City of Hillsboro

Transportation System Plan

Public Facility Plan

Prepared for

City of Hillsboro

Prepared by

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July 1999

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This project is partially funded by a grant from the Transportation and Growth Management (TGM) Program, a joint program of the Oregon Department of Transportation and the Oregon Department of Land Conservation and Development. TGM grants rely on federal Intermodal Surface Transportation Efficiency Act and Oregon Lottery funds. The contents of this document do not necessarily reflect views or policies of the State of Oregon.

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Chapter 1
Summary

INTRODUCTION

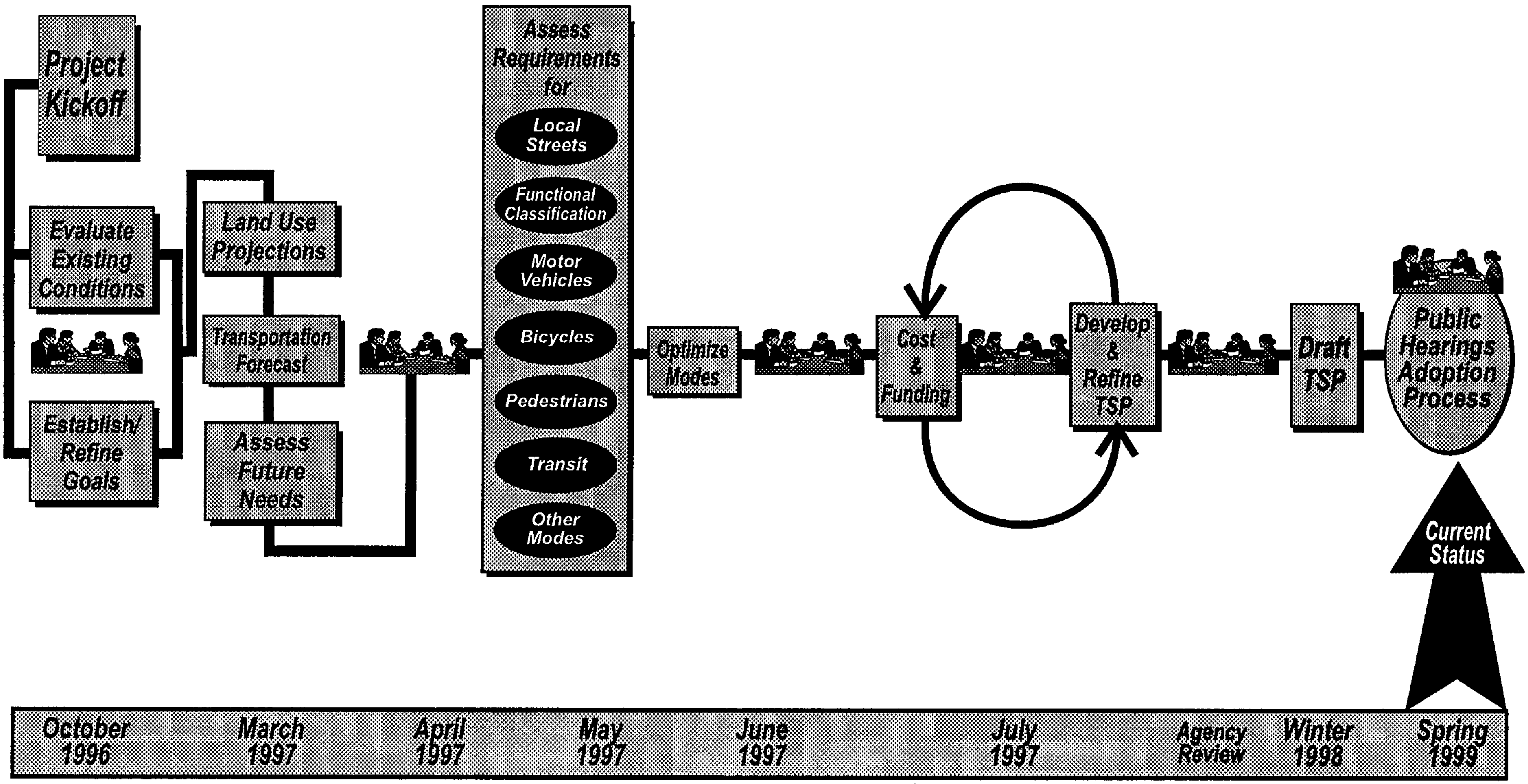
The City of Hillsboro currently has a population of approximately 65,110 and covers approximately 24 square miles. A transportation system study for the City of Hillsboro was completed in 1979 and adopted into the Comprehensive Plan for the city in 1980 (Ordinance 3102/580). The plan was updated and revised between 1990 and 1992. This update was not adopted in the comprehensive plan. Since that time, the intensity of development within the City has changed in response to the adopted Metro 2040 Urban Growth Management Concept Plan and the Tri-Met Westside Light Rail extension.

Planning for various mixed use communities prescribed by the 2040 Concept and for denser urban communities surrounding the light rail stations is defining the new urban form for the City of Hillsboro. The City has adopted street standards and public roadway maps as part of the light rail station community planning areas (ordinance 4544). In addition, the City has adopted ordinances related to land use review and off-street parking to implement the Transportation Planning Rule

With all of the past and recent transportation planning efforts in Hillsboro, the time has come to comprehensively address the transportation system citywide within Hillsboro. An update to the City's Transportation System Plan (TSP) was undertaken to provide a long-range master plan for transportation investment within Hillsboro. The TSP will guide transportation development in the City by identifying private development, public investment and/or regional funding. The plan is needed to comply with Oregon's *Transportation Planning Rule*, which was adopted in May 1991. The primary goals from the updated Transportation Plan are to: 1) provide a strategy for transportation investment in the City, 2) fulfill the state mandate (Goal 12) for comprehensive planning in Hillsboro, 3) address current problem areas, 4) identify the transportation system needs created by growth, and 5) provide guidelines for neighborhood traffic planning in the future.

The Transportation System Plan provides specific information regarding transportation needs to guide future transportation investment in the City and to determine how land use and transportation decisions can be coordinated beneficially for the City. Extensive research was conducted through 1996 and 1997. The majority of plan analysis was generated in 1997 and 1998. The plan reflects other jurisdictional plans including Metro's Draft *Regional Transportation Plan* (RTP), Washington County's *Transportation Plan* and ODOT's *Oregon Transportation Plan* (OTP).

Figure 1-1
TSP Work Approach



After several months of extensive engineering and planning analysis, the draft Transportation System Plan has been prepared for public review. The transportation planning process began with the involvement of the public (through a TSP Task Force comprised of Hillsboro citizens, including one Planning Commission member) and will continue with the public providing key input into the vision for transportation in Hillsboro through review of the *DRAFT Transportation System Plan.*

Plan Process

The Hillsboro Transportation System Plan process is summarized in Figure 1-1 and includes the following elements:

- Inventory/Data Collection
- Evaluate Existing Conditions and Needs
- Forecast Travel Needs
- Determine Needs by Mode
- Develop Improvements to Mitigate Deficiencies by Mode
- Cost Estimates of Improvements
- Action Plan
- Draft TSP

The transportation system was described as containing five basic travel mode plans (or mode groups):

- Pedestrians
- Bicycles
- Transit
- Motor Vehicles
- Other Modes (Including Rail, Air, Water, Pipeline, etc.)

The TSP planning objective was to optimize each of these travel modes within Hillsboro. The following sections summarize the findings of the Transportation System Plan technical studies. Specific chapters of this report address:

- TSP Goals and Policies (Chapter 2)
- Existing Conditions (Chapter 3)
- Future Demand and Land Use (Chapter 4)
- Modal plans (Chapters 5 through 9)
- Transportation Demand Management (Chapter 10)
- Costs/Phasing (Chapter 11)
- Plan Implementation (Chapter 12)

Regional Process

During the development of the Hillsboro TSP, concurrent planning efforts are being undertaken both regionally and locally that influence the city transportation system. In the fall of 1997 the initial draft of the TSP was completed. The draft findings have been used by the City as input to the Regional

Transportation Plan (RTP) being completed by Metro. The RTP is the document used to meet federal transportation planning requirements for the region and provides a basis for allocating regional transportation funding. Specific projects from the action plans in this TSP have been forwarded into the RTP planning studies over the period from the fall of 1997 until now. The RTP is ongoing and will not be completed until late 1999. Many cities have adopted their TSPs in advance of the RTP. Because this TSP was completed concurrently with the Metro RTP, it is consistent with its findings.

Additionally, the Portland region is considering the expansion of the urban growth boundary (UGB). One of the more significant areas under study is the South Hillsboro Urban Reserve (also commonly referred to as the St. Mary's property). The TSP was initiated in 1996 and by state guidelines outlined in the Transportation Planning Rule (Goal 12) must address areas within the UGB. All studies of transportation needs for any expansion of the UGB will address transportation system requirements separately, building from the TSP. The City studies for the South Hillsboro Urban Reserve Concept Plan began in the summer of 1998 and is ongoing. Those studies have utilized the findings of this TSP as a starting point for their analysis. The eventual Metro agreement to include this area in the UGB and the subsequent land use approvals will create amendments to this TSP and will be subject to the criteria and standards outlined in this document. Without the adoption of the TSP, there is no starting point for consideration of the South Hillsboro Urban Reserve Concept Plan.

Preface

As a starting point for this plan, a few of the commonly asked questions were outlined to provide an understanding of what this plan is and why it is being done now.

Why do a transportation system plan?

There are two basic reasons for updating the City's transportation plan. First, it makes good sense. Just as with family financial planning, transportation planning allows a community to look at its present and future transportation system needs and develop strategies to address them. It is a road map to good, well thought out transportation investment within Hillsboro. The plan can help avoid building unneeded, redundant or unwanted public infrastructure and assist officials in making short term decisions which build upon future transportation needs and thus reduce costs in the long run. The TSP allows the City to identify Hillsboro's needs within a regional context and allows Hillsboro transportation improvements to compete for regional funding.

A second reason is that Oregon State law requires it. The Statewide Planning Goal 12, Transportation, requires that all Oregon communities prepare a transportation plan to address existing and future access and circulation needs of the community. The recently adopted Transportation Planning Rule (May 1991, and updated April 1995) further defines the specific requirements to be addressed by a transportation system plan. Hillsboro's most recent transportation studies (1989 and 1992) do not address many of these requirements.

What is a transportation system plan?

A transportation system plan identifies the City's goals in developing its transportation facilities for both the short and long term. It identifies existing and future facility needs and the improvements needed to address those needs. The transportation plan can be developed in components, such as a Trails Plan, an Airport Master Plan, a Transit Plan and a Streets Plan. In Hillsboro, Pedestrian, Bicycle, Transit, Auto/Truck and Other Modes (Air, Rail, Water, Pipelines, etc.) are all incorporated into the Transportation System Plan, although other plans may address each mode in a more detailed manner (i.e. Port of Portland completed a Hillsboro Airport Master Plan in 1996). Basically, the Transportation System Plan (TSP) is a master plan to guide transportation-related decision making in Hillsboro and focus future evaluation of transportation facilities within a community context. Further detailed project specific or corridor studies will be undertaken as implementing actions of the TSP.

Why do the plan now?

It is timely and important to complete the updated Transportation System Plan and adopt it this year for several reasons. The City has existing transportation needs, which must be defined and mitigated. In planning for regional growth, Hillsboro must identify and plan to address the transportation needs associated with Metro's requirement under Title 1 for accommodating an additional 14,812 households and 58,247 new employees by the year 2017[1]. Periodic review of the City's Comprehensive Plan is required every 7 to 10 years (House Bill 2150). The Transportation System Plan is an approved work task in the City's current Periodic Review Work Program. The Transportation Planning Rule requires a Transportation Plan be put in place within one year of the Regional Transportation Plan (RTP). Metro will complete the Portland Region RTP next year. With an adopted TSP, Hillsboro is best positioned to compete for regional transportation funding.

How can I continue to make my concerns known?

Public review of the draft transportation system plan and public hearings (planning commission and city council) on the Transportation System Plan will provide the forum for continued public input as the plan heads toward adoption.

RECOMMENDATIONS

Optimal modal plans have been developed for each travel mode used in Hillsboro, including bicycles, motor vehicles, pedestrians, transit, trucks and other modes (i.e. air, water, rail, pipeline). For each mode, a master plan showing long range priorities and an action plan showing initial priorities for the City were developed. Modes such as transit, pipelines and rail do not have action plans.[2] The master plan identifies projects which are desirable to complete the modal network in Hillsboro and which should be pursued as opportunities arise (via land use development, transportation project development or other means). The action plan consists of projects, which are shorter-term steps, the framework or building blocks needed to start the implementation of the modal master plan. Modal summaries are provided in the chapters of the TSP. The following sections summarize the transportation goals and policies for Hillsboro followed by transportation mode elements.

[1] Urban Growth Management Functional Plan, Metro, November 1996, Title 1, Page 41, Table 1

[2] These are modes controlled by other agencies and companies that develop action plans. The TSP was developed to provide a framework for action plan development by others.

GOALS AND POLICIES

The City of Hillsboro Draft Transportation System Plan (TSP) Goals and Policies consist of seven goals with related policies organized under each goal. Goals were developed which should reflect community needs and values for many years. The goals are simple, brief guiding statements regarding transportation. The policies focus on how goals will be met by describing the types of actions that will contribute to achieving the goal. Policies may change as time goes on and would be the focus of any plan update (generally every 5 to 10 years). Goals should stand the test of time. Using the current goals as a starting point, input and comments received from the Hillsboro Transportation Planning Task Force, the Hillsboro TSP Technical Advisory Committee and Hillsboro staff have been incorporated into this draft. The full text of the goals and policies is contained in Chapter 2 of this document.

Policies supporting the goals are provided with background information and an explanation regarding their implementation in Chapter 2. The Draft TSP Goals and Policies are linked to modal plans provided in the City of Hillsboro Transportation System Plan. The TSP includes master plan maps for bicycles, motor vehicles (including trucks), pedestrians, transit and other modes. The goals of the TSP are as follows:

Goal 1: Safety. Develop and maintain a safe City transportation system.

Goal 2: Multi-modal Travel. Provide a balanced City transportation system.

Goal 3: Trip Reduction. Develop a transportation system that helps to reduce the number of motor vehicle trips and contributes to regional goals to reduce per capita vehicle miles of travel.

Goal 4: Performance. Provide an efficient transportation system that manages congestion.

Goal 5: Goods Movement. Provide for efficient movement of goods and services.

Goal 6: Livability. Transportation facilities within the City shall be designed and constructed in a manner that enhances livability of Hillsboro.

Goal 7: Accessibility. Develop transportation facilities that are accessible to all members of the community and minimize out-of-direction travel.

PEDESTRIANS

Sidewalks are provided on many of the arterial and collector roadways and are required within all-new local streets and roadways in the City of Hillsboro, forming an existing pedestrian network. However, there are gaps in the existing network where the sidewalks are discontinuous along roadway segments. These gaps significantly reduce the potential for system-wide as well as inter-community pedestrian circulation. Generally, where sidewalks are available there is sufficient capacity. In Hillsboro the greatest need is to develop a system of continuous sidewalks that enable inter-neighborhood and inter-community pedestrian travel.

The most important existing pedestrian needs in Hillsboro are connectivity of a system of walkways within a quarter mile grid and sidewalk connectivity to key activity centers in Hillsboro (parks, schools, retail, etc.). This includes safe, convenient crossings of large arterial streets, which now act as barriers to pedestrian movement. In the future, pedestrian needs will be similar, but there will be additional activity centers that will need to be considered and connected.

The Hillsboro Task Force evaluated various strategies for each of the modal elements and then ranked them. Each Task Force member was assigned a certain number of points that he or she could allocate to each of the strategies according to his or her vision of priorities for the City of Hillsboro. The ranking of these strategies for pedestrians as follows is from most important to least important[3]:

- Connect key pedestrian corridors to schools, parks, recreational uses and activity centers (public facilities, commercial areas, etc.)
- Fill in gaps in the network where some sidewalks exist
- Pedestrian corridors to transit stations and stops
- Pedestrian corridors that connect neighborhoods
- Signalized pedestrian crossings
- Pedestrian corridors that commuters might use
- Reconstruct all existing substandard sidewalks to City of Hillsboro Standards

The Pedestrian Master Plan (Figure 1-2) provides an overall framework plan to meet local and regional policy. From this Master Plan, a more specific, shorter term Action Plan was developed which reflects the priority of strategies suggested by the Task Force and likely land use or transportation action project developments. The Action Plan (Table 1-1 and Figure 1-3) consists of projects to which the City should give funding priority in the near term. As development occurs and streets are rebuilt or constructed other opportunities (such as grant programs) may arise therefore projects on the Master Plan should be pursued as well. Policy dictates that sidewalks are provided on all new streets built in Hillsboro. New sidewalks should consider:

- City design and construction standards including street lighting
- Sidewalks should be a minimum of five feet wide
- Adjoining landscape strips shall be provided between the adjacent street and sidewalk unless not practicable

[3] The technical appendix contains overall scoring.

DKS Associates

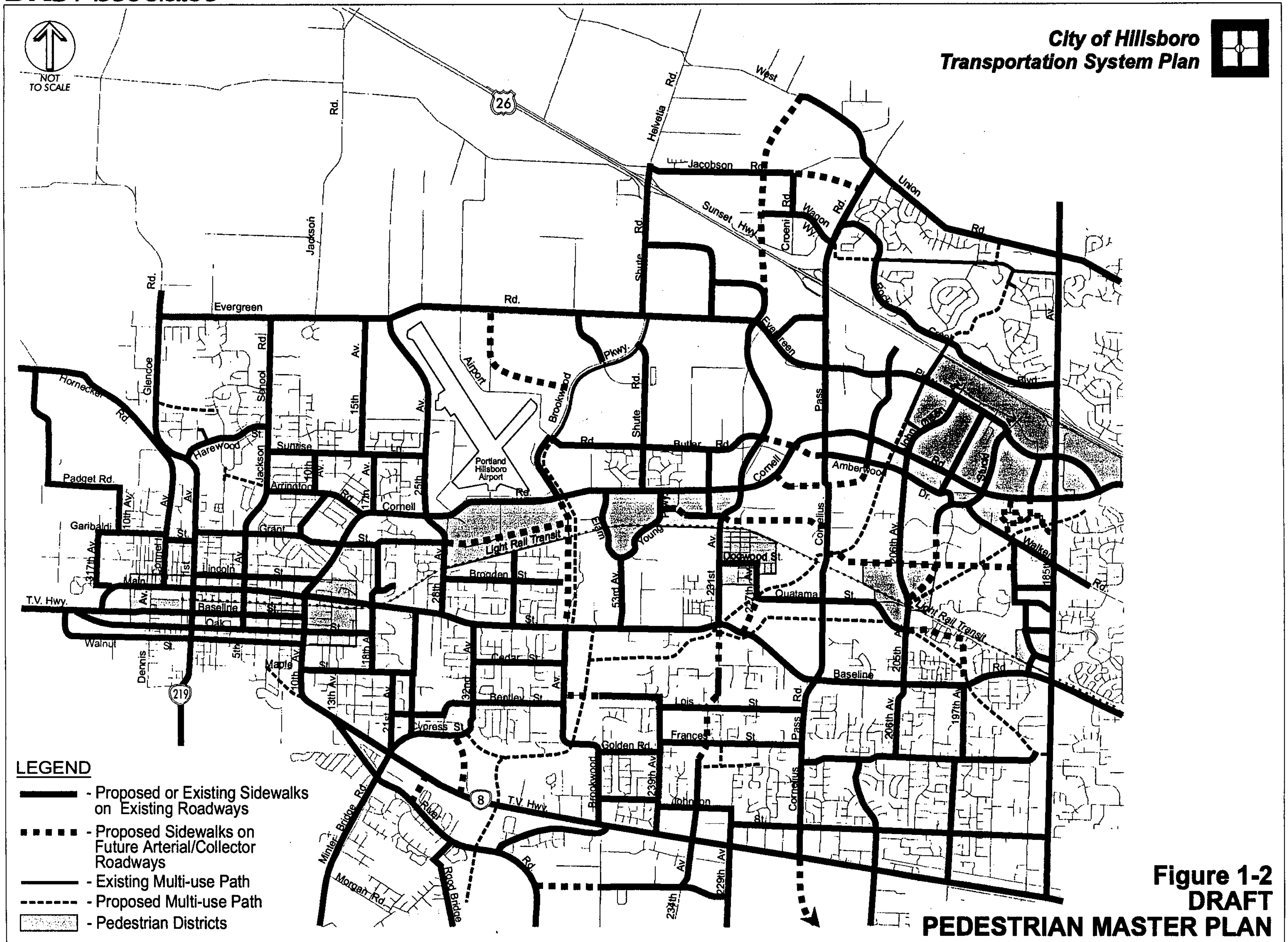
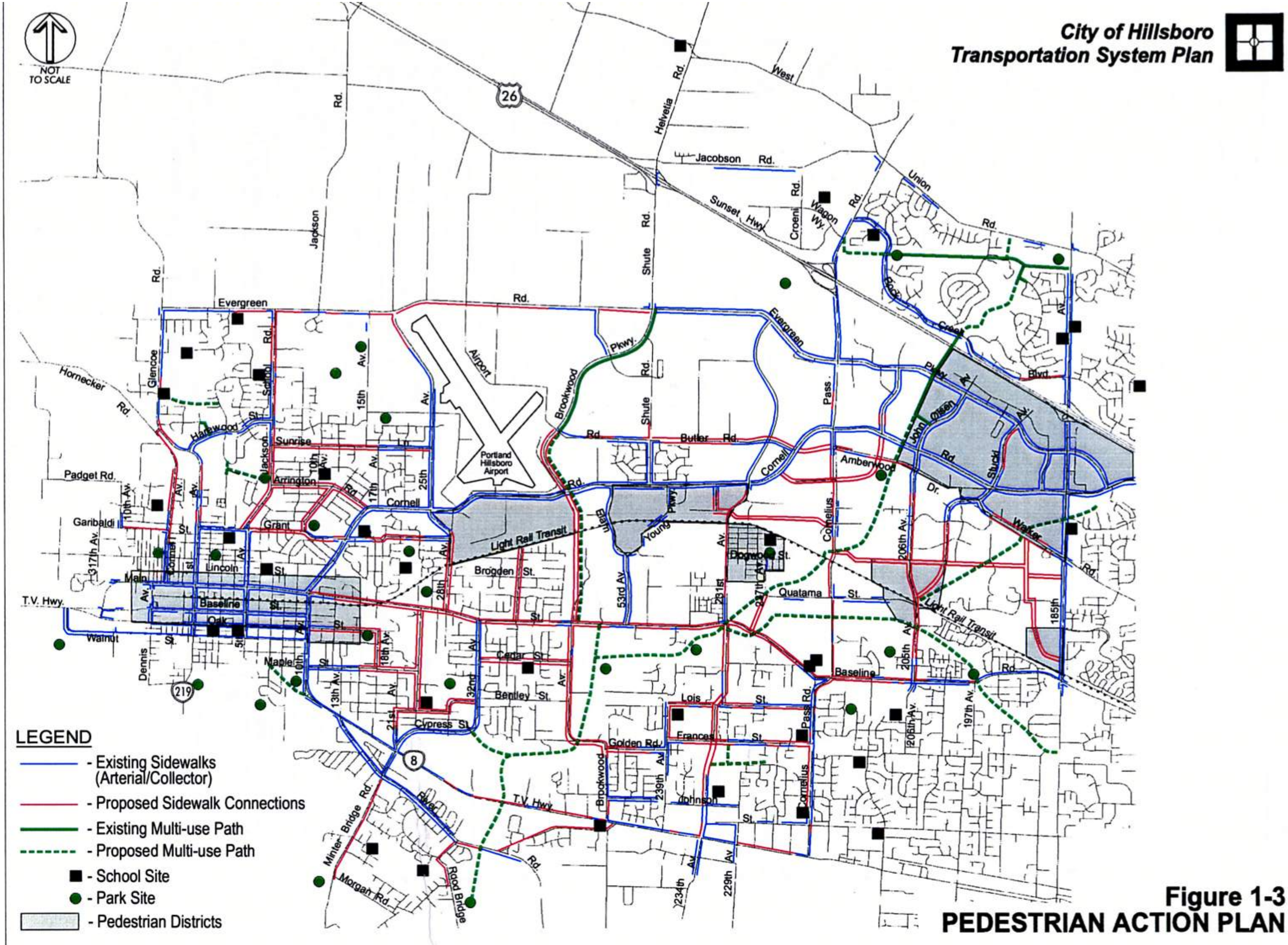


Figure 1-2
DRAFT
PEDESTRIAN MASTER PLAN

Table 1-1: Pedestrian Action Plan Project List

Project	From	To	Metro RTP No.*	Cost (in $1,000s)
Priority (1): Connect key pedestrian corridors to schools, parks, recreational uses and activity centers				
Maple Street	16th Avenue	24th Avenue	722	$300 *
Oak Street	10th Avenue	18th Avenue	722	$300 *
Walnut Street	10th Avenue	18th Avenue	722	$300 *
18th Avenue	Oak Street	Maple Street	722	$300 *
21st Avenue	Cypress Street	Maple Street	722	$300 *
Glencoe Road	north of Glencoe H.S.	Grant Street	712	$ 90 *
Jackson School Road	Evergreen Road	Grant Street	711b	$500 *
Connell Road	Garibaldi Street	Glencoe Road		$100
Arrington Road	Cornell Road	Jackson School Road		$230
Delsey Road	Arrington Road	Grant Street		$130
24th Avenue	Spruce Street	Maple Street		$85
Cedar Street	32nd Avenue	Brookwood Avenue		$260
Frances Street	239th Avenue	Cornelius Pass Road		$300
Minter Bridge Road	River Road	Morgan Road		$120
Rood Bridge Road	River Road	Rood Bridge Park		$60
Witch Hazel Road	TV Highway	River Road		$120
37th Avenue	Main Street	LRT Station		$240
Arrington Road	Jackson School Road	Cornell Road		$340
Sunrise Lane	Jackson School Road	25th Avenue		$360
Grant Street	Jackson School Road	28th Avenue		$400
Lois Street	239th Avenue	Cornelius Pass Road		$234
Priority (2): Fill in gaps where some sidewalks exist				
TV Highway	10th Avenue	Cornelius Pass Road	723	$8,300*
28th Avenue	Grant Street	E. Main Street	726c	$160 *
Cornelius Pass Road	TV Highway	Evergreen Road	737/738	$390
Walker Road	Amberglen Parkway	185th Avenue		$180
Stucki Avenue	Cornell Road	Evergreen Parkway		$120
Garabaldi Street	317th Avenue	1st Avenue		$100
Golden Road	Brookwood Avenue	239th Avenue		$180
Priority: Construct sidewalks with roadway improvement projects				
Baseline Road	Lisa Drive	Brookwood Avenue	714/715/928	$980 *
231st Avenue	Cornell Road	Johnson Street	729a	$720 *
Brookwood Parkway	Airport Road	TV Highway	739/740	$770 *
Evergreen Road	Shute Road	Glencoe Road	732/732b	$340 *
Aloclek Road	Amberwood Drive	Cornelius Pass Road	726d	$240 *
East/west connector/Parr	185th Avenue	63rd Parkway	728	$552 *
Amberglen Parkway/205th Ave.	Von Neuman Drive	Baseline Road	729b	$430 *
Quatama Street	227th Avenue	Baseline Road	707	$120
Butler/Old Cornell Road	Shute Road	206th Avenue/John Olsen		$624
Salix Extension	185th Avenue	Cornell Road		$410
206th Avenue	Amberwood Drive	Amberglen Parkway		$360
			TOTAL	**$20,045**

*Included in Draft RTP list, November 1998. Reference number used in Round 2 lists.


City of Hillsboro
Transportation System Plan
NOT TO SCALE
LEGEND
- Existing Sidewalks (Arterial/Collector)
- Proposed Sidewalk Connections
- Existing Multi-use Path
- Proposed Multi-use Path
- School Site
- Park Site
- Pedestrian Districts
Portland Hillsboro Airport
Light Rail Transit
Sunset Hwy
T.V. Hwy.
Evergreen
Cornell
Baseline
Brookwood
Shute Rd.
Cornelius Pass
185th
Figure 1-3
PEDESTRIAN ACTION PLAN

BICYCLES

Bikeways are currently provided on several arterials and collectors within the City, forming an initial bikeway network. Bikeways generally consist of designated bike lanes and roadway segments where specific accommodation (additional lane width) has been made for bicyclists. However, there are many gaps in the bicycle network where bikeways do not exist along arterial and collector roadways. Bikeway connectivity throughout the City is needed. Gaps in the City's existing bikeway network cause a significant problem for bicyclists.

The ranking of the strategies evaluated by the Task Force as follows is from most important to least important for bicycles[4]:

- Connect key bicycle corridors to schools, parks, recreational uses and activity centers (public facilities, industrial, commercial areas, etc.)
- Fill in gaps in the network where some bikeways exist
- Bicycle corridors that commuters might use
- Bicycle corridors for recreational needs
- Construct bike lanes with roadway improvement projects
- Bicycle corridors that connect neighborhoods
- Bicycle corridors providing mobility to and within commercial areas

The Bicycle Master Plan (Figure 1-4) outlines where bicycle facilities will be required in the future. It is supportive of the state policy from Transportation Planning Rule (Goal 12) and the City statutory requirements that off-site improvements to arterial and major collector roads have bicycle ways. Additional linkages with lanes or accommodations are outlined to make a complete network. The Bicycle Action Plan consists of projects that the City should actively try to fund in the near term. With the Action Plan in place (Figure 1-5), a substantial bicycle network would be constructed which would then allow attention to be placed on infill Master Plan projects. Many of the bicycle projects would be elements of multi-modal street improvement projects (for example, Baseline Road). The Action Plan is consistent with plans developed by Metro and Washington County.[5]

The Bicycle Master Plan will require incremental implementation. As development occurs, streets are rebuilt and other opportunities (such as grant programs) arise, projects on the Master Plan should be integrated into project development. The development of the off-street multi-use path network will require regional coordination with Metro and other jurisdictions.

[4] The overall scoring is included in the appendix.

[5] *Draft 3.0 Regional Bicycle System Map,* Metro, July 1997 and *Draft Bikeway Plan,* Washington County, Oregon, June 1995.

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City of Hillsboro
Transportation System Plan

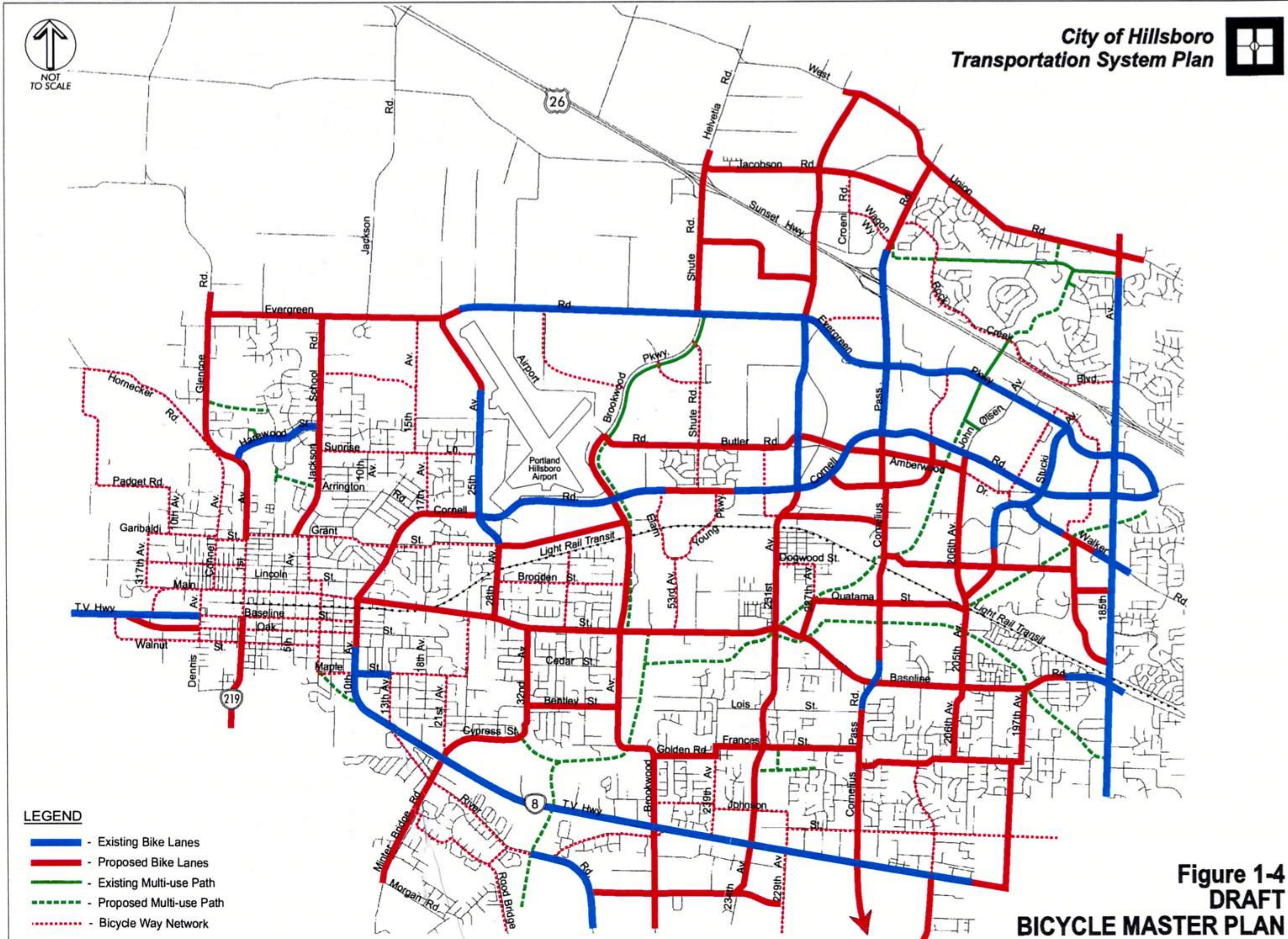

Figure 1-4
DRAFT
BICYCLE MASTER PLAN

Table 1-2
Bicycle Action Plan Project Priorities

Project	From	To	Approximate Cost (1000's of dollars)
Priority 1: Connect key bicycle corridors to schools, parks, recreational uses and activity centers			
Rock Creek Trail	Evergreen Parkway	Amberwood Drive	(79*) $ 500
Jackson School Road bike lanes	Evergreen Road	Grant Street	(711b*) $ 672
Glencoe Road bike lanes	Evergreen Road	Grant Street	(712*) $ 466
Grant Street bicycle way	1st Avenue	25th/28th Avenue	$ 252
Priority 2: Fill in gaps in bicycle network			
25th Avenue bike lanes	Evergreen Road	25th Avenue gap	(749*) $ 2,000
Cornell Road bike lanes	Elam Young (west)	Ray Circle	(706*) $ 600
10th Avenue bike lanes**	Walnut Street	Main Street	$ 151
Oak Street bike lanes**	TV Highway	Dennis Avenue	$ 252
Cornell Road bike lanes**	Grant Street	25th Avenue	$ 302
Priority: Construct bike lanes with roadway improvement projects			
Baseline Road bike lanes	Lisa Drive	10th Avenue	(714/715/928*) $1,875
Brookwood Parkway bike lanes	Airport Road	TV Highway	(739/740*) $1,200
Cornelius Pass Road bike lanes	Cornell Road	209th Avenue	(737/738*) $1,425
Evergreen Road bike lanes	Near 260th Avenue	Glencoe Road	(732b*) $ 450
Evergreen Road bike lanes	Near 25th Avenue	Glencoe Road	(732*) $ 675
231st/235th Avenue bike lanes	Evergreen Road	West Union Road	(743a/743b*) $1,125
28th Avenue bike lanes	Grant Street	Main Street	(726c*) $ 250
231st Avenue bike lanes	TV Hwy	Cornell Road	(729a*) $1,125
Quatama Street bike lanes	227th Avenue	Baseline Road	(707*) $ 120
Jacobson Road bike lanes	Helvetia Road	Cornelius Pass Road	$ 600
Butler/Amberwood bike lanes	Brookwood Parkway	John Olsen Avenue	$ 1,013
Walker Road bike lanes	Amberglen Parkway	185th Avenue	$ 270
Bicycle Action Plan Projects Total Cost:			**$15,323**

Other Master Plan Projects

Project	From	To	Approximate Cost
Priority: Bicycle corridors that connect neighborhoods			
Three Projects: Minter Bridge-Cyress-32nd/Quatama/Golden-/Frances			$ 2,394
Priority: Construct bike lanes with roadway improvement projects			
Eight Projects: West Union/Shute/Quatama/Grant/205th-206th/Salix/New Roads			$ 5,402
Priority: Multi-use trails for citywide and recreational needs			
Four corridors: Rock Creek/Beaverton Creek/Bronson Creek/Bethany Pond			$ 4,065
Other Bicycle Master Plan Projects Total Cost:			**$ 11,861**

* Included in Draft RTP list, November 1998 (reference number in parenthesis)
** Feasibility studies required; including alternative alignments and need for right-of-way acquisition.

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City of Hillsboro
Transportation System Plan

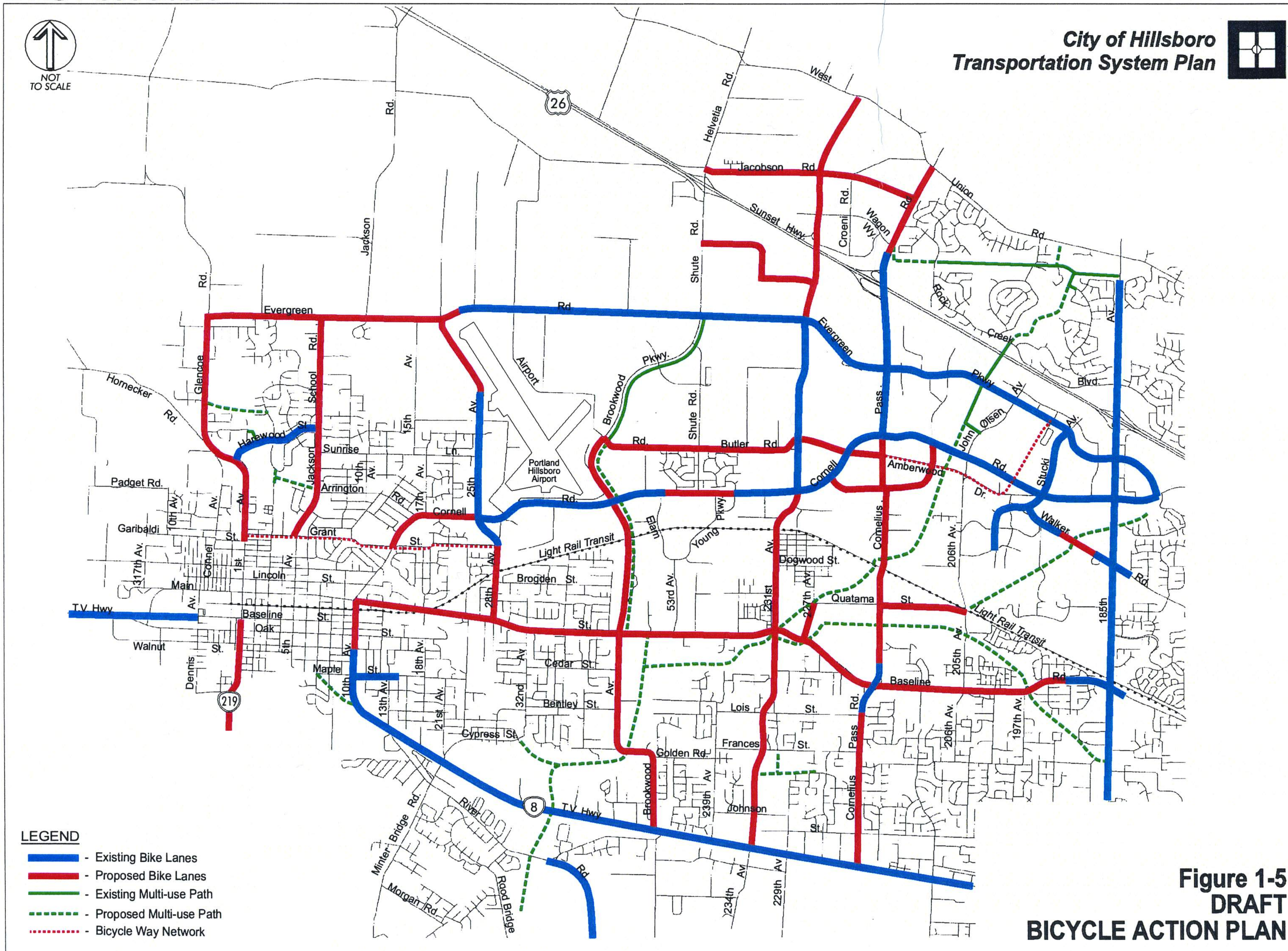

Figure 1-5
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BICYCLE ACTION PLAN

TRANSIT

Currently, there are seven bus/transit routes operated by Tri-Met in Hillsboro, which generally travel along 185th Avenue, TV Highway, Baseline Road, Cornell Road, 25th Avenue, Evergreen Road and Brookwood Parkway-Shute Road. The availability and frequency of transit in Hillsboro is limited. Some routes are limited to peak service and the extent and coverage of transit limits the use of transit as an alternative mode.

Metro's Draft Regional Transportation Plan (RTP)[6] identifies Cornell Road, Walker Road, Baseline Road and 185th Avenue as part of the *primary bus network* and TV Highway as part of the *frequent bus network* (potentially 15 minute service). Primary routes provide the backbone of the transit system and are intended to provide the highest quality service and carry the highest passenger volumes. Transit centers are identified for the LRT stops in Hillsboro.

Tri-Met's Board of Directors adopted the Westside Service Plan in March 1998 (Figure 1-6). As part of this plan, significant changes to transit routes in Hillsboro occurred. Six new routes 41S, 42S, 46, 47, 48, and 49S replaced the existing routes 58, 68, 91X, and 94X. Routes 88 and 89 were modified from their existing routes to serve the Willow Creek/SW 185th Ave. Transit Center. Routes 52 and 57 will have no significant changes to the routes.

One of Hillsboro's greatest transportation needs of the future will be improving local transit service, especially to the areas located between Baseline and Tualatin Valley Highway and the areas south of Tualatin Valley Highway. Local transit service will also serve Urban Reserve areas currently located south of Hillsboro. Rapidly increasing employment and housing creates a much greater opportunity to create productive public transit routing in Hillsboro. The Transportation Planning Task Force developed and prioritized transit strategies as follows:

- Encourage enhanced local services, particularly to residential areas
- Provide direct access to/from Light Rail Transit (MAX) by integration of bus services
- Provide access to commercial/employment areas
- Provide access to activity and service centers (schools, etc.)
- Provide express routes to regional employment centers
- Provide access to regional town centers/main streets
- Provide Park and Ride lots
- Dial-a-ride demand responsive

The City can also use its land use review process to support transit routings developed by Tri-Met and provide improved transit amenities near major bus stops (such as direct pedestrian links to front doors of adjacent uses, shelters and sidewalks). Tri-Met provides a "*Planning and Design for Transit Handbook*" for land development to be more "transit friendly".

[6] *Public Transportation System Map,* Metro, Draft 3.0, July 1, 1997.

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City of Hillsboro
Transportation System Plan

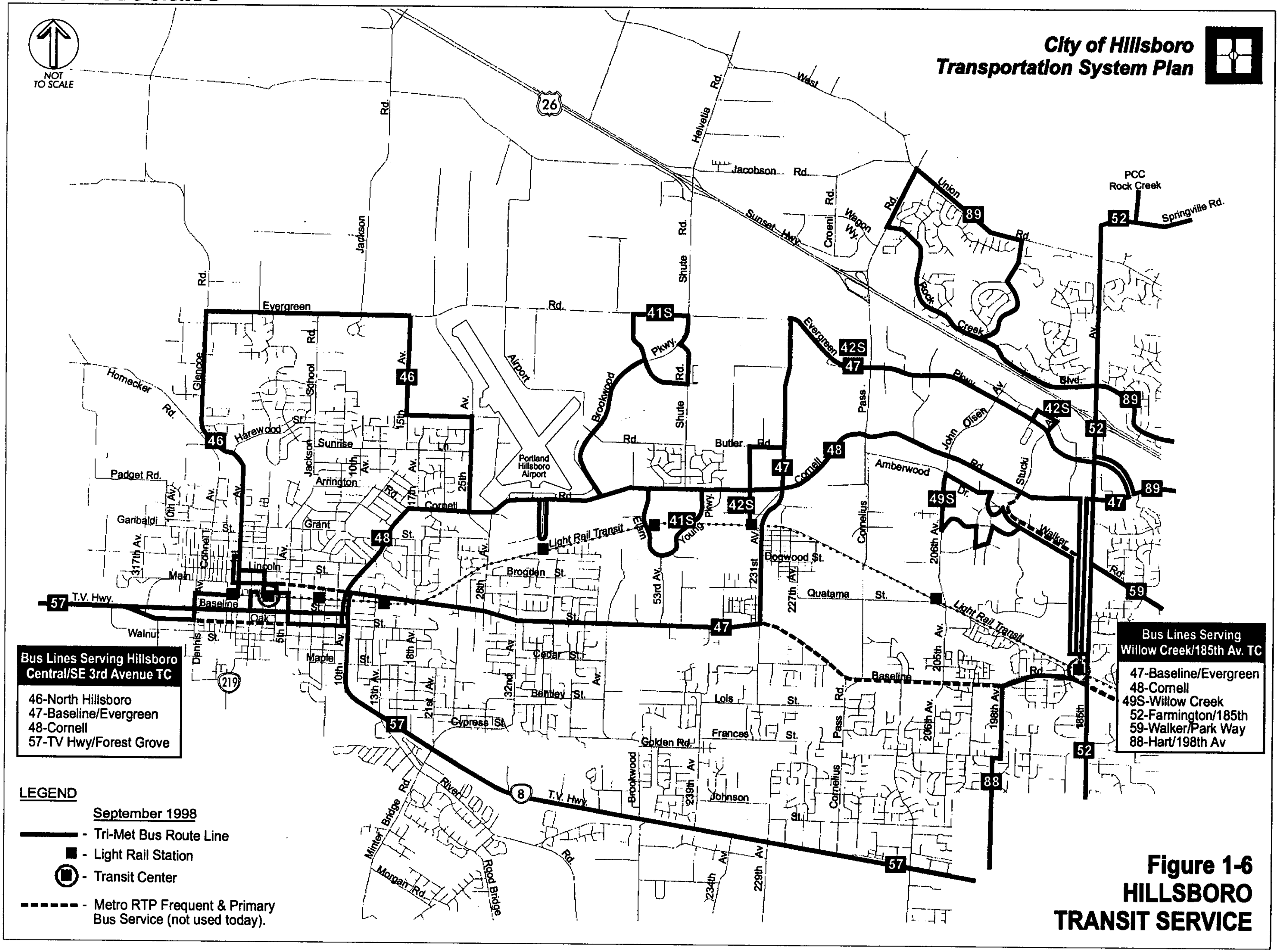

Figure 1-6
HILLSBORO
TRANSIT SERVICE

MOTOR VEHICLES

Motor vehicle needs were analyzed in terms of existing conditions and future forecasts (Chapter 8). Forecasts of 2015 trip making within the City were developed using Metro's travel demand forecast model (see Chapter 4). Based upon the evaluation of intersection level of service, 54 of the study intersections operate at or worse than level of service E in the 2015 evening peak hour with no improvements. This compares with 5 intersections operating at these levels today. The impact of future growth (caused by nearly 60,000 additional trips in the evening peak hour in 2015 as compared to today) would be severe without significant investment in transportation improvements. Without any street improvements, travel speeds would be below 5 MPH over long stretches of road (3 to 8-mile segments of roadways) resulting in unmanageable congestion. Poor performance on freeways and arterials would result in substantial impacts (added through traffic) to neighborhood and collector routes. The greatest problem areas can be grouped into the following areas:

- **Lack of east-west capacity.** The three key east-west routes (Cornell, Baseline, TV Highway) all experience significant congestion if improvements are not made.

- **Lack of US 26 interchange area capacity.** Interchange areas at 185th Avenue, Cornelius Pass, Shute and Jackson School Roads all experience demands well in excess of capacity. A significant problem is the lack of any other crossings of US 26 other than at interchanges. Throughout Hillsboro there are no places to cross the freeways except at interchanges. This results in interchange areas not only serving high freeways access needs, but through arterial traffic and local circulation. This results in congestion at interchanges.

- **Lack of north-south arterial capacity.** In the future, the eastern three north-south corridors (185th, Cornelius Pass and the new Brookwood alignment) all experience multiple intersection failures and segments with volumes well above capacity without improvements.

- **Lack of east-west capacity through the downtown area.** With the projected growth in the downtown regional center, demand leaving the downtown area exceeds capacity. While the core downtown appears to operate adequately, the fringes to the downtown experience congestion.

- **Lack of intersection turning capacity.** Many intersections experience Level of Service (LOS) F conditions (refer to Appendix for description), not for need of through capacity, but the need for additional right or left turning capacity.

- **Lack of adequate means to cross arterials.** Traffic volumes increases are such that the ability to cross or access arterial/collector routes in the future is very difficult. Traffic signal control must be planned to allow adequate control for autos, bikes and pedestrians, while not resulting in disruption caused by placing signals at low priority locations, such as private site driveways, or at locations too close to existing traffic signals.

A coordinated set of street and intersection improvements was developed to mitigate the operational deficiencies. Figure 1-7 outlines the locations where major improvements are identified. A summary list is provided in Table 1-3.

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City of Hillsboro
Transportation System Plan

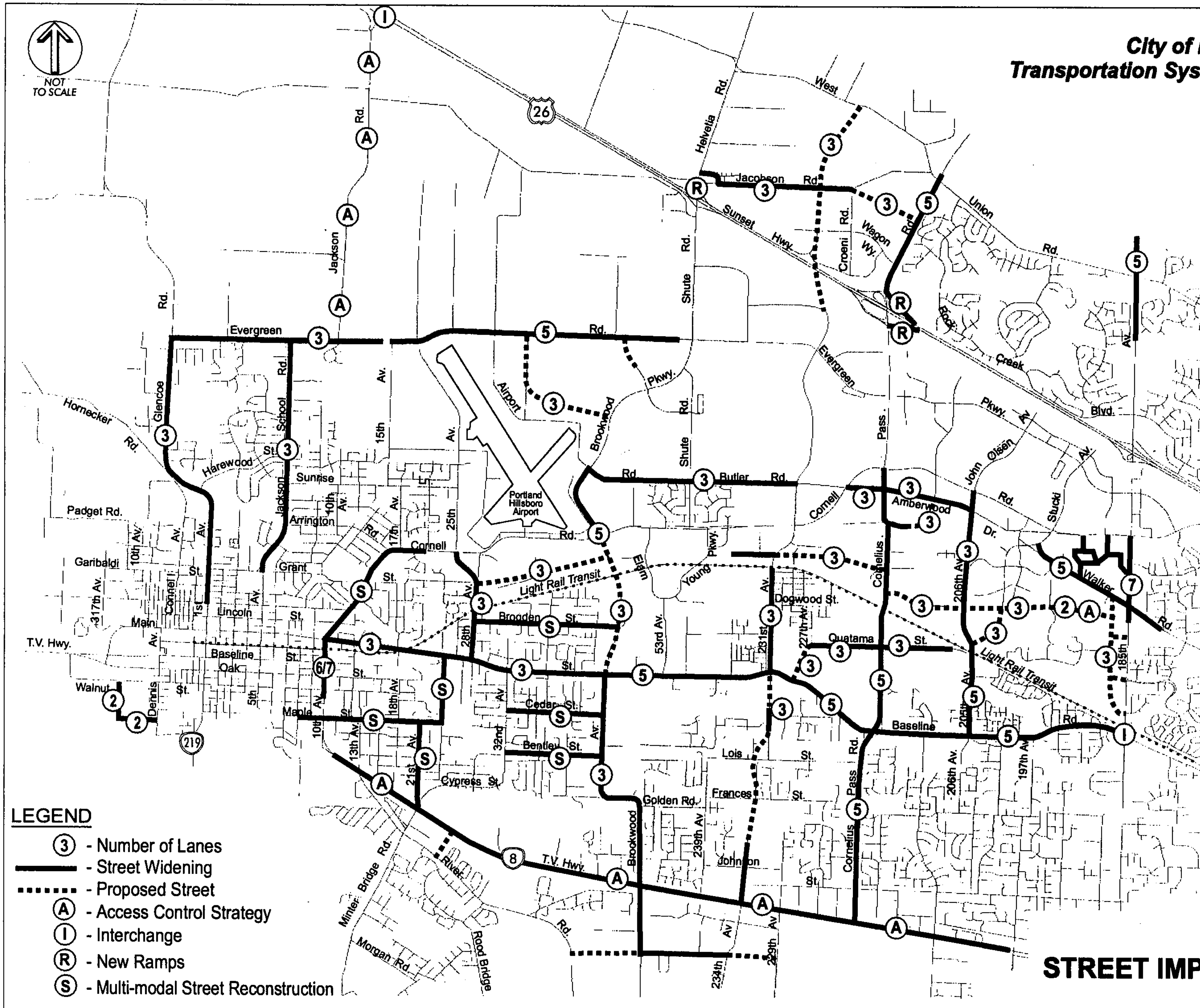

Figure 1-7
STREET IMPROVEMENT PLAN

Table 1-3
Motor Vehicle Project List
(All projects include sidewalks, bicycle lanes and transit accommodations as required)

Location	Description	Status*	Cost
HIGHEST PRIORITY PROJECTS			
10th Avenue: Main to Baseline Street	Add right turn lane, widen sidewalk	RTP 726b	$1,500,000
28th Avenue: Grant to Main	Widen to 3 lanes	RTP 726c	$ 9,600,000
231st / 234th Avenue Extension	Extend south of Baseline to Century High School a 3 lane roadway	RTP 729a	$23,200,000
Aloclek: Amberwood to Cornelius Pass	Extend 3 lane road	RTP 726d	$ 2,000,000
Baseline Road: Lisa to Brookwood	Widen to 5 Lanes	RTP 715	$ 6,000,000
Baseline Road: Lisa to 231st Avenue	Widen to 3 Lanes	RTP 714	$20,000,000
Baseline Road: 231st Ave. to Brookwood	Widen to 3 Lanes	RTP 928	$ 7,500,000
Brookwood Parkway: Airport to TV Hwy	Widen to 5 Lanes to past Cornell, extend south as 3 Lanes	RTP 739/740	$18,400,000
Cornelius Pass Road: US 26 to West Union	Widen to 5 Lanes	RTP 734	$ 3,500,000
Cornelius Pass Road: Aloclek to Baseline	Widen to 5 Lanes	RTP 738	$15,000,000
Cornelius Pass Road: Baseline to TV Hwy	Widen to 5 Lanes	RTP 737	$ 9,000,000
Evergreen: Glencoe to 15th Avenue	Widen to 3 Lanes	RTP 731a	$12,800,000
Evergreen: 15th to 253rd Avenue	Widen to 5 Lanes	RTP 732b	$ 8,900,000
TV Highway/Cornell Signal Timing/System	Operational Improvements	RTP 646b/727/730	$ 2,800,000
TV Highway Boulevard	Complete Boulevard Improvements	RTP 710a	$ 2,000,000
TV Highway: Cornelius Pass to 209th	Improvement	STIP Planned	$ 1,250,000
US 26/Jackson School Road	Channelization/Safety	RTP 711a	$ 500,000
US 26 at 185th	Sound Walls	STIP Planned	$ 1,950,000
Johnson at 198th	Traffic Signal	STIP Planned	$ 203,000
		Subtotal	**$ 146,103,000**
SECOND HIGHEST PRIORITY PROJECTS			
1st Ave./Glencoe Rd.: Lincoln to Evergreen	Widen to 3 Lanes	RTP 712	$ 3,500,000
185th Avenue: Westview to Springville	Widen to 5 Lanes	Not in Plans	$ 4,700,000
205th Avenue: LRT to Baseline	Widen to 5 Lanes	RTP 729b	$ 4,800,000
206th Avenue: Amberwood to LRT	Widen to 3 Lanes	Not in Plans	$ 3,100,000
Amberglen Parkway: Walker to 206th	Extend 3 lane roadway	Not in Plans	$ 2,100,000
Amberwood: 206th to Cornelius Pass	Widen to 3 Lanes	Not in Plans	$ 1,500,000
Butler Road: 63rd to Brookwood/Airport	Widen and extend to 3 lane road	Not in Plans	$ 1,200,000
Cornell: Arrington to Main	Widen to 5 Lanes	RTP 709b	$ 6,000,000
Downtown Area Improvements: 1st and 10th Avenues	Signals, Striping, Widening, and Two-way.	RTP 712b/726e-f	$ 2,270,000
East-West Collector: Cornelius Pass to Salix	Extend 3 lane road	RTP 728	$10,900,000
East-West Collector: Campus to Cornelius Pass	Extend 3 lane road	RTP 728	$ 7,600,000
Jackson School Road: Evergreen to Grant	Widen to 3 Lanes	RTP 711b	$ 3,500,000
Jacobson Road: Croeni to Cornelius Pass	Extend new 3 lane alignment	Not in Plans	$ 4,400,000
Jacobson Road @ Helvetia	Realign intersection north of US 26	Not in Plans	$ 1,700,000
Quatama Street: LRT to 227th Avenue	Widen/improve 3 lane road	RTP 707	$ 4,200,000

Location	Description	Status*	Cost
Quatama Street: 227th Ave. to Baseline Rd.	Extend 3 lane road	RTP 707	$ 2,200,000
Salix Extension: LRT to Walker	Extend 3 lane roadway	Not in Plans	$ 4,300,000
Walker Road: Amberglen to 185th	Widen to 5 Lanes	RTP 754	$ 10,000,000
Other Collector Reconstruction	Multiple Locations	Not in Plans	$38,100,000
Intersections Improvements	Multiple Locations (see Table 11-7)	Not in Plans	$50,500,000
Other Traffic Signals (16)	City/County operational enhancement	Not in Plans	$ 4,000,000
US 26/Cornelius Pass Road	Build new diagonal ramps in NE & SE Quadrants. Add ramp meter storage.	RTP 735	$ 5,000,000
US 26/Shute Road	New loop ramp and interchange modifications	US 26 Interchange Study	$ 5,000,000
US 26/229th Overcrossing	Extend 229th Ave. from NW Bennett Ave. to West Union Rd. as 3 lane roadway	RTP 743 a + b	$6,800,000
		Subtotal	**$ 187,370,000**
THIRD HIGHEST PRIORITY PROJECTS			
Airport Road: Evergreen to Brookwood	Realign and widen to 3 lanes	Not in Plans	$ 2,800,000
Amberwood: Cornelius Pass to Cornell	Extend 3 lane road to Butler	Not in Plans	$ 2,100,000
Baseline Road/185th Intersection	Upgrade Capacity/Grade Separation	Not in Plans	$15,000,000
Brookwood Extension s/o TV Hwy	Extend 3 Lanes, realign Witch Hazel	Not in Plans	$ 1,300,000
Cornelius Pass Road Extension	Extend 3 lane road south of TV Hwy to 209th	RTP 825d	$14,000,000
Heritage: 185th to Salix	Extend 2 lane road	Not in Plans	$ 1,900,000
Jackson School Road/US 26	Interchange	Not in Plans	$ 10,000,000
Parr: 185th to Salix	Connect 3 lane road	Not in Plans	$ 1,900,000
West of Rood Bridge: TV Hwy to River	Connecting 3 lane roadway	Not in Plans	$ 700,000
TV Highway: Access Control	Driveway/Turn Lane modifications	RTP 645c	$15,000,000
East-West Collector: Brookwood to 28th	Build new 3 lane road n/o LRT	Not in Plans	$ 7,100,000
East-West Collector: River to 209th	Extend and widen to 3 lane road	Not in Plans	$18,200,000
185th Avenue: Cornell to Walker	Widen to 7 Lanes	Not in Plans	$ 3,200,000
188th Extension: Cornell to Walker	Extend 3 lane road	Not in Plans	$ 2,400,000
US 26 Auxiliary Lanes: Shute to 185th	Add Auxiliary Lanes	Not in Plans	$20,000,000
US 26/Glencoe Road	Interchange improvement/modernization	RTP 731a	$ 12,000,000
		Subtotal	**$ 127,600,000**
MOTOR VEHICLE STREET IMPROVEMENT TOTAL			**$ 461,073,000**

- Based upon tentative draft RTP preferred improvement list from Metro, reference numbers from November 1998 listing. Planned indicates projects included in the MSTIP, STIP, CIP or approved (1995) RTP funding programs. Not in Plans indicates projects that have not been previously addressed in one of the local or regional transportation improvement plans.

Functional Classification

The current functional classification of streets in Hillsboro was updated to reflect on-going regional planning and the functional needs of Hillsboro. Classifications of principal arterial (freeway), arterial, collector, neighborhood and local streets have been developed based upon connectivity, which is the best indicator of function (Chapter 8 provides descriptions for each functional class). Figure 1-8 summarizes the functional classification recommendations.

Neighborhood Traffic Management

Neighborhood Traffic Management (NTM) is a term that has been used to describe traffic control devices typically used in residential neighborhoods to slow traffic. A number of streets in Hillsboro have been identified as neighborhood routes (Figure 1-9) which may be appropriate locations for potential NTM applications. It is recommended that the City develop a NTM program (Chapter 8 provides a description). This program can use the experience of other jurisdictions to help develop a system to prioritize implementation and address issues on a systematic basis rather than a reactive basis. Most importantly, the goals and policies of this plan call for land use development to outline impacts to neighborhoods in an attempt to have new land uses incorporate NTM features to avoid future problems

Trucks

Efficient truck movement plays a vital role in the economical movement of raw materials and finished products. The establishment of through truck routes provides for this efficient movement while at the same time maintaining neighborhood livability, public safety and minimizing maintenance costs of the roadway system. To accomplish this, a map of through truck routes in Hillsboro has been developed (Figure 1-10). This is aimed at addressing the through movement of trucks, not the local deliveries. The objective of this route designation is to allow these routes to focus on design criteria that is "truck friendly", i.e. 12 foot travel lanes, longer access spacing, 35 foot (or larger) curb returns and pavement design that accommodates a larger share of trucks.

Maintenance

Preservation, maintenance and operation are essential to protect the City investment in transportation. The majority of current gas tax revenues are used to maintain the transportation system. The City spends nearly $2,000,000 per year to maintain City streets. With an increasing road inventory and the need for greater maintenance of older facilities, protecting and expanding funds for maintenance is a recommended priority from the TSP task force. A key concept is that pavements deteriorate 40 percent in quality in the first 75 percent of its life. However, there is a rapid acceleration of this deterioration later, so that in the next 12 percent of life, there is another 40 percent drop in quality. The City's pavement management system identifies pavement problems before this rapid deterioration starts so that preventative maintenance can be applied. These fixes are generally one-fifth to one-tenth the cost required after a pavement is 80 percent deteriorated.

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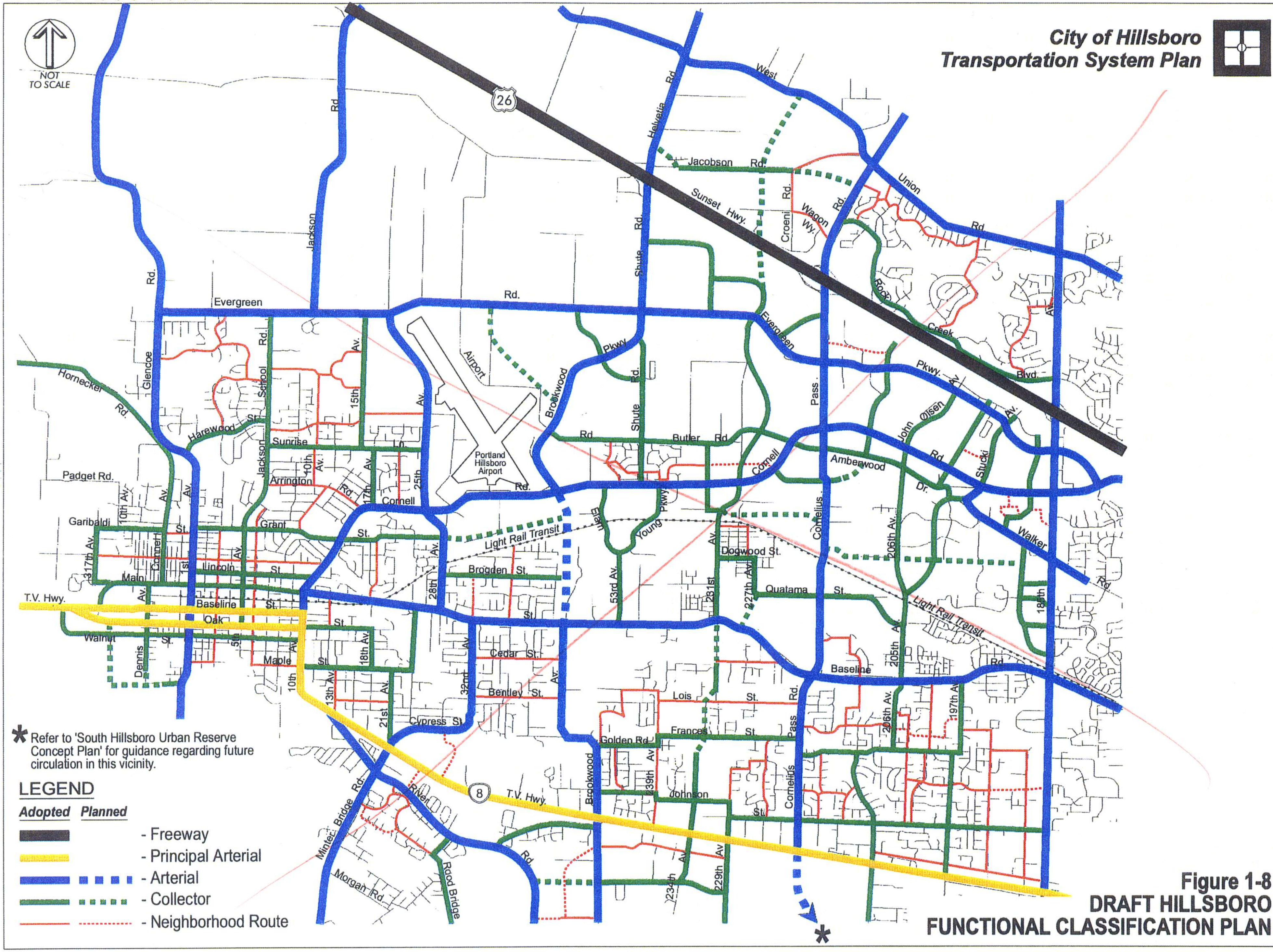

Figure 1-8
DRAFT HILLSBORO
FUNCTIONAL CLASSIFICATION PLAN

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City of Hillsboro
Transportation System Plan

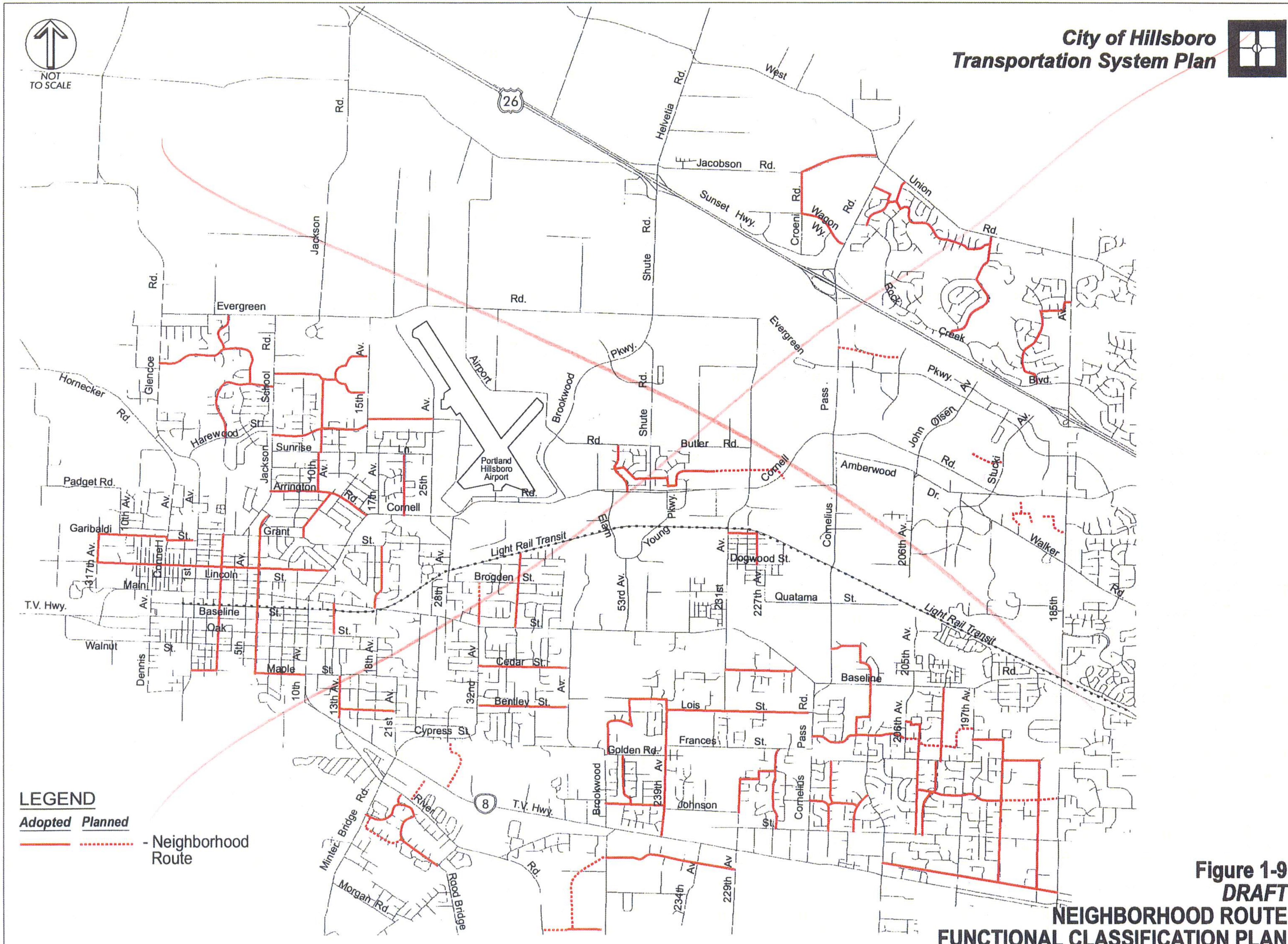

Figure 1-9
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NEIGHBORHOOD ROUTE
FUNCTIONAL CLASSIFICATION PLAN

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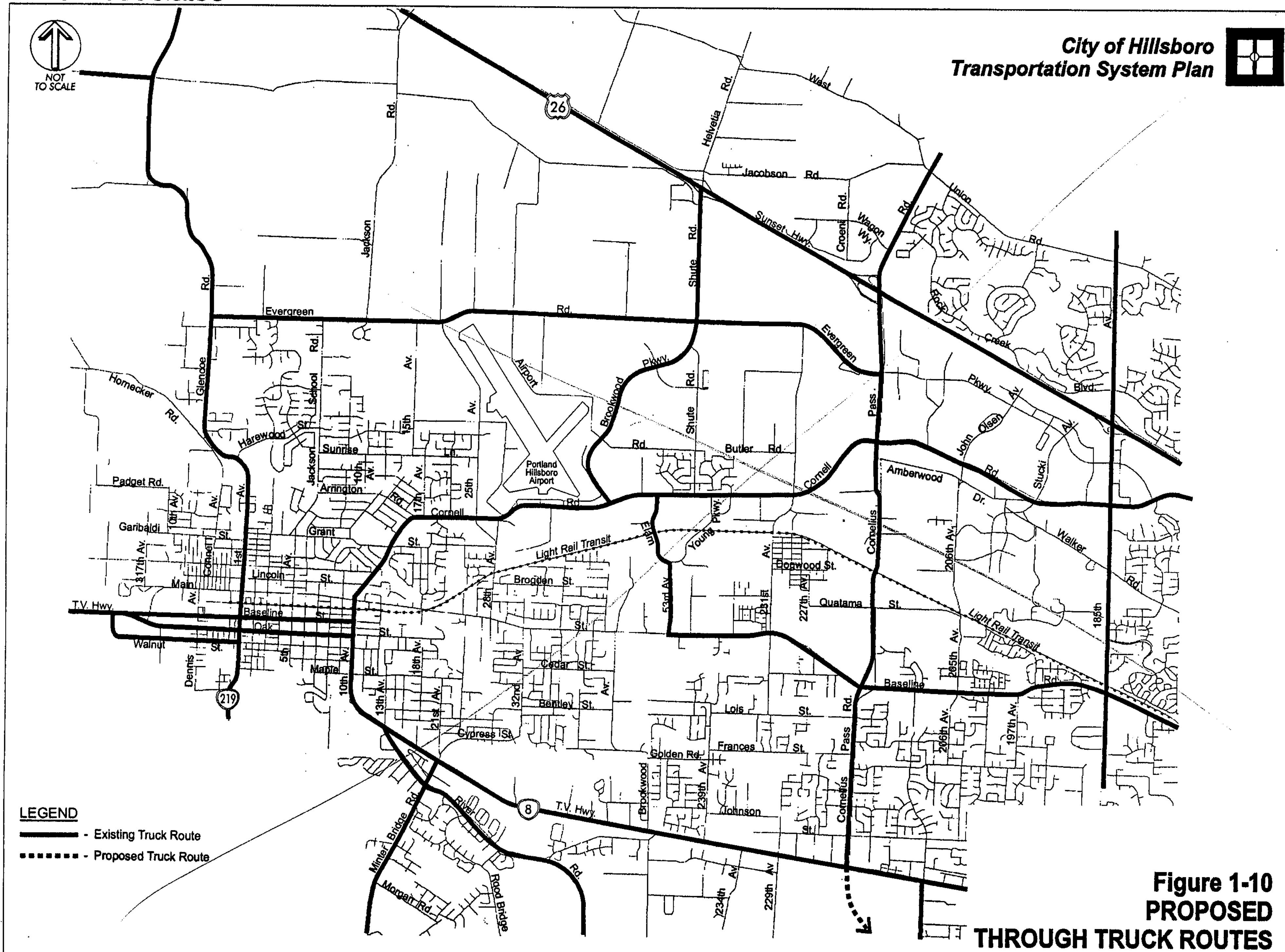

Figure 1-10
PROPOSED
THROUGH TRUCK ROUTES

TRANSPORTATION DEMAND MANAGEMENT

Transportation Demand Management (TDM) describes any action that eliminates single occupant vehicle trips during peak motor vehicle travel demand periods (carpooling, vanpooling, and ride sharing are a few examples). The Transportation Planning Rule outlines a goal of reducing vehicle miles traveled (VMT) per capita. TDM measures have proven to be effective in reducing vehicle trips and they can reduce or slow the need for new transportation capital. Transit is a key element of TDM, but other options must exist to have maximum impact. A few examples include providing transportation coordinators at large businesses, providing shuttles to activity centers or transit (Intel has done this) or staggering work hours/flex time (Nike's warehouse in Wilsonville achieves an 84% reduction in standard PM peak hour vehicle trip rates by varying hours of operation). The Westside Transportation Alliance currently acts as a transportation coordinator for private businesses in Washington County, maximizing the benefits of TDM to business. The DEQ Employee Commute Options rules require employers of over 50 people to have a plan for reducing vehicle trips by 10 percent. The ranking of the TDM strategies evaluated by the Task Force as follows is from most important to least important:

- Encourage linkage of housing, retail and employment centers
- Provide incentives to take transit and use other modes (i.e. free transit pass)
- Work with property owners to install bicycle racks and bicycle amenities
- Schedule deliveries outside of peak hours
- Coordinate shift changes/staggered work hours
- Work with property owners to place parking stalls for carpoolers near building entrances
- Focus demand management districts (i.e. downtown)
- Flexible working hours
- Provide information regarding commute options to larger employers
- Provide Association support to Hillsboro TDM coordination
- Congestion pricing
- Telecommuting

The strategies for transportation demand management were identified in working with the City's Task Force and TSP Technical Advisory Committee. These committees provided input regarding the transportation system in Hillsboro, specifically exploring TDM needs. While most TDM strategies focus on management, one capital oriented strategy would be to increase the park-and-ride capacity at regional transit stops and freeway interchanges. Figure 1-11 identifies the sites in Hillsboro. The freeway sites would be tied to interchange modifications, with 50 to 100 spaces to encourage ridesharing formation. LRT park and ride capacity may need to be increased to meet future demands.

OTHER MODES

Hillsboro also has air, rail and pipeline facilities. The Port of Portland maintains a master plan of the Hillsboro Airport, which is incorporated by reference into the TSP. The Portland & Western and Willamette Pacific Railroads operate the low-density rail lines in Hillsboro. These companies are looking to expand service in Hillsboro along the existing alignments. There are six major high-pressure natural gas lines in Hillsboro owned and operated by Northwest Natural Gas. There are no plans for upgrades or expansions of major pipeline facilities in Hillsboro.

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City of Hillsboro
Transportation System Plan

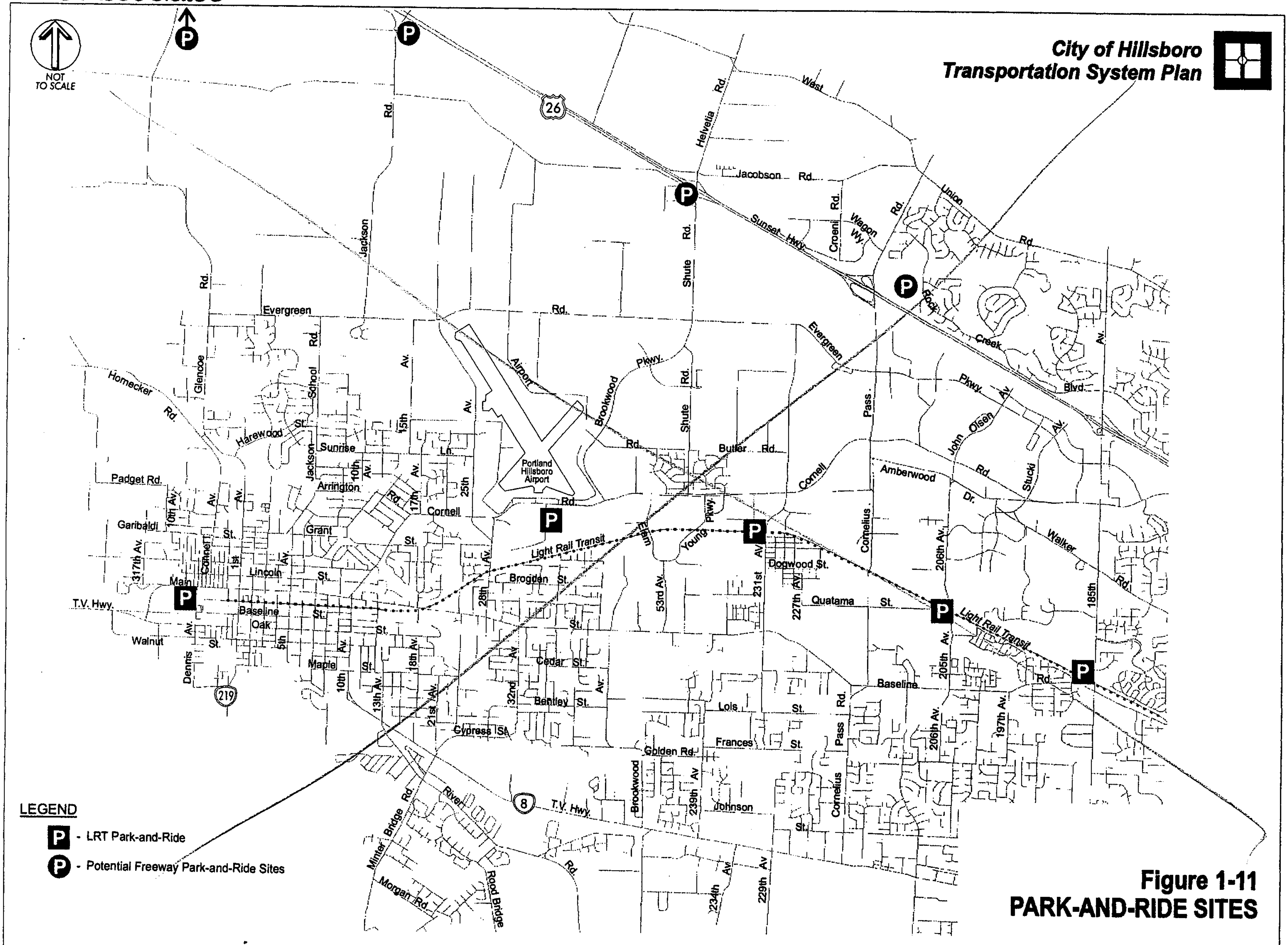

Figure 1-11
PARK-AND-RIDE SITES

FUNDING/COSTS

Funding Sources and Opportunities

There are several existing or potential funding sources for needed City transportation system improvements including the following: Traffic Impact Fees (or system development charges), gas taxes, street utility fees, exactions, local improvement districts, property tax levies (MSTIP), special assessments fees, vehicle fees and the Oregon Special Public Works Fund (IOF). These are sources, which have been used in the past by agencies in Oregon. Due to the complexity and size of today's transportation projects, it is necessary to seek several avenues of funding projects and many of the funding sources may need to be adjusted to meet current and future transportation needs. Unique or hybrid funding of projects is becoming necessary to assure implementation. In many cases, this means private/public cooperation rather than depending on user fees to fix every need. Table 1-4 summarizes several funding options available for transportation improvements. Examples of funding sources that generally cannot provide funds for roadways include: Property Tax General Funds, Car Rental Tax, Transient Lodging Tax, Business Income Tax, Business License Tax, Communication Services Tax, Income tax.

While motor vehicle fees and tax revenues fund many of the state highway projects within the Portland region, major transportation projects are frequently brought to a vote of the public for approval. This has been done to supplement existing funding sources, which cannot keep up with growing needs. Specific projects have been defined in ballot measures, such as the Major Streets Transportation Improvement Program (MSTIP) in Washington County or the Westside Light Rail Project. Because of the need to gain public approval for transportation funding, it is important to develop a consensus in the community, which supports needed transportation improvements. That is the value of the Transportation System Plan. In most communities where time is taken to build a consensus regarding a transportation plan, funding sources (similar to those noted) can be developed to meet the needs of the community.

The collective funding requirements of the Hillsboro TSP are outlined by mode in Table 1-5. Chapter 11 also summarizes the total revenues devoted to transportation for Hillsboro. Based upon current sources of funding, the cost of the needs far exceeds the existing funding over 20 years. Some of the difference can be made up by land use development exactions, where unimproved frontage is built to the TSP standards as projects are implemented. A rough estimate of the potential value of fronting development exactions is about $120 million dollars over 20 years, assuming that all the unimproved frontages of roadway projects (sidewalk plus 18 feet of street) identified in this plan were exactions. This would also assume that the fronting improvements would **not** be credited to TIF/SDC revenue, which is already included in the existing funding outlook.

Table 1-4
Potential Transportation Revenue Sources

Type	Description
Traffic Impact Fees (TIF) and/or System Development Charges (SDC)	Traffic Impact Fees or System Development Charges (SDCs) have been used in Oregon and throughout the United States. The cornerstone to development of TIF/SDCs involves two principles: 1) there must be a reasonable connection between growth generated by development and the facilities constructed to serve that growth (generally determined by level of service or connectivity); and 2) there must be a general system-wide connection between the fees collected from the development and the benefits development receives. Charges are typically based on a measurement of the demand that new development places on the street system and the capital costs required to meet that demand. Washington County has a traffic impact fee (TIF) which is voter approved. SDCs generally do not require a vote of the public and are not a tax.
Gas Tax	The State, cities and counties provide their basic roadway funding through a tax placed on gasoline. State gas tax is approved legislatively while local gas taxes are approved by voters. State funds are dedicated to roadway construction and maintenance, with one percent allocated to pedestrian and bicycle needs. This tax does not fall under the Measure 5 limits, because it is a pay-as-you-go user tax. Washington County has a one cent gas tax and a recent ballot initiative to increase this tax failed.
Other Motor Vehicle Fees	The state collects truck weight mile taxes, vehicle registration fees and license fees. These funds are pooled together with the gas tax in distributing state motor vehicle fees to local agencies. Annual motor vehicle fee allocations to Washington County highways amount to about $100 million (including gas tax).
Street Utility Fees	Certain cities have used street utility fees for maintenance. The fees are typically collected monthly with water or sewer bills. These funds are not for capacity improvements, but for supporting local roadway maintenance based upon land use type and trip generation. This frees other revenue sources for capacity needs. Utility fees can be vulnerable to Measure 5 limitations, unless they include provisions for property owners to reduce or eliminate charges based on actual use.
Exactions	Frontage improvements are common examples of exaction costs passed to development. These have been used to build much of Hillsboro's local street system. Developers of sites adjacent to unimproved roadway frontage are responsible to provide those roadway improvements. Developers of sites adjacent to improvements identified as TIF/SDC projects can be credited the value of their frontage work, which is included in the TIF/SDC project-list cost estimate.
Local Improvement Districts (LID)	LIDs provide a means for funding specific improvements that benefit a specific group of property owners. Assessments are placed against benefiting properties to pay for improvements. LIDs can be matched against other funds where a project has system wide benefit, beyond benefiting the adjacent properties. In Hillsboro, the current code renders LIDs less effective due to the mandate for fronting property. Another form of district use for funding transportation facilities is an urban renewal district where tax increment financing is used to fund infrastructure.
Special Assessments	A variety of special assessments are available in Oregon to defray costs of sidewalks, curbs, gutters, street lighting, parking and CBD or commercial zone transportation improvements. These assessments would be likely to fall within the Measure 50 limitations. In Washington County, other examples of transportation assessments include MSTIP (Major Streets Transportation Improvement Program) and the urban road maintenance district property tax levy. Both of these are property tax assessments, which have been imposed through votes of the public. Another example would be the Westside LRT where the local share of funding was voter approved as an addition to property tax.
Driveway Fees	Gresham collects a Public Street Charge and a Driveway Approach Permit Fee. These fees are project specific and the revenue varies year to year based upon development permits. These funds are used for city maintenance and operation.
Employee Payroll Tax	Tri-Met collects a tax for transit operations in the Portland region through an employee payroll tax. These funds are exclusively used by Tri-Met.
Oregon Special Public Works Fund	The Special Public Works Fund (SPWF) Program was created by the legislature in 1985 as an economic development element of the Oregon Lottery. The program provides grants and loan assistance to eligible municipalities. There has been little use of these funds on urban arterials. These funds are commonly used on state highways (a recent example being Immediate Opportunity Funds used for the US 26/Shute interchange associated with Nike)

Table 1-5
Costs for Hillsboro Transportation Plans over 20 years
1997 Dollars

Transportation Element	Approximate Cost
Street Improvement Projects*: Current Plans	$100,000,000
Unfunded/Not in Plans	$354,603,000
Signal Coordination/ITS Systems ($100,000/yr)	$2,000,000
Road Maintenance (assumes 4% per year growth)	$40,000,000
Bicycle Master Plan (Total $27,747,000)	$10,700,000
Pedestrian Action Plan (Total $20,045,000)	$14,500,000
Pedestrian/School Safety Program ($10,000/yr)	$200,000
Sidewalk Grant Program ($50,000/yr)	$1,000,000
Park-and-ride Expansion (1,000 spaces)	$2,000,000
Neighborhood Traffic Management ($50,000/yr)	$1,000,000
TSP Support Documents (i.e., Design standard update, ...)	$1,000,000
TDM Support ($50,000/yr)	$1,000,000
TWENTY YEAR TOTAL in 1997 Dollars	$528,003,000

* Many of these projects include multi-modal elements built with streets, such as bike lanes and sidewalks. Project costs are included here and not repeated in bicycle and pedestrian costs. While projects in the RTP do not have committed funds, they represent a level of funding that is considered likely over the next 20 years given current funding sources.

Exploring Funding Concepts

The anticipated funding for transportation facilities in Hillsboro over the next 20 years could be expected to be about $200 million. With over $500 million in needs, there is a sizable funding shortfall. Some of the shortfall (about $120 million) could be expected to be made up through exactions of fronting improvements to development (as long as they are not credited against TIF). The remaining $200 million shortfall requires the exploration of several funding concepts. Some of the funding ideas arose from discussion with other agencies, the Transportation Planning Task Force and the public. The following sections summarize the discussion regarding funding options.

A. Reduce the transportation plan costs. This can eliminate funding shortfalls by deferring or eliminating projects. While some cost reduction is expected in the normal implementation of transportation projects of this size, to meet the total funding shortfall by this strategy would have impacts. Lower service levels for all modes of transportation, more extensive congestion and impacts on community livability would be expected. Depending how much of the plan is eliminated (assuming land use forecasts occur), this strategy could negatively impact the economic potential of Hillsboro (businesses relocate, people move out, development does not reach 2015 forecasts).

Additionally, by deferring capital costs of significant projects outside of 20 years it can be expected that the same projects will cost multiples of their estimated costs in the short term. This is similar to deferring roadway maintenance and paying 4 to 5 times the cost of the same improvement by waiting years into the future to act. Rising land costs and the development of vacant land adjacent to roadways increases mitigation requirements (dealing with hundreds of residents rather than one vacant land property owner). These increases in cost erode transportation dollars making deferral of transportation system improvements an unwise choice in managing the public interests.

B. Build alternative mode projects and eliminate costly road projects. This strategy is commonly discussed by people as a way to "get people out of their cars". However, a majority of people in Hillsboro (and the region) continues to use motor vehicles for transportation (single occupant vehicles and carpool/vanpools). This would be the case even if the alternative mode strategies outlined in this plan were fully implemented. By not building road projects, the resulting congestion would severely impact bus transit, bicycle and pedestrian travel which all use the same streets as automobiles.

C. Increase gas tax to meet TSP needs. The scale of the TSP funding shortfall would, by itself, require an increase of over $0.83 per gallon of gasoline. While smaller motor vehicle fee increases are possible, funding all the needed improvements out of a gas tax increase by itself would not be likely to receive voter approval.

D. Make development pay for all the difference in future transportation needs since they are caused by growth. If all the excess funds were divided by the increment of trips between 1997 and year 2015, an additional $3,100 per trip would need to be charged to all development on top of all existing fees, taxes and exactions. This would impact the economic development potential of Hillsboro since other cities (or states) may not have similar charges. Additionally, many of the transportation projects identified in the TSP serve **existing and** future users. For example, a roadway connection project with sidewalks and bicycle lanes (such as 231st Avenue) is beneficial to all system users. This approach would unfairly impose the entire responsibility of TSP implementation on development. Additionally, some improvements are needed even if no growth occurs, creating a need to fund at least some transportation improvements by other means.

E. Do not allow land development unless all transportation needs can be funded. This concept is known as concurrency. This has been implemented in various forms through the addition of level of service code requirements to state laws (Florida and Washington). The examples over the last 15 years of these policies are clear. Funding policy redirects itself to fix capacity problems. Transit, pedestrian, bicycle and other mode facilities are generally not based on capacity but connectivity and access. The outcome in these communities is always larger roads - from Clark County, Washington to Contra Costa County, California to Boward County, Florida. A balanced transportation system is difficult to develop under concurrency assumptions. Outright development moratoria based upon transportation are difficult to impose, given Oregon Planning and property rights laws. Creating extraordinary requirements for development would impact economic vitality and would likely move the problem rather than fix it.

F. Use bonds to fund transportation needs. Bonds are commonly used for financing transportation projects (both MSTIP and Westside LRT are property tax levies that have used tax receipts as a way to support use of bonds to fund transportation projects). These bonds would require a vote of the public. This type of program would include a list of transportation projects that would be funded and a general time frame for completion. Based upon an estimate of property value in Hillsboro, the funding gap would require an increase in property tax, approximately $500 per year over 20 years for a homeowner of a $150,000 home. Because increases to property tax are not generally viewed positively by the public, an extensive public involvement effort would be necessary to coordinate the understanding of need, the extent that the bonds should fund transportation needs and what the actual program elements would include.

In studying various strategies, it is clear a "one size fits all" plan will not succeed. It is recommended that a diversified and pragmatic strategy be developed that reflects political realities, economic needs, community livability and a balanced transportation system. Since transportation funding is not controlled locally, it will require steps to be taken at the state, regional, county and city level to be effective and fair. The following steps are necessary to implement the Hillsboro TSP.

- Prioritize all transportation projects in Hillsboro and integrate the highest-ranking projects into the Fiscally Constrained Regional Transportation Plan. This assures that the projects of greatest need have the most secure funding source. Additionally, as conditions change in the future the need for certain projects may change.

- Start with funding the highest priority TSP needs on the anticipation that over the next 20 years, new and complementary funding programs will be developed (the recent federal government authorization for transportation (TEA21) is an example). This is more pragmatic than presuming all projects must have funding commitments today and accommodates changing needs and priorities over time. It is important not to stop everything today unless a plan to fully fund every transportation need is in place. Over time, policies and programs in the plan which are intended to reduce vehicle demand can mature and new technologies that improve transportation efficiency can evolve that may change how much or when funding is needed.

- Given the relative size of a gas tax increase needed to fund transportation improvements in Hillsboro, a more diverse source of state and regional funding will be needed. Assuming that funding shortfalls can best be paid by imposing a gas tax statewide ignores the fact that the rest of the state may not share Hillsboro's or the Portland region's need to fund transportation. Three steps can be taken including:

  Statewide: Support gradual and incremental increases to state gas tax (about $0.06 to $0.10 per gallon each seven years (assumes three increases in 20 years). Support statewide collection and proportional increases to truck fees (presently weight-mile tax, diesel tax in other states).

  Regionally: Support increases to motor vehicle registration and air quality surcharges (payable every two years at DEQ inspection or upon sale of vehicle based upon actual miles driven). These relate the urban needs and problems.

  County: Update the TIF to better reflect arterial and collector needs in the county. Credits and fronting improvements will need to be reevaluated, particularly with more and more potential for redevelopment. It can almost be assured that TIF's would need to be increased, given the countywide transportation needs. Funding $25 to $100 million over 20 years through a property tax levy, such as MSTIP, would be possible, with adequate public support for major projects on the TSP lists. County gas tax and vehicle registration fees could be increased or created.

- At a city level, consider needed legislative changes to allow broad use of local improvement districts, area SDC's and bond measures to fund elements of the transportation plan. One of the toughest problems for development created by concurrency are initial costs (or "up front"). By using improvement districts, costs can be financed over time and paid when the land is generating revenue. The City of Hillsboro does not allow improvement districts to be created unless the participants have frontage to the improvements. This severely limits the pooling of benefited parties to jointly fund transportation projects (for example, a freeway interchange project). Tax increment financing commonly used for redevelopment has been nearly discontinued by public agencies due to tax limitation measures. Tax increment means taking the net income of increased tax revenues caused by the increased property value of new development and paying off the cost of selling bonds that pay for infrastructure. This approach to funding transportation infrastructure can be very effective in district level master plans or redevelopment. Additionally, unique assessment districts that allow vacant property owners to defer all assessments until resale or development of land could also help reduce property owner concerns of proactively addressing transportation needs before they become more expensive to address (this is an entirely new concept which would require enabling legislation).

- Another bonding concept requiring legislative change would be to bond sidewalk/fronting improvements in already-developed areas with net proceeds tied to the title on the land such that upon transfer or resale of the fronting property the city is paid back, including interest. Current property owners would benefit from the improvements and could pay off the assessment earlier at their discretion. With the current housing market conditions, this has more applicability than when market conditions are slow. The city would need to carry the cost of the bonds and if over the bond life resale/transfer does not occur, the city would become responsible. Given that the great majority of homes change ownership over 20 years, the risks should be minimal. This concept requires further study and legislative review before testing the application.

- Using the development review process to protect needed rights-of-way in the next twenty years is another possible tool. Corridor set backs can reduce the ultimate cost of street improvements. This requires an analysis process (build out assessment or frequent updates) to stay current of future right-of-way needs based upon changing land use (for example, three lanes in 2015 may need to be 5 lanes in 2025).

- Develop funding programs (using new motor vehicle fees or other funding sources) to encourage private/public cooperation in funding transportation improvements. This may take several forms and will require more assessment. One example would be establishing a city-funding source that can be matched with private funding sources to implement elements of the TSP.

Chapter 2
Goals and Policies

BACKGROUND

These goals and policies have been developed to guide the City's twenty-year vision of transportation system needs. They are intended to replace the current transportation related goals and policies in the Hillsboro Comprehensive Plan. State Transportation Planning Rule requirements adopted since the time that the current City goals were developed call for a more comprehensive and balanced approach to transportation policy, addressing walking, bicycling, transit, rail, truck and other modes as well as automobile travel.

These goals and policies are a result of widespread technical work by staff, the Hillsboro TSP Task Force, the Hillsboro TSP technical advisory committee and the consultant. Presentations were made to the Task Force and Technical Advisory Committee regarding the existing transportation system and future needs based upon City and regional growth in the next twenty years. Using input from the presentations, goals and policies were developed.

The City of Hillsboro Draft TSP Goals and Policies consist of seven goals with related policies organized under each goal. The goals are simple, brief guiding statements, which describe a desired result. The policies focus on how goals will be met by describing the types of actions that will contribute to achieving the goal. Figure 2-1 provides an outline of the relationship between goals, policies, actions and implementation. The existing City of Hillsboro goals in the Transportation Element of the Comprehensive Plan have been incorporated into these Goals and Policies, reflecting other regional policy from the state, region and adjacent jurisdictions.

Below many of the policies, the italic text represents a detailed description about the intent of the policy. The italics are not intended to be policy and therefore would not be appealable as land use decisions. The Draft TSP Goals and Policies are linked to mode maps provided in the City of Hillsboro TSP. The TSP will include master plan maps for motor vehicles, pedestrians, bicycles, transit and other modes.

From Vision to Action
Hillsboro Transportation System Plan

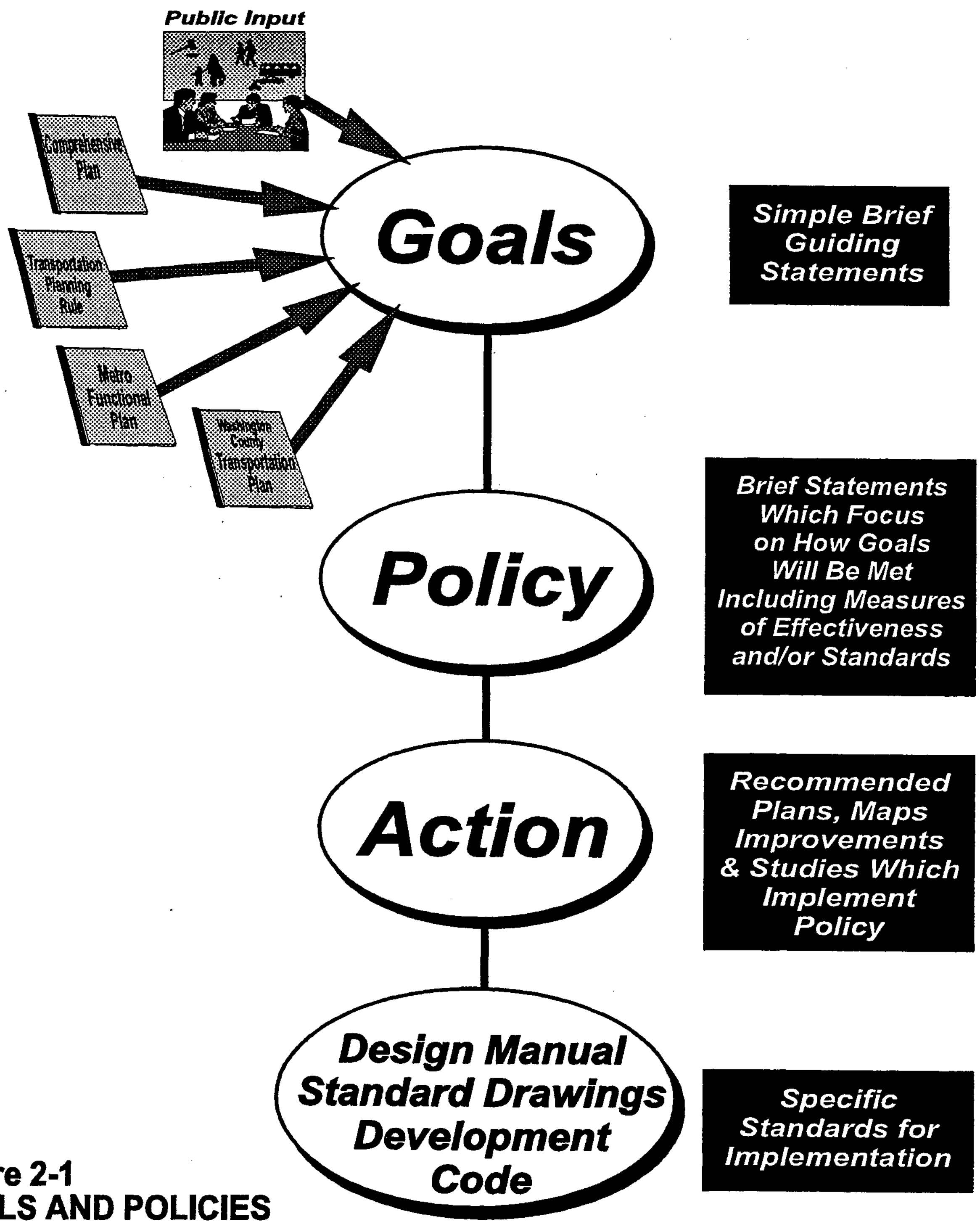

Figure 2-1
GOALS AND POLICIES RELATIONSHIP

GOALS AND POLICIES

Goal 1: <u>Safety</u>. Develop and maintain a safe City transportation system.

Key Elements: Accident Reduction, Maintenance, and Access Management

Policy 1 Build, maintain and/or support a well-defined and safe transportation system within the City for pedestrian, bicycle, transit, motor vehicles, air and rail travel.

Develop and apply a series of design standards for street, bicycle, pedestrian and transit improvements in Hillsboro. Allocate City road and bikeway maintenance expenditures in a manner that ensures that systems supporting these modes of travel are safe. Minimize conflicts between modes, particularly between motor vehicles, pedestrians, bicycles and transit. Develop City standards for safe pedestrian crossings of roadways. As transportation facilities are built, public involvement as outlined in the Comprehensive Plan will be undertaken.

Policy 2 Establish a City monitoring system that regularly evaluates, prioritizes and mitigates high accident locations within the City.

Review traffic accident information regularly to systematically identify, prioritize and remedy safety problems. Develop a list of projects necessary to eliminate such problems. Implement safety improvements through the City Capital Improvement Program and development review process.

Policy 3 Promote transportation system safety through education and law enforcement.

This applies to all modes of travel.

Policy 4 Implement enforceable access management standards for arterial and collector roadways consistent with City, County and State requirements.

Use Metro Title 6 and Washington County standards as a guide to establish City access spacing guidelines: Arterial (minimum 600 feet, maximum 1,000 feet) and Collector (minimum 200 feet, maximum 400 feet). ODOT Access Management Categories apply to State routes, but are generally less restrictive than the county standards.

Policy 5 Provide adequate access to properties for emergency services vehicles throughout the City using the City land use planning and development review procedures.

Policy 6 Do not permit land uses within airport noise corridors that are not noise compatible and avoid the establishment of uses that are physical hazards to air traffic at the Hillsboro Airport.

The airport is a resource to the community. Coordinate with the Port of Portland on the implementation of the Hillsboro Airport Master Plan and overlay Runway Protection Zone (RPZ) designations on the City zoning map. Work with the Port of Portland to establish a partnership, which addresses impacts. Avoid permitting future uses in the airport noise corridors that would be significantly impacted by allowable airport noise levels, unless such impacts can be effectively mitigated.

Policy 7 Coordinate, when applicable and appropriate, federal, state and local safety and compliance standards in the operation, construction and maintenance of the rail and pipeline systems in Hillsboro.

Policy 8 Encourage grade separations or gate controls at primary railroad crossings of streets.

Support the upgrade of railroad crossings to current design standards. ODOT/PUC provides grants to improve crossing safety. Current funding sources are not capable of financing all the rail crossing needs within the next 20 years (it could take more than 40 years).

Goal 2: Multi-modal Travel. Provide a balanced City transportation system.

Key Elements:

- Bicycles
- Motor Vehicles
- Pedestrian
- Transit
- Other modes

Policy 1 Design transportation facilities within Hillsboro that accommodate multiple modes of travel within transportation corridors where appropriate and encourage their use to move people, goods and services within these corridors. Encourage and coordinate efforts to provide convenient linkages between various modes of travel.

Corridors are key arterial and some collector routes within Hillsboro.

Policy 2 Construct bikeways and pedestrian facilities on major, new or reconstructed arterial and collector streets within Hillsboro (with roadway construction or reconstruction projects). Coordinate (or require where appropriate) convenient access to existing or planned bike and pedestrian facilities from nearby schools, parks, transit, public facilities and retail areas.

Sidewalks, landscape strips and bikeways shall be constructed in conjunction with new construction of streets and with improvements to a street in accordance with this Transportation System Plan. Pedestrian facility design shall buffer pedestrians from moving traffic with landscape strips, street trees and on-street parking where practicable. Pedestrian facility design shall also consider lighting and the safety/convenience of street crossings.

Policy 3 Connect gaps in the sidewalk system according to the Hillsboro Pedestrian System Plan.

Encourage the development of a "pedestrian grid" in Hillsboro that identifies recommended pedestrian routes. Whenever possible, space through pedestrian routes approximately every one-half mile within the pedestrian local network. Local pedestrian circulation should provide access to the pedestrian master plan approximately every 330 feet. Sidewalk standards will be developed to define various sidewalk widths as necessary for City street and development types.

Policy 4 Link the regional trails network to Hillsboro's bicycle and pedestrian systems.

Investigate using abandoned railroad rights-of-way to link pedestrian and bicycle facilities.

Policy 5 Encourage and work with Tri-Met to improve local bus transit service.

Work with Tri-Met to provide adequate bus frequency and service coverage. Work with Tri-Met and other agencies to provide transit amenities such as bus shelters, well-maintained stops, benches, lighting, street crossings, sidewalks, etc.

Goal 3: <u>Trip Reduction</u>. Develop a transportation system that helps to reduce the number of motor vehicle trips and contributes to regional goals to reduce per capita vehicle miles of travel.

Key Elements:

- Land Use/Development Code
- Transportation Demand Management
- Parking

Policy 1 Participate in trip reduction strategies developed locally and regionally including employment, tourist and recreational trip programs.

Encourage implementation of public and private travel demand management programs that reduce single occupant vehicle trips per capita and shift traffic to off-peak travel hours. Coordinate trip reduction strategies with Washington County, major employers in Hillsboro, Metro, Tri-Met, Westside Transportation Alliance, ODOT and DEQ. Seek to raise the PM peak average vehicle occupancy (AVO) to 1.3 in the evening peak hour, and/or move 50 percent of standard evening peak trip generation outside the peak hour. Educate business groups, employees and citizens about trip reduction strategies and work with business groups, citizens, employers and employees to develop and implement travel demand management programs: Work with ODOT to establish guidelines for planning interchange improvements to allocate space for park-and-ride lots to increase multi-occupant vehicles.

Policy 2 Ensure that nearby commercial, community service and high employment industrial land uses are developed in a manner that provides convenient access to pedestrians, bicyclists and transit riders. Support compact, mixed-use development including infill and redevelopment in appropriate areas of the City.

Apply City Transportation Planning Rule standards to developments adjacent to transit streets. Pedestrian accessways with minimal vehicle conflicts should be identified for every new development site for access to the public right-of-way and pedestrian system. Commercial site design should encourage internal trips by alternative modes. Appropriate areas of the City include, but are not limited to regional centers, town centers, station areas and transit corridors as defined by Metro.

Policy 3 Implement City Station Community Planning Areas in ways that encourage the location of the highest land use densities and mixed uses near the best transit services.

Policy 4 Limit the provision of parking to meet regional and state standards.

Policy 5 Be consistent with local, regional and state land use plans and programs.

Work cooperatively with transportation agencies and adjacent jurisdictions to implement the City Transportation System Plan within the Regional Transportation planning process.

Goal 4: <u>Performance</u>. Provide an efficient transportation system that manages congestion.

Key Elements:

- Level of service (LOS) standards
- Transportation System Management

Policy 1 Maintain a level of service consistent with regional goals and reduce traffic congestion.

