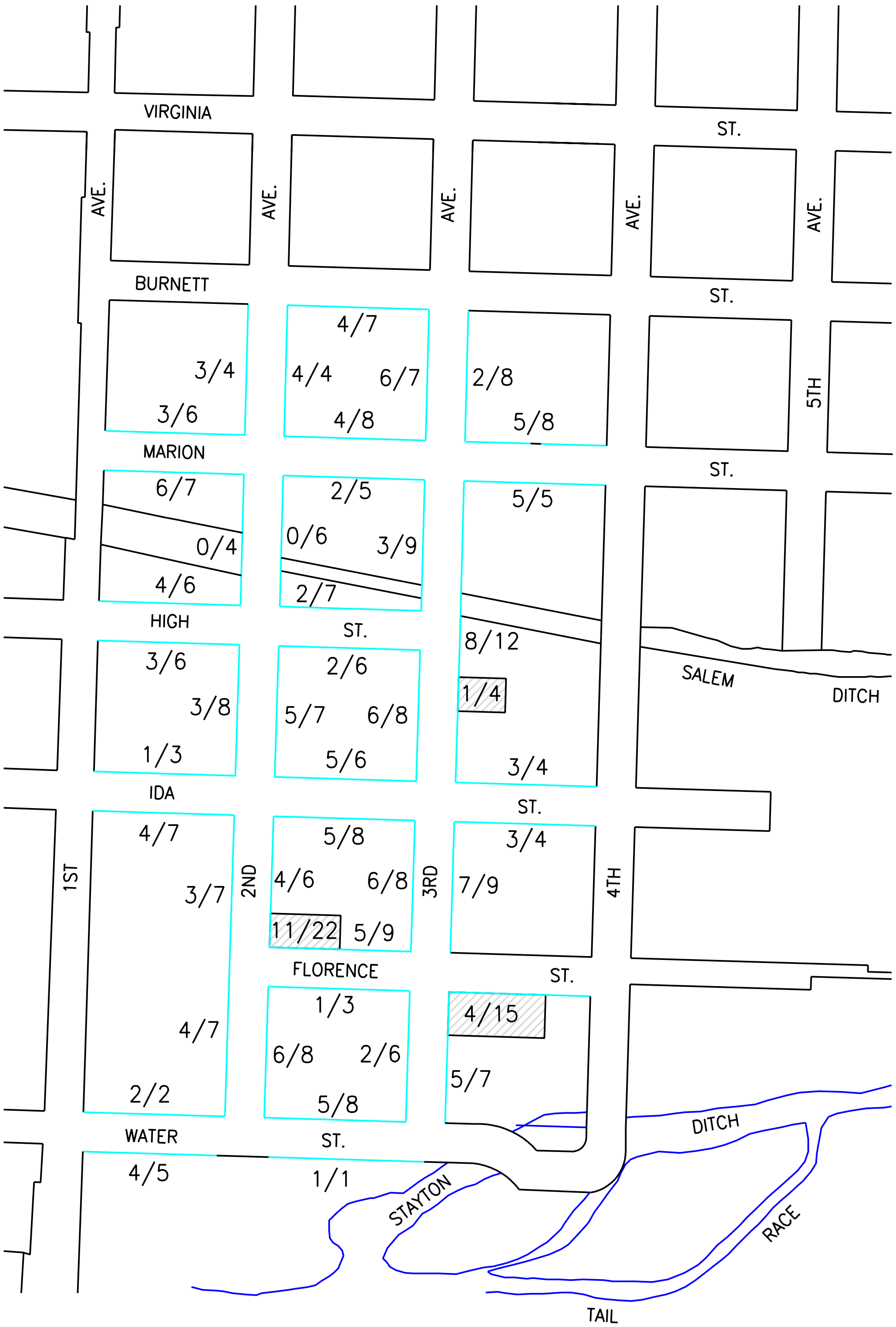
Stayton Transportation System Plan

Figure 4-12
High Accident Locations

LEGEND

● 2.50 Crashes Per Year
(Average between 2000–2002)

NOT TO SCALE



Stayton Transportation System Plan

Figure 4-13
Existing Downtown Parking Usage/Supply

LEGEND
ON-STREET PARKING (STRIPED STALLS)
OFF-STREET PARKING LOT
X/X CARS PARKED/NUMBER OF STALLS

NOT TO SCALE

Stayton Transportation System Plan

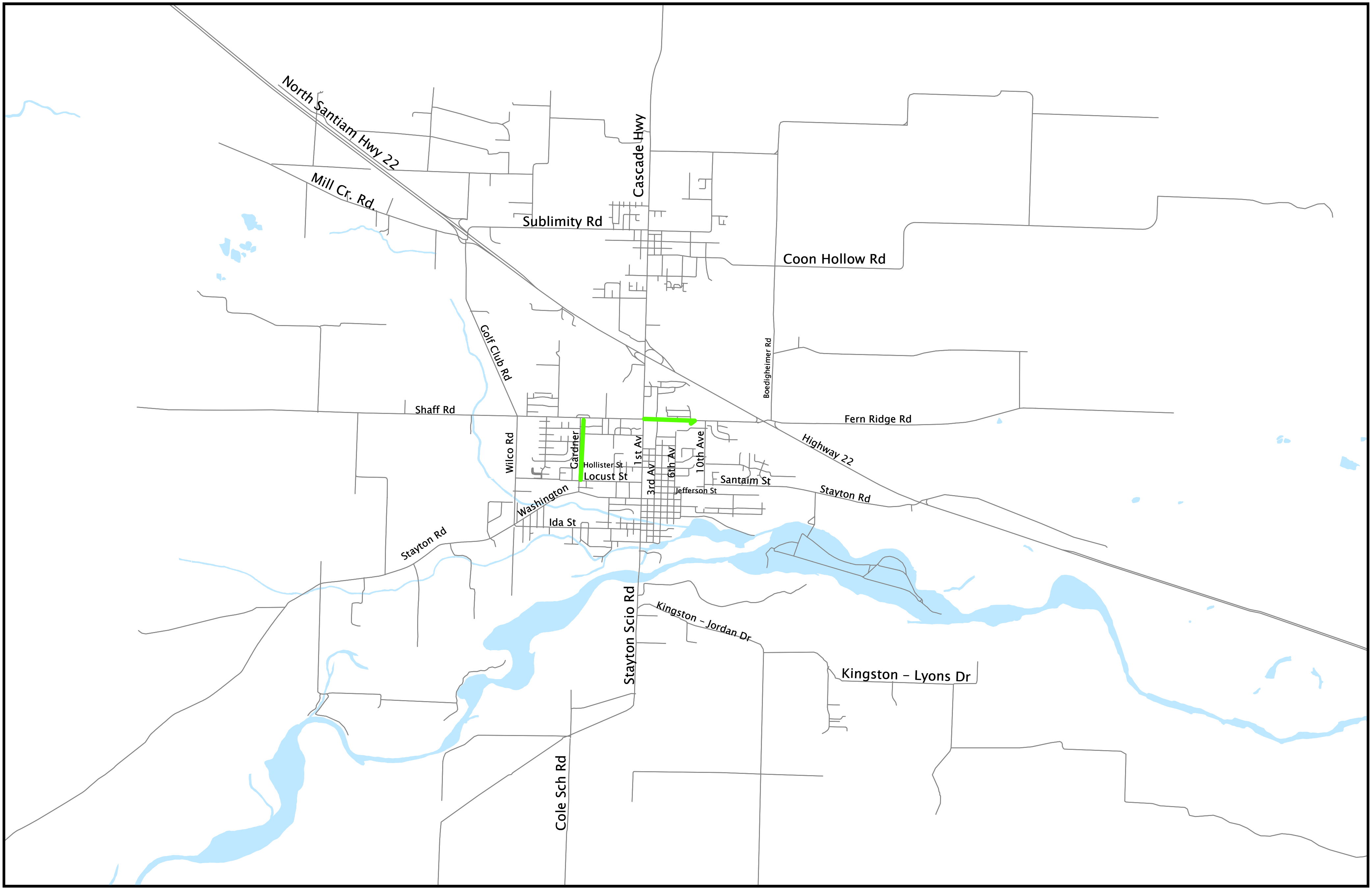
Figure 4-14

Existing Sidewalks

Legend

Roadway
Sidewalk

N



Stayton Transportation System Plan

Figure 4-15

Existing Bicycle Lanes

Legend

Roadway

Bicycle Lane

N

- Wilco Road,
- 3rd Avenue, and
- Ida Street.

Pedestrian crosswalks are located at the following locations:

- Washington Street at NORPAC Foods,
- the school crossing on 1st Avenue between Cedar Street and Regis Street,
- the school crossing on Shaff Road at Gardner Street,
- the 1st Avenue/Washington Street intersection
- 1st Avenue/Cascade Highway at Fern Ridge Road/Shaff Road intersection, and
- 1st Avenue at Ida Street.

Pedestrian crosswalks also exist at most of the stop-controlled intersections in the downtown Stayton area.

4.11.2. Bicycle Paths and Routes

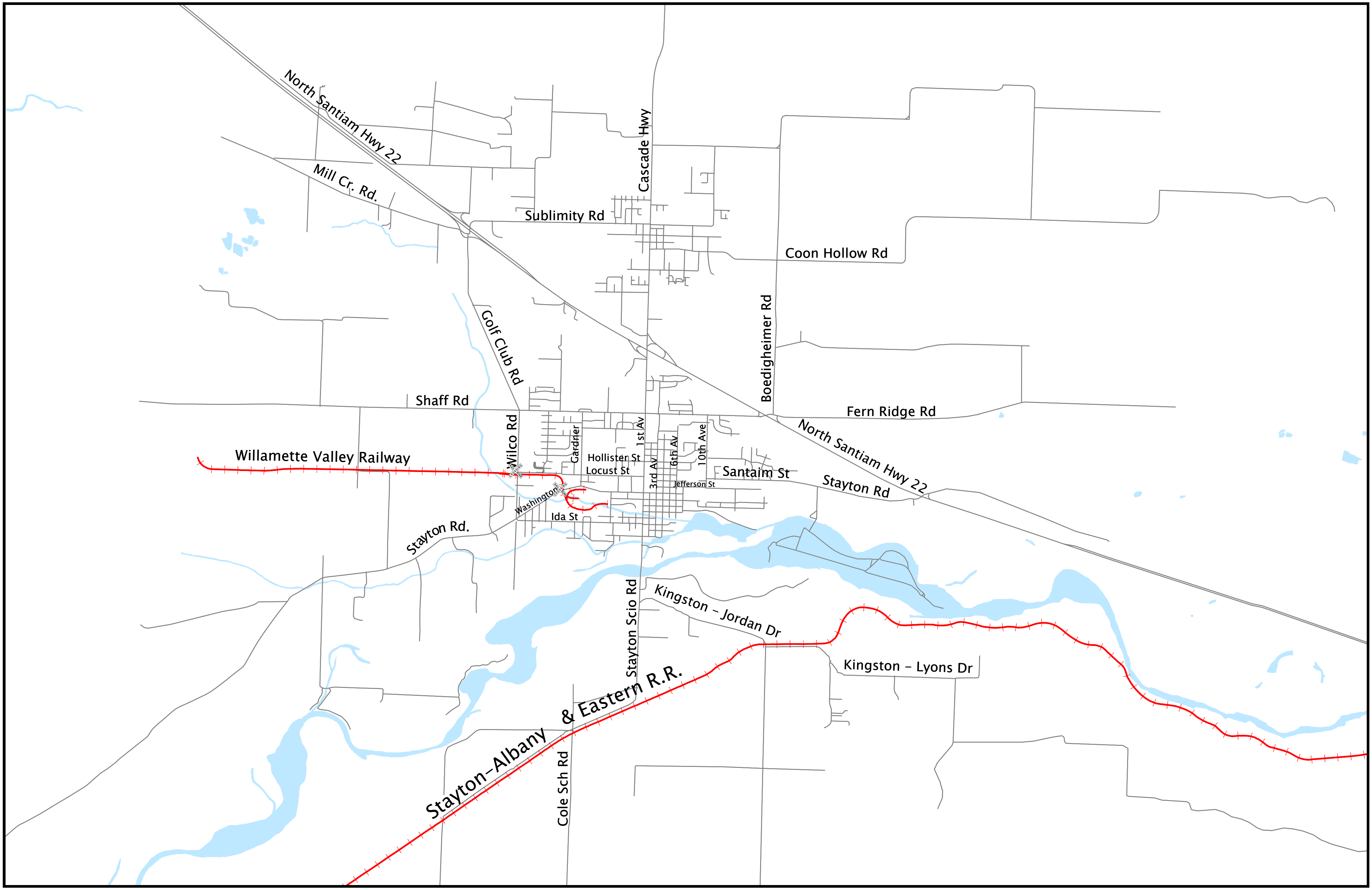
There are only two marked bicycle lane facilities along streets within Stayton. A short section of bicycle lanes exist along Fern Ridge Road between Cascade Highway and Wildflower Drive. The other bicycle lane facility within Stayton exists along Gardner Road between Locust Street and Shaff Road.

4.12. RAIL SERVICE/ROADWAY GRADE CROSSINGS

Figure 4-16 shows existing rail service and at-grade railroad highway crossings in Stayton. At present, there is a rail spur to Stayton from the Southern Pacific mainline in Salem, operated by the Willamette Valley Railroad. The spur terminates at NORPAC Foods, Inc. Wilco Farmers and Trus Joist also maintain sidings with this spur. The other industrial areas along the spur could also become a major user of these rail facilities as the need for rapid and inexpensive movement of bulky items increases. There are two at-grade railroad/highway grade crossings in Stayton:

- Washington Street at NORPAC, and
- the Locust Street/Wilco Road intersection.

Currently, the Willamette Valley Railroad makes two to three trips per week into Stayton (Monday and Thursday), between 1-3 p.m. The train services Trus Joist, NorPac Foods, and Wilco Farmers on demand. Yearly number of trips is estimated at 500 cars per year.



Stayton Transportation System Plan

Figure 4-16

Existing Rail Service/Roadway Grade Crossings

Legend

Roadway

Rail Line

Grade Crossing

N

4.13. TRANSIT SERVICE

4.13.1. Dial-a-Ride Service

Stayton's only existing form of transit is the *Wheels of Joy,* which is a dial-a-ride system. The *Wheels of Joy System* provides transportation for disabled persons who are unable to drive. This service currently operates between Stayton, Sublimity, and Aumsville. The *Wheels of Joy* currently owns five vans which totaled 5,531 trips in 1995.

4.13.2. School Bus Transportation

Laidlaw Transit provides bus service for the Stayton School District. Figure 4-17 shows the existing school bus routes in the Stayton area.

4.14. AIR TRANSPORTATION

The City of Stayton does not have an airport. There is a full service commercial airport 15 miles away in Salem that provides needed service. The Salem airport provides connections to other commercial airports such as the Portland International airport. Several small private air strips in Marion and Linn county are within 20 miles of Stayton. A heliport at Santiam Hospital provides for recreational and medical emergencies.

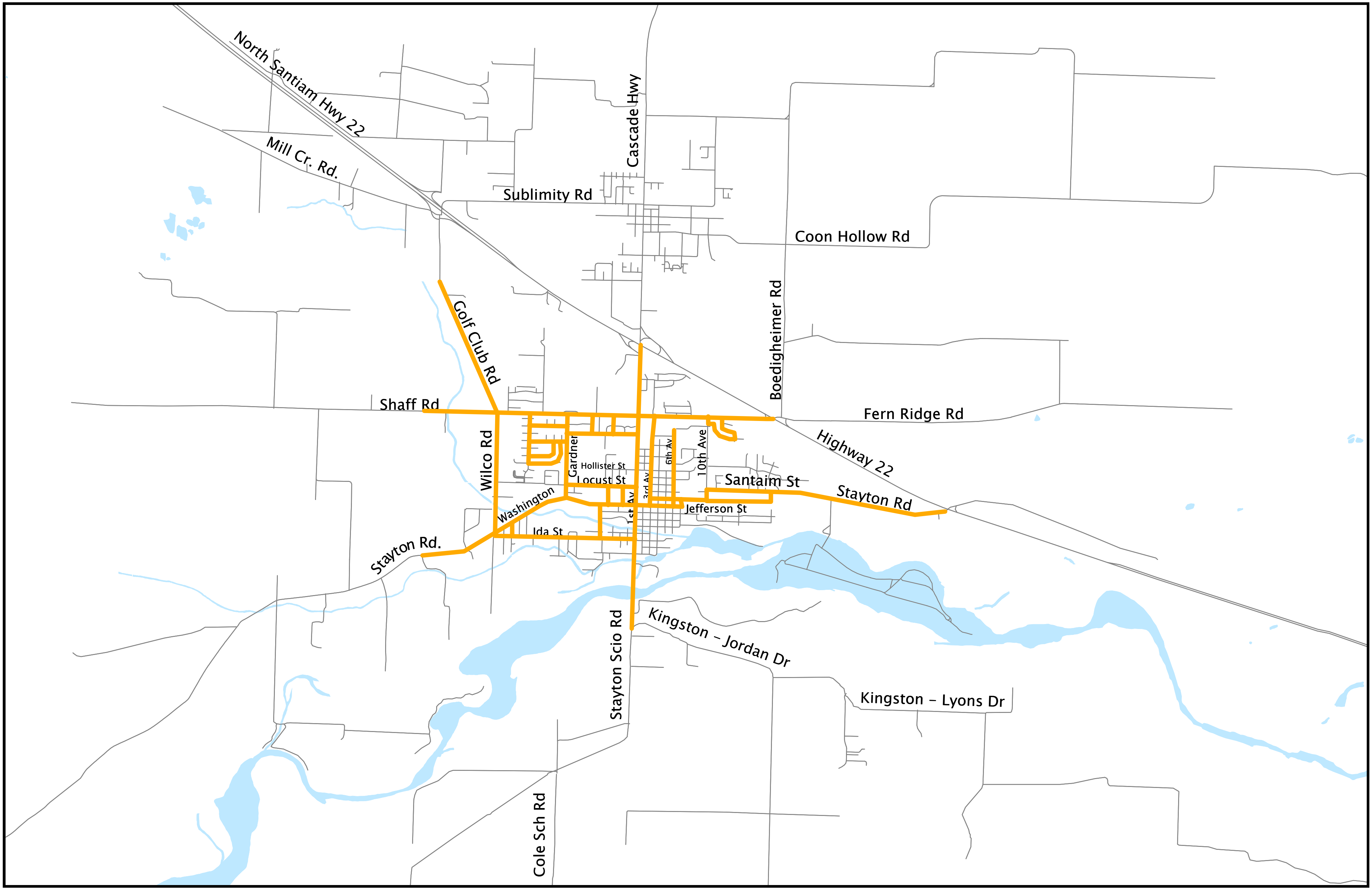
4.15. WATER TRANSPORTATION

Stayton is located adjacent to the North Santiam River and has developed around the need and demands of water-oriented industries. The river has not been utilized as a mode of transportation because it is fairly shallow and other modes have been more economical. It is possible to navigate by small craft from Stayton to Jefferson on the North Santiam River; however, there are more economical and timely methods of travel. The river will continue to be used for aesthetic and recreational values and protected as a source of drinking water. It is doubtful if anything other than small recreational craft will ever travel on the river.

4.16. PIPELINE FACILITIES

The primary pipeline facilities in Stayton are associated with the City storm sewer, sanitary sewer, and water lines (addressed in the City's Utility Master Plan). The City of Salem transmits potable water from their supply facilities in Stayton (Geren Island) via two large transmission mains (see Figure 4-18).

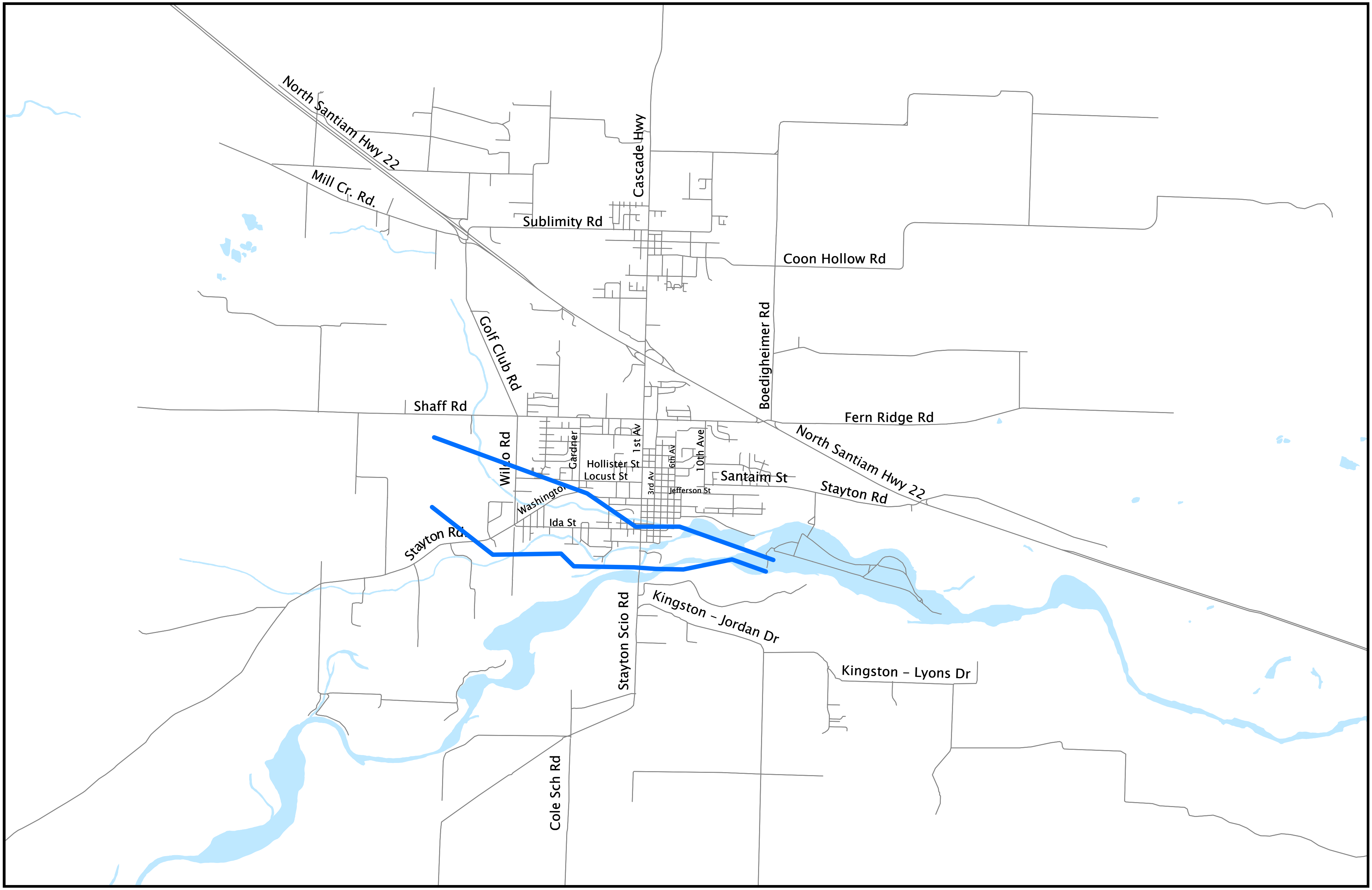
There are no natural gas pipelines in the Stayton area. This does not mean that Stayton does not have natural gas available in the area. There may be smaller feeder lines that service the Stayton area that are not classified as pipelines.



Stayton Transportation System Plan

Figure 4-17

Existing School Bus Routes



Stayton Transportation System Plan

Figure 4-18

Existing Pipeline Facilities

Legend

Roadway

Water Line

N

Section 5.0
Existing Deficiencies

5.1. INTRODUCTION

This section of the Stayton Transportation System Plan describes existing deficiencies in the City of Stayton related to its transportation system. This will be used as a foundation for identifying short-term transportation improvement needs and developing and evaluating longer-term transportation system alternatives.

Transportation system deficiencies were developed from both the technical analysis described in Section 4.0 and the Public Involvement Process. The Public Involvement Process was undertaken in the following four steps:

1. Walking tour with City of Stayton staff
2. Public Open House
3. Stakeholder Interviews
4. Public Opinion Survey

5.2. INTERSECTION CAPACITY IMPROVEMENT NEEDS

All of the major study intersections operate at LOS C or better, with the exception of the Highway 22 Eastbound Ramps/Cascade Highway and N. 1st Avenue/Locust Street intersections. The eastbound approach of the Highway 22 Eastbound Ramps/Cascade Highway intersection is currently operating at LOS E. This poor level of service is primarily a function of heavy traffic volumes on Cascade Highway conflicting with the side street movement. Although a poor level of service exists, this is an ODOT intersection and it is evaluated based on v/c ratio. The maximum v/c threshold is not met and therefore ODOT does not require mitigation. The 1st Avenue/Locust Street intersection also has a LOS E condition. The eastbound Locust Street approach is operating at LOS E due to heavy conflicting traffic volumes on N. 1st Avenue. Both of these locations are candidates for signalization and need additional study to determine if a traffic signal would be warranted.

The following intersections have been identified as potential congested intersections through input from the public involvement process:

- N 1st Avenue at Hollister Street, Locust Street, Ida Street, Washington Street (turning radius for trucks)
- Shaff Road at Wilco Road and Golf Club Road

5.3. SAFETY IMPROVEMENT NEEDS

As stated in Section 4, the crash data was obtained from the City of Stayton, Marion County, and Oregon Department of Transportation for the period between January 1, 1999 and June 30, 2002. Based on the crash analysis in Section 4, there are no high accident locations with the Stayton UGB.

The following locations have been identified as having safety issues through input from the public involvement process:

- E Pine Street/Scenic View Drive – motorists run stop sign
- Golf Club Road between the Shell station and the golf course
- N. Gardner Avenue
- Fern Ridge Road/N 3rd Avenue needs a four-way stop sign
- N 1st Avenue/Hollister Street
- N 1st Avenue/Douglas Street.
- Parking & landscaping at Roths, BiMart, McDonalds - redesign for safety & visibility.
- Golf Club Road/Shaff Road
- Fern Ridge Road/3rd Avenue
- Shaff Road needs a crosswalk between Quail Run & Roths
- N 1st Avenue/Washington Street – right turns on red lights should not be permitted
- Cascade Highway/Fern Ridge Road – right turns on red lights should not be permitted
- Shaff Road/N Gardiner Avenue – install a traffic light for school kids and traffic safety
- 10th Avenue/Fern Ridge Road

5.4. EXISTING STREET REALIGNMENTS AND EXTENSIONS

5.4.1. Arterials

There are currently two "S" curve alignments that require 90 degree turns to stay on the arterial/collector network. These "S" curves are located at the intersections of Santiam Street/10th Avenue/Jefferson Street and Jefferson Street/6th Avenue/Washington Street. The "S" curve alignments were identified as concerns by both city staff and the public. Along arterials and collectors, motorists should be able to maneuver through curves with a design travel speed of between 30 and 35 mph. The "S" curves prohibit motorists from traveling at continuous arterial travel speeds and most slow down to 10 to 15 mph to negotiate the almost 90 degree turns. While low vehicle speeds are desirable for minimizing the frequency and severity of crashes and providing a comfortable environment for pedestrians and neighbors, improvements should be considered that minimize stopping and reduce travel time for vehicles through the corridor.

The realignment of the private road to the west of Cascade Highway, south of Highway 22 should be made to align with Whitney Street. This would consolidate access points along this section of roadway.

5.4.2. Truck Route

There currently is an existing need for a truck route in the southwest part of Stayton that would allow a by pass of 1st Avenue for truck traffic traveling from Morse Bros. and other developments to the south of Stayton on Stayton-Scio Road, wanting to access Highway 22. This by pass would remove trucks from 1st Avenue and would route them west to Wilco Road. Due to the residential nature of Ida Street (which is an east-west collector connecting 1st Avenue with Wilco Road), there is no doubt public sensitivity about routing trucks along this street. Furthermore, environmental constraints present in the southwest portion of Stayton north of the North Santiam River may limit the possibility of developing a by pass in the near-term which would cross the Salem Ditch and tie into the southernmost portion of Wilco Road. Further study of alignment options for a truck route and its overall feasibility were examined in the alternatives analysis section of the transportation system plan.

During the public involvement process there were many comments regarding the substandard turning radius for trucks at the N 1st Avenue/Washington Street intersection. Improving this would increase safety and capacity along N 1st Avenue.

5.5. EXISTING STREET WIDENINGS

The current City of Stayton street design standards require that arterials and collectors have pavement widths of 40 feet, and that local streets have a pavement width of 34 feet. Right-of-way widths of 100 feet, 80 feet, and 60 feet are required for arterials, collectors, and local streets, respectively. Currently, all collectors and arterials in Stayton meet the current roadway cross section standards with the exception of Wilco Road, Fern Ridge Road, 10th Avenue, Shaff Road, and Hollister Street. Although the pavement cross-section of 1st Avenue may be sufficient, it lacks sufficient right-of-way for an arterial street in some sections. In addition, several local streets have been identified as having street widths less than the City's current standards. However, existing local streets of deficient pavement width are not targeted for widening given the low traffic volume on these streets, and the disruption widening would cause to adjacent properties, with limited benefits.

5.6. ACCESS MANAGEMENT

5.6.1. Problem Locations

1st Avenue between Ida Street and Shaff Road has become congested because of the high number of driveways on N 1st Avenue providing access to businesses. The excessive number of driveways increases the number of vehicles turning on and off of N 1st Avenue, thus interrupting the flow of traffic along the mainline arterial which leads to operational and safety problems. During the public involvement process access to businesses along N 1st Avenue was identified as a major concern to residents and businesses in Stayton.

Access to the Stayton Middle School is becoming increasingly congested during peak periods when school is dismissed on weekday afternoons. Buses block the school access while attempting to turn onto Shaff Road resulting in excessive vehicle queues. It is recommended that the Stayton School District evaluate the use of a patrolman during the weekday school dismissal period to control traffic.

5.6.2. Alternate Strategies

In order to reduce congestion along N 1st Avenue, it is recommended that possible driveway consolidation be evaluated near the following locations:

- Village Store (south of Ida Street)
- Stayton Public Library (south of Burnett Street)
- Chevron and Stro's Tire Store (north and south of Washington Street)
- Shopping Center (east side of 1st Avenue between Locust and Hollister Streets)
- Ace and Old Dairy Queen (north of Regis Street)

Reducing the number of driveways along 1st Avenue would help relieve congestion and improve on-site circulation to the businesses in this area.

Because congestion at Stayton Middle School occurs for approximately 15 minutes of each weekday afternoon, it is not recommended that improvements be made for the near-term. However, access issues at this location were reevaluated during the long-term (20 year) transportation analysis part of the plan.

5.7. PEDESTRIAN AND BICYCLE FACILITIES

5.7.1. Sidewalks

Sidewalks are provided in Stayton throughout most of the residential areas, as well as through the downtown area. Although most streets have sidewalks there are many sections missing along these roadways. Missing sections need to be completed to provide connectivity and a walkable community. In addition, during the public involvement process there were several comments regarding handicapped access to sidewalks in Stayton.

Notable arterial and collector street sections without sidewalks include:

- Shaff Road – north side from Stayton Middle School to Cascade Highway
- Shaff Road- south side from Quail Run Av to Gardner Road
- Fern Ridge Road – north side from Cascade Highway to west of Summerview Way
- Fern Ridge Road – north side from Wildflower Drive to east of Kent Avenue
- Fern Ridge Road – north side west of Highway 22
- Fern Ridge Road – south side between 10th Avenue and Highway 22
- Santiam St/Stayton-Mehama Road – both sides sides from 10th Avenue to Highway 22

- Jefferson Street – south side from 7th Avenue to 10th Avenue
- 10th Avenue –east side from Fern Ridge Road to Jefferson Street
- Golf Club Road – both sides from Highway 22 to Shaff Road
- Wilco Road – both sides from Shaff Road to Ida Street
- Washington Street – north side - intermittent sections between Wilco Road and Larch Av
- Washington Street – north side from Larch Avenue to railroad tracks
- Washington Street – south side from Wilco Road to Evergreen Avenue
- Locust Street – north side from east of Gardner Road to west of Douglas Avenue
- Ida Street – north side – intermittent short sections between Evergreen Av and 1st Av
- 3rd Avenue –west side between Fern Ridge Road and Regis Street
- Cascade Highway – west side from Highway 22 to Shaff Road
- Cascade Highway – east side from north of Whitney Street to Highway 22

The following roadways have been identified as having missing or incomplete sidewalks through input from the public involvement process:

- Ida Street
- Fern Ridge Road
- Shaff Road
- N 10th Avenue
- Golf Club Road
- Shaff Road
- N Myrtle Avenue

The following locations have been identified as being problem locations for pedestrians through input from the public involvement process:

- Shaff Road – open ditch from Bi-Mart to Gardner
- Wilco Road – Shaff Road to Washington Street
- Cascade Highway from Fern Ridge to Highway 22
- 10th between Fern Ridge Road and East Santiam Street
- East Santiam Street – N 10th Avenue to Highland Drive
- Washington Street – Wilco Road to 1st Avenue
- N 1st Avenue is difficult to cross

It is likely that the locations provided from public input regarding problem locations for pedestrians is a result of a discontinuous sidewalk system between the origin and destination being traveled.

5.7.2. Bicycle Paths and Routes

There are only two marked bicycle lane facilities along streets within Stayton. A short section of bicycle lanes exist along Fern Ridge Road between Cascade Highway and Wildflower Drive. The other bicycle lane facility within Stayton exists along Gardner Road between Locust Street and Shaff Road. A well interconnected bicycle route system needs to be developed to encourage additional bicycle usage in Stayton.

The arterial and collectors with pavement width less than the street standard, 40 feet, are as follows:

- Golf Club Road from Mill Creek Road to Shaff Road
- Wilco Road from Shaff Road to Ida Street
- Shaff Road from western UGB boundary to west of Cascade Highway
- Fern Ridge Road from west of 10th Avenue to Highway 22
- 10th Avenue from Fern Ridge Road to Santiam Street
- Cascade Highway south of Highway 22 Eastbound Ramps to Whitney Street
- Stayton-Scio Road from north of the Santiam River bridge to south UGB boundary

The arterials and collectors listed above do not have adequate width based on the Stayton street standards and may not be able to accommodate safe bicycle travel depending on whether there are shoulders or not. It is anticipated that arterials and collectors with deficient widths will have proposed street widening improvements in Section 6, Transportation System Alternatives Analysis. For reference, the attached appendix has the street inventory in tabular form including pavement width as well as shoulder conditions, speed limits, and number of travel lanes.

The arterials and collectors not listed above all meet the Stayton street width standard of 40 feet and are wide enough to accommodate on-street parking on both sides of the roadway, two travel lanes, and shared travel lanes with bicycle traffic.

5.8. PUBLIC TRANSIT SERVICE

Stayton's only existing form of transit is the Wheels of Joy, which is a dial-a-ride system. The Wheels of Joy System provides transportation for disabled persons who are unable to drive. This service currently operates between Stayton, Sublimity, and Aumsville. The Wheels of Joy currently owns five vans which totaled 5,531 trips in 1995. There is no fixed route transit system or taxi system within Stayton at this time, or intercity bus service between Stayton and Salem and other communities.

5.8.1. Park-n-Ride Availability

Based on 1990 data obtained from the Marion County Public Transportation Element Draft of the Transportation System Plan, approximately 600 workers commute on a daily basis from Stayton to Salem-Keizer, and another 50 workers from Stayton to the Portland metro area. These trips are potential car pool or intercity bus trips if adequate facilities and service are eventually provided. Stayton currently has a 94-car park and ride lot located on the southeast corner of the Cascade Highway/Highway 22 interchange. The lot also contains covered storage for 5 bicycles.

Additionally, there is a 4,800 square foot gravel park and ride lot southwest of the Mill Creek Road/Golf Club Road intersection near the Golf Club Road/Highway 22 interchange. Due to the unpaved condition of the lot, its usability is limited. The two existing public parking lots downtown could be used as park-n-ride facilities as well.

5.8.2. Para Transit Service Needs

From a transit feasibility study conducted by the Mid-Willamette Valley Council of Governments for the Marion County Transportation System Plan, it is recommended that Para transit service be expanded to serve the growing population of elderly and handicapped citizens in Marion County. Currently the Wheels of Joy Program operates five buses in the Stayton, Sublimity, and Aumsville area. Based on current demand, the Para transit operation needs to be increased to 10 buses within five years. This expansion would allow the Wheels of Joy to provide service to outlying areas such as Gates, Lyons, Detroit, Idanha, Scio, Jefferson, Turner, and Salem.

Table 5-1. Short term improvements for added Para transit service.

Transit Service[1]	Daily Trips (one-way)	Route Miles (one-way)	Additional Buses Required	Added Vehicle Miles/Year	Added Vehicle Hours/ Year	Added Estimated Annual Ridership
Added Para Transit Service[2] (Total)	–	–	5 (10)	62,500[3] (117,500)[3]	51,003	31,250[3] (40,000)[3]
Intercity Bus Service to Downtown Salem	10	1505	2	39,500	1,125[4]	30,000

Note: (1) Assumes bus operation only weekdays, for 51 weeks/year (thus accounting for no service on holidays).
(2) Analysis only includes expansion of existing system.
(3) Assumes 55 minute round-trip travel to central Salem during peak hours (45 minutes during mid-day).
(4) Assumes purchase of 10 passenger buses with wheelchair accessibility.

5.8.3. Potential Intercity Bus Service

As previously discussed, there currently is no intercity bus service between Stayton and Salem. A shuttle bus service could provide direct service to downtown Salem and the state office building area from Stayton. The bus service would reduce the use of single occupancy vehicles on Highway 22 during commuting hours, offer an alternate mode of travel, and provide another transportation service to the population. Table 5-1 identifies short term improvements for intercity bus service to downtown Salem.

5.9. TRAFFIC CALMING

The following roadways have been identified as having vehicle speeding problems by the City of Stayton:

- Virginia Street
- Ida Street
- Regis Street
- Shaff Road
- Gardner Road

The majority of the problem locations are near schools and residential neighborhoods where pedestrians are present. Also, a large portion of the streets listed above have pavement widths which could be narrowed to reduce the amount of speeding that occurs in those sections. A possible solution would be to construct curb extensions out from the existing curbs with landscaping placed in between. The locations above will be analyzed for potential improvements and necessary improvements proposed in the next two sections.

The intersections of 5th Avenue and 6th Avenue with Virginia Street are currently uncontrolled. A possible solution in this vicinity would be to place stop signs on the opposing approaches which experience the lowest traffic volumes and meet MUTCD warrants for stop control.

The following roadways have been identified as having vehicle speeding problems through input from the public involvement process:

- 10th Avenue from Fern Ridge Road to E Santiam Street
- Burnett Street by the park
- E Pine Street
- E Santiam Street
- Evergreen Avenue from Washington Street to Ida Street
- Fern Ridge Road from Highway 22 to N 3rd Avenue
- Golf Club Road from Shaff Road to Highway 22
- Ida Street from Wilco Road to N 1st Avenue (King to Holly section the worst)
- Locust Street
- N 1st Avenue – trucks go too fast
- N Gardner Avenue
- Regis Street
- Shaff Road
- Virginia Street
- Wilco Rd

During the public involvement process there were many comments regarding speed limits on roadways within the City of Stayton. Several comments suggested reducing speed limits along Fern Ridge Road or within residential neighborhoods. Other comments suggested greater enforcement of existing speed limits.

