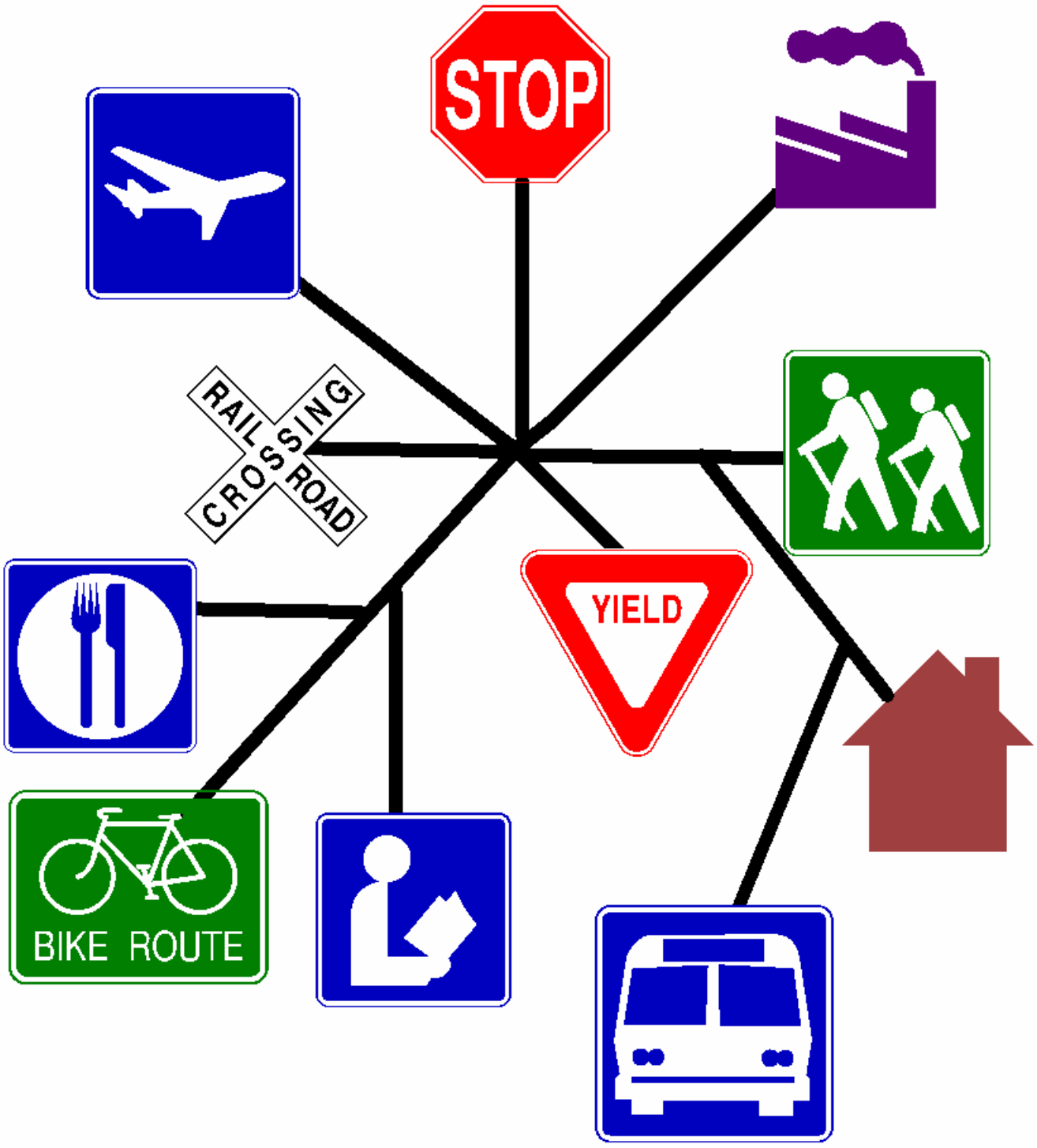
City of Madras
Transportation System Plan



City of Madras

Transportation System Plan

Adopted August 25, 1998
(Ordinance #668)

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ACKNOWLEDGMENT

The Madras Department of Public Works made an important contribution to this plan by preparing a draft Transportation Development Plan in 1993. The draft plan provided useful information for the system inventory and insight into the community and its future needs. DEA has incorporated most of the elements from the draft plan into this document. We would like to acknowledge the writer, Gerald Breazeale, for his valuable help in both preparing the draft plan and developing this TSP.

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CHAPTER 1: INTRODUCTION

The Madras Transportation System Plan (TSP) guides the management of existing transportation facilities and the design and implementation of future facilities for the next 20 years. **This Transportation System Plan constitutes the background study for the transportation element of the City's Comprehensive Plan and satisfies the requirements of the Oregon Transportation Planning Rule.**

PLANNING AREA

The Madras TSP planning area includes the City of Madras, as well as the area within the City's UGB and adjacent areas that are currently developing or that have a strong potential to develop within the 20-year planning period. The Madras TSP planning area is shown on Figure 1-1. Roadways included in the TSP fall under several jurisdictions: the City of Madras, Jefferson County, and the State of Oregon.

Madras and the surrounding area constitute a small but rapidly growing community. Madras' location along the US Highway 97/26 corridor through Central Oregon, and its desirable climate, outstanding scenery, and proximity to recreation assure that growth will continue at a strong pace. The area is economically strong, supported by a combination of resource-based industries, agriculture, and increasing important tourist trade. In addition, Madras is attractive to retired people because of its relatively inexpensive housing and attractive amenities.

Because Madras has developed along the US 97/26-highway corridor, the area has grown in a north-south pattern. City blocks are longer along the north-south axis than they are east and west. The majority of the retail businesses are located along the US 97/26-highway corridor, forming a two-mile long commercial strip through the city. Highway accesses to businesses have been largely unregulated. This land use pattern, typical of cities located along highway corridors, encourages automobile traffic to the exclusion of other forms of transportation. As the area grows, the conflicts of unlimited access and highway traffic will increase.

Local traffic relies heavily on the US 97/26-highway corridor through Madras. There are few good east/west routes across Madras. The only two existing streets that extend east and west the full width of the city are "B" and "C" Streets.

Willow Creek, which runs from southeast to northwest through the City, has also created pressure on existing streets because it interrupts the grid pattern. Many platted streets have not been connected across the creek because of the expense of building bridges and steep terrain in some locations. Traffic is therefore diverted onto a few main streets, especially onto US Highway 97. However, Willow Creek has also provided the City with an opportunity to develop a multi-use path for pedestrians and bicyclists.

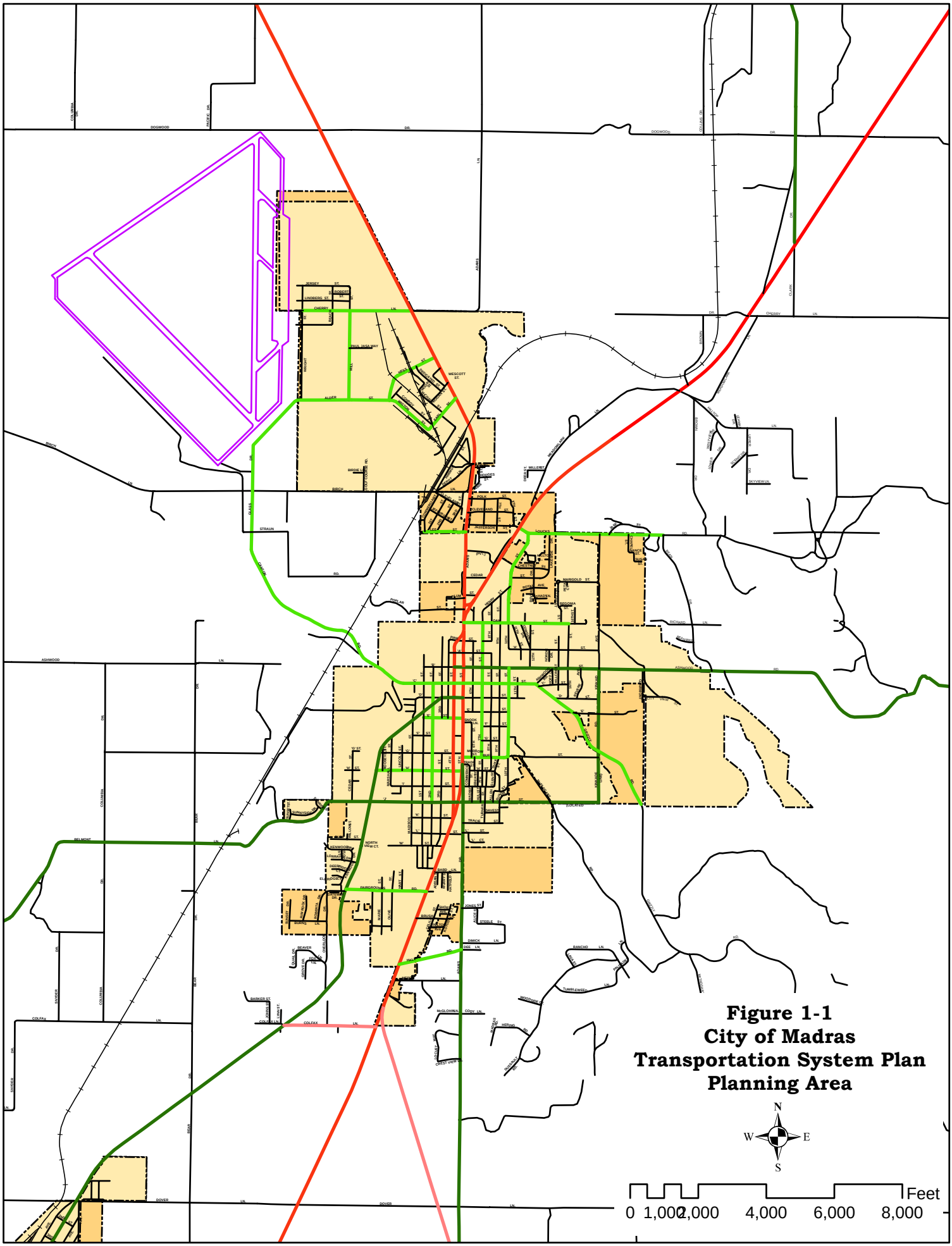


Figure 1-1
City of Madras
Transportation System Plan
Planning Area

The Madras Industrial Park is located north of the city on US Highway 26. Present vehicular access to the Industrial Park is limited to US Highway 26 because of the steep terrain to the south and the lack of any highway frontage roads. Employees commuting to the Industrial Park cause noticeable increases in traffic in the morning and late afternoon. The existing highway at the Industrial Park is only two lanes wide (with a portion having a center turn lane). The existing mix of truck traffic, commuters, and through traffic creates congestion during heavy use times and shift changes at the Industrial Park.

Local streets in Madras are generally very wide. The streets are largely paved with an oil mat surface over native materials. On average, streets are in fairly good condition; however, a lack of adequate base coupled with insufficient funding for surfacing and maintenance is contributing to a decline in condition. Rarely have sidewalks been constructed along streets. Consequently, pedestrians must share the streets with cars and trucks. The low traffic volumes on local City streets have minimized conflicts between pedestrians and motorists; however, conflicts will grow as volumes increase. The lack of walkways may discourage some from walking as a form of transportation.

A zoning map of the Madras TSP planning area is shown on Figure 1-2. The commercial zones are focused along the two highways. Residential zoning surrounds the commercial core. The manufacturing and industrial uses are primarily in the northwest quadrant of the city with some smaller pockets in other areas.

The challenge for the future of Madras is to provide a transportation system that will accommodate growth without the associated traffic problems. Appropriate planning while Madras is still relatively small will provide the opportunity to avoid the transportation problems that plague many cities.

PLAN ORGANIZATION

The Madras TSP was developed through a series of technical analyses combined with systematic input and review by City staff, a technical advisory committee (TAC), and the public. Key elements of the process include:

- Involving the Madras community (Chapter 1)
- Defining goals and objectives (Chapter 2)
- Reviewing existing plans and transportation conditions (Chapters 3 and 4; Appendix C)
- Developing population, employment and travel forecasts (Chapter 5)
- Developing and evaluating potential transportation system improvements (Chapter 6)
- Developing the transportation system plan (Chapter 7)
- Developing a capital improvement program (Chapter 8)
- Developing Recommended Policies and Ordinances (Chapter 9)

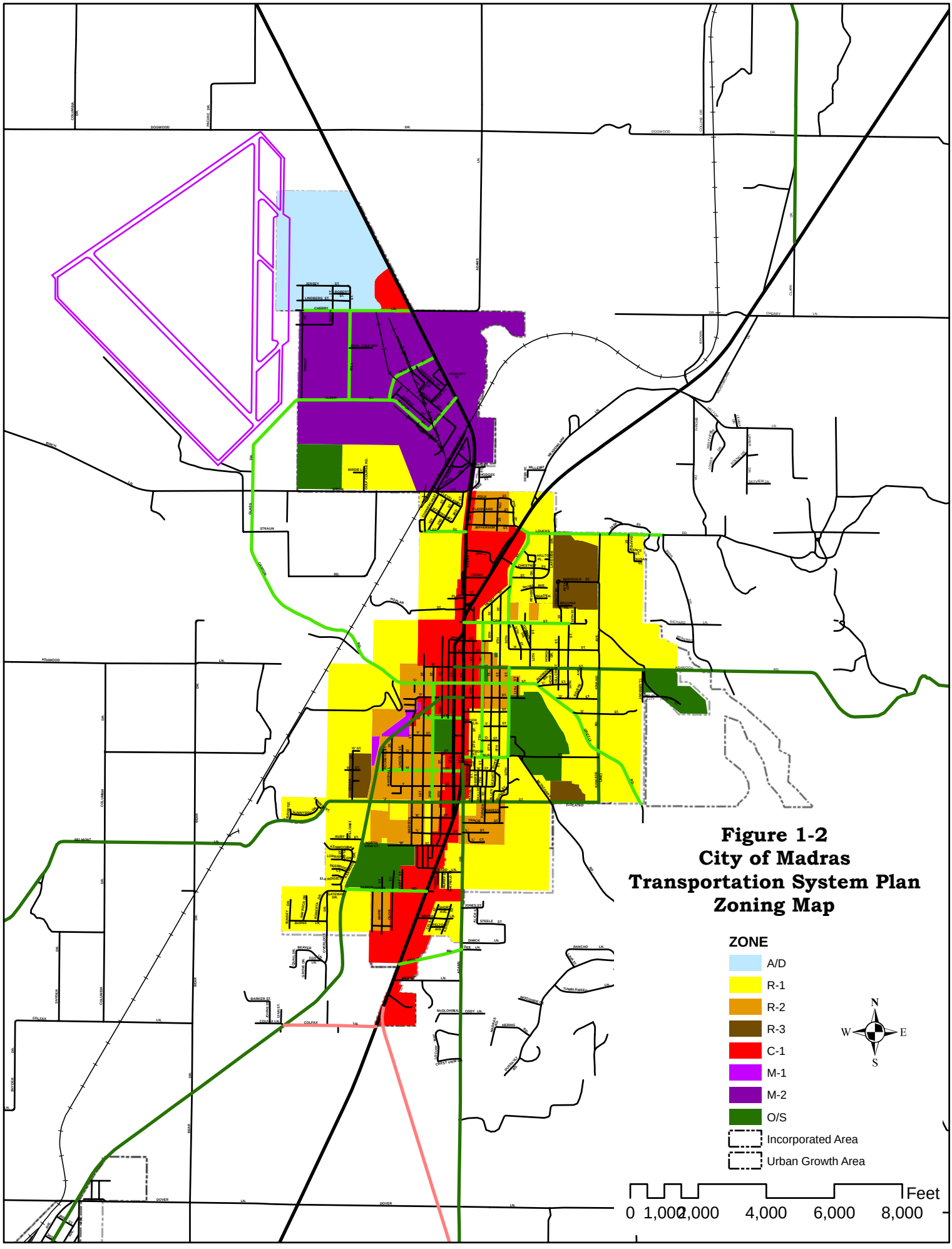


Figure 1-2
City of Madras
Transportation System Plan
Zoning Map
ZONE
A/D
R-1
R-2
R-3
C-1
M-1
M-2
O/S
Incorporated Area
Urban Growth Area
N
W
E
S
0 1,000 2,000 4,000 6,000 8,000
Feet

Community Involvement: Community involvement was an important part of developing the Madras Transportation System Plan. Interaction with the community was achieved through holding open meetings and by forming a Transportation Advisory Committee (TAC). The TAC functioned as a combination technical and citizen advisory committee. The TAC provided local knowledge and guidance to the consultant team, and review of work products. The TAC consisted of representatives from Madras, Jefferson County and the Oregon Department of Transportation (ODOT). Six TAC meetings were held throughout the planning process.

Three open community meetings were held in Madras on September 28, 1994, February 22 and June 29, 1995. The first meeting was held at the beginning of the process in a workshop format to solicit public input on issues and problems to be addressed. The results of this meeting formed the basis for the transportation goals and objectives. The second meeting was held in the middle of the process to review the potential improvement options for Madras. The third was held at the end of the process for community review and comments upon completion of the draft TSP. Two newsletters were published in the *Madras Pioneer*, one in advance of each the last two public meetings. These are included in Appendix B.

In addition, a Bicycle Advisory Committee was formed to provide review and recommendations for the bikeway-planning portion of the TSP. This committee included members from all segments of the community, including the Police Department. They met numerous times throughout the project.

Goals and Objectives: Based on input from the City, the TAC, and the community, a set of goals and objectives were defined for the TSP. These goals and objectives were used to make decisions about various potential improvement projects. They are described in Chapter 2.

Review and Inventory of Existing Plans, Policies, and Public Facilities: To begin the planning process, all applicable Madras and Jefferson County transportation and land use plans and policies were reviewed and an inventory of public facilities was conducted. The purpose of these efforts was to understand the history of transportation planning in the Madras area, including the street system improvements planned and implemented in the past, and how the City is currently managing its ongoing development. Existing plans and policies are described in Appendix C of this report.

The inventory of existing facilities catalogs the current transportation system. The results of the inventory are described in Chapter 3. Chapter 4 describes how the system now operates. Appendix D summarizes the inventory of the existing arterial and collector street system.

Future Transportation System Demands: The Transportation Planning Rule requires the TSP to address a 20-year forecasting period. Therefor, 20-year travel forecasts were developed based on projections of population and employment by different land use categories within the Urban Growth Boundary (UGB). The forecasting process is described in Chapter 5.

Transportation System Potential Improvements: Once the travel forecasts were developed, it was possible to evaluate a series of potential transportation system improvements. The initial evaluation was the "No Build" option, which is the existing street system plus any currently committed street system improvements. This evaluation revealed that a "No Build" option did not meet the goals and objectives of the TSP.

Based on projected capacity deficiencies and safety concerns identified in the "No Build" evaluation, potential improvements to the street system were developed and tested. After comparing the benefits of each improvement in meeting the project's goals and objectives, a series of transportation system improvements were selected. The recommended improvements are described in Chapter 6.

Modal Plans and Implementation Plan: The TSP was developed to address each mode of transportation. The street system plan was developed from the forecasting and potential improvement evaluation described above. The bicycle and pedestrian plans were developed based on current usage, land use patterns, and the requirements set forth by the Transportation Planning Rule. The public transportation, air, water, rail, and pipeline plans were developed based on discussions with the owners and operators of those facilities. Chapter 7 details the plan elements for each mode.

Capital Improvement Program and Funding Options: The capital improvement program was developed from the short-term improvements and the recommended street system plan. The funding analysis examines options for financing these improvements. These elements are described in Chapter 8.

Recommended Policies and Ordinances: Suggested Comprehensive Plan policies and implementing zoning and subdivision ordinances are included in Chapter 9 and the appendices.

CHAPTER 2: GOALS AND OBJECTIVES

The purpose of the Transportation System Plan is to provide a guide for Madras to meet its transportation system needs. The following goals and objectives were developed from information supplied by the Transportation Advisory Committee, City staff, and public. Throughout the planning process, each element of the plan was evaluated against these parameters.

An overall goal was first developed. Then more specific goals and objectives were formulated. The goals and objectives are listed below. All of the goals and objectives guided the development of the TSP.

OVERALL TRANSPORTATION GOAL:

Develop a transportation system that enhances the livability of Madras and accommodates growth and development through careful planning and management of existing and future transportation facilities.

GOAL 1: Improve and enhance safety and traffic circulation on the local street system.

Objectives:

A. Develop an efficient grid system for the community by improving the local street system.

B. Improve and maintain existing roadways.

C. Identify truck routes to reduce truck traffic in urban areas.

D. Examine the need for speed reduction and improved signalization in specific areas.

E. Identify local problem spots and recommend solutions; e.g., the junction of Highways 26 and 97.

This goal and its objectives are discussed in Chapters 6 and 7.

GOAL 2: Identify transportation system needs to accommodate developing or undeveloped areas.

Objectives:

A. Provide policies and standards that address street connectivity, spacing, and access management.

B. Integrate new streets into the city grid system with an emphasis on taking the pressure off of traditionally heavy traffic collectors.

C. Improve accesses into and out of Madras for goods and services.

This goal and its objectives are addressed in Chapters 6, 7, 8, and 9.

GOAL 3: Increase the use of alternate modes of transportation (walking, bicycling, and transit) through improved access, safety, and service.

Objectives:

A. Provide sidewalks and safe crossings on arterial and collector streets.

B. Provide shoulders on rural collectors and arterials.

C. Provide appropriate walkways and bikeways where high use occurs or may occur.

D. Promote alternate modes and carpool programs through community awareness and education.

E. Plan for expanded transit service by sustaining funding to local transit efforts and seeking consistent state support.

This goal and Objectives A-C are discussed in Chapter 7. A plan for Objective D was beyond the scope of the TSP. Objective E is partially met in Chapter 9, in that land use planning that does accommodates future transit expansion is included.

GOAL 4: Enhance the role of the Madras Airport as an important part of the health, safety and welfare of the area.

Objectives:

A. Improve emergency medical air access by providing instrument approach.

B. Continue runway improvements.

C. Improve access to the airport.

D. Continue to seek matching funds for state and federal funds.

This goal will be partially met by the City of Madras and Jefferson County adopting the recommended policies and ordinances included in Chapter 9 of the TSP. The ordinances help protect the function of the airport by restricting certain land uses in its vicinity. Objective C is met by the proposed improvements to Canyon Road/Glass Drive to Adler Street in the Industrial Park, and by adding shoulders to Cherry Road (see Chapter 6). Objectives A, B, and D are outside the scope of the TSP, and should be considered in a Madras Airport Master Plan update.

CHAPTER 3: TRANSPORTATION SYSTEM INVENTORY

As part of the planning process, an inventory of the existing transportation system in Madras was conducted. This inventory covered the street system as well as the pedestrian, bikeway, public transportation, rail, air, water, and pipeline systems.

STREET SYSTEM

The most common understanding of transportation is of roadways carrying cars and trucks. Most transportation dollars are devoted to building and maintaining these facilities. The mobility provided by the personal automobile has resulted in a great reliance on this form of transportation. Likewise, these facilities allow trucks to carry freight to nearly any destination.

Accommodating the use of cars and trucks must be balanced against costs, livability factors, the ability to accommodate other modes of transportation, and negative impacts on adjacent land uses. However, the basis of transportation in all American cities is the roadway system. This trend is clearly seen in the existing Madras transportation system. It consists almost entirely of roadway facilities for cars and trucks. The street system will most likely continue to be the basis of the transportation system through the 20-year planning period. Therefore, the emphasis of this plan is on improving the existing street system for all users.

An inventory of the existing street system was conducted for the Transportation System Plan planning area. Inventory elements include:

- Street classification and jurisdiction
- Street width and right-of-way
- Number of travel lanes
- Presence of on-street parking, sidewalks, or bikeways
- Speed limits
- General pavement conditions

Figure 3-1 shows the roadway functional classification and jurisdiction, and the location of traffic signals. Appendix D lists the complete inventory.

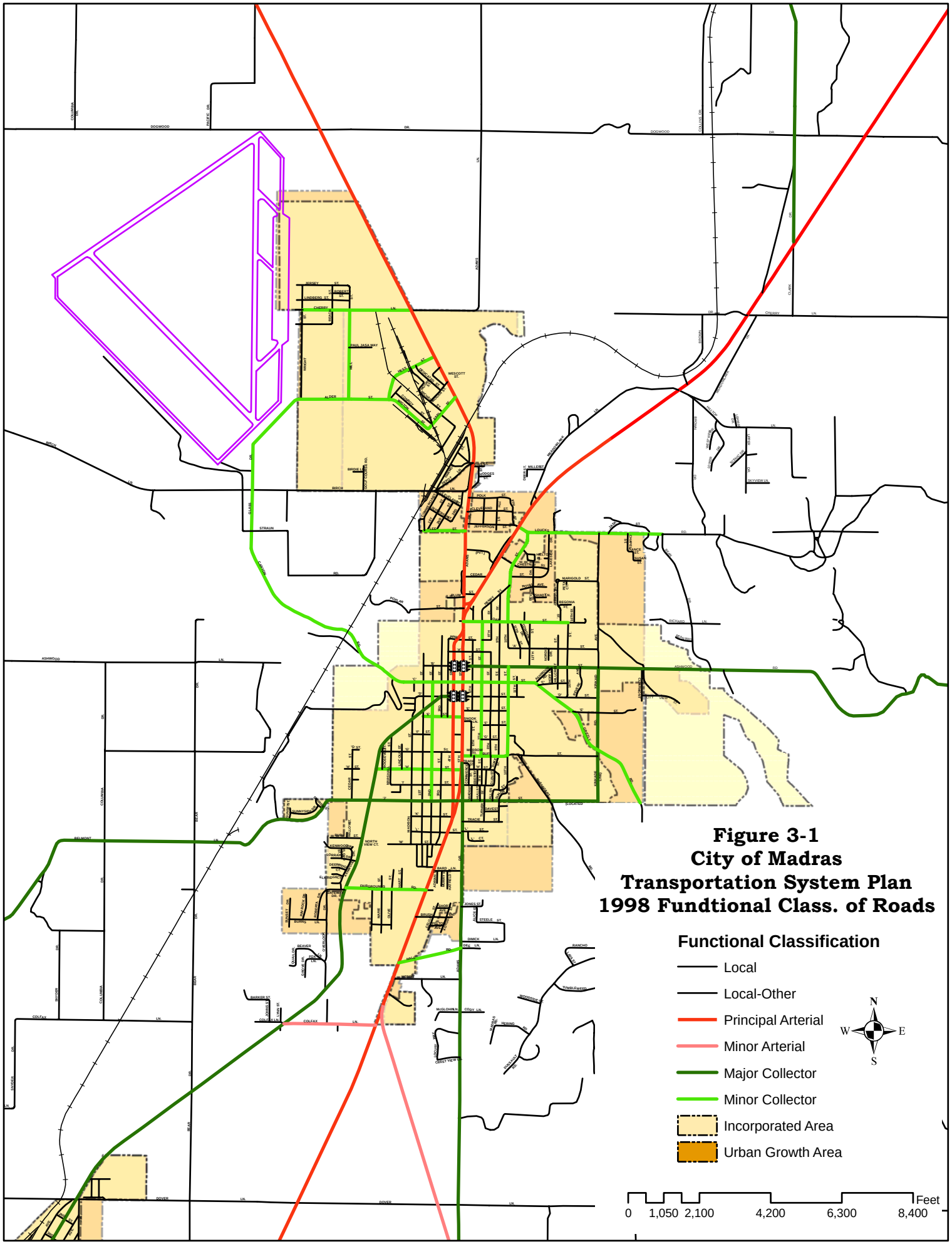


Figure 3-1
City of Madras
Transportation System Plan
1998 Fundtional Class. of Roads
Functional Classification
Local
Local-Other
Principal Arterial
Minor Arterial
Major Collector
Minor Collector
Incorporated Area
Urban Growth Area
N
W
E
S
0
1,050
2,100
4,200
6,300
8,400
Feet

State Highways

Any discussion of the Madras street system must include the State highways that traverse the planning area. Although Madras has no direct control over the State highways, adjacent development as well as traffic patterns are heavily influenced by the highways. Madras is served by three highways: US Highway 97, US Highway 26, and State Highway 361 (Culver Highway). These highways serve as the major route through town with commercial and industrial development focused along the corridors.

The 1991 Oregon Highway Plan (OHP) classifies the state highway system into four levels of importance (LOI): Interstate, Statewide, Regional, and District. Oregon Department of Transportation (ODOT) has established primary and secondary functions for each type of highway and objectives for managing the operations for each, as shown in Appendix E.

Both Highways 26 and 97 through the Madras area are classified as highways of Statewide Level of Importance, Access Oregon Highways (AOH), and are part of the National Highway System. The management emphasis on these highways is to preserve safe and efficient higher speed through travel in rural areas, and moderate to low-speed operations in urban or urbanizing areas. This means that design factors such as controlling access and providing passing lanes are of primary importance.

State Highway 361 is classified as a district highway, mainly serving local traffic.

US Highway 97

US Highway 97 bisects Madras into east and west sections. The highway widens from a two-lane roadway into a couplet of one-way streets from Pine Street at the north end of Madras to "J" Street at the south end. There it joins again into a two-way road south through the remainder of the City. The couplet consists of 5th Street for northbound traffic and 4th Street for southbound traffic.

Both 4th and 5th Streets were originally developed as city streets. 4th Street is still owned by the City, with the State using the street under permit from the City. The numerous intersections and accesses to the highway through town create conflicts with the relatively high volumes of highway traffic within the City. Current ODOT recommendations for a highway with the volume of US Highway 97 would limit intersection distances to one per ¼ mile (1,320 feet). Existing intersections are spaced at an average of 450 feet between Pine and "J" Streets.

Accesses to businesses along US Highway 97 have developed over time in an uncontrolled manner with little definition of ingress or egress. In many cases, the entire frontage of a business is the access. Only fairly recently have efforts been made to define and separate access points to businesses. Today, the Highway Plan guidelines of a minimum ¼ mile spacing for public road intersections and 500 ft. for private drives are used to guide development and access review decisions. In some cases this may not be possible due to lot/block size or other

constraints. Access control deficiencies are most severe at the south end of Madras.

Access control is critical in portions of the Madras study area where traffic speeds are over 30 MPH and the main purpose of the highway is to move through traffic. However, in the downtown core of Madras, where the posted speed limit is 25 MPH, it is both practical and appropriate for blocks to be 200 to 400 feet long. Driveway accesses should be limited, with businesses relying upon on-street parking or sharing off-street parking where possible. Numerous accesses reduce pedestrian and bicycle safety in the downtown core, where the potential for their use is the highest.

US Highway 26

US Highway 26 is the major route for traffic between Central Oregon and the Portland area. This highway carries essentially all the traffic in and out of the Industrial Park. There is no other practical vehicle access to the Park, which is a major employer in Jefferson County.

Traffic on US Highway 26 joins traffic from US Highway 97 just north of Oak Street in Madras. The alignment of the two highways where they intersect has caused numerous problems. ODOT has worked with the City to identify two preferred alternatives for this intersection. Comments made earlier regarding US Highway 97 and access issues apply equally to US Highway 26.

State Highway 361

State Highway 361, the Culver Highway, carries traffic between Madras and the cities of Metolius and Culver. Lake Billy Chinook and Cove State Park also add traffic to the Culver Highway. State Highway 361 joins US Highway 97 at "D" Street in Madras. Commercial development has not been intensive along State Highway 361. There is a pocket of commercial development near its intersection with Madison Street in Madras. As with Highways 26 and 97, access has been nearly unlimited along the Culver Highway.

Street Classification

Madras has classified their street system at three levels: arterial streets, collector streets, and local streets. The classification system includes city, county and state roadways.

Arterial Streets

Arterial streets form the primary roadway network within and through a region. They provide a continuous road system that distributes traffic between neighborhoods and districts. Generally, arterial streets are high capacity roadways that carry high traffic volumes with minimal localized activity.

In Madras, the arterial network consists of the two highways, US Highways 26 and 97. US Highway 97 runs concurrently with US Highway 26 beginning just north of Colfax Lane through the center of town. Between "J" Street on the south and Pine Street on the north, the roadway splits into a one-way couplet along 4th Street and 5th Streets. After Pine Street, the highways split with US Highway 26 heading northwest and 97 heading northeast.

Collector Streets

Collector streets connect local neighborhoods or districts to the arterial network. Madras has 26 designated collector streets. Within the study area limits, collector streets include the following:

B Street
C Street
E Street
H Street
J Street
2nd Street
7th Street
Adams Drive
Adler Lane
Bard Lane
Belmont Lane
Buff Street
Canal Street
Canyon Road
Cherry Lane
Conroy Street
Earl Street
Fairgrounds Road
Grizzly Road
Hess Street
Lee Street
Marie Street
Mill Street
Oak Street
10th Street
12th Street

Local Streets

Local streets form the majority of the street system in Madras. They are designed to carry low traffic volumes associated with the local uses that abut them. In Madras, the local streets help form part of the grid system; however, they are not intended to function as alternate routes to the arterial and collector street system.

General Street System Characteristics

There are currently 18 miles of roads under City ownership and control, excluding 4th Street. Of these streets, 14 miles are paved, two miles are graded and drained, and less than a mile is unimproved but open for travel. Of the paved streets, 2.7 miles are asphalt concrete and 11.5 miles are surfaced with an oil mat. Nearly all of the streets were built on native material without sufficient base to support heavy truck loading. The streets vary in width from 34 feet to 54 feet.

The majority of the streets in the core area of the city are from 44 feet wide to 54 feet wide. Most streets are curbed; however, most are lacking sidewalks. Rights-of-way in nearly every instance are 16 feet wider than the street. This allows only 8 feet outside the curb for sidewalks and utilities. Consequently, most utilities are buried within the street.

The unusually wide streets within the city may be a blessing or a liability depending on how they are viewed. Wide streets promote or provide for high traffic volumes, and encourage increased speeds. A 54-foot wide street could easily accommodate four lanes of traffic without curbside parking. Such streets

may be appropriate for major traffic routes, but are less desirable in a local neighborhood. Wide may contribute to excessive heat during the summer and increased storm water run off during rainstorms. The greater width of Madras streets does allow the storage of snow in the center of the street rather than along the sides where it can block driveways and storm sewers.

A number of roads within the Madras TSP planning area are under the jurisdiction of Jefferson County. These are summarized in Appendix A. Of these, many are without shoulders, and have an insufficient base.

While there is a good grid of connecting streets in the core of Madras, no local streets run the entire length of the city from north to south. This feature encourages local north/south traffic to use the state highway.

Two streets, "B" and "C", traverse Madras in the east-west direction. Willow Creek, along with the Madras Elementary and the High School, prevents streets between "C" and Buff Streets from traversing the city. This interruption of the grid system places a greater burden of traffic on "B" and "C" Streets. Although current traffic levels are not excessive on these streets, future development is likely to occur on the east side of Madras, which will place much greater demands on "B" and "C" Streets. "B" Street serves as the primary access to the hospital, which is currently being expanded. A middle school is currently being constructed on "B" Street just east of the Madras city limits. Some of the most desirable home sites lie east of the Madras along "B" Street.

Buff Street, which connects the Madras High School, Buff Elementary, and Madras Elementary to 5th Street, is unusually narrow by Madras standards, with a width of 34 feet at the crest of the hill at 7th Street. This street is quite steep and has an abrupt vertical curve near the intersection with 8th Street. School buses use the route to access the schools in the area, as well as parents driving children to school, children walking or bicycling to and from school, and residents of Madras Ranchos Subdivision. A great deal of attention has recently been given to the potential for motorist, pedestrian, and bicyclist conflicts on this street.

Traffic lights were installed by ODOT in 1991 at the intersections of the State highway and "B" and "D" Streets. These traffic signals were installed at the request of the City of Madras to facilitate safe crossing of the highway by vehicles and pedestrians at these two important locations.

PEDESTRIAN SYSTEM

The most basic transportation option is walking. Walking is the most popular form of exercise in the United States and can be performed by people of all ages and all income levels. However, it is not often considered as a means of travel. This is mainly because pedestrian facilities are generally an afterthought and not planned as an essential component of the transportation system.

The relatively small size of Madras indicates that walking could be employed regularly to reach a variety of destinations. Encouraging pedestrian activities may not only decrease the use of the personal automobile but may also provide benefits for retail businesses. Where people find it safe, convenient, and pleasant to walk, they may linger and take notice of shops that were overlooked before. They may also feel inclined to return to renew the pleasant experience time and again.

Developed facilities for pedestrian travel are scarce in the Madras planning area (Figure 3-2). Sidewalks are confined for the most part to the downtown business section. In this location, the sidewalks are 8 feet wide and concrete. Sidewalks run the length of 4th Street from Pine Street on the north to "J" Street on the south on both sides of the street. Lighting in the area consists of streetlights where cross streets intersect 4th Street. There are no sidewalks from "J" Street south along the highway.

Sidewalks extend along the west side of 5th Street from "J" Street north to Pine Street. There are two gaps in the sidewalk on this side where steep banks along the road would require fill to construct a sidewalk. These gaps occur between "G" Street and "F" Street.

On the east side of 5th Street, sidewalks extend from Buff Street to Oak Street. From Oak Street, the sidewalk extends north along US Highway 97 one block to the intersection with 6th Street. Most of the cross streets between 5th and 4th Streets have sidewalks.

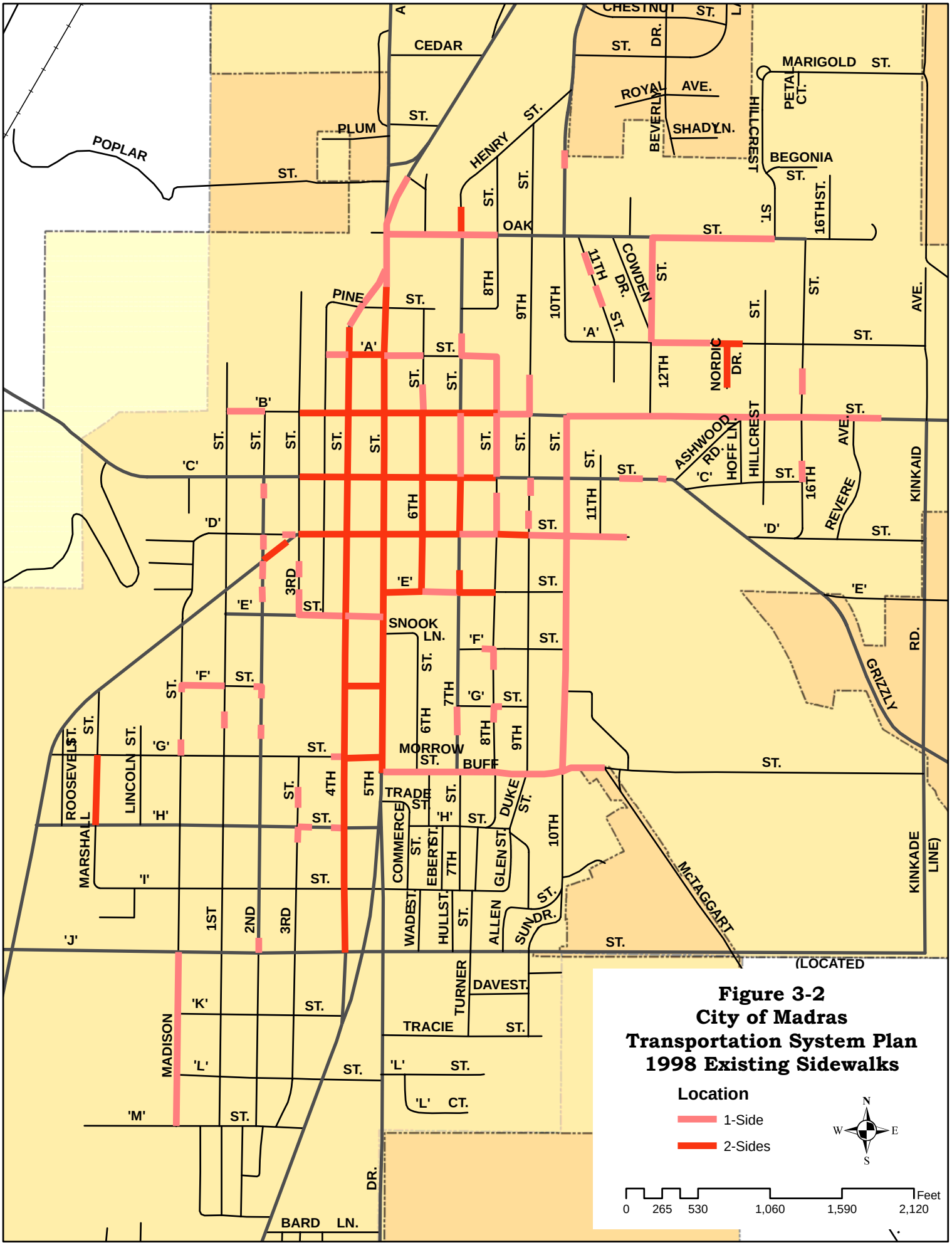


Figure 3-2
City of Madras
Transportation System Plan
1998 Existing Sidewalks

Location

1-Side

2-Sides

N
W E
S

0 265 530 1,060 1,590 2,120 Feet

Sidewalks also extend for a considerable distance along "B" Street. Beginning on the north side of "B" Street at 9th Street, the sidewalk runs to the intersection with 1st Street. Only in front of Madras Builders and Madras Crossings is a sidewalk missing. The sidewalk on the south side of "B" Street begins at 8th Street and extends west to 3rd Street.

There are also sidewalks on "D" Street, particularly on the south side. The walk runs from 10th Street west to 3rd Street. This is a major pedestrian access for children traveling to Madras Elementary. A significant portion of the sidewalk is in poor condition and there are no wheelchair ramps at the corners.

Other than the downtown business district, and along the streets mentioned, sidewalks appear sporadically where their construction has been required with new development. There are few places where one can travel by foot without having to walk in the street. Where sidewalks have been provided, most of the intersections do not have wheelchair ramps. Lighting in most areas consists of streetlights at strategic corners. The remainder of the walkway remains fairly dark at night. Many of the older sections of sidewalk are in a state of disrepair due to excessive weathering. No sidewalks are buffered from adjacent streets by a landscape strip.

A unique opportunity exists along many of Madras' roads. The unusual width of the road may allow the placement of new sidewalks within the paved roadway. This would accomplish several goals: slowing excessive motorist speeds through neighborhoods, reducing the amount of asphalt needed for construction or maintenance of the street, and providing needed sidewalks in areas where pedestrians currently walk unprotected within the street.

The Willow Creek Trail is an 8-foot wide asphaltic concrete pathway; constructed in 1990 that runs from Buff Street north along Willow Creek to 7th Street. Attractive fixtures spaced at approximately 100-foot intervals provide pedestrian scale lighting. The planting of many trees lining the way has further enhanced the Willow Creek Trail. The path is well used by walkers, joggers, and cyclists. The proximity of the path to the schools on 10th Street makes it a good route for children walking to school from the north. The lack of connecting sidewalks, especially at the highway couplet, limits the trail's utility for providing a route to some of Madras' destinations.

The Willow Creek Trail begins again at the end of "D" Street near the Madras Public Works Complex and extends west along Willow Creek to Canyon Road. This section was constructed in 1991 and is approximately ½ mile long. Construction is similar to the older section of the trail. This portion of the trail provides access to other, unpaved trails.

BIKEWAY SYSTEM

Like pedestrians, bicyclists are often overlooked when considering transportation facilities. Bicycles are thought of by many as children's toys. However, cycling is a very efficient mode of travel. Bicycles take up little space on the road or parked,

do not contribute to air or noise pollution, and offer relatively higher speeds than walking. Because of the small size of Madras, a cyclist can travel to any destination in town within a matter of minutes.

Bicycling should be encouraged to reduce the use of automobiles for short trips in order to reduce some of the negative aspects of urban growth. Noise, air pollution, and traffic congestion could be mitigated if more short trips were taken by bicycle or on foot. Typically, a short trip that would be taken by bicycle is around 2 miles.

Bike lanes, which are appropriate for collectors and arterials, were striped on "B" Street in 1993 (Figure 3-3). The bike lanes extend the entire length of the city-owned section of "B" Street from Kinkade Street to 1st Street. Bike lanes are also striped along Buff Street from 5th Street to 10th Street (¼ mile).

The unusual width of many of Madras' local streets easily accommodates bicycle traffic as well as motor vehicle traffic on a shared roadway. Most of these local streets are residential and have low traffic volumes. The major limitation to bicycle travel in Madras is the same as one of the most significant problems for motorists: the lack of connecting streets for through travel.

Another impediment to bicycle use is the lack of parking and storage facilities for bikes throughout the Madras area.

PUBLIC TRANSPORTATION

Public transportation in Madras consists of a "dial-a-ride" demand response service. This service is funded through the Central Oregon Council on Aging (COCOA). This service will pick up and carry senior citizens to any destination within Madras and to Metolius and Culver three days per week (Mondays, Wednesdays and Fridays), as well as to Bend one day per week (Thursdays).

Greyhound bus lines also serves Madras, providing connections to Bend, Portland and Yakima, where transfers can be made to travel to any destination.

The small size and low traffic volumes on city streets would indicate that mass transit is not currently necessary. A citywide public transportation program would not be economically feasible at this time. The Transportation Planning Rule exempts cities of less than population 25,000 from including mass transit facilities in their development regulations. However, Madras is eager to plan for future transit services so that growth patterns will support rather than discourage transit use in the future.

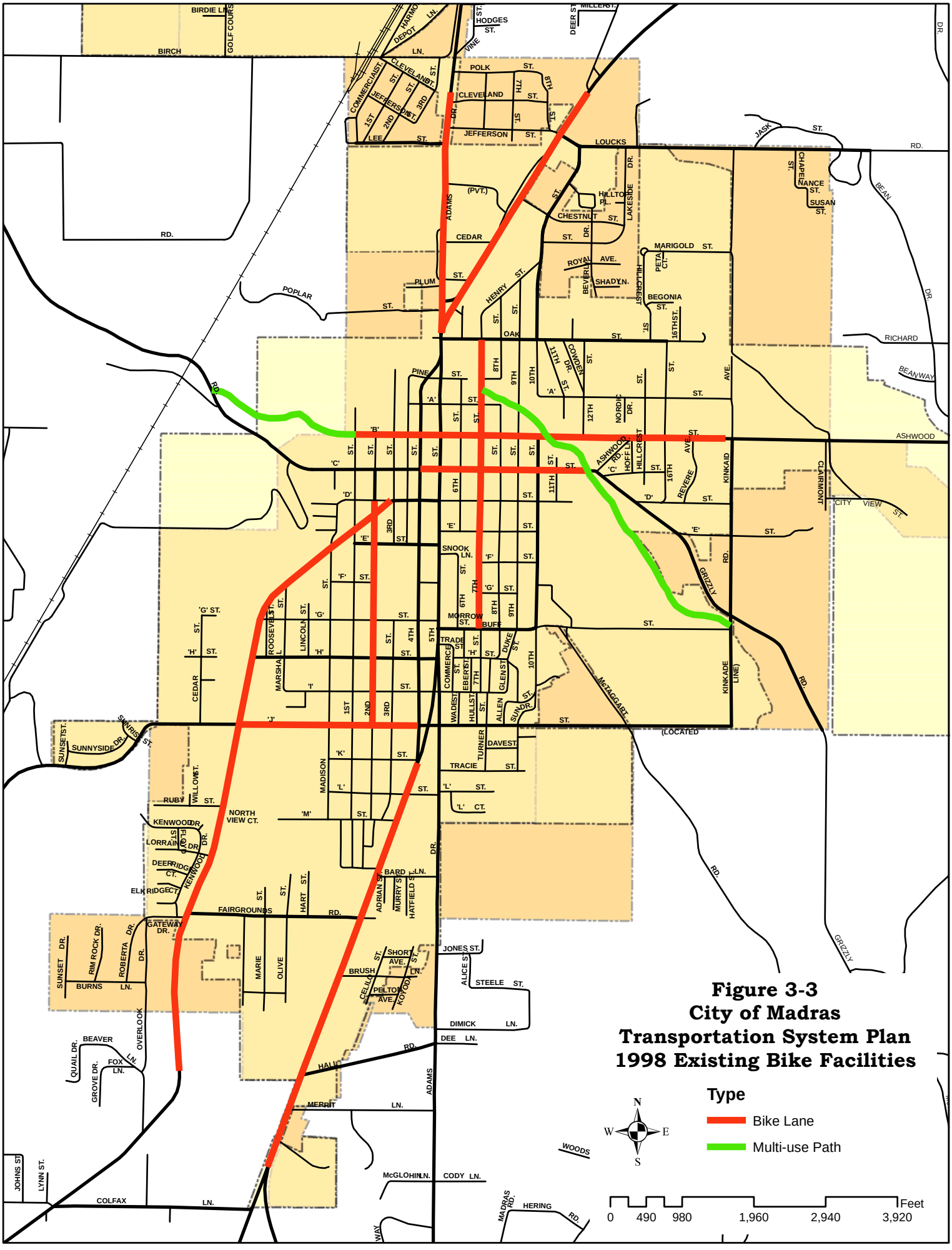


Figure 3-3
City of Madras
Transportation System Plan
1998 Existing Bike Facilities
Type
Bike Lane
Multi-use Path
N
W
E
S
0
490
980
1,960
2,940
3,920
Feet

RAIL SERVICE

The use of railroad facilities for the Madras area is confined mainly to freight trains serving the industrial park north of the city. The only railroad track near Madras is west of town and outside the Madras TSP planning area. There is no passenger rail service currently available locally. Although the current railroad facility does not directly serve the city of Madras, it is vital to the Industrial Park, which is critical to the economic health of the community. Future development must be considered in relationship to the railroad and should not inhibit its use. It is also conceivable that passenger service may someday be desired and restored.