Level of service D, Highway Capacity Manual, Chapters 9, 10 and 11 (or subsequent updated references) is recommended to balance provision of roadway capacity with level of service and funding. Monitor Metro and Washington County's current work to develop a level of service standard. Manage adequate operating conditions of arterials to minimize cut-through traffic and intrusion into residential neighborhoods.

When reviewing significant plan amendments or rezones, consider their traffic impacts on the regional facilities identified in the Regional Transportation Plan (RTP).

Policy 2 Work with Washington County, the City of Beaverton, Metro and ODOT to develop, operate and maintain intelligent transportation systems including coordination of traffic signals.

Policy 3 A Tualatin Valley Highway Corridor Plan shall be undertaken in cooperation with ODOT, Washington County, the City of Beaverton, Metro and other transportation agencies to address the specific long-term capacity and access needs for the corridor. The standards for performance shall recognize the Metro Title 6 level of service criteria and requirements in the City Transportation System Plan.

Policy 4 Provide a cost-effective transportation system where the public, land use development and users pay their respective share of the system's costs proportional to their respective demands placed upon the multi-modal system.

Goal 5: Goods Movement. Provide for efficient movement of goods and services.

Key Elements:

- Freight
- Rail
- Air Freight
- Hazardous Materials
- Other Goods and Services

Policy 1 Design arterial routes, highway access and adjacent land uses in ways that facilitate the efficient movement of goods and services.

Policy 2 Coordinate with the Port of Portland in planning for the Hillsboro Airport.

Policy 3 Encourage continued use and development of rail and air transportation facilities.

Coordinate with rail and air transportation service providers regarding safety and operational compatibility with surrounding uses.

Policy 4 Require safe routing of hazardous materials consistent with federal and state guidelines.

Work with federal agencies, the Public Utility Commission, the Oregon Department of Energy and ODOT to assure consistent laws and regulations for the transport of hazardous materials.

Goal 6: Livability. Transportation facilities within the City shall be designed and constructed in a manner that enhances livability of Hillsboro.

Key Elements:

- Aesthetics/Neighborhood traffic management
- Regional Facilities
- Environment
- Managing Growth

Policy 1 Design and build local and neighborhood streets to minimize speeding.

If appropriate, neighborhood traffic management programs for local and neighborhood streets in Hillsboro that currently experience speeding problems may include the following types of measures: narrower streets, humps, traffic circles, and curb/sidewalk extensions, curving streets, diverters and/or other measures. Consider neighborhood traffic management measures during development review and subdivision review of new development.

Policy 2 Relate the design of street capacity and improvements to their intended use.

A functional roadway classification system shall be developed for Hillsboro which meets the City's needs and is coordinated with County, Regional and State Roadway classification systems. Appropriate design standards for roadways in the City should be coordinated and developed by the responsible jurisdiction.

Policy 3 Construct transportation facilities to comply with applicable City landscape and design standards.

Include aesthetic considerations in the design, maintenance and improvement of corridors and rights-of-way for all modes of travel. Any consideration of sound walls should meet criteria established by the City.

Policy 4 Avoid potential adverse environmental impacts associated with traffic and transportation system development through facility design and system management.

Inform the DEQ, EPA, Corps of Engineers and Division of State Lands of transportation system development projects that may affect their jurisdictional interests at the earliest opportunity to ensure identification of project-related environmental issues and to ensure compliance with federal and state air, water, wetland and noise standards. Design transportation systems that promote efficient use of energy.

Goal 7: Accessibility. Develop transportation facilities that are accessible to all members of the community and minimize out-of-direction travel.

Key Elements:

- American Disabilities Act (ADA)
- Connectivity

Policy 1 Construct transportation facilities, which conform to the requirements of the Americans with Disabilities Act.

Policy 2 Locate transit dependent land uses close to transit stations.

Policy 3 Design the local street network to facilitate street connectivity and limit out-of-direction travel. Provide connectivity to and from activity centers and destinations, giving priority to pedestrian and bicycle connections.

Apply City spacing guidelines for roadways, signals and pedestrian connections to implement this policy. For pedestrian paths, direct routing should be between 1.25 and 1.5 times the straight-line distance. Implement City guidelines regarding cul-de-sac length and size.

Policy 4 Develop an efficient arterial grid system that provides access within the City and serves through City traffic.

As outlined in Title 6 of the Metro Urban Growth Management Functional Plan, access connection standards will be developed. The arterial street system should facilitate street and pedestrian connectivity.

OTHER PLANS

The relationship of the TSP to other regional planning documents can be puzzle of acronyms, activities and plans. Figure 2-2 summarizes the transportation planning puzzle, identifying where the Hillsboro TSP fits within the on-going regional context of planning. Many of the most common planning initiatives and terms are reduced to acronyms, which are summarized and defined below:

TPR - Transportation Planning Rule, Statewide Planning Goal 12 developed by Department of Land Conservation and Development (DLCD) to guide transportation planning in Oregon.

OTP - Oregon Transportation Plan, a federally mandated plan developed by Oregon Department of Transportation (ODOT) to guide statewide transportation development.

RTP - Regional Transportation Plan, developed by metropolitan planning organizations (MPO) to guide regional transportation investment, required to secure federal funding. In Portland this task is performed by Metro (Metropolitan Service District).

City of Hillsboro Transportation Puzzle

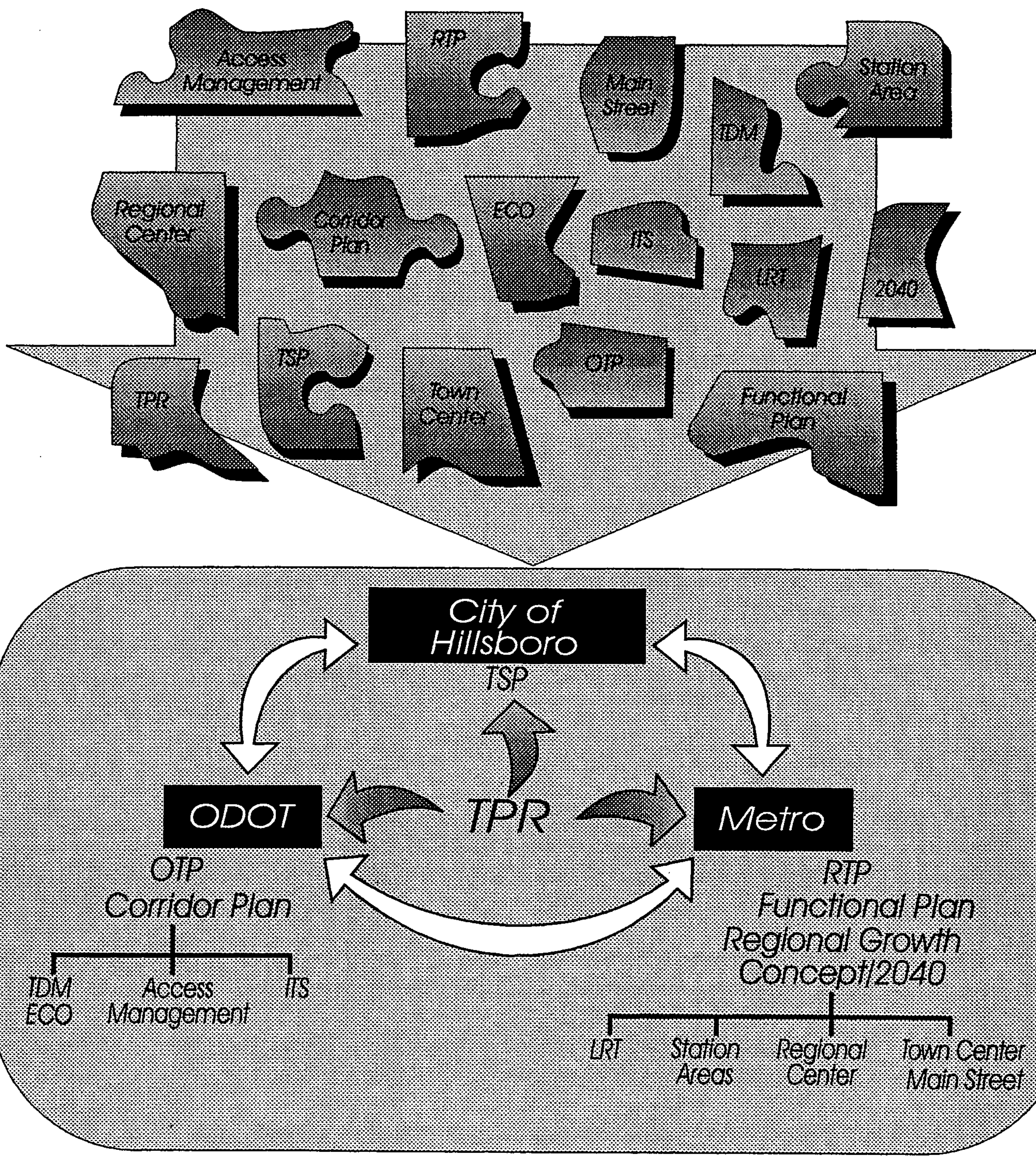

Figure 2-2
RELATIONSHIP OF TSP TO REGIONAL PLANNING

***DKS** Associates*

TSP - Transportation System Plan. A requirement of the TPR for cities and counties in Oregon to guide local transportation decisions and investments.

Corridor Plan -
ODOT transportation plans that focus on state transportation corridors to specifically outline needs, modes, strategies and effective investment.

Access Management -
Methods to address improved safety and performance of state highways through control of access commensurate with facility needs.

ITS - Intelligent Transportation Systems. Use of advancing technology to improve movement of people and goods safely.

TDM - Transportation Demand Management. An element of TSP's is a series of actions to reduce transportation demand during peak periods.

ECO - Employee Commute Options. An urban area TDM program required by Department of Environmental Quality (DEQ) of employers of 50 or more persons to reduce vehicle trips.

LRT - Light Rail Transit. Planned by Metro, designed and operated by Tri-Met, providing a high capacity transit option linking key centers in the region.

Functional Plan -
Metro's recently adopted plan which outlines mandatory criteria for evaluating transportation systems and land use, translating state and regional policy to local requirements necessary to implement the 2040 planning effort.

2040 - A long range effort directed by Metro to explore the choices for growth in the next 50 years and defining performance standards for local government to implement the regional growth concept. It defines several development types which will create higher density population and employment centers in the region. They are as follows:

- **Regional Center:** Compact centers of employment and housing served by high quality transit. They will become the focus of transit and highway improvements.
- **Town Center:** Provides for localized services within a 2-3 mile radius, with a community identity.
- **Station Areas:** Development centered on LRT or high capacity transit, accessible by all modes.
- **Main Street:** Similar to town centers, an area with a traditional commercial identity, but smaller in scale, along a street with good transit services.
- **Corridors:** Development along a primary and frequent transit corridor that encourages mixed use and pedestrian access to transit.

Chapter 3
Existing Conditions

Existing transportation conditions were evaluated as part of the City of Hillsboro Transportation System Plan. An analysis of current conditions provides an understanding of facility development, service and performance. This chapter summarizes existing conditions relating to traffic and transportation in Hillsboro. It considers vehicle traffic, as well as transit, pedestrian, bicycle, truck and other modes.

To understand existing travel patterns and conditions, multiple aspects of the city's transportation system were considered. In the fall of 1996, an inventory of traffic conditions in Hillsboro was undertaken to establish a base year for all subsequent analysis. Much of this data provides a benchmark (basis of comparison) for future assessment of transportation system and travel mode performance in Hillsboro relative to desired policies.

The following sections briefly describe existing roadway functions, circulation, traffic speeds and volumes and levels of service in the Hillsboro transportation system. Seventy-one study area intersections were selected[1] to evaluate traffic conditions in Hillsboro.

STREET NETWORK

The Transportation Planning Rule requires that classification of streets within the City be provided.[2] The classification must be consistent with state and regional transportation plans for continuity between adjacent jurisdictions. The City of Hillsboro has an existing street classification system as part of its comprehensive plan.[3] However, prior plans had not considered areas east of Cornelius Pass Road or north of US 26, since these areas have recently been annexed into the city.

[1] *Following discussion with City of Hillsboro staff.*

[2] *Transportation Planning Rule*, State of Oregon, Department of Land Conservation and Development, Section 660-12-020(2)(b), April, 1995.

[3] *Interim Functional Classification Map*, City of Hillsboro.

Functional Classification

Roadways have two functions, to provide mobility and to provide access. From a design perspective, these functions can be incompatible since high or continuous speeds are desirable for mobility, while low speeds are more desirable for land access. Arterials emphasize a high level of mobility for through movement; local facilities emphasize the land access function; and collectors offer a balance of both functions.

The existing functional classification of streets in Hillsboro is provided in the Past Plans and Policies section of the appendix. In that plan, a street not designated as either an arterial or collector is considered a local street. Some streets have dual classifications, since their current function changes along different segments of their length. Hillsboro's roadway functional classification system was reviewed as part of this project and a proposed city roadway functional classification system is discussed in Chapter 8: Motor Vehicles.

Washington County roadway classifications are generally consistent with City of Hillsboro designations. A comparison of the City of Hillsboro and Washington County functional classifications is provided in the technical appendix, using the current Hillsboro interim classifications.

ODOT and Metro only classify roads that are considered to be of statewide or regional significance, respectively. These classifications are compatible with Hillsboro classifications, although the specific classification names may differ. ODOT and Metro classifications can be found in the Roadway Functional Classification According to Jurisdiction table in the appendix of this report. Figure 3-1 shows the roadway jurisdiction for operating and maintenance purposes. Because of their more regional or area wide significance, the designation of arterials and collectors by ODOT, Metro and Washington County guides the City in its functional classification.

EXISTING CIRCULATION

The following sections review the performance of various key routes in Hillsboro in terms of traffic volumes, capacity, accidents, adjacent land use (including schools), intersection level of service, arterial level of service and general observations.

The key routes include: US 26 (Sunset Highway), ORE 8 (TV Highway), Cornell Road, Cornelius Pass Road, 185th Avenue, Baseline Road, Evergreen Road, Glencoe Road-1st Avenue (ORE 219), Brookwood Parkway-Shute Road-Helvetia Road, Walker Road, Jackson School Road, River Road, Minter Bridge Road, Cypress Street-32nd Avenue, 28th Avenue, and 25th Avenue and West Union Road. The state highway routes are summarized below to provide a description in terms of functional classification, connectivity and roadway volumes.

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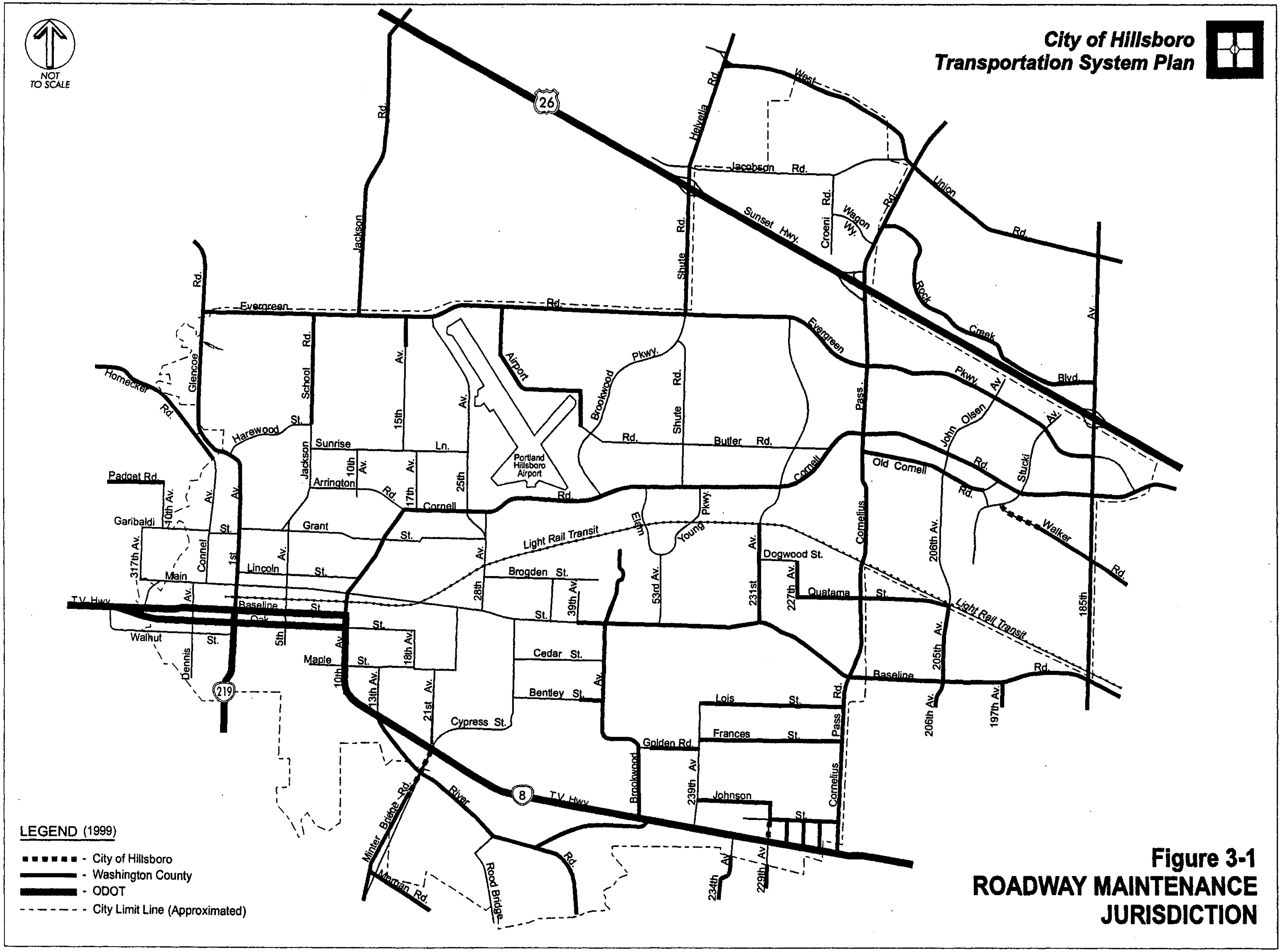


Figure 3-1
ROADWAY MAINTENANCE JURISDICTION

State Highways

Sunset Highway (US 26) is classified by ODOT as a Statewide Highway and as a freeway by adjacent jurisdictions. It serves vehicles traveling between Portland (I-405 to the east) and various destinations in western Oregon to the Oregon coast. US 26 also serves travel between cities in the Portland Metropolitan area. It is used as a commuter route between Washington County and Portland. Lastly, US 26 serves some local travel which may occur within Hillsboro or between Hillsboro and a neighboring city such as Beaverton or Portland.

Tualatin Valley Highway (TV Highway)/Canyon Road (ORE 8) is classified by ODOT as a District Highway. The City of Hillsboro classifies TV Highway as a Major Arterial (interim classification). Washington County classifies TV Highway as a principal route and Metro classifies TV Highway as a Regional Through-Route (Arterial). TV Highway provides direct access from Hillsboro to Beaverton, Aloha, Forest Grove and Portland.

Glencoe Road/1st Avenue (ORE 219) is classified by ODOT as a District Highway south of Baseline. The City of Hillsboro classifies Glencoe Road/1st Avenue as a Major Arterial (interim classification). Washington County classifies Glencoe Road/1st Avenue as a Minor Arterial and Metro classifies Glencoe Road-1st Avenue as a Multi-Modal Arterial (Minor). Glencoe Road - 1st Avenue provides direct access to the Sunset Highway and North Plains.

PAVEMENT CONDITION

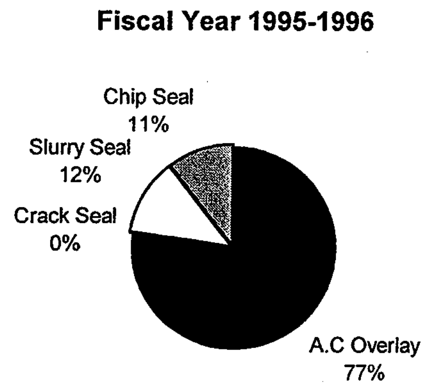
A visual inspection of Hillsboro's surface street system is prepared annually by the City of Hillsboro. This inspection, basically a "report card" of pavement condition rates each roadway in Hillsboro. Actual roadway ratings prepared by the City of Hillsboro are provided in the appendix. Table 3-1 summarizes the roadway maintenance funding history for the last four fiscal years. The total miles of roadways in Hillsboro for year 1996 is 153 miles, and 2.5 miles of roadway were overlayed in 1996. Figure 3-2 summarizes the roadway maintenance completed in fiscal year 1995 - 1996.

Table 3-1
City of Hillsboro Street Maintenance Funding History

	FY 92-93	FY 93-94	FY 94-95	FY 95-96
A.C Overlay	$84,863	$147,079	$268,060	$278,120
Crack Seal	$106,314	$50,241	$12,194	$0
Slurry Seal	$117,816	$0	$41,176	$43,790
Chip Seal	$20,012	$34,475	$38,194	$38,194
Total	$329,005	$231,795	$359,624	$360,104

Note: FY = Fiscal Year

Figure 3-2
Street Maintenance Completed in Fiscal Year 1995-1996



TRAFFIC SPEED AND VOLUME

Speed

Speed zones on arterials and collectors within the City of Hillsboro are summarized in Figure 3-3. Oregon's Speed Zone Review Panel sets speed zones. The Speed Zone Review Panel is an independent board, which sets speed zones for city streets, county roads and state highways passing through cities. The Speed Zone Review Panel conducts engineering studies and considers many factors such as roadway width, surface, lanes, shoulders, signals, intersections, roadside development, parking, accidents and 85th percentile speed. The 85th percentile speed is commonly used to establish speed zones for arterial and collector roadways. Typically, the 85th percentile represents the speeds that are reasonable and prudent for prevailing conditions[4]. A decision made by the Speed Zone Review Panel is not arbitrary or political, and is based on the considerations described above.[5]

In most cases, speeding becomes very noticeable to pedestrians when it is above 30-35 miles per hour. Speeding can usually be expected on local streets where the streets are wide and straight for long stretches or where downhill grades are extended.

Traffic Volume

A complete inventory of peak traffic conditions was performed in the fall of 1996 as part of the Hillsboro Transportation System Plan. The traffic counts conducted as part of this inventory provide the basis for analyzing existing problem areas as well as establishing a base condition for future monitoring. Turn movement counts were conducted at 71 intersections during the evening (4-6 PM)

[4] Traffic Engineering Handbook, 4th Edition, Institute of Transportation Engineers, 1992, pg. 348
[5] *Speed Zoning: Who Decides?*, State Speed Control Board, April, 1992.

peak period to determine intersection operating conditions.

On a typical day, TV Highway, 185th Avenue and Cornell Road are the most heavily traveled streets in Hillsboro. Near Brookwood Avenue, TV Highway carries about 30,000 vehicles per day (two-way) and Cornell Road carries about 29,500 vehicles per day (two-way). 185th Avenue carries about 28,000 vehicles per day (two-way) near Walker Road. As a comparison, daily traffic on US 26 (Sunset Highway) is about 47,100 vehicles per day west of the 185th interchange.[6] Daily and PM peak hour link volumes are shown in Figure 3-4.

Traffic data collected over the course of this study illustrates the typical fluctuations of traffic over the course of a day. Profiles of daily traffic indicate the period when traffic is greatest (Figures 3-5 to 3-7). The evening peak period is the time when traffic volume is typically highest (combination of commute, retail and school activities).

6 *1995 Traffic Volume Tables*, Oregon Department of Transportation, Transportation Development Branch, Published May, 1996.

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Transportation System Plan

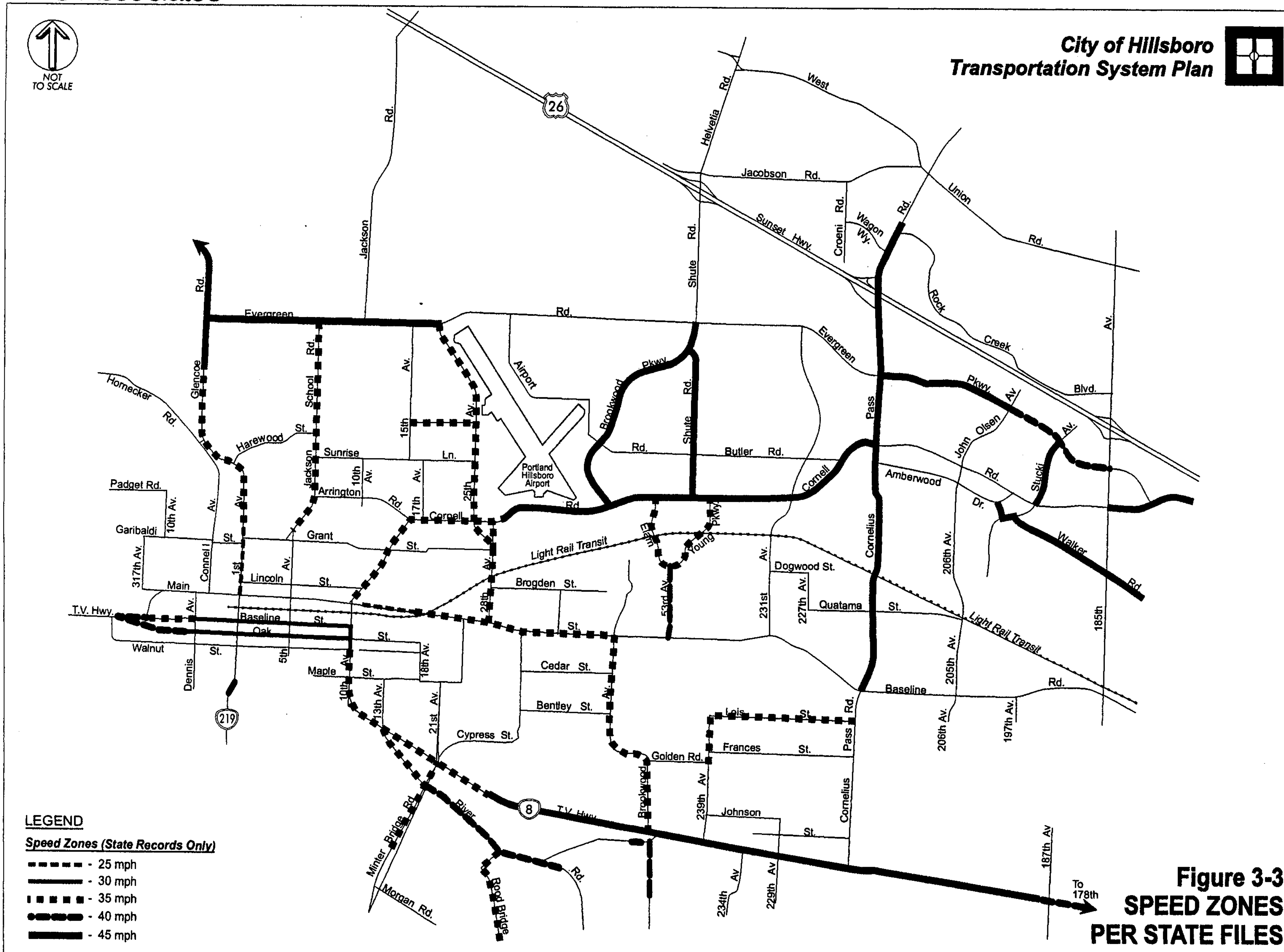

Figure 3-3
SPEED ZONES PER STATE FILES

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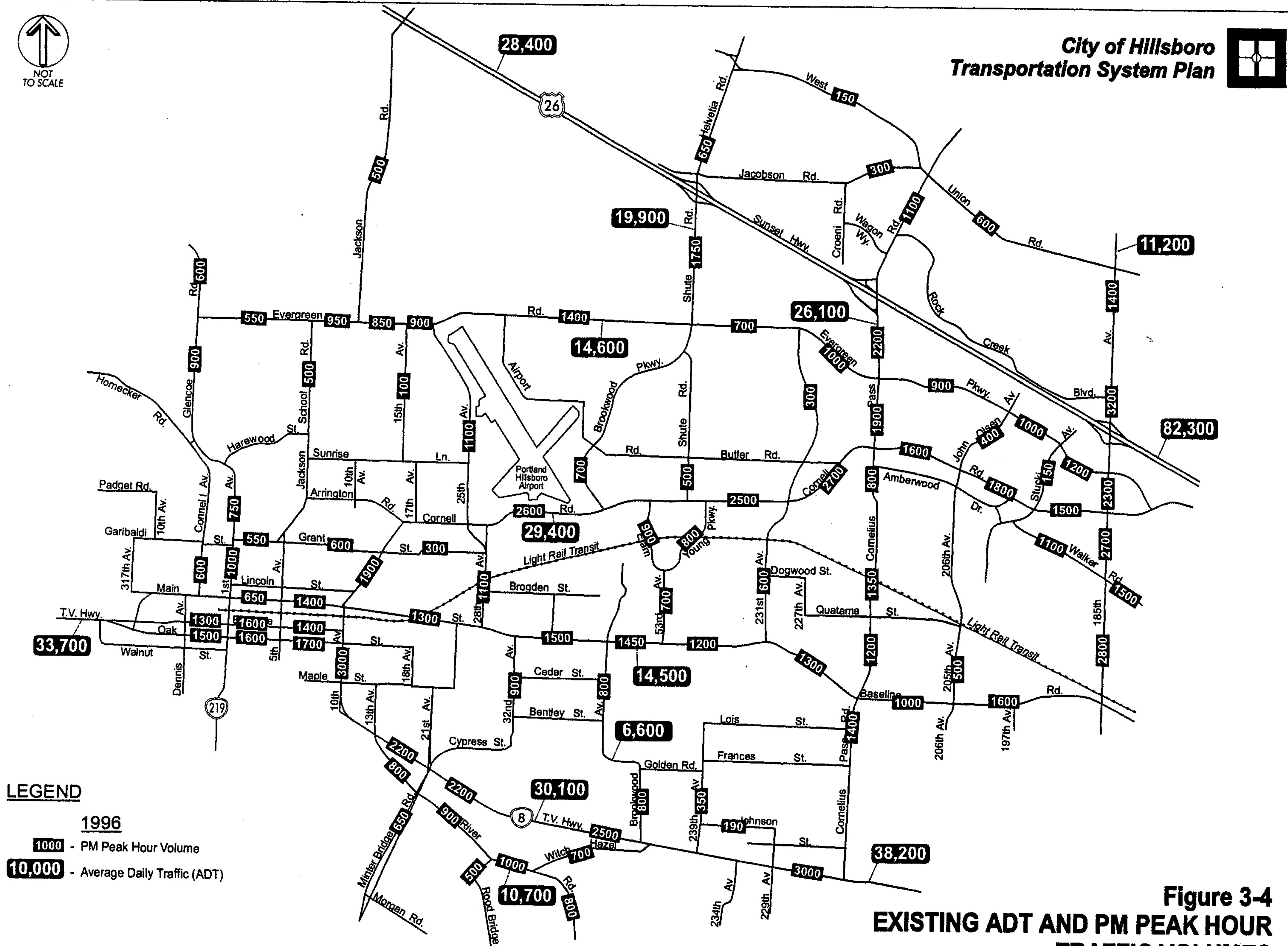
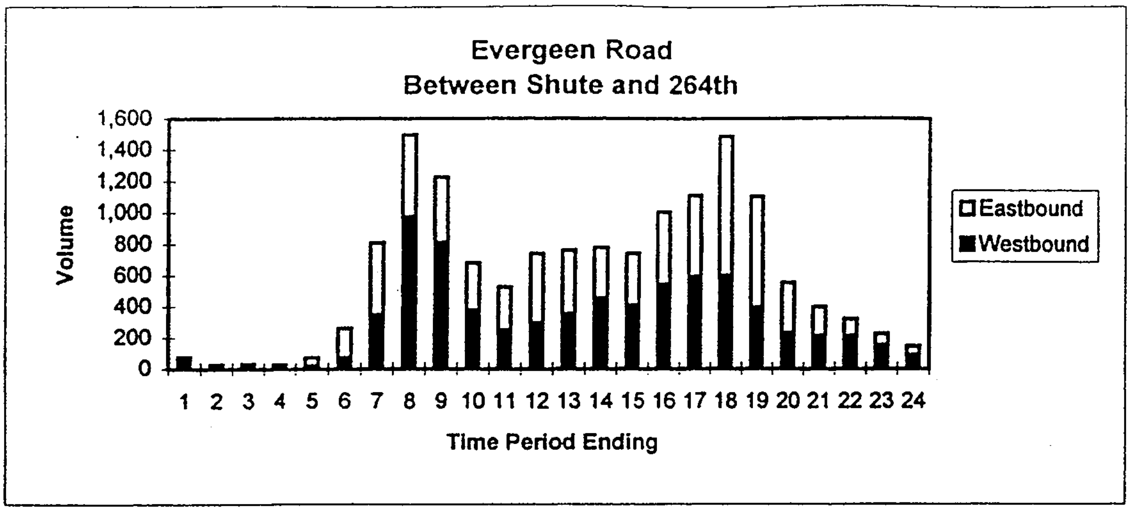
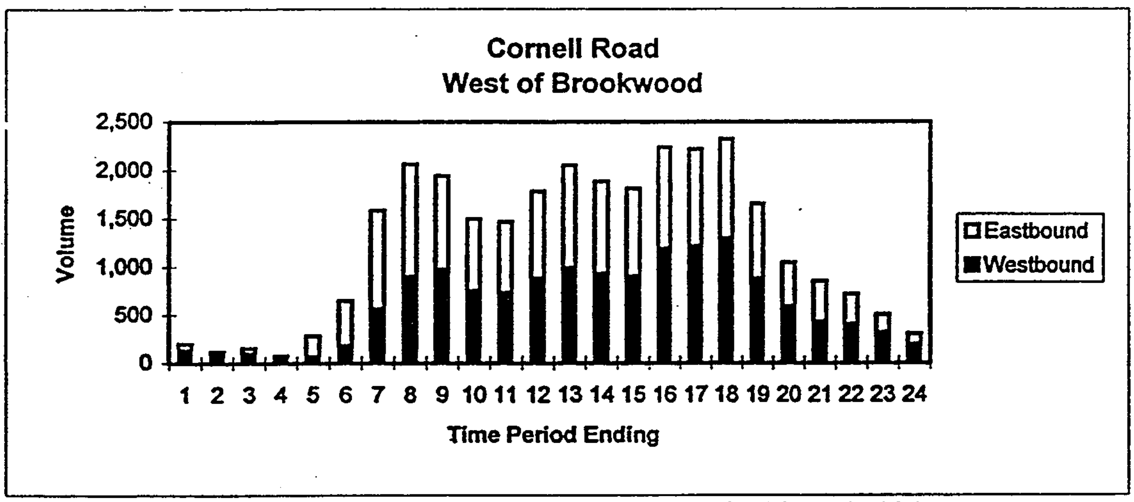


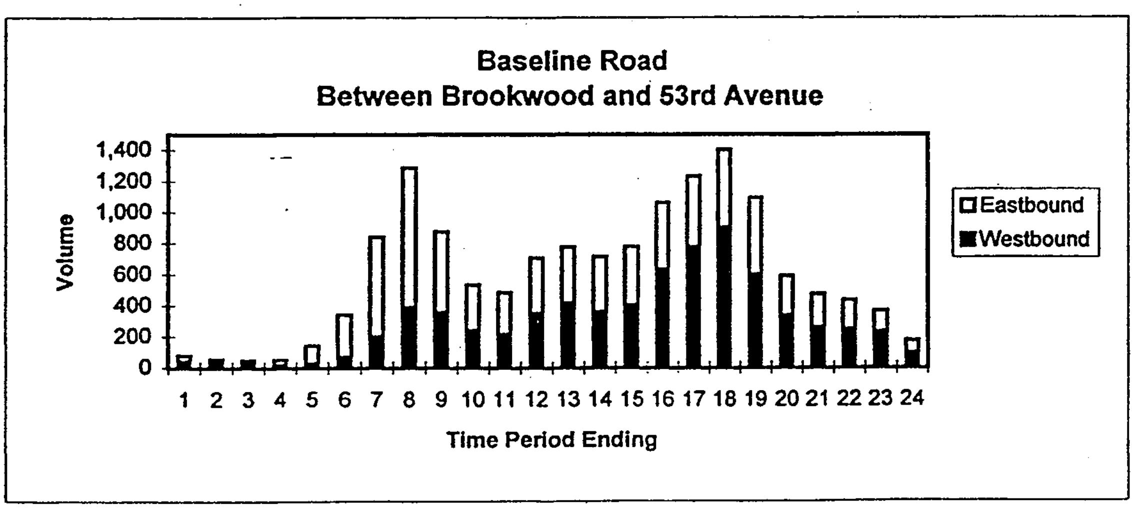
Figure 3-4
EXISTING ADT AND PM PEAK HOUR TRAFFIC VOLUMES



ADT = 14,600

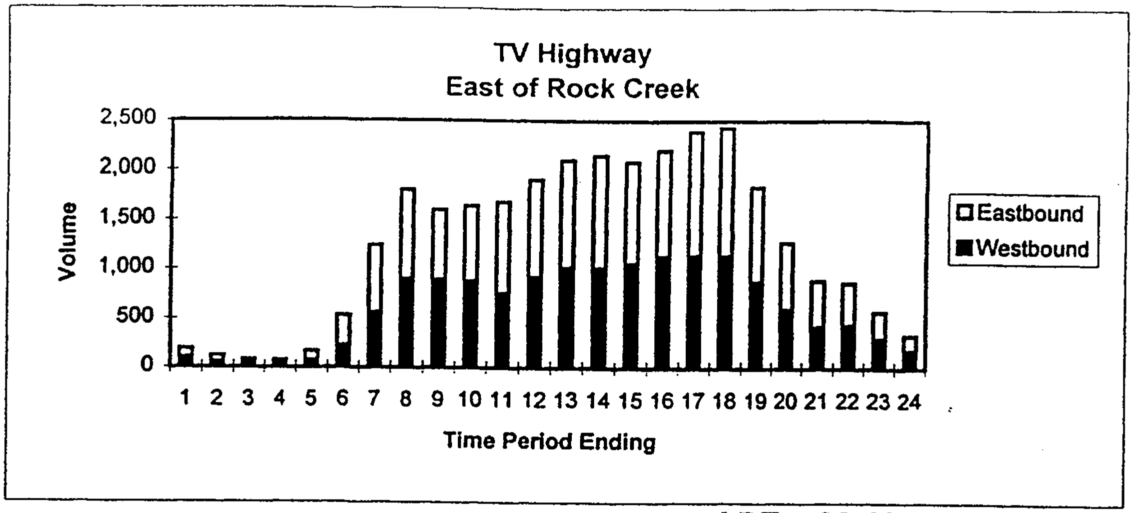


ADT = 29,400

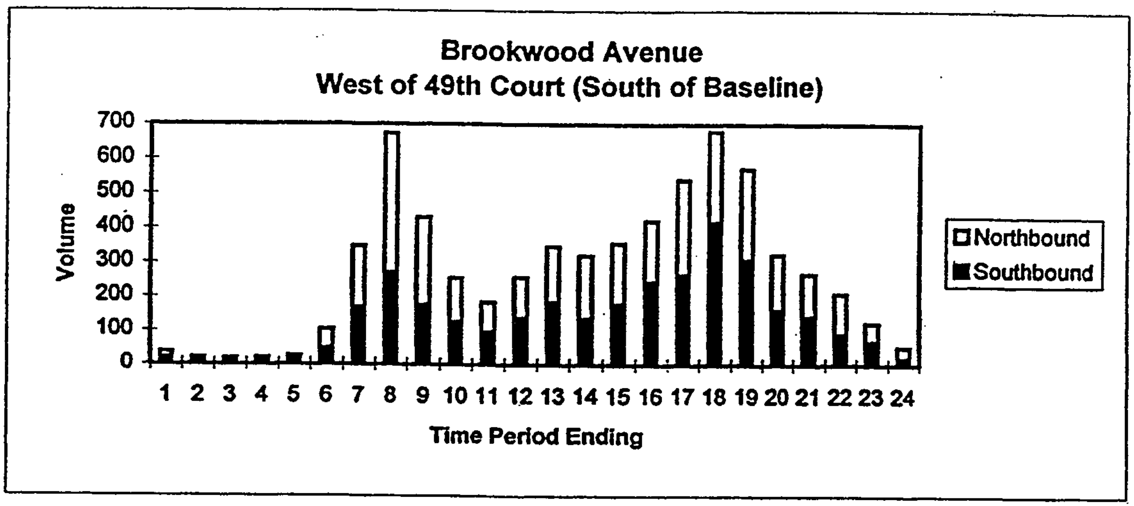


ADT = 14,500

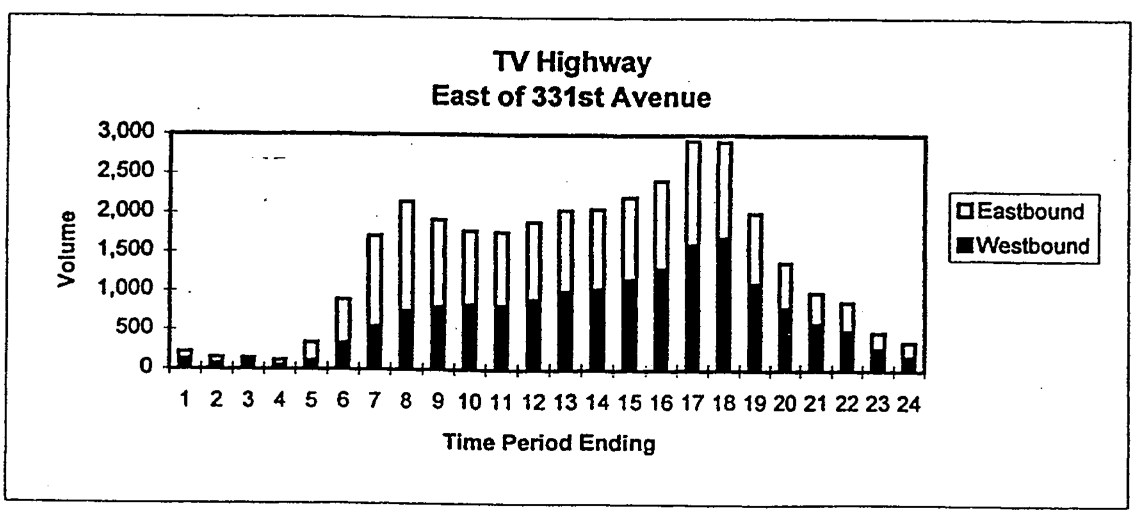
Figure 3-5
Hourly Variations



ADT = 30,100

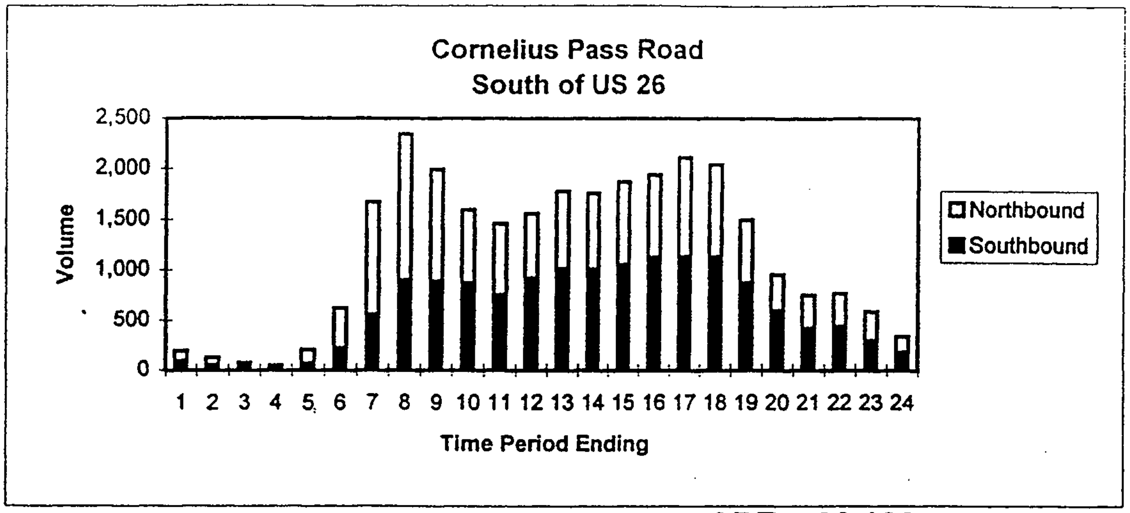


ADT = 6,600

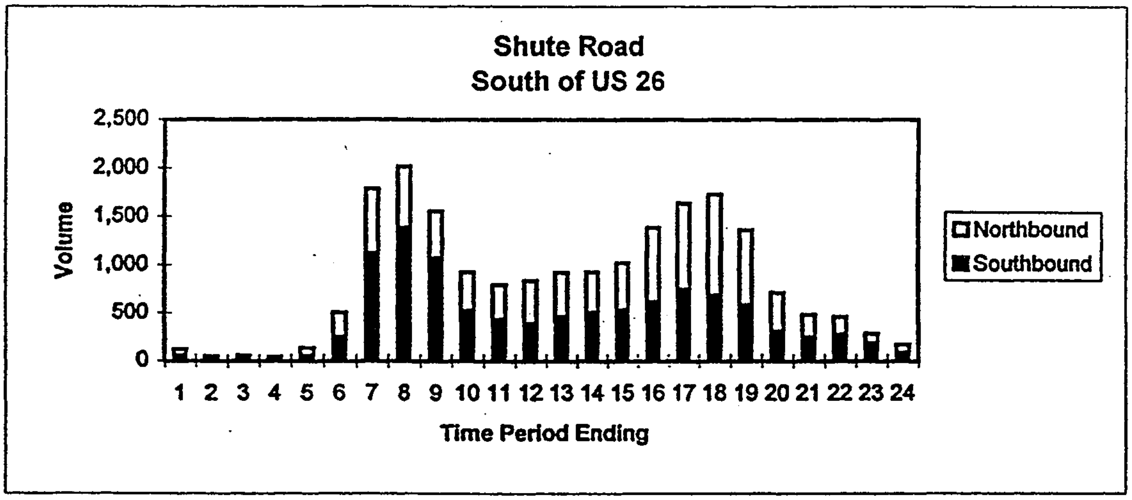


ADT = 33,700

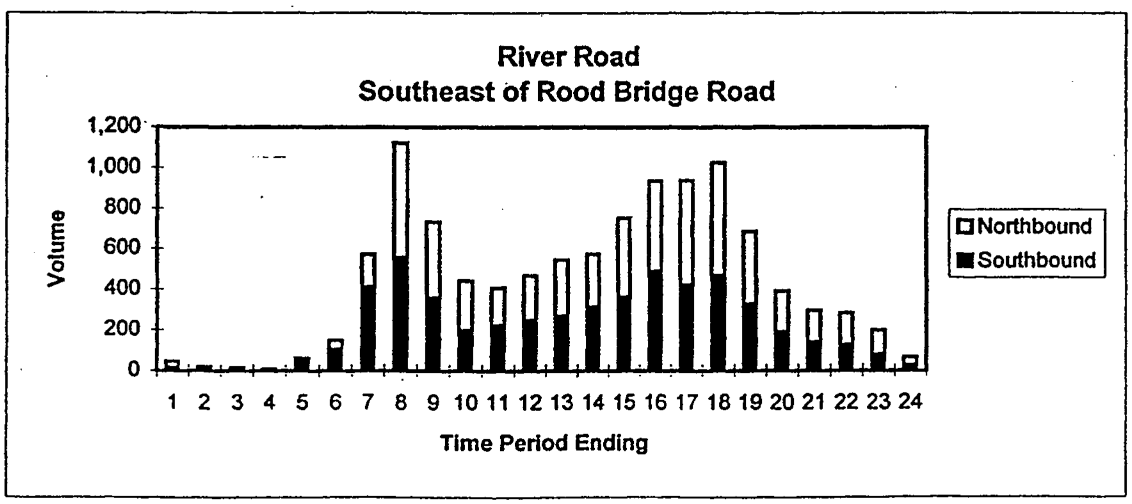
Figure 3-6
Hourly Variations



ADT = 26,100



ADT = 19,900



ADT = 10,700

Figure 3-7
Hourly Variations

TRAVEL TIME RUNS

Travel time is a key measure of transportation service and accessibility in a city. It provides a common reference for comparison between travel modes and a historical reference in future years. Travel time runs were conducted on several key routes in Hillsboro. These travel time runs measured the length of time it took to travel from one end of Hillsboro to the other on each key route during the PM peak period (4:00 PM to 6:00 PM) during the week. Five key routes were surveyed to provide a profile of travel times in Hillsboro:

- TV Highway from 185th Avenue to Dennis Avenue
- Cornell Road from Grant Street to 158th Avenue
- Evergreen Road from Cornell Road to Glencoe Road
- Cornelius Pass Road from West Union Road to TV Highway
- 185th Avenue from West Union Road to TV Highway

In addition, the following three routes from the Sunset Highway (starting at Cornell/Bethany Road interchange) into downtown Hillsboro were surveyed:

- Via Glencoe Road to Lincoln/1st Street
- Via Shute to Brookwood Parkway to Cornell Road to Grant Street
- Via Jackson School Road to Evergreen to Lincoln/1st.

The time periods observed were the 1996 weekday evening peak period. Figure 3-8 shows the locations of the travel time runs. The results of these travel time runs are shown in Tables 3-3 and 3-4 and in Figures 3-9 and 3-10. In general, it is possible to get across town in Hillsboro (either north/south or east/west) in approximately 10 to 15 minutes, including an average delay of about 40 to 60 seconds. This translates to average speeds of about 30 miles per hour, including delays at traffic signals and stop signs. Travel time along urban arterials can also be used as a measure of level of service.[7] Compared to capacity analysis, the average travel speed can help identify congested areas. Today, during the PM peak period the routes surveyed would relate to level of service C or better conditions.

[7] *1994 Highway Capacity Manual,* Special Report 209, Transportation Research Board, Washington D.C., 1994, Chapter 11.

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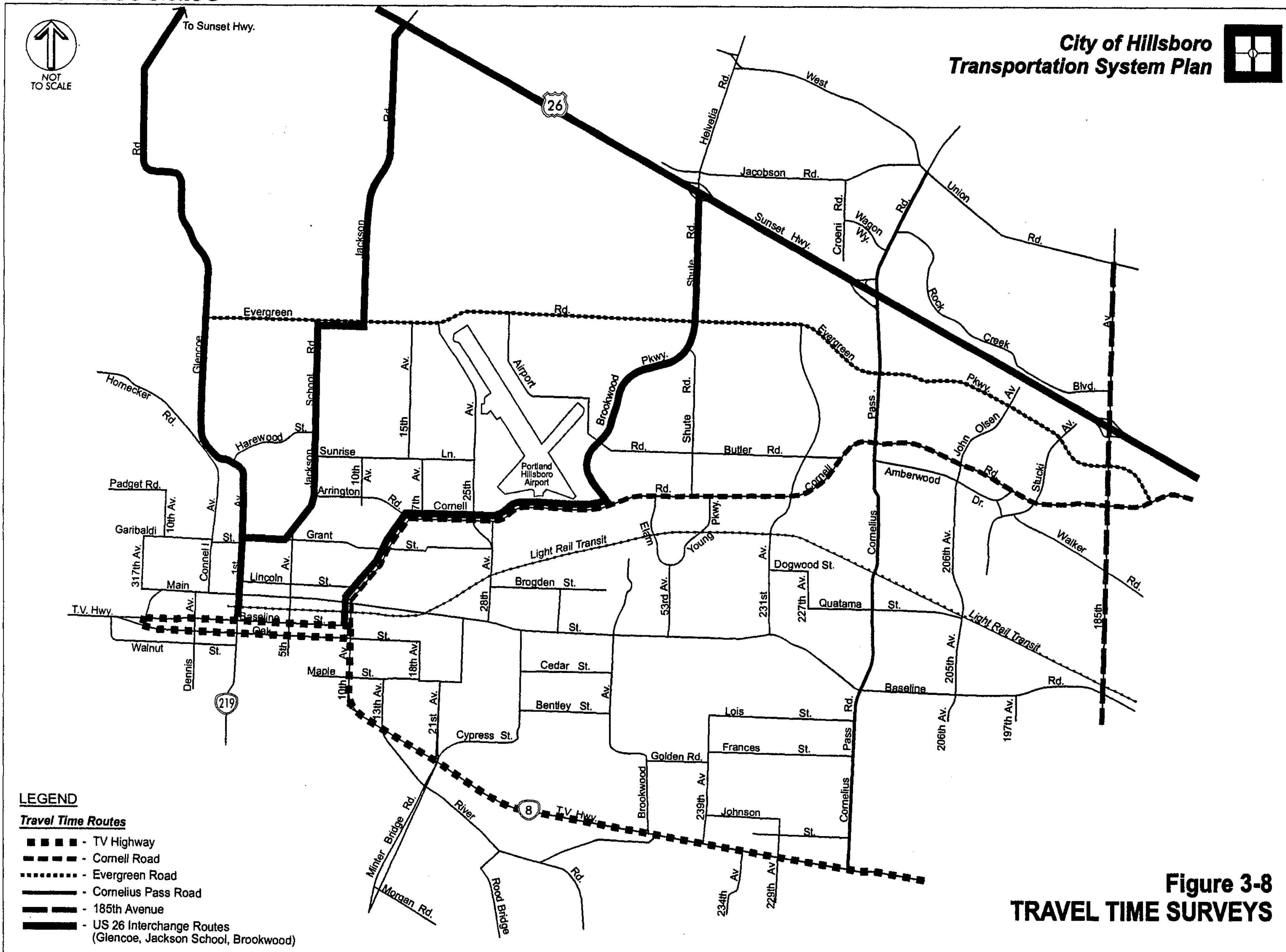
Transportation System Plan

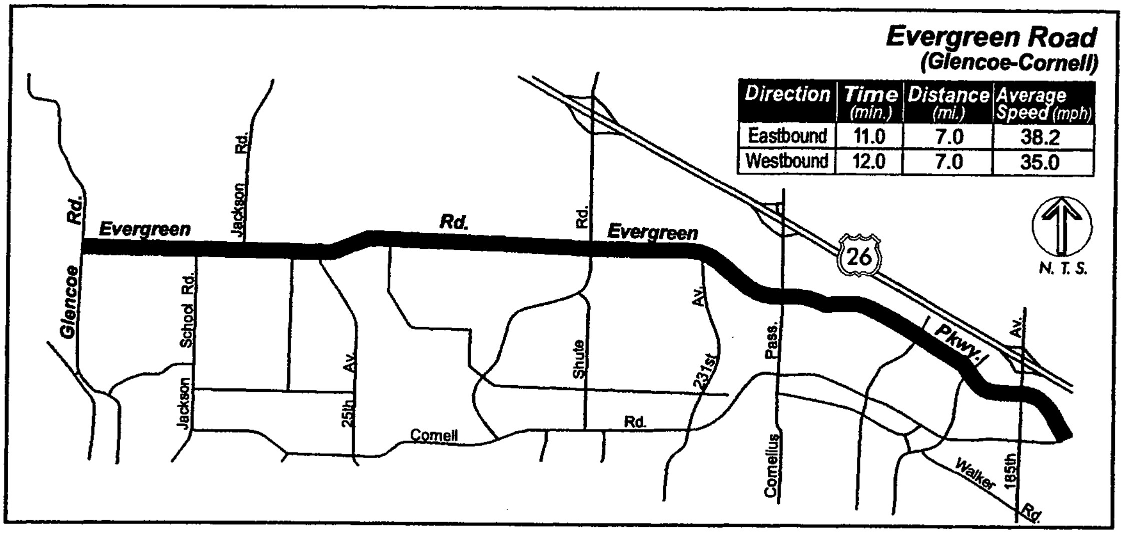


LEGEND

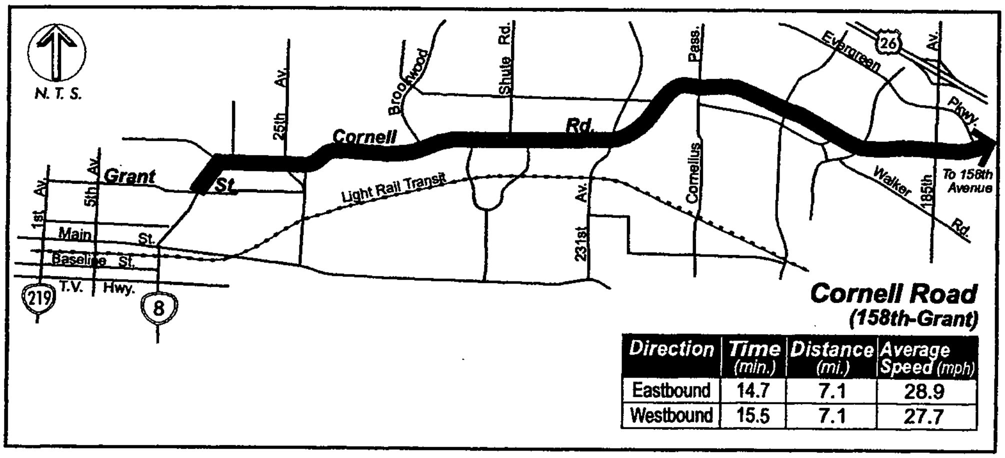
Travel Time Routes

- TV Highway
- Cornell Road
- Evergreen Road
- Cornelius Pass Road
- 185th Avenue
- US 26 Interchange Routes (Glencoe, Jackson School, Brookwood)

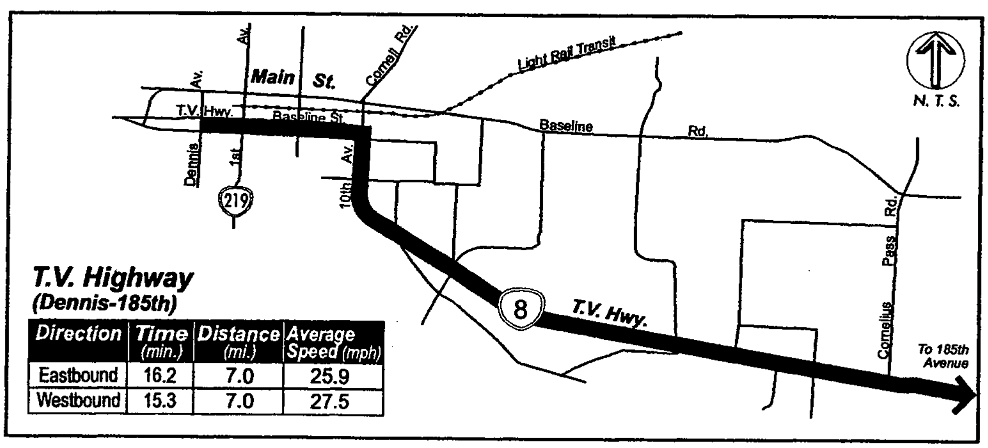
Figure 3-8
TRAVEL TIME SURVEYS



Direction	Time (min.)	Distance (mi.)	Average Speed (mph)
Eastbound	11.0	7.0	38.2
Westbound	12.0	7.0	35.0

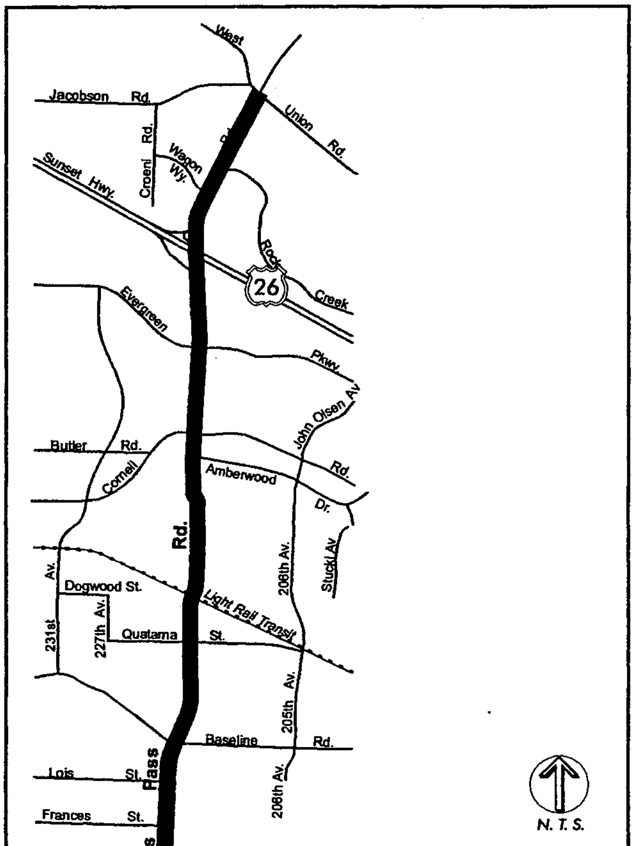


Direction	Time (min.)	Distance (mi.)	Average Speed (mph)
Eastbound	14.7	7.1	28.9
Westbound	15.5	7.1	27.7



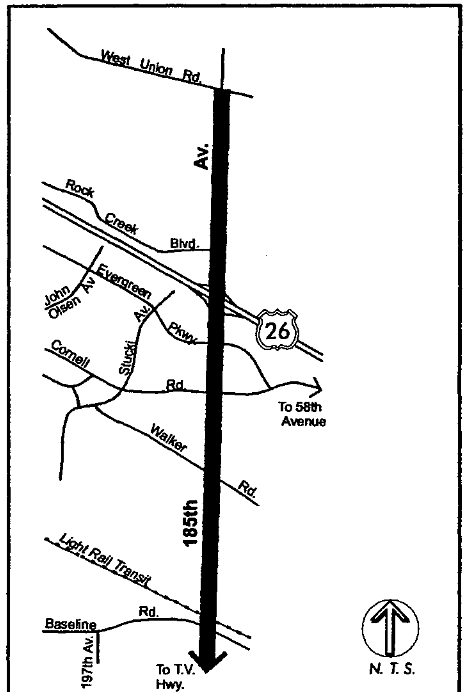
Direction	Time (min.)	Distance (mi.)	Average Speed (mph)
Eastbound	16.2	7.0	25.9
Westbound	15.3	7.0	27.5

Figure 3-9
TRAVEL TIME DATA PM PEAK PERIOD
February 1997



Cornelius Pass
(West Union-T.V. Hwy.)

Direction	Time *(min.)*	Distance *(mi.)*	Average Speed *(mph)*
Northbound	9.6	4.9	30.6
Southbound	10.3	4.9	28.4



185th Avenue
(West Union-T.V. Hwy.)

Direction	Time *(min.)*	Distance *(mi.)*	Average Speed *(mph)*
Northbound	9.9	4.5	27.0
Southbound	10.5	4.5	25.4

Figure 3-10
TRAVEL TIME DATA PM PEAK PERIOD
February 1997

Table 3-3
PM Peak Period Travel Time Surveys

Route	Direction	Time (min.)	Distance (miles)	Average Speed (mph)
Evergreen Road (from Glencoe Road to Cornell Road)	Eastbound	11.0	7.0	38.2
	Westbound	12.0	7.0	35.0
Cornell Road (from 158 Avenue to Grant)	Eastbound	14.7	7.1	28.9
	Westbound	15.5	7.1	27.7
TV Highway (from 185th Avenue to Dennis Avenue)	Eastbound	16.2	7.0	25.9
	Westbound	15.3	7.0	27.5
Cornelius Pass Road (from West Union to TV Highway)	Northbound	9.6	4.9	30.6
	Southbound	10.3	4.9	28.4
185th Avenue (from West Union to TV Highway)	Northbound	9.9	4.5	27.0
	Southbound	10.5	4.5	25.4

Note: Arterial Level of Service D (for a class II arterial) is less than 14 mph

Table 3-4
Travel Time Surveys

Route	Peak Period	Direction	Time (min)	Distance (miles)	Average Speed (mph)
Glencoe Road route from US 26 @ Cornell to Lincoln/1st	PM	Northbound	16.6	14.2	51.2
	PM	Southbound	16.9	14.2	50.1
	Non-peak	Northbound	16.2	14.2	52.5
	Non-peak	Southbound	16.8	14.2	50.5
Jackson School route from US 26 @ Cornell to Lincoln/1st	PM	Northbound	15.1	12.2	48.5
	PM	Southbound	15.3	12.2	47.8
	Non-peak	Northbound	15.2	12.2	48.2
Brookwood Parkway-Shute Road route from US 26 @ Cornell to Grant	PM	Northbound	14.7	9.5	38.8
	PM	Southbound	13.1	9.5	43.5
Brookwood Parkway-Shute Road route from US 26 @ Cornell to Cornell	PM	Northbound	11.0	7.8	42.3
	PM	Southbound	9.5	7.8	49.2
	Non-peak	Northbound	9.2	7.8	50.8
	Non-peak	Southbound	9.0	7.8	51.6

TRAFFIC CONTROL

Hillsboro has over 100 signalized intersections (including the Urban Growth Boundary Management Area), with the majority on arterial streets. Figure 3-11 shows the signalized locations. Traffic signals are valuable devices for the control of vehicle and pedestrian traffic. Traffic control signals, properly located and operated can have one or more of the following advantages:

- They provide for the orderly movement of traffic
- On larger roadways where proper physical layouts and control measures are used, they can increase the traffic handling capacity of the intersection
- They reduce the frequency of certain types of accidents, especially the right angle type
- Under favorable conditions, they can be coordinated to provide continuous or nearly continuous movement of traffic at a definite speed along a given route
- They permit minor street traffic, vehicular or pedestrian, to enter or cross continuous traffic on the major street

Improper or unwarranted signal installations may cause:

- Excessive delay
- Disregard of signal indications
- Circuitous travel of alternative routes
- Increased fuel use and wear and tear on vehicles, especially trucks
- Increased accident frequency, particularly rear-end type

Consequently, it is important that the consideration of a signal installation and the selection of equipment be preceded by a thorough study and based on consistent criteria. These studies identify the need for left turn phasing, lanes and phase type. The justification for the installation of a traffic signal at an intersection for ODOT, Washington County and Hillsboro is based upon the warrants stated in the Manual on Uniform Traffic Control Devices[8] (MUTCD). The MUTCD has been adopted by the state of Oregon and is used throughout the nation.

The same conditions hold true for installation of stop sign traffic controls. Specific warrants identify conditions, which may warrant two-way or multi-way stop sign installations. A stop sign is not a cure-all and is not a substitute for other traffic control devices. Guidelines and warrants for stop sign installations are outlined in the MUTCD.

[8] *Manual on Uniform Traffic Control Devices for Streets and Highways*, US Department of Transportation, Federal Highway Administration, 1988, pages 4C1-4C12.

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City of Hillsboro
Transportation System Plan

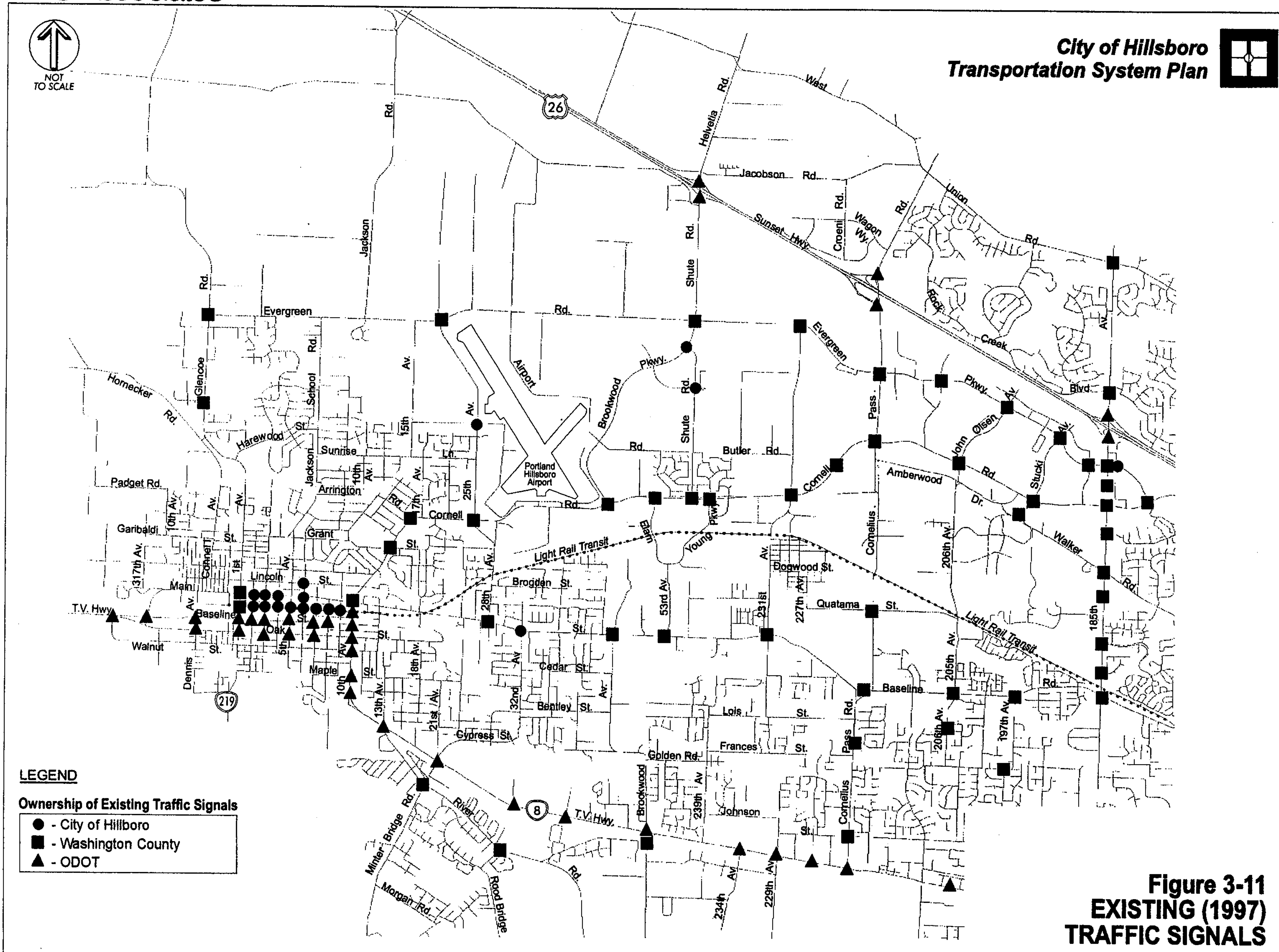

Figure 3-11
EXISTING (1997)
TRAFFIC SIGNALS

ability of the street network to carry additional traffic nor the quality of service afforded by the street facilities. For this, the concept of level of service has been developed to correlate traffic volume data to subjective descriptions of traffic performance at intersections. Level of service (LOS) is used as a measure of effectiveness for intersection operation. It is similar to a "report card" rating based upon average vehicle delay. Level of Service A, B and C indicate conditions where traffic moves without significant delays over periods of peak travel demand. Level of service D and E represent progressively worse peak hour operating conditions. Level of service F represents conditions where the average vehicle delay exceeds 60 seconds per vehicle entering a signalized intersection and demand has exceeded the capacity. This delay represents jammed conditions and any additional vehicle traffic would require mitigation. This condition is typically evident in long queues and delays. Level of service D or better has generally been the accepted standard for signalized intersections in urban conditions. Unsignalized intersections provide levels of service for major and minor street turning movements. For this reason, LOS E and even LOS F can occur for a specific turning movement; however, the majority of traffic may not be delayed (in cases where major street traffic is not required to stop). LOS E or F conditions at unsignalized intersections generally provide a basis to study the intersections further and to determine availability of acceptable gaps, safety and traffic signal warrants. A summary of the descriptions of level of service for signalized and unsignalized intersections in the City is provided in the appendix.

Intersection turn movement counts were conducted at the 71 study intersections shown in Figure 3-12 during the evening peak periods to determine existing LOS based on the 1994 Highway Capacity Manual methodology for signalized and unsignalized intersections.[9] Traffic counts, level of service calculation sheets and descriptions of level of service for signalized, unsignalized and all-way-stop controlled intersections can be found in the appendix this report.

Figure 3-13 provides a summary of PM peak hour levels of service for the study intersections in Hillsboro. Most intersections in Hillsboro operate at level of service D or better, with some exceptions.

ACCIDENTS

Accident data was obtained from the City of Hillsboro Engineering Department and compiled from the Hillsboro police department accident reports for 1995 and 1996. Figure 3-14 shows the locations with five or more reported accidents in 1996. Tables 3-5 and 3-6 show the ten highest reported accident locations and number of reported accidents for 1996 and 1995 respectively. It should be noted that many of the high accident sites are located on TV Highway. One of the factors for this could be the frequency of retail access directly accessing onto a major arterial. Retail uses increase opportunities for driveway movements, which can increase conflicts and accident potential.

9 *Highway Capacity Manual, Special Report 209*, Transportation Research Board, Washington D.C., 1994.

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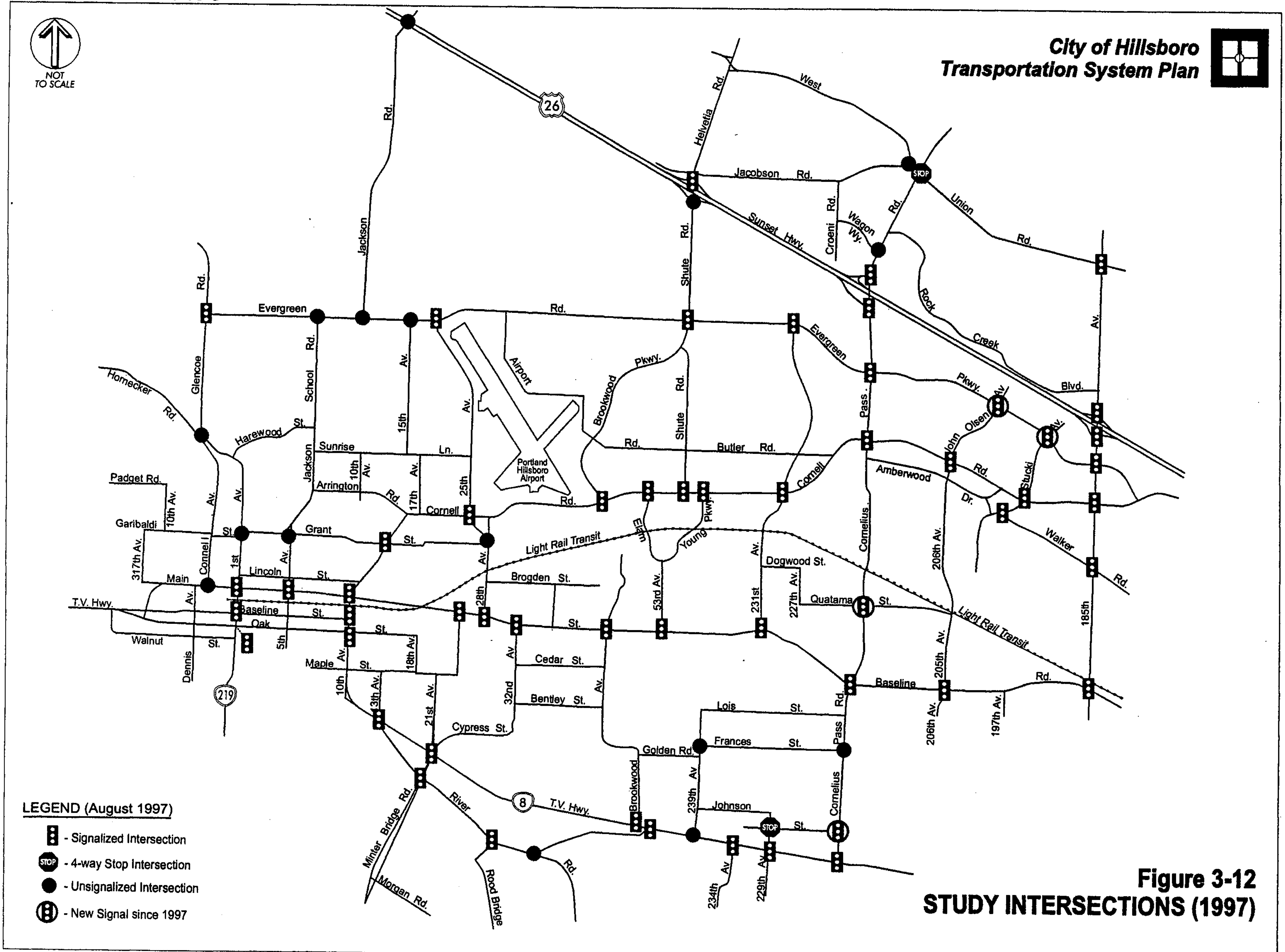
City of Hillsboro
Transportation System Plan



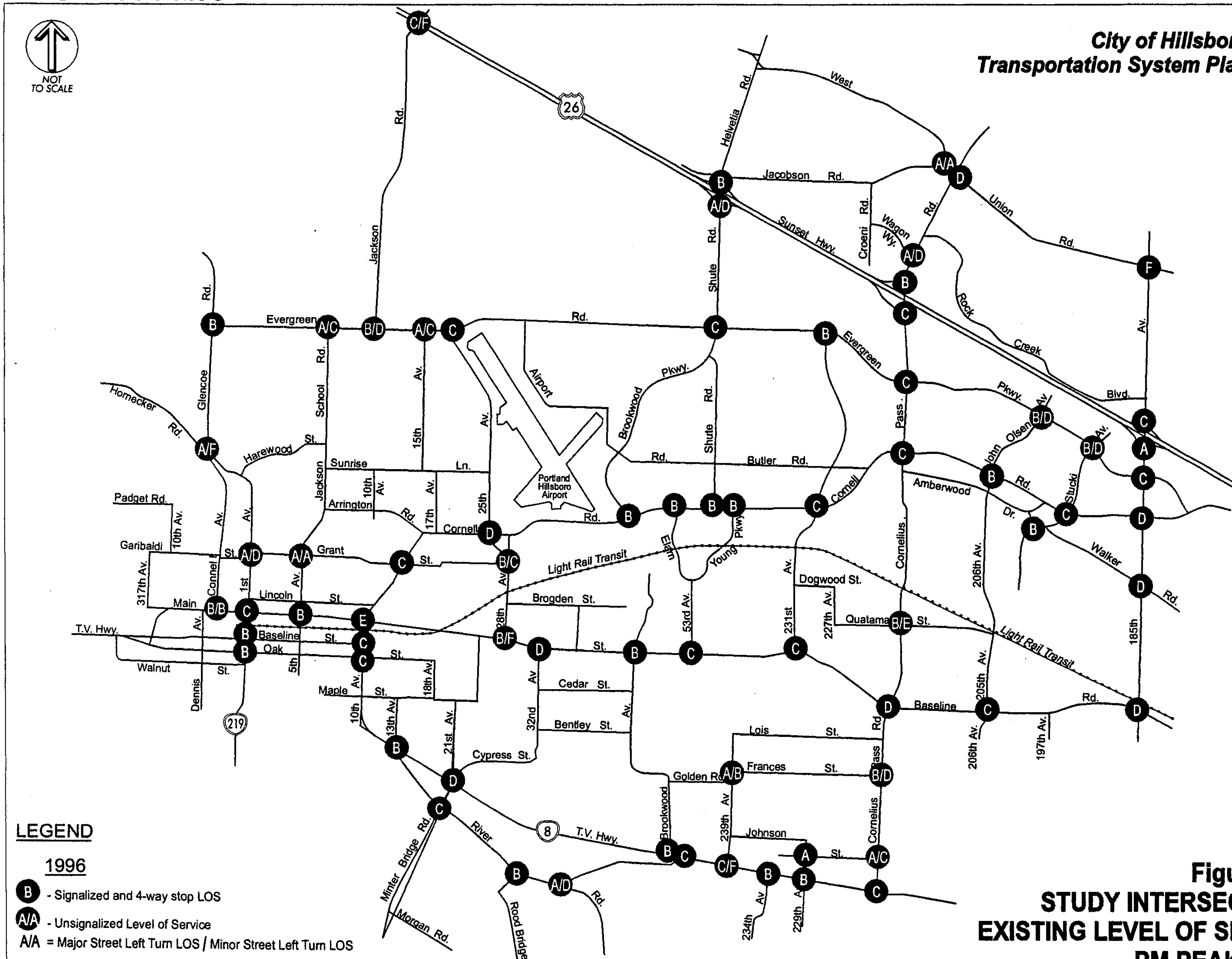
LEGEND (August 1997)

- Signalized Intersection
- 4-way Stop Intersection
- Unsignalized Intersection
- New Signal since 1997

Figure 3-12
STUDY INTERSECTIONS (1997)

DKS Associates

City of Hillsboro
Transportation System Plan



LEGEND

1996

- Signalized and 4-way stop LOS
- Unsignalized Level of Service

A/A = Major Street Left Turn LOS / Minor Street Left Turn LOS

Figure 3-13
STUDY INTERSECTIONS EXISTING LEVEL OF SERVICE PM PEAK HOUR

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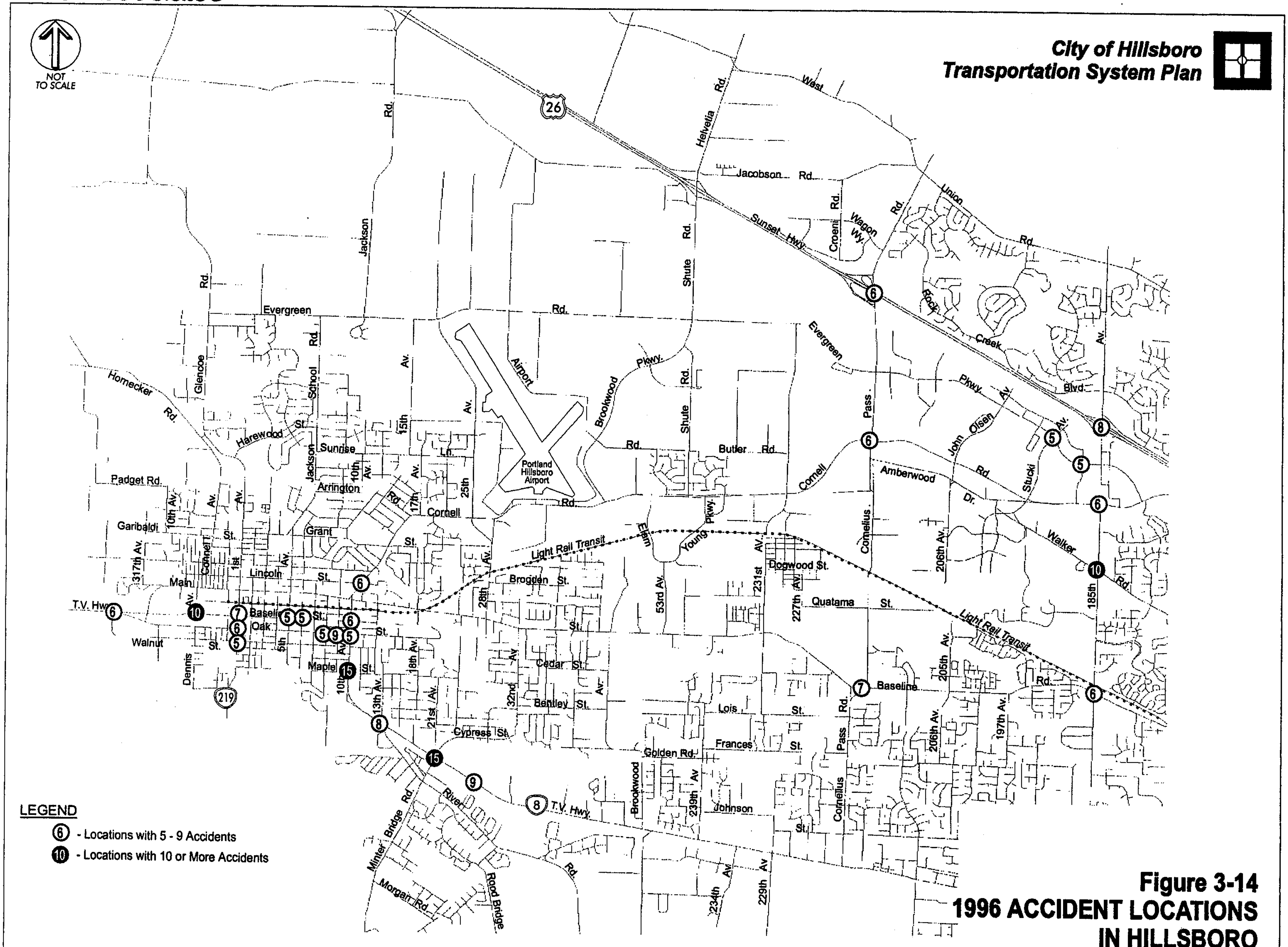
City of Hillsboro
Transportation System Plan



LEGEND

⑥ - Locations with 5 - 9 Accidents

❿ - Locations with 10 or More Accidents

Figure 3-14
1996 ACCIDENT LOCATIONS IN HILLSBORO

Table 3-5
Ten Highest Reported Accident/Locations in Hillsboro for 1996
City of Hillsboro Data

Ranking	Roadway	Location	Number of Accidents
1	TV Highway (ORE 8)	SE Maple Street	15
2	TV Highway (ORE 8)	SE Cypress St/SE Minter Bridge Rd	15
3	TV Highway (ORE 8)	SW Dennis Avenue	10
4	SW 185th Avenue	NW Walker Road	10
5	TV Highway (ORE 8)/SE Oak Street	SE 9th Avenue	9
6	TV Highway (ORE 8)	0.5 mi section from Cypress to SE 32nd Ave	9
7	TV Highway (ORE 8)	SE 13th Avenue/SE River Road	8
8	Sunset Highway (US 26)	SW 185th Avenue	8
9	TV Highway (ORE 8)/SW Baseline Street	1st Avenue (ORE 219)	7
10	NW Cornelius Pass Road	W Baseline Road	7

Table 3-6
Ten Highest Reported Accident/Locations in Hillsboro for 1995
City of Hillsboro Data

Ranking	Roadway	Location	Number of Accidents
1	TV Highway (ORE 8)	SE Cypress St/SE Minter Bridge Rd	16
2	TV Highway (ORE 8)	SE 13th Avenue/SE River Road	14
3	TV Highway (ORE 8)/SE Oak Street	SE 9th Avenue	12
4	SW 185th Avenue	NW Walker Road	11
5	TV Highway (ORE 8)/SE Oak Street	S 1st Avenue (ORE 219)	10
6	TV Highway (ORE 8)/SE Oak Street	TV Highway (ORE 8)/SE 10th Avenue	10
7	TV Highway (ORE 8)/SW Baseline St	S 1st Avenue (ORE 219)	8
8	TV Highway (ORE 8)/SW 10th Avenue	SW Walnut Street	8
9	NW 185th Avenue	NE Cornell Road	8
10	NW Cornelius Pass Road	NE Cornell Road	7

Accident data was also obtained from Washington County for the period between 1992 and 1996. Washington County takes data collected by the State of Oregon and converts it to a Safety Priority Index System (SPIS) number. SPIS represents the combination of accident rates, frequency, severity and volumes. The SPIS number associated with a given intersection represents only those accidents that took place within or very near that intersection. The SPIS system of accident reporting does not necessarily identify broad areas (i.e. a one-half mile segment) where a number of accidents may take place. The SPIS numbers for each intersection in Washington County where accidents have occurred were then ranked from highest to lowest. Table 3-7 summarizes where the ten highest accident intersections in Hillsboro fell in the Washington County ranking (data for 1992-1994 and 1994-1996). The 1996 data includes over 50 intersections in Hillsboro, which were identified on the Washington County SPIS list out of 209 on the overall listing.

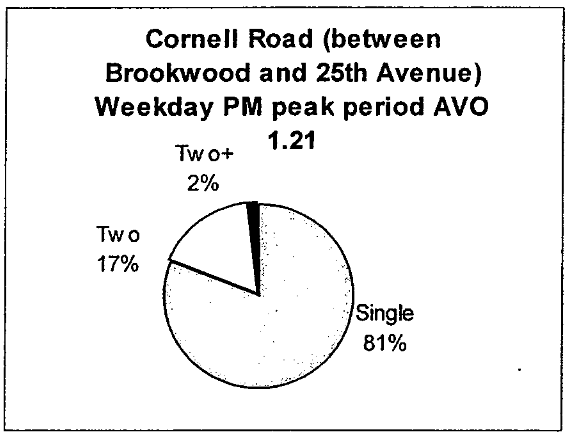
Table 3-7
Ten Highest SPIS Rated Intersections in Hillsboro from Washington County Data (1992-1994)

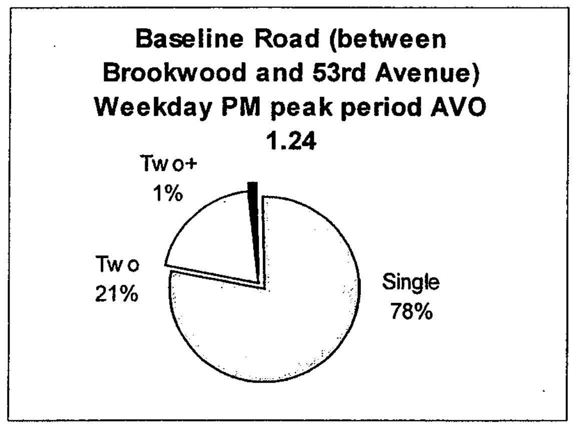
SPIS List Ranking	Street	Cross Street	Number of Accidents	SPIS Number
8	Baseline Road	185th Avenue	56	63.10
21	Evergreen Road	Glencoe Road	11	56.85
26	Baseline Road	Cornelius Pass Road	20	55.60
34	Rock Creek Blvd.	185th Avenue	25	53.15
41	Quatama Road	Cornelius Pass Road	12	51.40
52	West Union Road	185th Avenue	16	49.18
54	Evergreen Road	Jackson School Road	10	48.93
68	Baseline Road	231st Avenue	12	45.88
81	Baseline Road	197th Avenue	11	42.66
84	Baseline Road	206th Avenue	10	42.06
SPIS Data	**1994-1996**	(Note: Includes ODOT Data)		
9	Evergreen Road	Jackson School Road	16	58.81
10	Evergreen Parkway	188th Avenue	13	56.88
13	TV Highway	185th Avenue	75	56.02
17	Baseline Road	185th Avenue	47	53.60
24	Baseline Street	1st Avenue	30	50.47
26	Oelrich Road	231st Avenue	4	50.09
28	Quatama Road	Cornelius Pass Road	15	49.68
31	Evergreen Parkway	John Olson Road	12	49.17
36	TV Highway	209th Avenue	37	47.78
40	Evergreen Parkway	185th Avenue	33	46.95

AVERAGE VEHICLE OCCUPANCY

Average vehicle occupancy is a measure of the movement of people on key routes. For Hillsboro, the locations of Baseline Road between Brookwood and 53^{rd} Avenue and Cornell Road between Brookwood and 25^{th} Avenue were selected as representative monitoring points for Hillsboro vehicle activity. Average vehicle occupancy (AVO) was measured at Baseline Road during the PM peak hour (4:00 PM to 6:00 PM)[10] to be 1.24 persons per vehicle and at Cornell Road during the PM peak hour to be 1.21. This rate is slightly lower than observed typical ranges for auto occupancy (over all time periods and trip purposes) which range from about 1.31 to 1.54.[11] Figure 3-15 shows the percentage of vehicles with one, two or greater than two occupants at the survey site.

Figure 3-15
Average Vehicle Occupancy





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[10] Counts performed for ***DKS Associates*** on November 21 and December 3 and 5, 1996.

[11] *Calibration and Adjustment of System Planning Models*, U.S. Department of Transportation and Federal Highway Administration, December, 1990 and *Quick Response Urban Travel Estimation Techniques and Transferable Parameters: User's Guide*, NCHRB Report 187, Transportation Research Board, Washington, D.C., 1978.

TRANSIT (1997)

The Tri-County Metropolitan Transportation District of Oregon (Tri-Met) provides transit service to Hillsboro. There are eight Tri-Met bus routes which serve Hillsboro: Farmington-185th Route 52, Forest Grove Route 57, Sunset Route 58, Hillsboro-Tanasbourne Route 68, SW 198th Avenue Route 88, Rock Creek Route 89, TV Highway Express Route 91X and Walker Road Express 94X (see Figure 3-16). Table 3-8 provides the service days for the Tri-Met routes serving Hillsboro.[12]

Table 3-8
Transit Service in Hillsboro

Weekday All Day Tri-Met Routes	Weekday Peak Only Tri-Met Routes	Saturday Tri-Met Routes	Sunday Tri-Met Routes
52, 57, 88, 89	58, 68, 91X, 94X	52, 57	52, 57

The average weekday boarding rides system-wide for Tri-Met routes serving Hillsboro for the last three years is shown in Table 3-9.[13] The 1994 average weekday ridership in Hillsboro is provided in Table 3-10.[14]

Table 3-9
Average Weekday Boarding Rides System-wide for Tri-Met Routes serving Hillsboro

Route	93-94	94-95	95-96
52 Farmington-185th	1,582	1,781	1,911
57 Forest Grove	7,389	8,615	8,528
58 - Sunset Express Route	531	n/a	n/a
68 - Hillsboro-Tanasbourne Route	46	64	70
88 - SW 198th Avenue Route	1,204	1,981	1,754
89 - Rock Creek Route	1,070	1,125	1,185
91X TV HWY Express	786	890	975
94X Walker Road Express	n/a	441	n/a

[12] Data provided by Dennis Grimmer, Tri-Met staff, March 6, 1997.

[13] Data provided by Dennis Grimmer, Tri-Met staff, November 5, 1996.

[14] Ibid.

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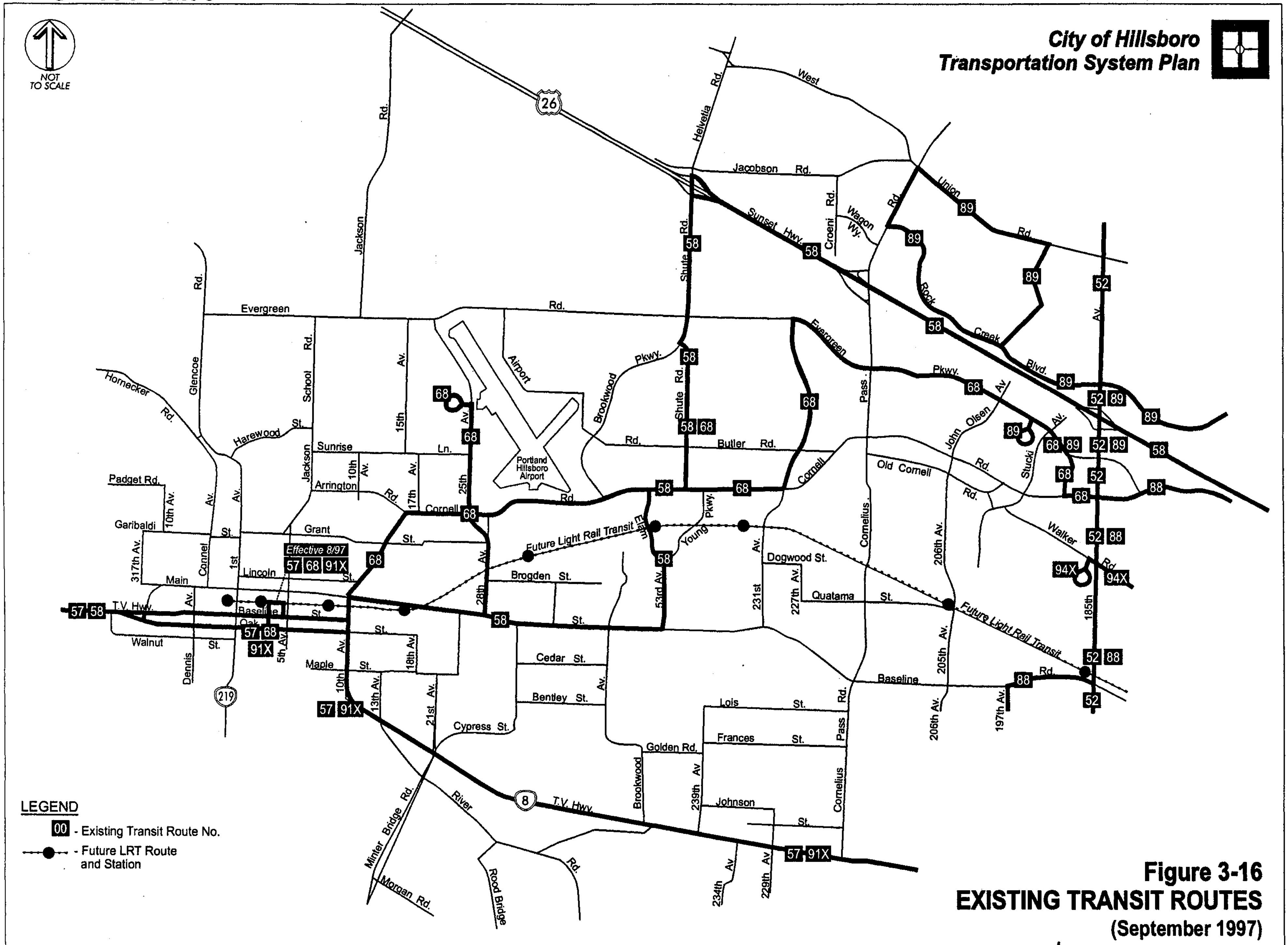

Figure 3-16
EXISTING TRANSIT ROUTES
(September 1997)

Table 6-4
Bicycle Action Plan Project Priorities

Project	From	To	Metro Draft RTP Project
Priority 1: Connect key bicycle corridors to schools, parks, recreational uses and activity centers			
Rock Creek Trail	Evergreen Parkway	Amberwood Drive	79*
Jackson School Road bike lanes	Evergreen Road	Grant Street	711b*
Glencoe Road bike lanes	Evergreen Road	Grant Street	712*
Grant Street bicycle way	1st Avenue	25th/28th Avenue	
Priority 2: Fill in gaps in bicycle network			
25th Avenue bike lanes	Evergreen Road	25th Avenue gap	749*
Cornell Road bike lanes	Elam Young (west)	Ray Circle	706*
10th Avenue bike lanes**	Walnut Street	Main Street	
Oak Street bike lanes**	TV Highway	Dennis Avenue	
Cornell Road bike lanes**	Grant Street	25th Avenue	
Priority: Construct bike lanes with roadway improvement projects			
Baseline Road bike lanes	Lisa Drive	10th Avenue	714/715/928*
Brookwood Parkway bike lanes	Airport Road	TV Highway	739/740*
Cornelius Pass Road bike lanes	Cornell Road	209th Avenue	737/738*
Evergreen Road bike lanes	Near 260th Avenue	Glencoe Road	732b*
Evergreen Road bike lanes	Near 25th Avenue	Glencoe Road	732*
231st/235th Avenue bike lanes	Evergreen Road	West Union Road	743a/743b*
28th Avenue bike lanes	Grant Street	Main Street	726c*
231st Avenue bike lanes	TV Hwy	Cornell Road	729a*
Quatama Street bike lanes	227th Avenue	Baseline Road	707*
Jacobson Road bike lanes	Helvetia Road	Cornelius Pass Road	
Butler/Amberwood bike lanes	Brookwood Parkway	John Olsen Avenue	
Walker Road bike lanes	Amberglen Parkway	185th Avenue	

* Included in Draft RTP list, November 1998 (reference number in parenthesis)
** Feasibility studies required; including alternative alignments and need for right-of-way acquisition.

The Transportation Planning Rule defines a Major Transit Stop as generally for light rail or transit transfer stations, or stops which are near (within 1/4 mile) intense development or uses which are likely to generate a high level of transit trips. Currently, there are several locations in Hillsboro that may meet that criteria including the Hillsboro Transit Center (downtown), Tanasbourne, 185th corridor and the Oregon Graduate Institute.

BICYCLES

Existing bike lanes, multi-use or off-street bike paths and the interim existing and future bikeway network without bike lanes are shown in Figure 3-17. The interim existing and future bikeway network without bike lanes are those facilities shown in the Hillsboro's Interim Bicycle Network Map.[15] The future bikeway network may or may not have future bike lanes.

There is limited connectivity for bicyclists traveling to activity centers in Hillsboro. However, there are three primary east/west routes (TV Highway, Cornell Road and Evergreen Road) and one primary north/south route (185th Avenue) in Hillsboro. Bicycles are permitted on all roadways in the City. In Hillsboro, bicycles are generally used for recreational, school and commuting purposes.

PEDESTRIANS

Figure 3-18 shows existing sidewalks on arterial and collector streets in Hillsboro. A majority of arterial and collector streets in Hillsboro have sidewalks on at least one side of the street. There are some locations where sidewalks are not connected; however, connectivity and pedestrian linkages are relatively good. In addition to the facilities that are shown on this map, many residential streets also have sidewalks.

Pedestrian counts were conducted during the evening peak period (4:00 to 6:00 PM) at the study intersections in Hillsboro. Many of these intersections had ten or more pedestrians in the PM peak period. The most significant pedestrian movements occur in the Hillsboro downtown area, Tanasbourne area and on TV Highway. Figure 3-19 shows the pedestrian movements at each study intersection during the PM peak period.

Sidewalks at least five feet wide are required in all new development. Existing roadways that do not have sidewalks are being retrofitted where the terrain and right-of-way make it economically feasible to do so. All newly constructed sidewalks include wheelchair ramps at intersections to permit easy ingress/egress for wheelchairs. In addition to paved sidewalks, pedestrian paths are included in many of the City's parks, open spaces and greenways.

[15] *Interim Bicycle Network Map*, City of Hillsboro, Oregon, January 1997.

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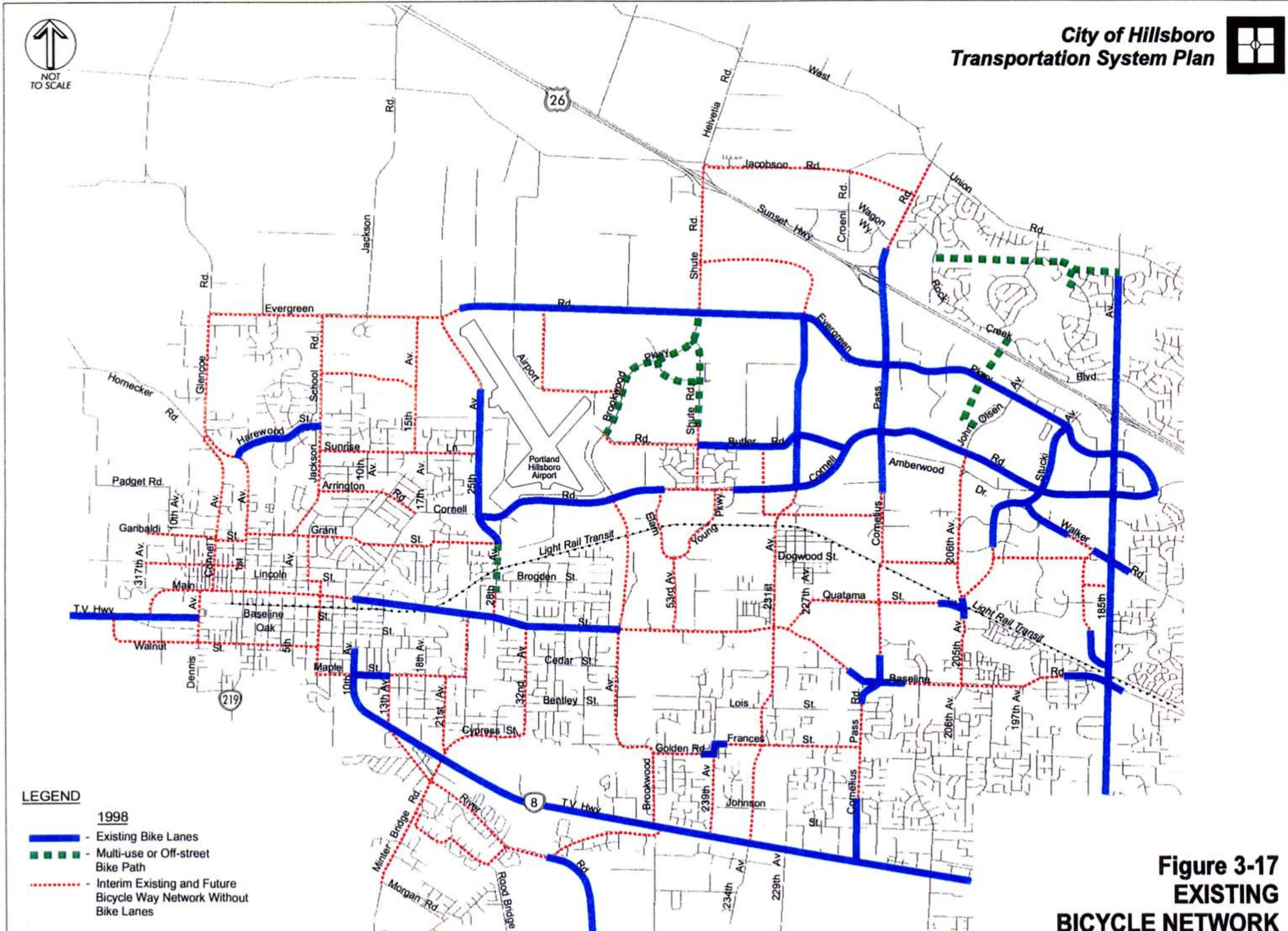
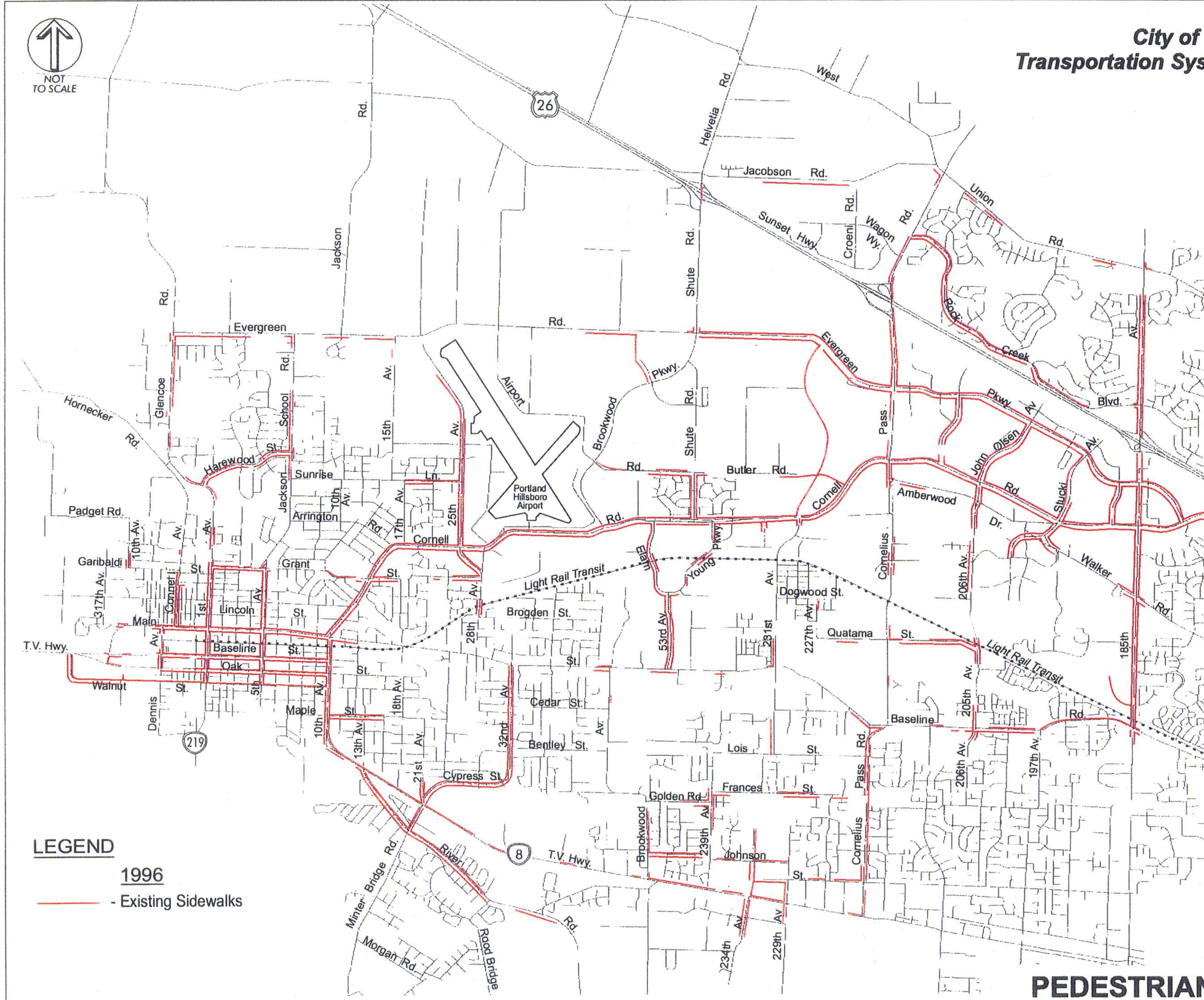


Figure 3-17
EXISTING
BICYCLE NETWORK

City of Hillsboro
Transportation System Plan



LEGEND

1996

- Existing Sidewalks

Figure 3-18
EXISTING PEDESTRIAN NETWORK

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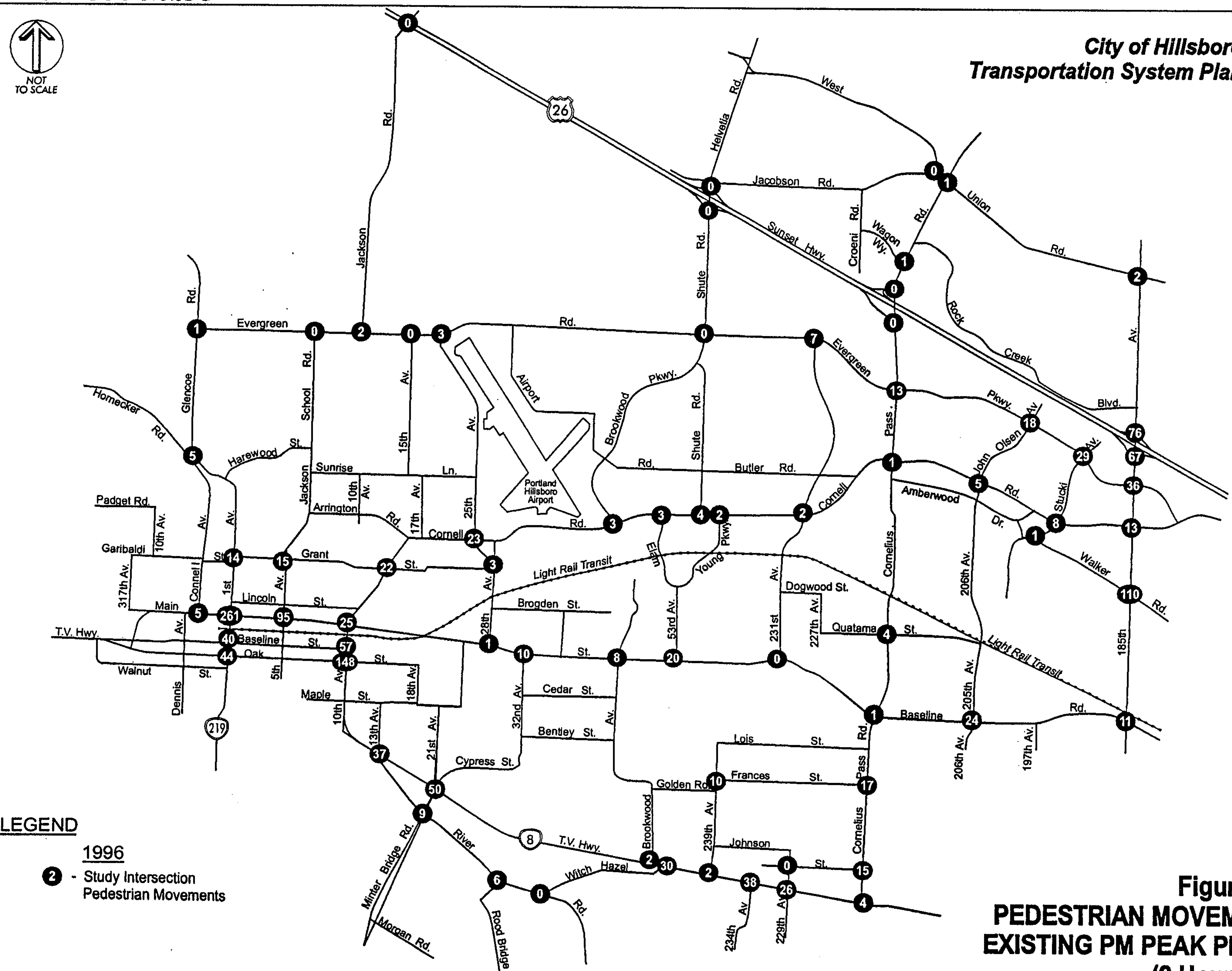
City of Hillsboro
Transportation System Plan



LEGEND

1996

❷ - Study Intersection Pedestrian Movements

Figure 3-19
PEDESTRIAN MOVEMENTS
EXISTING PM PEAK PERIOD
(2 Hour Peak)

TRUCKS

Through freight truck routes that have been identified in Hillsboro are generally located on roadways that have been classified as a minor arterial or above. Sunset Highway (ORE 26) and Tualatin Valley Highway (ORE 8) are included. This system provides connections with truck routes serving areas within and outside of Hillsboro making possible efficient truck movement and the delivery of raw materials, goods, services, and finished products. These routes are generally found in and serve areas where there are concentrations of commercial and/or industrial land uses. Figure 3-20 shows through freight truck routes within the vicinity of Hillsboro.[16] Percentage of truck movements at the study intersections is shown in Figure 3-21.