5.10. PARKING

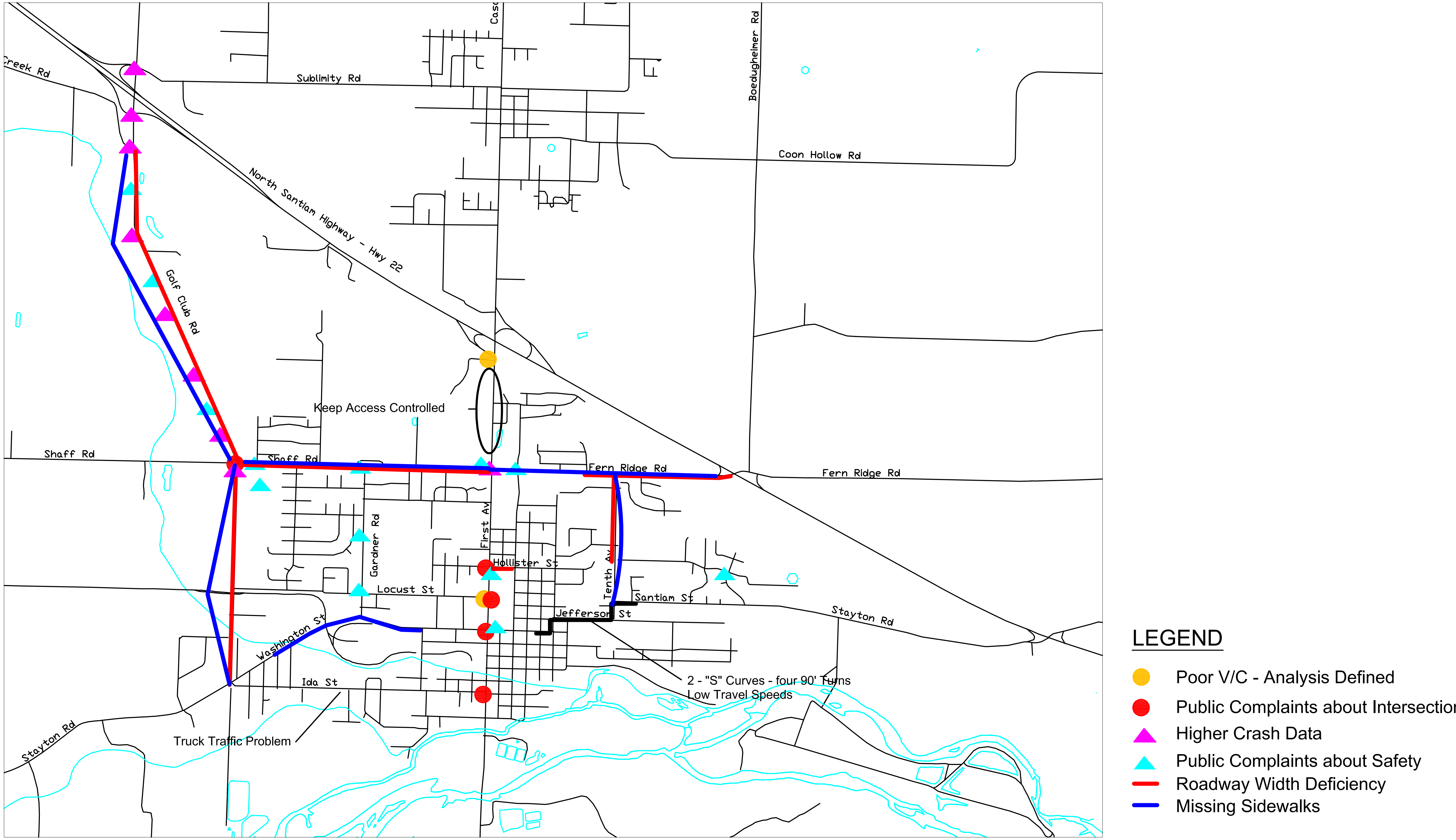
Most public parking in Stayton is in the downtown area, that area bounded by 1st Avenue on the west, 4th Avenue on the east, Burnett Street on the north, and Water Street on the south. Figure 4-13 shows existing on and off-street public parking locations in the downtown area. In a 17 block area there are a total of 274 on-street striped parking spaces, and three public parking lots (41 spaces). None of the public parking spaces are metered. The only spaces with a time restriction are the four spaces in the City Hall lot on the east side of 3rd Avenue at High Street.

A parking utilization survey was conducted during the 4-5 p.m. period on Friday, September 27, 1996 and during the 10:30-11:30 a.m. period on Thursday, October 3, 1996. Of the two periods surveyed, the 10:30-11:30 a.m. period had the greater overall parking demand, with 56% of all spaces occupied (58% of on-street spaces, and 39% of off-street spaces). Based on this survey there is ample parking to accommodate existing land uses in the downtown area.

During the public involvement process, the following locations were identified as having parking problems:

- N 1st Avenue/Locust Street
- Regis Street during ball games
- Locust Street - parking of commercial trucks and trailers at night

Figure 5-1 highlights some of the major deficiencies identified in this section.



Stayton Transportation System Plan

Figure 5-1
Existing Deficiencies

NOT TO SCALE

Section 6.0
Transportation System Alternatives Analysis

6.1. INTRODUCTION

The foundation of this section is the development, use, and results of a travel demand model used to project travel demand in the Stayton TSP study area. This section includes a discussion of the land use information used to construct and calibrate the model as well as the future land use forecasts used as model data inputs to project future traffic volumes. The data inputs and modeling procedures used were consistent with methodologies approved and accepted by ODOT's Transportation Planning Analysis Unit (TPAU). The land use forecasts used as inputs into the travel model were also consistent with Marion County's approved projections.

Based on the travel demand model results, long term future transportation needs for the City of Stayton were examined. The type of alternatives tested were based on extensive discussion with citizens and City staff, review of the proposed roadway network within the Stayton Comprehensive Plan, results from the operational analyses of the existing street system *(See Section 5)*, and the "No Build" future travel demand forecast results.

Each future transportation alternative developed was evaluated for their effectiveness in solving existing and future traffic problems as well as how they compared with each other. The preferred alternative selected was based on the technical information presented for each alternative as well as public input from the second project open house and the TAC. The preferred alternative provides the foundation for each modal plan presented in the next section.

6.2. TRAFFIC FORECASTING METHODOLOGY

Based on ODOT's 2001 Transportation System Planning Guidelines[1], there are four approved methodologies to forecast future traffic volumes. These methodologies are described below:

- Level 1 – Trending Forecast
  The trending forecast is based on historical traffic counts in the study area. The methodology requires existing traffic counts as well as 20-year old historical traffic counts to establish a growth rate. This methodology is typically employed in areas where traffic patterns are simple and that have low to moderate growth. It is the simplest methodology used to project future traffic volumes.

- Level 2 – Cumulative Analysis
  The cumulative analysis uses historical trending information as well as an examination of future development. This analysis requires a good understanding of development trends in the study area. Based on the understanding of future development, each area of projected development is assigned a trip-making

[1] 2001 Transportation System Planning Guidelines, Oregon Department of Transportation, Transportation Development Division, May 2001.

characteristic and those trips are manually assigned to the street network. The cumulative analysis methodology is typically used in small cities where traffic patterns are not complex. This methodology is also best employed where significant shifting of traffic is not expected between alternatives because the shifting traffic patterns would be estimated and applied manually as opposed to automatically with a computer model.

- Level 3 – Transportation Model
  A transportation model is a very sophisticated methodology in forecasting future traffic volumes. It requires a significant amount of traffic and land use data as well as specialized software. Transportation models are typically developed where there is a need to study complex alternatives that can affect traffic patterns significantly. Transportation models are useful to compare alternatives to each other because they effectively show the difference in travel behavior between alternatives.

- Level 4 – Regional Transportation Model
  A regional transportation model is developed in a similar manner as the Level 3; Transportation Model, except that it involves a larger study area. The study area in a regional model encompasses several urban areas as well as rural areas. It is typically employed at the Metropolitan Planning Organization (MPO) level.

The Level 3, Transportation Model, traffic forecast methodology was utilized in the development of this transportation system plan. The rationale for selecting this methodology was to study and compare a variety of system alternatives that could change the travel patterns within the city. The Level 1 and 2 methodologies are not well suited for comparing alternatives that significantly shift traffic from one facility to another.

To construct the travel demand model for the City of Stayton, ODOT's standard modeling methodologies, modeling parameters, and codes were used. The approved travel forecasting procedure was conducted in the state-of-the-practice four-step process which includes trip generation, mode split, trip distribution, and trip assignment. Based on ODOT's standard modeling procedure, the first three modeling steps are performed in custom-ODOT written code utilizing the "R" programming language. All of the model inputs for the "R" code are provided in a standard text (ASCII) format. Once the data inputs are prepared, the "R" code is executed and runs essentially as a "black box" that outputs the necessary trip tables to be utilized in Emme/2. Once the trip tables are produced by the "R" code, Emme/2 is used to prepare the trip assignment.

The process of travel demand modeling is to first develop an existing base year model. For purposes of this study, the base year was 2000 to correspond to available household information available from the US Census. The trip generation of the model is based on land use inputs of number of households and employment type by defined traffic analysis zones (TAZ) which is discussed in the next section. The existing model is calibrated based on existing traffic counts.

Once the travel demand model is calibrated, it is ready to receive the land use inputs for the future model and any changes to the roadway network.

It is important to understand that travel demand models are most accurate as a comparative tool, and should be used primarily in that role. To use the travel demand model results for operational intersection analysis, the model traffic volumes were "post-processed" using recommended methodologies outlined in NCHRP Report 255[2].

6.3. TRAFFIC ANALYSIS ZONES

The travel demand model is comprised of 80 total traffic analysis zones (TAZ), consisting of 12 external zones (numbered 1 through 12) and 68 internal zones (numbered 20 through 88). The zones numbered 13 through 19 were unused in the model and reserved for future use should any new external stations be developed to Stayton. The TAZs were developed first to be consistent with census block data since household census data was utilized as part of the land use input into the travel demand model. TAZs were then split based on the network structure and how the zones would be loaded to the network as well as local features such as natural barriers such as irrigation ditches, streams, and topography. Figure 6-1 shows the traffic analysis zones.

As shown in Figure 6-1, the travel demand model was developed to include the greater Stayton area due to its influence to Stayton. Sublimity is immediately north of Stayton and was included because it is directly related to the traffic in Stayton. Close interaction between Stayton and Sublimity exist due to their close proximity to each other. A small area of unincorporated Marion County and Linn County was also added since one of the transportation system alternatives is a by-pass with Marion County and Linn County roads.

6.4. HOUSEHOLD AND EMPLOYMENT PROJECTIONS

The data input necessary to develop the 2025 traffic projections for Stayton's arterial/collector system includes future household and employment estimates. These estimates were derived from information available from the Office of Economic Analysis and Marion County. The official adopted forecast numbers are from 1997. The following section summarizes the development of future household and employment projections that were used to develop travel demand forecasts for the Stayton urban area.

6.4.1. Household

The household data used for the 2000 existing model was based on the 2000 US Census data. This data is summarized in Table 6-1. Table 6-1 is itemized into three sections – Stayton UGB, Sublimity, and other which include small portions of unincorporated Marion County and Linn County. The study area was broken into sections because each area has a different growth rate. The 2000 average household size by area is also shown in Table 6-1. It should be noted that this household size is based on total housing units and not occupied units.

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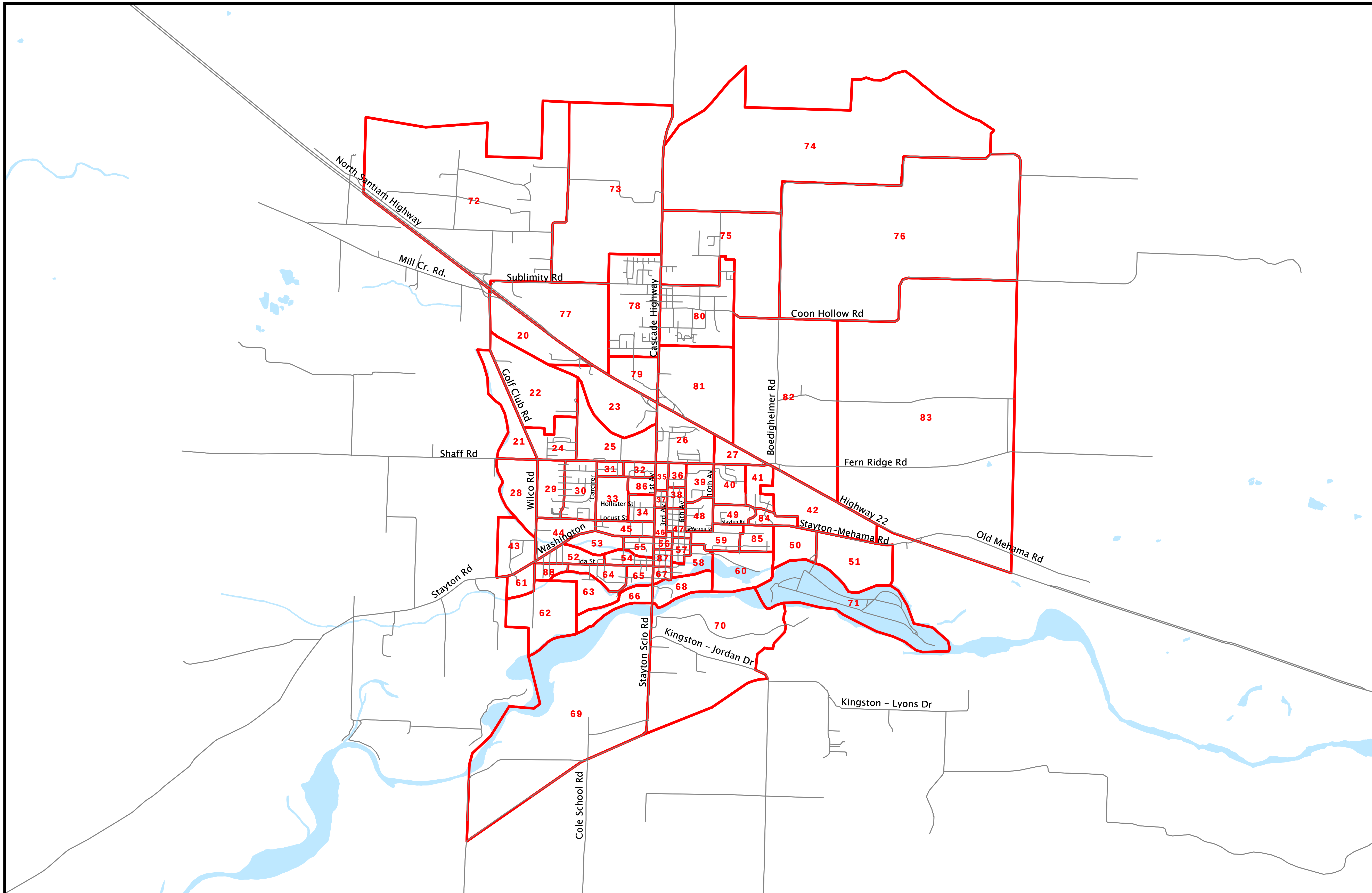
[2] NCHRP Report 255, Highway Traffic Data For Urbanized Area Project Planning and Design, Transportation Research Board, 1978.



CITY OF STAYTON

Stayton Transportation System Plan

Figure 6-1

Traffic Analysis Zones

Legend

Roadway

TAZ

N

Table 6-1. 2000 Population of Study Area

Area	Population	Number of Households	2000 Average Household Size
Stayton Urban Growth Boundary	6816	2654	2.568
Sublimity	2148	711	3.021
Other Surrounding Area	836	269	3.103
Total	9800	3634	

Source: 2000 US Census

The only regionally adopted 2020 population projections for the City of Stayton, Sublimity, and Marion County are from 1997. The 1997 population forecasts are consistent with projections provided to Marion County from the Office of Economic Analysis (OEA). The 2020 population projections for the study area are show in Table 6-2 with yearly growth rate derived from the difference between the 2000 and 2020 population.

Table 6-2. 2020 Population in Study Area

Area	2000 Population	2020 Population	2020 Number of Households	Growth Rate per Year
Stayton UGB	6816	9250	3602	1.0154%
Sublimity	2148	3590	1188	1.0260%
Other Surrounding Area	836	1026	330	1.0103%
Total	9800	13866	5120	

Source: Marion County Planning Department; 2020 households calculated

The corresponding 2020 household numbers were derived by using the household size information from the 2000 US Census. The average household size can be derived by dividing the total number of 2000 households into the total 2000 population for each discrete planning area. The 2020 number of households was derived by dividing the population of each area by the average household size. The 2020 number of households by area is also summarized in Table 6-2.

To derive the 2025 population forecast for each area, the 2000 to 2020 growth rate was used in Table 6-2. The only exception to this was the Stayton UGB. Since there are no adopted 2025 numbers by the State of Oregon or Marion County, the City of Stayton has some degree of freedom to establish their own growth rate between 2020 and 2025. Based on discussions with Stayton staff, it was agreed upon to use a two percent population growth rate from 2020 to 2025. Table 6-3 summarizes the derivation of the 2025 population forecast for the study area.

Table 6-3. 2025 Population Forecast

Area	2020 Population	2020-2025 Growth Rate Per Year	2025 Population	2025 Number of Household
Stayton UGB	9250	1.0200%	10213	3977
Sublimity	3590	1.0260%	4082	1351
Other Surrounding Area	1026	1.0103%	1080	348
Total	13866		15375	5676

Source: Calculated

The final step in deriving the necessary land use information is to convert the 2025 population forecast into number of households. Again, this was done by dividing the 2000 household size (see Table 6-1) into the 2025 population projections. Table 6-3 summarizes the 2025 number of households by area.

Figure 6-2 shows a thematic plot of the spatial distribution of the growth in households between 2000 and 2025.

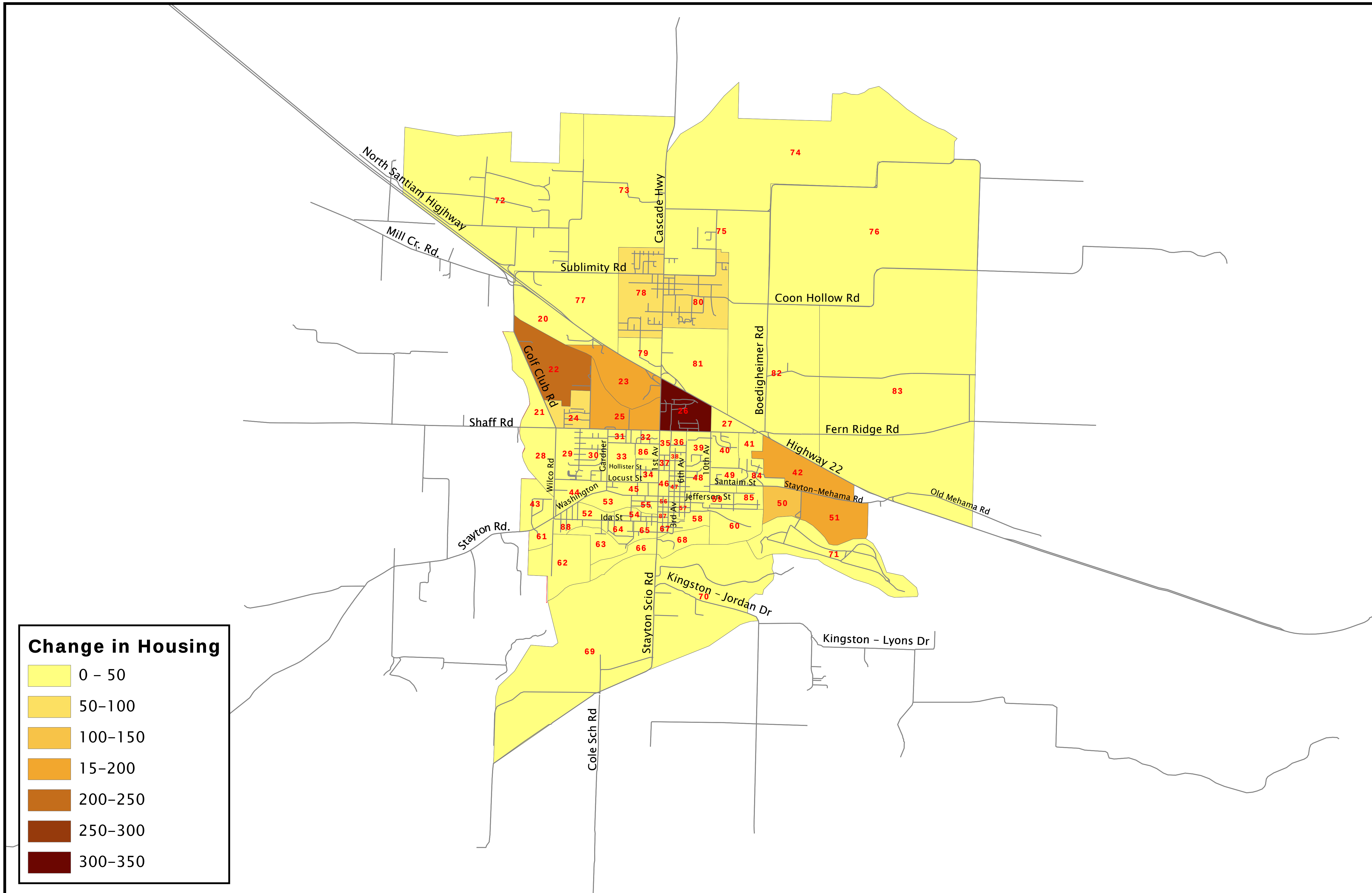
6.4.2. Employment

2000 employment data was obtained from state employment records (ES202 file). This data was geo-coded to a GIS street layer and then overlayed with the TAZ boundaries. The number of employees by employment type was then aggregated by TAZ for use in the travel demand model.

Employment for the model area was stratified into the following seven categories:

- Retail
- Service
- Industrial
- Education
- Government
- Agriculture
- Other

The 2000 employment, derived from the ES 202 date, in the greater Stayton area is summarized in Table 6-4.



Stayton Transportation System Plan

Figure 6-2

2000 to 2025 Growth in Households

Legend
Roadway
XX TAZ Number

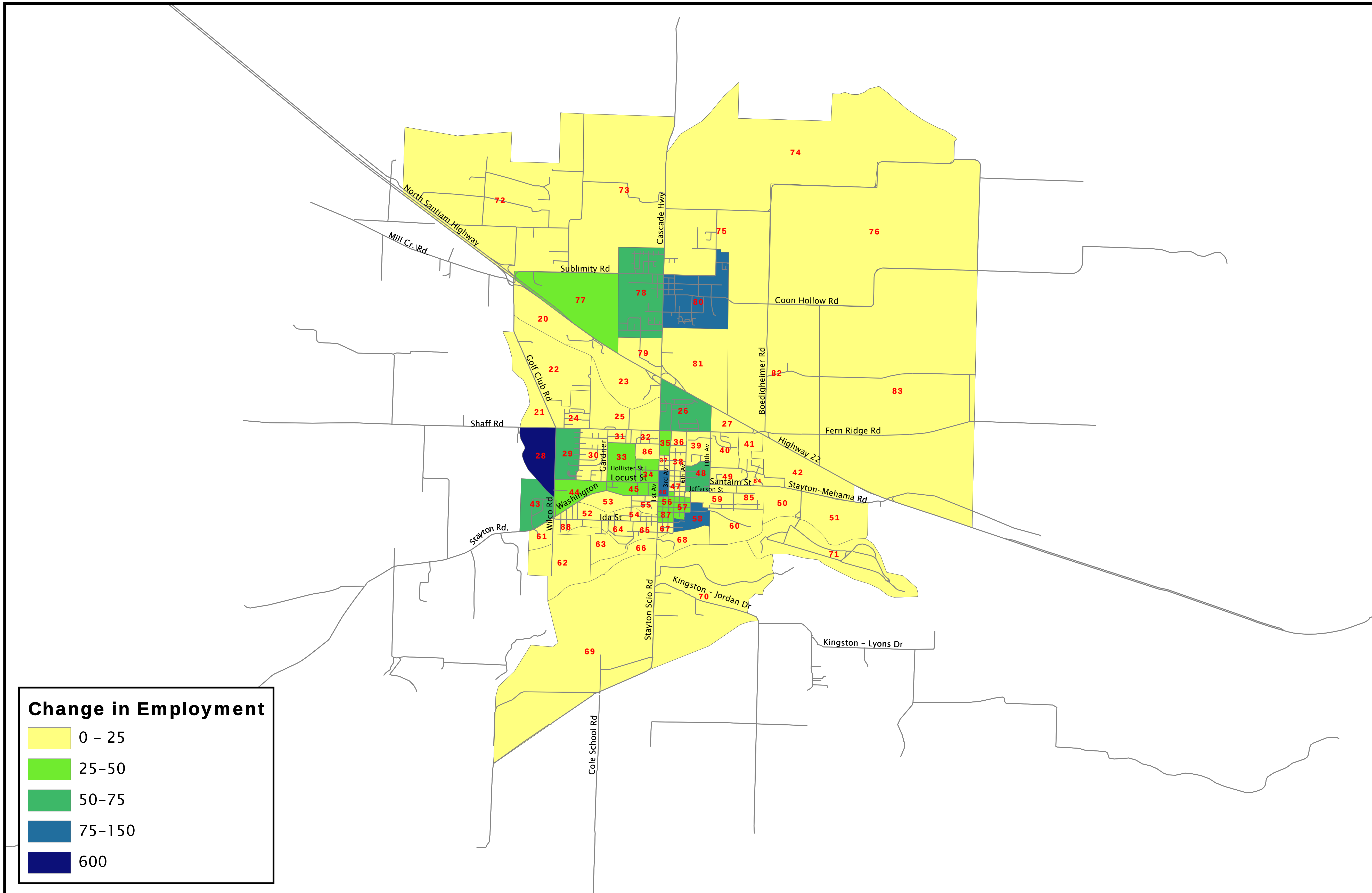
To derive the 2025 employment, it was assumed that the employment growth would be proportional to the household growth. A generalized, aggregated household/population growth rate of the entire study area from 2000 to 2025 was applied to the 2000 employment to derive the 2025 employment. The generalized, aggregated household/population growth rate amounted to 1.0182 percent per year. This annual growth rate was applied to the 2000 employment data to derive the 2025 employment numbers. The only exception to this methodology was the agricultural job growth. It was assumed that there would be no growth in this employment sector. Table 6-4 also summarizes the 2025 employment projections. The land use used in the 2000 base and 2025 No Build conditions can be referenced in the model documentation.

Table 6-4. 2000/2025 Employment

Employment Category	2000 Employment	2025 Employment
Agriculture	33	33
Industrial	873	1370
Retail	516	810
Service	769	1206
Education	358	562
Government	47	74
Other	820	1286
Total	3416	5341

Source: ES 202 File

Figure 6-3 shows a thematic plot of the spatial distribution of the growth in employment between 2000 and 2025.



Stayton Transportation System Plan

Figure 6-3

2000 to 2025 Growth in Employment

Legend

Roadway

XX TAZ Number

6.5. MODEL CALIBRATION - VALIDATION

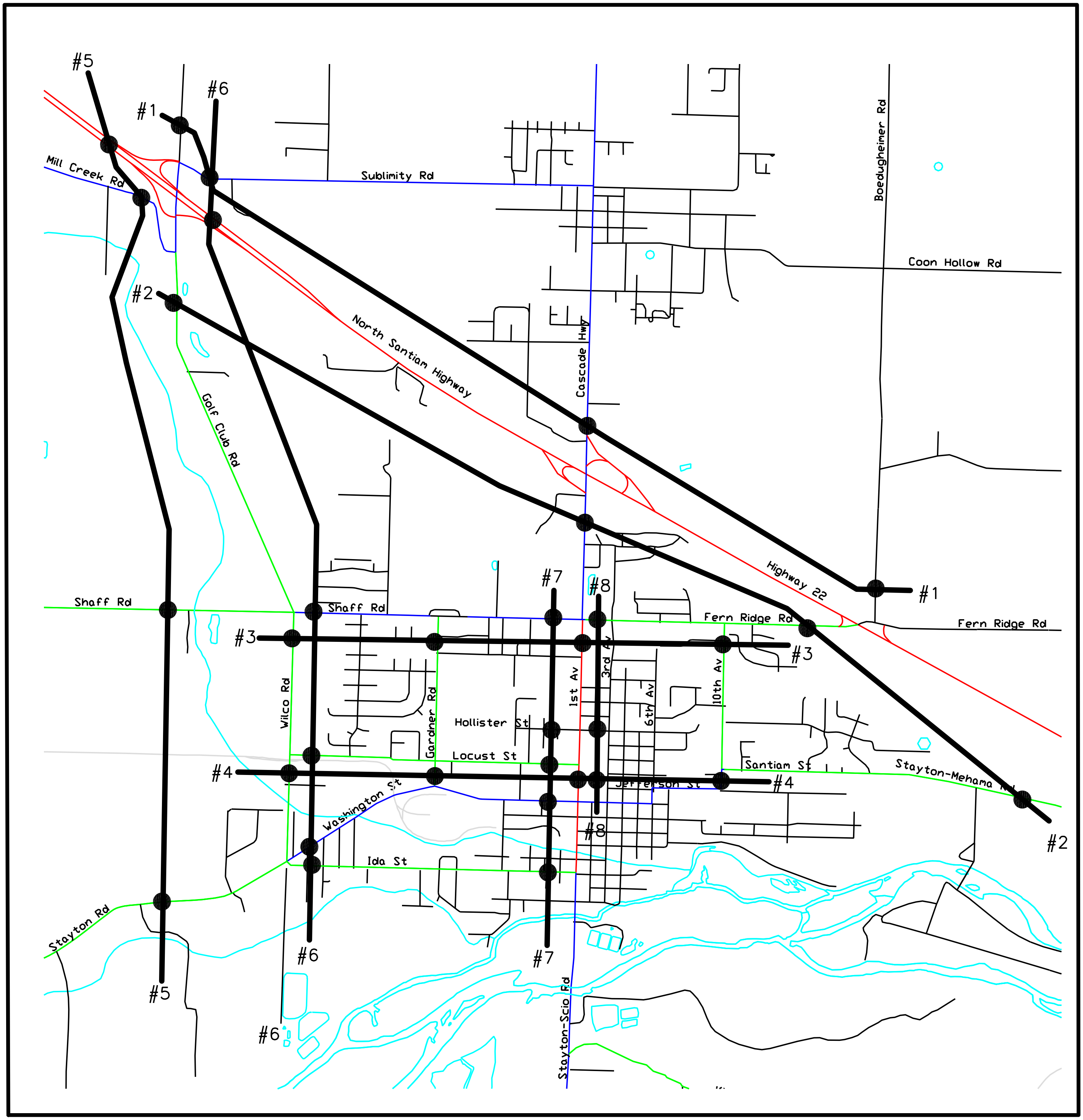
The final step in the travel model demand process was a statistical comparison of observed and estimated vehicular volumes for the 2000 base year. The comparisons provided a measure of how well the model simulates existing traffic volumes.

The travel demand model was calibrated based on 8 screen lines. The screen lines gauge total volumes and patterns entering and leaving screen line cordoned areas and are based on existing traffic counts collected in the study area. Figure 6-4 shows the 8 screen line locations.

Table 6-5 summarizes the aggregate screen line summary. As shown in Table 6-5, the travel demand model calibrated very well across the screen lines.

Table 6-5. Aggregate Screen line Summary

Screen line Number	Traffic Count	Model Volume	Percent Difference
1	749	772	103%
2	2149	1918	89%
3	1872	1618	86%
4	1956	1378	70%
5	2153	2100	98%
6	2364	1880	80%
7	1521	1070	70%
8	981	644	66%
Total	13,745	11,380	83%



Stayton Transportation System Plan

Figure 6-4
Travel Demand Model Screenlines

LEGEND
Count Location
Screenline

NOT TO SCALE

6.6. TRANSPORTATION SYSTEM ALTERNATIVES

6.6.1. 2025 "No-Build" Condition

6.6.1.a. Traffic Volumes

The "No-Build" alternative was analyzed assuming existing roadway lane configurations and intersection traffic control. Figure 6-5 shows the estimated year 2025 weekday P.M. peak hour traffic volumes on the street system in Stayton, based on the baseline post-processed 2025 "No-Build" model traffic volumes and assuming no added roadway improvements. These volumes were developed based on the Emme/2 model outputs and post processed based on the methodologies outlined in TRB report 255.

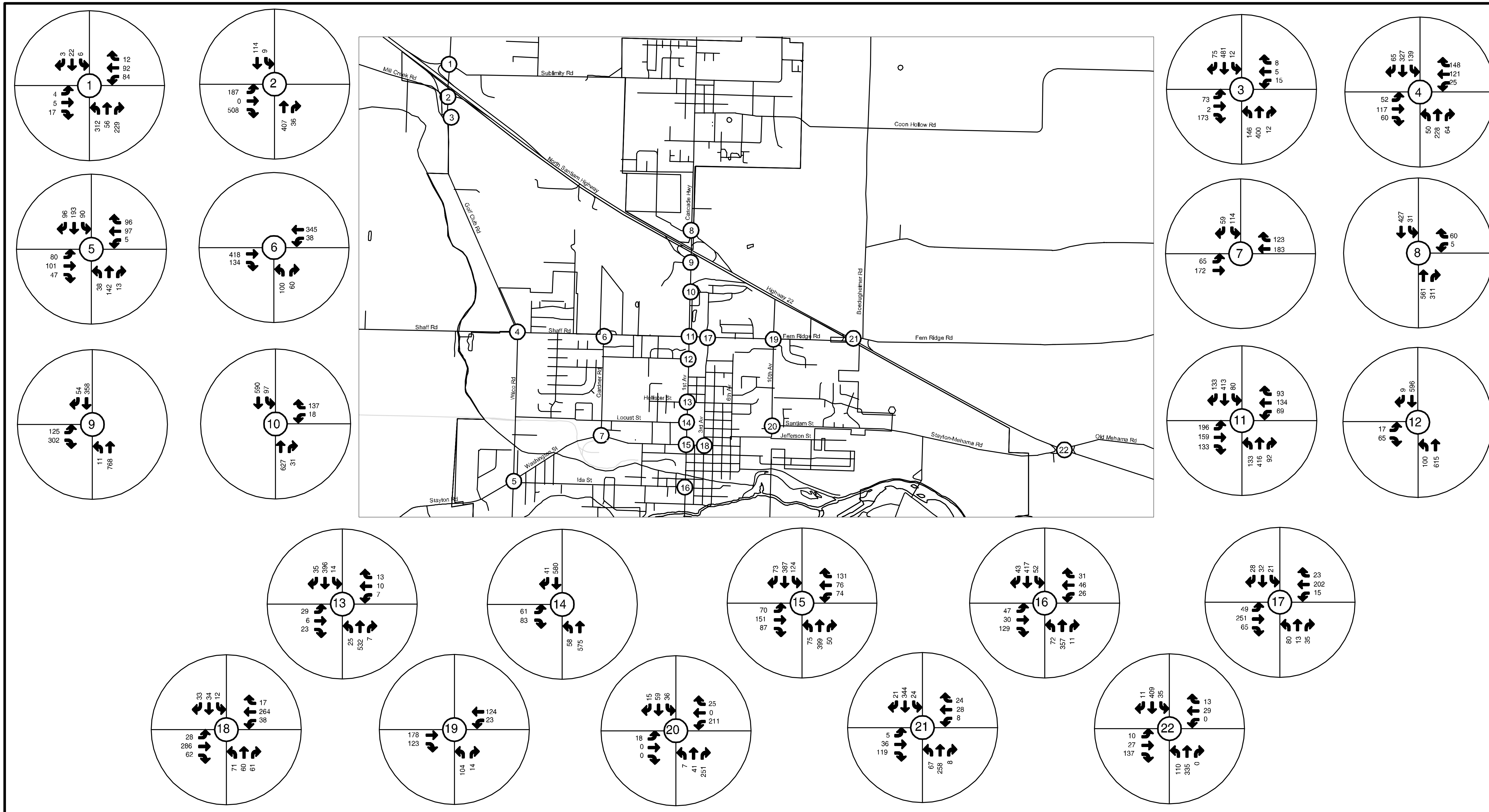
6.6.1.b. Volume to Capacity Ratio Analysis – Post Processed Roadway Link Volumes

Based on the post-processed turning movement volumes at the analysis intersections and roadway capacities used in the Emme/2 model, a v/c ratio was calculated for the roadways segments. This analysis is summarized in Figure 6-6. To facilitate analysis of the v/c ratios, the v/c ratios in Figure 6-6 are color coded. A v/c ratio within the maximum standard is coded in green. A v/c ratio exceeding the maximum v/c ratio to 1.00 is coded in yellow. V/C ratios exceeding 1.00 are coded in red.

For the v/c analysis, ODOT's standards were used. Highway 22 has a maximum v/c standard of 0.70. The local streets based on ODOT standards would have a maximum v/c ratio of 0.85. Intersections and ramp terminal v/c ratios will be discussed later in this section. Based on the v/c ratios in Figure 6-6, the following roadway segments indicate significant congestion:

- Golf Club Road south of Mill Creek Road, southbound – v/c = 1.03
- Golf Club Road south of Mill Creek Road, northbound – v/c = 0.86
- Cascade Highway – various sections between Highway 22 ramps and north of Washington Street in both directions have v/c ratios greater than 0.85

Areas showing 2025 No Build roadway congestion problems are along Golf Club Road immediately south of Mill Creek Road and Cascade Highway/1st Avenue from between the Highway 22 terminal ramps to north of Washington Street. The northbound and southbound movements along Golf Club Road are projected to operate with a v/c ratio of 0.86 and 1.03 respectively. South of this roadway segment, the v/c ratios in both travel directions are less than the maximum v/c standard of 0.85. The high v/c ratio along Golf Club Road south of Mill Creek Road is primarily due to a significant future increase in housing between the 2000 base year and 2025 No Build condition. As previously shown in Figure 6-2, this area has a future household increase of 200 to 250 new households by the year 2025. It may be possible to mitigate this v/c ratio condition by adding additional travel lanes between the future housing development access(es) and Mill Creek Road.