AIR SERVICE

The City of Madras owns and operates a general aviation airport about 5 miles north of town, adjacent to US Highway 26. The airport property is on land developed in the 1940's as an Army air base. Since the city has acquired the property, a number of improvements have been made that add greatly to its serviceability. Leading the improvements is the development and reconstruction of a 5,000-foot runway, a 3,000-foot cross wind runway, and resurfacing of the taxiways. The improvements constructed permit larger and faster aircraft to use the airport. The land available and alignment of the runways permit the main runway to be lengthened to 8,000 feet. This would allow large jets to land at the airport.

Because the airport is governed by its own Master Plan, recommendations for its improvement do not fall into the scope of this TSP. However, the airport is an essential part of the economy of the area. It is necessary to include the airport when considering future development proposals for the surrounding land. In many localities, uses have been allowed around airports that are not compatible with air traffic. This issue is addressed in Chapter 9 (Recommended Policies and Ordinances).

PIPELINE SERVICE

Although not often considered as transportation facilities, pipelines carry liquids and gases very efficiently. The use of pipelines can greatly reduce the number of trucks and rail cars carrying fluids such as natural gas, oil, and gasoline. Recently, a large natural gas pipeline was constructed east of Madras to carry natural gas from Canada to California. Although this pipeline does not serve Madras directly, it has provided economic benefits locally through dollars expended during construction and continuing tax income to the City. Also constructed in 1992 was a 4-inch natural gas pipeline that serves Madras and serves the City of Metolius.

WATER SERVICE

Madras has no waterborne transportation services.

CHAPTER 4: CURRENT TRANSPORTATION CONDITIONS

As part of the planning process, the current operating conditions for the transportation system were evaluated. This evaluation focused primarily on street system operating conditions since the automobile is by far the dominant mode of transportation in Madras. Accident data were also examined to identify hazardous locations. Lastly, census data was examined to determine travel mode distributions.

1994 TRAFFIC VOLUMES

Traffic volumes on the major streets in Madras were measured in the fall of 1994. Traffic surveys included 24-hour counts, peak hour turning movement counts, vehicle classification counts, and through traffic counts. Historic data on the highways were also available.

Average Daily Traffic

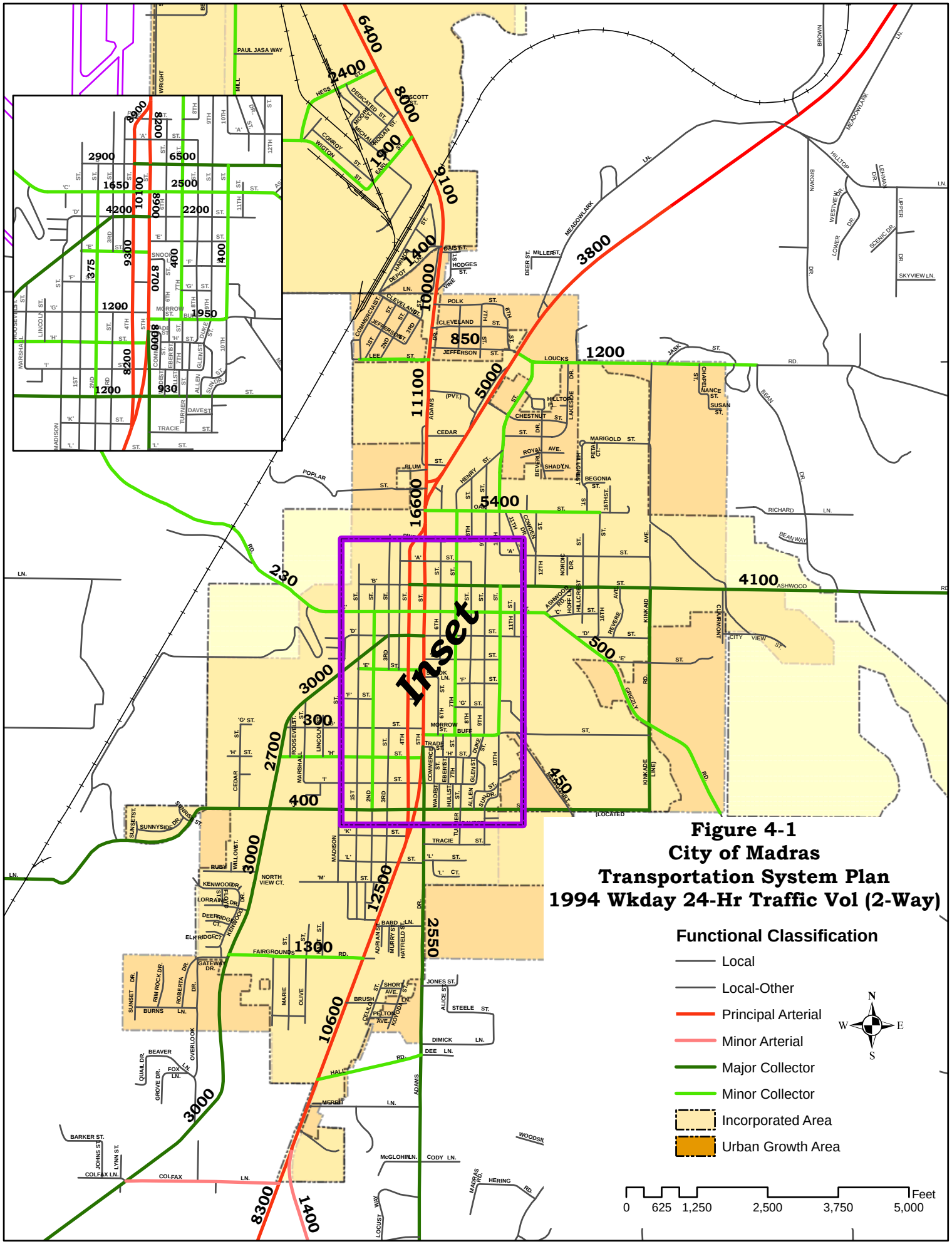
The Average Daily Traffic (ADT) on the major streets in Madras is shown in Figure 4-1. Traffic volumes are lowest outside of Madras and increase as they approach the City. On 5th Street, the greatest volumes occur south of "D" Street, peaking around Buff Street at about 12,000 vehicles per day. On 4th Street, volumes are highest near "D" Street at about 9,500 vehicles per day. The total of these two one-way streets comes to about 21,500 vehicles per day. In comparison, traffic volumes on US Highway 97 through Redmond are around 24,000 vehicles per day, and through Bend the volumes on US Highway 97 are approximately 40,000 vehicles per day.

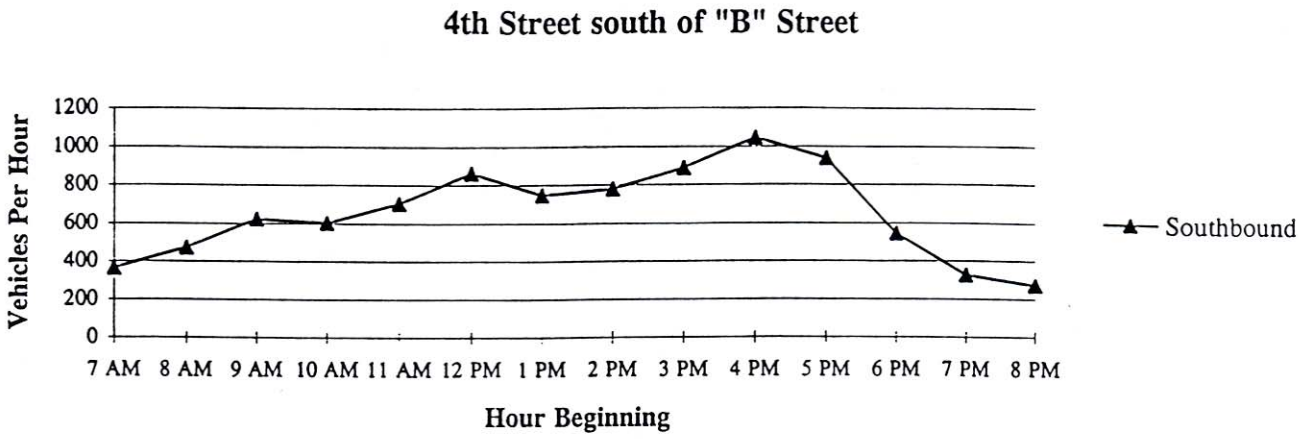
Outside of Madras, vehicle volumes drop off significantly to around 9,400 (1,400 on US 26 and 8,000 on US 97) vehicles per day four miles south of the city limits and 8,100 (5,300 on US 26 and 2,800 on US 97) four miles to the north.

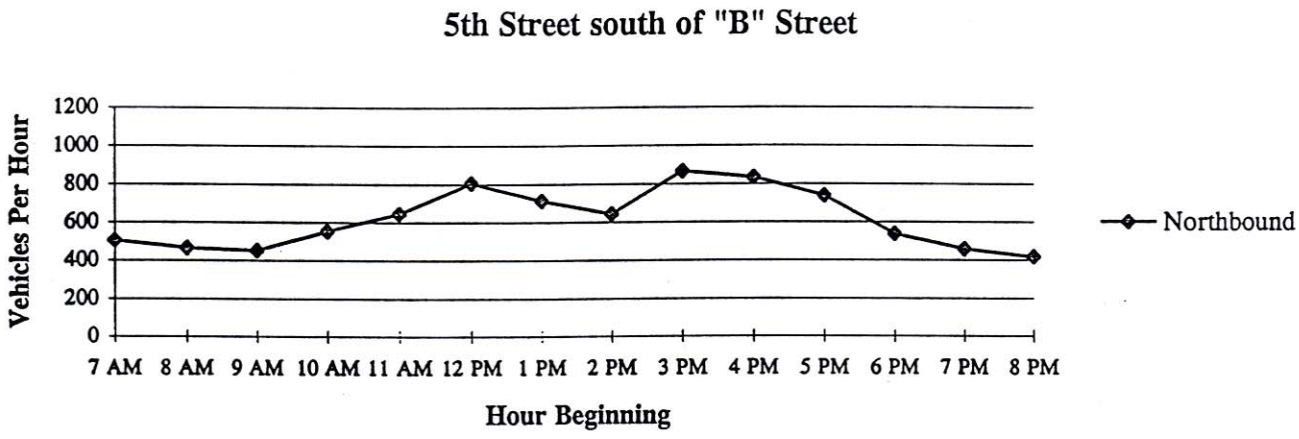
Hourly Traffic Patterns

Hourly traffic patterns at three locations in Madras are shown in Figure 4-2. These patterns are based on 14-hour traffic volumes measured in the fall of 1994. The locations shown in this figure were selected because they are identified as high activity spots by the city.

The first location, 4th Street south of "B" Street, is the point where the major downtown cross street intersects with US Highway 97/26. The peak hour occurs between 4:00 PM and 5:00 PM, with about 1,050 vehicles traveling southbound on 4th Street. Traffic volumes grow gradually throughout the day, with a small peak around noon. After 6:00 PM, traffic activity decreases rapidly.


Inset
Figure 4-1
City of Madras
Transportation System Plan
1994 Wkday 24-Hr Traffic Vol (2-Way)
Functional Classification
Local
Local-Other
Principal Arterial
Minor Arterial
Major Collector
Minor Collector
Incorporated Area
Urban Growth Area
N
W
E
S
0
625
1,250
2,500
3,750
5,000
Feet





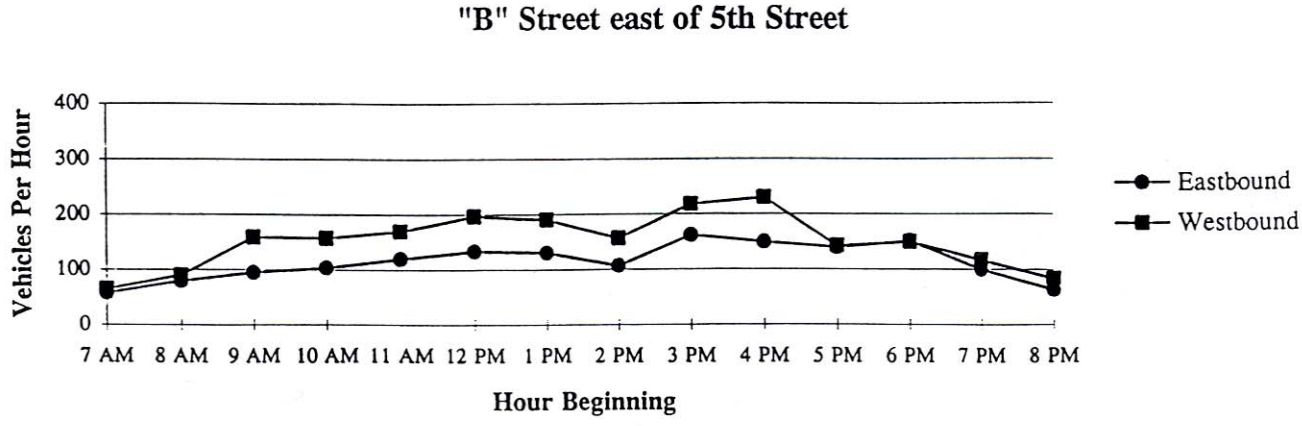


Figure 4-2
Hourly Traffic Patterns

The second location, 5th Street south of "B" Street, shows the other half of the highway couplet. The patterns at this location vary slightly from those on 4th Street. The peak hour is slightly earlier, starting at about 3:00 PM, with a peak of about 850 vehicles traveling northbound on 5th Street. Early morning traffic volumes are higher on 5th Street than 4th Street; but they increase more slowly during the day. The decrease after 6:00 PM is also more gradual. This location has a smaller peak in traffic around noon as well.

"B" Street east of 5th Street is the location of the third traffic pattern shown in Figure 4-2. Traffic volumes are considerably lower at this location than the highway locations. Overall volumes do not vary as much during the day, but the patterns are similar to those for the couplet. The peak hour occurs between 4:00 and 5:00 PM, with about 225 vehicles traveling westbound towards the couplet and about 150 vehicles traveling eastbound away from the couplet.

Weekday PM Peak Hour Volumes

From the hourly traffic patterns, the period of highest activity can be discerned as occurring between 3:00 and 5:00 PM; therefore, testing and evaluation of the street system was based on PM peak hour volumes.

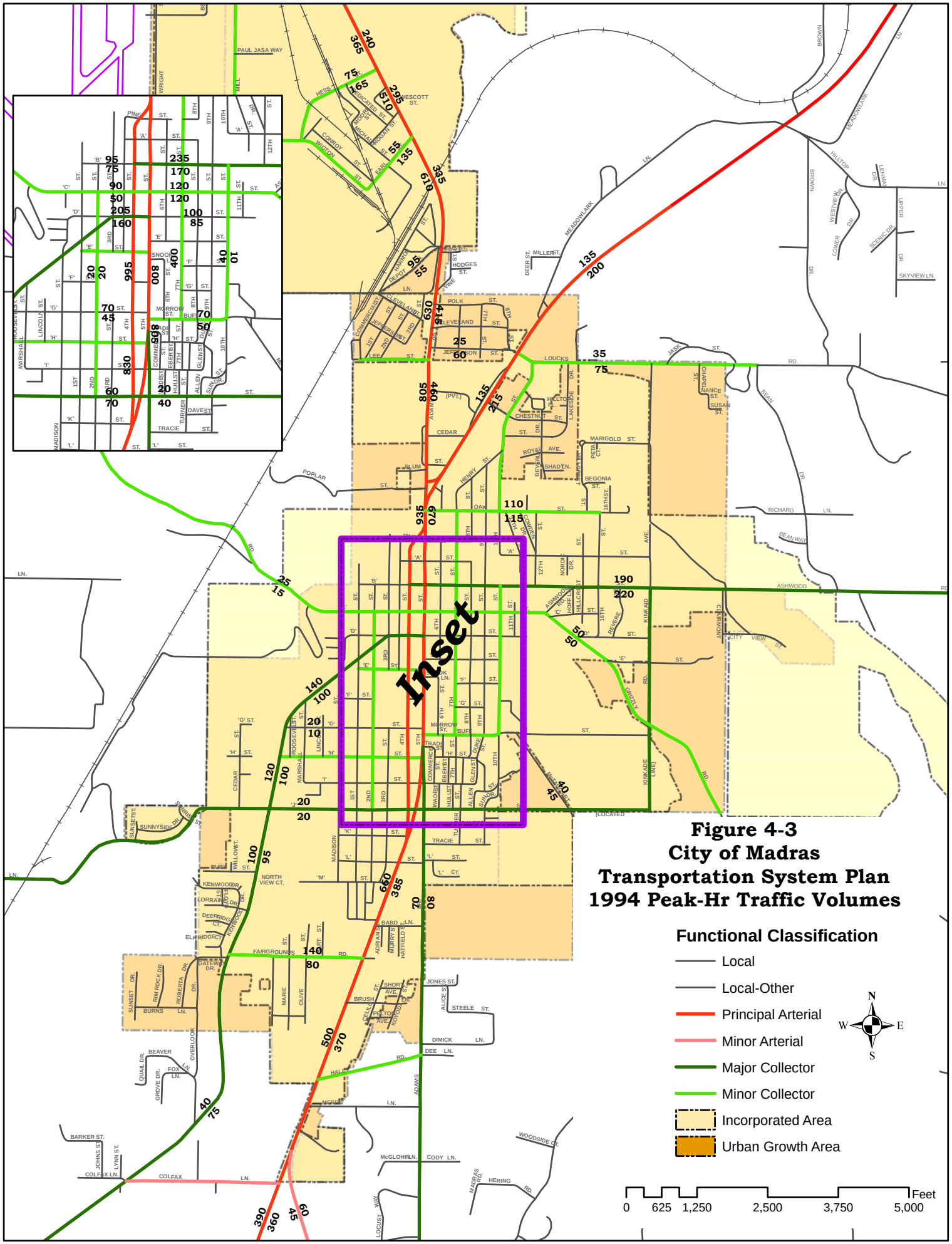
Directional PM peak hour volumes are shown on Figure 4-3. These volumes were calculated based on the 1994 traffic counts. The traffic pattern for the peak hour is similar to the daily traffic patterns. Volumes are highest on the state highways. Volumes on these roadways steadily increase as the roadway approach the downtown core from the boundaries of the study area.

Vehicle classification counts were also taken during the PM peak hour. On Highway 26 north of Madras, trucks are 4 to 5% of the total traffic. On US Highway 97 north of Madras, trucks are about 15% of the southbound traffic and 9% of the northbound traffic. To the south of Madras, trucks are about 8 to 10% of the traffic on US Highway 97 and about 5% of the southbound and 13% of the northbound traffic on Highway 26.

Through Traffic

Through traffic on Highways 26 and 97 was measured by comparing license plates of vehicles entering and exiting the city during the PM peak period. Recorders were stationed at locations immediately outside of the study area on each leg of the highway. Vehicles which passed through Madras in less than one hour were considered to be through traffic.

The through traffic component varies as a percentage of the total highway traffic depending on the location. On the highways outside of Madras, the through traffic component from about 12 to 24% of the total traffic. As local traffic activity increases closer to the downtown core, the through traffic component decreases to less than 10% of the total traffic.


Inset
Figure 4-3
City of Madras
Transportation System Plan
1994 Peak-Hr Traffic Volumes
Functional Classification
Local
Local-Other
Principal Arterial
Minor Arterial
Major Collector
Minor Collector
Incorporated Area
Urban Growth Area
N
W
E
S
0
625
1,250
2,500
3,750
5,000
Feet

On Highway 26 north of the study area, the traffic traveling southbound through Madras is estimated at 22% of the total highway traffic. On US Highway 97, approximately 12% of the southbound traffic are traveling through Madras. After these two highways merge, the through traffic component decreases to as little as 7% on 4th Street between "B" and "D" Streets.

A similar pattern is true for northbound traffic. On US Highway 97 south of the study area, the northbound through traffic comprises approximately 21% of the total northbound traffic. On Highway 26 south of the study area, northbound through traffic comprise about 24%. On 5th Street between "B" and "D" Streets, the through traffic makes up only about 8% of the total northbound traffic.

Average Trip Lengths

From the calibrated model of 1994 traffic volumes, average trip lengths can be estimated (See Table 4-1). More than 4% of the total trips are passing through Madras without stopping. Another 34 to 35% are trips that begin in Madras and end elsewhere, or begin somewhere else and end in Madras. The remaining 61% stay within the study area for their entire trip.

TABLE 4-1

1994 Average Trip Lengths

Trip Type/Length	Number of Trips	Percentage of Total	Percentage of Total within Madras
All Within the Study Area			
Up to 1/4 mile	159	4.1	6.6
1/4 to 1/2 mile	171	4.4	7.1
1/2 mile to 1 mile	409	10.5	17.0
1 mile to 2 miles	469	12.0	19.5
2 miles to 3 miles	639	16.3	26.7
3 miles to 4 miles	367	9.4	15.3
4 miles to 5 miles	83	2.1	3.5
More than 5 miles	103	2.6	4.3
Subtotal	2,400	61.4	100.0
One End of Trip within the Study Area	1,344	34.3	
Through Trips	169	4.3	
Total Trips	3,913	100.0	

Of the trips that are entirely within the study area, almost all trips are five miles or less in length. Approximately 14% are less than ½ mile in length, a distance that can be covered by a pedestrian in less than 15 minutes and by a bicyclist in approximately five minutes. Almost 31% of the trips within the city are less than one mile in length, a distance that could be covered by a pedestrian in less than 25 minutes and by a bicyclist in less than 10 minutes. Another 20% of the trips are between one and two miles in length, and about 27% of the trips are between two and three miles in length. Any of these trips (77% of the total within Madras) would take a bicyclist traveling 10 mph less than 20 minutes.

1995 Street Capacity

Transportation engineers have established various standards for measuring traffic capacity of roadways or intersections. Each standard is associated with a particular level of service (LOS). The LOS concept requires consideration of factors that include travel speed, delay, frequency of interruptions in traffic flow, relative freedom for traffic maneuvers, driving comfort and convenience and operating cost. Six standards have been established ranging from Level A where traffic flow is free-flowing, to Level F, where the street system is totally saturated with traffic and movement is very difficult. Table 4-2 presents the level of service criteria for arterial roadways.

The Oregon Highway Plan (OHP) establishes operating level of service standards for the State highway system[1]. Highways of statewide importance, such as Highways 26 and 97, in urban areas and urbanizing areas should operate at LOS C or better (i.e. stable traffic flow with average speeds between 20 and 25 mph). For highways of district importance, such as the Highway 361, the roadways should operate at LOS D or better in both urban and urbanizing areas.

[1] 1991 Oregon Highway Plan, Appendix A, Table 1, Operating Level of Service Standards for the State Highway System.

TABLE 4-2

Level of Service Criteria for Arterial and Collector Streets

Service Level	Typical Traffic Flow Conditions
A	Relatively free flow of traffic with some stops at signalized or stop sign controlled intersections. Average speeds would be at least 30 miles per hour.
B	Stable traffic flow with slight delays at signalized or stop sign controlled intersections. Average speed would vary between 25 and 30 miles per hour.
C	Stable traffic flow with delays at signalized or stop sign controlled intersections. Delays are greater than at level B but still acceptable to the motorist. The average speeds would vary between 20 and 25 miles per hour.
D	Traffic flow would approach unstable operating conditions. Delays at signalized or stop sign controlled intersections would be tolerable and could include waiting through several signal cycles for some motorists. The average speed would vary between 15 and 20 miles per hour.
E	Traffic flow would be unstable with congestion and intolerable delays to motorists. The average speed would be approximately 10 to 15 miles per hour.
F	Traffic flow would be forced and jammed with stop and go operating conditions and intolerable delays. The average speed would be less than 10 miles per hour.

Source: Transportation Research Board, *Highway Capacity Manual*, Special Report 209. National Research Council, 1985.

The operations at critical intersections in Madras were calculated for the Weekday PM Peak Hour (see Table 4-3).

In general, the intersections currently operate very well. Traffic on Highways 97 and 26 flows smoothly and operates at LOS B or better. There are two locations where delays are very high. US Highway 97 operates at LOS E at its junction with Highway 26 on the north side of town. This level of operation is well below the State standard. Oak Street operates at LOS F at its intersection with the highway indicating considerable delays during the PM peak hour.

TABLE 4-3

Summary of Level of Service at Critical Intersections

Location	Movement	1994
US 26 & Hess St	Northbound; Left	A
	Eastbound; Left, Right	B
US 26 & Earl St	Northbound; Left	A
	Eastbound; Left, Right	B
US 26 & Depot Rd	Northbound; Left	A
	Southbound; Left	A
	Eastbound; Left, Through, Right	C
	Westbound; Left, Through, Right	D
US 97 & US 26 North	Southbound; Left	A
	Westbound; Left, Right	E
US 97/26 & Oak St	Southbound; Left, Right	B
	Westbound; Left, Right	F
4th St & "B" St	All	B (0.51% of capacity)
5th St & "B" St	All	B (0.47% of capacity)
4th St & "D" St	All	B (0.51% of capacity)
5th St & "D" St	All	B (0.39% of capacity)
4th St & "G" St	Eastbound; Through, Right	A
	Westbound; Left, Through	C
5th St & Buff St	Westbound; Right	A
4th St & "J" St	Eastbound; Through, Right	B
	Westbound; Left, Through	C
5th St & "J" St	Eastbound; Left, Through	A
	Westbound; Through, Right	A
US 97/26 & Fairgrounds Rd	Northbound; Left	A
	Eastbound; Left, Right	D
US 97 & US 26 South	Southbound; Left	A
	Westbound; Left, Right	A

ACCIDENT ANALYSIS

Accident data provided by ODOT were examined for the period from January of 1990 through December of 1994. In Madras, there were a total of 113 accidents on US Highway 97/26, as shown in Table 4-4. No single location showed an accident rate that would indicate a location that was particularly unsafe or hazardous.

TABLE 4-4

Accident Analysis

Accident Type	Number of Accidents
Fatalities	3
Injuries	42
Property Damage Only	68
Total	113

TRANSPORTATION DEMAND MANAGEMENT MEASURES

In addition to inventorying the transportation facilities in Madras, transportation demand management measures that are currently in place were also reviewed.

Alternative Work Schedules

Five major employers account for more than 70% of the jobs in the Madras area. The employer, number of employees, and shift schedules are shown in Table 4-5. Most of these employers already stagger the departure times of their workers, which reduces the peak traffic and congestion. Many departure times are also staggered between employers, further spreading traffic volumes over a longer period of time.

Carpooling

Central Oregon Rideshare provides ride-matching services to encourage carpooling. The Oregon Department of Energy, Oregon State University Extension Service, Central Oregon Community College, Central Oregon Environmental Center, and ODOT developed the program. The Rideshare program began in mid-September of 1993 and has established a database of about 100 people. Interested drivers call a toll-free number, provide information about their trip, and are supplied with a list of others in their general area.

TABLE 4-5

Shift Schedules of Major Employers

Employer	Number of Employees	Shift Schedules
Bright Wood Corporation	1050	Staggered departure about 630 people leave between 3:00 and 4:30 PM, about 315 leave between 12:00 and 1:00 AM, and about 105 depart around 6:00 AM
509-J School District	250	Teachers are allowed to depart at 3:30 PM but many stay later. Office employees depart at 5:00 PM
Mountain View Hospital	190	Staggered departure at 2:00 PM, 3:15 PM, and 5:00 PM Night shift of around 50 arrive at 6:15 PM
Jefferson County	172	About 120 depart at 5:00 PM, about 35 depart at 3:00, about 10 depart at 11:00 PM, about 10 depart at 7:00 AM
Keith Manufacturing	120	Staggered departure 1:30 PM, 2:30 PM, 3:30 PM, small night shift arrives at 3:30 PM
Five-Employer Total	1,782	
Total Employees in Madras	2,459	
Percent	72.5 %	

TRAVEL MODE DISTRIBUTION

Although the automobile is the primary mode of travel for most residents in the Madras area, some alternative modes are used as well. Modal split data is not available for all types of trips. However, the 1990 census data does include statistics for journey to work trips as shown in Table 4-6.

Most Madras residents travel to work via a private vehicle. In 1990, 85.9% of all trips to work were in an auto, van, or truck. Trips in single-occupancy vehicles made-up 63.2 % of all trips, and carpooling accounted for 22.7%.

Bicycle usage was fairly low (approximately 1%) in 1990, but the census data does not include trips to school or other non-work activities. There are few roadways with dedicated bicycle lanes on them. In addition to bicycle lanes, bicycle parking, showers, and locker facilities can help to encourage bicycle commuting.

Pedestrian activity was at a moderate level (7.4% of trips to work). Again, census data do not include trips to school or other non-work activities. The difficulty in crossing the State highways at some locations and the separation of residential zones and the major employers (Madras Industrial Park) limit the ability to walk to work.

Although the census data reflects the predominant use of the automobile, the growing population and employment opportunities, relatively short travel distances, level terrain, and clear weather conditions are favorable for other modes of transportation. The Statewide emphasis on providing pedestrian and bicycle facilities along with roadways encourages the use of these modes.

Table 4-6
Journey to Work Trips
1990 Census

Trip Type	Trips	Percent
Private Vehicles	1,203	85.9
Drove alone	885	63.2
Carpooled	318	22.7
Public Transportation	1	0.1
Motorcycle	5	0.4
Bicycle	16	1.1
Walk	104	7.4
Other	11	0.8
Work at Home	60	4.3
Total	1,400	100

Source: U.S. Bureau of Census

CHAPTER 5: TRAVEL FORECASTS

Travel forecasts for the City were based on the land use and roadway designations contained in the existing Madras and Jefferson County Comprehensive Plans. Using the computer-modeling program, TMODEL2[1], future traffic (2015) was estimated for the PM peak hour of a typical weekday to reflect the critical time period of traffic operations.

Modeling is a five-step process: 1) study area definition; 2) land use projection; 3) trip generation; 4) trip distribution; and 5) trip assignment. The computer model is calibrated as closely as possible to an existing condition and then used to forecast future conditions. Calibration is achieved when simulated traffic volumes on the roadway system are generally within 10% of the actual measured traffic. This section defines these terms, describes the modeling process, and outlines the key assumptions for the City of Madras.

STUDY AREA DEFINITION

The first step in modeling requires defining the study area. For this definition, roadways network and traffic analysis zone scheme, which accurately represents the road system and density of land use activity in the study area, was developed.

Roadway System Network

The limits of the roadway system network for the City were defined by the study area boundary (see Figure 1-1). Within this boundary, a network composed of arterial and collector roads was selected. This network includes all of the state highways, most of the county roads, and city streets that are vital to the circulation of traffic in Madras.

Each roadway in the network has specific distance, speed, and capacity characteristics that are important factors in the traffic forecasting process. These factors help determine the route that a driver takes when traveling between two locations.

Traffic Analysis Zones

In addition to defining the study area network, a traffic analysis zone (TAZ) scheme was also developed. The TAZ scheme divides the study area into smaller analysis units that are used to tie land use activity and trip generation to physical locations within the network.

Within the planning area, 35 TAZ's were defined. Physical barriers, land use, and roadway characteristics were factors used to determine the TAZ structure. Whenever possible, the TAZ's were developed to have homogeneous land use characteristics because this scheme results in the most accurate traffic assignment.

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[1] *TMODEL2*, Micro-computer software by Professional Solutions, Inc./Metro, 1991.

Each TAZ is then connected to the network by one or more representative roadways. Since the traffic network does not include every road that exists within the study area, one connector may represent many local roads that are loading onto a collector or arterial street.

Outside of the study area, 10 zones load traffic from external locations, generally traffic from other cities. These zones produce three types of trips. The first type is through trips that begin in one external zone and end in another external zone but will pass through the city. For example, a vehicle traveling from Portland to John Day might take Highway 26 through Madras.
The second type is a trip that begins in the city and ends at another location. An example would be a Madras resident who works in Redmond.

The last type is a trip that begins at another location and ends in Madras, such as someone who lives in Metolius and works in Madras. In the modeling process, the trips traveling to and from these external zones are associated with the actual roads leading into Madras.

EXISTING AND FUTURE LAND USE

Once the traffic analysis zone scheme was defined, both existing and future (2015) land use forecasts were developed. The existing land use was used in the model calibration process. The future land use was the basis for the future travel forecasts.

The land use characteristics that define growth are population and employment. For the travel-forecasting model, the number of single-family and multi-family dwelling units in each TAZ represented population. Employment was broken down by type of land use (i.e. retail/commercial, office, industrial, etc.). Table 5-1 contains a summary of existing and future housing and employment by land use category. Appendix F contains the complete forecast by TAZ together with a detailed explanation of the land use forecasting process.

Existing Population

The existing (1994) population of the City and the surrounding area within the UGB is about 7,400, with about 4,500 within the city limits. This population count was established using 1990 U.S. Census data and 1993 information provided by the Center for Population Research at Portland State University.

As shown in Table 5-1, existing housing within the UGB totals about 2,800 dwelling units. Approximately 60% of these are single family homes (about 55% of them located within the city limits). The remaining 40% consist of multi-family houses, condominiums, and apartments (about 70% of them located within the city limits).

TABLE 5-1

Population and Employment Forecasts

Land Use	1994			2015		
	Within City Limits	Outside City Limits	Total	Within City Limits	Outside City Limits	Total
Single Family Dwelling Units	945	735	1,680	1,630	1,940	3,570
Multi-Family Dwelling Units	790	330	1,120	960	430	1,390
Retail/Commercial Employment	590	110	700	960	345	1,305
Industrial Employment	5	1,080	1,085	5	2,620	2,625
Hospital Employment	175	0	175	300	0	300
Government Office Employment	190	20	210	310	45	355
Office Employment	50	5	55	65	5	70
School Employment	235	0	235	325	75	400
Other Employment	0	5	5	0	5	5
Total Population	4,540	2,855	7,395	6,725	6,165	12,890
Total Dwelling Units	1,735	1,065	2,800	2,590	2,370	4,960
Total Employment	1,245	1,220	2,465	1,965	3,095	5,060

Year 2015 Population

Population within the UGB is estimated at about 12,900 for the year 2015 (just over 50% within the current city limits). This population represents an increase of about 5,500 over the present population, equating to a nearly 75% overall increase in population, or an annual growth rate of 2.56%.

To estimate the 2015 population, historical growth rates were examined. Since 1970, the City of Madras has grown at an annual rate of 3.45% while the overall Jefferson County growth was about 2.26% per year during that period. From long-term data, it is expected that the average growth rate over the next 20 years will be slightly slower than the present rate.

The projected increase of about 5,500 new residents within the study area will create a demand for about 2,160 additional dwelling units by the year 2015 (see Table 5-1). Some TAZ's already contain housing and may be at build-out. These zones will only

accommodate infill or replacement units. Most of these areas lie within the City limits where single- and multi-family housing is expected to increase by about 850 units.

Other TAZs contain large areas of vacant land that are currently zoned for residential use and can accommodate substantial growth. Therefore, for the 2015 estimates, it was assumed that these areas would be developed to capacity according to current minimum lot sizes for the existing zone designations. Two zones outside the eastern boundary of the UGB are expected to accommodate future growth, and the City expects to expand the UGB and City Limits in that direction. The new middle school scheduled to open in 1995 and located on the city's eastern boundary, will influence the speed at which that area develops.

Existing Employment

Existing employment within the study area totals about 2,465 (50% within the city limits). The resulting population/employment ratio is approximately 3.3 to 1. Major employers were identified and located on the TAZ map through visual surveys and information from the Madras Chamber of Commerce, Oregon Employment Department, and Oregon Economic Development Department. More detailed information was obtained from conversations with businesses and government offices.

As indicated in Table 5-1, the employment base within the study area is dominated by the industrial category. Approximately 1,085 of the 2,465 jobs (44%) in the study area are directly related to the Industrial Park north of Madras. Retail/commercial (700 jobs) and government/school (445 jobs) are a distant second and third to industrial employment in the study area. Agricultural-related employment was not included in the employment estimates because most agriculture occurs outside of the Transportation System Plan planning area and does not significantly impact traffic flow through the city.

Year 2015 Employment

Over the next 20 years, Madras employment is expected to more than double to 5,060. The population/employment ratio of the study area is expected to decrease from 3.3 to 2.8 to 1, as Madras grows and urbanizes, increasing its manufacturing and commercial employment. The projections assume that government, medical, and school employment will increase at approximately the same rate as population. Employment in the downtown core areas was projected to increase by a maximum of 20%. The greatest increases in employment will occur in the industrial category.

Most of the employment growth is expected to occur outside of the current City Limits (approximately 60%). This growth is dominated by a projected increase in industrial employment of more than 140% over the next twenty years in the industrial and business parks located north of the city.

TRIP GENERATION

Vehicle trip generation, the next step in the modeling process, is a method of estimating the number and type of trips a specific land use will produce or attract based on historic data and surveys of similar developments. The trip generation estimates were made for each TAZ in the planning area on the basis of the type and quantity of households and employees. Trip generation rates applied to these land uses were derived from the Institute of Transportation Engineers report, *Trip Generation* (*Fifth Edition, 1991*). These rates were modified to reflect generalized land use categories for planning purposes on the basis of experience in other similar size cities in Oregon and through the travel model calibration process. In particular, a trip characteristic survey conducted in Prineville, a similarly sized Central Oregon city, proved useful. In some cases, trip generation rates were slightly higher than the ITE rates, and in other cases they were lower. These trip rates, summarized in Table 5-2, also reflect the existing level of transit service and use of alternative modes. An increase in transit ridership or use of other modes was evaluated with the alternatives.

The land use from which it originates, the land use for which it is destined, and the purpose of the trip define each trip. Trip generation rates were refined for each origin and destination for four purposes:

- Home-based work—Trips between home and a place of employment.
- Home-based shopping—Trips between home and a retail center for the purpose of shopping.
- Home-based other—Trips between home and another land use for a purpose other than employment or shopping (e.g. school trips).
- Non-home based—Trips between two non-residential land uses.

The amount of traffic generated for each TAZ was estimated for the PM peak hour by multiplying the number of households or employees by the appropriate origin and destination trip generation rate by trip purpose. Trip origins and destinations were also calculated for the 10 external roadways leading into Madras. These trip calculations are based on historic growth along the roadways and potential increases in population and/or employment outside of the study area.

TRIP DISTRIBUTION

Vehicle trip distribution, the fourth step in the modeling process, is a method of determining the origin and destination of trips within the study area. For each TAZ, trip origins were distributed to all of the trip destinations within the planning area and to the roads leading out of the study area. Trip origins were also calculated for the roads leading into the area.

A standard gravity model was used for trip distribution. The basic premise of the gravity model is that the number of trips between two areas is directly related to the size of the attractions or destinations in each zone and inversely related to the travel time between zones. For example, if two destination zones of equal size were located 10 and 15 minutes from the origin zone, more of the trips from the origin zone would be distributed to the closer destination zone. Likewise, if two destination zones of different sizes were located equal driving times from the origin zone, more trips would be distributed to the larger destination zone. This procedure was followed for trips originating in all 35 internal zones and the roads leading into the study area.

VEHICLE TRIP ASSIGNMENT

Trip assignment, the final step in the modeling process, is a method of assigning trips distributed between origin zones and destination zones to specific paths on the street system. The forecasting model used a capacity-constrained assignment methodology that assigns traffic in percentage increments to the street system based on travel time. For the first increment, each trip is assigned to the shortest route between its origin and destination based on travel time. The travel time on each route is then adjusted to account for congestion and delay that may result from the first incremental assignment. As the fastest route becomes congested, its travel time increases, possibly making a previously slower route the faster of the two. For the second increment of traffic, each trip follows the same guidelines and is assigned to the quickest route, and then travel times are readjusted to account for the new level of congestion. This process continues until all the increments have been assigned. Using this procedure, the traffic between a single origin/destination pair could be assigned to several routes depending on the congestion of each route, thereby simulating "real world" motorists' choices on a travel route.

MODEL CALIBRATION

Prior to assigning 2015 traffic, this entire process of estimating trip generation, distribution, and assignment was completed for 1994 conditions and compared with actual measurements on the roadway system. The theory behind calibration reasons that if the modeling process forecasts current conditions reasonably well, the same process should then provide a reasonably good estimate of future conditions.

To calibrate the model, the trip generation, distribution, and assignment process was repeatedly modified until the assigned volumes were within approximately 10% of the actual counts. Roadway speed was the key factor used to adjust the trip assignment process.

Data on through traffic were also used to calibrate the model. Through traffic was measured in the fall of 1994 by matching the license numbers of all vehicles entering and leaving the City. The survey found that 15 to 30% of all trips on external roads that enter the City during the PM peak hour are through trips. Within Madras, as traffic volumes vary, through traffic accounts for as little as 5 to 10% of the total traffic. The most common PM peak hour through trip passes northbound along 5th Street from Highway

97 south of the city to Highway 26 north of the city. The reverse path was the second most common through trip.

FUTURE ASSIGNMENTS

For the future traffic analysis, 2015 traffic was first assigned to the existing major street system to determine which portions of the system would be deficient within the next twenty years. The model was then used to evaluate the affects of alternative roadway configurations on traffic assignment.

TABLE 5-2

PM Peak Hour Vehicle Trip Generation Rates
Madras Transportation Planning Model

Land Use:		Single Family	Multi-Family	Retail/ Commercial	Industrial	Hospital	Government Office	Office	School
		Trips/D.U.	Trips/D.U.	Trips/ Employee	Trips/ Employee	Trips/ Employee	Trips/ Employee	Trips/ Employee	Trips/ Employee
Home-Based Work	Origin	0.03	0.02	0.10	0.40	0.10	0.68	0.49	0.68
	Destination	0.39	0.27	0.00	0.05	0.00	0.00	0.00	0.00
Home-Based Shopping	Origin	0.10	0.07	0.93	0.00	0.00	0.00	0.00	0.00
	Destination	0.19	0.13	0.58	0.00	0.00	0.00	0.00	0.00
Home-Based Other	Origin	0.16	0.11	0.00	0.00	0.09	0.00	0.00	0.21
	Destination	0.08	0.06	0.18	0.00	0.03	0.00	0.00	0.10
Non-Home-Based	Origin	0.07	0.05	0.58	0.05	0.02	0.16	0.09	0.16
	Destination	0.08	0.06	0.79	0.05	0.06	0.16	0.12	0.35
Total Rates	Origin	0.36	0.25	1.61	0.45	0.21	0.84	0.58	1.05
	Destination	0.74	0.52	1.55	0.10	0.09	0.16	0.12	0.45

CHAPTER 6: TRANSPORTATION IMPROVEMENT OPTIONS ANALYSIS

A "No Build" scenario, transportation demand management measures, and potential transportation improvements were developed and analyzed as part of the transportation system analysis. These potential improvements were developed with the help of the TAC, referring to the goals and objectives (Chapter 2). The 2005 and 2015 travel patterns, roadway requirements, and costs were analyzed. Based on that analysis, a list of improvements to be incorporated is recommended.

Each of the potential transportation system improvements was developed to address specific deficiencies or access concerns. The following list includes all of the potential transportation system improvements considered. As discussed in the remaining sections of this chapter, not all of these improvements were recommended. The recommendations were based on costs and benefits relative to traffic operations, the transportation system, and the community livability.

- Revise zoning code to allow and encourage mixed-use development and redevelopment.
- Add walkways and bikeways; implement transportation demand management strategies.
- Improve the basic street grid to provide better north-south and east-west routes, as follows:

- Develop 2nd Street as a through street
- Extend "J" Street to Grizzly Road
- Improve Kinkade Road between "B" Street and Grizzly Road
- Improve 10th Street between Buff Street & "J" Street
- Extend "M" Street from Madison Street to State Highway 361
- Extend Fairgrounds Road, east to Adams Drive
- Extend Oak Street from US Highway 97 west to 3rd Street
- Extend 3rd Street north from "B" Street to Oak Street
- Improve "H" Street between State Highway 361 and Madison Street
- Extend Claremont Street south to Grizzly Road
- Realign US Highway 26 junction with US Highway 97 opposite Colfax Ln
- Improve Cherry Ln from US Highway 97 to Madras Airport
- Improve "E" Street from Kinkade Road to Grizzly Road
- Extend Oak Street from 16th Street to Kinkade Road
- Improve Grizzly Road from "C" Street to McTaggart Road
- Add left turn lane, at US Highway 26 north onto Depot Road

- Connect 10th Street between "A" and "B" Street.
- Improve the US Highway 97/26 intersection at the north end of Madras by:
    - Signalized Intersection; and
    - Realignment or US Highway 97
- Create truck route to bypass downtown.
- Redesign US Highway 97/26 couplet south of "J" Street to improve operation of the couplet.
- Connect Canyon Road/Glass Street with Adler Street and the Madras Industrial Park.
- Install traffic signals at two locations on US Highway 26 adjacent to the Industrial Park.

EVALUATION CRITERIA

The evaluation of the potential transportation improvements was based on an analysis of traffic projections, a qualitative review of safety, environmental, socioeconomic, and land use impacts, as well as estimated cost. The traffic analysis considered several factors. The operations of critical signalized and unsignalized intersections were evaluated with the improvements for each potential transportation system improvement. The potential improvements were analyzed to determine if they could reduce congestion and delay, as well as vehicle miles traveled, because of the beneficial effects of that reduction.

In addition to the quantitative traffic analysis, three factors were evaluated qualitatively. These are: 1) safety; 2) environmental factors, such as air quality, noise, and water quality; and 3) socioeconomic and land use impacts, such as right-of-way requirements and impacts on adjacent lands.

The final factor in the evaluation of the potential transportation improvements was cost. Costs were estimated in 1995 dollars based on preliminary alignments for each potential transportation system improvement.

"NO BUILD" SCENARIO"NO BUILD" SCENARIO

The "No Build" scenario establishes the baseline for all other analysis. This scenario assumes that no major changes would be made to the existing transportation system for the next 20 years. However, traffic volumes would increase in Madras as population and employment nearly double by the year 2015. By comparing the future traffic demand with the unchanged transportation system, one can determine where future problems are likely to occur.

Chapter 5 describes in detail how the travel-forecasting model was developed and the population and employment data was used to project 2015 PM peak hour traffic volumes. The results of the "No Build" model run are shown in Figure 6-1.

Motor vehicle traffic volumes (including trucks) throughout the Madras area are projected to increase between 50 and 100% by the year 2015, if no changes occur to modify the current trend of increasing motor vehicle use. On US Highway 26 north of the downtown, volumes would double due to further development in the Madras Industrial Park. In downtown Madras, volumes would increase approximately 50%. South of Madras, volumes on US Highway 97 will increase approximately 75%. The differences in traffic volumes are a function of the location and pattern of future development. If land develops away from the core of the city, the volumes on those roadways would increase more rapidly than those downtown, which are higher to start with. From the travel demand forecasting model for 1994 and 2015, average trip lengths can be estimated (See Table 6-1). The percentage of through trips (trips with no trip-end in Madras) and trips with one-trip-end or both within Madras are similar between 1994 and 2015. However, the distribution of trip distances may change substantially over the next twenty years if current land use patterns are continued.