[16] Based on the *Washington County Transportation Plan*, Comprehensive Plan Volume XV, October 1988 and Metro Regional Freight system map, draft RTP, July 1997.

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City of Hillsboro
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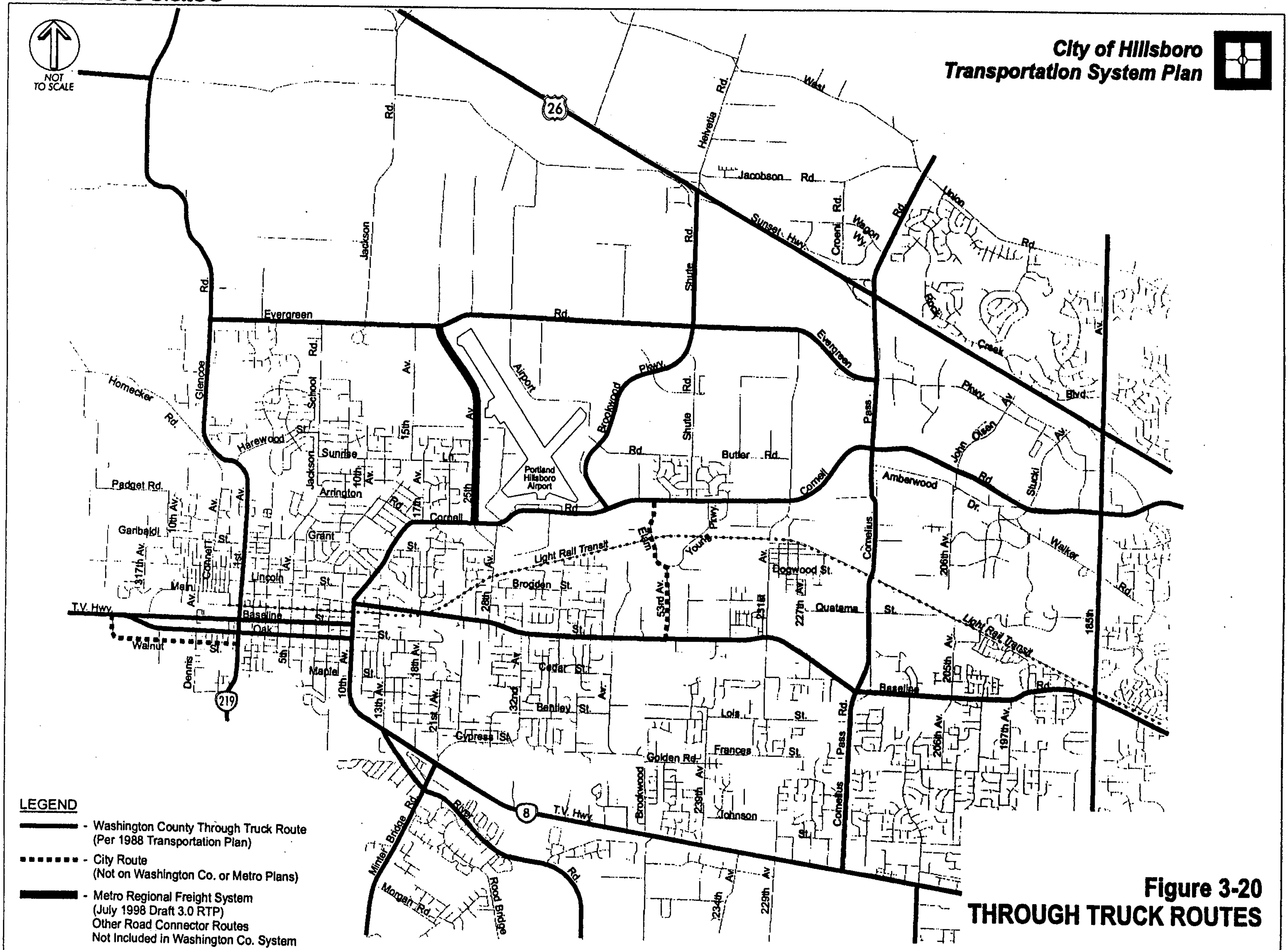

Figure 3-20
THROUGH TRUCK ROUTES

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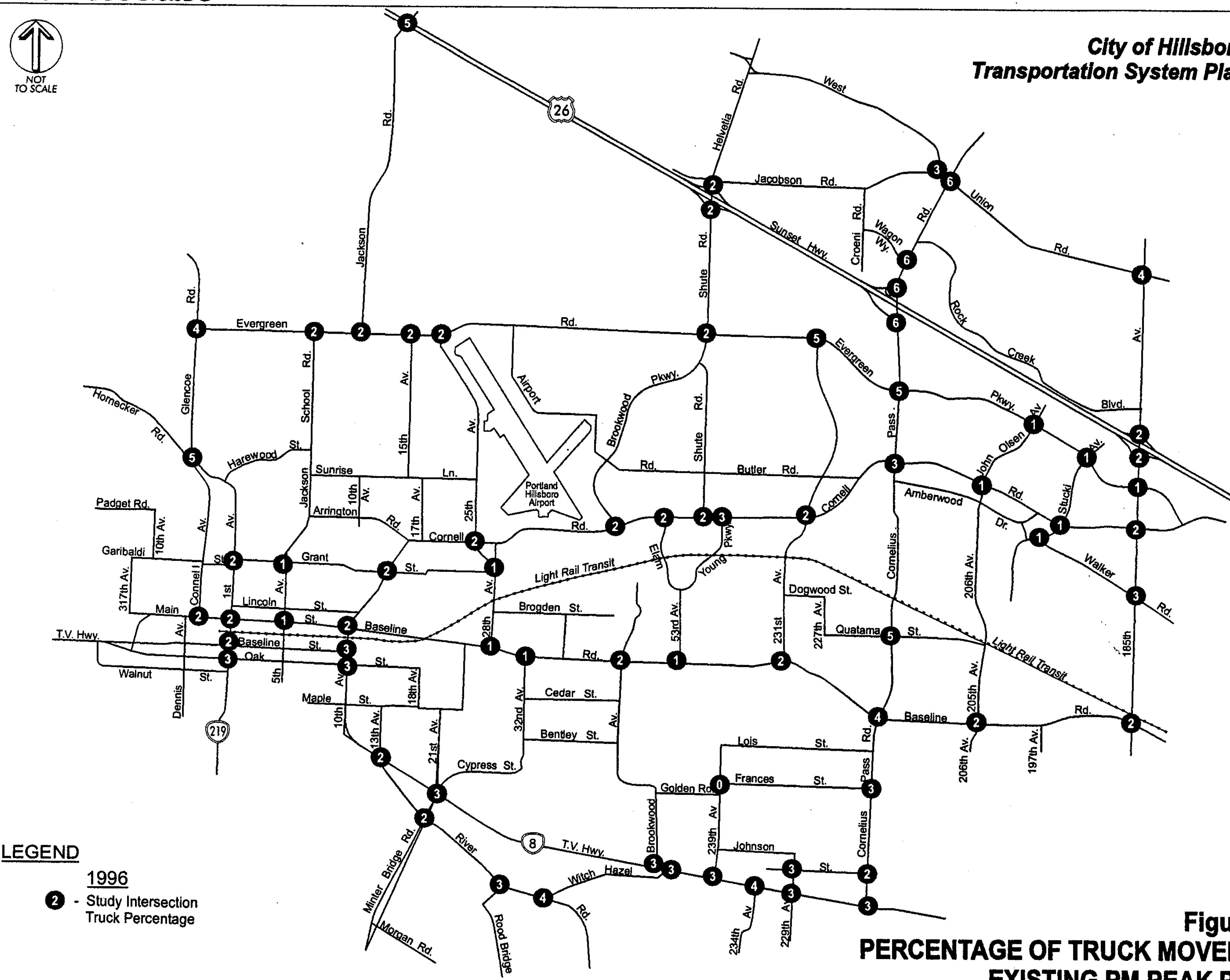
City of Hillsboro
Transportation System Plan



LEGEND

1996

● - Study Intersection Truck Percentage

Figure 3-21
PERCENTAGE OF TRUCK MOVEMENTS
EXISTING PM PEAK PERIOD

RAIL

All rail lines within the vicinity of Hillsboro are operated by Portland & Western (P&W), a sister company of Willamette & Pacific (W&P) Railroad and a subsidiary of Genesee & Wyoming Incorporated. Some of the lines are leased from Union Pacific and the old Burlington Northern Santa Fe lines have recently been purchased by W&P. The W&P purchase included a 7.6 mile line over Cornelius Pass. Figure 3-22 shows the existing rail routes and crossing treatments within the boundaries of Hillsboro. The rail lines are low-density, meaning they are not used as mainline routes.

In relation to Hillsboro, P&W currently has services extending north to Banks and Bendemeer, east to Beaverton and west to Forest Grove and Stimson-Forestex. From Beaverton, service continues south to the cities of Tigard and Tualatin where rail lines branch to serve areas east to Brooklyn and south to Quinaby and Eugene.[17]

Trains generally operate within the Hillsboro area Monday through Saturday. Time of operation can vary, but the approximate number of trains per day remains constant. Table 3-11 is a list of train origins, destinations, and times of operation and the numbers of trains per day.

Table 3-11
Train Schedules for the Hillsboro Area

Origin	Destination	Frequency and Hours of Operation	
		AM	PM
Beaverton (St. Mary's)	Hillsboro Depot	1 train daily Monday – Saturday	1 train daily Monday – Saturday
Hillsboro Depot	Cornelius	None	2 trains daily Monday – Friday
Hillsboro Depot	Banks	12 trains per week, schedule times varies greatly	

AIR

The Portland-Hillsboro Airport, a general aviation facility located in the north central portion of the city, serves Hillsboro. Brookwood Parkway borders it to the east, Cornell Road to the south, 25th Avenue to the west and Evergreen Road to the north. The airport facility is owned and operated by the Port of Portland as part of the Port's general aviation reliever system of airports. The Port of Portland maintains a Master Plan for this facility, which was most recently updated in October 1996.[18]

[17] Based Portland & Western Railroad/Willamette and Pacific Railroad map received from Susan Walsh-Enloe, Portland & Western Railroad, April 17, 1997.

[18] *Portland-Hillsboro Airport Master Plan Update 1995-2015*, Port of Portland, prepared by W&H Pacific, October, 1996.

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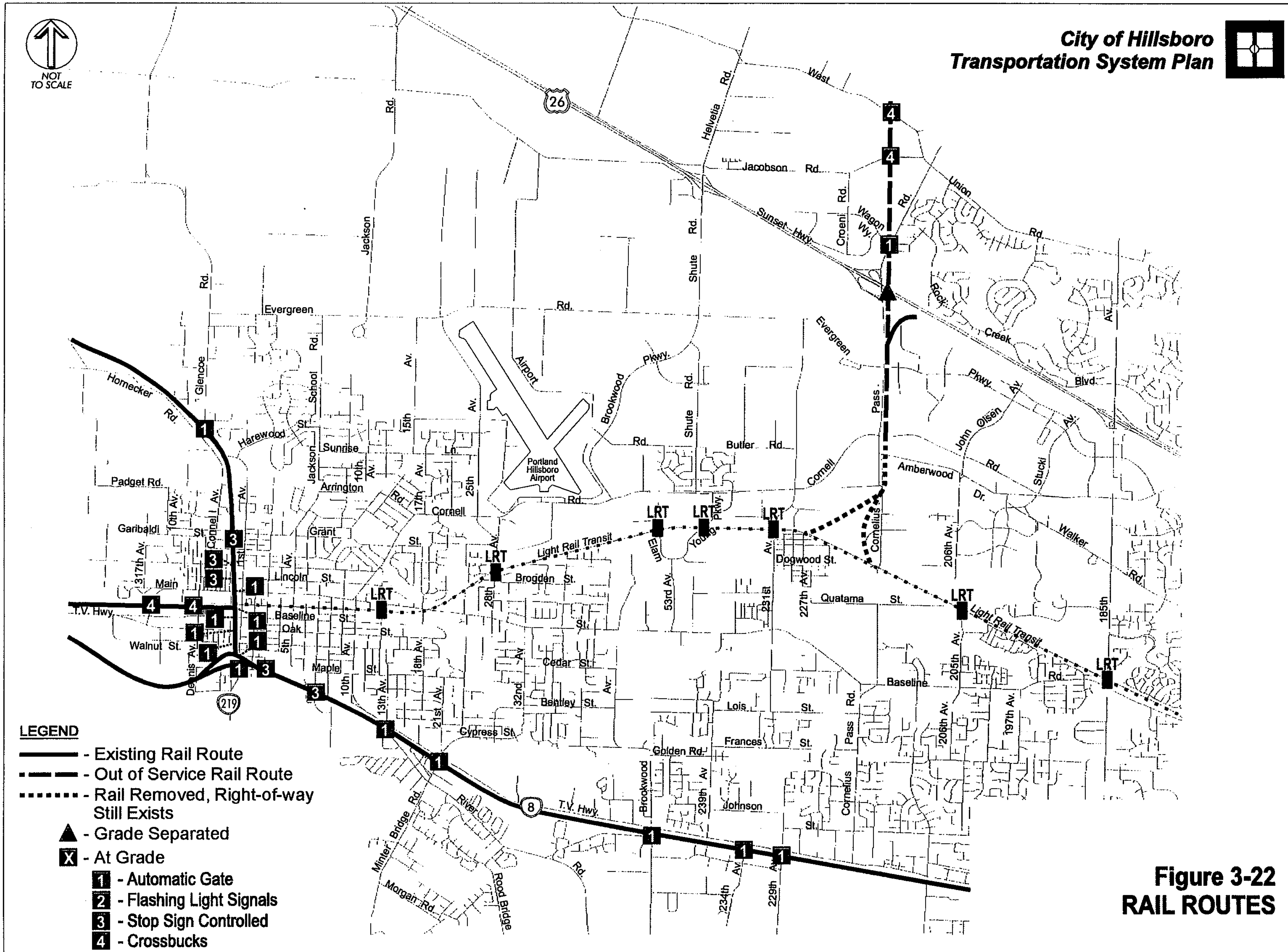

LEGEND

- Existing Rail Route
- Out of Service Rail Route
- Rail Removed, Right-of-way Still Exists
- ▲ - Grade Separated
- X - At Grade
  - 1 - Automatic Gate
  - 2 - Flashing Light Signals
  - 3 - Stop Sign Controlled
  - 4 - Crossbucks

Figure 3-22
RAIL ROUTES

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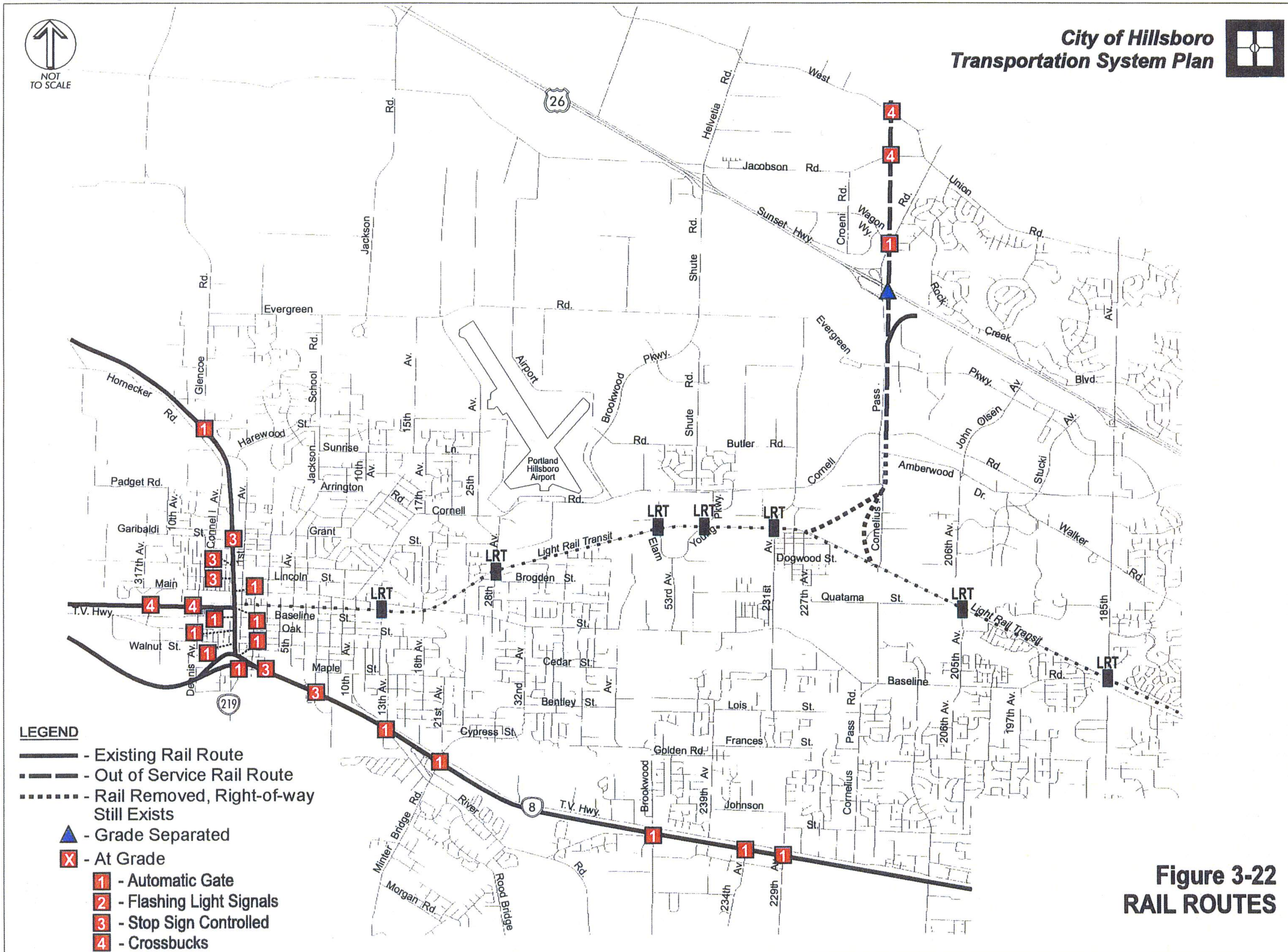

Figure 3-22
RAIL ROUTES

The Portland-Hillsboro airport has been and currently is the busiest general aviation airport in Oregon. In 1995, there were 368 based aircraft and 221,185 operations. The airport encompasses 877 acres, which consists of the airfield, developed areas, runway protection zones and non-aviation industrial and commercial land. It has two runways (12/30 and 2/20) with parallel taxiways. Runway 12/30 is equipped with high intensity edge lighting, runway end identifier lights (REILs), and an instrument landing system (ILS).

WATER

There are no navigable waterways within the vicinity of Hillsboro that support commercial use. The Tualatin River, to the south of Hillsboro is used for recreational purposes. No policies or recommendations in this area of transportation are provided.

PIPELINE

The only major pipeline facilities running through the Hillsboro area are high-pressure natural gas feeder lines owned and operated by Northwest Natural Gas Company. Figure 3-23 shows the feeder line routes for Hillsboro.[19] The feeder lines serving Hillsboro originate at Sauvie Island. From Hillsboro, these lines branch north to North Plains and west to Forest Grove.

PLANNED IMPROVEMENTS

Planned transportation improvements listed in the SIP, MSTIP, TIF, CIP, and RTP plans. Projects are listed on Hillsboro's Capital Improvement Plan (CIP) that are either to be funded by private development or have unknown construction dates. The Washington County Transportation Capital Improvement Program is a program that evaluates, ranks and schedules transportation capital project needs in Washington County for the next five years.[20] The projects are identified as either committed projects (projects under design or construction at the time of CIP preparation) and uncommitted projects (project submittals which have not been approved for funding). The committed projects identified in the program are summarized in Table 3-12. Many of these projects have been completed in the last 6 to 18 months. Additionally, Washington County manages the Major Streets Transportation Improvement Program, a property tax levy that funds a voter approved list of transportation projects. The approval of Measure 50 may delay or curtail certain projects in MSTIP3.

[19] Based on the Portland Area Distribution System Map (Dated: October 1996) received from Northwest Natural Gas Company, Engineering Facilities Information System, April 28, 1997.

[20] *Washington County Transportation Capital Improvement Program FY1995/1996-FY 1999/2000*, Washington County, February 1996.

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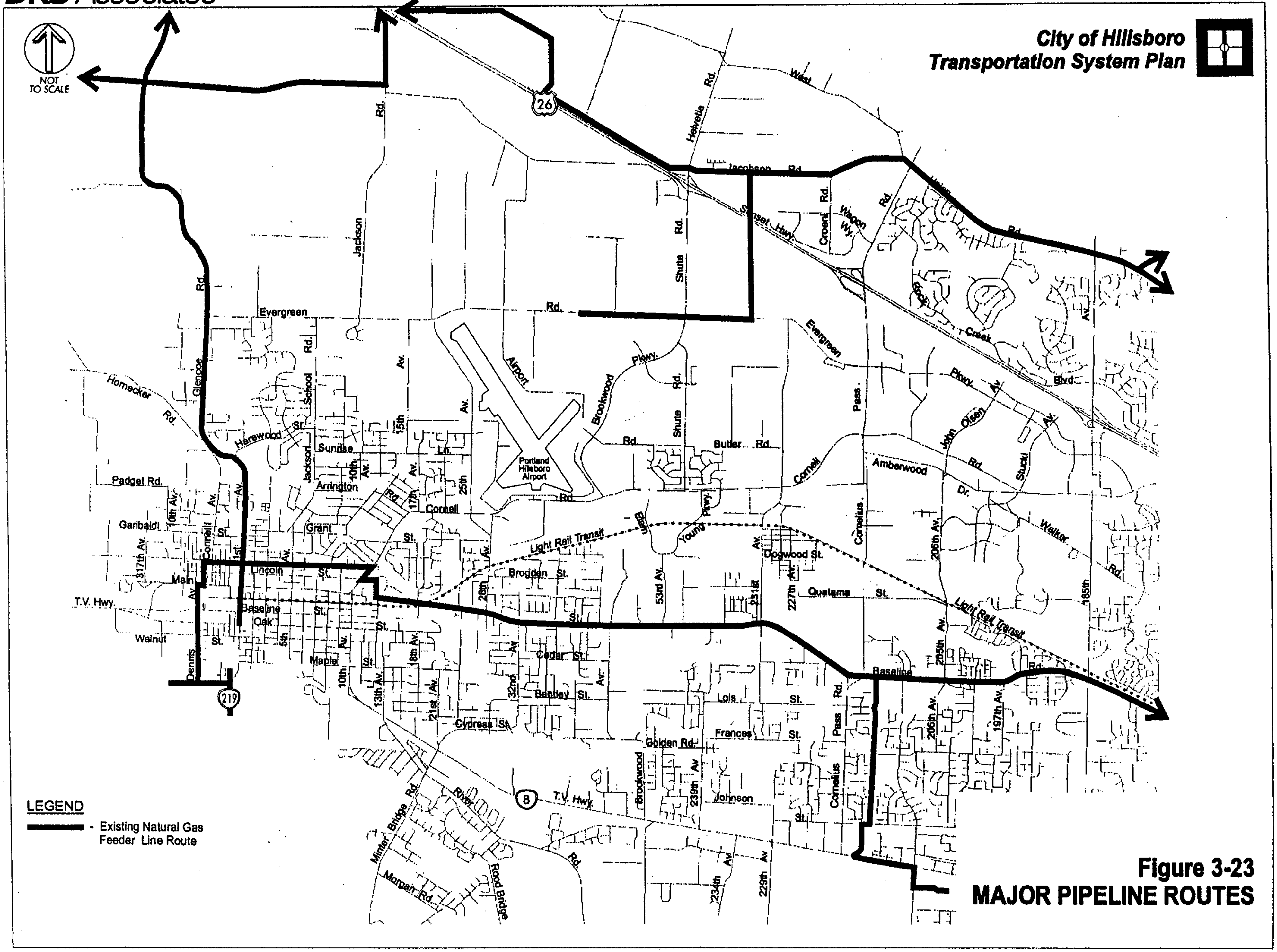

Figure 3-23
MAJOR PIPELINE ROUTES

Table 3-12
Recent Projects in Washington County CIP

Roadway/Intersection	Improvement
Cornelius Pass/Rock Cr. Bridge	Cornelius Pass bridge replacement.
Cornelius Pass	Widen Cornelius Pass to 3 lanes, add traffic signals at Francis and Johnson, interconnect signals and add sidewalks and a bikeway from TV Hwy to Baseline.
Cornelius Pass	Straighten at 2 existing RR crossings (removed) from Baseline to Cornell.
Main Street	Widen to 3 lanes with bike lanes, sidewalks and signals at 24^{th} and 28^{th} from 10^{th} to Brookwood.
Baseline Road	Reconstruct existing 2-lane arterial. Add bike lanes, a signal at Brookwood and turn lanes at major intersections from Brookwood to 231^{st}.
Baseline Road	Widen to 5 lanes from 177^{th} to 185^{th} and widen to 3 lanes from 185^{th} to 231^{st}. Replace 3 bridges, add/modify signals, interconnect signals and construct sidewalks and a bikeway.
Brookwood Avenue	Construct 3 lanes with sidewalks and a bikeway from Baseline to Cornell. Widen to 5 lanes from Cornell to Airport Rd and add signal.
Evergreen Road	Widen to 3 lanes with sidewalks and a bikeway from 25^{th} to Glencoe.

NOTE: 216th/219th Avenues have been renamed to Cornelius Pass Road.

The Statewide Transportation Improvement Program (STIP) is a program schedule for the Oregon Department of Transportation.[21] The purpose of the STIP is to schedule funding for Oregon's highest priority transportation projects for the next two years. The projects listed in the STIP that are relevant to Hillsboro follow:

- Traffic signal at Johnson and 198th
- Install soundwalls on US 26 near 185th Avenue

The Regional Transportation Plan provides a list of projects relevant to Hillsboro that could likely be funded in the fiscally constrained scenario over the next 20 years. Table 3-13 summarizes the list of projects identified in the RTP (which is currently being updated) and includes many of the MSTIP projects from Washington County.

[21] *Statewide Transportation Improvement Program 1996-1998*, Oregon Department of Transportation, January 1996.

Table 3-13
Improvements Identified in Current Plans (Approved Fiscally Constrained RTP dated July 1995)

Improvement	Description	RTP Key Agency
US 26 at 185th	Soundwalls	ODOT STIP
Johnson at 198th	Traffic Signal	ODOT STIP
Baseline Road: 177th to 187th	Widen to 5 Lanes	Wash Co MSTIP
Baseline Road: 187th to 231st	Widen to 5 Lanes	Wash Co MSTIP
Baseline Road: 231st to Brookwood	Widen to 3 Lanes	Wash Co
East Main: Brookwood to 10th	Widen to 3 Lanes	Wash Co
Brookwood Parkway: Airport to Baseline	Widen to 5 and Extend as 3 Lanes	Wash Co MSTIP
Cornell Road: Arrington to Main	Widen to 5 Lanes	Wash Co
Cornelius Pass Road: US 26 to West Union	Widen to 5 Lanes	Wash Co
Cornelius Pass Road: Cornell to Baseline	Widen to 5 Lanes	Wash Co
Cornelius Pass Road: TV Hwy to Baseline	Widen to 3 Lanes	Wash Co MSTIP
Evergreen : 25th to Glencoe	Widen to 3 Lanes	Wash Co MSTIP
Glencoe: Lincoln to Evergreen	Widen to 3 Lanes	Wash Co
185th Avenue: TV Hwy to Farmington	Widen to 3 Lanes	Wash Co
TV Highway: Cornelius Pass to 209th	Improve	ODOT STIP
TV Highway Signal Timing/System	Interconnect 209th to Brookwood	ODOT STIP

Chapter 4
Future Demand and Land Use

This chapter summarizes the methodology used to obtain future year forecasts for various modes in the City of Hillsboro.

The transportation system plan within Hillsboro addresses existing system needs and any additional facilities that will be required to serve future growth. Metro's urban area traffic forecast model was identified as the source for determining future traffic volumes in Hillsboro. This traffic forecast model translates assumed land uses into person travel, selects modes and assigns roadway volume projections. These traffic volume projections form the basis for identifying potential roadway deficiencies and for evaluating alternative circulation improvements. This section describes the forecasting process, including key assumptions and the land use scenario developed from existing and anticipated Comprehensive Plan designations and allowed densities. Future changes to these land development variables could significantly change the future travel forecast.

It should be understood that the forecasts for the TSP do not include expanded Urban Growth Boundary (UGB) areas currently being considered. This TSP is for the existing UGB and studies of UGB expansion should be built from this base forecast.

PROJECTED LAND USES

Land use is a key factor in developing a functional transportation system. The amount of land that is planned to be developed, the type of land uses and how the land uses are mixed together have a direct relationship to expected demands on the transportation system. Understanding the amount and type of land use is critical to taking actions to maintain or enhance transportation system operation.

Projected land uses were developed for all areas within the urban growth boundary reflecting the Comprehensive Plan and Metro's land use assumptions for the year 2015. Complete land use data sets were developed for the following conditions:

- Existing 1994 Conditions
- Year 2015 Conditions

The base year travel model is updated every two to three years. For this study effort, the available base model provided by Metro was for 1994. Land uses were inventoried throughout Hillsboro by Metro. This land use database includes the number of dwelling units, number of retail employees and number of other employees. Table 4-1 summarizes the land uses for existing conditions and the future scenario in the Hillsboro TSP planning area (beyond city limits). A detailed summary of the uses for each Transportation Analysis Zone (for both the existing conditions and future scenario) is provided in the appendix. These data are updated regionally providing more detailed information. As the land use data is updated in the future, TSP updates can reflect current conditions and new forecasts.

Table 4-1
Hillsboro Land Use Summary

Land Use	1994	2015	Increase	Percent Increase
Households	22,274	46,299	24,025	108 %
Retail Employees	6,205	14,955	8,750	141 %
Other Employees	30,072	85,260	55,188	184 %

Source: Metro

At the existing level of land development, the transportation system operates without significant deficiencies in the study area. As land uses are changed in proportion to each other (i.e. there is a significant increase in retail employment relative to household growth), there will be a shift in the overall operation of the transportation system. Retail land uses generate higher amounts of trips per acre of land than households do and other land uses. The location and design of retail land uses in a community can greatly affect transportation system operation. Additionally, if a community is homogeneous in land use character (i.e. all employment or all residential), the transportation system must support a lot of trips coming to or from the community rather than within the community. Ideally, there should be a mix of residential, commercial and other employment type land uses so that some residents may work and shop locally, reducing the need for residents to travel long distances.

Table 4-1 indicates that significant growth is expected in Hillsboro in the coming decades. The transportation system in Hillsboro should be monitored to make sure that land uses in the plan are balanced with transportation system capacity. This TSP balances transportation needs with the forecasted 2015 land uses.

For traffic forecasting, the land use data is stratified into geographical areas called transportation analysis zones (TAZs) which represent the sources of vehicle trip generation. There are 94 Metro TAZs in the Hillsboro TSP study area. These 94 TAZs were subdivided, as part of this plan, into 368 sub-TAZs to more specifically represent land use in the Hillsboro TSP study area. The disaggregated model zone boundaries are shown in Figure 4-1.

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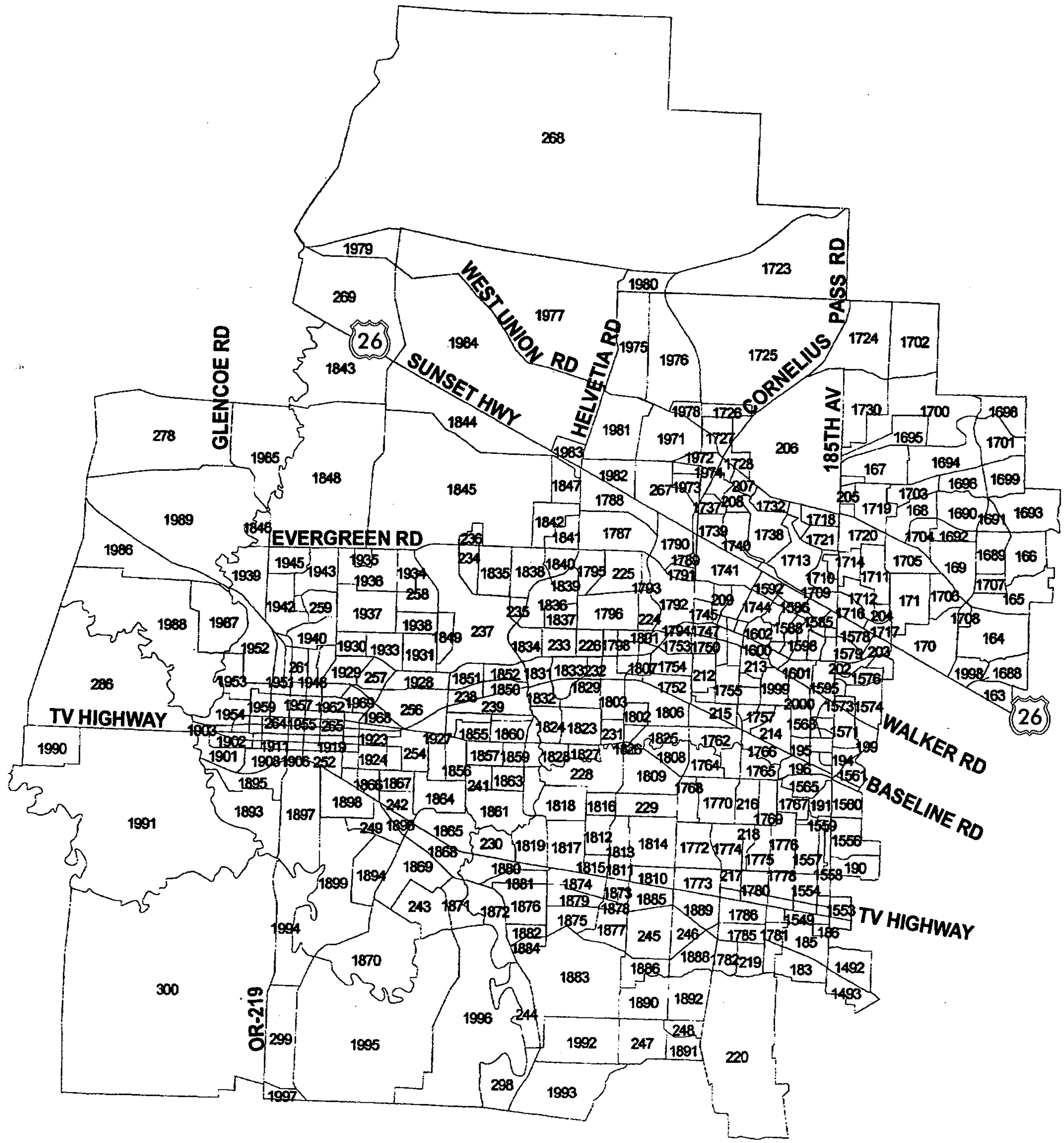
City of Hillsboro
Transportation System Plan

NOT TO SCALE



LEGEND

- Proposed Disaggregated Zone Boundary

Figure 4-1
TRANSPORTATION ANALYSIS ZONES

METRO AREA TRAFFIC MODEL

A determination of future traffic system needs in Hillsboro requires ability to accurately forecast travel demand resulting from estimates of future population and employment for the City. The objective of the transportation planning process is to provide the information necessary for making decisions on when and where improvements should be made to the transportation system to meet travel demands as developed in an urban area travel demand model as part of the Regional Transportation Plan Update process. Metro uses EMME/2, a computer based program for transportation planning, to process the large amounts of data for the Portland Metropolitan area. Traffic forecasting can be divided into several distinct but integrated components that represent the logical sequence of travel behavior (Figure 4-2). These components and their general order in the traffic forecasting process are as follows:

- Trip Generation
- Trip Distribution
- Mode Choice
- Traffic Assignment

The initial roadway network used in the traffic model was the existing streets and roadways. Future land use scenarios were tested and roadway improvements were added to mitigate traffic conditions, using programmed improvements as a starting basis. Forecasts of PM peak hour traffic flows were produced for every major roadway segment within Hillsboro. Traffic volumes are projected on all arterials and most collector streets. Some local streets are included in the model, but many are represented by connections to land use in the model process (called centroid connectors).

Trip Generation. The trip generation process translates land use quantities (in numbers of dwelling units and retail and other employment) into vehicle trip ends (number of vehicles entering or leaving a TAZ or sub-TAZ) using trip generation rates established during the model verification process. The Metro trip generation process is elaborate, entailing detailed trip characteristics for various types of housing, retail employment, non-retail employment and special activities. Typically, most traffic impact studies rely on the Institute of Transportation Engineers (ITE) research for analysis.[1] The model process is tailored to variations in travel characteristics and activities in the region. For reference, Table 4-2 provides a summary of the evening peak hour trip rates used in the Metro model. These are averaged over a broad area and thus, are different than driveway counts represented by ITE. This data provides a reference for the trip generation process used in the model.

[1] *Trip Generation Manual, 5th Edition,* Institute of Transportation Engineers, 1991.

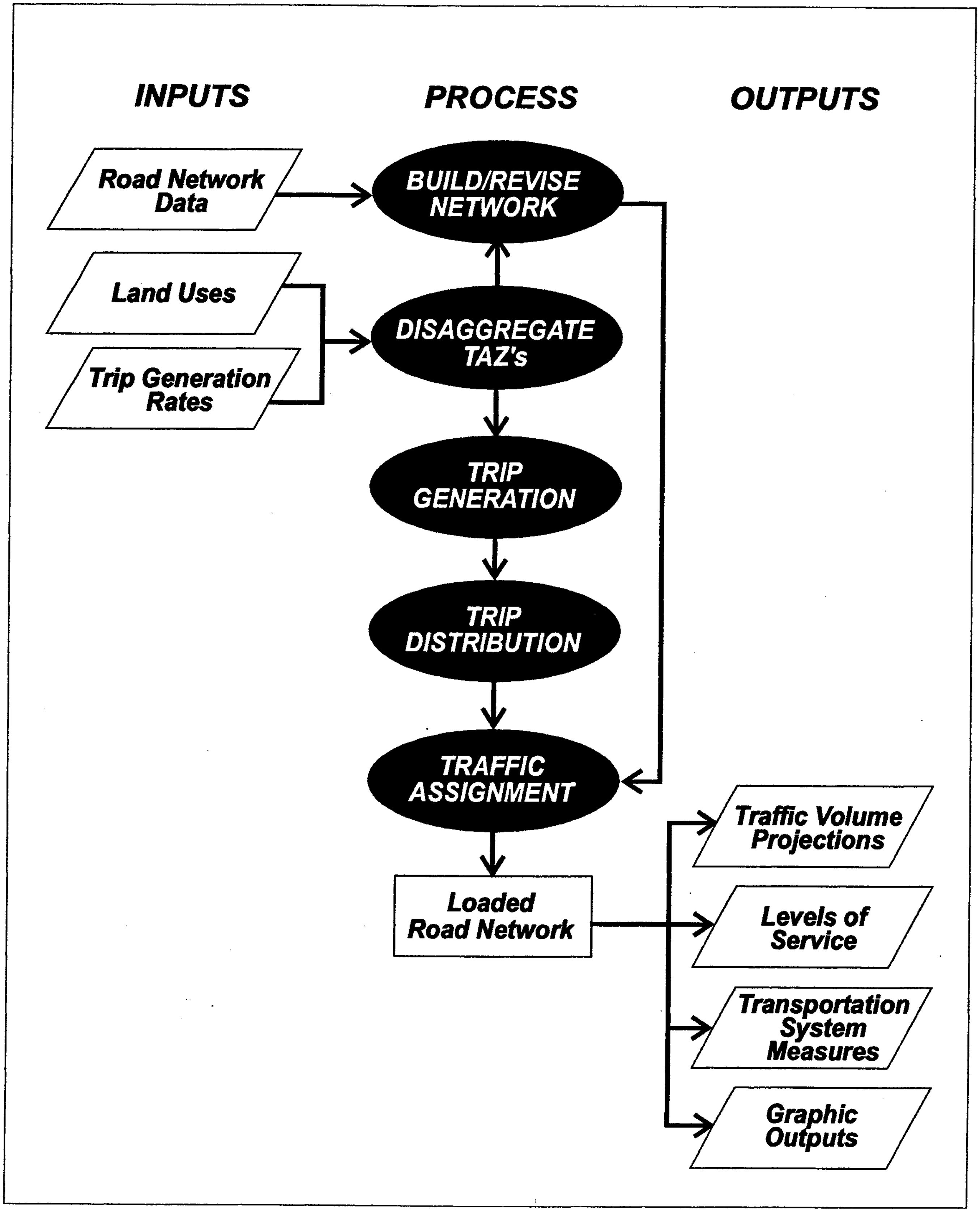


Figure 4-2
TRAFFIC FORECASTING MODEL PROCESS

Table 4-2
Approximate Average PM Peak Hour Trip Rates Used in Metro Model

Unit	**Average Trip Rate/Unit**		
	In	**Out**	**Total**
Household	0.43	0.19	0.62
Retail Employee	0.78	0.69	1.47
Other Employee	0.07	0.29	0.36

Source: Metro

Table 4-3 illustrates the estimated growth in vehicle trips generated within the Hillsboro area (the area shown in Figure 4-1) between 1994 and 2015. It indicates that vehicle trip generation in Hillsboro would grow by approximately 113 percent between 1994 and 2015 if the land develops according to Metro's 2015 land use assumptions and projected Tanasbourne area land use projections. Assuming a 20-year time horizon to the 2015 scenario, this represents a growth rate of about four percent per year.

Table 4-3
Existing and Future Projected Trip Generation
PM Peak Hour Vehicle Trips

	1994 Trips	2015 Trips
Hillsboro area	52,211	111,309

Source: Metro

Trip Distribution. This step estimates how many trips travel from one zone in the model to any other zone. The distribution is based on the number of trip ends generated in each zone pair, and on factors that relate the likelihood of travel between any two zones to the travel time between the zones. In projecting long-range future traffic volumes, it is important to consider potential changes in regional travel patterns. Although the locations and amounts of traffic generation in Hillsboro are essentially a function of future land use in the city, the distribution of trips is influenced by growth in neighboring areas such as Portland and unincorporated areas to the north, south and west of Hillsboro. External trips (trips which have either an origin or destination in Hillsboro but do not start or stop in Hillsboro) and through trips (trips which pass through Hillsboro and have neither an origin nor a destination there) were projected using trip distribution patterns based upon census data and traffic counts performed at gateways into the Metro area UGB for calibration.

Mode Choice. This is the step where it is determined how many trips will be by various modes (single-occupant vehicle, transit, carpool, pedestrian, etc.). The 1994 mode splits are incorporated into the base model and adjustments to that mode split may be made for the future scenario, depending on any expected changes in transit or carpool use. These considerations are built into the forecasts used for 2015. It is important to note that LRT use and the effects of improved transit are given as assumptions in the travel forecast of vehicle trips.

Traffic Assignment. In this process, trips from one zone to another are assigned to specific travel routes in the network, and the resulting trip volumes are accumulated on links of the network until all trips are assigned.

Network travel times are updated to reflect the congestion effects of the traffic assigned in each model iteration. Congested travel times are estimated using what are called "volume-delay functions". There are different forms of volume/delay functions, all of which attempt to simulate the capacity restraint effect of how travel times increase with increasing traffic volumes. The volume-delay functions take into account the specific characteristics of each roadway link, such as capacity, speed and facility type. This allows the model to reflect conditions somewhat similar to driver behavior.

Different models are actually used for auto assignment versus transit assignment. Various techniques exist for auto assignment, such as all-or-nothing, stochastic, incremental capacity restraint and equilibrium capacity restraint. The EMME/2 package, among others, uses the equilibrium capacity restraint technique, which is considered to produce the most realistic network traffic loading of all the techniques. With this technique, the auto trips are assigned iteratively to the network in such a way that the final traffic loading will closely approximate the true network "equilibrium." Network equilibrium is defined as the condition where no traveler can achieve additional travel timesavings by switching routes. Between iterations, network travel times are updated to reflect the congestion effects of the traffic assigned in the previous iteration. Congested travel times are estimated using what are called "volume-delay functions" in Metro's EMME/2 model. There are different forms of volume/delay functions, all of which attempt to simulate the capacity restraint effect of how travel times increase with increasing traffic volumes. The volume-delay functions take into account the specific characteristics of each roadway link, such as capacity, speed, and facility type.

Transit assignment techniques are typically much simpler than auto assignment techniques, in that capacity restraint effects are not considered. Transit trips are assigned in an "all-or-nothing" manner in which all of the transit trips between a particular pair of zones are assigned to the same, minimum time route based on transit service characteristics such as headway and the number of stops.

Model Verification. The base 1994 modeled traffic volumes were compared against actual traffic counts across screenlines, on key arterials and at key intersections. Most arterial traffic volumes meet screenline tolerances for forecast adequacy. Based on this performance, the model was used for future forecasting and assessment of circulation changes.

MODEL APPLICATION TO HILLSBORO

Intersection turn movements were extracted from the model at key intersections for both year 1994 and year 2015 scenarios. These intersection turn movements were not used directly, but the increment of the year 2015 turn movements over the year 1994 turn movements was applied (added) to existing (actual 1996) turn movement counts in Hillsboro. Actual turn movement volumes used for future year intersection analysis and traffic forecasting results can be found in Chapter 8: Motor Vehicles.

Chapter 5
Pedestrians

This chapter summarizes existing and future pedestrian needs in the City of Hillsboro, outlines the criteria to be used in evaluating these needs, provides a number of strategies for implementing a pedestrian plan and recommends a plan for the City. The needs, criteria and strategies were identified in working with the City's Task Force and Transportation System Plan Technical Advisory Committee. These committees provided input regarding the transportation system in Hillsboro, specifically exploring pedestrian needs. The methodology used to develop the pedestrian plan combined citizen and staff input, specific Transportation Planning Rule requirements[1] and continuity to the regional pedestrian network.[2]

NEEDS

Sidewalks are provided on many of the arterial and collector roadways (see Figure 3-17) in the City of Hillsboro, forming a basic existing pedestrian network. However, there are several gaps in the existing network where the sidewalks are discontinuous along a segment of roadway and the density of pedestrian facilities is not conducive to pedestrian travel. While there are sidewalks along major streets, there are few direct, conflict-free access routes to activity centers. Continuity and connectivity are key issues for pedestrians in Hillsboro since, generally, if there is a sidewalk available, there will be sufficient capacity. In other words, for most of the City it is much more important that a continuous sidewalk be available than that it be of a certain size or type. In town centers and regional centers, the width also becomes important. The City requires sidewalks on all public streets.[3]

The most frequently identified existing pedestrian need in Hillsboro is continuous sidewalks that connect to logical pedestrian destinations (schools, parks, neighborhood commercial, transit and activity centers). Another commonly identified need is the provision of facilities appropriate for the elderly or disabled. The most important existing pedestrian needs in Hillsboro are direct linkages among various components

[1] *Transportation Planning Rule,* State of Oregon, DLCD, Sections 660-12-020(2)(d) and 660-12-045-3.

[2] Interim RTP Pedestrian Plan.

[3] *Station Community Planning Areas (SCPA),* City of Hillsboro, Hillsboro Planning Commission Recommendation, June 12, 1996, pages D-95 to D-97.

of the existing pedestrian network, connectivity to the LRT stations and a pedestrian network between key activity centers in Hillsboro. This includes safe, convenient crossings of large arterial streets, which act as barriers to pedestrian movement. In the future, pedestrian needs will be similar, but there will be additional activity centers that will need to be considered and interconnected.

Walkway needs in Hillsboro must consider the three most prevalent trip types:

- **Residential based trips** - home to school, home to home, home to retail, home to park, home to transit, home to entertainment, home to library
- **Service based trips** - multi-stop retail trips, work to restaurant, work to services, work/shop to transit
- **Recreational based trips** - home to park, exercise trips, casual walking trips

Residential trips need a set of interconnected sidewalks radiating out from homes to destinations within one-half to one mile. Beyond these distances, walking trips of this type become significantly less common (over 20 minutes). Service based trips require direct, conflict free connectivity between uses (for example, a shopping mall with its central spine walkway that connects multiple destinations). Service based trips need a clear definition of connectivity. This requires mixed-use developments to locate front doors, which relate directly to the public right-of-way and provide walking links between uses with one-half mile. Recreational walking trips have different needs. Off-street trails, well-landscaped sidewalks and relationships to unique environmental features (creeks, trees, and farmland) are important.

Because all of these needs are different, there is no one pedestrian solution. The most common need is to provide a safe and interconnected system that affords the opportunity to consider the walking mode of travel, especially for trips less than one mile in length.

FACILITIES

Sidewalks should be built to current design standards of the City of Hillsboro and in compliance with the Americans with Disabilities Act (at least five feet of unobstructed sidewalk).[4] Wider sidewalks may be constructed in commercial districts or on arterial streets. Additional pedestrian facilities may include accessways on streets leading to LRT stations, pedestrian districts and pedestrian plazas. The *Transportation Planning Rule*[5] defines three key pedestrian facility types:

Accessway: A walkway that provides pedestrian and/or bicycle passage either between streets or from a street to a building or other destination such as a school, park or transit stop.

[4] *Americans with Disabilities Act*, Uniform Building Code.

[5] *Transportation Planning Rule*, State of Oregon, Department of Land Conservation and Development, OAR-660-12-005(2, 14 and 15).

Pedestrian District: A plan designation or zoning classification that establishes a safe and convenient pedestrian environment in an area planned for a mix of uses likely to support a relatively high level of pedestrian activity.

Pedestrian Plaza: A small, semi-enclosed area usually adjoining a sidewalk or a transit stop, which provides a place for pedestrians to sit, stand or rest.

These designations will be provided as the TSP is implemented. Any pedestrian districts, for example the downtown area, may be identified in further studies, which address pedestrian issues.

Sidewalks should be sized to meet the specific needs of the adjacent land uses and needs. Guidance to assess capacity needs for pedestrians can be found in the *Highway Capacity Manual* and *Pushkarev and Zupan*[6]. Typically the base sidewalk sizing for local and neighborhood routes should be 5 feet.

As functional classification of roadways change, so should the design of pedestrian facilities. Collectors may need to consider minimum sidewalks widths of 6 to 8 feet and arterials with sidewalk widths of 6 to 10 feet. Wider sidewalks may be necessary depending upon urban design needs and pedestrian flows (for example, adjacent to storefront retail or near transit stations). Where curb-tight sidewalks are the only option, additional sidewalk width should be provided to accommodate the other street side features (light poles, mail boxes, etc.).

CRITERIA

Hillsboro's Transportation Task Force and Transportation Technical Advisory Committee created and refined a set of goals and policies to guide transportation system development in Hillsboro (see Chapter 2). Several of these policies pertain specifically to pedestrian needs:

Goal 1: Safety

Policy 1 Build, maintain and/or support a well-defined and safe transportation system within the City for pedestrian, bicycle, transit, motor vehicles, air and rail travel.

Goal 2: Multi-Modal Travel

Policy 1 Design transportation facilities within Hillsboro that accommodate multiple modes of travel within transportation corridors, where appropriate and encourage their use to move people, goods and services within these corridors. Encourage and coordinate efforts to provide convenient linkages between various modes of travel.

Policy 2 Construct bikeways and pedestrians facilities on major, new or reconstructed arterial and collectors within Hillsboro (with roadway construction or reconstruction projects). Coordinate (or require where appropriate) convenient access to existing or planned bike and pedestrian facilities from nearby schools, parks, transit, public facilities and retail areas.

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[6]Highway Capacity Manual, Special Report 209, Transportation Research Board, 1994; Chapter 13; and Puskarev, Zupan, Urban Spaces for Pedestrians, 1975.

Policy 3 Connect gaps in the sidewalk system according to the Hillsboro Pedestrian System Plan.

Policy 4 Link the regional trails network to Hillsboro's bicycle and pedestrian systems.

Goal 3: Trip Reduction

Policy 2 Ensure that nearby commercial, community service and high employment industrial land uses are developed in a manner that provides convenient access to pedestrians, bicyclists and transit riders. Support compact, mixed-use development including infill and redevelopment in appropriate areas of the City.

Goal 7: Accessibility

Policy 1 Construct transportation facilities, which conform to the requirements of the Americans with Disabilities Act.

Policy 3 Design the local street network to facilitate street connectivity and limit out-of-direction travel. Provide connectivity to and from activity centers and destinations, giving priority to pedestrian and bicycle connections.

These goals and policies should be used in assessing land use and transportation actions to determine if they conform to the intended vision of the City. Goal 2, Policy 3 sets a specific requirement that the city will encourage development of a "pedestrian grid" in Hillsboro, outlining pedestrian routes. The city will also encourage citywide pedestrian accessibility that is safe, secure and attractive through citywide pedestrian routes, spaced approximately every one-half mile as elements of the pedestrian network. In local areas, pedestrian access should be allowed for connections spaced approximately 330 feet apart. Overlaying a one-half mile grid over a base map of Hillsboro identified a series of pedestrian corridors based on this spacing. In addition, Goal 2, Policy 2 sets a specific requirement that pedestrian facilities be constructed on all arterials and collectors within Hillsboro (with roadway construction and reconstruction projects).

STRATEGIES

The Task Force evaluated several strategies for future pedestrian projects in Hillsboro. These strategies are aimed at providing the City with priorities to direct its funds toward pedestrian projects that meet the goals and policies of the City:

Strategy 1 - " Connect key pedestrian corridors to schools, parks, recreational uses and activity centers (public facilities, commercial/retail areas, etc.)"

This strategy provides sidewalks leading to activity centers in Hillsboro such as schools, commercial/retail areas and parks from the pedestrian network. This strategy also provides added safety on routes to popular pedestrian destinations by separating pedestrian flow from auto travel lanes. These routes are also common places that children may walk or play, providing them a safer environment. A key element of this strategy could include consideration of requiring all new development to define direct safe pedestrian paths to parks, activity centers and schools within one mile of the development site.

Direct will be defined as no more than 1.5 times the straight line connection to these points from the development, as feasible (with desirable design less than 1.25 times the straight line distance). Any gaps (off-site) will be defined (location and length).

Strategy 2 - " Fill in gaps in the network where some sidewalks exist"

This strategy provides sidewalks, which fill in the gaps between existing sidewalks where a significant portion of a pedestrian corridor already exists. This strategy maximizes the use of existing pedestrian facilities to create complete sections of an overall pedestrian network.

Strategy 3 - " Pedestrian corridors to transit stations and stops"

This strategy puts priority on pedestrian connections at locations where transit can be accessed in accordance with City Transportation Planning Rule requirements. Sidewalks, which link the overall pedestrian network with transit stations or bus stops, would be a priority.

Strategy 4 - " Pedestrian corridors that connect neighborhoods"

This strategy puts priority on linking neighborhoods together with pedestrian facilities. This can include walkways at the end of cul-de-sacs, off-street paths, pedestrian crossings of small creeks or drainage-ways (in an environmentally sensitive manner) and direct connections between neighborhoods (avoiding "walled" communities). Sidewalk connections from end of cul-de-sacs must be designed with adequate lighting and width.

Strategy 5 - "Enhanced Pedestrian Crossings"

This strategy focuses on providing pedestrian facilities, which enhance the pedestrian's ability to cross major arterial streets that do not have controlled crossing locations. These improvements are likely to be made on streets that have high traffic volumes, multiple lanes and signals that are spaced relatively far apart. Crossing enhancements could include new traffic signals, pedestrian signals, improved pedestrian crossing warning, and shortened crossing distances, medians and larger corner sidewalk areas. New intelligent transportation systems (ITS) include technologies that can detect pedestrian presence and change traffic signals to the walk phase more efficiently and safely than push buttons.

Strategy 6 - "Pedestrian Corridors that Commuters Might Use"

This strategy focuses on providing pedestrian facilities where commuters are likely to travel, such as local employment centers or leading to transit routes, which provides access to regional employment centers.

Strategy 7 - "Reconstruct All Sidewalks to City of Hillsboro Standards"

This strategy focuses on upgrading any substandard sidewalks to current city standards. Current standards are for five-foot sidewalks. This exceeds ADA mandates. Recent station area planning standards call for planter strips and six-foot walks when adjacent to the street curb. Some sidewalks exist that do not meet the minimum five-foot requirement. Sidewalk construction is the responsibility of adjacent property owners. Many homes were purchased with the cost of new sidewalks included in the sale price, enhancing their value.

Table 5-1 provides an assessment of how each of the strategies meets the requirements of each of the goals and policies. Clearly the top three strategies are effective at meeting the goals and policies of Hillsboro.

Table 5-1
Pedestrian Facility Strategies Comparisons

Strategy	Goal-Policy							
	1-1	2-1	2-2	2-3	2-5	3-2	7-1	7-3
1. Connect key pedestrian corridors to schools, parks, recreational uses and activity centers (public facilities, commercial areas, etc.)	■	◆	■	◆	■	■	□	■
2. Fill in gaps in network where some sidewalks exist	◆	□	◆	■	□	□	□	□
3. Pedestrian corridors to transit stations and stops	◆	◆	◆	◆	□	◆	□	■
4. Pedestrian corridors that connect neighborhoods	◆	□	□	□	□	□	□	■
5. Signalized Pedestrian Crossings	◆	◆	□	□	□	□	□	◆
6. Pedestrian corridors that commuters might use	□	◆	□	□	□	■	□	■
7. Reconstruct all sidewalks to City of Hillsboro standards	◆	□	□	□	□	□	■	□

○ Does not meet criteria ■ Fully meets criteria
□ Partially meets criteria ◆ Mostly meets criteria

RECOMMENDED PEDESTRIAN FACILITY PLAN

City of Hillsboro TSP Advisory Task Force evaluated several strategies for future pedestrian and bicycle projects in Hillsboro. These strategies are aimed at providing the City with priorities to direct its funds toward pedestrian and bicycle projects that meet the goals and policies of the City. The highest to lowest ranking strategies are noted below:

- Connect key pedestrian corridors to schools, parks, recreational uses and activity centers (public facilities, commercial areas, etc.)
- Fill in gaps in the network where some sidewalks exist
- Pedestrian corridors to transit stations and stops
- Pedestrian corridors that connect neighborhoods
- Signalized pedestrian crossings
- Pedestrian corridors that commuters might use
- Reconstruct all existing substandard sidewalks to City of Hillsboro Standards

Based on a review of potential strategies and corresponding needs, there is consistency in City staff and citizen determined overall pedestrian improvement priorities. The City's priorities should be to connect key pedestrian corridors to schools, parks, recreational uses and activity centers; to eliminate gaps in the walkway network; and to provide pedestrian corridors to transit stations and stops. The City should also reconstruct existing intersections that are in need of handicap ramps to improve accessibility for all pedestrians.

Connecting key pedestrian corridors to schools, parks, recreational uses and activity centers (public facilities, commercial areas, etc.) was considered to be the highest priority for pedestrians in Hillsboro. The second highest priority for pedestrians in Hillsboro was filling in the gaps in the existing network where some sidewalks exist. An action list was developed to focus on these two areas.

A list of likely actions to achieve fulfillment of these priorities was developed into a Pedestrian Master Plan. The Pedestrian Master Plan (Figure 5-1) is an overall plan and summarizes the "wish list" of pedestrian-related projects in Hillsboro. From this Master Plan, a more specific, shorter term Action Plan (Figure 5-2) was developed. The Action Plan consists of projects that the City should provide priority in funding. As development occurs, streets are rebuilt and other opportunities (such as grant programs) arise, projects on the Master Plan should also be pursued.

DKS Associates

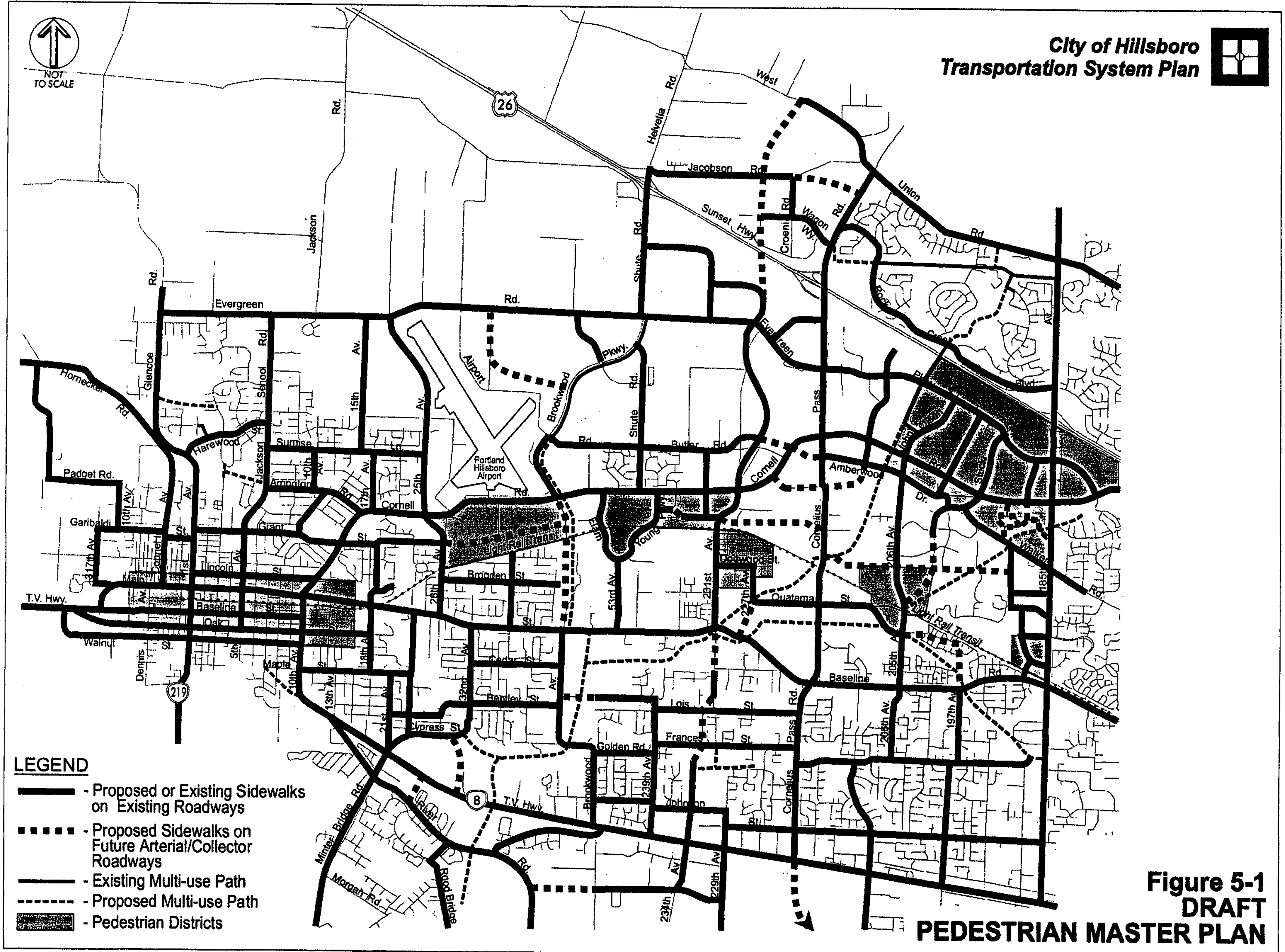


Figure 5-1
DRAFT
PEDESTRIAN MASTER PLAN

City of Hillsboro
Transportation System Plan

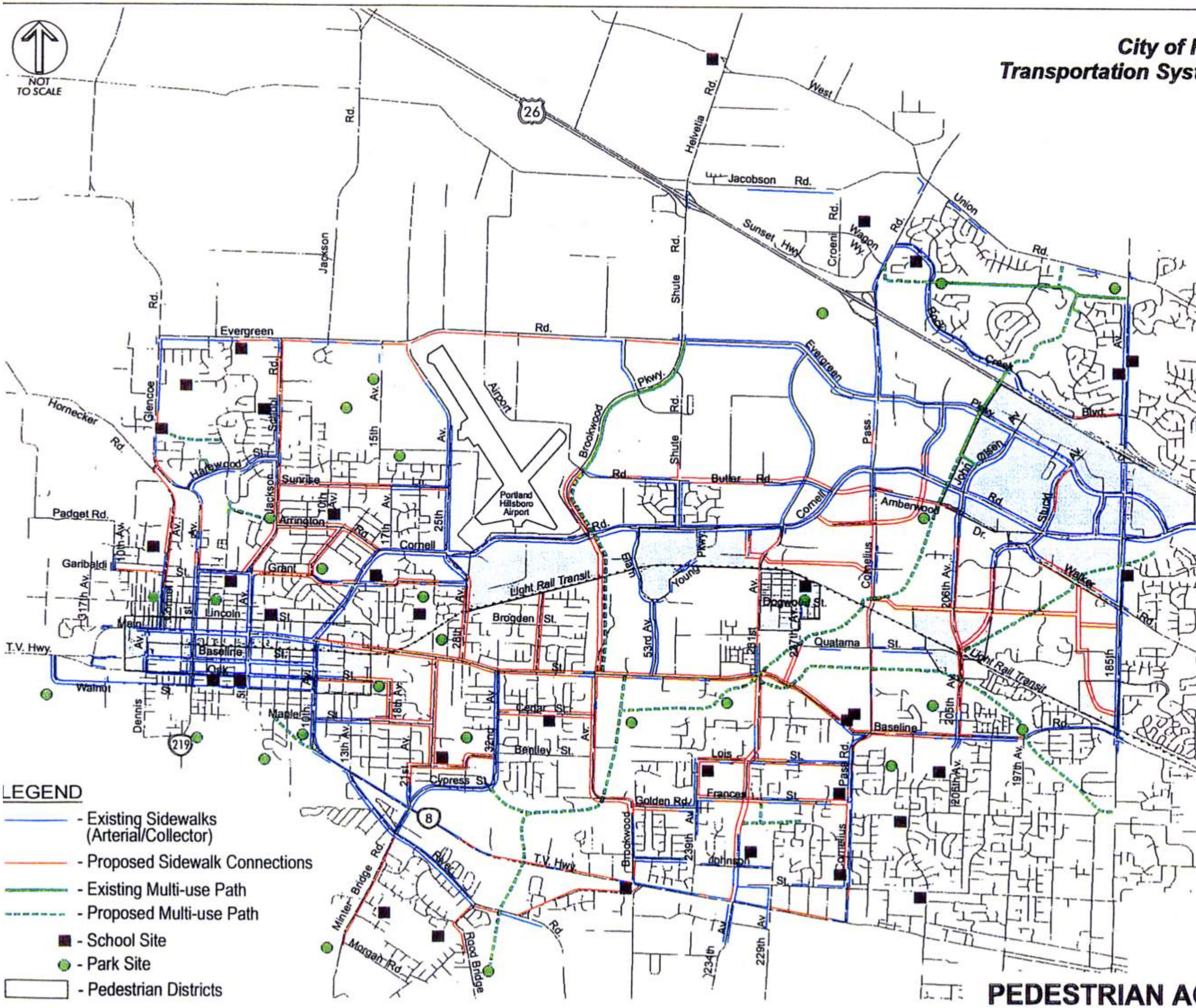


Figure 5-2
PEDESTRIAN ACTION PLAN

ACTION PLAN

The pedestrian action plan outlines a series of pedestrian improvements in Hillsboro that are considered the highest priority projects in the short term. These projects meet the city's goals, policies, criteria and strategies for developing an effective walking mode of transportation in Hillsboro.

Figure 5-2 and Table 5-2 outline potential pedestrian projects in Hillsboro. The City would implement these projects through its Capital Improvement Program (CIP), joint funding with other agencies (Washington County, Metro, ODOT, and Tri-Met) and its land use approval process. The following considerations should be made for each sidewalk installation:

- Meet City standards
- Sidewalks should be a minimum of five feet wide
- Landscape strips between the curb and sidewalk is required.

There are four elements to the action plan. First, a list of capital projects is identified.

The second element is complementary land development actions. Fronting improvements to new land uses will constitute a majority of new sidewalk construction in Hillsboro. A third element is focused on the concept of filling gaps in the network, using incentive programs for sidewalk development. The fourth element focuses on recreational trail development through parks and greenspace.

The pedestrian projects listed under "*Construct sidewalks with roadway improvement projects*" are priority projects that would be constructed with abutting land use development or roadway improvement projects on arterials or collectors and would not necessarily be constructed as pedestrian projects alone. Multi-use paths identified on the pedestrian plans should be aligned to cross roadways at intersections for safe crossing rather than crossing roadways at mid block without traffic control. In some cases, multi-use paths may travel under bridges of intersecting roadways when sufficient clearance exists. Where preferred multi-use paths or trails cannot be implemented as depicted on the Pedestrian Master and Action Plan maps, alternate routes can be considered.

Table 5-2
Pedestrian Action Plan Project Priorities

Project	From	To	Metro RTP No.*
riority (1): Connect key pedestrian corridors to schools, parks, recreational uses and activity centers			
Maple Street	16th Avenue	24th Avenue	722
Oak Street	10th Avenue	18th Avenue	722
Walnut Street	10th Avenue	18th Avenue	722
18th Avenue	Oak Street	Maple Street	722
21st Avenue	Cypress Street	Maple Street	722
Glencoe Road	North of Glencoe H.S.	Grant Street	712
Jackson School Road	Evergreen Road	Grant Street	711b
Connell Road	Garibaldi Street	Glencoe Road	
Arrington Road	Cornell Road	Jackson School Road	
Delsey Road	Arrington Road	Grant Street	
24th Avenue	Spruce Street	Maple Street	
Cedar Street	32nd Avenue	Brookwood Avenue	
Frances Street	239th Avenue	Cornelius Pass Road	
Minter Bridge Road	River Road	Morgan Road	
Rood Bridge Road	River Road	Rood Bridge Park	
Witch Hazel Road	TV Highway	River Road	
37th Avenue	Main Street	LRT Station	
Arrington Road	Jackson School Road	Cornell Road	
Sunrise Lane	Jackson School Road	25th Avenue	
Grant Street	Jackson School Road	28th Avenue	
Lois Street	239th Avenue	Cornelius Pass Road	
Priority (2): Fill in gaps where some sidewalks exist			
TV Highway	10th Avenue	Cornelius Pass Road	723
28th Avenue	Grant Street	E. Main Street	726c
Cornelius Pass Road	TV Highway	Evergreen Road	737/738
Walker Road	Amberglen Parkway	185th Avenue	
Stucki Avenue	Cornell Road	Evergreen Parkway	
Garabaldi Street	317th Avenue	1st Avenue	
Golden Road	Brookwood Avenue	239th Avenue	
Priority: Construct sidewalks with roadway improvement projects			
Baseline Road	Lisa Drive	Brookwood Avenue	714/715/928
231st Avenue	Cornell Road	Johnson Street	729a
Brookwood Parkway	Airport Road	TV Highway	739/740
Evergreen Road	Shute Road	Glencoe Road	732/732b
Aloclek Drive	Amberwood Drive	Cornelius Pass Road	726d
East/west connector/Parr	185th Avenue	63rd Parkway	728
Amberglen Parkway/205th Ave.	Von Neuman Drive	Baseline Road	729b
Quatama Street	227th Avenue	Baseline Road	707
Salix Extension	185th Avenue	Cornell Road	
206th Avenue	Amberwood Drive	Amberglen Parkway	

*Included in Draft RTP list, November 1998. Reference number used in Round 2 lists.

Complementing Land Development Actions

As new development occurs, it should provide pedestrian facilities, which complement the Hillsboro pedestrian master plan. As a guideline, the sidewalk distance from the building entrance to the public right-of-way should not exceed 1.25 times the straight-line distance. If a development fronts a proposed sidewalk (as shown in the Pedestrian Master Plan), the developer should be responsible for providing the walkway facility as part of any half-street improvement required for mitigation. It is also very important that residential developments consider the routes that children will walk to school and provide safe and accessible sidewalks to accommodate these routes, particularly within one mile of a school site. Additionally, all commercial projects generating over 1,000 trip ends per day should provide a pedestrian connection plan showing how pedestrian access to the site links to adjacent uses, the public right-of-way and the site front door. Conflict free paths and traffic calming elements should be identified, as appropriate.

Address Gaps in Pedestrian System

Many of the areas developed in Hillsboro 5 to 25 years ago did not provide sidewalks. These areas create gaps in the pedestrian walking system that become more important as land development continues. Current land developments build sidewalks on project frontages, but have little means or incentive to extend sidewalks beyond their property. Property owners without sidewalks are unlikely to independently build sidewalks that do not connect to anything. In fact, some property owners are resistant to sidewalk improvements due to cost (they do not want to pay) or changes to their frontage (they may have landscaping in public right-of-way). As an incentive to fill some of these gaps concurrent with development activities, the City could consider an annual walkway fund that would supplement capital improvement-type projects. A fund of about $40,000 to $50,000 per year could build over a quarter mile of sidewalk. If matching funds were provided, over double this amount may be possible. The fund could be used several ways:

- Matching other governmental transportation funds to build connecting sidewalks identified in the master plan.

- Matching funds with land use development projects to extend a developer's sidewalks off-site to connect to non-contiguous sidewalks.

- Supplemental funds to roadway projects, which build new arterial/collector sidewalks creating better linkages into neighborhoods.

Parks and Trails Development

The City Parks and Recreation Department and Metro Greenspaces programs are responsible for the majority of off-street trail opportunities. These two agencies must coordinate their pedestrian plans to provide an integrated off-street walking system in Hillsboro. Recent Metro Greenspaces initiatives and City park projects provide an opportunity to implement the off-street trails in Hillsboro as an integrated element of the pedestrian action plan.

Safety

Pedestrian safety is a major issue. Pedestrian conflicts with motor vehicles are a major impact to pedestrian safety. These conflicts can be reduced by providing direct links to buildings from public rights-of-way, considering neighborhood traffic management (see Chapter 8), providing safe roadway crossing points and analyzing/reducing the level of pedestrian/vehicle conflicts in every land use application.

School safety was an issue raised at several of the public meetings held throughout the development of the TSP. In setting priorities for the pedestrian action plan, school access was given a high priority to improve safety. However, beyond simply building more sidewalks, school safety involves education and planning. Many cities have followed guidelines provided by Federal Highway Administration and Institute of Transportation Engineers[7]. Implementing plans of this nature has demonstrated accident reduction benefits. However, this type of work requires staffing and coordination by the School District as well as the City to be effective. As a response to this program, establishing an annual budget (say $10,000 per year) would allow for incremental benefits to be achieved and would determine effectiveness in Hillsboro, without a major capital program.

[7] Manual of Uniform Traffic Control Devices, Federal Highway Administration, 1988: Traffic Control Devices Handbook, FHWA, 1983; A Program for School Crossing Protection, Institute of Transportation Engineers.

Chapter 6
Bicycles

This chapter summarizes existing and future facility needs for bicycles in the City of Hillsboro. The following sections outline the criteria to be used to evaluate needs, provide a number of strategies for implementing a bikeway plan and recommend a bikeway plan for the City of Hillsboro. The needs, criteria and strategies were identified in working with the City's Transportation Planning Task Force and the Transportation Technical Advisory Committee. These committees provided input regarding the transportation system in Hillsboro, specifically exploring bicycle needs. The methodology used to develop the bicycle plan combined citizen and staff input, specific Transportation Planning Rule (TPR) requirements,[1] and continuity to the regional[2] and county[3] bicycle network.

REGIONAL PLANNING

Metro's *Draft Regional Transportation Plan (RTP)* has identified a Proposed Regional Bicycle System. Metro's definitions of bicycle classifications are provided in the technical appendix. Washington County's *Draft Bikeway Plan* identifies a preferred bikeway network. Table 6-1 summarizes the common bicycle route designations of Metro's Regional Bicycle System, the preferred Washington County Bikeway network and the proposed City Master Plan. All of the designations are consistent.

NEEDS

Bikeways are provided on many of the arterial and collector roadways in the City of Hillsboro (see Figure 3-17). There are, however, many segments where bikeways do not exist on the arterial and collector roadway network. Continuity and connectivity are key issues for bicyclists, and gaps in the bikeway network cause the most significant problems for bicyclists in Hillsboro. Without connectivity of the bicycle system, this mode of travel is severely limited (similar to a road system full of cul-de-sacs). The TPR[4] calls for all arterial and collector streets to have bicycle facilities. To meet the TPR requirements and fill-in existing gaps in the existing bicycle system, action plan that focuses on a framework system should be developed to prioritize bicycle investment.

[1] *Transportation Planning Rule*, State of Oregon, DLCD, Section 660-12-020(2)(d), 660-12-035(3)(e), 660-12-095(3)(b&c).

[2] *Regional Bicycle System Map, Draft 3.0*, Metro, July 1, 1997.

[3] *Draft Bikeway Plan*, Washington County, June 1995.

[4] Oregon Administrative Rules, Chapter 660, Division 12, Section 045(3).

Table 6-1
Bicycle System Designations

Route	Proposed City Plan	Washington County	Metro Bikeways
East-West			
West Union Road	Lane	Bike Lane/Shoulder	Community Connector
Evergreen Road	Lane	Bike Lane/Shoulder	Community Connector
Cornell Road	Lane	Bike Lane/Shoulder	Regional Corridor
Walker Road	Lane	Bike Lane/Shoulder	Community Connector
Baseline Road	Lane	Bike Lane/Shoulder	Regional Corridor
TV Highway	Lane	ODOT Bike Lane/Should.	Regional Corridor
North-South			
Glencoe Road/1st Ave.	Lane	Bike Lane/Shoulder	Regional Corridor
25th Avenue	Lane	Bike Lane/Shoulder	Community Connector
Shute/Brookwood	Lane	Bike Lane/Shoulder	Community Connector
231st Avenue	Lane	Bike Lane/Shoulder	Regional Access/CC
Cornelius Pass Road	Lane	Bike Lane/Shoulder	Community Connector
Stucki Avenue	Lane	Bike Lane/Shoulder	Community Connector
185th Avenue	Lane	Bike Lane/Shoulder	Regional Access
Bronson Creek	Multi-Use Path	--	Off-street Multi Use Path
Rock Creek/Beaverton Creek	Multi-Use Path	--	Off-street Multi Use Path

Bicycle trips are different from pedestrian and motor vehicle trips. Common bicycle trips are longer than walking trips and generally shorter than motor vehicle trips. Bicycle trips can generally fall into three groups: commuters, activity-based and recreational. Commuter trips are typically home/work/home (sometimes linking to transit) and are made on direct, major connecting roadways and/or local streets. Bicycle lanes provide good accommodations for these trips. Activity based trips can be home to school, home to park, home to neighborhood commercial or home to home. Many of these trips are made on local streets with some connections to the major functional classification streets. The needs are for lower volume/speed traffic streets, safety and connectivity. Recreational trips share many of the needs of both the commuter and activity-based trips, but create greater needs for off-street routes, connections to rural routes and safety. Bicycle facility needs fall into two primary categories: route facilities and parking facilities. Bicycle lanes are the most common route facilities in Hillsboro. Racks, lockers and shelters are typical bicycle parking facilities.

FACILITIES

The bicycle network can generally be categorized as bike lanes, bicycle accommodation, or off-street bike paths/multi-use paths. Bike lanes are areas within the street right-of-way designated specifically for bicycle use. Federal research has indicated that bike lanes are the most cost effective and safe facilities for bicyclist when considering all factors of design. Bicycle accommodations are where bicyclists and autos share the same travel lanes including a wider outside lane and/or bicycle boulevard treatment (priority to through bikes on local streets). Multi-use paths are generally off-street routes (typically recreationally focused) that can be used by several transportation modes, including bicycles, pedestrians and other non-motorized modes (i.e. skateboards, roller blades, etc.). The term bikeway is used in this report to describe any of the bicycle accommodations described above. The bicycle plan designates where bike lanes and multi-use paths are anticipated and other bicycleways are expected to be bike accommodations.

Bicycle lanes adjacent to the curb are preferred to bicycle lanes adjacent to parked cars. Six-foot bicycle lanes are recommended. Design features in the roadway can improve bicycle safety [5]. For example, using curb storm drain inlets rather than catch basins significantly improves bicycle safety. On reconstruction projects, bicycle lanes of five feet may need to be considered. Widening the curb travel lane (for example, from 12 feet to 14 or 15 feet) can provide bicycle accommodations. This extra width makes bicycle travel more accommodating and provides a greater measure of safety. Signing and marking of bicycle lanes should follow the *Manual of Uniform Traffic Control Devices*, as adopted for Oregon.

CRITERIA

Hillsboro's Transportation Planning Task Force and Transportation Technical Advisory Committee created a set of goals and policies to guide transportation system development in Hillsboro (see Chapter 2). These goals and policies form the criteria for measuring which actions conform to the desires of the City relative to bikes. Several of these policies pertain specifically to bicycle needs:

Goal 1: Safety

Policy 1 Build, maintain and/or support a well-defined and safe transportation system within the City for pedestrian, bicycle, transit, motor vehicles, air and rail travel.

Goal 2: Multi-Modal Travel

Policy 1 Design transportation facilities within Hillsboro that accommodate multiple modes of travel within transportation corridors, where appropriate, and encourage their use to move people, goods and services within these corridors. Encourage and coordinate efforts to provide convenient linkages between various modes of travel.

[5] *Oregon Bicycle and Pedestrian Plan, ODOT, June 1995*; this provides an in depth discussion on bicycle network development.

Policy 2 Construct bikeways and pedestrians facilities on major, new or reconstructed arterial and collector streets within Hillsboro (with roadway construction or reconstruction projects). Coordinate (or require where appropriate) convenient access to existing or planned bike and pedestrian facilities from nearby schools, parks, transit, public facilities and retail areas.

Policy 4 Link the regional trails network to Hillsboro's bicycle and pedestrian systems.

Goal 3: Trip Reduction

Policy 2 Ensure that nearby commercial, community service and high employment industrial land uses are developed in a manner that provides convenient access to pedestrians, bicyclists and transit riders. Support compact, mixed-use development including infill and redevelopment in appropriate areas of the City.

Goal 2, Policy 2 sets a specific requirement that bikeway facilities be constructed on all arterials and collectors within Hillsboro and that these be convenient bike and pedestrian access to all schools, parks, public facilities and retail areas. Table 6-2 summarizes the bicycle corridors created by overlaying the bicycle network over the arterial and collector system in Hillsboro.

Table 6-2
Corridors in Proposed Bikeway Network

North-South Corridors	East-West Corridors
Glencoe Road - 1st Avenue	West Union Road
Jackson School Road	Evergreen Road-Parkway
25th Ave/32nd Ave/Cypress/Minter Bridge	Cornell Road
Brookwood Parkway-Shute Road	Baseline Road-Main Street
231st Avenue	TV Highway-Oak Street-Baseline Street
Cornelius Pass Road	Butler Road-Old Cornell-Walker Road
205th - 206th Avenue	Grant Street
185th Avenue	Walnut Street

Since bicyclists can generally travel further than pedestrians, connections that lead to regional destinations such as Tanasbourne and Beaverton are important. Hillsboro's bicycle network as planned connects to Washington County's, ODOT's and the City of Beaverton's bicycle networks and is consistent with the Regional Bicycle System. Key locations where connections should be made to these other jurisdictions' networks include Walker Road, Cornell Road, Baseline Road, TV Highway, West Union Road and Cornelius Pass Road.

STRATEGIES

Several strategies were considered for construction of future bikeway facilities in Hillsboro. These strategies were studied to provide the City with priorities since it is likely that the available funding will be insufficient to address all of the projects identified in the Bikeway Master Plan. The strategies are listed in terms of priority as provided by the Advisory Committee.

Strategy 1 - "Connect Key Bicycle Corridors to Schools, Parks, Recreational Uses and Activity Centers (public facilities, commercial areas, etc.)"

This strategy provides bikeway links to schools, parks and activity centers from the arterial/collector bikeway network. This alternative provides added safety to likely bicyclist destinations as well as destinations where children are likely to travel.

Strategy 2 - "Fill in Gaps in the Network where Some Bikeways Exist"

This strategy provides bikeways, which fill in the gaps between existing bikeways where a significant portion of a bikeway corridor already exists. This strategy maximizes the use of existing bicycle facilities to create complete sections of an overall bikeway network.

Strategy 3 - "Bicycle Corridors that Commuters Might Use"

This strategy focuses on providing bicycle facilities where commuters are likely to go such as local (within Hillsboro) or regional (i.e. Beaverton or Tanasbourne) employment centers or leading to transit which provides access to regional employment centers.

Strategy 4 - "Bicycle Corridors for Recreational Needs"

This strategy focuses on providing facilities for recreational bicycling. This strategy would direct resources to constructing off-street bike paths or multi-use paths in Hillsboro (working with other agencies). While these routes may be oriented to recreational needs, they can also be used for commute or activity based bicycle trips.

Strategy 5 - "Construct Bike Lanes with Roadway Improvement Projects"

This strategy focuses on providing bike lanes on all arterial and collector roadway improvement projects within the City of Hillsboro, as designated in the master plan.

Strategy 6 - "Bicycle Corridors that Connect Neighborhoods"

This alternative puts priority on bicycle lanes for arterials/collectors, which link neighborhoods together. Some of the bicycle connections could include paths crossing parks, schools or utility rights-of-way.

Table 6-3 summarizes the strategies in terms of meeting the transportation goals and objectives. Nearly all the strategies meet the criteria established in Hillsboro's goals and policies.

Table 6-3
Bikeway Facility Strategies Comparisons

Strategy	Policies				
	1-1	2-1	2-2	2-5	3-2
1. Connect key bicycle corridors to schools, parks, recreational uses and activity centers (public facilities, commercial areas, etc.)	◆	■	■	■	■
2. Fill in gaps in the network where some bikeways exist	◆	◆	◆	◆	■
3. Bicycle corridors that commuters might use	◆	■	■	□	■
4. Bicycle corridors for recreational needs	□	□	□	■	□
5. Construct bike lanes with roadway improvement projects	■	■	◆	◆	◆
6. Bicycle corridors that connect neighborhoods	◆	◆	◆	□	□
7. Bicycle corridors providing mobility to and within commercial areas	◆	◆	◆	□	■

○ Does not meet criteria
□ Partially meets criteria
◆ Mostly meets criteria
■ Fully meets criteria

RECOMMENDED BIKEWAY FACILITY PLAN

The committee then ranked the strategies that had been evaluated by the Transportation Planning Task Force. Each task force member was assigned a certain number of points that he or she could allocate to each of the strategies according to his or her vision of priorities for the City of Hillsboro. The ranking of these strategies follows, from most important to least important:

- Connect key bicycle corridors to schools, parks, recreational uses and activity centers (public facilities, commercial areas, etc.)
- Fill in gaps in the network where some bikeways exist
- Bicycle corridors that commuters might use
- Bicycle corridors for recreational needs
- Construct bike lanes with roadway improvement projects
- Bicycle corridors that connect neighborhoods
- Bicycle corridors providing mobility to and within commercial areas

A list of likely actions to achieve fulfillment of these priorities was developed into a Bicycle Master Plan. The Bicycle Master Plan (Figure 6-1) is an overall plan and summarizes the "wish list" of bicycle-related projects in Hillsboro, providing a long term map for planning bicycle facilities. From this Master Plan, a more specific, shorter term, Action Plan was developed. The Action Plan (Figure 6-2) consists of projects that the City should actively try to fund. These projects form a basic bicycle grid system for Hillsboro. As development occurs, streets are rebuilt and other opportunities (such as grant programs) arise, projects on the Master Plan should be pursued as well.

POTENTIAL PROJECT LIST

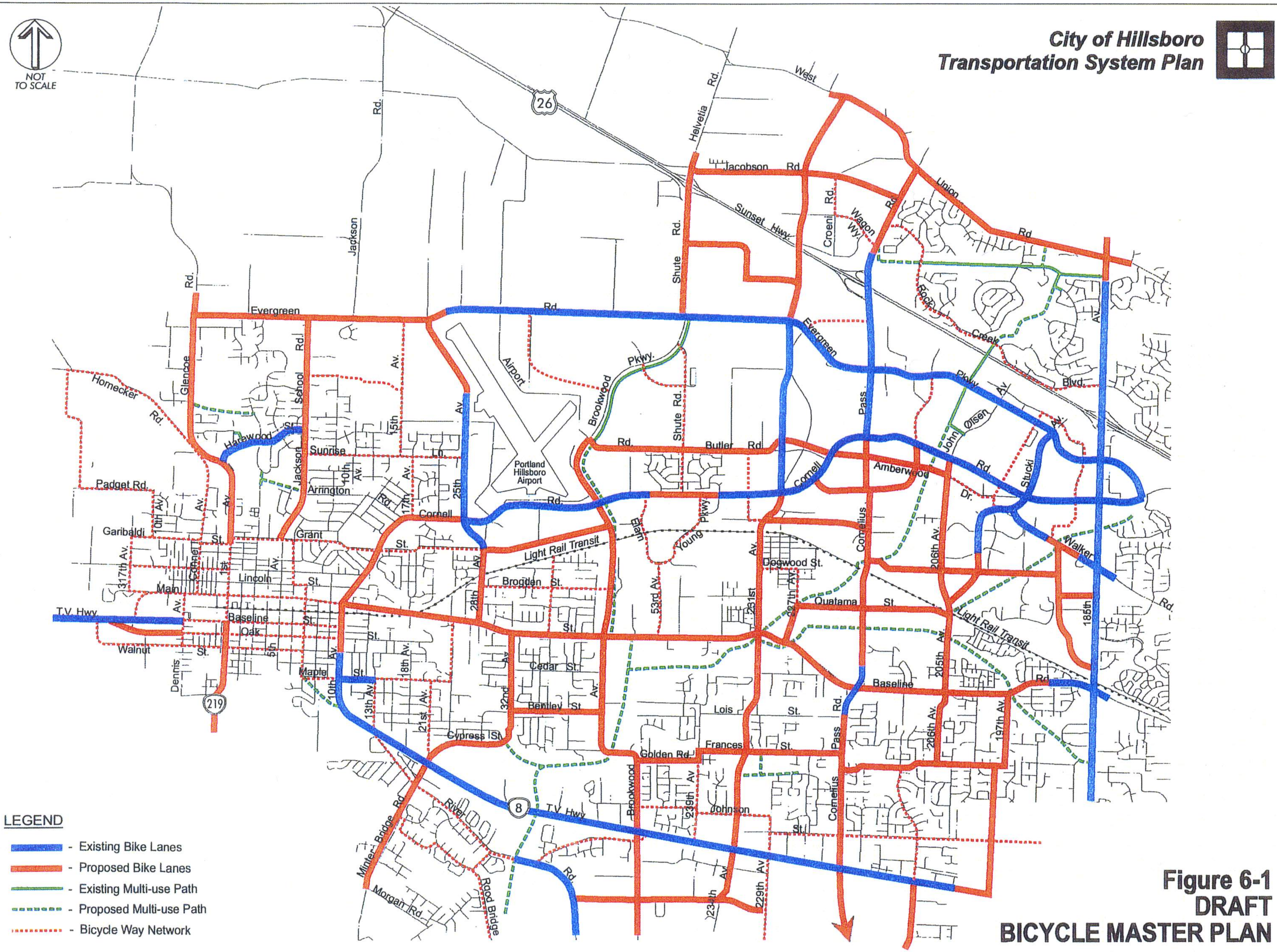
Table 6-4 outlines potential bicycle action plan projects in Hillsboro, and Table 6-5 outlines potential bicycle master plan projects in Hillsboro. The master plan projects include the action plan projects listed in Table 6-4. The City, through its Capital Improvement Program (CIP), joint funding with other agencies (County, Metro) and development approval would implement these projects. Figure 6-2 summarizes the Bicycle Action Plan. Bicycle projects, which provide access to regional centers, town centers and transit stations are regional priorities.

Several roadways on the plans are identified as bicycle-way network where bicycle accommodations on the roadway should be made and installation of bicycle lanes is less likely. It is important to note that bicycle lanes should be installed on these facilities where feasible, but physical constraints due to the original construction could create environmental and fiscal concerns. Examples of roadways identified as bicycle-way network are Oak Street, Baseline Street, 1st Avenue between Baseline Street and Grant Street, Elam Young Parkway/53rd Avenue, and Shute Road between Cornell Road and Brookwood Parkway.

The bicycle projects listed under *"Construct bicycle lanes with roadway improvement projects"* priority are projects that would be constructed with abutting land use development or roadway improvement projects on arterials or collectors and would not necessarily be constructed as bicycle projects alone.

Multi-use paths identified on the bicycle plans should be aligned to cross roadways at intersections for safe crossing rather than crossing roadways at mid blocks without traffic control. Where preferred multi-use paths or trail routes cannot be implemented as depicted on the Bicycle Master and Action Plan maps, alternate routes can be considered. Areas where existing multi-use pathways parallel bicycle facilities on roadways such as Dawson Creek Drive and Brookwood Parkway are shown as bikeway network or bicycle lanes on the plans.

City of Hillsboro
Transportation System Plan



LEGEND

- Existing Bike Lanes
- Proposed Bike Lanes
- Existing Multi-use Path
- Proposed Multi-use Path
- Bicycle Way Network

Figure 6-1
DRAFT
BICYCLE MASTER PLAN

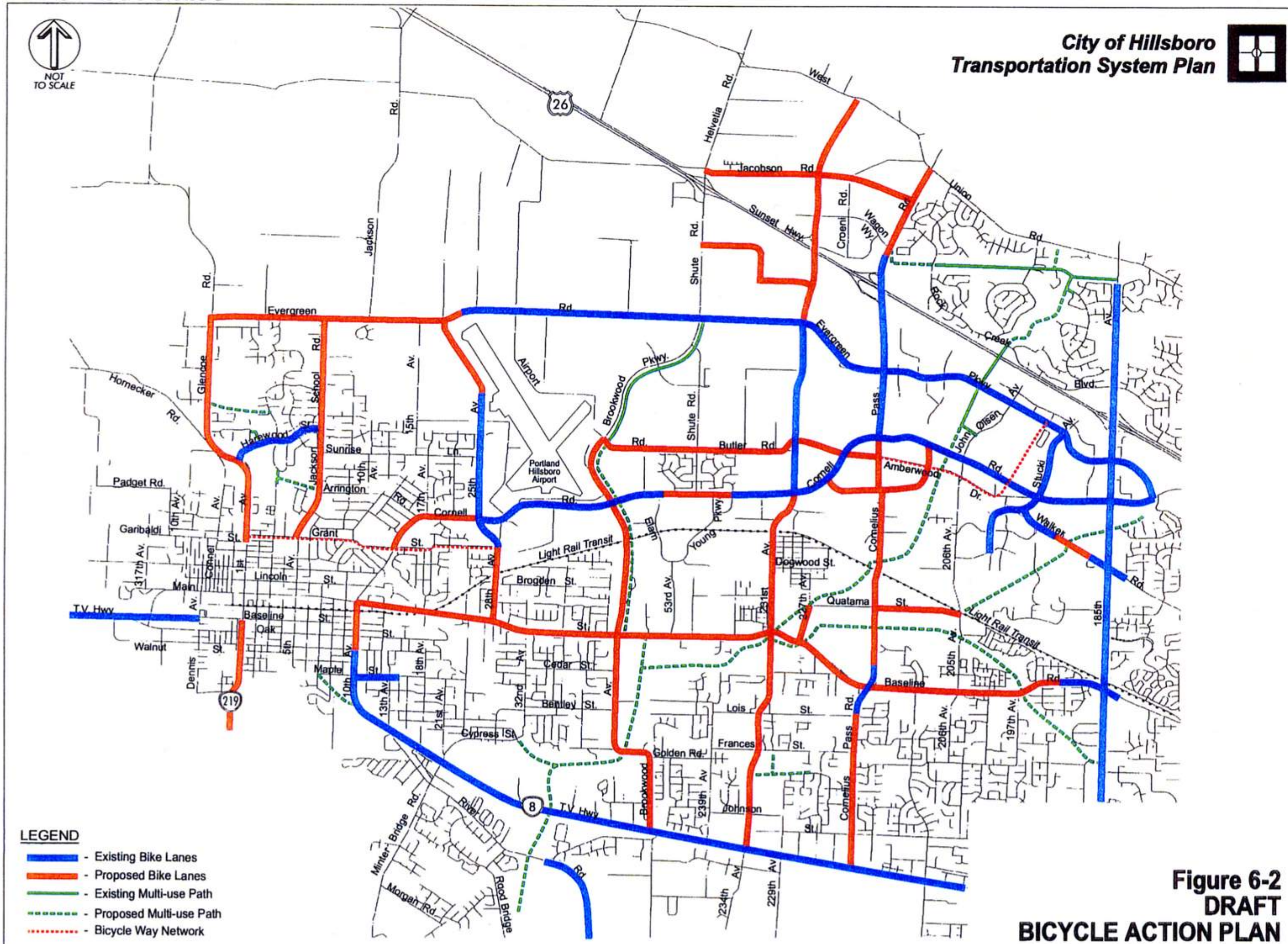


Figure 6-2
DRAFT
BICYCLE ACTION PLAN

Table 6-4
Bicycle Action Plan Project Priorities

Project	From	To	Metro Draft RTP Project
Priority 1: Connect key bicycle corridors to schools, parks, recreational uses and activity centers			
Rock Creek Trail	Evergreen Parkway	Amberwood Drive	79*
Jackson School Road bike lanes	Evergreen Road	Grant Street	711b*
Glencoe Road bike lanes	Evergreen Road	Grant Street	712*
Grant Street bicycle way	1st Avenue	25th/28th Avenue	
Priority 2: Fill in gaps in bicycle network			
25th Avenue bike lanes	Evergreen Road	25th Avenue gap	749*
Cornell Road bike lanes	Elam Young (west)	Ray Circle	706*
10th Avenue bike lanes**	Walnut Street	Main Street	
Oak Street bike lanes**	TV Highway	Dennis Avenue	
Cornell Road bike lanes**	Grant Street	25th Avenue	
Priority: Construct bike lanes with roadway improvement projects			
Baseline Road bike lanes	Lisa Drive	10th Avenue	714/715/928*
Brookwood Parkway bike lanes	Airport Road	TV Highway	739/740*
Cornelius Pass Road bike lanes	Cornell Road	209th Avenue	737/738*
Evergreen Road bike lanes	Near 260th Avenue	Glencoe Road	732b*
Evergreen Road bike lanes	Near 25th Avenue	Glencoe Road	732*
231st/235th Avenue bike lanes	Evergreen Road	West Union Road	743a/743b*
28th Avenue bike lanes	Grant Street	Main Street	726c*
231st Avenue bike lanes	TV Hwy	Cornell Road	729a*
Quatama Street bike lanes	227th Avenue	Baseline Road	707*
Jacobson Road bike lanes	Helvetia Road	Cornelius Pass Road	
Butler/Amberwood bike lanes	Brookwood Parkway	John Olsen Avenue	
Walker Road bike lanes	Amberglen Parkway	185th Avenue	

* Included in Draft RTP list, November 1998 (reference number in parenthesis)
** Feasibility studies required; including alternative alignments and need for right-of-way acquisition.

Table 6-5
Bicycle Master Plan Project Priorities
(Includes all Bicycle Action Plan projects in Table 6-3 plus the following)

Project	From	To
	Priority: Bicycle corridors that connect neighborhoods	
Minter Bridge/Cypress/32nd Ave bike lanes	Morgan Road	Baseline Street
Quatama Street bike lanes	205th Avenue	227th Avenue
Golden Road/Frances bike lanes	Brookwood Avenue	Cornelius Pass Road
	Priority: Construct bike lanes with roadway improvement projects	
West Union Road bike lanes	185th Avenue	Helvetia Road
Shute Road/Helvetia Road	Evergreen Road	West Union
East/West roadway (south of TV Highway) bike lanes	River Road	Cornelius Pass Road
Grant Street bike lanes	25th/28th Avenue	Brookwood Parkway
205th/206th Avenue bike lanes	Baseline Road	Cornell Road/Gibbs
Salix extension/Parr bike lanes	185th Avenue	Cornell Road
East/West Connector bike lanes	231st Avenue	185th Avenue
	Priority: Multi-use trails for citywide and recreational needs	
Rock Creek Trail	US 26	River Road
Beaverton Creek Trail	Rock Creek	185th Avenue
Bronson Creek Trail	205th Avenue	185th Avenue
Bethany Pond Trail	Cornelius Pass Road	185th Avenue

COMPLEMENTING LAND DEVELOPMENT ACTIONS

The Transportation Planning Rule requires that bicycle-parking facilities be provided as part of new residential developments of four units or more, new retail, office and institutional developments, and all transit transfer stations and park and ride lots.[6]

It is important as new development occurs, that connections or accessways are provided to link the development to the existing bicycle and pedestrian facilities in as direct a manner as possible. If a development fronts a proposed bikeway or sidewalk (as shown in the Bicycle or Pedestrian Master Plan), the developer shall be responsible for providing the bikeway or walkway facility as part of any half-street improvement required for that project.

[6] *Transportation Planning Rule*, State of Oregon, Department of Land Conservation and Development, Section 660-12-045(3)(a).

Chapter 7
Transit

This chapter summarizes existing and future transit needs in the City of Hillsboro. The following sections outline the criteria to be used to evaluate needs, provides a number of strategies for implementing a transit plan and recommends a transit plan for the City of Hillsboro. The needs, criteria and strategies were identified in working with the City's Transportation Planning Task Force and Transportation Technical Advisory Committee. This committee provided input regarding the transportation system in Hillsboro, specifically exploring transit needs. Concurrent with the TSP, Tri-Met undertook a process called Transit Choices for Livability, engaging the public in the fall of 1996 in planning for the Westside service plan with light rail transit. The methodology used to develop the transit plan combined citizen, employer and staff input.

NEEDS

The existing bus service in Hillsboro is described in Chapter 3. Currently there are seven routes in Hillsboro, which generally travel along 185th Avenue, Tualatin Valley Highway, Baseline Road, Cornell Road, 25th Avenue, Evergreen Road and Brookwood Parkway/Shute Road. Prior to the completion of Westside light rail, the availability and frequency of transit in Hillsboro was limited. Many routes were limited to peak service and the extent and coverage of transit limited the use of transit as an alternative mode.

Metro's Draft Regional Transportation Plan (RTP)[1] identifies Cornell Road, Walker Road, Baseline Road and 185th Avenue as part of the *primary bus network* and TV Highway as part of the *frequent bus network*. Primary routes provide the backbone of the transit system and are intended to provide the highest quality service and carry the highest passenger volumes. Transit centers are identified for the LRT stops in Hillsboro.

While transit mode share is low in Hillsboro, current transit service does not reflect the significant growth in the area or attempt to link activities in and near Hillsboro. The completion of light rail transit service in the Westside corridor will enhance transit services both due to light rail and its supporting bus service.

Much of the existing route structure has been modified to access and integrate Light Rail Transit service (Figure 7-1). Tri-Met's Board of Directors adopted the Westside Service Plan in March 1998.

[1] *Public Transportation System Map,* Metro, Draft 3.0, July 1, 1997.