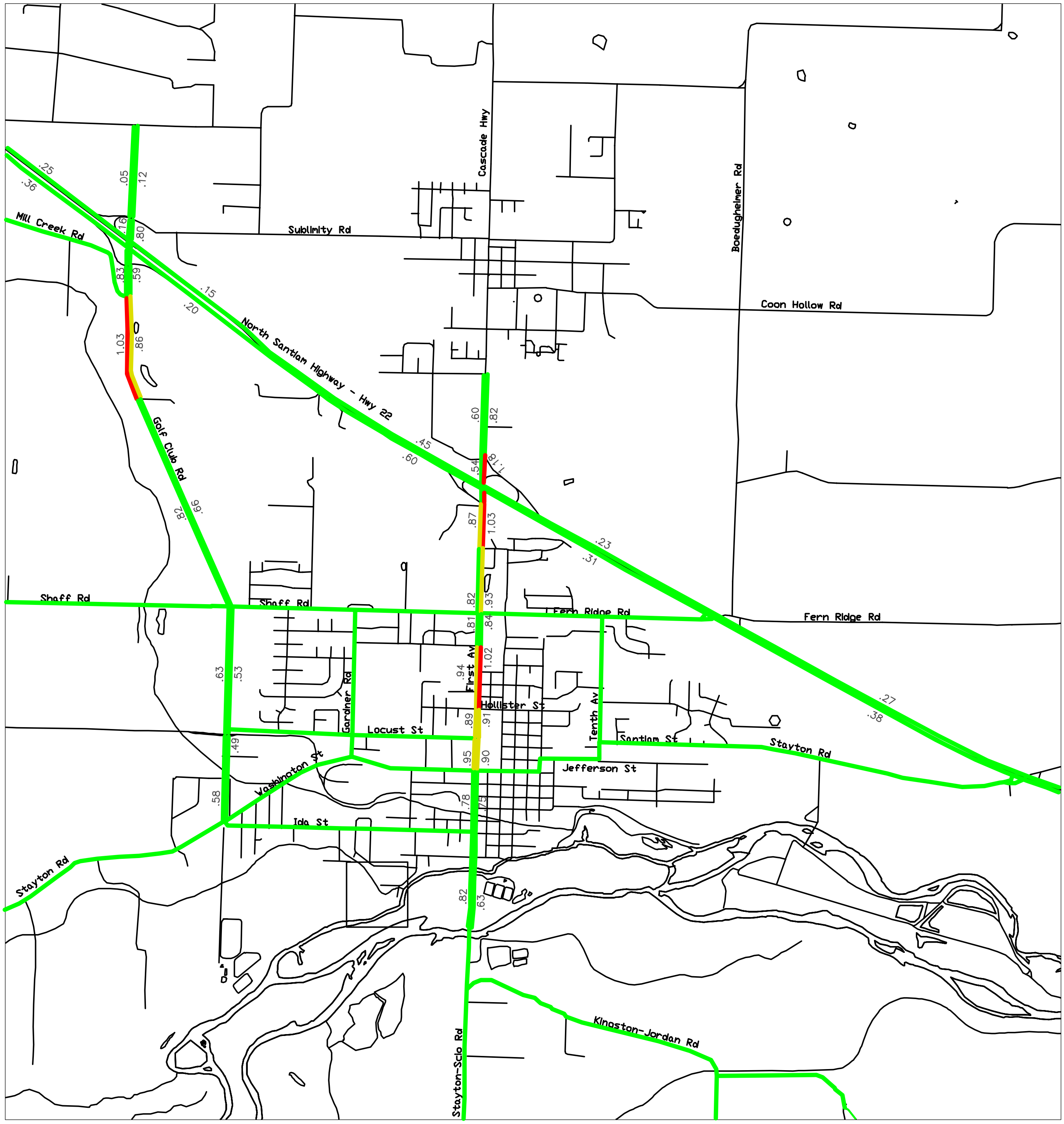
Stayton Transportation System Plan

Figure 6-5
2025 Weekday P.M. Peak Hour Traffic Volumes

LEGEND

P.M. Peak Hour Traffic Volume

NOT TO SCALE



Stayton Transportation System Plan

Figure 6-6
2025 No Build V/C Ratio

The v/c ratio analysis shows significant congestion along Cascade Highway/1st Avenue from between the Highway 22 terminal ramps to north of Washington Street. The v/c ratios that exceed the maximum standard range from 0.86 to 1.18. The most congested area is Cascade Highway in the northbound direction of travel as it approaches the eastbound and westbound on-ramps to Highway 22. These v/c ratios are 1.03 approaching the eastbound on-ramp and 1.18 approaching the westbound on-ramp. These v/c ratios are 21 to 39 percent higher than the maximum allowed v/c ratio standard. The segment of 1st Street between Regis Street and Hollister Street is another area in the Cascade Highway/1st Avenue corridor that exceeds the maximum v/c ratio standard of 0.85. The 1st Avenue segment between Regis Street and Hollister Street in the northbound and southbound directions is projected to operate with a v/c ratio of 1.02 and 0.94 in the 2025 No Build condition, respectively. The last segment that is projected to operate with v/c ratios exceeding the 0.85 maximum standard is the section of 1st Avenue between Hollister Street and Washington Street. The v/c ratios projected range from 0.89 to 0.95 in the 2025 No Build Condition.

All other roadways modeled are projected to operate with v/c ratios well under the maximum v/c ratio standard of 0.85.

6.6.1.c. Intersection Level of Service and V/C Ratio Analysis

Levels of service and v/c analysis were conducted with the 2025 No-Build P.M. peak hour traffic volumes to determine future transportation system deficiencies. Table 6-6 summarizes the level of service and v/c ratio analysis.

The two signalized intersections within Stayton are projected to operate at LOS D in the 2025 No Build condition and therefore no improvements are projected to be necessary.

Of the six ODOT intersections in the study area, the following two are projected to operate beyond the maximum v/c standard for unsignalized ramp terminal intersections:

- Highway 22 Eastbound Ramps/Cascade Highway – eastbound approach – V/C >1.00
- Highway 22 Eastbound Ramps/Golf Club Road – eastbound approach – V/C>1.00

The maximum v/c ratio standard for unsignalized ramp terminal intersections is 0.85. Both of the intersections above are projected to be well above this maximum standard. Improvements will be necessary to mitigate the 2025 No Build traffic.

There are seven city unsignalized intersections projected to operate at LOS E or F. These intersections and their worst movements are listed below:

- Golf Club Road/Shaff Road – southbound approach – LOS E
- Shaff Road/Gardner Road – northbound approach – LOS E
- 1st Avenue/Locust Street – eastbound approach – LOS F
- 3rd Avenue/Washington Street – northbound approach – LOS E
- 1st Avenue/Ida Street – southbound approach – LOS F

- Golf Club Road/Mill Creek Road – eastbound and westbound approaches – LOS F
- Cascade Highway/Whitney Street – westbound approach – LOS E

Table 6-6. 2025 No Build Level of Service and V/C Ratio

	PM Peak Hour		
Signalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Cascade Highway/Shaff Road	D	45.0	0.82
N 1st Avenue/Washington Street	D	37.1	0.73
ODOT Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Hwy 22 Westbound Ramps/Cascade Highway			
Westbound Approach	C	19.8	0.24
Southbound Left	B	10.7	0.05
Hwy 22 Eastbound Ramps/Cascade Highway			
Eastbound Approach	F	>100	>1.00
Northbound Left	A	8.5	0.01
Hwy 22 Westbound Ramps/SE Golf Club Road			
Eastbound Left	E	36.3	0.03
Eastbound Through-Right	B	12.7	0.05
Westbound Left	D	31.0	0.42
Westbound Through-Right	D	29.3	0.46
Northbound Left	A	7.9	0.22
Southbound Left	A	7.9	0.01
Hwy 22 Eastbound Ramps/SE Golf Club Road			
Eastbound Approach	F	>100	>1.00
Northbound Left	A	8.5	0.01
Hwy 22/Fern Ridge Road			
Eastbound Left	A	8.0	0.02
Westbound Left	A	8.5	0.07
Northbound Approach	C	18.7	0.42
Southbound Approach	C	21.4	0.24
Hwy 22/Stayton-Mehama Road			
Eastbound Left	A	8.3	0.04
Westbound Left	A	9.0	0.13
Northbound Approach	D	28.9	0.58
Southbound Approach	D	29.5	0.25

Table 6-6. 2025 No Build Level of Service and V/C Ratio Continued

City Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
SE Golf Club Road/Shaff Road			
Eastbound Approach	C	17.1	0.37
Westbound Approach	D	25.2	0.48
Northbound Approach	D	28.1	0.53
Southbound Approach	E	49.1	0.70
Shaff Road/N Gardner Road			
Westbound Left	A	9.1	0.05
Northbound Approach	E	36.7	0.64
Fern Ridge Road/N 3rd Avenue			
Eastbound Left	A	7.9	0.04
Westbound Left	A	8.1	0.01
Northbound Approach	C	23.3	0.44
Southbound Approach	C	17.6	0.25
Fern Ridge Road/N 10th Avenue			
Westbound Left	A	8.1	0.02
Northbound Approach	B	13.8	0.25
N 1st Avenue/Regis Street			
Eastbound Approach	D	27.8	0.38
Northbound Left	A	9.8	0.13
N 1st Avenue/Hollister Street			
Eastbound Approach	D	30.5	0.33
Westbound Approach	C	24.0	0.15
Northbound Left	A	8.6	0.03
Southbound Left	A	8.9	0.02
N 1st Avenue/Locust Street			
Eastbound Approach	F	57.2	0.74
Northbound Left	A	9.4	0.07
SE Stayton Road/Washington Street/Wilco Road			
Eastbound Approach	C	15.4	0.52
Westbound Approach	B	13.8	0.48
Northbound Approach	B	14.7	0.31
Southbound Approach	C	18.3	0.51

Table 6-6. 2025 No Build Level of Service and V/C Ratio Continued

City Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
W Washington Street/N Gardner Road			
Eastbound Left	A	8.2	0.06
Southbound Left	C	16.4	0.30
Southbound Right	A	9.8	0.08
N 3rd Avenue/Washington Street			
Eastbound Left	A	8.0	0.03
Westbound Left	A	8.3	0.04
Northbound Approach	E	47.7	0.76
Southbound Approach	C	20.7	0.29
N 10th Avenue/E Santiam Street			
Eastbound Approach	A	9.0	0.08
Westbound Approach	B	12.1	0.53
Northbound Approach	B	10.6	0.41
Southbound Approach	A	9.6	0.34
N 1st Avenue/Ida Street			
Eastbound Approach	B	14.2	0.44
Westbound Approach	B	13.2	0.32
Northbound Approach	D	29.9	0.60
Southbound Approach	F	57.1	0.70
SE Golf Club Road/Mill Creek Road			
Eastbound Approach	F	>100	>1.00
Westbound Approach	F	76.2	0.45
Northbound Left	A	9.6	0.17
Southbound Left	A	8.1	0.01
Cascade Highway/Whitney Street			
Westbound Approach	E	36.2	0.63
Southbound Left	B	10.0	0.14

Based on a comparison of traffic volumes at the Cascade Highway/Whitney Street intersection between the 2025 “No-Build” P.M. peak hour traffic volumes and the Kittelson & Associates study[3] of the Cascade Highway/Whitney Street intersection at full build out, the 2025 Emme/2 model may be under-generating traffic volumes. Based on the Kittelson & Associates study, the Cascade Highway/Whitney Street intersection would operate at LOS F in 2021 with a full build out of Santiam Station and would likely need a traffic signal. The Emme/2 model constructed

[3] Whitney Street/Cascade Highway Operational Analysis, Kittelson & Associates, Inc., August 20, 2001.

for the TSP update did not have the capability to conduct special trip generation for special generators such as the Santiam Station. After the completion of the Stayton travel demand model, ODOT has updated the model code structure to allow for special trip generation. Since this code was not available to implement within the schedule of the TSP update, it is suggested that consideration should be given to assume that the Cascade Highway/Whitney Street intersection would operate at LOS F in the 2025 “No-Build” condition rather than the LOS E calculated with the post-processed traffic volumes.

The Manual on Uniform Traffic Control Devices (MUTCD) peak hour signal warrant (Warrant #3) was chosen as a “screening” to determine candidate intersections for possible future signalization. Since the Stayton Emme/2 model only produces P.M. peak hour volumes, the peak hour warrant is the only warrant directly applicable at this level of planning analysis. The model does not provide traffic volumes for the highest eight/four hours of the day, therefore Warrants #1 and #2 for the 2025 No Build condition can not be directly analyzed at this time. Actual signalization should be based on future traffic engineering studies to determine whether the intersection meets the Eight Hour Warrants (MUTCD Warrant #1) and/or Four Hour Warrants (MUTCD Warrant #2).

Peak hour signal warrant analysis was performed at all intersections where turn lane improvements would not fully mitigate the LOS E/F or v/c ratio condition above the maximum standard. If the peak hour signal warrant was not met, then the intersection was not considered a candidate for signalization. The results of the peak hour signal warrant analysis for the 2025 No Build condition is shown in Table 6-7.

Based on the results of the peak hour signal warrant analysis shown in Table 6-7, the following intersections are forecast to meet at least one MUTCD signal warrant by year 2025 and should be monitored by the City of Stayton over time to determine if and when signalization is warranted:

- Highway 22 Eastbound Ramps/Cascade Highway
- Golf Club Road/Shaff Road
- 1st Avenue/Locust Street
- Highway 22 Eastbound Ramps/Golf Club Road

Based on the Whitney Street/Cascade Highway Operation Analysis, it is recommended that the Cascade Highway/Whitney Street intersection be signalized. Per the Kittelson & Associates study, Golf Lane should be realigned to intersect Cascade Highway directly opposite Whitney Street as part of the signalization improvement. See the May 19, 2003 Memorandum of Understanding (MOU) between Marion County and the City of Stayton for further details regarding this area.

In addition to establishing locations that should be considered for signalization in the 2025 No Build condition, an analysis was undertaken to determine the need for additional turn lanes a the intersections with LOS E/F or v/c ratio conditions exceeding the established maximum standard of 0.85. The list below summarizes the necessary improvements to the sub-standard intersections identified in the analysis above including additional turn lanes and signalization.

- Highway 22 EB Ramps/Cascade Hwy – signalize and eastbound right turn lane
- Golf Club Road/Shaff Road – signalize, no additional turn lanes needed
- 1st Avenue/Locust Street – signalize, no additional turn lanes needed
- 3rd Avenue/Washington Street – northbound left turn lane
- 1st Avenue/Ida Street – eastbound right turn lane
- Shaff Road/Gardner Road – northbound right turn lane
- Highway 22 EB Ramps/Golf Club Road – signalize and eastbound right turn lane
- Golf Club Road/Mill Creek Road – eastbound right turn lane
- Cascade Highway/Whitney Street - signalization

Table 6-7. 2025 No Build Signal Warrant Analysis

	Volume By Approach				Approach Volume Totals		Minor Volume Required to meet Warrant	Is Warrant Met?
Intersection	SB	NB	WB	EB	Major Approach Total	Min or Max		
Hwy 22 EB Ramps/Cascade Hwy	412	779	0	276	1,191	276	160	Yes
SE Golf Club Rd/Shaff Rd	531	342	294	229	873	294	260	Yes
Shaff Rd/N Gardner Rd	0	160	383	552	935	160	230	No
N 1st Ave/Locust St	621	633	0	144	1,254	144	140	Yes
N 1st Ave/W Ida St	512	440	103	206	952	206	220	No
Hwy 22 EB Ramps/SE Golf Club Rd	123	443	441	0	566	441	395	Yes
3rd Avenue/Washington Street	79	192	319	376	695	192	340	No
SE Golf Club Rd/Mill Creek Rd	568	558	28	162	1,126	162	170	No
Cascade Hwy/Whitney St	687	658	155	87	1,345	87	125	No

Table 6-8 summarizes the levels of service and v/c ratios of the intersections listed above with their described intersection improvements. As shown in Table 6-8, all of the levels of service and v/c ratio conditions are mitigated with the proposed improvements with the exception of the 1st Avenue/Ida Street and Golf Club Road/Mill Creek Road intersections. Since these intersections do not meet signal warrants, the proposed turn lanes improvements will only make a minimal improvement to the levels of service and v/c ratios.

Table 6-8. 2025 No Build Mitigation Levels of Service

	PM Peak Hour		
Signalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Hwy 22 Eastbound Ramps/Cascade Highway	C	21.2	0.83
SE Golf Club Road/Shaff Road	C	31.0	0.63
N 1st Avenue/Locust Street	B	14.4	0.63
Hwy 22 Eastbound Ramps/SE Golf Club Road	B	17.1	0.44
Cascade Highway/Whitney Street	C	21.2	0.71
Unsignalized Intersection			

N 3rd Avenue/Washington Street Eastbound Left Westbound Left	 A A	 8.0 8.3	 0.03 0.04

Table 6-8. 2025 No Build Mitigation Levels of Service Continued

Unsignalized Intersection			
N 3rd Avenue/Washington Street Continued Northbound Left Northbound Through-Right Southbound Approach	 D C C	 33.1 19.6 20.7	 0.40 0.37 0.29
N 1st Avenue/Ida Street Eastbound Left Westbound Approach Northbound Approach Southbound Approach	 B B D F	 13.3 13.9 32.6 64.9	 0.32 0.32 0.61 0.71
SE Golf Club Road/Mill Creek Road Eastbound Left Eastbound Right Westbound Approach Northbound Left Southbound Left	 F C F A A	 105.2 15.4 73.7 9.5 8.2	 0.77 0.36 0.44 0.16 0.01
Shaff Road/N Gardner Road Westbound Left Northbound Left Northbound Right	 A E B	 9.1 35.1 13.1	 0.05 0.50 0.14

6.6.2. "Build" Alternative Descriptions

The transportation system "build" alternative focuses on added roadway improvements to address future transportation system operations deficiencies in Stayton.

6.6.2.a. "S" Curve Improvements

Common to all of the system alternatives is the improvement to the "S" curves between Santiam Street, Jefferson Street, and Washington Street. Three alternatives were considered:

- Alternative #1 - The first alternative begins with a reverse curve between Washington Street and Jefferson Street between 6th Avenue and 10th Avenue. The second half of the curve would occur between Jefferson Street and Santiam Street between 10th Avenue and approximately 500 to 600 feet east of 10th Avenue. Several homes may need to be purchased to implement this alternative.

- Alternative #2 - The second improvement alternative considered in improving the "S" curves between Santiam Street, Jefferson Street, and Washington Street involved a much longer realignment intended to create a new east-west route. The "S" curve between Santiam Street, 10th Avenue, and Jefferson Street would be realigned by extending the existing eastern terminus of Jefferson Street to connect with Santiam

Street in the vicinity of Scenic View Drive. This connection can be made entirely through vacant land and would allow vehicle destined to Stayton Road unobstructed travel through the "S" curve to 6th Avenue. At Jefferson Street/6th Avenue/Washington Street, another "S" curve exists. To develop a continuous alignment between Jefferson Street and Washington Street, a smooth transition could be made from 7th Avenue to 10th Avenue. This alignment may encroach on up to four homes. It is likely that these homes would need to be purchased for necessary right of way.

- Alternative #3 – The third alternative involves constructing roundabouts at the intersections of Washington Street/6th Avenue, Jefferson Street/6th Avenue, Jefferson Street/10th Avenue, and Santiam Street/10th Avenue. All roundabouts would be constructed with single lane approaches and one circulating lane. The central island would be mountable to accommodate the turning path of larger trucks. The roundabouts would likely require right-of-way acquisition at the intersection corners. This alternative eliminates the need for new roadway construction.

Other east-west realignment alternatives of Santiam Street, Jefferson Street, and Washington Street were not pursued since other functional alignments would either go through the St. Mary's Elementary School or Stayton Elementary School.

Through the public involvement process, Alternative #3 was selected as the preferred "S" curve improvement alternative.

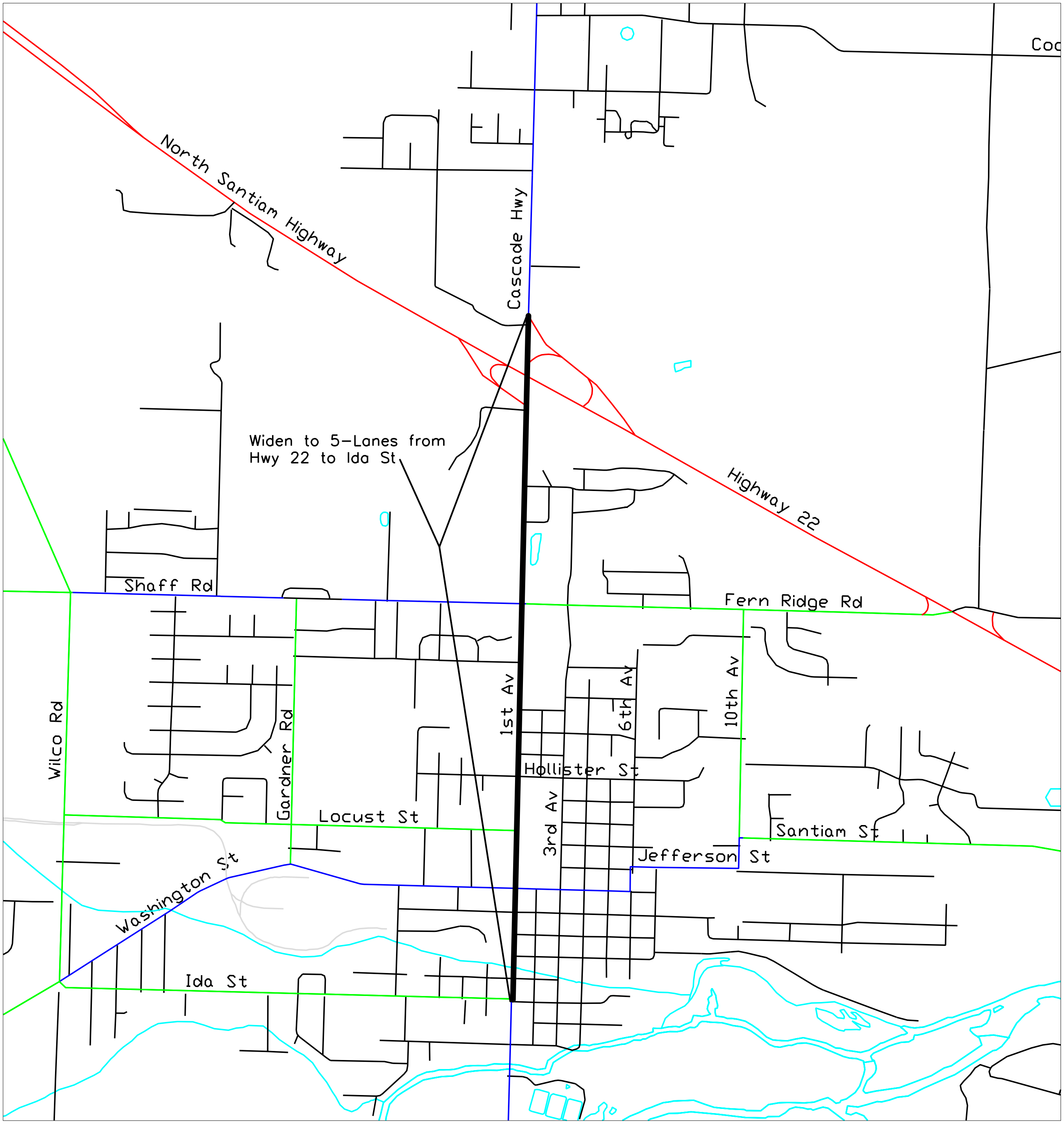
6.6.2.b. North-South Corridor Improvement Alternatives Description

The 2025 No Build post-processed traffic volumes show that the primary problem in the Stayton UGB is congestion along the Cascade Highway/1st Avenue corridor. A secondary issue is congestion along Golf Road south of Mill Creek Road. Based on the 2025 No Build v/c ratios, additional capacity is needed along the north-south corridors within the Stayton UGB.

Three road improvement options were evaluated in the north-south corridor through Stayton under the "build" alternative. A description of each of the three alternatives follows:

- Cascade Highway/1st Avenue Widening (Alternative 1) – Based on the 2025 "No Build" condition, Cascade Highway/First Avenue is projected to be congested with a v/c ratio approaching and exceeding 1.00. This alternative is designed to alleviate this congestion directly by adding capacity to the corridor by widening Cascade Highway/1st Avenue to 5 lanes from Highway 22 to Ida Street. Another benefit of this alternative is that it may divert traffic away from the Golf Club Road/Wilco Road corridor. The draw back to this alternative is that it may require the relocation and/or removal of approximately 18 businesses due to the proximity of existing buildings to 1st Avenue. Figure 6-7 illustrates the Cascade Highway/1st Avenue widening alternative.

- By-Pass Alternative (Alternative 2) – The by-pass alternative is an improvement that would create an alternative path for trips externally oriented to and from the south. Currently, to access Stayton-Scio Road south of Stayton, a vehicle from Highway 22 or another external area would need to travel through either the residential area or



Stayton Transportation System Plan

LEGEND

New Roadway Alignment

NOT TO SCALE

Figure 6-7
First Avenue 5-Lane Widening Alternative

commercial area of Stayton. The by-pass alternative would create a western by-pass between Golf Club Road, Wilco Road, Jetters Way, and Stayton-Scio Road via a new Santiam River bridge crossing. This alternative would reduce truck traffic through the residential and commercial areas of Stayton. Also, as an external by-pass, this should divert through trips away from the 1st Avenue/Cascade Highway corridor. The effectiveness of this alternative rests in whether the by-pass can be attractive enough from a travel time perspective. The 1st Avenue/Cascade Highway corridor must be sufficiently congested to result in travel speeds that make the by-pass corridor more attractive. This may be difficult to achieve because of the freeway speed advantage the travel path the 1st Avenue/Cascade Highway corridor has over the by-pass corridor along Golf Road and Wilco Road. Figure 6-8 illustrates the by-pass alternative concept.

- 1st Avenue/3rd Avenue Couplet (Alternative 3) – The couplet alternative responds to the congestion along the 1st Avenue/Cascade Highway corridor by developing additional capacity through the formation of a one-way couplet system between 1st Avenue/Cascade Highway and 3rd Avenue. The 1st Avenue/3rd Avenue couplet alternative assumes two travel lanes in each direction with one-way traffic operation in the southbound direction on 1st Avenue and one-way traffic operation in the northbound direction on 3rd Avenue, between Whitney Street and Water Street. The implementation of this alternative would require construction of roadway connections at the termini points at Water Street/First Avenue and Whitney Street/Cascade Highway or Fern Ridge Road/3rd Avenue/Cascade Highway. Since these termini points are already built out, to achieve a smooth transition between the two parallel corridors, significant rights-of-way would need to be obtained. The advantage of this alternative is that it has significant less impact on the number of adjacent businesses and road widening through the commercial area is not necessary. At minimum, the 3rd Avenue/Fern Ridge Road intersection would need to be signalized. Figure 6-9 illustrates the 1st Avenue/3rd Avenue Couplet alternative concept.

- Golf Club Road Widening (Alternative 4) – The Golf Club Road widening alterative assumes that Golf Club Road would be widened to four/five lanes from the Highway 22 Ramps to Ida Street and is shown in Figure 6-10. This alternative would provide an improved north-south alternative to First Avenue and Cascade Highway on the west side of Stayton. The main issue with the effective of this alternative is whether or not it can achieve a travel time advantage from the 1st Avenue/Cascade Highway corridor. It has a disadvantage in achieving this travel time advantage because of the additional distance of travel needed to access destinations near the 1st Avenue/Cascade Highway corridor and the speed of the travel path of the roadways. Unless significant congestion is achieved along the 1st Avenue/Cascade Highway corridor, it is not likely that the Golf Club widening alternative can achieve the necessary travel time advantage to make it an effective alternative. One way to make this alternative effective is to deliberately limit the capacity improvements along the 1st Avenue/Cascade Highway corridor to force motorists to use an alternative route. The main disadvantage of this concept is that traffic volumes would increase along Locust Street, Washington Street, and Ida Street which all have significant

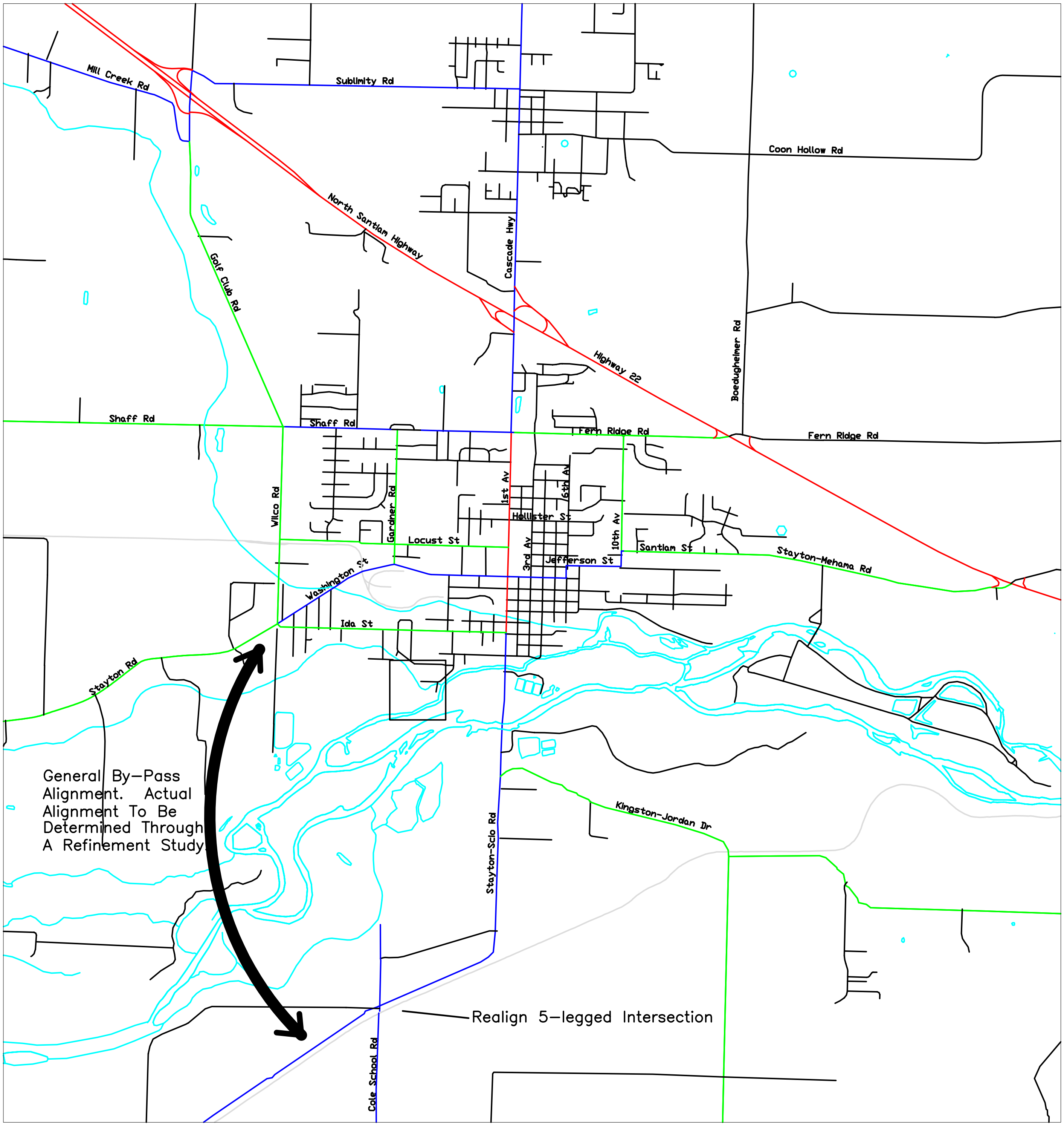


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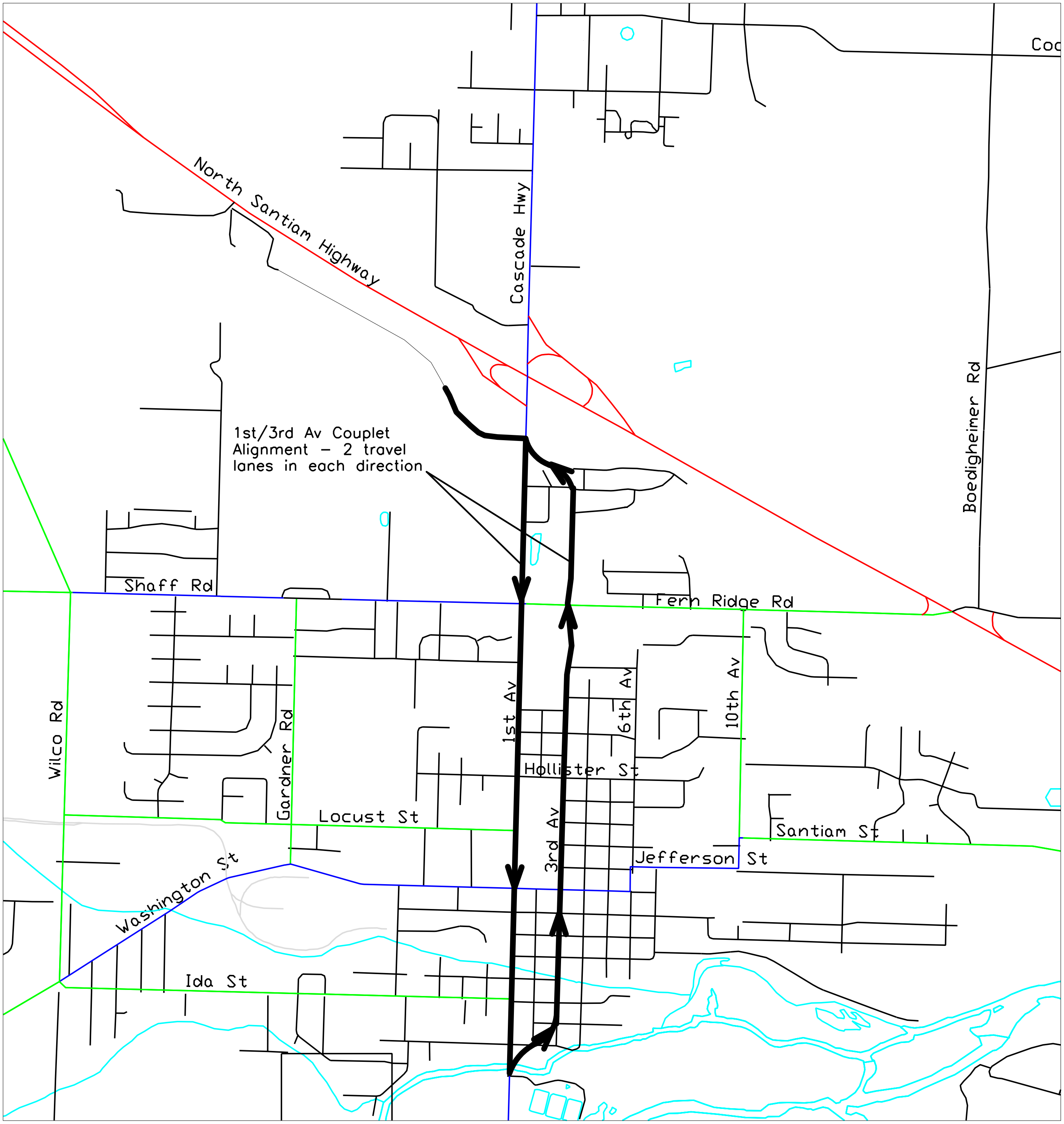
Figure 6-8
By-Pass Alternative

LEGEND
New Roadway Alignment

NOT TO SCALE



Stayton Transportation System Plan

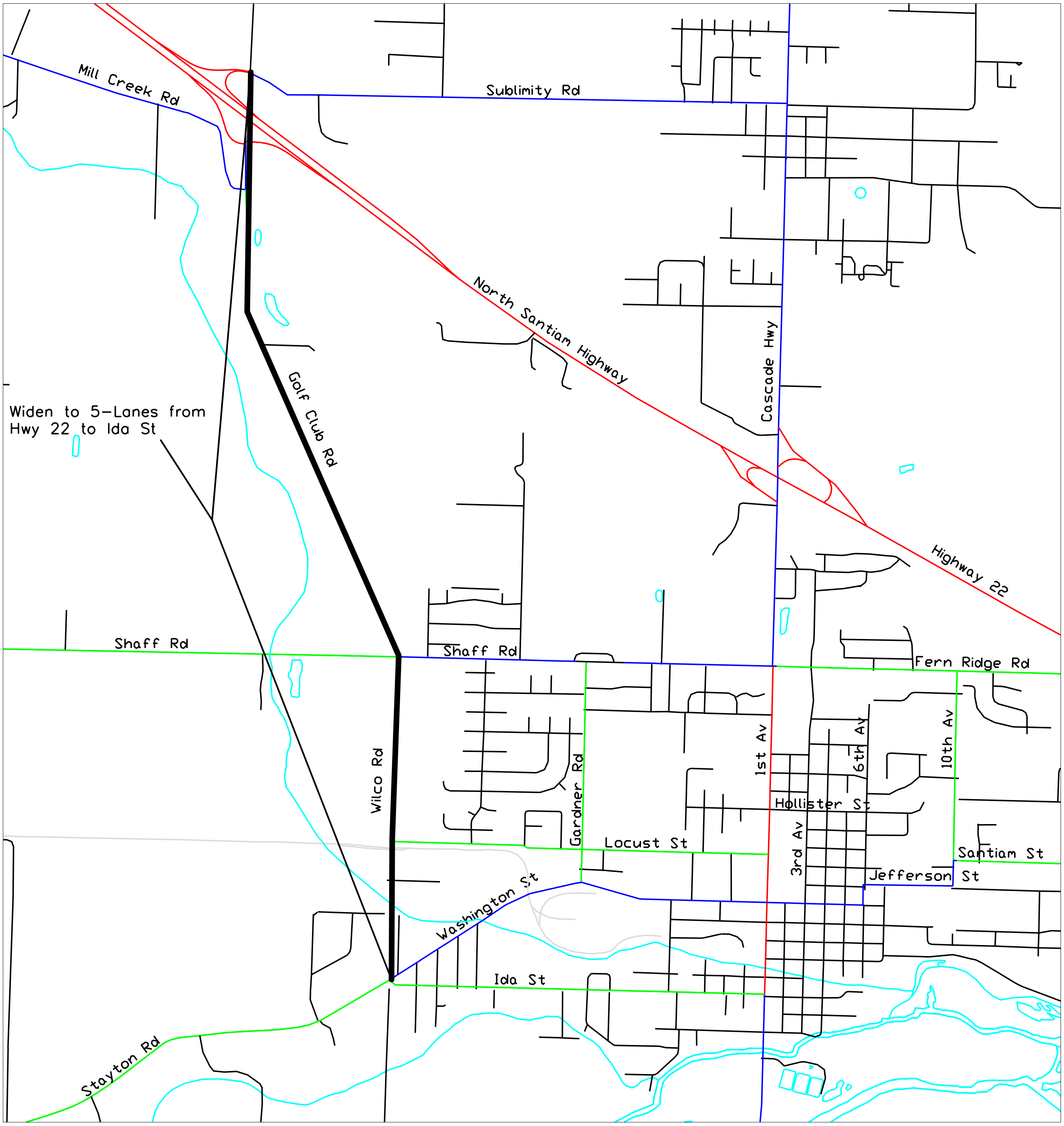
LEGEND

New Roadway Alignment

NOT TO SCALE

Figure 6-9

First Avenue/Third Avenue Couplet Alternative



Stayton Transportation System Plan

LEGEND

New Roadway Alignment

NOT TO SCALE

Figure 6-10
Golf Club Road 5-Lane Widening Alternative

components of residential uses. On the other hand, all of these streets are part of the arterial/collector system and the additional traffic is within the planned use of those streets.

6.6.3. 2025 Alternative 1 - Cascade Highway/1st Avenue Widening

6.6.3.a. Traffic Volumes

Alternative 1 was analyzed assuming that Cascade Highway and 1st Avenue would be widened from their existing three lane configuration to five lanes. Figure 6-11 shows the 2025 P.M. peak hour traffic volumes for Alternative 1 based on the post-processed 2025 Alternative 1 model traffic volumes and assuming only the five-lane widening of Cascade Highway and 1st Avenue as future improvements. These volumes were developed based on the Emme/2 model outputs and post processed based on the methodologies outlined in TRB report 255.