TABLE 6-1

Future Average Trip Lengths

Trip Type/Length	1994			2015		
	Number of Trips	Percentage of Total	Percentage of Total within Madras	Number of Trips	Percentage of Total	Percentage of Total within Madras
Within the Study Area						
Up to 1/4 mile	159	4.1	6.6	256	3.5	5.5
1/4 to 1/2 mile	171	4.4	7.1	166	2.2	3.6
1/2 mile to 1 mile	409	10.5	17.0	210	2.8	4.5
1 mile to 2 miles	469	12.0	19.5	291	3.9	6.3
2 miles to 3 miles	639	16.3	26.7	356	4.8	7.7
3 miles to 4 miles	367	9.4	15.3	524	7.1	11.3
4 miles to 5 miles	83	2.1	3.5	2,456	33.2	52.6
More than 5 miles	103	2.6	4.3	394	5.3	8.5
Subtotal	2,400	61.4	100.0	4,653	62.8	100.0
One End of Trip within the Study Area	1,344	34.3		2,445	33.0	
Through Trips	169	4.3		308	4.2	
Total Trips	3,913	100.0		7,406	100.0	

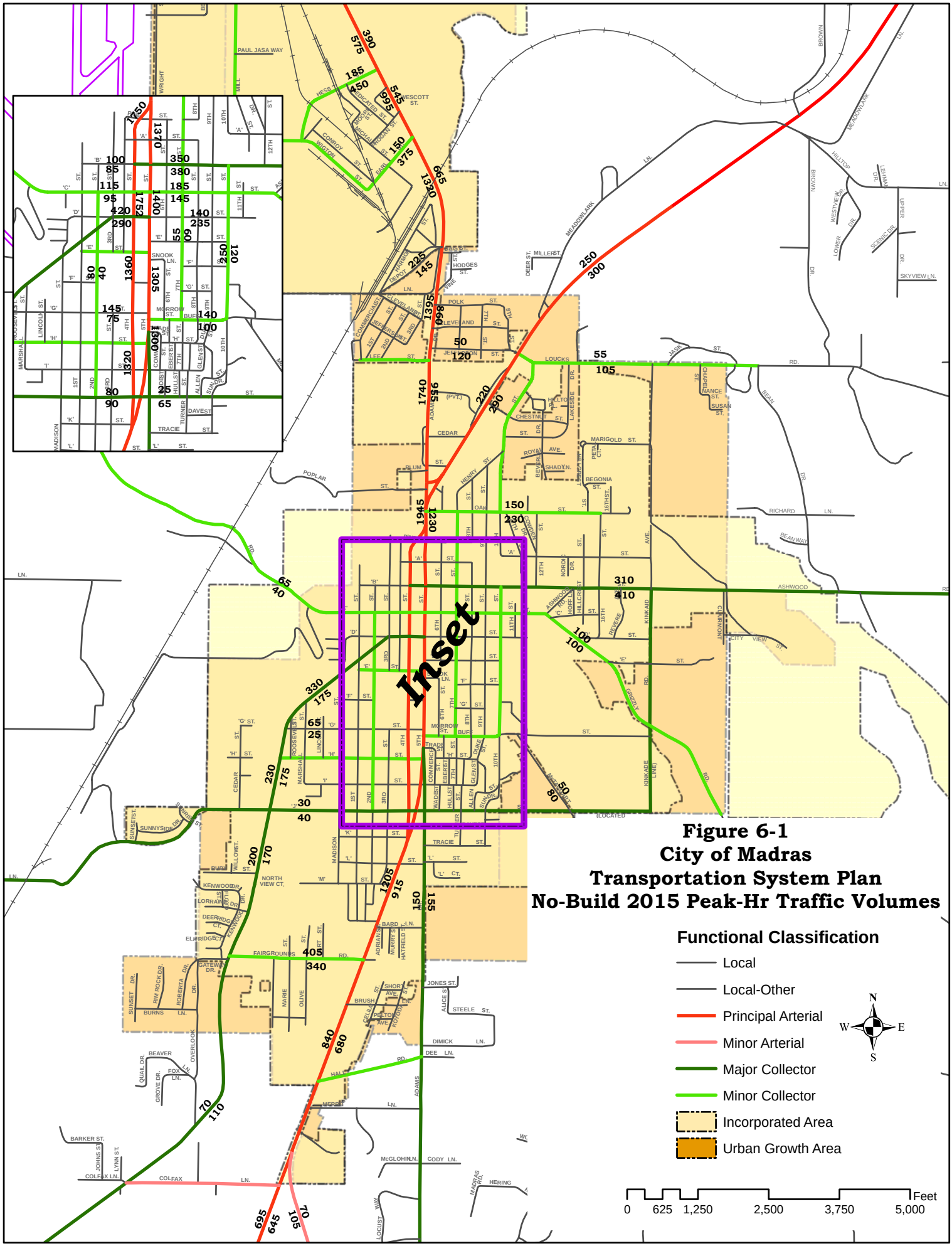
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Figure 6-1
City of Madras
Transportation System Plan
No-Build 2015 Peak-Hr Traffic Volumes
Functional Classification
Local
Local-Other
Principal Arterial
Minor Arterial
Major Collector
Minor Collector
Incorporated Area
Urban Growth Area
N
W
E
S
0
625
1,250
2,500
3,750
5,000
Feet

In 1994, most (95.7%) of the motor vehicle trips that are entirely within the planning area were 5 miles or less in length. Fifty percent of the trips were less than 2 miles in length. Another 25% were 2 to 3 miles in length. The remainder of trips were over 3 miles in length.

By 2015, most (91.5%) of the trips that are entirely within the study area would still be under 5 miles in length. However, the distribution of trips would be much higher for longer trips. About 20% of the trips would be less than 2 miles in length. Less than 20% are between 2 and 4 miles in length. The largest category would be 4 to 5 miles in length with about 50% of the trips.

These increases in average trip length translate to a much greater number of vehicle miles traveled than at present. Although the number of trips generated in the city is expected to double over the next 20 years, the higher average trip length would result in total vehicle miles more than tripling during the same time period.

The increases in motor vehicle volumes under the assumptions of the model would result in the intersection operations summarized in Table 6-2. Side street intersections with the US Highway 97/26 corridor are the principal locations where failure would occur. The addition of traffic signals may mitigate the failures at some of the intersections. However, ODOT policy limiting use of traffic signals on State highways, together with the geometry and topography of the street system would require investigation of additional improvements before they are recommended. At the US Highway 26 intersections serving the Madras Industrial Park and development north of the City (Hess Street, Earl Street, Depot Road), all of the side streets and some of the highway left turns would operate at failure or near failure conditions.

The north junction of Highways 97/26 is also expected to reach a failure condition by the year 2015. The principal problem at this intersection would be the southbound movement from US Highway 97 onto US Highway 97/26. The intersection of US Highway 97/26 and Oak Street would continue to operate at a failure condition with its present configuration and traffic control.

The intersections of "J" Street with 4th Street and 5th Street would also worsen by the year 2015. The queues caused by delays at the stop signs on "J" Street may result in unsafe conditions due to the closeness of 4th and 5th Street to each other and to Adams Drive.

Fairground Road is also expected to experience substantial delays due to the higher volumes on US Highway 97/26. Delays at the south junction of Highways 97/26 would also increase from LOS A in 1994 to LOS D by the year 2015. Making the left turn at this junction would be particularly difficult.

The increased congestion and delay in the "No Build" scenario would have both environmental and socioeconomic impacts. Air quality and noise levels would worsen along the US Highway 97/26 corridor due to increased congestion. The environmental impacts and long delays would also affect the livability of Madras, which might discourage new residents and businesses from locating in the area.

TABLE 6-2

Summary of Level of Service at Critical Intersections: Existing and 2015 "No Build"

Location	Traffic Movement	1994 Existing Level of Service	2015 "No Build" Level of Service
Hwy 26 & Hess St	Northbound; Left	A	B
	Eastbound; Left, Right	B	F
Hwy 26 & Earl St	Northbound; Left	A	D
	Eastbound; Left, Right	B	F
Hwy 26 & Depot Rd	Northbound; Left	A	E
	Southbound; Left	A	A
	Eastbound; Left, Through, Right	C	F
	Westbound: Left, Through, Right	D	F
Hwy 97 & Hwy 26 North	Southbound; Left	A	C
	Westbound; Left, Right	E	F
Hwy 97/26 & Oak St	Southbound; Left	B	E
	Westbound; Left, Right	F	F
4th St & "B" St	All	B (51% capacity)	B (86% capacity)
5th St & "B" St	All	B (47% capacity)	B (77% capacity)
4th St & "D" St	All	B (51% capacity)	B (82% capacity)
5th St & "D" St	All	B (39% capacity)	B (61% capacity)
4th St & "G" St	Eastbound; Through, Right	A	C
	Westbound; Left, Through	C	E
5th St & Buff St	Westbound; Right	A	B
4th St & "J" St	Eastbound; Through, Right	B	D
	Westbound; Left, Through	C	E
5th St & "J" St	Eastbound; Left, Through	A	D
	Westbound; Through, Right	A	C
Hwy 97/26 & Fairgrounds Rd	Northbound; Left	A	C
	Eastbound; Left, Through, Right	D	F
Hwy 97 & Hwy 26 South	Southbound; Left	A	A
	Westbound; Left, Through, Right	A	D

Notes: The Level of Service is shown for all movements of the unsignalized intersections. At signalized intersections, the overall Level of Service is shown for the intersection together with the overall volume versus capacity ratio.

EVALUATION OF POTENTIAL TRANSPORTATION IMPROVEMENTS

Option 1. Revise Zoning and Development Codes

This improvement would amend Madras' zoning and development codes to permit mixed use developments and increases in density in certain areas. Specific amendments include allowing neighborhood commercial uses within residential zones and allowing residential uses within commercial zones.

Such code amendments can encourage residents to walk and bicycle throughout the community by providing shorter travel distances between land uses. A shift in mode could reduce reliance on the automobile, a goal of the State Transportation Planning Rule. These changes combined with the construction of new sidewalks and bicycle lanes can help reduce traffic congestion and improve air quality and noise levels in Madras. Maintaining the livability of the community also encourages new residents and businesses to locate in Madras, helping to keep the area economically viable.

The suggested code amendments are included in Chapter 9 of this Transportation System Plan.

Cost: No direct costs are associated with making the zoning code amendments.

Recommendation: Because this transportation improvement would contribute to less need for new road construction and would enhance the quality of life in the Madras area, it is recommended.

Option 2. Add Walkways and Bikeways; Implement Transportation Demand Management Strategies

This improvement would change the demand on the transportation system by providing facilities for other modes of transportation, implementing carpooling programs, altering shift schedules, and applying other transportation measures within the community.

The construction and maintenance of walkways and bikeways is needed within the Madras area to improve safety for pedestrians and bicyclists and encourage more residents to limit their use of motorized vehicles. The addition of new sidewalks and bicycle lanes should be considered as part of all new street improvement projects. Local businesses, particularly those within the Madras Industrial Park should be encouraged to institute carpooling or vanpooling programs for their employees. Local businesses should also be encouraged to stagger shifts so that travel to and from work is spread over a longer period.

A sensitivity exercise was performed using the average trip lengths from the model to test the effects of different trip reduction options. Each option was compared to the "No Build" condition. The results of this sensitivity test are summarized in Table 6-3.

TABLE 6-3

Effect of Transportation Demand Management Measures

Trip Type/Length	"No Build"	A	B	C	D	E
Within the Study Area						
Up to 1/2 mile	422	379	338	338	338	338
1/2 mile to 2 miles	501	451	451	401	401	401
2 miles to 5 miles	3,336	3,336	3,336	3,336	3,169	3,169
More than 5 miles	394	394	394	394	394	374
Subtotal	4,653	4,561	4,519	4,468	4,302	4,282
One End of Trip within the Study Area	2,445	2,445	2,445	2,445	2,445	2,323
Through Trips	308	308	308	308	308	308
Total Trips	7,406	7,314	7,272	7,221	7,055	6,913
Percent Reduction	NA	1.2	1.8	2.5	4.7	6.7

"No Build": No trip reductions
A: "No Build" with a 10% reduction in trips under 2 miles.
B: "No Build" with a 20% reduction in trips under ˝ mile and 10% reduction in trips from ˝ to 2 miles.
C: "No Build" with a 20% reduction in trips under 2 miles.
D: "No Build" with a 20% reduction in trips under 2 miles and a 5% reduction in trips from 2 to 5 miles.
E: "No Build" with a 20% reduction in trips under 2 miles and a 5% reduction in trips over 2 miles or with only one end within the study area.

A through E looked at different reductions in trip length due to the implementation of transportation demand management measures. The reduction in trips of less than 2 miles was assumed to be between 10 and 20%. These reductions would occur predominantly because of modal shifts from motor vehicles to walking or bicycling. Trips over 2 miles were tested with reductions between 0 and 5%. The reductions at this distance may also be due to carpooling measures as well as modal shifts.

Overall, the options resulted in total trip reductions of less than 10% in all cases. This indicates that, while some beneficial mode shifting would occur, Madras would have a need for additional transportation improvements unless further measures are undertaken.

The predicted mode shifts and demands management measures would contribute to improved traffic flow and less congestion. These conditions mean air quality and noise levels would be better than the "No Build" Condition. Fewer vehicle miles traveled would also result in reduced energy consumption. In addition, providing adequate facilities for pedestrians and bicyclists increases the livability of a city, and improves traffic safety.

Nineteen bicycle improvements have been identified. Details of these recommendations are provided in Chapter 7 and in Appendix G. Nine pedestrian improvements have also been identified. Details of these recommendations are provided in Chapter 7.

Cost: The cost of improving the pedestrian system is estimated at $1,400,000 and the cost for improving the bicycle system is estimated at $594,140. These cost estimates are for stand-alone improvements; the cost of these improvements can be reduced when they are included as needed in roadway improvement projects throughout the Madras urban area.

Recommendation: Because this option would provide needed facilities for pedestrians and bicyclists, increase the safety of the roadway system, and enhance the quality of life in the Madras area, these transportation improvements are recommended.

Option 3. Improve the Basic Street Grid

This potential transportation improvement suggests a combination of local street system improvements designed to provide an excellent circulation system for local traffic. An improved basic grid of local streets would enable cars, bicycles, and pedestrians to travel through Madras more efficiently and with less use of the state highways.

Basic street system improvements will enable Madras to develop a more complete street grid system. The grid pattern will allow the local street system to function more efficiently and reduce reliance on Highways 97 and 26 within the Madras urban area. The local street grid system when combined with the addition of new sidewalks and bicycle lanes and paths will also encourage people to limit their use of automobiles. *The basic street system improvements will need to be made in addition to any of the other site-specific options that are adopted as part of the Madras Transportation System Plan.*

As shown in Figure 6-2, the elements of this option include the following projects:

- **Develop 2nd Street as a Through Street Between "M" Street and "B" Street**

  The existing mild grades and adequate width as well as current usage suggest this improvement. This project would provide an alternative to using the highway to travel north and south on the west side of town. The lack of adequate base would require considerable reconstruction activity to allow the use of trucks and other heavy vehicles.

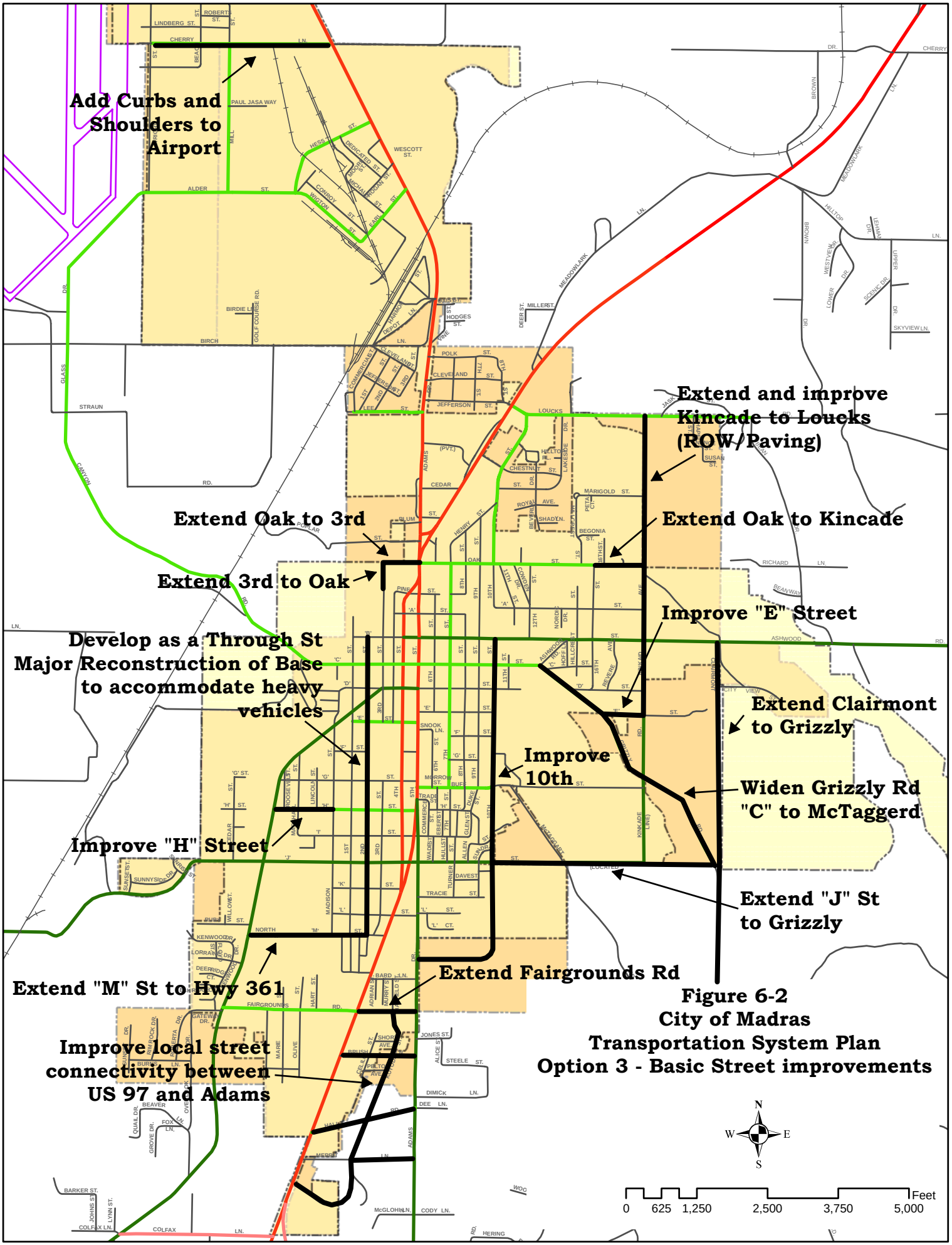


Figure 6-2
City of Madras
Transportation System Plan
Option 3 - Basic Street improvements

- **Extend "J" Street to Grizzly Road**

  The extension of "J" Street to McTaggart Road was initially recommended by ODOT as a result of a traffic study conducted to determine how to alleviate congestion and conflict on Buff Street. This extension would reduce the traffic on Buff Street by providing an alternate for traffic originating from the south to access the central business section and the State highway without traveling this street. Plans are being developed for this improvement. Additional right-of-way would be required from the Fire Station at "J" Street/South Adams Drive intersection. In addition, relocation of existing driveways, sidewalks, and utilities will be needed.

  Along with the extension of "J" Street to McTaggart Road, "J" Street would be extended across Willow Creek to Grizzly Road. An east/west route from Grizzly Road to the business district and US Highway 97/26 is needed. Presently, traffic is relatively heavy on Grizzly Road and all that traffic must now enter Madras on "C" Street. The difficulty with that much traffic being funneled through "C" Street is that "C" Street is mainly a residential area and the intersection with US Highway 97 lies directly between two signalized intersections.

  It should be noted that "J" Street, from 5th Street east, is a County-owned and maintained road. Just east of 10th Street, the extension of "J" Street would leave the current city limits. Madras would need to work with the County to implement this improvement. Work has begun between City and County officials to lay out the route for the extension. "J" Street would become much more important after the construction of the new middle school and with the anticipated growth on the east side of the city.

- **Improve SE Kinkade Street between "B" Street and Grizzly Road**

  This section of SE Kinkade Street is an unimproved right-of-way that runs between Grizzly Road and "B" Street. Improved, this street would provide an important travel route for traffic generated by the new middle school and new residential areas developing on the east side. City sewer and water exist in the area and pressures for growth are high. This alignment would relieve traffic volumes on "B" and "C" Streets to help avoid future congestion.

  The existing right-of-way width of 60 feet should be widened to further provide for adequate road, sidewalk, and utilities. There would also be the need to make substantial cuts and fills due to the hilly terrain. The wider right-of-way would permit room for cut slopes and fill banks. Access from the street should be limited to provide for through traffic.

- **Improve SE 10th Street between Buff Street and "J" Street**

  Jefferson County owns and maintains SE 10th Street between SE Buff Street and SE "J" Street. This section is currently a gravel road with several steep grades and vertical curves. Substantial work would be required to bring the street up to City standards. Development of this street is needed to provide better access to property in the Wistful Vista subdivision and to the schools on 10th and Buff Streets. As with the development of "J" Street, improving this portion of 10th Street would relieve traffic pressure on Buff Street. The City would need to work with the County to improve this street.

- **Extend SE "M" Street from Madison Street to State Highway 361**

  The extension of SE "M" Street from Madison Street to State Highway 361 would provide access to properties that would be otherwise landlocked, and relieve congestion on "J" Street west of US Highway 97. The gentle grades make this a desirable extension. The City's participation in an extension at this time would be to reserve right-of-way along the alignment and ensure that future development would not block the extension.

- **Extend Fairgrounds Road East to S Adams Drive**

  There is currently a substantial development along S Adams Drive. Without an adequate connection west from S Adams Drive, all the traffic generated must either travel north to "J" Street or south to the US Highway 26, or traverse one of the poorly designed streets such as Bard Lane to access US Highway 97. The alignment and existing development at the intersection of S Adams Drive and "J" Street make this an undesirable location to channel traffic.

  To extend Fairgrounds Road east would require the acquisition of right-of-way along with the construction of needed improvements. Unfortunately, the dedicated right-of-way that would have allowed for some of the extension has been vacated in the past.

- **Extend Oak Street West from US Highway 97 to 3rd Street**

  To extend Oak Street west would require additional right-of-way. There are several homes in the area using this section of roadway, which is not improved and is not in the City maintenance inventory. There have been several requests for the City to improve this road. There is no other access route out of the area and all traffic must enter the highway. The improvements would work in concert with the next proposal, the improvement of 3rd Street.

- **Extend 3rd Street North from "B" Street to Oak Street**

  Third Street in this section consists only of right-of-way at this time. The street was platted but never improved. To connect 3rd Street between Oak and "B" Streets would require a bridge across Willow Creek. A majority of the cost of improving this section would be directly attributed to the bridge construction. By developing this street, additional access would be provided to property in the city without causing greater impact upon the State highway.

- **Improve "H" Street Between State Highway 361 and Madison Street**

  Currently, this section of "H" Street is graveled with curbs and would require a minimum of investment to improve to City standards. The remaining section of "H" Street is in good condition with an asphalt surface. There is already good base under the section being considered and could carry heavy truck traffic. This street is preferable to "G" Street as an east/west route since the grades are milder. There is also a City park under development along this section of the street.

- **Extend Claremont Street south to Grizzly Road**

  With the construction of the new school on "B" Street, access to and from the east side of Madras becomes critical. Currently, the only access to the school is from "B" Street. By creating a connection between "B" Street and Grizzly Road along the Claremont Street right-of-way route, improved access to the school from the south would be provided. Grading for some of this route has already begun.

- **Realign US Highway 26 junction with US Highway 97 opposite Colfax Road**

  This is a project that ODOT has been pursuing for a variety of reasons. The current approach of US Highway 26 is not perpendicular to US Highway 97. The right turns have an easy movement with an angle greater than 90 degrees, which allows vehicles to accelerate into traffic. The left turn is much more difficult to make because of the sharp angle and the traffic coming from two directions. Although the right turn movement is more frequent than the left turn, improving the geometry of this intersection is important.

  By realigning the US Highway 26 approach opposite Colfax Lane a single intersection is formed. This has the safety advantage of reducing the number of locations where vehicles may turn onto and off of the highway. It also allows traffic to travel through from US

Highway 26 to Colfax Lane, providing a shorter, safer route between Culver and Prineville.

- **Improve Cherry Lane from US Highway 26 to the Airport**

  This would improve access to the Madras Airport by adding shoulders and curbs to Cherry Lane between US Highway 26 and airport. The road at present is narrow, and would be insufficient to support expected increases in the use of the airport.

- **Improve "E" Street from Kinkade Road to Grizzly Road**

  This option improves the street grid within the City.

- **Extend Oak Street from 16th Street to Kinkade Road**

  This option improves the street grid within the City.

- **Improve Grizzly Road from "C" Street to McTaggart Road**

  This option improves the street grid within the City, and would improve existing safety concerns.

- **Add a Left-turn Lane from US Highway 26 northbound onto Depot Road**

  US Highway 26 northbound currently has two northbound lanes at the intersection with Depot Road on a steep grade. Without an exclusive left-turn lane, vehicles turning left onto Depot Road must stop in the left-hand lane, blocking traffic. Since this is a passing lane for faster vehicles to go around slower vehicles accelerating up the hill, it causes problems in the traffic flow and perhaps dangerous lane changes. A left-turn lane would alleviate this problem.

This list of street improvement projects was developed from the 1993 City of Madras Transportation Development Plan, inventory and analysis of the current and projected traffic volumes, and from public input generated at a series of public meetings and through the development review process. It is expected that all of these street improvements would be necessary during the next 20 years. The timing of individual improvements would be guided by population growth and corresponding growth in traffic volumes.

The basic street system improvements would enable Madras to develop a more complete street grid system. The grid pattern would allow the local street system to function more efficiently and reduce reliance on Highways 97 and 26 within the Madras urban area. The local street grid system combined with the addition of new sidewalks and bicycle lanes and paths would also encourage people to limit their use of automobiles.

Cost: The overall cost of the basic street system improvements is estimated at $6,265,000.

Recommendation: Because this transportation improvement would result in improved traffic flow, better air quality and noise levels, a reduction in the number of vehicle miles traveled, a more pleasant living and working environment, and a safer transportation system, it is recommended.

Option 4. Connect 10th Street between "A" and "B" Streets

This transportation improvement would connect the missing link on 10th Street between "A" and "B" Streets. This connection would provide an eastside parallel route extending most of the length of Madras.

Although this connection would be beneficial for circulation, it has several geographical challenges that would make it very difficult and costly to implement. The grade between "B" and "" Streets is very steep. Also, Willow Creek runs between these cross streets, and a bridge crossing would be needed. Such a bridge would eliminate a portion of the Willow Creek Trail, may require fill into the creek, and could have water quality impacts on the creek from road surface runoff.

Cost: Because this option was dismissed early in the planning process for environmental reasons, no costs were estimated.

Recommendation: Because this improvement would have excessive impact costs relative to the benefits, it is not recommended.

Option 5. Improve the US Highway 97/26 Intersection at the North End of Madras

ODOT and Madras have identified the junction of Highways 97 and 26 at the north end of Madras as a problem area for many years. Portions of the intersection currently function at a LOS E, and further degradation is expected in the future. Trucks heavily use the highways. The junction is very difficult and dangerous to cross on foot or bicycle, and is also difficult for motorized cross traffic.

An ODOT design team, working with the City of Madras, the TAC, the public, stakeholders, and the Madras Planning Commission, has developed a number of concepts for improving the US Highway 97/26 intersection. These are summarized in Table 6-4 and discussed further in Appendix I. The two concepts that best meet the operational and safety goals for the intersection are discussed below as alternatives 5A and 10B.

Table 6-4: Summary of Intersection Improvement Concepts

CONCEPT	COST	2015 LOS
5A: Signalization (Recommended Alternative 5A)	$1,500,000	C
10B: Hwy 26 Realignment w/3rd St Connection (Recommended Alternative 10B)	$3,900.000	C-D
Jefferson St. Grade Separation	$5,200,000	D
Modified Jefferson St. Grade Separation	$4,200,000	D
Cedar St. Grade Separation	$3,900,00	D
Folded Loop w/Stop Sign	$4,500,000	D
Folded Loop w/Ramp	$4,500,000	D
Grade separation w/3rd St Connection	$5,400,000	D
Grade separation w/o 3rd St Connection	$5,400,000	D
Hwy 26 Realignment w/o 3rd St Connection	$3,900.000	C

- **Alternative 5A: At-Grade Signalization**

  Overview: Reroute US Highway 97 traffic onto 6th Street to connect with US Highway 26 at a signalized intersection north of Pine Street where the 4th/5th Street couplet begins (Figure 6-3). This improvement would divert US Highway 97 traffic down the present 6th Street right-of-way and go through the existing ODOT maintenance facility to make a connection at the north junction of 4th and 5th streets. The section of highway located between 6th Street and US Highway 26 would be abandoned after this improvement was in place. This option would require the acquisition of the ODOT maintenance facility that is used to store equipment and rock. A traffic signal would be constructed at the couplet intersection of the rerouted US Highway 97 and the junction of 4th and 5th.

  Operations Analysis: Traffic modeling and analysis of Option 5A shows a substantial improvement in operations. The major shift in traffic would be the southbound left turns from US Highway 97. Because the traffic from US Highway 97, which currently experiences long delays, would be able to merge easily at the signalized intersection, delays would be significantly reduced. Movements that are currently near failure, and would certainly fail over the next 20 years, would improve from LOS F to LOS C.

  A second smaller shift of traffic making westbound left turns from Oak Street would also shift onto the new highway alignment to use the signalized intersection. An added benefit of this option would be the improvement in operations from LOS F to LOS B at the Oak Street intersection. Depending on projected traffic volumes at the time of construction, Oak Street will be cul-de-saced either initially or at a later date.

This intersection configuration would also be safer than the current intersection configuration for two reasons. First, it would eliminate the risks associated with turning from either US Highway 97 or Oak Street into the oncoming US Highway 26-traffic stream. Second, pedestrians and bicyclists would have the protection of crossing US Highway 97/26 at a signalized intersection.

This analysis assumes that the City of Madras would allow US Highway 97 to be rerouted along 6th Street, between US Highway 97 and a point north of Pine Street; and that ODOT would abandon the existing state highway maintenance facility, located at the intersection of 4th and Oak Streets.

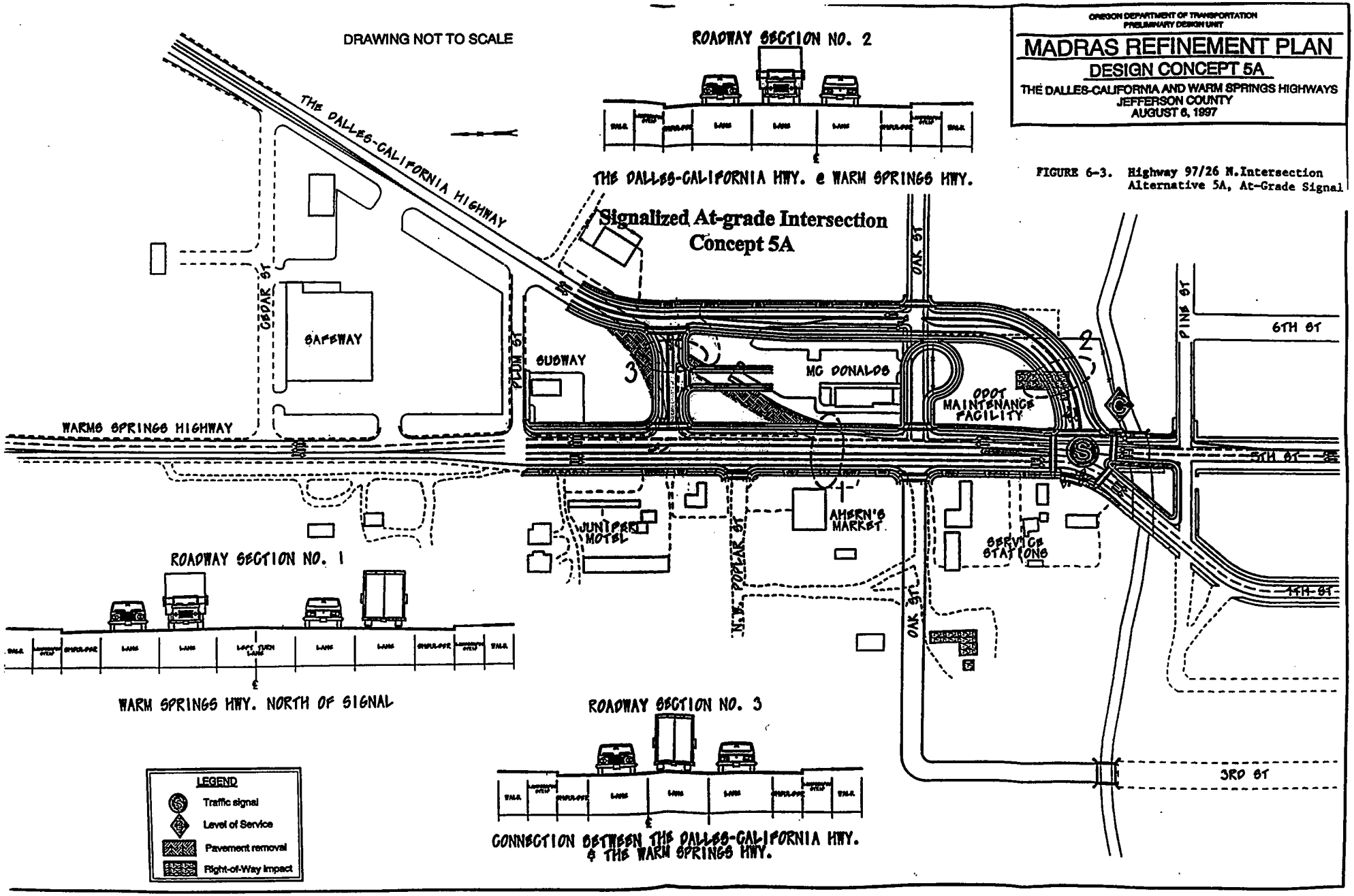
The advantages of Alternative 5A are as follows:

- Signal location at the intersection of Highways 97/26 is on a level grade.
- Need for change of access to most businesses along US Highway 26 is minimized.
- Eliminating left turns at the existing intersection of the two highways minimizes accident potential.
- The proposed local street improvement plan is accommodated by allowing the connection of Oak St. to 3rd St.
- The need to take right-of-way is minimized by using the existing ODOT maintenance facility property.
- Large trucks and emergency vehicles are accommodated.
- Projected LOS meets State standards.

The disadvantages of Alternative 5A are as follows:

- The intersection has unconventional geometry and circulation pattern, potentially creating driver confusion.
- The cul-de-sac on Oak St. creates out-of-direction east-west travel.
- A raised median necessary north of the signalized intersection eliminates access for service stations for northbound travel on 5th St./US Highway 26.
- Emergency vehicle circulation will be out-of-direction from southbound US Highway 26 to Oak St. because of cul-de-sac.
- Service station access requires a separate signal phase.
- There are potential noise impacts to residences on 6th St.

Cost: The estimated cost of the Signalized alternative is $1,500,000.


DRAWING NOT TO SCALE
ROADWAY SECTION NO. 2
THE DALLES-CALIFORNIA HWY. & WARM SPRINGS HWY.
OREGON DEPARTMENT OF TRANSPORTATION
PRELIMINARY DESIGN UNIT
MADRAS REFINEMENT PLAN
DESIGN CONCEPT 5A
THE DALLES-CALIFORNIA AND WARM SPRINGS HIGHWAYS
JEFFERSON COUNTY
AUGUST 6, 1997
FIGURE 6-3. Highway 97/26 N.Intersection Alternative 5A, At-Grade Signal
THE DALLES-CALIFORNIA HIGHWAY
Signalized At-grade Intersection
Concept 5A
CEDAR ST
SAFEWAY
PINE ST
SUBWAY
MC DONALDS
OAK ST
ODOT MAINTENANCE FACILITY
PINE ST
6TH ST
WARM SPRINGS HIGHWAY
5TH ST
JUNIPER MOTEL
AHERN'S MARKET
SERVICE STATIONS
N.W. POPLAR ST
OAK ST
11TH ST
3RD ST
ROADWAY SECTION NO. 1
WARM SPRINGS HWY. NORTH OF SIGNAL
ROADWAY SECTION NO. 3
CONNECTION BETWEEN THE DALLES-CALIFORNIA HWY. & THE WARM SPRINGS HWY.
LEGEND
Traffic signal
Level of Service
Pavement removal
Right-of-Way Impact

- **Alternative 10B: US Highway 26 Realignment with Oak St Connection to 3rd St.**

  This alternative eliminates the existing left turn at the US Highway 97/26 intersection. The existing 4th/5th St. couplet will be extended by lengthening the northbound leg of 5th St. and the southbound leg of 4th St. to Jefferson St. The intersection of Cedar St./5th St. will be signalized, as will the intersection of Oak Street and US Highway 26. An additional southbound travel lane will be added on the 4th St. couplet extension, and an additional northbound travel lane will be added north of Pine St. to the existing Safeway market. This alternative will have right-of-way needs for 15.7 acres of vacant land and 3 single-family residences. In the design year 2015, the LOS will be C at the Oak St./US Highway 97/26 intersection (northbound), C-D at the intersection of the new highway and Oak St (southbound), and B at the intersection of Cedar St. and US Highway 26 (northbound).

  The advantages of Alternative 10B are summarized as follows:

  - One-way movement with 2-phase signals along 5th and 4th St. will improve intersection operation and capacity and reduce delay.
  - Minimizes accident potential by eliminating left turn at the existing intersection of US Highway 97/26 intersection.
  - Provides opportunity to develop local access management plan.
  - Accommodates the proposed local street improvement plan.
  - Accommodates emergency vehicle circulation to the hospital.
  - Accommodates large trucks.
  - Has a reduced construction cost, since it does not require a grade-separated structure on US Highway 26.
  - Provides long-term operational and safety benefits along entire segment of highway due to one-way movement.

  The disadvantages of Alternative 10B are summarized as follows:

  - Signalized intersection at the 5th St./US Highway 26 and Cedar St. is on a +5% grade.
  - Southbound traffic must travel out-of-direction to businesses on 5th St. north of Pine St.
  - Requires large right-of-way taking on the west side of US Highway 26.
  - Access management requirements may limit movements to existing businesses or may move existing access points.

- Requires significant earthwork cuts into the hillside west of US Highway 26.
- Requires the closure of Lee St. at US Highway 26.
- Some residences along the new alignment may experience increased noise.

Cost: The estimated cost of Alternative 10B is $3,900,000.

Conclusion and Recommendation for US Highway 97/26 North Junction

In conclusion, Alternative 5A, the at-grade signal, or Alternative 10B, the realignment of US Highway 26 with connection to 3rd St. would meet intersection operational goals for the planning period. During the adoption of the Transportation System Plan, the City of Madras City Council selected Option 5A as their preferred alternative. This decision was reached after considering the significant cost differential of the two alternatives and the minimal improvement in level of service. Option 5A is believed to be the most cost-effective option for improving the overall operation of the US highway 97/26 junction.

Option 6. Create Truck Route to Bypass Downtown

This transportation improvement would establish a new north/south truck route along the west side of the Madras urban area to reduce through traffic on US Highway 97/26 in the city core (see Figure 6-5). The proposed truck route would start at the new US Highway 97/26 north signalized couplet (discussed under Potential Transportation Improvement 5, above), then extend west and south to connect with the State Highway 361 in the vicinity of "G" Street. The new truck route would follow the State Highway 361 south beyond the southwest Madras UGB.

A new route would be established to connect the truck bypass to Colfax Lane west of the intersection with US Highway 97. The southern truck route connection would need to be coordinated with the US Highway 97/26 and Colfax Lane junction improvement identified in potential transportation improvement 3. The new truck route would require two new road sections. At the north end, a new road section would need to be constructed between the US Highway 97/26 north signalized couplet and the State Highway 361 connection. The other new road section would need to be constructed at the south end of the truck route from a point where the truck route heads southeast from the State Highway 361 to where it would connect with Colfax Lane.

Traffic modeling and analysis of this option shows a shift of about 400 vehicles during the PM peak hour. Approximately 100 of those vehicles would use the truck route as an alternative route through Madras. The remaining 300 vehicles would use the route to access the State Highway 361 to travel to Culver and Metolius.

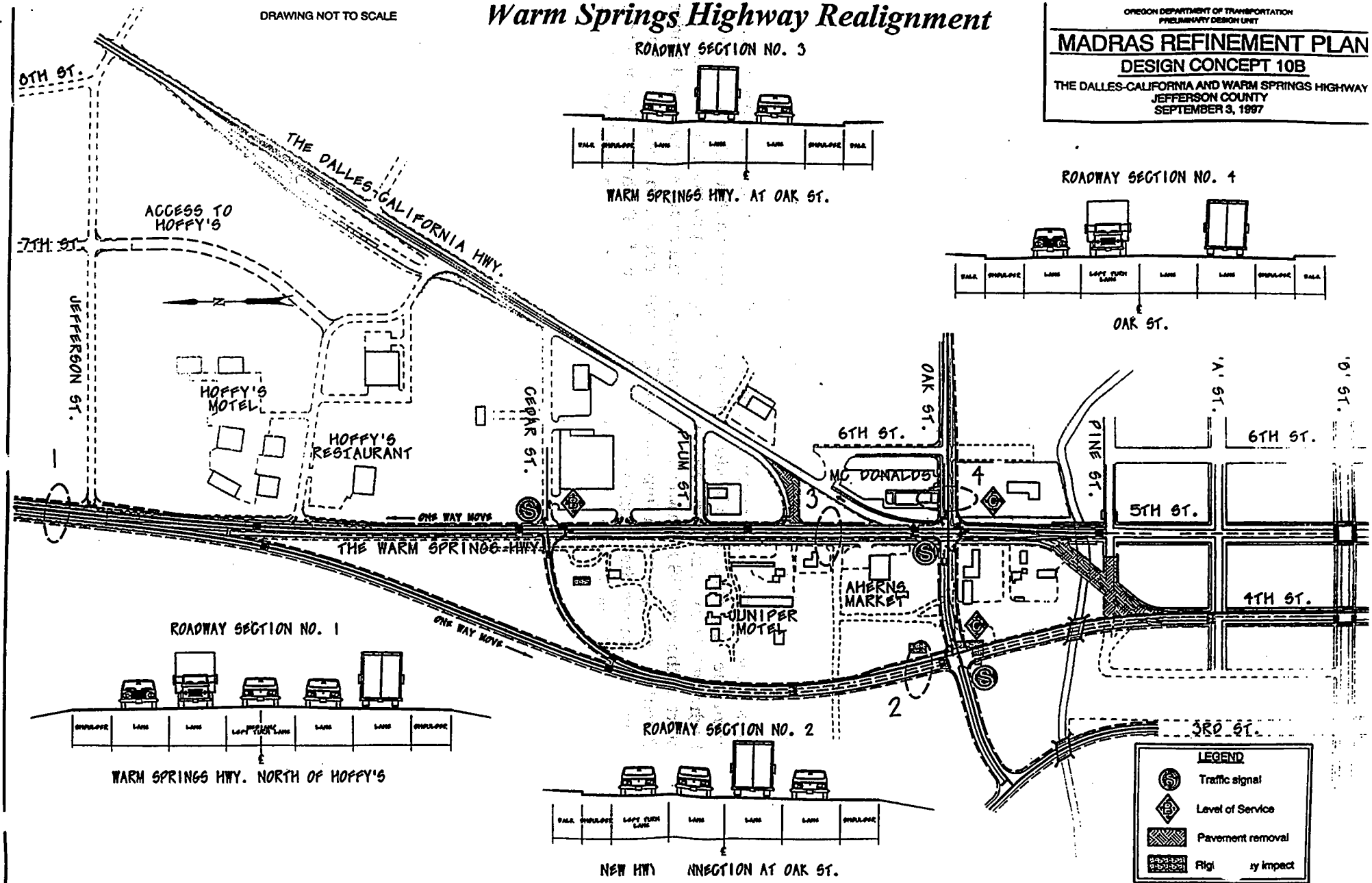
DRAWING NOT TO SCALE

Warm Springs Highway Realignment

OREGON DEPARTMENT OF TRANSPORTATION
PRELIMINARY DESIGN UNIT

MADRAS REFINEMENT PLAN
DESIGN CONCEPT 10B

THE DALLES-CALIFORNIA AND WARM SPRINGS HIGHWAY
JEFFERSON COUNTY
SEPTEMBER 3, 1997



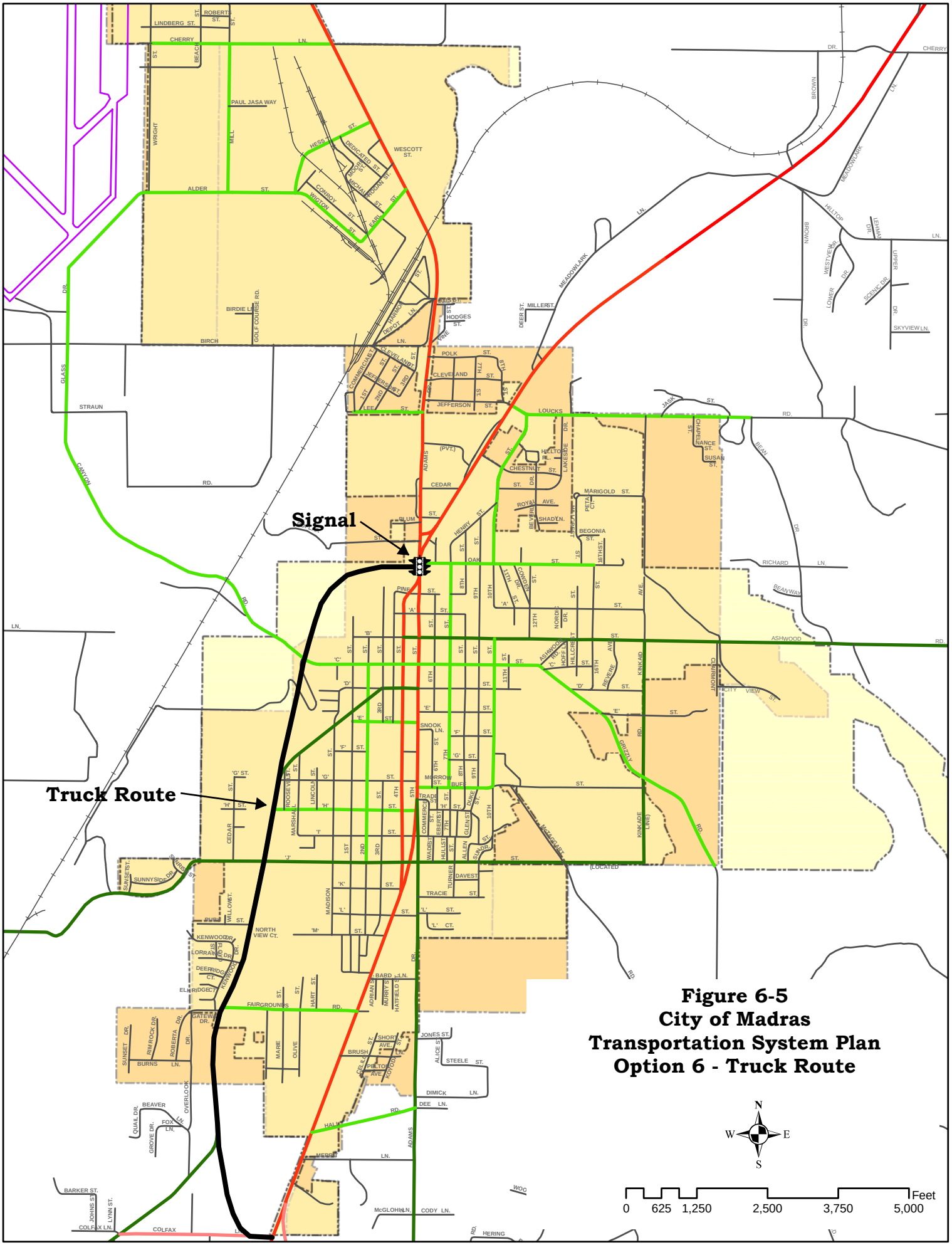


Figure 6-5
City of Madras
Transportation System Plan
Option 6 - Truck Route

In addition to the improvements in operations at the US Highway 97/26 junction and Oak Street due to the new at-grade signalized intersection, the shift in traffic to the truck route would improve operations along the entire US Highway 97/26 corridor in the Madras area. Operations would improve to the greatest extent north of "D" Street, where the State Highway 361 traffic currently turns. South of "D" Street, the volume shift would be smaller.