DKS Associates

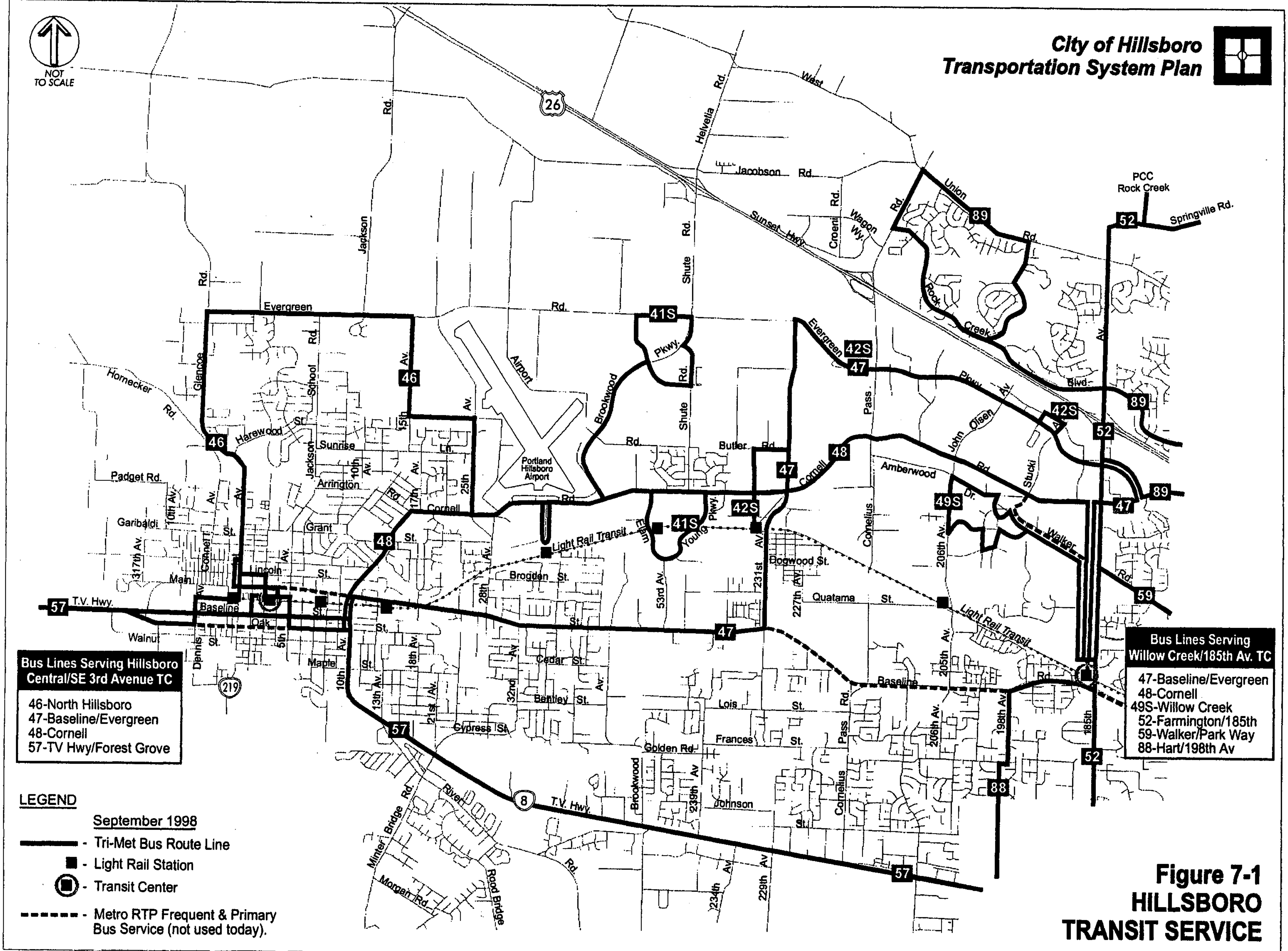


Figure 7-1
HILLSBORO
TRANSIT SERVICE

As part of this plan, significant changes to the current transit routes in Hillsboro has occurred. The existing routes 58, 68, 91X, and 94X will be replaced with six new routes 41S, 42S, 46, 47, 48 and 49S. Routes 88 and 89 will be modified from their existing routes to serve the Willow Creek/SW 185th Ave. Transit Center. Routes 52 and 57 will have no significant changes to the routes (only a change in headway).

Routes 41S, 42S and 49S are new bus shuttle routes dedicated to serving Hillsboro employers. Route 41S serves the companies located in the Dawson Creek development and along Elam Young Parkway, from the Hawthorn Farm Station. Route 42S runs between the Orenco Station and Willow Creek/SW 185th Ave. Transit Center to serve employers along 229th Avenue and Evergreen Parkway. Route 49S operates between the Quatama Station and the Willow Creek/SW 185th Ave. Transit Center and serves businesses throughout the Amber Glen development. All three routes have peak hour service on weekdays.

Route 46 travels between the Hillsboro Central Transit Center and the Fair Complex/Hillsboro Airport Station via 1st Avenue, Glencoe Road, Evergreen Road, 15th Avenue, Griffin Oaks Street, 25th Avenue, Cornell Road and 34th Avenue. Service on this route is two-way and serves commercial, residential and industrial areas. Frequency of service is initially scheduled to run on weekdays only.

Route 47 travels between the Hillsboro Central Transit Center and the Willow Creek/SW 185th Ave. Transit Center via Washington Street, Main Street/Baseline Road, 231st Avenue, Orenco Station, 229th Avenue, Evergreen Parkway, Tanasbourne Town Center, Cornell Road and 185th Avenue. Service will be provided seven days a week.

Route 48 travels between the Hillsboro Central Station and Willow Creek/SW 185th Ave. Transit Center via Cornell Road. Buses are scheduled to operate seven days a week.

One of Hillsboro's greatest transportation needs in the future will be improving local transit service, especially to the areas located between Baseline and Tualatin Valley Highway, and the areas south of Tualatin Valley Highway. Eventually local transit service will be modified to serve the Urban Reserve areas currently located south of Hillsboro. Rapidly increasing employment and housing creates a much greater opportunity to create productive public transit routing in Hillsboro.

Walking distances to transit within one quarter mile of a bus line are outlined in Tri-Met's service planning. Current transit service in Hillsboro is well behind this goal. Large employers and mixed-use commercial centers have public transportation needs that if not met, will result in greater impacts to the motor vehicle system. Mode share estimates for 2015[2] indicate that 8 to 15 percent of evening peak hour trips will be made via public transit near the LRT station areas. However, only one mile away from these station areas, the transit mode share drops below 1 to 3 percent given the transit service levels of the past. More effective route planning, greater frequency, and acceptance of buses into neighborhoods by residents will need to occur if the transit mode share is to rise above the low 2015 forecasts.

[2] Based upon Metro travel demand model data for year 2015 providing transit share by transportation analysis zone.

CRITERIA

Hillsboro's Task Force and Transportation Advisory Committee created a set of goals and policies to guide transportation system development in Hillsboro. These goals and policies represent the criteria that all transit improvements in Hillsboro should be compared against to determine if they conform to the intended vision of the City. Several of these policies pertain specifically to transit needs:

Goal 1: Safety

Policy 1 Build, maintain and/or support a well-defined and safe transportation system within the City for pedestrian, bicycle, transit, motor vehicles, air and rail travel.

Goal 2: Multi-Modal Travel

Policy 1 Design transportation facilities within Hillsboro that accommodate multiple modes of travel within transportation corridors, where appropriate and encourage their use to move people, goods and services within these corridors. Encourage and coordinate efforts to provide convenient linkages between various modes of travel.

Policy 5 Encourage and work with Tri-Met to improve local bus transit service.

Goal 3: Trip Reduction

Policy 2 Ensure that nearby commercial, community service and high employment industrial land uses are developed in a manner that provides convenient access to pedestrians, bicyclists and transit riders. Support compact, mixed-use development including infill and redevelopment in appropriate areas of the city.

Policy 3 Implement City Station Community Planning Areas in ways that encourage the location of the highest land use densities and mixed uses near the best transit services.

Goal 7: Accessibility

Policy 1 Construct transportation facilities, which conform to the requirements of the Americans with Disabilities Act.

Policy 2 Locate transit dependent land uses close to transit stations.

STRATEGIES

Several strategies were developed for the implementation of future transit facilities in Hillsboro. These strategies were developed to provide the City with priorities in providing guidance to Tri-Met.

Strategy 1 - " Encourage enhanced local transit services within Hillsboro "

This strategy focuses on improving local transit services in Hillsboro. Under this strategy, service, which meets the goal of having transit available within 1/4 mile of Hillsboro residents and major employment areas, would be developed. This is the dominant finding of the TSP and Tri-Met public involvement work.

Strategy 2 - "Provide direct access to and from Light Rail Transit (MAX) by integration of bus services "

This strategy focuses on providing direct access to Light Rail Transit Stations in Hillsboro. Feeder routes to MAX are in keeping with Tri-Met's service objectives for the Westside LRT service.

Strategy 3 - "Provide transit access to and from commercial/employment areas within Hillsboro"

This strategy provides access to locations in Hillsboro where people either work or choose to do their shopping. Commercial areas in Hillsboro might include the Tanasbourne area and downtown Hillsboro.

Strategy 4 - "Provide transit access to and from activity & service centers (schools, etc.) in Hillsboro"

This strategy focuses on providing transit access to destinations in Hillsboro such as shopping centers, hospitals, schools, etc.

Strategy 5 - "Provide transit express routes and transit service to regional employment centers"

This strategy is aimed at providing service directly from Hillsboro to regional employment centers without necessarily using Light Rail Transit. This might include a few stops in Hillsboro followed by express service to a regional employment centers (one or two stops at park & ride lots near freeway interchanges along the way).

Strategy 6- " Provide transit services to regional town centers and main streets in Hillsboro "

This strategy focuses on providing transit routes to regional town centers/main streets in Hillsboro.

Strategy 7 - "Provide Park and Ride Lots"

This strategy provides park & ride lots at locations where Tri-Met stops or where it is desirable for Tri-Met to stop. A park & ride lot near the freeway could be used in conjunction with an express bus to regional centers or a park-and-ride lot near the LRT Stations could be used in conjunction with access to Light Rail Transit or feeder bus routes.

Strategy 8 - " Dial-a-ride demand responsive"

This strategy focuses on development of a dial-a-ride demand responsive transit service. This type of service differs from fixed route transit in that passengers contact the transit service (usually by phone) to be picked up or to schedule arrival of transit services to nearby pick up points. The passenger is taken to their destination along with other users going in the same general direction.

Table 7-1 summarizes the strategies in terms of meeting the transportation goals and objectives. Strategies 1 and 4 are the most effective at meeting the city's goals and policies.

Table 7-1
Transit Strategies Comparisons

Strategy	Policies						
	1-1	2-1	2-6	3-2	3-3	7-1	7-2
1. Encourage enhanced local services	□	□	■	□	■	□	◆
2. Provide direct access to/from Light Rail Transit (MAX) by integration of bus services	□	□	◆	□	■	□	□
3. Provide access to commercial/employment areas	□	□	◆	■	◆	□	□
4. Provide access to activity and service centers (schools, etc.)	□	□	◆	■	■	□	◆
5. Provide express routes to regional employment centers	□	□	□	□	□	□	□
6. Provide access to regional town centers/main streets	□	□	◆	□	■	□	◆
7. Provide Park & Ride Lots	□	◆	□	□	□	□	□
8. Dial-a-Ride demand responsive	□	□	◆	□	□	■	◆

○ Does not meet criteria
□ Partially meets criteria
◆ Mostly meets criteria
■ Fully meets criteria

RECOMMENDED TRANSIT PLAN

The strategies developed by the Transportation Planning Task Force and Transportation Technical Advisory Committee was then ranked by the Task Force. Each task force member was assigned a certain number of points that he or she could allocate to each of the strategies according to his or her priorities. The ranking of these strategies follows, from most important to least important:

- Encourage enhanced local services
- Provide direct access to/from Light Rail Transit (MAX) by integration of bus services
- Provide access to commercial/employment areas
- Provide access to activity and service centers

- Provide express routes to regional employment centers
- Provide access to regional town centers/main streets
- Provide Park and Ride lots
- Dial-a-ride demand responsive

Tri-Met's proposed Westside Service Plan was adopted on March 25, 1998. The plan was developed after a series of workshops, neighborhood meetings, and discussions between Tri-Met and the City of Hillsboro. The new plan allows Hillsboro residents greater opportunity to travel by transit to employment centers, commercial areas and to light rail stations. Tri-Met will need to continue to work with City of Hillsboro, citizens and employers to provide service to areas still not served, especially the area of Hillsboro between Baseline Road and Tualatin Valley Highway (and areas south of Tualatin Valley Highway).

Based upon input received in the TSP process, the City of Hillsboro should take the following four actions in regard to public transit:

- Work closely with Tri-Met to achieve improved local transit services/shuttles in Hillsboro, linking mixed-use centers, LRT, major employers and high-density housing. The most critical areas include Tanasbourne, Oregon Graduate Institute, Intel and other major manufacturing/electronics employers, Fairgrounds, and downtown/Government Center.

- Consider integrating Tri-Met's Planning for Transit[3] into the land use review process for sites within 1,000 feet of transit stops. These planning guidelines could assist site designers in making land use more transit friendly. Descriptions are provided of site amenities such as sidewalk linkages, shelter and signage.

- Work with Tri-Met, ODOT and Metro to encourage the development of enhanced transit traveler information systems. For Hillsboro these could take the form of:

    1. "Smart bus stops" that can inform the traveler of the time until the next bus, in real time.
    2. Kiosks at major activity centers (Tanasbourne, Intel, etc.) that can provide information regarding highway operating conditions (video of congestion with estimated delays) and the status of public transit that service that center.
    3. An Internet service center for transit trip planning and real time position of transit vehicles in Hillsboro.

- Coordinate with Tri-Met to consider development of additional transit services along the most congested corridors in Hillsboro to help relieve congestion. The 185th Avenue, Baseline Road, Cornell Road and Tualatin Valley Highway corridors are the most congested in the City and provide links between regional centers, town centers and LRT station areas. These routes are all designated as part of the regional public transportation system by Metro. While frequent service along Tualatin Valley Highway may be viewed as parallel to LRT service, this corridor services south Hillsboro within reasonable walking distances. Transit routing

[3] Planning for Transit, Handbook, Tri-Met. January 1996.

that can be used to reduce automobile demand on these corridors can help forestall more expensive roadway improvements in the next 20 years. Additionally, blending these corridors with high capacity bus transit services that link to other regional centers or town centers in Washington County (Beaverton, Washington Square, Kruse Way) would further strengthen the benefits of these transit services by reducing longer trips in the area.

- Coordinate with Tri-Met to consider development of additional transit services or improvement to existing service in under-served areas such as The Meadows neighborhood, the area south of SE Witch Hazel Road and the neighborhoods north of the Sunset Esplanade shopping center. Also consider adding local transit routes in the neighborhoods surrounding Century and Hillsboro High Schools.

Chapter 8
Motor Vehicles

This chapter summarizes needs for the motor vehicle system for both existing and future conditions in the City of Hillsboro. This chapter also outlines the criteria to be used in evaluating needs, provides a number of strategies and recommends plans for motor vehicles (automobiles, trucks, buses and other vehicles). The needs, criteria and strategies were identified in working with the City's Transportation Planning Task Force and Transportation Technical Advisory Committee. These groups explored automobile and truck needs in the City of Hillsboro and provided input about how they would like to see the transportation system in their city develop. The Motor Vehicle modal plan is intended to be consistent with other jurisdictional plans including Metro's *Draft Regional Transportation Plan (RTP)*, Washington County's *Transportation Plan (Comprehensive Plan Volume XV)* and *Draft Bikeway Plan*, and ODOT's *Oregon Transportation Plan* (OTP).

The motor vehicle element of the TSP involves several elements as shown in Figure 8-1. This chapter is separated into the following ten sections (Chapter 10 addresses Transportation Demand Management):

- Criteria
- Functional Classification (including summary of cross sections and local street connectivity)
- Circulation and Capacity Needs
- Safety
- Maintenance
- Neighborhood Traffic Management
- Parking
- Access Management
- Transportation System Management/Intelligent Transportation Systems
- Truck Routes

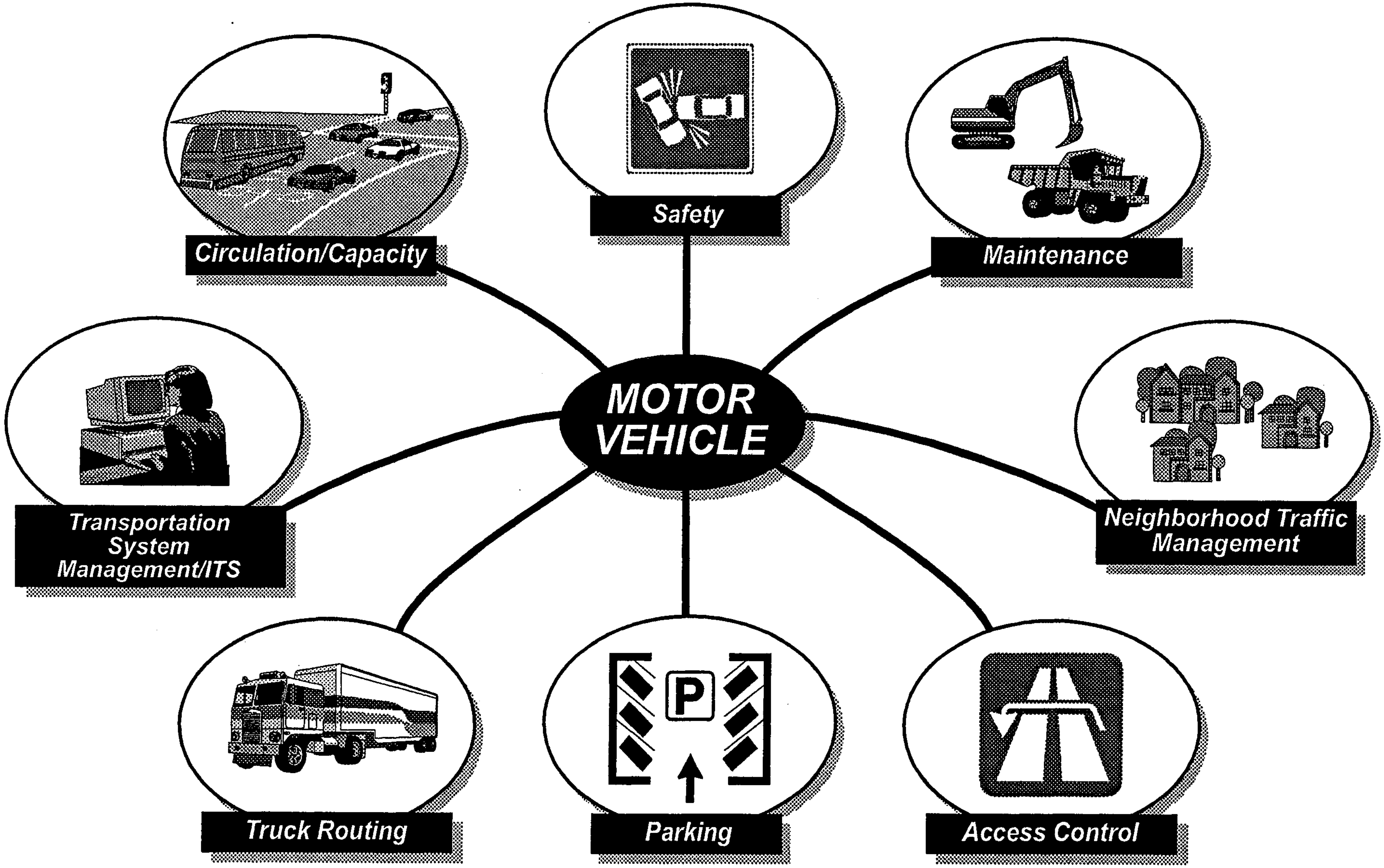


Figure 8-1
VEHICULAR ELEMENTS OF THE STREET PLAN

CRITERIA

Hillsboro's Transportation Planning Task Force and Transportation Technical Advisory Committee created a set of goals and policies to guide transportation system development in Hillsboro (see Chapter 2). Many of these goals and policies pertain specifically to motor vehicles. These goals and policies represent the criteria that all motor vehicle improvements or changes in Hillsboro should be measured against to determine if they conform to the intended direction of the City. The most significant of these criteria is the level of service requirements outlined in Goal 4, Policy 1. These are used to determine adequacy of motor vehicle facilities.

Goal 1: Safety

Policy 1 Build, maintain and/or support a well defined and safe transportation system within the City for pedestrian, bicycle, transit, automobile, air and rail travel.

Policy 2 Establish a City monitoring system that regularly evaluates, prioritizes and mitigates high accident locations within the City.

Policy 3 Promote transportation system safety through education and law enforcement.

Policy 4 Implement enforceable access management standards for arterial and collector roadways consistent with City, County and State requirements.

Policy 5 Provide adequate access to properties for emergency services vehicles throughout the City through the City land use planning and development review procedures.

Goal 2: Multi-modal Travel

Policy 1 Design transportation facilities within Hillsboro that accommodate multiple modes of travel within transportation corridors where appropriate and encourage their use to move people, goods and services within these corridors. Encourage and coordinate efforts to provide convenient linkages between various modes of travel.

Goal 3: Trip Reduction

Policy 4 Limit the provision of parking to meet regional and state standards.

Goal 4: Performance

Policy 1 Maintain a level of service consistent with regional goals and reduce traffic congestion.

Policy 2 Work with Washington County, the City of Beaverton, Metro and ODOT to develop, operate and maintain intelligent transportation systems including coordination of traffic signals.

Policy 3 A Tualatin Valley Highway Corridor Plan shall be undertaken in cooperation with ODOT, Washington County, the City of Beaverton, Metro and other transportation agencies to address specific long-term capacity and access needs for the corridor. The standards for performance shall recognize the Metro Title 6 level of service criteria and requirements in the City Transportation System Plan.

Policy 4 Provide a cost-effective transportation system where the public, land use development and users pay their respective share of the system's costs proportional to their respective demands placed upon the multi-modal system.

Goal 5: Goods Movement

Policy 1 Design arterial routes, highway access and adjacent land uses in ways that facilitate the efficient movement of goods and services.

Policy 4 Require safe routing of hazardous materials consistent with federal and state guidelines.

Goal 6: Livability

Policy 1 Design and build local and neighborhood streets to minimize speeding.

Policy 2 Relate the design of street capacity and improvement to their intended use.

Policy 3 Construct transportation facilities to comply with applicable City landscape and design standards.

Policy 4 Avoid potential adverse environmental impacts associated with traffic and transportation system development through facility design and system management.

Goal 7: Accessibility

Policy 1 Construct transportation facilities, which conform to the requirements of the Americans with Disabilities Act.

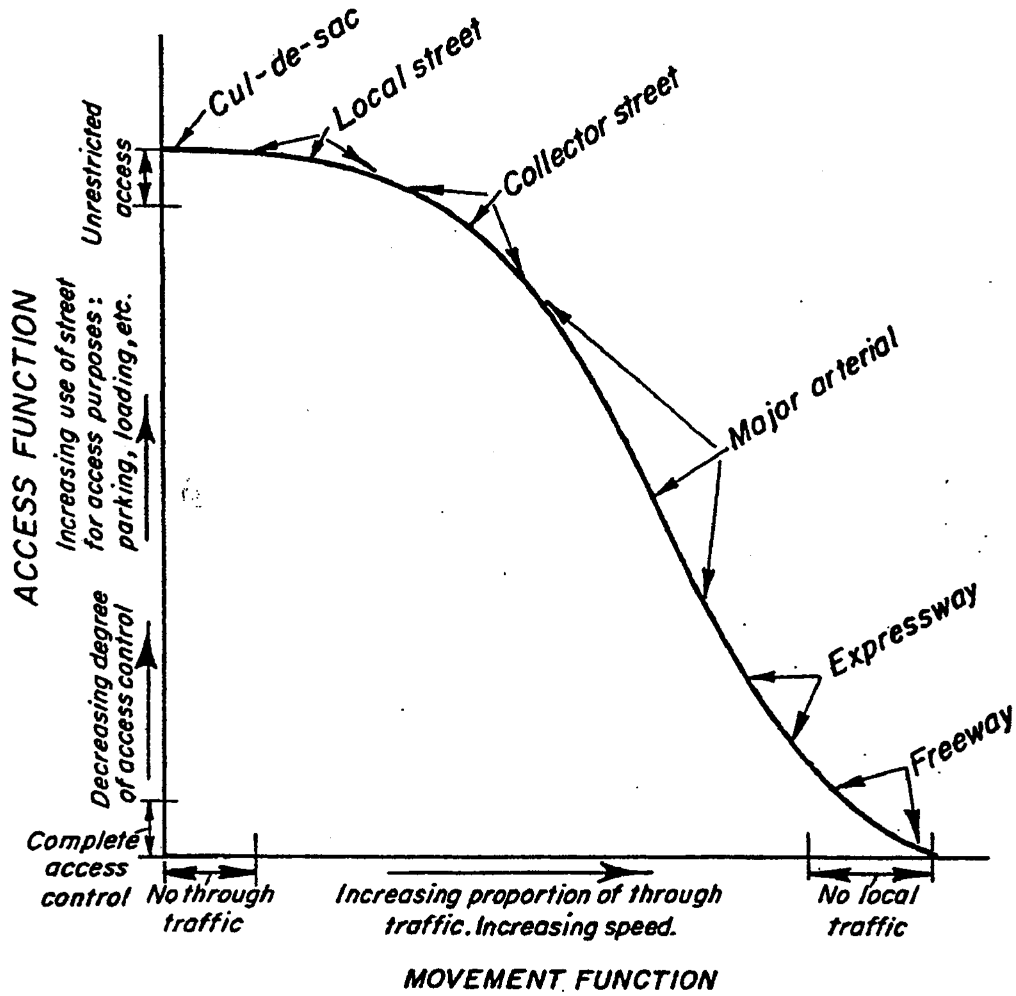
Policy 3 Design the local street network to facilitate street connectivity and limit out-of-direction travel. Provide connectivity to and from activity centers and destinations, giving priority to pedestrian and bicycle connections.

Policy 4 Develop an efficient arterial grid system that provides access within the City, and serves through traffic.

FUNCTIONAL CLASSIFICATION

Roadways have two functions, to provide mobility and to provide access. From a design perspective, these functions can be incompatible since high or continuous speeds are desirable for mobility, while low speeds are more desirable for land access. Arterials emphasize a high level of mobility for through movement; local facilities emphasize the land access function; and collectors offer a balance of both functions (Figure 8-2).

Functional classification has commonly been mistaken as a determinant for traffic volume, road size, urban design, land use and various other features which collectively are the elements of a roadway, but not its function. For example, the traffic on a roadway can be more directly related to land uses and because a roadway carries a lot or a little traffic does not necessarily determine its function. The traffic volume, design (including access standards) and size of the roadway are outcomes of function, but do not define function.



Source: University of California,
'Fundamentals of Traffic Engineering'
Wolfgang S. Homburger and
James H. Kell

Figure 8-2
STREET FUNCTION RELATIONSHIP

Function can be best defined by connectivity. Without connectivity, neither mobility nor access can be served. Roadways that provide the greatest reach of connectivity are the highest level facilities. Arterials can be defined by regional level connectivity. These routes go beyond the city limits in providing connectivity and can be defined into two groups: principal arterials (typically state routes) and arterials. The movement of persons, goods and services depends on an efficient arterial system. Collectors can be defined by citywide and adjacent area connectivity. These routes span large areas of the city but typically do not extend significantly into adjacent jurisdictions. They are important to city circulation. The past text books on functional classification then define all other routes as local streets, providing the highest level of access to adjoining land uses. These routes do not connect at any significant regional, city wide or district level.

Recent work in the area of neighborhoods and their specific street needs provides a fourth level of functional classification - neighborhood route. In many past plans, agencies defined a minor collector or a neighborhood collector; however, use of the term collector is not appropriate. Collectors provide citywide or large district connectivity and circulation. There is a level between collector and localstreets that is unique due to its level of connectivity. Local streets can be cul-de-sacs or short streets that do not connect to anything.[1] Residents to circulate into or out of their neighborhood commonly use neighborhood routes. They have connections within the neighborhood and between neighborhoods. These routes have neighborhood connectivity, but do not serve as citywide streets. They have been the most sensitive routes to through, speeding traffic due to their residential frontages. Because they do provide some level of connectivity they can commonly be used as cut-through routes in lieu of congested or less direct arterial or collector streets which are not performing adequately. Cut-through traffic has the highest propensity to speed, creating negative impacts on these neighborhood routes. By designating these routes, a more systematic citywide program of neighborhood traffic management can be undertaken to protect these sensitive routes.

In the past, traffic volume and roadway size was linked to functional classification. More recently, urban design and land use has also been tied to functional class. Discussions of neo-traditional street grids that eliminate the need for functional class add another commentary. This tends to become confusing, complicating an essential transportation planning exercise. The planning effort to identify connectivity of routes in Hillsboro is essential to preserve and protect future mobility and access, by all modes of travel. In Hillsboro, it is not possible to have a citywide neo-traditional layout. Past land use decisions, topography and environmental features preclude this[2]. Without defining the varying levels of connectivity now in the TSP, the future impact of the adopted Comprehensive Plan land uses will result in a degraded ability to move goods and people (existing and new) in Hillsboro. The outcome would be intolerable delays and much greater costs to address solutions later rather than sooner.

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[1] Or in the case of neo-traditional grid systems, extensive redundancy in facilities results in local status to streets that have greater than local connectivity.

[2] While subdivisions or areas of neo-traditional development exist and are possible (even desirable), on the whole, the concept cannot be generically applied to the city in lieu of functional classification.

By planning an effective functional classification of Hillsboro streets[3], the City can manage public facilities pragmatically and cost effectively.

These classifications do not mean that because a route is an arterial it is large and has lots of traffic. Nor do the definitions dictate that a local street should only be small with little traffic. Identification of connectivity does not dictate land use or demand for facilities. The demand for streets is directly related to the land use. The highest level connected streets have the greatest potential for higher traffic volumes, but do not necessarily have to have high volumes as an outcome, depending upon land uses in the area. Typically, a significant reason for high traffic volumes on surface streets at any point can be related to the level of land use intensity within a mile or two. Many arterials with the highest level of connectivity have only 33 to 67 percent "through traffic". Without the connectivity provided by arterials and collectors, the impact of traffic intruding into neighborhoods and local streets goes up substantially.

If land use is a primary determinate of traffic volumes on streets, then how is it established? In Oregon, land use planning laws require the designation of land uses in the Comprehensive Plan. Hillsboro's Comprehensive Plan land uses have been designated for over two decades. These land use designations are very important not only to the City for planning purposes, but to people that own land in Hillsboro. The adopted land uses in Hillsboro have been used in this study, working with the Metro regional forecasts for growth in the region for the next 20 years. A regional effort, coordinated by Metro and local agencies, has been undertaken to allocate the determined overall land use in the most beneficial manner for transportation. Without this allocation, greater transportation impacts would occur (wider and more roads than identified in this plan). As discussed in Chapter 11, if the outcome of this TSP is either too many streets or solutions that are viewed to be too expensive, it is possible to reconsider the core assumptions regarding Hillsboro's livability - its adopted land uses or its service standards related to congestion. The charge of this TSP (as mandated by State law) is to develop a set of multi-modal transportation improvements to support the Comprehensive Plan land uses. Key to this planning task is the functional classification of streets.

Functional Classification Definitions

The proposed functional classification of streets in Hillsboro is represented by Figure 8-3. Any street not designated as either an arterial, collector or neighborhood route is considered a local street.

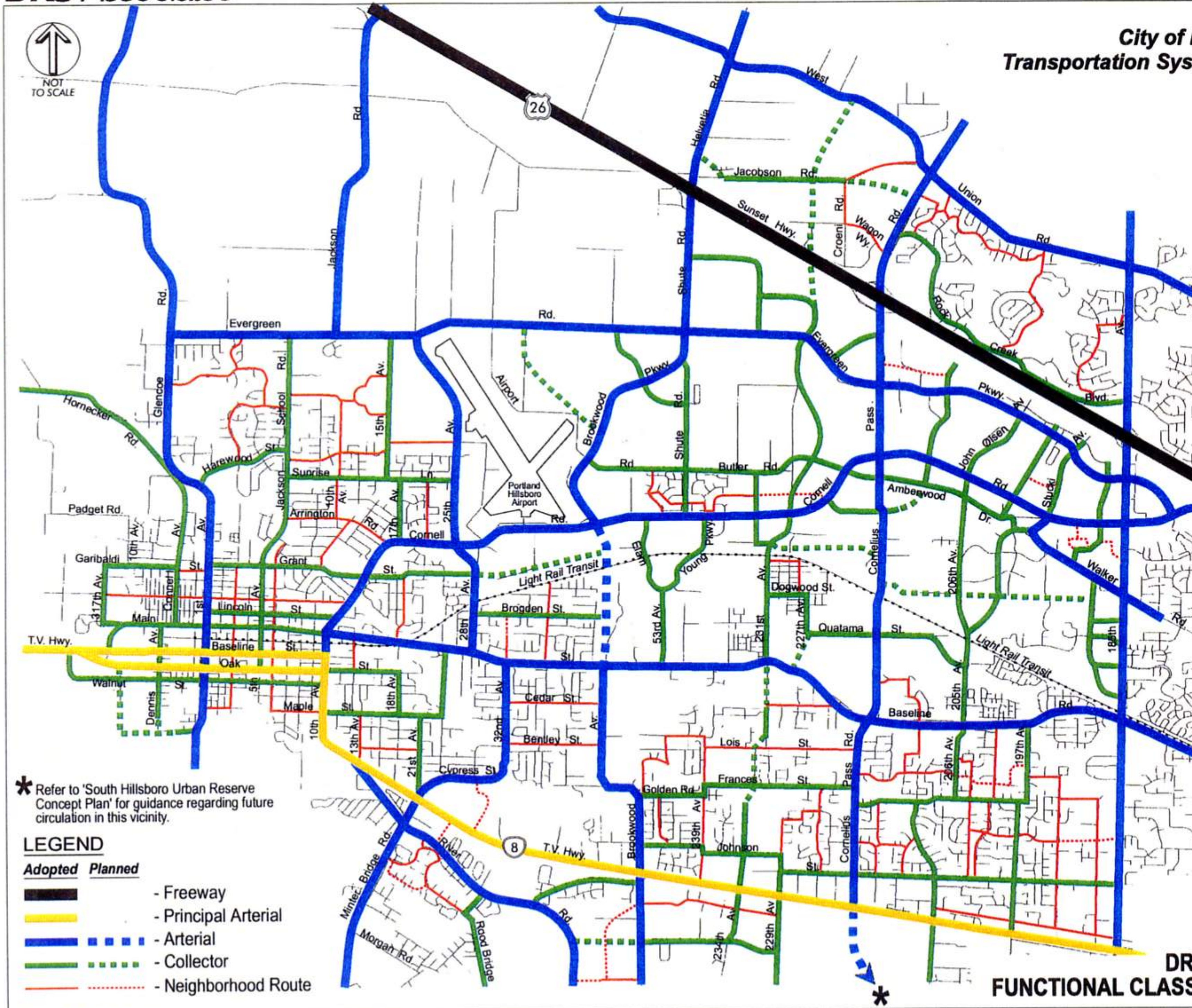
Principal Arterials are typically freeways and state highways that provide the highest level of connectivity. These routes connect over the longest distance (sometimes miles long) and are less frequent than other arterials or collectors. These highways generally span several jurisdictions and many times have statewide importance (as defined in the ODOT Level of Importance categorization)[4]

[3] Including definition of which routes connect through Hillsboro, within Hillsboro and which routes serve neighborhoods and the local level in the city.

[4] Oregon Highway Plan, ODOT, 1991, Appendix A.

DKS Associates

City of Hillsboro
Transportation System Plan



* Refer to 'South Hillsboro Urban Reserve Concept Plan' for guidance regarding future circulation in this vicinity.

LEGEND

Adopted	*Planned*	
		- Freeway
		- Principal Arterial
		- Arterial
		- Collector
		- Neighborhood Route

Figure 8-3
DRAFT HILLSBORO FUNCTIONAL CLASSIFICATION PLAN

Arterial streets serve to interconnect and support the principal arterial highway system. These streets link major commercial, residential, industrial and institutional areas. Arterial streets are typically spaced about one mile apart to assure accessibility and reduce the incidence of traffic using collectors or local streets in lieu of a well placed Arterial Street. Many of these routes connect to cities surrounding Hillsboro.

Collector streets provide both access and circulation within residential and commercial/industrial areas. Collectors differ from arterials in that they provide more of a citywide circulation function, do not require as extensive control of access and penetrate residential neighborhoods, distributing trips from the neighborhood and local street system. Collectors typically link two or more arterial streets.

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

Local Streets have the sole function of providing access to immediate adjacent land. Local streets are not designed to accommodate "through traffic" movements.

Functional Classification Changes

The proposed functional classification differs from the existing approved functional classification. Neighborhood routes were not defined in the existing functional classification. The prior system added major and minor classifications to arterials and collectors. These designations are removed since they define more of the design and demand (which are outcomes of function and land use) of a route, but not its function. The proposed functional classification was developed following detailed review of Hillsboro's, Washington County and Metro's existing and current proposals for functional classification. Table 8-1 summarizes the major differences between the proposed functional classification and the existing designations in Hillsboro. This table also outlines the streets, which were previously designated collectors that are now identified as neighborhood routes.

Criteria for Determining Changes to Functional Classification

The criterion used to assess connectivity has two components: the extent of connectivity (as defined above) and the frequency of the facility type. Maps can be used to determine regional, city/district and neighborhood connections. The frequency or need for facilities of certain classifications is not routine or easy to package into a single criterion. While planning textbooks call for arterial spacing of a mile, collector spacing of a quarter to a half-mile, and neighborhood connections at an eighth to a sixteenth of

Table 8-1
Proposed Changes to Existing Roadway Classification

Roadway	Roadway Classification According to Jurisdiction			Proposed TSP
	Hillsboro	Washington County	Metro	
205th Avenue	Minor Arterial	Major Collector	Regional Collector	Collector
Shute Road (s/o Brookwood)	Minor Arterial	Minor Arterial	-	Collector
25th/28th/32nd/Cypress	Minor Arterial	Major Collector	Regional Collector	Arterial
Witch Hazel Road	Minor Arterial	Major Collector	Minor Arterial	Collector
Brookwood	-	-	-	Arterial
231st/234th Avenue Extension	Minor Arterial	Major Collector	Regional Collector	Collector

Changes from Collector designation to Neighborhood Route

Rogahn Street	Cedar Street
Griffin Oaks Street	Bentley Road
6th Avenue	239th Avenue
10th Avenue	Lois Street
Arrington Road	201st Avenue/203rd Avenue
Delsey Road	Stacey Street
Jackson Street	192nd Avenue
13th Avenue	Vista Street
Spruce Street	187th Avenue
37th Avenue	Alexander Street

a mile, this does not form the only basis for defining functional classification. Changes in land use, environmental issues or barriers, topographic constraints, and demand for facilities can change the frequency for routes of certain functional classifications. While spacing standards can be a guide, they must consider other features and potential long term uses in the area (some areas would not experience significant changes in demand, where others will). Linkages to regional centers, town centers and station areas are another consideration for addressing frequency of routes of a certain functional classification. Connectivity to these areas is important, whereas linkages that do not connect any of these centers could be classified as lower levels in the functional classification.

Characteristics of Streets for each Functional Classification

The design characteristics of streets in Hillsboro were developed to meet the function and demand for each facility type. Because the actual design of a roadway can vary from segment to segment due to adjacent land uses and demands, the objective was to define a system that allows standardization of key characteristics to provide consistency, but also to provide criteria for application that provides some flexibility, while meeting standards. Figures 8-4 to 8-7 depict sample street cross-sections and design criteria for arterials, collectors, neighborhood routes and local streets. Table 8-3 provides a summary of the key street characteristics and how they can be applied on a case by case basis. While these are not entirely consistent with the Metro urban design guidelines of streets, they provide the best match for the specific needs of Hillsboro.

The analysis of capacity and circulation needs for Hillsboro outlines several roadway cross sections. The most common are 2, 3 and 5 lanes wide. Where center left turn lanes are identified (3, 5 and 7 lane sections), the actual design of the street may include sections without center turn lanes (2, 4 and 6 lanes sections) or with median treatments, where feasible. The actual treatment will be determined within the design and public process for implementation of each project. The plan outlines requirements, which will be used in establishing right-of-way needs for the development review process. The right-of-way (ROW) requirements for arterial and collector streets on the Washington County system are 60 feet for the two lane streets, 74 feet for three lane streets, 98 feet for five lane streets and 122 feet for seven lane streets.

Wherever arterial or collectors cross each other, planning for additional right-of-way to accommodate turn lanes should be considered within 500 feet of the intersection. Figure 8-4 summarizes the Hillsboro streets, which are anticipated within the TSP planning horizon to require right-of-way for more than two lanes. Planning level right-of-way width requirements shall be determined utilizing Figures 8-5 through 8-8 (Sample Street Cross Sections, Required ROW Width) and Table 8-3 and the lane geometry outlined later in this chapter. The ROW requirements for arterial streets on the City of Hillsboro system are same as Washington County, i.e., 60 feet for two lane streets, 74 feet for three lane streets, 98 feet for five lane streets and 122 feet for seven lane streets. For collector streets on the City system, the ROW requirements are 60 feet for two lane streets, 70 feet for three lane streets and 90 feet for five lane streets.

These cross sections are provided for guiding discussions that will update the City of Hillsboro Engineering Design Manual. There is an on-going discussion at the regional level regarding street cross sections. Many of the major streets in Hillsboro are maintained and operated by Washington County or ODOT. Metro has specified Regional Street Design designations in their draft of the RTP[5]. These designations change over the length of the road. The City of Hillsboro will need to coordinate with Metro and Washington County to assure consistency in cross section planning as the County Transportation Plan and the Metro Regional Transportation Plan move forward. The designations are summarized below in Table 8-2. The Metro definitions for their designations are provided in the Technical Appendix.

Table 8-2
Metro Regional Street Design Designations

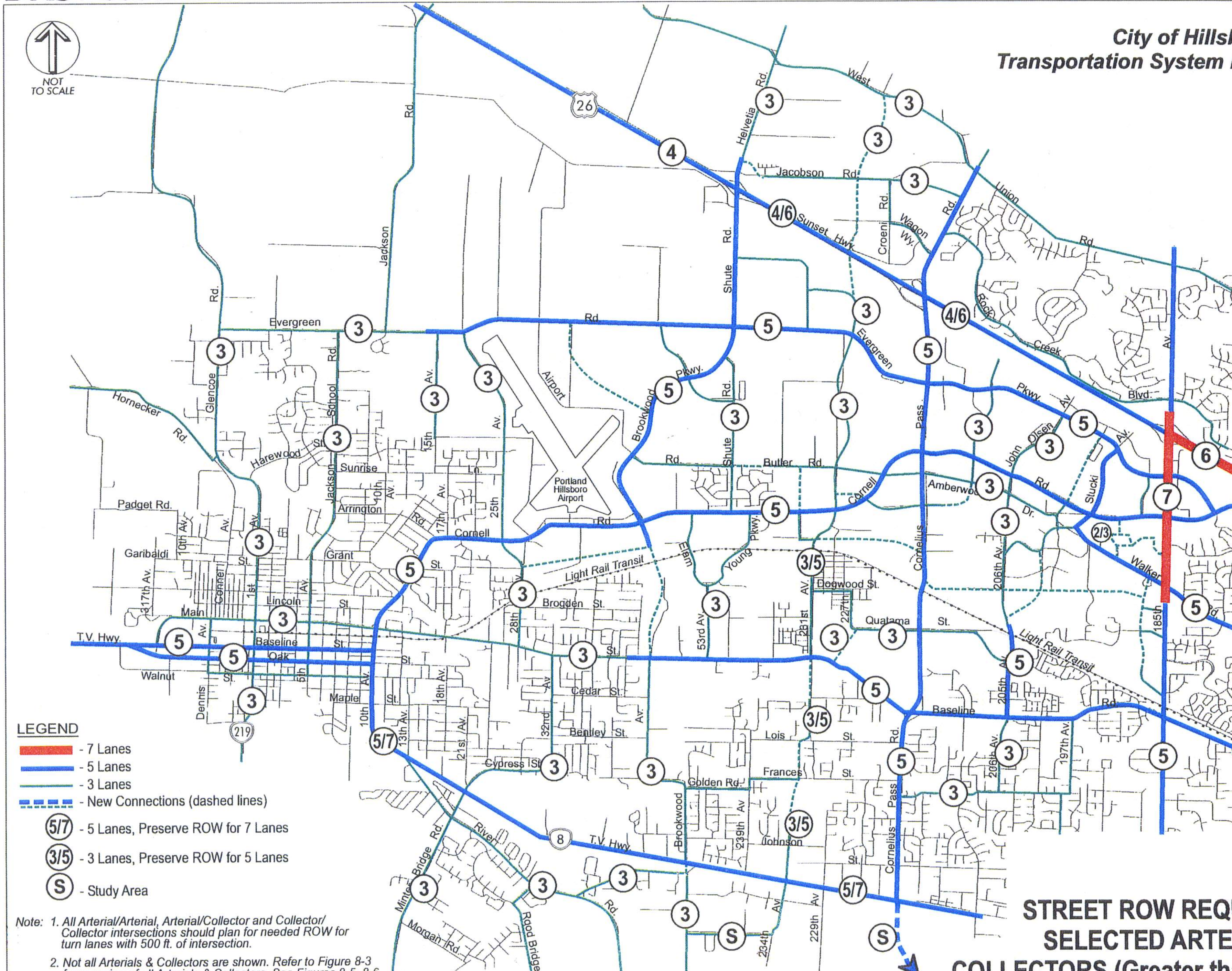
ROADWAY	DESIGNATION
TV Highway	Regional Street/Regional Boulevard
Cornell Road	Regional Street
Evergreen Road	Urban Road/Community Boulevard/Community Street
Baseline Road	Community Street/Community Boulevard
Jacobson Road	Urban Road
Glencoe/First Avenue	Community Street
25th Avenue	Urban Road
Shute/Brookwood	Urban Road
231st/229th/234th	Urban Road/Community Boulevard/Community Street
Cornelius Pass Road	Urban Road/Regional Street
John Olsen/206th-205th	Urban Road/Regional Street
185th Avenue	Regional Street/Regional Boulevard
Walker Road/Stucki Avenue	Urban Road/Community Street
River Road	Community Street

NOTE: Refer to Metro's RTP Policy Chapter for background on guidelines for streets, 1997.

[5] Refer to Regional Street Design, RTP and 2040 planning for maps and descriptions, Metro, Draft 3.0, July 2, 1997. Adopted in Regional Framework Plan, Metro, Ordinance 96-647C, November 1996.

DKS Associates

City of Hillsboro
Transportation System Plan



LEGEND

- 7 Lanes
- 5 Lanes
- 3 Lanes
- New Connections (dashed lines)

(5/7) - 5 Lanes, Preserve ROW for 7 Lanes

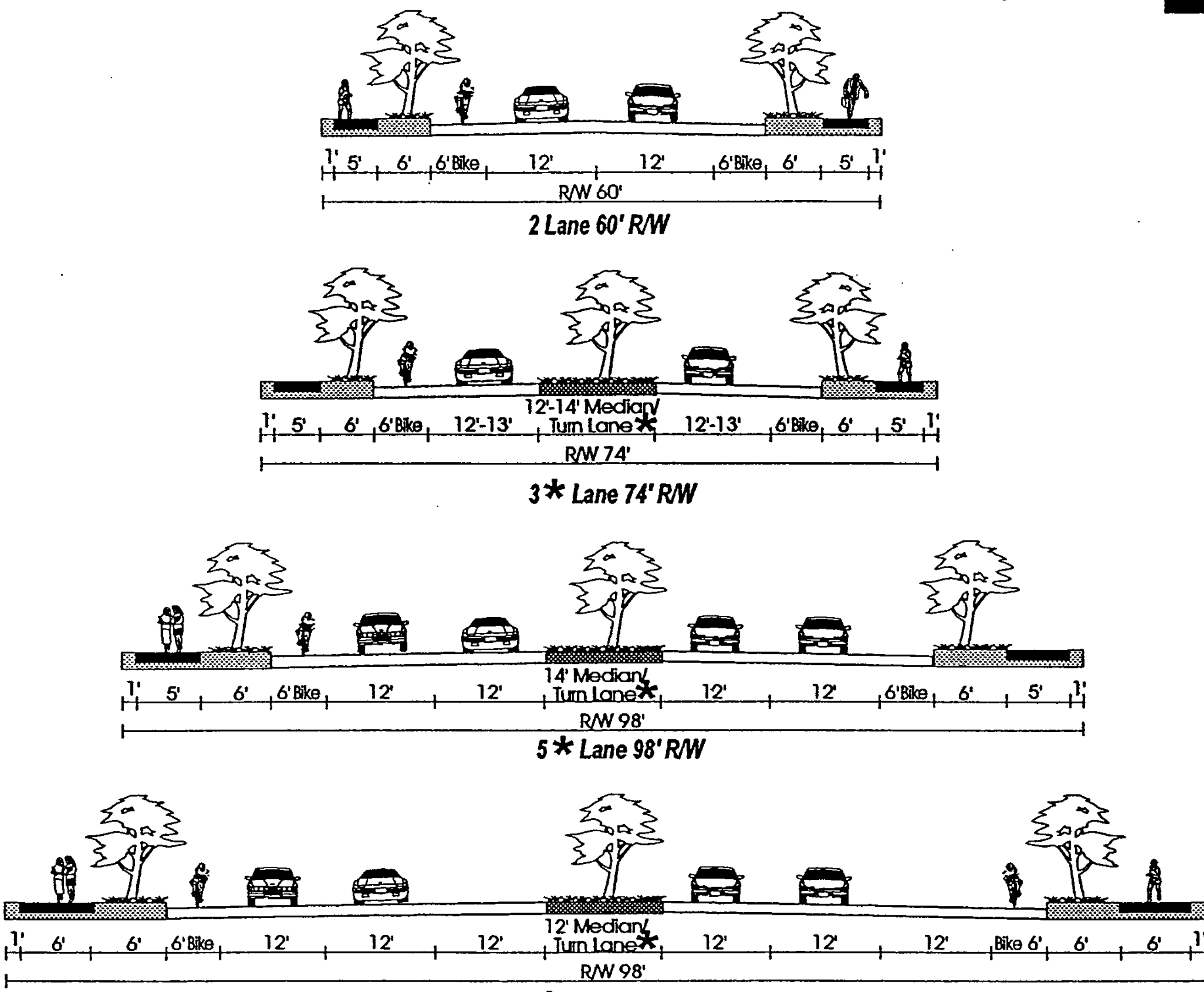
(3/5) - 3 Lanes, Preserve ROW for 5 Lanes

(S) - Study Area

Note: 1. *All Arterial/Arterial, Arterial/Collector and Collector/Collector intersections should plan for needed ROW for turn lanes with 500 ft. of intersection.*

2. *Not all Arterials & Collectors are shown. Refer to Figure 8-3 for mapping of all Arterials & Collectors. See Figures 8-5, 8-6, 8-7 and 8-8 for ROW of all streets.*

Figure 8-4
STREET ROW REQUIRED FOR SELECTED ARTERIALS AND COLLECTORS (Greater than 2 Lanes)



7* Lane 122' R/W

List

- Glencoe Road/1st Avenue
- Jackson School Road (North of Evergreen)
- 28th Avenue/25th Avenue
- Minter Bridge Road/Cypress Street/32nd Avenue
- Brookwood Parkway
- Shute Road (North of Brookwood)
- Helvetia Road
- Cornelius Pass Road
- 185th Avenue
- West Union Road
- Evergreen Road/Parkway
- Cornell Road
- Walker Road
- Baseline Road
- Baseline Street
- Oak Street
- TV Highway/10th Avenue
- River Road

Notes:

1. Space between curb and median minimum 19' with mountable curb design (to be coordinated with Fire Department).
2. Selection of placement of sidewalk and planter specific to application. Cross sections show choices for reference.
3. Width of curb is included in sidewalk or planter strip width when adjacent to street.
4. Samples show the desirable applications given number of lanes; minimum standards can be applied case by case.
5. Actual width of street and sidewalk area can be adjusted within R/W based on modal priorities and adjacent land use.
6. Typically 1' is provided from R/W line to edge of concrete surface (for maintenance/utilities).

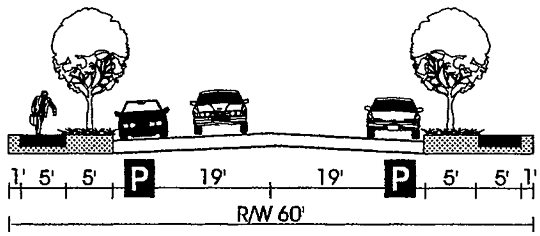
* Note that, sidewalk widths above 6 ft. may require additional right-of-way. Where appropriate, the median/lane may not be provided resulting in 2,4 and 6 lane cross sections. The removal of the center turn lane must consider both safety and pedestrian needs.

Criteria

Vehicle Lane Widths: (minimum widths)	Truck Route = 12 ft. Bus Route = 12 ft. 11 ft. (12 ft. Preferred)
On Street Parking:	None (with few existing exceptions)
Bicycle Lanes: (minimum widths)	New Construction = 6 ft. Reconstruction = 5 to 6 ft.
Sidewalks: (minimum width)	5-13 ft. Consider Curb Extensions on Ped Routes
Landscape Strips:	Required
Medians:	5/7 Lane = Required 3 Lane = Optional
Neighborhood Traffic Management:	Only Under Special Conditions: Selected Measures

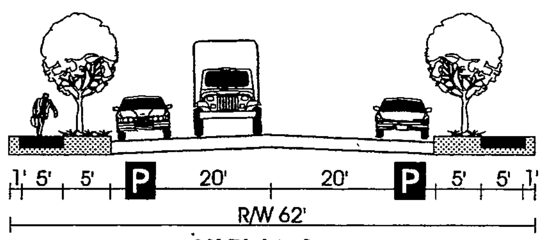
Figure 8-5
ARTERIAL
SAMPLE STREET CROSS SECTIONS
REQUIRED ROW WIDTH

38' Standard Commercial



60' Right-of-way

40' Standard Industrial



62' Right-of-way

Notes:

1. These cross sections apply where fronting adjacent land uses are commercial or industrial and are not designated arterial or collector streets.
2. The wider right-of-way standard will apply where adjacent land uses vary.
3. Width of curb is included in planter strip width.
4. Samples show the desirable applications given number of lanes; minimum standards can be applied case by case.
5. Actual width of sidewalk may be adjusted to meet modal priorities of adjacent land use. Sidewalk widths above 10 feet require additional R/W.

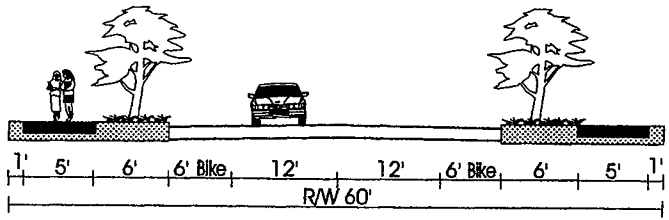
Criteria

Vehicle Lane Widths: (minimum widths)	11 ft.
On-Street Parking:	
Commercial	8 ft.
Industrial	8 ft.
Sidewalks: (minimum width)	5 ft.
Landscape Strips:	
Commercial	Required
Industrial	Urban street trees or strip required

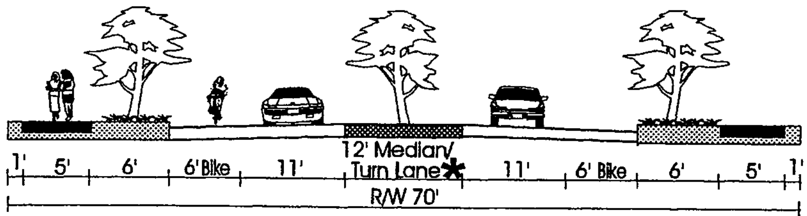
Legend

P - On-street Parking Lane

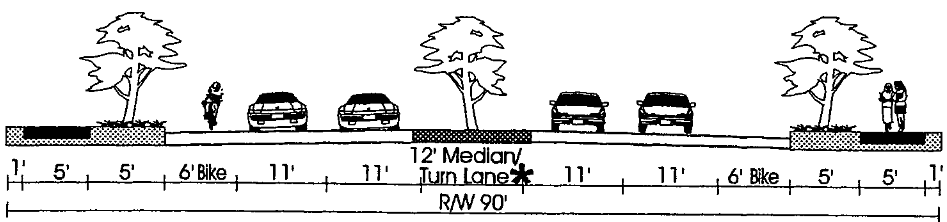
Figure 8-5a
COMMERCIAL/INDUSTRIAL SAMPLE STREET CROSS SECTIONS REQUIRED ROW WIDTH



2 Lane 60' R/W



3* Lane 70' R/W



5* Lane 90' R/W

List

- Jacobson Road
- Rock Creek Boulevard
- Shute Road (South of Brookwood)
- Butler Road
- 231st Avenue
- NE Orenco Station Prkwy
- Aloclek Place
- Amberwood Drive
- John Olsen Avenue
- 206th Avenue
- 205th Avenue
- Stucki Avenue
- 188th Avenue
- Elam Young Parkway
- 53rd Avenue
- Dogwood Street/227th Avenue
- Quatama Street
- East - West Connector
- Salix Extension
- Hornecker Road/Connell Avenue
- Garibaldi Street
- 317th Avenue
- Walnut Street
- Main Street
- Lincoln Street
- Grant Street
- Harewood Street
- Jackson School Road (South of Evergreen)
- 15th Avenue
- 17th Avenue
- Sunrise Lane
- Brogden Street
- Rood Bridge Road
- Witch Hazel Road
- Davis Road Connection
- 229th Avenue
- Johnson Street
- Golden Road
- Frances Street
- Rock Road
- 197th Avenue
- 198th Avenue
- Anthony Drive/209th Avenue
- Armco Avenue
- Wood Street
- Oak Street
- Maple Street
- 24th Avenue
- 21st Avenue
- Dennis Avenue
- 18th Avenue

Notes:

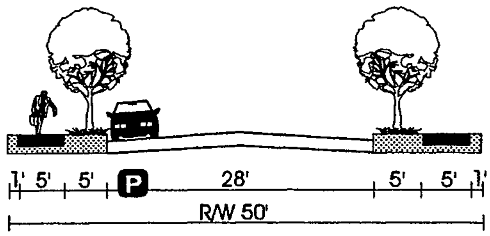
1. Space between curb and median minimum 19' with mountable curb design (to be coordinated with Fire Department).
2. Selection of placement of sidewalk and planter specific to application. Cross sections show two choices for reference.
3. Width of curb is included in sidewalk or planter strip width when adjacent to street.
4. Samples show the desirable applications given number of lanes; minimum standards can be applied case by case.
5. Actual width of street and sidewalk area can be adjusted within R/W based on modal priorities and adjacent land use.
6. Typically 1' is provided from R/W line to edge of concrete surface (for maintenance/utilities).
7. Encourage use of curb extensions at intersections in commercial areas and on any pedestrian routes.
8. For constrained settings, a three lane cross section can be developed in 44 feet (6 ft. bike lanes, 10 ft. travel lane, 12 ft. turn lane/median)

* Note that, where appropriate, the median/lane may not be provided resulting in 2 and 4 lane cross sections. The removal of the center turn lane must consider both safety and pedestrian needs. Reduced right-of-way between 64' - 69' can be considered through design exception (for example, station areas).

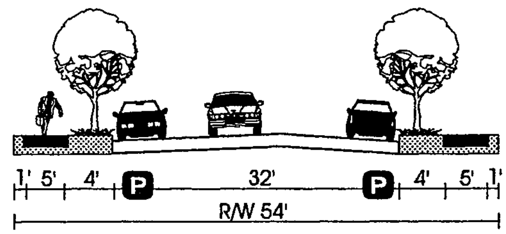
Criteria

Vehicle Lane Widths: (minimum)	11 ft. Preferred 10 ft. Minimum (adjacent to 6 ft. bike lane)
On Street Parking: (adds to right-of-way width)	Residential 7 ft. Commercial 8 ft.
Bicycle Lanes: (minimum widths)	New Construction = 6 ft. Reconstruction = 5 to 6 ft.
Sidewalks: (minimum width)	5 to 7 ft.
Landscape Strips:	Required
Medians:	3-Lane = Optional
Neighborhood Traffic Management:	Under Special Conditions

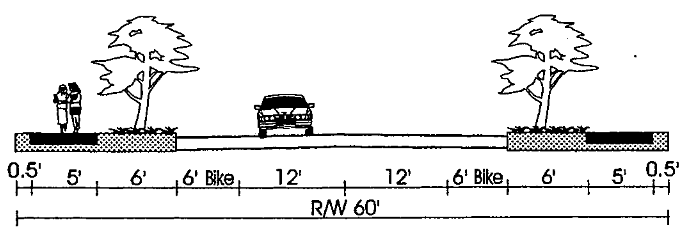
Figure 8-6
COLLECTOR
SAMPLE STREET CROSS SECTIONS
REQUIRED ROW WIDTH



No Parking on One Side



With Parking on Both Sides



With Bike Lanes / No Parking

Notes:

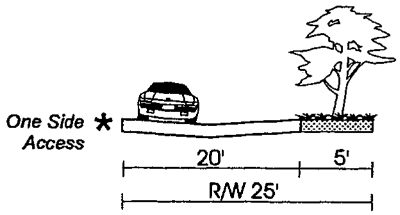
1. *Space between curb and median minimum 19' with mountable curb design (to be coordinated with Fire Department).*
2. *Selection of placement of sidewalk and planter specific to application. Cross sections show two choices for reference.*
3. *Width of curb is included in sidewalk or planter strip width when adjacent to street.*
4. *Samples show the desirable applications given number of lanes; minimum standards can be applied case by case.*
5. *Actual width of street and sidewalk area can be adjusted within R/W based on modal priorities and adjacent land use.*
6. *Typically 1' is provided from R/W line to edge of concrete surface (for maintenance/utilities).*
7. *These are guidelines for future neighborhood route development and does not require changes/conversion to existing streets.*

P - *On-street Parking*

Criteria

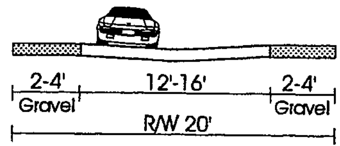
Vehicle Lane Widths: *(minimum widths)*	10 ft.
On-Street Parking	6 to 8 ft.
Curb Extensions for Pedestrians:	Consider on Pedestrian Routes
Sidewalks: *(minimum width)*	5 ft.
Landscape Strips:	Required
Neighborhood Traffic Management:	Appropriate when Warranted

Figure 8-7
NEIGHBORHOOD
SAMPLE STREET CROSS SECTIONS
REQUIRED ROW WIDTH



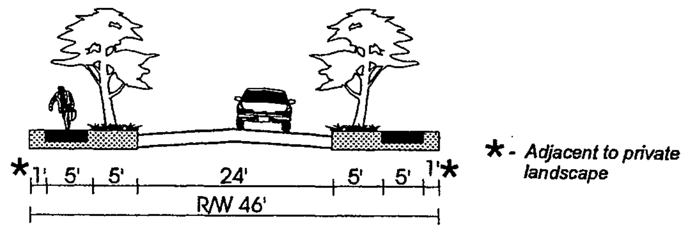
Alley

(No parking)



Alley

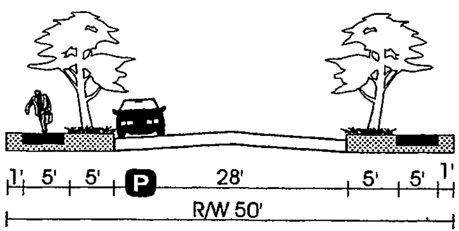
(No parking)



Cul-de-sac/Local Street

<250 vpd

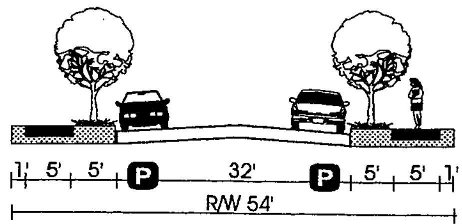
(No parking)



Local Street/Cul-de-sac

One Side On-street Parking

<1500 vpd



On-street Parking

>1500 vpd

If parking on both sides,
block length not to exceed 600 feet

Notes:

1. *Space between curb and median minimum 19' with mountable curb design (to be coordinated with Fire Department).*
2. *Selection of placement of sidewalk and planter specific to application. Cross sections show two choices for reference.*
3. *Width of curb is included in sidewalk or planter strip width when adjacent to street.*
4. *Samples show the desirable applications given number of lanes; minimum standards can be applied case by case.*
5. *Actual width of street and sidewalk area can be adjusted within R/W based on modal priorities and adjacent land use.*

Criteria

Vehicle Lane Widths: *(minimum widths)*	*9 to 10 ft.*
On-Street Parking	*6 to 7 ft.*
Sidewalks: *(minimum width)*	*5 ft.*
Landscape Strips:	*Required*
Neighborhood Traffic Management:	*Should not be necessary (under special conditions)*

P - *On-street Parking*

<1500 vpd - *Guide for Traffic Volume Per Day (does not require conversion of existing routes)*

Figure 8-8
ALLEY, CUL-DE-SAC AND LOCAL RESIDENTIAL STREET SAMPLE STREET CROSS SECTIONS REQUIRED ROW WIDTH

Table 8-3
Proposed Street Design Characteristics

Vehicle Lane Widths: (minimum widths)	Truck Route = 12 feet Bus Route = 11 feet Arterial = 12 feet Collector = 11 feet Neighborhood = 10 feet Local = 9[6] to 10 feet Turn Lane = 10 feet[7]
On-Street Parking:	Residential = 6 to 8 feet Commercial = 7 to 8 feet
Bicycle Lanes: (minimum widths)	New Construction = 6 feet Reconstruction = 5 to 6 feet
Curb Extensions for Pedestrians:	Consider on any Pedestrian Master Plan Route
Sidewalks: (minimum width)	Local = 5 feet[8] Neighborhood = 5 feet[8] Collector = 5 to 7[9] feet Arterial = 5 to 13[9] feet
Landscape Strips:	Residential/Neighborhood = Required[10] Collector/Arterial = Required[10]
Medians:	5-Lane = Required 3-Lane = Optional
Neighborhood Traffic Management:	Local = Should not be necessary (Under Special Conditions) Neighborhood = Should Consider Collectors = Under Special Conditions Arterials = Only under Special Conditions: Selected Measures
Transit:	Arterial/collectors = Appropriate Neighborhood = Only in special circumstances
Turn Lanes:	When Warranted[11]
Access Control:	Goal 3, Policy 8

[6] 9-foot lanes would only be used in conjunction with on-street parking.

[7] Desirable 12 feet for arterial streets and bus and truck routes.

[8] 5 foot with landscape strip, 6 foot against curb.

[9] Larger sidewalks than minimums should be considered for areas with significant pedestrian volumes. In commercial areas where pedestrian flows of over 100 pedestrians an hour are present or forecast, specific analysis should be conducted to size sidewalks appropriately for safe movement.

[10] Landscape strips are required unless not practicable because of limited ROW widths, environmental constraints such as wetlands, tree conservation or topography (steep slopes) as determined by the City Engineer.

[11] Turn lane warrants should be reviewed using Highway Research Record, No. 211, NCHRP Report No. 279 or other updated/superseding reference.

Connectivity/Local Street Plan

There are a number of locations in Hillsboro where, due to the lack of connection points, the majority of neighborhood traffic is funneled onto one single street. This type of street network results in out-of-direction travel for motorists and an imbalance of traffic volumes that impacts residential frontage. By providing connectivity between neighborhoods, out-of-direction travel and vehicle miles traveled (VMT) can be reduced, accessibility between various modes can be enhanced and traffic levels can be balanced between various streets. Several goals and policies established by this TSP are intended to accomplish these objectives.

In Hillsboro, some of these local connections can contribute with other street improvements to mitigate capacity deficiencies by better dispersing traffic. For example, the neighborhood areas surrounding Cornell Road and Cornelius Pass Road and the area near Stucki Avenue are benefited by improved connectivity.

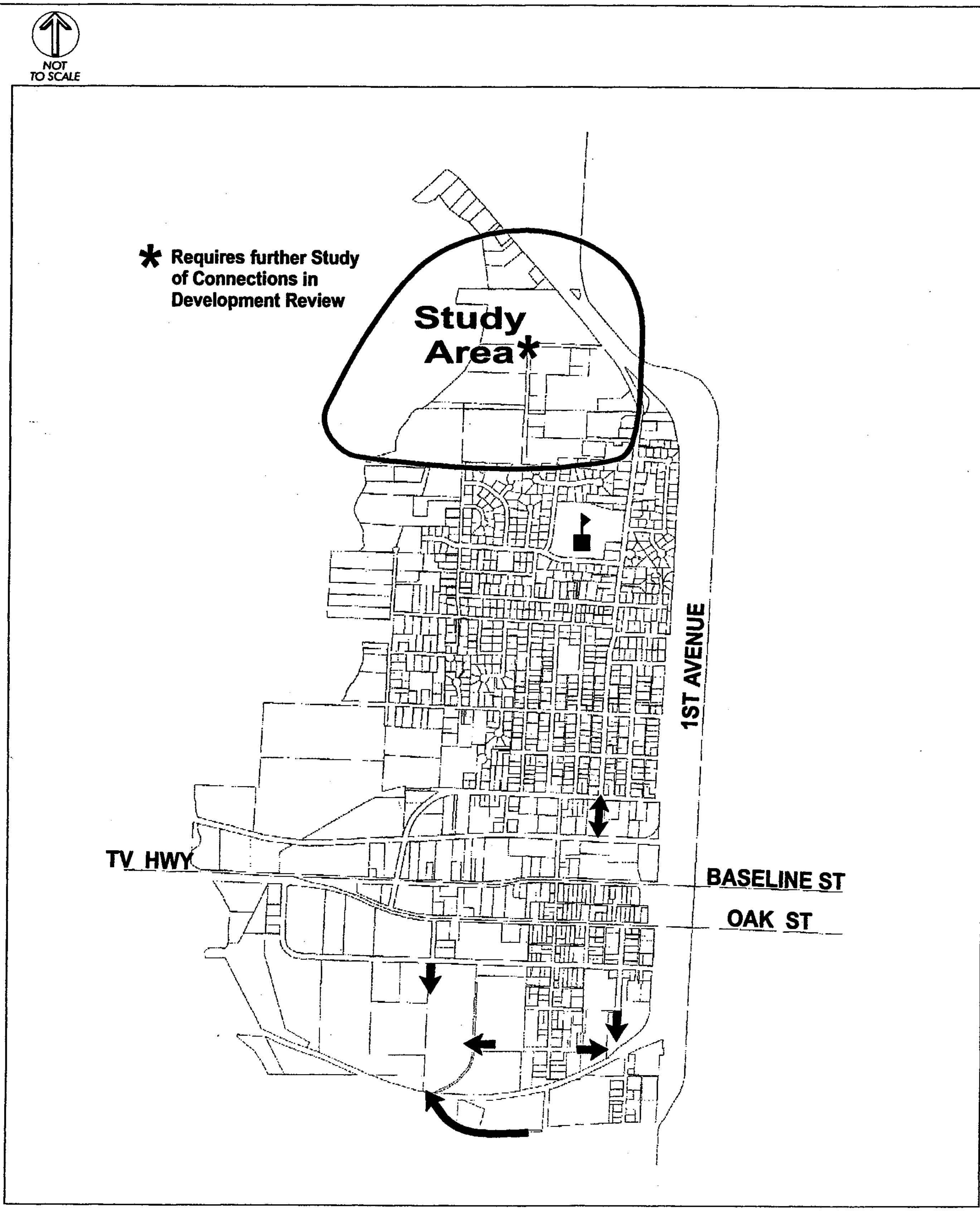
Several roadway connections will be needed within neighborhood areas to reduce out of direction travel for vehicles, pedestrians and bicyclists. The proposed Functional Classification map (Figure 8-3) shows several neighborhood routes through currently undeveloped areas and indicates desired connection points to arterial or collector roadways. In most cases, the connector alignments are not specific and are aimed at reducing potential neighborhood traffic impacts by better balancing traffic flows on neighborhood routes. These local connections shown on Figures 8-9 to 8-16 (representing the City of Hillsboro neighborhood districts) are specified. The arrows shown in the figures represent potential connections and the general direction for the placement of the connection. In each case, street alignments and design will be determined upon review of specific developments. The criteria used for providing connections is as follows:

- Every 300 to 500 foot grid for pedestrians and bicycles
- Every 1,000 foot grid for automobiles

To protect existing neighborhoods from potential traffic impacts of extending stub end streets, connector roadways could in some cases incorporate neighborhood traffic management into their design and construction. Neighborhood traffic management is described later in this chapter.

The arrows shown on the local connectivity figures indicate priority connections only. Other stub end streets in the City's road network may become cul-de-sacs, extended cul-de-sacs or provide local connections. Connections from these stub end streets could be deemed appropriate and beneficial to the public, as future development occurs. The goal would continue to be improved city connectivity for all modes of transportation.

DKS *Associates*



LEGEND

- Stub End Street
- School Site

Figure 8-9
LOCAL STREET CONNECTIVITY
West Hillsboro

DKS Associates

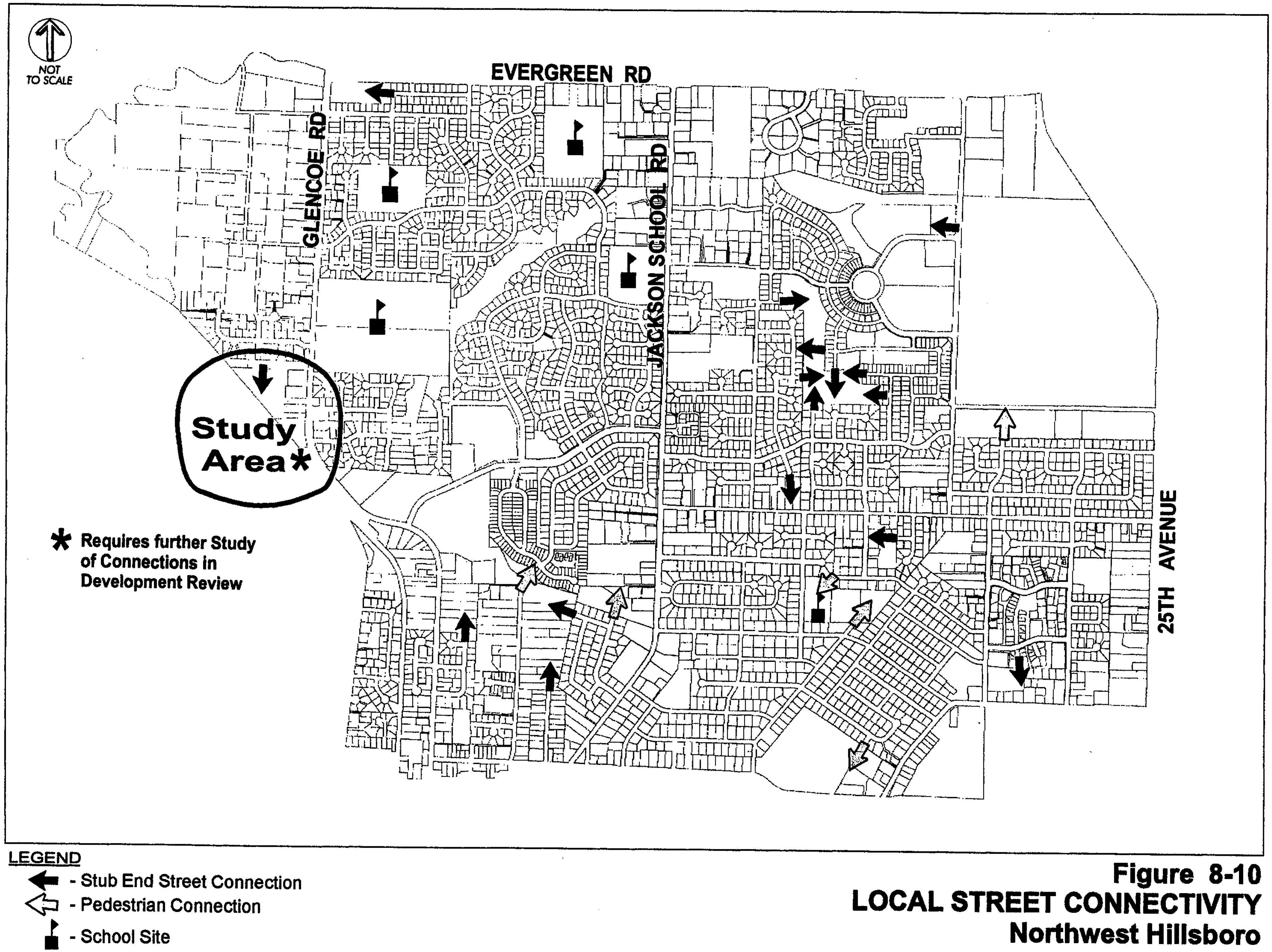


Figure 8-10
LOCAL STREET CONNECTIVITY
Northwest Hillsboro

DKS Associates

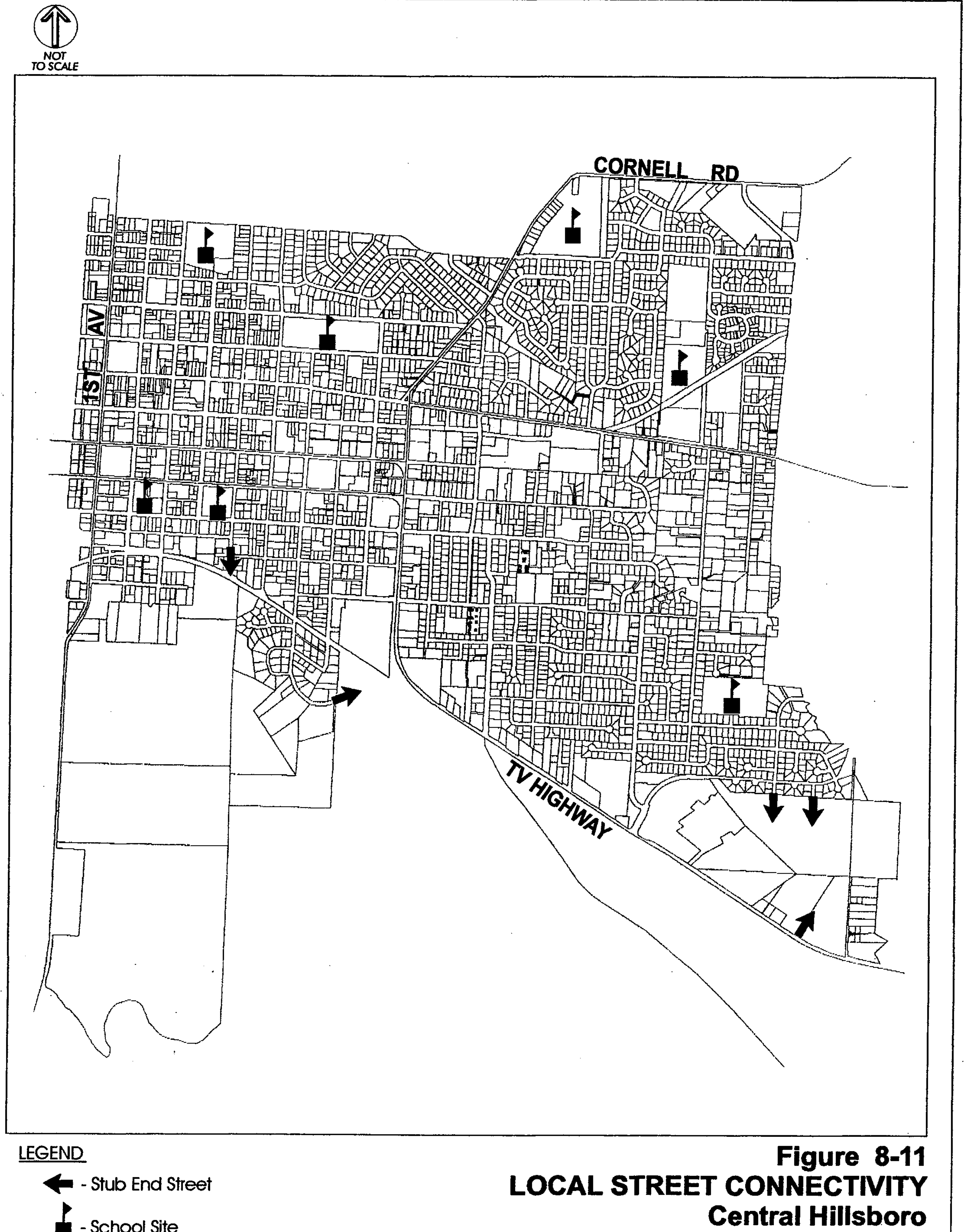
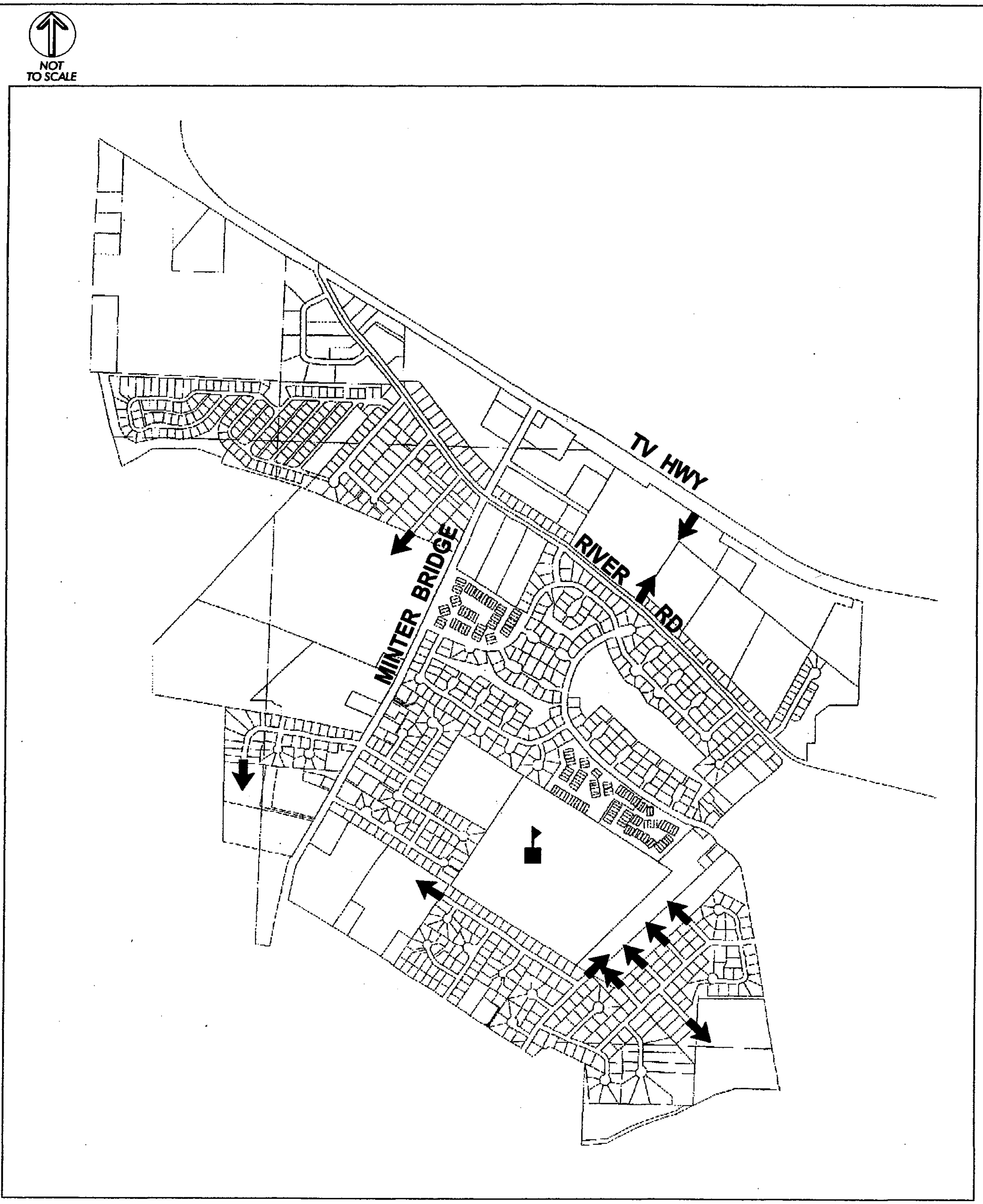


Figure 8-11
LOCAL STREET CONNECTIVITY
Central Hillsboro

DKS Associates

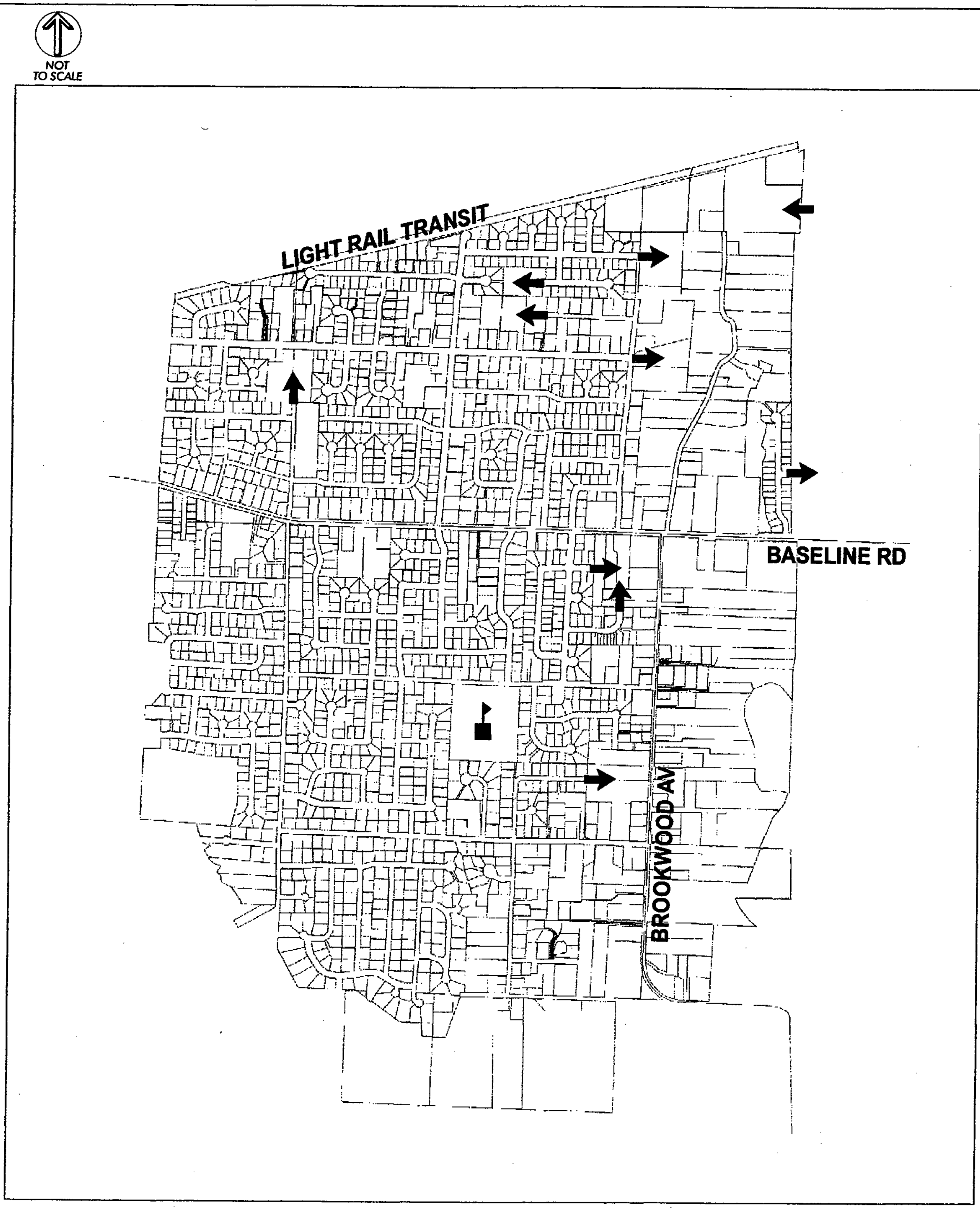


LEGEND

- Stub End Street

- School Site

Figure 8-12
LOCAL STREET CONNECTIVITY
South Hillsboro

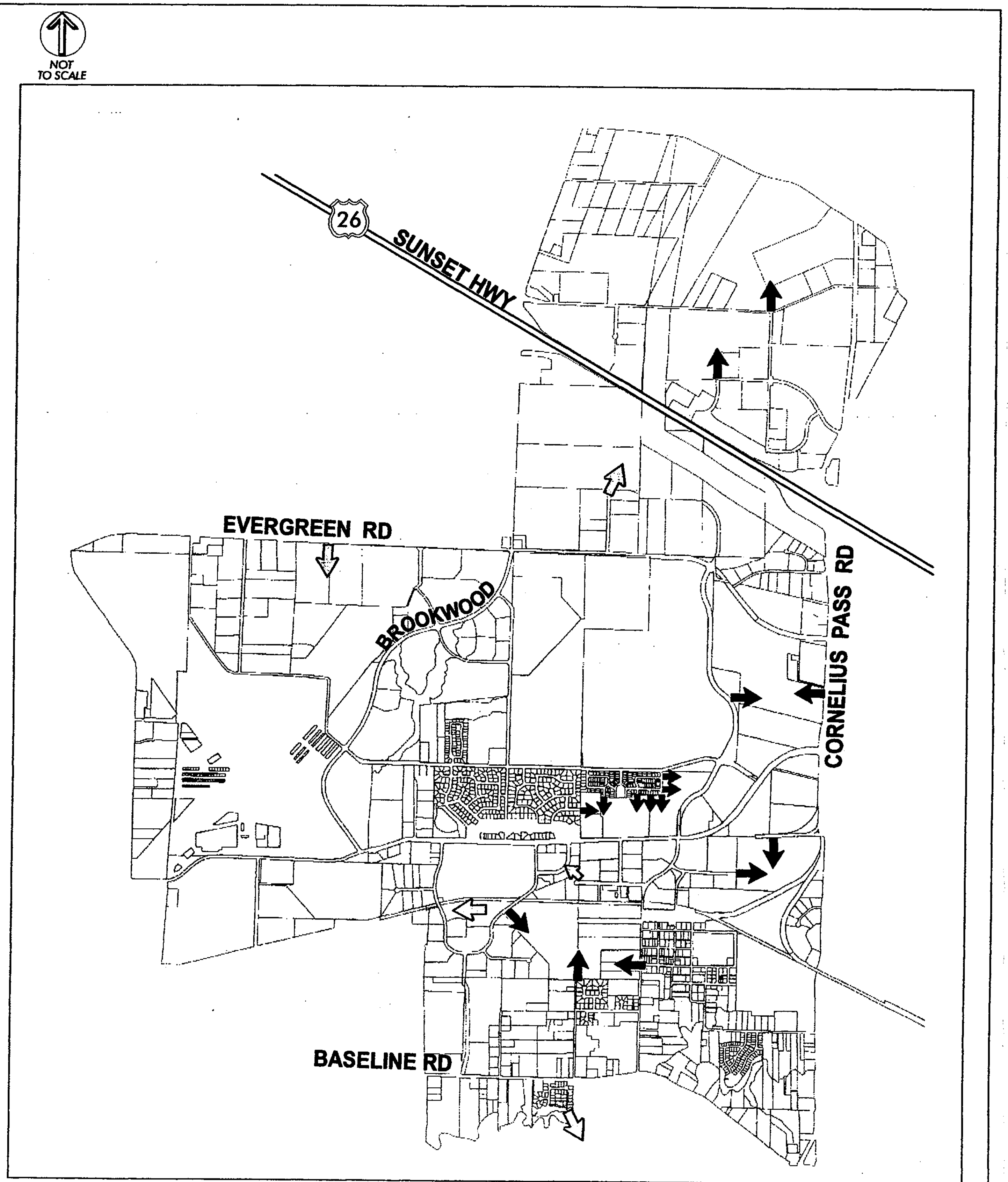


LEGEND

- Stub End Street
- School Site

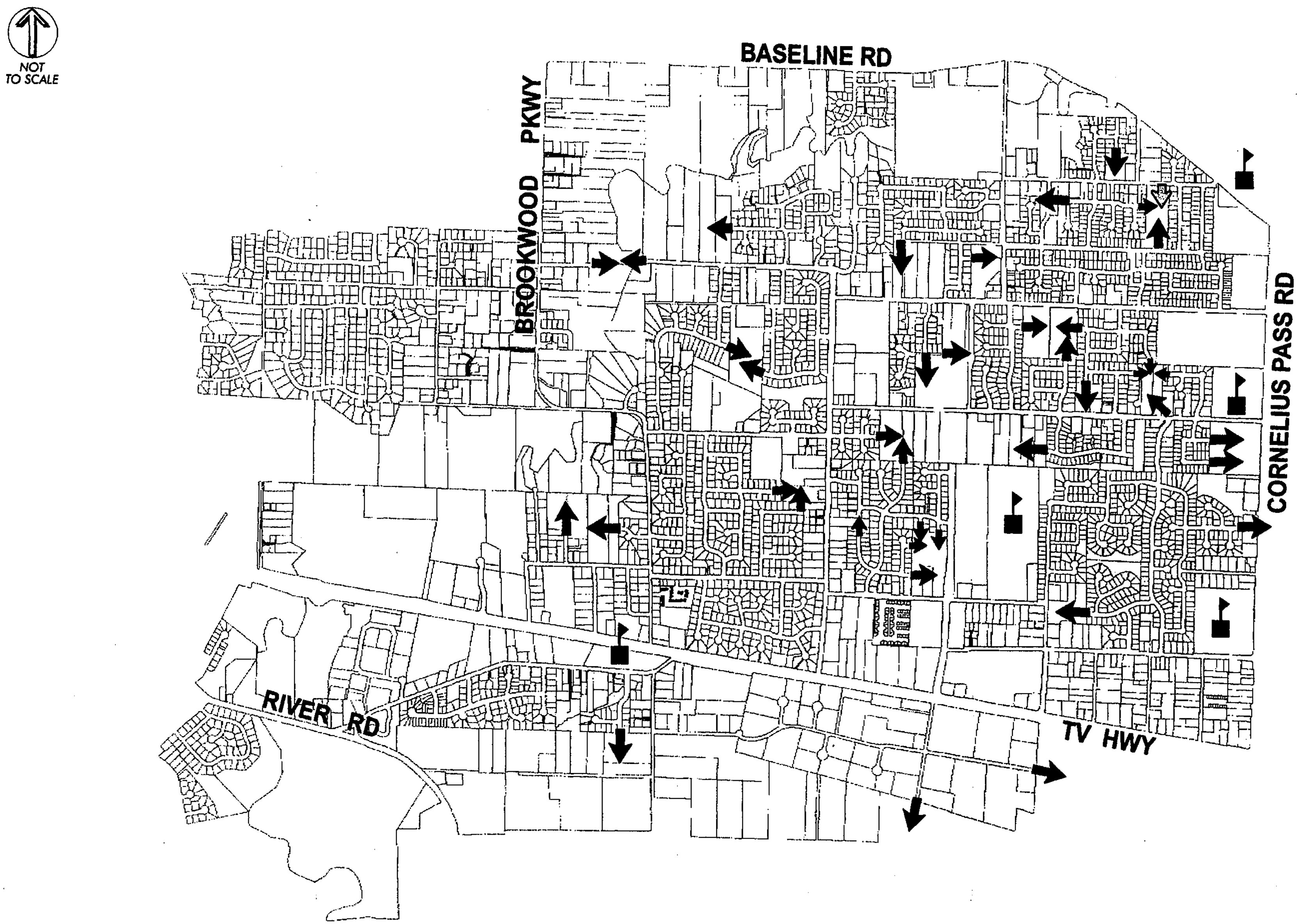
Figure 8-13
LOCAL STREET CONNECTIVITY
Brookwood

DKS Associates



LEGEND
- Stub End Street Connection
- Pedestrian Connection
- School Site

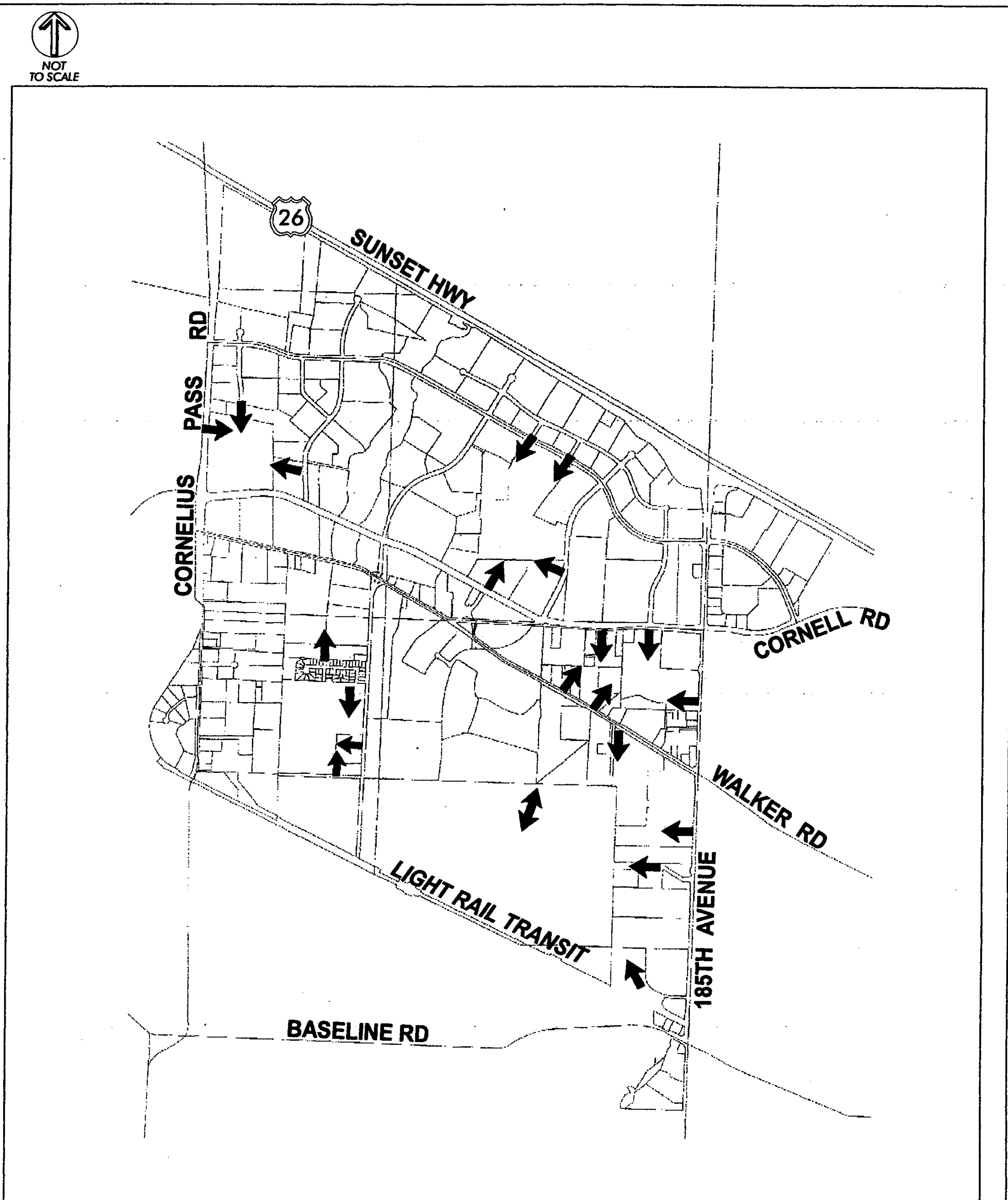
Figure 8-14
LOCAL STREET CONNECTIVITY
Northeast Hillsboro



LEGEND
- Stub End Street
- Pedestrian Connection
- School Site

Figure 8-15
LOCAL STREET CONNECTIVITY
Southeast Hillsboro

DKS Associates



LEGEND

- Stub End Street

- School Site

Figure 8-16
LOCAL STREET CONNECTIVITY
East Hillsboro

CIRCULATION AND CAPACITY NEEDS

The motor vehicle capacity and circulation needs in Hillsboro were determined for existing and future conditions. The process used for analysis is outlined below, followed by the findings and recommendations of the analysis. The extent and nature of the street improvements for Hillsboro are significant. This section outlines the type of street improvements that would be necessary as part of a long range master plan. Phasing of implementation will be necessary since all the improvements cannot be done at once. This will require prioritization of projects and periodic updating to reflect current needs. Most importantly, it should be understood that the improvements outlined in the following section are a guide to managing growth in Hillsboro, defining the types of right-of-way and street needs that will be required as development occurs.

Approach

Existing conditions were identified in Chapter 3. Future capacity needs were developed using a detailed travel demand forecast tool, based on the Metro regional travel demand model. This detailed model more accurately reflects access and land use in Hillsboro than the regional travel demand model. Evening peak hour traffic volumes were forecast for the future (year 2015) scenario for the Hillsboro area. This 2015 forecast included the Westside LRT and the highest level of transit service given regional funding constraints[12]. It assumes that Transportation Demand Management (TDM) will occur and that significant shifts to transit will occur (from existing levels at 1 to 3 percent of total person trips to 8 to 15 percent in LRT station areas). The initial 2015 test was performed on a street network similar to today's system (without improvements). Problem areas were identified and alternative improvements were developed to address deficiencies. Performance was evaluated using a three tiered assessment of capacity and operations.

- Demand to capacity ratios was evaluated on roadway segments and conditions where the demand to capacity ratio exceeded 1.0. Potential improvement alternatives were then evaluated.

- Intersection level data were developed for over 60 intersections in Hillsboro (based upon staff input, for primarily arterial and collector intersections). While this is a broad sampling of intersections, it does not represent every intersection in the City. Therefore, there may be other locations, which may require some mitigation. Alternative improvements were considered where level of service was at F or worse (Chapters 9 and 10 of the Highway Capacity Manual). Mitigated levels of service (LOS) were generally brought to the LOS D or E range for the 20-year planning assessment. Level of service D was considered desirable but not achievable at every location. The goal of mitigation was to obtain demand to capacity ratios of below 1.0, but mitigation typically was stopped if V/C ratios were slightly above 1.0 and feasibility of further improvement was considered questionable.

[12] This system assumes the Westside rail and all the feeder bus systems that support it. Other Westside bus service is provided also. The system design is essentially that which was put in place when the Westside rail opened this year, with better headways.

- Where improvements beyond the Metro Functional Plan desire of five lanes became apparent, the system level of service (arterial system rather than one intersection - looking at travel speed on a segment or system usually one to two miles) was initially tested to seek mitigation to LOS D (Chapter 11 of the Highway Capacity Manual).

Assessment of Need

Based upon the evaluation of intersection level of service, 54 of the study intersections operate at or worse than level of service E in the 2015 evening peak hour with no improvements (Figure 8-17). This compares with 5 intersections operating at these levels today. The impact of future growth (caused by nearly 60,000 additional trips in the evening peak hour in 2015 as compared to today) would be severe without significant investment in transportation improvements. Travel speeds would be below 5 MPH over long stretches of road (3 to 8-mile segments of roadways) resulting in unmanageable congestion. Poor performance on freeways and arterials would result in substantial impacts (added through traffic) to neighborhood and collector routes. The greatest problem areas can be grouped into the following areas:

- **Lack of east-west capacity.** The three key east-west routes (Cornell, Baseline and TV Highway) all experience significant congestion if improvements are not made.

- **Lack of US 26 interchange area capacity.** Interchange areas at 185th, Cornelius Pass, Shute and Jackson School all experience demands well in excess of capacity. A significant problem is the lack of any other crossings of US 26 other than at interchanges. Throughout Hillsboro there are no places to cross the freeways except at interchanges. This results in interchange areas not only serving freeway access needs, but through arterial traffic and local circulation. This results in congestion at interchanges.

- **Lack of north-south arterial capacity.** The eastern three north-south corridors (185th, Cornelius Pass and the new Brookwood alignment) all experience multiple intersection failures and segments with volumes well above capacity without improvements.

- **Lack of east-west capacity through the downtown area.** With the projected growth in the downtown regional center, demand leaving the downtown area exceeds capacity. While the core downtown appears to operate adequately, the fringes of the downtown experience congestion.

- **Lack of intersection turning capacity.** Many intersections experience LOS F conditions, not for need of through capacity, but the need for additional right or left turning capacity.

- **Lack of adequate means to cross arterials.** Traffic volumes increases are such that the ability to cross or access arterial/collector routes in the future is very difficult. Traffic signal control must be planned to allow adequate control for autos, bikes and pedestrians, while not resulting in disruption caused by placing signals at low priority locations, such as private site driveways, or at locations too close to existing traffic signals.

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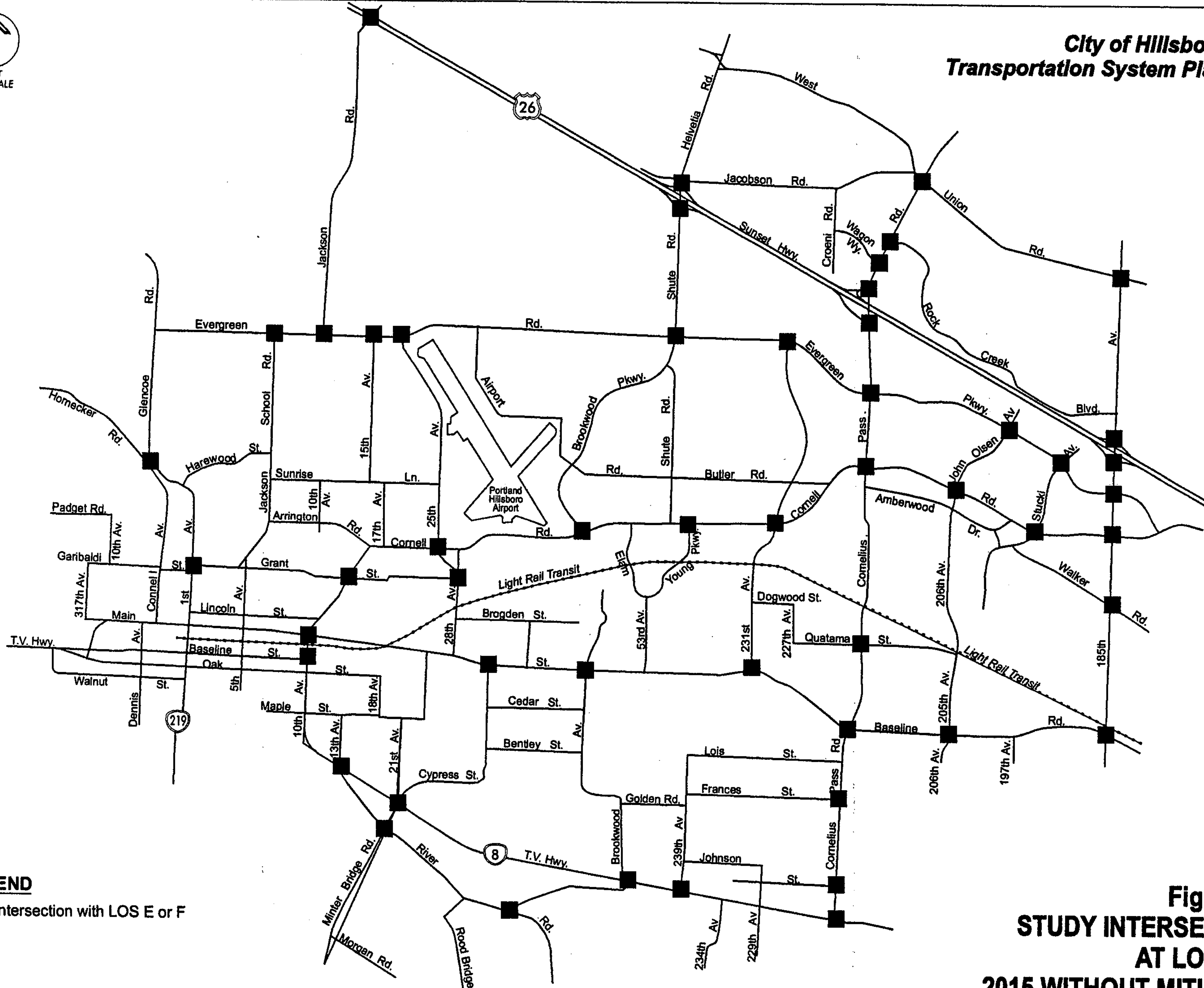

City of Hillsboro
Transportation System Plan

LEGEND

■ - Intersection with LOS E or F

Figure 8-17
STUDY INTERSECTIONS AT LOS E or F 2015 WITHOUT MITIGATION

Recommended Improvement Plan

To address these seven deficiencies, a series of alternatives and strategies were considered. The range of strategies includes:

- **Do nothing.** This results in severe impacts to motor vehicle and transit circulation in Hillsboro with delays, which would not be tolerable.

- **Assume that alternative modes can serve excess demand.** The TSP analysis assumed that alternative modes would be developed to their optimal levels. The order of magnitude of trips to be served in 2015 goes well beyond the capacity of the alternative mode systems by themselves, even at their optimal levels. The estimated growth in PM peak hour trips (over 60,000) far exceeds the capacity of the alternative modes by themselves to support this demand.