6.6.3.b. Volume to Capacity Ratio Analysis – Post Processed Roadway Link Volumes

Based on the post-processed turning movement volumes at the analysis intersections and roadway capacities used in the Emme/2 model, a v/c ratio was calculated for the roadways segments. This analysis is summarized in Figure 6-12. To facilitate analysis of the v/c ratios, the v/c ratios in Figure 6-12 are color coded. A v/c ratio within the maximum standard is coded in green. A v/c ratio exceeding the maximum v/c ratio to 1.00 is coded in yellow. V/C ratios exceeding 1.00 are coded in red.

For the v/c analysis, ODOT's standards were used. Highway 22 has a maximum v/c standard of 0.70. The local streets based on ODOT standards would have a maximum v/c ratio of 0.85. Intersections and ramp terminal v/c ratios will be discussed later in this section. Based on the v/c ratios in Figure 6-12, the following roadway segments indicate significant congestion:

- Golf Club Road south of Mill Creek Road, southbound – v/c = 1.01
- Golf Club Road south of Mill Creek Road, northbound – v/c = 0.87

The only areas showing a 2025 Alternative 1 roadway congestion problem is Golf Club Road immediately south of Mill Creek Road. The northbound and southbound movements along Golf Club Road are projected to operate with a v/c ratio of 0.87 and 1.01 respectively. South of this roadway segment, the v/c ratios in both travel directions are less than the maximum v/c standard of 0.85. The high v/c ratios along Golf Club Road south of Mill Creek Road is primarily due to a significant future increase in housing between the 2000 base year and 2025 condition. As previously shown in Figure 6-2, this area has a future household increase of 200 to 250 new households by the year 2025. It may be possible to mitigate this v/c ratio condition by adding additional travel lanes between the future housing development access(es) and Mill Creek Road.

All other roadways modeled are projected to operate with v/c ratios well under the maximum v/c ratio standard of 0.85.

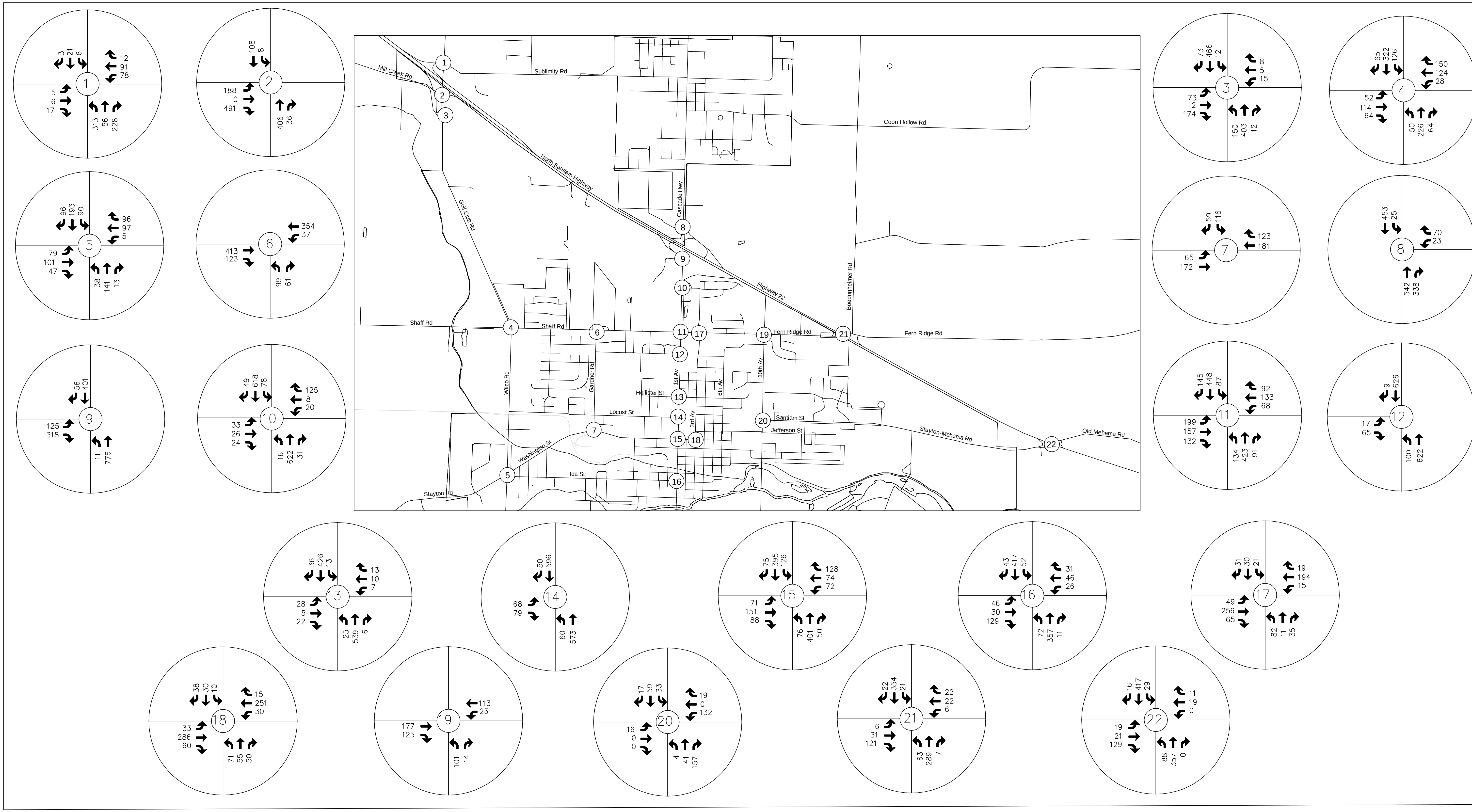


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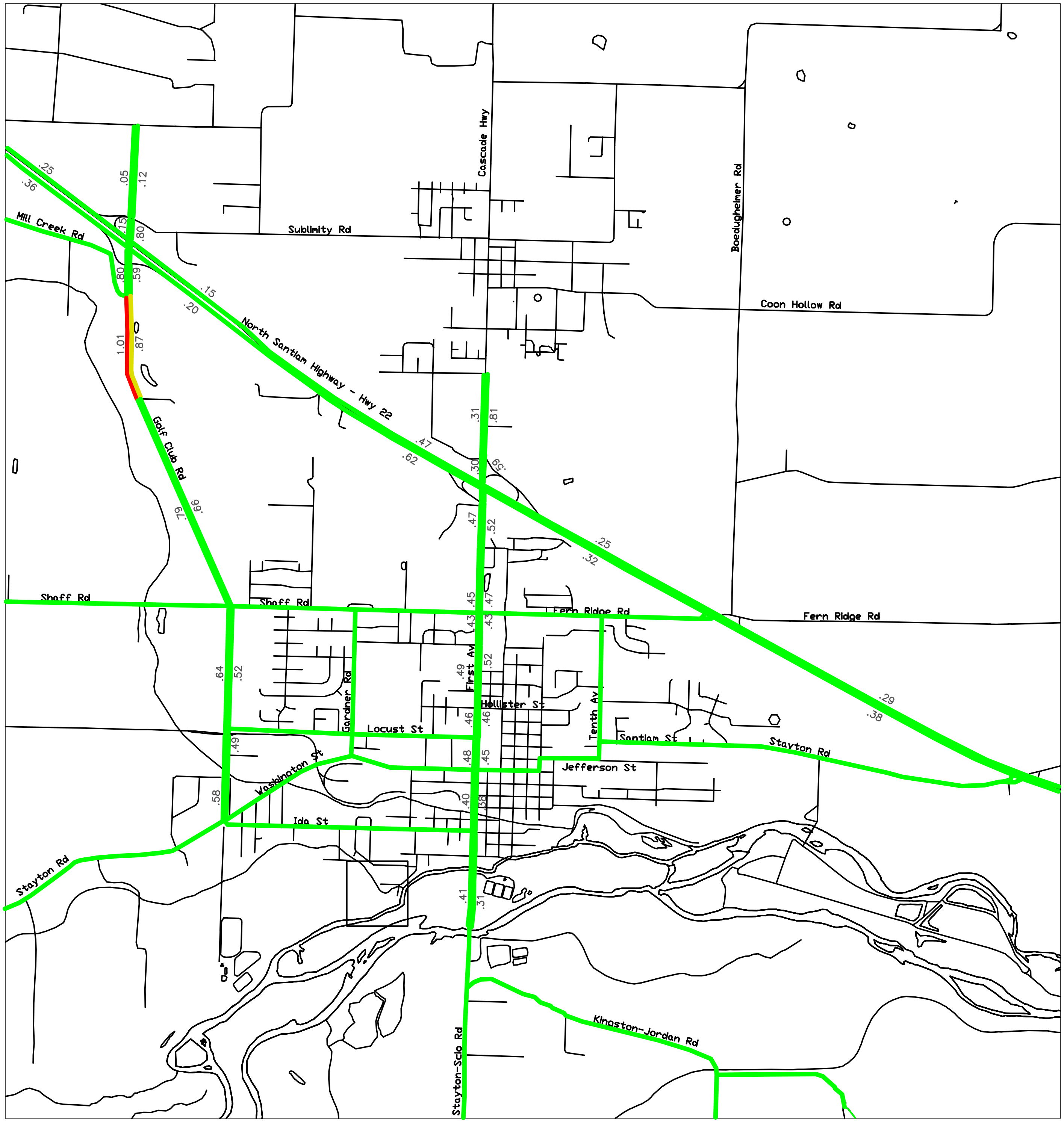
Figure 6-11
2025 Alternative 1 - 1st Av 5-Lane Widening Traffic Volumes

LEGEND
P.M. Peak Hour Traffic Volume

NOT TO SCALE



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LEGEND

V/C = >1.0

V/C = 0.81–1.0

V/C = <0.80

NOT TO SCALE

Figure 6-12

2025 Alternative 1 - 1st Avenue Widening V/C Ratios

6.6.3.c. Intersection Level of Service and V/C Ratio Analysis

Levels of service and v/c analysis were conducted with the 2025 Alternative 1 peak hour traffic volumes to determine the performance of the system alternative and whether other improvements are necessary to support Alternative 1. Table 6-9 summarizes the level of service and v/c ratio analysis.

The two signalized intersections within Stayton are projected to operate at LOS C in the 2025 Alternative 1 condition and therefore no improvements are projected to be necessary.

Of the six ODOT intersections in the study area, the following two are projected to operate beyond the maximum V/C standard for unsignalized ramp terminal intersections:

- Highway 22 Eastbound Ramps/Cascade Highway – eastbound approach – V/C >1.00
- Highway 22 Eastbound Ramps/Golf Club Road – eastbound approach – V/C>1.00

The maximum V/C ratio standard for unsignalized ramp terminal intersections is 0.85. Both of the intersections above are projected to be well above this maximum standard. Improvements will be necessary to mitigate the 2025 Alternative 1 traffic.

There are six city unsignalized intersections projected to operate at LOS E or F. These intersections and their worst movements are listed below:

- Golf Club Road/Shaff Road – southbound approach – LOS E
- Shaff Road/Gardner Road – northbound approach – LOS E
- 1st Avenue/Locust Street – eastbound approach – LOS E
- 3rd Avenue/Washington Street – northbound approach – LOS E
- Golf Club Road/Mill Creek Road – eastbound and westbound approaches – LOS F
- Cascade Highway/Whitney Street – eastbound and westbound approaches – LOS F

Based on a comparison of traffic volumes at the Cascade Highway/Whitney Street intersection between the 2025 Alternative 1 P.M. peak hour traffic volumes and the Kittelson & Associates study[4] of the Cascade Highway/Whitney Street intersection at full build out, the 2025 Emme/2 model may be under-generating traffic volumes. Based on the Kittelson & Associates study, the Cascade Highway/Whitney Street intersection would operate at LOS F in 2021 with a full build out of Santiam Station and would likely need a traffic signal. The Emme/2 model constructed for the TSP update did not have the capability to conduct special trip generation for special generators such as the Santiam Station. After the completion of the Stayton travel demand model, ODOT updated the model code structure to allow for special trip generation. Since this code was not available to implement within the schedule of the TSP update, it is suggested that consideration should be given to assume that the Cascade Highway/Whitney Street intersection would operate at LOS F in the 2025 Alternative 1.

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[4] Whitney Street/Cascade Highway Operational Analysis, Kittelson & Associates, Inc., August 20, 2001.

Table 6-9. 2025 Alternative 1 Level of Service and V/C Ratio

	PM Peak Hour		
Signalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Cascade Highway/Shaff Road	C	31.5	0.65
N 1st Avenue/Washington Street	C	29.8	0.56
ODOT Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Hwy 22 Westbound Ramps/Cascade Highway			
Westbound Approach	D	29.4	0.43
Southbound Left	B	10.7	0.04
Hwy 22 Eastbound Ramps/Cascade Highway			
Eastbound Approach	F	>100	>1.00
Northbound Left	A	8.6	0.01
Hwy 22 Westbound Ramps/SE Golf Club Road			
Eastbound Left	E	36.6	0.04
Eastbound Through-Right	B	13.4	0.05
Westbound Left	D	30.0	0.39
Westbound Through-Right	D	29.2	0.45
Northbound Left	A	7.9	0.22
Southbound Left	A	7.9	0.01
Hwy 22 Eastbound Ramps/SE Golf Club Road			
Eastbound Approach	F	>100	>1.00
Northbound Left	A	8.5	0.01
Hwy 22/Fern Ridge Road			
Eastbound Left	A	8.1	0.02
Westbound Left	A	8.6	0.08
Northbound Approach	C	18.8	0.42
Southbound Approach	C	20.8	0.20
Hwy 22/Stayton-Mehama Road			
Eastbound Left	A	8.3	0.03
Westbound Left	A	8.9	0.10
Northbound Approach	D	29.5	0.58
Southbound Approach	C	24.6	0.16

Table 6-9. 2025 Alternative 1 Level of Service and V/C Ratio Continued

City Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
SE Golf Club Road/Shaff Road			
Eastbound Approach	C	17.2	0.37
Westbound Approach	D	25.7	0.48
Northbound Approach	D	27.5	0.53
Southbound Approach	E	48.0	0.69
Shaff Road/N Gardner Road			
Westbound Left	A	9.0	0.05
Northbound Approach	E	35.7	0.63
Fern Ridge Road/N 3rd Avenue			
Eastbound Left	A	7.9	0.04
Westbound Left	A	8.1	0.01
Northbound Approach	C	23.0	0.43
Southbound Approach	C	17.1	0.24
Fern Ridge Road/N 10th Avenue			
Westbound Left	A	8.1	0.02
Northbound Approach	B	13.5	0.24
N 1st Avenue/Regis Street			
Eastbound Approach	C	19.2	0.27
Northbound Left	B	10.0	0.14
N 1st Avenue/Hollister Street			
Eastbound Approach	C	21.8	0.22
Westbound Approach	C	21.3	0.13
Northbound Left	A	8.7	0.03
Southbound Left	A	9.0	0.02
N 1st Avenue/Locust Street			
Eastbound Approach	E	35.5	0.60
Northbound Left	A	9.7	0.08
SE Stayton Road/Washington Street/Wilco Road			
Eastbound Approach	C	15.2	0.52
Westbound Approach	B	13.8	0.48
Northbound Approach	B	14.6	0.31
Southbound Approach	C	18.2	0.51

Table 6-9. 2025 Alternative 1 Level of Service and V/C Ratio Continued

City Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
W Washington Street/N Gardner Road			
Eastbound Left	A	8.2	0.06
Southbound Left	C	16.4	0.30
Southbound Right	A	9.8	0.08
N 3rd Avenue/Washington Street			
Eastbound Left	A	8.0	0.03
Westbound Left	A	8.3	0.03
Northbound Approach	E	40.6	0.69
Southbound Approach	C	18.2	0.25
N 10th Avenue/E Santiam Street			
Eastbound Approach	A	5.0	0.24
Westbound Approach	A	4.9	0.29
Northbound Approach	A	5.0	0.32
Southbound Approach	A	6.1	0.47
N 1st Avenue/Ida Street			
Eastbound Approach	B	14.8	0.49
Westbound Approach	B	12.6	0.32
Northbound Approach	C	17.0	0.53
Southbound Approach	C	17.9	0.58
SE Golf Club Road/Mill Creek Road			
Eastbound Approach	F	>100	>1.00
Westbound Approach	F	73.7	0.44
Northbound Left	A	9.5	0.17
Southbound Left	A	8.1	0.01
Cascade Highway/Whitney Street			
Eastbound Approach	F	>100	>1.00
Westbound Approach	F	50.3	0.72
Northbound Left	A	9.6	0.02
Southbound Left	A	9.9	0.11

The MUTCD peak hour signal warrant (Warrant #3) was chosen as a "screening" to determine candidate intersections for possible future signalization. Since the Stayton Emme/2 model only produces P.M. peak hour volumes, the peak hour warrant is the only warrant directly applicable at this level of planning analysis. The model does not provide traffic volumes for the highest eight/four hours of the day, therefore Warrants #1 and #2 for the 2025 Alternative 1 condition can not be directly analyzed at this time. Actual signalization should be based on future traffic engineering studies to determine whether the intersection meets the Eight Hour Warrants (MUTCD Warrant #1) and/or Four Hour Warrants (MUTCD Warrant #2).

Peak hour signal warrant analysis was performed at all intersections where turn lane improvements would not fully mitigate the LOS F or v/c ratio condition above the maximum standard. If the peak hour signal warrant was not met, then the intersection was not considered a candidate for signalization. The results of the peak hour signal warrant analysis for the 2025 Alternative 1 condition is shown in Table 6-10.

Based on the results of the peak hour signal warrant analysis shown in Table 6-10, the following intersections are forecast to meet at least one MUTCD signal warrant by year 2025 and should be monitored by the City of Stayton over time to determine if and when signalization is warranted:

- Highway 22 Eastbound Ramps/Cascade Highway
- Golf Club Road/Shaff Road
- Highway 22 Eastbound Ramps/Golf Club Road

Based on the Whitney Street/Cascade Highway Operation Analysis, it is recommended that the Cascade Highway/Whitney Street intersection be signalized. Per the Kittelson & Associates study, Golf Lane should be realigned to intersect Cascade Highway directly opposite Whitney Street as part of the signalization improvement.

In addition to establishing locations that should be considered for signalization in the 2025 Alternative 1 condition, an analysis was undertaken to determine the need for additional turn lanes at the intersections with LOS E/F or v/c ratio conditions exceeding the established maximum standard of 0.85. The list below summarizes the necessary improvements to the sub-standard intersections identified in the analysis above including additional turn lanes and signalization.

- Highway 22 Eastbound Ramps/Cascade Highway – signalize and eastbound right turn lane
- Golf Club Road/Shaff Road – signalize, no additional turn lanes needed
- Shaff Road/Gardner Road – northbound right turn lane
- 3rd Avenue/Washington Street – northbound left turn lane
- Highway 22 Eastbound Ramps/Golf Club Road – signalize and eastbound right turn lane
- Golf Club Road/Mill Creek Road – eastbound right turn lane
- Cascade Highway/Whitney Street – signalize, add eastbound and westbound left turn lanes

Table 6-11 summarizes the levels of service and v/c ratios of the intersections listed above with their described intersection improvements. As shown in Table 6-11, all of the levels of service and v/c ratio conditions are mitigated with the proposed improvements except for the Golf Club Road/Mill Creek Road intersection. Even with the eastbound right turn lane improvement, the intersection is still projected to operate at LOS F for the eastbound left turn lane and westbound approach movements. This condition is primarily caused by the heavy through movements along Golf Club Road. Based on the signal warrant analysis in Table 6-10, the Golf Club Road/Mill Creek Road intersection would not meet signal warrants in the 2025 Alternative 1 condition. Also, since the upstream intersection at the Highway 22 Eastbound Ramps/Golf Club Road intersection did meet signal warrants, another signal in close proximity at the Golf Club Road/Mill Creek Road intersection is not advised.

Table 6-10. 2025 Alternative 1 Signal Warrant Analysis

Intersection	Volume By Approach				Approach Volume Totals		Minor Volume Required to meet Warrant	Is Warrant Met?
	SB	NB	WB	EB	Major Approach Total	Minor Max		
Hwy 22 EB Ramps/Cascade Hwy	457	787	0	284	1,244	284	145	Yes
Golf Club Rd/Shaff Rd	513	340	302	230	853	302	260	Yes
Shaff Rd/Gardner Rd	0	160	391	536	927	160	230	No
N 1st Ave/Locust St	646	633	0	108	1,279	108	135	No
Hwy 22 EB Ramps/Golf Club Rd	114	442	0	434	556	434	395	Yes
3rd Avenue/Washington Street	78	176	296	379	675	176	340	No
Golf Club Rd/Mill Creek Rd	551	565	28	162	1,116	162	175	No
Cascade Hwy/Whitney St	745	669	91	83	1,414	91	115	No

Table 6-11. 2025 Alternative 1 Mitigation Levels of Service

Signalized Intersection	PM Peak Hour		
	LOS	Average Delay (sec)	V/C Ratio
Hwy 22 Eastbound Ramps/Cascade Highway	C	22.4	0.84
SE Golf Club Road/Shaff Road	C	31.1	0.63
Hwy 22 Eastbound Ramps/SE Golf Club Road	B	17.1	0.44
Cascade Highway/Whitney Street	C	20.1	0.42
Unsignalized Intersection			
Shaff Road/N Gardner Road			
Westbound Left	A	9.0	0.05
Northbound Left	D	34.4	0.49
Northbound Right	B	12.9	0.14
N 3rd Avenue/Washington Street			
Eastbound Left	A	8.0	0.03
Westbound Left	A	8.3	0.03
Northbound Left	D	31.1	0.38
Northbound Through-Right	C	18.5	0.31
Southbound Approach	C	18.2	0.25
SE Golf Club Road/Mill Creek Road			
Eastbound Left	F	101.2	0.76
Eastbound Right	C	15.7	0.37
Westbound Approach	F	73.7	0.44
Northbound Left	A	9.5	0.17
Southbound Left	A	8.1	0.01

6.6.4. 2025 Alternative 2 Condition

6.6.4.a. Traffic Volumes

Alternative 2 was analyzed assuming that a by-pass would be constructed to allow traffic travel around the City of Stayton. The by-pass alternative would create a western by-pass between Golf Club Road, Wilco Road, Jetters Way, and Stayton-Scio Road via a new Santiam River bridge crossing. Figure 6-13 shows the 2025 P.M. peak hour traffic volumes for Alternative 2 based on the post-processed 2025 Alternative 2 model traffic volumes and assuming the by-pass to be in place as the only future improvements. These volumes were developed based on the Emme/2 model outputs and post processed based on the methodologies outlined in TRB report 255.

6.6.4.b. Volume to Capacity Ratio Analysis – Post Processed Roadway Link Volumes

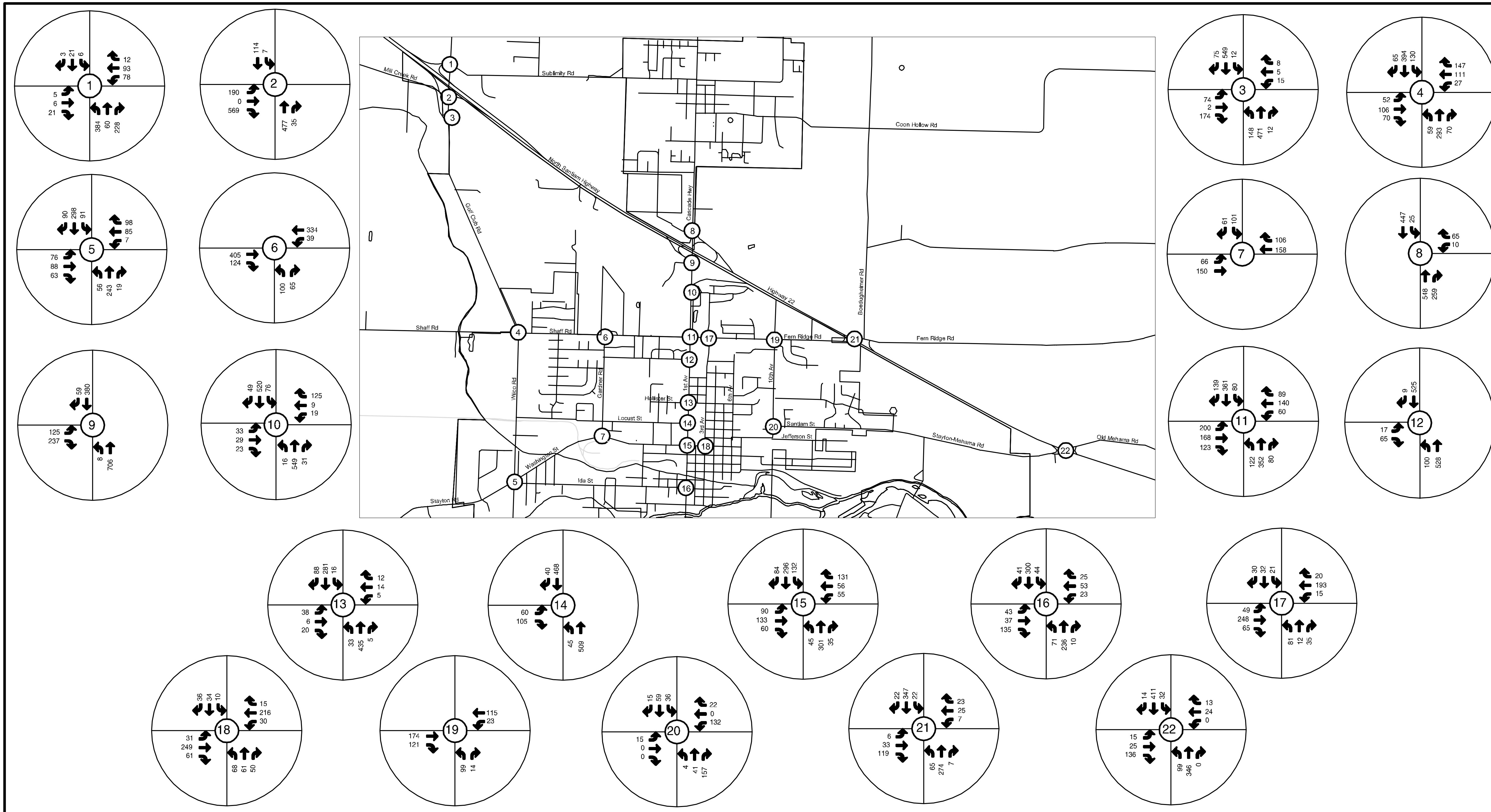
Based on the post-processed turning movement volumes at the analysis intersections and roadway capacities used in the Emme/2 model, a v/c ratio was calculated for the roadways segments. This analysis is summarized in Figure 6-14. To facilitate analysis of the v/c ratios, the v/c ratios in Figure 6-14 are color coded. A v/c ratio within the maximum standard is coded in green. A v/c ratio exceeding the maximum v/c ratio to 1.00 is coded in yellow. V/C ratios exceeding 1.00 are coded in red.

For the v/c analysis, ODOT's standards were used. Highway 22 has a maximum v/c standard of 0.70. The local streets based on ODOT standards would have a maximum v/c ratio of 0.85. Intersections and ramp terminal v/c ratios will be discussed later in this section. Based on the v/c ratios in Figure 6-14, the following roadway segments indicate significant congestion:

- Golf Club Road between Highway 22 Ramps, northbound – v/c = 0.90
- Golf Club Road south of Mill Creek Road, northbound – v/c = 0.97
- Golf Club Road south of Mill Creek Road, southbound – v/c = 1.14
- Golf Club Road north of Shaff Road, southbound – v/c = 0.91
- Cascade Highway between Highway 22 Ramps, northbound – v/c = 1.09
- Cascade Highway south of Highway 22 Eastbound Ramps, northbound – v/c = 0.94
- 1st Avenue – south of Regis Street, northbound – v/c = 0.90

The primary areas showing 2025 Alternative 2 roadway congestion problems are Golf Club Road from the vicinity of Highway 22 ramps and Shaff Road and intermittent locations along Cascade Highway/1st Avenue from the vicinity of the Highway 22 ramps to Hollister Street. There are three primary roadway segments along Golf Club Road with v/c ratios exceeding the maximum standard of 0.85. These locations are between the Highway 22 Westbound Ramps and Eastbound Ramps in the northbound direction (v/c ratio of 0.90), south of Mill Creek Road in both northbound (v/c ratio of 0.97) and southbound (v/c ratio of 1.14) directions; and north of Shaff Road in the southbound direction (v/c ratio of 0.91). There are also three primary congestion areas along Cascade Highway/1st Avenue with v/c ratios exceeding the maximum standard of 0.85. These roadway segments along Cascade Highway/1st Avenue are between the

Highway 22 Eastbound and Westbound Ramps in the northbound direction (v/c ratio of 1.09),



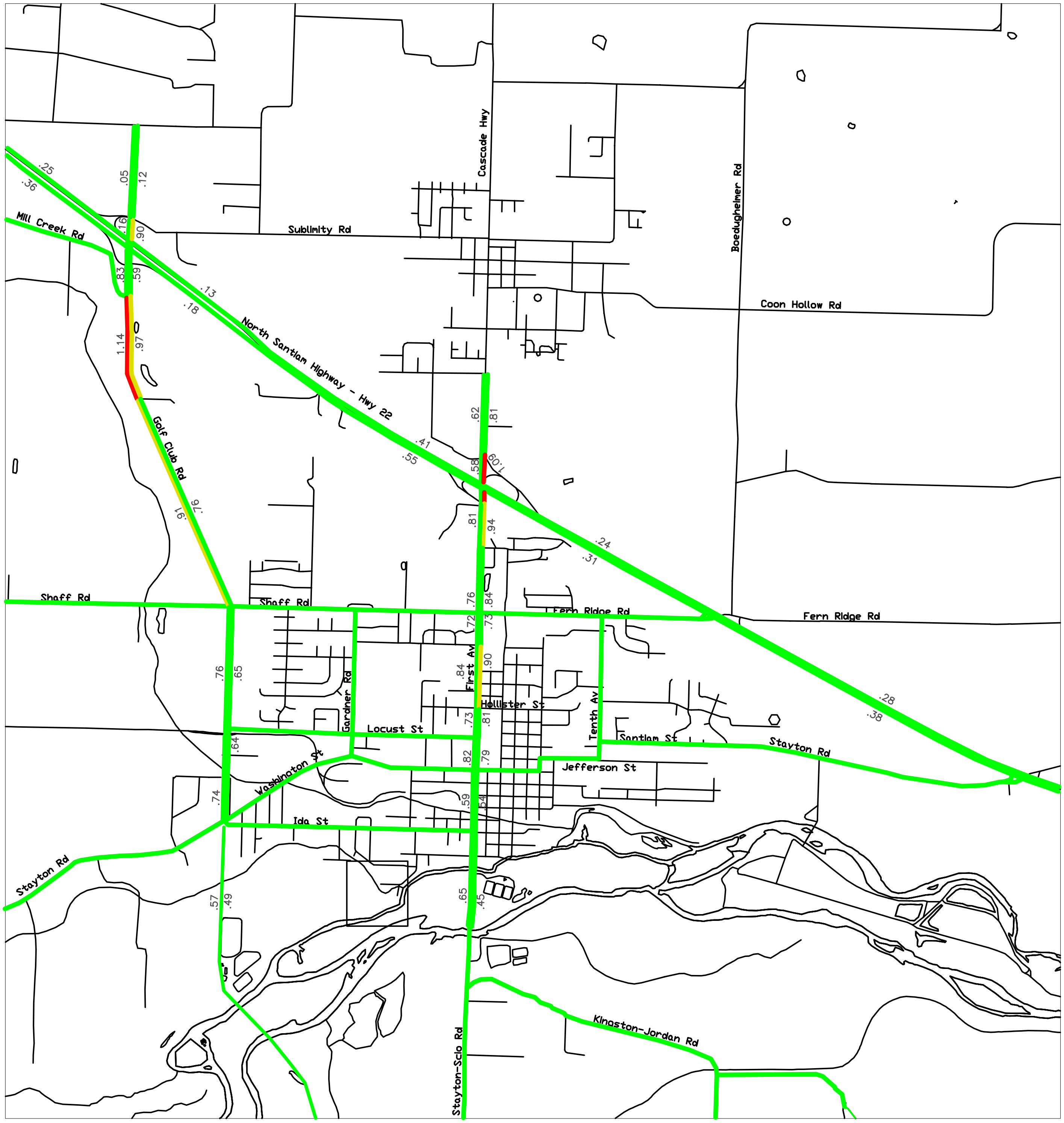
Stayton Transportation System Plan

Figure 6-13
2025 Alternative 2 - By Pass Traffic Volumes

LEGEND

P.M. Peak Hour Traffic Volume

NOT TO SCALE



Stayton Transportation System Plan

Figure 6-14
2025 Alternative 2 - By Pass V/C Ratios

LEGEND
V/C = >1.0
V/C = 0.81–1.0
V/C = <0.80

NOT TO SCALE

south of the Highway 22 Eastbound Ramps in the northbound direction (v/c ratio of 0.94), and between Regis Street and Hollister Street in the northbound direction (v/c ratio of 0.90).

The high v/c ratios along Golf Club Road are primarily due to a significant future increase in housing between the 2000 base year and 2025 condition and the additional traffic that would utilize the by-pass alignment. As previously shown in Figure 6-2, this area has a future household increase of 200 to 250 new households by the year 2025. The most logical mitigation to alleviate this congestion would to add additional travel lanes and construct Golf Club Road between Mill Creek Road and Shaff Road to a five lane roadway.

The v/c ratio analysis shows significant congestion along Cascade Highway/1st Avenue in the northbound direction of travel. The results of the Emme/2 model travel demand forecast confirms that the Cascade Highway/1st Avenue corridor will still be the dominant travel corridor in the future as indicated by its projected congested condition. The v/c ratio problems along Cascade Highway in the vicinity of the Highway 22 terminal ramps could be mitigated by widening Cascade Highway to 5 lanes. For the one roadway segment along 1st Avenue south of Regis Street in the northbound direction, the v/c ratio above the maximum standard may be mitigated by access management techniques.

All other roadways modeled are projected to operate with v/c ratios well under the maximum v/c ratio standard of 0.85.

6.6.4.c. Intersection Level of Service and V/C Ratio Analysis

Levels of service and v/c analysis were conducted with the 2025 Alternative 2 P.M. peak hour traffic volumes to determine future transportation system deficiencies. Table 6-12 summarizes the level of service and v/c ratio analysis.

The two signalized intersections within Stayton are projected to operate at LOS D or better in the 2025 Alternative 2 condition and therefore no improvements are projected to be necessary.

Of the six ODOT intersections in the study area, the following two are projected to operate beyond the maximum V/C standard for unsignalized ramp terminal intersections:

- Highway 22 Eastbound Ramps/Cascade Highway – eastbound approach – V/C >1.00
- Highway 22 Eastbound Ramps/Golf Club Road – eastbound approach – V/C>1.00

The maximum V/C ratio standard for unsignalized ramp terminal intersections is 0.85. Both of the intersections above are projected to be well above this maximum standard. Improvements will be necessary to mitigate the 2025 Alternative 2 traffic.

There are four city unsignalized intersections projected to operate at LOS E or F. These intersections and their worst movements are listed below:

- Golf Club Road/Shaff Road – northbound and southbound approaches – LOS F
- Stayton Road/Washington Street/Wilco Road – southbound approach – LOS F
- Golf Club Road/Mill Creek Road – eastbound and westbound approaches – LOS F
- Cascade Highway/Whitney Street – eastbound and westbound approaches – LOS F

Table 6-12. 2025 Alternative 2 Level of Service and V/C Ratio

	PM Peak Hour		
Signalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Cascade Highway/Shaff Road	D	40.4	0.78
N 1st Avenue/Washington Street	C	32.1	0.66
ODOT Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Hwy 22 Westbound Ramps/Cascade Highway			
Westbound Approach	C	20.8	0.26
Southbound Left	B	10.3	0.04
Hwy 22 Eastbound Ramps/Cascade Highway			
Eastbound Approach	F	>100	>1.00
Northbound Left	A	8.6	0.01
Hwy 22 Westbound Ramps/SE Golf Club Road			
Eastbound Left	F	59.5	0.07
Eastbound Through-Right	B	14.5	0.07
Westbound Left	E	48.7	0.54
Westbound Through-Right	E	47.6	0.61
Northbound Left	A	8.1	0.27
Southbound Left	A	7.9	0.01
Hwy 22 Eastbound Ramps/SE Golf Club Road			
Eastbound Approach	F	>100	>1.00
Northbound Left	A	8.7	0.01
Hwy 22/Fern Ridge Road			
Eastbound Left	A	8.1	0.02
Westbound Left	A	8.5	0.07
Northbound Approach	C	18.7	0.41
Southbound Approach	C	21.0	0.22
Hwy 22/Stayton-Mehama Road			
Eastbound Left	A	8.3	0.03
Westbound Left	A	8.9	0.11
Northbound Approach	D	30.4	0.60
Southbound Approach	D	26.4	0.20

Table 6-12. 2025 Alternative 2 Level of Service and V/C Ratio Continued

City Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
SE Golf Club Road/Shaff Road			
Eastbound Approach	C	17.8	0.37
Westbound Approach	D	25.4	0.46
Northbound Approach	F	50.5	0.64
Southbound Approach	F	100.6	0.73
Shaff Road/N Gardner Road			
Westbound Left	A	9.0	0.05
Northbound Approach	D	34.0	0.62
Fern Ridge Road/N 3rd Avenue			
Eastbound Left	A	7.9	0.04
Westbound Left	A	8.1	0.01
Northbound Approach	C	22.7	0.43
Southbound Approach	C	17.1	0.24
Fern Ridge Road/N 10th Avenue			
Westbound Left	A	8.1	0.02
Northbound Approach	B	13.4	0.24
N 1st Avenue/Regis Street			
Eastbound Approach	C	22.1	0.31
Northbound Left	A	9.4	0.13
N 1st Avenue/Hollister Street			
Eastbound Approach	D	25.5	0.30
Westbound Approach	C	19.7	0.13
Northbound Left	A	8.4	0.03
Southbound Left	A	8.5	0.02
N 1st Avenue/Locust Street			
Eastbound Approach	D	32.2	0.60
Northbound Left	A	8.9	0.05
SE Stayton Road/Washington Street/Wilco Road			
Eastbound Approach	C	20.7	0.61
Westbound Approach	C	17.9	0.52
Northbound Approach	D	31.7	0.52
Southbound Approach	F	53.5	0.68

Table 6-12. 2025 Alternative 2 Level of Service and V/C Ratio Continued

City Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
W Washington Street/N Gardner Road			
Eastbound Left	A	8.1	0.06
Southbound Left	B	14.8	0.24
Southbound Right	A	9.6	0.08
N 3rd Avenue/Washington Street			
Eastbound Left	A	7.9	0.03
Westbound Left	A	8.1	0.03
Northbound Approach	D	31.3	0.62
Southbound Approach	C	16.8	0.23
N 10th Avenue/E Santiam Street			
Eastbound Approach	A	5.3	0.25
Westbound Approach	A	5.1	0.29
Northbound Approach	A	5.7	0.40
Southbound Approach	A	6.9	0.53
N 1st Avenue/Ida Street			
Eastbound Approach	B	13.9	0.50
Westbound Approach	B	11.8	0.32
Northbound Approach	C	15.2	0.43
Southbound Approach	C	21.8	0.53
SE Golf Club Road/Mill Creek Road			
Eastbound Approach	F	>100	>1.00
Westbound Approach	F	>100	0.62
Northbound Left	B	10.0	0.18
Southbound Left	A	8.4	0.01
Cascade Highway/Whitney Street			
Eastbound Approach	F	>100	>1.00
Westbound Approach	F	63.6	0.80
Northbound Left	A	9.1	0.02
Southbound Left	A	9.4	0.10

Based on a comparison of traffic volumes at the Cascade Highway/Whitney Street intersection between the 2025 Alternative 2 P.M. peak hour traffic volumes and the Kittelson & Associates study[5] of the Cascade Highway/Whitney Street intersection at full build out, the 2025 Emme/2 model may be under-generating traffic volumes. Based on the Kittelson & Associates study, the Cascade Highway/Whitney Street intersection would operate at LOS F in 2021 with a full build out of Santiam Station and would need a traffic signal. The Emme/2 model constructed for the TSP update did not have the capability to conduct special trip generation for special generators such as the Santiam Station. After the completion of the Stayton travel demand model, ODOT has updated the model code structure to allow for special trip generation. Since this code was

[5] Whitney Street/Cascade Highway Operational Analysis, Kittelson & Associates, Inc., August 20, 2001.

not available to implement within the schedule of the TSP update, it is suggested that consideration should be given to assume that the Cascade Highway/Whitney Street intersection would operate at LOS F in the 2025 Alternative 2.