The major benefit of the truck route would be providing through traffic, specifically large trucks, and a way to bypass downtown Madras. Hazardous materials being transported along US Highway 97/26 would no longer go directly through the Madras downtown core. This is an issue of particular concern to Jefferson County Fire District No. 2, who is responsible for public safety within the community. The Fire District sees the truck route option as way to significantly reduce risks of hazardous material spills within the Madras city core.

The major drawbacks of the truck route option are the cost of the improvement and significant environmental constraints associated with new construction. The cost of the truck route would make it very difficult for the Madras community to finance construction during the 20-year planning horizon. Some portions of the project, such as right-of-way acquisition and protection, and some construction, can likely be accomplished during the 20-year planning period of the Transportation System Plan. However, the completion of the full truck route would likely extend beyond the 20-year planning horizon.

Environmental constraints such as identifying a suitable route through uneven terrain at the north end, crossing Willow Creek, and dealing with land use regulations for the area outside of the UGB would need to be resolved to complete the truck route project.

Cost: The estimated total cost of the truck route is approximately $10,456,000. The cost of this improvement option is high because a significant amount of right-of-way would need to be acquired and the environmental constraints would make construction difficult. This improvement option would require funding from multiple sources. Likely funding would need to come from the City of Madras, Jefferson County, and the State of Oregon.

Recommendation: The high costs of this option relative to the benefits make this option difficult to recommend; however, its potential benefits over the long-term justify further study by the City, County, and State.

Option 7. Redesign US Highway 97/26 Couplet South of "J" Street to Improve Operation of the Couplet

Two design alternatives were originally presented to resolve the potential for future conflicts at the south end of the US Highway 97/26 couplet. One of these was to realign 5th Street and provide a connection to 7th Street. The second was to realign 5th Street and provide a connection to 10th Street.

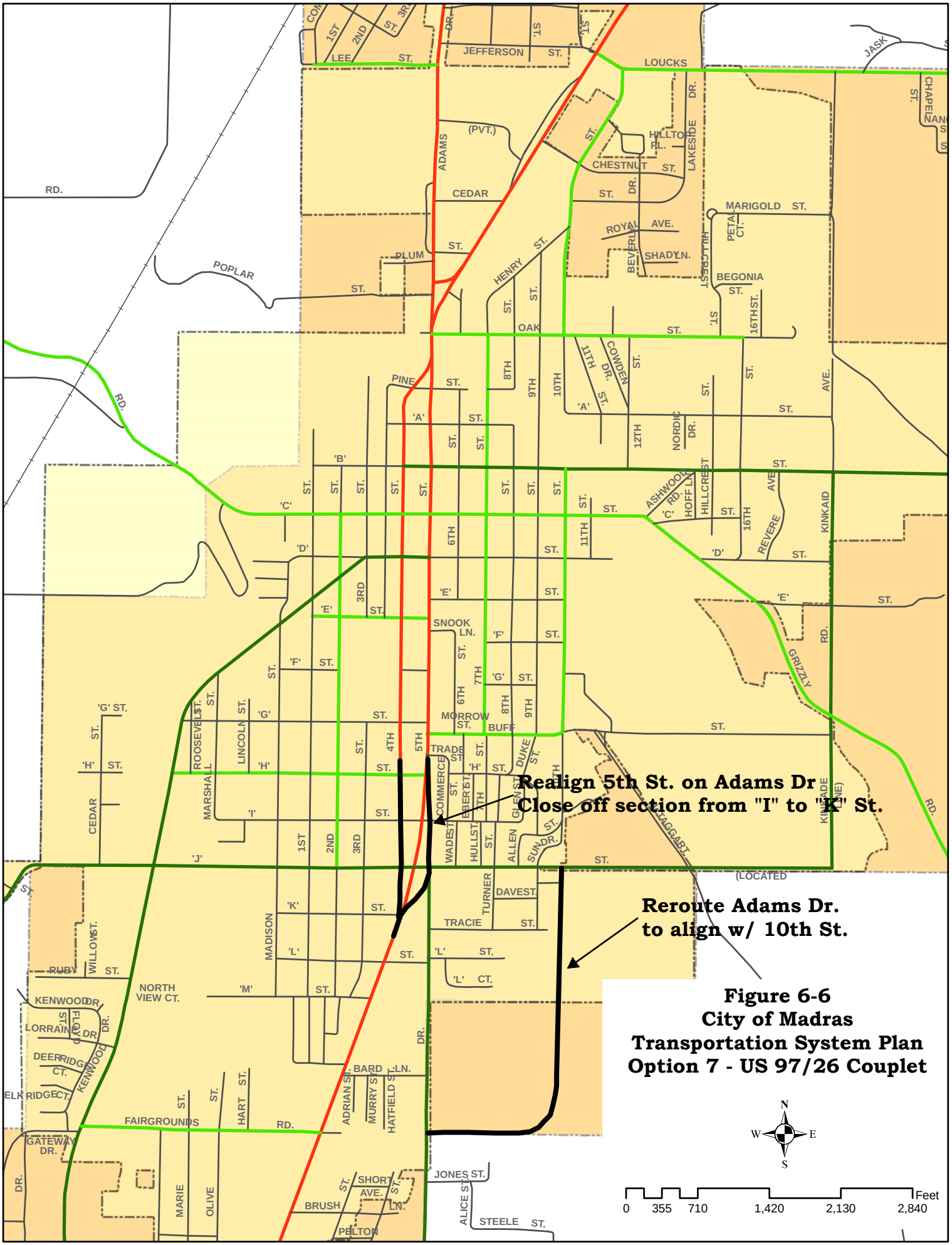


Figure 6-6
City of Madras
Transportation System Plan
Option 7 - US 97/26 Couplet

The purpose of both these alternatives would be to widen the spacing between the intersections of "J" Street with 4th and 5th Streets. As development occurs on the south side of Madras, "J" Street will become a more important travel route. The current proximity of the "J" Street intersections with the highway couplet and with South Adams Drive would become a safety hazard as the traffic volumes increased. Traffic signals may be able to control some of the queuing between 4th and 5th Streets, but queued vehicles may still back up onto South Adams Drive without improvements. Although the traffic volumes on "I" Street are lower, a similar safety hazard exists because of the proximity of the intersections. South Adams Drive and 5th Street are only separated by about one car length. The intersection of South Adams Drive and 5th Street is just north of "I" Street, also very close to adjacent intersections. By realigning 5th Street, these hazards would be eliminated as well.

During analysis of this option, it was determined that 7th Street has inadequate geometry to function as a good north-south route. Therefore, that alternative design was dropped from discussion, and a connection to 10th Street was assumed.

The negative impacts of this option are primarily on the existing land uses immediately adjacent to 5th Street and South Adams Drive, and the potential for increased traffic on 10th Street when the Adams Drive/10th Street connection is made. Several commercial businesses would be impacted by the construction of the connection between US Highway 97/26 and South Adams Drive. The businesses along the existing 5th Street alignment would need to be set back further from the highway, and they would need access and signage to accommodate them.

The Adams Drive north cul-de-sac would include a driveway into the Fire Station property to allow for emergency vehicles to exit directly out onto Adams Drive. The realignment would be designed to retain the existing Jefferson County Fire District No. 2 Fire Station parking area.

The realignment of US Highway 97 northbound traffic and the realignment of Adams Drive over to 10th Street need to be considered as a phased improvement option to address circulation and safety problems at the south end of Madras. The first phase would be the 5th Street realignment. The second phase would be the Adams Drive/10th Street connection. The timing of the Adams Drive/10th Street connection is expected to be made as urban development continues in the southeast section of the Madras urban area. If this area develops at a faster rate, then it is expected that the Adams Drive/10th street connection would be constructed at an earlier time during the plan life.

Cost: The realignment of 5th Street and associated street improvements is expected to cost approximately $900,000. The cost estimate assumes that existing rights-of-way would be used and that there are no significant environmental or geotechnical constraints that would adversely impact this project. Some of the costs of this improvement could be funded by new development that would use the Adams Drive/10th Street connection on the south and east sides of Madras.

Recommendation: Because this improvement would solve existing and anticipated traffic flow problems, it is recommended.

Option 8. Industrial Park Connection

This transportation improvement would connect Canyon Road/Glass Street with Adler Street and the Madras Industrial Park to improve circulation for industrial and agricultural traffic to the Industrial Park and to the west of Madras. The full extension would allow trucks and farm machinery to stay off of US Highway 26. This improvement option would require the completion of Adler Street from Birch Lane to the industrial park, clarification of the Adler Street route within the industrial park, widening of Canyon Road from Birch Lane to "C" Street, and improvement of "C" Street from Canyon Road to US Highway 97. The Industrial Park connection would be considered a phased improvement option to improve traffic circulation and safety for both farmers and Industrial Park users on the west side of Madras. These improvements may or may not require a goal exception, depending on the legal interpretation of OAR 660-12-065 (3) (g). In either case, these improvements should be coordinated with Jefferson County and included in the County's TSP and Comprehensive Plan.

The first phase would consist of completing Adler Street, between the Industrial Park and Birch Lane. It would include the construction of a new street section and a possible realignment of Adler/Wigton/Conroy intersections within the Industrial Park. It would be expected that this first phase could be completed in the first half of the plan life. These improvements would be coordinated with the ODOT improvement of the US Highway 26/Depot Lane intersection.

The second phase would include the improvement of Canyon Road, extending from Birch Lane to "C" Street. Canyon Road would need to be widened and the roadbed improved to be adequate for farm machinery and large trucks. This phase could also include some improvements to "C" Street between Canyon Road and the 4th/5th Street couplet in downtown Madras. Possible improvements could consist of modifying the corners to allow for truck turning movements onto and off the highway. The Canyon Road section would be considered to be a long-range improvement expected to occur during the second 10 years of the planning period.

The benefits of the Industrial Park connection include reducing reliance on US Highway 26 as a local Street for agricultural and industrial traffic on the west side of Madras. This phased improvement would allow farmers and truckers to use Adler Street to access US Highway 26 via Birch Lane and use Adler Street and Canyon Road to access the city core.

As employment increases at the Madras Industrial Park, traffic congestion at the Hess Street and Michals Street intersections with US Highway 26 is expected to become a larger problem. Constructing the Adler Street/Canyon Road connection could decrease this congestion. Industrial Park users would be able to connect to US Highway 26 via Birch Lane or to US Highway 97/26 via "C" Street. The Adler

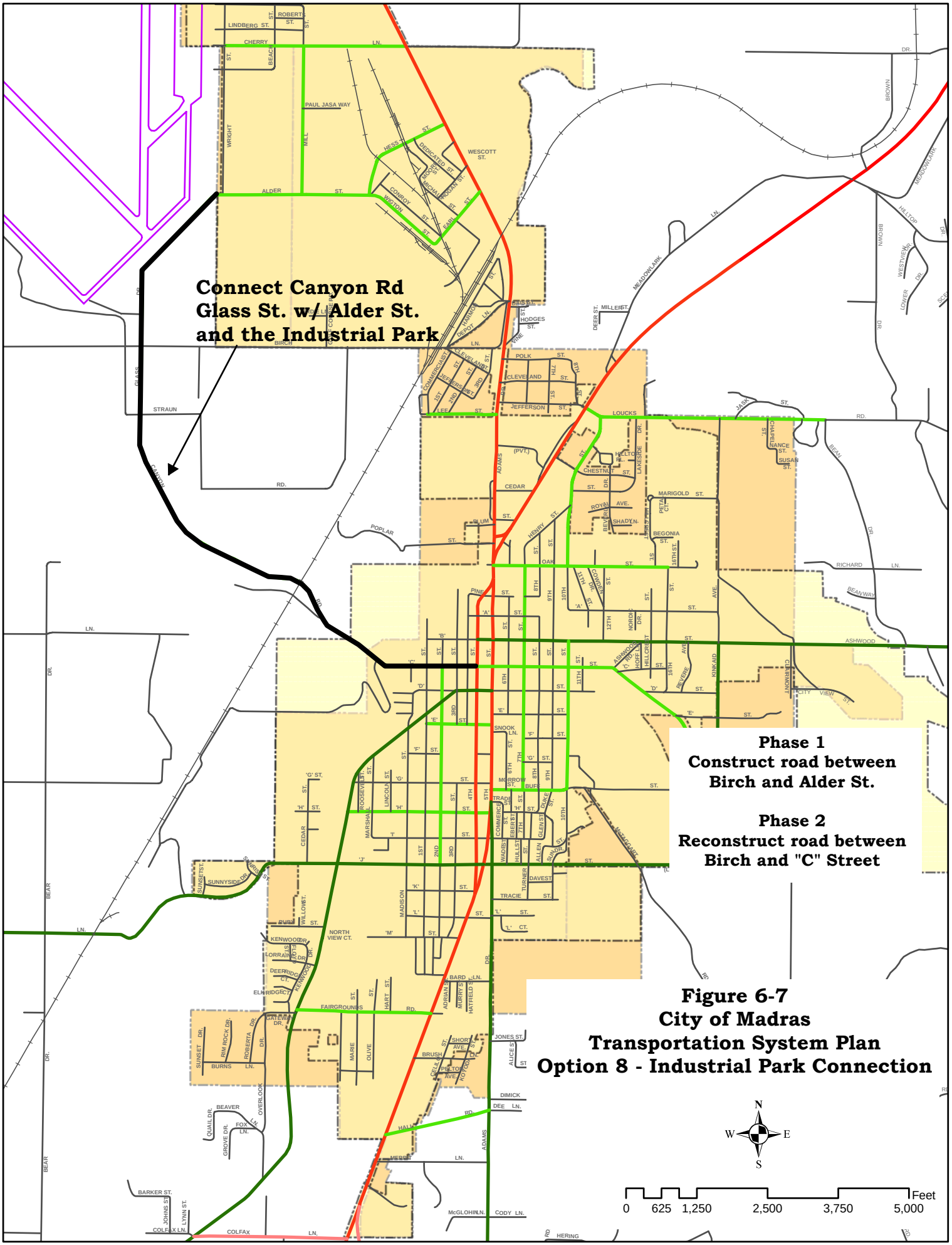


Figure 6-7
City of Madras
Transportation System Plan
Option 8 - Industrial Park Connection

Street section would need to be coordinated with the planned improvement of the US Highway 97/Depot Road intersection. This connection would also improve truck circulation for farmers who haul agricultural supplies from the businesses within the Industrial Park. There are disadvantages of the Industrial Park connection as it relates to Canyon Road improvements. The widening of this road section would be difficult and costly as it follows a steep side slope along the canyon. This improvement would also increase truck traffic into a residential area along "C" Street.

Cost: The cost of the Industrial Park connection is expected to be approximately $1,818,000. The Adler Street to Birch Lane segment is expected to cost $1,034,000, while the Canyon Road segment is expected to cost $784,000. It is expected that the entire cost of these Street costs would need to be borne by the public since there is no expected future development that would be expected to benefit from the Industrial Park connection. The cost of the Canyon Road section could increase if a geotechnical analysis identifies problems with the existing route along the canyon side slope.

Recommendation: Although this option is costly and could have environmental impacts, it is critical to the future function of the Madras Industrial Park; therefore, it is recommended.

Option 9. US Highway 26 Traffic Signals

A combination of improvements and facility management at the intersections of Cherry, Hess, and Earl Streets with US Highway 26 will be needed to improve safety and operating conditions. When signal warrants are met at these intersections, ODOT will work with the City to determine whether a signal should be installed, or whether some other type of solution is more appropriate. The City supports installation of a signal in combination with needed access management measures at adjacent intersections if this is determined to be the best answer. It is important to minimize development in the immediate vicinity of these intersections in case grade-separating the intersections proves to be the best long-term solution and funding is available.

Cost Estimate: It is assumed that ODOT would fund the installation of these new signals and keep maintenance responsibility of them into the future. Each signal is expected to cost $250,000. Included within the cost estimate would be funding to make minor highway/street intersection improvements.

Recommendation: This option is recommended.

SUMMARY

Table 6-5 summarizes the recommendations of the Transportation System Plan, based on the evaluation process described in this chapter. Table 6-6 compares existing conditions with 2015 conditions, if the recommended projects are implemented. Chapter 7 discusses how these improvement options fit into the modal plans for the Madras area.

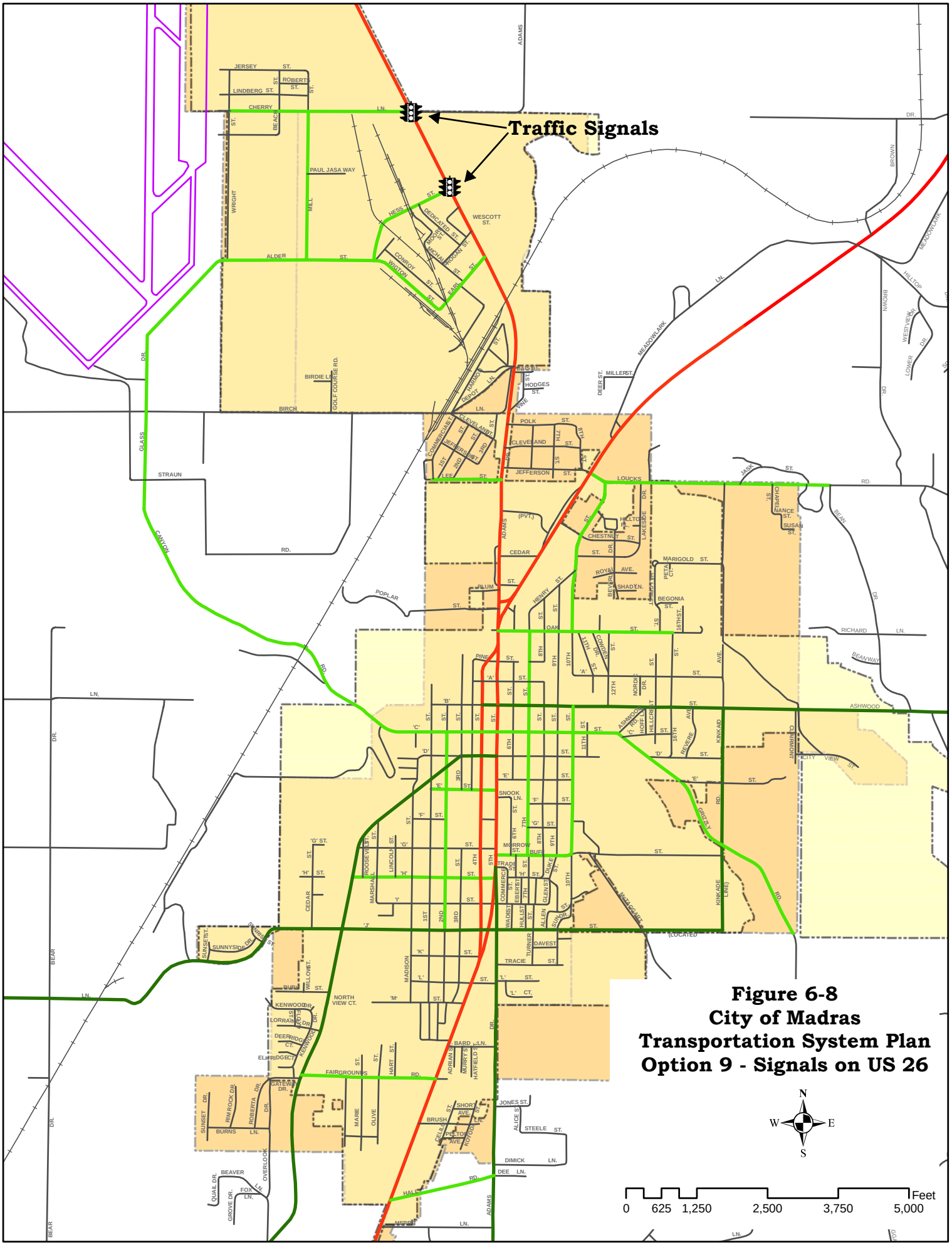


Figure 6-8
City of Madras
Transportation System Plan
Option 9 - Signals on US 26

TABLE 6-5

Transportation Improvement Options: Recommendation Summary

Option	Recommendation
1. Revise Zoning Code	Implement
2. Add walkways, bikeways, and transportation demand management measures	Implement
3. Improve the basic street grid	Implement
4. Connect 10th Street between "A" & "B" St	Do not implement
5. Improve north Hwy 97/26 junction	Implement either Alternative 5A or 10B, pending environmental analysis & funding availability
6. Create truck bypass	Conduct further studies since the need for the project is likely beyond the 20-year planning horizon
7. Redesign south Hwy 97/26 couplet	Implement
8. Industrial Park Connection	Implement in 2 phases
9. US Highway 26 Traffic Signals	Implement

TABLE 6-6

Summary of Level of Service (LOS) at Critical Intersections: Existing & 2015 "Recommended Projects"

Location	Traffic Movement	1994 Existing LOS	2015 "Recommended Projects" LOS
Hwy 26 & Hess St	Northbound; Left	A	B
	Eastbound; Left, Right	B	F
Hwy 26 & Earl St	Northbound; Left	A	D
	Eastbound; Left, Right	B	F
Hwy 26 & Depot Rd	Northbound; Left	A	E
	Southbound; Left	A	A
	Eastbound; Left, Through, Right	C	F
	Westbound; Left, Through, Right	D	F
Hwy 97 & 26 N:-Alternative 5A	Southbound; Left	A	NA
	Westbound; Left, Right	E	NA
	Overall	NA	C
Hwy 97 & 26 N: Alternative 5B	Southbound; Left	A	C-D
	Westbound; Left, Right	E	B
Hwy 97/26 & Oak St	Southbound; Left	B	A
	Westbound; Left, Right	F	A
4th St & "B" St	All	B (51% capacity)	B (65% capacity)
5th St & "B" St	All	B (47% capacity)	B (60% capacity)
4th St & "D" St	All	B (51% capacity)	B (57% capacity)
5th St & "D" St	All	B (39% capacity)	B (50% capacity)
4th St & "G" St	Eastbound; Through, Right	A	B
	Westbound; Through, Right	C	D
5th St & Buff St	Westbound; Right	A	A

TABLE 6-6, continued

4th St & "J" St	Eastbound; Through, Right	B	NA
	Westbound; Left, Through	C	NA
	Overall	NA	A (53% capacity)
5th St & "J" St	Eastbound; Left, Through	A	NA
	Westbound; Through, Right	A	NA
	Overall	NA	B (56% capacity)
Hwy 97 & Fairgrounds Rd	Northbound; Left	A	C
	Southbound: Left	NA	A
	Eastbound; Left, Through, Right	D	F
	Westbound; Left	NA	E
Hwy 97 & Hwy 26 S	Northbound; Left	NA	A
	Southbound; Left	A	A
	Eastbound; Left, Through, Right	NA	C
	Westbound; Left, Through, Right	A	C

Notes: Level of Service (LOS) is shown for all movements of the unsignalized intersections; at signalized intersections, the overall LOS is shown for the intersection with the overall volume versus capacity ratio.

CHAPTER 7
STREET STANDARDS, ACCESS MANAGEMENT, MODAL PLANS, AND IMPLEMENTATION PLAN

The purpose of this chapter is to provide detailed operational plans for each of the transportation systems within the community. The Madras TSP covers all the transportation modes that exist and are interconnected throughout the urban area. Components of the street system plan include street classification standards, access management recommendations, transportation demand management measures, modal plans, and a system plan implementation program.

STREET CLASSIFICATION STANDARDS

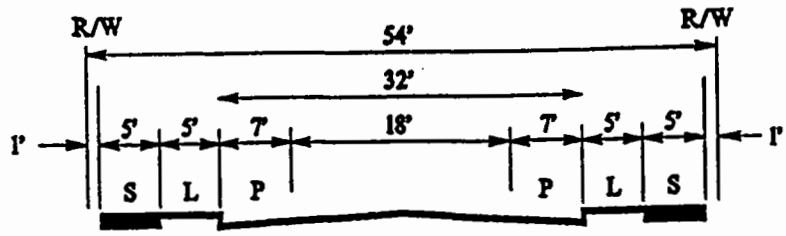
Street classification standards relate the design of a roadway to its function. The function is determined by operational characteristics such as traffic volume, operating speed, safety, and capacity. Street standards are necessary to provide a community with roadways that are relatively safe, aesthetic, and easy to administer when new roadways are planned or constructed. They are based on experience, policies, and publications of the profession.

Existing Madras City Ordinances outline minimum right-of-way and roadway widths for all types of streets within the city. These ordinances specify a minimum 90-foot right-of-way for a 40 to 50-foot arterial and a minimum 60-foot right-of-way for a 40-foot collector. Both these specifications include two five-foot-wide sidewalks and space for curbs and on-street parking. Under the existing Ordinances, right-of-way widths for residential local streets are specified to be 50-60 feet, adequate for a 32 to 36-foot wide street, on-street parking, curb, and five-foot wide sidewalks on both sides.

Existing Jefferson County Ordinances require an 80-foot right-of-way for arterials, 60 feet for collectors, and 40 to 60 feet for local residential roads. Paved road width recommendations are not given.

The development of the Madras TSP provides the City and County with an opportunity to review and revise street design standards to more closely fit with the functional street classification, and the goals and objectives of the TSP. The recommended street standards are shown graphically in Figure 7-1, summarized in Table 7-1 and described in detail on the following pages. For the portion of the Madras TSP that is located within the UGB, the urban road standards should be applied. For the portion that is outside the UGB, rural standards are described.

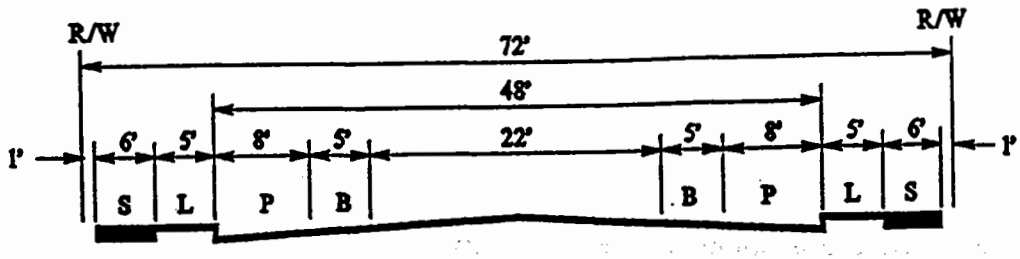
A. LOCAL STREET



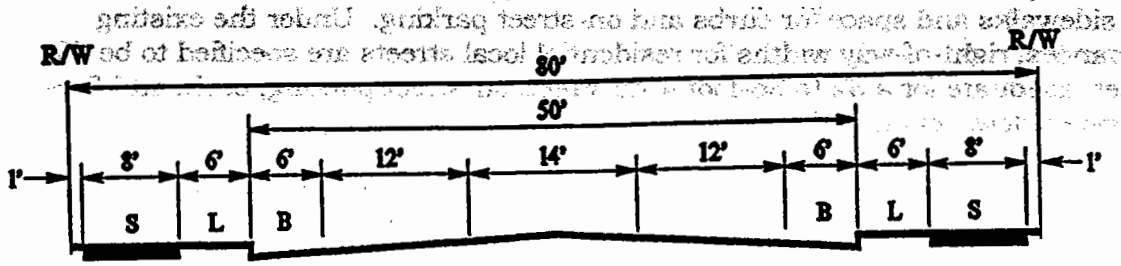
LEGEND

B = BIKE LANE
P = PARKING
S = SIDEWALK
L = LANDSCAPE STRIP
R/W = RIGHT-OF-WAY LINE

B. COLLECTOR



C. ARTERIAL



D. DOWNTOWN COMMERCIAL

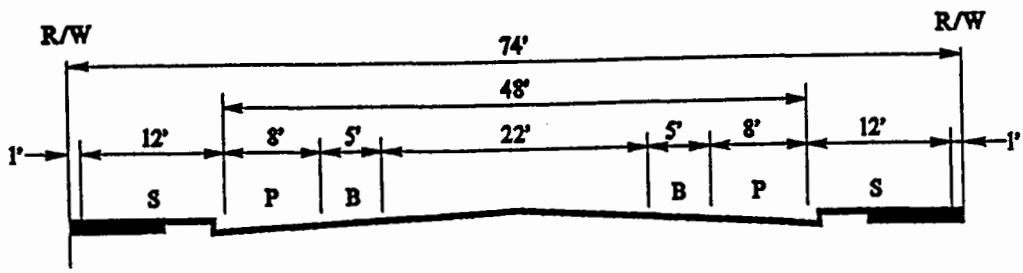


FIGURE 7-1
URBAN STREET DESIGN STANDARDS

Table 7-1
Recommended Street Standards for the Madras Planning Area

Classification	Pavement Width	Right-of-Way Width	Min. Posted Speed
Urban (inside UGB)			
Local Residential	32	54	15-25
Collector	48	72	25-35
Arterial	50	80	25-45
Downtown Commercial	48	74	15-25
Alleys	20-24	20-24	15
Rural (outside UGB)			
Local Residential	24-36	60	25
Collector	32-36	60	25-35
Arterial	36-40	60	35-55

URBAN STREET STANDARDS

Urban Residential Streets

The design of a residential street affects its traffic operation, safety, and livability. A residential street should be designed to enhance the livability of the neighborhood as well as to accommodate less than 1,200 vehicles per day. Design speeds should be 15-25 MPH. When traffic volumes exceed approximately 1,000 to 1,200 vehicles per day, the residents on that street will begin to notice the traffic as a noise and safety problem. To maintain neighborhoods, local residential streets should be designed to encourage low speed travel and to discourage through traffic.

A good, well-connected grid system of relatively short blocks can minimize excessive volumes of vehicles by providing a series of equally attractive or restrictive travel options. This street pattern is also beneficial to pedestrians and bicyclists.

The standard for a local residential street should be a 32-foot roadway, curb face-to-curb face within a 54-foot right-of-way, as shown on Figure 7-1, Section A. Five-foot wide sidewalks should be provided on each side of the roadway, located one foot from the right-of-way line to provide a five-foot planting strip.

The 32-foot cross section will accommodate passage of two lanes of moving traffic in each direction with curb parking. On low volume residential streets where curb parking may occur on both sides of the street, traffic will move

freely but slowly. Narrower streets improve neighborhood aesthetics and discourage speeding and through traffic. They also reduce right-of-way needs, construction costs, storm water run-off, and the need to clear vegetation.

Sidewalks must be included on all urban streets as an important component of the pedestrian system. When sidewalks are located directly adjacent to the curb, they can include such impediments as mailboxes, street light standards, and sign poles. These obstructions reduce the effective width of the walk. Sidewalks buffered from the street by a planting strip eliminate obstructions in the walkway, provide a more pleasing design, buffer pedestrians from traffic, and make the sidewalk more useable for disabled persons. To maintain a safe and convenient walkway for at least two adults, a five-foot sidewalk should be used in residential areas.

Cul-de-sac or "dead-end" residential streets are intended to serve only the adjacent land in residential neighborhoods. These streets should be short, serving a maximum of 20 single-family houses. Because the streets are short and the traffic volumes relatively low, the street width can be narrower than a standard residential street. A cul-de-sac should be designed to allow for the passage of two lanes of traffic when no vehicles are parked at the curb or one lane of traffic when vehicles are parked at the curb.

The street width of a cul-de-sac should be 24 feet, curb face-to-curb face within a 40-foot right-of-way, as shown in Figure 7-1, Section A. A five-foot-wide sidewalk should be located one foot from the right-of-way line on each side of the roadway, providing a five-foot planting strip.

Because cul-de-sac streets limit street and neighborhood connectivity, they should only be used where topographical or other environmental constraints prevent street connections. Where cul-de-sacs must be used, pedestrian and bicycle connections to adjacent cul-de-sacs or through streets should be included.

Urban Collector Streets

Collector streets are primarily intended to serve abutting lands and the local access needs of neighborhoods. They are intended to carry between 1,200 and 10,000 vehicles per day, including limited through traffic, at a design speed of 25-35 MPH. A collector can serve residential, commercial, industrial, or mixed land uses.

Figure 7-1, Section B shows a cross section with a 72-foot right-of-way and a 48-foot paved width. The 50-foot curb-to-curb distance allows two travel lanes, two bicycle lanes, and parking on both sides of the street. The roadway can also be striped to provide two travel lanes plus left-turn lanes at intersections or driveways by removing parking for short distances.

Six-foot sidewalks should be provided on each side of the roadway, one foot from the right-of-way line to allow a five-foot-wide planting strip. In commercial or business areas, the sidewalks may be eight feet wide, extend to the property

line, and may be located adjacent to the curb to facilitate loading and unloading at the curb.

If traffic volume forecasts exceed 5,000 vehicles per day on a collector, then driveways serving single or multi-family houses should not be permitted on that section.

Urban Arterial Streets

Arterial streets form the primary roadway network within the city and through the region. They provide a continuous roadway system that distributes traffic between different neighborhoods and districts. Generally, arterial streets are higher capacity roadways that carry high traffic volumes with minimal localized activity. Design speeds are generally between 25 and 45 MPH. Residential property should not face or be provided with access onto arterial streets.

Two-way arterial streets should consist of two or three-lane cross-sections; therefore, 80 feet of right-of-way needs to be reserved, as shown on Figure 7-1, Section C. A 50-foot paved width will provide two 12-foot travel lanes, two six-foot bike lanes, and a 14-foot center refuge lane, if needed. It should be noted that the inclusion of a center turn lane should be unnecessary in most situations if the access management standards for arterials described below are followed.

The 12-foot-wide center refuge lane could also be developed with a raised non-traversable median between left-turn lanes. The raised median should be 10 feet wide, curb face-to-curb face, and the adjacent travel lanes should be widened to 12 feet.

A one-way arterial, such as the 4th and 5th Street couplet, should be two lanes with a six-foot bike lane. Because only one bike lane and no center median are needed, the R-O-W widths can be reduced. Street curb-to-curb width should be 30 feet without on-street parking. If the one-way arterial is located within a downtown commercial area, the Downtown Commercial street section standards (Figure 7-1, Section D) should be used, since these provide for on-street parking and encourage lower travel speeds.

Sidewalks along arterials should be at least eight feet wide and located five feet from the curb face to provide a planting strip.

Urban Downtown Commercial Streets

Streets that serve the downtown core of a city must meet special demands for on-street parking and pedestrian comfort and accessibility. Figure 7-1, Section D shows a typical cross-section for a downtown commercial street. If possible, sidewalks should be 12 feet wide, and such details as clearly marked crossings, curb extensions, street furniture and landscaping should be included. Diagonal parking should be avoided if possible, and five-foot bike lanes provided.

Alleys

Alleyways can be a useful way to diminish street width by providing rear access and parking to residential areas. Including alleys in a subdivision design allows homes to be placed closer to the street and eliminates the need for garages to be the dominant architectural feature. This pattern, once common, has been recently revived as a way to build better neighborhoods. Alleys can also be useful in commercial and industrial areas. Alleys allow access to businesses by delivery trucks off of the main streets. Alleys should be encouraged in the urban area of Madras.

Urban Bike Lanes

In cases where a bike lane is proposed within the street right-of-way, 10-12 feet of roadway pavement (between curbs) should be provided. This will allow for a five-foot bike lane on a collector street or a six-foot bike lane on an arterial street (on each side of the street, as shown on the cross sections in Figure 7-1). Except in rare circumstances, bike lanes on one-way streets should be located on the right side of the roadway, be one-way, and flow in the same direction as vehicular traffic. The striping should be done in conformance with the State Bicycle and Pedestrian Plan (1995). In cases where curb parking will exist with a bike lane, the bike lane will be located between the parking and travel lanes. In some situations, curb parking may have to be removed to permit a bike lane.

A bike lane on new streets or streets to be improved as part of the street system plan should be added when improvements are made. The implementation program identifies an approximate schedule for these improvements.

On arterial and collector streets that are not scheduled to be improved as part of the street system plan, bike lanes may be added to the existing roadway at any time to encourage cycling, or when forecast traffic volumes exceed 2,500 to 3,000 vehicles per day. The striping of bike lanes on streets that lead directly to schools should be high priority. For Madras, where most of the collector and arterial streets are 54 to 57 feet wide, adding bike lanes will not require widening streets or removing parking.

Urban Sidewalks

A complete pedestrian system should be implemented in the urban portion of the Madras planning area. Every urban street should have sidewalks on both sides of the roadway as shown on the cross sections in Figure 7-1. Sidewalks on residential streets should have a five-foot wide paved width with a five-foot wide planting strip separating it from the street. Collector streets should have six-foot wide sidewalks with five-foot planting strips. Arterial streets should have eight-foot sidewalks with a six-foot planting strip, and Commercial Downtown streets should have 12-foot wide curb sidewalks. In addition, pedestrian and bicycle connections should be provided between any cul-de-sac and other dead-end streets.

The Madras urban area has a unique opportunity to simultaneously retrofit existing local streets with sidewalks and eliminate excessive street width in many neighborhoods by constructing the sidewalk and landscape buffer within the existing paved street. By narrowing streets and providing the necessary sidewalks, this would eliminate the need to disturb existing landscaping or to acquire additional right-of-way to construct the sidewalks.

Urban Curb Parking Restrictions

Curb parking should be prohibited at least 25 feet from the end of an intersection curb return to provide sight distance at street crossings.

Roundabouts

A roundabout is an intersection design commonly used in Europe, Australia and Japan that is gaining acceptance in this country (Figure 7-2). Roundabouts use speed reduction and clear right-of-way to control traffic without expensive signals. Roundabouts are most typically used in urban and suburban areas.

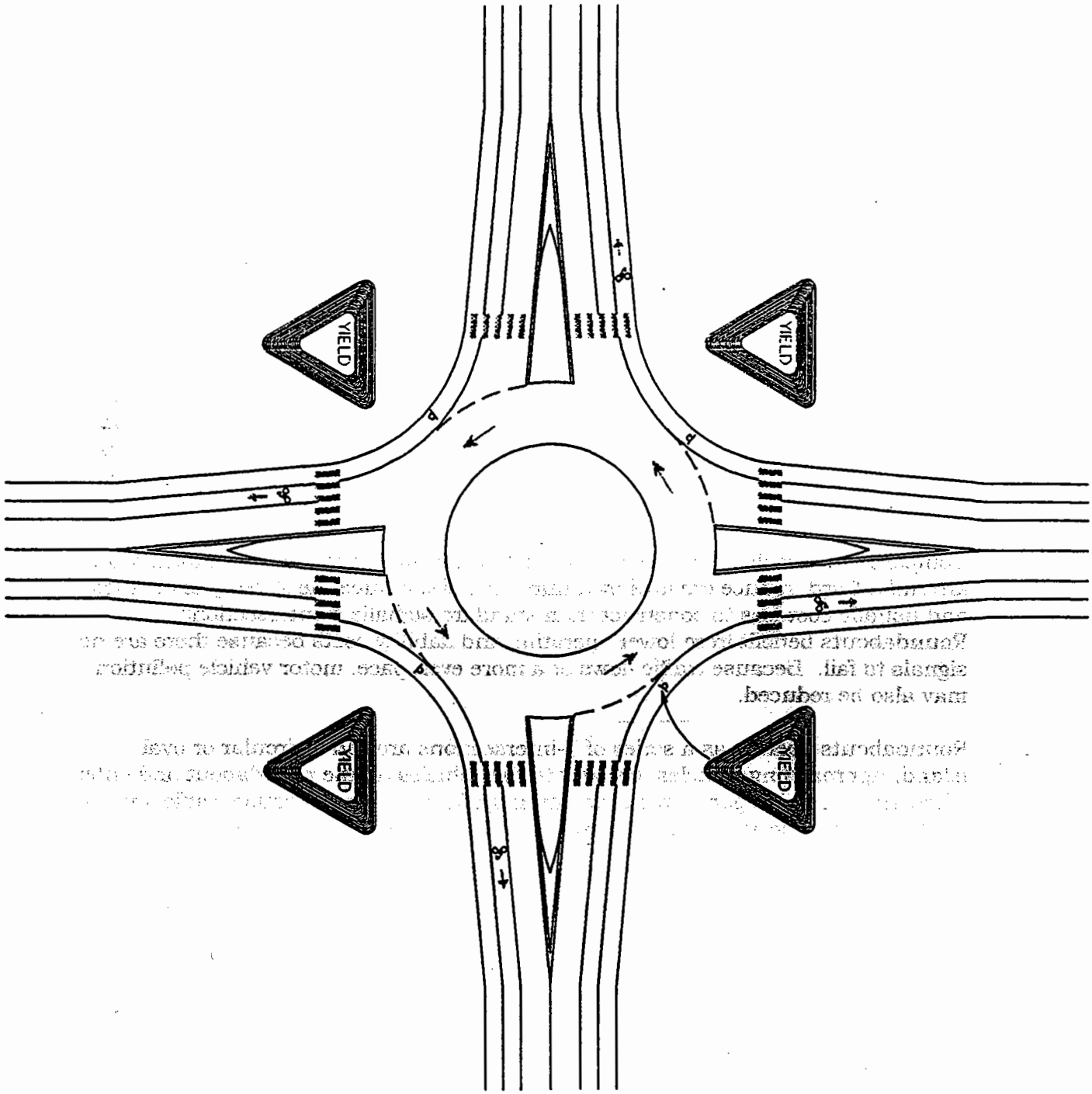
Compared to signalized intersections, modern roundabouts increase capacity by around a third, reduce crashes by a third or more, reduce the severity of crashes, and usually cost less to construct than standard signalized intersections. Roundabouts benefit from lower operating and liability costs because there are no signals to fail. Because traffic flows at a more even pace, motor vehicle pollution may also be reduced.

Roundabouts operate as a series of T-intersections around a circular or oval island. Approaching vehicles give way to the vehicles on the roundabout and enter when an acceptable gap in the circulating traffic develops. Because traffic speeds are kept low by design, motorists and bicyclists can easily judge when it is safe to enter.

A key feature of roundabouts is that incoming vehicles slow down and yield as necessary but experience minimal delays. The need for vehicle storage capacity is small compared to signalized intersections. This results in the need for fewer through lanes and no need for dedicated turn lanes. A single-lane roundabout can typically handle from 750 to 1500 vehicles per hour, depending on the dimensions and traffic mix.

The ideal radius of a roundabout should be large enough to accommodate trucks but small enough to slow traffic speed. Experience shows that a 38 to 50 ft radius works best. A mountable curb around the island accommodates unusually large trucks.

Multi-lane roundabouts, multi-lane entry points, and adjacent multi-use paths increase the conflict points and complicate the design. Although roundabouts have been applied successfully to major arterials and even freeway interchanges, the conditions under which they work the best



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DAVID EVANS AND ASSOCIATES, INC
709 NW WALL STREET, SUITE 102
BEND, OREGON 97701 (503)389-7614

FIGURE 7-2
MODERN
URBAN ROUNDABOUT

are most often found on sub-arterial streets. The lane in a single-lane roundabout should be kept less than 25 ft in width to prevent vehicles from trying to pass.

Vehicle operators approaching a roundabout must have a clear indication of the layout and the need to slow down. This is usually accomplished by lane curvature, splitter islands at the entrances and exits, and signing and striping. Adequate sight distance permits approaching vehicles and pedestrians to be seen. However, seeing across the island is unnecessary and high landscaping discourages excessive speed.

Roundabouts work best when the traffic flow is relatively balanced in all directions. Because a roundabout treats all entering traffic equally, there could be unacceptable delays where a high-volume street crosses a low-volume street. For example, a roundabout would probably work where a collector street crosses a minor arterial but would be an unlikely application where the collector meets a major arterial. Note that roundabouts, unlike other intersection designs, handle right-turning vehicles extremely well.

Pedestrians should cross 20 to 40 ft back from the roundabout where a traffic splitter offers a refuge and only one lane needs to be crossed at a time. Although pedestrians can cross with reasonable ease because of the short crossing distances and low vehicle speeds, too much pedestrian activity can interrupt the traffic flow. In such cases, pedestrian signals may be necessary or a signalized intersection may work better. Crossing signals may also be desirable where there are high numbers of elderly or children who find a positive form of traffic control more secure.

The safest way for bicycles to negotiate roundabouts is to join the traffic flow and occupy the lane. Bike lanes should be dropped about 60 ft before the roundabout lane with sufficient space to merge. A 1994 study of over 100 roundabouts in Switzerland showed bicycle safety at well-designed roundabouts to be about the same as at signalized intersections.

As with any intersection, a roundabout should fit into the street network. In a network of linked traffic signals, a roundabout is rarely an effective choice for one intersection. Roundabouts can also be affected by nearby signalized intersections that interrupt traffic flow and cause queuing back into the roundabout.

The best intersection design varies with each situation. In many cases, analysis of all options may show that a roundabout is an effective and less expensive way to meet mobility and safety objectives. The City of Madras may wish to consider the use of modern roundabouts instead of more expensive and limited signalized intersections.

RURAL STREET STANDARDS

Rural Local Streets

Generally, the average weekday traffic volume on a rural local residential street averages less than 500 vehicles per day, and design speeds are 25 MPH. The recommended standard for a rural local residential street is a 24 to 36-foot roadway within a 60-foot right-of-way, as shown on Figure 7-3, Section A. The width of the roadway and right-of-way is determined by the width of the shoulder, assuming two 10-foot travel lanes as a constant.

Narrower streets and travel lanes generally improve neighborhood aesthetics, and discourage speeding. They also reduce right-of-way needs, construction cost, storm water run-off, and vegetation clearance. Anticipated traffic volumes, as shown in Table 7-2 determine the width of the shoulder. It is expected that on rural local streets, parking will be off-pavement.

For the most part, rural streets will not include sidewalks. Pedestrians are generally accommodated on the shoulder of the road, as are bicyclists. However, in areas with high pedestrian or bicycle use, a pathway should be considered. The pathway should be located on both sides of the roadway, separated from the roadway by at least five feet of greenbelt or drainage ditch.

Table 7-2
Recommended Shoulder Widths on Rural Roads

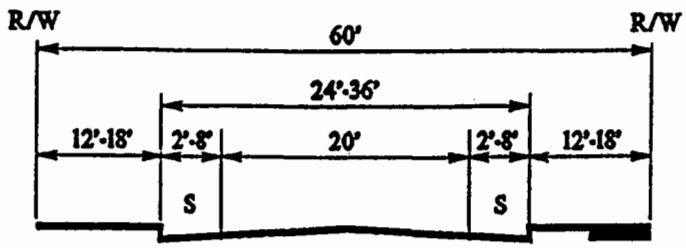
Shoulder Width	ADT < 400	ADT 400-DHV* 100	DHV 100-200	DHV 200-400	DHV > 400
Rural Arterials	4 feet	6 feet	6 feet	8 feet	8 feet
Rural Collectors	2 feet	4 feet	6 feet	8 feet	8 feet
Rural Local Street		2 feet	4 feet	6 feet	8 feet

* DHV (Design Hour Volume) is the expected traffic volume in the peak design hour (usually at commuter times), usually 13 to 25% of ADT.