- **Build all the road capacity necessary to achieve level of service D conditions at intersections.** This strategy would result in nearly doubling the cost of the improvements identified in this plan. For example, many five-lane cross sections would need to become seven lanes.

- **Pragmatically add capacity to all modes, developing a balanced system. Outline the long-term configuration of streets to allow development to best accommodate needs. Allow LOS E at intersections and maintain system performance measures at LOS D.** This is the strategy that was pursued. It involves significant system improvements, but is the only alternative that balances performance between modes, consistent with regional policy.

The mitigation measures for the street system are outlined in a series of graphics and tables. Figure 8-18 outlines the street improvements, which are summarized in Table 8-4. Figure 8-19 locates the intersections where improvements will be needed and Table 8-5 summarizes the type of improvement identified. Each of the problem areas noted above have been addressed in the following manner:

East-West Capacity: Four primary improvements were defined for improving east-west capacity: 1) widening Baseline Road to five lanes from Brookwood to Beaverton is the most significant capacity increase; 2) developing an access control plan on TV Highway that stops new access and seeks to consolidate existing access in an effort to increase through capacity; 3) completion of Evergreen Parkway as a 3/5 lane corridor through Hillsboro; and 4) developing a three lane collector route along Butler/Amberwood Drive. TV Highway, Baseline and Cornell each have operational problems in the future. Strategies for east-west capacity focused on each route differently. For TV Highway, the only strategies that seemed to have positive impact were access control/ITS[13] signal coordination strategies to increase the route capacity by 10 to 15 percent. This would result in loss of access to individual parcels and consolidation/relocation of access points off TV Highway.

[13] Intelligent Transportation Systems

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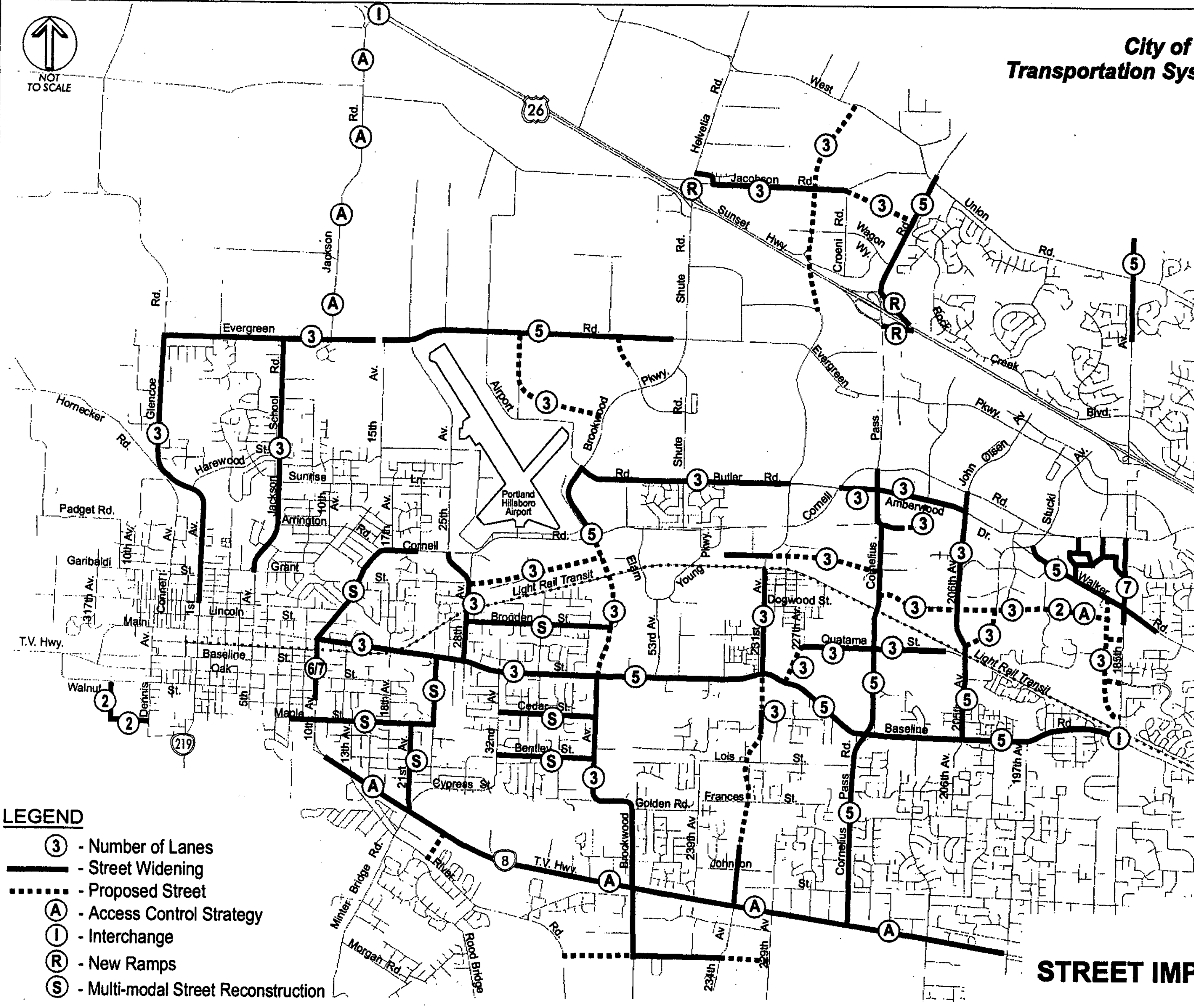
City of Hillsboro
Transportation System Plan



LEGEND

- ③ - Number of Lanes
- ▬▬ - Street Widening
- ▪▪▪▪▪▪ - Proposed Street
- Ⓐ - Access Control Strategy
- Ⓘ - Interchange
- Ⓡ - New Ramps
- Ⓢ - Multi-modal Street Reconstruction

Figure 8-18
STREET IMPROVEMENT PLAN

Table 8-4

Future Street Improvements

(All Projects include sidewalks, bicycle lanes and transit accommodations as required)

Location	Description	Status*
HIGHEST PRIORITY PROJECTS		
10th Avenue: Main to Baseline Street	Add right turn lane, widen sidewalk	RTP 726b
28th Avenue: Grant to Main	Widen to 3 lanes	RTP 726c
231st / 234th Avenue Extension	Extend south of Baseline to Century High School a 3 lane roadway	RTP 729a
Aloclek: Amberwood to Cornelius Pass	Extend 3 lane road	RTP 726d
Baseline Road: Lisa to Brookwood	Widen to 5 Lanes	RTP 715
Baseline Road: Lisa to 231st	Widen to 3 Lanes	RTP 714
Baseline Road: 231st to Brookwood	Widen to 3 Lanes	RTP 928
Brookwood Parkway: Airport to TV Hwy	Widen to 5 Lanes to past Cornell, extend south as 3 lanes	RTP 739/740
Cornelius Pass Road: US 26 to West Union	Widen to 5 Lanes	RTP 734
Cornelius Pass Road: Aloclek to Baseline	Widen to 5 Lanes	RTP 738
Cornelius Pass Road: Baseline to TV Hwy	Widen to 5 Lanes	RTP 737
Evergreen: Glencoe to 15th	Widen to 3 Lanes	RTP 731a
Evergreen: 15th to 253rd	Widen to 5 Lanes	RTP 732b
TV Highway/Cornell Signal Timing/System	Operational Improvements	RTP 646b/727/730
TV Highway Boulevard	Complete Boulevard Improvements	RTP 710a
TV Highway: Cornelius Pass to 209th	Improvement	STIP Planned
US 26/Jackson School Road	Channelization/Safety	RTP 711a
US 26 at 185th	Sound Walls	STIP Planned
Johnson at 198th	Traffic Signal	STIP Planned
SECOND HIGHEST PRIORITY PROJECTS		
1st Ave./Glencoe Road: Lincoln to Evergreen	Widen to 3 Lanes	RTP 712
185th Avenue: Westview to Springville	Widen to 5 Lanes	Not in Plans
205th Avenue: LRT to Baseline	Widen to 5 Lanes	RTP 729b
206th Avenue: Amberwood to LRT	Widen to 3 Lanes	Not in Plans
Amberglen Parkway: Walker to 206th	Extend 3 lane roadway	Not in Plans
Amberwood: 206th to Cornelius Pass	Widen to 3 Lanes	Not in Plans
Butler Road: 63rd to Brookwood/Airport	Widen and extend to 3 lane road	Not in Plans
Cornell: Arrington to Main	Widen to 5 Lanes	RTP 709b
Downtown Area Improvements: 1st and 10th Avenues	Signals, Striping, Widening, Two-way (see following discussion)	RTP 712b/726e-f
East-West Collector: Cornelius Pass to Salix	Extend 3 lane road	RTP 728
East-West Collector: Campus to Cornelius Pass	Extend 3 lane road	RTP 728
Jackson School Road: Evergreen to Grant	Widen to 3 Lanes	RTP 711b
Jacobson Road: Croeni to Cornelius Pass	Extend new 3 lane alignment	Not in Plans
Jacobson Road @ Helvetia	Realign intersection north of US 26	Not in Plans
Quatama Street: LRT to 227th Avenue	Widen/improve 3 lane road	RTP 707
Quatama Street: 227th Avenue to Baseline	Extend 3 lane road	RTP 707

Location	Description	Status*
Salix Extension: LRT to Walker	Extend 3 lane roadway	Not in Plans
Walker Road: Amberglen to 185th	Widen to 5 Lanes	RTP 754
Other Collector Reconstruction	Multiple Locations (see following sections)	Not in Plans
Intersections Improvements	Multiple Locations (see Table 8-5)	Not in Plans
Other Traffic Signals (16)	City/County operational enhancement	Not in Plans
US 26/Cornelius Pass Road	Build new diagonal ramps in NE & SE Quadrants. Add ramp meter storage.	RTP 735
US 26/Shute Road	New loop ramp and interchange modifications	US 26 Interchange Study
US 26/229th Overcrossing	Extend 229th from NW Bennett Ave. to West Union Rd. as 3 lane roadway	RTP 743 a + b
THIRD HIGHEST PRIORITY PROJECTS		
Airport Road: Evergreen to Brookwood	Realign and widen to 3 lanes	Not in Plans
Amberwood: Cornelius Pass to Cornell	Extend 3 lane road to Butler	Not in Plans
Baseline Road/185th Intersection	Upgrade Capacity/Grade Separation	Not in Plans
Brookwood Extension s/o TV Hwy	Extend 3 Lanes, realign Witch Hazel	Not in Plans
Cornelius Pass Road Extension	Extend 3 lane road south of TV Hwy to 209th	RTP 825d
Heritage: 185th to Salix	Extend 2 lane road	Not in Plans
Jackson School Road/US 26	Interchange	Not in Plans
Parr: 185th to Salix	Connect 3 lane road	Not in Plans
West of Rood Bridge: TV Hwy to River	Connecting 3 lane roadway	Not in Plans
TV Highway: Access Control	Driveway/Turn Lane modifications	RTP 645c
East-West Collector: Brookwood to 28th	Build new 3 lane road n/o LRT	Not in Plans
East-West Collector: River to 209th	Extend and widen to 3 lane road	Not in Plans
185th Avenue: Cornell to Walker	Widen to 7 Lanes	Not in Plans
188th Extension: Cornell to Walker	Extend 3 lane road	Not in Plans
US 26 Auxiliary Lanes: Shute to 185th	Add Auxiliary Lanes	Not in Plans
US 26/Glencoe Road	Interchange improvement/modernization	RTP 731a

All improvements are multi-modal including sidewalks and bicycle accommodations

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City of Hillsboro
Transportation System Plan

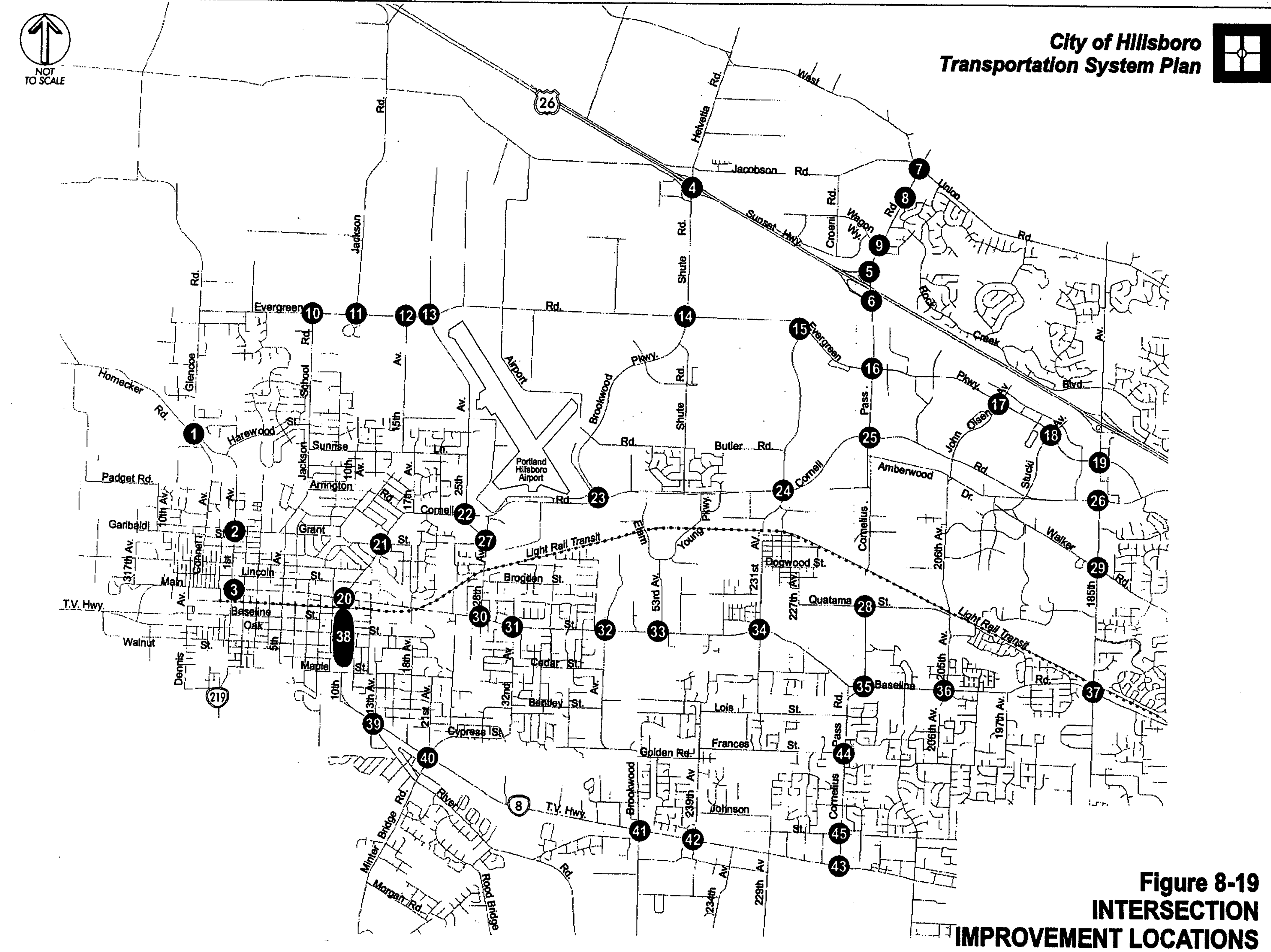


Figure 8-19
INTERSECTION
IMPROVEMENT LOCATIONS

Table 8-5
City of Hillsboro 2015 Intersection Improvements

No.	Intersection	Description
1	Glencoe Road/Hornecker Road	Install traffic signal; add SB right turn lane, NB left turn lane EB right turn lane
2	Glencoe Road-1st Street/Grant Street	Install traffic signal; Glencoe 3 Lanes
3	Main Street/1st Avenue/Lincoln Street	Add WB right turn lane (restripe - remove parking); signal modification/additions
4	US 26/Shute Road	Add 2nd NB thru & right turn lane + interchange study of future geometry
5	US 26/Cornelius Pass Road EB ramps	Add N/B to E/B diagonal ramp as a free movement
6	US 26/Cornelius Pass Road WB ramps	Add WB diagonal off-ramp
7	Cornelius Pass Road/West Union Road	Install traffic signal; add left turn lanes SB, EB, WB; add NB and EB RT lanes
8	Cornelius Pass Road/Jacobson	Install traffic signal; add SB right turn lane: Cornelius Pass 5 Lanes
9	Cornelius Pass Road/Wagon Way	Install traffic signal; Cornelius Pass 5 Lanes
10	Evergreen Road/Jackson School (east)	Install traffic signal; add SB right turn lane; Evergreen 3 Lanes; Connect W/B right turn lane with 5 lane section of Evergreen
11	Evergreen Road/Jackson School (west)	Install traffic signal; Evergreen 3 Lanes
12	Evergreen Road/15th Avenue	Install traffic signal; EB right turn lane; Evergreen 5 Lane section starts
13	Evergreen Road/25th Avenue	Provide second NB right turn lane, second WB left turn lane; Evergreen 5 Lanes
14	Evergreen Road/Shute-Brookwood Parkway	Add NB and SB right turn lanes
15	Evergreen Parkway/229th Avenue	Add NB and EB right turn lanes; use protected/permitted signals N/S
16	Evergreen Road/Cornelius Pass Road	Double left turn lanes on all approaches; add right turn lanes on all approaches
17	Evergreen Parkway/John Olsen Avenue	Install traffic signal
18	Evergreen Parkway/Stucki Avenue	Install traffic signal
19	Evergreen Parkway/185th Avenue	Add SB right turn lane; NB double left turn lanes
20	Cornell Road/10th/ East Main Street	Add NB right turn lane; add SB through lane
21	Cornell Road-10th Ave/Grant Street	Add EB left turn lane
22	Cornell Road/25th Avenue	NB + SB double lefts; add SB and EB right turn lanes
23	Cornell Road/Brookwood Parkway	Add second left turn lanes EB + WB; Add SB right turn lane
24	Cornell Road/231st - 229th Avenue	Add EB and SB right turn lanes; add WB 2nd left turn lane
25	Cornell Road/ Cornelius Pass Road	Add WB right turn lane; EB double left turn lanes
26	Cornell Road/185th Avenue	Add NB and SB double left turn lanes; add NB right turn lane; 185th 7 Lanes
27	Grant Street/'25th -28th Avenue	Install traffic signal; add WB left turn lane

No.	Intersection	Description
28	Quatama/Cornelius Pass	Install traffic signal; SB right turn lane, Quatama 3 Lanes
29	Walker Road/185th Avenue	Add double left turn lanes on all approaches; add WB right turn lane; 185th 7 Lanes
30	Baseline-East Main/28th Avenue	Install traffic signal; add WB right turn lane
31	Baseline-East Main/32nd Avenue	Widen Baseline Road to 5 lanes
32	Baseline Road/Brookwood Parkway	Widen Baseline Road to 5 lanes; add EB + SB right turn lanes; signal change
33	Baseline Road/53rd Avenue	Widen Baseline Road to 5 lanes
34	Baseline Road/231st Avenue	Widen Baseline Road to 5 lanes; extend 3 Lane 231st
35	Baseline Road/Cornelius Pass Road	Widen Cornelius Pass + Baseline Road to 5 lanes; right turn lanes all approaches
36	Baseline Road/205th-206th Avenue	Widen 205th + Baseline to 5 lanes; add EB and WB right turn lanes
37	Baseline Road/185th Avenue	Interchange or 185th 7 lanes with double lefts
38	Baseline Street/10th Avenue	Add SB right turn lane; NB double left turn; restripe for 2nd WB lane
39	TV Highway/13th Avenue-River Rd	Add EB right turn lane
40	TV Highway/Minter-Bridge Road	Add NB right turn lane; remove split traffic signal phasing
41	TV Highway/Brookwood Parkway	Extend Brookwood south 3 Lane ; traffic signal phasing; double left turns for NB and SB approaches; add NB, SB and EB right turn lanes; add WB left turn lane
42	TV Highway/239th Avenue	Traffic signal
43	TV Highway/Cornelius Pass Road	Add NB + SB double left turn lanes; add EB right turn lane
44	Frances Street/Cornelius Pass Road	Traffic signal; 5 lane Cornelius Pass
45	Johnson/Cornelius Pass Road	Traffic signal; 5 lane Cornelius Pass

Based upon information from the Beaverton TSP, the potential need for seven lanes on TV Highway corridor stops east of 185th Avenue. In the future as lands in the urban reserves are developed, it is recommended that a new east-west collector roadway be developed from 209th Avenue west to River Road, as this corridor can barely be mitigated with five lanes. Due to the regional nature of TV Highway (and the potential for UGB expansion), the best strategy for long range planning would be to preserve right-of-way along the TV Highway corridor for seven lanes (if eventually seven lanes was not determined to be needed, then an off-street bicycle lane could use the additional right of way due to the heavy traffic volumes). As for Baseline Road, a five-lane cross section is needed as planned from 185th Avenue to Brookwood Parkway. The area west of 28th Avenue would be constructed as three lanes. To maintain adequate capacity with five lanes, routes north of Baseline Road will need to be developed, such as Quatama Road (to Baseline east of Cornelius Pass Road). For Cornell Road, two options were previously tested in the Hillsboro LRT Station Area Studies: widening Cornell Road to seven lanes or developing alternative east-west roadways and connecting streets. These options were tested and confirmed in the TSP. The development of a new east-west collector roadway from Orenco to the Oregon Health Sciences University – West Campus, a link from Old Cornell Road to Butler Road, the extension of Aloclek Drive, and the completion of AmberGlen Parkway provide adequate mitigation with intersection improvements to produce acceptable operation with five lanes on Cornell Road.

Interchange Capacity: Three primary improvements were identified to mitigate the lack of interchange capacity through analysis of alternatives. They include:

- Added interchange lane capacity
- Added overcrossings of the US 26 freeway
- New and rebuilt interchanges (Jackson School Road, Cornelius Pass Road, Shute Road, Glencoe Road)

Each of the interchange locations in Hillsboro would fail in the future without improvement. Much of the problem at these locations is the concentration of freeway access, cross freeway circulation and through traffic all occurring in one location. Improvement alternatives included: widening all the north-south arterials (this was rejected due to the size of arterials, cost and lack of performance); new interchanges (this was rejected due to freeway access spacing requirements), adding freeway capacity (this did not solve the problem); and, adding new non-interchange crossings of US 26 along with intersection improvements at the freeway ramps. The last strategy was the most productive in mitigating the problems of increased north-south demand on the arterials at interchanges. Several overcrossing locations were preliminarily assessed. The overcrossings that had the most impact connected well north (to West Union) and south (to Cornell/Baseline) of US 26. The findings are summarized in the following matrix.

Alternative	Finding
Between Bethany and 185th Interchange: 173rd/174th Overcrossing	Attracts substantial traffic away from 185th Avenue. Future volume of the overcrossing is about 20,000 vehicle per day.
Between 185th and Cornelius Pass Interchange: John Olson Overcrossing	Attracts little traffic from 185th. Only about 3,000 to 6,000 vehicles per day. Does not link to West Union, which reduces its benefit.
Between Cornelius Pass and Shute Interchange: 235th Overcrossing	Attracts significant traffic away from both Cornelius Pass and Shute interchanges. Attracts about 12,000 to 16,000 vehicles per day. Requires coordination with multiple developing properties. Can link from West Union to 229th.
Between Shute and Jackson School	Attracts little traffic, outside UGB
Jackson School Road Interchange	This at-grade intersection has been studied previously by ODOT for an interchange. Future traffic demand would warrant interchange and improved safety/access control/capacity would benefit Shute interchange.

The recommendations for arterial capacity at US 26 include the following:

- Support Beaverton, Washington County and ODOT in development of a 173rd/174th Avenue overcrossing of US 26;
- Add turn lanes at US 26/185th Avenue ramp junction intersections;
- Rebuild Cornelius Pass Road interchange to include diagonal ramps in the NE and SE quadrants;
- Build a new north-south collector roadway from Evergreen Parkway to West Union Road in the vicinity of 229th Avenue. Link to 229th Avenue loop roadway north of Evergreen Parkway. Coordinate roadway development with adjacent developing parcels to complete the connection between 229th and West Union Roads.
- Modify US 26/Shute interchange including adding turn lanes, loop ramp and ramp grade modifications, or other operational enhancements;
- Build new diamond interchange at US 26/Jackson School Road. Jackson School would be a two-lane roadway, with turn lanes at the interchange. Full access control (no driveways or streets 1,000 feet north and south of the interchange) would be required. Interim or short term improvements may also be considered;
- Widen and modernize Glencoe Road interchange overcrossing and ramps;
- Complete study of future interchange needs in Hillsboro to refine specific implementation items. (Refer to Sunset Highway US 26 Interchange Study, City of Hillsboro/Washington County/ODOT, by DKS Associates, November 1998)

North-South Capacity: Four primary improvements were outlined to enhance north-south capacity.

1) Completion of the 231st /229th corridor from TV Highway, with linkage over US 26 acts to mitigate capacity deficiencies on Cornelius Pass Road.
2) Widening Cornelius Pass Road and the 205th/206th corridor (this helps 185th),
3) Completing the Brookwood/Shute corridor (this helps relieve congestion on 25th/28th Avenues),
4) Enhancing access to US 26 via Jackson School Road, allowing the balancing of traffic between multiple US 26 interchanges.

Future north-south demand on Cornelius Pass Road is well above capacity. Widening Cornelius Pass beyond five lanes was considered but intersections became very large with additional turn lane needs. A second alternative considered was the extension of 231st Avenue south from Baseline Road to TV Highway. Together with the extension of Brookwood Parkway and enhancements to the 205th/206th corridor, Cornelius Pass Road can operate at acceptable levels of services at five lanes with some turn lane modifications at intersections (rather than seven lanes). The 231st extension strategy is recommended. Even with the 173rd/174th overcrossing of US 26, the segment of 185th Avenue south of Cornell Road operates below acceptable standards. A two tiered strategy was considered for this problem. First, improved local and collector circulation near and around 185th was identified. Second, widening 185th to seven lanes from Cornell to Walker Road was considered (185th is seven lanes north of Cornell). A series of streets were tested including Salix extension from the LRT station north to Walker Road, a north-south route from Walker Road to 188th Avenue, a set of new east-west streets (a group of streets north of Walker and one south of Walker through Oregon Primate Research Center), and extension of 194th Avenue to Amberwood Drive. The local/collector road system has significant benefit to the overall circulation system and eliminates the need for consideration of seven lane 185th south of Walker Road; however, 185th from Walker north to Cornell could not be mitigated without the seven lane modification.

East-West Downtown Capacity: The lack of capacity on the fringe of the downtown area is a difficult problem to mitigate given the development pattern of the regional center. The capacity problem results from the combination of through east-west traffic movement on TV Highway and the future development of the downtown Hillsboro regional center. Key intersections on 1st and 10th Avenue would operate at deficient levels of service if no improvements were made. To better understand the traffic flow in downtown, a select link and simulation[14] analysis was performed of the key downtown access routes (Figure 8-20). The analysis of future traffic flow indicates that a substantial share (typically near 50%) of the traffic demand at the east and west gateways to downtown will be originating from destinations within the downtown regional center. With this understanding, several improvement alternatives were considered:

- Widening the Oak Street/Baseline Street couplet,
- Extending Evergreen Parkway to the south to link with TV Highway to the west,
- Creating a 9th/10th Avenue one way couplet on the east end of downtown,
- Improved Walnut and a southern by-pass, and
- Intersection improvements in combination with demand management for the regional center area.

[14] Downtown Hillsboro Light Rail Transit Simulation Analysis – 2015, DRAFT, City of Hillsboro, by ITC, November 1998.

Downtown Findings: ***Couplet Widening:*** The severe property impacts of Oak/Baseline couplet widening resulted in rejection of that option. In addition, this option would have resulted in significant impact to cross street delays in downtown Hillsboro (due to the heavy demand for east/west traffic). ***Evergreen Extension:*** Extending Evergreen Parkway west and south to TV Highway did not reduce the impact of demand on TV Highway enough to mitigate the capacity problems downtown. This extension, while attractive as an alternative route for traffic using Zion Church Road and traffic in north Hillsboro, did not substantially improve operation of the Oak/Baseline couplet and 10th Avenue. ***9th/10th Couplet:*** Operationally this allows for multiple turning lanes for northbound and southbound traffic on TV Highway which improves system capacity and queue storage. However, the conversion of 9th Avenue to serve southbound traffic would have significant impacts. The 9th/10th Avenue couplet would extend from Main Street to Maple/Cedar Street. The decoupling points would require significant modification of adjacent land uses along Main Street and one-way operation on 9th Avenue would have an impact on adjacent properties. These decoupling points would be very pedestrian unfriendly areas. There is not enough width in some blocks to provide adequate capacity on 9th Avenue without widening. The combination of using Main Street as a decoupling route and future traffic forecasts for Main Street would require the conversion of Main Street to one-way operation (westbound) west of 10th Avenue. This would place greater pressure on Lincoln Street and Washington Street (the LRT alignment) west of 10th Avenue to accommodate more eastbound traffic (requiring new traffic signal at Cornell/Lincoln). This alternative may be more appropriate in the future (beyond 2015) but is not necessary to address 2015 traffic demand. ***Bypass/Walnut:*** Walnut is not an adequate route for high traffic volumes and was rejected. The southern by-pass has been considered in previous Hillsboro studies[15]. While the common perception of the problem is through traffic on the Baseline/Oak bypass, the reality is that the couplet serves as an east-west service arterial for the downtown and its growth. Even with the bypass in place it was found that similar improvements would be needed on 10th Avenue in any case[16].

The attractiveness of the bypass and the 9th/10th couplet in serving regional traffic should be considered for planning horizons beyond 2015; however, within the 20 year horizon it is not necessary to employ such measures to mitigate capacity deficiencies in the downtown.

[15] Transportation Plan Update, City of Hillsboro, by Carl Buttke, 1992.

[16] It was found that the bypass would attract 10,000 to 20,000 vehicles per day, however, there is no logical alignment, which can be environmentally and economically pursued in this horizon. Even with the significant demand for the bypass, the majority of users are diverted from alternative routes around Hillsboro (Zion Church) attracting latent demand that does not necessarily benefit the downtown area.

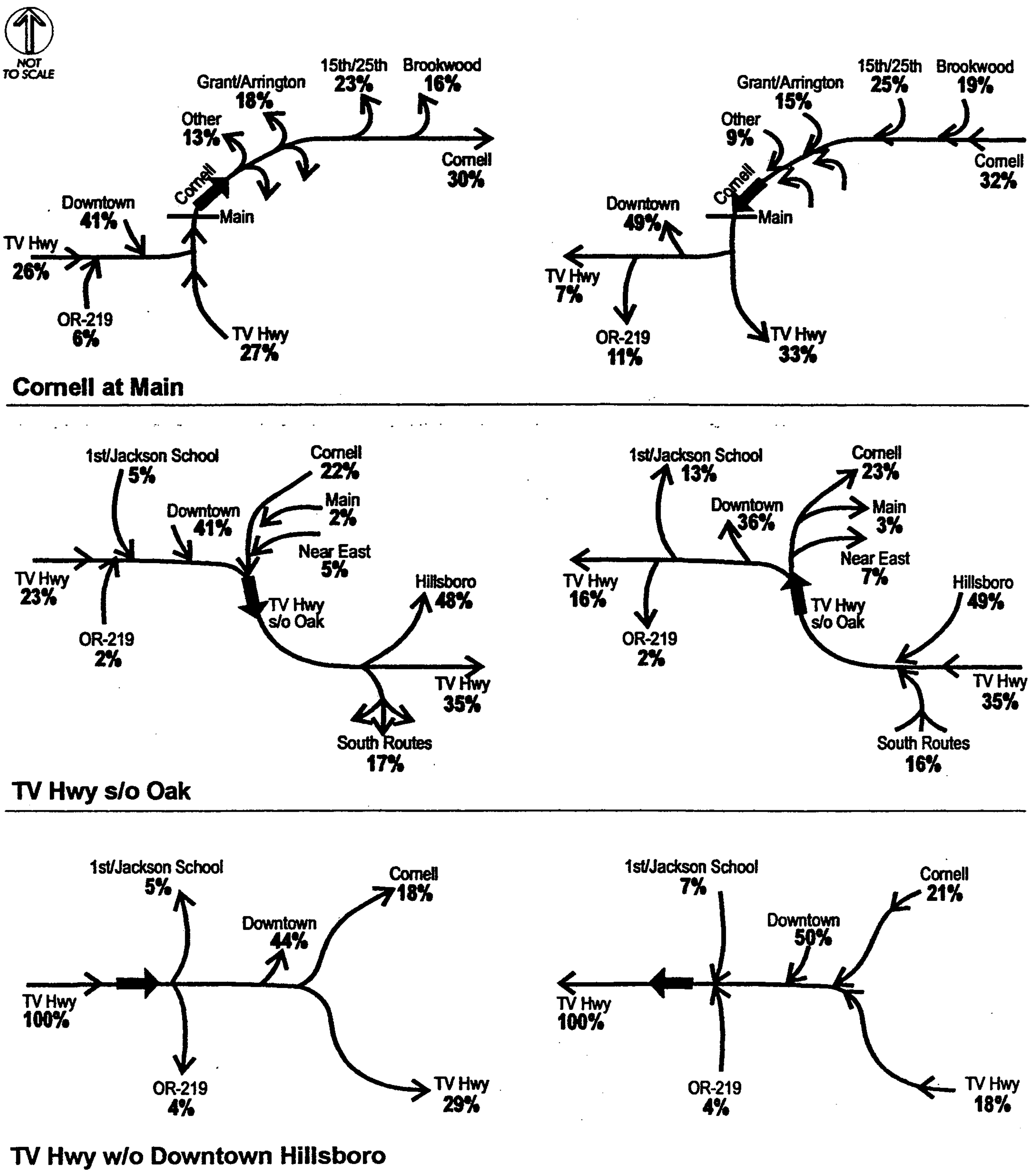


Figure 8-20
ORIGINS AND DESTINATIONS OF TRAFFIC ON APPROACH ROUTES TO DOWNTOWN HILLSBORO
2015 PM PEAK HOUR IMPROVED

System Improvements & Management: Since a significant portion of the traffic problem is generated by regional center demand, taking a management approach to the downtown area may best solve this problem. This would include system improvements in the downtown and demand management programs for the regional center. System improvements would consist of:

- Intersection widening on TV Highway and restriping lanes at the Oak/Baseline couplet; (see below)
- Adding a third southbound through lane between Main and Baseline Road on 10th Avenue;
- Two-way streets for 2nd, 3rd, 4th and 5th Avenues;
- Extending one way operation on Main Street west from 1st Avenue to Adams Street;
- Creating a new north/south local street between Main and Washington Street west of Adams Street (using county land);
- Traffic signals at 1st/Lincoln and Adams/Oak,
- Restriping of 1st Avenue from Oak to Baseline Street to maximize capacity;
- Enhancing the traffic signal control system for the downtown (utilizing technology such as video detection to manage traffic flows more efficiently).

SUMMARY OF DOWNTOWN IMPROVEMENT CONCEPTS

Location	Improvement
10th Avenue	Widen to 3 lanes southbound Main to Baseline Widen from Oak to Baseline for four northbound lanes Widen from Washington to Main for three northbound lanes Restripe approach to Baseline starting at Walnut Add northbound right turn lane at Baseline
2nd/3rd/4th/5th Avenues	Convert to two way operation in downtown
Lincoln/First	Signalize
First Avenue	Restripe and signal modifications
Main Street	Extend one way from 1st west to Adams Restripe from 9th to 10th as three lanes (remove parking) Restripe from 6th to 7th for second westbound lane
Bailey Road (approximate alignment)	Extend new two lane road between Main and Washington (County parking lot)
Walnut Street	Restripe eastbound approach to 10th adding a right turn lane (remove parking)
Baseline Street	Restripe westbound approach at 10th for two lanes

These improvements would be part of an overall regional center improvement strategy and could be considered independently, on a project by project basis allowing for incremental implementation (unlike the bypass options or couplets). Since LRT has begun operation and there are several large institutional users in the downtown, there is potential to reduce traffic demand in the regional center through demand management strategies. Chapter 10 outlines these strategies. A transportation demand management program coupled with transportation system management strategies (intersection improvements, signal timing, etc.) mitigates future deficiencies and is recommended.

Intersection Turning Capacity: A series of 45 intersection improvements were identified which primarily add turning movement capacity (Table 8-5 and Figure 8-19). These roadway improvements typically consist of left and right turn lanes and/or traffic signals. Two of the intersections have significant improvements. At Jacobson Road and Helvetia/Shute Road, the intersection is too close to the US 26 interchange at Shute Road (about 200 feet away). With increased development in the land north of US 26, this intersection fails. Since the land north of Jacobson Road is outside the UGB, the preferred solution is difficult to implement and will require significant coordination. The preferred intersection improvement would be to relocate the intersection northward out of the access control area of the US 26 interchange. No access should be allowed on Helvetia Road 500 feet north of the westbound ramps. The Jacobson Road intersection with Helvetia Road would preferably be 1,000 feet north of the westbound ramps[17]. The other intersection is at Baseline Road and 185th Avenue. Due to the heavy future traffic volumes and the proximity of the LRT crossing, there are few options. Widening 185th to seven lanes does not produce a desirable operating characteristic. Washington County and Tri-Met have been analyzing a grade separation at this location, which appears to be the best means of balancing transit needs, traffic operation and land requirements[18].

Traffic Signals: To guide future implementation of traffic signals to locations which have the maximum public benefit by serving arterial/collector/neighborhood routes, a framework master plan of traffic signal locations was developed (Figure 8-21). The intent of this plan is to outline desirable locations where future traffic signals would be placed to avoid conflicts with other development site oriented signal placement. To maintain the best opportunity for efficient traffic signal coordination on arterials, spacing of up to 1,000 feet should be considered. No traffic signal should be installed unless it meets **Manual of Uniform Traffic Control Devices** warrants. Three key traffic signal issues should be addressed within the transportation policy of Hillsboro:

- Establishing a traffic signal spacing standard of 1,000 feet and a traffic signal master plan to guide future traffic signal placements. When this standard is not met, additional evaluation should be prepared to assure signal progression can be efficiently maintained;

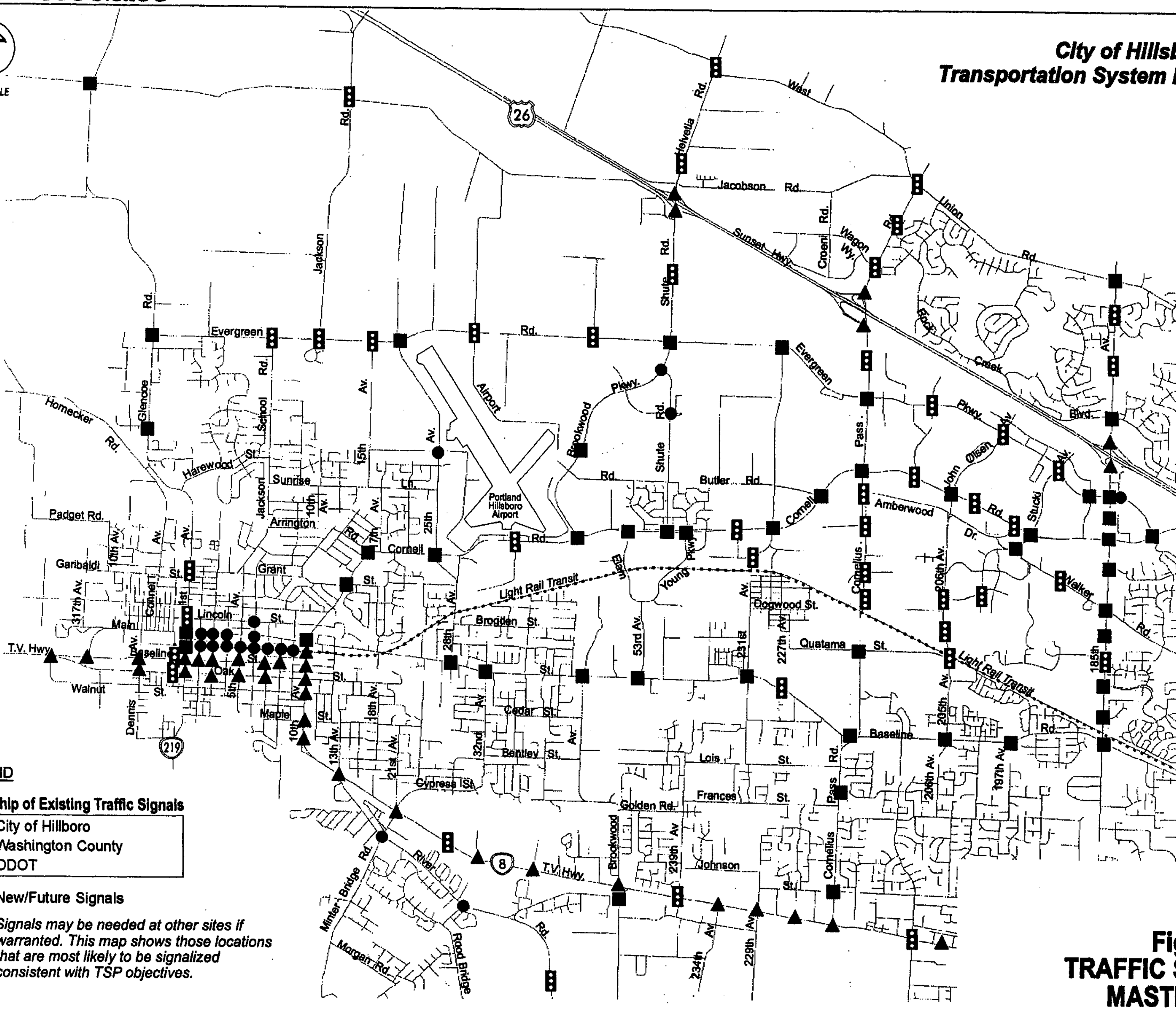
- Traffic signals disrupt traffic flow. Their placement is important for neighborhood access, pedestrian access and traffic control. To not utilize the limited placements of traffic signals to serve public streets will impact neighborhood and pedestrian access. Limiting placement of traffic signals to locations that are public streets would minimize or eliminate the potential for traffic signals solely serving private access.

[17] Other alternative solution concepts that accomplish the same access control results could be considered as part of the US 26 interchange evaluation at Shute Road.

[18] Refer to concept plan presented in Hillsboro Station Area Plan Transportation Design Element, City of Hillsboro, by DKS Associates, 1996.

DKS Associates

City of Hillsboro
Transportation System Plan



LEGEND

Ownership of Existing Traffic Signals

- ● - City of Hillboro
- ■ - Washington County
- ▲ - ODOT

- New/Future Signals

Note - Signals may be needed at other sites if warranted. This map shows those locations that are most likely to be signalized consistent with TSP objectives.

Figure 8-21
TRAFFIC SIGNALS MASTER PLAN

- Current policy to address new traffic signal installations places the burden of construction completely on the one land use action that tips the traffic volume above a MUTCD warrant. This places undue burden on individual developments and is not equitable. A system of allocating cost of new traffic signals in a fair share manner should be considered. This could be a system development charge (SDC - similar to a traffic impact fee, that can be authorized by City Council) for traffic signals. The SDC could be applied to districts or subareas that are anticipated (based upon the traffic signal master plan) to have several new signals in the next 20 years.

Collector Rehabilitation: Several of the collector roadways that will become necessary to serve Hillsboro neighborhoods in the future are roads developed prior to the standards for multi-modal access. The pavement condition on these roads has reached and exceeded its design life. In many cases, these streets were developed for traffic that was rural in nature and the urban area has grown up around them. For these roadways to address future transportation needs of all modes, many collectors will need to be evaluated when it becomes time to undertake major maintenance or street rehabilitation. This is the best time to consider the needs not only of the pavement, but also for all modes of travel. Table 8-6 outlines several of these collector/neighborhood level streets. Funds for programming these reconstruction efforts should be considered in the next twenty years. The street improvement program includes a line item to address the funding of such a program. The budget for this program was developed using the candidate routes noted below; however, the actual program will need to prioritize routes and determine the best use of funds.

Table 8-6
Collector/Neighborhood Rehabilitation Routes

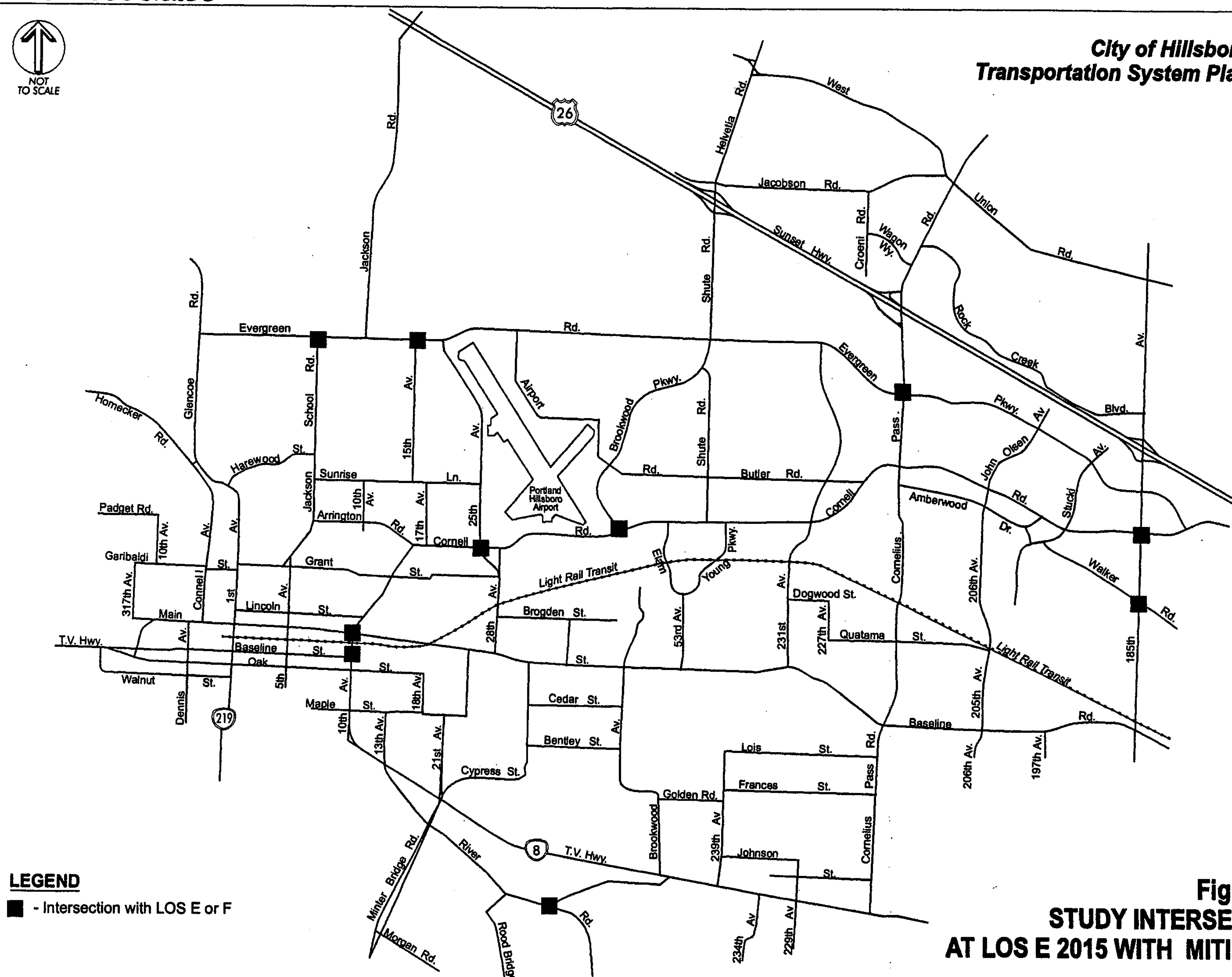
Candidate Routes		
5th Avenue	Brogden Street	Johnson Street
15th Avenue	Cedar Street	Lois Street
24th Avenue	Connell Avenue	W. Main Street
239th Avenue	Frances Street	Maple Street
317th Avenue	Garibaldi Street	Sunrise Lane
Bentley Street	Golden Road	Witch Hazel Road

Results

The result of these improvements is significant. While level of service E conditions still exist for the most part, the 2015 traffic conditions can be mitigated to the point that mobility can be preserved in Hillsboro and congestion is manageable. Only 10 intersections operate at LOS E (none at F) (Figure 8-22) compared to over 54 intersections if improvements are not made. The extent of certain street improvements goes beyond RTP and Functional Plan desires to not have seven lane streets. 185th Avenue was designated in the Washington County Transportation Plan as seven lanes to Cornell Road. To produce acceptable operation, the seven-lane section would need to extend to Walker Road. In this

DKS Associates

City of Hillsboro
Transportation System Plan



LEGEND

■ - Intersection with LOS E or F

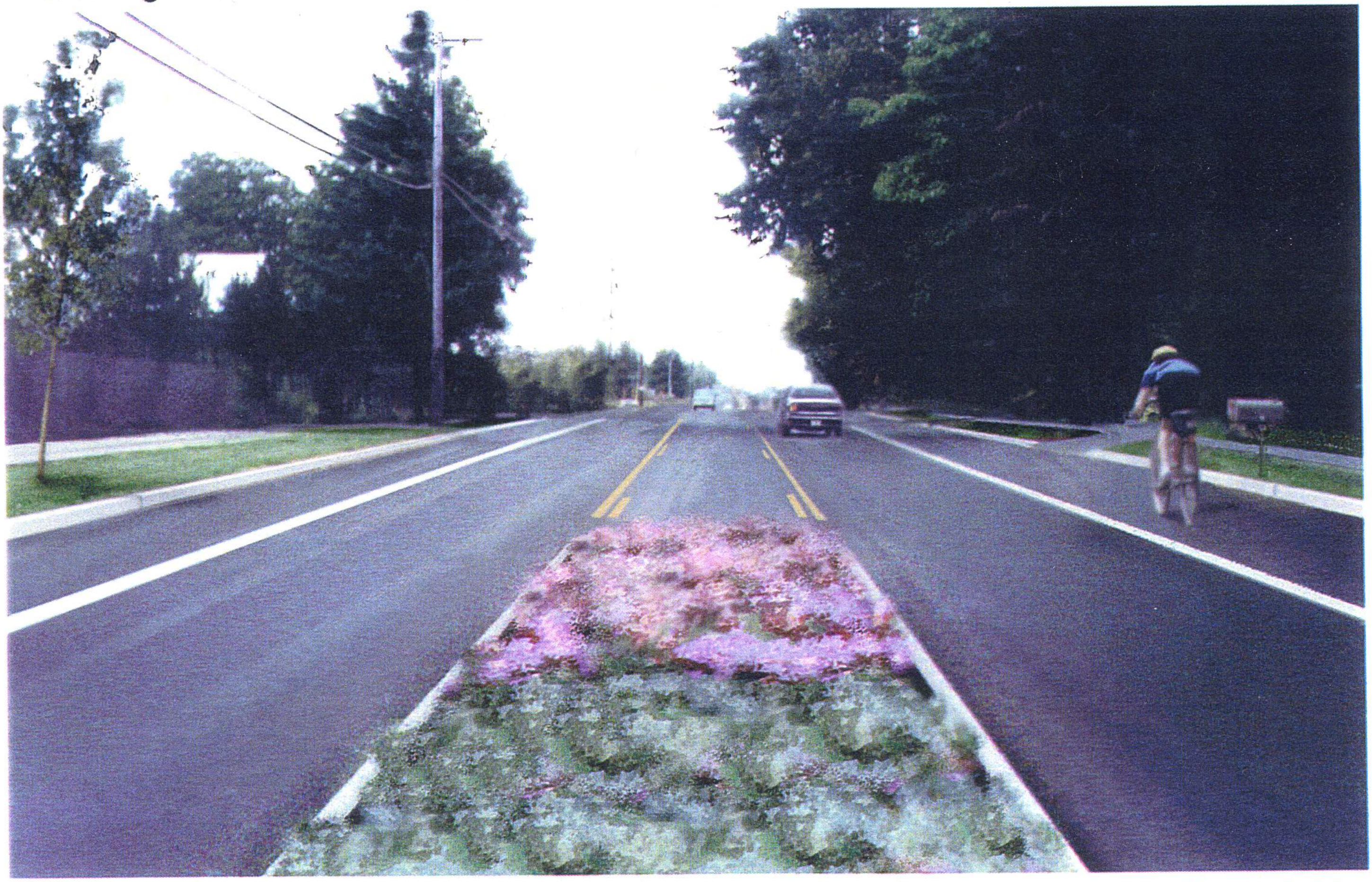
Figure 8-22
STUDY INTERSECTIONS
AT LOS E 2015 WITH MITIGATION

case, every transit/TDM oriented strategy should be implemented prior to consideration of seven lane improvements. However, using the travel forecasts for 2015 that include transit and TDM improvements, the analysis indicates that an ultimate seven-lane improvement should be planned for in the next 20 years. Additionally on Tualatin Valley Highway, maintaining adequate operational performance will require consideration of either significant access control and/or widening to seven lanes. While it is anticipated that with the 2015 land use plan that five lanes and access control would be adequate, planning for future needs in this corridor could call for right-of-way planning for seven lanes or limited access. A corridor study will be necessary for TV Highway from Beaverton through Hillsboro, planning for a horizon year beyond 2015.

Visual Simulations

The previous sections have focused on the quantitative aspects of the transportation system and its operation. To provide a better understanding of the character of the street improvements that have been discussed, a set of visual simulations were undertaken. Using a computer to simulate hypothetical characteristics of the recommended improvements, a set of illustrations were developed showing existing conditions and changes with the proposed improvements (Figures 8-23 and 8-24). These two photographs provide a comparison of the improvements on 235th crossing of US 26 and of the proposed three-lane section of 231st Avenue north of Baseline Road. The roadway locations and characteristics shown in the visual simulation are only approximate in nature and do not reflect the specific character or design intended for the area. The technical appendix provides additional visual simulations for reference (on 205th/AmberGlen Parkway, Cornelius Pass to 209th and local collectors).

Existing



Future

Figure 8-23
View of 231st Avenue

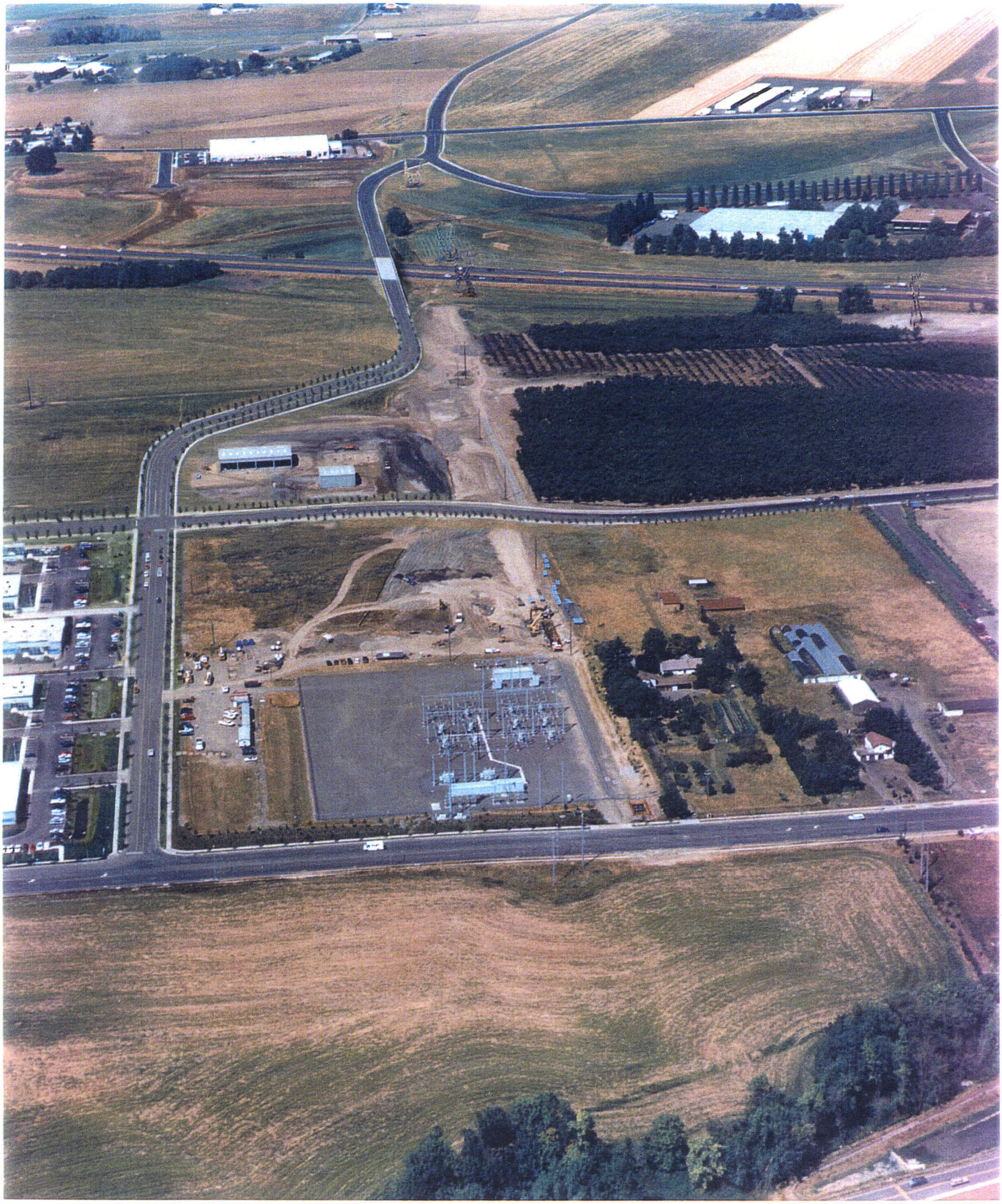


Figure 8-24
Future View of an Alternative Alignment for 235th Overcrossing of US 26

SAFETY

Needs

Accident data was obtained from the City of Hillsboro and Washington County. Chapter 3 provides detailed data regarding motor vehicle accidents in Hillsboro. The City of Hillsboro Task Force evaluated several strategies for safety. These strategies aimed at providing the City with priorities that meet the goals and policies of the City. The City of Hillsboro Task Force ranked these strategies for safety. Each task force member was assigned a certain number of points that he or she could allocate to each of the strategies according to his or her vision of priorities for the City of Hillsboro. The ranking of these safety strategies follows from most important to least important:

- Work with other agencies such as Washington County and ODOT to help prioritize and fund safety programs - coordinated approach *(received 58 percent of points)*
- Develop a citywide safety priority system which identifies high accident locations, ranks the locations and identifies safety mitigation measures *(received 27 percent of points)*
- Continue existing program *(received 15 percent of points)*
- Address safety issues on an as needed basis *(received no points)*

Suggested Improvements

Most of these high accident locations are included in future street improvements listed in Tables 8-4, 8-5 and 8-6. In the short term, specific action plans should be prepared to address whether beneficial improvements at these locations can be made without affecting future plans.

A future issue with regard to safety involves the decision to go to three lanes from two lanes or five lanes from four lanes. National research has clearly demonstrated the benefits of providing a turning lane when daily traffic volumes exceed 15,000 vehicles per day[19]. While widening the street can commonly be viewed as pedestrian unfriendly, the potential impact of not having a turning lane is that accident rates will increase substantially (11 to 35 percent) on two lane roads compared to three lane roads.

One safety action that can have an immediate impact is to condition all land use development projects that require access on city streets to maintain adequate sight distance. This should address all fixed or temporary objects (plants, poles, signs, etc.) that potentially obstruct sight distance. Any property owner, business, agency or utility that places or maintains fixed or temporary objects in the sight distance of vehicles, bicycles or pedestrians should be required to demonstrate that adequate sight distance is provided (per American Association of State Highway and Transportation Officials).[20]

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[19] Multilane Design Alternatives for Improving Suburban Highways, TRB NCHRP Report No. 282, March 1986.

[20] "A Policy on Geometric Design of Highways and Streets", Green Book American Association of State Highway and Transportation Officials, 1994.

MAINTENANCE

Preservation, maintenance and operation are essential to protect the City investment in transportation facilities. The majority of current gas tax revenues are used to maintain the transportation system. With an increasing road inventory and the need for greater maintenance of older facilities, protecting and expanding funds for maintenance is critical.

A Pavement Management Program is a systematic method of organizing and analyzing information about pavement conditions to develop the most cost effective maintenance treatments and strategies. As a management tool, it aids the decision-making process by determining the magnitude of the problem, the optimum way to spend funds for the greatest return on the dollar, and the consequences of not spending money wisely. Hillsboro maintains an annual program of pavement management and monitors conditions in setting priorities for overlays, slurry seals and joint sealing. With nearly 180 miles of roadway and 20 bridges to maintain, maintenance is one of the largest transportation expenditures.

A pavement management program can be a major factor in improving performance in an environment of limited revenues. A pavement management program is not and should not be considered the answer to every maintenance question. It is a tool that enables the public works professional to determine the most cost-effective maintenance program. The concept behind a pavement management system is to identify the optimal rehabilitation time and to pinpoint the type of repair, which makes the most sense. With a pavement management program, professional judgment is enhanced not replaced.

The City of Hillsboro prepared a visual inspection of Hillsboro's surface street system. This inspection, basically a "report card" of the street system rates each roadway in Hillsboro. Actual roadway ratings prepared by the City of Hillsboro are provided in the appendix. Table 8-5 summarizes the roadway maintenance funding history for the last four fiscal years. The total miles of roadways in Hillsboro for the year 1996 are 178 miles. 2.5 miles of roadway were overlaid in 1996.

Table 8-7 summarizes the existing street maintenance program for the City of Hillsboro, while Table 8-8 summarizes the maintenance budgets for the last five years.

A critical concept is that pavements deteriorate 40 percent in quality in the first 75 percent of their life. However, there is a rapid acceleration of this deterioration later, so that in the next 12 percent of life, there is another 40 percent drop in quality. A pavement management system can identify when pavements will begin to deteriorate before rapid deterioration starts in order to focus preventative maintenance efforts cost effectively. These solutions are generally one-fifth to one-tenth the cost required after a pavement is 80 percent deteriorated. Figure 8-24 illustrates the pavement life cycle. For this reason, support of gradual increases to the gas tax to support maintenance is critical.

Table 8-7
City of Hillsboro Street Maintenance Program[21]

	FY 1994-95 (Actual)	FY 1995-96 (Actual)	FY 1996-97 (Budgeted)	FY 1997-98 (Proposed)
Program Objectives				
Preventative maintenance to the street system	175.05 miles	175.05 miles	177.65 miles	177.65 miles
Bridge maintenance inspections	20 bridges	20 bridges	20 bridges	20 bridges
Performance Measures				
Square yards of street repairs	13,447	13,935	13,064	13,350
Number of bridge inspections completed	20	20	20	20

Note FY= Fiscal Year

Table 8-8
Street Maintenance Budget Summary[22]

Requirements	FY 1994-95 (Actual)	FY 1995-96 (Actual)	FY 1996-97 (Budgeted)	FY 1997-98 (Proposed)	FY 1997-98 (Adopted)
Personal Services	$ 450,599	$ 417,359	$ 452,669	$ 470,847	$ 470,847
Materials and Services	$ 127,319	$ 140,236	$ 185,940	$ 148,650	$ 148,650
Capital Outlay	$ 444,519	$ 618,147	$ 677,311	$ 670,750	$ 670,750
Transfers	$ 373,739	$ 280,803	$ 332,883	$ 445,808	$ 445,808
Total	$1,396,176	$1,456,545	$1,648,803	$1,736,055	$1,736,055

Note FY= Fiscal Year

[21] Based on fax received from Pete Davis, City of Hillsboro Operations Department, June 26, 1997.

[22] Ibid.

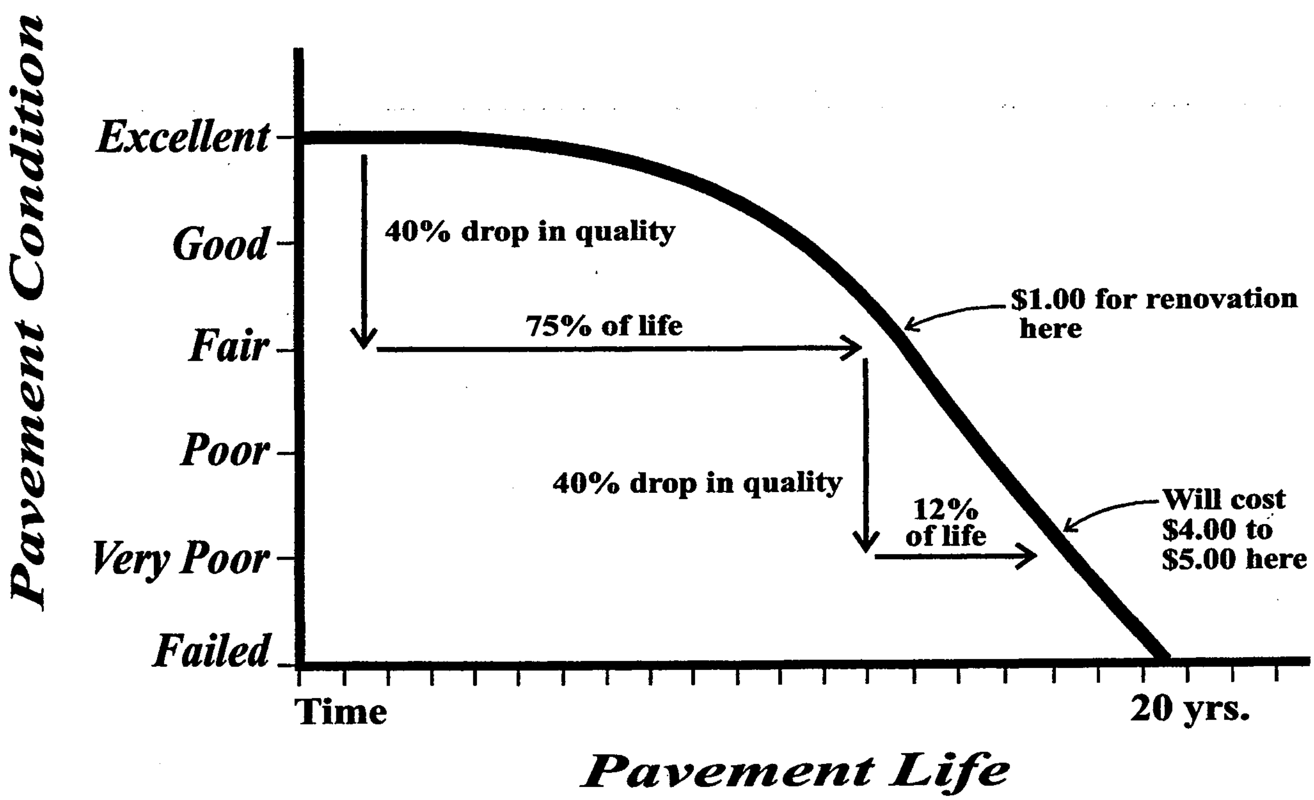

Figure 8-25
PAVEMENT LIFE CYCLE

Strategies - Street Maintenance

Strategy 1 - "No maintenance program"

If nothing is done to improve pavement surface condition, the City's ability to maintain its streets will fall far behind its possible resources as the number of paved roads in good condition diminish and the amount of lane miles in need of rehabilitation increase.

Strategy 2 - "Maintain at highest level"

A strategy where the pavement conditions is maintained at the highest level resulting in high expenditures.

Strategy 3 - "Maintain roadways using a need based approach which addresses current and future needs as they arise"

A "need based" strategy seeks to address current and future needs as they arise, so that all roads are maintained in good pavement condition.

Strategy 4 - "Maintain roadways using a balanced approach which develops a pavement management system and budget to address needs over a ten year period"

A "balanced" approach addressing pavement management needs in Hillsboro would spread estimated expenditures over the next ten years.

The City of Hillsboro Transportation Planning Task Force evaluated these street maintenance strategies. These strategies aimed at providing the City with priorities that meet the goals and policies of the City. The City of Hillsboro Task Force ranked these street maintenance strategies. Each task force member was assigned a certain number of points that he or she could allocate to each of the strategies according to his or her vision of priorities for the City of Hillsboro. The ranking of these maintenance strategies follows from most important to least important:

- Maintain roadways using a balanced approach which further develops the pavement management system and budget to address needs over a ten year period (76 % of points)
- Maintain roadways using a need based approach which addresses current and future needs as they arise (24 % of points)
- Strategies 1 and 2 did not receive any points from the Task Force.

NEIGHBORHOOD TRAFFIC MANAGEMENT

Neighborhood Traffic Management (NTM) is a term that has been used to describe traffic control devices typically used in residential neighborhoods to slow traffic or possibly reduce the volume of traffic. NTM is descriptively called traffic calming due to its ability to improve neighborhood livability. Hillsboro has done very little in the way of testing and implementing NTM measures such as speed humps, chokers, pavement texturing, circles, chicanes and other elements. The City has no formalized NTM program. The following are examples of neighborhood traffic management strategies:

- speed wagon (reader board that displays vehicle speed)
- speed humps
- traffic circles
- medians
- landscaping
- curb extensions
- chokers (narrows roadway at spots in street)
- narrow streets
- closing streets
- photo radar
- on-street parking
- selective enforcement
- neighborhood watch

Typically, NTM can receive a favorable reception by residents adjacent to streets where vehicles travel at speeds above 30 MPH. However, NTM can also be a very contentious issue within and between neighborhoods, being viewed as moving the problem rather than solving it, impacting emergency travel or raising liability issues. A number of streets in Hillsboro have been identified in the draft functional classification as neighborhood routes. These streets are typically longer than the average local street and would be appropriate locations for discussion of NTM applications. A wide range of traffic control devices is being tested throughout the region, including such devices as chokers, medians, traffic circles and speed humps. No NTM standards have been developed in Hillsboro, although test cases are now being undertaken. NTM traffic control devices must be tested within the confines of Hillsboro before guidelines are developed for implementation criteria and applicability. Also, NTM may be considered in an area wide manner to avoid shifting impacts between areas and should only be applied where a majority of neighborhood residents agree that it should be done. Strategies for NTM seek to reduce traffic speeds on neighborhood routes, thereby improving livability. Research of traffic calming measures demonstrates their effectiveness in reducing vehicle speeds. Table 8-9 summarizes nationwide research of over 120 agencies in North America.

It is recommended that the City explore the development of a NTM program. This program can use regional experience and success to help prioritize implementation and address issues on a systematic basis rather than a reactive basis. Criteria should be established for the appropriate application of NTM in the City. This would address warrants, special conditions for functional classifications other than neighborhood routes and the required public process.

Table 8-9
NTM Performance

Measures	No. of Studies	Speed Reduction (MPH) Low	High	Average	Volume Change (ADT) Low	High	Ave.	Public Satisfaction
Speed Humps	262	1	11.3	7.3	0	2922	328	79%
Speed Trailer	63	1.8	5.5	4.2	0	0	0	90%
Diverters	39	-	-	.4	85	3000	1102	72%
Circles	26	2.2	15	5.7	50	2000	280	72%
Enforcement	16	0	2	2	0	0	0	71%
Traffic Watch	85	.5	8.5	3.3	0	0	0	98%
Chokers	32	2.2	4.6	3.3	45	4100	597	79%
Narrow Streets	4	5	7	4.5	0	0	0	83%

SOURCE: *Survey of Neighborhood Traffic Management Performance and Results, ITE District 6 Annual Meeting, by R S. McCourt, July 1977.*

PARKING

Parking has typically been a benign transportation issue in the past for Hillsboro. New land uses were required to provide the code designated number of parking spaces to assure there would be no impact to surrounding land uses (overflow parking). These parking ratios were developed based upon past parking demand characteristics of each land use type. Most recently, parking has become an element of transportation planning policy through two actions. The adoption of the Transportation Planning Rule in 1991, which was updated in December 1995 (sections 660-12-020(2g) and 660-12-045(5c)) and the Metro Functional Plan of November 1996, Title 2. By adopting the minimum and maximum parking ratios outlined in Title 2, the City will be able to address the TPR required reduction in parking spaces per capita over time.

Within the TSP goals and policies for the City of Hillsboro, Goal 3 Policy 4 addresses these requirements. It states "*Limit the provision of parking to meet regional and state standards*".

Several strategies were evaluated for future parking by the TSP Task Force. These strategies aimed at providing the City with parking priorities that meet the goals and policies of this plan. The ranking of these parking strategies follows from most important to least important:

- Shared parking
- Parking pricing
- Lower parking ratios for land uses within ¼ mile of LRT stations
- Parking needs should be reviewed by individual developments at the site plan review stage. Parking provisions should be compared to demand, as identified by ITE or DEQ.[23]
- Maximum Parking Ratios

[23] *Parking Demand*, 2nd Edition, Institute of Transportation Engineers, 1987; and *Peak Parking Space Demand Study*, Oregon Department of Environmental Quality, by JHK & Associates, June 1995.

One of the concerns with parking reduction policies is the impact to adjacent land uses if the vehicle needs of a site exceed the provision of parking. The City of Hillsboro should undertake a study of parking management for its regional center. This assessment should consider the benefits (if any) and impacts of parking pricing (including use of parking meters), shared use parking and parking provision in areas well served by transit (LRT stations).

ACCESS MANAGEMENT

Access management is important, particularly on high volume roadways for maintaining traffic flow and mobility. Where local and neighborhood streets function to provide access, collector and arterial streets serve greater traffic volume. Numerous driveways or street intersections increase the number of conflicts and potential for accidents and decrease mobility and traffic flow. Hillsboro, as with every city, needs a balance of streets, which provide access with streets that serve mobility.

Several access management strategies were evaluated and ranked by the TSP Task Force. The ranking of these access management strategies follows from most important to least important:

- Provide left turn lanes where warranted for access onto cross streets
- Work with land use development applications to consolidate driveways where feasible
- Meet Washington County access requirements on arterials
- Establish City access standards for new developments
- Develop city access requirements that are consistent with Metro Title 6 access guidelines *(received no points by the Task Force)*

Based upon the TSP Task Force, staff and consultant input the following recommendations are made for access management:

- Develop an access variance process for situations where no practicable access alternative exists or where access spacing standards will not allow access to a property.

- Set standards for access spacing (working with Washington County and ODOT) for arterials (600-foot minimum, 1,000 foot maximum) and collectors (200-foot minimum, 400-foot maximum).

- Recommend that ODOT use Access Management Category 4 for TV Highway east of 13th Avenue and Category 5 west of SE 13th Avenue to SW 17th Avenue west of town then back to Category 4 to the west.

- Specific access management plans are developed for TV Highway, Cornell Road, 185th Avenue and Baseline Road to maximize the capacity of the existing facilities and protect their functional integrity.

TRANSPORTATION SYSTEM MANAGEMENT/INTELLIGENT TRANSPORTATION SYSTEMS

Transportation System Management (TSM) focuses on low cost strategies to enhance operational performance of the transportation system. Measures that can optimize performance of the transportation system include signal improvements, intersection channelization, access management (noted in prior section), HOV lanes, ramp metering, rapid incident response, and programs that smooth transit operation. The most significant measure that can provide tangible benefits to the traveling public is traffic signal coordination and systems. This was the highest-ranking strategy from the TSP Task Force. While Hillsboro has had success in coordinating traffic signals, there is still room for improvement. Traffic signal system improvements can reduce the number of stops by 35 percent, delay by 20 to 30 percent, fuel consumption by 12.5 percent and emissions by 10 percent[24]. This can be done without the major cost of roadway widening.

The City of Hillsboro TSP Task Force ranked key TSM/ITS strategies, as noted below:

- Enhance detection systems (video, etc.)
- Signal coordination for arterial system
- Improve signing (advance freeway and arterials)
- Enhance traffic signal systems (areawide control, model 2070, etc.)
- Transit priority signal systems
- One-way streets
- Traveler information systems for Hillsboro arterials (changeable message signs, etc.)
- Bus queue jump lanes
- Ramp metering
- HOV lanes

Several of the strategies were elements of an Intelligent Transportation System (ITS) plan being implemented regionally by ODOT and participating agencies. ITS focuses on a coordinated, systematic approach toward managing the region's transportation multi-modal infrastructure. ITS is the application of new technologies with proven management techniques to reduce congestion, increase safety, reduce fuel consumption and improve air quality. One element of ITS is Advanced Traffic Management Systems (ATMS). ATMS collects, processes and disseminates real-time data on congestion alerting travelers and operating agencies, allowing them to make better transportation decisions. Examples of future ITS applications include: routine measures such as "smart" ramp meters, automated vehicle performance (tested recently in San Diego), improved traffic signal systems, improved transit priority options and better trip information prior to making a vehicle trip (condition of roads - weather or congestion, alternative mode options - a current "real time" schedule status, availability/pricing of retail goods). Some of this information will be produced by Hillsboro, but most will be developed by ODOT or other ITS partners (private and public). The information will be available to drivers in vehicles, people at home, at work, at events or shopping. The Portland region is just starting to implement ITS and the City of Portland and ODOT have already developed their own ITS strategic plans.

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[24] *Portland Regionwide Advanced Traffic Management System Plan,* ODOT, by DKS Associates, October 1993.

One of the transportation system management measures that will have greater impact on peak period travel in the future is ramp metering of US 26. ODOT has been ramp metering freeway ramps for these facilities since the early 1990s. This measure has been used to manage overall traffic flow on the freeways and to provide more uniform merge rates at the ramp terminals to improve safety. The net result of this operation is that vehicles are stored on the freeway on-ramps. While at the initiation of ramp metering vehicle queues could easily be accommodated on the ramps, recently ramps such as the Shute Road, Cornelius Pass Road and 185th Avenue (eastbound) ramps have queues reaching back to the arterials. The existing two-lane ramp design has been used on most ramps. However, in the future, it may be necessary to consider greater storage areas and other management techniques to effectively manage the freeway flows with ramp metering while not impacting arterial operation by having queues spilling back onto the adjacent streets. The City should work with Washington County and ODOT (particularly as US 26 is widened and reconstructed) to develop strategies that seek to reduce the impact of ramp metering on adjacent arterial operation. Measures such as added ramp storage, ITS strategies including "smart HOV bypasses" (similar to the Cornell Road ramp), end of queue detection and added arterial turn lane storage approach ramps should be considered.

As a recommendation of this plan, Hillsboro should pursue development of a strategic plan forITS to proactively identify opportunities to improve system performance and operation. A signal optimization program should be developed city wide for all arterials and collectors. The City should work with ODOT to develop strategies for smart ramp meters.[25]

TRUCKS

Efficient truck movement plays a vital role in maintaining and developingHillboro's economic base. Well-planned truck routes can provide for the economical movement of raw materials, finished products and services. Trucks moving from industrial areas to regional highways or traveling through Hillsboro are different than trucks making local deliveries. The transportation system should be planned to accommodate this goods movement need. The establishment of through truck routes provides for this efficient movement while at the same time maintaining neighborhood livability, public safety and minimizing maintenance costs of the roadway system. The City has a map of through truck routes in Hillsboro (Figure 8-26). This is aimed at addressing the through movement of trucks, not local deliveries. The objective of this route designation is to allow these routes to focus on design criteria that is "truck friendly", i.e., 12 foot travel lanes, longer access spacing, 35 foot (or larger) curb returns and pavement design that accommodates a larger share of trucks. Because these routes are through routes and relate to regional movement, the Metro regional freight system was reviewed. The Draft Regional Transportation Plan[26] includes the following routes in the regional freight system in Hillsboro, which are consistent with the city map:

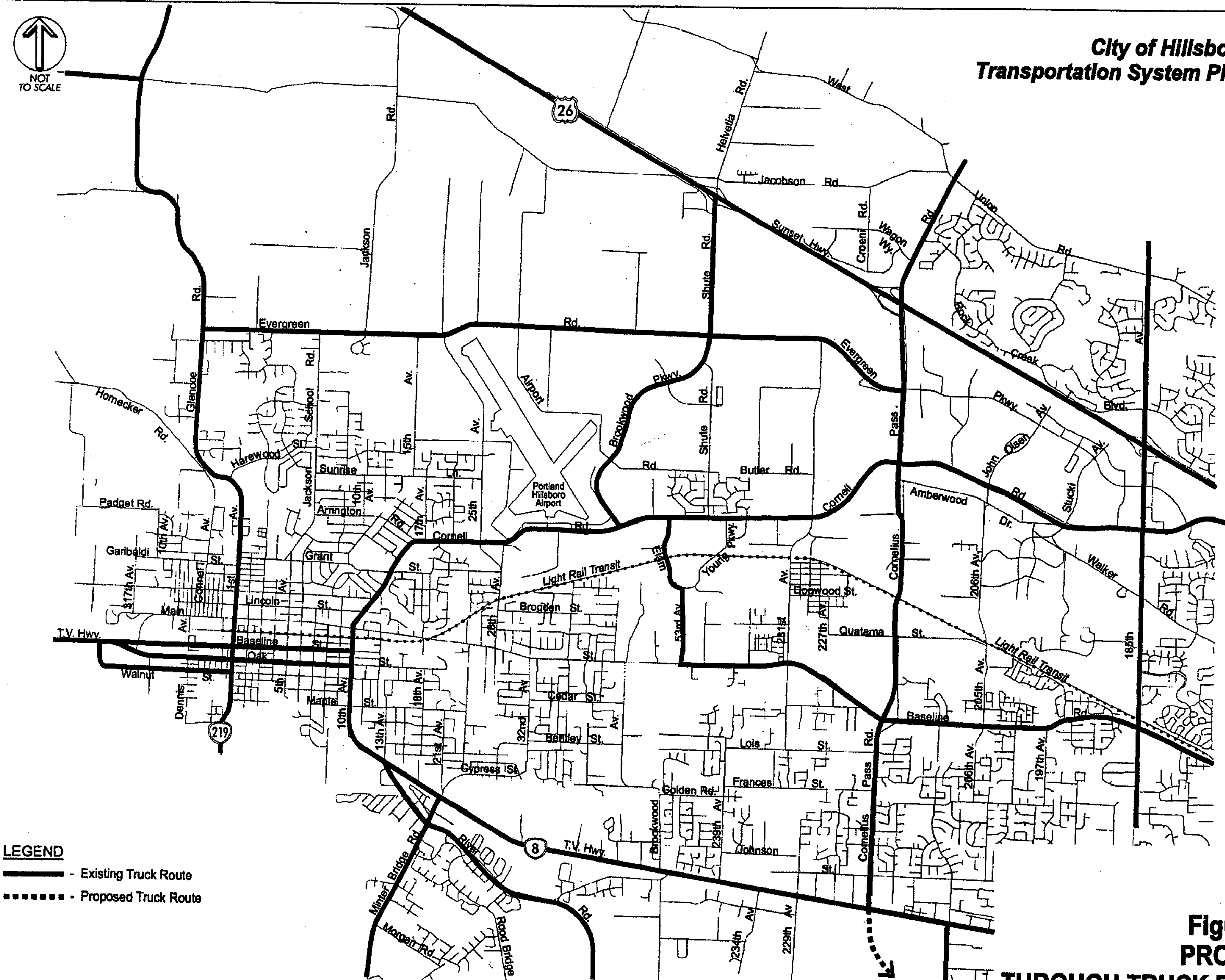
• Sunset Highway (US 26)	Main Roadway Route
• TV Highway (west of ORE 217)	Road Connector

[25] Ramp meters that adjust flow ranks based upon current mainline freeway operation, have potential for highway occupancy vehicle bypass and adequate queue storage.

[26] *Draft Regional Transportation Plan*, Metro, Draft 3.0, July 1, 1997.

DKS Associates

City of Hillsboro Transportation System Plan



LEGEND
- Existing Truck Route
- Proposed Truck Route

Figure 8-26
PROPOSED
THROUGH TRUCK ROUTES

• Evergreen Boulevard (w/o Cornelius Pass, e/o 25th)	Road Connector
• Shute/Brookwood (s/o US 26, w/o Cornell)	Road Connector
• Cornelius Pass Road	Road Connector
• 185th Avenue (s/o US 26, w/o TV Hwy)	Road Connector
• Cornell Road	Road Connector

Criteria

Hillsboro's Task Force and Transportation Advisory Committee created a set of goals and policies to guide transportation system development in Hillsboro (see Chapter 2). Several of these policies pertain specifically to trucks:

Goal 2: Multi-Modal

Policy 1 Design transportation facilities within Hillsboro that accommodate multiple modes of travel within transportation corridors where appropriate and encourage their use to move people, goods and services within these corridors. Encourage and coordinate efforts to provide convenient linkages between various modes of travel.

Goal 5: Goods Movement

Policy 1 Design arterial routes and highway access and adjacent land uses in ways that facilitate the efficient movement of goods and services.

Policy 4 Require safe routing of hazardous materials consistent with federal and state guidelines.

Goal 7: Accessibility

Policy 4 Develop an efficient arterial grid system that provides access within the City and serves through City traffic.

These goals and policies are the criteria that all truck related improvements in Hillsboro should be measured against to determine if they conform to the intended vision of the City.

Strategies

The TSP Task Force and Transportation Advisory Committee evaluated several strategies for future truck/freight related projects in Hillsboro. These strategies were aimed at providing the City with priorities to direct its funds toward truck related projects that meet the goals and policies of the City:

Strategy 1 - "Allow trucks to use all streets in Hillsboro for through movement and design streets accordingly"

This strategy did not receive any points by the Task Force committee.

Strategy 2 - "Designate only arterials for through goods movement and service routes"

This strategy focuses trucking activity in Hillsboro on the arterial roadways only.

Strategy 3 - "Designate through goods movement as a sub-set of arterials and design to accommodate trucks"

This strategy focuses trucking activity in Hillsboro on specified arterial roadways with design accommodations.

Strategy 4 - "Strategy 3 without design accommodations for trucks"

This strategy focuses trucking activity in Hillsboro on specified arterial roadways without design accommodations.

The City of Hillsboro Task Force evaluated these strategies for truck/freight circulation. The City of Hillsboro Transportation Planning Task Force ranked these strategies for truck/freight circulation. Each task force member was assigned a certain number of points that he or she could allocate to each of the strategies according to his or her vision of priorities for the City of Hillsboro. The ranking of these strategies follows from most important to least important:

Strategy 2: Designate through goods movement and service routes only to arterials. (32 percent of points)

Strategy 3: Designate through goods movement as a sub-set of arterials and design to accommodate trucks. (65 percent of points)

Strategy 4: Designate through goods movement as a sub-set of arterials without design accommodations for trucks. (3 percent of points)

Recommended Truck Routes

The general outcome of the strategies evaluated by the committee is that a "Truck Route Map" be adopted as part of this TSP. The map showing proposed truck routes in Hillsboro is Figure 8-26.

Chapter 9
Other Modes

This chapter summarizes existing and future rail, air, water and pipeline needs in the City of Hillsboro.

CRITERIA

Hillsboro's Transportation Planning Task Force and Transportation Technical Advisory Committee developed policies, which relate to the rail and air systems in Hillsboro.

Goal 1: Safety

Policy 1 Build, maintain and/or support a well defined and safe transportation system within the City for pedestrian, bicycle, transit, motor vehicles, air and rail travel.

Policy 6 Do not permit land uses within airport noise corridors that are not noise compatible and avoid the establishment of uses that are physical hazards to air traffic at the Hillsboro airport.

Policy 7 Coordinate, when applicable and appropriate, federal, state and local safety and compliance standards in the operation, construction and maintenance of the rail and pipeline systems in Hillsboro.

Policy 8 Encourage grade separations or gate controls at primary railroad crossings of streets.

Goal 2: Multi-Modal Travel

Policy 1 Design transportation facilities within Hillsboro that accommodate multiple modes of travel within transportation corridors where appropriate and encourage their use to move people, goods and services within these corridors. Encourage and coordinate efforts to provide convenient linkages between various modes of travel.

Goal 5: Goods Movement

Policy 2 Coordinate with the Port of Portland in planning for the Hillsboro Airport.

Policy 3 Encourage continued use and development of rail and air transportation facilities.

RECOMMENDED FACILITIES

Air

Hillsboro is served by the Portland-Hillsboro Airport, a general aviation facility located on the north side of the City of Hillsboro. The airport facility is owned and operated by the Port of Portland as part of the Port's general aviation reliever system of airports. The Port of Portland maintains the Master Plan for this facility, which was most recently updated in October 1996. The airport encompasses 877 acres, which consists of the airfield, developed areas, runway protection zones, and non-aviation industrial and commercial land. It has two runways (12/30 and 2/20) with parallel taxiways. Runway 12/30 is equipped with high intensity edge lighting, runway end identifier lights (REILs), and an instrument landing system (ILS).

From 1980 to 1995, the population growth for the Airport Service Area (Washington County) grew 49 percent (245,860 to 369,387)[1]. From 1996 to 2010, the population is expected to grow another 33 percent to 491,000[2]. As a result of past growth and expected continued growth in high tech development in the area, based aircraft and operations at the Portland-Hillsboro Airport facility are expected to change as listed in Table 9-1.

The changes listed in Table 9-1 will require that maintenance and various improvements to the airport facilities be made. Among the major maintenance requirements and facility improvements are property acquisitions, taxiway construction, runway construction, reconstruction and rehabilitation of pavement surfaces, slurry seals and overlays on various pavement surfaces. The most critical projects to the continued growth of the airport are [3]:

- Purchase land on the northeast side of the airport for future expansion. This will be a multi-year process and is critical to the continued expansion of the airport to meet market driven growth and provide land for the third runway. Without additional land, the continued development of the airport (such as for additional corporate hangers or airport businesses) will be seriously impaired.

- Continued consideration of the development of the general aviation runway parallel to the main runway. Based upon planning guidelines used by the Federal Aviation Administration, development of a third runway is presently justified. Construction of a third runway designated for use by small aircraft will allow more efficient operations and will enable the air traffic controllers to better manage the mix of large and small aircraft, which use the airport.

[1] Hillsboro Airport Master Plan Final Report, prepared for The Port of Portland by W&H Pacific, October 1996.

[2] Ibid.

[3] Ibid.

Table 9-1
Forecast Changes in Based Aircraft and Operations

Description	Year	
	1995	2015
Based Aircraft	368	475
Annual Operations	221,185	268,781
Peak Month	22,119	26,878
Average Day	714	867
Peak Hour	78	95
Critical Aircraft Type	Gulfstream II	Gulfstream IV

*Source: Hillsboro Airport Master Plan Final Report, prepared for The Port of Portland by W&H Pacific, October 1996.

The Hillsboro Airport Master Plan recommended the following[4]:

- Provide future development at the airport in accordance with the Hillsboro Airport Master Plan.
- Continue the process of acquiring land on the northeast side of the airport to provide land for future market driven airport growth.
- Continue to pursue the development of a third runway for use by small general aviation aircraft.
- Submit copies of the Hillsboro Airport Master Plan to local planning agencies for incorporation into comprehensive plans and other necessary planning documents and land use regulations.
- Begin the process of updating the Hillsboro Land Use Compatibility Study in late 1996.
- Request and utilize funding assistance as provided by the Federal Aviation Administration.

Future Rail[5]

All low-density rail lines within the vicinity of Hillsboro are operated by Portland & Western (P&W), a sister company of Willamette & Pacific (W&P) Railroad and a subsidiary ofGenesee & Wyoming Incorporated (refer to Figure 3-22, page 3-37). This includes the 7.6-mile Burlington Northern Santa Fe line that P&W recently acquired which goes over Cornelius Pass.

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[4] Ibid.

[5]Information contained within this section was taken from a letter from Robert Melbo to Winslow Brooks, Planning Director for the City of Hillsboro.

Trains operate in the Hillsboro area Monday through Saturday at various times throughout the day. The current frequency of train traffic is not anticipated to change. However, the number of cars per train will vary and is expected to increase over time depending on the demand to transfer freight by rail[6] to connect with Burlington Northern Santa Fe (BNSF) and Union Pacific lines in Portland.

W&P and P&W are focusing on long-term growth through acquisition (usually by leasehold) of existing trackage to expand existing networks that can aggressively compete with trucks. Part of this growth would be the acquisition of the Cornelius Pass line (north of Sunset Highway), as well as other line segments in Northwestern Oregon (the Burlington Northern Santa Fe "Oregon Electric Line between Salem and Eugene, and the Port of Tillamook Bay Railroad upon an acceptable agreement between BNSF and W&P/P&W).[7] The Cornelius Pass line would connect to the BNSF Portland-Astoria line, which may be operated by P&W. These acquisitions would help in developing significant new rail traffic and cause rerouting of existing traffic, all of which would move over Cornelius Pass and through Hillsboro.

Commuter trains operating on the existing low-density rail freight line infrastructure is becoming of increasing interest in the Washington and Yamhill County areas. Using this concept as a feeder mechanism for the Tri-Met Westside Light Rail Line is being considered.[8] If commuter rail becomes an option, recreating the old Carlton rail route would create a loop rather than an end point to end point route which is characteristic of most commuter rail systems. Reconstruction of this route is feasible from a financial and engineering perspective and would avoid the need for construction of sidings required for opposing trains, in line signalization, time required for turning and repositioning equipment, and the need for trains to back track over their routes. It would also bring residents in the vicinity of Cornelius, Forest Grove, Gaston, Yamhill and Carlton into the commuter market.

Unlike larger railroads, local haul railroads such as W&P/P&W are interested in incremental carloads. A recent study by the Oregon Cascades West Council of Governments on the Highway 20/34 Corridor has shown that between Corvallis and Toledo, short-haul rail eliminates 240 to 360 truck trips per day and reduces road surface maintenance by an equivalent 27,000 vehicles. Encouraging movement of certain commodities by rail could help with future highway and maintenance expenses.

Reconstruction of the old Southern Pacific line that connected Hillsboro and McMinnville could create a railroad bypass circumventing the core of Portland, southeast Portland and Lake Oswego. This route would function as a bypass for rail freight moving through the Portland metro area where congestion will increase with more freight and inner city high-speed passenger trains. The route would run via Cornelius Pass, Banks, Hillsboro, Carlton, McMinnville and Independence.

[6] Fax received from Susan Walsh-Enloe, Portland & Western Railroad, April 17, 1997.

[7] Cornelius Pass line information obtained through telephone conversation with Susan Walsh-Enloe , April 17, 1997.

[8] The *Inter-Urban Rail Feasibility Study* is examining the feasibility of a commuter rail service from Wilsonville, Oregon to Murray West Light Rail Station in Beaverton.

Pipeline

The only major pipeline facilities running through the Hillsboro area are high-pressure natural gas feeder lines owned and operated by Northwest Natural Gas Company. Figure 9-1 shows the feeder line routes for Hillsboro.[9] There are no current plans for future upgrades or expansions to the pipeline facilities within the Hillsboro area.[10]

Water

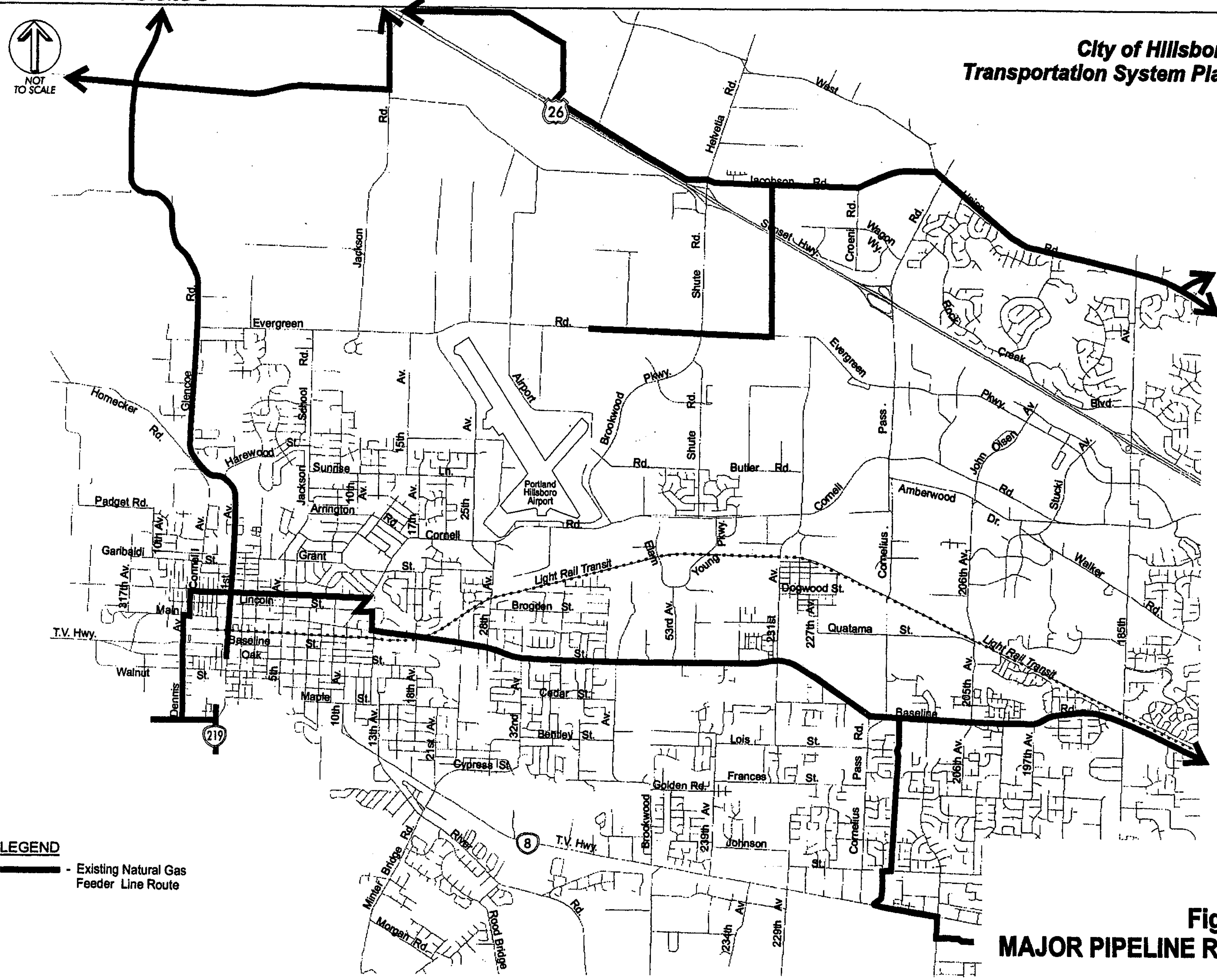
There are no navigable waterways within the vicinity of Hillsboro that support commercial use. Therefore, no policies or recommendations in this area of transportation are provided. The Tualatin River south of Hillsboro is used for recreational purposes.

[9] Based on the Portland Area Distribution System Map (Dated: October 1996) received from Northwest Natural Gas Company, Engineering Facilities Information System, April 28, 1997.

[10] Based on telephone conversation with Mike Osterman, Northwest Natural Gas, April 24, 1997.

DKS Associates

City of Hillsboro
Transportation System Plan



LEGEND

- Existing Natural Gas Feeder Line Route

Figure 9-1
MAJOR PIPELINE ROUTES

Chapter 10
Transportation Demand Management

INTRODUCTION

Transportation Demand Management (TDM) is the general term used to describe any action that removes single occupant vehicle trips from the roadway network during peak travel demand periods. The Transportation Planning Rule outlines a goal of reducing vehicle miles traveled (VMT) per capita.[1] TDM measures applied on a regional basis can be an effective tool in reducing vehicle miles traveled. The strategies for transportation demand management were identified in working with the City's Transportation Planning Task Force and Transportation Technical Advisory Committee. These committees provided input regarding the transportation system in Hillsboro, specifically exploring TDM needs.

BACKGROUND

In 1993, the Oregon Legislature passed a law to help protect the health of Portland area residents from air pollution and to ensure that the area complies with the federal Clean Air Act. The Employee Commute Options (ECO) rules are provisions of the law.[2] The ECO program requires larger employers to provide commute options to encourage employees to reduce auto trips to the work site. It is one of several strategies included in the Ozone Maintenance Plan for the Portland Air Quality Maintenance Area (AQMA) which will be in place until the year 2006. Employers in the Portland AQMA with more than 50 employees at a work site must provide commute options that have the potential to reduce employee commute auto trips by 10 percent within three years, and maintain the trip reductions through the life of the plan.

TDM can include a wide variety of actions tailored to the individual needs of employers to achieve trip reduction. Table 10-1 provides a list of several strategies identified in the ECO program. Research has indicated that a comprehensive set of complementary policies implemented over a large geographic area can have an effect on vehicle miles traveled[3]. However, the emphasis of much of the research indicates that these policies must go well beyond the low-cost, uncontroversial measures commonly attributed to TDM (such as carpooling, transportation coordinators/associations, priority parking spaces) to be effective. Elements including parking and congestion pricing, improved services for

[1] By 10 percent over 20 years

[2] Oregon Administrative Rules, Chapter 340, Division 30.

[3] *The Potential for Land Use Demand Management Policies to Reduce Automobile Trips,* ODOT, by ECO Northwest, June 1992.

Table 10-1

Transportation Demand Management Strategies

Strategy	**Description**	**Potential Trip Reduction**
Telecommuting	Employees perform regular work duties at home or at a work center closer to home, rather than commuting from home to work. This can be full time or on selected workdays. This can require computer equipment to be most effective.	82-91% (Full Time) 14-36% (1-2 day/wk)
Compressed Work Week	Schedule where employees work their regular scheduled number of hours in fewer days per week (for example, a 40 hour week in 4 days or 36 hours in 3 days)	7-9% (9 day/80 hr) 16-18% (4/40) 32-36% (3/36)
Transit Pass Subsidy	For employees who take transit to work on a regular basis, the employer pays for all or part of the cost of a monthly transit pass.	19-32% (full subsidy, high transit service) 2-3% (half subsidy, medium transit service)
Cash Out Employee Parking	An employer that has been subsidizing parking (free parking) discontinues the subsidy and charges all employees for parking. An amount equivalent to the previous subsidy is then provided to each employee, who then can decide which mode of travel to use (with subsidy above the cost of a monthly transit pass, those employees would realize monetary gain for using transit).	8-20 % (high transit service available) 5-9 % (medium transit services available) 2-4% (low transit services available)
Reduced Parking Cost for HOVs	Parking costs charged to employees are reduced for high occupancy vehicles (HOV) such as carpools and vanpools.	1-3 %
Alternative Mode Subsidy	For employees that commute to work by modes other than driving alone, the employer provides a monetary bonus to the employee. Most often, the bonus is provided monthly in the employee's paycheck.	21-34% (full subsidy of cost, high alt.modes) 2-4% (half subsidy of cost, medium alt.modes)
On-Site Services	Provide services at the worksite that are frequently used by the employees of that worksite. Examples include cafes, restaurants, dry cleaners, day care and bank machines.	1-2 %

Strategy	**Description**	**Potential Trip Reduction**
Bicycle Program	Provides support services to those employees that bicycle to work. Examples include: safe/secure bicycle storage, shower facilities and subsidy of commute bicycle purchase.	0-10 %
On-site Rideshare Matching for HOVs	Employees who are interested in carpooling or vanpooling provide information to a transportation coordinator regarding their work hours, availability of a vehicle and place of residence. The coordinator then matches employees who can reasonably rideshare together.	1-2 %
Provide Vanpools	Employees that live near each other are organized into a vanpool for their trip to work. The employer may subsidize the cost of operation and maintaining the van.	15-25% (company provided van with fee) 30-40% (company subsidized van)
Gift/Awards for Alternative Mode Use	Employees are offered the opportunity to receive a gift or an award for using modes other than driving alone.	0-3 %
Provide Buspools	Employees that live near each other or along a specified route are organized into a buspool for their trip to work	3-11 %
Walking Program	Provide support services for those who walk to work. This could include buying walking shoes or providing showers.	0-3 %
Company Cars for Business Travel	Employees are allowed to use company cars for business-related travel during the day.	0-1 %
Guaranteed Ride Home Program	A company owned or leased vehicle or taxi fare is provided in the case of an emergency for employees that use alternative modes.	1-3 %
Time off with Pay for Alternative Mode Use	Employees are offered time off with pay as an incentive to use alternative modes (rather than monetary, bonus, gift or awards)	1-2 %

SOURCE: *Guidance for Estimating Trip Reductions from Commute Options,* Oregon Department of Environmental Quality, August 1996.

alternative modes and other market-based measures are needed for TDM to have significant impact on reducing overall vehicle miles traveled.

At the same time, the same research indicates that employee trip reduction programs can be effective instruments for localized congestion relief[4]. For example, employers can substantially reduce peak hour trips by shifting work schedules, which may not reduce VMT but can effectively manage congestion. In Wilsonville, a Nike warehouse/distribution site generates 80% less vehicle trips than standard similar uses in the evening peak hour by using employee shifts that are outside the peak period (4 - 6 PM) [5]. This type of congestion management technique can extend the capacity of transportation facilities.

CRITERIA

Hillsboro's Transportation Planning Task Force and Transportation Technical Advisory Committee created and refined a set of goals and policies to guide transportation system development in Hillsboro (see Chapter 2). Several of these policies pertain specifically to transportation demand management:

Goal 3: Trip Reduction

Policy 1 Participate in trip reduction strategies developed locally and regionally, including employment, tourist and recreational trip programs.

Encourage implementation of public and private travel demand management programs that reduce single occupant vehicle trips per capita and shift traffic to off-peak travel hours. Coordinate trip reduction strategies with Washington County, major employers in Hillsboro, Metro, Tri-Met, Westside Transportation Alliance, ODOT and DEQ. Seek to raise the PM peak average vehicle occupancy (AVO) to 1.3 in the evening peak hour and/or move 50 percent of standard evening peak trip generation outside the peak hour. Educate business groups, employees and citizens about trip reduction strategies and work with business groups, citizens, employers and employees to develop and implement travel demand management programs. Work with ODOT to establish guidelines for planning interchange improvements to allocate space for park-and-ride lots to increase multi-occupant vehicles.

Policy 2 Ensure that nearby commercial, community service and high employment industrial land uses are developed in a manner that provides convenient access to pedestrians, bicyclists and transit riders. Support compact, mixed-use development including infill and redevelopment in appropriate areas of the city.

Apply City Transportation Planning Rule standards to developments adjacent to transit streets. Pedestrian accessways with minimal vehicle conflicts should be identified for every new development site for access to the public right-of-way and pedestrian system. Commercial site design should encourage internal trips by alternative modes. Appropriate areas of the City include, but are not limited to regional centers, town centers, station areas and transit corridors as defined by Metro.

Policy 3 Implement City Station Community Planning Areas in ways that encourage the location of the highest land use densities and mixed uses near the best transit services.

[4] *Evaluation of Employee Trip Reduction Programs Based upon California's Experience with Regulation XV*, Institute of Transportation Engineers, Technical Council Committee 6Y-51, January 1994.

[5] *Nike Parking Lot Expansion Trip Generation Study*, City of Wilsonville, by DKS Associates, May 1997.

These goals and policies are the criteria that all transportation demand management strategies in Hillsboro should be compared against to determine if they conform to the intended vision of the City.

STRATEGIES

Several strategies were evaluated by the Transportation Planning Task Force for transportation demand management in Hillsboro. These strategies are aimed at providing the City with priorities toward implementing transportation demand management projects that meet the goals and policies of the City.

The City of Hillsboro Transportation Planning Task Force ranked these strategies for transportation demand management. Each task force member was assigned a certain number of points that he or she could allocate to each of the strategies according to his or her vision of priorities for the City of Hillsboro. The ranking of the strategies follows from most important to least important:

- Encourage linkage of housing, retail and employment centers
- Provide incentives to take transit and use other modes (i.e. free transit pass)
- Work with property owners to install bicycle racks and bicycle amenities
- Schedule deliveries outside of peak hours
- Coordinate shift changes/staggered work hours
- Work with property owners to place parking stalls for carpoolers near building entrances
- Focus demand management districts (i.e. downtown)
- Flexible working hours
- Provide information regarding commute options to larger employers
- Provide business association support for coordination of TDM
- Congestion pricing
- Telecommuting *(received no points)*

RECOMMENDED PLAN

State, regional and county policy[6] all call for encouraging and promoting transportation demand management. The proposed policy of this plan calls for the city to support TDM. Collectively, the implementation of the modal plans in this TSP, along with the TDM plan, will contribute to the regional VMT reduction goal. Unlike bicycles, pedestrians and motor vehicles, implementation of this policy does not necessarily require capital infrastructure. In fact, much more of TDM is policy and management rather than concrete and asphalt. Because of this, the recommended TDM plan for Hillsboro consists of the following:

- Encourage development that effectively mix land uses to reduce vehicle trip generation. These plans may include development of linkages (particularly non-auto) that support greater use of alternative modes. Land use density should be higher at transit stations (half-mile radius) than elsewhere in the community.

[6] Transportation Planning Rule, Section 660-12-035; Regional Transportation Policy, Metro, July 1996, page 1-39; and Washington County Transportation Plan, October 1988, page 30.