The MUTCD peak hour signal warrant (Warrant #3) was chosen as a "screening" to determine candidate intersections for possible future signalization. Since the Stayton Emme/2 model only produces P.M. peak hour volumes, the peak hour warrant is the only warrant directly applicable at this level of planning analysis. The model does not provide traffic volumes for the highest eight/four hours of the day, therefore Warrants #1 and #2 for the 2025 Alternative 2 condition can not be directly analyzed at this time. Actual signalization should be based on future traffic engineering studies to determine whether the intersection meets the Eight Hour Warrants (MUTCD Warrant #1) and/or Four Hour Warrants (MUTCD Warrant #2).

Peak hour signal warrant analysis was performed at all intersections where turn lane improvements would not fully mitigate the LOS E/F or v/c ratio condition above the maximum standard. If the peak hour signal warrant was not met, then the intersection was not considered a candidate for signalization. The results of the peak hour signal warrant analysis for the 2025 Alternative 2 condition is shown in Table 6-13.

Based on the results of the peak hour signal warrant analysis shown in Table 6-13, the following four intersections are forecast to meet at least one MUTCD signal warrant by year 2025 and should be monitored by the City of Stayton over time to determine if and when signalization is warranted:

- Highway 22 Eastbound Ramps/Cascade Highway
- Golf Club Road/Shaff Road
- Highway 22 Eastbound Ramps/Golf Club Road
- Golf Club Road/Mill Creek Road

Based on the Whitney Street/Cascade Highway Operation Analysis, it is recommended that the Cascade Highway/Whitney Street intersection be signalized. Per the Kittelson & Associates study, Golf Lane should be realigned to intersect Cascade Highway directly opposite Whitney Street as part of the signalization improvement.

Table 6-13. 2025 Alternative 2 Signal Warrant Analysis

	Volume By Approach				Approach Volume Totals		Minor Volume Required to meet Warrant	Is Warrant Met?
Intersection	SB	NB	WB	EB	Major Approach Total	Min or Max		
Hwy 22 EB Ramps/Cascade Hwy	439	714	0	244	1,153	244	165	Yes
Golf Club Rd/Shaff Rd	589	422	285	228	1,011	285	200	Yes
Hwy 22 EB Ramps/Golf Club Rd	121	512	0	475	633	475	360	Yes
Golf Club Rd/Mill Creek Rd	636	631	28	163	1,267	163	140	Yes
Stayton Rd/Washington St/Wilco Rd	479	318	190	227	797	227	290	No

Cascade Hwy/Whitney St	645	596	91	85	1,241	91	145	No

In addition to establishing locations that should be considered for signalization in the 2025 Alternative 2 condition, an analysis was undertaken to determine the need for additional turn lanes at the intersections with LOS E/F or v/c ratio conditions exceeding the established maximum standard of 0.85. The list below summarizes the necessary improvements to the sub-standard intersections identified in the analysis above including additional turn lanes and signalization.

- Highway 22 Eastbound Ramps/Cascade Highway – signalize and eastbound right turn lane
- Golf Club Road/Shaff Road – signalize, no additional turn lanes needed
- Stayton Road/Washington Street/Wilco Road – eastbound and westbound right turn lanes
- Highway 22 Eastbound Ramps/Golf Club Road – signalize and eastbound right turn lane
- Golf Club Road/Mill Creek Road – signalize, no additional turn lanes needed
- Cascade Highway/Whitney Street – signalize and addition of an eastbound and westbound left turn lane

Table 6-14 summarizes the levels of service and v/c ratios of the intersections listed above with their described intersection improvements. As shown in Table 6-14, all of the levels of service and v/c ratio conditions are mitigated with the proposed improvements. The LOS E condition at the Stayton Road/Washington Street/Wilco Road intersection is acceptable in the 2025 Alternative 2 condition since signal warrants are not projected to be met.

Table 6-14. 2025 Alternative 2 Mitigation Levels of Service

	PM Peak Hour		
Signalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Hwy 22 Eastbound Ramps/Cascade Highway	B	17.4	0.71
SE Golf Club Road/Shaff Road	C	32.1	0.68
Hwy 22 Eastbound Ramps/SE Golf Club Road	B	18.8	0.56
SE Golf Club Road/Mill Creek Road	C	25.3	0.67
Cascade Highway/Whitney Street	C	32.5	0.59
Unsignalized Intersection			
SE Stayton Road/Washington Street/Wilco Road			
Eastbound Approach	C	15.1	0.35
Westbound Approach	B	12.7	0.31
Northbound Approach	C	25.0	0.49
Southbound Approach	E	38.5	0.65

6.6.5. 2025 Alternative 3 Condition

6.6.5.a. Traffic Volumes

Alternative 3 was analyzed assuming that a one-way couplet between Cascade Highway/1st Avenue and 3rd Avenue would be constructed. The couplet alternative would create additional capacity along the Cascade Highway and 1st Avenue corridor to mitigate the primary congestion problem in Stayton in 2025. Figure 6-15 shows the 2025 P.M. peak hour traffic volumes for Alternative 3 based on the post-processed 2025 Alternative 3 model traffic volumes and assuming the couplet to be in place as the only future improvements. These volumes were developed based on the Emme/2 model outputs and post processed based on the methodologies outlined in TRB report 255.

6.6.5.b. Volume to Capacity Ratio Analysis – Post Processed Roadway Link Volumes

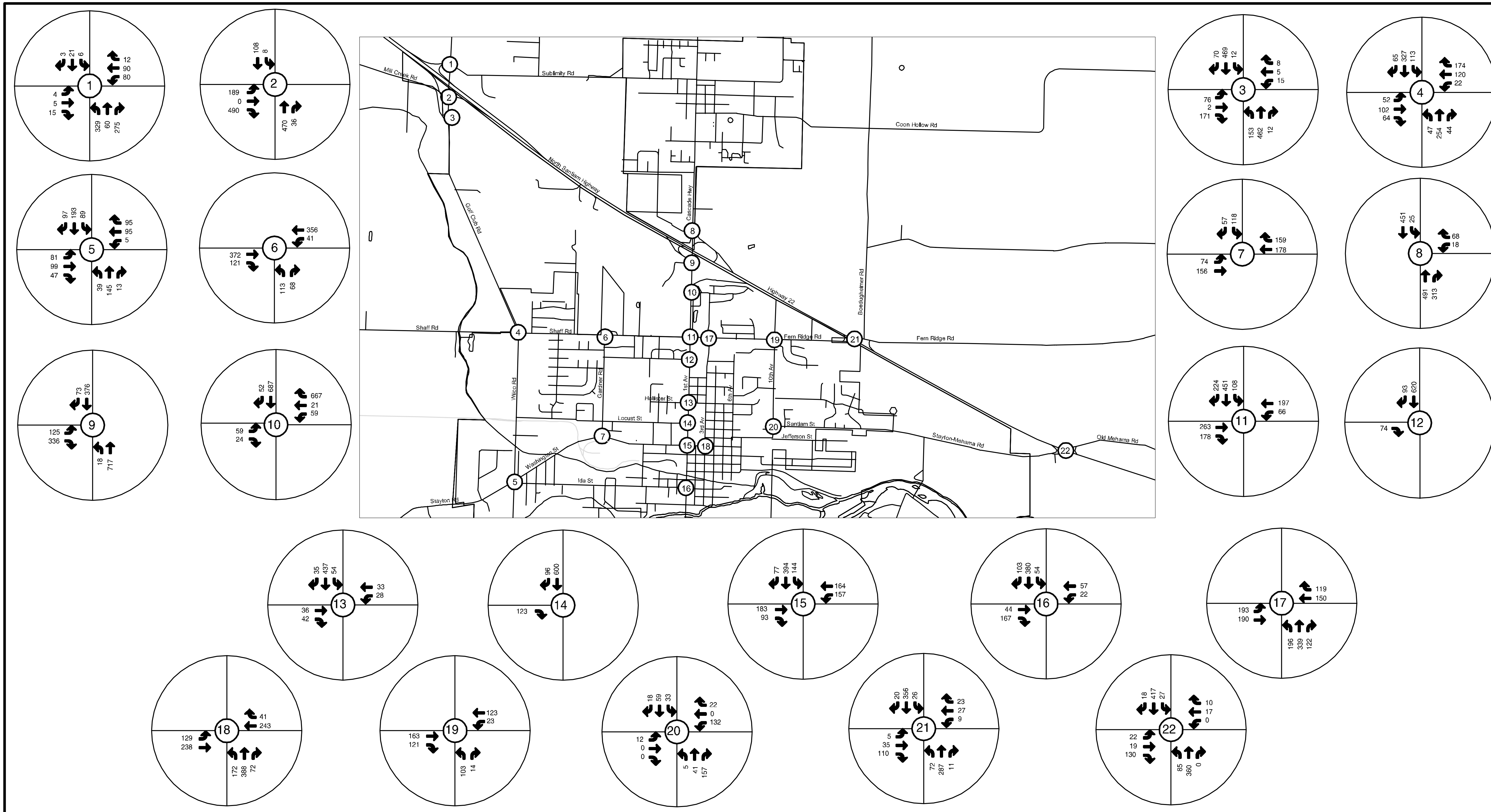
Based on the post-processed turning movement volumes at the analysis intersections and roadway capacities used in the Emme/2 model, a v/c ratio was calculated for the roadways segments. This analysis is summarized in Figure 6-16. To facilitate analysis of the v/c ratios, the v/c ratios in Figure 6-16 are color coded. A v/c ratio within the maximum standard is coded in green. A v/c ratio exceeding the maximum v/c ratio to 1.00 is coded in yellow. V/C ratios exceeding 1.00 are coded in red.

For the v/c analysis, ODOT's standards were used. Highway 22 has a maximum v/c standard of 0.70. The local streets based on ODOT standards would have a maximum v/c ratio of 0.85. Intersections and ramp terminal v/c ratios will be discussed later in this section. Based on the v/c ratios in Figure 6-16, the following roadway segments indicate significant congestion:

- Golf Club Road between the Highway 22 ramps, northbound – v/c = .89
- Golf Club Road south of Mill Creek Road, northbound – v/c = 0.96
- Golf Club Road south of Mill Creek Road, southbound – v/c = 1.01

Areas showing 2025 Alternative 3 roadway congestion problems are Golf Club Road between the Highway 22 terminal ramps and south of Mill Creek Road. The v/c ratio problem on Golf Club Road between the Highway 22 terminal ramps will be addressed in the level of service and intersection analysis. The southbound movement along Golf Club Road south of Mill Creek Road is projected to operate with a v/c ratio of 1.01 while the northbound movement is projected to operate with a v/c ratio of 0.96. The high v/c ratios along Golf Club Road are primarily due to a significant future increase in housing between the 2000 base year and 2025 condition. As previously shown in Figure 6-2, this area has a future household increase of 200 to 250 new households by the year 2025. It may be possible to mitigate this v/c ratio condition by adding additional travel lanes between the future housing development access(es) and Mill Creek Road.

All other roadways modeled are projected to operate with v/c ratios well under the maximum v/c ratio standard of 0.85.



CITY OF STAYTON

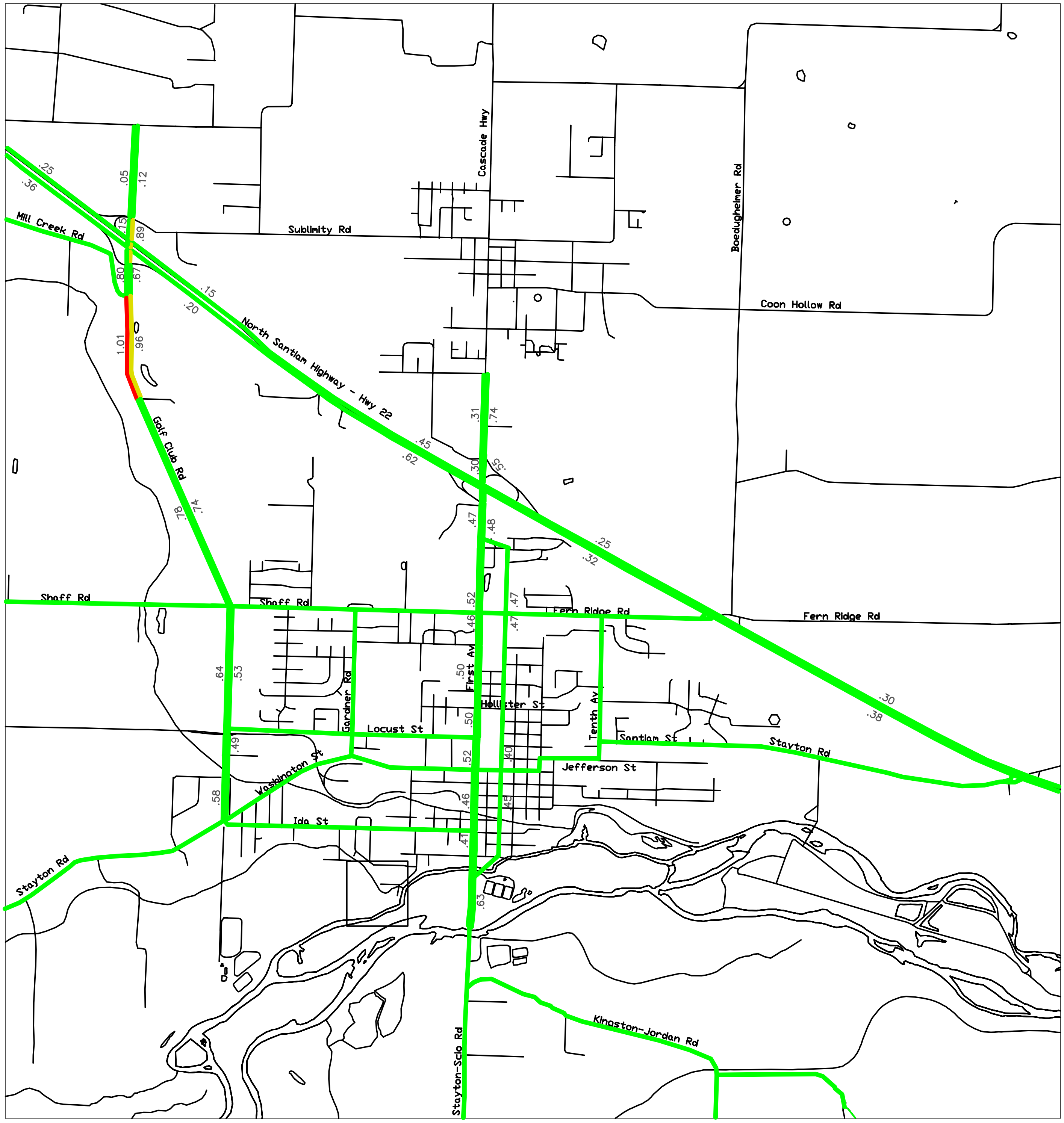
Stayton Transportation System Plan

Figure 6-15
2025 Alternative 3 - 1st Av/3rd Av Couplet Traffic Volumes

LEGEND

P.M. Peak Hour Traffic Volume

NOT TO SCALE



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LEGEND

V/C = >1.0

V/C = 0.81–1.0

V/C = <0.80

NOT TO SCALE

Figure 6-16

2025 Alternative 3 1st Av/3rd Av Couplet V/C Ratios

6.6.5.c. Intersection Level of Service and V/C Ratio Analysis

Levels of service and v/c analysis were conducted with the 2025 Alternative 3 weekday P.M. peak hour traffic volumes to determine future transportation system deficiencies. Table 6-15 summarizes the level of service and v/c ratio analysis.

The two signalized intersections within Stayton are projected to operate at LOS C or better in the 2025 Alternative 3 condition and therefore no improvements are projected to be necessary.

Of the six ODOT intersections in the study area, the following two are projected to operate beyond the maximum v/c standard for unsignalized ramp terminal intersections:

- Highway 22 Eastbound Ramps/Cascade Highway – eastbound approach – V/C >1.00
- Highway 22 Eastbound Ramps/Golf Club Road – eastbound approach – V/C>1.00

The maximum v/c ratio standard for unsignalized ramp terminal intersections is 0.85. Both of the intersections above are projected to be well above this maximum standard. Improvements will be necessary to mitigate the 2025 Alternative 3 traffic.

There are five city unsignalized intersections projected to operate at LOS E or F. These intersections and their worst movements are listed below:

- Golf Club Road/Shaff Road – southbound approach – LOS F
- Shaff Road/Gardner Road – northbound approach – LOS E
- Fern Ridge Road/3rd Avenue – northbound movements – LOS F
- 3rd Avenue/Washington Street – eastbound and westbound lefts – LOS F
- Golf Club Road/Mill Creek Road – eastbound and westbound approaches – LOS F

Based on a comparison of traffic volumes at the Cascade Highway/Whitney Street intersection between the 2025 Alternative 3 P.M. peak hour traffic volumes and the Kittelson & Associates study[6] of the Cascade Highway/Whitney Street intersection at full build out, the 2025 Emme/2 model may be under-generating traffic volumes. Based on the Kittelson & Associates study, the Cascade Highway/Whitney Street intersection would operate at LOS F in 2021 with a full build out of Santiam Station and would need a traffic signal. The Emme/2 model constructed for the TSP update did not have the capability to conduct special trip generation for special generators such as the Santiam Station. After the completion of the Stayton travel demand model, ODOT has updated the model code structure to allow for special trip generation. Since this code was not available to implement within the schedule of the TSP update, it is suggested that consideration should be given to assume that the Cascade Highway/Whitney Street intersection would operate at LOS F in the 2025 Alternative 3 condition.

[6] Whitney Street/Cascade Highway Operational Analysis, Kittelson & Associates, Inc., August 20, 2001.

Table 6-15. 2025 Alternative 3 Level of Service and V/C Ratio

	PM Peak Hour		
Signalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Cascade Highway/Shaff Road	C	25.2	0.68
N 1st Avenue/Washington Street	B	19.3	0.56
ODOT Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Hwy 22 Westbound Ramps/Cascade Highway			
Westbound Approach	C	23.5	0.34
Southbound Left	B	10.3	0.04
Hwy 22 Eastbound Ramps/Cascade Highway			
Eastbound Approach	F	>100	>1.00
Northbound Left	A	8.6	0.02
Hwy 22 Westbound Ramps/SE Golf Club Road			
Eastbound Left	E	41.0	0.04
Eastbound Through-Right	B	13.9	0.05
Westbound Left	D	33.5	0.43
Westbound Through-Right	D	31.6	0.47
Northbound Left	A	8.0	0.23
Southbound Left	A	8.0	0.01
Hwy 22 Eastbound Ramps/SE Golf Club Road			
Eastbound Approach	F	>100	>1.00
Northbound Left	A	8.7	0.01
Hwy 22/Fern Ridge Road			
Eastbound Left	A	8.1	0.03
Westbound Left	A	8.6	0.08
Northbound Approach	C	19.9	0.42
Southbound Approach	C	24.0	0.26
Hwy 22/Stayton-Mehama Road			
Eastbound Left	A	8.4	0.03
Westbound Left	A	8.9	0.10
Northbound Approach	D	29.5	0.59
Southbound Approach	C	23.6	0.13
City Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
SE Golf Club Road/Shaff Road			
Eastbound Approach	C	16.7	0.35
Westbound Approach	D	29.3	0.51
Northbound Approach	D	30.2	0.54
Southbound Approach	F	52.7	0.69
Shaff Road/N Gardner Road			
Westbound Left	A	8.8	0.05
Northbound Approach	E	37.9	0.68

Table 6-15. 2025 Alternative 3 Level of Service and V/C Ratio Continued

City Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Fern Ridge Road/N 3rd Avenue			
Eastbound Left	A	8.6	0.04
Northbound Left-Through	F	>100	>1.00
Northbound Through-Right	F	>100	>1.00
Fern Ridge Road/N 10th Avenue			
Westbound Left	A	8.0	0.02
Northbound Approach	B	13.4	0.24
N 1st Avenue/Regis Street			
Eastbound Approach	B	11.6	0.14
N 1st Avenue/Hollister Street			
Eastbound Approach	B	13.6	0.18
Westbound Approach	C	15.6	0.17
Southbound Left	A	7.3	0.04
N 1st Avenue/Locust Street			
Eastbound Right	B	12.0	0.21
SE Stayton Road/Washington Street/Wilco Road			
Eastbound Approach	C	15.3	0.52
Westbound Approach	B	13.7	0.48
Northbound Approach	B	14.8	0.32
Southbound Approach	C	18.1	0.51
W Washington Street/N Gardner Road			
Eastbound Left	A	8.4	0.08
Southbound Left	C	16.6	0.31
Southbound Right	A	9.7	0.08
N 3rd Avenue/Washington Street			
Eastbound Left	F	>100	>1.00
Westbound Left	F	>100	>1.00
Northbound Approach	A	7.6	0.13
N 10th Avenue/E Santiam Street			
Eastbound Approach	A	4.8	0.23
Westbound Approach	A	5.1	0.31
Northbound Approach	A	5.0	0.32
Southbound Approach	A	5.9	0.46
N 1st Avenue/Ida Street			
Eastbound Approach	B	10.3	0.50
Westbound Approach	A	9.6	0.27
Southbound Approach	B	11.2	0.56
SE Golf Club Road/Mill Creek Road			
Eastbound Approach	F	>100	>1.00
Westbound Approach	F	88.4	0.50
Northbound Left	A	9.6	0.17
Southbound Left	A	8.3	0.01
Cascade Highway/Whitney Street			
Eastbound Approach	C	21.7	0.31
Westbound Approach	C	15.5	0.21

The MUTCD peak hour signal warrant (Warrant #3) was chosen as a “screening” to determine candidate intersections for possible future signalization. Since the Stayton Emme/2 model only produces P.M. peak hour volumes, the peak hour warrant is the only warrant directly applicable at this level of planning analysis. The model does not provide traffic volumes for the highest eight/four hours of the day, therefore Warrants #1 and #2 for the 2025 Alternative 3 condition can not be directly analyzed at this time. Actual signalization should be based on future traffic engineering studies to determine whether the intersection meets the Eight Hour Warrants (MUTCD Warrant #1) and/or Four Hour Warrants (MUTCD Warrant #2).

Peak hour signal warrant analysis was performed at all intersections where turn lane improvements would not fully mitigate the LOS E/F or v/c ratio condition above the maximum standard. If the peak hour signal warrant was not met, then the intersection was not considered a candidate for signalization. The results of the peak hour signal warrant analysis for the 2025 Alternative 3 condition is shown in Table 6-16.

Table 6-16. 2025 Alternative 3 Signal Warrant Analysis

	Volume By Approach				Approach Volume Totals		Minor Volume Required to meet Warrant	Is Warrant Met?
Intersection	SB	NB	WB	EB	Major Approach Total	Minor Max		
Hwy 22 EB Ramps/Cascade Hwy	449	735	0	293	1,184	293	160	Yes
Golf Club Rd/Shaff Rd	505	345	316	218	850	316	260	Yes
Shaff Rd/Gardner Rd	0	181	397	493	890	181	250	No
Fern Ridge Rd/3rd Ave	0	657	269	383	652	657	345	Yes
3rd Ave/Washington St	0	632	284	367	632	367	360	Yes
Hwy 22 EB Ramps/Golf Club Rd	116	506	0	434	622	434	375	Yes
SE Golf Club Rd/Mill Creek Rd	551	627	28	164	1,178	164	160	Yes

Based on the results of the peak hour signal warrant analysis shown in Table 6-16, the following intersections are forecast to meet at least one MUTCD signal warrant by year 2025 and should be monitored by the City of Stayton over time to determine if and when signalization is warranted:

- Highway 22 Eastbound Ramps/Cascade Highway
- Golf Club Road/Shaff Road
- Fern Ridge Road/3rd Avenue
- 3rd Avenue/Washington Street
- Highway 22 Eastbound Ramps/Golf Club Road
- Golf Club Road/Mill Creek Road

Based on the Whitney Street/Cascade Highway Operation Analysis, it is recommended that the Cascade Highway/Whitney Street intersection be signalized. Per the Kittelson & Associates study, Golf Lane should be realigned to intersect Cascade Highway directly opposite Whitney

Street as part of the signalization improvement.

Although the Fern Ridge Road/3rd Avenue and Golf Club Road/Mill Creek Road intersections are projected to meet signal warrants in the 2025 Alternative 3 condition, the installation of these signals may not be advisable due to the close proximity of other signalized intersections in the future condition. At the time that signal warrants are met at these locations, a thorough traffic engineering study should be conducted to determine whether a traffic signal should be installed.

In addition to establishing locations that should be considered for signalization in the 2025 Alternative 3 condition, an analysis was undertaken to determine the need for additional turn lanes at the intersections with LOS E/F or v/c ratio conditions exceeding the established maximum standard of 0.85. The list below summarizes the necessary improvements to the sub-standard intersections identified in the analysis above including additional turn lanes and signalization.

- Highway 22 Eastbound Ramps/Cascade Highway – signalize and EB right turn lane
- Golf Club Road/Shaff Road – signalize, no additional turn lanes needed
- Shaff Road/Gardner Road – northbound right turn lane
- 3rd Avenue/Fern Ridge Road – signalize, no additional turn lanes needed
- 3rd Avenue/Washington Street – signalize, no additional turn lanes needed
- Highway 22 Eastbound Ramps/Golf Club Road – signalize and eastbound right turn lane
- Golf Club Road/Mill Creek Road – signalize, no additional turn lanes needed
- Cascade Highway/Whitney Street – signalize

Table 6-17 summarizes the levels of service and v/c ratios of the intersections listed above with their described intersection improvements. As shown in Table 6-17, all of the levels of service and v/c ratio conditions are mitigated with the proposed improvements. LOS E is acceptable at the Shaff Road/Gardner Road intersection since it is not projected to meet signal warrants.

Table 6-17. 2025 Alternative 3 Mitigation Levels of Service

	PM Peak Hour		
Signalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Hwy 22 Eastbound Ramps/Cascade Highway	C	21.5	0.81
SE Golf Club Road/Shaff Road	C	32.3	0.65
Fern Ridge Road/N 3rd Avenue	C	27.3	0.63
N 3rd Avenue/Washington Street	B	19.1	0.63
Hwy 22 Eastbound Ramps/Golf Club Road	B	17.4	0.48
SE Golf Club Road/Mill Creek Road	C	24.2	0.62
Unsignalized Intersection			
Shaff Road/N Gardner Road			
Westbound Left	A	8.8	0.05
Northbound Left	E	35.4	0.54
Northbound Right	B	12.5	0.14

6.6.6. 2025 Alternative 4 – Golf Club Road/Wilco Road Widening

6.6.6.a. Traffic Volumes

Alternative 4 was analyzed assuming that Golf Club Road and Wilco Road would be widened from their existing two lane configuration to five lanes. Figure 6-17 shows the 2025 P.M. peak hour traffic volumes for Alternative 4 based on the post-processed 2025 Alternative 4 model traffic volumes and assuming only the five-lane widening of Golf Club Road and Wilco Road as future improvements. These volumes were developed based on the Emme/2 model outputs and post processed based on the methodologies outlined in TRB report 255.

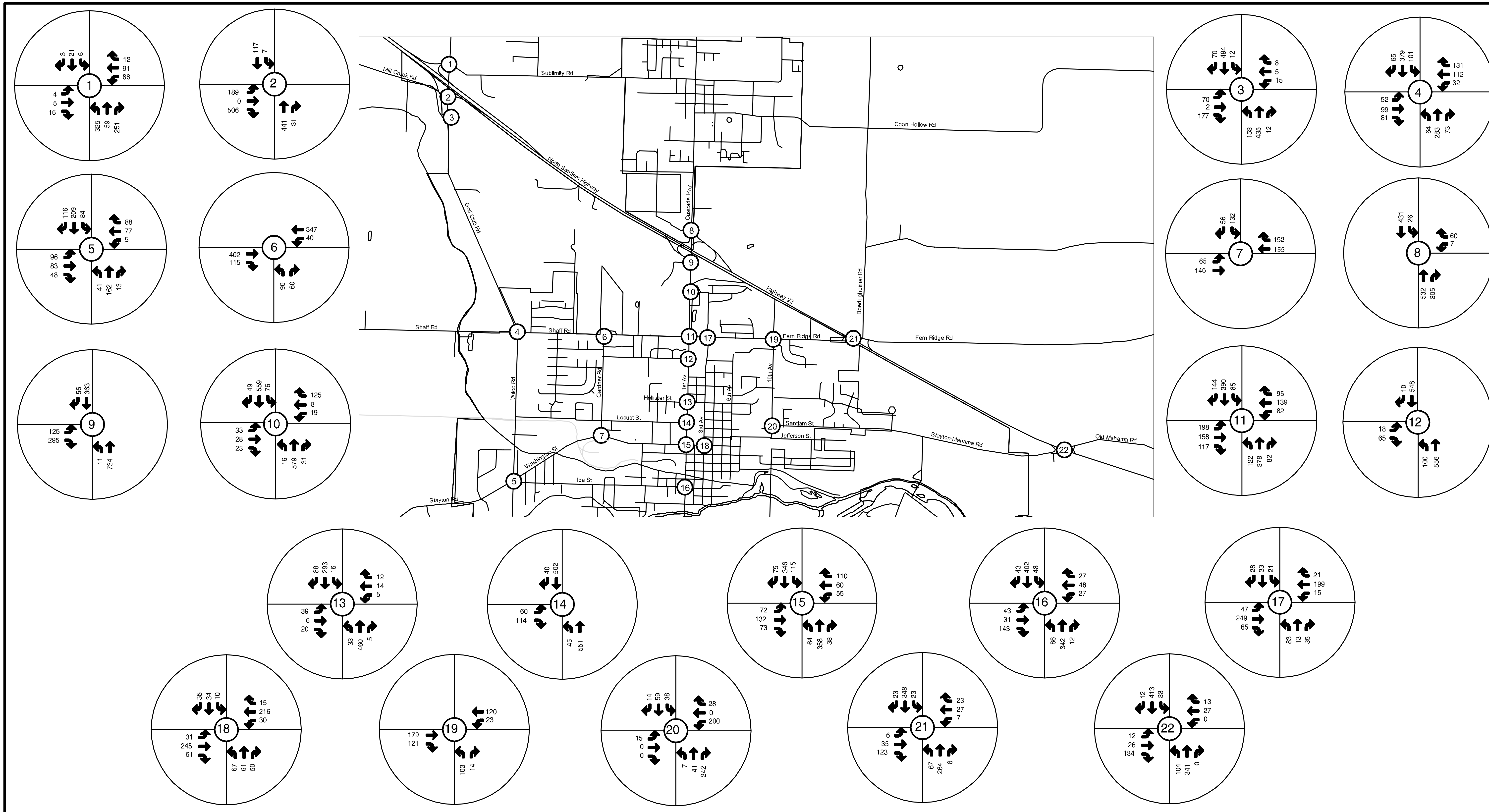
6.6.6.b. Volume to Capacity Ratio Analysis – Post Processed Roadway Link Volumes

Based on the post-processed turning movement volumes at the analysis intersections and roadway capacities used in the Emme/2 model, a v/c ratio was calculated for the roadways segments. This analysis is summarized in Figure 6-18. To facilitate analysis of the v/c ratios, the v/c ratios in Figure 6-18 are color coded. A v/c ratio within the maximum standard is coded in green. A v/c ratio exceeding the maximum v/c ratio to 1.00 is coded in yellow. V/C ratios exceeding 1.00 are coded in red.

For the v/c analysis, ODOT's standards were used. Highway 22 has a maximum v/c standard of 0.70. The local streets based on ODOT standards would have a maximum v/c ratio of 0.85. Intersections and ramp terminal v/c ratios will be discussed later in this section. Based on the v/c ratios in Figure 6-18, the following roadway segments indicate significant congestion:

- Cascade Highway north of Highway 22 Westbound Ramps to south of Locust Street – many of the sections are greater than 0.85 in both directions and range from 0.85 to 1.13

The v/c ratio analysis shows significant congestion along Cascade Highway/1st Avenue from north of the Highway 22 Westbound Ramps to south of Locust Street. The v/c ratios that exceed the maximum standard range from 0.85 to 1.13. The most congested area is Cascade Highway in the northbound direction of travel as it approaches the eastbound and westbound on-ramps to Highway 22. These v/c ratios are 0.98 approaching the eastbound on-ramp and 1.13 approaching the westbound on-ramp. These v/c ratios are 15 to 33 percent higher than the maximum allowed v/c ratio standard of 0.85. Most of the v/c ratio problems along Cascade Highway between the Highway 22 terminal ramps and Shaff Road/Fern Ridge Road could be mitigated by widening Cascade Highway to 5 lanes. For the roadway segments along 1st Avenue between Fern Ridge Road and Washington Street, most of the v/c ratios are only slightly above the maximum standard and may be mitigated by access management techniques. Only the section of 1st Avenue south of Regis Street in the northbound direction is much higher than the maximum standard with a v/c ratio of 0.94 and may require capacity improvements in addition to access management techniques. All other roadways modeled are projected to operate with v/c ratios well under the maximum v/c ratio standard of 0.85.



Stayton Transportation System Plan

Figure 6-17
2025 Alternative 4 - Golf Club Rd 5-Lane Widening Traffic Volumes

LEGEND
P.M. Peak Hour Traffic Volume

NOT TO SCALE

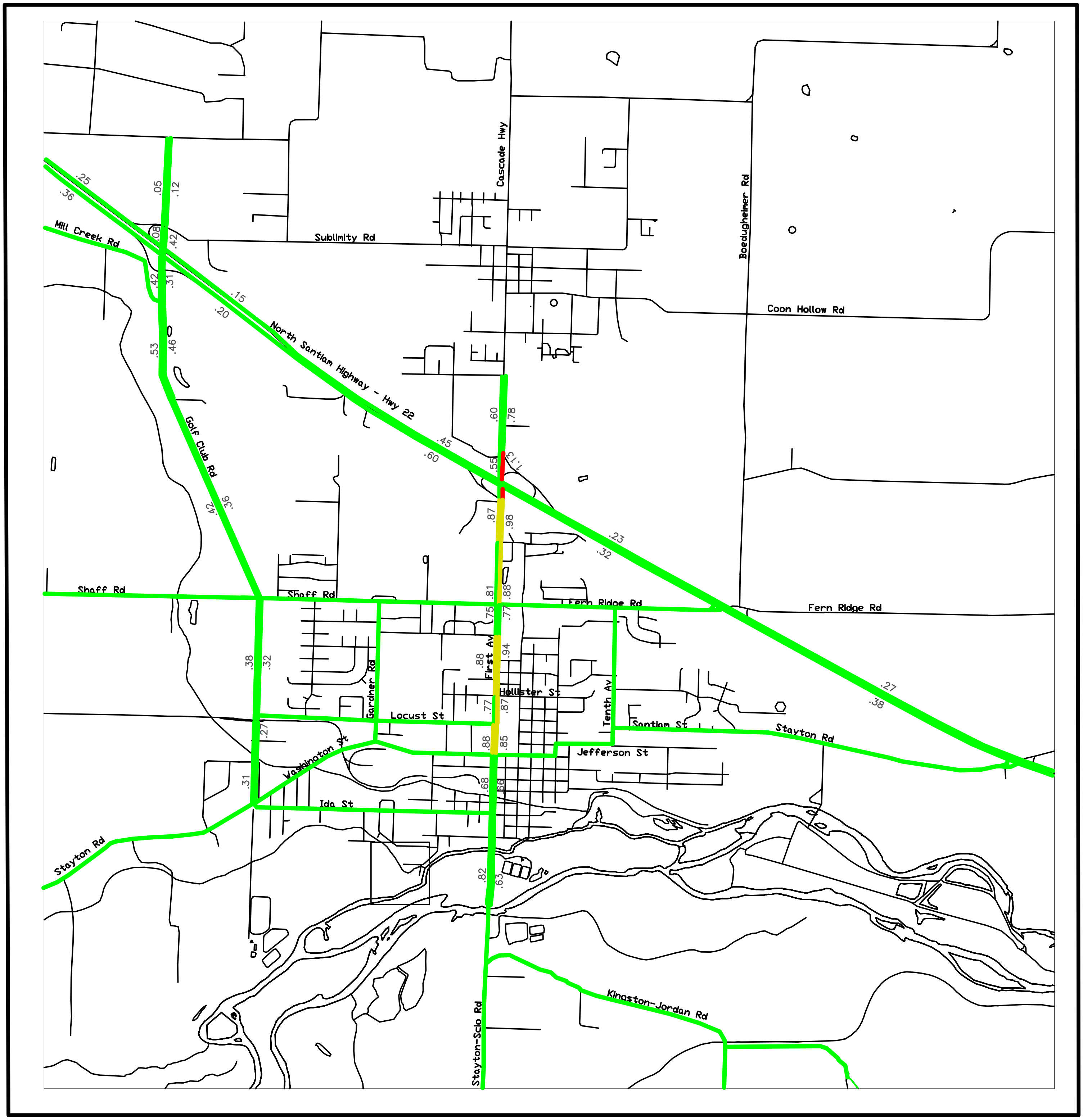


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Figure 6-18

2025 Alternative 4 - Golf Club Widening V/C Ratios

6.6.6.c. Intersection Level of Service and V/C Ratio Analysis

Levels of service and v/c analysis were conducted with the 2025 Alternative 4 peak hour traffic volumes to determine the performance of the system alternative and whether other improvements are necessary to support Alternative 4. Table 6-18 summarizes the level of service and v/c ratio analysis.

The two signalized intersections within Stayton are projected to operate at LOS D or better in the 2025 Alternative 4 condition and therefore no improvements are projected to be necessary.

Of the six ODOT intersections in the study area, the following two are projected to operate beyond the maximum v/c standard for unsignalized ramp terminal intersections:

- Highway 22 Eastbound Ramps/Cascade Highway – eastbound approach – V/C >1.00
- Highway 22 Eastbound Ramps/Golf Club Road – eastbound approach – V/C>1.00

The maximum v/c ratio standard for unsignalized ramp terminal intersections is 0.85. Both of the intersections above are projected to be well above this maximum standard. Improvements will be necessary to mitigate the 2025 Alternative 4 traffic.