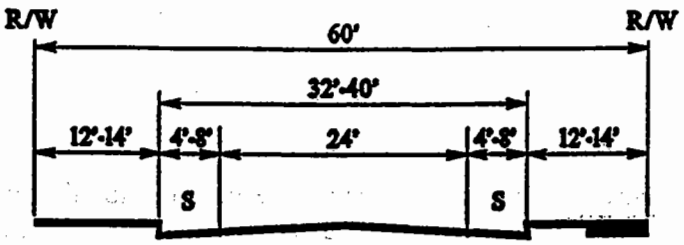
LEGEND

R/W = RIGHT-OF-WAY LINE
S = SHOULDER

A. LOCAL STREET



B. COLLECTOR



C. ARTERIAL

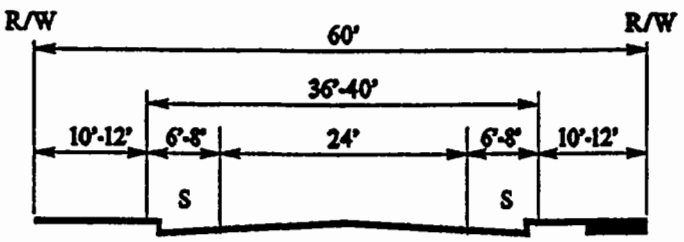


FIGURE 7-3
RURAL STREET DESIGN STANDARDS

Rural Collector Streets

Collector streets are primarily intended to serve abutting lands and local access needs of neighborhoods. They are intended to carry between 1,200 and 10,000 vehicles per day. Collectors can serve residential, commercial, industrial, and mixed land uses. Figure 7-3, Section B shows a cross section with a 60-foot right-of-way and a 32 to 40-foot paved width. This width allows two twelve-foot travel lanes and four to eight-foot shoulders. The width of the roadway and right-of-way is determined by the width of the shoulder. Anticipated traffic volumes, as shown in Table 7-2 determine the width of the shoulder. It is expected that on rural collector streets, parking will be off-pavement.

Generally, rural collectors will not include sidewalks. Pedestrians are usually accommodated on the shoulder of the road, as are bicyclists. However, in areas with high pedestrian or bicycle use, a pathway should be considered. The pathway should be located on both sides of the roadway, separated from the roadway by at least five feet of greenbelt or drainage ditch.

If traffic volume forecasts exceed 5,000 vehicles per day, then driveways serving single family houses, duplexes, or triplexes should not be permitted on that section.

Rural Arterial Streets

Arterial streets form the primary roadway network within the planning area. They provide a continuous roadway system that distributes traffic between different neighborhoods and districts. Generally, arterial streets are high capacity roadways that carry high traffic volumes with minimal localized activity. Residential property should not face or be provided with access onto arterial streets.

Figure 7-3, Section C shows an arterial cross section with a 60 to 64-foot right-of-way and a 36 to 40-foot paved width. This width allows two 12-foot travel lanes and six to eight-foot shoulders. The width of the roadway and right-of-way is determined by the width of the shoulder. Anticipated traffic volumes, as shown in Table 7-2 determine the width of the shoulder. No on-street parking should be allowed on arterial streets.

For the most part, rural arterials will not include sidewalks. Pedestrians are generally accommodated on the shoulder of the road, as are bicyclists. However, in areas with high pedestrian or bicycle use, a pathway should be considered. The pathway should be located on both sides of the roadway, separated from the roadway by at least five feet of greenbelt or drainage ditch.

ACCESS MANAGEMENT

Access management is an important tool for maintaining a transportation system. The lack of an access management plan can result in excessive numbers of accesses along arterial streets. Too many access points can diminish the carrying

capacity of an arterial, and result in delays and safety hazards to motorists created by turning movements. Traditionally, the response to this situation is to add lanes to the street. However, this can lead to increases in traffic and, in a cyclical fashion, require increasingly expensive capital investments to continue to expand the roadway.

Reducing capital expenditures is not the only argument for access management. Additional driveways along arterial streets lead to an increased number of potential conflict points between vehicles entering and exiting the roadway and vehicles traveling through on the arterial street. This leads to increased vehicle delay and deterioration in the level of service on the arterial, and increased potential for accidents.

Research has shown a direct correlation between the number of access points and accident rates. In addition, wider arterials that can result from poor access management can diminish the livability of a community. Therefore, it is essential that all levels of government maintain the efficiency of existing arterial streets through an access management program.

Access Management Techniques

The number of access points to an arterial can be restricted through the following techniques:

- Restricting spacing between access points (driveways) based on the type of development and the speed along the arterial;
- Sharing access points between adjacent properties;
- Providing access via collector or local streets, where possible;
- Constructing frontage roads to separate local traffic from through traffic;
- Providing service drives to prevent spill-over of vehicle queues onto the adjoining roadways;
- Providing acceleration, deceleration, and right turn only lanes;
- Offsetting driveways to produce T-intersections to minimize the number of conflict points between traffic using the driveways and through traffic;
- Installing median barriers to control conflicts associated with left turn movements; and
- Installing side barriers to the property along the arterial to restrict access width to a minimum.

Access management is hierarchical, ranging from complete access control on freeways to increasing use of streets for access purposes, parking and loading at

the local and minor collector level. Table 7-3 describes recommended general access management guidelines by roadway functional classification.

These access management restrictions are generally not intended to eliminate existing intersections or driveways. Rather, they should be applied as new development and/or redevelopment occurs. Over time, as land is developed and redeveloped, the access to roadways will meet these guidelines. However, where there is a recognized problem, such as an unusual number of collisions, these techniques and standards can be applied to retrofit existing roadways.

To summarize, access management strategies consist of managing the number of access points and providing traffic and facility improvements. The solution is a balanced, comprehensive program that provides reasonable access while maintaining the safety and efficiency of traffic movement.

Table 7-3
Recommended Access Management Standards

Functional Classification	Intersections				Signal Spacing[3]	Median control[4]
	Public Road		Private Drive[2]			
	Type[1]	Spacing	Type	Spacing		
Urban Arterial	@ Grade	1/4 mile	L/R Turns	300-500'	1/2 mile	Partial/ None
Urban Collector	@ Grade	500'	L/R Turns	100'	1/4-1/2 mile	None
Urban Local Street	@ Grade	200-400'	L/R Turns	Access to Each Lot	N/A	None
Downtown Commercial	@ Grade	200-400'	L/R Turns	100'	400'	None
Alley (Urban)	@ Grade	200-400'	L/R Turns	Access to Each Lot	N/A	None
Rural Arterial	@ Grade	1 mile	L/R Turns	1200'	None	None
Rural Collector	@ Grade	1/4 mile	L/R Turns	300'	1/2 mile	None
Rural Local Street	@ Grade	200-400'	L/R Turns	Access to Each Lot	N/A	None

(1) For most roadways, at-grade crossings are appropriate.

(2) Generally, no signals are allowed at private access points on statewide and regional highways. If warrants are met, alternatives to signals include median closing. Allowed moves and spacing requirements may be more restrictive than those shown to optimize capacity and safety. Any access to a State Highway requires a permit from the ODOT District Office. Access will generally not be granted where there is reasonable alternative access.

(3) Generally, signals should be spaced to minimize delay and disruptions to through traffic. Signals may be spaced at intervals closer than those shown to optimize capacity and safety. Pedestrian crossing is often benefited by a closer intervals of signal placing.

(4) Partial median control allows well defined and channelized breaks in the physical median barrier between intersections. Use of physical median barriers can be interspersed with segments of continuous left-turn lane, or, if demand is light, no median at all. Medians can be beneficial to crossing pedestrians.

Special Access Management Areas in the Madras Study Area

Access management is important to promoting safe and efficient travel for both local and long distance users along the US Highway 97/26 corridor. The 1991 *Oregon Highway Plan* (OHP) specifies an access management classification system for State facilities. Although Jefferson County and the City of Madras may designate State highways as arterial roadways within their transportation systems, the access management categories for these facilities should generally follow the guidelines of the OHP. This section of the TSP describes the state highway access categories and specific roadway segments where special access areas may apply.

US Highways 97 and 26 through the Madras planning area are roadway facilities of "statewide significance", and OHP Category 4, “Limited Control” applies. This classification permits at-grade intersections or interchanges at a minimum spacing of one-quarter mile. Private driveways should have a minimum spacing of 500 feet from each other and from intersections. Traffic signals are permitted at a minimum of 1/4-1/2 mile spacing. These requirements are similar to the general access management guidelines specified for major arterial roadways.

However, while these access management guidelines can be applied to some portions of Us Highway 97/26, the City has a grid system through the downtown area, with intersections spaced at approximately 400-foot intervals. Neither the general access category for major arterial roadways nor the OHP Category 4 classification can be met along these sections of the roadways.

The Highway standards are too restrictive for areas with centralized commercial development, such as downtown Madras. Shorter block lengths and a well-developed grid system are important to a downtown area. Downtown commercial arterials typically have blocks 200-400 feet long, driveway access sometimes as close as 100-foot intervals, and, occasionally, signals spaced as close as every 400 feet. The streets in downtown areas must have sidewalks and crosswalks, along with on-street parking. The need to maintain these typical downtown characteristics must be carefully considered along with the need to maintain the safe and efficient movement of through traffic.

Therefore, the Highway corridor has been separated into two segments for the purposes of access management. Segment 1 consists of the US Highway 97/26 corridor through the urban downtown core of the City from Pine Street on the north to "J" Street on the south end of the couplet. Segment 2 consists of US Highway 26 from the north end of the couplet to the northern study boundary and US Highway 97 from the south end of the couplet to the southern study boundary and US 97 from its junction with US 26 and the northeast planning area boundary. These segments are shown in Figure 7-4 and in Table 7-4, below.

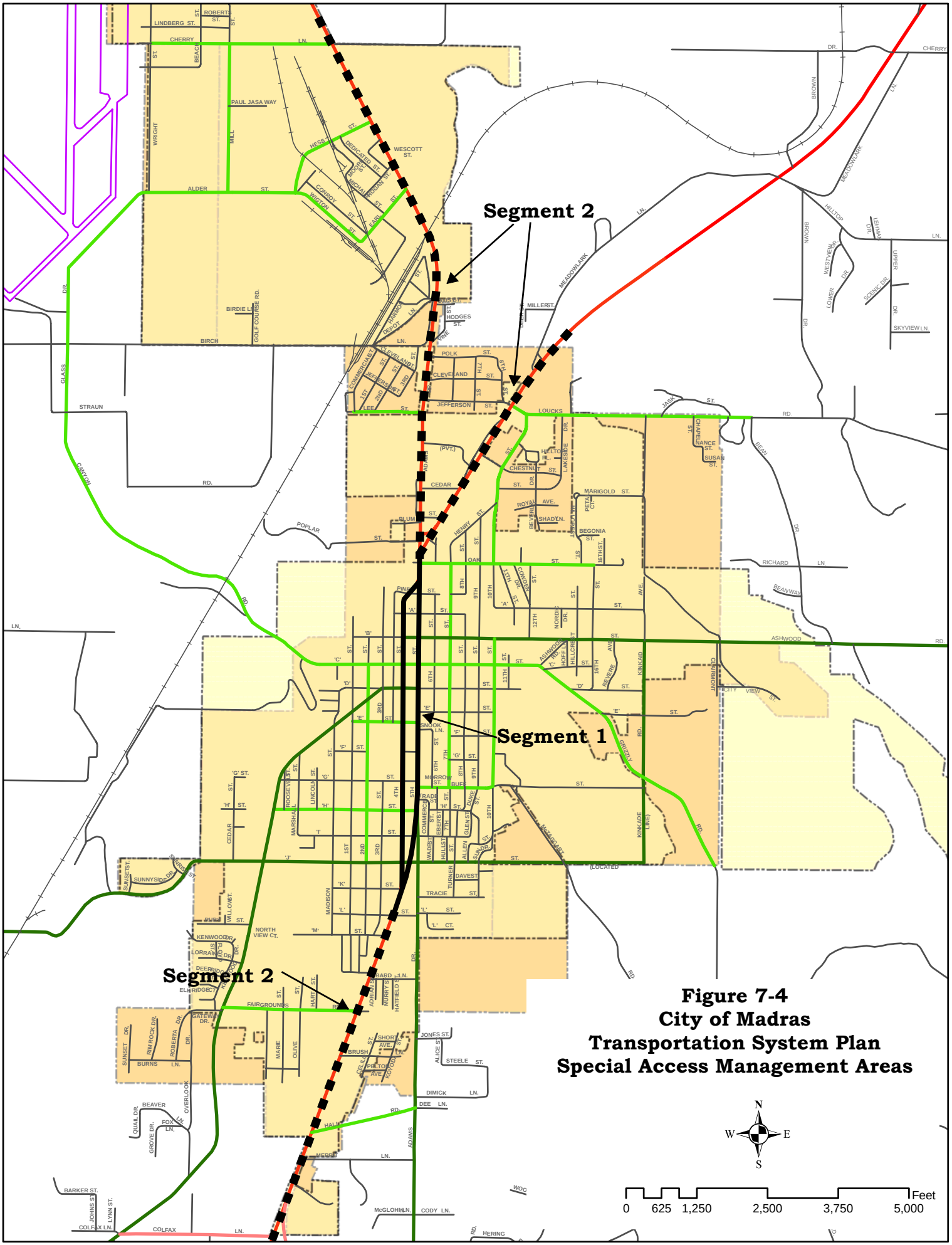


Figure 7-4
City of Madras
Transportation System Plan
Special Access Management Areas

Table 7-4
Special Access Management Guidelines for the Madras Transportation Plan

	Segment 1	Segment 2
Posted Speed (MPH)	15-25	35-40
Minimum Spacing Between Driveways	500 feet	500 feet
Spacing Between Intersections	300 feet	1/4 mile
Area of Application	Hwy 97/26 Couplet area	Hwy 26 & 97 from Segment 1 to the North & South UGB

MODAL PLANS

The Madras modal plans have been formulated using information collected and analyzed through a physical inventory, forecasts, goals and objectives, and input from area residents. The plans consider transportation system needs for the Madras study area during the next 20 years. The plans assume that the entire TSP area, extending beyond the present UGB, will be built out to currently allowed densities within that time frame. The changes in land use patterns and growth of the population will guide the timing for individual improvements in future years. Adjustment to specific projects and improvement schedules will likely need to be modified depending on where growth occurs within the Madras urban area.

Seven modal plans are described in the following text. These are 1) Pedestrian System, 2) Bicycle System, 3) Street System, 4) Transportation Demand Management Plan, 5) Public Transportation Plan, 5) Rail Service, 6) Air Service, and 7) Pipeline Service. (Madras has no water-based transportation.) All of these plans closely interrelate. For example, the street system plan, although primarily designed around the motor vehicle traffic forecasts, will also serve pedestrians, bicyclists, and transit users. In addition, all modes will be served by the implementation of revised zoning ordinances and development codes supporting mixed uses and higher density, as described in Chapter 9.

Each modal plan also includes an implementation schedule and budgetary cost estimate. The funding strategy recommended for the TSP is discussed in detail in Chapter 8.

Pedestrian System Plan

A complete pedestrian system shall be implemented in the City. Every paved street shall have sidewalks on both sides of the roadway meeting the requirements set forth in the street standards. Pedestrian access on walkways shall be provided between all buildings including shopping centers and abutting streets and adjacent neighborhoods. (Ordinances specifying these requirements are included in Chapter 9.)

Most of the existing roadways in Madras do not have sidewalks except in the downtown core. Even in the downtown core, many of the streets either do not have sidewalks on both sides or are fragmented and non-continuous.

Some sidewalks will be added as improvements to the street system are made. The implementation program identifies an approximate schedule for these improvements.

Lists of specific sidewalk improvements are included in the CIP. City Staff has indicated priorities. These improvements are shown in Table 7-5, below.

Table 7-5
Madras Walkway Projects

Location	Project Description	Priority	Cost
Buff St.	Sidewalks on north side between 4th and 10th streets.	High	$105,000
Oak St.	Sidewalks both sides between US Hwy 97/26 and 16th St.	High	$500,000
2nd St.	A sidewalk on both sides between "B" and "J" streets.	High	$642,000
10th St.	Sidewalks on west side between "B" and Buff streets.	Medium	$187,000
US Hwy 97/26	Sidewalks on both sides south of "E" Street	Medium	$875,000
Friendship Park	Sidewalks on "E" and "G" streets adjacent to the park.	Medium	$37,000
"B," "C," "E," and "F" streets	Infill sidewalks between 8th and 10th streets.	Medium	$84,000
US Hwy 26	Sidewalks both sides between 97/26 couplet and Lee St.	Low	$500,000
Fairgrounds Rd.	Sidewalks on both sides.	Low	$362,000
US Hwy 97	Sidewalks on west side between 97/26 couplet to Jefferson St.	Low	$164,000
TOTAL ESTIMATE			**$3,456,000**

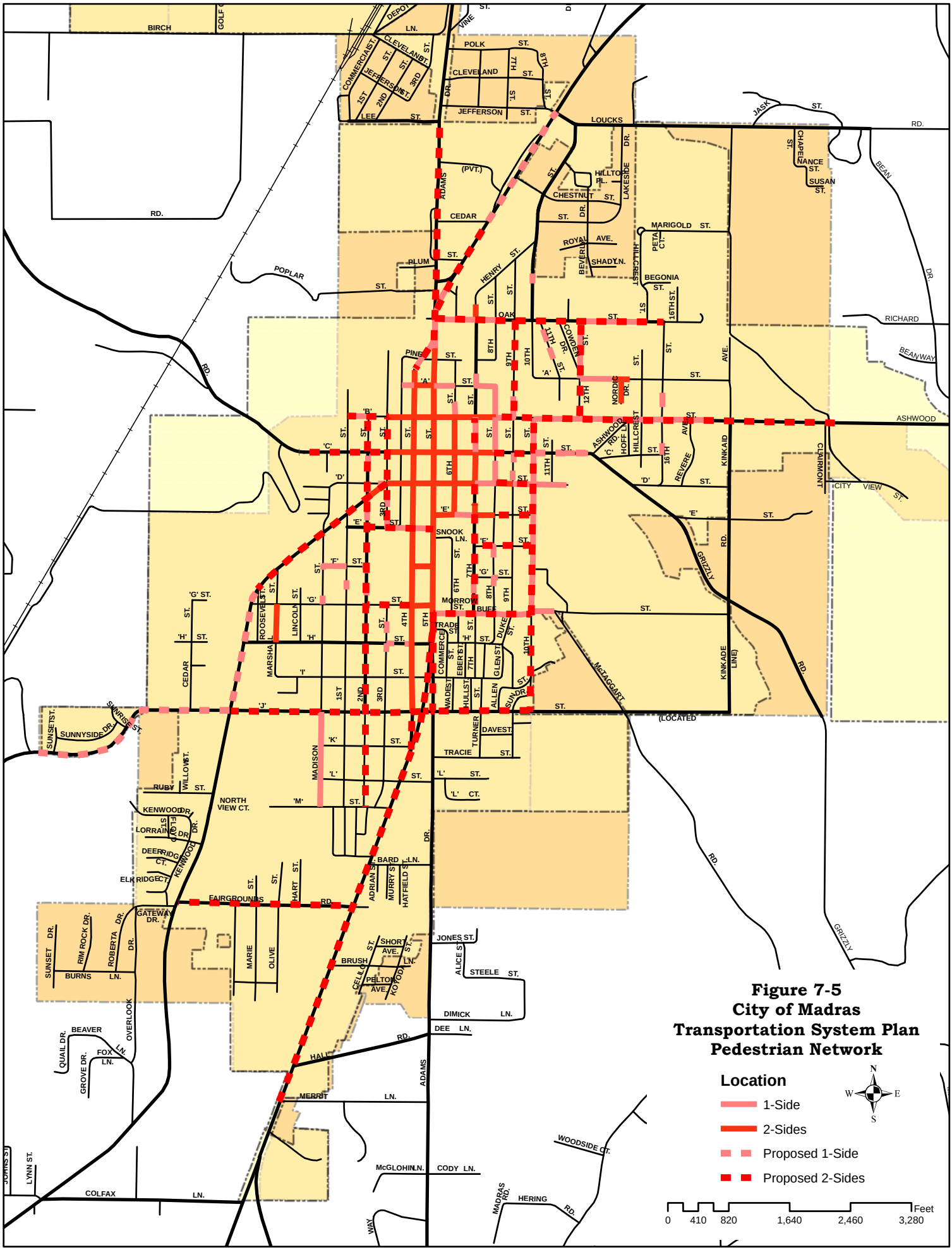


Figure 7-5
City of Madras
Transportation System Plan
Pedestrian Network
Location
1-Side
2-Sides
Proposed 1-Side
Proposed 2-Sides
N
W
E
S
0
410
820
1,640
2,460
3,280
Feet

A six-foot wide sidewalk with no curb costs about $30 per linear foot. Adding a curb as well as a six-foot wide sidewalk costs about $35 per linear foot. In commercial areas, an eight-foot wide sidewalk with a curb will cost about $45 per linear foot. Applying these costs to a typical block in Madras would require about 300 linear feet of sidewalk. For a six-foot wide sidewalk with curbs, the cost would be approximately $10,500. Without curbs, the cost would be approximately $9,000.

Bicycle System Plan

The recommended bicycle system plan is shown on Figure 7-6. The map shows the existing bikeway system, bikeways currently under construction, future bikeways planned by Jefferson County, future bikeways associated with street system improvements, and the future city bikeways designated on all arterial and collector streets. A list of recommended bikeway improvements is shown in Table 7-6.

In addition to the projects proposed in Table 7-6, new collectors and arterials recommended, as part of the Street System Plan will include bike lanes. The complete Bikeway Plan, including the inventory data, is included in Appendix G.

Bike lanes should be one-way, five or six feet wide and located adjacent to the curb, except where there is curb parking or a right-turn lane. Where these conditions occur, the bike lane is located between the through travel lane and the parking or right-turn lane. The bike lane is marked in the same direction as the adjacent travel lane. The striping should conform to the 1995 State Bicycle and Pedestrian Plan.

Shared roadway facilities are appropriate for local residential streets where speeds and volumes of motor vehicles are relatively low. On a shared roadway facility, bicyclists share normal vehicle lanes with motorists.

Bicycle parking is lacking in the Madras area. Bike racks should be installed in front of downtown businesses and all public facilities (schools, post office, library, city hall, and parks). Typical rack designs cost about $50 per bike plus installation. An annual budget of approximately $1,500 to $2,000 should be established so that Madras can begin to place racks where needs are identified and to respond to requests for racks at specific locations. Bicycle parking requirements are further addressed in Chapter 9 (Policies and Ordinances).

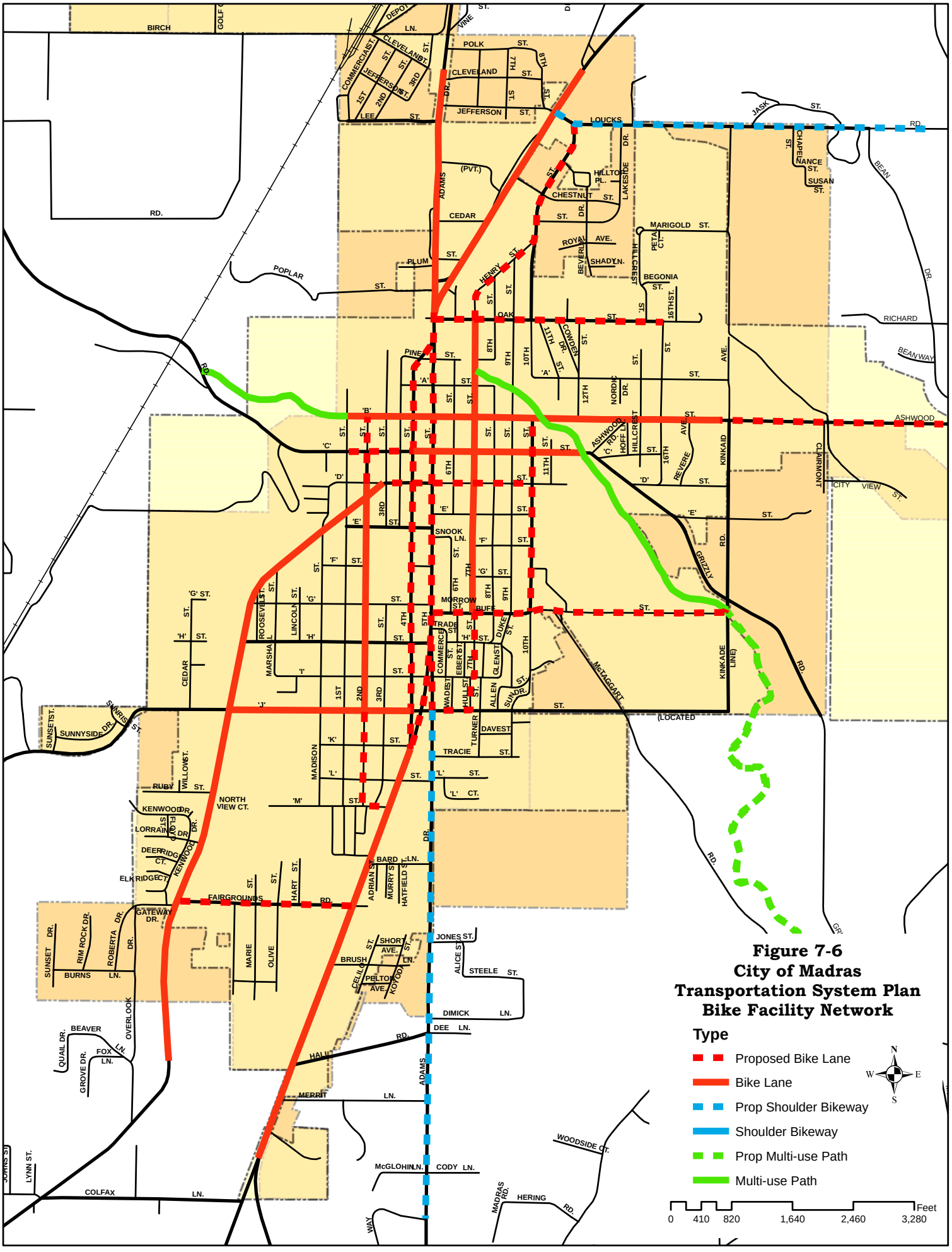


Figure 7-6
City of Madras
Transportation System Plan
Bike Facility Network
Type
Proposed Bike Lane
Bike Lane
Prop Shoulder Bikeway
Shoulder Bikeway
Prop Multi-use Path
Multi-use Path
N
W
E
S
0
410
820
1,640
2,460
3,280
Feet

Table 7-6
Madras Bikeway Projects

Location	Project Description	Priority	Cost
"B" St./ Ashwood Rd.	Widen east of Kinkade from 30-34 feet to 36 ft with bike lanes. Examine feasibility of separated path on hill.	High	$47,000
Buff St.	Stripe bike lanes. Redesign crossing at 5th.	High	$2,000
7th St.	Stripe bike lanes from Oak to Buff.	High	$7,000
"J" St.	Stripe bike lanes from State Highway 361 to 5th.	High	$4,500
Oak St.	Add bike lanes from US Hwy 97/26 to 16th	High	$4,000
2nd St.	Stripe bike lanes from "B" to "J" when improved or when traffic reaches 1500 ADT.	High	$3,500
4th/5th St. couplet	Stripe bike lanes from US Hwy 97/26 Y to Fairgrounds	High	$11,000
Various public locations	Install bicycle parking @ $50/bike, provide parking for 50 bikes annually for 5 yrs = 250 racks	High	$12,500
Willow Creek Trail	Link gap from 1st to 7th, provide at-grade crossing of US Hwy 97/26, and add trail access from "E" and Buff to Grizzly.	High	$100,000
10th St.	Stripe bike lanes from "B" to Buff.	Medium	$3,500
"C" St.	Stripe bike lanes from 1st to Grizzly.	Medium	$5,500
"E" St.	Stripe bike lanes from 5th to 10th.	Medium	$2,500
Adams Dr.	Widen to 34 ft and sweep in Spring.	Medium	$90,000
Culver Hwy.	Sweep in Spring (16 hours @ $40/hour).	Low	$640
"D" St.	Stripe bike lanes from 3rd to 10th.	Low	$4,000
Fairgrounds Rd.	Widen to 36 ft from State Highway 361 to US Hwy 97/26 and add bike lanes.	Low	$1,500
Grizzly Rd.	Widen to 34 ft and sweep in Spring.	Low	$140,000
Loucks Rd.	Widen to 34 ft and sweep in Spring.	Low	$110,000
McTaggard Rd.	Widen to 34 ft and sweep in Spring.	Low	$45,000
TOTAL ESTIMATE			**$594,140**

Street System Plan

The street system plan outlines a series of improvement options that are recommended for construction within the Madras area during the next 20 years. The street system plan was developed by applying recommended street classification standards to the year 2015 traffic forecasts for the recommended street system. These options have been discussed in Chapter 6 (Improvement Options Analysis). The proposed street system plan are summarized in Table 7-6 and shown in Figure 7-7.

Table 7-7
Recommended Street System Improvements

Street Improvement	Cost
Improve Basic Street Grid	$6,265,000
US Hwy 97/26 North Junction Improvements	$1,500,000 - $3,900,000*
US Hwy 97/26 South Couplet Redesign	$900,000
Industrial Park Connection (Phase 1)	$1,034,000
Industrial Park Connection (Phase 2)	$784,000
Traffic Signals at US Hwy 26/Industrial Park	$500,000
Total Street Improvement Cost	**$10,983,000 - $13,383,000***

* Depending on which option is chosen during project development.

Transportation Demand Management Plan

Through transportation demand management, peak travel demands can be reduced or spread out to make more efficiently use the transportation system. Techniques that have been successful and could be initiated to help alleviate some traffic congestion include carpooling and vanpooling, alternative work schedules, bicycle and pedestrian facilities, and programs focused on high-density employment areas.

- **Alternative Work Schedules**

  Alternative work schedules (such as flextime or staggered work hours), especially with large employers, can help spread the peak period traffic volumes over a longer time period. This can provide greater service out of a fixed capacity roadway. Staggered work schedules shall be encouraged with new industries and be coordinated to eliminate high surges of traffic.

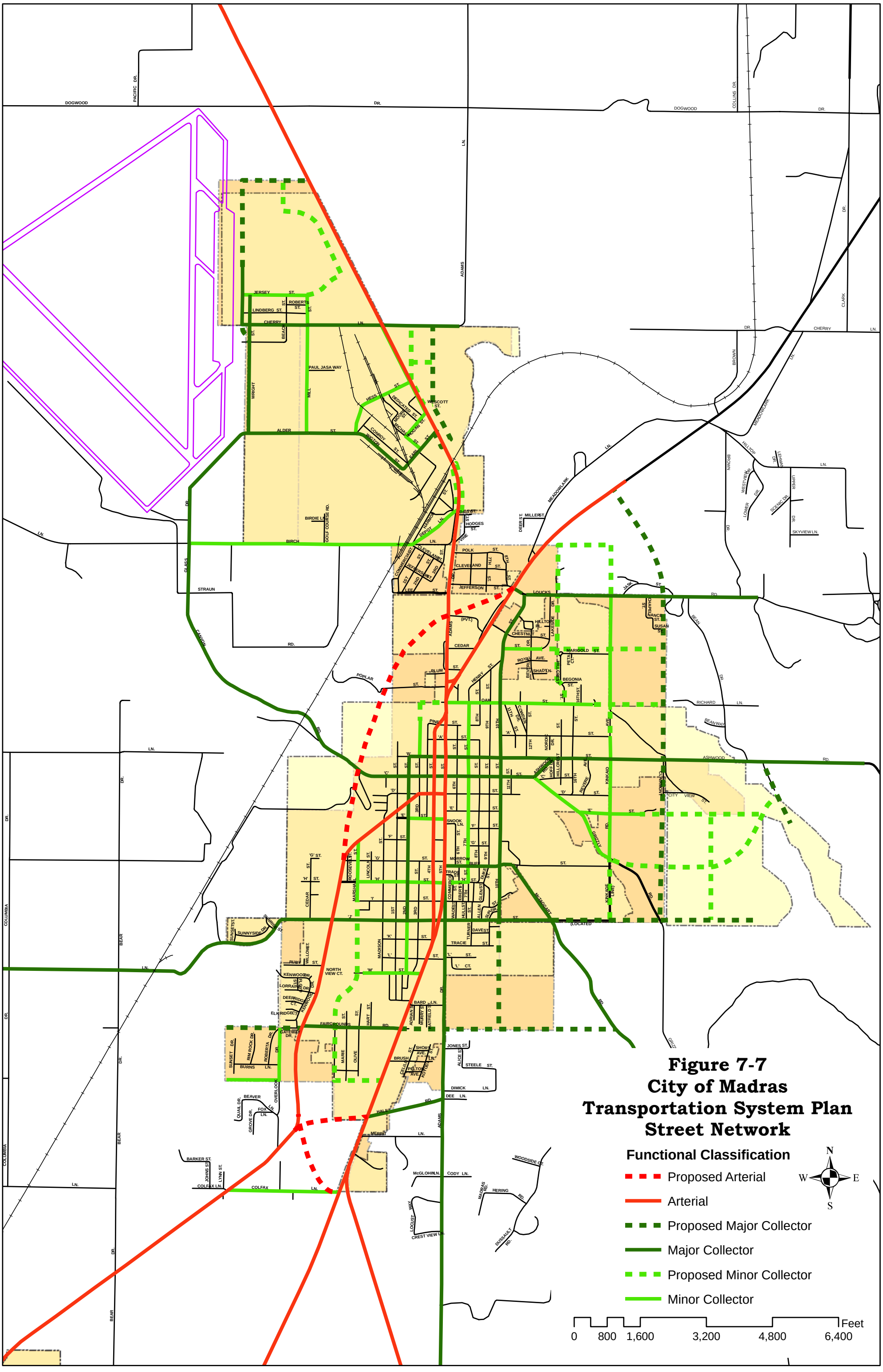


Figure 7-7
City of Madras
Transportation System Plan
Street Network
Functional Classification
Proposed Arterial
Arterial
Proposed Major Collector
Major Collector
Proposed Minor Collector
Minor Collector
N
W
E
S
0
800
1,600
3,200
4,800
6,400
Feet

- **Carpooling and Vanpooling**

  Central Oregon already has a ridesharing program to encourage carpooling. It was established in September of 1993 and already has a database of about 100 people. The service allows interested drivers to call a toll-free number, provide information about their trip, and receive a list of others in their general area.

  The City can work with large employers, to establish a carpool and vanpool program. These programs, especially oriented to workers living in other neighboring cities, will help reduce travel and parking requirements, and reduce air pollution. Employers can encourage ridesharing by providing matching services, subsidizing vanpools, establishing preferential car and vanpool parking, convenient drop-off sites, and other promotional incentives.

- **Bicycle/Pedestrian Facilities**

  Implementing strategies discussed earlier in this plan can encourage bicycling and walking. Providing bicycle parking, showers and locker facilities helps to encourage bicycle commuting and walking to work.

- **Telecommuting**

  The ability for people to work at home using telecommuting technology is likely to continue to grow during the next two decades. During the past ten years, the percent of people working at home has more than doubled. If this trend continues, an additional 3 percent of the work force could stay home and work, thus reducing trips during the peak hour.

  No costs have been estimated for this modal plan. Grants may be available to set up programs. Other aspects of encouraging Transportation Demand Management can be encouraged through ordinance and policy (see Chapter 9).

Public Transportation Plan

Public transportation in Madras consists of a demand responsive system for local trips, van shuttle for trips to nearby communities, and Greyhound Bus Line service for long distance trips. Transit providers currently plan no specific expansions of any services. However, increased usage of these services should be encouraged.

The existing public transportation services already meet the requirements of the Oregon Transportation Plan. Connections are possible and convenient between all the services provided. The service frequency meets the required daily trip to a larger city specified for communities the size of Madras. However, the City may consider a shuttle bus system to the Industrial Park to relieve peak demands, should this becomes a problem in the future.

In addition, there may be an increasing need for on-demand transportation services as the area population grows. Growth should be guided so that it does not prevent transit development in the future. Techniques for encouraging transit-compatible design are discussed in Chapter 9 (Policies and Ordinances).

No costs have been estimated for this modal plan. Grants may be available to conduct feasibility studies. State and Federal funding may be available to purchase equipment.

Rail Service Plan

The Burlington Northern Main Rail Line runs from south to north on the west side of Madras. This rail line, operated by the Union Pacific Railroad, has spur lines feeding into the Madras Industrial Park. One spur line that presently extends up near Cherry Lane is owned and maintained by the City of Madras. In the 1995/1996-budget year, the City of Madras plans to extend the City spur line north across Cherry Lane to the Air Development Park. The Union Pacific and City spur lines provide rail freight service to a number of industrial businesses within the industrial park. No passenger service is currently in operation in the Madras plan area.

Air Service Plan

The City of Madras owns and operates a general service airport. The Madras City-County Airport is located north of town along US Highway 26. The airport lies outside the city limits and the Madras urban growth boundary. The last master plan for the airport was written in 1987 and has not been updated. The master plan called for a business park by the airport, which has since been constructed along NW Cherry Lane. The City is interested in the long-term potential for the airport and industrial site to be developed as a multi-modal freight node (air, truck, and train freight).

Pipeline Service Plan

The nearest pipelines to Madras are the Pacific Gas Transmission Company's parallel 36-inch and 42-inch natural gas pipelines. These major natural gas transmission mains extend from Canada to California. These pipelines run through Jefferson County in the Cove Canyon area, and do not extend into the Madras TSP planning area.

TRANSPORTATION SYSTEM PLAN IMPLEMENTATION PROGRAM

Implementation of the Madras TSP will require both changes to the City comprehensive Plan and Zoning Code and preparation of a 20-Year Capital Improvement Plan. These actions will enable Madras to address both existing and emerging transportation issues throughout the urban area in a timely and cost effective manner. This implementation program is geared towards providing the City of Madras with the tools to amend the comprehensive plan and zoning ordinance to conform with the Oregon Transportation Planning Rule and to fund and schedule transportation system improvements.

Model policy and ordinance language that conforms to the requirements of the Transportation Planning Rule is provided in Chapter 9. In addition, a list of proposed zoning ordinance amendments are included that will enable the City of Madras to revise the Zoning Code to encourage mixed-uses within the urban area. The intent is to encourage compatible uses that reduce reliance on use of automobiles as proposed in Option 1. The proposed zoning code amendments will encourage greater densities and better use of existing land within the UGB that is already served by local streets and public utilities such as sewer and water. The proposed ordinance amendments will require approval by the City Council and those that affect the unincorporated urban area will also require approval by the Board of County Commissioners.

The second part of the implementation program is the formulation of a 20-Year Capital Improvement Plan (CIP). The purpose of the CIP is to detail what transportation system improvements will be needed as Madras grows and provide a process to fund and schedule the identified transportation system improvements. It is expected that the TSP Capital Improvement Plan can be integrated into the existing City CIP, Jefferson County Road Plan, and ODOT STIP. This integration is important since the TSP proposes that all three governmental agencies will fund some of the transportation improvement projects.

Table 7-8 summarizes the Madras TSP Capital Improvement Program. It lists the specific projects, identifies them by improvement option, and provides cost information. The cost estimates for all the projects listed on the CIP were prepared on the basis of 1995 dollars. These costs include design, construction, right-of-way acquisition, and contingencies where appropriate. The highway and street cost estimates are preliminary by road segment and do not include the cost of adding or relocating public utilities or detailed design of existing street intersections.

The entire 20-year CIP is estimated to cost approximately $15.0 million. Of the total, it has been assumed that ODOT will fund up to a maximum of $2.9 million of the improvements located within the US Highway 97/26 corridor. The remaining $12.1 million, which include street, pedestrian, and bikeway improvements, will need to be funded through local sources. The TSP Funding chapter details how the transportation system improvements can be funded during the next 20 years.

Table 7-8
Madras TSP Capital Improvement Plan

Project Description	Option	Cost
STATE HIGHWAY SYSTEM		
North US Highway 97/26 Intersection	5A	$1,500,000
South US Highway 97/26 Couplet	6	$900,000
US Highway 26 Traffic Signals	9	$500,000
Subtotal (State Highway)	**5A,6,9**	**$2,900,000**
LOCAL SYSTEM - STREETS		
Revise Zoning Patterns	1	$0
Basic Street Grid	3	$6,265,000
Industrial Park Connection	7	$1,818,000
Subtotal (Local System)	**1,3,7**	**$8,083,000**
LOCAL SYSTEM - ALTERNATIVE MODES		
Pedestrian Improvements	2	$3,456,000
Bikeway Improvements	2	$594,140
Subtotal (Local System -Alt. Modes)	**2**	**$4,050,140**
Total CIP Cost Estimate		**$15,033,140**

It is expected that the Madras TSP improvement projects will be constructed during the next 20 years. The timing of specific projects will be guided by the rate of population growth and the corresponding increase in traffic volumes in the planning area. A prioritization of all the TSP projects is shown in Table 7-9. This table includes State system projects, assumed to be funded by ODOT; and local street, walkway, and bikeway projects assumed to be the principal responsibility of the City of Madras. The prioritization covers short through long-term transportation system improvements. The funding options to finance the Madras TSP projects are discussed in Chapter 8.

Table 7-9
Prioritized Capital Improvement Plan
(1995 Dollars)

Project Description	Short Term (0-5 Years)	Mid Term (6-10 Years)	Long Term (11-20 Years)	Total
STATE SYSTEM				
North US Highway 97/26 Signal	$1,500,000			$1,500,000
South US Highway 97/26 Couplet		$ 900,000		$ 900,000
US Highway 26 Traffic Signals	$ 250,000	$ 250,000		$ 500,000
Subtotal (State Highway)	$1,750,000	$1,150,000		$2,900,000
LOCAL SYSTEM - STREETS				
Basic Street Grid	$1,879,500	$1,879,500	$2,506,000	$ 6,265,000
Industrial Park Connection				
Phase I	$1,034,000			$ 1,034,000
Phase II		$ 784,000		$ 784,000
Subtotal (Local System - Streets)	$2,913,500	$2,663,500	$2,506,000	$ 8,083,000
LOCAL SYSTEM - WALKWAY				
High Priority	$ 1,247,000			$ 1,247,000
Medium Priority		$ 1,183,000		$ 1,183,000
Low Priority			$ 1,026,000	$ 1,026,000
Subtotal (Local System - Walkway)	$ 1,247,000	$ 1,183,000	$ 1,026,000	$ 3,456,000
LOCAL SYSTEM - BIKEWAY				
High Priority	$ 191,500			$ 191,500
Medium Priority		$ 101,500		$ 101,500
Low Priority			$ 301,140	$ 301,140
Subtotal (Local System - Bikeway)	$ 191,500	$ 101,500	$ 301,140	$ 594,140
Subtotal (All Local Systems)	**$ 4,352,000**	**$ 3,948,000**	**$ 3,833,140**	**$12,133,140**
Total (State and Local Systems)	**$ 5,910,500**	**$ 5,098,000**	**$ 3,833,140**	**$15,033,140**

CHAPTER 8
FUNDING OPTIONS AND FINANCIAL PLAN

The successful implementation of the Transportation System Plan will require that the City of Madras work with ODOT and Jefferson County to secure adequate funding to finance new transportation projects during the next 20 years. The formulation of a comprehensive Capital Improvement Plan (CIP) will enable Madras to schedule the construction and funding of new improvements that address existing capacity and safety issues and those improvements that will be needed to accommodate future population and employment throughout the urban area. This chapter provides an analysis of available funding options that can be considered by Madras and provides a framework for a 20 year Capital Improvement Plan.

The Madras TSP identifies the need for over $17,000,000 (1995 dollars) in funding to finance the transportation system improvements over the next 20 years. It is expected that transportation system improvements will be made to city streets, county roads, and state highways within the Madras Urban Growth Boundary. This TSP cost estimate only covers the costs associated with constructing new transportation system improvements and does not cover any costs associated with maintaining the current or future system. This funding analysis assumes that there will be a cost sharing of future improvements by Madras, Jefferson County, and ODOT. Close coordination on scheduling and funding transportation improvements will be vital for the timely construction of the identified transportation system improvements.

Although this TSP considers a 20-year planning horizon, the timing for specific transportation system improvements will be governed by the rate of population and employment growth within the urban area. In recent years, Madras and Jefferson County have been growing at a high rate. If this recent high growth pattern continues, Madras, Jefferson County, and ODOT may need to consider constructing TSP improvements at an accelerated rate. If, however, the growth rate levels off, then it is more likely the City, the County, and ODOT will be able to schedule future transportation system improvements over the entire 20 year TSP life span.

At the present time, the City of Madras is doing a good job of making street, pedestrian, and bicycle improvements within the City on an annual basis. Projects that are funded are typically identified in the public facilities plan and have been identified and prioritized by the Public Works Department. This yearly capital outlay funding has been successful in financing a small number of projects each year. But the success of the program is limited due to inadequate City funding and does not address need transportation system improvements within the study area outside the city limits. In order to implement the TSP, the City of Madras will need to work closely with ODOT and Jefferson County to increase funding for transportation projects and to consider needed improvements throughout the urban area.

This section of the TSP discusses the various funding and financing options that may be available to the City of Madras to meet its 20 year transportation funding needs. Included in this chapter is a review of historic street improvement funding sources, potential new revenue sources, a review of transportation system funding requirements, and general recommendations for financing future transportation system improvements. In addition, a brief analysis of how Jefferson County and ODOT finance transportation system improvements is included to provide a context on how the different governmental agencies can work together in the future.

HISTORIC STREET IMPROVEMENT FUNDING SOURCES

The City of Madras accounts for transportation related revenues and expenditures in three separate funds. Each fund is accounted for separately in the annual fiscal year budget. These funds include the Street Tax, Public Facilities Plan, and Industrial Park.

State Street Tax Fund

The purpose of the Madras State Street Tax Fund is to maintain, rehabilitate, improve and expand city streets, drainage systems, sidewalks and traffic control devices in an orderly and cost effective program. A summary of the State Street Tax Fund over the last four years is detailed in Tables 8-1 and 8-2.

Revenues received from the State of Oregon, such as gas taxes and vehicle registration fees, provided more than 56% of the State Street Fund revenues in the 1995/1996 budget year. System Development Fees (SDF) for storm drains and streets provide the other significant revenue source.

The major street construction project during the 1995/1996 budget year was the completion of the “C” Street Reconstruction. Major street maintenance expenditures will be devoted to the implementation of a Pavement Management System (PMS), asphalt overlays, crack sealing and pothole repair.

The capital outlay expenditures from the State Street Tax Fund are shown on Table 8-3. During the 1995/1996 fiscal year, the City of Madras dedicated a total of $83,860 or 42% of capital outlay expenditures to street, walkway and bikeway improvements within the community. These funds were used to finance the painting of bike lanes, ADA curb ramps and sidewalks along Buff Street, and the reconstruction of “C” Street.

Table 8-1
Madras Street Tax Fund: Historical Revenues

Description	1992/1993	1993/1994	1994/1995	1995/1996
Cash On Hand	$58,752	$24,796	$110,000	$48,000
Shared Revenues				
• Bike Grant	$0	$0	$5,000	$5,000
Other Agencies				
• SCA Funds	$12,500	0	$25,000	$12,500
• State Funds	$153,257	$180,674	$189,260	$196,740
• Transportation Plan	0	0	$67,500	$67,500
Miscellaneous Charges	$1,066	$251	$500	$500
Current Services Charges				
• SDF-Storm Drains	$10,206	$9,092	$15,000	$25,000
• SDF-Streets	0	$13,176	$40,000	$60,000
Interest on Investments	$741	$3,215	$3,000	$2,800
Transfers-Industrial Site	0	$70,000	0	0
Total Revenues	**$236,523**	**$301,204**	**$455,260**	**$418,040**

Table 8-2
Madras Street Tax Fund: Historical Expenditures

Description	1992/1993	1993/1994	1994/1995	1995/1996
Personal Services	$41,910	$27,547	$49,745	$60,523
Material and Services	$65,789	$84,782	$91,050	$96,900
Capital Outlay	$88,048	$63,744	$290,320	$198,860
Equip. Replacement	$15,980	$16,330	$15,000	$15,000
Operating Contingency	$0	$0	$9,145	$46,757
Unappropriated Ending Balance	$24,796	$108,801	$0	$0
Totals	**$236,523**	**$301,204**	**$455,260**	**$418,040**

Table 8-3
Madras Street Tax Fund: Capital Outlay Expenditures

Description	1992/1993	1993/1994	1994/1995	1995/1996
Bicycle Path	$0	$3,285	$11,420	$3,860
Building Improvement	$0	$0	$2,500	$5,000
Equipment Purchases	$1,817	$6,314	$10,000	$10,000
Facilities Improvements	$0	$0	$100,000	$20,000
Storm Sewers	$8,777	$9,806	$15,000	$25,000
Street Expansion	$0	$0	$25,000	$0
Street Improvements	$77,453	$44,339	$126,400	$60,000
Transportation Plan	$0	$0	$0	$75,000
Total Capital Outlay	**$88,048**	**$63,744**	**$290,320**	**$198,860**

Public Facilities Plan

The Madras Public Facilities Plan is in compliance with OAR 660-11-000, the Public Facilities Rule. A summary of the Public Facilities Plan Fund revenues and expenditures over the last four years is shown on Tables 8-4 and 8-5. The purpose of this fund is to finance infrastructure construction associated with growth within the community. Revenues for the Public Facilities Plan is generated through a variety of sources including grants, loan proceeds, bond sales, construction warrants, and Local Improvement District (LID) assessments. The disbursement of funds from the Public Facilities Plan Fund is for all public infrastructures needed to permit orderly growth and development in the community. Specific areas that have been targeted include the Industrial Park, Downtown, and the overall housing stock within Madras. Transportation system improvements are included as part of the annual expenditures from this fund. During the 1995/1996 budget year, the City of Madras used the majority of the available funds to finance a total of $417,750 on transportation related infrastructure projects within downtown.