Mixed land use projects have demonstrated the ability to reduce vehicle trips by capturing internal trips between land use types, encouraging walk/bike trips and producing shorter vehicle trips[7].

- Support continued efforts by Washington County, ODOT, DEQ, Tri-Met and the Westside Transportation Alliance to develop productive TDM measures that reduce VMT and peak hour trips. This may require City funding of TDM management to get maximum benefit or results (possibly $25,000 to $75,000 per year).

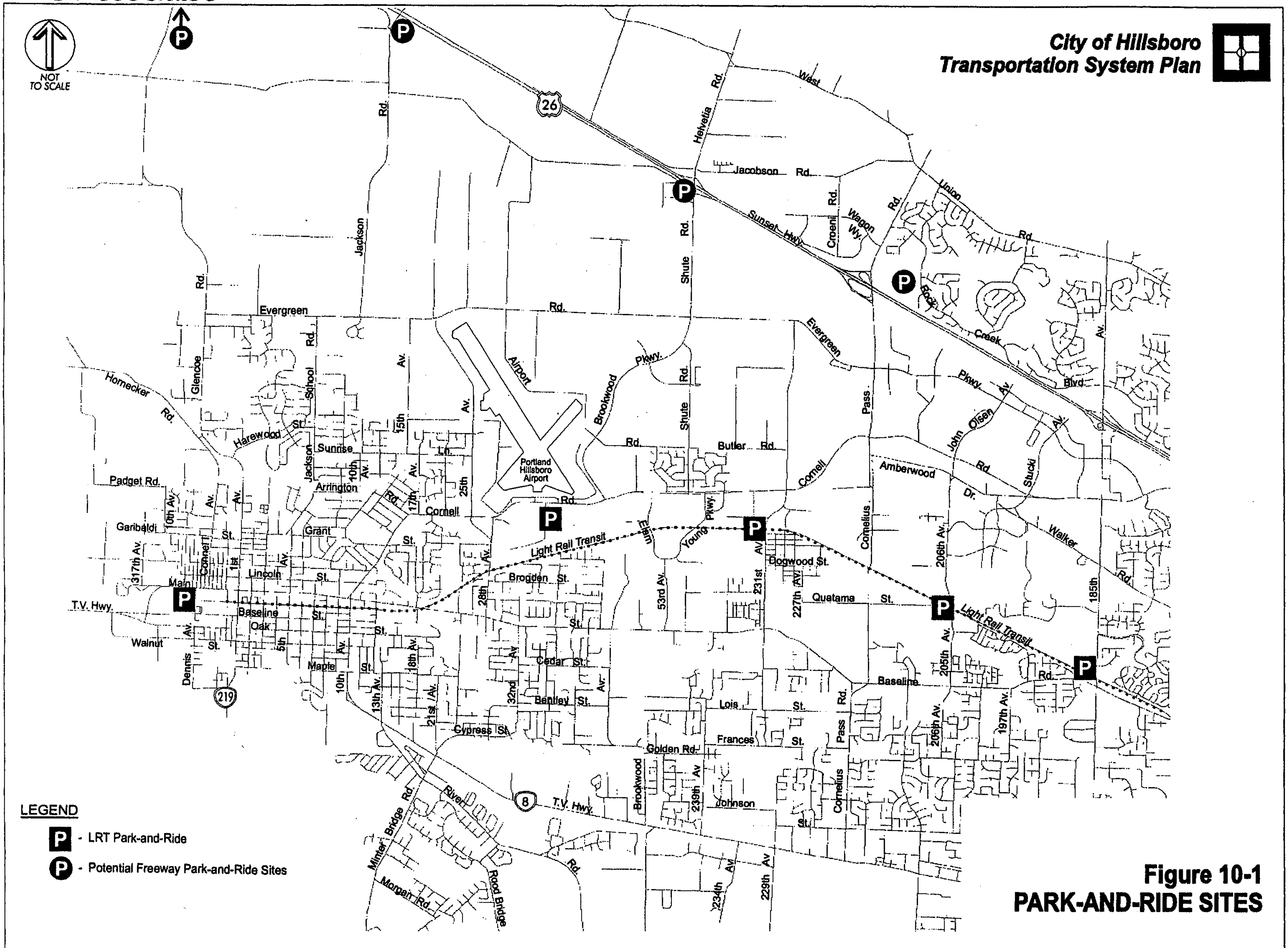
- As vehicle traffic levels increase with the build out of land uses within Hillsboro, it may become necessary to go beyond the coordination with the regional Employee Commute Options program developed by DEQ. This may include developing localized TDM programs for the city or subareas of the city to address vehicle trip reduction. For example, measures which are appropriate for site planning such as close-in parking for carpools, bicycle parking, shower facilities and convenient transit stops may be considered in the design review process.

- As a capital oriented element, coordinate with ODOT and Tri-Met on the development of park- and -ride transit station or freeway interchange locations in Hillsboro (these are locations proven to be successful in attracting carpool/transit use). Figure 10-1 shows the current park and ride locations. Expansion of these sites should focus on transit station or freeway interchange locations. Interchange reconstruction projects should be required to identify potential sites for park-and-ride (even small sites of 50 spaces). Over the next 20 years, a reasonable budget for park-and-ride expansion might be about $100,000 per year (about 50 spaces a year, assuming pre-existing ROW).

[7] *Trip Generation, 5th edition,* Institute of Transportation Engineers, 1991, Chapter VII, indicates potential for PM peak hour capture of between 27% and 66%.

DKS Associates

City of Hillsboro
Transportation System Plan



LEGEND

- LRT Park-and-Ride
- Potential Freeway Park-and-Ride Sites

Figure 10-1
PARK-AND-RIDE SITES

Chapter 11
Funding

This chapter outlines the funding sources, which can be used to meet the needs of the transportation system. The costs for the elements of the transportation system plan are outlined and compared to the potential revenue sources. Options are discussed regarding how costs of the plan and revenues can be balanced.

Transportation funding is commonly viewed as a user fee system where the users of the system pay for infrastructure through motor vehicle fees (such as gas tax and registration fees) or transit fares. However, a great share of motor vehicle user fees goes to road maintenance, operation and preservation of the system rather than construction of new system capacity. Much of what the public views as new construction is commonly funded (partially or fully) through property tax levies, traffic impact fees and fronting improvements to land development. In Washington County, the Major Streets Transportation Improvement Program (MSTIP) and traffic impact fees (TIF), similar to system development charges (SDC) are key examples.

The overall transportation system needs can typically out pace dedicated funding sources. A key to balancing needs and funding are user fees. Motor vehicle fees have become a limited source of funding new transportation system capacity due to many factors:

- Gas taxes have been applied on a fixed cents per gallon basis not a percentage basis. Increases in the gasoline tax have not kept pace with cost of transportation needs. The Department of Transportation's Bureau of Transportation Statistics data indicates that in real terms the amount of federal gas tax paid by American households has actually declined by 41 percent from 1965 (when Interstate freeway building was at its peak) to 1995. That occurred with the real dollar gas tax increasing from 4 cents to 18.4 cents in the same time frame (although 4.3 cents per gallon were added for deficit reduction, not transportation in the last ten years).

- Oregon gas taxes have not increased since 1992 (currently 24 cents per gallon) and registration fees have been at $15 per vehicle per year for over ten years. Significant new roadway construction particularly that attributed to new development, has increased Hillsboro's inventory of roads and maintenance during this time. Additionally, the demands of region-wide growth have increased the need for capacity improvements in the system.

- Significant improvements in fuel economy over the last 15 years have reduced the relationship of user fees to actual use. For example, a passenger car with 12,000 miles of use in a year at 15 miles per gallon could generate about $350 per year in revenue using current federal, state and county gas tax levels (about 44 cents) compared to less than $200 per year with a 27 miles per gallon vehicle (a 45 percent reduction).

- The bill is coming due on many roads built 20 years ago in terms of maintenance. As the inventory of roads increased, the use of the roads increased faster. This is evident from national transportation statistics. The number of passenger cars and miles of urban roadways doubled from 1960 to 1995. However, the number of vehicle miles traveled on those roadways increased 470%. This increased use proportionally increases maintenance needs. Many of these roads are heavily used and the maintenance activities in the urban area have a substantial impact on operation unless work is conducted in off-peak periods, which increases the cost to maintain these roads. To compound matters, the amount of passenger car fuel consumed from 1960 to 1995 has only increased 66%, reducing the rate that revenue comes in from user fees relative to actual use.

FUNDING

Funding Sources and Opportunities

There are several potential funding sources for transportation improvements. Table 11-1 summarizes several funding options available for transportation improvements. These are sources, which have been used in the past by agencies in Oregon. In most cases these funding sources when used collectively are sufficient to fund transportation improvements for local communities. Due to the complexity of today's transportation projects, it is necessary to seek several avenues of funding projects. Unique or hybrid funding of projects generally will include these funding sources combined in a new package. Examples of funding sources which generally do not provide funding for roadways include: Property Tax General Funds, Car Rental Tax, Transient Lodging Tax, Business Income Tax, Business License Tax and Communication Services Tax.

The federal gas tax is allocated through Intermodal Surface Transportation Efficiency Act (ISTEA). The United States Congress has approved reauthorization of transportation funding (TEA 21) for the next six years. Federal transportation funds are distributed in the Portland region by Metro (hence the term "regional funds"). ISTEA/TEA 21 funds are much more flexible than state gas tax funds, with an emphasis on multi-modal projects. ISTEA/TEA 21 funds are allocated through several programs including the National Highway System (NHS), Surface Transportation Program (STP) and Congestion Mitigation and Air Quality (CMAQ) Improvement Programs. NHS funds focus on the interstate highway system and CMAQ funds are targeted for air quality non-attainment areas.

Within the Portland region, funding for major transportation projects often is brought to a vote of the public for approval. This is usually for a large project or list of projects. Examples of this public funding include the Major Streets Transportation Improvement Program (MSTIP) in Washington County or the Westside Light Rail Project. Because of the need to gain public approval for transportation funding, it is important to develop a consensus in the community, which supports needed transportation improvements. That is the value of the Transportation System Plan. In most communities where time is taken to build a consensus regarding a transportation plan, funding sources can be developed to meet the needs of the community.

Table 11-1
Potential Transportation Revenue Sources

Type	Description
Traffic Impact Fees (TIF) & System Development Charges (SDC)	Traffic Impact Fees or System Development Charges (SDCs) have been used in Oregon and throughout the United States. The cornerstone to development of TIF/SDCs involves two principles: 1) there must be a reasonable connection between growth generated by development and the facilities constructed to serve that growth (generally determined by level of service or connectivity); and 2) there must be a general system-wide connection between the fees collected from the development and the benefits development receives. Charges are typically developed based on a measurement of the demand that new development places on the street system and the capital costs required to meet that demand. Washington County has a traffic impact fee (TIF) which is a voter approved tax. SDCs do not require a vote of the public and are not a tax.
Gas Tax	The State, cities and counties provide their basic roadway funding through a tax placed on gasoline. State gas tax is approved legislatively while voters approve local gas taxes. State funds are dedicated to roadway construction and maintenance, with one percent allocated to pedestrian and bicycle needs. This tax does not fall under the Measure 5 limits, because it is a pay-as-you-go user tax. Washington County has a one-cent gas tax and a recent ballot initiative to increase this tax failed.
Other Motor Vehicle Fees	The state collects truck weight mile taxes, vehicle registration fees and license fees. These funds are pooled together with the gas tax in distributing state motor vehicle fees to local agencies. Annual motor vehicle fee allocations to Washington County highways amount to about $100 million (including gas tax). Washington County considered raising motor vehicle registration by $15 per year in 1997 but it was not approved.
Street Utility Fees	Certain cities have used street utility fees for maintenance. The fees are typically collected monthly with water or sewer bills. These funds are not for capacity improvements, but for supporting local roadway maintenance based upon land use type and trip generation. This frees other revenue sources for capacity needs. Utility fees can be vulnerable to Measure 5 limitations, unless they include provisions for property owners to reduce or eliminate charges based on actual use.
Exactions	Frontage improvements are common examples of exaction costs passed to developers. These have been used to build much of Hillsboro's local street system. Developers of sites adjacent to unimproved roadway frontage are responsible for providing those roadway improvements. Developers of sites adjacent to improvements identified as TIF/SDC projects can be credited the value of their frontage work, which is included in the TIF/SDC project-list cost estimate.
Local Improvement Districts (LID)	LIDs provide a means for funding specific improvements that benefit a specific group of property owners. Assessments are placed against benefiting properties to pay for improvements. LIDs can be matched against other funds where a project has system wide benefit beyond benefiting the adjacent properties. Similarly, districts can be created for tax increment type financing. In Hillsboro, the current code renders LIDs less effective due to the mandate for fronting property.
Special Assessments	A variety of special assessments are available in Oregon to defray costs of sidewalks, curbs, gutters, street lighting, parking and CBD or commercial zone transportation improvements. These assessments would likely fall within the Measure 50 limitations. In Washington County, other examples of transportation assessments include MSTIP (Major Streets Transportation Improvement Program) and the urban road maintenance district property tax levy. Both of these are property tax assessments, which have been imposed through votes of the public. A regional example would be the Westside LRT where the local share of funding was voter approved as an addition to property tax.
Driveway Fees	Gresham collects a Public Street Charge and a Driveway Approach Permit Fee. These fees are project specific and revenue varies year to year based upon development permits. These funds are used for city maintenance and operation.
Employment Taxes	Tri-Met collects a tax for transit operations in the Portland region through payroll and self-employment taxes. Approximately $120 million are collected annually in the Portland region for transit.
Oregon Special Public Works Fund	The Special Public Works Fund (SPWF) Program was created by the legislature in 1985 as an economic development element of the Oregon Lottery. The program provides grants and loan assistance to eligible municipalities. There has been limited use of these funds on urban arterials. These funds are commonly used on state highways (a recent example being Immediate Opportunity Funds used for the US 26/Shute interchange associated with Nike).

Traffic impact fees (TIF) are used to off set the cost of growth related capacity needs within the transportation system. Washington County manages a countywide TIF program. The fee is updated periodically to adjust for inflation. System development charges (SDCs) are similar to TIF, except TIF require a vote of the public for implementation where SDCs do not. Both SDCs and TIFs rely upon a strong nexus between the impact of growth on the transportation system and the cost for transportation capacity improvements to serve land use growth. For example, maintenance costs or upgrading design without adding capacity are elements that would not be included in a TIF or SDC. SDC can also be placed over districts to address growth related impacts. In Wilsonville, the city has imposed an interchange SDC to provide local matching funds to ODOT for the widening of the I-5/Wilsonville Road interchange. New development pays a SDC for each trip they add to the I-5/Wilsonville Road interchange area in the PM peak hour. Table 11-2 provides a comparison of SDC/TIF rates in the Portland region.

Table 11-2
Sample TIF in the Region

	Residential Cost per Dwelling Unit		Non-Residential Cost per 1,000 Square Feet				
Land Use ITE Code	Single Family 210	Multi-Family 220	Light Industry 110	Office* 710	Medical Office 720	Retail* 820	Fast Food 834
Lake Oswego	$ 3,592	$ 2,573	$ 3,820	$ 6,383	$ 13,221	$ 4,002	$ 61,052
Vancouver	$ 989	$ 672	$ 313	$ 710	$ 1,844	Traffic Study	$ 4,071
Gresham	$ 1,202	$ 750	$ 1,166	$ 2,225	$ 4,855	$ 3,641	$ 17,386
Troutdale	$ 588	$ 285	$ 570	$ 1,088	$ 2,375	$ 3,393	$ 24,642
Wilsonville	$ 2,256	$ 1,573	$ 2,547	$ 3,700	$ 3,700	$ 4,755	$ 14,265
Washougal	$ 775	$ 445	$ 752	$ 1,159	$ 3,132		
Clark County: Mt. Vista	$ 2,638	$ 1,787	$ 1,807	$ 3,169	$ 7,415	$ 3,359	$ 32,062
Clark County: Orchards	$ 1,161	$ 786	$ 795	$ 1,394	$ 3,262	$ 1,478	$ 14,107
Washington County	$ 1,790	$ 1,181	$ 1,199	$ 2,034	$ 5,604	$ 2,998	$ 4,500
Clackamas County	$ 1,277	$ 884	$ 985	$ 1,557	$ 5,108	$ 2,874	$ 12,895
Battleground	$ 2,869	$ 1,988	$ 1,955	$ 3,169	$ 8,489	$ 3,894	$ 27,226
Ridgefield	$ 1,913	$ 1,099	$ 1,858	$ 4,243	$ 7,728	$ 11,042	$ 80,192
Camas (proposed)	$ 1,416	$ 921	$ 1,348	$ 2,626	$ 4,592	$ 2,708	$ 21,636
West Linn	$ 2,170	$ 1,470	$ -	$ 2,961	$ -	$ 8,349	$ -

Note: Assumes a 100,000 sf office and a 150,000 sf retail center.

COSTS

Cost estimates (general order of magnitude) were developed for the projects identified in the motor vehicle, bicycle and pedestrian elements. Costs estimates from the RTP or MSTIP projects in Hillsboro were used in this study. Other projects were estimated using general unit costs for transportation improvements, but do not reflect the unique project costs that can (on some projects due to right-of-way, environmental mitigation and/or utilities) significantly add to project cost (25 to 75 percent in some cases, due to environmental, utility or right-of-way issues). Development of more detailed project costs can be prepared in the future with more refined financial analysis. Since many of the project overlap elements of various modes, the costs were developed at a project level incorporating all modes, as appropriate. It may be desirable to break project mode elements out separately, however, in most cases, there are greater cost efficiencies of undertaking a combined, overall project. Each of these project costs will need further refinement to detail right-of-way requirements and costs associated with special design details as projects are pursued. Table 11-3 summarizes the elements of the plan, which were not project specific and how costs will be addressed for these elements.

It should be noted that all costs are 1997 based. Using the Engineering News Record[1] research on historical construction costs, it can be anticipated that (based on the past eight years) construction costs will increase 2.5 percent per year. Since 1978, construction costs have increased 218 percent over 20 years.

Tables 11-4, 11-5 and 11-6 summarize the key projects in the TSP by three key groups including:

- Bicycle Improvements
- Pedestrian Improvements
- Motor Vehicle Improvements

Washington County, Metro or ODOT has developed many of the project costs for projects in the RTP. These project costs have been utilized for the purposes of this TSP.

[1] Engineering News Record, construction cost index data, enr.com.

Table 11-3
Issues with Non-Auto, Pedestrian and Bicycle Costs

Mode	Issues
Parking	The TSP does not define specific projects. Private property owners will provide off-street parking as land develops. Downtown area parking issues will need to be addressed based upon needs using packaged funding including local and private sources.
Neighborhood Traffic Management	Specific NTM projects is not defined. These projects will be subject to neighborhood consensus based upon City of Hillsboro placement and design criteria. A city NTM program, if desired, should be developed with criteria and policy adopted by the City Council. Traffic humps can cost $2,000 to $4,000 each and traffic circles can cost $3,000 to $8,000 each. A speed trailer can cost about $10,000. Based upon this, a limited program could cost $50,000 per year depending upon neighborhood needs. If this cost were entirely funded through the city, implementation may lag behind neighborhood needs. If private cost sharing (or matching funds) is established a criterion for the neighborhoods, the program could become more comprehensive. The City in determining whether to pursue non-public funds should consider value provided by NTM. It is important, where appropriate, that any new development incorporate elements of NTM as part of its on-site design.
Public Transportation	Tri-Met will continue to develop costs for implementing transit related improvements. The City can supplement this by incorporating transit features through development exactions and roadway project design. Developing new transit services in Hillsboro similar to the corridor services outlined in the TSP will require Tri-Met to reallocate funding or seek additional sources of operating funds.
Trucks/Freight	Roadway funding will address these needs. Roadway overcrossings of railroads can use special Public Utilities Commission funds set aside for safety improvements to railroad crossings.
Rail	Costs to be addressed and funded by private railroad companies and the state.
Air, Water, Pipeline	Not required by City.
Transportation Demand Management	DEQ has established regional guidelines. Private business will need to support employee trip reduction programs. In the future, the city may need to support a supplemental program, which may have a cost range of $25,000 to $75,000 per year.

Table 11-4

Pedestrian Action Plan Project List

Project	From	To	Metro RTP No.*	Cost (in $1,000s)
Priority (1): Connect key pedestrian corridors to schools, parks, recreational uses and activity centers				
Maple Street	16th Avenue	24th Avenue	722	$300 *
Oak Street	10th Avenue	18th Avenue	722	$300 *
Walnut Street	10th Avenue	18th Avenue	722	$300 *
18th Avenue	Oak Street	Maple Street	722	$300 *
21st Avenue	Cypress Street	Maple Street	722	$300 *
Glencoe Road	North of Glencoe H.S.	Grant Street	712	$ 90 *
Jackson School Road	Evergreen Road	Grant Street	711b	$500 *
Connell Road	Garibaldi Street	Glencoe Road		$100
Arrington Road	Cornell Road	Jackson School Road		$230
Delsey Road	Arrington Road	Grant Street		$130
24th Avenue	Spruce Street	Maple Street		$85
Cedar Street	32nd Avenue	Brookwood Avenue		$260
Frances Street	239th Avenue	Cornelius Pass Road		$300
Minter Bridge Road	River Road	Morgan Road		$120
Rood Bridge Road	River Road	Rood Bridge Park		$60
Witch Hazel Road	TV Highway	River Road		$120
37th Avenue	Main Street	LRT Station		$240
Arrington Road	Jackson School Road	Cornell Road		$340
Sunrise Lane	Jackson School Road	25th Avenue		$360
Grant Street	Jackson School Road	28th Avenue		$400
Lois Street	239th Avenue	Cornelius Pass Road		$234
Priority (2): Fill in gaps where some sidewalks exist				
TV Highway	10th Avenue	Cornelius Pass Road	723	$8,300*
28th Avenue	Grant Street	E. Main Street	726c	$160 *
Cornelius Pass Road	TV Highway	Evergreen Road	737/738	$390
Walker Road	Amberglen Parkway	185th Avenue		$180
Stucki Avenue	Cornell Road	Evergreen Parkway		$120
Garabaldi Street	317th Avenue	1st Avenue		$100
Golden Road	Brookwood Avenue	239th Avenue		$180
Priority: Construct sidewalks with roadway improvement projects				
Baseline Road	Lisa Drive	Brookwood Avenue	714/715/928	$980 *
231st Avenue	Cornell Road	Johnson Street	729a	$720 *
Brookwood Parkway	Airport Road	TV Highway	739/740	$770 *
Evergreen Road	Shute Road	Glencoe Road	732/732b	$340 *
Aloclek Road	Amberwood Drive	Cornelius Pass Road	726d	$240 *
East/west connector/Parr	185th Avenue	63rd Parkway	728	$552 *
Amberglen Parkway/205th Ave.	Von Neuman Drive	Baseline Road	729b	$430 *
Quatama Street	227th Avenue	Baseline Road	707	$120
Butler/Old Cornell Road	Shute Road	206th Avenue/John Olsen		$624
Salix Extension	185th Avenue	Cornell Road		$410
206th Avenue	Amberwood Drive	Amberglen Parkway		$360
			TOTAL	**$20,045**

*Included in Draft RTP list, November 1998. Reference number used in Round 2 lists.

Table 11-5
Bicycle Action Plan Project Priorities

Project	From	To	Approximate Cost (1000's of dollars)
Priority 1: Connect key bicycle corridors to schools, parks, recreational uses and activity centers			
Rock Creek Trail	Evergreen Parkway	Amberwood Drive	79* $ 500
Jackson School Road bike lanes	Evergreen Road	Grant Street	(711b*) $ 672
Glencoe Road bike lanes	Evergreen Road	Grant Street	(712*) $ 466
Grant Street bicycle way	1st Avenue	25th/28th Avenue	$ 252
Priority 2: Fill in gaps in bicycle network			
25th Avenue bike lanes	Evergreen Road	25th Avenue gap	(749*) $ 2,000
Cornell Road bike lanes	Elam Young (west)	Ray Circle	(706*) $ 600
10th Avenue bike lanes**	Walnut Street	Main Street	$ 151
Oak Street bike lanes**	TV Highway	Dennis Avenue	$ 252
Cornell Road bike lanes	Grant Street	25th Avenue	$ 302
Priority: Construct bike lanes with roadway improvement projects			
Baseline Road bike lanes	Lisa Drive	10th Avenue	(714/715/928*) $1,875
Brookwood Parkway bike lanes	Airport Road	TV Highway	(739/740*) $1,200
Cornelius Pass Road bike lanes	Cornell Road	209th Avenue	(737/738*) $1,425
Evergreen Road bike lanes	Near 260th Avenue	Glencoe Road	(732b*) $ 450
Evergreen Road bike lanes	Near 25th Avenue	Glencoe Road	(732*) $ 675
231st/235th Avenue bike lanes	Evergreen Road	West Union Road	(743a/743b*) $1,125
28th Avenue bike lanes	Grant Street	Main Street	(726c*) $ 250
231st Avenue bike lanes	TV Hwy	Cornell Road	(729a*) $1,125
Quatama Street bike lanes	227th Avenue	Baseline Road	(707*) $ 120
Jacobson Road bike lanes	Helvetia Road	Cornelius Pass Road	$ 600
Butler/Amberwood bike lanes	Brookwood Parkway	John Olsen Avenue	$ 1,013
Walker Road bike lanes	Amberglen Parkway	185th Avenue	$ 270
Bicycle Action Plan Projects Total Cost:			**$15,323**

Other Master Plan Projects

Project	From	To	Approximate Cost
Priority: Bicycle corridors that connect neighborhoods			
Three Projects: Minter Bridge-Cyress-32nd/Quatama/Golden-/Frances			$ 2,394
Priority: Construct bike lanes with roadway improvement projects			
Eight Projects: West Union/Shute/Quatama/Grant/205th-206th/Salix/New Roads			$ 5,402
Priority: Multi-use trails for citywide and recreational needs			
Four corridors: Rock Creek/Beaverton Creek/Bronson Creek/Bethany Pond			$ 4,065
Other Bicycle Master Plan Projects Total Cost:			**$ 11,861**

* Included in Draft RTP list, November 1998 (reference number in parenthesis)
** Feasibility studies required; including alternative alignments and need for right-of-way acquisition.

Table 11-6
Motor Vehicle Project List

(All projects include sidewalks, bicycle lanes and transit accommodations as required)

Location	Description	Status*	Cost
HIGHEST PRIORITY PROJECTS			
10th Avenue: Main to Baseline Street	Add right turn lane, widen sidewalk	RTP 726b	$1,500,000
28th Avenue: Grant to Main	Widen to 3 lanes	RTP 726c	$ 9,600,000
231st / 234th Avenue Extension	Extend south of Baseline to Century High School a 3 lane roadway	RTP 729a	$23,200,000
Aloclek: Amberwood to Cornelius Pass	Extend 3 lane road	RTP 726d	$ 2,000,000
Baseline Road: Lisa to Brookwood	Widen to 5 Lanes	RTP 715	$ 6,000,000
Baseline Road: Lisa to 231st Avenue	Widen to 3 Lanes	RTP 714	$20,000,000
Baseline Road: 231st Ave. to Brookwood	Widen to 3 Lanes	RTP 928	$ 7,500,000
Brookwood Parkway: Airport to TV Hwy	Widen to 5 Lanes to past Cornell, extend south as 3 Lanes	RTP 739/740	$18,400,000
Cornelius Pass Road: US 26 to West Union	Widen to 5 Lanes	RTP 734	$ 3,500,000
Cornelius Pass Road: Aloclek to Baseline	Widen to 5 Lanes	RTP 738	$15,000,000
Cornelius Pass Road: Baseline to TV Hwy	Widen to 5 Lanes	RTP 737	$ 9,000,000
Evergreen: Glencoe to 15th Avenue	Widen to 3 Lanes	RTP 731a	$12,800,000
Evergreen: 15th to 253rd Avenue	Widen to 5 Lanes	RTP 732b	$ 8,900,000
TV Highway/Cornell Signal Timing/System	Operational Improvements	RTP 646b/727/730	$ 2,800,000
TV Highway Boulevard	Complete Boulevard Improvements	RTP 710a	$ 2,000,000
TV Highway: Cornelius Pass to 209th	Improvement	STIP Planned	$ 1,250,000
US 26/Jackson School Road	Channelization/Safety	RTP 711a	$ 500,000
US 26 at 185th	Sound Walls	STIP Planned	$ 1,950,000
Johnson at 198th	Traffic Signal	STIP Planned	$ 203,000
		Subtotal	**$ 146,103,000**
SECOND HIGHEST PRIORITY PROJECTS			
1st Ave./Glencoe Rd.: Lincoln to Evergreen	Widen to 3 Lanes	RTP 712	$ 3,500,000
185th Avenue: Westview to Springville	Widen to 5 Lanes	Not in Plans	$ 4,700,000
205th Avenue: LRT to Baseline	Widen to 5 Lanes	RTP 729b	$ 4,800,000
206th Avenue: Amberwood to LRT	Widen to 3 Lanes	Not in Plans	$ 3,100,000
Amberglen Parkway: Walker to 206th	Extend 3 lane roadway	Not in Plans	$ 2,100,000
Amberwood: 206th to Cornelius Pass	Widen to 3 Lanes	Not in Plans	$ 1,500,000
Butler Road: 63rd to Brookwood/Airport	Widen and extend to 3 lane road	Not in Plans	$ 1,200,000
Cornell: Arrington to Main	Widen to 5 Lanes	RTP 709b	$ 6,000,000
Downtown Area Improvements: 1st and 10th Avenues	Signals, Striping, Widening, and Two-way.	RTP 712b/726e-f	$ 2,270,000
East-West Collector: Cornelius Pass to Salix	Extend 3 lane road	RTP 728	$10,900,000
East-West Collector: Campus to Cornelius Pass	Extend 3 lane road	RTP 728	$ 7,600,000
Jackson School Road: Evergreen to Grant	Widen to 3 Lanes	RTP 711b	$ 3,500,000
Jacobson Road: Croeni to Cornelius Pass	Extend new 3 lane alignment	Not in Plans	$ 4,400,000
Jacobson Road @ Helvetia	Realign intersection north of US 26	Not in Plans	$ 1,700,000
Quatama Street: LRT to 227th Avenue	Widen/improve 3 lane road	RTP 707	$ 4,200,000
Quatama Street: 227th Ave. to Baseline Rd.	Extend 3 lane road	RTP 707	$ 2,200,000
Salix Extension: LRT to Walker	Extend 3 lane roadway	Not in Plans	$ 4,300,000

Location	Description	Status*	Cost
Walker Road: Amberglen to 185th	Widen to 5 Lanes	RTP 754	$ 10,000,000
Other Collector Reconstruction	Multiple Locations	Not in Plans	$38,100,00
Intersections Improvements	Multiple Locations (see Table 11-7)	Not in Plans	$50,500,00
Other Traffic Signals (16)	City/County operational enhancement	Not in Plans	$ 4,000,000
US 26/Cornelius Pass Road	Build new diagonal ramps in NE & SE Quadrants. Add ramp meter storage.	RTP 735	$ 5,000,00
US 26/Shute Road	New loop ramp and interchange modifications	US 26 Interchange Study	$ 5,000,000
US 26/229th Overcrossing	Extend 229th Ave. from NW Bennett Ave. to West Union Rd. as 3 lane roadway	RTP 743 a + b	$6,800,00
		Subtotal	$ 187,370,00
THIRD HIGHEST PRIORITY PROJECTS			
Airport Road: Evergreen to Brookwood	Realign and widen to 3 lanes	Not in Plans	$ 2,800,00
Amberwood: Cornelius Pass to Cornell	Extend 3 lane road to Butler	Not in Plans	$ 2,100,00
Baseline Road/185th Intersection	Upgrade Capacity/Grade Separation	Not in Plans	$15,000,000
Brookwood Extension s/o TV Hwy	Extend 3 Lanes, realign Witch Hazel	Not in Plans	$ 1,300,00
Cornelius Pass Road Extension	Extend 3 lane road south of TV Hwy to 209th	RTP 825d	$14,000,00
Heritage: 185th to Salix	Extend 2 lane road	Not in Plans	$ 1,900,000
Jackson School Road/US 26	Interchange	Not in Plans	$ 10,000,00
Parr: 185th to Salix	Connect 3 lane road	Not in Plans	$ 1,900,00
West of Rood Bridge: TV Hwy to River	Connecting 3 lane roadway	Not in Plans	$ 700,000
TV Highway: Access Control	Driveway/Turn Lane modifications	RTP 645c	$15,000,00
East-West Collector: Brookwood to 28th	Build new 3 lane road n/o LRT	Not in Plans	$ 7,100,00
East-West Collector: River to 209th	Extend and widen to 3 lane road	Not in Plans	$18,200,000
185th Avenue: Cornell to Walker	Widen to 7 Lanes	Not in Plans	$ 3,200,00
188th Extension: Cornell to Walker	Extend 3 lane road	Not in Plans	$ 2,400,00
US 26 Auxiliary Lanes: Shute to 185th	Add Auxiliary Lanes	Not in Plans	$20,000,000
US 26/Glencoe Road	Interchange improvement/modernization	RTP 731a	$ 12,000,00
		Subtotal	$ 127,600,00
MOTOR VEHICLE STREET IMPROVEMENT TOTAL			$ 461,073,000

* Based upon tentative draft RTP preferred improvement list from Metro, reference numbers from November 1998 listing. Planned indicates projects included in the MSTIP, STIP, CIP or approved (1995) RTP funding programs. Not in Plans indicates projects that have not been previously addressed in one of the local or regional transportation improvement plans.

Table 11-7
Future Intersection Improvement List

No.	Intersection	Description	Cost
1	Glencoe Road/Hornecker Road	Install traffic signal; add SB right turn lane, NB left turn lane EB right turn lane	$ 1,250,000
2	Glencoe Road-1st Street/Grant Street	Install traffic signal; Glencoe 3 Lanes	$ 250,000
3	Main Street/1st Avenue/Lincoln Street	Add WB right turn lane (restripe- remove parking); signal modification/additions	$ 500,000
4	US 26/Shute Road	Add 2nd NB thru & right turn lane + interchange study of future geometry	$ 2,600,000
5	US 26/Cornelius Pass Road EB ramps	Add N/B to E/B diagonal ramp as a free movement	$ -
6	US 26/Cornelius Pass Road WB ramps	Add WB diagonal off-ramp	$ -
7	Cornelius Pass Road/West Union Road	Install traffic signal; add left turn lanes SB, EB, WB;add NB and EB RT lanes	$ 2,250,000
8	Cornelius Pass Road/Jacobson	Install traffic signal; add SB right turn lane: Cornelius Pass 5 Lanes	$ 500,000
9	Cornelius Pass Road/Wagon Way	Install traffic signal; Cornelius Pass 5 Lanes	$ 250,000
10	Evergreen Road/Jackson School (east)	Install traffic signal; add SB right turn lane; Evergreen 3 Lanes; Connect W/B right turn lane with 5 lane section of Evergreen	$ 1,150,000
11	Evergreen Road/Jackson School (west)	Install traffic signal; Evergreen 3 Lanes	$ 250,000
12	Evergreen Road/15th Avenue	Install traffic signal; EB right turn lane; Evergreen 5 Lane section starts	$ 500,000
13	Evergreen Road/25th Avenue	Provide second NB right turn lane, second WB left turn lane; Evergreen 5 Lanes	$ 750,000
14	Evergreen Road/Shute-Brookwood Parkway	Add NB and SB right turn lanes	$ 500,000
15	Evergreen Parkway/229th Avenue	Add NB and EB right turn lanes; use protected/permitted signals N/S	$ 625,000
16	Evergreen Road/Cornelius Pass Road	Double left turn lanes on all approaches; add right turn lanes on all approaches	$ 3,000,000
17	Evergreen Parkway/John Olsen Avenue	Install traffic signal	$ 250,000
18	Evergreen Parkway/Stucki Avenue	Install traffic signal	$ 250,000
19	Evergreen Parkway/185th Avenue	Add SB right turn lane; NB double left turn lanes	$ 750,000
20	Cornell Road/10th/ East Main Street	Add NB right turn lane; add SB through lane	$ 1,950,000
21	Cornell Road-10th Ave/Grant Street	Add EB left turn lane	$ 500,000
22	Cornell Road/25th Avenue	NB + SB double lefts; add SB and EB right turn lanes	$ 1,500,000
23	Cornell Road/Brookwood Parkway	Add second left turn lanes EB + WB; Add SB right turn lane	$ 1,250,000
24	Cornell Road/231st - 229th Avenue	Add EB and SB right turn lanes; add WB 2nd left turn lane	$ 1,000,000
25	Cornell Road/ Cornelius Pass Road	Add WB right turn lane; EB double left turn lanes	$ 750,000
26	Cornell Road/185th Avenue	Add NB and SB double left turn lanes; add NB right turn lane; 185th 7 Lanes	$ 1,250,000
27	Grant Street/'25th -28th Avenue	Install traffic signal; add WB left turn lane	$ 750,000
28	Quatama/Cornelius Pass	Install traffic signal; SB right turn lane, Quatama 3 Lanes	$ 500,000

No.	Intersection	Description	Cost
29	Walker Road/185th Avenue	Add double left turn lanes on all approaches; add WB right turn lane; 185th 7 Lanes	$ 2,250,000
30	Baseline-East Main/28th Avenue	Install traffic signal; add WB right turn lane	$ 500,000
31	Baseline-East Main/32nd Avenue	Widen Baseline Road to 5 lanes	
32	Baseline Road/Brookwood Parkway	Widen Baseline Road to 5 lanes; add EB + SB right turn lanes; signal change	$ 625,000
33	Baseline Road/53rd Avenue	Widen Baseline Road to 5 lanes	
34	Baseline Road/231st Avenue	Widen Baseline Road to 5 lanes; extend 3 Lane 231st	$ -
35	Baseline Road/Cornelius Pass Road	Widen Cornelius Pass + Baseline Road to 5 lanes; right turn lanes all approaches	$ 1,000,000
36	Baseline Road/205th-206th Avenue	Widen 205th + Baseline to 5 lanes; add EB and WB right turn lanes	$ 500,000
37	Baseline Road/185th Avenue	Interchange or 185th 7 lanes with double lefts	$ 15,000,000
38	Baseline Street/10th Avenue	Add SB right turn lane; NB double left turn; restripe for 2nd WB lane	$ 1,625,000
39	TV Highway/13th Avenue-River Rd	Add EB right turn lane	$ 500,000
40	TV Highway/Minter-Bridge Road	Add NB right turn lane; remove split traffic signal phasing	$ 325,000
41	TV Highway/Brookwood Parkway	Extend Brookwood south 3 Lane ; traffic signal phasing; double left turns for NB and SB approaches; add NB, SB and EB right turn lanes; add WB left turn lane	$ 1,500,000
42	TV Highway/239th Avenue	Traffic signal	$ 250,000
43	TV Highway/Cornelius Pass Road	Add NB + SB double left turn lanes; add EB right turn lane	$ 1,250,000
44	Frances Street/Cornelius Pass Road	Traffic signal; 5 lane Cornelius Pass	$ 250,000
45	Johnson/Cornelius Pass Road	Traffic signal; 5 lane Cornelius Pass	$ 250,000
		TOTAL	**$ 50,500,000**

FINANCING ISSUES

The collective funding requirements of the Hillsboro TSP is outlined by mode in Table 11-8. Based upon current sources of funding, the cost of the needs far exceeds the existing funding projected over the next 20 years. It should be noted that elements of the bicycle and pedestrian project lists, which are redundant to the street improvement list, were deducted to avoid double counting. A major portion of this difference can be made up by land use development exactions, where unimproved frontage is built to the TSP standards as projects are implemented. Since a significant number of the transportation projects directly serve new development of vacant land, it can be assumed that fronting improvements would be a means to implement many of the projects with these characteristics. A rough estimate of the potential value of fronting development exactions is about $120 million dollars over 20 years, assuming that all the unimproved frontages of roadway projects (sidewalk plus 18 feet of street) identified in this plan were exactions. This would assume that the fronting improvements would **not** be credited to TIF/SDC revenue, which is already included in the existing funding outlook. The magnitude of the fronting improvements is such that the City and County will need to develop private/public partnerships to assure the reasonable delivery of future improvements in a timely manner.

Table 11-8
Costs for Hillsboro Transportation Plan over 20 years (1997 Dollars)

Transportation Element	Approximate Cost
Street Improvement Projects*: Current Plans	$100,000,000
Unfunded/Not in Plans	$354,603,000
Signal Coordination/ITS Systems ($100,000/yr)	$2,000,000
Road Maintenance (assumes 4% per year growth)	$40,000,000
Bicycle Master Plan (Total $27,747,000)	$10,700,000
Pedestrian Action Plan (Total $20,045,000)	$14,500,000
Pedestrian/School Safety Program ($10,000/yr)	$200,000
Sidewalk Grant Program ($50,000/yr)	$1,000,000
Park-and-ride Expansion (1,000 spaces)	$2,000,000
Neighborhood Traffic Management ($50,000/yr)	$1,000,000
TSP Support Documents (i.e., Design standard update, ...)	$1,000,000
TDM Support ($50,000/yr)	$1,000,000
TWENTY YEAR TOTAL in 1997 Dollars	$528,003,000

* Many of these projects include multi-modal elements built with streets, such as bike lanes and sidewalks. Project costs are included here and not repeated in bicycle and pedestrian costs. While projects in the RTP do not have committed funds, they represent a level of funding that is considered likely over the next 20 years given current funding sources.

The funding sources, which can be used for various modes of transportation, are summarized in Table 11-9. Historically, funding sources have been developed to support roadways for automobiles. Few funding sources have been allocated to other travel modes. Other travel modes were commonly implemented as an element of a roadway project, if funded at all. A few funding sources that the City receives for other modes include an allocation of the state motor vehicle fees which come to the City being dedicated to pedestrian/bicycle paths (about $24,000 per year) and a small set aside of the MSTIP funds for bikeways (about $20,000 per year). While federal gas tax funds are specifically allocated to multi-modal and balanced investments in transportation, other sources of funds such as state gas tax cannot be used for anything but highway use. To address these other modes the City will need to specifically seek funds for a balanced transportation system, while managing the overall needs and revenues.

Table 11-9
Fund Source by Project Type

Source	Bicycle	Pedestrian	Streets	Maintenance	Transit
Traffic Impact Fee (TIF)	•	•	✓		
System Development Charges (SDC)					
Gas Tax/Motor Vehicle Fees					
STATE	•	•	✓	✓	
FEDERAL	✓	✓	✓	✓	✓
Street Utility Fees				✓	
Exaction's	•	✓	✓		
Local Improvement Districts (LID)	•	•	✓		
Tax Increment Financing	✓	✓	✓		
Special Assessments		•	✓	✓	✓
Driveway Fees			✓	✓	
Payroll Employee Tax					✓
Oregon Special Public Works Fund	•	•	✓		✓

• Typically as part of roadway project where other modes are incorporated
✓ Used as a primary source of funding

Current transportation revenue for the City of Hillsboro can be summarized as noted in Table 11-10. Presuming a constant funding level for 20 years, this would potentially fund about $200,000,000 of transportation projects (maintenance, operation, construction). As a comparison to this number, the amount of regional funding allocated to transportation projects in Hillsboro was calculated using the RTP constrained funding scenario. Approximately $80 million of transportation projects have been identified in the current funding programs.[2] While these numbers are not exactly the same (the numbers from Table 11-10 include all City and local funding sources), they clearly point out that there is a serious shortfall between the cost of the transportation plan and the current funding sources. The transportation plan costs of $503 million are much greater than the best case revenue scenario of about $200 million using existing funding sources. While fronting improvements and exactions have the potential to be roughly $120 million in the best scenario, this leaves a $180 million gap between needs and reasonably expected revenue.

Table 11-10
Estimation of Available Transportation Funding From Existing Sources
1997 Dollars (approximate)

Source	Approximate Annual Revenue
State Motor Vehicle Fees to City	$2,400,000
County Gas Tax to City	$200,000
TIF to City	$1,600,000
MSTIP with City (approximate)	$2,000,000
State/Federal Fees use in City (approximate, assuming 30% capital allocation)	$4,000,000
ANNUAL TOTAL	**$10,200,000**
20 YEARS OF CURRENT FUNDING	**$204,000,000**

Exploring Funding Concepts

The gap between transportation plan costs and existing revenue sources creates the need to explore several other concepts. Several options are outlined below:

A. **Reduce the transportation plan costs.** This can eliminate funding shortfalls by deferring or eliminating projects. While some cost reduction is expected in the normal implementation of transportation projects of this size, to meet the total funding shortfall by this strategy would have negative impacts. Lower service levels for all modes of transportation, more extensive congestion, and impacts on community livability would be expected. Depending how much of the plan is eliminated (assuming land use forecasts occur), this strategy could negatively impact the economic potential of Hillsboro (businesses relocate, people move out and development does not reach 2015 forecasts). Additionally, by deferring capital costs of significant projects outside of 20 years it can be expected that the same projects will cost multiples of their estimated costs in the short term. This is similar to deferring roadway maintenance and paying 4 to 5 times the cost of the same improvement by waiting years into the future to act. Rising land costs and the development of vacant land adjacent to roadways,

[2]Interim Federal Regional Transportation Plan, Metro, July 1995, Table 7-2.

which increases mitigation requirements (dealing with hundreds of residents rather than one landowner). These increases in cost erode transportation dollars, making deferral of transportation system improvements an unwise choice in managing the public interest.

B. **Build alternative mode projects and eliminate costly road projects.** This strategy is commonly discussed by people as a way to "get people out of their cars". However, the overall future need for transportation in Hillsboro results from the majority of people using motor vehicles (single occupant vehicles and carpool/vanpools). By not building road projects, the resulting congestion would severely impact bus transit, bicycle and pedestrian travel which all use the same streets as automobiles.

C. **Increase gas tax to meet TSP needs.** The gas tax, although assumed to be the major transportation funding element is one of many sources of funds. It is primarily used to maintain the transportation system not build new local street system capacity. Presently, the state gas tax generates about $2.4 million per year in revenue for the city and the county one-cent gas tax generates about $200,000 per year for the city. If all the motor vehicle fees of the state, county and city were increased proportionately to by themselves fund the Hillsboro transportation shortfall, it would require an increase of over $0.83 per gallon of gasoline. Major increases to motor vehicle fees of this type would likely require voter approval. This amount of gas tax increase by itself would not be reasonable today, and points to the fact that funding will need to be from a variety of sources, not just one fee.

D. **Make development pay for all the difference in future transportation needs since they are caused by growth.** If all the excess funds were divided by the increment of trips between 1997 and the year 2015, an additional $3,100 per evening peak trip would need to be charged to all development on top of all existing fees, taxes and exactions. This would double the current TIF by just adding on Hillsboro's needs. An increase of this type would impact the economic development potential of Hillsboro since other cities (or states) may not have similar charges. Additionally, many of the transportation projects identified in the TSP serve **existing and** future users. For example, a roadway connection project with sidewalks and bicycle lanes (such as 231st Avenue) is beneficial to all system users. This approach would unfairly impose the entire responsibility of TSP implementation on development. Additionally, some improvements are needed even if no growth were to occur, creating a need to fund at least some transportation improvements by other means.

E. **Do not allow land development unless all transportation needs can be funded.** This concept is known as concurrency. This has been implemented in various forms through level of service code amendments required by state laws (Florida and Washington). The examples over the last 15 years of these policies are clear. Funding policy redirects itself to fix capacity problems. Transit, pedestrian, bicycle and other mode facilities are generally not based on capacity but connectivity and access. The outcome in these communities is always larger roads - from Clark County, Washington to Contra Costa County, California to Boward County, Florida. A balanced transportation system is difficult to develop under concurrency assumptions. Outright development moratoria based upon transportation are difficult to impose given Oregon Planning and property rights laws. Creating extraordinary requirements for development would impact economic vitality and likely move the problem rather than fix it.

ODOT has taken positions recently that have opposed rezoning of land if state facilities do not have adequate capacity and funding is not programmed. This is similar to concurrency. It blends assumptions that Comprehensive Plan land uses could be adequately served and that all new/additional vehicle trips are bad for the transportation system. Again, the linkage of concurrency in any form, no matter how simple or appealing does not produce the most effective or efficient transportation system. This approach defers improvements increasing their eventual cost of implementation. It is a reactive policy, not a progressive plan to reduce overall transportation system costs.

F. <u>**Use bonds to fund transportation needs.**</u> Bonds are commonly used for financing transportation projects (the Westside LRT project property tax levy uses tax receipts to fund bond payments to fund the project). The use of public bonds would require a vote of the public. This type of program would include a list of transportation projects that would be funded and a general time frame for completion. Based upon an estimate of property value in Hillsboro, the funding gap would require an increase in property tax approximately $500 per year over 20 years for a homeowner of a $150,000 home. Because increases to property tax are not generally viewed positively by the public, an extensive public involvement effort would be necessary to coordinate the understanding of need, the extent that the bonds should fund transportation needs and what the actual program elements would include.

In studying various strategies, it is clear a "one size fits all" plan will not succeed. It is recommended that a diversified and pragmatic strategy be developed that reflects political realities, economic needs, community livability and a balanced transportation system. Since transportation funding is not controlled locally, it will require steps to be taken at the state, regional, county and city level to be effective and fair. The following steps are necessary to implement the Hillsboro TSP.

- Prioritize all transportation projects in Hillsboro so that the Regional Transportation Plan includes the projects of greatest need. The other projects should be included in preferred and strategic project lists to be eligible to compete for future regional funding. Additionally, as conditions change in the future the need for certain projects may change.

- Start with funding the highest priority TSP needs on the anticipation that over the next 20 years, new and complementary funding programs will be developed. This is more pragmatic than presuming all projects must have funding commitments today and accommodates changing needs and priorities over time. It is important not to stop everything today until a plan to fully fund all the transportation needs is approved. Over time policies and programs in the plan which are intended to reduce vehicle demand can mature and new technologies that improve transportation efficiency can evolve that may change how much or when funding becomes needed.

- Given the relative size of a gas tax increase to fund transportation improvements in Hillsboro, a more diverse source of state and regional funding will be needed. Assuming that funding shortfalls can best be paid by gas tax statewide ignores the fact that the rest of the state may not share Hillsboro's or the Portland region's need to fund transportation. Three steps can be taken including:

Statewide: Support gradual and incremental increases to the state gas tax are made (about \$0.06 to \$0.10 per gallon each six years (assumes three increases in 20 years). Support statewide collection and proportional increases to truck fees (presently based on weight-mile taxes in Oregon as contrasted with diesel taxes in other states).

Regionally: Support increases to motor vehicle registration and air quality surcharges (payable every two years at DEQ inspection or upon sale of vehicle based upon actual miles driven). These relate the urban needs and problems. However, if air quality improves the nexus of higher fees may be difficult.

County: Update the TIF to better reflect arterial and collector needs in the county. Credits and fronting improvements will need to be reevaluated, particularly with more and more potential for redevelopment. It can almost be assured that TIF's would need to be increased given the countywide transportation needs. In addition, a program similar to the MSTIP where a property tax levy is used to fund the most significant projects in Hillsboro (or regionally, as in Washington County) could be done over the next 20 years, potentially funding up to a quarter to a half of the funding shortfall. Additionally, county gas tax and vehicle registration fees could be increased or created.

- At a city level, consider needed city code/charter changes to allow broad use of local improvement districts, area SDC's and bond measures to fund elements of the transportation plan. One of the toughest problems for development of concurrency are initial costs for street improvements. By using improvement districts, costs can be financed over time and paid when the land is generating revenue. The City of Hillsboro does not allow improvement districts to be created unless the participants have frontage to the improvements. This severely limits the pooling of benefited parties to jointly fund transportation projects. Tax increment financing commonly used for redevelopment has nearly been discontinued by public agencies due to tax reduction measures. Tax increment refers to selling bonds to pay for infrastructure that are paid off by the net income of increased tax revenues created by increased property value. Tax increment financing can be very effective in district level master plans or redevelopment. Additionally, unique assessment districts that allow vacant property owners to defer all assessments until resale or development of land could also help reduce property owner concerns of proactively addressing transportation needs before they become more expensive to address. This new concept would require enabling legislation.

- Another bonding concept requiring legislative change would be to bond sidewalk/fronting improvements in already-developed areas with net proceeds tied to the title on the land such that upon transfer or resale the city is paid back, including interest. Current property owners would benefit from the improvements and could pay off the assessment earlier at their discretion. With the current housing market conditions, this has more applicability than when market conditions are slow. The city would need to front and back the bonds and if over the bond life resale/transfer does not occur the city would be responsible. Given that the great majority of homes change ownership over 20 years the risks should be minimal. This concept requires further study and legislative review before testing the application.

- Using the development review process to protect the needed right-of-way in the next twenty years to meet transportation system demands is another possible tool. This can reduce the ultimate cost of street improvements. This requires an analysis process (build out assessment or frequent updates) to stay current of future right-of-way needs based upon changing land use (for example, three lanes in 2015 may need to be 5 lanes in 2025). Also known as a corridor set back strategy, this approach helps preserve long-term right-of-way needs.

- Develop funding programs (using new motor vehicle fees or other funding sources) to encourage private/public cooperation in funding transportation improvements. This may take several forms and will require more assessment. One example would be establishing a city-funding source that can be matched with private funding sources to implement elements of the TSP.

Chapter 12
Plan Implementation

As a part of the City's comprehensive plan, the provisions of ORS 197.175 govern implementation of this transportation system plan.[1] This chapter describes the tools through which the TSP will be implemented. This chapter has five sections that describe five primary TSP implementation tools:

- TSP goals and policy statements
- TSP-related zoning, subdivision and minor land partition regulations
- TSP "Action Plans"
- TSP Street Design Manual
- TSP User Guide

This chapter describes the contents of each TSP implementation tool. After adoption of the TSP as a part of the Comprehensive Plan, these tools will be incorporated into an "Omnibus City TSP Implementation Ordinance" ("omnibus ordinance") to be initiated for City adoption. The omnibus ordinance will identify various provisions in the City's Comprehensive Plan, Zoning and Subdivision Ordinances that will be amended to include recommended TSP policies, standards, regulations and design requirements. This chapter also identifies roadway design standards that implement the TSP that will be included in a new City TSP Street Design Manual. The omnibus ordinance will assure that TSP implementation will comply with ORS 197.175.

TSP IMPLEMENTATION TOOLS

TSP Goals & Policy Statements

Part 1 identifies revisions to existing City comprehensive plan transportation system policies to be contained in the omnibus ordinance. These revisions are needed to establish new City transportation policies and implementing actions that: (1) help to bring the City's comprehensive plan into compliance with Statewide Planning Goal 12 (Transportation) and the State Transportation Planning Rule; (2) enable the preparation and adoption of TSP-related City land use regulations to be contained in the new City Code and TSP-related administrative regulations; and, (3) provide the policy bases for

[1] ORS 197.175(2) directs Oregon cities and counties to prepare and adopt comprehensive plans and enact land use regulations to implement these plans. This provision has been construed to require that comprehensive plan provisions may not be imposed directly upon land use development applications. TSP implementation, therefore, requires the establishment and adoption of specific TSP regulations that embody the policies, standards and implementation recommendations of the TSP, which can then be applied, to such applications. However, the statute does not exclusively limit TSP implementations to land use regulations. The City's TSP, therefore, may be implemented by both land use regulations and non-land use regulations that derive from adopted TSP provisions.

the City TSP Action Plans. Part 1 also identifies new City transportation system master plan maps for each major travel mode in the City's transportation network. These "master plans" show the preferred system in each travel mode to be achieved by the Year 2015 plan horizon of the TSP.

TSP-related Zoning & Subdivision Regulations

Part 2 is a compilation of proposed TSP-related substantive and procedural amendments to the Development Review & Approval Section (133) of the City Zoning Ordinance and Article VI of the City's Subdivision Ordinance to be contained in the omnibus ordinance. The amendments result from the prescription in ORS 197.175, which prohibits direct implementation of the TSP itself.

The substantive amendments incorporate recommended transportation system provisions, regulations and standards contained in the TSP into the City Development Review Ordinance 1945, as amended (Chap. 133), and City Subdivision Ordinance No. 2808, as amended (Article VI). By amending these ordinances, the transportation system provisions, regulations and standards will be applied to all new developments in the City.

The procedural amendments enable the City to condition approvals of zone changes, planned unit developments, conditional uses, variances and development review applications upon compliance with the transportation system provisions, regulations and standards contained in either the Development Review or Subdivision Ordinance as applicable, the TSP Action Plans, as well as Street Design Standards contained in the TSP Street Design Manual.

TSP Action Plans

Part 3 describes the TSP Action Plans to be contained in the omnibus ordinance. The Action Plans identify recommended transportation system improvements concerning pedestrian, bike, roadway, public transit and street connectivity (specific project lists and action plan maps for each transportation mode) to be made within the City over the TSP' 20-year duration. Compliance of development projects with the Action Plan Maps may be required as conditions of approval of such projects through zone changes, planned unit developments, conditional uses, variances, Development Review & Approval and residential subdivisions. Their inclusion within the omnibus ordinance assures proper implementation of the planned improvements for each mode pursuant to ORS 197.175. Because the Action Plan project lists and maps are already contained in the TSP, they also provide explicit policy direction to City capital improvement programming and budgeting for transportation system improvements.

TSP Street Design Manual

Part 4 contains some specifications relating to street design that will eventually be included within a TSP Street Design Manual. The Manual will be prepared after the adoption of the TSP.

The Manual will include non-discretionary standards and other information concerning the design of City roadways. Its scope will cover multi-modal design (bike and pedestrian standards), design speeds, sight distance standards, street lighting, roadway access spacing, motor vehicle Level of Service (LOS), local street spacing, traffic signal spacing, cul-de-sac lengths, roadway slopes, roadway widths, setbacks, street connectivity, shelters, disabled access needs, truck accommodation, special roadway districts and other features that routinely are required as part of street design. It will be adopted by City Council Resolution and administered b1y the City Engineer with advice from the City Council Street Committee.

The information described in Part 4 represents street design provisions that will be included in the initial version of the Manual. It is expected that additional street design standards and information will be added to the Manual over time, including the consolidation of existing City street design standards now contained in the comprehensive plan.

TSP User's Guide

Part 5 is not a TSP implementation tool per se and need not be adopted by the City in any form, although its contents derive from transportation standards to be contained in the Development Review and Subdivision Ordinances. Rather, it is the beginning of a TSP User's Guide which identifies information that must be obtained by applicants seeking City land use approval for projects that meet or exceed a motor vehicle trip generation threshold thereby necessitating a transportation impact report. The initial TSP User's Guide will contain a table of basic street design standards to be followed in planning, designing and constructing new arterials, collectors and local streets in the City. Together, the User's Guide, TSP Action Plans and TSP Street Design Manual will provide a complete picture of policies to be satisfied and street design standards to be met when creating new streets or altering existing roadways in the City.

TSP GOALS AND OBJECTIVES

The current Comprehensive Plan contains City transportation goals and policies in Section 13 of the Comprehensive Plan Ordinance 2397, as amended, and City transportation system maps in Section 14 of the Plan Ordinance. These current transportation system goals, policies and maps in the Comprehensive Plan shall be modified in the omnibus ordinance as shown in this Part of Chapter 12.

Transportation Planning Goals and Policies

To implement this TSP, the current transportation system planning goals in the Comprehensive Plan Ordinance shall be modified as follows:

Section 1. Section 13(I), Transportation - deleting the current transportation planning goals therein, and adopting the following new City Comprehensive Plan Transportation Goals amends Goals, of the Plan Ordinance:

Goals:

Goal 1: Safety – Develop and maintain a safe City transportation system.

Goal 2: Multi-modal Travel - Provide a balanced City transportation system.

Goal 3: Trip Reduction - Develop a transportation system that helps to reduce the number of motor vehicle trips and contributes to regional goals to reduce per capita vehicle miles traveled.

Goal 4: Performance - Provide an efficient transportation system that manages congestion.

Goal 5: Goods Movement - Provide for efficient movement of goods and services.

Goal 6: Livability - Transportation facilities within the City shall be designed and constructed in a manner that enhances livability of Hillsboro.

Goal 7: Accessibility - Develop transportation facilities that are accessible to all members of the community and minimize out-of-direction travel.

Section 2. Section 13(II), Transportation – Definitions, is hereby incorporated into this Transportation System Plan as follows:

Definitions

- **Transportation** - Refers to the movement of people and goods.

- **Transportation facility** - Any physical facility that moves or assists in the movement of people and goods.

- **Transportation system** - One or more transportation facilities that are planned, developed, operated, and maintained in a coordinated manner to supply continuity of movement between geographic and jurisdictional areas.

- **Transportation disadvantaged** - Individuals who have difficulty in obtaining transportation because of their age, income, physical or mental disability.

- **Mass Transit** - Any form of passenger transit which carries members of the public on a regular and continuing basis, including but not limited to, bus, rail and air transportation in and between urban and non-urban areas.

To implement this TSP, the current transportation system planning policies in the City's Comprehensive Plan Ordinance shall be modified as follows:

Section 13(III), Transportation - Policies is amended by deleting the current policies therein in their entirety and by adopting the following new City Comprehensive Plan Transportation Policies:

Policies

The following policies are organized by the seven transportation goals. Actions are listed below appropriate policies that direct how the policy will be implemented.

Goal 1: Safety

Policy 1 Build, maintain and/or support a well-defined and safe transportation system within the City for pedestrian, bicycle, transit, motor vehicles, air and rail travel.

Develop and apply a series of design standards for street, bicycle, pedestrian and transit improvements in Hillsboro. Allocate City road and bikeway maintenance expenditures in a manner that ensures that systems supporting these modes of travel are safe. Minimize conflicts between modes, particularly between motor vehicles, pedestrians, bicycles and transit. Develop City standards for safe pedestrian crossings of roadways. As transportation facilities are built, public involvement as outlined in the Comprehensive Plan will be undertaken.

Policy 2 Establish a City monitoring system that regularly evaluates, prioritizes and mitigates high accident locations within the City.

Review traffic accident information regularly to systematically identify, prioritize and remedy safety problems. Develop a list of projects necessary to eliminate such problems. Implement safety improvements through the City Capital Improvement Program and development review process.

Policy 3 Promote transportation system safety through education and law enforcement.

This applies to all modes of travel

Policy 4 Implement enforceable access management standards for arterial and collector roadways consistent with City, County and State requirements.

Use Metro Title 6 and Washington County standards as a guide to establish City access spacing guidelines: Arterial (minimum 600 feet, maximum 1,000 feet) and collector (minimum 200 feet, maximum 400 feet). ODOT Access Management Categories apply to State routes, but are generally less restrictive than the county standards.

Policy 5 Provide adequate access to properties for emergency services vehicles throughout the City through the City land use planning and development review procedures.

Policy 6 Do not permit land uses within airport noise corridors that are not noise compatible and avoid the establishment of uses that are physical hazards to air traffic at the Hillsboro Airport.

The airport is a resource to the community. Coordinate with the Port of Portland on the implementation of the Hillsboro Airport Master Plan and overlay Runway Protection Zone (RPZ) designations on the City zoning map. Work with the Port of Portland to establish a partnership, which addresses impacts. Avoid permitting future uses in the airport noise corridors that would be significantly impacted by allowable airport noise levels, unless such impacts can be effectively mitigated

Policy 7 Coordinate, when applicable and appropriate, federal, state and local safety and compliance standards in the operation, construction and maintenance of the rail and pipeline systems in Hillsboro.

Policy 8 Encourage grade separations or gate controls at primary railroad crossings of streets.

Support the upgrade of railroad crossings to current design standards. ODOT/PUC provides grants to improve crossing safety. Current funding sources are not capable of financing all the rail crossing needs within the next 20 years (it could take more than 40 years).

Goal 2: Multi-modal Travel

Policy 1 Design transportation facilities within Hillsboro that accommodate multiple modes of travel within transportation corridors where appropriate and encourage their use to move people, goods and services within these corridors. Encourage and coordinate efforts to provide convenient linkages between various modes of travel.

Corridors are key arterial and some collector routes within Hillsboro.

Policy 2 Construct bikeways and pedestrians facilities on major, new or reconstructed arterial and collector streets within Hillsboro (with roadway construction or reconstruction projects.) Coordinate (or require where appropriate) convenient access to existing or planned bike and pedestrian facilities from nearby schools, parks, transit, public facilities and retail areas.

Sidewalks, landscape strips and bikeways shall be constructed in conjunction with new construction of streets and with improvements to a street in accordance with this Transportation System Plan. Pedestrian facility design shall buffer pedestrians from moving traffic with landscape strips, street trees and on-street parking where practicable. Pedestrian facility design shall also consider lighting and the safety/convenience of street crossings.

Policy 3 Connect gaps in the sidewalk system according to the Hillsboro Pedestrian System Plan.

Encourage the development of a "pedestrian grid" in Hillsboro that identifies recommended pedestrian routes. Whenever possible, space through pedestrian routes approximately every one-half mile within the pedestrian local network. Local pedestrian circulation should provide access to the pedestrian master plan approximately every 330 feet. Sidewalk standards will be developed to define various sidewalk widths as necessary for City street and development types.

Policy 4 Link the regional trails network to Hillsboro's bicycle and pedestrian systems.

Investigate using abandoned railroad rights-of-way to link pedestrian and bicycle facilities.

Policy 5 Encourage and work with Tri-Met to improve local bus transit service.

Work with Tri-Met to provide adequate bus frequency and service coverage. Work with Tri-Met and other agencies to provide transit amenities such as bus shelters, well-maintained stops, benches, lighting, street crossings, sidewalks, etc.

Goal 3: Trip Reduction

Policy 1 Participate in trip reduction strategies developed locally and regionally including employment, tourist and recreational trip programs.

Encourage implementation of public and private travel demand management programs that reduce single occupant vehicle trips per capita and shift traffic to off-peak travel hours. Coordinate trip reduction strategies with Washington County, major employers in Hillsboro, Metro, Tri-Met, Westside Transportation Alliance, ODOT and DEQ. Seek to raise the PM peak average vehicle occupancy (AVO) to 1.3 in the evening peak hour, and/or move 50 percent of standard evening peak trip generation outside the peak hour. Educate business groups, employees and citizens about trip reduction strategies and work with business groups, citizens, employers and employees to develop and implement travel demand management programs. Work with ODOT to establish guidelines for planning interchange improvements to allocate space for park-and-ride lots to increase multi-occupant vehicles.

Policy 2 Ensure that nearby commercial, community service and high employment industrial land uses are developed in a manner that provides convenient access to pedestrians, bicyclists and transit riders. Support compact, mixed-use development including infill and redevelopment in appropriate areas of the City.

Apply City Transportation Planning Rule standards to developments adjacent to transit streets. Pedestrian accessways with minimal vehicle conflicts should be identified for every new development site for access to the public right-of-way and pedestrian system. Commercial site design should encourage internal trips by alternative modes. Appropriate areas of the City include, but are not limited to regional centers, town centers, station areas and transit corridors as defined by Metro.

Policy 3 Implement City Station Community Planning Areas in ways that encourage the location of the highest land use densities and mixed uses near the best transit services.

Policy 4 Limit the provision of parking to meet regional and state standards.

Policy 5 Be consistent with local, regional and state land use plans and programs.

Work cooperatively with transportation agencies and adjacent jurisdictions to implement the City Transportation System Plan within the Regional Transportation planning process.

Goal 4: Performance

Policy 1 Maintain a level of service consistent with regional goals and reduce traffic congestion.

Level of service D, Highway Capacity Manual, Chapters 9, 10 and 11 (or subsequent updated references) is recommended to balance provision of roadway capacity with level of service and funding. Monitor Metro and Washington County's current work to develop a level of service standard. Manage adequate operating conditions of arterials to minimize cut-through traffic and intrusion into residential neighborhoods.

When reviewing significant plan amendments or rezones, consider their traffic impacts on the regional facilities identified in the Regional Transportation Plan (RTP).

Policy 2 Work with Washington County, the City of Beaverton, Metro and ODOT to develop, operate and maintain intelligent transportation systems including coordination of traffic signals.

Policy 3 A Tualatin Valley Highway Corridor Plan shall be undertaken in cooperation with ODOT, Washington County, the City of Beaverton, Metro and other transportation agencies to address specific long-term capacity and access needs for the corridor. The standards for performance shall recognize the Metro Title 6 level of service criteria and requirements in the City Transportation System Plan.

Policy 4 Provide a cost-effective transportation system where the public, land use development and users pay their respective share of the system's costs proportional to their respective demands placed upon the multi-modal system.

Goal 5: Goods Movement

Policy 1 Design arterial routes, highway access and adjacent land uses in ways that facilitate the efficient movement of goods and services.

Policy 2 Coordinate with the Port of Portland in planning for the Hillsboro Airport.

Policy 3 Encourage continued use and development of rail and air transportation facilities.

Coordinate with rail and air transportation service providers regarding safety and operational compatibility with surrounding uses.

Policy 4 Require safe routing of hazardous materials consistent with federal and state guidelines.

Work with federal agencies, the Public Utility Commission, the Oregon Department of Energy and ODOT to assure consistent laws and regulations for the transport of hazardous materials.

Goal 6: Livability

Policy 1 Design and build local and neighborhood streets to minimize speeding.

If appropriate, neighborhood traffic management programs for local and neighborhood streets in Hillsboro that currently experience speeding problems may include the following types of measures: narrower streets, humps, traffic circles, and curb/sidewalk extensions, curving streets, diverters and/or other measures. Consider neighborhood traffic management measures during development review and subdivision review of new development.

Policy 2 Relate the design of street capacity and improvements to their intended use.

A functional roadway classification system shall be developed for Hillsboro which meets the City's needs and is coordinated with County, Regional and State Roadway classification systems. Appropriate design standards for roadways in the City should be coordinated and developed by the responsible jurisdiction.

Policy 3 Construct transportation facilities to comply with applicable City landscape and design standards.

Include aesthetic considerations in the design, maintenance and improvement of corridors and rights-of-way for all modes of travel. Any consideration of sound walls should meet criteria established by the City.

Policy 4 Avoid potential adverse environmental impacts associated with traffic and transportation system development through facility design and system management.

Inform the DEQ, EPA, Corps of Engineers and Division of State Lands of transportation system development projects that may affect their jurisdictional interests at the earliest opportunity to ensure identification of project-related environmental issues and to ensure compliance with federal and state air, water, wetland and noise standards. Design transportation systems that promote efficient use of energy.

Goal 7: Accessibility

Policy 1 Construct transportation facilities, which conform to the requirements of the Americans with Disabilities Act.

Policy 2 Locate transit dependent land uses close to transit stations.

Policy 3 Design the local street network to facilitate street connectivity and limit out-of-direction travel. Provide connectivity to and from activity centers and destinations, giving priority to pedestrian and bicycle connections.

Apply City spacing guidelines for roadways, signals and pedestrian connections to implement this policy. For pedestrian paths, direct routing should be between 1.25 and 1.5 times the straight-line distance. Implement City guidelines regarding cul-de-sac length and size.

Policy 4 Develop an efficient arterial grid system that provides access within the City and serves through City traffic.

As outlined in Title 6 of the Metro Urban Growth Management Functional Plan, access connection standards will be developed. The arterial street system should facilitate street and pedestrian connectivity.

To implement this TSP, the current transportation system plan maps in the City's Comprehensive Plan Ordinance shall be modified as follows:

Section 14(I)(A), Comprehensive Plan – Transportation Maps is amended to modify the existing provisions in Section 14 (text and maps) as follows:

Included, as parts of this Ordinance are seventeen transportation system maps for the City of Hillsboro including eleven transportation maps and six land use maps. The purposes of these maps are as follows:

Transportation Maps:

1) The Functional Classification Map (Figure 8-3) designates the arterial, collector and neighborhood route street system;

2) The Street ROW Required for Selected Arterials and Collectors (Greater than 2 Lanes) (Figure 8-4) indicates the street right-of-way required for arterial and collector streets that are greater than 2 lanes.

3) The Street Improvement Plan Map (Figure 8-18) designates the number of travel lanes on the arterial and collector street system;

4) The Through Truck Routes Map (Figure 3-20) designates the arterials that should be designed to accommodate through truck movement;

5) The Bicycle Master Plan Map (Figure 6-1) indicates the master plan for the bikeway system;

6) The Transit Map (Figure 7-1) indicates Transit Streets and the Light Rail Station Locations;

7) The Traffic Signal Master Plan Map (Figure 8-21) indicates the desirable locations for future traffic signals;

8) The Pedestrian Master Plan Map (Figure 5-1) designates the system of sidewalks on arterial and collector streets;

9) The Park and Ride Sites Map (Figure 10-1) indicates potential sites for park and ride facilities;

10) The Rail Routes Map (Figure 3-22) indicates alignments of railroad service and grade crossings;

11) The Major Pipeline Map (Figure 3-23) indicates alignments of major gas transmission lines.

Figure 8-3 Functional Classification Map

DKS Associates

City of Hillsboro
Transportation System Plan

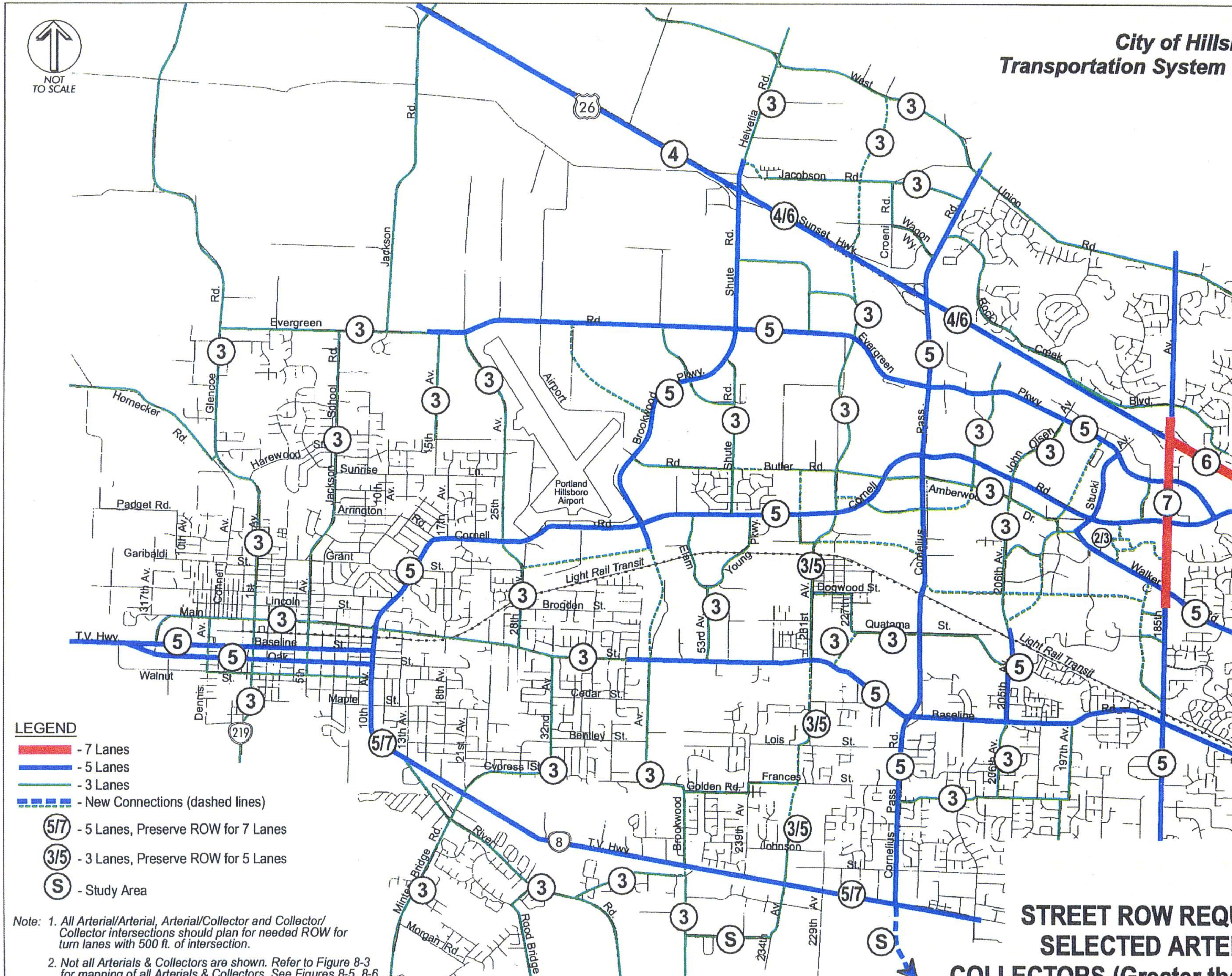


Figure 8-4
STREET ROW REQUIRED FOR SELECTED ARTERIALS AND COLLECTORS (Greater than 2 Lanes)

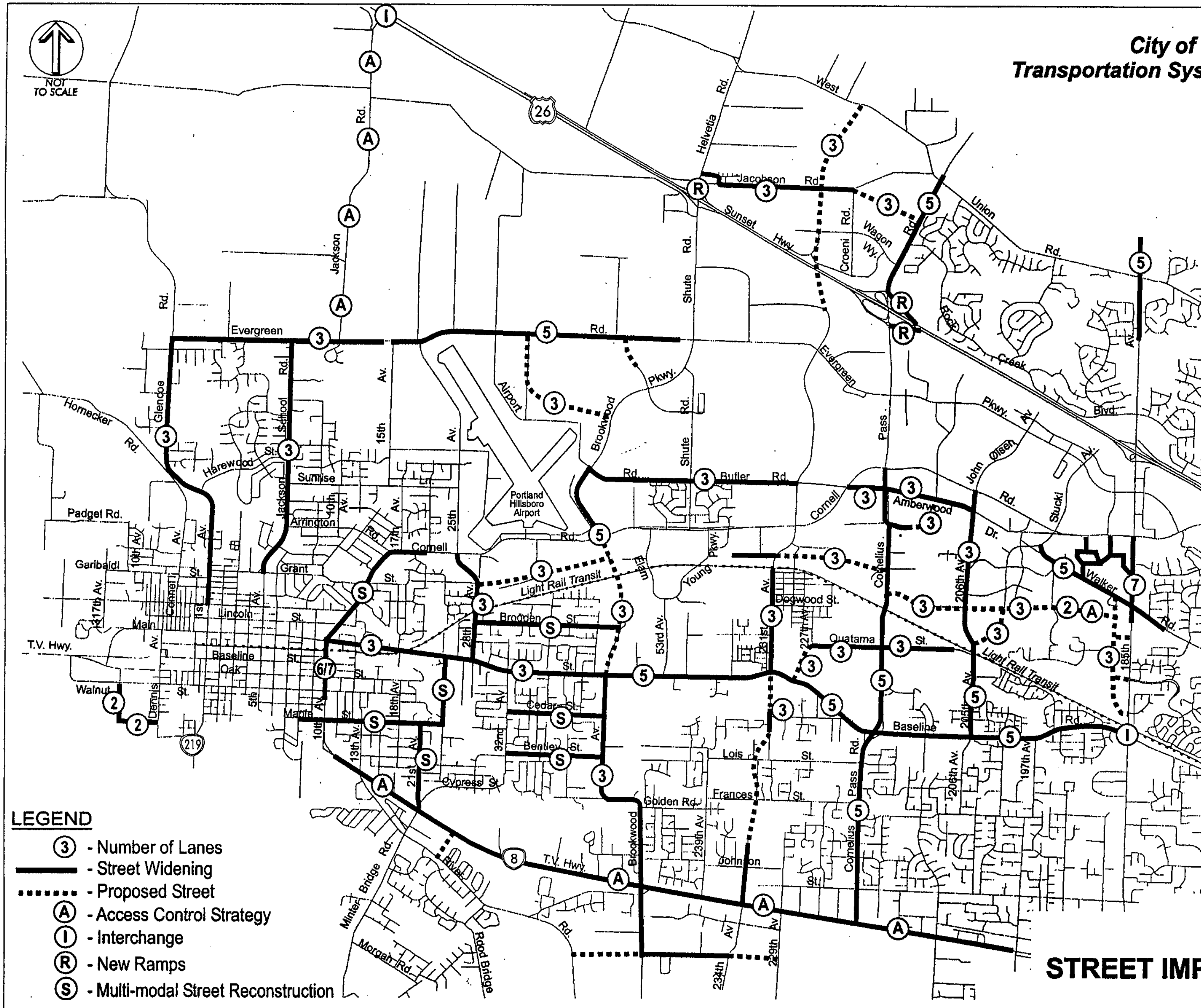
LEGEND

- 7 Lanes
- 5 Lanes
- 3 Lanes
- New Connections (dashed lines)
- 5/7 - 5 Lanes, Preserve ROW for 7 Lanes
- 3/5 - 3 Lanes, Preserve ROW for 5 Lanes
- S - Study Area

Note:
1. All Arterial/Arterial, Arterial/Collector and Collector/Collector intersections should plan for needed ROW for turn lanes with 500 ft. of intersection.
2. Not all Arterials & Collectors are shown. Refer to Figure 8-3 for mapping of all Arterials & Collectors. See Figures 8-5, 8-6, 8-7 and 8-8 for ROW of all streets.

DKS Associates

City of Hillsboro
Transportation System Plan



LEGEND

- ③ - Number of Lanes
- ▬ - Street Widening
- ▪▪▪▪▪▪ - Proposed Street
- Ⓐ - Access Control Strategy
- Ⓘ - Interchange
- Ⓡ - New Ramps
- Ⓢ - Multi-modal Street Reconstruction

Figure 8-18
STREET IMPROVEMENT PLAN

DKS Associates

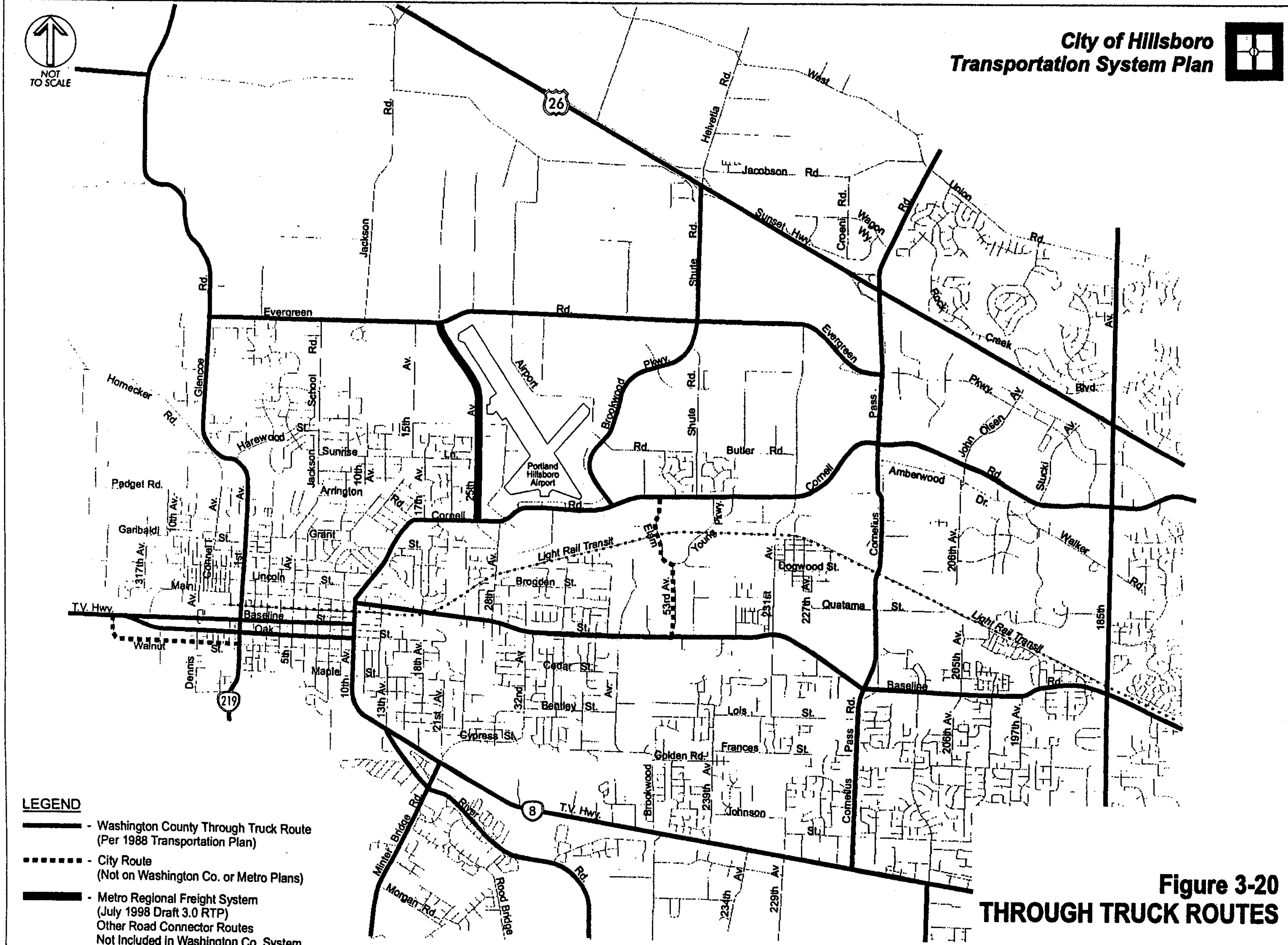
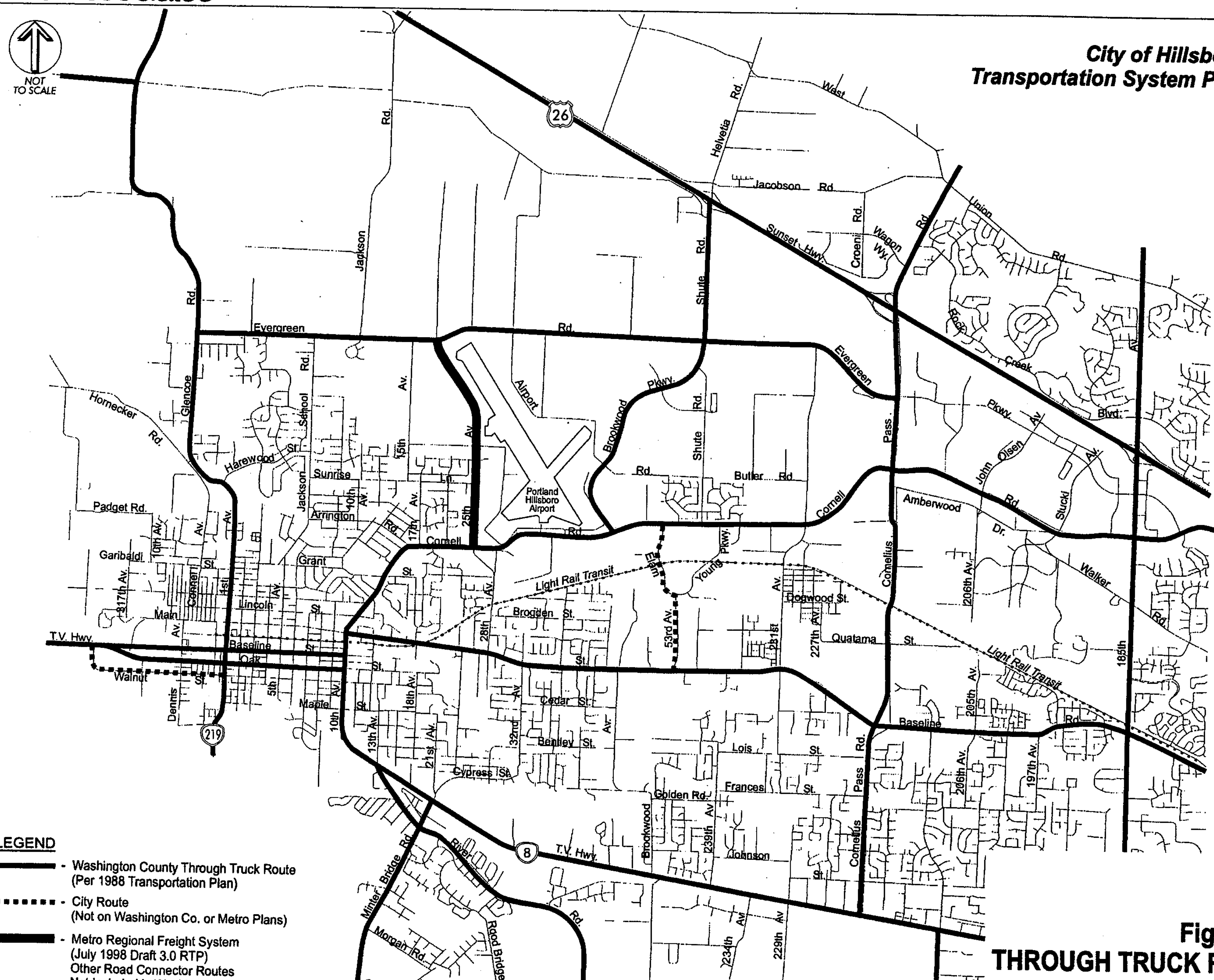


Figure 3-20
THROUGH TRUCK ROUTES

DKS Associates

City of Hillsboro
Transportation System Plan



LEGEND

- Washington County Through Truck Route (Per 1988 Transportation Plan)
- City Route (Not on Washington Co. or Metro Plans)
- Metro Regional Freight System (July 1998 Draft 3.0 RTP) Other Road Connector Routes Not Included in Washington Co. System

Figure 3-20
THROUGH TRUCK ROUTES

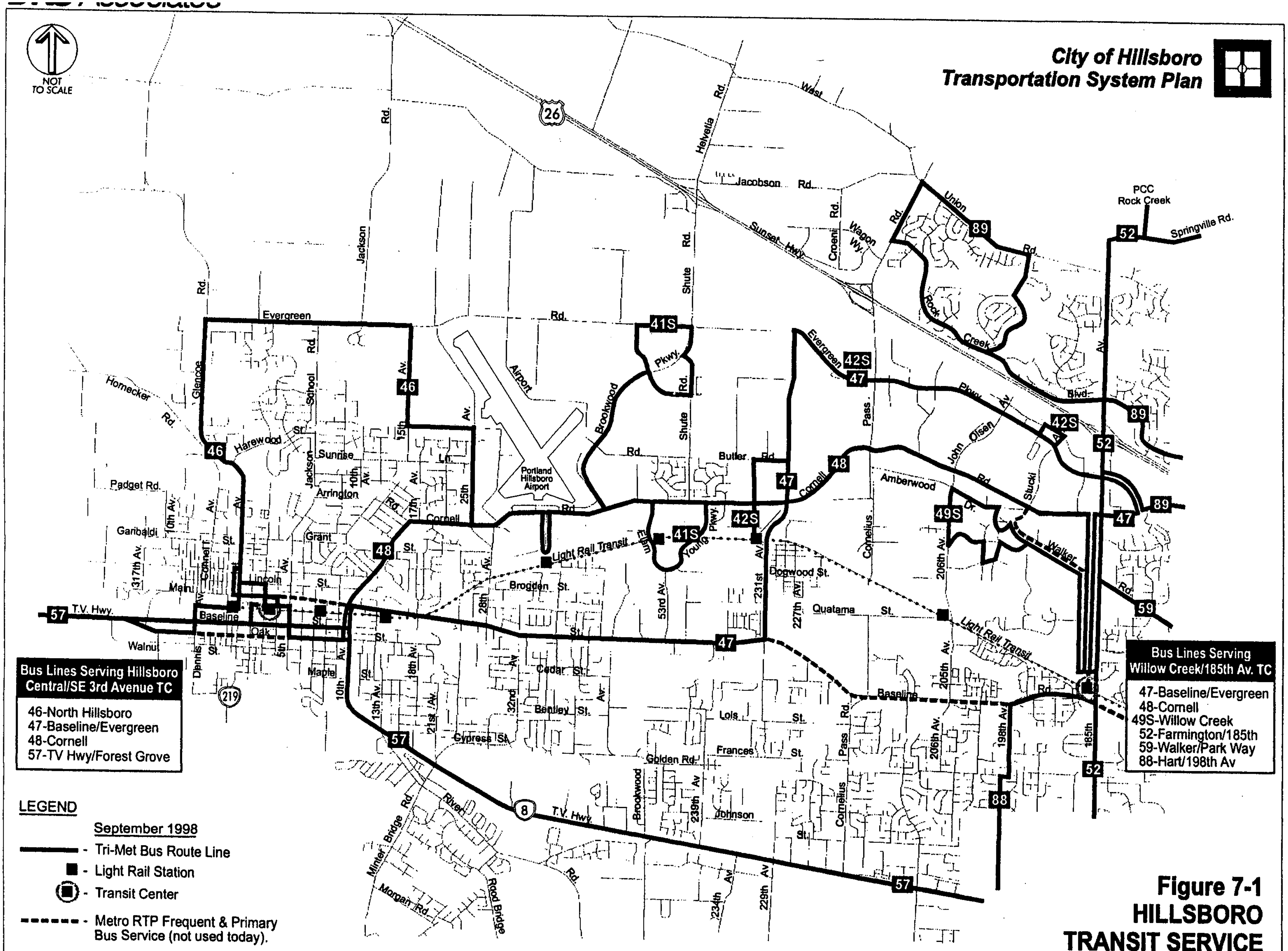
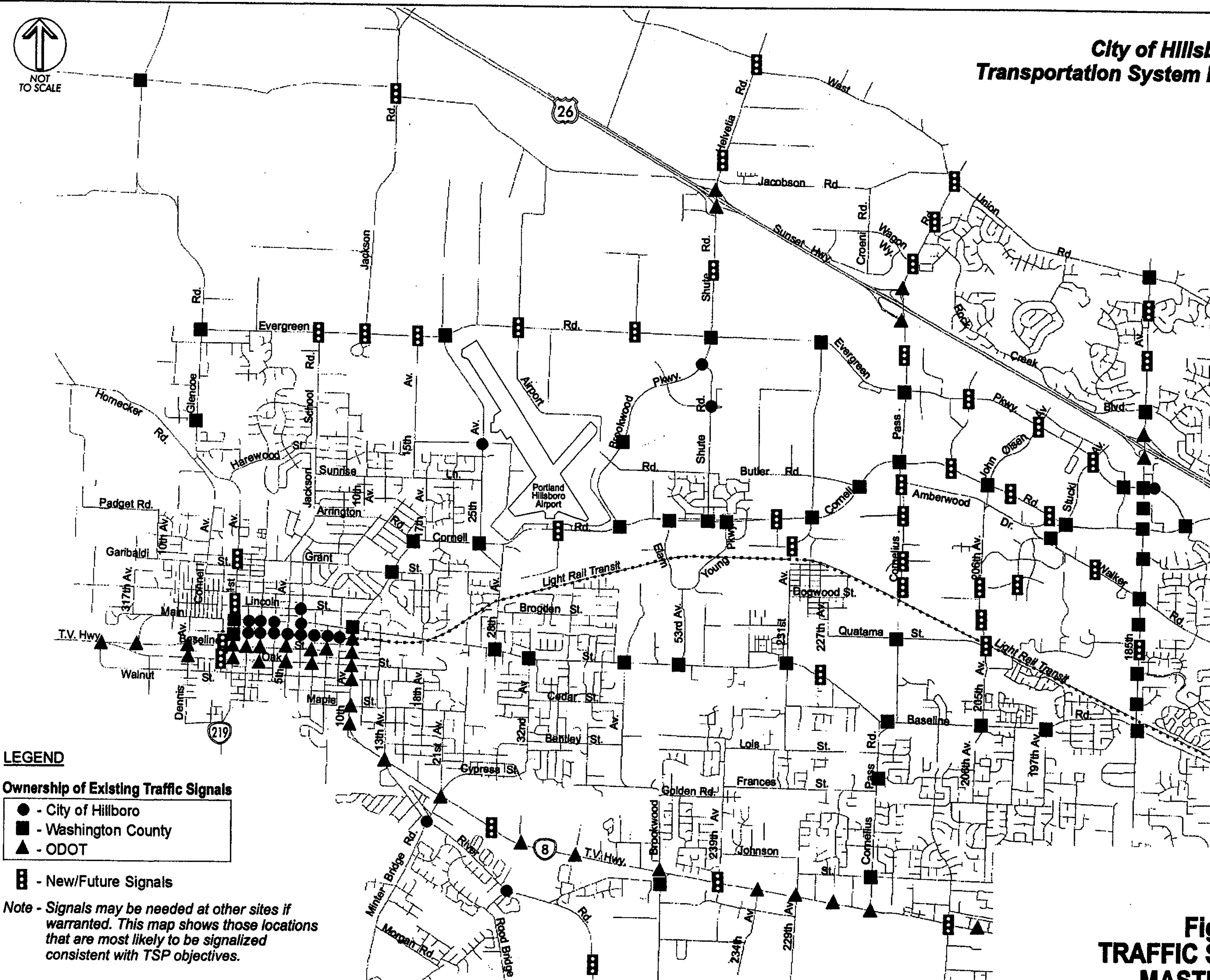


Figure 7-1
HILLSBORO
TRANSIT SERVICE

DKS *Associates*

City of Hillsboro
Transportation System Plan



LEGEND

Ownership of Existing Traffic Signals

- ● - City of Hillboro
- ■ - Washington County
- ▲ - ODOT

- New/Future Signals

Note - Signals may be needed at other sites if warranted. This map shows those locations that are most likely to be signalized consistent with TSP objectives.

Figure 8-21
TRAFFIC SIGNALS
MASTER PLAN

DKS Associates

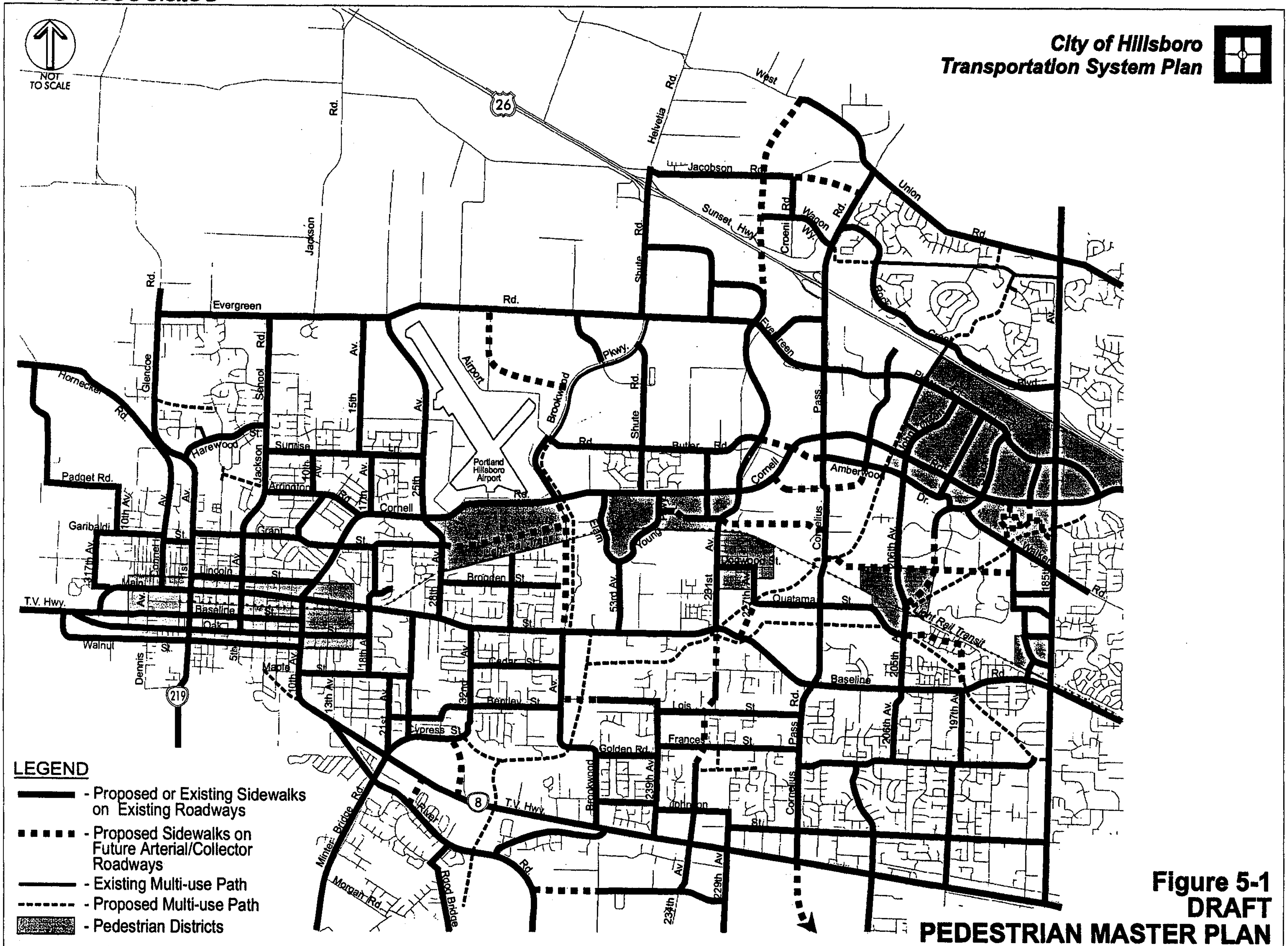
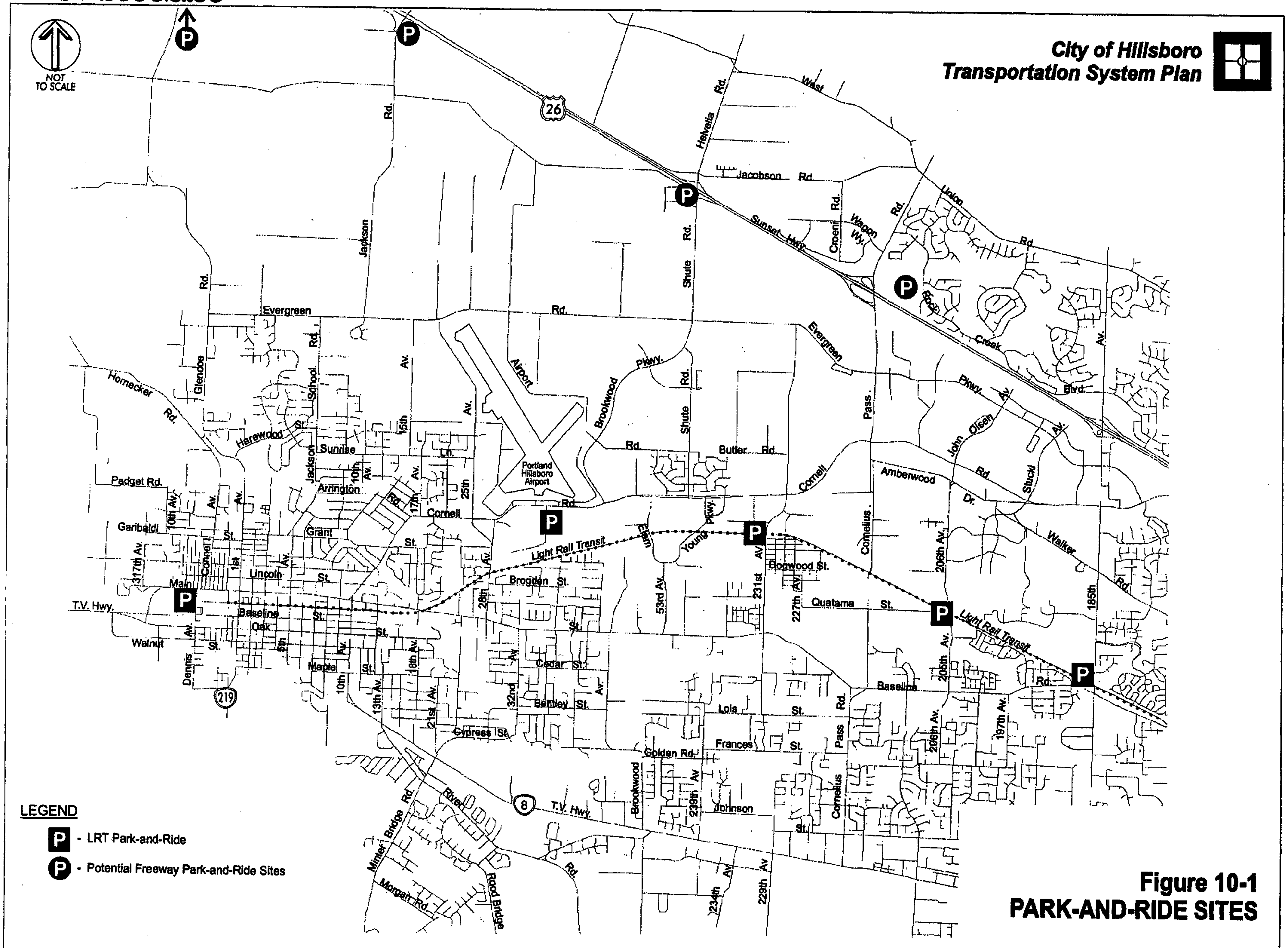


Figure 5-1
DRAFT
PEDESTRIAN MASTER PLAN



LEGEND

P - LRT Park-and-Ride

P - Potential Freeway Park-and-Ride Sites

Figure 10-1
PARK-AND-RIDE SITES

DKS Associates

City of Hillsboro
Transportation System Plan

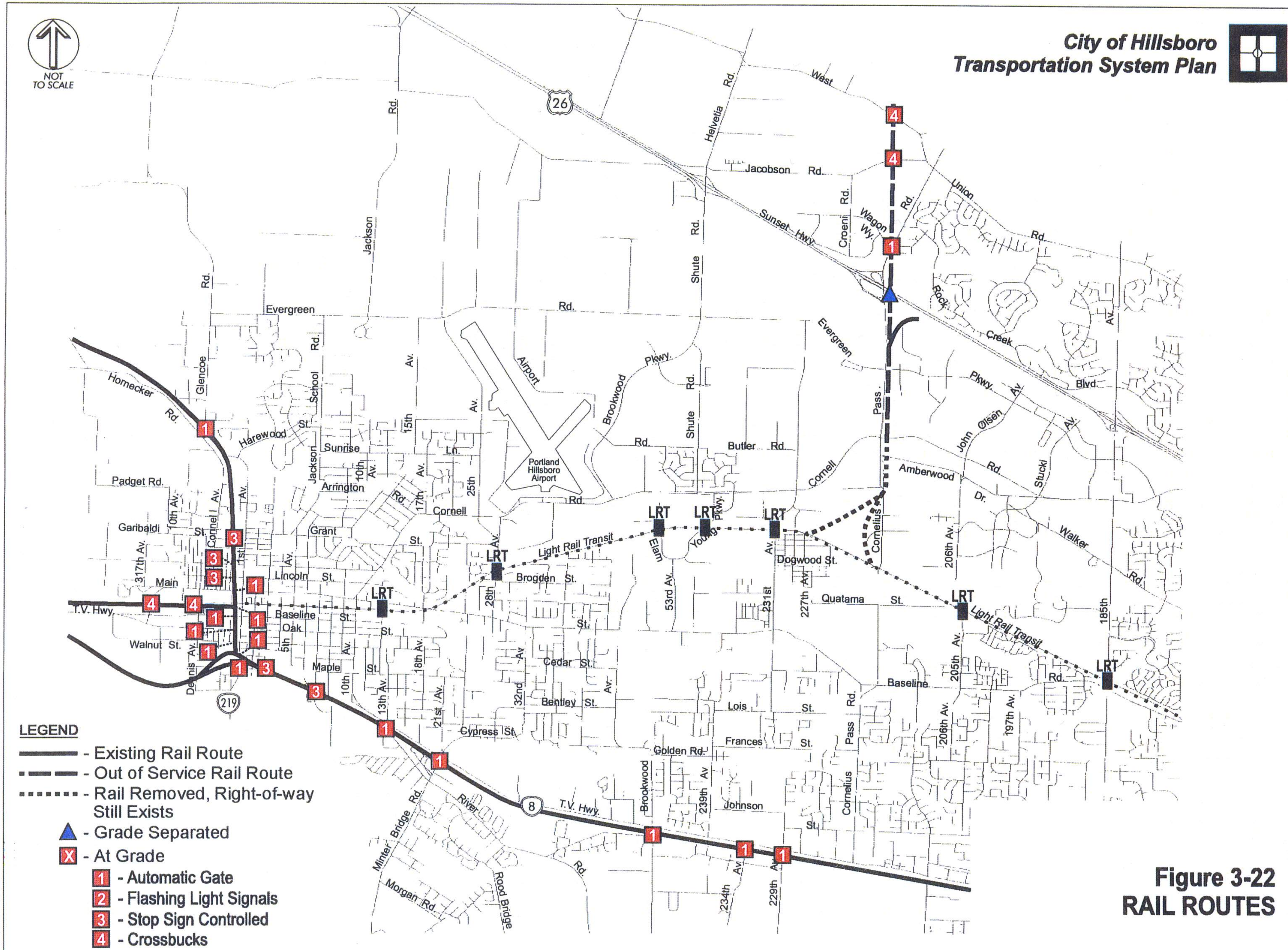


Figure 3-22
RAIL ROUTES

DKS Associates

City of Hillsboro
Transportation System Plan

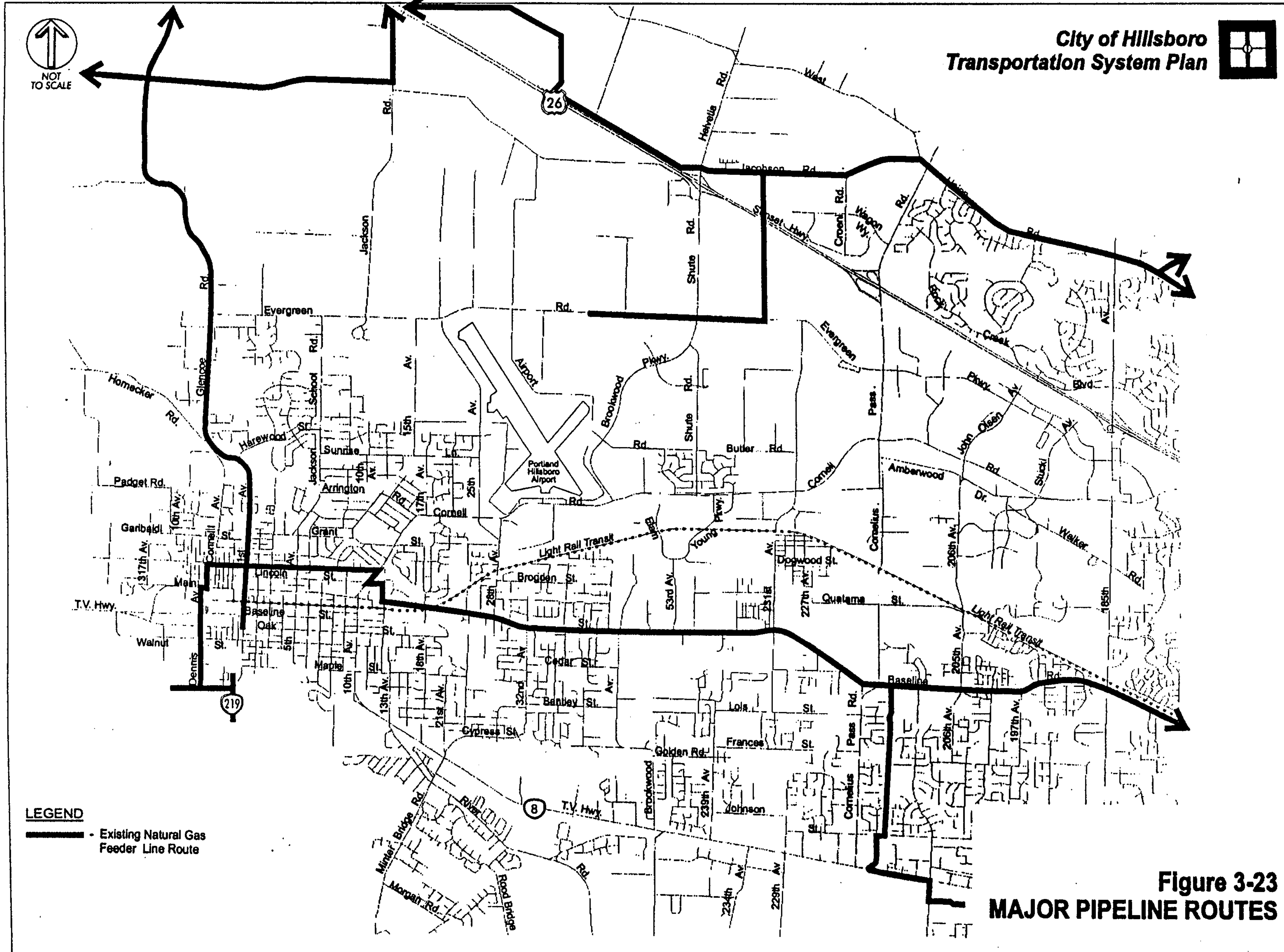


Figure 3-23
MAJOR PIPELINE ROUTES

TSP-RELATED LAND USE REGULATIONS

Part 2 describes substantive transportation-related development standards and procedural zoning ordinance amendments that are recommended for inclusion within the new City Community Development Code scheduled to be prepared for adoption in 1999 through the omnibus ordinance. The substantive amendments are revised comprehensive plan transportation "implementing actions" that reflect transportation system provisions, regulations and standards recommended in the TSP. Consistent with ORS 197.175, these revised implementing actions will be folded into the new Code as parts of the City's Development Review and Approval Ordinance No. 133 (DR) of City Zoning Ordinance No. 1945, as amended, and the City's Subdivision Ordinance No. 2808, as amended. Part 2 identifies proposed DR and Subdivision Ordinance amendment language to be incorporated into the new Code that contain these implementing actions.