There are four city unsignalized intersections projected to operate at LOS E or F. These intersections and their worst movements are listed below:

- 1st Avenue/Locust Street – eastbound approach – LOS E
- 1st Avenue/Ida Street – southbound approach – LOS F
- Golf Club Road/Mill Creek Road – eastbound and westbound approaches – LOS F/E
- Cascade Highway/Whitney Street – eastbound and westbound approaches – LOS F

Based on a comparison of traffic volumes at the Cascade Highway/Whitney Street intersection between the 2025 Alternative 4 weekday P.M. peak hour traffic volumes and the Kittelson & Associates study[7] of the Cascade Highway/Whitney Street intersection at full build out, the 2025 Emme/2 model may be under-generating traffic volumes. Based on the Kittelson & Associates study, the Cascade Highway/Whitney Street intersection would operate at LOS F in 2021 with a full build out of Santiam Station and would need a traffic signal. The Emme/2 model constructed for the TSP update did not have the capability to conduct special trip generation for special generators such as the Santiam Station. After the completion of the Stayton travel demand model, ODOT updated the model code structure to allow for special trip generation. Since this code was not available to implement within the schedule of the TSP update, it is suggested that consideration should be given to assume that the Cascade Highway/Whitney Street intersection would operate at LOS F in the 2025 Alternative 4.

[7] Whitney Street/Cascade Highway Operational Analysis, Kittelson & Associates, Inc., August 20, 2001.

Table 6-18. 2025 Alternative 4 Level of Service and V/C Ratio

	PM Peak Hour		
Signalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Cascade Highway/Shaff Road	D	43.5	0.81
N 1st Avenue/Washington Street	C	33.0	0.66
ODOT Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Hwy 22 Westbound Ramps/Cascade Highway			
Westbound Approach	C	19.9	0.24
Southbound Left	B	10.5	0.04
Hwy 22 Eastbound Ramps/Cascade Highway			
Eastbound Approach	F	>100	>1.00
Northbound Left	A	8.5	0.01
Hwy 22 Westbound Ramps/SE Golf Club Road			
Eastbound Left	E	39.9	0.04
Eastbound Through-Right	B	13.4	0.05
Westbound Left	D	34.3	0.46
Westbound Through-Right	D	31.4	0.48
Northbound Left	A	8.0	0.23
Southbound Left	A	8.0	0.01
Hwy 22 Eastbound Ramps/SE Golf Club Road			
Eastbound Approach	F	>100	>1.00
Northbound Left	A	8.6	0.01
Hwy 22/Fern Ridge Road			
Eastbound Left	A	8.0	0.02
Westbound Left	A	8.6	0.07
Northbound Approach	C	19.3	0.44
Southbound Approach	C	21.5	0.23

Table 6-18. 2025 Alternative 4 Level of Service and V/C Ratio Continued

City Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Hwy 22/Stayton-Mehama Road			
Eastbound Left	A	8.3	0.03
Westbound Left	A	8.9	0.12
Northbound Approach	D	29.6	0.59
Southbound Approach	D	28.0	0.23
SE Golf Club Road/Shaff Road			
Eastbound Approach	C	16.8	0.37
Westbound Approach	C	21.5	0.44
Northbound Approach	C	19.1	0.55
Southbound Approach	D	25.8	0.69
Shaff Road/N Gardner Road			
Westbound Left	A	8.9	0.05
Northbound Approach	D	31.0	0.57
Fern Ridge Road/N 3rd Avenue			
Eastbound Left	A	7.9	0.04
Westbound Left	A	8.1	0.01
Northbound Approach	C	23.2	0.44
Southbound Approach	C	17.4	0.25
Fern Ridge Road/N 10th Avenue			
Westbound Left	A	8.1	0.02
Northbound Approach	B	13.7	0.25
N 1st Avenue/Regis Street			
Eastbound Approach	C	24.7	0.35
Northbound Left	A	9.5	0.13
N 1st Avenue/Hollister Street			
Eastbound Approach	D	27.6	0.32
Westbound Approach	C	20.8	0.13
Northbound Left	A	8.4	0.03
Southbound Left	A	8.6	0.02
N 1st Avenue/Locust Street			
Eastbound Approach	E	39.8	0.68
Northbound Left	A	9.0	0.05
SE Stayton Road/Washington Street/Wilco Road			
Eastbound Approach	B	14.7	0.51
Westbound Approach	B	12.6	0.44
Northbound Approach	B	12.1	0.34
Southbound Approach	B	14.1	0.49

Table 6-18. 2025 Alternative 4 Level of Service and V/C Ratio Continued

City Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
W Washington Street/N Gardner Road			
Eastbound Left	A	8.2	0.06
Southbound Left	C	15.6	0.31
Southbound Right	A	9.6	0.08
N 3rd Avenue/Washington Street			
Eastbound Left	A	7.9	0.02
Westbound Left	A	8.1	0.03
Northbound Approach	D	30.8	0.61
Southbound Approach	C	16.7	0.23
N 10th Avenue/E Santiam Street			
Eastbound Approach	A	5.1	0.25
Westbound Approach	A	5.0	0.28
Northbound Approach	A	5.5	0.39
Southbound Approach	A	6.5	0.50
N 1st Avenue/Ida Street			
Eastbound Approach	C	17.0	0.52
Westbound Approach	B	13.7	0.32
Northbound Approach	D	31.2	0.61
Southbound Approach	F	62.9	0.70
SE Golf Club Road/Mill Creek Road			
Eastbound Approach	F	95.8	1.01
Westbound Approach	E	41.8	0.29
Northbound Left	A	9.7	0.17
Southbound Left	A	8.2	0.01
Cascade Highway/Whitney Street			
Eastbound Approach	F	>100	>1.00
Westbound Approach	F	83.1	0.88
Northbound Left	A	9.2	0.02
Southbound Left	A	9.6	0.10

The MUTCD peak hour signal warrant (Warrant #3) was chosen as a “screening” to determine candidate intersections for possible future signalization. Since the Stayton Emme/2 model only produces P.M. peak hour volumes, the peak hour warrant is the only warrant directly applicable at this level of planning analysis. The model does not provide traffic volumes for the highest eight/four hours of the day, therefore Warrants #1 and #2 for the 2025 Alternative 4 condition can not be directly analyzed at this time. Actual signalization should be based on future traffic engineering studies to determine whether the intersection meets the Eight Hour Warrants (MUTCD Warrant #1) and/or Four Hour Warrants (MUTCD Warrant #2).

Peak hour signal warrant analysis was performed at all intersections where turn lane improvements would not fully mitigate the LOS E/F or v/c ratio condition above the maximum standard. If the peak hour signal warrant was not met, then the intersection was not considered a candidate for signalization. The results of the peak hour signal warrant analysis for the 2025 Alternative 4 condition is shown in Table 6-19.

Table 6-19. 2025 Alternative 4 Signal Warrant Analysis

Intersection	Volume By Approach				Approach Volume Totals		Minor Volume Required to meet Warrant	Is Warrant Met?
	SB	NB	WB	EB	Major Approach Total	Minor Max		
Hwy 22 EB Ramps/Cascade Hwy	419	745	0	273	1,164	273	165	Yes
1st Ave/Locust St	542	596	0	174	1,138	174	170	Yes
1st Ave/Ida St	493	440	102	217	933	217	230	No
Hwy 22 WB Ramps/Golf Club Rd	124	472	0	442	596	442	385	Yes
Golf Club Rd/Mill Creek Rd	576	600	28	161	1,176	161	160	Yes
Cascade Hwy/Whitney St	684	626	90	84	1,310	90	130	No

Based on the results of the peak hour signal warrant analysis shown in Table 6-19, the following intersections are forecast to meet at least one MUTCD signal warrant by year 2025 and should be monitored by the City of Stayton over time to determine if and when signalization is warranted:

- Highway 22 Eastbound Ramps/Cascade Highway
- 1st Avenue/Locust Street
- Highway 22 Eastbound Ramps/Golf Club Road
- Golf Club Road/Mill Creek Road

Although the Golf Club Road/Mill Creek Road intersection is projected to meet signal warrants in the 2025 Alternative 4 condition, the installation of this signal may not be advisable due to the close proximity of another signalized intersection at the Highway 22 Eastbound Ramps/Golf Club Road intersection in the future condition. At the time that signal warrants are met at this location a thorough traffic engineering study should be conducted to determine whether a traffic signal should be installed.

Although, the Cascade Highway/Whitney Street intersection did not meet signal warrants based on the post-processed model traffic volumes for Alternative 4, based on the Whitney Street/Cascade Highway Operation Analysis it is recommended that the Cascade Highway/Whitney Street intersection be signalized. Per the Kittelson & Associates study, Golf Lane should be realigned to intersect Cascade Highway directly opposite Whitney Street as part of the signalization improvement.

In addition to establishing locations that should be considered for signalization in the 2025 Alternative 4 condition, an analysis was undertaken to determine the need for additional turn lanes at the intersections with LOS E/F or v/c ratio conditions exceeding the established maximum standard of 0.85. The list below summarizes the necessary improvements to the sub-standard intersections identified in the analysis above including additional turn lanes and signalization.

- Highway 22 Eastbound Ramps/Cascade Highway – signalize and EB right turn lane
- 1st Avenue/Locust Street – signalize, no additional turn lanes needed
- 1st Avenue/Ida Street – eastbound right turn lane
- Highway 22 Eastbound Ramps/Golf Club Road – eastbound right turn lane
- Golf Club Road/Mill Creek Road – signalize, no additional turn lanes needed
- Cascade Highway/Whitney Street – signalize, add eastbound and westbound left turn lanes

Table 6-20 summarizes the levels of service and v/c ratios of the intersections listed above with their described intersection improvements. As shown in Table 6-20, all of the levels of service and v/c ratio conditions are mitigated with the proposed improvements with the exception of the 3rd Avenue/Washington and 1st Avenue/Ida Street intersections. With the addition of northbound left turn lane, the northbound left turn movement at the 3rd Avenue/Washington Street intersection would still operate at LOS E. Since the intersection would not meet signal warrants, based on the level of service standards, this condition is acceptable. The southbound approach of the 1st Avenue/Ida Street intersection is projected to operate at LOS F even with the addition of an eastbound right turn lane. The 1st Avenue/Ida Street intersection is not projected to meet signal warrants and therefore the standard is LOS E. Since the intersection is already a four-way stop, no other improvement measures are proposed. At the time the intersection meets signal warrants, it should be signalized to improve the LOS F condition.

Table 6-20. 2025 Alternative 4 Mitigation Levels of Service

	PM Peak Hour		
Signalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Hwy 22 Eastbound Ramps/Cascade Highway	B	19.8	0.79
SE Golf Club Road/Mill Creek Road	C	26.0	0.64
N 1st Avenue/Locust Street	B	13.9	0.59
Hwy 22 Eastbound Ramps/Golf Club Road	B	17.5	0.48
Cascade Highway/Whitney Street	C	21.2	0.61
Unsignalized Intersection			
N 1st Avenue/Ida Street			
Eastbound Left	B	13.5	0.34
Westbound Approach	B	13.9	0.32
Northbound Approach	D	29.5	0.60
Southbound Approach	F	58.5	0.70

6.6.7. EVALUATION OF ALTERNATIVES

Table 6-21 compares all of the future alternatives based on their v/c impact along critical sections of roadway that are projected to be congested in the 2025 No Build condition.

Table 6-21. Alternative Comparisons of V/C Ratios

Location	Alternative				
	No Build	**1st Widening**	**By-Pass**	**1st/3rd Couplet**	**Golf Club Widening**
Cascade Hwy north of Hwy 22 EB Ramps	**0.54/1.18**	0.30/0.59	0.58/1.09	0.30/0.55	0.55/1.13
First Av south of Shaff Rd	**0.81/0.84**	0.43/0.43	0.72/0.73	0.46/0.00	0.75/0.77
Golf Club Rd south of Mill Creek Rd	**1.03/0.86**	1.01/0.87	1.14/0.97	1.01/0.96	0.53/0.46
Highway 22 west of Cascade Hwy	**0.60/0.45**	0.62/0.47	0.55/0.41	0.62/0.45	0.60/0.45
Highway 22 east of Stayton-Mehama Rd	**0.44/0.36**	0.44/0.36	0.44/0.36	0.44/0.36	0.44/0.36

The First Avenue Widening Alternative is projected to have a dramatic improvement in future traffic congestion. The Cascade Highway/First Avenue v/c ratios improve upwards of 40 to 50 percent from the No Build condition. With so much additional capacity created along the Cascade Highway/First Avenue corridor, a moderate amount of Golf Club Road/Wilco Road traffic would shift to it. The only area this alternative does not help is Golf Club Road south of Mill Creek Road. The traffic congestion along Golf Club Road south of Mill Creek Road is primarily due to a significant increase in future housing along Golf Club Road.

As shown in Table 6-21, the By-Pass Alternative only has moderate effects on most of the critical v/c ratio locations. The By-Pass Alternative shift upwards of 10 percent of traffic away from the Cascade Highway/1st Avenue corridor. Most of this shift would be in truck traffic by-passing central Stayton or external trips traveling through the area. This shift in traffic is almost enough for the 1st Avenue section of the corridor to operate within the maximum v/c ratio of 0.85. Several sections along Cascade Highway/1st Avenue are above the maximum standard. The sections of Cascade Highway from the Highway 22 Westbound Ramps to Whitney Street are projected to operate with v/c ratios between 0.94 and 1.09 in the northbound direction. The 1st Avenue section south of Regis Street in the northbound direction is projected to operate at a v/c ratio of 0.90. In comparison, the v/c ratios along Golf Club Road and Wilco Road worsen from 11 to 13 percent of the 2025 No Build levels. Approximately 10 to 15 percent more capacity could be realized along the Golf Club Road/Wilco Road corridor by adding a center left turn lane and implementing access management practices to maintain the through capacity of the roadway. This may be enough to mitigate the v/c ratios to an acceptable level. The by-pass alternative could also be combined with the Golf Club Road widening alternative to create the needed capacity to mitigate the high v/c ratios. If this created more capacity along the Golf Club Road/Wilco Road corridor, then a greater shift from Cascade Highway/First Avenue may be achievable. It should be noted that about one third of the Santiam Bridge traffic would divert to the new bridge crossing under the By-Pass Alternative. The By-Pass Alternative helps reduce traffic volumes on Highway 22 between Golf Club Road and Cascade Highway. It should be noted that the By-Pass Alternative is likely an improvement beyond the 2025 planning period. Also, alternatives to the By-Pass Alternative could be another Santiam River bridge crossing elsewhere such as Aumsville.

The First/Third Avenue Couplet Alternative is very similar in performance to the First Avenue Widening Alternative. The maximum Cascade Highway/First Avenue v/c would be 0.55. Traffic would shift away from the Golf Club Road/Wilco Road corridor to Cascade Highway/First Avenue in the southbound direction during the P.M. peak hour. The only area this alternative does not help is Golf Club Road south of Mill Creek Road. The traffic congestion along Golf Club Road south of Mill Creek Road is primarily due to a significant increase in future housing along Golf Club Road.

The Golf Club Widening Alternative reduces the v/c ratio along Golf Club Road and Cascade Highway/First Avenue. The v/c ratio along Golf Club Road is reduced by almost half at most locations. The v/c ratio along Cascade Highway/First Avenue is reduced from 0 to approximately 11 percent depending on the location. With an access management policy enforced along Cascade Highway and 1st Avenue, the 2025 traffic may be managed such that the v/c ratio standard may be met.

Table 6-22 evaluates the alternatives against each other based on traffic operation improvements at key roadway sections, right-of-way issues, and environmental issues. All of the alternatives have their advantages and disadvantages. No alternative has the advantage in every area.

The major advantage of the 1st Avenue Widening Alternative is that it helps reduce congestion in every congested area with the exception of Golf Club Road south of Mill Creek Road. The major disadvantage is that it may displace up to 18 businesses along 1st Avenue and therefore may be very difficult to get the support of the community. With all of its right-of-way needs, it may not be very feasible to construct. Minor environmental issues exist.

The By-Pass Alternative has two distinct advantages. First, it would significantly reduce any future congestion at the existing Santiam River Bridge along 1st Avenue. Second, truck traffic through the central commercial district and residential neighborhoods would be reduced significantly. The major disadvantage of the By-Pass Alternative is that it does not have a big impact in reducing congestion elsewhere in Stayton and any new alignment across the Santiam River has significant environmental and constructability issues. Another major issue with the By-Pass Alternative is that it is an improvement beyond the 2025 planning period and is outside the urban growth boundary. The By-Pass Alternative should be studied in the future in the larger context of another Santiam River bridge crossing. An alternative to the By-Pass Alternative could be another river crossing in the vicinity of Aumsville.

The 1st/3rd Avenue Couplet alternative has a similar advantage as the 1st Avenue Widening Alternative in that almost all congested areas of Stayton experience improvement in travel times. The disadvantages of the 1st/3rd Avenue Couplet Alternative is that the termini points to the north and south are built out and make the transition to the couplet difficult. One of the most viable solutions is to compromise and construct an enhanced 90 degree connection at both ends of the couplet. This obviously would reduce some of the couplet's effectiveness. Although the Couplet Alternative is not likely to need any right-of-way along its alignment other than the termini points, the northbound couplet alignment does run parallel with several historic buildings as well as the local cemetery. Also, the 3rd Avenue portion of the couplet goes through a residential area and noise may be an impact to the residences in this neighborhood.

The Golf Club Road/Wilco Road Widening Alternative almost diverts enough traffic away from the section of 1st Avenue between Shaff Road/Fern Ridge Road and Washington Street. However, it does not significantly help Cascade Highway from Highway 22 to Shaff Road/Fern Ridge Road. The Golf Club Road/Wilco Road Widening Alternative reduces traffic on Highway 22 between Golf Club Road to Cascade Highway almost enough for the v/c ratio standard to be met. It seems that the Golf Club Road/Wilco Road Widening Alternative almost does what it is intended to do but still falls short of reducing congestion sufficiently to meet the v/c standards.

Since no one alternative has a decisive advantage over the other due to construction constraints and effectiveness, a fifth option may need to be explored. The 2025 modeling indicates that in the year 2025, the City of Stayton may just start entering into a situation where system-wide improvements are needed. In the interim, the City may want to focus on spot improvements to mitigate isolated congestion problems identified in the 2025 No Build analysis. These interim improvements may be sufficient to minimize congestion through most of the planning horizon.

Table 6-22. Evaluation of Alternatives

	Alternative				
Evaluation Criteria	**No Build**	**1st Widening**	**By-Pass**	**1st/3rd Couplet**	**Golf Club Road Widening**
Improve v/c on Cascade Hwy/First Av	**NA**	Significan t	Moderate	Significant	Moderate
Improve v/c on Golf Club Rd	**NA**	Moderate	No	Moderate	Significant
Improve v/c on Highway 22	**NA**	No	Yes	No	Yes
Reduction of truck traffic along 1st Av	**NA**	No	Yes	No	Yes
Right of way Issues	**NA**	Significan t and may be difficult to obtain	Significant amount needed to be obtained but obtainable	Minimal along alignment but very significant at the two termini points	Significant amount may need to be obtained but it is very obtainable
Constructability	**NA**	Marginal	Marginal	Good along alignment but marginal at the termini points	Good
Environmental Issues	**NA**	Minimal	Significant due to Santiam River crossing	Historic Buildings, noise in residential areas	Minimal

6.6.8. PREFERRED ALTERNATIVE

6.6.8.a. Preferred Alternative Description

Based on the alternatives analysis, a preferred alternative has been developed. This preferred alternative takes the best components of the four alternatives. The preferred alternative is described below and depicted in Figure 6-19.

- Golf Club Road – widen to 5-lanes from Highway 22 Westbound Ramps to Shaff Road
- Cascade Highway/1st Avenue – widen to 5 lanes from Highway 22 Westbound Ramps to Regis Street
- Highway 22 Interchange with Cascade Highway – rebuild to a diamond interchange

The Golf Club Road widening is necessary primarily to serve residential growth associated with vacant residential land east of Golf Club Road. The Cascade Highway/1st Avenue widening is necessary to serve adjacent residential and commercial development as well as serve city-wide traffic destined to and from Highway 22. Due to significant increase in traffic along the Cascade Highway/1st Avenue corridor, the Highway 22 interchange will need to be reconstructed to meet the future traffic demands. In conjunction with these improvements, 1st Avenue should be under an access management program to preserve and better manage its traffic.

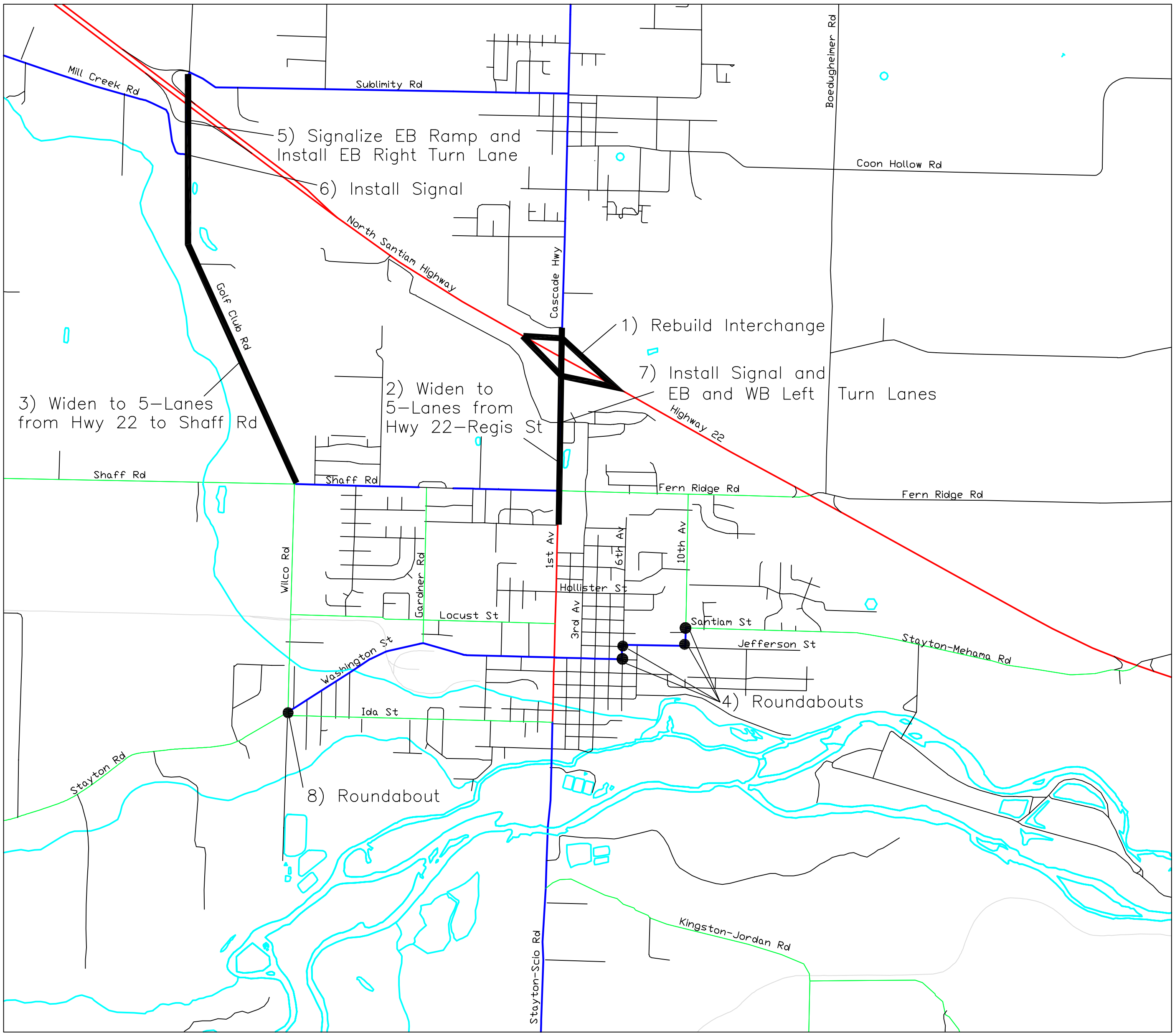
6.6.8.b. Traffic Volumes

Figure 6-20 shows the 2025 P.M. peak hour traffic volumes for Alternative 5 based on the post-processed 2025 Alternative 5 model traffic volumes based on the improvements identified above. These volumes were developed based on the Emme/2 model outputs and post processed based on the methodologies outlined in TRB Report 255.

6.6.8.c. Volume to Capacity Ratio Analysis – Post Processed Roadway Link Volumes

Based on the post-processed turning movement volumes at the analysis intersections and roadway capacities used in the Emme/2 model, a v/c ratio was calculated for the roadways segments. This analysis is summarized in Figure 6-21. To facilitate analysis of the v/c ratios, the v/c ratios in Figure 6-21 are color coded. A v/c ratio within the maximum standard is coded in green. A v/c ratio exceeding the maximum v/c ratio to 1.00 is coded in yellow. V/C ratios exceeding 1.00 are coded in red.

For the v/c analysis, ODOT's standards were used. Highway 22 has a maximum v/c standard of 0.70. The local streets based on ODOT standards would have a maximum v/c ratio of 0.85. Intersections and ramp terminal v/c ratios will be discussed later in this section. Based on the v/c ratios in Figure 6-21, the following roadway segments indicate significant congestion:



Stayton Transportation System Plan

Figure 6-19
Preferred Alternative

LEGEND

New Roadway Alignment

NOT TO SCALE

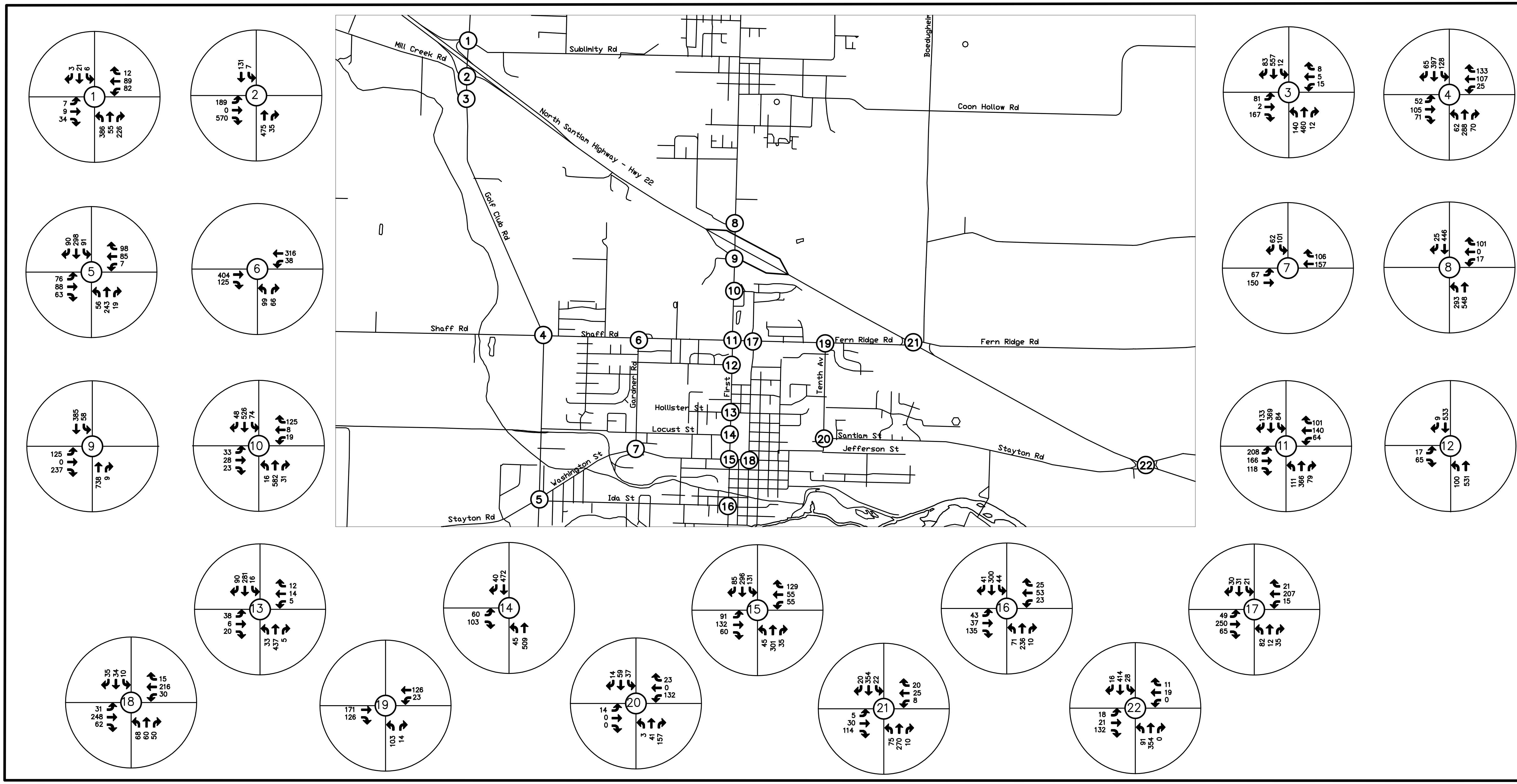


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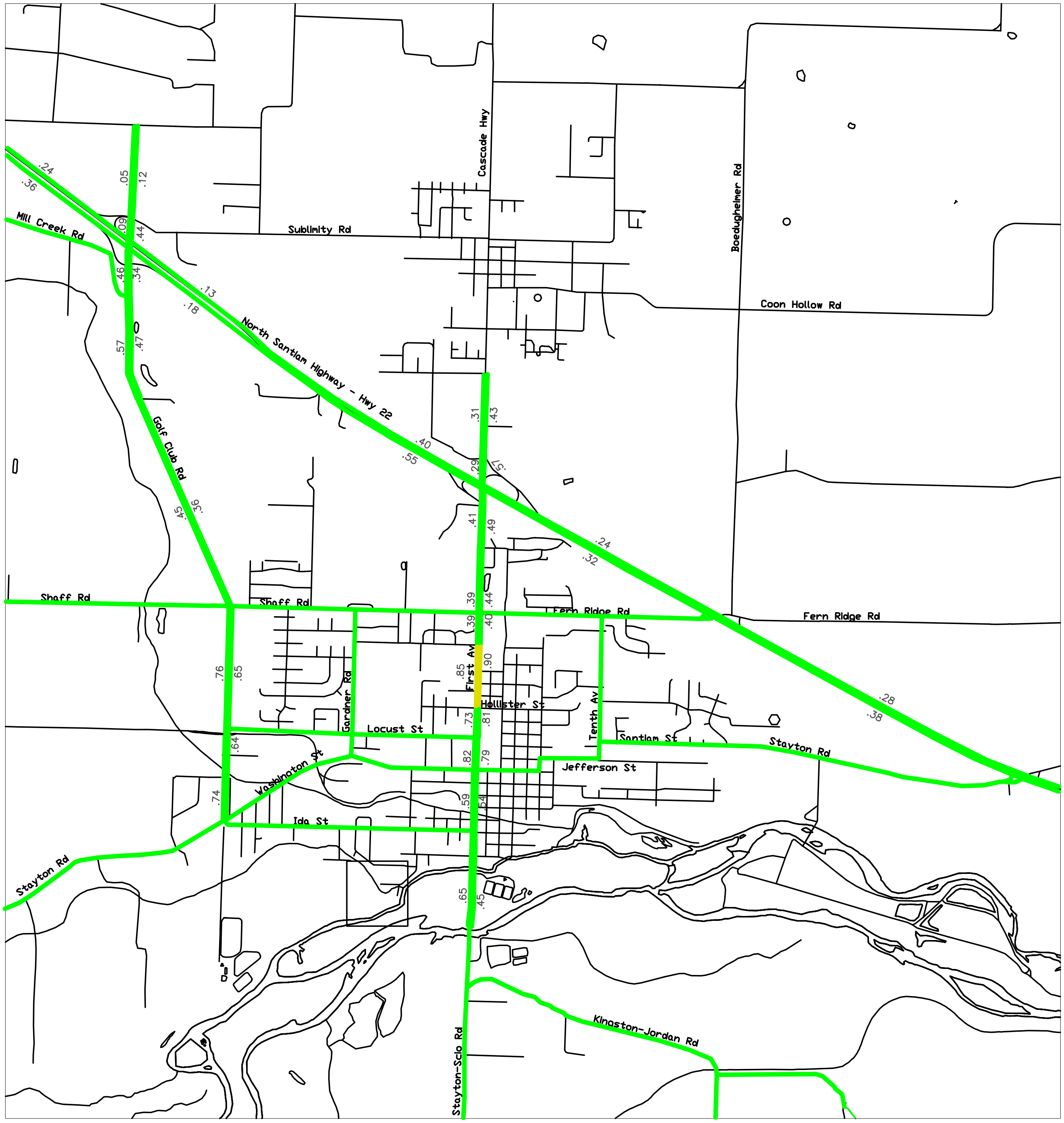
Figure 6-20
Alternative 5 Weekday P.M. Peak Hour Traffic Volumes

LEGEND

P.M. Peak Hour Traffic Volume

NOT TO SCALE



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LEGEND

- V/C = >1.0
- V/C = 0.81–1.0
- V/C = <0.80

NOT TO SCALE

Figure 6-21

2025 Alternative 5 - Preferred Alternative V/C Ratios

- 1st Avenue southbound – south of Regis Street – v/c ratio = 0.85
- 1st Avenue northbound – south of Regis Street – v/c ratio = 0.90

The segments along 1st Avenue identified above have v/c ratios equal to the maximum v/c ratio standard or approximately six percent above the maximum standard. No mitigation is being proposed to mitigate this situation because it is likely that with stricter access management along 1st Avenue the v/c ratios would sufficiently improve to less than the maximum standard.

All other roadways modeled are projected to operate with v/c ratios well under the maximum v/c ratio standard of 0.85.

6.6.8.d. Intersection Level of Service and V/C Ratio Analysis

Levels of service and v/c analysis were conducted with the 2025 Alternative 5 peak hour traffic volumes to determine the performance of the system alternative and whether other improvements are necessary to support Alternative 5. Table 6-23 summarizes the level of service and v/c ratio analysis.

The two signalized intersections within Stayton are projected to operate at LOS C or better in the 2025 Alternative 5 condition and therefore no improvements are projected to be necessary.

Of the six ODOT intersections in the study area, the following two are projected to operate beyond the maximum V/C standard for unsignalized ramp terminal intersections:

- Highway 22 Eastbound Ramps/Cascade Highway – eastbound approach – v/c = 0.99
- Highway 22 Eastbound Ramps/Golf Club Road – eastbound approach – v/c > 1.00

The maximum V/C ratio standard for unsignalized ramp terminal intersections is 0.85. Both of the intersections above are projected to be well above this maximum standard. Improvements will be necessary to mitigate the 2025 Alternative 5 traffic.

There are three city unsignalized intersections projected to operate at LOS E or F. These intersections and their worst movements are listed below:

- Stayton Road/Washington Street/Wilco Street - southbound approach – LOS F
- Golf Club Road/Mill Creek Road – eastbound and westbound approaches – LOS F/E
- Cascade Highway/Whitney Street – eastbound and westbound approaches – LOS F

Table 6-23. 2025 Alternative 5 Level of Service and V/C Ratio

	PM Peak Hour		
Signalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Cascade Highway/Shaff Road	C	31.2	0.60
N 1st Avenue/Washington Street	C	32.0	0.65
ODOT Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
Hwy 22 Westbound Ramps/Cascade Highway			
Westbound Approach	D	30.4	0.50
Southbound Left	B	10.5	0.35
Hwy 22 Eastbound Ramps/Cascade Highway			
Eastbound Approach	F	75.9	0.99
Northbound Left	B	10.2	0.09
Hwy 22 Westbound Ramps/SE Golf Club Road			
Eastbound Left	F	58.7	0.09
Eastbound Through-Right	B	14.5	0.11
Westbound Left	F	59.0	0.63
Westbound Through-Right	E	45.2	0.58
Northbound Left	A	8.1	0.27
Southbound Left	A	7.9	0.01
Hwy 22 Eastbound Ramps/SE Golf Club Road			
Eastbound Approach	F	>100	>1.00
Northbound Left	A	8.7	0.01
Hwy 22/Fern Ridge Road			
Eastbound Left	A	8.1	0.02
Westbound Left	A	8.6	0.08
Northbound Approach	C	18.4	0.39
Southbound Approach	C	22.8	0.23
Hwy 22/Stayton-Mehama Road			
Eastbound Left	A	8.3	0.03
Westbound Left	A	8.9	0.10
Northbound Approach	D	28.9	0.58
Southbound Approach	C	24.6	0.16

Table 6-23. 2025 Alternative 5 Level of Service and V/C Ratio Continued

City Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
SE Golf Club Road/Shaff Road			
Eastbound Approach	C	16.8	0.36
Westbound Approach	C	21.7	0.43
Northbound Approach	C	19.3	0.55
Southbound Approach	D	31.2	0.74
Shaff Road/N Gardner Road			
Westbound Left	A	9.0	0.05
Northbound Approach	D	29.0	0.55
Fern Ridge Road/N 3rd Avenue			
Eastbound Left	A	7.9	0.04
Westbound Left	A	8.1	0.01
Northbound Approach	C	23.7	0.44
Southbound Approach	C	17.5	0.25
Fern Ridge Road/N 10th Avenue			
Westbound Left	A	8.1	0.02
Northbound Approach	B	13.7	0.25
N 1st Avenue/Regis Street			
Eastbound Approach	C	20.7	0.29
Northbound Left	A	9.5	0.13
N 1st Avenue/Hollister Street			
Eastbound Approach	D	25.6	0.30
Westbound Approach	C	19.8	0.13
Northbound Left	A	8.4	0.03
Southbound Left	A	8.5	0.02
N 1st Avenue/Locust Street			
Eastbound Approach	D	32.4	0.60
Northbound Left	A	8.9	0.05
SE Stayton Road/Washington Street/Wilco Road			
Eastbound Approach	C	20.7	0.61
Westbound Approach	B	17.9	0.52
Northbound Approach	D	31.7	0.52
Southbound Approach	F	53.5	0.68

Table 6-23. 2025 Alternative 5 Level of Service and V/C Ratio Continued

City Unsignalized Intersection	LOS	Average Delay (sec)	V/C Ratio
W Washington Street/N Gardner Road			
Eastbound Left	A	8.1	0.06
Southbound Left	B	14.8	0.24
Southbound Right	A	9.6	0.08
N 3rd Avenue/Washington Street			
Eastbound Left	A	7.9	0.03
Westbound Left	A	8.1	0.03
Northbound Approach	D	31.1	0.61
Southbound Approach	C	16.8	0.23
N 10th Avenue/E Santiam Street			
Eastbound Approach	A	5.3	0.25
Westbound Approach	A	4.9	0.27
Northbound Approach	A	5.6	0.40
Southbound Approach	A	6.9	0.53
N 1st Avenue/Ida Street			
Eastbound Approach	B	13.8	0.50
Westbound Approach	B	11.7	0.32
Northbound Approach	C	15.3	0.43
Southbound Approach	C	21.7	0.53
SE Golf Club Road/Mill Creek Road			
Eastbound Approach	F	>100	>1.00
Westbound Approach	E	45.9	0.31
Northbound Left	B	10.1	0.17
Southbound Left	A	8.3	0.01
Cascade Highway/Whitney Street			
Eastbound Approach	F	>100	>1.00
Westbound Approach	F	72.8	0.84
Northbound Left	A	9.1	0.02
Southbound Left	A	9.6	0.10

Based on a comparison of traffic volumes at the Cascade Highway/Whitney Street intersection between the 2025 Alternative 5 weekday P.M. peak hour traffic volumes and the Kittelson & Associates study[8] of the Cascade Highway/Whitney Street intersection at full build out, the 2025 Emme/2 model may be under-generating traffic volumes. Based on the Kittelson & Associates

[8] Whitney Street/Cascade Highway Operational Analysis, Kittelson & Associates, Inc., August 20, 2001.

study, the Cascade Highway/Whitney Street intersection would operate at LOS F in 2021 with a full build out of Santiam Station and would need a traffic signal. The Emme/2 model constructed for the TSP update did not have the capability to conduct special trip generation for special generators such as the Santiam Station. After the completion of the Stayton travel demand model, ODOT updated the model code structure to allow for special trip generation. Since this code was not available to implement within the schedule of the TSP update, it is suggested that consideration should be given to assume that the Cascade Highway/Whitney Street intersection would operate at LOS F in the 2025 Alternative 5.