Table 8-4
Madras Public Facilities Plan Fund: Historical Revenues

Revenue Sources	1992/1993	1993/1994	1994/1995	1995/1996
Cash on Hand	$32,648	$26,674	$1,000	$1,000
Shared Revenues:				
- CDB Grant	$0	$0	$300,000	$270,000
- Industrial Site Loan/Grant	$0	$343,534	$410,000	$0
- ISTEA Grant	$0	$0	$387,750	$387,750
- Beautification Grant	$0	$0	$25,000	d$0
- Property Owner Reimbursement	$0	$0	$30,000	$30,000
Charges for Services	$0	$14,710	$0	$0
LID Assessment	$2,541	$1,851	$4,595	$1,850
Interest on Investment	$1,376	$345	$1,000	$200
Total Revenues	**$36,566**	**$387,114**	**$1,159,345**	**$690,800**

Table 8-5
Madras Public Facilities Plan Fund: Historical Expenditures

Expenses	1992/1993	1993/1994	1994/1995	1995/1996
Capital Outlay:				
- CDB Grant	$0	$255	$300,000	$270,000
- Infrastructure	$385	$43,774	$447,345	$418,800
- Water Project	$9,507	$338,320	$410,000	$0
Interfund Transfers	$0	$2,000	$2,000	$2,000
Unappropriated Ending Balance	$26,674	$2,764	$0	$0
Total Fund Expenses	**$36,566**	**$387,114**	**$1,159,345**	**$690,800**

Industrial Site Fund

The City of Madras has the responsibility for the sale and lease of properties at the Madras Industrial Park. A summary of the Industrial Site Fund revenues and expenditures over the last four years is shown on Tables 8-6 and 8-7. The City maintains control of industrial park leases and sales to actively promote economic activity and diversification. This promotion is done in conjunction with the Economic Development for Jefferson County (EDJ) organization. One of the critical objectives of this fund is to finance public works infrastructure to retain existing businesses and to attract new business to Madras. The City spent approximately $130,000 during the 1995/1996 budget year to extend the existing City rail spur line north across Cherry Lane to the Air Development Park.

Table 8-6
Madras Industrial Site Fund: Historical Revenues

Revenue Source	1992/1993	1993/1994	1994/1995	1995/1996
Cash on Hand	$257,529	$346,352	$200,000	$298,000
Revenues from other Agencies:				
- OEDD Grant - RR Extension	$0	$0	$0	$129,700
- Community Forestry	$0	$0	$40,000	$0
Charges for Services	$6,971	$1,027	$500	$1,000
Use of Money and Property:				
- Interest on Investments	$13,444	$15,437	$10,000	$10,000
- Industrial Site Sales	$104,399	$68,474	$50,000	$12,200
- Industrial Site Leases	$7,116	$7,180	$8,000	$15,000
- Interfund Loan - Airport	$2,000	$2,000	$6,000	$6,000
Total Revenues	**$391,459**	**$440,470**	**$314,500**	**$471,900**

Table 8-7
Madras Industrial Site Fund: Historical Expenditures

Expenses	1992/1993	1993/1994	1994/1995	1995/1996
Materials and Services:				
- Industrial Site Improvements	$6,057	$28,038	$110,500	$50,000
- Industrial Site Promotion	$17,924	$10,868	$50,000	$30,000
- Miscellaneous Expenses	$681	$117	$1,000	$500
- Street Lights	$1,316	$1,316	$2,000	$2,000
Capital Outlay:				
- Industrial Park Expansion	$7,128	0	$119,000	$326,070
Interfund Transfers:				
- General Fund	$12,000	$12,000	$12,000	$21,000
- State Street Tax	$0	$70,000	$0	$0
Operating Contingency	$0	$0	$20,000	$42,330
Unappropriated Ending Balance	$346,352	$318,131	$0	$0
Total Fund Expenses	**$391,459**	**$440,470**	**$314,500**	**$471,900**

ALTERNATIVE REVENUE SOURCES[1]

In order to finance future transportation system improvements within the Madras urban area, it will be important to consider a range of alternative sources. The use of alternative revenue funding is a trend throughout Oregon as a result of implementation of Measure 5. Measure 5 has significantly reduced property tax revenues. The alternative revenue sources covered in this chapter may not all be appropriate for Madras or Jefferson County. However, a full overview is being provided to enable the City and County to consider a range of options to finance future transportation improvements during the next 20 years.

Property Taxes

Property taxes are the major revenue source for Oregon cities. Property taxes are levied through 1) tax base levies, 2) serial levies, and 3) bond levies. The most common method is tax base levies that are continuous and are allowed to increase by 6% per annum. The amount and time they can be imposed limit serial levies. Bond levies are for specific projects and are limited by time based on the debt load of the local government.

The historic dependence on property taxes is changing with the passage of Ballot Measure 5 in the early 1990's. With the 1995/1996 budget year, Ballot Measure 5 will be fully implemented. In brief, Ballot Measure 5 limits the property tax rate for purposes other than payment of certain voter approved general obligation indebtedness. With full implementation in the current budget year, the tax rate for all local taxing authorities is limited to $15 per $1,000 of assessed valuation. As a group, all non-school taxing authorities are limited to $10 per $1,000 of assessed valuation. All tax bases, serial and special levies are subject to the tax rate limitation. Excluded from the limitation is debt service used to retire voter approved general obligation bonds. Ballot Measure 5 requires that all non-school taxing districts property tax rate be reduced if together they exceed $10 per $1,000 of assessed valuation by the County. If the non-debt tax rate exceeds the constitutional limit of $10 per $1,000 of assessed valuation, then all of the taxing districts' tax rates are reduced on a proportional basis. This proportional reduction in the taxing rate is commonly referred to as compression of the tax rate.

The City of Madras had a compressed property tax rate from the 1991/1992 through the 1993/1994 budget years. Over the last two years, the City of Madras has limited the City tax rate to conform to the actual or estimated Ballot Measure 5 compression rate. For the 1995/1996 budget year, the City of Madras taxed properties at a rate of $5.36 per $1,000 assessed valuation which is the Ballot Measure 5 compression rate. At that tax rate and with the 6% constitutional allowed increase, the City of Madras plans levied $540,088 in property taxes. Of

[1] This section of the TSP was written before passage of Measure 11, subsequently modified by Measure 50 which further limits property tax and the ability of local to raise funds locally.

this total, $477,559 was targeted to the general fund, while $62,525 was allocated to retire general obligation debt.

Historically, Madras has not used property taxes to fund public works functions. In the 1995/1996 budget year, the City dedicated only 1.55% of the general fund, derived from property taxes, to the Public Works Department. Rather, the City of Madras has relied almost exclusively on State of Oregon shared revenues to fund both public works maintenance and new construction. The shared revenues are derived from the local allocation of State gas tax and vehicle registration fees. In recent years, the City of Madras has supplemented public works funding through local System Development Charges (SDCs) and State grants.

DEBT FINANCING

There is a number of debt financing options available to the City. The use of debt to finance capital improvements must be balanced with the City's ability to make future debt service payments and to deal with the impact on its overall debt capacity and underlying credit rating. Debt financing should be viewed not as a source of funding, but as a time shifting of funds available to the City. Its use should be incorporated into the overall financing plan that may include some "pay-as-you-go" funding methods that utilize currently available revenues to meet a portion of the City's transportation needs.

While a wide variety of debt financing techniques exist, some of the primary financing tools used for transportation related projects are listed below. These include general obligation bonds, limited tax general obligation bonds, local improvement district bonds, and special tax revenue bonds.

General Obligation Bonds

General obligation bonds (GO) are voter approved bond issues and represent the least expensive borrowing mechanism available to municipalities. GO bonds are typically supported by a separate property tax levy specifically approved for the purposes of retiring debt. The levy does not terminate until all the debt is paid off. The property tax levy is distributed equally throughout the taxing jurisdiction according to assessed value of property. General obligation debt is typically used to make public improvement projects that will benefit the entire community.

State statutes require that the general obligation indebtedness of a city not exceed three percent of the city's true cash value. Bonds issued for water, sewer, and other utility purposes are excluded from this limitation. Since general obligation bonds would be issued subsequent to voter approval, they would not be restricted to the limitations set forth in Ballot Measure 5 described earlier.

Limited Tax General Obligation Bonds

Limited tax general obligation bonds (LTGO) are similar to general obligation bonds in that they represent an obligation of the municipality. However, a municipality's obligation is limited to its current revenue sources and is not secured by the public entity's ability to raise taxes. As a result, LTGOs do not require voter approval. However, since the LTGOs are not secured by the full taxing power of the issuer, investors typically require a higher rate of return than they would from a more secure, tax-backed general obligation issue. Since LTGOs are not voter approved, they are subject to limitations under Ballot Measure 5.

Local Improvement District Bonds

The Oregon Revised Statutes allow local governments to form Local Improvement Districts (LIDs) to construct public improvements. LIDs are most often used by cities to construct local projects such as streets, sidewalks or bikeways. The Statutes allow formation of a district by either city government or property owners. Cities that use LIDs are required to have a local LID ordinance that provides a process for district formation and payback provisions. Through the LID process, the cost of local improvements is generally spread out among a group of property owners along a public street or within a specified area. The cost can be allocated based on property frontage or other methods such as traffic trip generation. The types of allocation methods are only limited by the Local Improvement Ordinance.

The cost of LID participation is considered an assessment against the property which is a lien equivalent to a tax lien. Individual property owners typically have the option of paying the assessment in cash or apply for assessment financing through the city. Since the passage of Ballot Measure 5, cities have most often funded local improvement districts through the sale of special assessment bonds. Although the interest rates for these special assessment bonds are higher than GO bonds, they are not subject to the limitation of Ballot Measure 5.

The City of Madras has a Local Improvement Ordinance in place. The City requires property owners to sign a LID non-remonstrance form in lieu of making frontage improvements as a condition of receiving building permits. The City of Madras has not historically used LIDs on a regular basis to fund the construction of local public improvements. However, the City expects use of LIDs will be become more common in the future for neighborhood transportation projects.

In addition to forming LIDs based on property frontage, the Madras ordinance allows LID assessments to be allocated in other ways. This flexibility is important as the benefit of specific improvements, such as a street-widening project, is not always dependent on the amount of frontage of individual properties. The Madras LID ordinance enables the City to form multiple types of LIDs regardless property frontage.

Jefferson County also has a Local Improvement Ordinance that covers the unincorporated areas of the County. The County's use of LIDs has been significantly less than Madras. County personnel have expressed reservations

about using LIDs as a financing tool to fund transportation projects because of the impacts on the Public Works Department budget. When Jefferson County has formed a LID, the County's up-front contribution has come directly out of the Public Works Department's operating budget. Because of this process, the County Public Works Department has not promoted the use of LIDs to finance transportation improvements on County roads. The Public Works Department would rather require that property owners and developers construct public transportation improvements to city standards within incorporated city urban growth boundaries. By requiring conformance to city standards at the time of development, there would not be a need to form a LID in the future. In addition, such a policy would also enable the cities to accept county roads when new properties are annexed and eliminate the need for Jefferson County to improve roads to individual city standards.

One of the challenges of utilizing a local improvement district is managing the risk of prepaid assessments. Property owners typically have the option to pre-pay assessments in order to forgo paying continued interest payments. However, when the city first issues bonds it commits to meeting a specific stream of debt service payments at certain rates to investors. When a prepayment occurs, the city loses expected interest payments in future years.

Consequently, the city must actively invest such prepayments in order to maintain previously expected cash flows. The challenge of investing numerous small streams of prepayments can be administratively daunting. More often than not prepayments are left in low interest earning accounts. As a result, when the city is required to make debt service payments, it is forced to make up the difference of a low savings rate and the higher borrowing cost of the issue. To counter this potential difficulty, a city can structure bonds to allow for early redemption. This helps to mitigate the risks posed by prepayments. However, since the predictability of debt service streams are less sure, the investor will require a higher rate of return, thus leaving the city, and ultimately the assessed property owners, with a higher cost of borrowing.

Special Tax Revenue Bonds

Cities may issue revenue bonds based on the expected receipt of special taxes. Examples of such revenues are gas taxes, hotel-motel taxes, or SDCs. Generally speaking, the more predictable the revenue source, the easier it is to support debt financing with the revenue. These types of bonds are more complicated to issue and usually restrict the other uses of the dedicated revenues so the bond holders can be assured timely payment.

A few cities in Oregon have secured revenue bond issues with State gas taxes or other special transportation revenues. In many cases, local governments have become accustomed to using state gas tax revenues solely for maintenance needs. Using gas tax revenues to pay debt service on bonds instead of funding maintenance would require an issuer to either reduce its maintenance budget or provide some other source of funding for maintenance needs.

SYSTEM DEVELOPMENT CHARGES

System Development Charges (SDC) are becoming increasingly popular in funding public works infrastructure needed for new development within local communities. Local governments have the legal authority to charge property owners and/or developers fees for improving the local public works infrastructure. The charges are most often targeted towards improving community water, sewer, and/or transportation systems. Cities and counties must have specific infrastructure plans in places that comply with State guidelines in order to collect SDCs.

The City of Madras has a SDC dedicated solely to transportation. The fee is collected when new building permits are issued within the corporate city limits. Madras calculates the fee based on trip generation of the proposed development. For a single-family residence, the City calculates the rate based on the assumption that a typical household will generate 9.5 vehicle trips per day. Non residential use calculations are based on employee ratios for the type of business or industrial uses. The City of Madras transportation SDC has been a revenue source for the State Street Tax Fund since the 1993/1994 budget year and currently generates 24% of the total State Street Tax Fund revenues. During the 1995/1996 budget year, transportation SDC fees generated approximately $60,000 to the State Street Tax Fund. The SDC fees will help fund construction of the transportation network throughout the City.

Jefferson County has explored the feasibility of implementing a SDC fee program. The County's program would likely be similar to the one currently in place within the City of Madras. Jefferson County would also likely have the SDCs directed only towards transportation system improvements within the County. As dictated by the State guidelines, Jefferson County would need to prepare a transportation inventory and adopt a systems development charge ordinance before fees could be applied to development projects.

It may be appropriate for the City of Madras and Jefferson County to consider a transportation SDC for the unincorporated urban area around Madras. The boundaries of the area to be included can coincide with the area covered by the Madras TSP. SDCs generated from the area outside the city could be targeted towards upgrading county roads. In order to put a SDC in place outside of Madras, Jefferson County would need to adopt a SDC Ordinance with a plan showing how the fees would be calculated and how revenues would be spent in the future. In addition, Madras and Jefferson County would need to amend the City/County Urban Growth Management Agreement (UGMA) to specify how SDC fees would be collected and what urban land areas would be included in the SDC zone.

VEHICLE REGISTRATION FEES

The Oregon Vehicle Registration Fee is currently $30 every 2-years for regular passenger vehicles and is allocated to the State, counties and cities for road funding. Cities receive 15.57%, counties 24.38%, while the State retains 60.05%. Oregon counties are granted authority to impose a vehicle registration fee that covers the entire county. The Oregon Revised Statutes allows Jefferson County to impose a biannual registration fee for all passenger cars licensed within the County. Although both counties and special districts have this authority, vehicle registration fees have not been imposed by local jurisdictions. In order for a local vehicle registration fee program to be viable in Jefferson County, all the incorporated cities and the county would need to formulate an agreement which would detail how the fees would be spent on future street construction and maintenance.

GRANTS AND LOANS

The City of Madras has been very successful in obtaining a number of grants in recent years to assist with transportation related projects. Examples include the ISTEA grant used to improve the downtown street system and the bikeway grant used to construct the bike path along Willow Creek. The majority of the grant and loan programs available today are geared towards economic development, and not specifically for construction of new streets.

Typically, grant programs target areas that lack basic public works infrastructure needed to support new or expanded industrial businesses. Because of the popularity of some grant programs such as the Oregon Special Public Works Fund, the emphasis has shifted to more of a loan program. The loan programs often require an equal match from the local jurisdiction as a condition of approval. Although Madras should continue to pursue public works grants in the future, the City should not base their long-term capital improvement funding on future grants or loan programs. Rather, the City should continue to pursue federal and state grants for site specific projects to retain and attract new businesses, and to assist with area specific improvements. Two common State grant/loan programs are described below.

ODOT Immediate Opportunity Grant Program

ODOT administers a grant program designed to assist local and regional economic development efforts. The program is funded to a level of approximately $5,000,000 per year through state gas tax revenues. ODOT officials use the following as primary factors in determining eligible projects:

- Funding used to improve public roads;
- Used for an economic development related project of regional significance;
- Primary project must create primary employment; and

- Preference to grantee providing local funds to match grant (lesser matches may also be considered).

The maximum amount of any grant under the program is $500,000. Local governments which have received grants under the program include Washington County, Multnomah County, Douglas County, City of Hermiston, Port of St. Helens, and the City of Newport.

Oregon Special Public Works Fund

The Special Public Works Fund (SPWF) program was created by the 1995 State Legislature as one of the several programs for the distribution of funds from the Oregon Lottery to economic development projects in communities throughout the State. The program provides grant and loan assistance to eligible municipalities for the construction of public infrastructure. Projects funded through the program must support commercial and industrial development that result in permanent job creation or job retention. To be awarded funds, each infrastructure project must support businesses wishing to locate, expand, or remain in Oregon.

A SPWF award can be used for improvement, expansion, and new construction of public sewage treatment plants, public water supply treatment and distribution facilities, public roads, and public transportation.

While SPWF program assistance is provided in the form of both loans and grants, the program emphasizes loans. This assures that funds will return to the State over time for reinvestment in local economic development infrastructure projects. The maximum loan amount per project is $11,000,000 and the term of the loan cannot exceed the useful life of the project, or 25 years, whichever is less. Interest rates for loans funded with State of Oregon Revenue Bonds are based on the rate the State may borrow through the Oregon Economic Development Department Bond Bank.

The Department may also make loans directly from the SPWF and the term and rate on direct loans can be structured to meet project needs. The maximum amount of a direct loan from the SPWF is $500,000 per project, but may not exceed 85% of the total project cost.

Local agencies that have received SPWF funding for projects including some type of transportation related improvement are the Cities of Cornelius, Woodburn, Forest Grove, Portland, Reedsport, Wilsonville, Redmond, and Bend, and Douglas County.

ODOT FUNDING OPTIONS

The State of Oregon provides funding for all highway related transportation projects through the Statewide Transportation Improvement Program (STIP). The STIP is administered by the Oregon Department of Transportation (ODOT). The

STIP outlines the schedule for ODOT projects throughout the State. The STIP, which identifies transportation for a three year funding cycle, is updated on an annual basis.

Starting with the 1998 budget year, ODOT is identifying projects for a 4 year funding cycle. In developing this funding program, ODOT must verify that the identified projects comply with the Oregon Transportation Plan (OTP), ODOT Modal Plans, Corridor Plans, compliance with local comprehensive plans, and ISTEA Planning Requirements. The STIP must fulfill ISTEA planning requirements for a staged, multi-year, statewide, intermodal program of transportation projects.

Specific transportation projects are prioritized based on a review of the ISTEA planning requirements and the different State plans. ODOT consults with local jurisdictions before highway related projects are added to the STIP.

The highway related projects identified in the Madras TSP would be considered for future inclusion in the STIP. The timing of including specific projects will be determined by ODOT based on an analysis of all the project needs within Region 4. The TSP will provide ODOT with a prioritized project list for the Madras Urban Area for the next 20 years. The City of Madras, Jefferson County, and ODOT will need to communicate on an annual basis to review the status of the STIP and the prioritization of individual projects within the US Highway 97 and 26 highway corridors. Ongoing communication will be important for the City, County, and ODOT to coordinate the construction of both local and state transportation projects.

ODOT also has the option of making some highway improvements as part of their ongoing highway maintenance program. The type of road construction projects that can be included within the ODOT maintenance programs includes intersection realignments, addition of turn lanes, and striping for bike lanes. The addition of a left-turn lane, from US Highway 26 onto Depot Road, is the type of project that may be constructed through the ODOT maintenance program.

ODOT maintenance crews using State equipment usually do not construct projects. The maintenance crews do not have the staff or specialized road equipment needed for large construction projects.

An ODOT funding technique that will likely have future application to the Madras TSP is the use of state and federal transportation dollars for off-system improvements. Until the passage and implementation of ISTEA, state and federal funds were limited to transportation improvements on highways. ODOT now has the authority and ability to fund transportation projects that are located outside the boundaries of the highway. The criteria for determining what off-system improvements can be funded has not yet been clearly established. It is expected that this new funding technique will be used to finance local system improvements that reduce traffic on state highways or reduce the number of access points for future development along state highways.

JEFFERSON COUNTY FUNDING OPTIONS

The Madras TSP area includes roads that are under the maintenance jurisdiction of Jefferson County. The City/County Urban Growth Management Agreement (UGMA) stipulates that Jefferson County retains jurisdiction of county roads within the Urban Growth Boundary until:

1. Annexation; and

2. The roads are brought up to urban standards.

At present, there are a number of county roads still within the corporate limits of Madras. Jefferson County provides maintenance on all the county roads within the Madras area while the City has maintenance responsibility for city streets and former county roads that have been annexed and upgraded to city standards.

Jefferson County allocates limited funding to the City of Madras through a countywide revenue sharing program. In the 1995/1996 budget year, the city's share totaled $9,000. These funds are deposited directly into the City's general fund and are not dedicated specifically for either transportation system maintenance or new construction.

In past years, Jefferson County has contributed funding for individual street projects based on allocations of a former five-year road plan. However, in recent years the County has not provided funding to Madras for construction projects because the County has had to fund major road repair projects elsewhere. After the County completes work on a new road inventory, it is expected funding for incorporated cities transportation projects will be made available.

Jefferson County does not have an updated Capital Improvement Plan (CIP) for transportation projects. The County is in the process of developing a comprehensive inventory of their road system. After the inventory has been completed, a classification will be applied based on the amount of service. A new CIP is expected to be prepared after the inventory and road classification phases are completed. The intent of the new CIP will be to plan transportation projects for the entire County and to coordinate funding construction with all incorporated cities. The projects identified in the Jefferson County TSP and the Madras TSP can form the basis for a new County CIP.

A short-term serial levy has received the most consideration by Jefferson County as a funding method to supplement limited property taxes and State revenue sharing moneys for county transportation system improvements. The serial levy would likely be established to run from one to three years and would be used to finance specific transportation projects within unincorporated areas of the county. Revenues generated from a levy could be used to fund some county road projects in and around Madras. However, as with the consideration of a SDC fee, Jefferson County will not likely consider a special transportation serial levy until after work has been completed on the transportation road inventory and the application of uniform road classifications.

MADRAS TRANSPORTAION SYSTEM PLAN FUNDING REQUIREMENTS

The Madras TSP identifies a range of transportation improvements that will be needed during the next 20 years. Overall, a total of five transportation system alternatives have been selected for funding as part of the Madras TSP. These improvements, shown on Table 8-8, are for improvements along the State Highway system and improvements to the local street network within the Madras Urban Area. The preliminary estimated cost for the six transportation improvement options is $15,033,140. ODOT will be considered the funding agency for the transportation improvements located within the US Highway 97 and 26 corridors. The City of Madras and Jefferson County will be the primary funding agencies for the local improvements within the city limits and the unincorporated urban area. The specific project alternatives recommended for funding are detailed below:

Table 8-8
Madras Improvement Options: Funding Requirements

Project Description	Cost Estimate
ODOT Projects	
North US Highway 97/26 Intersection	$1,500,000
South US Highway 97/26 Couplet	$900,000
US Highway 26 Traffic Signals	$500,000
Subtotal	**$2,900,000**
Local Projects	
Walkway and Bikeway	$4,050,140
Basic Street Grid	$6,265,000
Industrial Park Connection	$1,818,000
Subtotal	**$12,133,140**
Total Funding Requirements	**$15,033,140**

Oregon Department of Transportation Projects

ODOT will need to be the primary funding source for future improvements to the US Highway 97/26 intersection at the north end of Madras and the South US Highway 97/26 couplet at the south end of Madras. In addition, ODOT would likely be the primary funding source for those local improvements that would reduce the amount of local traffic on the State highways within the urban area. The ODOT related transportation improvement projects include:

US Highway 97/26 Intersection

At the present time, two alternatives have been identified to improve the north US Highway 97/26 intersection. Shown as improvement Alternative 5A in the TSP, they include the realignment or US Highway 97 south on 6th Street to Oak Street.

At the intersection of Oak Street and US Highway 26, a signal would be installed. The preliminary cost estimate of $1,500,000. The recommendation is for the improvements to be constructed in the near term, during the next 5 year planning cycle.

South US Highway 97/26 Couplet

Transportation System Plan improvement Alternative 7 would reroute a portion of the US Highway 97/26 (5th Street) northbound traffic along a section of the existing Adams Drive right-of-way. This improvement option also would include the future connection of a section of Adams Drive, south of the highway realignment to 10th Street. The south Highway couplet improvement project has a preliminary engineering cost estimate of $814,000. This cost would be expected to be shared by ODOT, the City of Madras, and Jefferson County. The local share would be expected to include revenue obtained through transportation system development fees applied to new residential development that would use the Adams Drive/10th Street connection for access.

US Highway 26 Traffic Signals

Transportation System Plan improvement Option 9 identifies the need to install two traffic signals along US Highway 26 in the vicinity of the Madras Industrial Park. Two traffic signals, estimated to cost approximately $500,000, would be constructed at the US Highway 26/Cherry Lane Intersection and the US Highway 26/Earl or Hess Streets intersections. It is expected that these two traffic signals would be installed and maintained by ODOT. Installation of the signals would occur when they met the required traffic and safety warrants.

Local Projects

Walkway & Bikeway Improvements

Madras TSP Option 2 identifies the pedestrian and bikeway improvements recommended for the Madras Urban Area during the next 20 years. The sidewalk related improvements are estimated to cost $3,456,000. The bikeway improvements are expected to cost an additional $594,140. Funding for these improvements would be expected to come primarily from local sources with some assistance from ODOT. Local funds can be generated through SDC fees for new development and LIDs along local streets within Madras. ODOT would be expected to fund the pedestrian and bikeway improvements along US Highway 97 and 26 within the planning area.

Basic Street Grid Improvements

An extensive list of local street improvements has been identified in TSP Option 3. The purpose of these improvements will be to continue to improve the street grid pattern throughout the city and the urban area. The total cost of the basic street grid improvements is expected to cost approximately $6,265,000. Funding for these improvements would mainly come from the City of Madras, Jefferson

County. Some of the basic grid street improvements that would reduce reliance on the state highways could be funded by ODOT in the future. The locally generated funds would include revenues generated by SDC fees for new developments, and LIDs.

Industrial Park Connection

The Madras Industrial Park connection project is detailed in TSP Option 8. It is considered an important project to improve safety for trucks moving between the Industrial Park and downtown Madras, and farm trucks and machinery that access the agricultural areas west of Madras. The industrial park connection is planned to be done in two phase. The expected project cost is $1,818,000. Primary funding for this project would come from local revenues. ODOT may consider participating in financing part of this improvement if it can be shown that the level of local traffic on US Highway 26 will be reduced.

MADRAS TRANSPORTATION SYSTEM PLAN FUNDING STRATEGY

The City of Madras, Jefferson County, and ODOT will need to coordinate and cooperate on a funding strategy to fund the expected $17.5 million Capital Improvement Plan. It is recommended that ODOT continue as the lead agency in funding the transportation related improvements along the US Highway 97 and US Highway 26 corridors. The City of Madras will need to continue as the lead local government in financing local transportation system improvements. Jefferson County would be expected to assist in funding improvements to county roads within the Madras Urban Area.

In order to increase funding to implement the Madras TSP, the City, County, and ODOT will all need to consider a range of possible funding sources during the next 20 years. The recommended funding strategy for the Madras TSP is detailed below.

City of Madras

The City of Madras Capital Improvement Program should concentrate on funding improvements to the basic street grid and pedestrian and bikeway systems. The adoption of the TSP will provide an extensive list of local transportation related projects that should be constructed over the next 20 years. Madras will need to increase funding to construct the identified projects. Likely funding sources include increasing the existing transportation SDC for basic street improvements, and increasing the use of LIDs for pedestrian and bikeway projects. The City will need to work closely with Jefferson County, and ODOT on developing funding strategies for non-city urban roads and State highway improvements.

Transportation System Development Charge

The Madras transportation SDC fee is expected to generate $60,000 during the 1995/1996 budget year. The amount of revenue received from the SDC is tied directly to construction activity within the City. After the City adopts the TSP,

consideration should be given to increasing the transportation SDC fee. The SDC fee revenue should be dedicated to financing part or all of the local street grid improvements over the next 20-year planning cycle.

Local Gas Tax

Based on a preliminary analysis conducted by the City, it may be possible to generate from $30,000 to $40,000 for transportation projects from a local gas tax. Ongoing discussions should continue with Madras, Prineville, and Redmond regarding a tri-city local gas taxes. If a local gas tax is implemented, the Madras revenues should be dedicated towards funding street grid system improvements. It is recommended that Madras continue with the evaluation of a local gas tax and consider including Jefferson County in any local gas tax proposal.

Local Improvement Districts

The City of Madras has a strong Local Improvement District (LID) Ordinance which permits the formation of districts for transportation related projects. The City has not actively used LIDs in the past to fund local street projects. Madras will need to consider using LIDs as a funding technique to finance construction of local street, pedestrian and bikeway projects adopted as part of the TSP. It is recommended that the City of Madras implement a program to target future LIDs for pedestrian and bikeway improvements within residential areas of the City. As part of such a LID program, the City should consider funding a portion of the LIDs to make them affordable to property owners. Priority for future LIDs should include improving sidewalks and bikeways in the vicinity of the schools, and improving pedestrian and bike corridors across US Highway 97/26.

County and ODOT Coordination

Jefferson County will need to be the lead-funding agency for the improvement of county roads within the Madras Urban Area. Both the City and County should consider formulating a joint Capital Improvement Plan for the Madras Urban Area. Such a CIP would be a refinement of the Madras and Jefferson County Transportation System Plans. This refined CIP should include the entire street, pedestrian, and bikeway projects that have been identified for the Madras Urban Area. As part of the process of formulating a joint Urban Growth Area CIP, Jefferson County should be encouraged to adopt a transportation SDC fee, and join the discussions on adoption of a local gas tax. Jefferson County and the City of Madras will need to work closely together on funding techniques that will finance the transportation system improvements.

All transportation related improvements on US Highway 97 and US Highway 26 are assumed to be funded by ODOT. With the adoption of the TSP, ODOT will consult the City of Madras before any highway-related projects are added to the State Transportation Improvement Program (STIP) plan. In the future, ODOT may have the ability to assist in funding some of the basic street grid projects that reduce dependence on State highways. As the City of Madras plans local street

improvement projects, ODOT should be consulted to determine whether state transportation funds could be used for specific local transportation projects.

Jefferson County

Jefferson County has jurisdiction of all the local roads outside the City of Madras and inside the Urban Growth Area. As the urban area is developed, it is expected that county roads will be upgraded to city standards and turned over to the City at time of annexation. The County's contribution to the Madras TSP should include:

- Funding the extension of county roads detailed as part of the basic street grid improvement option;
- Funding to bring the non-city urban area roads up to city standards; and
- Funding the expansion of the pedestrian and bikeway systems throughout the urban area.

Adoption of a countywide transportation SDC will likely be the best funding technique to bring non-city roads up to city standards. Another possible funding technique will be consideration of a county gasoline tax.

Jefferson County will not likely be in a position to increase funding for transportation related projects in the Madras Urban Area until after work has been completed on a new county road inventory. As discussed earlier in this chapter, Jefferson County is currently involved with developing a detailed inventory of the entire County transportation system. Likewise, the County will then consider adopting a road classification for all arterial and collector roads under their jurisdiction. Until the inventory and road classification process is completed, it will be difficult to make projections on what are the most viable funding techniques to enable Jefferson County to bring urban area roads up to city standards.

Transportation System Development Charges

Jefferson County should continue to evaluate the feasibility of adopting a countywide transportation SDC. The existing Madras SDC would be a good model for the County to use in the unincorporated areas. If a transportation SDC is adopted by Jefferson County, the fees collected within the Madras Urban Area should be dedicated to bringing county roads up to city standards. This funding strategy can also be used to help finance the basic street grid improvements. As discussed above, Jefferson County will not likely be in a position to consider adopting a transportation SDC until after work has been completed on the county road inventory and road classification.

Local Gas Tax

The passage of a local gas tax measure could be a new funding source for Jefferson County. All funds generated by such a tax would need to be dedicated towards transportation projects within the County. It is recommended that Jefferson County participate with the City of Madras in discussions with other local communities regarding a possible regional gas tax.

Oregon Department of Transportation

ODOT will be responsible for funding all highway related transportation projects within the Madras TSP boundaries. Other than consulting with the City as part of the STIP process, ODOT has the authority to prioritize highway projects based on their own analysis and evaluation. The detailed study completed on the north US Highway 97/26 intersection is an example of this independent ODOT process. The adoption of the Madras TSP will provide ODOT with highway related transportation projects that are important to Madras and Jefferson County.

The one new ODOT funding technique that should be considered for the Madras TSP is possible use of State money to fund off-system improvements that reduce reliance on State highways. A policy to enable ODOT to use this possible new funding technique is still being formulated as the Madras TSP is being completed. It is recommended that the City of Madras consult ODOT on a yearly basis regarding State funding options for local street improvements.

CITY OF MADRAS TRANSPORTATION FUNDING PLAN

Identified Street Improvement Projects

Approximately $17.4 million in transportation system improvements are projected to be required within the Madras Urban Area over the next 20 years (See Table 8-8 for a breakdown of expected project costs). It is assumed that ODOT will fund $5,400,000 or 35% of these costs for US Highway 97 and US Highway 26 improvement projects. The City of Madras would be responsible for funding $13,000,000 or 65% of the total transportation system costs over the next 20 years.

A review has been conducted of a range of alternative transportation funding mechanisms that are available to the City. This review was done in order to develop a list of options that are considered to be the most feasible methods to fund local projects. **A funding package combining SDC revenues, state gas tax revenues, Local Improvement Districts, as well as some type of debt financing mechanism backed by property taxes, represents the most feasible funding strategy available to the City to meet expected capital and maintenance funding needs.**

System Development Charges

The City of Madras already has a transportation SDC (SDC) fee in place. The current fee is computed based on a SDC of $600 per dwelling unit (9.55 ADT). Commercial and industrial SDC fees are calculated based on employees using the trip rates identified in the Uniform Traffic Manual. The City will need to consider increasing the transportation SDC to help fund local projects identified in the TSP.

A SDC is a means of requiring that new developments pay a fair-share of the capital costs of improvements needed to accommodate growth. State law allows the imposition of systems development charges for specified purposes. The requirements and limitations are found in the Oregon Revised Statutes (ORS) 223.297 to 223.314. This section of the report outlines the methodology for a transportation systems development charge. It identifies SDC funding options for projects to meet the long-range transportation needs of the City of Madras.

The basic methodology used to assess transportation SDC fees was to compare employment, dwelling units, and forecasted trips with street improvement needs for year 2015. This section of the report describes the calculations upon which the charge per trip is based. The charge is calculated by dividing the eligible costs of transportation projects by the forecast trips that cause the need for improvements. The eligible costs are those which increase capacity and service.

Finally, the fee levied against a development is derived by determining the number of trips forecast and multiplying this by the per trip fee.

The growth assumptions for the City of Madras are documented elsewhere, but are summarized in Table 8-9. Table 8-9 lists anticipated increases in both residential development and employment between 1995 and 2015. In addition to the number of dwelling units and employment increases, Table 8-9 lists the average number of trips caused on a daily basis by these broad land use categories. These are the figures used in the computer-based transportation model used to assess the City of Madras' long-range transportation system needs.

As shown in Table 8-9, an increase of almost 40,000 daily trips within Madras is forecasted between 1995 and 2015.

Table 8-9
Forecasted Increase in Trip Generation from New Development
1995 - 2015

Development Type	Forecasted Increase in Number of Units	Trips/Unit	Forecast Increase in Number of Trips
RESIDENTIAL USES			
Single-family Dwelling Units	1,890	9.55[1]	18,050
Multi-family Dwelling Units	270	6.47	1,747
NON-RESIDENTIAL DEVELOPMENT			
Commercial Employees	1,055	17.5	18,463
Industrial Employees	1,540	1.06	1,632
TOTAL TRIPS			**39,892[2]**

[1] ITE Trip Generation Manual, 5th Edition, 1991
[2] Assumes unincorporated land areas within UGB will be annexed to the City within 20-year plan life.

The key assumption for the SDC program is that these trips directly cause the need for improvements to the City's transportation system. The total cost of transportation projects under the City's jurisdiction is estimated to be $12,133,140. The basic concept behind project-based systems development charge is to divide the cost of needed projects by the number of trips expected to occur during the same time period. If the City of Madras seeks to recover all costs for construction of street projects from new development through SDC fees, the calculation is as follows:

$12,133,140 / 39,892 = $ 304.15 per trip.

Note that certain other costs associated with annual monitoring and compliance are also eligible for recovery under an SDC program and are permitted under the ORS. Bookkeeping and documentation associated with these compliance activities may not make the option attractive to Madras. Since the City of Madras already has a transportation systems development charge in place, the methodology needs to be reviewed only briefly.

Typically, SDC's are levied on new developments and are collected at the time of issuance of a building permit or as otherwise provided for by the ordinance.

One potential change to the City of Madras' SDC program is to change the basis upon which the fee is calculated. The amount of the transportation systems development charge levied against a development is most easily explained if it is based upon the average daily number of trips generated multiplied by the per trip fee calculated above. The trip rate for each use should be derived from the latest edition of the Institute of Transportation Engineers' Trip Generation Manual.

For residential uses, the fee is determined by multiplying the number of units by the per unit trip generation rate. For non-residential uses, the fee is determined by multiplying the gross floor area (measured in thousands of square feet) by the applicable trip generation rate. The City may also give the developer the option of submitting a detailed traffic study to establish a trip generation rate for a specific project. The traffic study must be prepared by a licensed traffic engineer in the State of Oregon and shall be prepared in accordance with the methodology contained in the Institute of Transportation Engineers' Trip Generation Manual.

The City of Madras has the option of choosing the amount of funding it wants to recover from new development to pay for needed long-range transportation improvements. To recover 100 percent of the $12,133,140 needed to fund all local projects, the SDC fee is calculated to be $304.15 per trip. If the City chooses to collect only half of the $10 million amount, the SDC fee could be lowered to approximately $150 per daily trip.

Table 8-10 summarizes the trip generation rates and proposed SDC fees for a broad range of possible developments. Table 8-10 is a nearly complete list of land use categories and daily trip rates listed in the Institute of Transportation Engineers' Trip Generation Manual. The column headed by "ID #" refers to the land use category in Trip Generation and the column headed with "Trip Rate" lists the average daily trip rate taken directly from, or derived from, the same manual. The "Assumed Size" column lists a typical size for a building in this land use category. The building size is then used to calculate the number of trips and the proposed SDC fee.

Table 8-10 lists three options for the SDC fee. These are in columns headed with the descriptions "100% Recovery," "75% Recovery," and "50% Recovery." These refer to the proportion of the $12 million needed for local projects that would be recovered from the SDC program. For example, if the development summarized in Table 8-9 occurs over the next twenty years and the City uses a $304.15 fee per trip, the City might reasonably expect to recover 100 percent of the funding needed for the $12 million list of projects. The fees for typical developments would be those shown in the "100% Recovery" column.

Table 8-10
SYSTEMS DEVELOPMENT CHARGE CALCULATIONS
Proposed SDC for City of Madras for Sample Developments

ID #	Land Use	Trip Rate	Unit	Assumed Size	Calculated Trips	100% Recovery	75% Recovery	50% Recovery
			per TGSF unless otherwise	Sq. Ft.		$ 252.61	$ 189.46	$ 126.31
030	Truck Terminal	9.85		100000	985.00	$ 248,820.85	$ 186,615.64	$ 124,410.43
110	General Light Industrial	6.97		100000	697.00	$ 176,069.17	$ 132,051.88	$ 88,034.59
120	General Heavy Industrial	1.50		700000	1050.00	$ 265,240.50	$ 198,930.38	$ 132,620.25
130	Industrial Park	6.97		400000	2788.00	$ 704,276.68	$ 528,207.51	$ 352,138.34
140	Manufacturing	3.85		400000	1540.00	$ 389,019.40	$ 291,764.55	$ 194,509.70
150	Warehousing	4.88		300000	1464.00	$ 369,821.04	$ 277,365.78	$ 184,910.52
151	Mini-Warehouse	2.61		50000	130.50	$ 32,965.61	$ 24,724.20	$ 16,482.80
170	Utilities	0.79		100000	79.00	$ 19,956.19	$ 14,967.14	$ 9,978.10
210	Single Family Detacted Housing	9.55	per DU	1	9.55	$ 2,412.43	$ 1,809.32	$ 1,206.21
220	Apartment	6.47	per DU	1	6.47	$ 1,634.39	$ 1,225.79	$ 817.19
221	Low-Rise Apartments	6.59	per DU	1	6.59	$ 1,664.70	$ 1,248.52	$ 832.35
222	High-Rise Apartments	4.20	per DU	1	4.20	$ 1,060.96	$ 795.72	$ 530.48
230	Residential Townhouse/Condo	5.86	per DU	1	5.86	$ 1,480.29	$ 1,110.22	$ 740.15
232	High-Rise Townhouse/Condo	4.18	per DU	1	4.18	$ 1,055.91	$ 791.93	$ 527.95
240	Mobile Home Park	4.81	per DU	1	4.81	$ 1,215.05	$ 911.29	$ 607.53
252	Congregate Care Facility	2.15	per DU	1	2.15	$ 543.11	$ 407.33	$ 271.56
270	Residential Planned Development	7.44	per DU	1	7.44	$ 1,879.42	$ 1,409.56	$ 939.71
310	Hotel	21.75 *		60000	1305.00	$ 329,656.05	$ 247,242.04	$ 164,828.03
320	Motel	25.50 *		60000	1530.00	$ 386,493.30	$ 289,869.98	$ 193,246.65
411	City Park	2.23	per acre	15	33.45	$ 8,449.80	$ 6,337.35	$ 4,224.90
412	County Park	2.99	per acre	30	89.70	$ 22,659.12	$ 16,994.34	$ 11,329.56
416	Campground/RV Park	74.38	per acre	20	1487.60	$ 375,782.64	$ 281,836.98	$ 187,891.32
430	Golf Course	8.33	per acre	50	416.50	$ 105,212.07	$ 78,909.05	$ 52,606.03
443	Movie Theater	77.79		20000	1555.80	$ 393,010.64	$ 294,757.98	$ 196,505.32
491	Tennis Courts	33.33	per court	6	199.98	$ 50,516.95	$ 37,887.71	$ 25,258.47
492	Racquet Club	17.14		20000	342.80	$ 86,594.71	$ 64,946.03	$ 43,297.35
493	Health Club	15.82 *		20000	316.40	$ 79,925.80	$ 59,944.35	$ 39,962.90

Table 8-10
SYSTEMS DEVELOPMENT CHARGE CALCULATIONS
Proposed SDC for City of Madras for Sample Developments

ID #	Land Use	Trip Rate	Unit	Assumed Size	Calculated Trips	100% Recovery	75% Recovery	50% Recovery
			per TGSF unless otherwise	Sq. Ft.		$ 252.61	$ 189.46	$ 126.31
494	Bowling Alley	33.33		20000	666.60	$ 168,389.83	$ 126,292.37	$ 84,194.91
520	Elementary School	10.72		60000	643.20	$ 162,478.75	$ 121,859.06	$ 81,239.38
530	High School	10.90		100000	1090.00	$ 275,344.90	$ 206,508.68	$ 137,672.45
560	Church	9.32		20000	186.40	$ 47,086.50	$ 35,314.88	$ 23,543.25
561	Syagogue	10.64		20000	212.80	$ 53,755.41	$ 40,316.56	$ 26,877.70
565	Day Care Center	79.26		3000	237.78	$ 60,065.61	$ 45,049.20	$ 30,032.80
566	Cemetery	4.16	per acre	10	41.60	$ 10,508.58	$ 7,881.43	$ 5,254.29
590	Library	45.50		30000	1365.00	$ 344,812.65	$ 258,609.49	$ 172,406.33
610	Hospital	16.78		200000	3356.00	$ 847,759.16	$ 635,819.37	$ 423,879.58
620	Nursing Home	5.50 *		150000	825.00	$ 208,403.25	$ 156,302.44	$ 104,201.63
630	Clinic	23.79		150000	3568.50	$ 901,438.79	$ 676,079.09	$ 450,719.39
710	General Office Building					$ -	$ -	$ -
	0-10,000 sq. ft.	24.60		10000	246.00	$ 62,142.06	$ 46,606.55	$ 31,071.03
	10,001-25,000	19.72		20000	394.40	$ 99,629.38	$ 74,722.04	$ 49,814.69
	25,001-50,000	16.58		40000	663.20	$ 167,530.95	$ 125,648.21	$ 83,765.48
	50,001-100,000	14.03		80000	1122.40	$ 283,529.46	$ 212,647.10	$ 141,764.73
	100,001-200,000	11.85		150000	1777.50	$ 449,014.28	$ 336,760.71	$ 224,507.14
	200,001-300,000	10.77		250000	2692.50	$ 680,152.43	$ 510,114.32	$ 340,076.21
	300,001-400,000	9.96		350000	3486.00	$ 880,598.46	$ 660,448.85	$ 440,299.23
	400,001-500,000	9.45		450000	4252.50	$ 1,074,224.03	$ 805,668.02	$ 537,112.01
	500,001-600,000	9.05		550000	4977.50	$ 1,257,366.28	$ 943,024.71	$ 628,683.14
	600,001-700,000	8.75		650000	5687.50	$ 1,436,719.38	$ 1,077,539.53	$ 718,359.69
	700,001+	8.46		800000	6768.00	$ 1,709,664.48	$ 1,282,248.36	$ 854,832.24
715	Single Tenant Office Building	11.50		100000	1150.00	$ 290,501.50	$ 217,876.13	$ 145,250.75
720	Medical-Dental Office Building	34.17		30000	1025.10	$ 258,950.51	$ 194,212.88	$ 129,475.26
730	Government Office Building	68.93		20000	1378.60	$ 348,248.15	$ 261,186.11	$ 174,124.07
733	Government Office Complex	25.00		140000	3500.00	$ 884,135.00	$ 663,101.25	$ 442,067.50

Table 8-10
SYSTEMS DEVELOPMENT CHARGE CALCULATIONS
Proposed SDC for City of Madras for Sample Developments

ID #	Land Use	Trip Rate	Unit	Assumed Size	Calculated Trips	100% Recovery	75% Recovery	50% Recovery
			per TGSF unless otherwise	Sq. Ft.		$ 252.61	$ 189.46	$ 126.31
750	Office Park	11.42		200000	2284.00	$ 576,961.24	$ 432,720.93	$ 288,480.62
760	Research & Development Center	7.70		200000	1540.00	$ 389,019.40	$ 291,764.55	$ 194,509.70
770	Business Park	14.37		200000	2874.00	$ 726,001.14	$ 544,500.86	$ 363,000.57
812	Building Supply & Lumber Store	30.56		15000	458.40	$ 115,796.42	$ 86,847.32	$ 57,898.21
814	Specialty Retail Center	40.67		20000	813.40	$ 205,472.97	$ 154,104.73	$ 102,736.49
815	Discount Store	70.13		50000	3506.50	$ 885,776.97	$ 664,332.72	$ 442,888.48
816	Hardware-Paint Store	51.29		20000	1025.80	$ 259,127.34	$ 194,345.50	$ 129,563.67
817	Nursery (Garden Center)	36.08		10000	360.80	$ 91,141.69	$ 68,356.27	$ 45,570.84
820	Shopping Center					$ -	$ -	$ -
	0-10,000 sq. ft.	167.59		10000	1675.90	$ 423,349.10	$ 317,511.82	$ 211,674.55
	10,001-50,000	91.65		40000	3666.00	$ 926,068.26	$ 694,551.20	$ 463,034.13
	50,001-100,000	70.67		80000	5653.60	$ 1,428,155.90	$ 1,071,116.92	$ 714,077.95
	100,001-200,000	54.50		150000	8175.00	$ 2,065,086.75	$ 1,548,815.06	$ 1,032,543.38
	200,001-300,000	46.41		250000	11602.50	$ 2,930,907.53	$ 2,198,180.64	$ 1,465,453.76
	300,001-400,000	42.02		350000	14707.00	$ 3,715,135.27	$ 2,786,351.45	$ 1,857,567.64
	400,001-500,000	38.65		450000	17392.50	$ 4,393,519.43	$ 3,295,139.57	$ 2,196,759.71
	500,001-600,000	36.35		550000	19992.50	$ 5,050,305.43	$ 3,787,729.07	$ 2,525,152.71
	600,001-800,000	33.88		700000	23716.00	$ 5,990,898.76	$ 4,493,174.07	$ 2,995,449.38
	800,000-1,000,000	32.09		900000	28881.00	$ 7,295,629.41	$ 5,471,722.06	$ 3,647,814.71
	1,000,001-1,200,000	30.69		1100000	33759.00	$ 8,527,860.99	$ 6,395,895.74	$ 4,263,930.50
	1,200,001-1,400,000	29.56		1300000	38428.00	$ 9,707,297.08	$ 7,280,472.81	$ 4,853,648.54
	1,400,001+	28.61		1500000	42915.00	$ 10,840,758.15	$ 8,130,568.61	$ 5,420,379.08
831	Quality Restaurant	96.51		7000	675.57	$ 170,655.74	$ 127,991.80	$ 85,327.87
832	High-Turnover (Sit Down) Restaurant	205.36		7000	1437.52	$ 363,131.93	$ 272,348.95	$ 181,565.96
833	Fast Food Restaurant w/o Drive Thru	786.22		2000	1572.44	$ 397,214.07	$ 297,910.55	$ 198,607.03
834	Fast Food Restaurant with Drive Thru	632.12		2000	1264.24	$ 319,359.67	$ 239,519.75	$ 159,679.83
835	Drinking Place	15.49		3000	46.47	$ 11,738.79	$ 8,804.09	$ 5,869.39

Table 8-10
SYSTEMS DEVELOPMENT CHARGE CALCULATIONS
Proposed SDC for City of Madras for Sample Developments

ID #	Land Use	Trip Rate	Unit	Assumed Size	Calculated Trips	100% Recovery	75% Recovery	50% Recovery
			per TGSF unless otherwise	Sq. Ft.		$ 252.61	$ 189.46	$ 126.31
840	Automobile Care Center	26.35 *		10000	263.50	$ 66,562.74	$ 49,922.05	$ 33,281.37
841	New Car Sales	47.91		25000	1197.75	$ 302,563.63	$ 226,922.72	$ 151,281.81
844	Service Station	680.45 *		1000	680.45	$ 171,888.47	$ 128,916.36	$ 85,944.24
845	Service Sta w/ Convenience Mkt	743.80 *		1000	743.80	$ 187,891.32	$ 140,918.49	$ 93,945.66
846	Service Sta w/ Con Mkt & Car Wash	688.88 *		1500	1033.32	$ 261,026.97	$ 195,770.22	$ 130,513.48
847	Car Wash	200.00 *		1500	300.00	$ 75,783.00	$ 56,837.25	$ 37,891.50
848	Tire Store	47.15 *		5000	235.75	$ 59,552.81	$ 44,664.61	$ 29,776.40
850	Supermarket	87.82 *		40000	3512.80	$ 887,368.41	$ 665,526.31	$ 443,684.20
851	Convenience Market (24-hours)	737.99		2000	1475.98	$ 372,847.31	$ 279,635.48	$ 186,423.65
854	Discount Supermarket	69.74 *		80000	5579.20	$ 1,409,361.71	$ 1,057,021.28	$ 704,680.86
861	Discount Club	78.02		100000	7802.00	$ 1,970,863.22	$ 1,478,147.42	$ 985,431.61
870	Apparel Store	37.00 *		5000	185.00	$ 46,732.85	$ 35,049.64	$ 23,366.43
890	Furniture Store	4.34		30000	130.20	$ 32,889.82	$ 24,667.37	$ 16,444.91
895	Video Arcade	40.00 *		3000	120.00	$ 30,313.20	$ 22,734.90	$ 15,156.60
911	Walk-In Bank	140.61		6000	843.66	$ 213,116.95	$ 159,837.71	$ 106,558.48
912	Drive-In Bank	265.21		3000	795.63	$ 200,984.09	$ 150,738.07	$ 100,492.05
	Home occupation			na		$0	$0	$0

NOTES:
* Indicates Weekday Rate Derived from Other Data
TGSF = Thousands of Gross Square Feet

Note that in Table 8-10, residential development SDC fees would be based on the number of dwelling units (DU's). As proposed in Table 8-10, almost all commercial and industrial uses would be charged based upon building size. The sizes listed in Table 8-10 are only examples. In actual practice, the city building official or planner will meet with the developer or owner to determine the appropriate land use category and actual building size from which the SDC fee is calculated.