Part 2 also identifies recommended future modifications to the City's zone change, planned unit development, conditional use and variance provisions in the Zoning Ordinance which will enable the City to apply the transportation-related standards and regulations in the DR Ordinance consistent with ORS 197.175.

Revisions to Comprehensive Plan Transportation Implementing Actions

Before these implementing actions can be incorporated into the DR provisions of the Zoning Ordinance and the Subdivision Ordinance, they are modified in the manner shown below that implement TSP recommendation. The following are amendments to Section 13(VII) of the Hillsboro Comprehensive Plan Ordinance No. 2793-4-77, as amended, based on this TSP:

Section 13(VII), Transportation - Implementing Actions, of the Hillsboro Comprehensive Plan Ordinance No. 2793-4-77, as amended, is hereby amended by the following modifications thereto:

Implementation Measures

- Access limitations shall minimize driveway conflicts and maximize street capacity. The Development Review (Section 133) and Planned Unit Development (Section 127) sections in the Zoning Ordinance and the Subdivision Ordinance shall include restrictions for single family residential driveways on arterial or collector streets. If traffic volumes are forecast to be in excess of 5,000 vehicles per day, new developments should access side streets or parallel roads, and/or driveways should be aggregated to serve more than one development.

- The City shall coordinate with Metro, Tri-Met and Washington County in the implementation of the Station Area Plans.

Street Standards for Public Roadways

Cul-de-sac Streets

These streets are intended to serve a maximum of 25 dwelling units and shall not exceed 200 feet in length[2]. The cul-de-sac street is be designed to an improvement width[3] of 28 feet within a 50 foot right-

[2] Except where topography, barriers (railroads, freeways, existing development, etc.), or environmental constraints (major streams, rivers, wetlands, etc.) prevent ultimate street connectivity (extension) beyond the parcel in question; in which case a cul-de-sac street may exceed 200 feet in length with City Engineer approval. Where the City Engineer finds that there may be the possibility of connectivity in the future, the street shall not end in a cul-de-sac, the development shall be sited so as not to preclude the possibility of future connectivity, and a public right-of-way easement shall be dedicated to effect future construction.

of-way, with sidewalks on each side being a minimum of 5 feet wide[4]. A minimum 5-foot wide landscape strip shall separate the sidewalks and roadway. Refer to Figure 8-8. The circular paved turning area must have a radius of at least 40 feet to the curb. Alternative radii and paved area turn around configurations may be considered by the Street Committee at the time of Development Review.

With City Engineer[5] approval, the cul-de-sac street may be constructed to 24 feet wide within a 46 foot right-of-way where no on-street parking will be provided

Alleys

Alleys are intended to serve only abutting land. Alleys shall be an inverted crown design constructed of Portland Cement Concrete ("PCC") pavement[6] with a travel lane of 12-16 feet plus a 2-4 foot gravel shoulder on each side to create a 20 foot right-of-way clear of any and all obstacles. On-street parking is prohibited on alley streets. An alternative alley configuration would have 20 feet of PCC pavement with a minimum 5-foot landscape strip for one-sided alley loadings. Refer to Figure 8-8.

Local Residential Streets

These streets are intended to serve only abutting land and should carry less than 1,500 vehicles per day. If traffic volume is projected to exceed 1,500 vehicles per day, neighborhood traffic management measures as identified in the Transportation System Plan shall be considered. The standard local residential street shall be designed as a 32-foot roadway improvement within a 54-foot right-of-way (where daily traffic volume exceeds 1,500 vehicles), with a 5-foot minimum width sidewalk and a minimum 4-foot landscape strip separating the sidewalks and roadway on each side. Refer to Figure 8-8. With City Engineer approval, other designs can be considered. When the projected buildout daily traffic volume is below 250 vehicles per day, the improved roadway width may be reduced to not less than 24 feet with a right-of-way of not less than 46 feet with no on-street parking allowed and adequate off-street parking is available on the abutting properties. When projected daily traffic volumes exceed 600 vehicles per day and are less than 1,500 vehicles per day, the improved roadway width may be reduced to not less than 28 feet with a right-of-way of not less than 50 feet if on-street parking is restricted to one side and adequate off-street parking is available on abutting properties.

---

[3] "Improvement width" includes: travel lanes; the curb and gutter assembly; and, as permitted or required: the median (landscaped and/or left turn lane), bicycle lanes, and on-street parking space.

[4] Where a cul-de sac street has terminated for a reason cited in footnote #1, above, the developer shall nonetheless make a good faith effort to establish and construct pedestrian and bicycle connections to the neighboring parcel from the end of the cul-de-sac street, or show cause to the satisfaction of the City Engineer why such connections are not technically feasible and should not be required of the applicant. Even if not technically or economically feasible to construct all of the connection as a part of the development in question, if the City Engineer finds that such a connection may be feasible upon development of the adjacent parcel, the City Engineer shall require a fourteen foot (14') public easement and the development shall be sited so as not to preclude the possibility of connectivity in the future and may require the construction, or fee in lieu, of the portion that is within the development in question as a condition of approval. If the abutting properties are in common ownership such connections may be required to include pedestrian bridges.

[5] The City Engineer may delegate decision-making authority to qualified engineering staff, and may refer policy decisions to the City Council Street Committee.

[6] Streets designated as alleys and constructed with an inverted crown, and all curb and gutter sections shall be of PCC construction. Preference shall be given to PCC construction for "Transit Streets," arterial streets, and streets abutting commercial zones and districts. All other standard crown streets may be constructed to an equivalent structural cross section using asphaltic concrete (AC) with the approval of the City Engineer. Streets shall be constructed with thermoplastic markings and all regulatory and roadway informational signs shall be installed per the Manual of Uniform Traffic Control Devices.

Neighborhood Streets

Neighborhood routes are usually long relative to local streets and provide connectivity to collectors or arterials. Because neighborhood routes have greater connectivity, they generally have more traffic than local streets and are used by residents in the area to get into and out of the neighborhood, but do not serve citywide/large area circulation. Traffic from cul-de-sacs and other local streets may drain onto neighborhood routes to gain access to collectors or arterials. Because traffic needs are greater than a local street, certain measures should be considered to retain the neighborhood character and livability of these routes. Neighborhood traffic management measures are often appropriate as defined in the Transportation System Plan. The standard configuration for neighborhood streets (routes) without on-street parking shall be a 36-foot roadway improvement within a 60-foot right-of-way, with two 12-foot travel lanes, two 6-foot landscape strips and two 5-foot sidewalks. Refer to Figure 8-7.

Collector Streets

Collector streets provide both access and circulation within residential and commercial/industrial areas. Collectors differ from arterials in that they provide more of a citywide circulation function, do not require as extensive control of access and penetrate residential neighborhoods distributing trips from the neighborhood and local street system.

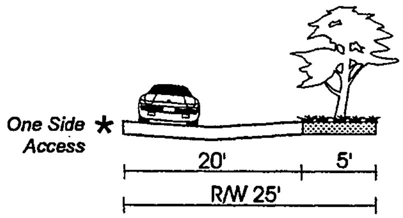
The standard configuration for collector streets without on-street parking shall be a 46-foot roadway improvement within a 70-foot right-of-way including two 11-foot travel lanes, a 12-foot median/turn lane and two 6-foot bicycle lanes. Five-foot (5' minimum) sidewalks separated from the curb by a 6-foot landscape strip are also required on both sides of the street. This typical cross section and other options are shown in Figure 8-6. Left turn lanes shall be provided at major intersections and may be provided, if approved by the City Engineer, at authorized property access points between intersections. The size of collector streets is defined in the Street ROW Required for Selected Arterials and Collectors (Greater than 2 Lanes) (Figure 8-4) and the Street Improvement Plan (Figure 8-18).

Arterial Streets

Arterial streets are intended to serve as the primary routes for travel between the City of Hillsboro and other parts of the region, between major areas of urban activity and to access the highway system. The size of arterial streets is defined in the Street ROW Required for Selected Arterials and Collectors (Greater than 2 Lanes) (Figure 8-4) and the Street Improvement Plan (Figure 8-18). Arterial streets vary in size from two-lanes up to seven lanes. Typical cross sections for arterial streets are shown in Figure 8-5. Access spacing shall be established by city land use regulations. Additional left and right turn lanes as defined in the Development Review Transportation Impact Report shall add 12 feet for each additional turn lane to the rights-of-way identified in Figure 8-5. All property access points from an arterial street between intersections require approval of the City Engineer, and may be subject to right turn only configuration, consolidation among adjacent properties, and minimum spacing standards set so as not to unduly impede traffic volume along the arterial street. Standard sidewalks and landscape strips are required. Wider sidewalks shall be constructed to at least 8 feet wide in commercial areas, and 13 feet or wider along specific streets in the Station Community Planning Areas. This requires wider rights-of-way than those shown on Figure 8-5 (equivalent to the difference between the minimum 5 or 6-foot sidewalks as shown to the sizes required).

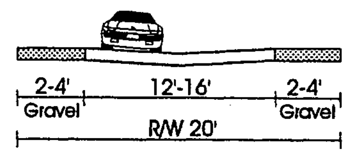
Commercial and Industrial Streets

Commercial and industrial streets are not through routes and are intended to serve primarily abutting non-residential land uses. However, due to the nature of the adjacent land uses, such vehicles will include larger trucks, requiring wider travel lanes and additional turning radii. The standard commercial street shall be designed as a 38-foot roadway improvement with 60-foot right-of-way, with a 5-foot minimum width sidewalk and a minimum 5-foot landscape strip separating the sidewalks and roadway on each side. Refer to Figure 8-5a. The standard industrial street shall be designed as a 40-foot roadway improvement with 62-foot right-of-way, with a 5-foot minimum width sidewalk and a minimum 5-foot landscape strip separating the sidewalks and roadway on each side. Refer to Figure 8-5a.



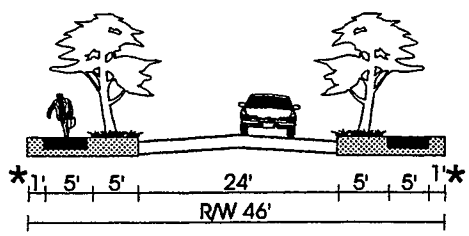
Alley

(No parking)



Alley

(No parking)

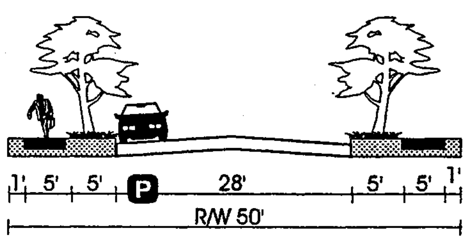


* - Adjacent to private landscape

Cul-de-sac/Local Street

<250 vpd

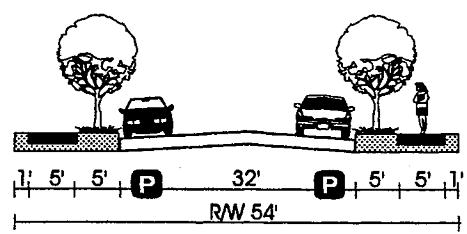
(No parking)



Local Street/Cul-de-sac

One Side On-street Parking

<1500 vpd



On-street Parking

>1500 vpd

If parking on both sides, block length not to exceed 600 feet

Notes:

1. *Space between curb and median minimum 19' with mountable curb design (to be coordinated with Fire Department).*
2. *Selection of placement of sidewalk and planter specific to application. Cross sections show two choices for reference.*
3. *Width of curb is included in sidewalk or planter strip width when adjacent to street.*
4. *Samples show the desirable applications given number of lanes; minimum standards can be applied case by case.*
5. *Actual width of street and sidewalk area can be adjusted within R/W based on modal priorities and adjacent land use.*

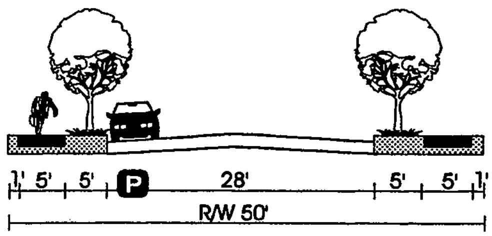
Criteria

Vehicle Lane Widths: (minimum widths)	9 to 10 ft.
On-Street Parking	6 to 7 ft.
Sidewalks: (minimum width)	5 ft.
Landscape Strips:	Required
Neighborhood Traffic Management:	Should not be necessary (under special conditions)

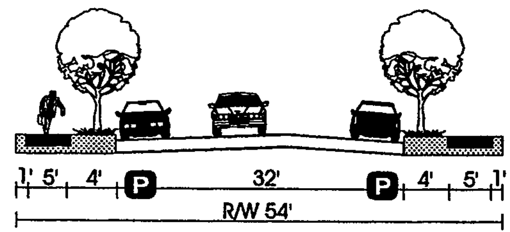
P - *On-street Parking*

<1500 vpd - *Guide for Traffic Volume Per Day (does not require conversion of existing routes)*

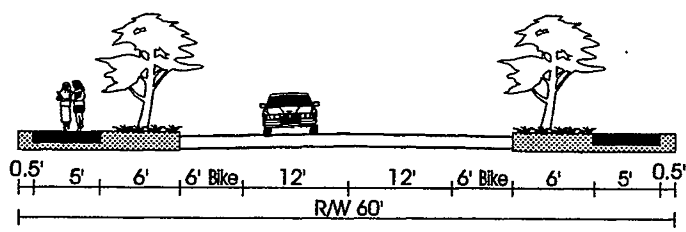
Figure 8-8
ALLEY, CUL-DE-SAC AND LOCAL RESIDENTIAL STREET SAMPLE STREET CROSS SECTIONS REQUIRED ROW WIDTH



No Parking on One Side



With Parking on Both Sides



With Bike Lanes / No Parking

Notes:

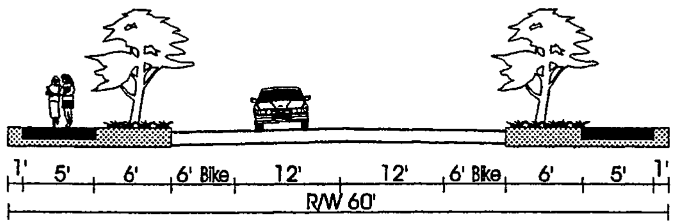
1. *Space between curb and median minimum 19' with mountable curb design (to be coordinated with Fire Department).*
2. *Selection of placement of sidewalk and planter specific to application. Cross sections show two choices for reference.*
3. *Width of curb is included in sidewalk or planter strip width when adjacent to street.*
4. *Samples show the desirable applications given number of lanes; minimum standards can be applied case by case.*
5. *Actual width of street and sidewalk area can be adjusted within R/W based on modal priorities and adjacent land use.*
6. *Typically 1' is provided from R/W line to edge of concrete surface (for maintenance/utilities).*
7. *These are guidelines for future neighborhood route development and does not require changes/conversion to existing streets.*

P - *On-street Parking*

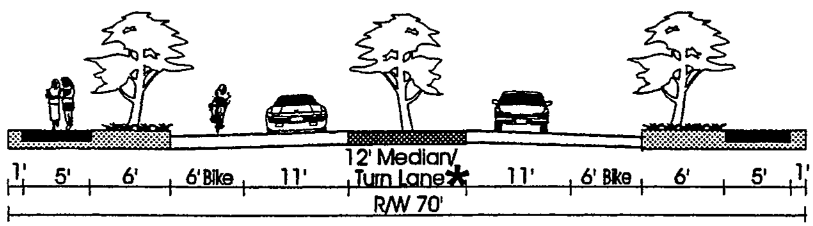
Criteria

Vehicle Lane Widths: *(minimum widths)*	10 ft.
On-Street Parking	6 to 8 ft.
Curb Extensions for Pedestrians:	Consider on Pedestrian Routes
Sidewalks: *(minimum width)*	5 ft.
Landscape Strips:	Required
Neighborhood Traffic Management:	Appropriate when Warranted

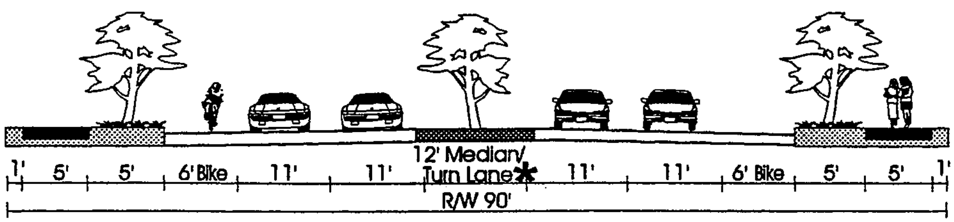
Figure 8-7
NEIGHBORHOOD
SAMPLE STREET CROSS SECTIONS
REQUIRED ROW WIDTH



2 Lane 60' R/W



3 * Lane 70' R/W



5 * Lane 90' R/W

List

- Jacobson Road
- Rock Creek Boulevard
- Shute Road (South of Brookwood)
- Butler Road
- 231st Avenue
- NE Orenco Station Prkwy
- Aloclek Place
- Amberwood Drive
- John Olsen Avenue
- 206th Avenue
- 205th Avenue
- Stucki Avenue
- 188th Avenue
- Elam Young Parkway
- 53rd Avenue
- Dogwood Street/227th Avenue
- Quatama Street
- East - West Connector
- Salix Extension
- Hornecker Road/Connell Avenue
- Garibaldi Street
- 317th Avenue
- Walnut Street
- Main Street
- Lincoln Street
- Grant Street
- Harewood Street
- Jackson School Road (South of Evergreen)
- 15th Avenue
- 17th Avenue
- Sunrise Lane
- Brogden Street
- Rood Bridge Road
- Witch Hazel Road
- Davis Road Connection
- 229th Avenue
- Johnson Street
- Golden Road
- Frances Street
- Rock Road
- 197th Avenue
- 198th Avenue
- Anthony Drive/209th Avenue
- Armco Avenue
- Wood Street
- Oak Street
- Maple Street
- 24th Avenue
- 21st Avenue
- Dennis Avenue
- 18th Avenue

Notes:

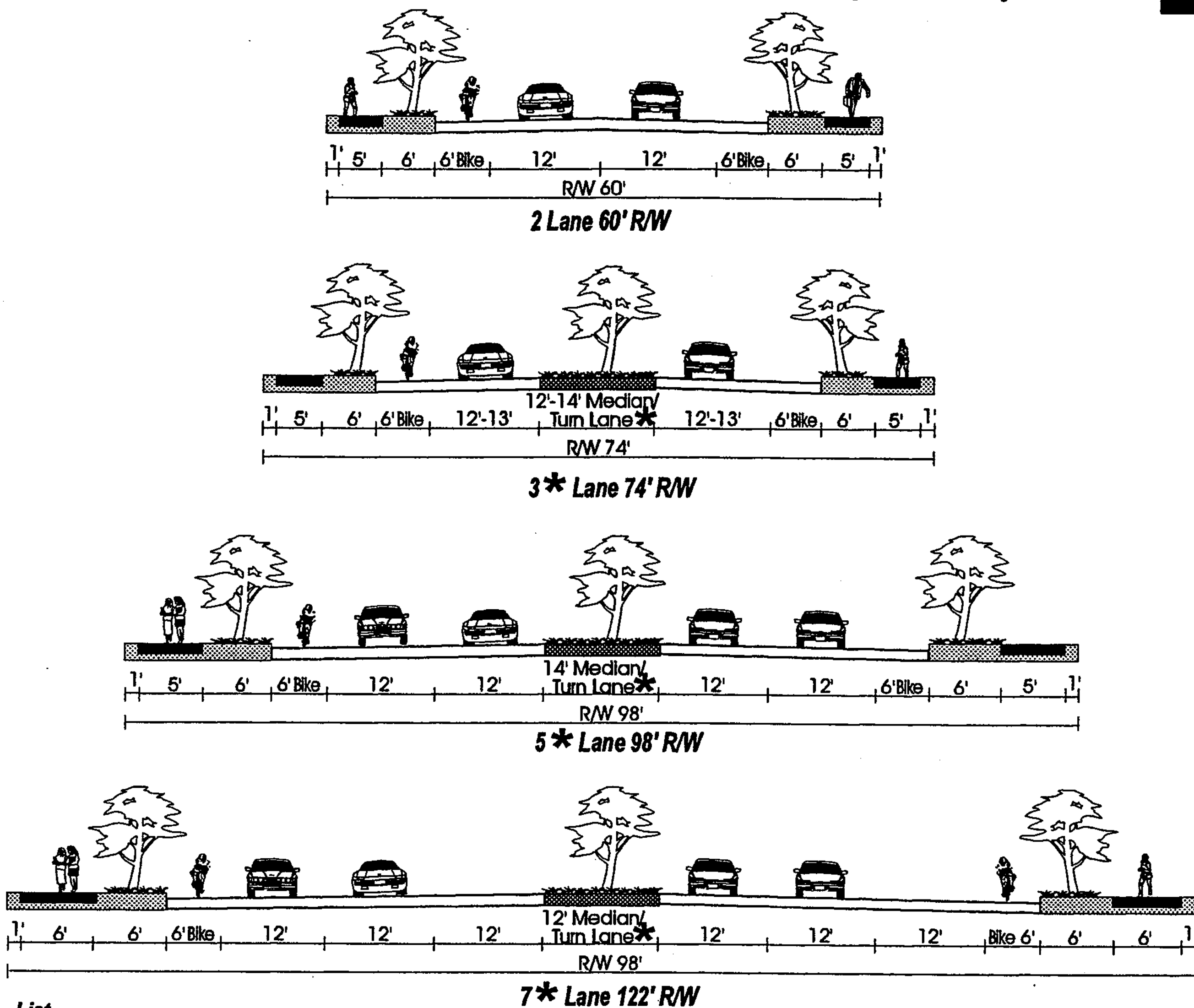
1. Space between curb and median minimum 19' with mountable curb design (to be coordinated with Fire Department).
2. Selection of placement of sidewalk and planter specific to application. Cross sections show two choices for reference.
3. Width of curb is included in sidewalk or planter strip width when adjacent to street.
4. Samples show the desirable applications given number of lanes; minimum standards can be applied case by case.
5. Actual width of street and sidewalk area can be adjusted within R/W based on modal priorities and adjacent land use.
6. Typically 1' is provided from R/W line to edge of concrete surface (for maintenance/utilities).
7. Encourage use of curb extensions at intersections in commercial areas and on any pedestrian routes.
8. For constrained settings, a three lane cross section can be developed in 44 feet (6 ft. bike lanes, 10 ft. travel lane, 12 ft. turn lane/median)

* Note that, where appropriate, the median/lane may not be provided resulting in 2 and 4 lane cross sections. The removal of the center turn lane must consider both safety and pedestrian needs. Reduced right-of-way between 64' - 69' can be considered through design exception (for example, station areas).

Criteria

Vehicle Lane Widths: (minimum)	11 ft. Preferred 10 ft. Minimum (adjacent to 6 ft.bike lane)
On Street Parking: (adds to right-of-way width)	Residential 7 ft. Commercial 8 ft.
Bicycle Lanes: (minimum widths)	New Construction = 6 ft. Reconstruction = 5 to 6 ft.
Sidewalks: (minimum width)	5 to 7 ft.
Landscape Strips:	Required
Medians:	3-Lane = Optional
Neighborhood Traffic Management:	Under Special Conditions

Figure 8-6
COLLECTOR
SAMPLE STREET CROSS SECTIONS
REQUIRED ROW WIDTH



List

- Glencoe Road/1st Avenue
- Jackson School Road (North of Evergreen)
- 28th Avenue/25th Avenue
- Minter Bridge Road/Cypress Street/32nd Avenue
- Brookwood Parkway
- Shute Road (North of Brookwood)
- Helvetia Road
- Cornelius Pass Road
- 185th Avenue
- West Union Road
- Evergreen Road/Parkway
- Cornell Road
- Walker Road
- Baseline Road
- Baseline Street
- Oak Street
- TV Highway/10th Avenue
- River Road

Notes:

1. Space between curb and median minimum 19' with mountable curb design (to be coordinated with Fire Department).
2. Selection of placement of sidewalk and planter specific to application. Cross sections show choices for reference.
3. Width of curb is included in sidewalk or planter strip width when adjacent to street.
4. Samples show the desirable applications given number of lanes; minimum standards can be applied case by case.
5. Actual width of street and sidewalk area can be adjusted within R/W based on modal priorities and adjacent land use.
6. Typically 1' is provided from R/W line to edge of concrete surface (for maintenance/utilities).

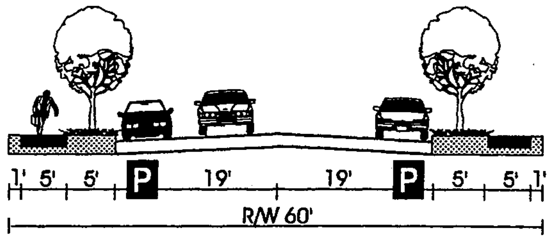
* Note that, sidewalk widths above 6 ft. may require additional right-of-way. Where appropriate, the median/lane may not be provided resulting in 2,4 and 6 lane cross sections. The removal of the center turn lane must consider both safety and pedestrian needs.

Criteria

Vehicle Lane Widths: (minimum widths)	Truck Route = 12 ft. Bus Route = 12 ft. 11 ft. (12 ft. Preferred)
On Street Parking:	None (with few existing exceptions)
Bicycle Lanes: (minimum widths)	New Construction = 6 ft. Reconstruction = 5 to 6 ft.
Sidewalks: (minimum width)	5-13 ft. Consider Curb Extensions on Ped Routes
Landscape Strips:	Required
Medians:	5/7 Lane = Required 3 Lane = Optional
Neighborhood Traffic Management:	Only Under Special Conditions: Selected Measures

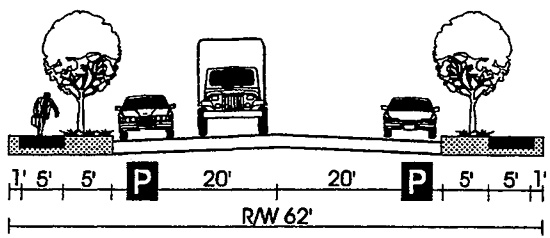
Figure 8-5
ARTERIAL
SAMPLE STREET CROSS SECTIONS
REQUIRED ROW WIDTH

38' Standard Commercial



60' Right-of-way

40' Standard Industrial



62' Right-of-way

Notes:

1. *These cross sections apply where fronting adjacent land uses are commercial or industrial and are not designated arterial or collector streets.*
2. *The wider right-of-way standard will apply where adjacent land uses vary.*
3. *Width of curb is included in planter strip width.*
4. *Samples show the desirable applications given number of lanes; minimum standards can be applied case by case.*
5. *Actual width of sidewalk may be adjusted to meet modal priorities of adjacent land use. Sidewalk widths above 10 feet require additional R/W.*

Criteria

Vehicle Lane Widths: (minimum widths)	11 ft.
On-Street Parking:	
Commercial	8 ft.
Industrial	8 ft.
Sidewalks: (minimum width)	5 ft.
Landscape Strips:	
Commercial	Required
Industrial	Urban street trees or strip required

Legend

P - *On-street Parking Lane*

Figure 8-5a
COMMERCIAL/INDUSTRIAL SAMPLE STREET CROSS SECTIONS REQUIRED ROW WIDTH

Recommended Development Review & Subdivision Ordinances Modifications

Section 133(IX), Development Review, of City Zoning Ordinance No. 1945, as amended, and Article VI, General Principles of Design and Improvement Standards, of City Subdivision Ordinance No. 2808, as amended, are hereby amended to add the following transportation standards that may apply to applications for zone changes, planned unit developments, conditional uses, City Development Review & Approval and residential subdivision and minor land partitions, respectively, as conditions of approval thereof:

Implementation Measures

- Land use actions, which would create substantially higher traffic volumes, than were assumed in the development of the Transportation Maps shall be evaluated. Land use actions, which would exceed the street capacities of the Transportation Maps, shall not be allowed unless mitigated or the maps and other applicable ordinances are otherwise amended.

- Approvals of land use actions on properties that include land adjacent to rights-of-way and street improvements, which are less than that specified in the transportation plan and maps, shall require: dedication of adequate land for public right-of-way to meet that specified in the plan; construction of the required interior street system; and construction of, or execution of a non-remonstrance deed restriction for the specified street improvements immediately adjacent to the properties. For the purpose of this measure, land use actions are limited to zone changes, planned unit developments, conditional uses, variances, expansions of nonconforming uses, development reviews, site plan reviews, subdivisions, major partitions and minor partitions.

- The Zoning Ordinance shall include increased setback requirements along inadequate or substandard street right-of-way. This will help assure that structures will not be built in areas needed for future street right-of-way

- The transportation plan addresses the widening of 10th Avenue and the 9th Avenue/10th Avenue one-way couplet alternatives. The Zoning Ordinance shall contain additional setback requirements to assure that structures will not be built in the potential right-of-way areas of either alternative. A decision as to which alternative will be implemented shall be made upon more detailed analysis of the impacts of each.

- Right-of-way on 239th Avenue, Golden Road, Lois Street and Frances Street shall not exceed 50 feet in width, except where right-of-way is dedicated pursuant to Transportation Implementation Measure B. In addition, the fully improved street widths shall not exceed 36 feet when adequate off street parking is provided on the abutting properties.

- Where required and consistent with the applicable Transportation System Action Plan and maps, sidewalks and bikeways shall be constructed in conjunction with improvements to the street system.

- Prior to the next major update, improvements required bringing the street system in conformance with the transportation plan and maps shall be identified and prioritized in a capital improvement program.

- Access limitations shall minimize driveway conflicts and maximize street capacity. The Development Review (Section 133), and Planned Unit Development (Section 127) sections of the Zoning Ordinance and Subdivision Ordinance shall include restrictions for single family residential driveways on arterials and collector streets. If traffic volumes are forecast to be in excess of 5,000 vehicles per day, new developments should access to side streets or parallel roads, and/or driveways should be aggregated to serve more than one development.

- The City shall coordinate with Tri-Met to help expand local transit service. Service should radiate from a central bus transfer point in the downtown area. In addition to the central transfer point, there should be a north-south line to the east of downtown to provide cross-town service.

- The land use map shall, to the extent possible, reinforce and encourage public transportation service by clustering high density residential uses, employment centers and shopping opportunities in areas served by arterial or collector streets.

- The City shall coordinate with Metro, Tri-Met and Washington County on the implementation of Station Area Plans.

- The City shall encourage the use of carpools, vanpools and staggered work hours as a means of reducing peak daily traffic loads.

Street Standards for Public Roadways

The street classification descriptions reflect the street cross-section design standards illustrated below[7] and the designations contained in the Transportation System Plan Functional Classification Map. The design standards are prescribed in the City' TSP Street Design Manual and are intended to implement the TSP Functional Classification Map. The traffic capacity volumes within each classification provide an order of magnitude distinction between classifications, and are generally consistent with the Washington County Transportation System Plan.

The standards prescribed by the City's TSP Street Design Manual and illustrated below are for roadways that are or will be dedicated to the public (City). This subsection provides enabling legislative authority for the Design Manual and the specific roadway design standards therein, and incorporates by reference the Design Manual standards as a part of this subsection of this ordinance. This subsection also permits application of Design Manual standards as conditions of approvals for applications for zone changes, planned unit developments, conditional uses, variances and Development Review & Approval.

Private property developers may choose to construct roadways at a lesser standard. However, in doing so developers should be made aware of the fact that roads constructed to a lesser standard may not be accepted for dedication at a later date. Further, even if the general public is allowed to use private streets, the developer or a legally responsible property-owner's association retains liability for the property and is financially responsible for the upkeep and maintenance of the roadway, sidewalks and landscaping.

Cul-de-sac Streets (See Figure 8-8 For Design Criteria)

The design standards for cul-de-sacs are prescribed in and governed by the TSP Street Design Manual. These streets are intended to serve a maximum of 25 dwelling units and shall not exceed 200 feet in

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[3] All street section standards contain the following common required elements: a six inch (6") Portland Cement Concrete ("PCC") curb with an eighteen inch (18") PCC gutter pan; face of curb storm drain inlets; a four foot (4') minimum width back of curb landscape strip with street trees at least 2 ½ inch caliper at time of planting, sidewalks at least five feet (5') in width, right-of-way width extending to not less than twelve inches (12") behind the sidewalk, "Option B" streetlights, and a public utility easement for public and private underground utilities (including gas, electric, telephone and cable communications conduits or ductbanks) of up to eight feet (8') if public and private utilities are not allowed or can not be designed to fit within the right-of-way. Where lane width, cross section and traffic safety requirements are dependent on a traffic engineering analysis, all traffic counts and traffic engineering studies shall be per the Highway Capacity Manual and/or AASHTO standards, and may utilize standards and methodologies adopted by Washington County in order to promote uniformity and coordination between the two jurisdictions, as directed by the City Engineer.

length[8]. The cul-de-sac street is be designed to an improvement width[9] of 28 feet within a 50 foot right-of-way, with sidewalks on each side being a minimum of 5 feet wide[10]. A minimum 5-foot wide landscape strip shall separate the sidewalks and roadway. The circular paved turning area must have a radius of at least 40 feet to the curb. Alternative radii and paved area turn around configurations may be considered by the Street Committee at the time of Development Review.

With City Engineer[11] approval, the cul-de-sac street may be constructed to 24 feet wide within a 46-foot right-of-way where no on-street parking will be provided and adequate off-street parking is available on the abutting properties.

Alley (See Figure 8-8 For Design Criteria)

The design standards for alleys are prescribed in and governed by the TSP Street Design Manual. Alleys are intended to serve only abutting land. Alleys shall be an inverted crown design constructed of Portland Cement Concrete ("PCC") pavement[12] with a travel lane of 12-16 feet plus a 2-4 foot gravel shoulder on each side to create a 20 foot right-of-way clear of any and all obstacles. On-street parking is prohibited on alley streets. An alternative alley configuration would have 20 feet of PCC pavement with a minimum 5-foot landscape strip for one-sided alley loadings.

Local Residential Streets (See Figure 8-8 For Design Criteria)

The design standards for local residential streets are prescribed in and governed by the TSP Street Design Manual. These streets are intended to serve only abutting land and should carry less than 1,500 vehicles per day (vpd). If traffic volume is projected to exceed 1,500 vehicles per day, neighborhood traffic management measures as identified in the Transportation System Plan shall be considered. The standard local residential street shall be designed as a 32-foot roadway improvement within a 54-foot right-of-way (where daily traffic volume exceeds 1,500 vehicles per day), with a 5-foot minimum width sidewalk and a minimum 4-foot landscape strip separating the sidewalks and roadway on each side. With City Engineer

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[8] Except where topography, barriers (railroads, freeways, existing development, etc.) or environmental constraints (major streams, rivers, wetlands, etc.) prevent ultimate street connectivity (extension) beyond the parcel in question; in which case a cul-de-sac street may exceed 200 feet in length with City Engineer approval. Where the City Engineer finds that there may be the possibility of connectivity in the future, the street shall not end in a cul-de-sac, the development shall be sited so as not to preclude the possibility of future connectivity, and a public right-of-way easement shall be dedicated to effect future construction.

[9] "Improvement width" includes travel lanes; the curb and gutter assembly; and, as permitted or required the median (landscaped and/or left turn lane), bicycle lanes, and on-street parking space.

[10] Where a cul-de sac street has terminated for a reason cited in footnote #4, above, the developer shall nonetheless make a good faith effort to establish and construct pedestrian and bicycle connections to the neighboring parcel from the end of the cul-de-sac street, or show cause to the satisfaction of the City Engineer why such connections are not technically feasible and should not be required of the applicant. Even if not technically or economically feasible to construct all of the connection as a part of the development in question, if the City Engineer finds that such a connection may be feasible upon development of the adjacent parcel, the City Engineer shall require a fourteen foot (14') public easement and the development shall be sited so as not to preclude the possibility of connectivity in the future and may require the construction, or fee in lieu of the portion that is within the development in question as a condition of approval. If the abutting properties are in common ownership such connections may be required to include pedestrian bridges.

[11] The City Engineer may delegate decision-making authority to qualified engineering staff, and may refer policy decisions to the City Council Street Committee.

[12] Streets designated as alleys and constructed with an inverted crown, and all curb and gutter sections shall be of PCC construction. Preference shall be given to PCC construction for "Transit Streets," arterial streets, and streets abutting commercial zones and districts. All other standard crown streets may be constructed to an equivalent structural cross section using asphaltic concrete (AC) with the approval of the City Engineer. Streets shall be constructed with thermoplastic markings and all regulatory and roadway informational signs shall be installed per the Manual of Uniform Traffic Control Devices.

approval other designs can be considered. When the projected buildout daily traffic volume is below 250 vehicles per day, the improved roadway width may be reduced to not less than 24 feet with a right-of-way of not less than 46 feet with no on-street parking allowed and adequate off-street parking is available on the abutting properties. When projected daily traffic volumes exceed 600 vehicles per day and are less than 1,500 vehicles per day, the improved roadway width may be reduced to not less than 28 feet with a right-of-way of not less than 50-feet, if parking is restricted to one side and adequate off-street parking is available on the abutting properties.

Neighborhood Streets (See Figure 8-7 For Design Criteria)

The design standards for neighborhood streets (routes) are prescribed in and governed by the TSP Street Design Manual. Neighborhood routes are usually long relative to local streets and provide connectivity to collectors or arterials. Because neighborhood routes have greater connectivity, they generally have more traffic than local streets and are used by residents in the area to get into and out of the neighborhood, but do not serve citywide/large area circulation. Traffic from cul-de-sacs and other local streets may drain onto neighborhood routes to gain access to collectors or arterials. Because traffic needs are greater than a local street, certain measures should be considered to retain the neighborhood character and livability of these routes. Neighborhood traffic management measures are often appropriate as defined in the Transportation System Plan. The standard configuration for neighborhood streets (routes) without on-street parking shall be a 36-foot roadway improvement within a 60-foot right-of-way, with two 12-foot travel lanes, two 6-foot bicycle lanes, two 6-foot landscape strips, and two 5-foot sidewalks.

Collector Streets (See Figure 8-6 For Design Criteria)

The design standards for collector streets are prescribed in and governed by the TSP Street Design Manual. Collector streets provide both access and circulation within residential and commercial/industrial areas. Collectors differ from arterials in that they provide more of a citywide circulation function, do not require as extensive control of access and penetrate residential neighborhoods distributing trips from the neighborhood and local street system.

The standard configuration for collector streets without on-street parking shall be a 46-foot roadway improvement within a 70-foot right-of-way, including two 11-foot travel lanes, a 12-foot median/turn lane and two 6-foot bicycle lanes. Five-foot (5' minimum) sidewalks separated from the curb by a 6-foot landscape strip are required on both sides of the street. Left turn lanes shall be provided at major intersections and may be provided, if approved by the City Engineer, at authorized property access points between intersections.

Arterial Streets (See Figure 8-5 For Design Criteria)

The design standards for arterial streets are prescribed in and governed by the TSP Street Design Manual. Arterial streets are intended to serve as the primary routes for travel between the City of Hillsboro and other parts of the region, between major areas of urban activity, and to access the highway system. Arterial streets vary in size from two-lanes up to seven lanes. Access spacing shall be established by city land use regulations. Additional left and right turn lanes as defined in the Development Review Transportation Impact Report shall add 12 feet for each additional turn lane to the rights-of-way identified in Figure 8-5. All property access points from an arterial street between intersections require approval of the City Engineer, and may be subject to right turn only configuration, consolidation among adjacent properties, and minimum spacing standards set so as not to unduly impeded traffic volume along the arterial street. Standard sidewalks and landscape strips are required. Wider sidewalks shall be constructed to at least 8 feet wide in commercial areas, and 13 feet or wider along specific streets in the Station Community Planning Areas. This requires wider rights-of-way than those shown in Figure 8-5 (equivalent to the difference between the minimum 5- or 6-foot sidewalks as shown to the sizes required).

Commercial and Industrial Streets (See Figure 8-5a For Design Criteria)

The design standards for commercial and industrial streets are prescribed in and governed by the TSP Street Design Manual. Commercial and industrial streets are not through routes and are intended to serve primarily abutting non-residential land uses. However, due to the nature of the adjacent land uses, such vehicles will include larger trucks, requiring wider travel lanes and additional turning radii. The standard commercial street shall be designed as a 38-foot roadway improvement with 60-foot right-of-way, with a 5-foot minimum width sidewalk and a minimum 5-foot landscape strip separating the sidewalks and roadway on each side. The standard industrial street shall be designed as a 40-foot roadway improvement with 62-foot right-of-way, with a 5-foot minimum width sidewalk and a minimum 5-foot landscape strip separating the sidewalks and roadway on each side.

Street Design

In addition to the street design criteria listed above, City approvals of zone change, planned unit development, conditional use, variance, Development Review & Approval and residential subdivision applications may be conditioned on development consistency with the street design provisions contained in the TSP Street Design Manual administered by the City Engineer. The Manual design standards shall include standards concerning multi-modal design (bike and pedestrian facilities design standards), design speeds, sight distance standards, street lighting, roadway access spacing, Motor Vehicle Level of Service (LOS), local street spacing, traffic signal spacing, cul-de-sac lengths and design, roadway slopes, roadway widths, setbacks, street connectivity, shelters, disabled access needs, truck accommodation, special roadway districts, and other features that routinely are require as part of street design.

TSP Action Plans Consistency

Applications for zone changes, planned unit developments, conditional uses, variances, Development Review & Approval and residential subdivisions may be approved subject to conditions that require the proposed land use or subdivision to be consistent with the TSP Action Plans and corresponding Action Plan Project Lists identified in, Section 97B of the Zoning Ordinance and Article VI, Section 3 of the Subdivision Ordinance, as applicable, including but not limited to the following TSP Actions Plans and corresponding Project Lists:

1. Pedestrian Action Plan (See TSP Figure 5-2 and corresponding Table).
2. Bicycle Action Plan (See TSP Figure 6-2 and corresponding Table).
3. Street Improvement Action Plan (See Figure 8-18, and corresponding Table).
4. Intersection Improvement Locations Plan (See TSP Figure 8-19 and corresponding Table).
5. Local Street Connectivity Plan (See TSP Figures 8-9 through 8-16).
6. Other Transportation Action Plans that are adopted by the City from time to time as part of an amended Transportation System Plan.

Street Connectivity

The Local Street Connectivity Plan shall be used to identify potential street and pedestrian accessway connections. The City may require additional street and pedestrian accessway connections to adjacent areas in order to achieve land use project or subdivision compliance with the Roadway Access Spacing standards, Local Street Spacing standards and Pedestrian/Bike Accessway standards identified in the Table on page 52 and prescribed in the TSP Street Design Manual.

Table 5-2

Pedestrian Action Plan Project Priorities

Project	From	To	Metro RTP No.*
Priority (1): Connect key pedestrian corridors to schools, parks, recreational uses and activity centers			
Maple Street	16th Avenue	24th Avenue	722
Oak Street	10th Avenue	18th Avenue	722
Walnut Street	10th Avenue	18th Avenue	722
18th Avenue	Oak Street	Maple Street	722
21st Avenue	Cypress Street	Maple Street	722
Glencoe Road	North of Glencoe H.S.	Grant Street	712
Jackson School Road	Evergreen Road	Grant Street	711b
Connell Road	Garibaldi Street	Glencoe Road	
Arrington Road	Cornell Road	Jackson School Road	
Delsey Road	Arrington Road	Grant Street	
24th Avenue	Spruce Street	Maple Street	
Cedar Street	32nd Avenue	Brookwood Avenue	
Frances Street	239th Avenue	Cornelius Pass Road	
Minter Bridge Road	River Road	Morgan Road	
Rood Bridge Road	River Road	Rood Bridge Park	
Witch Hazel Road	TV Highway	River Road	
37th Avenue	Main Street	LRT Station	
Arrington Road	Jackson School Road	Cornell Road	
Sunrise Lane	Jackson School Road	25th Avenue	
Grant Street	Jackson School Road	28th Avenue	
Lois Street	239th Avenue	Cornelius Pass Road	
Priority (2): Fill in gaps where some sidewalks exist			
TV Highway	10th Avenue	Cornelius Pass Road	723
28th Avenue	Grant Street	E. Main Street	726c
Cornelius Pass Road	TV Highway	Evergreen Road	737/738
Walker Road	Amberglen Parkway	185th Avenue	
Stucki Avenue	Cornell Road	Evergreen Parkway	
Garabaldi Street	317th Avenue	1st Avenue	
Golden Road	Brookwood Avenue	239th Avenue	
Priority: Construct sidewalks with roadway improvement projects			
Baseline Road	Lisa Drive	Brookwood Avenue	714/715/928
231st Avenue	Cornell Road	Johnson Street	729a
Brookwood Parkway	Airport Road	TV Highway	739/740
Evergreen Road	Shute Road	Glencoe Road	732/732b
Aloclek Drive	Amberwood Drive	Cornelius Pass Road	726d
East/west connector/Parr	185th Avenue	63rd Parkway	728
Amberglen Parkway/205th Ave.	Von Neuman Drive	Baseline Road	729b
Quatama Street	227th Avenue	Baseline Road	707
Salix Extension	185th Avenue	Cornell Road	
206th Avenue	Amberwood Drive	Amberglen Parkway	

*Included in Draft RTP list, November 1998. Reference number used in Round 2 lists.

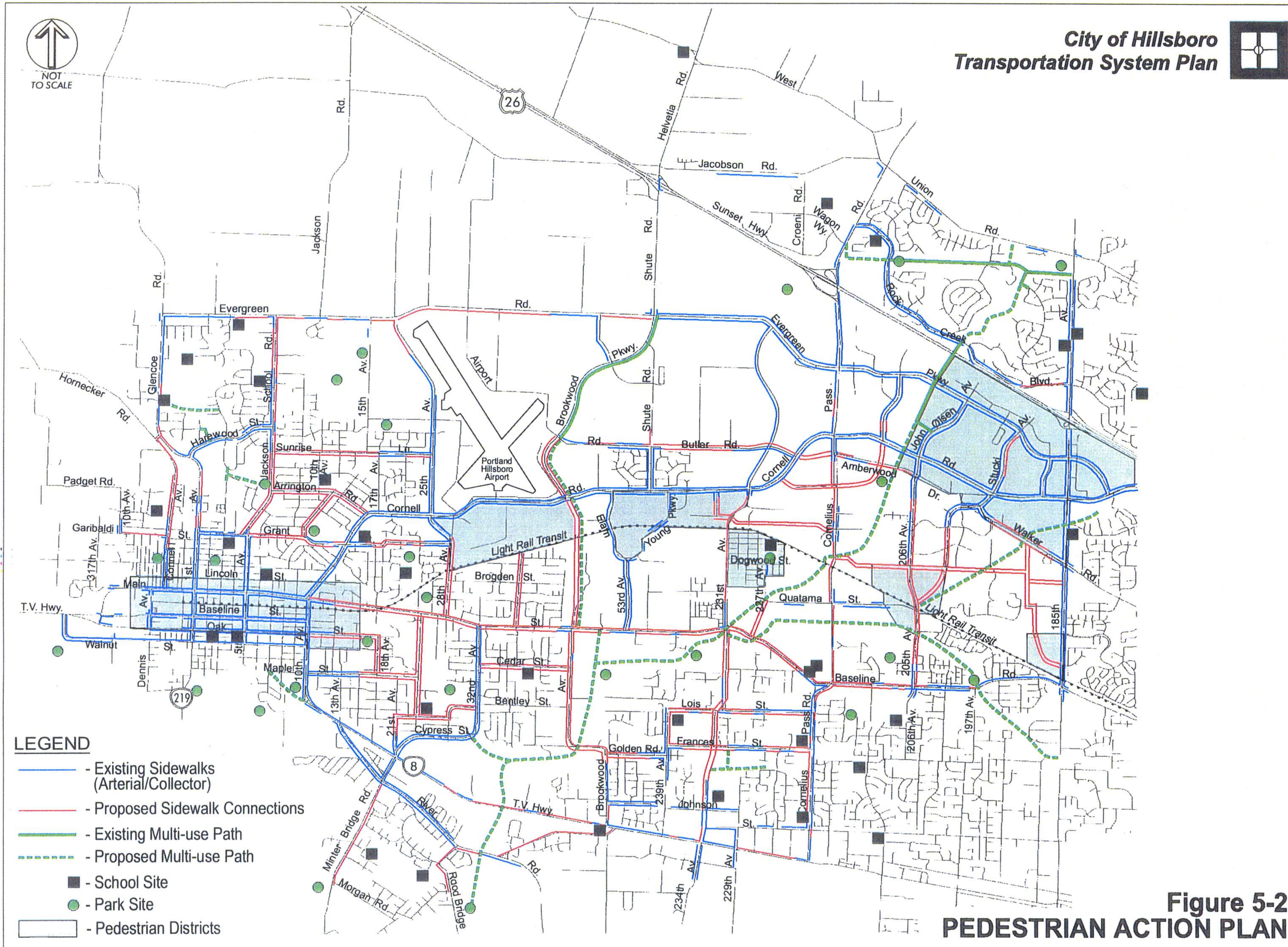

Figure 5-2
PEDESTRIAN ACTION PLAN

DKS Associates

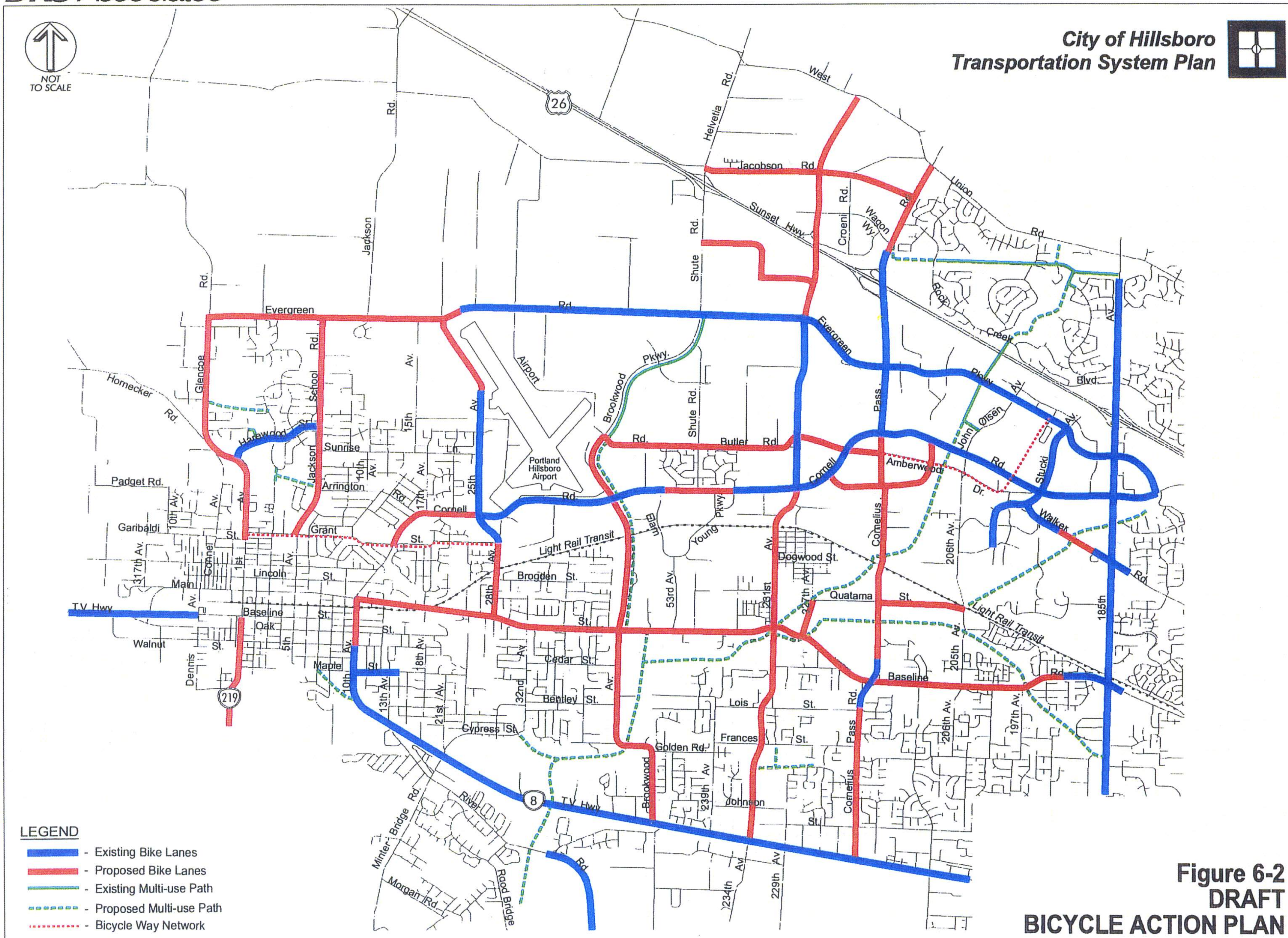

Figure 6-2
DRAFT
BICYCLE ACTION PLAN

Table 6-4
Bicycle Action Plan Project Priorities

Project	From	To	Metro Draft RTP Project
Priority 1: Connect key bicycle corridors to schools, parks, recreational uses and activity centers			
Rock Creek Trail	Evergreen Parkway	Amberwood Drive	79*
Jackson School Road bike lanes	Evergreen Road	Grant Street	711b*
Glencoe Road bike lanes	Evergreen Road	Grant Street	712*
Grant Street bicycle way	1st Avenue	25th/28th Avenue	
Priority 2: Fill in gaps in bicycle network			
25th Avenue bike lanes	Evergreen Road	25th Avenue gap	749*
Cornell Road bike lanes	Elam Young (west)	Ray Circle	706*
10th Avenue bike lanes**	Walnut Street	Main Street	
Oak Street bike lanes**	TV Highway	Dennis Avenue	
Cornell Road bike lanes**	Grant Street	25th Avenue	
Priority: Construct bike lanes with roadway improvement projects			
Baseline Road bike lanes	Lisa Drive	10th Avenue	714/715/928*
Brookwood Parkway bike lanes	Airport Road	TV Highway	739/740*
Cornelius Pass Road bike lanes	Cornell Road	209th Avenue	737/738*
Evergreen Road bike lanes	Near 260th Avenue	Glencoe Road	732b*
Evergreen Road bike lanes	Near 25th Avenue	Glencoe Road	732*
231st/235th Avenue bike lanes	Evergreen Road	West Union Road	743a/743b*
28th Avenue bike lanes	Grant Street	Main Street	726c*
231st Avenue bike lanes	TV Hwy	Cornell Road	729a*
Quatama Street bike lanes	227th Avenue	Baseline Road	707*
Jacobson Road bike lanes	Helvetia Road	Cornelius Pass Road	
Butler/Amberwood bike lanes	Brookwood Parkway	John Olsen Avenue	
Walker Road bike lanes	Amberglen Parkway	185th Avenue	

* Included in Draft RTP list, November 1998 (reference number in parenthesis)
** Feasibility studies required; including alternative alignments and need for right-of-way acquisition.

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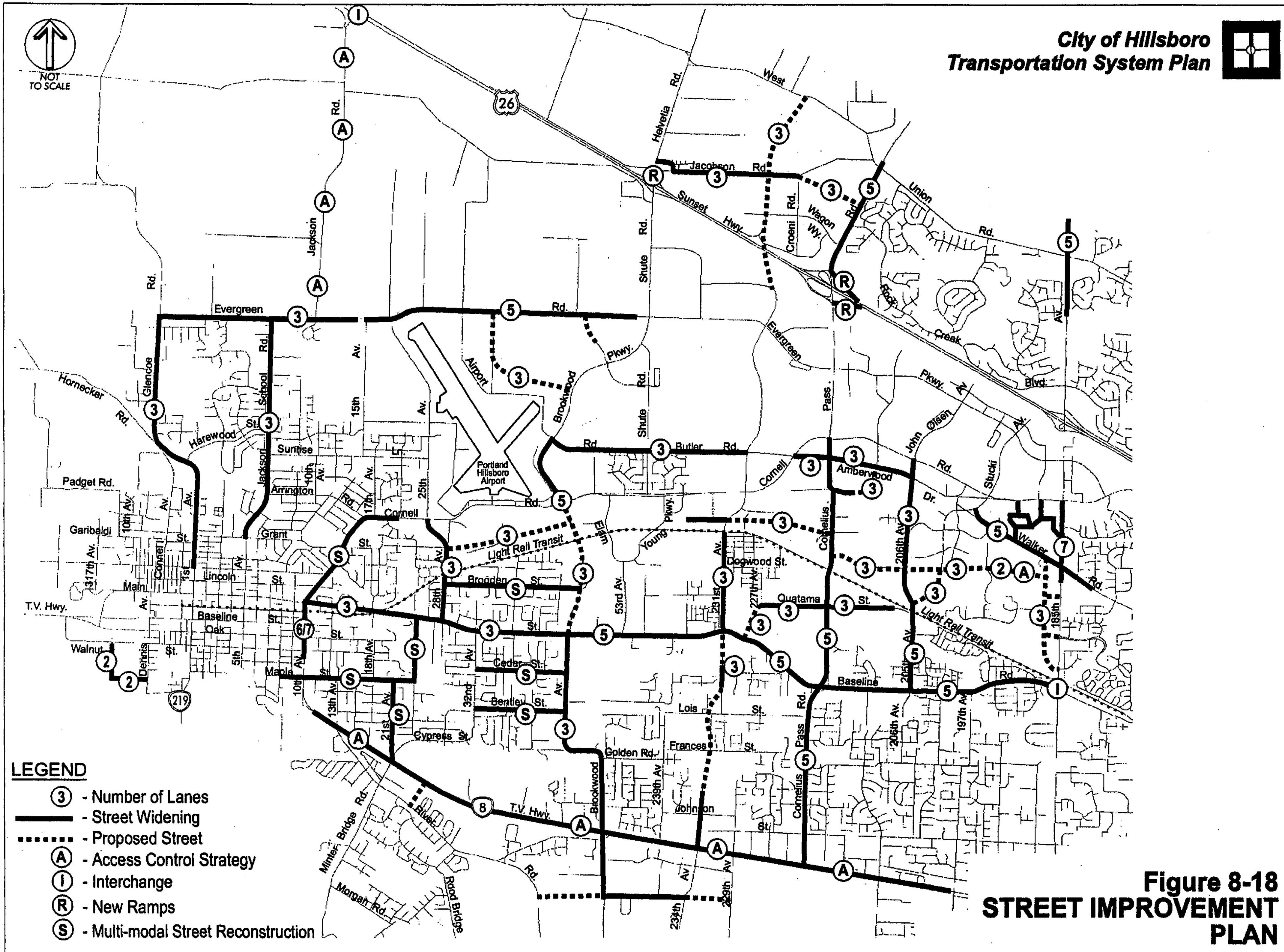

Figure 8-18
STREET IMPROVEMENT PLAN

Table 8-4

Future Street Improvements

(All Projects include sidewalks, bicycle lanes and transit accommodations as required)

Location	Description	Status*
HIGHEST PRIORITY PROJECTS		
10th Avenue: Main to Baseline Street	Add right turn lane, widen sidewalk	RTP 726b
28th Avenue: Grant to Main	Widen to 3 lanes	RTP 726c
231st / 234th Avenue Extension	Extend south of Baseline to Century High School a 3 lane roadway	RTP 729a
Aloclek: Amberwood to Cornelius Pass	Extend 3 lane road	RTP 726d
Baseline Road: Lisa to Brookwood	Widen to 5 Lanes	RTP 715
Baseline Road: Lisa to 231st	Widen to 3 Lanes	RTP 714
Baseline Road: 231st to Brookwood	Widen to 3 Lanes	RTP 928
Brookwood Parkway: Airport to TV Hwy	Widen to 5 Lanes to past Cornell, extend south as 3 lanes	RTP 739/740
Cornelius Pass Road: US 26 to West Union	Widen to 5 Lanes	RTP 734
Cornelius Pass Road: Aloclek to Baseline	Widen to 5 Lanes	RTP 738
Cornelius Pass Road: Baseline to TV Hwy	Widen to 5 Lanes	RTP 737
Evergreen: Glencoe to 15th	Widen to 3 Lanes	RTP 731a
Evergreen: 15th to 253rd	Widen to 5 Lanes	RTP 732b
TV Highway/Cornell Signal Timing/System	Operational Improvements	RTP 646b/727/730
TV Highway Boulevard	Complete Boulevard Improvements	RTP 710a
TV Highway: Cornelius Pass to 209th	Improvement	STIP Planned
US 26/Jackson School Road	Channelization/Safety	RTP 711a
US 26 at 185th	Sound Walls	STIP Planned
Johnson at 198th	Traffic Signal	STIP Planned
SECOND HIGHEST PRIORITY PROJECTS		
1st Ave./Glencoe Road: Lincoln to Evergreen	Widen to 3 Lanes	RTP 712
185th Avenue: Westview to Springville	Widen to 5 Lanes	Not in Plans
205th Avenue: LRT to Baseline	Widen to 5 Lanes	RTP 729b
206th Avenue: Amberwood to LRT	Widen to 3 Lanes	Not in Plans
Amberglen Parkway: Walker to 206th	Extend 3 lane roadway	Not in Plans
Amberwood: 206th to Cornelius Pass	Widen to 3 Lanes	Not in Plans
Butler Road: 63rd to Brookwood/Airport	Widen and extend to 3 lane road	Not in Plans
Cornell: Arrington to Main	Widen to 5 Lanes	RTP 709b
Downtown Area Improvements: 1st and 10th Avenues	Signals, Striping, Widening, Two-way (see following discussion)	RTP 712b/726e-f
East-West Collector: Cornelius Pass to Salix	Extend 3 lane road	RTP 728
East-West Collector: Campus to Cornelius Pass	Extend 3 lane road	RTP 728
Jackson School Road: Evergreen to Grant	Widen to 3 Lanes	RTP 711b
Jacobson Road: Croeni to Cornelius Pass	Extend new 3 lane alignment	Not in Plans
Jacobson Road @ Helvetia	Realign intersection north of US 26	Not in Plans
Quatama Street: LRT to 227th Avenue	Widen/improve 3 lane road	RTP 707
Quatama Street: 227th Avenue to Baseline	Extend 3 lane road	RTP 707
Salix Extension: LRT to Walker	Extend 3 lane roadway	Not in Plans
Walker Road: Amberglen to 185th	Widen to 5 Lanes	RTP 754
Other Collector Reconstruction	Multiple Locations (see following sections)	Not in Plans
Intersections Improvements	Multiple Locations (see Table 8-5)	Not in Plans

Location	Description	Status*
Other Traffic Signals (16)	City/County operational enhancement	Not in Plans
US 26/Cornelius Pass Road	Build new diagonal ramps in NE & SE Quadrants. Add ramp meter storage.	RTP 735
US 26/Shute Road	New loop ramp and interchange modifications	US 26 Interchange Study
US 26/229th Overcrossing	Extend 229th from NW Bennett Ave. to West Union Rd. as 3 lane roadway	RTP 743 a + b
THIRD HIGHEST PRIORITY PROJECTS		
Airport Road: Evergreen to Brookwood	Realign and widen to 3 lanes	Not in Plans
Amberwood: Cornelius Pass to Cornell	Extend 3 lane road to Butler	Not in Plans
Baseline Road/185th Intersection	Upgrade Capacity/Grade Separation	Not in Plans
Brookwood Extension s/o TV Hwy	Extend 3 Lanes, realign Witch Hazel	Not in Plans
Cornelius Pass Road Extension	Extend 3 lane road south of TV Hwy to 209th	RTP 825d
Heritage: 185th to Salix	Extend 2 lane road	Not in Plans
Jackson School Road/US 26	Interchange	Not in Plans
Parr: 185th to Salix	Connect 3 lane road	Not in Plans
West of Rood Bridge: TV Hwy to River	Connecting 3 lane roadway	Not in Plans
TV Highway: Access Control	Driveway/Turn Lane modifications	RTP 645c
East-West Collector: Brookwood to 28th	Build new 3 lane road n/o LRT	Not in Plans
East-West Collector: River to 209th	Extend and widen to 3 lane road	Not in Plans
185th Avenue: Cornell to Walker	Widen to 7 Lanes	Not in Plans
188th Extension: Cornell to Walker	Extend 3 lane road	Not in Plans
US 26 Auxiliary Lanes: Shute to 185th	Add Auxiliary Lanes	Not in Plans
US 26/Glencoe Road	Interchange improvement/modernization	RTP 731a

All improvements are multi-modal including sidewalks and bicycle accommodations

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City of Hillsboro
Transportation System Plan

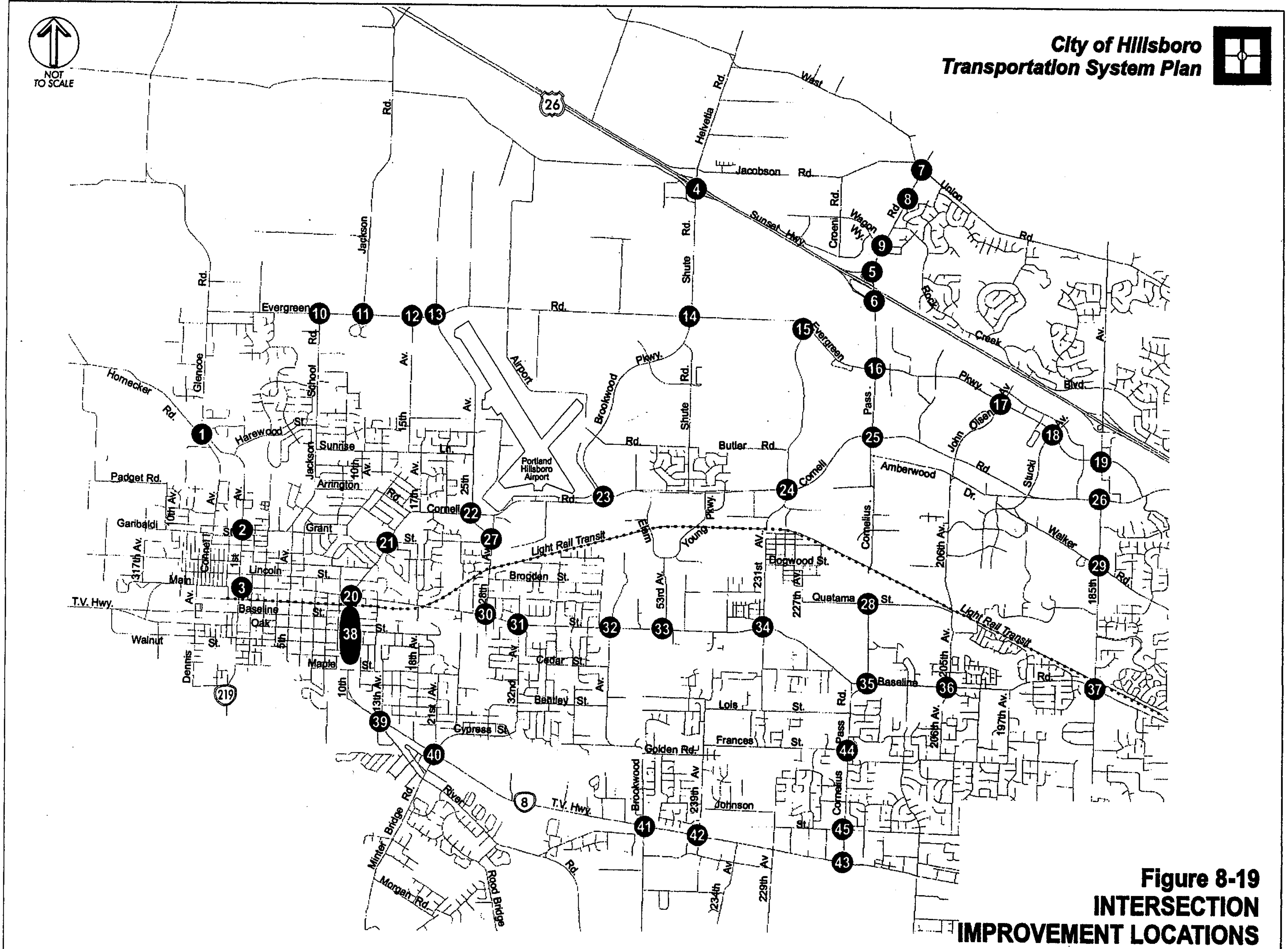

Figure 8-19
INTERSECTION IMPROVEMENT LOCATIONS

Table 8-5
City of Hillsboro 2015 Intersection Improvements

No.	Intersection	Description
1	Glencoe Road/Hornecker Road	Install traffic signal; add SB right turn lane, NB left turn lane EB right turn lane
2	Glencoe Road-1st Street/Grant Street	Install traffic signal; Glencoe 3 Lanes
3	Main Street/1st Avenue/Lincoln Street	Add WB right turn lane (restripe - remove parking); signal modification/additions
4	US 26/Shute Road	Add 2nd NB thru & right turn lane + interchange study of future geometry
5	US 26/Cornelius Pass Road EB ramps	Add N/B to E/B diagonal ramp as a free movement
6	US 26/Cornelius Pass Road WB ramps	Add WB diagonal off-ramp
7	Cornelius Pass Road/West Union Road	Install traffic signal; add left turn lanes SB, EB, WB; add NB and EB RT lanes
8	Cornelius Pass Road/Jacobson	Install traffic signal; add SB right turn lane: Cornelius Pass 5 Lanes
9	Cornelius Pass Road/Wagon Way	Install traffic signal; Cornelius Pass 5 Lanes
10	Evergreen Road/Jackson School (east)	Install traffic signal; add SB right turn lane; Evergreen 3 Lanes; Connect W/B right turn lane with 5 lane section of Evergreen
11	Evergreen Road/Jackson School (west)	Install traffic signal; Evergreen 3 Lanes
12	Evergreen Road/15th Avenue	Install traffic signal; EB right turn lane; Evergreen 5 Lane section starts
13	Evergreen Road/25th Avenue	Provide second NB right turn lane, second WB left turn lane; Evergreen 5 Lanes
14	Evergreen Road/Shute-Brookwood Parkway	Add NB and SB right turn lanes
15	Evergreen Parkway/229th Avenue	Add NB and EB right turn lanes; use protected/permitted signals N/S
16	Evergreen Road/Cornelius Pass Road	Double left turn lanes on all approaches; add right turn lanes on all approaches
17	Evergreen Parkway/John Olsen Avenue	Install traffic signal
18	Evergreen Parkway/Stucki Avenue	Install traffic signal
19	Evergreen Parkway/185th Avenue	Add SB right turn lane; NB double left turn lanes
20	Cornell Road/10th/ East Main Street	Add NB right turn lane; add SB through lane
21	Cornell Road-10th Ave/Grant Street	Add EB left turn lane
22	Cornell Road/25th Avenue	NB + SB double lefts; add SB and EB right turn lanes
23	Cornell Road/Brookwood Parkway	Add second left turn lanes EB + WB; Add SB right turn lane
24	Cornell Road/231st - 229th Avenue	Add EB and SB right turn lanes; add WB 2nd left turn lane
25	Cornell Road/ Cornelius Pass Road	Add WB right turn lane; EB double left turn lanes
26	Cornell Road/185th Avenue	Add NB and SB double left turn lanes; add NB right turn lane; 185th 7 Lanes
27	Grant Street/'25th -28th Avenue	Install traffic signal; add WB left turn lane
28	Quatama/Cornelius Pass	Install traffic signal; SB right turn lane, Quatama 3 Lanes
29	Walker Road/185th Avenue	Add double left turn lanes on all approaches; add WB right turn lane; 185th 7 Lanes
30	Baseline-East Main/28th Avenue	Install traffic signal; add WB right turn lane

No.	Intersection	Description
31	Baseline-East Main/32nd Avenue	Widen Baseline Road to 5 lanes
32	Baseline Road/Brookwood Parkway	Widen Baseline Road to 5 lanes; add EB + SB right turn lanes; signal change
33	Baseline Road/53rd Avenue	Widen Baseline Road to 5 lanes
34	Baseline Road/231st Avenue	Widen Baseline Road to 5 lanes; extend 3 Lane 231^{st}
35	Baseline Road/Cornelius Pass Road	Widen Cornelius Pass + Baseline Road to 5 lanes; right turn lanes all approaches
36	Baseline Road/205th-206th Avenue	Widen 205th + Baseline to 5 lanes; add EB and WB right turn lanes
37	Baseline Road/185th Avenue	Interchange or 185th 7 lanes with double lefts
38	Baseline Street/10th Avenue	Add SB right turn lane; NB double left turn; restripe for 2nd WB lane
39	TV Highway/13th Avenue-River Rd	Add EB right turn lane
40	TV Highway/Minter-Bridge Road	Add NB right turn lane; remove split traffic signal phasing
41	TV Highway/Brookwood Parkway	Extend Brookwood south 3 Lane ; traffic signal phasing; double left turns for NB and SB approaches; add NB, SB and EB right turn lanes; add WB left turn lane
42	TV Highway/239th Avenue	Traffic signal
43	TV Highway/Cornelius Pass Road	Add NB + SB double left turn lanes; add EB right turn lane
44	Frances Street/Cornelius Pass Road	Traffic signal; 5 lane Cornelius Pass
45	Johnson/Cornelius Pass Road	Traffic signal; 5 lane Cornelius Pass

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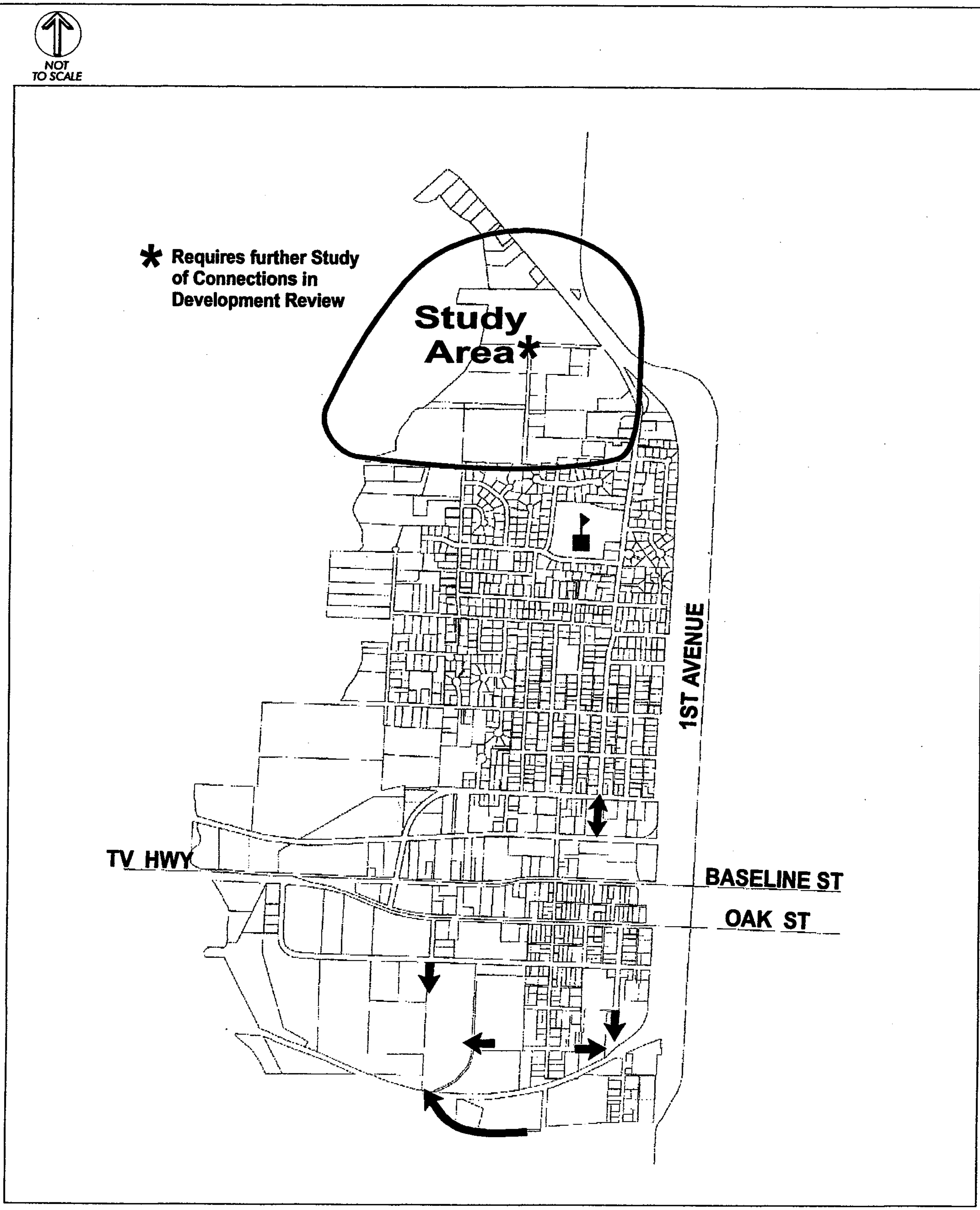

LEGEND

- Stub End Street

- School Site

Figure 8-9
LOCAL STREET CONNECTIVITY
West Hillsboro

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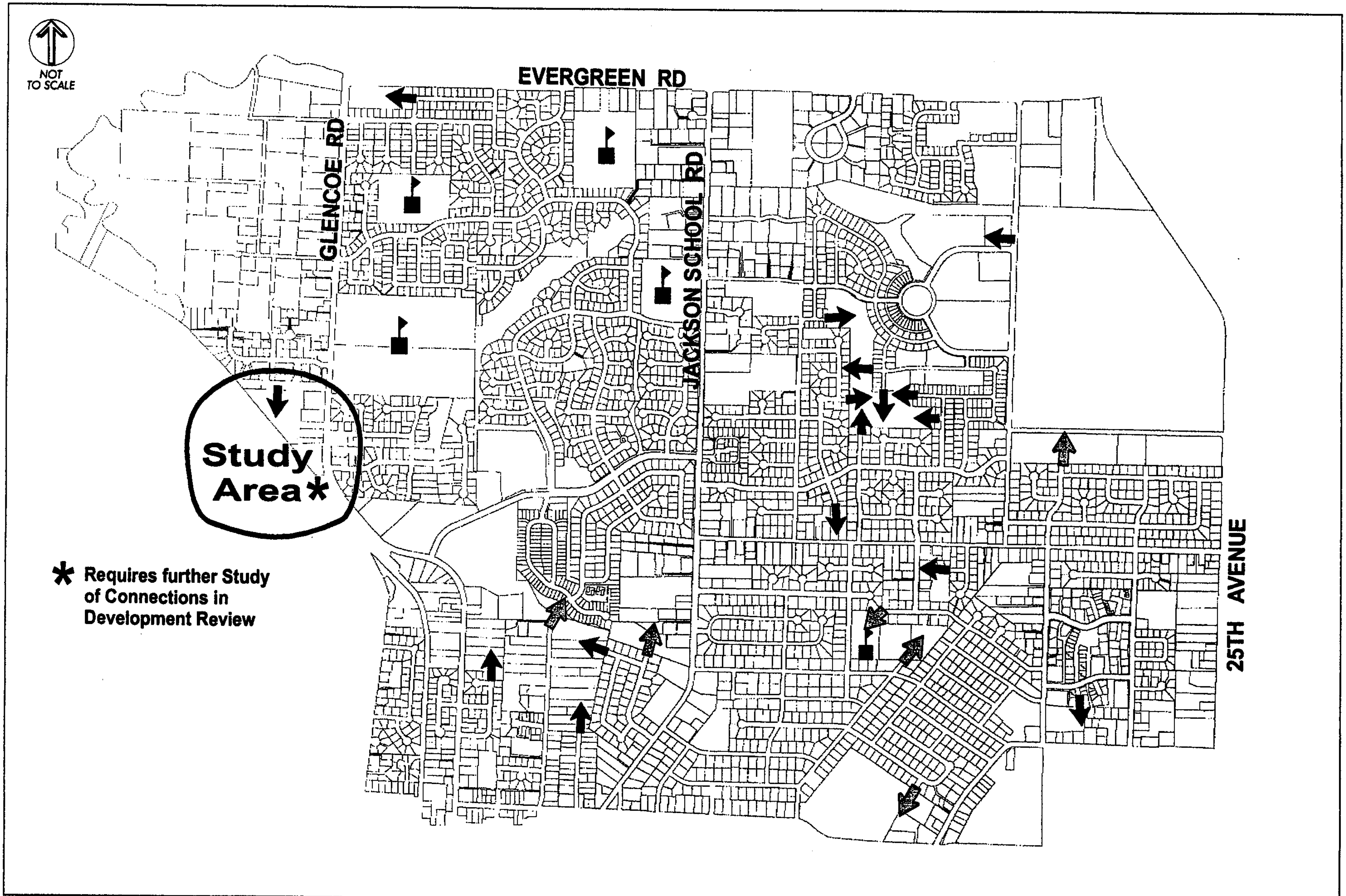
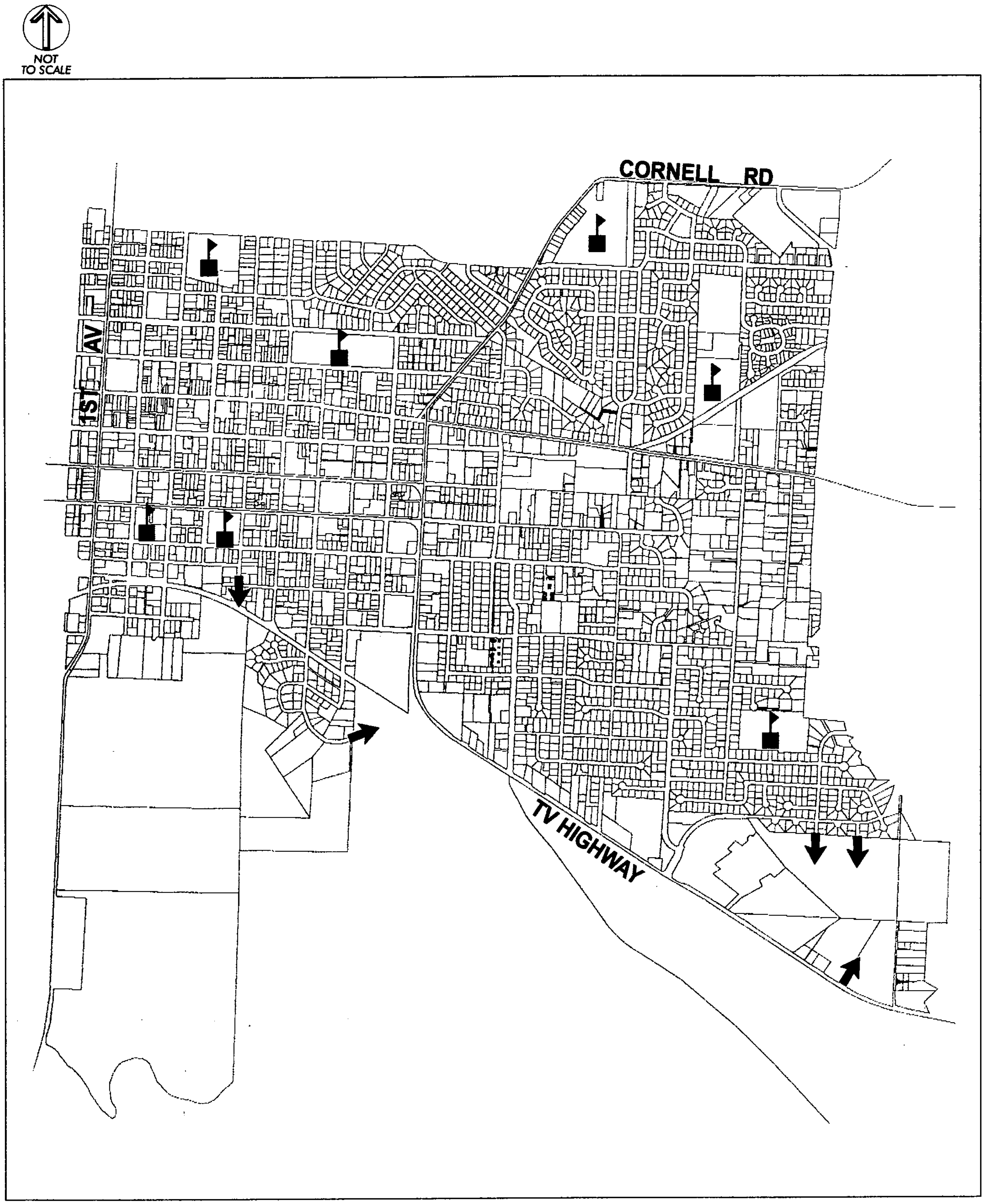


Figure 8-10
LOCAL STREET CONNECTIVITY
Northwest Hillsboro

DKS Associates



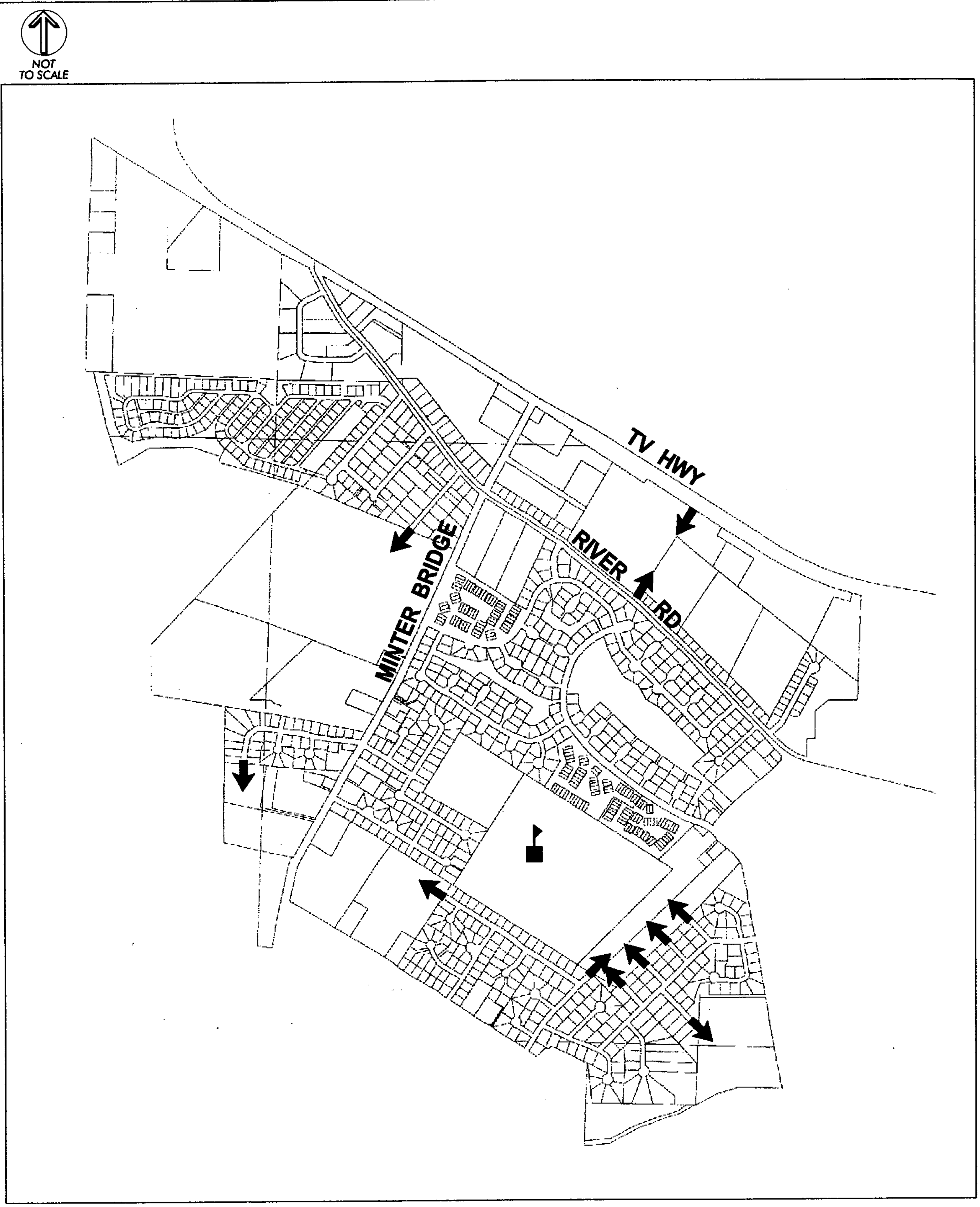
LEGEND

- Stub End Street

- School Site

Figure 8-11
LOCAL STREET CONNECTIVITY
Central Hillsboro

DKS Associates



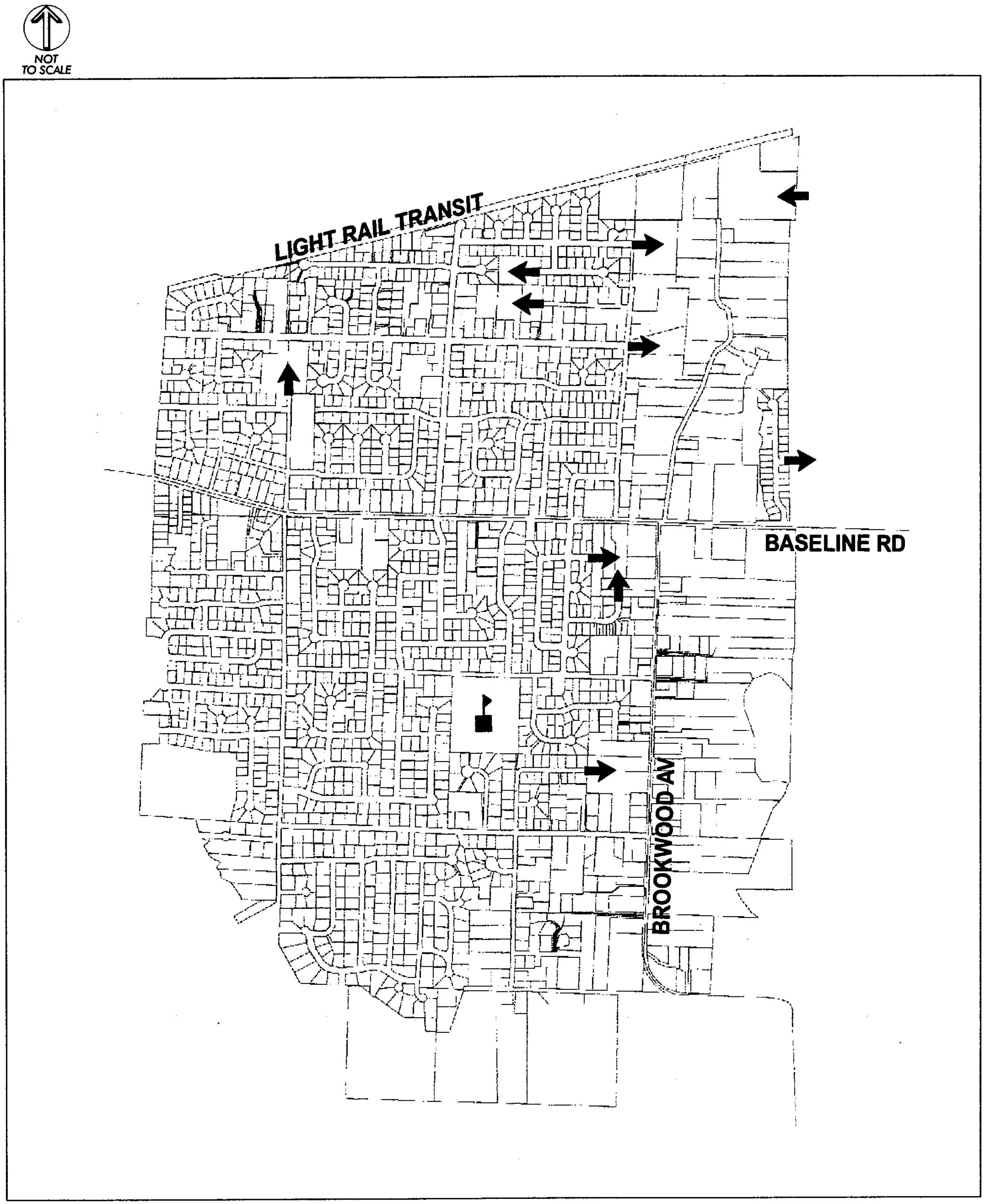
LEGEND

- Stub End Street

- School Site

Figure 8-12
LOCAL STREET CONNECTIVITY
South Hillsboro

DKS Associates



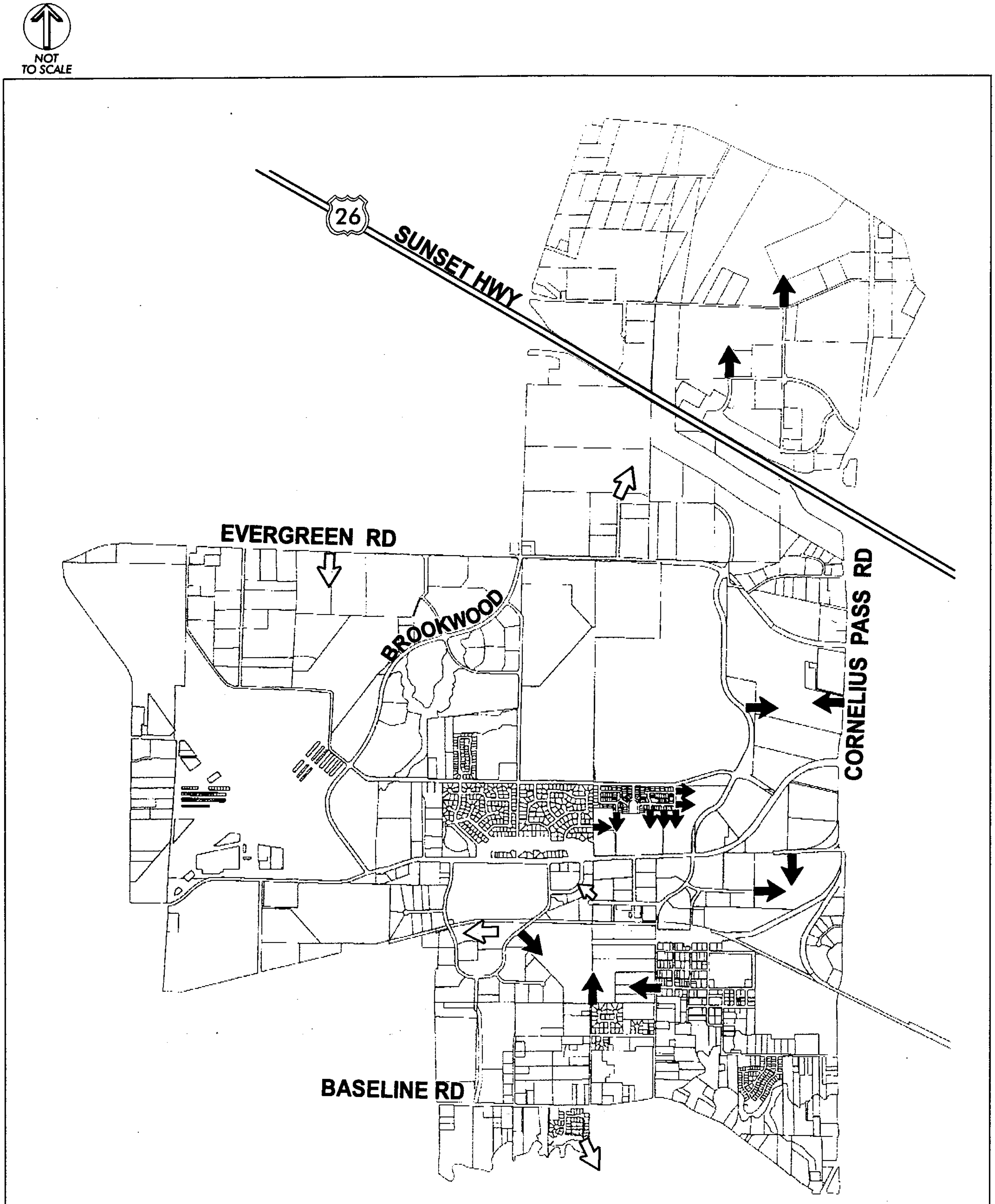
LEGEND

- Stub End Street

- School Site

Figure 8-13
LOCAL STREET CONNECTIVITY
Brookwood

DKS Associates



LEGEND

- Stub End Street Connection
- Pedestrian Connection
- School Site

Figure 8-14
LOCAL STREET CONNECTIVITY
Northeast Hillsboro

DKS Associates

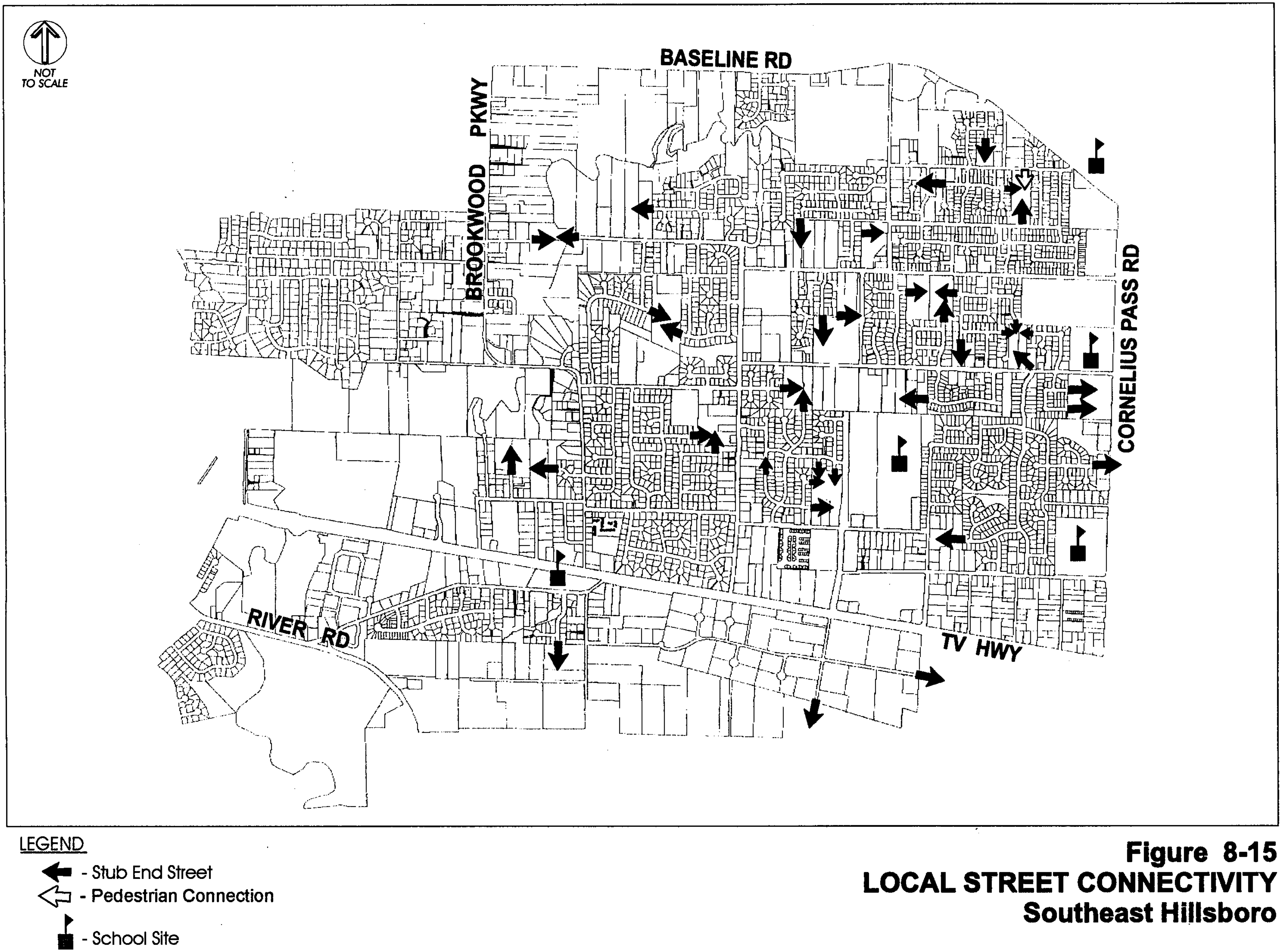
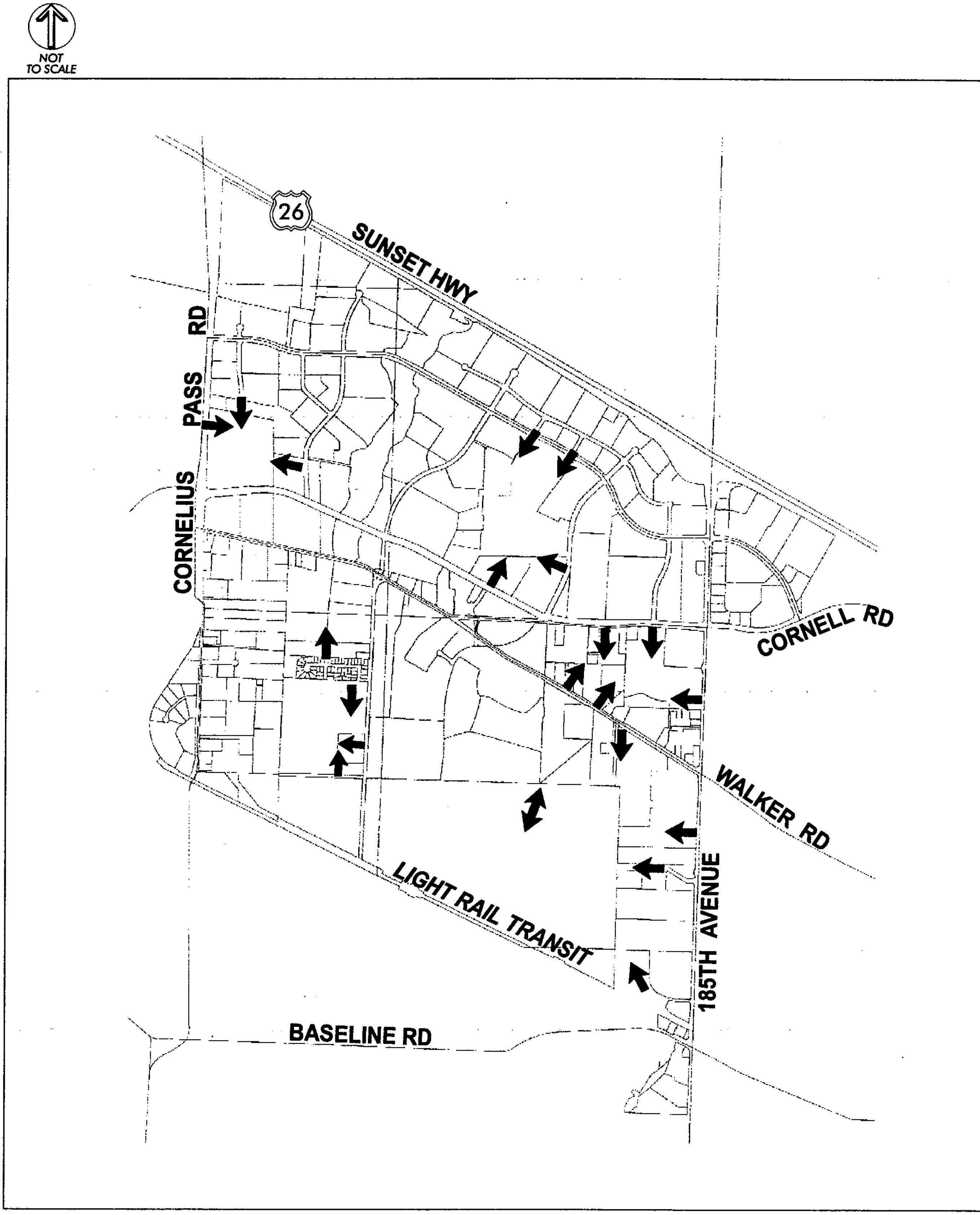


Figure 8-15
LOCAL STREET CONNECTIVITY
Southeast Hillsboro

DKS Associates



LEGEND

- Stub End Street
- School Site

Figure 8-16
LOCAL STREET CONNECTIVITY
East Hillsboro

Level of Service

Applications for zone changes, planned unit developments, conditional uses, variances, Development Review & Approval and residential subdivisions may be approved provided that the proposed land use or subdivision maintains the applicable level of service prescribed in the two-stage Motor Vehicle Level of Service Standard (LOS) for the City identified in the Table in Section ___(B)[13] and prescribed in the TSP Street Design Manual.