The MUTCD peak hour signal warrant (Warrant #3) was chosen as a "screening" to determine candidate intersections for possible future signalization. Since the Stayton Emme/2 model only produces PM peak hour volumes, the peak hour warrant is the only warrant directly applicable at this level of planning analysis. The model does not provide traffic volumes for the highest eight/four hours of the day, therefore Warrants #1 and #2 for the 2025 Alternative 5 condition can not be directly analyzed at this time. Actual signalization should be based on future traffic engineering studies to determine whether the intersection meets the Eight Hour Warrants (MUTCD Warrant #1) and/or Four Hour Warrants (MUTCD Warrant #2).

Peak hour signal warrant analysis was performed at all intersections where turn lane improvements would not fully mitigate the LOS E/F or v/c ratio condition above the maximum standard. If the peak hour signal warrant was not met, then the intersection was not considered a candidate for signalization. The results of the peak hour signal warrant analysis for the 2025 Alternative 5 condition is shown in Table 6-24.

Table 6-24. 2025 Alternative 5 Signal Warrant Analysis

	Volume By Approach				Approach Volume Totals		Minor Volume Required to meet Warrant	Is Warrant Met?
Intersection	SB	NB	WB	EB	Major Approach Total	Minor Max		
Hwy 22 EB Ramps/Cascade Hwy	443	747	0	244	1,190	244	160	Yes
SE Stayton Rd/Washington Street	479	318	190	227	797	227	290	No
Hwy 22 EB Ramps/Golf Club Rd	138	510	0	474	648	474	211	Yes
Golf Club Rd/Mill Creek Rd	652	612	28	167	1,264	167	140	Yes
Cascade Hwy/Whitney St	648	629	90	84	1,277	90	135	No

Based on the results of the peak hour signal warrant analysis shown in Table 6-24, the following intersections are forecast to meet at least one MUTCD signal warrant by year 2025 and should be monitored by the City of Stayton over time to determine if and when signalization is warranted:

- Highway 22 Eastbound Ramps/Cascade Highway
- Highway 22 Eastbound Ramps/Golf Club Road

- Golf Club Road/Mill Creek Road

Although the Golf Club Road/Mill Creek Road intersection is projected to meet signal warrants in the 2025 Alternative 4 condition, the installation of this signal may not be advisable due to the close proximity of another signalized intersection at the Highway 22 Eastbound Ramps/Golf Club Road intersection in the future condition. At the time that signal warrants are met at this location a thorough traffic engineering study should be conducted to determine whether a traffic signal should be installed.

Although, the Cascade Highway/Whitney Street intersection did not meet signal warrants based on the post-processed model traffic volumes for Alternative 5, based on the Whitney Street/Cascade Highway Operation Analysis it is recommended that the Cascade Highway/Whitney Street intersection be signalized. Per the Kittelson & Associates study, Golf Lane should be realigned to intersect Cascade Highway directly opposite Whitney Street as part of the signalization improvement.

In addition to establishing locations that should be considered for signalization in the 2025 Alternative 5 condition, an analysis was undertaken to determine the need for additional turn lanes at the intersections with LOS E/F or v/c ratio conditions exceeding the established maximum standard of 0.85. The list below summarizes the necessary improvements to the sub-standard intersections identified in the analysis above including additional turn lanes and signalization.

- Highway 22 Eastbound Ramps/Cascade Highway – signalize and eastbound right turn lane
- Stayton Road/Washington Street/Wilco Road – no improvements
- Highway 22 Eastbound Ramps/Golf Club Road – signalize and eastbound right turn lane
- Golf Club Road/Mill Creek Road – signalize, no additional turn lanes needed
- Cascade Highway/Whitney Street – signalize, add eastbound and westbound left turn lanes

Table 6-25 summarizes the levels of service and v/c ratios of the intersections listed above with their described intersection improvements. As shown in Table 6-25, all of the levels of service and v/c ratio conditions are mitigated. It should be noted that the only intersection projected to operate with a sub-standard level of service is the Stayton Road/Washington Street/Wilco Road intersection. No mitigation was proposed because additional turn lanes will not help the traffic operations at this intersection and the intersection did not meet signal warrants. Although the worst intersection movement is LOS F, the corresponding v/c ratio is only 0.68. Therefore, the LOS F may not be indicative of the future condition and the future condition may actually be less congested.

Table 6-25. 2025 Alternative 5 Mitigation Levels of Service

Signalized Intersection	PM Peak Hour		
	LOS	Average Delay (sec)	V/C Ratio
Hwy 22 Eastbound Ramps/Cascade Highway	B	18.2	0.55
SE Golf Club Road/Mill Creek Road	C	24.8	0.67
Hwy 22 Eastbound Ramps/Golf Club Road	B	18.9	0.55
Cascade Highway/Whitney Street	C	21.0	0.61

6.7 FUTURE STREET NETWORK

A future street network plan was developed to assure that the future street network within the Stayton planning area would develop as a grid system. The grid system assures that access, mobility, and circulation will be achieved at a high level throughout the city. Figure 6-22 shows the future street network plan.

The "S" curves that exist along the Washington Street/Santiam Street/Jefferson Street corridor need to be improved to meet current arterial/collector design standards as well as improve safety, mobility, and connectivity along the corridor. Based on field reconnaissance and discussions with city staff, three alternative alignments were identified.

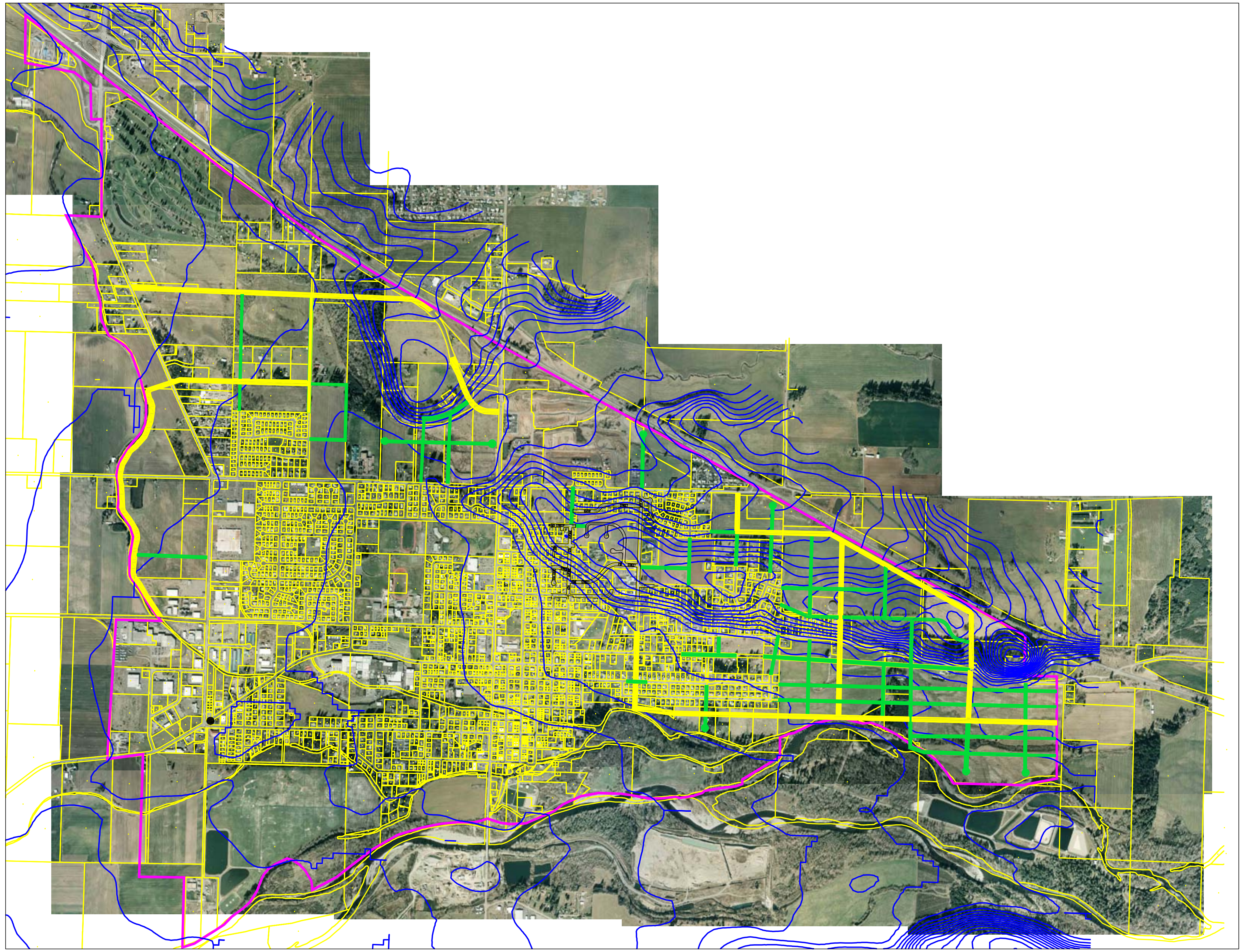
The first "S" curve alternative alignment is to create two back-to-back reverse curves between Washington Street and Santiam Street. The first half of the curve would occur between Washington Street and Jefferson Street between 6th Avenue and 10th Avenue. This section would likely require obtaining two houses. The second half of the curve would occur between Jefferson Street and Santiam Street between 10th Avenue an approximately 500 to 600 feet east of 10th Avenue. This second section would likely require obtaining three houses.

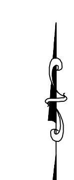
The second "S" curve realignment would be to utilize the first half of the curve of the first alternative from Washington Street to Jefferson Street. From the end of this curve on Jefferson Street, Jefferson Street would be improved and extended to Stayton-Mehama Road.

A third "S" curve alternative involves the construction of single-lane roundabouts at the following intersections: Washington Street/6th Avenue, Jefferson Street/6th Avenue, Jefferson Street/10th Avenue, and Santiam Street/10th Avenue.

Based on public input from the TSP public hearings, Alternative #3 is preferred. The preferred alternative alignment is shown in Figure 6-23.

The following intersection improvements are recommended in addition to the capacity improvements identified under the preferred alternative (Alternative #5):





Stayton Transportation System Plan

Figure 6-22
Future Street Plan

LEGEND

Future Collector

Future Neighborhood Collector or Local Street

NOT TO SCALE

Stayton Transportation System Plan

Figure 6-23
Roundabouts at 6th and 10th Avenues

NOT TO SCALE

- **Construct roundabout at the Wilco Road-Ida Street/Washington Street-Stayton Road intersection**. The roundabout will incorporate five approach legs (including Jetters Way) and will eliminate the existing skewed approaches. Figure 6-24 provides a conceptual drawing of this improvement.

- **Install traffic signal at Golf Club Road-Wilco Road/Shaff Road intersection.** This improvement is recommended as part of the widening of Golf Club Road to five lanes.

6.8 FUTURE SIDEWALK PLAN

The future sidewalk plan, depicted in Figure 6-25, shows where sidewalk improvements are needed to achieve a continuous sidewalk system along all of the City of Stayton's arterials and collectors.

6.8 FUTURE BICYCLE FACILITY PLAN

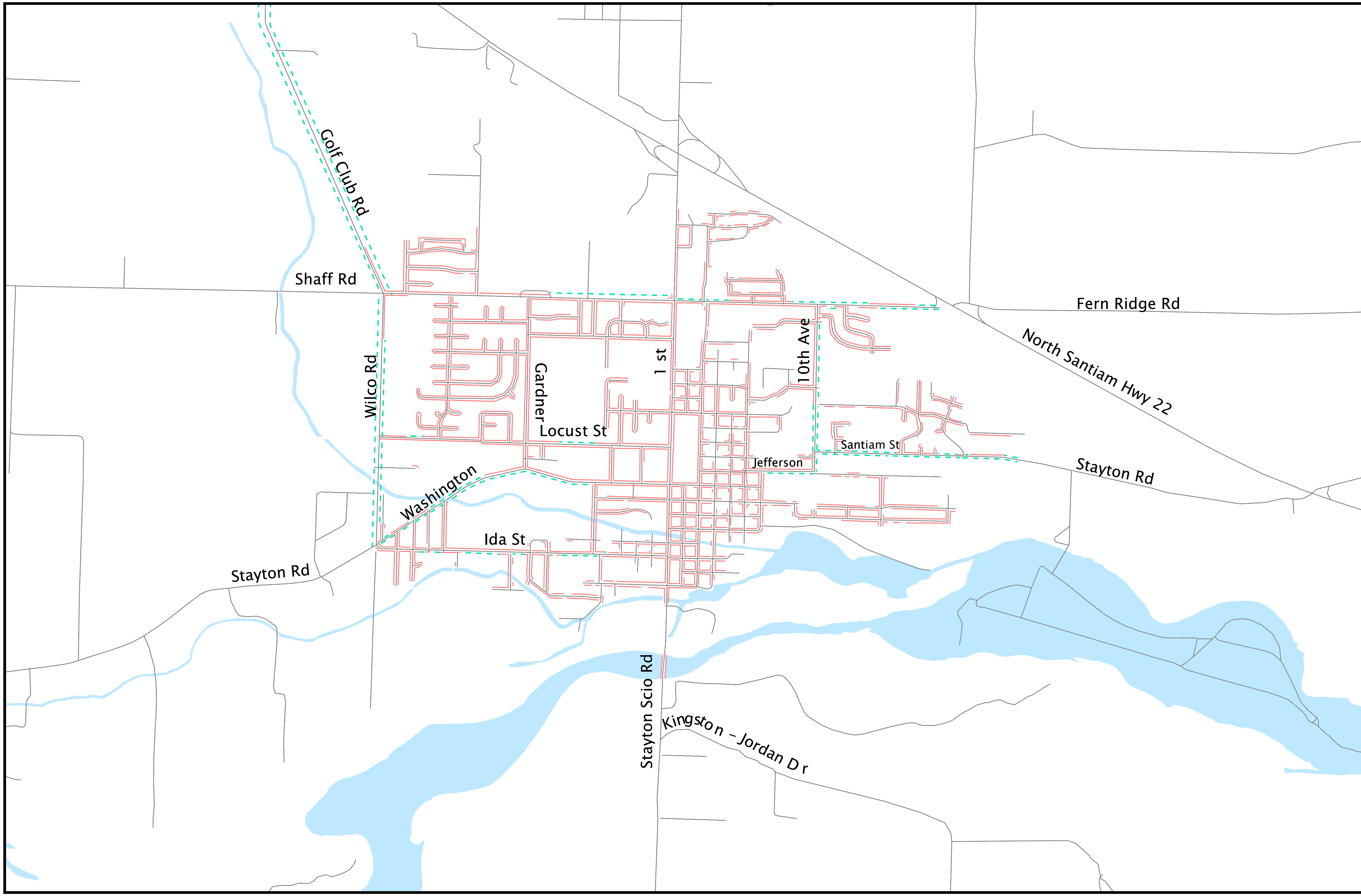
The future bicycle facility plan, depicted in Figure 6-26, shows where bicycle facility improvements are needed to achieve a continuous bicycle system along all of the City of Stayton's arterials and collectors.

Figure 6-27 shows the future parks trails system.

Stayton Transportation System Plan

Figure 6-24
Roundabout Wilco Rd/Stayton Rd/Washington St/Ida St

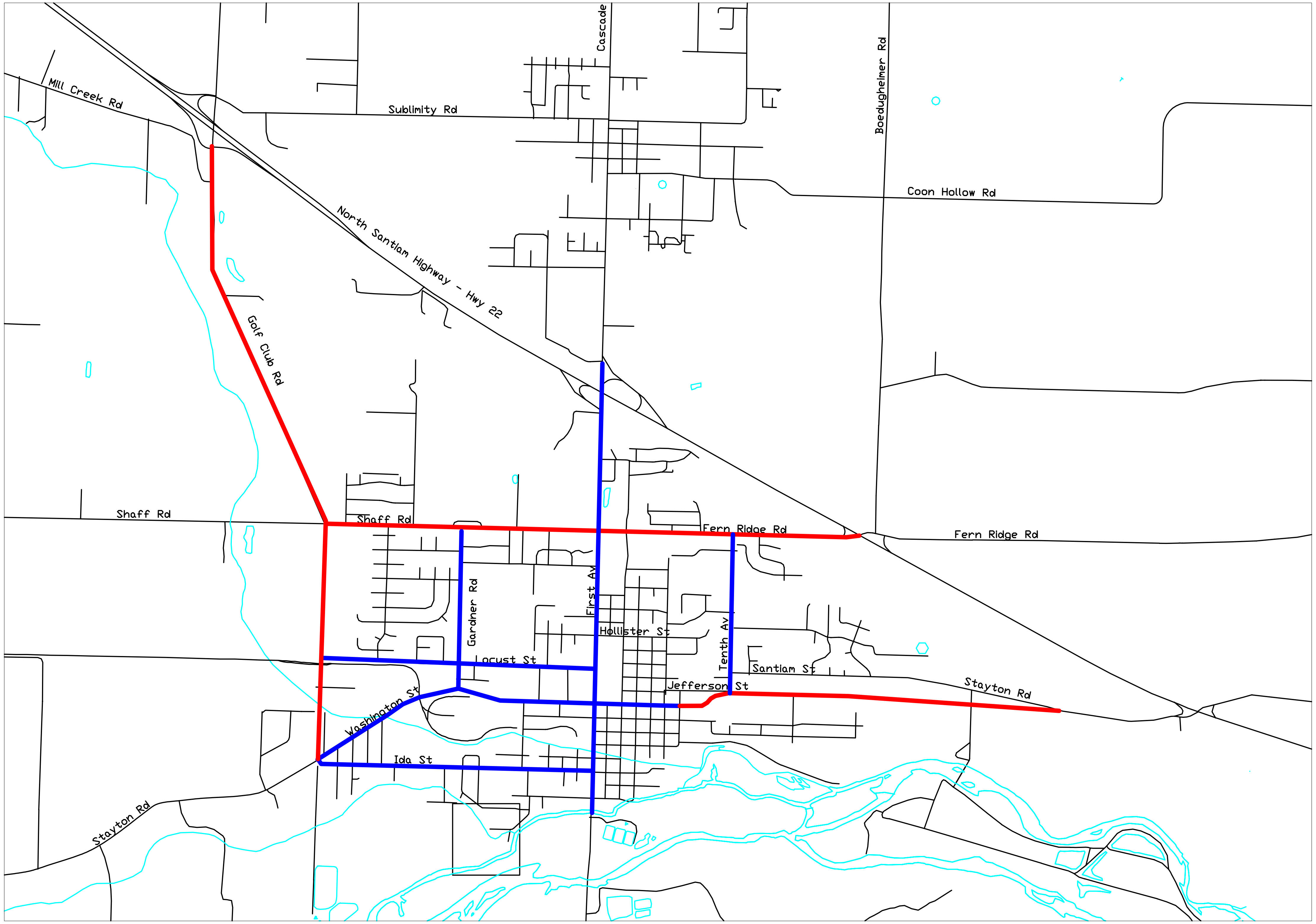
NOT TO SCALE



Stayton Transportation System Plan

Figure 6-25

Sidewalk Improvements

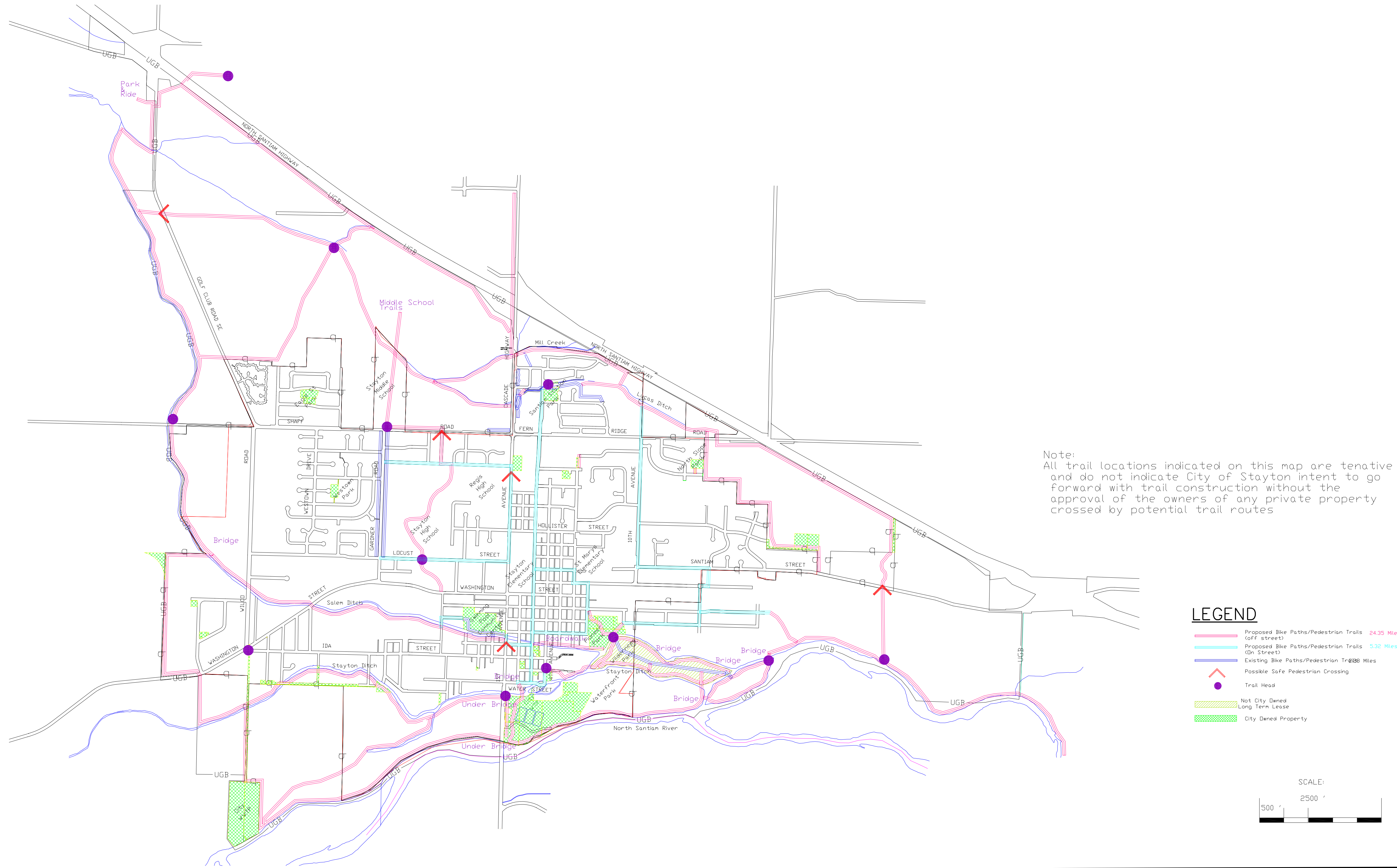


Stayton Transportation System Plan

Figure 6-26
Bicycle Facility Plan

LEGEND
- New Bike Lane
- Signed Shared Bike Route

NOT TO SCALE



Stayton Transportation System Plan

Figure 6-27
Non-Motorized Trails Plan

NOT TO SCALE

Section 7.0
Transportation Modal Plans

7.1. STREET PLAN

7.1.1. Transportation System Plan (TSP) Requirements

OAR 660-12-020 Elements of Transportation System Plans

(2) (b) A road plan for a system of arterials and collectors and standards for the layout of local streets and other important non-collector street connections. Functional classifications of roads in regional and local TSPs shall be consistent with functional adjacent jurisdictions. The standards for the layout of local streets shall provide for safe and convenient bike and pedestrian circulation necessary to carry out OAR 660-12-045(3)(b). New connections to arterials and state highways shall be consistent with designated access management categories. The intent of this requirement is to provide guidance on the spacing of future extensions and connections along existing and future streets, which are needed to provide reasonably direct routes for bicycle and pedestrian travel. The standards for the layout of local streets shall address:

(A) Extensions of existing streets;
(B) Connections to existing or planned streets, including arterials and collectors; and
(C) Connections to neighborhood destinations.

7.1.2. Functional Classification

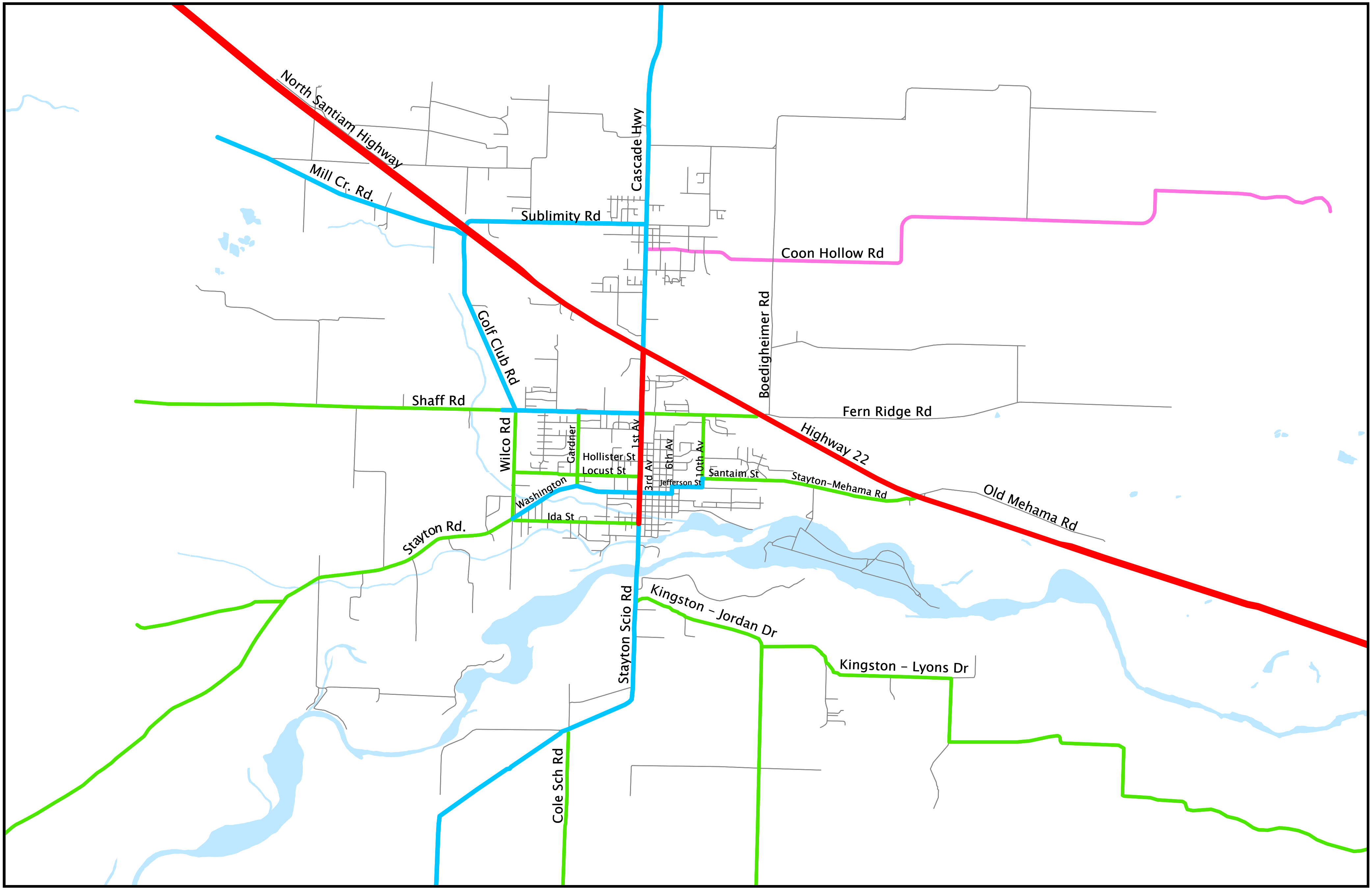
The functional classification of the City of Stayton roadways has been previously discussed in Section 4.3. Most of the existing roadway classifications remain the same except for the following:

- Golf Club Road is upgraded from a collector to a minor arterial due to its increased role in the future
- Cascade Highway from Highway 22 is upgraded from a minor arterial to a primary arterial. It is currently a primary route into Stayton and already functions as a primary arterial.

Figure 7-1 shows the new functional classification.

7.1.3. Street Design Standards

The City of Stayton already has a current set of roadway standards. These roadway standards can be referenced from *Standard Specifications for Public Works Construction in the City of Stayton, Oregon* and *Stayton Municipal Code*.



Stayton Transportation System Plan

Figure 7-1

Roadway Classification

Legend

- Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- Local

N

7.1.4. Local Street Network

The purpose of the Local Street Network Plan is to identify future right-of-way that the City of Stayton will need in order to have and maintain, as much as possible, a balanced street network in accordance with the Oregon Transportation Rule. The plan designates:

1) where existing collector/arterials will be extended or new ones will be added;
2) where new local access streets and/or pedestrian ways will be located to provide better connection between existing streets (grid infill); and
3) where new local access streets will be located to provide adequate connection to significant local destinations for both automobiles and pedestrians.

Locations for the right-of-way and improvements are designated based on review of the existing street grid, existing parcel boundary locations, physical constraints (such as steep slopes and floodplain that might preclude economical road construction) and access management guidelines for access onto major arterials.

The local street network plan was previously shown in Figure 6-22. It is anticipated that the majority of the local street network designated in Figure 6-22 will be constructed by developers. System development charge credit will only be given toward the construction of arterial or collectors.

7.1.5. Traffic Calming Measures

Background

Traffic calming is the use of various techniques and control devices to slow traffic and/or shift traffic to more appropriate routes. Traffic calming concepts were first employed in Germany, Holland and Australia several decades ago. Over the past twenty years, an increasing number of cities throughout the United States have used a variety of traffic control devices to improve street conditions in residential neighborhoods. Some of these devices are best employed in existing neighborhoods to address unsafe or undesirable conditions; others can be designed into streets when they are constructed to prevent or minimize the development of future problems.

Applicable Planning Principles

Installation of traffic calming devices must be evaluated on a case-by-case basis using engineering judgment, and based on the following principles:

- Local streets help determine the form and character of neighborhoods; street design should be considered a part of neighborhood design.

- Local streets should be designed to carry low traffic volumes at low speeds and to function efficiently and safely, yet minimize the need extensive for traffic regulation, control devices and enforcement. A successful design will result in traffic calming and reduce the need of future installation of traffic calming measures.

- The function of the local street should be readily apparent to the user through its appearance and design in order to reduce non-local through traffic on local residential streets.

- Local streets should be interconnected to reduce travel distance, promote the use of alternative modes, provide for efficient provision of utilities and emergency services, and provide for more even dispersal of traffic.

- The local street circulation pattern should provide connections to and from activity centers such as schools, commercial areas, employment centers, and other major attractors.

- The pavement area of local streets should be minimized, consistent with efforts to reduce street construction and maintenance costs, storm water runoff, and environmental impacts of street construction. Narrower streets also distinguish local residential streets from collector and arterial streets and enhance neighborhood character.

- Planning and design should be coordinated with emergency and other service providers who will be affected by their use. Streets should be designed to efficiently and safely accommodate emergency fire and medical service vehicles.

- Traffic calming devices are intended for use only on non-arterial residential streets.

Traffic Calming Devices

The following is a discussion of the various traffic calming devices that are appropriate for implementation in Stayton:

Traffic Circles

Traffic Circles are raised landscaped islands placed in the center of an intersection. Their primary purpose is to reduce speed and to separate intersection vehicle conflicts. Circles are especially effective in a series and may result in diversion of cut-through traffic to other areas. Traffic circles are typically used on relatively low volume residential streets. Traffic Circles are not analogous to roundabouts.

Speed Humps

Speed humps reduce speeds on residential streets by compelling motorists to slow to residential speed limits when approaching the speed hump. Speed humps are 14 feet to 22 feet in length and are approximately 3 inches high. They are most effectively used in clusters of three to five, and are generally installed at intervals ranging from 200 feet to 500 feet apart. Speed humps are not to be confused with speed bumps. Speed bumps are much more abrupt, usually less than 3 feet in length, and are used in parking lots and private drives. Speed bumps should not be used on public streets.

The 14 foot speed hump design, when used in series, will reduce the average vehicle speed to approximately 25 mph. The 22 foot design will reduce the average speed to approximately 35 mph. While primarily used for speed reductions, speed humps can reduce traffic volumes on street where they are employed by diverting traffic to other nearby streets as motorists choose alternate routes to avoid them.

Raised Crosswalks

The purpose of raised crosswalks is to slow vehicles entering a given area from an adjacent street. These features are also intended to identify a “threshold” or entry and exit point for a neighborhood and can be used to highlight the importance of a pedestrian or bicycle dominated intersection.

A raised crosswalk is designed to maintain the same grade as the approaching sidewalk. The width of the approaching sidewalk is also maintained (typically 5 feet). In retrofit situations the slope and grade will vary depending on existing conditions.

A landscaped median or curb extension may be used in combination with the raised crosswalk to encourage vehicle speed reductions. Raised crosswalks are generally only used with some form of intersection control such as a stop sign or traffic signal. The speed of vehicles leaving an intersection with a raised crosswalk is not affected due to the presence of the intersection control.

Not all pedestrians support the use of raised crosswalks. For visually impaired pedestrians, the grade transition between the sidewalk and the street pavement indicates a crossing. The absence of a grade change reduces their ability to recognize a street crossing and increases the potential for a pedestrian-vehicle accident. If a raised crosswalk is used, there must be a detectable grade change between the sidewalk and the raised crosswalk.

Curb Extensions

Curb extensions, also called chokers or bulb-outs, narrow the street by widening the sidewalks or landscaped parking strip. They are used to make pedestrian crossings shorter, and therefore easier and safer. They also narrow the area of pavement and travel lane widths providing a visual cue to the driver that caution is necessary. Where curb extensions are constructed by widening the landscaped parking strip, they can have a positive effect on visual appearance of a neighborhood.

Curb extensions can be used at intersections to create a street gateway or threshold effect, visually announcing an entrance to a residential neighborhood. At intersections, curb extensions are normally used in conjunction with a stop sign or traffic signal; in these locations when curb extensions are designed with a raised crosswalk and/or a landscaped median, the effect on street appearance and vehicle turning speeds can be pronounced. Dimensions of curb extensions depend on a variety of factors including the desired design speed of the street and the turning radius required for emergency and other service vehicles.

Chicanes

A chicane is a device used to slow traffic by forcing vehicles to follow a one-lane serpentine route. Typically, a chicane is comprised of a series of three or more curb extensions located on alternating sides of a street. Like curb extensions, chicanes narrow the street by widening the sidewalks or landscaped parking strip. They also narrow the pavement and travel lane width, extending from the curb to a point past the centerline of the street.

When landscaped, they create a series of screens that obscure the view of oncoming traffic. The combination of reduced vision, narrowed street width, and the curved path of travel slows traffic and elicits a cautious response from motorists. Often, these devices will yield lower traffic volumes by shifting traffic to other nearby streets.

Traffic Diverters

Traffic diversion devices are generally employed on existing streets to reduce traffic volumes within a limited area. Diverters discourage through trips on the street which they are installed and divert those trips to other routes. Several traffic diverter designs may be effectively used to calm traffic. Design options range from full closure of a street to diagonal or half-diverter designs. Wherever traffic diverters are employed, provisions should be made for continuation of pedestrian and bicycle routing around or through the diverter.

Street closure is a drastic option that involves the complete closure of a street at an intersection or in mid block, leaving the street open at one end but physically closing the other. Street closures may have an extreme effect on accessibility but may be the most effective technique to control cut-through traffic where other traffic management devices have failed.

Diagonal diverts limit access to a street by placing a barrier diagonally across an intersection. The diverter allows for greater accessibility than full street closure but still limits undesirable through traffic movements.

Half-diverters limit access by blocking half the street. Like diagonal diveters, they are effective in reducing volume and allow more freedom of circulation within a neighborhood than street closures. Both diagonal and half diverters should be designed and installed to allow for emergency vehicle access.

Median Barriers

This device is used on arterial streets to prevent cut-through traffic on local streets or to control turning direction into or out of a neighborhood. Medians may also be used within a residential neighborhood to prevent non-local through traffic movements. Typically, median barriers are used to control specific traffic movements, rather than traffic speeds.

Forced Turn Channelization

This technique allows traffic entering or exiting a neighborhood street to move in one direction only. Its purpose is essentially the same as a diagonal diverter; it is used to discourage potential or existing through-traffic patterns and limits traffic movement choice but does not physically prevent it.

Parking Bays

Construction of parking bays can be used to slow traffic on the street. Curb extensions are used to narrow street width where parking is not needed or desired, while leaving space for parking where it is desired. Where curbs are extended, enhanced street tree planting or landscape are possible. This technique has the added benefit of markedly improving the appearance of the street. Parking bays reduce the amount of available on-street parking; the extent of their use should be balanced against the demand for on-street parking. Other parking changes can be utilized to either facilitate traffic (parking removal to facilitate turns or improve visibility) or to slow traffic. Parking bays may increase street construction and maintenance costs.

Pavement Surface Modifications

A motorist's awareness of pedestrian crossings or neighborhood gateways can be heightened by modifying pavement texture and materials. This change in pavement surface is a very effective visual cue for drivers when contrasting paving materials are used. While this is an effective technique to raise motorists awareness of pedestrians or to indicate neighborhood gateways, this device has not been shown to reduce traffic speeds or volumes.

Guidelines for Implementing Traffic Calming Measures

The following criteria should be used as a guide to determine the appropriateness of implementing traffic calming measures along a particular roadway section. The City Engineer shall make the final determination that traffic calming devices are warranted.

Existing Roadway Facilities

- Must be a residential roadway.
- 85^{th} percentile speed greater than 15 miles over speed limit.
- Existing average daily traffic volumes greater than 600 and less than 2,000 vehicles. These volumes may be exceeded if engineering studies determine that there is a significant amount of cut through traffic on the particular roadway section.
- Sight distance in excess of 600 feet.
- A two-thirds (67%) majority of residents along the particular roadway section agree with to the implementation of the proposed traffic calming device(s).

New Roadway Facilities

- Must be a residential roadway.
- Projected average daily traffic volumes greater than 600 and less than 2,000 vehicles.
- Sight distance in excess of 600 feet.

7.1.6. Street Improvements

The street improvements identified in Section 6 are summarized in Table 7-1.

Table 7-1
Capital Improvement Cost

Improvement Description	**Cost**
1. Highway 22 Joseph Street project[1] - Highway 22 widening and reconstruction of Cascade Highway interchange	$50,000
2. Cascade Highway/1st Avenue Widening from Highway 22 to Regis Street – widen to 5 lanes with sidewalks	$1,500,000
3. Widen Golf Club Road from Highway 22 to Shaff Road – widen to 5 lanes with sidewalks and signalize Golf Club Road-Wilco Road/Shaff Road intersection	$4,000,000
4. Construct Washington Street to Santiam Street Corridor Roundabouts	$1,100,000
5. Signalize Golf Club Road/Highway 22 EB Ramps and Install EB Right Turn Lane	$250,000
6. Signalize Golf Club Road/Mill Creek Rd	$175,000
7. Cascade Highway/Whitney Street signalization with EB and WB Left Turn Lanes and Realign Golf Lane	$1,500,000
8. Washington St/Ida Street/Wilco Road Roundabout	$850,000
9. Future Collectors[2]	$21,400,000
Grand Total	**$30,950,000**

[1] This project is an ODOT project. It is not currently funded. As ODOT develops this project onto their STIP, a project cost estimate should become available. At this time, the City of Stayton has designated $50,000 for their share of the improvement cost.