Cities or counties are sometimes concerned that their SDC fees will discourage desired development and choose to adjust the methodology as a matter of policy. In doing so, these agencies also accept the fact that by lowering SDC fees, they will need to find other funding sources to pay for needed transportation projects. Besides the option of choosing a lower recovery percentage, the City may consider other methods of reducing transportation SDC fees. Some of the options the City might consider are:

- Adjustments to account for "passer by" trips;
- Combining specific land uses into broader development categories; or
- Placing "caps" or maximums on the trip generation rate.

An adjustment to account for "passer-by" trips has an impact on commercial developments. For some uses within the retail sector, a variety of studies indicate some trips are "passer-by" trips. That is, the trip to an individual business is merely an intermediate stop as part of a longer trip made by a motorist who is passing-by. The argument is that since the motorist was using the street anyway, a lesser impact on the street system occurs than would with a non-passer-by trip. The only employment sector for which a passer-by component has been identified is the retail sector. Furthermore, not all retail businesses have a passer-by component. Using a passer-by adjustment would have no impact on SDC fees for residential development.

Another possibility for reducing the SDC fees for some businesses involves combining some categories. For example, careful examination of Table 8-10 reveals that restaurants have a wide range of trip generation rates. Fast food restaurants generate approximately seven times as many trips per thousand square feet than do quality restaurants. In an effort to encourage fast food restaurants, some cities establish a single "restaurant" category and apply the lower trip generation rate from the "quality restaurant" category. In doing so, these cities forego much of the SDC revenue from the development and must find other funding sources to accommodate the transportation needs caused by that restaurant.

Yet another common approach used by cities is to establish a "cap" or maximum rate to be used in the calculation of trips. This is sometimes set at 200 or 300 trips per thousand square feet. This has the effect of limiting the fees collected from fast food restaurants and convenience markets. Like other adjustments, a

cap on trip rates reduces SDC fee collections and forces the cities to find other funding sources.

The SDCs stated above are substantially higher than those currently levied by the City of Madras. Additional types of funding will need to be considered in order to reduce the SDC requirements. The City will need to make a determination on what levels of SDCs best fit the City's overall growth strategy and development policies.

While an increased SDC fee program will provide increased annual revenues to the City for financing related capital projects, they will most likely not match exactly the timing of required capital projects. The City has two options for funding transportation projects depending on the timing of required capital. If the increased SDC inflows are initially greater than the capital requirements, then the City can build up a larger SDC fund balance in order to pay for those costs. If required transportation related project costs outpace inflows of charges, then some type of debt financing based on SDC and other revenues will need to be pursued.

Since SDC are a less stable form of revenue than more secure forms such as property taxes, the City of Madras will likely need to secure debt paid by the SDC program with additional forms of revenue such as gas tax receipts. In the event that future SDC inflows were not sufficient to pay required debt service, then investors would have claim on additional pledged City revenues. Even with the pledge of other revenues, the City would have a higher cost of borrowing than it would with general obligation debt in order to compensate investors for the additional perceived risk associated with purchasing the City's SDC-based bonds.

General Obligation Debt Secured By Property Taxes

General obligation bond financing secured by property tax revenues is a common method of financing road improvements. Due to the tax's strong security, general obligation bonds are the least costly debt-financing tools available to local governments.

Oregon revised statutes provide that the total outstanding general obligation indebtedness of a city not exceed three percent of the city's true cash value. Bonds issued for water, sewer, and utility purposes are excluded from the 3% limitation. Based on the City's 1995 true cash value of $138 million and netting out legal deductions, the City's debt limit would be just over $4 million (Table 8-11). This is the remaining capacity that the City has available to issue additional general obligation debt for transportation or any other public improvements. Because the City is growing, it should be able to add more assessed value in future years to its tax roll and be able to increase the issuance limit for general obligation debt.

Table 8-11
City of Madras Street Fund Calculation of Legal Debt Limit

Time Cash Value	$138,000,000
	x 3%
	$4,140.000
Current Bonded Debt (Less Legal Deductions)	
Industrial Park Bonds	
Phase I	-$500,000
Phase II	-$200,000
Sewer Bonds	-$1,650,000
Net Debt Subject to 3% Limitations	$0
Amount Available for Future Indebtedness	$4,140,000

Given the City's current debt limitation, bonds to cover the cost of some of the transportation improvement options can be issued up to $4,000,000. The role of general obligation bond financing in the City's overall funding program will be dependent on the willingness of the council to dedicate some or all of the City's debt capacity to street improvements. The City will have the ability to issue GO bonds, with repayment by SDC fees. Since these bonds will be secured by the full faith of the City, the bond rates will have a lower interest rate. In addition, this funding technique would not require an increase to the City property tax rate.

MADRAS TRANSPORTATION SYSTEM PLAN FUNDING RECOMMENDATIONS

In the funding requirements section, a total of $17.5 million in State and Local transportation improvement projects were identified (Table 8-8). This total includes the funds needed for both State highway and local street system improvements. The analysis assumed that ODOT would continue to be the primary funding agency for the $5.4 million identified for improvements to US Highway 97 and 26 within the study area. ODOT conducted a detailed study of possible improvement options for the US Highway 97/26 intersection. This analysis assumed that any selected option would cost $4 million dollars. The City of Madras, with some possible financial assistance from Jefferson County, would have primary funding responsibility for the $12,133,140 in local transportation system improvements during the next 20 years.

The recommended funding techniques for the Madras TSP have been detailed in the proceeding section. Based on an analysis of historic local funding techniques, it is expected the City of Madras will not be able to fund the TSP transportation system improvement projects unless existing fees are increased and new funding sources are dedicated towards transportation. Even with the City of Madras, Jefferson County, and ODOT adopting new funding techniques, it may be difficult to fund all the TSP projects during the 20 year planning cycle. The City may want to consider a process to prioritize the local transportation system funding based on a further analysis of available funding.

The City of Madras, Jefferson County, and ODOT should implement the following actions to fund the TSP projects:

City of Madras

Increase Transportation SDC Fee

It is recommended that the City increase the current transportation SDC fee by 50 to 75 percent for new development. This action will enable Madras to finance $5.0 -7.6 million of the local TSP improvement projects.

Jefferson County Funding Request

It is recommended that the City request that Jefferson County provide future funding to improve all non-city urban roads within the Madras UGB to city standards. This funding would be used to upgrade existing county roads and to extend future roads to improve the local street grid system.

General Obligation Bond Financing

It is recommended that the City use a portion of the City's bonding debt authority to issue General Obligation bonds to fund a portion of the TSP projects. The bonds should be secured with future SDC fee revenues to make the bonds attractive to investors. The funds obtained through a GO bond sale should be dedicated towards local street improvement projects identified within the TSP.

Local Gasoline Tax

It is recommended that the City adopt a 1 - 2 cent local gasoline tax dedicated towards maintenance of the transportation system.

ODOT Off-System Funding

It is recommended that the City request ODOT to use Off-System funds to finance a portion of the local street improvements that specifically reduce traffic on either US Highway 97 or 26 within the TSP boundaries.

Street Improvement LIDs

It is recommended that Madras implement a comprehensive Local Improvement District program targeted towards walkway improvements along city streets.

Jefferson County

Systems Development Charges (SDC) Fee

It is recommended that Jefferson County continue their evaluation of a countywide transportation SDC. As part of the countywide evaluation, it is also recommended that Jefferson County implement a transportation SDC for the Madras TSP planning area. Fee revenues received from new development within the Madras TSP area should be dedicated to the basic street grid improvements identified in the TSP. These county generated funds can be used to finance county road improvements that are part of the basic street grid in the Madras Urban Area.

Local Gas Tax

It is recommended that Jefferson County consider passage of a local gasoline tax dedicated to transportation improvements. A portion of these gas tax revenues should be used to finance the local street grid improvements within the TSP boundaries.

Street Design Standards

It is recommended that Jefferson County amend the City/County Urban Growth Management Agreement (UGMA) to require city street design standards for new development within the Madras Urban Growth Area.

Oregon Department of Transportation

North US Highway 97/26 Intersection

It is recommended that ODOT continue their evaluation of the North US Highway 97/26 intersection. When a recommended improvement option has been identified and approved, the Madras TSP will need to be amended.

Off-System Funding

It is recommended that ODOT continue the evaluation of funding off-system improvements in the Madras TSP area. Local street improvement projects that will reduce use of either US Highway 97 or 26 should be considered for possible future funding.

CHAPTER 9: RECOMMENDED POLICIES AND ORDINANCES

In 1991, the Oregon Transportation Planning Rule (TPR) was adopted to implement State Planning Goal 12 (Transportation). The TPR was amended in May 1995 and September 1995. The TPR requires jurisdictions to adopt ordinances that support all transportation modes. In addition, the TPR requires all jurisdictions to complete a Transportation System Plan, and then adopt ordinances to implement that plan.

The City of Madras has previously adopted ordinances that generally support bicycle and pedestrian facilities, as directed by the TPR in Section 660-12-045(3). Recommendations for additional detail and clarification are included in this Chapter. In addition, this TSP recommends access management standards and street standards that should be implemented by policy and ordinance.

Jefferson County has not yet adopted ordinances to implement the TPR. For the portion of the Madras TSP that is included in the Madras UGB, the ordinances recommended for the urban area will apply. For the portions of the TSP that are located outside of the UGB, rural ordinances are recommended.

In addition to meeting the requirements of the TPR, the City of Madras is examining the potential for establishing mixed-use zones and possibly higher densities to mitigate some of the expected growth impacts on the transportation system. A suggested set of ordinances for providing some of these features are discussed following the Elements required by the TPR.

Finally, like many growing communities Madras has been considering how to best measure the potential impacts of rezoning and development on the transportation system. An ordinance that helps guide when a traffic impact study should be completed is included in this chapter for consideration.

ELEMENTS REQUIRED BY THE TRANSPORTATION PLANNING RULE

The applicable portion of the Transportation Planning Rule is found in Section 660-12-045 — Implementation of the TSP, which is included in Appendix H. In summary, the TPR requires that local governments revise their land use regulations to implement the TSP in the following manner:

- Amend land use regulations to reflect and implement the TSP.
- Clearly identify which transportation facilities, services, and improvements are allowed outright, and which will be conditionally permitted or permitted through other procedures.
- Adopt land use or subdivision ordinance measures, consistent with applicable federal and state requirements, to protect transportation facilities, corridors and sites for their identified functions, including the following topics:
    - Access management and control;
    - Protection of public use airports;
    - Coordinated review of land use decisions potentially affecting transportation facilities;
    - Conditions to minimize development impacts to transportation facilities;
    - Regulations to provide notice to public agencies providing transportation facilities and services of land use applications that potentially affect transportation facilities;
    - Regulations assuring that amendments to land use applications, densities, and design standards are consistent with the TSP.
- Adopt land use or subdivision regulations for urban areas and rural communities to provide safe and convenient pedestrian and bicycle circulation and bicycle parking, and to ensure that new development provides on-site streets and accessways that provide reasonably direct routes for pedestrian and bicycle travel.
- Establish street standards that minimize pavement width and total right-of-way.

These elements are discussed in the following sections, where they are grouped by similarity in terms of appropriate policy and ordinance.

Approval Processes for Transportation Facilities

Section 660-12-045(1) of the TPR requires that jurisdictions amend land use regulations to conform to the jurisdiction's adopted TSP. This section of the TPR is intended to clarify the approval process for transportation-related projects. Madras and Jefferson County must consider the level of review necessary for transportation projects, and include policy and ordinance language, such as the following recommendations, to give clear guidance:

1. Recommended Policies for Approval Process

Policies should clarify the approval process for different types of projects. It is recommended that the following policies be recommended as part of adopting the TSP:

A. Changes in the specific alignment of proposed public road and highway projects shall be permitted without plan amendment if the new alignment falls within a transportation corridor identified in the TSP.

B. Public road and highway projects involving the operation, maintenance, repair, and preservation of existing facilities that are consistent with the TSP, the classification of that roadway and approved road standards shall be allowed without land use review, except where specifically regulated (i.e., within a floodplain).

C. Dedication of right-of-way, authorization of construction and the construction of facilities and improvements, where the improvements are consistent with the TSP, the classification of the roadway and approved road standards shall be allowed without land use review.

D. When uses permitted outright under ORS 215.213(1)(m) through (p) and ORS 215.283(1)(k) through (n) are consistent with the TSP, the classification of the roadway and approved road standards, they shall be allowed without land use review.

E. Where changes in the frequency of transit, rail and airport services are consistent with the TSP, they shall be allowed without land use review.

F. For State projects that require an EIS or EA, the draft EIS or EA shall serve as the documentation for local land use review, if required. The appropriate procedure shall be followed:

(1) Where the project is consistent with the TSP, formal review of the draft EIS or EA;

(2) Where the project is consistent with the TSP, formal review of the draft EIS or EA and concurrent or subsequent compliance with applicable development standards or conditions;

(3) Where the project is not consistent with the TSP, formal review of the draft EIS or EA and concurrent completion of necessary goal exceptions or plan amendments.

2. Recommended Ordinances for Approval Process

Once the Madras area has completed its TSP, there are two directions that the City and County may take to govern review of transportation projects. The City and County can decide that *all* projects identified in the TSP are permitted outright, with no further land use review, and subject only to the standards established by the Plan. This is the simplest approach, requiring the least amount of administration. This approach is recommended for the portion of the project area that is outside of the UGB, since all major projects will be associated with the State Highway and be subject to ODOT's review process.

For projects within the UGB and urban portion of Madras, however, there are significant differences in level of detail provided for the projects included in the TSP and the studies that are usually required for construction. For example, it is not possible to clearly identify the amounts of grading, cuts and fills, vegetation removal, or other environmental impacts in the TSP. These are frequently issues of great concern to the community. Clear identification of the impacts of a project through the land use review process affords the best opportunity to build community support and develop mitigation measures, if needed. Also, it is important to note that some transportation projects in rural areas may require goal exceptions or other findings to address State statutes or rules.

Therefore, it is recommended that the City of Madras and Jefferson County review transportation projects within the UGB as regulated land use actions, using conditional use language as contained in Appendix H. This language is recommended for inclusion in the supplementary provision section or as a new section within the development code.

3. Protecting the Existing and Future Operation of Facilities

Section 60-12-045(2) of the TPR requires that jurisdictions protect future operation of transportation corridors. For example, an important arterial for through traffic must have that function protected in order to meet the community's identified needs. In addition, the proposed function of a future roadway must be protected from incompatible land uses. It is also important to preserve the operation of existing and proposed transportation facilities, such as airports, that are vulnerable to the encroachment of incompatible land uses. A set of proposed ordinances to protect the function of general use airports is included below.

Other future transportation facilities that Madras may wish to protect include the space and building orientation necessary to support future transit, and right-of-ways or other easements for accessways, paths, and trails. Policies are suggested below that will demonstrate the desire of the community to protect these transportation facilities.

Protection of existing and planned transportation systems can be provided by ongoing coordination with other relevant agencies, adhering to the road standards recommended in Chapter 7 of this Plan, and applying the policies and ordinances suggested below.

A. Recommended Policies for Protection of Transportation Facilities

1. **The function of existing and planned roadways as identified in the Transportation System Plan shall be protected through the application of appropriate access control measures.**

2. **Land use decisions shall include a consideration of their effect on existing or planned transportation facilities.**

3. **The function of existing or planned roadways or roadway corridors shall be protected through the application of appropriate land use regulations; for example, residential uses shall not have direct access off of a proposed arterial.**

4. **The function of existing or planned general use airports shall be protected through the application of appropriate land use designation, particularly as it pertains to airport-compatible uses.**

5. **The function of existing or planned transit shall be protected by identifying potential transit corridors and encouraging transit-compatible land uses and site planning (i.e., retaining space for bus pull-outs and orienting major new buildings to the street with good pedestrian access).**

6. **The potential to establish or maintain accessways, paths, or trails shall be considered prior to the vacation of any public easement or right-of-way.**

B. Recommended Access Control Ordinances

Access Management standards are recommended in Chapter 7 of this TSP. Appendix K contains recommended policies and ordinance to support the access management standards.

4. Recommended Policies to Protect Public Use Airports

Section 660-12-045(2)(c) of the TPR requires all jurisdictions to adopt measures to protect public use airports. The following are examples of recommended policies to protect airports.

A. To avoid danger to the public safety from potential aircraft accidents, commercial and residential uses resulting in concentrations of people shall not be permitted beneath the airport approach surfaces and an area within 500 feet parallel from the runway centerline.

B. Land uses around the Madras Airport shall be required to provide an environment that will not be adversely affected by noise and safety problems and will be compatible with the airport and its operations.

C. The Madras Airport is recognized as an important transportation facility. Its operation, free from conflicting land uses, is in the best interests of the citizens of the City of Madras and Jefferson County; therefore, incompatible land uses will be prohibited on the lands adjacent to the airport.

D. The City of Madras shall encourage cooperation between the City, Jefferson County, and the Oregon Department of Transportation; Aeronautics Section when reviewing any land uses development near the Madras Airport.

E. The City of Madras, Jefferson County, and the Oregon Department of Transportation, Aeronautics Section shall work together in developing an Airport Master Plan for the Madras Airport.

F. The City of Madras will cooperate and coordinate with Jefferson County, and the Oregon Department of Transportation, Aeronautics Section in the protection of the Madras Airport and future expansion areas from potential adverse effects posed by incompatible land uses.

G. The City of Madras and Jefferson County shall create local Airport Advisory Committees for each airport. This committee shall be responsible for advising the sponsors during the development of Airport Master plans, implementing ordinances or in individual land use actions.

H. The land use element of the Madras Airport Master Plan shall become part of this comprehensive plan and guide land use decision making in the vicinity of these transportation facilities.

I. The Airport Runway Protection Zones shall be protected from development that could conflict with aircraft approach safety, or threaten surrounding development.

J. Development in highly hazardous areas, such as land within a floodway or under the Airport Runway Protection Zone will be restricted or prohibited.

K. Because of potential bird hazards to airborne aircraft, land uses beneath designated airport approach surfaces within 500 feet off the approach end of runway(s) accommodating piston engine aircraft, and within 10,000 feet of the approach end

of runway(s) accommodating jet aircraft shall not create water impoundments, sanitary landfills, or sewer treatment plants.

L. The City of Madras and Jefferson County shall adopt and implement an Airport Overlay Zone supporting land use compatibility around the Madras Airport.

M. The City of Madras and Jefferson County support:

1. **Land Use Zoning with respect to the Airport land use plan and noise contours;**

2. **A comprehensive capital-improvements program for land acquisition for airport expansion and safety; and**

3. **Frequent updating of the Airport Master Plan and related land use plans to keep the planning program current with changes in community goals.**

5. Recommended Ordinance to Protect Public Use Airports

Airport overlay zones are commonly used to protect smaller public use airports. Appendix L contains a recommended Airport Overlay Zone developed by the Oregon Department of Transportation, Aeronautics Section.

6. Process for Coordinated Review of Land Use Decisions

A lack of coordination between State and local decision processes can result in costly delays and changes in public road and highway projects, as well as some maintenance and operation activities. Section 660-12-045(2)(d) of the TPR requires that jurisdictions develop a process for the coordinated review of land use decisions affecting transportation facilities. The following recommended policies would demonstrate the community's desire to establish coordinated review. Ordinance language for coordinated review is provided within the suggested ordinances for Access Management.

7. Recommended Policies for Coordinated Review

A. The City of Madras/Jefferson County shall coordinate with the Department of Transportation to implement the highway improvements listed in the *Six-Year Highway Improvement Program* that are consistent with the TSP and comprehensive plan.

B. The City of Madras/Jefferson County shall consider the land use findings of ODOT's draft EISs and EAs as integral parts of the land use decision-making procedures. Other actions required, such as a goal exception or plan amendment will be combined with review of the draft EA or EIS and land use approval process. In addition, if a project must comply with standards or conditions to be allowed in a particular development zone, these conditions and standards will be applied during review of the draft EIS or EA.

8. Process for Applying Conditions to Development Proposals

Section 660-12-045(2)(e) of the TPR requires that jurisdictions develop a process that allows them to apply conditions to development proposals in order to minimize impacts on transportation facilities. These conditions are largely those that would be covered by the access management standards as suggested in Appendix L.

In addition, the Site Plan review process of the City of Madras and Jefferson County Codes should include a requirement to provide data on the potential traffic impacts of a project through a traffic impact study or, at the minimum, an estimation of the number of trips expected to be generated. Recommended language to be included under Site Plan Criteria can be found in Appendix J.

9. Regulations to Provide Notice to Public Agencies

A Notice typically initiates review of land use actions. The Zoning and Subdivision Ordinances usually defines this process. These ordinances should be amended to provide for Notice to ODOT regarding any land use action that could potentially affect a State facility. Similarly, all actions by a city or county potentially affecting another jurisdiction's road should require notice to that jurisdiction's public works department. In addition, the policy should be to notice providers of public transit and special interest transportation groups such as truckers, railroad, bicyclists, pedestrians, and the disabled on any roadway or other transportation project.

Information that should be conveyed to reviewers is included in Appendix J.

10. Regulations Assuring Amendments are Consistent with the TSP

Section 660-12-045(2)(g) of the TPR requires that jurisdictions develop regulations to assure that all development proposals, plan amendments, or zone changes conform to the TSP. This requirement can be addressed by adding a policy to the Comprehensive Plan, as follows:

- **All development proposals, plan amendments, or zone changes shall conform to the adopted TSP.**

Within the zoning ordinance, development proposals can be addressed through Site Plan Review, discussed above. Zone changes and plan amendments are partially addressed by the standard language found in most codes, such as follows:

- **The applicant must show that the proposed change conforms with the Comprehensive Plan...**

A statement should be added to the local ordinance and policy language governing zone changes and plan amendments as contained in Appendix J.

11. Safe and Convenient Pedestrian and Bicycle Circulation

Bicycling and walking are often the most appropriate mode for short trips. Especially in smaller cities like Madras where the downtown area is compact, walking and bicycling can replace short auto trips, reducing the need for construction and maintenance of new roads. However, the lack of safe and convenient bikeways and walkways can be a strong discouragement for these mode choices. The TPR requires that jurisdictions plan for bicycling and walking as part of the overall transportation system.

12. Recommended Policies for Pedestrian and Bicycle Circulation

The current City of Madras and Jefferson County Comprehensive Plans do not provide policies to protect or promote bicycle and pedestrian transportation. To comply with the objectives of the TSP and the TPR, it is recommended that Madras and Jefferson County amend their Comprehensive Plans with policies such as the following to protect, support, and encourage bicycle and pedestrian travel.

A. In areas of new development the City of Madras/Jefferson County shall investigate the existing and future opportunities for bicycle and pedestrian accessways. Many existing accessways such as user trails established by school children distinguish areas of need and shall be incorporated into the transportation system.

B. Bikeways shall be established on all arterials and major collectors within the Madras Urban Growth Boundary.

C. Sidewalks shall be established on all arterials and collectors within the Madras Urban Growth Boundary.

D. Priority shall be given to accessways to major activity centers within the Madras Urban Growth Boundary, such as the downtown commercial center, schools, and community centers.

E. Bikeways and pedestrian accessways shall be connected to local and regional recreation and alternative travel routes.

F. Bikeways and pedestrian accessways shall be designed and constructed to minimize potential conflicts between transportation modes and adjacent uses. Design and construction of such facilities should follow the guidelines established by the Oregon Bicycle and Pedestrian Plan.

G. Maintenance and repair of existing bikeways and pedestrian accessways (including sidewalks) shall be consistent with the maintenance and repair of motor vehicle facilities.

H. Bicycle parking facilities shall be provided at all new multiplex (four units or more) residential, commercial, industrial, recreational, and institutional facilities. Showers and changing areas shall be encouraged at all commercial, professional, industrial, and institutional facilities.

I. A citizens advisory committee shall be established to protect and promote bicycle and pedestrian transportation within the Madras Urban Growth Boundary.

13. Recommended Ordinances for Bicycle Parking

Section 660-12-045(3)(a) of the TPR deals with bicycle parking. Madras Zoning Ordinance #528 Article 4, Section 4.5 establishes the bicycle parking standards for the City of Madras. Article 4, Section 4.5 also adequately addresses the pertinent issues regarding bicycle parking and satisfies the requirements of Section 660-12-045(3)(a) of the TPR. However, because the lack of safe and convenient bicycle parking can waste resources and further discourage bicycling as a transportation mode, as well as irritate non-cyclists, Appendix J contains recommended amendments to Article 4, Section 4.5.

Jefferson County Land-Use Code Section 423 (Off-Street Parking Requirements) does not include provisions for bicycle Parking. To remedy this, it is recommended that Jefferson County adopt the bicycle parking requirements established by the City of Madras (including the recommendations stated above) for new multi-family residential developments of four units or more, retail, office and institutional developments, and any park and ride lots within the Madras Urban Growth Boundary. Outside of the Urban Growth Boundary, it is suggested that Jefferson County adopt the bicycle-parking ordinance specified for rural areas.

14. Recommended Ordinances for Bicycle and Pedestrian Circulation and Access

Sections 660-12-045(3)(b), (c), and (d) of the TPR deal with providing facilities for safe and convenient pedestrian and bicycle circulation and access, both within new residential and commercial development, and on public thoroughfares. In order for walking and bicycling to be viable forms of transportation, especially in the smaller urban centers where they can constitute a significant portion of local trips, the proper facilities must be supplied. In addition, certain development design patterns, such as orienting commercial uses to the street and placing parking behind the building, make a commercial district more accessible to non-motorized transportation and to existing or future transit.

The TPR specifies that, at a minimum, sidewalks and bikeways be provided along arterials and collectors in urban areas, and separate bicycle and providing a "short cut" provides pedestrian facilities where these would safely minimize trips distances. The City of Madras should consider enhancing the existing City codes by adopting the recommended ordinances and additions as contained in Appendix J.

It is also recommended that Jefferson County adopt the Internal Circulation Requirements established by the City of Madras (including the recommendations stated above) as part of new multi-family residential developments of four units or

more, commercial, industrial, and institutional developments within the Madras Urban Growth Boundary.

Adding the provisions contained in Appendix J will satisfy the objectives of the TPR by creating more favorable conditions for pedestrians and bicyclists within new developments. While current Design Standards within the Land Use Codes for Madras provide for sidewalks and bike paths, the City may decide that additional provisions could further encourage transportation alternatives.

In addition to the above provisions, the recommended bikeway and sidewalk road standards for new road construction or the reconstruction of existing roads within the Madras Urban Area should be enhanced to include specifications for bikeways and sidewalks as outlined in Appendix J.

MIXED-USE LAND USE ORDINANCES

Mixed-use development allows residential and commercial uses to occur within the same development or property. The practice of mixing uses, especially where somewhat higher densities than typical are allowed, may have a beneficial effect on transportation needs in a community. This is because trips become shorter, encouraging walking or bicycling, and employment is located adjacent to housing.

A mixed-use development is modeled on the small towns, neighborhoods, and villages that were common in the pre-World War II era. It has been observed that many quality of life issues, such as mobility, safety, and lack of congestion are often superior in the remaining enclaves of this type of development still found in older parts of our cities. Appendix M contains a model ordinance for consideration by the City of Madras.

MODEL TRAFFIC IMPACT STUDY ORDINANCE

Appendix N contains an example ordinance for determining when a traffic impact study might be needed.

A. COUNTY ROADS INVENTORY TABLE

COUNTY ROADS WITHIN THE MADRAS STUDY AREA

"COUNTY NUMBER"	NAME	FROM	TO
1-9	Grizzly Rd.	Kincade St.	Study Area Boundary (SAB)
1-10	Loucks Rd.	Highway 97	SAB
1-11A	Ashwood Rd.	B St	SAB
1-13	Belmont Ln.	Culver Highway (361)	SAB
1-34	Colfax Ln.	Culver Highway (361)	Highway 97
1-36	Bean Dr.	Ashwood Rd.	Loucks Rd.
1-37	Brown Dr.	Loucks Rd.	SAB
1-47A	Bear Dr.	SAB	Ashwood Ln.
1-48A	Adams Dr.	Highway 26	SAB
1-52	McTaggart Rd.	Grizzly Rd.	Buff St.
1-54	McTaggart Rd.	Dover Ln.	Grizzly Rd.
1-57	Glass Rd.	City Limits	Birch Ln.
1-58	Cascade	South Adams Dr.	Dead End
1-60	Winchester	South Adams Dr.	Dead End
2-9	Meadowlark Ln.	Highway 97	SAB
2-13	Golf Course Rd.	Birch Ln.	Dead End
2-22	Cherry Ln.	Airport	Adams Dr.
2-23	Birch Ln.	SAB	Highway 26
2-30	Adams Dr.	Cherry Ln.	SAB
11-3	K St.	Madison St.	Highway 97
11-4	L St.	Madison St.	Highway 97
11-5	M St.	Dead End	Highway 97
11-6	1st St.	M St.	J St.
11-8	3rd St.	M St.	J St.
11-9	Madison St.	M St.	J St.
12-1	Jefferson St.	Highway 26	Highway 97
12-2	7th St.	Jefferson St.	Polk St.
13-1	Chestnut St.	Highway 97	Lakeside Dr.
13-2	Beverly Dr.	Shady Ln.	Dead End
13-3	Lakeside Dr.	Cedar St.	Dead End
13-4	Cedar St.	10th St.	Lakeside Dr.
13-5	10th St.	Cedar St.	Loucks Rd.
14-1	Sun Dr.	J St.	10th St.
14-2	Allen St.	J St.	10th St.
14-3	Turner St.	J St.	H St.
14-4	H St.	Commerce St.	8th St.
14-5	8th St.	H St.	Buff St.
14-6	I St.	Highway 97	Dead End
14-7	Commerce St.	I St.	Trade St.
14-8	J St.	Highway 97	Sun Dr.
14-9	10th St.	Sun Dr.	Buff St.

15-1	Lee St.	Commercial St.	Highway 26
15-2	Commercial St.	Lee St.	Birch Lane
15-3	N. 1st St.	Lee St.	Cleveland St.
15-4	N. 2nd St.	Lee St.	Cleveland St.
15-5	N. 3rd St.	Jefferson St.	Birch Lane
15-6	N. 4th St.	Lee St.	Depot Rd.
15-7	Cleveland St.	Commercial St.	N. 4th St.
15-8	Jefferson St.	Commercial St.	N. 3rd St.
16-1	Marie St.	Dead End	Fairgrounds Road
17-1	Dussault St.	Crestview Ln.	Dead End
17-2	Sagebrush Dr.	Mctaggart Rd.	Knoll Ln.
17-3	Tumbleweed St.	Dussault St.	End
17-4	Barber Dr.	Adams Dr.	End
17-5	Crestview Ln.	Dead End	End
17-6	Hering Rd.	Madras Rd.	Dussault St.
17-7	Madras Rd.	Crestview Ln.	Hering Rd.
17-8	Locust Wy.	Crestview Ln.	Adams Dr.
19-1	Burns Ln.	Sunset Dr.	End
19-2	Juniper Dr.	Burns Ln.	Culver Highway
19-3	Rim Rock Dr.	Burns Ln.	Dead End
20-1	Earl St.	Conroy St.	Highway 26
20-2	Conroy St.	Adler St.	Earl St.
20-3	Adler St.	Mill St.	Wigton St.
20-4	Mill St.	Adler St.	Cherry Ln.
20-5	Hess St.	Conroy St.	Highway 26
21-1	Teresa Dr.		
21-2	James Dr.		
21-3	Jason Ln.		
?	"B" St.	City Limits	UGB
?	"E" St.	Kinkade Rd.	East
?	10th St.	Loukes Rd.	Cedar St.
?	Canal St.	Hess St.	Adler St.
?	Canyon Rd.	Straun Rd.	"C" St.

The following roads are within the study area, but outside of the UGB (according to the base map we prepared for Madras), yet they did not appear in either the Jefferson Co. or Madras Road Inventories.

Knoll Ln.
Tanglewood Ln.
Schnider Ln.
This Place
That Place
Estate Dr.
Dry Gulch Dr.
SW Tompsett St.
SW Aaron St.
SW Foss St.
Mcglohin Ln.
Cody Ln.
SW Merritt Ln.
SE Woodside Ct.
SE Jones St.
SE Alice St.
SE Steele St.
SE Dimick Ln.
SE Dee Ln.

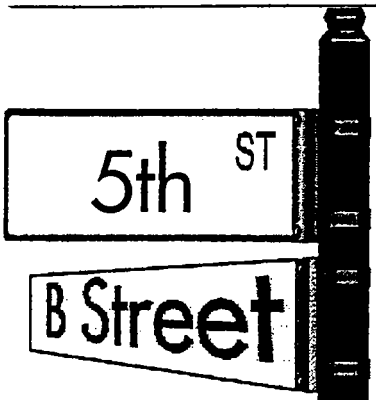
SW John St.
SW Lynn St.
SW Barker St.
SW Johnston Rd.
NW Richard Ln.
NW Bean Way
NW Aspen Way
NE Lancaster Dr.
NE Deer St.
NE Miller St.

B. NEWSLETTERS

Transportation News

Oregon Department of Transportation
City of Madras and Jefferson County

February 1995



Come to an Open House and Transportation Meeting on February 22 and give us your comments! Here's your opportunity to be involved in making decisions about your streets and roadways. See page 4 for details.

All of us have noticed the recent growth in Jefferson County and the City of Madras. Jefferson County's beauty and healthy economy is attracting more people each year. The friendly Central Oregon town of Madras is becoming home for more families seeking crisp dry air, spectacular mountain views, and the richness of a smaller community.

The Oregon Department of Transportation, Jefferson County, Camp Sherman, Crooked River Ranch, and the cities of Madras, Culver, and Metolius are working together to ensure the quality of life in Jefferson County. Through the development of a Transportation Plan to carry the community into the twentieth century, the problems associated with growth can be avoided. We're focusing on improving the road system to reduce congestion and to improve safety.

THE TRANSPORTATION STUDY IS UNDERWAY!

Are you worried about high traffic speeds through downtown Madras? Limited access to Crooked River Ranch? Road maintenance coordination in Camp Sherman? Or the need for improving safety within Jefferson County? A study is currently underway to identify, inventory, and analyze the existing conditions within your communities. We have already identified problems and possible solutions, and now it's time to show you our work so far.

WHAT ARE THE GOALS OF THE STUDY?

The study will develop a Transportation Plan for the next twenty years. The goal is to enhance the livabil of Jefferson County and the city of Madras, as well as to accommodate growth through careful management of transportation facilities. To accomplish this broad goal, we had to do the following:

- *Identify a list of projects for both local transportation needs and the needs of people who are passing through the area to another destination.*
- *Develop realistic funding strategies for the Transportation Plan.*

WHO'S DOING THE STUDY?

We're a team brought together by the Oregon Department of Transportation (ODOT) to develop the Transportati Plan. The team includes representatives from Jefferson County, the City of Madras, a number of other interested parties, and a consulting team of transportation experts from the firm of David Evans and Associates, Inc.

HOW WILL THE STUDY BE CONDUCTED?

The transportation study for Jefferson County and Madras contains the following four steps:

Step 1. Gather Technical and Community Information

A catalog of existing conditions is critical to good planning. Identifying problems and possible solutions req us to verify the following:

- *existing transportation problem areas,*
- *traffic counts,*
- *land use plans,* and
- *population and employment growth projections.*

Step 2. Develop Improvement Alternatives

Based on the team's analysis of the existing conditions, the following ALTERNATIVES were developed to improve and support the transportation systems within Madras and throughout the County.

- ☞ *Evaluate a "no build" condition assuming no new projects.*
- ☞ *Modify land use patterns to reduce car trips.*
- ☞ *Identify needed bike and pedestrian facilities.*
- ☞ *Provide additional east-west roads in Jefferson County.*
- ☞ *Develop Second Street as a through street between M Street and B Street.*
- ☞ *Extend J Street to Grizzly Road.*
- ☞ *Connect Tenth Street between A Street and B Street.*
- ☞ *Improve Kinkade Street between B Street and Grizzly Road.*
- ☞ *Improve Tenth Street between Buff Street and J Street.*
- ☞ *Extend M Street from Madison Street to Culver Highway (Highway 361).*

- ☞ *Extend Fairgrounds Road east to Adams Drive.*
- ☞ *Extend Oak Street from Highway 97 west to Third Street.*
- ☞ *Extend Third Street north from B Street to Oak Street.*
- ☞ *Improve H Street between Culver Highway and Madison Street.*
- ☞ *Connect Canyon Road/Glass Street with Adler Street and the Industrial Park.*
- ☞ *Re-route Highway 97 behind McDonald's to connect with the couplet at a signalized intersection.*
- ☞ *Re-route Highway 97 southbound traffic along Cedar Street under Highway 26 to merge with Fourth Street.*
- ☞ *Relocate the south junction of Highway 26 with Highway 97 to an intersection opposite Colfax Lane.*
- ☞ *Provide a truck route which takes truck traffic out of downtown Madras.*
- ☞ *Consolidate or close some roads in the Camp Sherman area.*
- ☞ *Construct a new bridge across the Crooked River Canyon to provide additional access to Crooked River Ranch.*

Step 3: Evaluate the Alternatives

The team looked at how each ALTERNATIVE listed above would:

- *result in the kind of environment that the community wants,*
- *meet the transportation needs of local and through traffic,*
- *impact the natural environment,* and
- *affect our pocketbooks.*

Step 4: Recommend an Implementation Strategy

After refining and comparing the ALTERNATIVES, the team will recommend an ALTERNATIVE and corresponding implementation strategy to the County, the City of Madras, and to ODOT. The following will also be included as part of the whole ALTERNATIVE recommendation package:

- *A prioritized list of roadway improvements.*
- *Any land use or planning changes that might be required.*
- *Any rights-of-way that may need to be acquired.*

WHAT ARE THE DECISIONS BASED ON?

The team has drafted the following list of criteria they will use to evaluate the ALTERNATIVES:

- ✔ *Overall cost (state and local).*
- ✔ *Community and business support.*
- ✔ *Compatibility with current and planned land uses and policies.*
- ✔ *Potential and expected environmental impacts.*
- ✔ *Traffic circulation and community access.*
- ✔ *Alternative modes of transportation (public transit, bicycle travel, pedestrian travel).*
- ✔ *Traffic capacity and congestion.*

COME TO THE TRANSPORTATION MEETING!

We'd like to hear your comments and concerns. Please come to our Open House and meeting; learn more while talking face-to-face with the members of the study team!

7:00 PM
Wednesday, February 22nd
Senior Center in Madras (860 S.W. Madison)

INFORMATION SOURCES:

Newsletters and study updates will be available at the following locations:

Madras City Hall, Culver Post Office, Metolius Post Office, Crooked River Ranch–Association Office, Post Office, and Real Estate Office, and the Camp Sherman Post Office

Look for regular articles and announcements in the *Madras Pioneer*, *Sisters Nugget*, and *The Paper 97760* (Crooked River Ranch) for articles and meeting announcements.

NEED MORE INFORMATION?

If you have questions or comments, please call:

Karen Swirsky, Project Manager

503-389-7614

If you would like to be on our mailing list for newsletters (there will be one more), please fill out and mail the form below to:

Karen Swirsky, David Evans and Associates, Inc., 709 N.W. Wall St., Suite 102, Bend, OR 97701-2744

WANT TO BE ON OUR MAILING LIST?

please complete the form below, then cut on the dotted line and mail it to the above address

Please put me on your mailing list for the second Jefferson County/Madras Transportation Plan 'Transportation News' newsletter.

Please Print:

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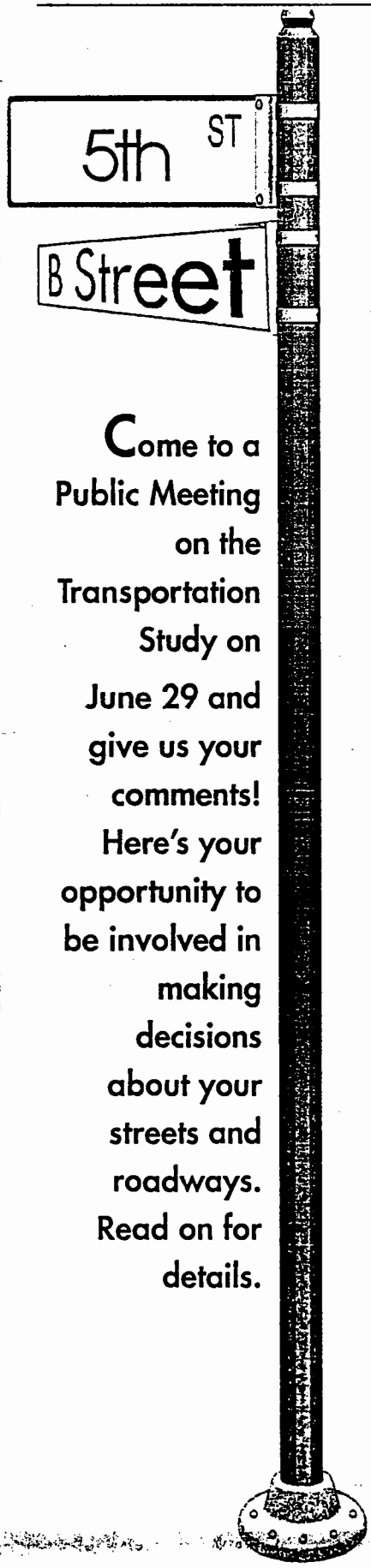
Transportation News

Oregon Department of Transportation
City of Madras and Jefferson County

No. 2
June 1995



Come to a Public Meeting on the Transportation Study on June 29 and give us your comments! Here's your opportunity to be involved in making decisions about your streets and roadways. Read on for details.

In February of this year, the City of Madras and Jefferson County held a public meeting to discuss the transportation future of the area. Many excellent suggestions were offered by the area residents. The Study Team has been working hard to incorporate all the good ideas, and a draft plan has been prepared for presentation at the third public meeting, scheduled for Thursday, June 29, 1995.

The purpose of the Transportation Plan is to plan for what's needed over the next 20 years to protect the qualities that make Jefferson County a good place to live: Easy access to services, beautiful countryside, clean air, and strong communities.

The draft plan includes recommended transportation projects to take Madras and Jefferson County through the next 20 years. The following list will be described in detail at the public meeting, and your comments are welcome.

IN MADRAS:

Add Mixed-Use Zoning. Mixed-use zoning increases opportunities to get to work, schools, or shopping on foot or by bicycle, and reduces the demand on the highway for local trips.

Build Walkways and Bikeways. A number of projects are needed to complete the walking and cycling network in Madras.

Improve the Basic Street System. This set of improvements will reduce traffic volumes on the highway, improve traffic flow downtown, and improve safety.