Traffic Management Plan

If required as a condition of approval of any zone change, planned unit development, conditional use, variance, Development Review and Approval or residential subdivision application, a traffic management plan shall identify:

1. The total volume of through trips on the nearby (within one-half mile) street(s) before and after the proposed development where a proposed land use project or residential subdivision will generate more than 200 and 250 vehicle trips per day, respectively.

2. The total traffic volume for the identified nearby street(s) before and after the proposed development.

3. The number of through trips as a percentage of the total volume on the identified street(s) in item 1 above. The percentage should be shown for conditions on the street(s) before and after the development. Through trips are vehicle trips that have neither origin nor destination in the nearby area.

4. Existing speed zones and actual speed data for street(s) identified in item 1 above.

5. Traffic management strategies designed to mitigate the impacts of increased through trips attributed to the development. The strategy shall be approved by the City Engineer based on its effectiveness in mitigating the impacts of increased through trips.

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[13] The two-stage LOS is as follows: Stage 1 requires achieving a peak hour Level of Service "D" at signalized intersections (in accordance with current Highway Capacity Manual, Chapter 9) and a peak hour Level of Service "E" for unsignalized intersections (in accordance with current Highway Capacity Manual 10). If a project fails to mitigate traffic conditions caused by the project in order to maintain the Stage 1 LOS standard, the project applicant may request application of a Stage 2 LOS standard to the project.

When a Stage 2 LOS standard applies, the project applicant must prepare a project traffic management plan which specifies the necessary traffic impact mitigation measures to be implemented in order to maintain the LOS "D" or "E" standard, as applicable. Establishment and performance of such measures may become conditions of project approval by the City. Additionally, the project applicant must prepare a systems analysis of the transportation facilities affected by the project's failure to meet the applicable Stage 1 LOS standard. The results of this analysis shall determine the LOS to be attained by the project based upon Arterial Analysis methods in current Highway Capacity Manual 11.

General Road Design Standards

- A Transportation Impact Report (TIR) will be required of a proposed land use project seeking City Development Review approval that generates 200 vehicles per day (vpd) or more, and a proposed residential subdivision that generates 250 vehicles per day or more. The applicants of such City land use permits shall prepare the Report. Trip generation will be based upon the current version of the Institute of Transportation Engineers Trip Generation Manual. Additionally, transportation impact reports are required for approval of transportation related projects designed to accommodate increased motor vehicle traffic by over 5,000 vpd before reaching the Year 2015 plan horizon of the Transportation System Plan (TSP).

- For land use projects generating less than 200 vpd, and for residential subdivisions generating less than 250 vpd, a traffic circulation map shall be required as parts of a development permit application. The map shall show the functional classification and routes of proposed streets and roadways within the subdivision; the locations of driveway access to properties along such routes; and, the daily and evening peak hour vehicle trip generation from the proposed subdivision using the rates from the current Institute of Transportation Engineers Trip Generation Manual. Direct access from single family residential lots onto arterials or collectors shall be discouraged, and may be allowed only when necessary to provide access to a lot.

- A TIR Checklist shall be prepared and used to determine the technical completeness of a Transportation Impact Report. A traffic engineer currently licensed by the State of Oregon shall prepare the Report. The Report shall identify roadway safety or capacity improvements proposed by the applicant to mitigate the traffic impacts of its project if such mitigation is required to maintain an acceptable Level-of-Service at intersections or arterials affected by trips to be generated from the project.

- In the case of residential subdivisions, the Report shall also contain a circulation map prepared by the applicant showing how pedestrian and bicycle access will be accommodated safely.

- The general road design standards contained in the Table in this subsection shall be used to determine traffic impacts of all proposed land use development projects, residential subdivisions, or land use actions that may require traffic impact mitigation measures. In cases where traffic impacts exceeding the thresholds identified in the Table are identified as a result of a land use project or residential subdivision, mitigation measures or design exceptions shall be prepared. If a design exception is requested, the proposed land use project or residential subdivision shall justify why the exception is necessary. The City Engineer, subject to review upon request may approve the requested exception by the City Council Street Committee.

Measure	Threshold	Specifications
Motor Vehicle Level of Service (LOS): Stage I: Unsignalized Signalized Signalized (Station Area) Stage II: Arterial	 E D E D	Refer to Comprehensive Plan Transportation Policy in Sec. 13 (III)(D)(1). The current version of the Highway Capacity Manual (HCM) shall be used to determine LOS. Peak hour basis is retained, unless updated by HCM.
Roadway Access Spacing: Arterial Collector	 600' min/1,000' max 200' min/400' max	The minimum standards for access spacing between access points shall require detailed access/safety analysis if not met.
Local Street Spacing	Not to exceed 530 feet between streets	
Neighborhood Impact	20^+ through vehicles per hour on local/neighborhood residential streets carrying greater than 600 vpd	Above this level, a separate neighborhood traffic management plan shall be submitted with the TIR that reduces the occurrence of cut-through traffic
Traffic Signal Spacing	1,000 foot desirable 500 foot minimum (downtown area excepted)	If traffic signals are proposed which are less than 1,000 feet apart (and not on the current traffic signal master plan map), a separate analysis of traffic signal timing shall be conducted to demonstrate that adequate progression can be maintained.
Cul-de-sac Length	Maximum Units Served = 25 Maximum Length = 200 feet	
Mixed Use Warrant	A development or where collective phases of development are projected to generate more than 500 evening peak hour vehicle trips	The TIR should map residential/ commercial areas within 1,500 feet. Consideration should be given to providing mixed uses if none exist within a 1,500 foot walking distance.
Direct Pedestrian Connection from Front Door to Public Sidewalk	Maximum 1.25 times the shortest straight line distance	Measured as the walking path a pedestrian would use compared to the straight-line distance.
Connection to Transit Stops	Apply criteria above to the bus stop location adjacent to site	Direct path to bus stop must not exceed 1.25 times straight-line distance.
Pedestrian Circulation Map	Above 500 evening peak hour vehicle trips	A pedestrian circulation map shall be prepared identifying linkages to all uses and transit stops within 1,500 feet. Define the number of auto/public sidewalk pedestrian conflict points for the site.
Pedestrian/Bike Connectivity	330 foot spacing minimum	
School Safety	For residential development within 1,500 feet of schools	Prepare a route to school map showing sidewalks.

1

Access Spacing

For Washington County roadways, the access spacing standards, requirements and reporting for the County shall apply. The access spacing standards for arterial and collector streets in the City are provided to address safety related to the number of access points (public streets or private access) on either side of a street. The maximum spacing standards are provided to assure connectivity. The minimum spacing standards are for safety. Exceptions to the maximums are permitted for environmental and topographic considerations.

1) Arterial: Minimum spacing between access points: 600 feet
   Maximum spacing between access points: 1,000 feet

2) Collector: Minimum spacing between access points: 200 feet
   Maximum spacing between access points: 400 feet

3) Access is measured between the inside right-of-way lines or edges of driveways.

4) On neighborhood routes and local streets that intersect with a collector or arterial, no access shall be permitted within 50 feet of the intersection. All driveways should be placed at least 25 feet from an intersection with public streets.

5) No new single family residential driveway shall be permitted to have direct access onto an arterial or collector street. The Planning Commission may approve access to an arterial or collector in unusual circumstances where access to a local residential street is not practical.

6) The number of access points on arterial and collector streets from any development should be minimized whenever possible through the use of driveways common to more than one development and interior circulation design which furthers this requirement.

Recommended Enabling Procedural Amendments

The omnibus ordinance will contain the following proposed amendments which enable the City to approve applications for zone changes, planned unit developments, conditional uses, variances, Development Review & Approvals and residential subdivisions subject to conditions requiring the proposed developments to comply with the transportation provisions and standards contained in the Development Review & Approval Section of the Zoning Ordinance and Article VI of the Subdivision Ordinance.

Section 114(1), Authorization for Conditional Amendment and Standards for Zone Change Consideration, shall be amended to read as follows:

Amendment of this Ordinance by amending the zoning map may be contingent upon compliance with conditions found necessary to accomplish the purposes of this Ordinance and implement the goals and policies of the Hillsboro Comprehensive Plan. To that purpose, any of the following conditions, stipulations or limitations may be attached to a zone change approval: (Amended by Ord. No. 3451/3-84.)

- Street improvements abutting/within the development area
- Street dedication abutting/within the development area
- Joint use/access agreement
- Improvement agreements for the installation of necessary on-site public facilities
- Utility easements
- Landscaping
- Off-street parking
- Storm drainage improvements
- Off-site public improvements when the rezoning and subsequent development will contribute significantly to the need for such off-site public improvements
- Development plan review by the Planning Commission
- Screening, fencing
- Limiting access
- Surety/performance bond
- Non-remonstrance clause
- The condition that the proposed project sought by zoning amendment implement the applicable Development Review standards contained in Section 133(V) through 133(IX) of the Zoning Ordinance and is consistent with the TSP Action Plans adopted by City Ordinance No.___.

Section 127(III), Planned Unit Development, Standards and Criteria, shall be amended to add a new subsection "K" to read as follows:

Transportation System Plan Conformance

In order to implement the adopted City Transportation System Plan component of the City Comprehensive Plan, the Planning Commission may condition its approval of an application for Planned Unit Development by requiring the proposed PUD project to conform with the applicable Development Review standards contained in Sections 133(V) through 133(IX) of the Zoning Ordinance, or by requiring the proposed PUD residential subdivision to conform with the standards contained in Article VI, Section 2 of City Subdivision Ordinance No. 2808, as amended. The Planning Commission may also condition its approval of the PUD subject to its consistency with the TSP Action Plans adopted by City Ordinance No. .

Section 111, Action of the (Variance) Hearings Board, shall be amended as follows:

Action of the Hearings Board

The Board may attach conditions to an authorized variance, which it feels are necessary to protect the public interest and carry out the purpose of this Ordinance. The Board may also attach conditions to an authorized variance that requires the proposed development to be consistent with standards contained in Section 133(V) through 133(IX) of the Zoning Ordinance that it deems applicable to the proposed development, or by requiring the proposed residential subdivision authorized by the variance to conform with the standards contained in Article VI, Section 2 of City Subdivision Ordinance No. 2808, as amended, that it deems applicable to the proposed subdivision. The Board may also condition its approval of the variance subject to the development's consistency with the TSP Action Plans adopted by City Ordinance No.____. The City Recorder shall notify the applicant for a variance, in writing, of the Board's action within five days after the Board has rendered its decision.

TSP ACTION PLANS

The omnibus ordinance will be the legislative measure that adopts the TSP Action Plans in accordance with ORS 197.175 as a new Section 97B in the Supplementary Provisions of the Zoning Ordinance, and a new Section 3 of Article VI, General Principles of Design and Improvement Standard, of the Subdivision Ordinance. Their application as conditions of approval of zone change, planned unit development, conditional use, variance and Development Review & Approval and residential subdivision applications are authorized by separate provisions in corresponding sections of the City Zoning Ordinance and Subdivision Ordinance that also will be parts of the omnibus ordinance. The authorizing TSP Action Plans language to be contained in the omnibus ordinance will be as follows:

Section 97 of the Supplementary Provisions of the Zoning Ordinance is hereby amended to add a new Section 97B, Transportation System Action Plan, and Article VI, General Principles of Design and Improvement Standard, of the Subdivision Ordinance is hereby amended to add a new Section 3, Transportation System Action Plan, to read as follows:

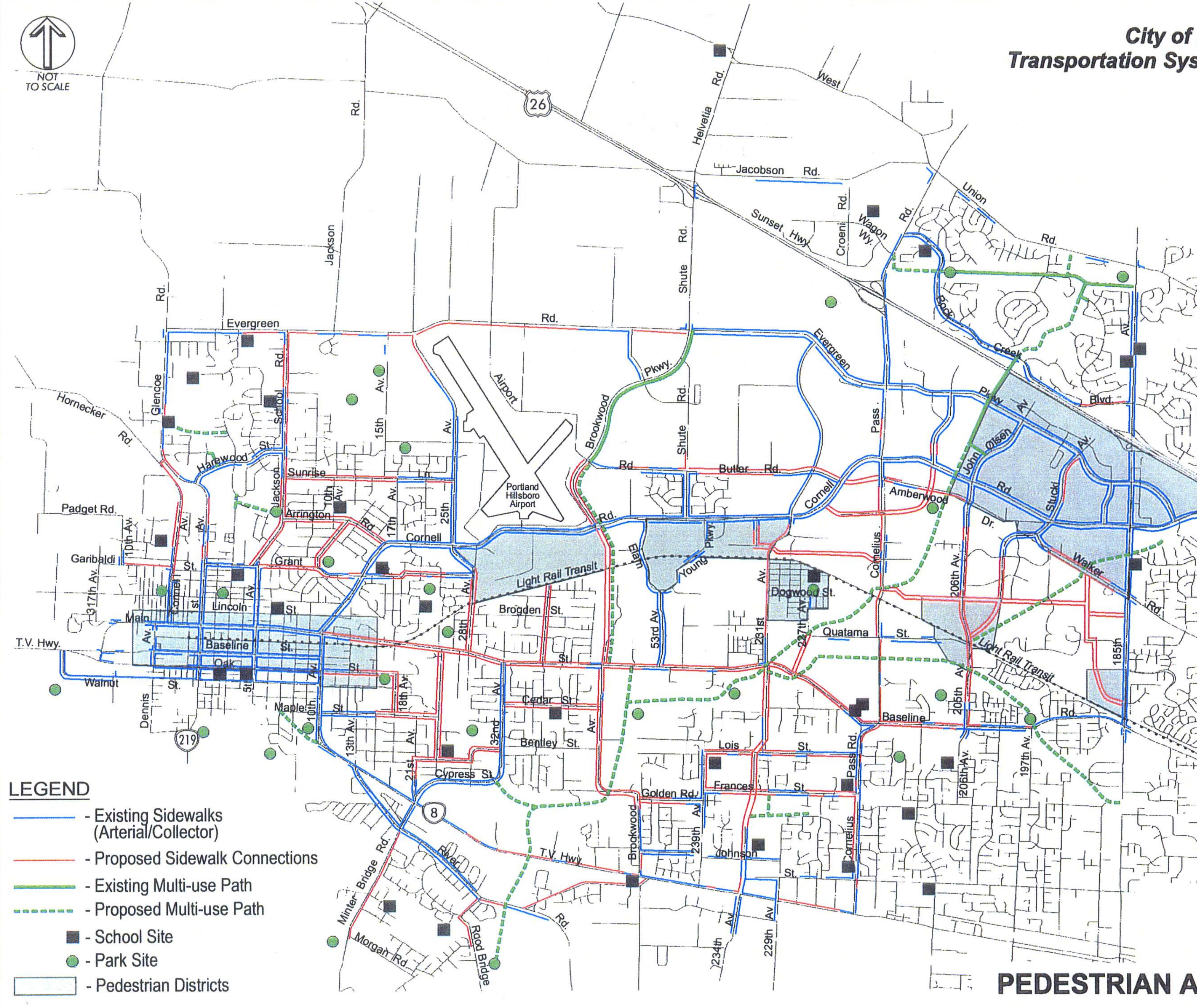
Transportation System Action Plans

1) The Transportation Action Plans the City prepared as part of the adopted City Transportation System Plan shall consist of the Action Plan Maps and corresponding Project Lists as shown in the following map and list exhibits for each of the following modes of travel in the City:

a) Pedestrian Action Plan (Figure 5-2) and Pedestrian Action Plan Project Priorities (Table 5-2).
b) Bicycle Action Plan (Figure 6-2) and Bicycle Action Plan Project Priorities (Table 6-4).
c) Street Improvement Plan (Figure 8-18) and Future Street Improvements List (Table 8-4).
d) Intersection Improvement Locations Plan (Figure 8-19) and City of Hillsboro 2015 Intersection Improvement List (Table 8-5).
e) Local Street Connectivity Plan (Figures 8-9 through 8-16).
f) Other Transportation Action Plans that are later adopted by the City from time to time as part of an amended Transportation System Plan.

2) Applications for zone changes, planned unit developments, conditional uses, variances, Development Review & Approval and residential subdivisions may be approved subject to conditions that require the proposed land use or subdivision to be consistent with the TSP Action Plans and corresponding Action Plan Project Lists identified in this section.

City of Hillsboro
Transportation System Plan



LEGEND

- Existing Sidewalks (Arterial/Collector)
- Proposed Sidewalk Connections
- Existing Multi-use Path
- Proposed Multi-use Path
- School Site
- Park Site
- Pedestrian Districts

Figure 5-2
PEDESTRIAN ACTION PLAN

Table 11-4

Pedestrian Action Plan Project List

Project	From	To	Metro RTP No.*	Cost (in $1,000s)
Priority (1): Connect key pedestrian corridors to schools, parks, recreational uses and activity centers				
Maple Street	16th Avenue	24th Avenue	722	$300 *
Oak Street	10th Avenue	18th Avenue	722	$300 *
Walnut Street	10th Avenue	18th Avenue	722	$300 *
18th Avenue	Oak Street	Maple Street	722	$300 *
21st Avenue	Cypress Street	Maple Street	722	$300 *
Glencoe Road	North of Glencoe H.S.	Grant Street	712	$ 90 *
Jackson School Road	Evergreen Road	Grant Street	711b	$500 *
Connell Road	Garibaldi Street	Glencoe Road		$100
Arrington Road	Cornell Road	Jackson School Road		$230
Delsey Road	Arrington Road	Grant Street		$130
24th Avenue	Spruce Street	Maple Street		$85
Cedar Street	32nd Avenue	Brookwood Avenue		$260
Frances Street	239th Avenue	Cornelius Pass Road		$300
Minter Bridge Road	River Road	Morgan Road		$120
Rood Bridge Road	River Road	Rood Bridge Park		$60
Witch Hazel Road	TV Highway	River Road		$120
37th Avenue	Main Street	LRT Station		$240
Arrington Road	Jackson School Road	Cornell Road		$340
Sunrise Lane	Jackson School Road	25th Avenue		$360
Grant Street	Jackson School Road	28th Avenue		$400
Lois Street	239th Avenue	Cornelius Pass Road		$234
Priority (2): Fill in gaps where some sidewalks exist				
TV Highway	10th Avenue	Cornelius Pass Road	723	$8,300*
28th Avenue	Grant Street	E. Main Street	726c	$160 *
Cornelius Pass Road	TV Highway	Evergreen Road	737/738	$390
Walker Road	Amberglen Parkway	185th Avenue		$180
Stucki Avenue	Cornell Road	Evergreen Parkway		$120
Garabaldi Street	317th Avenue	1st Avenue		$100
Golden Road	Brookwood Avenue	239th Avenue		$180
Priority: Construct sidewalks with roadway improvement projects				
Baseline Road	Lisa Drive	Brookwood Avenue	714/715/928	$980 *
231st Avenue	Cornell Road	Johnson Street	729a	$720 *
Brookwood Parkway	Airport Road	TV Highway	739/740	$770 *
Evergreen Road	Shute Road	Glencoe Road	732/732b	$340 *
Aloclek Road	Amberwood Drive	Cornelius Pass Road	726d	$240 *
East/west connector/Parr	185th Avenue	63rd Parkway	728	$552 *
Amberglen Parkway/205th Ave.	Von Neuman Drive	Baseline Road	729b	$430 *
Quatama Street	227th Avenue	Baseline Road	707	$120
Butler/Old Cornell Road	Shute Road	206th Avenue/John Olsen		$624
Salix Extension	185th Avenue	Cornell Road		$410
206th Avenue	Amberwood Drive	Amberglen Parkway		$360
			TOTAL	**$20,045**

*Included in Draft RTP list, November 1998. Reference number used in Round 2 lists.

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City of Hillsboro
Transportation System Plan

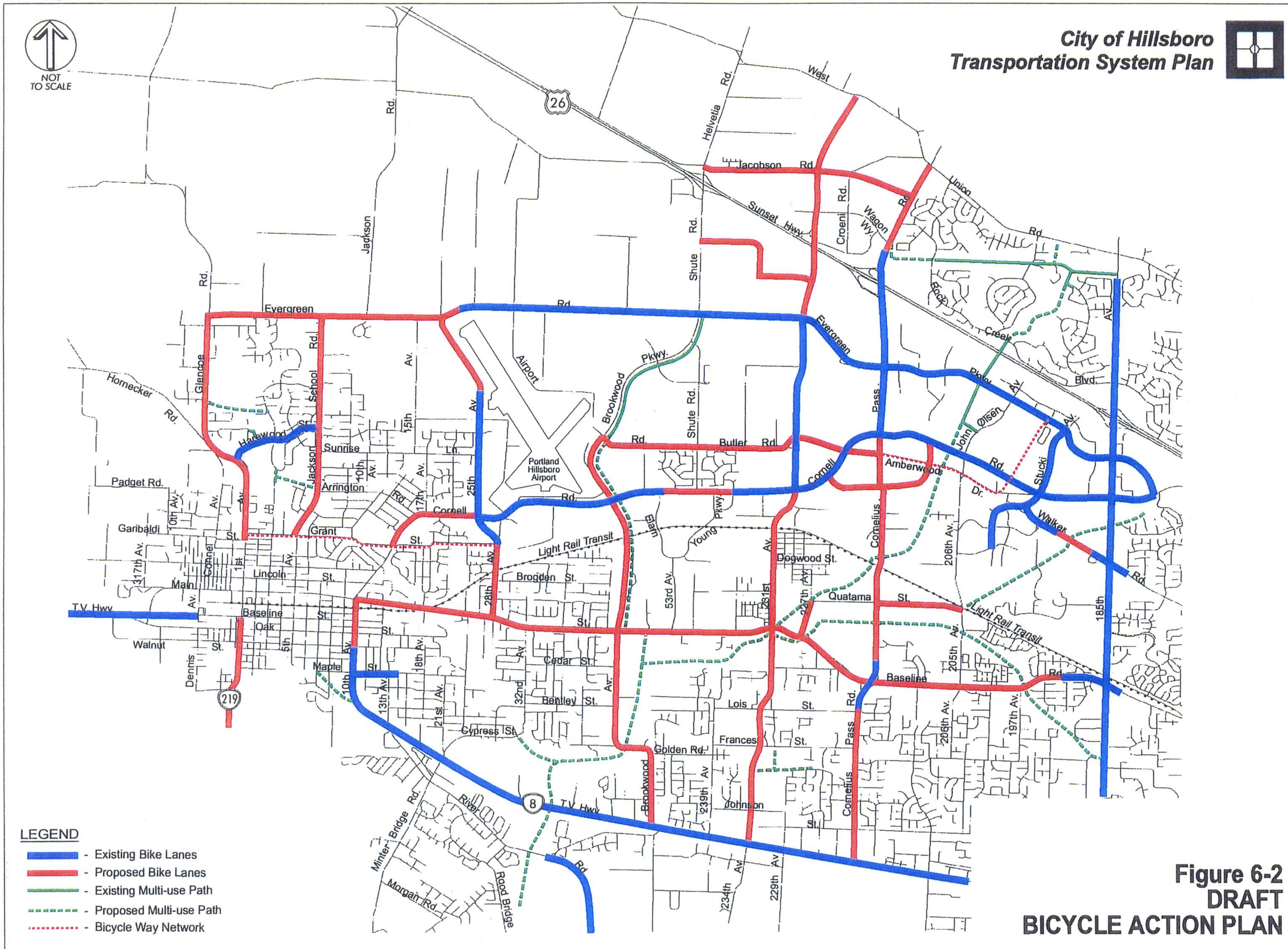

Figure 6-2
DRAFT
BICYCLE ACTION PLAN

Table 11-5
Bicycle Action Plan Project Priorities

Project	From	To	Approximate Cost (1000's of dollars)
Priority 1: Connect key bicycle corridors to schools, parks, recreational uses and activity centers			
Rock Creek Trail	Evergreen Parkway	Amberwood Drive	79* $ 500
Jackson School Road bike lanes	Evergreen Road	Grant Street	(711b*) $ 672
Glencoe Road bike lanes	Evergreen Road	Grant Street	(712*) $ 466
Grant Street bicycle way	1st Avenue	25th/28th Avenue	$ 252
Priority 2: Fill in gaps in bicycle network			
25th Avenue bike lanes	Evergreen Road	25th Avenue gap	(749*) $ 2,000
Cornell Road bike lanes	Elam Young (west)	Ray Circle	(706*) $ 600
10th Avenue bike lanes**	Walnut Street	Main Street	$ 151
Oak Street bike lanes**	TV Highway	Dennis Avenue	$ 252
Cornell Road bike lanes	Grant Street	25th Avenue	$ 302
Priority: Construct bike lanes with roadway improvement projects			
Baseline Road bike lanes	Lisa Drive	10th Avenue	(714/715/928*) $1,875
Brookwood Parkway bike lanes	Airport Road	TV Highway	(739/740*) $1,200
Cornelius Pass Road bike lanes	Cornell Road	209th Avenue	(737/738*) $1,425
Evergreen Road bike lanes	Near 260th Avenue	Glencoe Road	(732b*) $ 450
Evergreen Road bike lanes	Near 25th Avenue	Glencoe Road	(732*) $ 675
231st/235th Avenue bike lanes	Evergreen Road	West Union Road	(743a/743b*) $1,125
28th Avenue bike lanes	Grant Street	Main Street	(726c*) $ 250
231st Avenue bike lanes	TV Hwy	Cornell Road	(729a*) $1,125
Quatama Street bike lanes	227th Avenue	Baseline Road	(707*) $ 120
Jacobson Road bike lanes	Helvetia Road	Cornelius Pass Road	$ 600
Butler/Amberwood bike lanes	Brookwood Parkway	John Olsen Avenue	$ 1,013
Walker Road bike lanes	Amberglen Parkway	185th Avenue	$ 270
Bicycle Action Plan Projects Total Cost:			**$15,323**

Other Master Plan Projects

Project	From	To	Approximate Cost
Priority: Bicycle corridors that connect neighborhoods			
Three Projects: Minter Bridge-Cyress-32nd/Quatama/Golden-/Frances			$ 2,394
Priority: Construct bike lanes with roadway improvement projects			
Eight Projects: West Union/Shute/Quatama/Grant/205th-206th/Salix/New Roads			$ 5,402
Priority: Multi-use trails for citywide and recreational needs			
Four corridors: Rock Creek/Beaverton Creek/Bronson Creek/Bethany Pond			$ 4,065
Other Bicycle Master Plan Projects Total Cost:			**$ 11,861**

* Included in Draft RTP list, November 1998 (reference number in parenthesis)
** Feasibility studies required; including alternative alignments and need for right-of-way acquisition.

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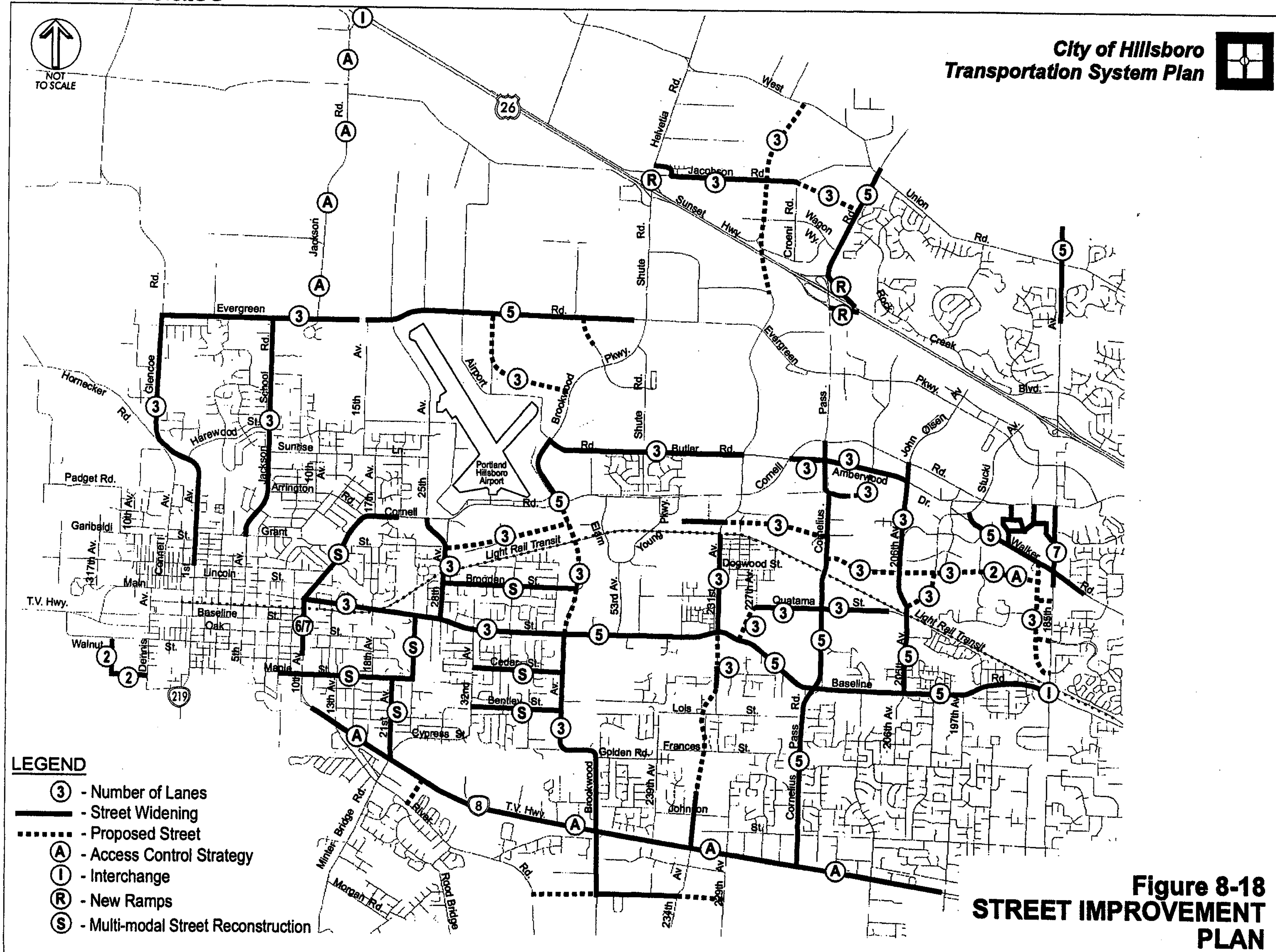

Figure 8-18
STREET IMPROVEMENT
PLAN

Table 11-6
Motor Vehicle Project List

(All projects include sidewalks, bicycle lanes and transit accommodations as required)

Location	Description	Status*	Cost
HIGHEST PRIORITY PROJECTS			
10th Avenue: Main to Baseline Street	Add right turn lane, widen sidewalk	RTP 726b	$1,500,000
28th Avenue: Grant to Main	Widen to 3 lanes	RTP 726c	$ 9,600,000
231st/234th Avenue Extension	Extend south of Baseline to Century High School a 3 lane roadway	RTP 729a	$23,200,000
Aloclek: Amberwood to Cornelius Pass	Extend 3 lane road	RTP 726d	$ 2,000,000
Baseline Road: Lisa to Brookwood	Widen to 5 Lanes	RTP 715	$ 6,000,000
Baseline Road: 187th to 231st	Widen to 3 Lanes	RTP 714	$20,000,000
Baseline Road: 231st to Brookwood	Widen to 3 Lanes	RTP 928	$ 7,500,000
Brookwood Parkway: Airport to TV Hwy	Widen to 5 Lanes to past Cornell, extend south as 3 lanes	RTP 739/740	$18,400,000
Cornelius Pass Road: US 26 to West Union	Widen to 5 Lanes	RTP 734	$ 3,500,000
Cornelius Pass Road: Aloclek to Baseline	Widen to 5 Lanes	RTP 738	$15,000,000
Cornelius Pass Road: Baseline to TV Hwy	Widen to 5 Lanes	RTP 737	$ 9,000,000
Evergreen: Glencoe to 15th	Widen to 3 Lanes	RTP 731a	$12,800,000
Evergreen: 15th to 253rd	Widen to 5 Lanes	RTP 732b	$ 8,900,000
TV Highway/Cornell Signal Timing/System	Operational Improvements	RTP 646b/727/730	$ 2,800,000
TV Highway Boulevard	Complete Boulevard Improvements	RTP 710	$ 2,000,000
TV Highway: Cornelius Pass to 209th	Improvement	STIP Planned	$ 1,250,000
US 26/Jackson School Road	Channelization/Safety	RTP 711a	$ 500,000
US 26 at 185th	Sound Walls	STIP Planned	$ 1,950,000
Johnson at 198th	Traffic Signal	STIP Planned	$ 203,000
		Subtotal	**$ 146,103,000**
SECOND HIGHEST PRIORITY PROJECTS			
1st Ave./Glencoe Rd.: Lincoln to Evergreen	Widen to 3 Lanes	RTP 712	$3,500,000
185th Avenue: Westview to Springville	Widen to 5 Lanes	Not in Plans	$ 4,700,000
205th Avenue: LRT to Baseline	Widen to 5 Lanes	RTP 729b	$ 6,000,000
206th Avenue: Amberwood to LRT	Widen to 3 Lanes	Not in Plans	$ 3,100,000
Amberglen Parkway: Walker to 206th	Extend 3 Lane roadway	Not in Plans	$ 2,100,000
Amberwood: 206th to Cornelius Pass	Widen to 3 Lanes	Not in Plans	$ 1,500,000
Butler Road: 63rd to Brookwood/Airport	Widen and extend to 3 lane road	Not in Plans	$ 1,200,000
Cornell: Arrington to Main	Widen to 5 Lanes	RTP 709b	$ 6,000,000
Downtown Area Improvements: 1st and 10th Avenues	Signals, Striping, Widening and Two-way.	RTP 712b/726b-e-f	$ 5,700,000
East-West Collector: Cornelius Pass to Salix	Extend 3 lane road	RTP 728	$10,900,000
East-West Collector: Campus to Cornelius Pass	Extend 3 lane road	RTP 728	$ 7,600,000
Jackson School Road: Evergreen to Grant	Widen to 3 Lanes	RTP 711b	$ 3,500,000
Jacobson Road: Croeni to Cornelius Pass	Extend new 3 lane alignment	Not in Plans	$ 4,400,000
Jacobson Road @ Helvetia	Realign intersection north of US 26	Not in Plans	$ 1,700,000
Quatama Street: LRT to 227th Avenue	Widen/improve 3 lane road	RTP 707	$ 4,200,000
Quatama Street: 227th to Baseline	Extend 3 lane road	RTP 707	$ 2,200,000
Salix Extension: LRT to Walker	Extend 3 Lane roadway	Not in Plans	$ 4,300,000
Walker Road: Amberglen to 185th	Widen to 5 Lanes	RTP 754	$ 10,000,000

Location	Description	Status*	Cost
Other Collector Reconstruction	Multiple Locations	Not in Plans	$38,100,000
Intersections Improvements	Multiple Locations (see Table 11-7)	Not in Plans	$50,500,000
Other Traffic Signals (16)	City/County operational enhancement	Not in Plans	$ 4,000,000
US 26/Cornelius Pass Road	Build new diagonal ramps in NE & SE Quadrants. Add ramp meter storage.	RTP 735	$ 5,000,000
US 26/Shute Road	New loop ramp and interchange modifications	US 26 Interchange Study	$ 5,000,000
US 26/229th Overcrossing	Extend 229th from Evergreen to West Union as 3 Lane roadway	RTP 743 a + b	$6,800,000
		Subtotal	**$ 187,370,000**
THIRD HIGHEST PRIORITY PROJECTS			
Airport Road: Evergreen to Brookwood	Realign and widen to 3 lanes	Not in Plans	$ 2,800,000
Amberwood: Cornelius Pass to Cornell	Extend 3 lane road to Butler	Not in Plans	$ 2,100,000
Baseline Road/185th Intersection	Upgrade Capacity/Grade Separation	Not in Plans	$15,000,000
Brookwood Extension s/o TV Hwy	Extend 3 Lanes, realign Witch Hazel	Not in Plans	$ 1,300,000
Cornelius Pass Road Extension	Extend 3 lane road south of TV Hwy to 209th	RTP 825d	$14,000,000
Heritage: 185th to Salix	Extend 2 lane road	Not in Plans	$ 1,900,000
Jackson School Road/US 26	Interchange	Not in Plans	$ 10,000,000
Parr: 185th to Salix	Connect 3 lane road	Not in Plans	$ 1,900,000
West of Rood Bridge: TV Hwy to River	Connecting 3 lane roadway	Not in Plans	$ 700,000
TV Highway: Access Control	Driveway/Turn Lane modifications	RTP 645c	$ 15,000,000
East-West Collector: Brookwood to 28th	Build new 3 lane road n/o LRT	Not in Plans	$ 7,100,000
East-West Collector: River to 209th	Extend and widen to 3 lane road	Not in Plans	$18,200,000
185th Avenue: Cornell to Walker	Widen to 7 Lanes	Not in Plans	$ 3,200,000
188th Extension: Cornell to Walker	Extend 3 lane road	Not in Plans	$ 2,400,000
US 26 Auxiliary Lanes: Shute to 185th	Add Auxiliary Lanes	Not in Plans	$20,000,000
US 26/Glencoe Road	Interchange improvement/modernization	RTP 731a	$ 12,000,000
		Subtotal	**$ 127,600,000**
MOTOR VEHICLE STREET IMPROVEMENT TOTAL			**$ 461,073,000**

- Based upon tentative draft RTP preferred improvement list from Metro, reference numbers from November 1998 listing. Planned indicates projects included in the MSTIP, STIP, CIP or approved (1995) RTP funding programs. Not in Plans indicates projects that have not been previously addressed in one of the local or regional transportation improvement plans.

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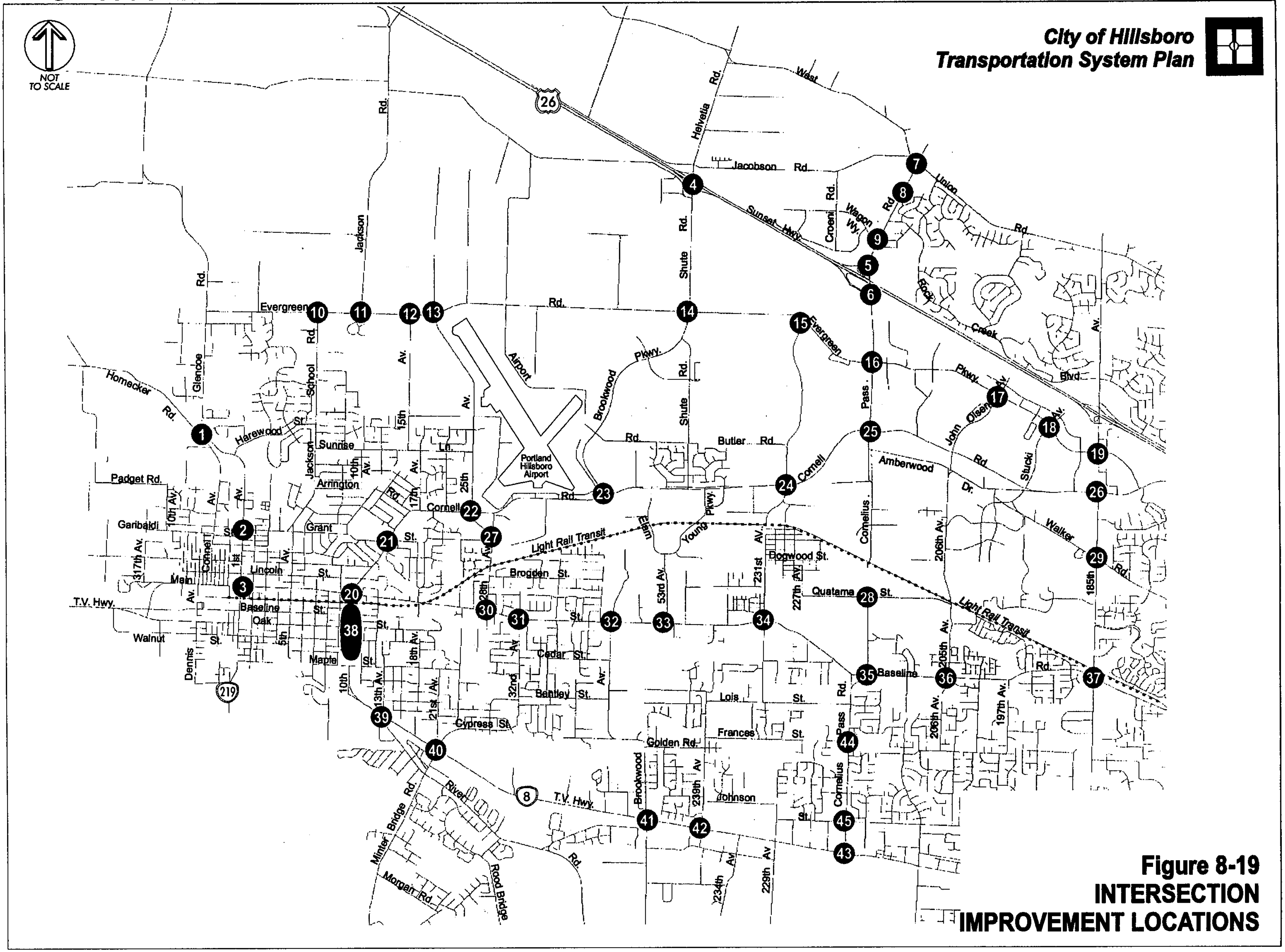

Figure 8-19
INTERSECTION IMPROVEMENT LOCATIONS

Table 11-7
Future Intersection Improvement List

No.	Intersection	Description	Cost
1	Glencoe Road/Hornecker Road	Install traffic signal; add SB right turn lane, NB left turn lane EB right turn lane	$ 1,250,000
2	Glencoe Road-1st Street/Grant Street	Install traffic signal; Glencoe 3 Lanes	$ 250,000
3	Main Street/1st Avenue/Lincoln Street	Add WB right turn lane (restripe- remove parking); signal modification/additions	$ 500,000
4	US 26/Shute Road	Add 2nd NB thru & right turn lane + interchange study of future geometry	$ 2,600,000
5	US 26/Cornelius Pass Road EB ramps	Add N/B to E/B diagonal ramp as a free movement	$ -
6	US 26/Cornelius Pass Road WB ramps	Add WB diagonal off-ramp	$ -
7	Cornelius Pass Road/West Union Road	Install traffic signal; add left turn lanes SB, EB, WB;add NB and EB RT lanes	$ 2,250,000
8	Cornelius Pass Road/Jacobson	Install traffic signal; add SB right turn lane: Cornelius Pass 5 Lanes	$ 500,000
9	Cornelius Pass Road/Wagon Way	Install traffic signal; Cornelius Pass 5 Lanes	$ 250,000
10	Evergreen Road/Jackson School (east)	Install traffic signal; add SB right turn lane; Evergreen 3 Lanes; Connect W/B right turn lane with 5 lane section of Evergreen	$ 1,150,000
11	Evergreen Road/Jackson School (west)	Install traffic signal; Evergreen 3 Lanes	$ 250,000
12	Evergreen Road/15th Avenue	Install traffic signal; EB right turn lane; Evergreen 5 Lane section starts	$ 500,000
13	Evergreen Road/25th Avenue	Provide second NB right turn lane, second WB left turn lane; Evergreen 5 Lanes	$ 750,000
14	Evergreen Road/Shute-Brookwood Parkway	Add NB and SB right turn lanes	$ 500,000
15	Evergreen Parkway/229th Avenue	Add NB and EB right turn lanes; use protected/permitted signals N/S	$ 625,000
16	Evergreen Road/Cornelius Pass Road	Double left turn lanes on all approaches; add right turn lanes on all approaches	$ 3,000,000
17	Evergreen Parkway/John Olsen Avenue	Install traffic signal	$ 250,000
18	Evergreen Parkway/Stucki Avenue	Install traffic signal	$ 250,000
19	Evergreen Parkway/185th Avenue	Add SB right turn lane; NB double left turn lanes	$ 750,000
20	Cornell Road/10th/ East Main Street	Add NB right turn lane; add SB through lane	$ 1,950,000
21	Cornell Road-10th Ave/Grant Street	Add EB left turn lane	$ 500,000
22	Cornell Road/25th Avenue	NB + SB double lefts; add SB and EB right turn lanes	$ 1,500,000
23	Cornell Road/Brookwood Parkway	Add second left turn lanes EB + WB; Add SB right turn lane	$ 1,250,000
24	Cornell Road/231st - 229th Avenue	Add EB and SB right turn lanes; add WB 2nd left turn lane	$ 1,000,000
25	Cornell Road/ Cornelius Pass Road	Add WB right turn lane; EB double left turn lanes	$ 750,000
26	Cornell Road/185th Avenue	Add NB and SB double left turn lanes; add NB right turn lane; 185th 7 Lanes	$ 1,250,000
27	Grant Street/'25th -28th Avenue	Install traffic signal; add WB left turn lane	$ 750,000
28	Quatama/Cornelius Pass	Install traffic signal; SB right turn lane, Quatama 3 Lanes	$ 500,000
29	Walker Road/185th Avenue	Add double left turn lanes on all approaches; add WB right turn lane; 185th 7 Lanes	$ 2,250,000

No.	Intersection	Description	Cost
30	Baseline-East Main/28th Avenue	Install traffic signal; add WB right turn lane	$ 500,000
31	Baseline-East Main/32nd Avenue	Widen Baseline Road to 5 lanes	
32	Baseline Road/Brookwood Parkway	Widen Baseline Road to 5 lanes; add EB + SB right turn lanes; signal change	$ 625,000
33	Baseline Road/53rd Avenue	Widen Baseline Road to 5 lanes	
34	Baseline Road/231st Avenue	Widen Baseline Road to 5 lanes; extend 3 Lane 231st	$ -
35	Baseline Road/Cornelius Pass Road	Widen Cornelius Pass + Baseline Road to 5 lanes; right turn lanes all approaches	$ 1,000,000
36	Baseline Road/205th-206th Avenue	Widen 205th + Baseline to 5 lanes; add EB and WB right turn lanes	$ 500,000
37	Baseline Road/185th Avenue	Interchange or 185th 7 lanes with double lefts	$ 15,000,000
38	Baseline Street/10th Avenue	Add SB right turn lane; NB double left turn; restripe for 2nd WB lane	$ 1,625,000
39	TV Highway/13th Avenue-River Rd	Add EB right turn lane	$ 500,000
40	TV Highway/Minter-Bridge Road	Add NB right turn lane; remove split traffic signal phasing	$ 325,000
41	TV Highway/Brookwood Parkway	Extend Brookwood south 3 Lane ; traffic signal phasing; double left turns for NB and SB approaches; add NB, SB and EB right turn lanes; add WB left turn lane	$ 1,500,000
42	TV Highway/239th Avenue	Traffic signal	$ 250,000
43	TV Highway/Cornelius Pass Road	Add NB + SB double left turn lanes; add EB right turn lane	$ 1,250,000
44	Frances Street/Cornelius Pass Road	Traffic signal; 5 lane Cornelius Pass	$ 250,000
45	Johnson/Cornelius Pass Road	Traffic signal; 5 lane Cornelius Pass	$ 250,000
		TOTAL	**$ 50,500,000**

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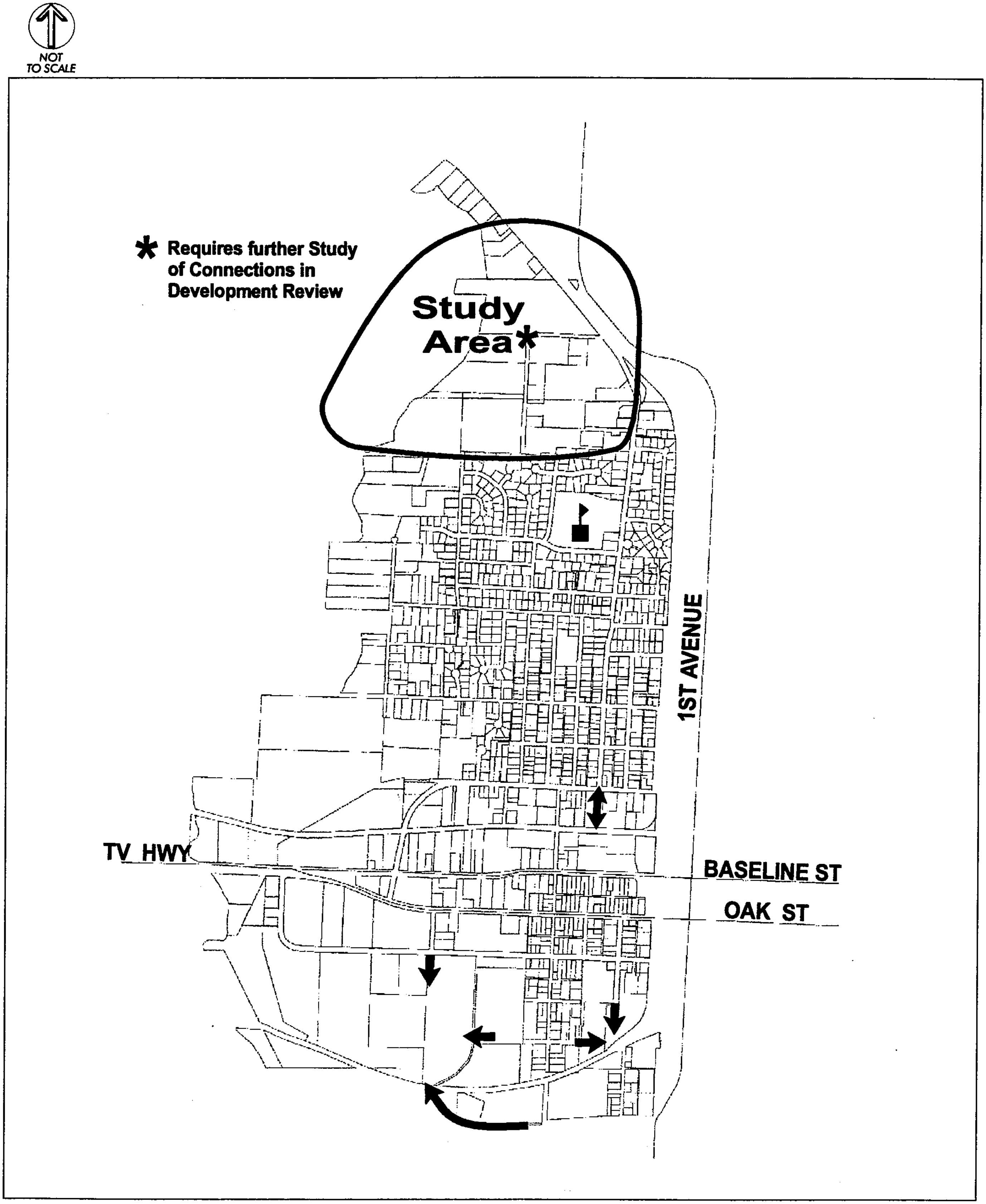


LEGEND

- Stub End Street
- School Site

Figure 8-9
LOCAL STREET CONNECTIVITY
West Hillsboro

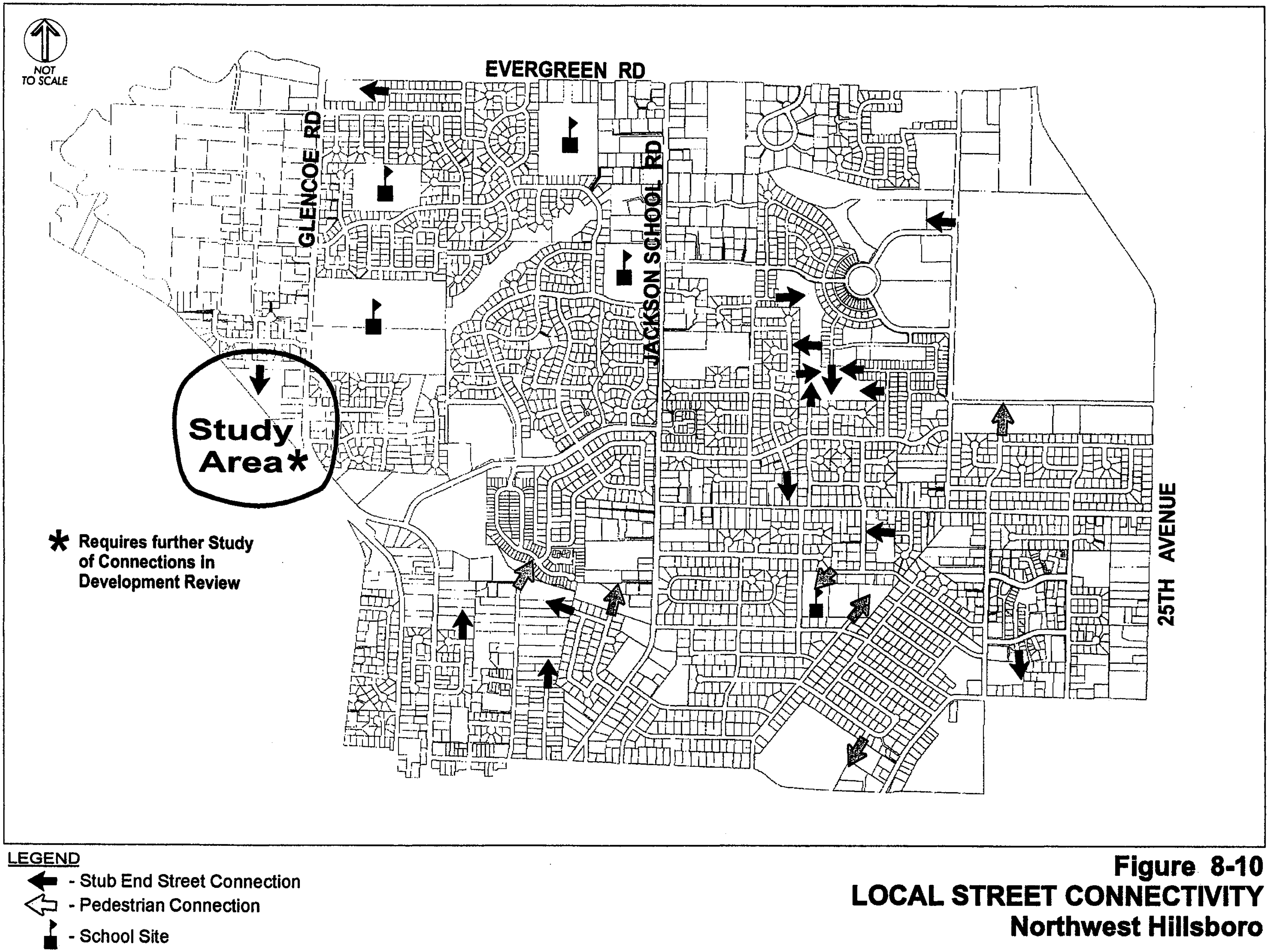
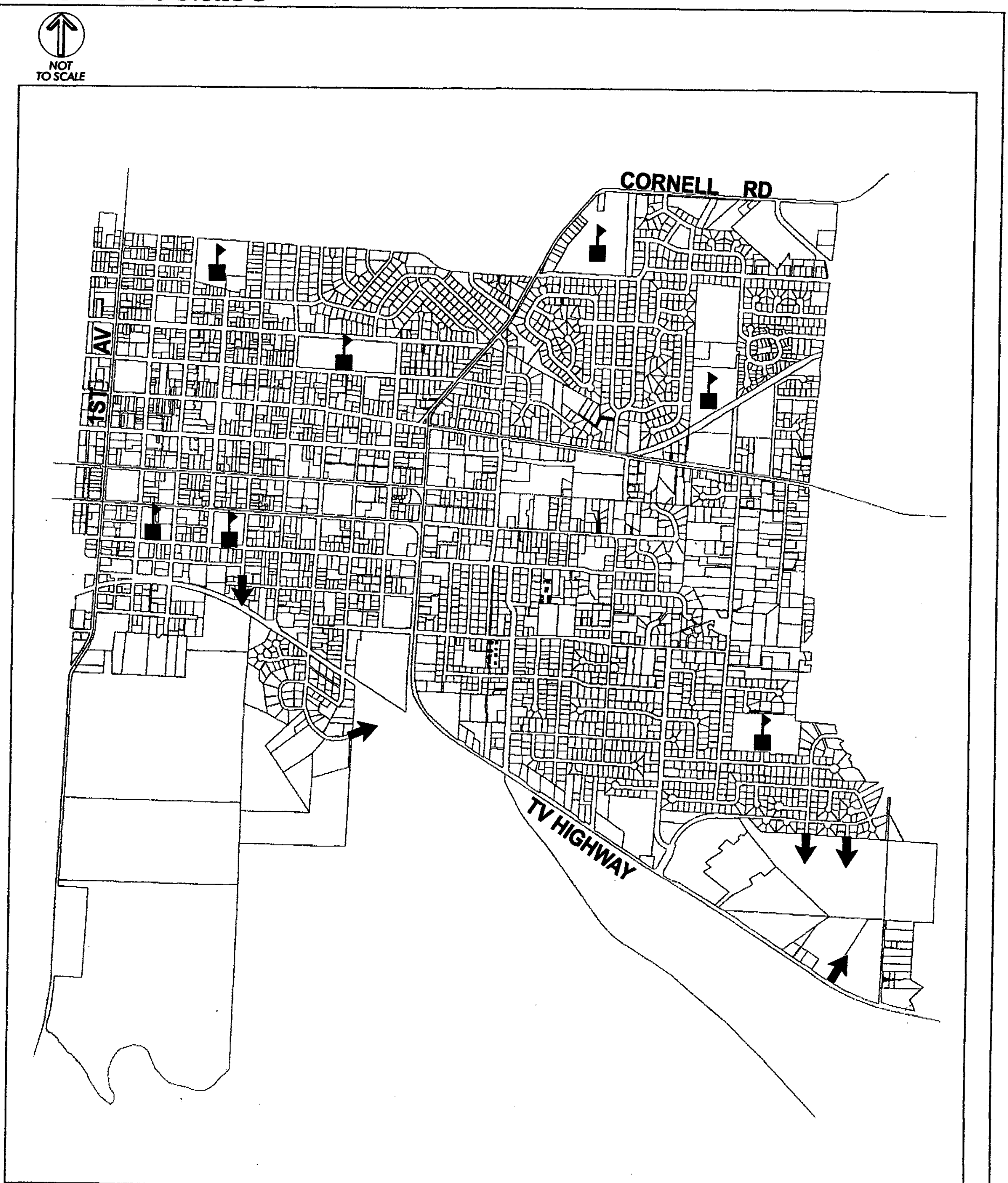


Figure 8-10
LOCAL STREET CONNECTIVITY
Northwest Hillsboro

DKS Associates

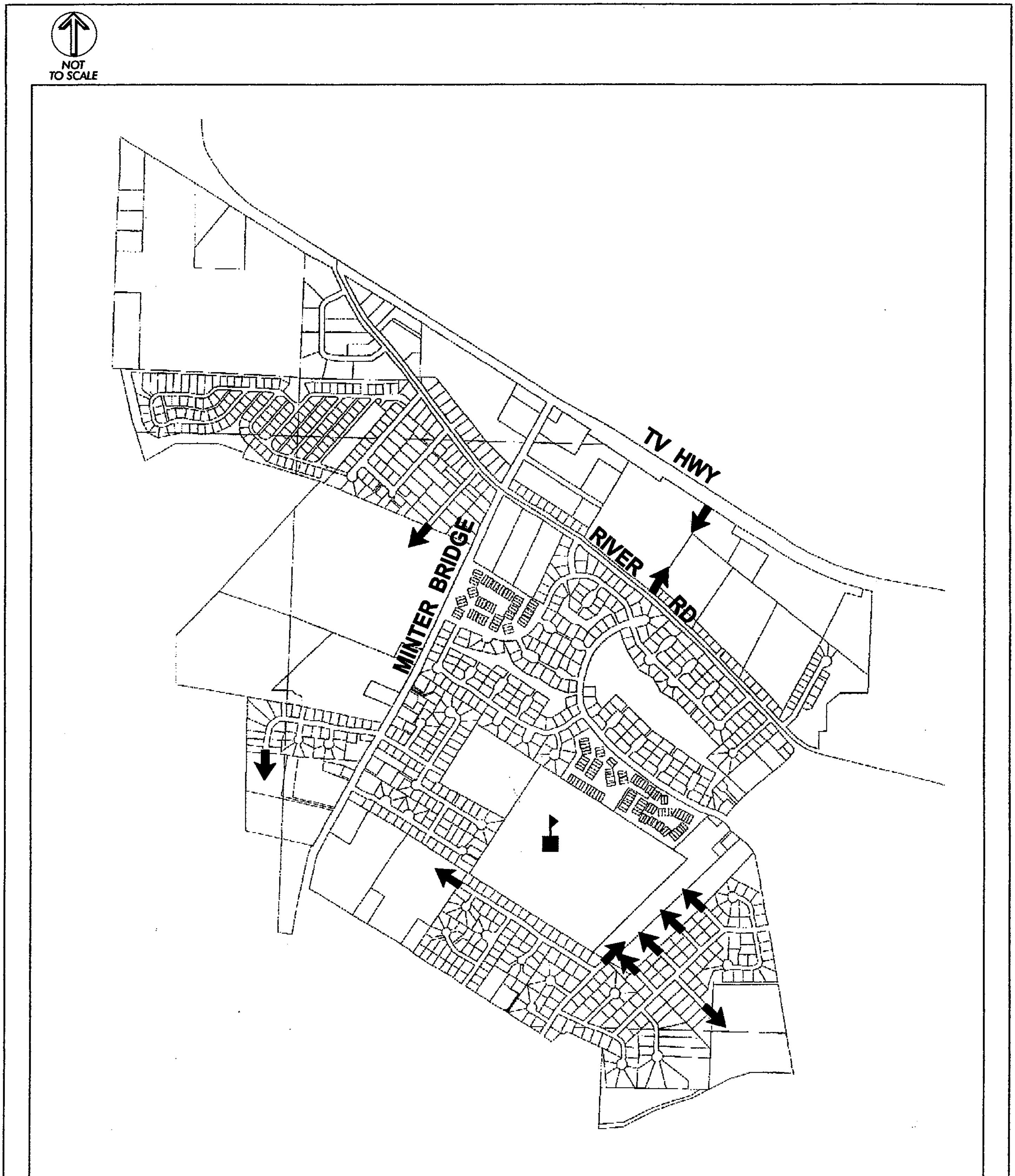


LEGEND

- Stub End Street
- School Site

Figure 8-11
LOCAL STREET CONNECTIVITY
Central Hillsboro

DKS Associates



LEGEND

- Stub End Street
- School Site

Figure 8-12
LOCAL STREET CONNECTIVITY
South Hillsboro

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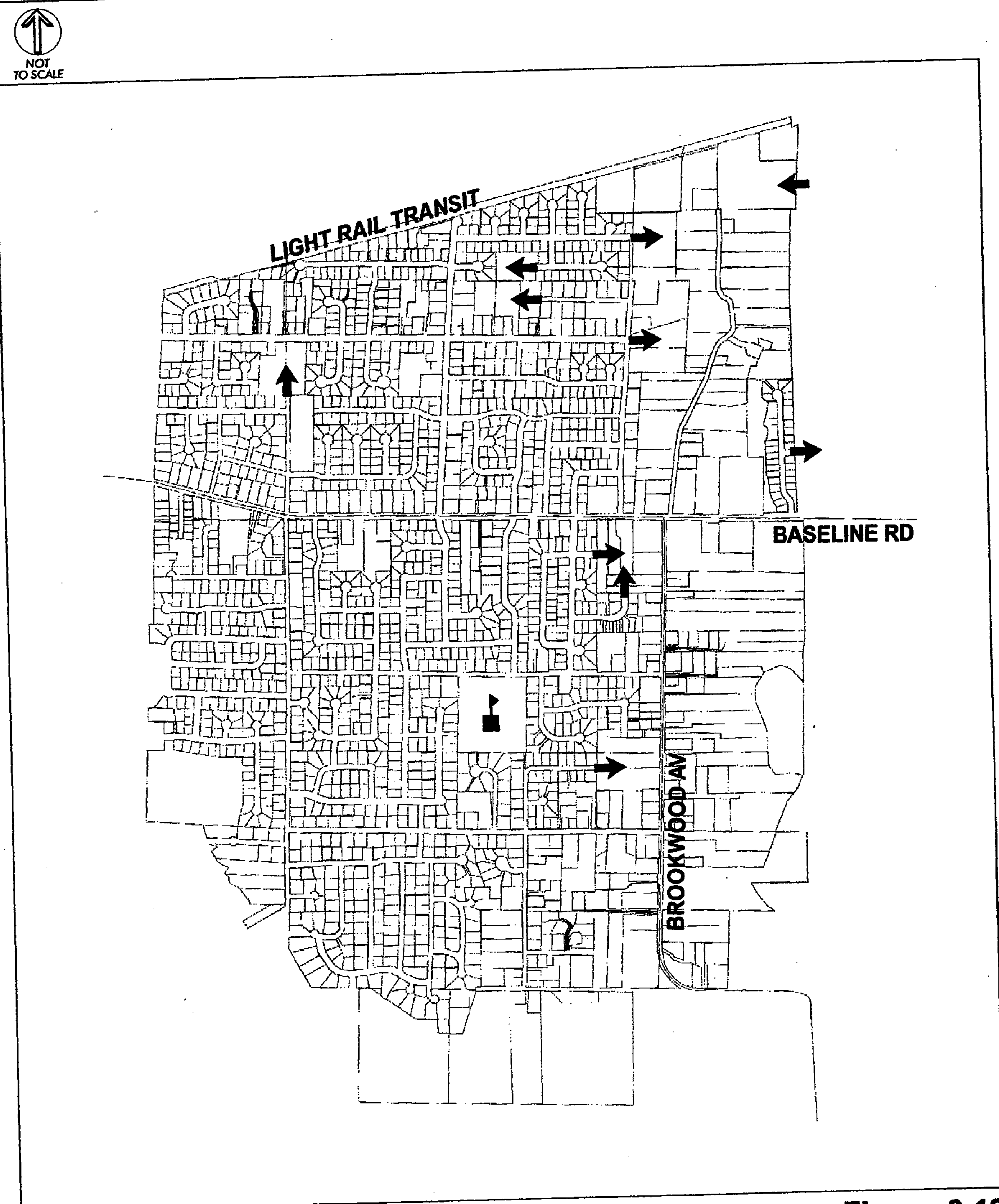


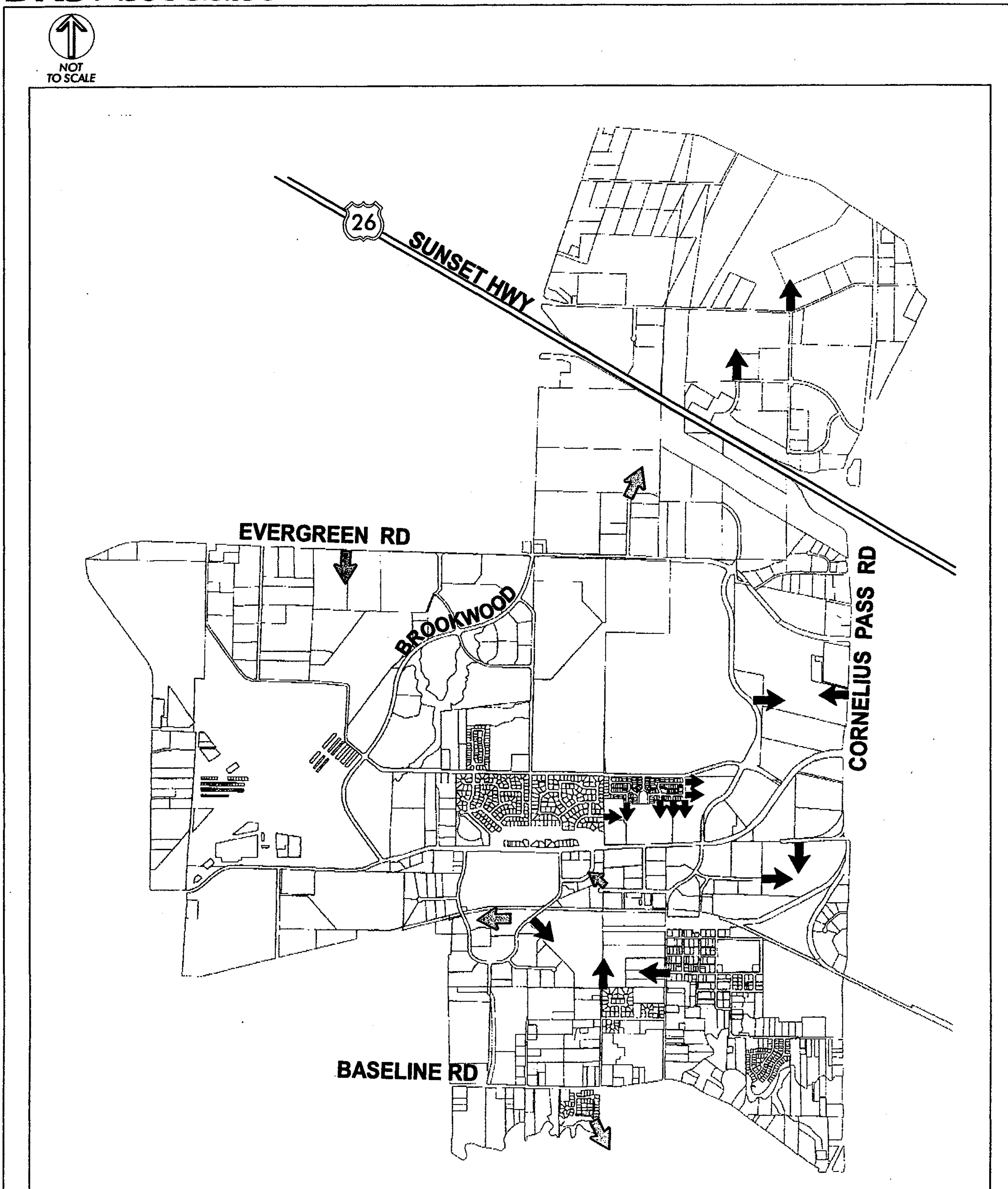
LEGEND

- Stub End Street

- School Site

Figure 8-13
LOCAL STREET CONNECTIVITY
Brookwood

DKS Associates



LEGEND
- Stub End Street Connection
- Pedestrian Connection
- School Site

Figure 8-14
LOCAL STREET CONNECTIVITY
Northeast Hillsboro

DKS Associates

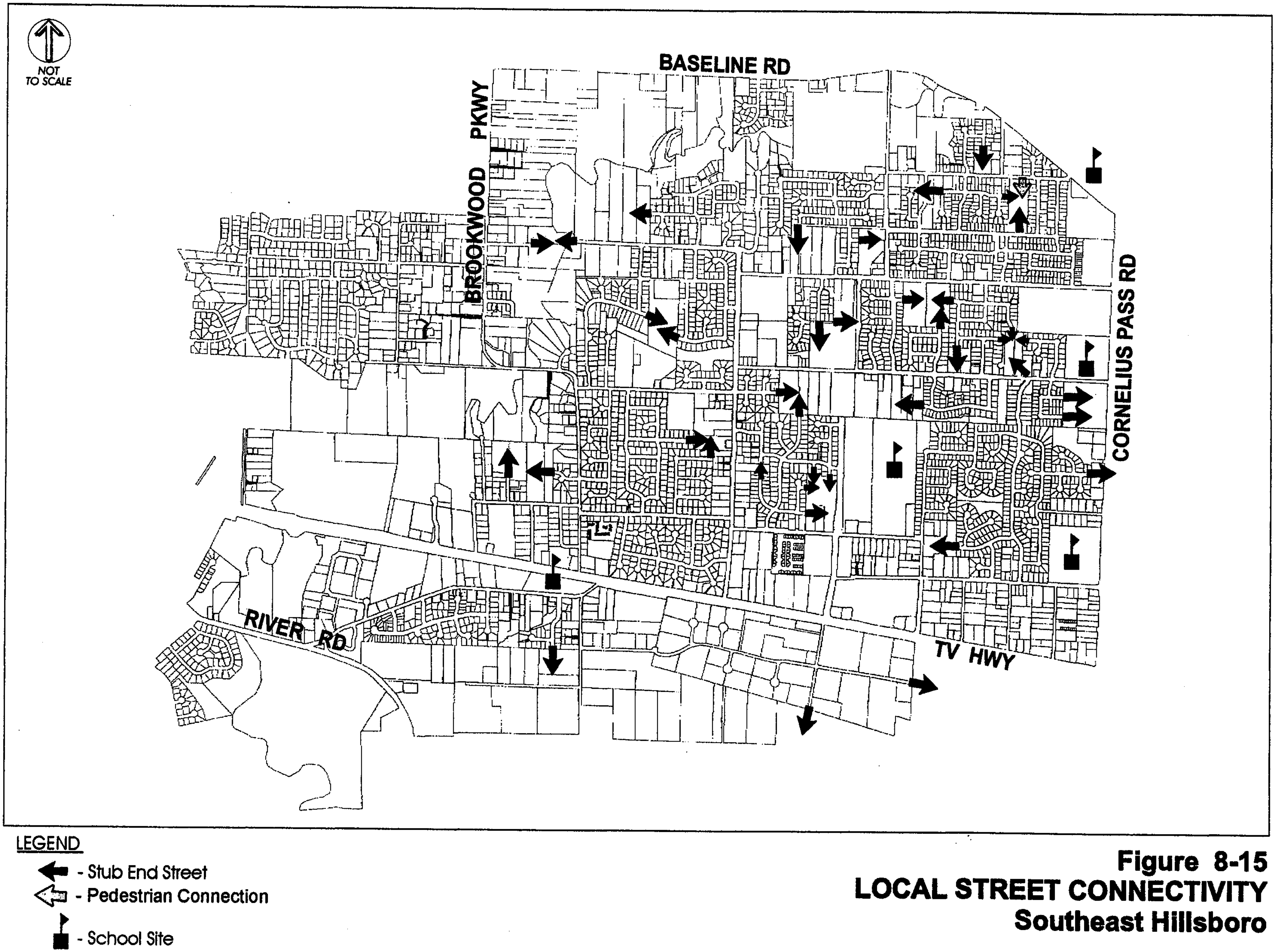
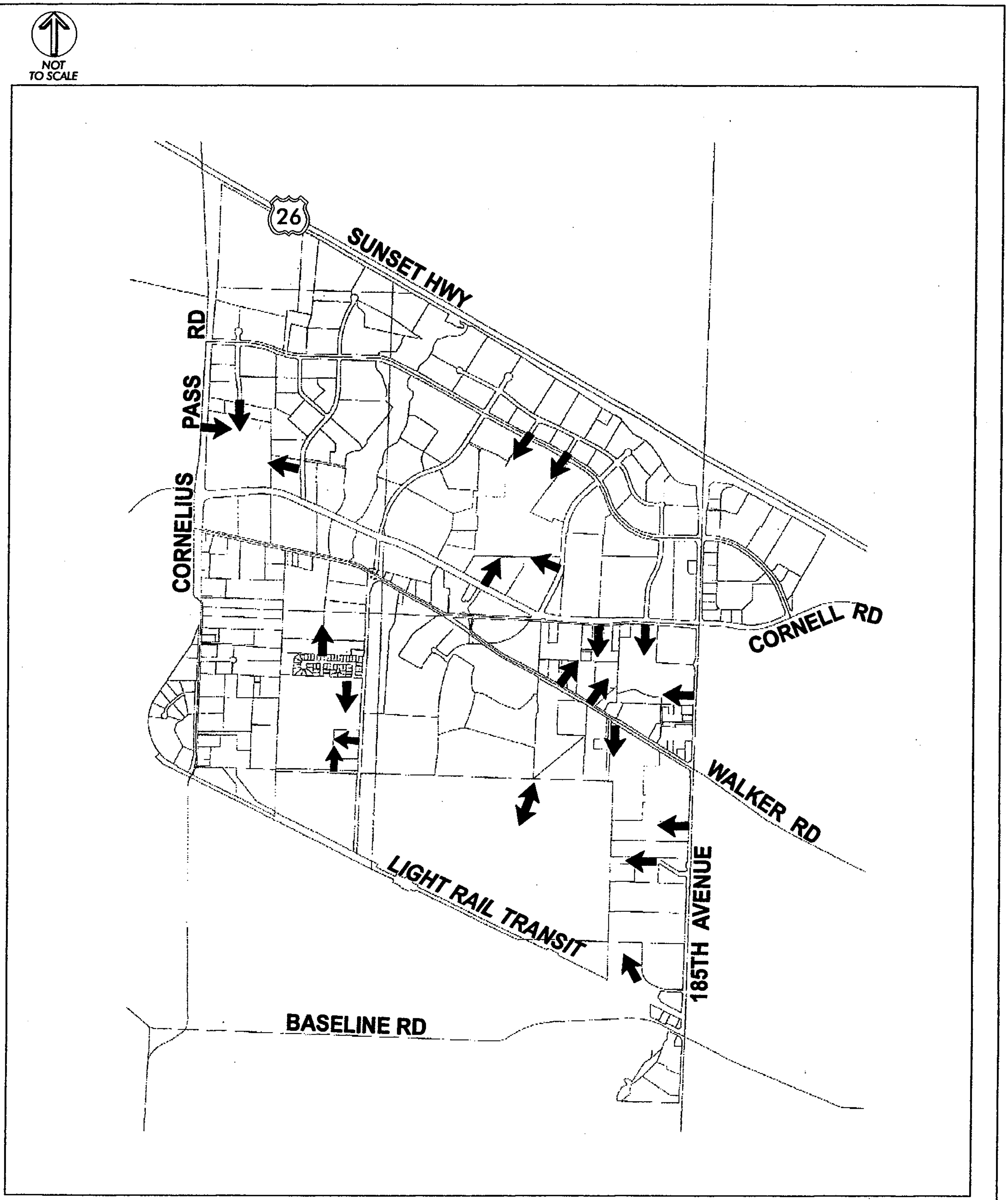


Figure 8-15
LOCAL STREET CONNECTIVITY
Southeast Hillsboro

DKS Associates



LEGEND

- Stub End Street
- School Site

Figure 8-16
LOCAL STREET CONNECTIVITY
East Hillsboro

TSP STREET DESIGN MANUAL

The TSP Street Design Manual is intended to provide non-discretionary standards governing the design of public and private streets and roadways in the City to be administered by the City Engineer. Exceptions to the standards and specifications contained in the Manual would be permitted only after review and approval by the City Council Street Committee. The Manual will be prepared after adoption of the omnibus ordinance. A State Transportation Growth Management Grant assistance will be requested by the City for the preparation of the Manual The initial contents of the Manual will contain the following provisions which include street and roadway design standards recommended in the TSP:

PART I. GENERAL PROVISIONS

Section 1. Short Title

Pursuant to adopted City Council Resolution No. _______, this document and all subsequent amendments thereto shall be known as the "City of Hillsboro TSP Street Design Manual, Relating to Standards and Specifications for the Design and Construction of Streets and Roads" (hereinafter "Street Design Manual").

Section 2. Purpose and Objective

This Manual is approved by City Council Resolution No.______ and administered by the City Engineer pursuant to City authority under ORS 373.210, et seq., and Title 12 of the Revised City Charter. The purpose of the Manual is to provide standards for the design and construction of various classes of streets and roads in the City in order to implement the adopted Transportation System Plan element of the City's Comprehensive Plan.

Section 3. Definitions [Reserved]

Section 4. Activities Regulated

A. No person or entity shall create a street or road in the City without approval of the Planning Commission in the case of residential subdivisions and land partitions and planned unit developments, or otherwise without the approval of the City pursuant to Title 12 of the City Charter.

B. Any street or road created in the City shall be designed and constructed in a manner that conforms to the design standards and specifications contained in Section ________ of this Manual. The location and classification of such streets and roads shall conform with the Transportation System Plan element of the City Comprehensive Plan.

Section 5. Procedure for Approval of Creation of Streets and Roads

A. If the creation of a street or road is undertaken as part of a subdivision plat, the street or road creation procedures shall be considered as a part of the City subdivision plat review procedures specified in City Subdivision Ordinance No. 2808, as amended. The design of any street created through the subdivision process shall comply with the standards and specifications contained in Section ____ of this Manual.

B. In all other cases of street and road creation in the City, the procedures and requirements in Title 12 of the City Charter shall apply; provided, however, that the design and construction of such streets and roads shall comply with the standards and specifications contained in Section ____ of this Manual.

Section 6. Variances

The design standards and specifications contained in Section ______ of this Manual may be varied by the City Street Committee following current Street Committee procedures governing variances and exceptions from City street and road design standards. The Street Committee shall consider any technical advice and report on a requested variance or exception submitted by the City Engineer or Planning Director. Upon proper application to the Street Committee by the affected property owner on forms provided by the City Engineer, the Committee may grant a design variance or exception only if all of the following conditions are met:

A. All Street Committee variance and exception standards have been met, and all variance or exception procedures are satisfied;

B. The particular design standard or specification causes:
   1. practical difficulty;
   2. unnecessary expense or hardship; or
   3. deprives the owner of a substantial use of property without corresponding public benefit.

C. Such variance is consistent with implementation of the City Comprehensive Plan.

D. The applicant or its predecessor in title to the property did not create the need for the variance in question.

E. A variance application shall be heard approximately the same time as the subdivision application or other request to create the proposed City street or roadway needing the variance.

F. In approving the variance, the Street Committee may attach conditions thereto to assure street or road development consistency with the Comprehensive Plan and its Transportation System Plan element.

Section 7. Penalties

Violations of this Design Manual without a duly approved variance or exception shall result in a fine of $________ and the required redesign and reconstruction of the subject street or road in conformance with the applicable standards and specifications in the Manual.

PART II. DESIGN STANDARDS AND SPECIFICATIONS FOR CITY STREETS AND ROADS

Section 1. Basic Standards & Specifications

General reference information regarding the design of City streets and roads are contained in the ***Washington County Uniform Road Improvement Design Standards*** (Washington County Ordinance No. 524, Adopted July 28, 1998) (hereinafter the "County Uniform Standards"), a copy of which is on file with the City Engineering Department. The standards contained in this reference document are hereby adopted as the general physical design standards and specifications for City streets and roads, and are incorporated by reference into this Street Design Manual. These provisions shall apply to the creation of City streets and roads through the City subdivision process or pursuant to Title 12 of the City Charter, unless these conflict with the specific City street and roadway design standards and corresponding exhibits contained in Section ____ of this Manual. In cases of such conflicts, the specific provisions in Section ____ shall prevail and apply.

Unless specifically altered by the design standards contained in Sections II.1 and ____ below, the County Uniform Standards for the following matters shall apply to the design and construction of City streets and roads:

Chapter 1. General Specifications

Sec. 110. Requirements for Roadway Improvements:
- 110.1 General requirements [reserved]

Sec. 120. Plan submittal requirements:
- 120.1 General Requirements [reserved]
- 120.2 Design Plan Format [reserved]
  - Plan view
  - Profile view
- 120.3 Site grading plan [reserved]
- 120.4 Drainage calculations [reserved]
- 120.5 Other requirements: [reserved]
  - Design assumptions
  - Design elements
  - Construction plans and calculations for proposed structures within rights-of-way
- 120.6 Review procedure [reserved]
- 120.7 As-Built plans [reserved]
- 120.8 Conformance with City Zoning and Subdivision Ordinances and approved land use applications and permits [reserved]
- 120.9 Revocation of approval [reserved]

Sec. 130 Street and Road Requirements:

130.1 Functional Classification

The functional classification of existing and proposed roads is established in the Transportation System Plan element of the City Comprehensive Plan and includes the following classifications:

(1) Principal arterials (typically freeways and State highways)
(2) Arterials streets.
(3) Collector streets.
(4) Neighborhood routes.
(5) Local streets.

Figure 8-3 the next page is taken from the adopted City Transportation System Plan and shall be used in designing City streets and roads that fall within any of these roadway classifications:

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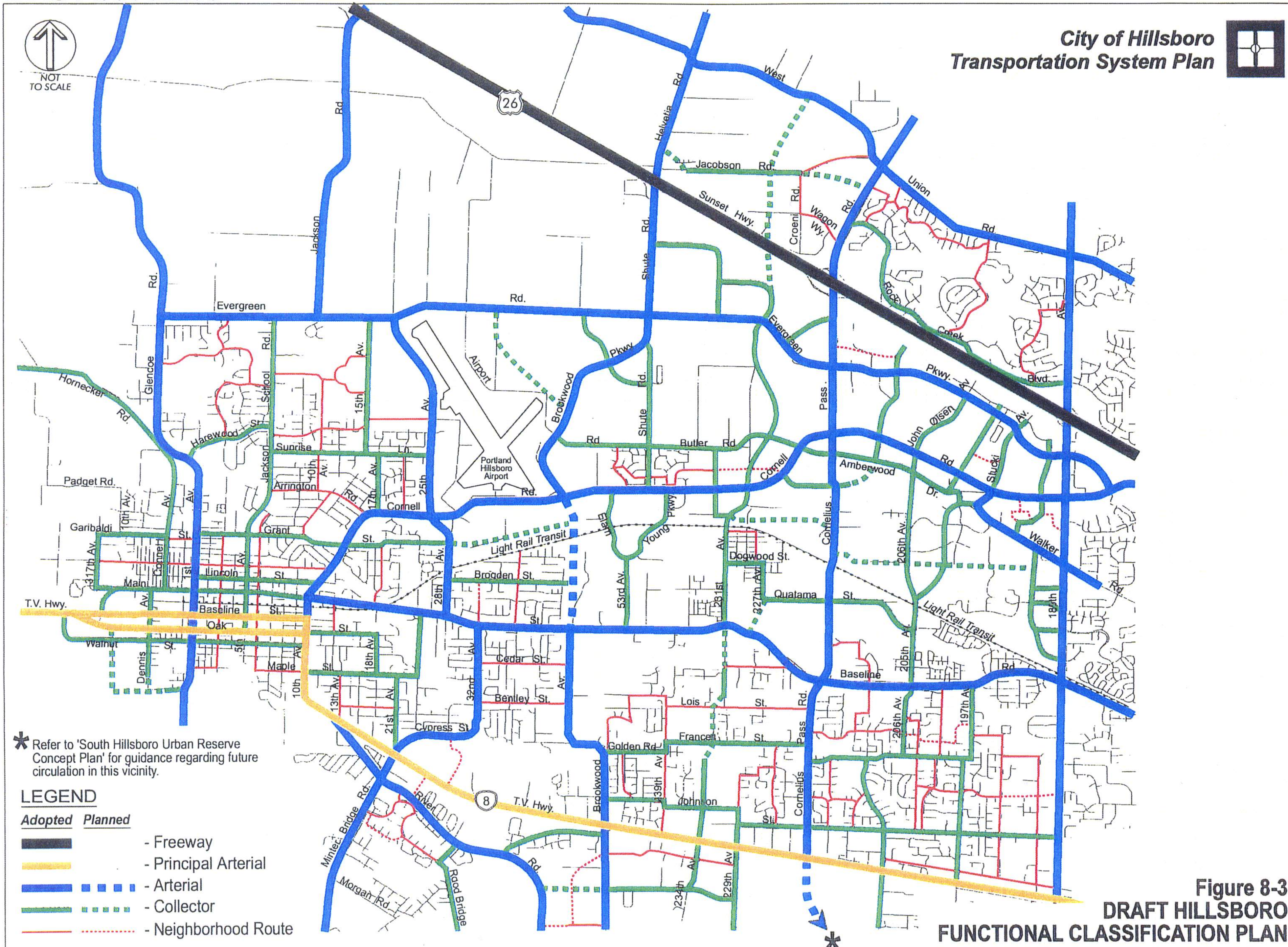

Figure 8-3
DRAFT HILLSBORO FUNCTIONAL CLASSIFICATION PLAN

130.2 Street and Road Design Characteristics

Vehicle Lane Widths:	Truck Route = 12 feet Bus Route = 11 feet Arterial = 12 feet Collector = 11 feet Neighborhood = 10 feet Local = 9[14] to 10 feet Turn Lane = 10 feet[15]
On-Street Parking:	Residential = 6 to 8 feet Commercial = 7 to 8 feet
Bicycle Lanes: (minimum widths)	New Construction = 6 feet Reconstruction = 5 to 6 feet
Curb Extensions for Pedestrians:	Consider on any Pedestrian Master Plan Route
Sidewalks: (minimum width)	Local = 5 feet[16] Neighborhood = 5 feet[16] Collector = 5 to 7[17] feet Arterial = 5 to 13[17] feet
Landscape Strips:	Residential/Neighborhood = Required[18] Collector/Arterial = Required[14]
Medians:	5/7 Lane = Required 3-Lane = Optional
Neighborhood Traffic Management:	Local = Should not be necessary (Under Special Condition) Neighborhood = Should Consider Collectors = Under Special Conditions Arterials = Only under Special Conditions: Selected Measures
Transit:	Arterial/collectors = Appropriate Neighborhood = Only in special circumstances
Turn Lanes:	When Warranted[19]

[14] 9-foot lanes would only be used in conjunction with on-street parking.

[15] Desirable 12 feet for arterial streets, bus and truck routes.

[16] 5 foot with landscape strip.

[17] Larger sidewalks than minimums should be considered for areas with significant pedestrian volumes. In commercial areas where pedestrian flows of over 100 pedestrians an hour are present or forecast, specific analysis should be conducted to size sidewalks appropriately for safe movement.

[18] Landscape strips are required unless not practicable because of limited ROW widths, environmental constraints such as wetlands, tree conservation or topography (steep slopes) as determined by the City Engineer.

[19] Turn lane warrants should be reviewed using Highway Research Record, No. 211, NCHRP Report No. 279 or other updated/superseding reference.

130.3 Cul-de-sac Streets (See Figure 8-8 For Design Criteria)

These streets are intended to serve a maximum of 25 dwelling units and shall not exceed 200 feet in length[20]. The cul-de-sac street is be designed to an improvement width[21] of 28 feet within a 50 foot right-of-way, with sidewalks on each side being a minimum of 5 feet wide[22]. A minimum 5-foot wide landscape strip shall separate the sidewalks and roadway. The circular paved turning area must have a radius of at least 40 feet to the curb. Alternative radii and paved area turn around configurations may be considered by the Street Committee at the time of Development Review.

With City Engineer[23] approval, the cul-de-sac street may be constructed to 24 feet wide within a 46-foot right-of-way where no on-street parking will be provided and adequate off-street parking is available on the abutting properties.

130.4 Alleys (See Figure 8-8 For Design Criteria)

Alleys are intended to serve only abutting land. Alleys shall be an inverted crown design constructed of Portland Cement Concrete ("PCC") pavement[24] with a travel lane of 12-16 feet plus a 2-4 foot gravel shoulder on each side to create a 20 foot right-of-way clear of any and all obstacles. On-street parking is prohibited on alley streets. An alternative alley configuration would have 20 feet of PCC pavement with a minimum 5-foot landscape strip for one-sided alley loadings.

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[20] Except where topography, barriers (railroads, freeways, existing development, etc.) or environmental constraints (major streams, rivers, wetlands, etc.) prevent ultimate street connectivity (extension) beyond the parcel in question; in which case a cul-de-sac street may exceed 200 feet in length with City Engineer approval. Where the City Engineer finds that there may be the possibility of connectivity in the future, the street shall not end in a cul-de-sac, the development shall be sited so as not to preclude the possibility of future connectivity, and a public right-of-way easement shall be dedicated to effect future construction.

[21] "Improvement width" includes travel lanes; the curb and gutter assembly; and, as permitted or required the median (landscaped and/or left turn lane), bicycle lanes, and on-street parking space.

[22] Where a cul-de sac street has terminated for a reason cited in footnote #4, above, the developer shall nonetheless make a good faith effort to establish and construct pedestrian and bicycle connections to the neighboring parcel from the end of the cul-de-sac street, or show cause to the satisfaction of the City Engineer why such connections are not technically feasible and should not be required of the applicant. Even if not technically or economically feasible to construct all of the connection as a part of the development in question, if the City Engineer finds that such a connection may be feasible upon development of the adjacent parcel, the City Engineer shall require a fourteen foot (14') public easement and the development shall be sited so as not to preclude the possibility of connectivity in the future and may require the construction, or fee in lieu of the portion that is within the development in question as a condition of approval. If the abutting properties are in common ownership such connections may be required to include pedestrian bridges.

[23] The City Engineer may delegate decision-making authority to qualified engineering staff, and may refer policy decisions to the City Council Street Committee.

[24] Streets designated as alleys and constructed with an inverted crown, and all curb and gutter sections shall be of PCC construction. Preference shall be given to PCC construction for "Transit Streets," arterial streets, and streets abutting commercial zones and districts. All other standard crown streets may be constructed to an equivalent structural cross section using asphaltic concrete (AC) with the approval of the City Engineer. Streets shall be constructed with thermoplastic markings and all regulatory and roadway informational signs shall be installed per the Manual of Uniform Traffic Control Devices.

130.5 Local Residential Streets (See Figure 8-8 For Design Criteria)

These streets are intended to serve only abutting land and should carry less than 1,500 vehicles per day. If traffic volume is projected to exceed 1,500 vehicles per day, neighborhood traffic management measures specified in Section ___ should be included in the design. The standard local residential street shall be designed as a 32-foot roadway improvement within a 54-foot right-of-way (where daily traffic volume exceeds 1,500 vehicles per day), with a 5-foot minimum width sidewalk and a minimum 4-foot landscape strip separating the sidewalks and roadway on each side.

When the projected buildout daily traffic volume is below 250 vehicles per day, the improved roadway width may be reduced to not less than 24 feet with a right-of-way of not less than 46 feet with no on-street parking allowed and adequate off-street parking is available on the abutting properties. When projected daily traffic volumes exceed 600 vehicles per day and are less than 1,500 vehicles per day, the improved roadway width may be reduced to not less than 28 feet with a right-of-way of not less than 50 feet if parking is restricted to one side and adequate off-street parking available on the abutting properties.

130.6 Neighborhood Streets (See Figure 8-7 For Design Criteria)

Neighborhood routes provide connectivity to collectors or and are used by residents in the area to get into and out of the neighborhood, but do not serve citywide/large area circulation. Traffic from cul-de-sacs and other local streets may drain onto neighborhood routes to gain access to collectors or arterials. Because traffic needs are greater than a local street, traffic management measures should be considered to retain the neighborhood character and livability of these routes.

The standard configuration for neighborhood streets (routes) without on-street parking shall be a 36-foot roadway improvement within a 60-foot right-of-way with two 12-foot travel lanes, two 6-foot bicycle lanes, two 6-foot landscape strips, and two 5-foot sidewalks.

130.7 Collector Streets (See. Figure 8-6 For Design Criteria)

Collector streets provide both access and circulation within residential and commercial/industrial areas. The standard configuration for collector streets without on-street parking shall be a 46-foot roadway improvement within a 70-foot right-of-way, including two 11-foot travel lanes, a 12-foot median/turn lane, and two 6-foot bicycle lanes. Five-foot (5' minimum) sidewalks separated from the curb by a 6-foot landscape strip are required on both sides of the street. Left turn lanes shall be provided at major intersections and may be provided, if approved by the City Engineer at authorized property access points between intersections.

130.7 Arterial Streets (See Figure 8-5 For Design Criteria.)

Arterial streets are intended to serve as the primary routes for travel between the City of Hillsboro and other parts of the region, between major areas of urban activity, and to access the highway system. The size of arterial streets is defined in the Street ROW Required for Selected Arterials and Collectors (Greater than 2

Lanes) (Figure 8-4) and in the Street Improvement Plan (Figure 8-18). Arterial streets vary in size from two-lanes up to seven-lanes. Typical arterial street cross sections are shown in Figure 8-5. Access spacing shall be established by city land use regulations. Additional left and right turn lanes as defined in the Development Review Transportation Impact Report shall add 12 feet for each turn lane added to the rights-of-way identified in Figure 8-5. All property access points from an arterial street between intersections require approval of the City Engineer, and may be subject to right turn only configuration, consolidation among adjacent properties, and minimum spacing standards set so as not to unduly impede traffic flow. Standard sidewalks and landscape strips are required. Wider sidewalks shall be constructed to at least 8 feet wide in commercial areas, and 13 feet or wider along specific streets in the Station Community Planning Areas. This requires wider rights-of-way than those shown on Figure 8-5 (equivalent to the difference between the minimum 5- or 6-foot sidewalks as shown to the sizes required).

130.8 Commercial and Industrial Streets (See Figure 8-5a For Design Criteria)

Commercial and industrial streets are not through routes and are intended to serve primarily abutting non-residential land uses. However, due to the nature of the adjacent land uses, such vehicles will include larger trucks, requiring wider travel lanes and additional turning radii. The standard commercial street shall be designed as a 38-foot roadway improvement with 60-foot right-of-way, with a 5-foot minimum width sidewalk and a minimum 5-foot landscape strip separating the sidewalks and roadway on each side. The standard industrial street shall be designed as a 40-foot roadway improvement with 62-foot right-of-way, with a 5-foot minimum width sidewalk and a minimum 5-foot landscape strip separating the sidewalks and roadway on each side.

130.9 Other Road & Street Design Standards

130.9.1 Transportation Impact Report (TIR)

A Transportation Impact Report (TIR) is required for any land use that generates 200 vehicles per day (vpd) or more; any new residential subdivision that generates 250 vehicles per day or more; and, any transportation related projects designed to accommodate increased motor vehicle traffic by over 5,000 vpd. Trip generation will be based upon the current version of the Institute of Transportation Engineers Trip Generation Manual. A TIR Checklist shall be prepared and used to determine the technical completeness of a Transportation Impact Report.

130.9.2 Access; Level-of-Service; Spacing Standards

The standards in the Table on the next page shall be used to determine traffic impacts. When traffic impacts exceed the thresholds identified in the Table, traffic mitigation measures or design exceptions should be prepared. A requested design exception may be approved by the City Engineer, subject to Street Committee review upon request.

1

Measure	Threshold	Specifications
Motor Vehicle Level of Service (LOS): Stage I: Unsignalized Signalized Signalized (Station Area) Stage II: Arterial	 E D E D	The current version of the Highway Capacity Manual (HCM) shall be used to determine LOS. Peak hour basis is retained, unless updated by HCM.
Roadway Access Spacing: Arterial Collector	 600' min/1,000' max 200' min/400' max	The minimum standards for access spacing between access points shall require detailed access/safety analysis if not met.
Local Street Spacing	Not to exceed 530 feet between streets	
Neighborhood Impact	20^{+} through vehicles per hour on local/ neighborhood residential streets carrying greater than 600 vpd	Above this level, a neighborhood traffic management plan shall be submitted with the TIR that reduces the occurrence of cut-through traffic.
Traffic Signal Spacing	1,000 foot desirable 500 foot minimum (downtown area excepted)	If traffic signals are proposed which are less than 1,000 feet apart (and not on the current traffic signal master plan map), a separate analysis of traffic signal timing shall be conducted to demonstrate that adequate progression can be maintained.
Cul-de-sac Length	Maximum Units Served = 25 Maximum Length = 200 feet	
Direct Pedestrian Connection from Front Door to Public Sidewalk	Maximum 1.25 times the shortest straight line distance	Measured as the walking path a pedestrian would use compared to the straight-line distance.
Connection to Transit Stops	Apply criteria above to the bus stop location adjacent to site	Direct path to bus stop must not exceed 1.25 times straight line
Pedestrian Circulation Map	Above 500 evening peak hour vehicle trips	A pedestrian circulation map shall be prepared identifying linkages to all uses and transit stops within 1,500 feet. Define the number of auto/public sidewalk pedestrian conflict points for the site.
Pedestrian/Bike Connectivity	330 foot spacing minimum	
School Safety	For residential development within 1,500 feet of schools	Prepare a route to school map showing sidewalks.

2

130.9.3 Access Spacing.

For Washington County roadways, the current County access spacing standards and requirements shall apply. City access spacing standards for arterial and collector streets are as follows: Exceptions to the maximums are permitted for environmental and topographic considerations.

Arterial: Minimum spacing between access points: 600 feet
Maximum spacing between access points: 1,000 feet

Collector: Minimum spacing between access points: 200 feet
Maximum spacing between access points: 400 feet

Access is measured between the inside right-of-way lines or edges of driveways.

On neighborhood routes and local streets that intersect with a collector or arterial, no access shall be permitted within 50 feet of the intersection. All driveways should be placed at least 25 feet from an intersection with public streets.

The number of access points on arterial and collector streets from any development should be minimized whenever possible through the use of driveways common to more than one development and interior circulation design which furthers this requirement.

130.10 Street Structural & Composition Design

130.10.1 Width [reserved]
130.10.2 Number of lanes [reserved]
130.10.3 Design speed [reserved]
130.10.4 Utility & sidewalk easements [reserved]
130.10.5 Subgrade elevations [reserved]
130.10.6 Structural section construction [reserved]
130.10.7 Portland Cement Concrete structures [reserved]
130.10.8 Horizontal & vertical alignments [reserved]
130.10.9 Intersections [reserved]
130.10.10 Cul-de-sacs, eyebrows & turnarounds [reserved]
130.10.11 Curbs and grading [reserved]
130.10.12 Sidewalks [reserved]
130.10.13 Bikeways [reserved]
130.10.14 Raised medians [reserved]
130.10.15 Subsurface drainage [reserved]
130.10.16 Guardrails [reserved]
130.10.17 Transitions [reserved]
130.10.18 Stub streets [reserved]
130.10.19 Private streets [reserved]
130.10.20 Utilities [reserved]
130.10.21 Neighborhood Traffic Management

Upon request, traffic management devices may be permitted on local streets, neighborhood routes, and collectors only upon Street Committee approval of a neighborhood traffic management plan. If Committee approval is requested by a private entity, the plan must be prepared by and approved in writing by at least 75% of the property owners residing along the street covered by the plan. For new construction projects only, the City Engineer or Street Committee may determine that traffic management devices are needed and may require construction of such devices as a condition of approval of the project.

Traffic management devices are permissible in new construction and as traffic control devices as follows:

1. In new construction, curb extensions, colored and/or textured pavements and medians are deemed appropriate, subject to City Engineer approval.
2. In other cases, traffic control devices such as speed humps, intersection diverters, traffic circles and raised sidewalks and other devices are available as approved by the City Engineer.

130.11 Special Area Road Design

Hillsboro Special Area road design standards provide standards for public streets in higher density and/or mixed use land use areas described in the comprehensive plan. Special Area roads are intended to provide multi-modal access and circulation to development within special land use areas in the City such as station communities, town centers, the regional center and main streets. While traffic volumes may be high in these areas, operating speeds are anticipated to be low and street design will encourage non-auto modes, especially pedestrian travel modes.

130.11.1 Intent [reserved]
130.11.2 Application. [reserved]
130.11.3 Sidewalk/utility easements. [reserved]
130.11.4 Neighborhood traffic management. [reserved]
130.11.5 Paved width. [reserved]
130.11.6 Right-of-way. [reserved]
130.11.7 Special requirements by road classification.
130.11.8 Special Area collectors. [reserved]
130.11.9 Special Area arterials. [reserved]
130.11.10 Special Area neighborhood routes. [reserved]
130.11.11 Special Area local streets. [reserved]

TSP USER GUIDE

The TSP User Guide is intended to describe information that must be provided by applicants seeking City land use approval for projects, which generate significant traffic impacts within the immediate area. The contents of the initial TSP User Guide will include the information requirements that are based on the adopted TSP.

The Guide will respond to a new proposed provision in the Zoning and Subdivision Ordinances calling for the preparation and availability of a Transportation Impact Report Checklist for applicants that the City will use to determine technical completeness of such reports. It will be prepared after approval of the TSP Street Design Manual by City Council Resolution. It will be a part of all applications for City zone changes, planned unit developments, conditional use permits, variances, Development Review & Approval and residential subdivisions, and also will be included in the TSP Street Design Manual for public reference. From time to time, the TSP User Guide will be revised to add more information required of applicants as may result, for example, from a major revision of the TSP.

A key purpose of the initial TSP User Guide is to draw information from applicants regarding the potential impacts of their projects on Level of Service (LOS) of streets, roads and intersections expected to absorb the peak hour vehicle traffic volumes generated by the projects. The Guide will respond to a new proposed provision in the Zoning and Subdivision Ordinances calling for the preparation and availability of a Transportation Impact Report Checklist for applicants that the City will use to determine technical completeness of such reports. (See pp. ___, above.) The Checklist will be similar in appearance and contents to the example on the next page.

In part, responses to applicant information called for by the Checklist will describe whether a development project satisfies the following thresholds and standards contained in an information table in the Guide:

1. The current LOS standards for City arterials and intersections; and
2. Trip generation thresholds that, if exceeded by the number of vehicle trips forecasted from a project, triggers an applicant requirement to prepare a transportation impact report for the purpose of identifying the types of traffic mitigation measures that may need to be undertaken to mitigate the impacts of such trips on affected arterials and at affected intersections.

The table will also contain information concerning roadway access and spacing standards; standards for pedestrian and bike travel facilities; and other useful project information to be presented in development applications.

TRANSPORTATION IMPACT REPORT
TECHNICAL COMPLETENESS CHECKLIST

Project Name: ______________________________
Developer & Engineer: ______________________________
Tax Lot, Section, Range: ______________________________
City Reference Code: ______________________________

TRIP REQUIREMENT

☐ Yes ☐ No Traffic generated greater than 200 or 250 vehicles per day
☐ Yes ☐ No Report Required Comment: ______________________________ Date: __________

BACKGROUND INFORMATION

☐ Yes ☐ No Oregon PE Stamp, Signature and Expiration Date

☐ Yes ☐ No **INTRODUCTION AND SUMMARY**
☐ Yes ☐ No Provide summary of project compliance with provisions in the "Thresholds & Standards Table in Checklist.

EXISTING CONDITIONS

☐ Yes ☐ No Roadway Network - summary of roadway classifications and description of study area
☐ Yes ☐ No Analysis Period Correct (AM, Mid-day, PM and/or Saturday)
☐ Yes ☐ No Existing Traffic Operations (Existing Level of Service, traffic volumes, speeds, accident data, etc.)

IMPACTS

☐ Yes ☐ No Trip Generation - Daily, peak hour trips generated by site development: ITE Trip Generation Manual/Survey
☐ Yes ☐ No Level of Service Analysis - projected LOS with site build out and phased impacts, existing traffic, and background traffic growth including all approved projects impacting the study area (Identify existing and projected LOS deficiencies)
☐ Yes ☐ No Signal Warrant Analysis
☐ Yes ☐ No Analysis of impact to coordinated signal system
☐ Yes ☐ No Turn Lane Warrant Analysis
☐ Yes ☐ No Access Spacing Standards Met (within 1,000 feet of the project, on both sides of the street)
☐ Yes ☐ No Analyze all SPIS intersections where a project adds 10% traffic to an approach
☐ Yes ☐ No Analysis of sight distance at frontage road access point(s)
☐ Yes ☐ No For residential projects; identify safe routes to school or school bus stop (Contact with school district)
☐ Yes ☐ No Analysis of safe pedestrian/bicycle access to nearest transit stop (if within 1/2 mile of project site)
☐ Yes ☐ No Identify accessibility to public transit

MITIGATION

☐ Yes ☐ No Identify need for right/left turn lanes, storage capacity and length, traffic signals and other traffic control devices
☐ Yes ☐ No Identify possible corrections of any LOS deficiencies or 10% impacted SPIS intersection
☐ Yes ☐ No Identify any access deficiencies (including pedestrian/bicycle connections)

FIGURES

☐ Yes ☐ No Vicinity Map (study area includes all arterial and/or collector intersections within 1,000 feet of property, as approved by City engineer).
☐ Yes ☐ No Site Plan (showing all access points (both sides of the street) within 1,000 feet of property on adjacent arterials and 400 feet for collectors)
☐ Yes ☐ No Existing weekday peak hour turn movement volumes (counts conducted within previous 12 months)
☐ Yes ☐ No Trip Distribution (%) and resulting Added Project Peak Hour Traffic Volumes (see sample)
☐ Yes ☐ No Approved Projects Peak Hour Traffic Volumes (see sample)
☐ Yes ☐ No TSP Future Year turn movement volumes comparison
☐ Yes ☐ No Programmed transportation improvements and transportation mitigation outlined in study

TABLES

☐ Yes ☐ No Intersection Performance Existing Conditions
☐ Yes ☐ No Project Trip Generation
☐ Yes ☐ No Intersection Level of Service

OTHER

☐ Yes ☐ No Technical appendix - sufficient material to convey complete understanding of traffic issues (e.g. HCM analyses, trip generation calculations, signal warrant analyses, turn lane warrant analyses, copy of intersection counts, etc.)

Completed By: ______________________________
Date: ______________________________

ACKNOWLEDGEMENT

Production of this report has been the collective effort of the following people:

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