[2] Includes a total of 7.3 miles of new Collector Roadways. Each new Collector facility is assumed to be constructed with a 40-foot curb-to-curb width and sidewalks on both sides.

7.2. PEDESTRIAN AND BICYCLE SYSTEM PLAN

7.2.1. TPR Requirements

OAR 660-12-020 Elements of Transportation System Plans

(2) (d) A bicycle and pedestrian plan for a network of bicycle and pedestrian routes throughout the planning area. The network and list of facility improvements shall be consistent with the requirements of ORS 366.514.

OAS 660-12-045 Implementation of the Transportation System Plan

(6) In developing a bicycle and pedestrian circulation plan as required by 660-12-020(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 example, constructing walkways between cul-de-sacs and adjacent roads, providing walkways between buildings, and providing direct access between adjacent uses.

The City of Stayton Sidewalk Plan was developed to enhance the pedestrian system to encourage more residents to walk when making short trips within the city and to improve school children safety for those children walking to school. For a functional pedestrian system, connectivity between activity centers such as the downtown, city hall, school, and residential areas is important. The Sidewalk Plan strives to connect these activity centers and provide safe facilities for its users.

Because of the limited size of Stayton, it does not have the resources to retrofit every city street with sidewalks. Instead, local connectivity between activity centers and major north-south and east-west walking routes were used to develop the Sidewalk Plan. The Sidewalk Plan was previously shown in Figure 6-25.

It should be noted that additional bike lanes have been proposed in only the locations where it is likely that arterial or collectors will be reconstructed or widened. These future bike lanes are part of the street improvement project and therefore are not costed out separately.

Table 7-2 summarizes the non-motorized improvement project cost. It should be noted that sidewalk and bicycle lane projects that are part of a street improvement project are not included in Table 7-2.

Table 7-2
Non-Motorized Improvement Cost

Improvement Description	Cost
1. Shaff Road – south side between Wilco Road and Gardner Street	$80,000
2. Shaff Road – north side, east of Douglas Street	$28,500
2. Fern Ridge Road – north side, intermittent sections between 1st Avenue and Highway 22	$72,000
3. Washington Street - north side, east of Myrtle Avenue	$29,000
4. Washington Street – south side from Wilco Road to Evergreen Avenue	$132,000
5. Ida Street – south side, intermittent sections between Noble Avenue and Evergreen Avenue	$66,000
6. Santiam Street – both sides, intermittent sections between Highland Drive and eastern city limits	$80,000
7. Locust Street – north side, intermittent sections between Wilco Road and 1st Av	$25,000
Grand Total	$512,500

7.3. PUBLIC TRANSPORTATION PLAN

7.3.1. Transportation Planning Rule (TPR) Requirements

OAR 660-12-020 Elements of Transportation System Plans

(2) (c) A public transportation plan which:

(A) Describes public transportation services for the transportation disadvantaged and identifies service inadequacies.
(B) Describes intercity bus and passenger rail service and identifies the location of terminals.
(C) For areas within an urban growth boundary which have public transit service, identifies existing and planned transit trunk routes, exclusive transit ways, terminals and major transfer stations, major transit stops, and park-and-ride stations. Designation of stop or station locations may allow for minor adjustments in the location of stops to provide for efficient transit or traffic operation or to provide convenient pedestrian access to adjacent or nearby uses.
(D) For areas within an urban area containing a population of greater than 25,000 persons, not currently served by transit, evaluates the feasibility of developing a public transit system at build out. Where a transit system is determined to be feasible, the plan shall meet the requirements of subsection 2(c)(C) of this section.

This section of the TSP references the requirement for public transportation plan in the *Transportation Planning Rule*, describes types of services and facilities, reviews recommended service and facilities (ODOT, 1997), identifies Stayton public transportation users, and completes an inventory of these facilities in Stayton.

7.3.2. Types of Public Transportation and Recommended Services

As used in this section, public transportation includes the following services and facilities:

- Intra- and inter-city fixed route systems: fixed-route scheduled bus, rail, light rail, and park-and-ride express services.
- Paratransit services which primarily serve the disabled, elderly, or other transportation disadvantaged individuals.
- Rideshare/ Demand Management program: carpool, vanpool, bus pool matching services; preferential parking programs; and reduced parking fees.
- Other: taxi services, privately owned inter-city bus lines or shuttle services.

The best mix of services in any community or planning area will depend on the needs of the service population, spatial distribution of the service population, economic factors, and the existing transportation system and policies.

The Oregon Public Transportation Plan (ODOT, 1997) described a preferred state of public transportation in 2015 to respond to state and federal goals, which established targets for service types and frequencies relevant to the City of Stayton. The plan identifies minimum levels of public transportation services that provide a range of services intended to keep pace with Oregon's changing and increasing public transportation needs. Minimum level of service recommendations were given by types of services, size of community, and distance from other major intermodal centers (only Portland in Oregon) or urban central cities. For planning purposes, communities are divided into large urban areas, small communities of 25,000 or more, small communities of 2,500 to 25,000, communities of 2,500 or more within 20 miles of an urban central city, and rural (<2,500) communities (ODOT, 1997). The population of Stayton is currently under 25,000 and is considered a small community. In 2020, Stayton's population is still projected to be below 25,000 and will still be considered a small community. It should use the goals set forth for a small community in the Oregon Public Transportation Plan to enhance its public transportation services within the community.

7.4. AIR, RAIL, WATER AND PIPELINE PLAN

7.4.1. TPR Requirements

OAR 660-12-020 Elements of Transportation System Plans

(2) (e) An air, rail, water and pipeline transportation plan which identifies where public use airports, mainline and branchline railroads and railroad facilities, port facilities, and major regional pipelines and terminals are located or planned within the planning area. For airports, the planning area shall include all areas within airport imaginary surfaces and other areas covered by state or federal regulations.

7.4.2. Air Service

There are no public use airports within the planning area of the City of Stayton.

7.4.3. Rail Service

The City of Stayton has one railroad spur owned by the Willamette Valley Railway. It is not anticipated to grow significantly in its activity.

7.4.4. Water Transportation Service

There are no water transportation services within the planning area of the City of Stayton.

7.4.5. Pipeline Service

There is one major regional pipeline within the planning area of the City of Stayton. It is not anticipated to expand in the Stayton area.

Section 8.0
Transportation Finance Plan

8.1. TRANSPORTATION IMPROVEMENT REVENUE NEEDS

As part of the requirement of the Transportation Planning Rule (TPR) for TSPs, a financing plan for the recommended improvements was developed. The cost of transportation projects proposed under this TSP is shown in Table 8-1 for street projects and 8-2 for non-motorized facility improvements.

Table 8-1
Capital Improvement Cost – Street Improvements

Improvement Description	**Cost**
1. Highway 22 Joseph Street project[1] - Highway 22 widening and reconstruction of Cascade Highway interchange	$50,000
2. Cascade Highway/1st Avenue Widening from Highway 22 to Regis Street – widen to 5 lanes with sidewalks	$1,500,000
3. Widen Golf Club Road from Highway 22 to Shaff Road – widen to 5 lanes with sidewalks and signalize Golf Club Road-Wilco Road/Shaff Road intersection	$4,000,000
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6. Signalize Golf Club Road/Mill Creek Rd	$175,000
7. Cascade Highway/Whitney Street signalization with EB and WB Left Turn Lanes and Realign Golf Lane	$1,500,000
8. Washington St/Ida Street/Wilco Road Roundabout	$850,000
9. Future Collectors[2]	$21,400,000
Grand Total	**$30,950,000**

[1] This project is an ODOT project. It is not currently funded. As ODOT develops this project onto their STIP, a project cost estimate should become available. At this time, the City of Stayton has designated $50,000 for their share of the improvement cost.

[2] Includes a total of 7.3 miles of new Collector Roadways. Each new Collector facility is assumed to be constructed with a 40-foot curb-to-curb width and sidewalks on both sides.

Table 8-2
Capital Improvement Cost – Non-Motorized Improvement Projects

Improvement Description	Cost
1. Shaff Road – south side between Wilco Road and Gardner Street	$80,000
2. Shaff Road – north side, east of Douglas Street	$28,500
2. Fern Ridge Road – north side, intermittent sections between 1st Avenue and Highway 22	$72,000
3. Washington Street - north side, east of Myrtle Avenue	$29,000
4. Washington Street – south side from Wilco Road to Evergreen Avenue	$132,000
5. Ida Street – south side, intermittent sections between Noble Avenue and Evergreen Avenue	$66,000
6. Santiam Street – both sides, intermittent sections between Highland Drive and eastern city limits	$80,000
7. Locust Street – north side, intermittent sections between Wilco Road and 1st Av	$25,000
Grand Total	$512,500

As shown in Tables 8-1 and 8-2, the projects proposed in the transportation system plan have a total cost of $31,462,500. To fully implement this capital improvement program, an average of $1,430,000 would need to be expended each year through the year 2025.

8.2. TRANSPORTATION REVENUE OUTLOOK

Almost all of the City of Stayton's general fund revenues allocated to streets are for maintenance. New sources of funding would need to be developed by the city to actually fund a capital improvement plan. The city will update their system development charges soon to reflect the update in capital improvements identified in the transportation system plan. Another potential source of revenue may be a local gas tax.

8.3. REVENUE SOURCES AND FINANCING OPTIONS

Several possible funding sources exist to implement the recommended transportation improvements. The following pages describe the funding sources that may be available.

LOCAL SOURCES

The following options are available on the local level to raise funds for transportation improvements:

Local Option Gasoline Tax

Revenues raised from a local option gasoline tax could be used by the City to fund recommended transportation improvements. Based on initial conversations with city staff, it appears that this funding source is being looked at very closely. Stayton has several gas stations that could generate enough monies to at least generate local matching money for grants.

Property Taxes

Local property taxes can be used to fund transportation system improvements. A specific allocation of property taxes to transportation improvements could be identified or set at a fixed and predictable level to provide a longer-term stable and predictable source of revenue. This would be important in implementing larger, longer-term projects with a high capital cost. Voter approval is necessary for the use of property taxes to fund roadway improvements and the uncertainty of this approval affects the attractiveness of this revenue choice. A major disadvantage of using property taxes to support transportation improvements includes the inequity of this tax when compared with the users of the system (a user tax such as the tax on gasoline is more equitable in that persons who drive and use the street system pay for it rather than persons who own property). Additionally, the use of property taxes to fund transportation improvements would be restricted by the limitations of Measure 5.

Debt Funding

The City could issue municipal bonds to finance improvements. This approach would spread the cost of improvements over the life of the bonds and lower the annual expenses during construction years. If revenue bonds are issued, voter approval might not be necessary, but an identified revenue source (i.e., property taxes) would need to be identified to satisfy the bond underwriter. General obligation bonds would require voter approval. Both bonding approaches would be limited by the restrictions of Measure 5 and the bonding capacity of the local agencies.

System Development Charges

Oregon law enables communities to fund growth-related transportation improvements by imposing system development charges. These charges apply to newly developed property and can be used to recover the costs of past or future roadway improvement projects necessitated by growth. They may not be used to fund transportation improvements to serve existing residents. Therefore, while it is relatively easy to estimate the system development charges which would be needed to build improvements associated with growth, these charges will not be sufficient to meet all of the infrastructure needs identified in this plan. The city already collects SDCs. It may be in a position to increase the SDC's with a new list of capital improvement projects.

System development charges (SDCs) are considered by many to be an equitable method of funding as they provide for many of the improvements needed because of growth in the community. On the other hand, growth in non-local traffic or traffic attributable to existing residents may also fuel the need for improvements which the system development charges are used to fund. Revenue from SDCs is generally not stable or predictable over time as it is received only when development occurs. During times of economic downturn, this revenue source may taper off entirely. This makes it difficult to rely on this source of funds for larger, multi-phased or multi-year projects.

It is required by state law for SDCs to finance those transportation improvements that are tied to local growth needs and, if the anticipated growth does not occur when expected or at all, both the improvement costs and the development charge revenue will not be needed.

Local Improvement Districts

Local improvement districts, known as LIDs, could be formed to finance public transportation improvements. LIDs may be formed by either the city or property owners. Their use and benefit are usually restricted to a specific area. The cost of a project with an LID in place is distributed to each property owner according to the benefit that property receives. With transportation improvements, that benefit may be measured by trips generated by each property. Or, in the example of a sidewalk improvement, the cost could be equitably divided by lineal feet of sidewalk along property frontages. The cost distributed becomes an assessment or lien against the property. It can be paid in cash or through assessment financing.

NON-LOCAL FUNDING SOURCES

State Gasoline Tax

Gas tax revenues received from the state are used by all counties and cities to fund road construction and maintenance. The revenue share to cities is divided through an allocation formula related to population. The state gas tax received by Stayton will not sufficiently fund the improvements identified in the TSP and may not even cover maintenance needs.

Grants and Loans

Most grant and loan programs available through the state are related to economic development and not specifically for construction of new streets. Programs such as the Oregon Special Public Works Fund provides grant and loan assistance for construction of public infrastructure that support commercial and industrial development that results in permanent job creation or retention. Another grant program is the Immediate Opportunity Fund (IOP). Again, this grant is tied to local and regional economic development efforts.

<u>ODOT Funding Options</u>

The State of Oregon provides funding for all highway-related transportation projects through the Statewide Transportation Improvement Program (STIP) administered by ODOT. The STIP outlines the schedule for ODOT projects throughout the state. Projects within the STIP are identified for a four-year funding cycle. In developing this funding program, ODOT must verify that the identified projects comply with the OHP, ODOT modal plans, corridor plans, local comprehensive plans, and TEA-21 planning requirements. The STIP must fulfill TEA-21 planning requirements. Specific transportation projects are prioritized based on a review of the TEA-21 planning requirements and the different state plans. ODOT consults with local jurisdictions before highway related projects are added to the STIP.

GLOSSARY

Access Point
An intersection, driveway, or opening on the right-hand side of a roadway. An entry on the opposite side of a roadway or a median opening can also be considered as an access point if it is expected to influence traffic flow significantly in the direction of interest.

All-Way Stop-Controlled
An intersection with stop signs at all approaches. The driver's decision to proceed is based on the rules of the road (e.g. the driver on the right has the right-of-way) and also on the traffic conditions of the other approaches.

Analysis Period
A single time period during which a capacity analysis is performed on a transportation facility. If the demand exceeds capacity during an analysis period, consecutive analysis periods can be selected to account for initial queue from the previous analysis period. Also referred to as time interval.

Analytical Model
A model that relates system components using theoretical considerations that are tempered, validated, and calibrated by field data.

Annual Average Daily Traffic
The total volume of traffic passing a point or segment of a highway facility in both directions for one year divided by the number of days in the year.

Approach
A set of lanes at an intersection that accommodates all left-turn, through, and right-turn movements from a given direction.

Arterial
A signalized street that primarily serves through-traffic and that secondarily provides access to abutting properties, with signal spacings of 3. 0 km or less.

Average Travel Speed
The length of the highway segment divided by the average travel time of all vehicles traversing the segment, including all stopped delay times.

Back of Queue
The distance between the stop line of a signalized intersection and the farthest reach of an upstream queue, expressed as a number of vehicles. The vehicles previously stopped at the front of the queue are counted even if they begin moving.

Bicycle Facility
A road, path, or way specifically designated for bicycle travel, whether exclusively or with other vehicles or pedestrians.

Bicycle Lane
A portion of a roadway designated by striping, signing, and pavement markings for the preferential or exclusive use of bicycles.

Bicycle Path
A bikeway physically separated from motorized traffic by an open space or barrier, either within the highway right-of-way or within an independent right-of-way.

Bus Stop
An area in which one or more buses load and unload passengers. It consists of one or more loading areas and may be on line or off line.

Calibration
The process of comparing model parameters with real-world data to ensure that the model realistically represents the traffic environment. The objective is to minimize the discrepancy between model results and measurements or observations.

Capacity
The maximum sustainable flow rate at which vehicles or persons reasonably can be expected to traverse a point or uniform segment of a lane or roadway during a specified time period under given roadway, geometric, traffic, environmental, and control conditions; usually expressed as vehicles per hour, passenger cars per hour, or persons per hour.

Collector Street
A surface street providing land access and traffic circulation within residential, commercial, and industrial areas.

Conflicting Approach
The approach opposite the subject approach at an all-way stop-controlled intersection.

Conflicting Movements
The traffic streams in conflict at an unsignalized intersection.

Congested Flow
A traffic flow condition caused by a downstream bottleneck.

Control Delay
The component of delay that results when a control signal causes a lane group to reduce speed or to stop. It is measured by comparison with the uncontrolled condition.

Corridor
A set of essentially parallel transportation facilities designed for travel between two points. A corridor contains several subsystems, such as freeways, rural (or two-lane) highways, arterials, transit, and pedestrian and bicycle facilities.
The density at which capacity occurs for a given facility, usually expressed as vehicles per kilometer per lane.

Critical Gap
The minimum time, in seconds, between successive major-stream vehicles, in which a minor-street vehicle can make a maneuver. Also see Pedestrian critical gap.

Critical Volume-to-Capacity Ratio
The proportion of available intersection capacity used by vehicles in critical lane groups.

Crosswalk
A marked area for pedestrians crossing the street at an intersection or designated mid-block location.

Cycle
A complete sequence of signal indications.

Cycle Length
The total time for a signal to complete one cycle.

Deceleration Lane
A paved auxiliary lane, including tapered areas, allowing vehicles leaving the through-traffic lane of the roadway to decelerate.

Delay
The additional travel time experienced by a driver, passenger, or pedestrian.

Demand
The number of users desiring service on the highway system, usually expressed as vehicles per hour or passenger cars per hour.

Demand-Responsive Service
Passenger cars, vans, or buses with fewer than 25 seats, dispatched by a transit operator in response to calls from passengers or their agents.

Density
The number of vehicles on a roadway segment averaged over space, usually expressed as vehicles per kilometer or vehicles per kilometer per lane. Also see Pedestrian density.

Design Hour
An hour with a traffic volume that represents a reasonable value for designing the geometric and control elements of a facility.

Design Speed
A speed used to design the horizontal and vertical alignments of a highway.

Deterministic Model
A mathematical model that is not subject to randomness. The result of one analysis can be repeated with certainty.

Diamond Interchange
An interchange that results in two or more closely spaced surface intersections, so that one connection is made to each freeway entry and exit, with one connection per quadrant.

Downstream
The direction of traffic flow.

Downtown Street
A surface facility providing access to abutting property in an urban area.

Effective Green Time
The time during which a given traffic movement or set of movements may proceed; it is equal to the cycle length minus the effective red time.

Effective Red Time
The time during which a given traffic movement or set of movements is directed to stop; it is equal to the cycle length minus the effective green time.

Effective Walkway Width
The width, in meters, of a walkway usable by pedestrians, or the total walkway width minus the width of unusable buffer zones along the curb and building line.

85th-Percentile Speed
A speed value that is less than 15 percent of a set of field measured speeds.

Empirical Model
A model that describes system performance based on the statistical analysis of field data.

Exclusive Turn Lane
A designated left or right turn lane or lanes used only by vehicles making those turns.

Exit Ramp
A ramp for traffic to depart from a freeway.

Facility
A length of highway composed of connected sections, segments, and points.

Fixed Route Service
Service provided by transit vehicles on a repetitive, fixed schedule along a specific route, picking up and delivering passengers to specific locations. Each fixed route serves an assigned origin and destination.

Flared Approach
A shared right-turn lane that allows right-turning vehicles to complete their movement while other vehicles are occupying the lane.

Flow Rate
The equivalent hourly rate at which vehicles, bicycles, or persons pass a point on a lane, roadway, or other trafficway. It is computed as the number of vehicles, bicycles, or persons passing the point, divided by the time interval (usually less than I h) in which they pass, and, expressed as vehicles, bicycles, or persons per hour.

Free Flow
A flow of traffic unaffected by upstream or downstream conditions.

Free-Flow Speed
(I) The theoretical speed of traffic, in kilometers per hour, when density is zero. That is, when no vehicles are present.
(2) The average speed of vehicles over an urban street segment without signalized intersections, under conditions of low volume.

(3) The average speed of passenger cars over a basic freeway or multilane highway segment under conditions of low volume.

Freeway
A multilane, divided highway with a minimum of two lanes for the exclusive use of traffic in each direction and full control of access without traffic interruption.

Freeway Facility
An aggregation of sections comprising basic freeway segments, ramp segments, and weaving segments.

Fully Actuated Control
A signal operation in which vehicle detectors at each approach to the intersection control the occurrence and length of every phase.

Functional Class
A transportation facility defined by the traffic service it provides.

Gap
The time, in seconds, for the front bumper of the second of two successive vehicles to reach the starting point of the front bumper of the first.

Gap Acceptance
The process by which a minor-street vehicle accepts an available gap to maneuver.

Geometric Delay
The component of delay that results when geometric features cause vehicles to reduce their speed in negotiating a facility.

Green Time
The duration, in seconds, of the green indication for a given movement at a signalized intersection.

Growth Factor
A percentage increase applied to current traffic demands to estimate future demands.

Headway
(1) The time, in seconds, between two successive vehicles as they pass a point on the roadway, measured from the same common feature of both vehicles (for example, the front axle or the front bumper).
(2) The time, usually expressed in minutes, between the passing of the front ends of successive transit units (vehicles or trains) moving along the same lane or track (or other guideway) in the same direction.

Heavy Rail
A transit system using trains of high-performance, electrically powered rail cars operating in exclusive right-of-way.

Heavy Vehicle
A vehicle with more than four wheels touching the pavement during normal operation.

High Occupancy Vehicle (HOV)
A vehicle with a defined minimum number of occupants (>I); HOVs often include buses, taxis, and carpools, when a lane is reserved for their use.

Intelligent Transportation System (ITS)
A transportation technology that enhances the safety and efficiency of vehicles and roadway systems.

Interchange Density
The average number of interchanges per kilometer. Computed for 10 km of freeway including the basic freeway segment.

Interchange Ramp Terminal
A junction with a surface street to serve vehicles entering or exiting a freeway.

Interrupted Flow
A category of traffic facilities characterized by traffic signals, stop signs, or other fixed causes of periodic delay or interruption to the traffic stream.

Intersection Delay
The total additional travel time experienced by drivers, passengers, or pedestrians as a result of control measures and interaction with other users of the facility, divided by the volume departing from the corresponding cross section of the facility.

Isolated Intersection
An intersection at least 1. 6 km from the nearest upstream signalized intersection.

Lane Utilization
The distribution of vehicles among lanes when two or more lanes are available for a movement; however, as demand approaches capacity, uniform lane utilization develops.

Lane Width
The arithmetic mean of the lane widths of a roadway in one direction, expressed in meters.

Level of Service
A qualitative measure describing operational conditions within a traffic stream, based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience.

Light Rail Transit (LRT)
A metropolitan electric railway system operating single cars or short trains along exclusive rights-of-way at ground level, on aerial structures, in subways, or occasionally in streets. An LRT also can board and discharge passengers at track or car floor level.

Link
A segment of highway ending at a major intersection on an urban street or at a ramp merge or diverge point on a freeway. Links have a node at each end.

Local Bus
A bus that stops for passengers within 80m of the stop line of an intersection approach.

Loop Ramp

A ramp requiring vehicles to execute a left turn by turning right, accomplishing a 90-degree left turn by making a 270-degree right turn.

Lost Time
The time, in seconds, during which an intersection is not used effectively by any movement; it is the sum of clearance lost time plus start-up lost time.

Macroscopic Model
A mathematical model that employs traffic flow rate variables.

Mainline
The primary through roadway as distinct from ramps, auxiliary lanes, and collector-distributor roads.

Major Street
The street not controlled by stop signs at a two-way stop-controlled intersection.

Measure of Effectiveness
A quantitative parameter indicating the performance of a transportation facility or service.

Merge
A movement in which two separate lanes of traffic combine to form a single lane without the aid of traffic signals or other right-of-way controls.

Mesoscopic Model
A mathematical model for the movement of clusters or platoons of vehicles, incorporating equations to indicate how these clusters interact.

Microscopic Model
A mathematical model that captures the movement of individual vehicles.

Midblock Stop
A transit stop located at a point away from intersections.

Minor Arterial
A functional category of a street allowing trips of moderate length within a relatively small geographical area.

Minor Movement
A vehicle making a specific directional entry into an unsignalized intersection from a minor street.

Minor Street
The street controlled by stop signs at a two-way stop-controlled intersection; also referred to as a side street.

Mixed-Traffic Bus Facility
Buses operating in mixed traffic with automobiles.

Movement Capacity

The capacity of a specific traffic stream at a stop-controlled intersection approach, assuming that the traffic has exclusive use of a separate lane, in passenger cars per hour.

Multilane highway

A highway with at least two lanes for the exclusive use of traffic in each direction, with no control or partial control of access, but that may have periodic interruptions to flow at signalized intersections no closer than 3. 0 km.

Multimodal

A transportation facility for different types of users or vehicles.

Near-Side Stop

A transit stop located on the approach side of an intersection. The transit units stop to serve passengers before crossing the intersection.

No-Passing Zone

A segment of a two-lane, two-way highway along which passing is prohibited in one or both directions.

Node

The endpoint of a link; also used interchangeably with point.

Normative Model

A mathematical model that identifies a set of parameters that provide the best system performance.

Off-Ramp

See Exit ramp.

Off-Street Path

A path physically separated from highway traffic for the use of pedestrians, bicycles, and non-motorized traffic.

On-Ramp

See Entrance Ramp.

Opposing Approach

The approach approximately 180 degrees opposite the subject approach at an all-way stop-controlled intersection.

Oversaturation

A traffic condition in which the arrival flow rate exceeds capacity.

Paratransit

Transportation services that are more flexible and personalized than conventional fixed-route, fixed-schedule services, however, such exclusive services as charter bus trips are not considered paratransit. The vehicles usually are low or medium capacity highway vehicles and the service is often adjustable to individual users requirements.

Parclo

See Partial Cloverleaf Interchange.

Park and Ride
An access mode to transit in which patrons drive private automobiles or ride bicycles to a transit station, transit stop, or carpool or vanpool waiting area, parking in the areas provided.

Partial Cloverleaf Interchange
Also called a parclo, it is an interchange with one or two loop ramps.

Partial Diamond Interchange
A diamond interchange with fewer than four ramps so that not all of the freeway-street or street-freeway movements are served.

Passenger Car Equivalent
The number of passenger cars displaced by a single heavy vehicle of a particular type under specified roadway, traffic, and control conditions.

Passing Lane
A lane added to improve passing opportunities in one direction of travel on a conventional two-lane highway.

Passing Sight Distance
The visibility distance required for drivers to execute safe passing maneuvers in the opposing traffic lane of a two-lane, two-way highway.

Peak-Hour Factor
The hourly volume during the maximum-volume hour of the day divided by the peak 15-min flow rate within the peak hour; a measure of traffic demand fluctuation within the peak hour.

Pedestrian Density
The number of pedestrians per unit of area within a walkway or queuing area, expressed as pedestrians per square meter.

Percent Time-Spent-Following
The average percent of total travel time that vehicles must travel in platoons behind slower vehicles due to inability to pass on a two-lane highway.

Performance Measure
A quantitative or qualitative characteristic describing the quality of service provided by a transportation facility or service.

Permitted Plus Protected
Compound left-turn protection that displays the permitted phase before the protected phase.

Permitted Turn
Left or right turn at a signalized intersection that is made against an opposing or conflicting vehicular or pedestrian flow.

Person Capacity
The maximum number of persons, in persons per hour, that reasonably can be expected to be carried past a given point on a highway or transit right-of-way during a given time period, under specified operating conditions, without unreasonable delay, hazard, or restriction.

Phase
The part of the signal cycle allocated to any combination of traffic movements receiving the right-of-way simultaneously during one or more intervals.

Planning Application
A use of capacity analysis to estimate the level of service, the volume that can be accommodated, or the number of lanes required, using estimates, HCM default values, and local default values as inputs.

Platoon
A group of vehicles or pedestrians traveling together as a group, either voluntarily or involuntarily because of signal control, geometrics, or other factors.

Point
A boundary between segments, usually places at which traffic enters, leaves, or crosses a facility.

Pretimed Control
A signal control in which the cycle length, phase plan and phase times are preset to repeat continuously.

Principal Arterial
A major surface street with relatively long trips between major points, and with through-trips entering, leaving, and passing through the urban area.

Protected Plus Permitted
Compound left-turn protection at a signalized intersection that displays the protected phase before the permitted phase.

Protected Turn
The left or right turns at a signalized intersection that are made with no opposing or conflicting vehicular or pedestrian flow allowed.

Quality of Service
A performance indicator of a traveler's perceived satisfaction with the trip.

Quantity of Service
A measure of the utilization of the transportation system.

Queue
A line of vehicles, bicycles, or persons waiting to be served by the system in which the flow rate from the front of the queue determines the average speed within the queue. Slowly moving vehicles or people joining the rear of the queue are usually considered part of the queue. The internal queue dynamics can involve starts and stops. A faster-moving line of vehicles is often referred to as a moving queue or a platoon.

Ramp
A short segment of roadway connecting two traffic facilities.

Ramp Junction
A short segment of highway along which vehicles transfer from an entrance ramp to the main roadway or from the main roadway to an exit ramp.

Ramp Meter
A traffic signal that controls the entry of vehicles from a ramp onto a limited access facility; the signal allows one or two vehicles to enter on each green or green flash.

Ramp Roadway
See Ramp.

Ramp Segment
See Ramp.

Ramp-Freeway Terminal
The roadway segment over which an entrance or an exit ramp joins the mainline of a freeway.

Ramp-Street Terminal
The roadway segment over which an entrance or an exit ramp joins with a surface street.

Ramp-Weave Segment
A weaving segment formed by a one-lane entrance ramp followed by a one-lane exit ramp joined by a continuous auxiliary lane.

Rapid Bus
A bus that operates on an exclusive or reserved right-of-way permitting higher speeds. On limited access roads it can include reverse lane operations.

Rapid Transit
Rail systems operating on exclusive right-of-way, i.e. heavy rail or metro.

Real-Time Model
A model that keeps pace with actual time.

Recreational Vehicle
A heavy vehicle generally operated by a private motorist for transporting recreational equipment or facilities. Examples include campers, boat trailers, and motorcycle or jet-ski trailers.

Red Time
The period, expressed in seconds, in the signal cycle during which, for a given phase or lane group, the signal is red.

Residual Queue
The unmet demand at the end of an analysis period, resulting from operation while demand exceeded capacity.

Roadway Characteristic
A geometric characteristic of a street or highway, including the type of facility, number and width of lanes (by direction), shoulder widths and lateral clearances, design speed, and horizontal and vertical alignments.

Roadway Occupancy

The proportion of roadway length covered by vehicles, used to identify the proportion of time a roadway cross section is occupied by vehicles. Because it is easier to measure in the field, roadway occupancy is used as a surrogate for density in control systems.

Roundabout
A circular intersection with yield control of all entering traffic, channelized approaches, counter-clockwise circulation, and appropriate geometric curvature to ensure that travel speeds on the circulatory roadway are typically less than 30 mph.

Rural
An area with widely scattered development and a low density of housing and employment.

Saturation Flow Rate
The equivalent hourly rate at which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour or vehicles per hour per lane.

Segment
A portion of a facility on which a capacity analysis is performed; it is the basic unit for the analysis, a one-directional distance. A segment is defined by two endpoints.

Semi-Actuated Control
A signal control in which some approaches (typically on the minor street) have detectors, and some of the approaches (typically on the major street) have no detectors.

Service Measure
A specific performance measure used to assign a level of service to a set of operating conditions for a transportation facility or service.

Service Time
The average time that a vehicle on the subject approach is serviced at an all-way stop-controlled intersection, depending on arrival rates of the opposing and conflicting approaches.

Service Volume
The maximum hourly rate at which vehicles, bicycles, or persons reasonably can be expected to traverse a point or uniform segment of a roadway during an hour under specific assumed conditions while maintaining a designated level of service.

Shared-Lane Capacity
The capacity of a lane, in vehicles per hour, at an unsignalized intersection that is shared by two or three movements.

Shock Wave
The compression wave that moves upstream through traffic as vehicles arriving at a queue slow down abruptly, or the decompression wave of thinning traffic that moves downstream from the point of a capacity reduction on a freeway.

Shoulder
A portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, emergency use, and lateral support of the sub-base, base, and surface courses.

Shoulder Bypass Lane
A portion of the paved shoulder opposite the minor-road leg at a three-leg intersection, marked as a lane for through traffic to bypass vehicles that are slowing or stopped to make a left turn.

Side Street
See Minor street.

Simple Weaving Segment
A segment formed by a single merge point followed by a single diverge point.

Simulation Model
A computer program that uses mathematical models to conduct experiments with traffic events on a transportation facility or system over extended periods of time.

Single-Point Diamond Interchange
A diamond interchange that combines all the ramp movements into a single signalized intersection.

Speed
A rate of motion expressed as distance per unit of time.

Split-Diamond Interchange
Diamond interchanges in which freeway entry and exit ramps are separated at the street level, creating four intersections.

Start-up Lost Time
The additional time, in seconds, consumed by the first few vehicles in a queue at a signalized intersection above and beyond the saturation headway, because of the need to react to the initiation of the green phase and to accelerate.

Static Flow Model
A mathematical model in which the traffic flow rate is constant.

Stochastic Model
A mathematical model that employs random variables for at least one input parameter.

Stop Time
A portion of control delay when vehicles are at a complete stop.

Streetcar
An electrically powered rail car that is operated singly or in short trains in mixed traffic on track in city streets.

Study Period
A duration of time on which to base capacity analyses of a transportation facility.

Suburban
An area with a mixture of densities for housing and employment where high-density, non-residential development is intended to serve the local community.

Suburban Street
A street with low-density driveway access on the periphery of an urban area.

Taper Area
An area characterized by a reduction or increase in pavement width to direct traffic.

Through Vehicles
All vehicles passing directly through a street segment and not turning.

Time-Based Model
A model in which time advances from one point to the next.

Traffic Circle

A circular intersection that does not have one or more of the characteristics of a roundabout. Also known as a rotary.

Total Delay
The sum of all components of delay for any lane group, including control delay, traffic delay, geometric delay, and incident delay. See also Aggregate Delay.

Traffic Condition
A characteristic of traffic flow, including distribution of vehicle types in the traffic stream, directional distribution of traffic, lane use distribution of traffic, and type of driver population on a given facility.

Traffic Delay
The component of delay that results when the interaction of vehicles causes drivers to reduce speed below the free-flow speed.

Transit Accessibility
A measure of pedestrian, bicycle, automobile, and Americans with Disabilities Act accessibility to transit.

Transit Availability
A measure of a transit system's capability for use by potential passengers, including the hours the system is in operation, route spacing, and accessibility for the physically handicapped.

Transit Quality of Service
The overall measured or perceived quality of transit service from the passenger's point of view.

Transit Reliability
A measure of the time performance and the regularity of headways between successive transit vehicles that affect the amount of time passengers must wait at a transit stop as well as the consistency of a passenger's arrival time at a destination.

Transit Stop
An area where passengers await, board, alight, and transfer between transit units (vehicles or trains). It is usually indicated by distinctive signs and by curb or pavement markings and may provide service information, shelter, seating, or any combination of these.

Transit-Supportive Area
An area with sufficient population or employment density to warrant at least hourly transit service.

Travel Speed
The average speed, in kilometers per hour, of a traffic stream computed as the length of a highway segment divided by the average travel time of the vehicles traversing the segment.

Travel Time
The average time spent by vehicles traversing a highway segment, including control delay, in seconds per vehicle or minutes per vehicle.

Trolleybus
An electrically propelled bus that obtains power from an overhead wire system. The power-collecting apparatus allows the bus to maneuver in mixed traffic over several lanes.

Truck
A heavy vehicle engaged primarily in the transport of goods and materials or in the delivery of services other than public transportation.

Turnout
A short segment of a lane, usually a widened, unobstructed shoulder area, added to a two-lane, two-way highway, allowing slow-moving vehicles to leave the main roadway and stop so that faster vehicles can pass.

Two-Stage Gap Acceptance
A process used by drivers entering an unsignalized intersection from the minor street and reaching the median area in a first move, then completing the entry with a second move.

Two-Way Left-Turn Lane
A lane in the median area that extends continuously along a street or highway and is marked to provide a deceleration and storage area, out of the through-traffic stream, for vehicles traveling in either direction to use in making left turns at intersections and driveways.

Two-Way Stop-Controlled
The type of traffic control at an intersection where drivers on the minor street or a driver turning left from the major street wait for a gap in the major-street traffic to complete a maneuver.

Unconstrained Operation
An operating condition when the geometric constraints on a weaving segment do not limit the ability of weaving vehicles to achieve balanced operation.

Uncontrolled Ramp Terminal
A ramp terminal without a traffic control device.

Uninterrupted Flow
A category of facilities that have no fixed causes of delay or interruption external to the traffic stream; examples include freeways and unsignalized sections of multilane and two-lane rural highways.

Unmet Demand

The number of vehicles on a signalized lane group that have not been served at any point in time as a result of operation in which demand exceeds capacity, in either the current or previous analysis period. This does not include the normal cyclical queue formation on the red and discharge on the green phase. See also Initial Queue and Residual Queue.

Unsignalized Intersection
An intersection not controlled by traffic signals.

Upstream
The direction from which traffic is flowing.

Urban
An area typified by high densities of development or concentrations of population, drawing people from several areas within a region.

Urban Street
A street with relatively high density of driveway access located in an urban area and with traffic signals no farther than 3. 0 kIn apart.

Urban Street Segment
A length of urban street (in one direction) from one signal to the next, including the downstream signalized intersection but not the upstream signalized intersection.

Validation
Determining whether the selected model is appropriate for the given conditions and for the given task; it compares model prediction with measurements or observations.

Vehicle Capacity
(1) The maximum number of passengers that a transit vehicle is designed to accommodate comfortably, seated and standing; also known as normal vehicle capacity or total vehicle capacity.
(2) The maximum number of vehicles that can be accommodated in a given time by a transit facility.

Volume
The number of persons or vehicles passing a point on a lane, roadway, or other traffic-way during some time interval, often 1 h, expressed in vehicles, bicycles, or persons per hour.

Volume to Capacity Ratio
The ratio of flow rate to capacity for a transportation facility.

Walkway
A facility provided for pedestrian movement and segregated from vehicular traffic by a curb, or provided for on a separate right-of-way.

Weaving
The crossing of two or more traffic streams traveling in the same direction along a significant length of highway, without the aid of traffic control devices (except for guide signs).

Weaving Segment
A length of highway over which traffic streams cross paths through lane-changing maneuvers, without the aid of traffic signals; formed between merge and diverge points.

Work Zone

A segment of highway in which maintenance and construction operations impinge on the number of lanes available to traffic or affect the operational characteristics of traffic flowing through the segment.

Zebra-Striped Crosswalk

A crosswalk painted with diagonal stripes at an unsignalized intersection, in which pedestrians have the right-of-way.