Improve the Highway 26/97 Intersection. An option for the intersection is to reroute Hwy. 97 onto 6th Street to connect with the couplet at a signalized intersection. Because this would be relatively simple and less expensive than other options, it is recommended as a *near-term* solution. Rerouting Hwy. 97 southbound traffic along Jefferson Street and under Hwy. 26 to merge with 4th Street would reduce delays for southbound Hwy. 97 traffic at north junction with Hwy. 26. Because of the expense and complexity, this is recommended as a *long-term* solution.

Realign 5th Street. A *near-term* solution to safety problems at the south end of 5th Street would be to realign 5th Street on Adams Drive south of J Street, close existing 5th Street between I and K Streets, and realign Adams Drive along 7th Street to connect with 7th Street/Hull Street. A *long-term* solution would be to realign 5th Street on Adams Drive south of J Street, close existing 5th Street between I and K streets, and realign Adams Drive to connect with 10th Street.

Improve Access to the Industrial Park. Connecting Canyon Road/Glass Street with Adler Street and the Industrial Park will improve access into the industrial park for both industrial and agricultural users. It is recommended that this improvement be done in two phases.

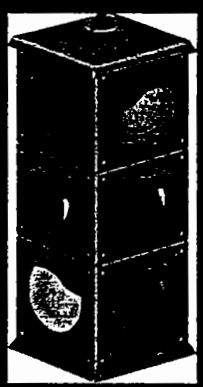
IN JEFFERSON COUNTY:

Provide Passing Lanes on Highways 97 and 26. An ODOT goal is to have passing lanes every 3-4 miles on highways of statewide importance. On Hwy. 97 south of Madras, 2 passing lanes are needed. On Hwy. 26 northwest of Madras, one more passing lane is needed.

Improve Intersections. A number of intersections need to be improved for safety. These are: Dover Lane, Iris Lane, Jericho Lane, and Juniper Butte at Hwy. 97; Bear Drive at Hwy. 361; and Gem at the railroad tracks.

Protect the Rural Character of Camp Sherman. Jefferson County can maintain the rural character and natural setting of the Camp Sherman area by adopting a policy to not construct new roads or widen existing roads.

Provide Access Control and Pedestrian Improvements in Culver and Metolius. Culver and Metolius can define their downtown areas with curbs, sidewalks, and access ways to parking areas in order to preserve the present and future function of the Culver Highway and provide pedestrian safety.



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7:00 PM
Thursday, June 29th
Madras Senior Center (860 SW Madison in Madras)

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C. TECHNICAL MEMORANDUM - EXISTING COMPREHENSIVE PLANS AND ORDINANCES

TECHNICAL MEMORANDUM
MADRAS TRANSPORTATION SYSTEM PLAN

The following memo summarizes the major transportation elements of the existing Comprehensive Plans, Subdivision, and Zoning Ordinances for Jefferson County and the City of Madras, as well as the Madras City - County Airport Master Plan. Any conflicts between the plans are discussed and documented as are data assumptions on pertinate subjects such as population and employment.

1. JEFFERSON COUNTY COMPREHENSIVE PLAN

The transportation element of the Jefferson County Comprehensive Plan inventoried the existing modes of transportation within the County circa 1981. Jefferson County's large area and relative low population density has required the use of the private motor vehicle as the primary mode of transportation. In addition to discussing the major road systems, the 1981 Comprehensive Plan addressed air transportation, bus service, the needs of the transportation disadvantaged (senior citizen transportation), motor freight, railroad, and natural gas transport. The plan does not address bicycle or pedestrian alternatives.

A. *ROAD SYSTEM*

State Highways

♦ U.S. 97, the Dalles-California highway, runs north - south through the center of the county, bisecting U.S. 26 at the City of Madras. In 1977, the Average Daily Trips (ADT) for U.S. 97 was 9% above the higway capacity of 6,400 (p. 108). The ODOT Six-Year Improvement Program listed the following State projects to be completed by 1985:

- Guard rail installation at the North end Madras couplet.
- Grading and paving of South city limits to Prineville Jct.
- End Guard Rail installation at Crooked River Bridge.

The Jefferson County Comprehensive Plan highlighted the following projects as "necessary for proper utilization of the State supported Highway System in Jefferson County" (p. 109).

- Creating four-lanes from "J" Street in Madras to U.S. 26.
- Passing and left turn lanes from Dover to Eureka.
- Northbound passing lane from Monroe to Juniper Butte Crest.
- Stop lights at the intersections of 4th and C and 5th and C.

♦ U.S. 26, Portland to Prineville, runs northwest and southwest, traversing the center of the County at a diagonal and intersecting with U.S. 97 in Madras. The ADT for U.S. 26 surpassed the projected capacity of 4,300 in 1978 (Table 28, p. 108). No improvement projects were suggested in the Comprehensive Plan.

♦ U.S. 20, Central Oregon to Salem and mid-Willamette Valley, runs through a major recreation area in the southwest corner of the county. This 10.5 - mile stretch carried 2,200 - 2,800 vehicles per day in 1975 (p. 108). In 1980, ODOT's Six Year Highway Improvement Program cited the overlaying and construction of a passing lane from the Linn County line to the Suttle Lake Road Junction to be completed by 1985.

In addition to the specific suggestions above, the Goal 12 discussion (12A and 12C) in the Plan briefly outlined policies for highway improvements within Jefferson County in coordination with the State and City efforts.

County Roads

The Jefferson County Comprehensive Plan identified 621.5 miles of county road. Of these 408.1 miles consisted of gravel surface, while the remaining 213.4 miles were paved surfaces. The roads are maintained by the County Road Department. While the Plan did not point to specific areas of need, the Goal 12 discussion (12-B1-B3) of the Plan did seek to improve the county road system. In addition to suggesting improvements, the Goal 12 discussion (12-B4-B7) outlined policies for County roads in conjunction with land-use.

B. *AIR TRANSPORTATION*

The Comprehensive Plan identified the City-County Airport at Madras and the Lake Billy Chinook State Airport as the two airstrips serving Jefferson County. For each of the airports, the Plan provided a brief inventory of the facilities, a discussion of the sites relation to land-use and local economy, and suggested improvements. In particular, the Plan highlighted the Oregon State Board of Aeronautics recommendations for the Lake Billy Chinook facility (p. 113):

- Clear zone acquisition.
- Fencing of the airport.
- Improve and Pave runway, taxiway, and apron.

In addition, the Goal 12 discussions (12D-D2) included policies for air transportation protection and expansion for Jefferson County.

C. *BUS SERVICE*

The Comprehensive Plan identified Pacific Trailways Bus Line with a station in Madras as the sole service in the county.{Pacific Trailways has subsequently merged with Greyhound's services and, unlike the Plan projected, bus travel in and out of Jefferson County has decreased.}

D. *TRANSPORTATION DISADVANTAGED*

The Comprehensive Plan identified Central Oregon Council on Aging's (COCOA) Dial-A-Ride program for senior citizens as providing transportation to the disadvantaged. The program continues to operate, serving the local communities surrounding Madras three days a week, and offering transportation to Bend one day a week. The Plan did not make any suggestions for future service to the transportation disadvantaged.

E. *MOTOR FREIGHT*

The Comprehensive Plan identified that there were no freight lines based in the area, but several lines did service the County. The Plan pointed to the Madras Freight Lines terminal on U.S. 97 as the center of motor freight activity. The Plan did not provide any suggestions or projects for the future of motor freight in Jefferson County.

F. *RAILROAD*

The Comprehensive Plan identified the Oregon Trunk Line of the Union Pacific Co. and Burlington Northern Inc. as the sole provider of rail service in the County. The line continues to provide daily freight service to Madras, Metolius, and Culver with the majority of activity focusing on the Madras switching yard and depot. The Plan suggested that rail service has been a prominent factor in the County's economy due to its proximity to industrial operations and agricultural import/export services. There is no mention of rail passenger service.

G. *PIPELINES*

One major interstate transmission pipeline existed in the Jefferson County in 1981. The Plan identified the Pacific Gas Transmission Company as the operator of the 36" diameter natural gas pipeline that runs through the County from the Cove Canyon area to the Lone pine area enroute from Canada to California.

2. JEFFERSON COUNTY SUBDIVISION AND ZONING ORDINANCES

A. *SUBDIVISION ORDINANCE*

The Jefferson County 1981 Subdivision Ordinance (Ordinance #0-21-81) prescribed the "regulations governing: the subdivision of land, the preparation of major and minor partitions, procedures and approval of subdivision plats, and the improvements thereof, in the unurbanizable areas in the County" (p. 1) An inventory and a brief explanation of the major Articles pertaining to transportation within Ordinance #0-21-81 follow.

- Art. 3, Sec. 302 C - Transportation considerations required in site suitability study.
- Art. 3, Sec. 305 B and C - Transportation considerations required on the tentative Subdivision Plan.

- Art. 4, Sec. 404 D-I,N - Transportation considerations required on the Final Subdivision Plat.
- Art. 7. Sec.701 - 724 - Specific requirements for Subdivision Design and Improvement in regards to streets and transportation.

B. *ZONING ORDINANCE*

The 1987 Jefferson County Zoning Ordinance (Ordinance #0-22-81) includes reference to various modes of transportation in the following land use zones:

- Art. 3, Sec. 301-B-7 - Exclusive Farm Use - Conditionally permits personal-use airports for airplanes and helicopter pads.
- Art. 3, Sec. 302-B-7 - Range Land - Conditionally permits personal-use airports for airplanes and helicopter plans.
- Art. 3, Sec. 307-C-8 - Camp Sherman Resort Residential Zone - Conditionally permits a marina or boat launch ramp (in accordance with additional criteria set forth in Sec. 307-E).

Ordinance # 0-22-81 includes references to various modes of transportation in the following land-use zones:

- Art. 3, Sec. 303 - Forest Management Zone - Personal use airport or heliport in conformance with requirements of the Aeronautics division. Outright use permitted subject to site plan review.
- Art. 3, Sec. 313 - Airport Management Zone - Air transportation systems in accordance with regulations within Sec. 313.

Article 4 of Ordinance # 0-22-82 created supplementary provisions for Zoning requirements in Jefferson County. The following pertain to transportation:

- Sec. 414-F-5-6, H-2 - Contents pertaining to transportation required in the site plan.
- Sec. 416-B - Requirements for permit to transport mobile home.
- Sec. 418 - Airport Protection Procedures.
- Sec. 423 - Off Street Parking Requirements.
- Sec. 425 - Dock Design and Review Requirements.

3. CITY OF MADRAS COMPREHENSIVE PLAN

The transportation element of the City of Madras Comprehensive Plan inventoried the existing transportation systems operating in the City of Madras circa 1990. The Comprehensive Plan addressed private motor vehichle, motor freight, rail, air and commercial transit systems serving the City. In addition, discussion on Goal 8 and Goal 12

in the City Comprehensive Plan included potential policies for meeting the projected transportation needs of the community in accordance with Oregon Statewide Planning Goals.

A. *ROAD SYSTEM*

Highways

U.S. 97 and U.S. 26 bisect Jefferson County and meet each other in a one-way couplet in the center of Madras. The Madras Comprehensive Plan reported "relatively high traffic counts" on each of these major regional roadways as they pass through the city. At junction sites in Madras, the Plan recorded 8,800 vehicles/day on U.S. 97 and 2,900 vehicles/day on U.S. 26 (p.48).

In addition to the two major highways, the Madras Plan also recorded Culver Highway (Hwy.361) as a major federal-aid secondary highway carrying approximately 2,150 vehicles/day (p. 47).

Local Road Systrm And Transportation

The Madras Comprehensive Plan identified the City streets as developed on a near true north-south grid pattern and as typically having exceptionally wide rights-of-way. In addition, the Plan noted that sidewalks were not required, but did exist in most residential areas.

The Plan accounted for one taxi service and the COCOA Dial-A-RIDE service for senior citizens, but identified the private auto as the primary local transportation vehicle.

The Comprehensive Plan documented the following improvements the City planned to undertake to improve local traffic circulation.

- Construction of a bridge over Willow Creek to complete 10th St.
- Improvement of the "Y" intersection of northbound U.S. 97 and Adams Drive.
- Extension of Buff Street to Grizzly Road.

The Plan also noted the City's support of the following road improvements outside of the City's jurisdiction.

- Additional directional signs in the northbound lanes of 5th street to announce the junction of Highways U.S. 26 and 97.
- Construction of traffic islands and the relocation to the north of the east-west lanes to reduce the traffic hazard created by the short "U" turn at the south end of the one-way couplet.

- Installation of stoplights on one intersection of both north and south bound lanes of the one-way couplet.
- Construction of a left turn lane at Cherry Lane on U.S. 26, an ODOT Six Year Improvement project.

The Plan noted "serious consideration was given to the establishment of a highway bypass around the City," and concluded that it was the "City's official position to oppose any relocation of the existing highway through the City at the present time" (p. 54)

B. *AIR TRANSPORTATION*

The Madras Comprehensive Plan identified the City-County Airport located three miles northwest of the city center as the major air transportation facility. The plan inventoried four runways, hanger and tie-down facilities for plane storage, and a shop hanger for aircraft repairs.

According to the Comprehensive Plan, the facility offered commercial and chartered service for passengers, freight, and air express, in addition to air service for agricultural flight operations and fire fighting.

The Comprehensive Plan indicated that future expansion and improvements of the facility and the addition of a "taxi-in" Air Business Industrial Park may prompt the inclusion of the airport in the Madras Urban Growth Boundary.

C. *BUS SERVICE*

The Madras Comprehensive Plan identified Pacific Trailways Bus System as the sole bus service in the City.{ Pacific Trailways has subsequently merged with Greyhound's services and bus service to and from Madras has decreased.}

D. *MOTOR FREIGHT*

The Madras Comprehensive Plan inventoried three carriers with terminals in the Madras vicinity. Madras Freight Lines is the largest of the carriers indicated serving both inter and intra-state commerce.

E. *RAILROAD*

The Madras Comprehensive Plan identified the Oregon Trunk Line operated by the Union Pacific and Burlington-Northern Railroad Companies as the provider of daily freight service to Madras, with a spur line serving the Madras Industrial Park. According to the Plan, passenger service was discontinued in the 1970's and the railway use is now the transport of agricultural, forest, and energy commodities.

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and other land use controls as deemed essential to protect the health, safety and welfare of the people of the City of Madras and Jefferson County." (8-8.3.9)

- Art. 4, Sec. 4.2 - Internal Pedestrian Circulation - Requires elements for the establishment of an effective pedestrian circulation system within the City of Madras. Provisions included Connections, Routing, Design, and ADA Compliance.
- Art. 4, Sec. 4.5 - Off Street Parking - Requires elements for Off-Street Parking and Bicycle Parking. Table #1 attached at the end of Ordinance #528 included specific zoning requirements for off-site parking.
- Art. 4, Sec. 4.6 - Off Street Parking and Loading - Requires provisions for off street parking areas in conjunction with off street loading spaces.
- Art. 4, Sec. 4.7 - Design Improvement Standards For Parking Lots - Requires improvement standards for parking lots.
- Art. 4, Sec. 4.8 - Parking Table and Diagram - Attached to Ordinance #528 the table and diagram provides the minimum dimensions for public and private parking areas.

5. MADRAS CITY - COUNTY AIRPORT MASTER PLAN

The Madras City - County Airport Master Plans (updated in 1986) primary focus was on the aeronautical issues surrounding the needs of Jefferson County and the City of Madras. As a secondary focus, the Master Plan discussed the possibilities of better land utilization in and around the airport as an economic means to further the development of the facility. The Master Plan was designed to "re-examine the aviation forecasts, projections, and re-evaluate the site's needs, both aeronautically and economically, for use through the planning period of approximately ten years, to 1996" (p. 1) This Technical Memo will focus on the Master Plan's discussions on land use, projected growth, facility improvements, and any conflicts which may seem to exist between this Plan and either the County or City Comprehensive Plans.

A. *LAND USE*

The Master Plan indicated that the majority of the airport property was utilized by agricultural interests or was in an unused state. The only other non-aeronautical uses indicated by the Master Plan were that of Freightliner Corporation using a closed portion of airfield pavements for field testing their trucks, two agriculture operators, and a number of sewage treatment ponds located in the western portion of the airport property. The actual land area used for airport purposes was documented by the Master Plan as relatively small, consisting of the three active runways, their approaches and the terminal area.

Section VIII of the Master Plan suggested the land use plans for the future of the facility. Of primary concern was the desire to establish a new land use zone, entitled Airport Industrial Management Zone, which would allow broadened airport related industrial activities, most notably the construction of an Airport Business Park with "taxi-in" capabilities. According to the Master Plan, the addition of a new zone would require the expansion of the Madras Urban Growth Boundary.

F. *BIKING/HIKING TRAIL*

The Madras Comprehensive Plan inventoried a proposal for a bike/hike/running trail beginning southeast of the City, running through the City, and down the Willow Creek Canyon to the Deschutes River.

The Madras Comprehensive Plan discussion's of Goal 12 incorporated the City suggestions for traffic and transportation improvements, as previously discussed (2-A).

4. CITY OF MADRAS SUBDIVISION AND ZONING ORDINANCE

A. *SUBDIVISION ORDINANCE*

The City of Madras 1993 Subdivision Ordinance (Ordinance #522) prescribes the regulations "governing the subdivision of land, for the preparation, procedures, and approval of minor partitions, subdivision plats, and improvements, in the incorporated areas in the City of Madras" (8-6). Consideration of transportation systems designs were required within each Article of the Ordinance. An inventory of the major Articles pertaining to transportation within Ordinance # 522 follows:

- Art. 6, Sec. 6.2 - Requires considerations of street design standards and improvements.
- Art. 8 - Requires standard specifications for design and construction of roads and other improvement facilities.
- Supplement to Art. 8 - Drawings for the standard specifications for design and construction of roads and other improvement facilities.

B. *ZONING ORDINANCE*

The City of Madras 1993 Zoning Ordinance (Ordinance #528) established the "land use zones to regulate the location of building structures and the use of land within the City of Madras." (Madras Ordinances, 8-8) An inventory of the major Articles pertaining to transportation within the Ordinance #528 follows:

- Art. 3, Sec. 3.8 - Airport Development Zone - According to the Ordinance the "purpose of this zone is to provide land adjacent to the airport facilities for future commercial and light industrial uses which will be directly dependent on air transportation" (8-8.3.8). The provisions of this 8-8.3.8 outlined the requirements for land use within the AD Zone.
- Art. 3, Sec. 3.9 - Airport Overlay Zone - Requires elements for land use lying beneath the Airport Imaginary Surfaces, as shown on the 1986 Airport approach and Clear Zone Map. In addition the provisions of 8-8.3.9 "intended to prevent the establishment of air space obstructions in airport approaches and surrounding areas through height restrictions

and other land use controls as deemed essential to protect the health, safety and welfare of the people of the City of Madras and Jefferson County." (8-8.3.9)

- Art. 4, Sec. 4.2 - Internal Pedestrian Circulation - Requires elements for the establishment of an effective pedestrian circulation system within the City of Madras. Provisions included Connections, Routing, Design, and ADA Compliance.
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B. *PROJECTED AIRPORT USE*

The Master Plan projected that total aircraft operations per year would increase from an estimated 15,700 in 1986 to a medium forecast of 21,000 in 1995 (Table 4, p.19). To accommodate the forecasted increase in aircraft operations, the Master Plan suggested that certain improvements, such as a larger runway, would need to be completed in order for the facility to upgrade to an FAA General Utility airport status.

C. *FACILITY IMPROVEMENTS*

The Master Plan focused possible airport improvements around the addition of an Air Business Industrial Park. In order to meet the aeronautical needs of the facility, the Plan suggested that runway 16R/34L should be reconstructed and lighted, while runway 16L/34R should be converted to a parallel taxiway. In addition, improvements to the crosswind runway and taxiway were recommended. According to the Plan, the addition would greatly benefit Jefferson County and the City of Madras; however, in order to create such an addition, improvements in public utilities (streets, water, sewage) would have to accompany the project.

D. *POSSIBLE CONFLICTS WITH OTHER COMPREHENSIVE PLANS*

Within the Master Plan there exists the possibility of two conflicts with Jefferson County and Madras Comprehensive plans if an Airport Business Industrial Park materialized. Primarily, the aforementioned discussion of the expansion of the Madras Urban Growth Boundary to accommodate a new Airport Industrial Management Zone (an addition to both Comprehensive Plans). According to the Master Plan, UGB's rarely expand and the desired annexation may cause a planning dilemma. Secondly, the Master Plan indicated that the Madras right-of-way provisions were excessive within the proposed Industrial Park environment, and suggested a variance to the Ordinance may be in order.

6. ADDITIONAL TRANSPORTATION IMPROVEMENT SUGGESTIONS

In addition to the Comprehensive Plans and the Airport Master Plan, the following suggestions for traffic improvements have been presented to Jefferson County and the City of Madras.

- Officer Jon E. Granby, of the Oregon State Police proposed that "South Adams Drive be eliminated at the North East side of 'I' street and that traffic Northbound on South Adams be required to stop at the intersection of South Adams and 'I' street" (June 23, 1994 Officer Jon E. Granby to Safety Council of Jefferson Co.).

- ODOT Region 4 Traffic Engineering Study for the City of Madras analyzed the intersection of U.S. 26 and U.S. 97 in Madras, and from seven options recommended that Cedar Street in Madras be lowered to pass under US 26 and then be extended south to

connect with Fourth St. south of Willow Creek. Southbound traffic on U.S. 97 would be routed over the new connection providing a safer and more efficient interchange (Alternative 7). Recognizing the high cost of the project ODOT, recommended extending U.S. 97 south on Sixth Street to a new connection to Fifth Street at the north end of the Willow Creek structure as a short-term, cost-effective solution (Alternative 4).

- ODOT Region 4 also studied the intersection at Warm Springs Highway and Depot Road. Out of five proposed alternatives, ODOT recommended Alternative #3, construction of a left-turn refuge in the vicinity of Depot Rd.

- In the 1993 City of Madras Transportation Systems Plan Draft, the following Transportation System Improvements were proposed:

  - Develop Second Street as a through street.
  - Extend J street from Fifth Street to Grizzly Rd.
  - S.E. Kinkade Street Improvements.
  - S.E. Tenth Street Improvements.
  - Extend S.E. M Street.
  - Extend Fairgrounds Rd. East to S. Adams Dr.
  - Extend Oak street West to Third Street.
  - Extend Third Street North from terminus to N.W. Oak.
  - Improve H Street between Highway 361 and Madison St.
  - Link between Glass Dr. and Addler St. (Industrial Site)
  - Bicycle link between Grizzly Rd. and Buff St.
  - Provide bicycle storage facilities @ City Property.
  - Connect Phase II and III of Willow Creek Trail.
  - Construct strategic sidewalks.
  - Buff Street sidewalks.
  - D Street sidewalks.
  - E Street Walking path/bike path.
  - Highway 97 South sidewalks.
  - Highway 97 and 26 sidewalks.

D. 1995 MADRAS MAJOR STREET INVENTORY

1994 MAJOR STREETS INVENTORY
Madras Transportation System Plan

Street Segment	Jurisdiction	Classification	Speed Limit (mph)	ROW Width (feet)	Street Width (feet)	# of Travel Lanes	Direction	Curbs	On-Street Parking	Sidewalks	Bikeway	Ride Quality
"B" Street												
1st Street to 2nd Street	City	Collector	25	65	54	2	EB/WB	Yes	Yes	Yes-N	Shared	Fair
2nd Street to 3rd Street	City	Collector	25	65	54	2	EB/WB	Yes	Yes	No	Shared	Fair
3rd Street to 4th Street	City	Collector	25	65	54	2	EB/WB	Yes	Yes	Yes	Shared	Fair
4th Street to 5th Street	City	Collector	25	65	54	3	EB/WB	Yes	No	Yes	Lane	Fair
5th Street to 6th Street	City	Collector	25	70	54	2	EB/WB	Yes	Yes	Yes	Lane	Good
6th Street to 7th Street	City	Collector	25	70	54	2	EB/WB	Yes	Yes	Yes	Lane	Good
7th Street to 8th Street	City	Collector	25	70	50	2	EB/WB	Yes	Yes	Yes	Lane	Good
8th Street to 9th Street	City	Collector	25	70	50	2	EB/WB	Yes	Yes	Yes-N	Lane	Good
9th Street to 10th Street	City	Collector	25	70	54	2	EB/WB	Yes	Yes	Yes-N	Lane	Very Good
10th Street to 12th Street	City	Collector	35	75	44	2	EB/WB	Yes	No?	Intermittent	Shared?	Good
12th Street to Ashwood Road	City	Collector	35	75	44	2	EB/WB	Yes	No?	No	Shared?	Good
Ashwood Road to Hillcrest Street	City	Collector	45	60	44	2	EB/WB	Yes	No?	No	Shared?	Good
Hillcrest Street to 16th Street	City	Collector	45	60	44	2	EB/WB	Yes	No?	No	Shared?	Good
16th Street to Revere Avenue	City	Collector	45	60	44	2	EB/WB	Yes	No?	No	Shared?	Good
Revere Avenue to Kinkade Road	City	Collector	45	60	44	2	EB/WB	Yes	No?	No	Shared?	Good
Kinkade Road to City Limits	City	Collector	45	60	34	2	EB/WB	No	No?	No	Shared?	Good
City Limits to UGB	County?	Collector?	45	60	?	2	EB/WB	?	No?	No	Shared?	Good
"C" Street												
1st Street to 2nd Street	City	Collector	25	70	54	2	EB/WB	Yes	Yes	No	Shared	Fair
2nd Street to 3rd Street	City	Collector	25	70	54	2	EB/WB	Yes	Yes	No	Shared	Fair
3rd Street to 4th Street	City	Collector	25	70	54	2	EB/WB	Yes	Yes	Yes	Shared	Fair
4th Street to 5th Street	City	Collector	25	70	54	2?	EB/WB	Yes	Yes?	Yes	Shared	Poor
5th Street to 6th Street	City	Collector	25	70	54	2	EB/WB	Yes	Yes	Yes	Shared	Poor
6th Street to 7th Street	City	Collector	25	70	54	2	EB/WB	Yes	Yes	Yes	Shared	Poor
7th Street to 8th Street	City	Collector	25	70	54	2	EB/WB	Yes	Yes	Yes	Shared	Poor
8th Street to 9th Street	City	Collector	25	70	54	2	EB/WB	Yes	Yes	No	Shared	Fair
9th Street to 10th Street	City	Collector	25	70	54	2	EB/WB	Yes	Yes	No	Shared	Fair
10th Street to 11th Street	City	Collector	25	70	54	2	EB/WB	Yes	Yes	Intermittent	Shared	Fair
11th Street to Grizzly Road	City	Collector	25	70	54	2	EB/WB	Yes	Yes	Intermittent	Shared	Fair
Grizzly Road to Hoff Lane	City	Collector	25	30	40	2	EB/WB	No	Yes	No	Shared	Fair
Hoff Lane to Hillcrest Street	City	Collector	25	50	44	2	EB/WB	Yes	Yes	No	Shared	Fair
Hillcrest Street to 16th Street	City	Collector	25	50	44	2	EB/WB	Yes	Yes	No	Shared	Fair

1994 MAJOR STREETS INVENTORY
Madras Transportation System Plan

Street Segment	Jurisdiction	Classification	Speed Limit (mph)	ROW Width (feet)	Street Width (feet)	# of Travel Lanes	Direction	Curbs	On-Street Parking	Sidewalks	Bikeway	Ride Quality
"E" Street												
1st Street to 2nd Street	City	Collector	25	60	54	2	EB/WB	Yes	Yes	No	Shared	Fair
2nd Street to 3rd Street	City	Collector	25	60	54	2	EB/WB	Yes	Yes	No	Shared	Fair
3rd Street to 4th Street	City	Collector	25	60	54	2	EB/WB	Yes	Yes	Yes-N	Shared	Fair
4th Street to 5th Street	City	Collector	25	60	54	2?	EB/WB	Yes	Yes?	Yes-N	Shared	Fair
5th Street to 6th Street	City	Local	25	70	54	2	EB/WB	Yes	Yes	Yes	Shared	Fair
6th Street to 7th Street	City	Local	25	70	54	2	EB/WB	Yes	Yes	Yes-S	Shared	Fair
7th Street to 8th Street	City	Local	25	70	54	2	EB/WB	Yes	Yes	Yes	Shared	Fair
8th Street to 9th Street	City	Local	25	70	54	2	EB/WB	Yes	Yes	Yes-S	Shared	Fair
9th Street to 10th Street	City	Local	25	70	54	2	EB/WB	Yes	Yes	Yes-S	Shared	Fair
Grizzly Road to Kinkade Road	City	Local	25	60	44	2	EB/WB	No	?	No	Shared	Unpaved
Kinkade Road to East	County	Local	25	60	?	2	EB/WB	No	?	No	Shared	Unpaved
"H" Street												
Culver Hwy (361) to Roosevelt Street	City	Collector	25	60	44	2	EB/WB	No	Yes	No	Shared	Unpaved
Roosevelt Street to Marshall Street	City	Collector	25	60	44	2	EB/WB	Yes	Yes	No	Shared	Unpaved
Marshall Street to Lincoln Street	City	Collector	25	60	44	2	EB/WB	Yes	Yes	No	Shared	Unpaved
Lincoln Street to Madison Street	City	Collector	25	60	44	2	EB/WB	Yes	Yes	No	Shared	Unpaved
Madison Street to 1st Street	City	Collector	25	60	44	2	EB/WB	Yes	Yes	No	Shared	Fair
1st Street to 2nd Street	City	Collector	25	60	44	2	EB/WB	Yes	Yes	No	Shared	Fair
2nd Street to 3rd Street	City	Collector	25	60	44	2	EB/WB	Yes	Yes	No	Shared	Fair
3rd Street to 4th Street	City	Collector	25	60	44	2	EB/WB	Yes	Yes	Intermittent	Shared	Fair
4th Street to 5th Street	City	Collector	25	60	44	2?	EB/WB	Yes	Yes?	Yes-R	Shared	Fair
7th Street to Ebert Street	City	Collector	25	60	50	2	EB/WB	No	Yes	No	Shared	Unpaved
Turner Street to 7th Street	City	Collector	25	60	50	2	EB/WB	No	Yes	No	Shared	Unpaved
Turner Street to 8th Street	City	Collector	25	60	44	2	EB/WB	Yes	Yes	No	Shared	Fair
8th Street to Duke	City	Local	25	60	50	2	EB/WB	No	Yes	No	Shared	Unpaved
"J" Street												
Culver Hwy (361) to Madison Street	City	Collector	25	60	54	2	EB/WB	Yes	Yes	No	Shared	Good
Madison Street to 1st Street	City	Collector	25	77	54	2	EB/WB	Yes	Yes	No	Shared	Good
1st Street to 2nd Street	City	Collector	25	77	54	2	EB/WB	Yes	Yes	No	Shared	Good
2nd Street to 3rd Street	City	Collector	25	77	54	2	EB/WB	Yes	Yes	No	Shared	Good
3rd Street to 4th Street	City	Collector	25	77	54	2	EB/WB	Yes	Yes	No	Shared	Good
4th S[illegible] to 5th Street	City	Collector	25	60	54	2	EB/WB	Yes	Yes	Yes-N	Shared	Fair

1994 MAJOR STREETS INVENTORY
Madras Transportation System Plan

Street Segment	Jurisdiction	Classification	Speed Limit (mph)	ROW Width (feet)	Street Width (feet)	# of Travel Lanes	Direction	Curbs	On-Street Parking	Sidewalks	Bikeway	Ride Quality
5th Street to Adams Drive	City	Collector	25	77	36	2	EB/WB	Yes	Yes	No	Shared	Fair
"J" Street (continued)												
Adams Drive to Wade Street	City	Collector	25	50	34	2	EB/WB	No	Yes?	No	Shared	Fair
Wade Street to Hull Street	City	Collector	25	50	34	2	EB/WB	No	Yes?	No	Shared	Fair
Hull Street to Turner Street	City	Collector	25	70	34	2	EB/WB	No	Yes?	No	Shared	Fair
Turner Street to Allen Street	City	Collector	25	70	34	2	EB/WB	No	Yes?	No	Shared	Fair
Allen Street to Sun Drive	City	Collector	25	70	34	2	EB/WB	No	Yes?	No	Shared	Fair
10th Street												
Loukes Road to Chestnut Street	County?	Collector	25	50?	?	2	NB/SB	?	?	No	Shared	?
Chestnut Street to Cedar Street	County?	Collector	25	50?	?	2	NB/SB	?	?	No	Shared	?
Cedar Street to Henry Street	City	Collector	25	50?	?	2	NB/SB	?	?	No	Shared	?
Henry Street to Oak Street	City	Collector	25	50?	?	2	NB/SB	?	?	No	Shared	?
Oak Street to Pine Street	City	Local	25	50?	?	2	NB/SB	?	?	No	Shared	?
Pine Street to "A" Street	City	Local	25	50?	?	2	NB/SB	?	?	No	Shared	?
"B" Street to "C" Street	City	Collector	25	60	44	2	NB/SB	Yes	Yes	Yes-E	Shared	Fair
"C" Street to "D" Street	City	Collector	25	60	44	2	NB/SB	Yes	Yes	Yes-E	Shared	Fair
"D" Street to "E" Street	City	Collector	25	60	44	2	NB/SB	Yes	Yes	Yes-E	Shared	Fair
"E" Street to "F" Street	City	Collector	25	60	44	2	NB/SB	Yes	Yes	Yes-E	Shared	Fair
"F" Street to "G" Street	City	Collector	25	60	44	2	NB/SB	Yes	Yes	Yes-E	Shared	Fair
"G" Street to Buff Street	City	Collector	25	60	44	2	NB/SB	No	Yes	No	Shared	Unpaved
12th Street												
Oak Street to "A" Street	City	Collector	25	62	50	2	NB/SB	Yes	Yes	No	Shared	Fair
"A" Street to "B" Street	City	Collector	25	62	48	2	NB/SB	Yes	Yes	No	Shared	Fair
2nd Street												
"B" Street to "C" Street	City	Collector	25	70	54	2	NB/SB	Yes	Yes	No	Shared	Fair
"C" Street to "D" Street	City	Collector	25	70	54	2	NB/SB	Yes	Yes	Intermittent	Shared	Fair
"D" Street to Culver Hwy (361)	City	Collector	25	70	54	2	NB/SB	Yes	Yes	Intermittent	Shared	Fair
Culver Hwy (361) to "E" Street	City	Collector	25	70	54	2	NB/SB	Yes	Yes	Intermittent	Shared	Fair
"E" Street to "F" Street	City	Collector	25	70	54	2	NB/SB	Yes	Yes	No	Shared	Fair
"F" Street to "G" Street	City	Collector	25	71	54	2	NB/SB	Yes	Yes	Intermittent	Shared	Fair
"G" Street to "H" Street	City	Collector	25	70	54	2	NB/SB	Yes	Yes	No	Shared	Poor
"H" Street to "I" Street	City	Collector	25	70	54	2	NB/SB	No	Yes	No	Shared	Unpaved

1994 MAJOR STREETS INVENTORY
Madras Transportation System Plan

Street Segment	Jurisdiction	Classification	Speed Limit (mph)	ROW Width (feet)	Street Width (feet)	# of Travel Lanes	Direction	Curbs	On-Street Parking	Sidewalks	Bikeway	Ride Quality
"I" Street to "J" Street	City	Collector	25	70	54	2	NB/SB	No	Yes	No	Shared	Unpaved
"J" Street to K Street	City	Local	25	70	24	2	NB/SB	No	No	No	Shared	Unpaved
2nd Street (continued)												
"K" Street to "L" Street	City	Local	25	70	24	2	NB/SB	No	No	No	Shared	Unpaved
"L" Street to "M" Street	City	Local	25	70	24	2	NB/SB	No	No	No	Shared	Unpaved
4th Street												
5th Street to Pine Street	State	Arterial	30	70?	?	2	SB	?	?	Yes-W	Shared	?
Pine Street to "A" Street	State	Arterial	30	70?	?	2	SB	?	?	Yes	Shared	?
"A" Street to "B" Street	State	Arterial	30	70?	?	2	SB	?	?	Yes	Shared	?
"B" Street to "C" Street	State	Arterial	30	70?	?	2	SB	?	?	Yes	Shared	?
"C" Street to "D" Street	State	Arterial	30	70?	?	2	SB	?	?	Yes	Shared	?
"D" Street to "E" Street	State	Arterial	30	70?	?	2	SB	?	?	Yes	Shared	?
"E" Street to "G" Street	State	Arterial	30	70?	?	2	SB	?	?	Yes	Shared	?
"G" Street to "H" Street	State	Arterial	30	70?	?	2	SB	?	?	Yes	Shared	?
"H" Street to "I" Street	State	Arterial	30	70?	?	2	SB	?	?	Yes	Shared	?
"I" Street to "J" Street	State	Arterial	30	70?	?	2	SB	?	?	Yes	Shared	?
"J" Street to K Street	State	Arterial	30	70?	?	2	SB	?	?	No	Shared	?
5th Street												
4th Street to Pine Street	State	Arterial	30	70?	?	2	NB	?	?	Yes	Shared	?
Pine Street to "A" Street	State	Arterial	30	70?	?	2	NB	?	?	Yes	Shared	?
"A" Street to "B" Street	State	Arterial	30	70?	?	2	NB	?	?	Yes	Shared	?
"B" Street to "C" Street	State	Arterial	30	70?	?	2	NB	?	?	Yes	Shared	?
"C" Street to "D" Street	State	Arterial	30	70?	?	2	NB	?	?	Yes	Shared	?
"D" Street to "E" Street	State	Arterial	30	70?	?	2	NB	?	?	Yes	Shared	?
"E" Street to Snook Lane	State	Arterial	30	70?	?	2	NB	?	?	Yes	Shared	?
Snook Lane to "F" Street	State	Arterial	30	70?	?	2	NB	?	?	Yes	Shared	?
"F" Street to "G" Street	State	Arterial	30	70?	?	2	NB	?	?	Yes	Shared	?
"G" Street to Buff Street	State	Arterial	30	70?	?	2	NB	?	?	Intermittent	Shared	?
Buff Street to Trade Street	State	Arterial	30	80-100?	?	2	NB	?	?	Intermittent	Shared	?
Trade Street to "I" Street	State	Arterial	30	100?	?	2	NB	?	?	Intermittent	Shared	?
"I" Street to "J" Street	State	Arterial	30	100?	?	2	NB	?	?	Intermittent	Shared	?
"J" Street to K Street	State	Arterial	30	100?	?	2	NB	?	?	No	Shared	?

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Street Segment	Jurisdiction	Classification	Speed Limit (mph)	ROW Width (feet)	Street Width (feet)	# of Travel Lanes	Direction	Curbs	On-Street Parking	Sidewalks	Bikeway	Ride Quality
7th Street												
Oak Street to Pine Street	City	Collector	25	90?	?	2	NB/SB	?	Yes	Intermittent	Shared	?
Pine Street to "A" Street	City	Collector	25	90?	?	2	NB/SB	?	Yes	Intermittent	Shared	?
"A" Street to "B" Street	City	Collector	25	90?	?	2	NB/SB	?	Yes	No	Shared	?
"B" Street to "C" Street	City	Collector	25	90?	54	2	NB/SB	Yes	Yes	Yes-E	Shared	Good
"C" Street to "D" Street	City	Collector	25	90?	54	2	NB/SB	Yes	Yes	Intermittent	Shared	Good
"D" Street to "E" Street	City	Collector	25	90?	54	2	NB/SB	Yes	Yes	Intermittent	Shared	Good
"E" Street to "F" Street	City	Collector	25	90?	54	2	NB/SB	Yes	Yes	No	Shared	Good
"F" Street to "G" Street	City	Collector	25	90?	54	2	NB/SB	Yes	Yes	No	Shared	Good
"G" Street to Buff Street	City	Collector	25	90?	54	2	NB/SB	Yes	Yes	No	Shared	Good
Buff Street to "H" Street	City	Local	25	40	30	2	NB/SB	No	No	No	Shared	Unpaved
"H" Street to "I" Street	City	Local	25	30	25	2	NB/SB	No	No	No	Shared	Unpaved
Adams Drive												
4th Street to "J" Street	City	Collector	25	60?	?	2	NB/SB	?	?	No	Shared	?
"J" Street to K Street	City	Collector	25	60?	?	2	NB/SB	?	?	No	Shared	?
"K" Street to Tracie Street	City	Collector	35	60?	?	2	NB/SB	?	?	No	Shared	?
Tracie Street to "L" Street	City	Collector	35	60?	?	2	NB/SB	?	?	No	Shared	?
"L" Street to "M" Street	City	Collector	35	60?	?	2	NB/SB	?	?	No	Shared	?
"M" Street to Bard Lane	County	Collector	45	60?	?	2	NB/SB	?	?	No	Shared	?
Bard Lane to Terrace Avenue	County	Collector	45	60?	?	2	NB/SB	?	?	No	Shared	?
Terrace Avenue to Brush Lane	County	Collector	45	60?	?	2	NB/SB	?	?	No	Shared	?
Brush Lane to UGB	County	Collector	45	60?	?	2	NB/SB	?	?	No	Shared	?
Adler Street												
End of Pavement to Canal Street	County?	Collector	25	70?	?	2	EB/WB	?	?	No	Shared	
Bard Lane												
Hwy 97/26 to Adrian Street	City	Collector	25	50	24	2	EB/WB	No	No	No	Shared	Fair
Adrian Street to Murray Street	City	Collector	25	50	24	2	EB/WB	No	No	No	Shared	Good
Murray Street to Hatfield Street	City	Collector	25	50	24	2	EB/WB	No	No	No	Shared	Good
Hatfield Street to Adams Drive	City	Collector	25	50	24	2	EB/WB	No	No	No	Shared	Good
Belmont Lane												
Culver Hwy (361) to UGB	County	Collector	25	61	24	2	EB/WB	No	No	No	Shared	Fair

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Madras Transportation System Plan

Street Segment	Jurisdiction	Classification	Speed Limit (mph)	ROW Width (feet)	Street Width (feet)	# of Travel Lanes	Direction	Curbs	On-Street Parking	Sidewalks	Bikeway	Ride Quality
Buff Street												
5th Street to 6th Street	City	Collector	25	50	36	2	EB/WB	Yes	No	Yes-S	Lane	Fair
6th Street to 7th Street	City	Collector	25	50	36	2	EB/WB	Yes	No	Yes-S	Lane	Fair
7th Street to 8th Street	City	Collector	25	45	34	2	EB/WB	Yes	No	Yes-S	Lane	Fair
8th Street to 9th Street	City	Collector	25	45	34	2	EB/WB	Yes	No	Yes-S	Lane	Fair
9th Street to 10th Street	City	Collector	25	45	34	2	EB/WB	Yes	No	Yes-S	Lane	Fair
10th Street to McTaggard	City	Collector	25	60	44	2	EB/WB	Yes	Yes?	Yes-N	Lane	Fair
McTaggard to End of Pavement	City	Collector	25	60	44	2	EB/WB	Yes	Yes?	Yes	Lane	Fair
Canal Street												
Hess Street Mason Street	County?	Collector	25	80?	?	2	NB/SB	?	?	No	Shared	?
Mason Street to Adler Street	County?	Collector	25	80?	?	2	NB/SB	?	?	No	Shared	?
Canyon Road												
Straun Road to "C" Street	County?	Collector	45	50?	?	2	EB/WB	?	No	No	Shared	?
Cherry Lane												
Airport Way to Wright Street	County?	Collector	25	70?	?	2	EB/WB	?	?	No	Shared	?
Wright Street to Beach Street	County?	Collector	25	70?	?	2	EB/WB	?	?	No	Shared	?
Beach Street to Mill Street	County?	Collector	25	70?	?	2	EB/WB	?	?	No	Shared	?
Mill Street to Hwy 26	County?	Collector	25	70?	?	2	EB/WB	?	?	No	Shared	?
Hwy 26 to Adams Drive	County?	Collector	25	70?	?	2	EB/WB	?	?	No	Shared	?
Adams Drive to UGB	County?	Collector	25	70?	?	2	EB/WB	?	?	No	Shared	?
Conroy Street												
Adler Street to Moore Street	County?	Collector	25	90?	?	2	NWB/SEB	?	?	No	Shared	?
Moore Street to Hogan Street	County?	Collector	25	90?	?	2	NWB/SEB	?	?	No	Shared	?
Hogan Street to Earl Street	County?	Collector	25	90?	?	2	NWB/SEB	?	?	No	Shared	?
Culver Hwy (361)												
5th Street to 4th Street	State	Arterial	25	70?	?	2	EB/WB	?	?	Yes	Shared	?
4th Street to 3rd Street	State	Arterial	25	70?	?	2	EB/WB	?	?	Yes-N	Shared	?
3rd Street to 2nd Street	State	Arterial	25	70?	?	2	NEB/SWB	?	?	Intermittent	Shared	?
2nd S to 1st Street	State	Arterial	25	70?	?	2	NEB/SWB	?	?	No	Shared	?

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Street Segment	Jurisdiction	Classification	Speed Limit (mph)	ROW Width (feet)	Street Width (feet)	# of Travel Lanes	Direction	Curbs	On-Street Parking	Sidewalks	Bikeway	Ride Quality
1st Street to Madison Street	State	Arterial	25	70?	?	2	NEB/SWB	?	?	No	Shared	?
Madison Street to Roosevelt Street	State	Arterial	35	70?	?	2	NEB/SWB	?	?	No	Shared	?
Culver Hwy (361) (continued)												
Roosevelt Street to "G" Street	State	Arterial	35	70?	?	2	NB/SB	?	?	No	Shared	?
"G" Street to "H" Street	State	Arterial	45	70?	?	2	NB/SB	?	?	No	Shared	?
"H" Street to "J" Street	State	Arterial	45	60?	?	2	NB/SB	?	?	No	Shared	?
"J" Street to Fairgrounds Road	State	Arterial	45	60?	?	2	NB/SB	?	?	No	Shared	?
Fairgrounds Road to Overlook Drive	State	Arterial	55	60?	?	2	NB/SB	?	?	No	Shared	?
Overlook Drive to Colfax Lane	State	Arterial	55	60?	?	2	NB/SB	?	?	No	Shared	?
Earl Street												
Conroy Street to Hwy 26	County?	Collector	25	80?	?	2	NEB/SWB	?	?	No	Shared	?
Fairgrounds Road												
Overlook Drive to Culver Hwy (361)	City	Local	25	60	24	2	EB/WB	No	No	No	Shared	Fair
Culver Hwy (361) to Marie Street	City	Collector	25	60	24	2	EB/WB	No	No	No	Shared	Good
Marie Street to Olive Street	City	Collector	25	60	44	2	EB/WB	No	No	No	Shared	Fair
Olive Street to Hart Street	City	Collector	25	60	24	2	EB/WB	No	No	No	Shared	Fair
Hart Street to Highway 97	City	Collector	25	60	24	2	EB/WB	No	No	No	Shared	Fair
Grizzly Road												
"C" Street to "D" Street	City	Collector	45	60	24	2	NWB/SEB	No	No	No	Shared	Fair
"D" Street to "E" Street	City	Collector	45	60	24	2	NWB/SEB	No	No	No	Shared	Fair
"E" Street to Buff Street	City	Collector	45	60	24	2	NWB/SEB	No	No	No	Shared	Fair
Buff Street to Kinkade Street	City	Collector	45	60	24	2	NWB/SEB	No	No	No	Shared	Fair
Kinkade Street to UGB	County	Collector	45	60	24	2	NWB/SEB	No	No	No	Shared	Fair
Henry Street												
10th Street to 9th Street	City	Local	25	50?	?	2	NEB/SWB	?	?	No	Shared	?
9th Street to 8th Street	City	Local	25	50?	?	2	NEB/SWB	?	?	No	Shared	?
8th Street to Oak Street	City	Local	25	50?	?	2	NEB/SWB	?	?	Intermittent	Shared	?
Hess Street												
Canal Street to Hwy 26	County?	Collector	25	90?	?	2	EB/WB	No	No	No	Shared	?

1994 MAJOR STREETS INVENTORY
Madras Transportation System Plan

Street Segment	Jurisdiction	Classification	Speed Limit (mph)	ROW Width (feet)	Street Width (feet)	# of Travel Lanes	Direction	Curbs	On-Street Parking	Sidewalks	Bikeway	Ride Quality
Hwy 26												
UGB to Cherry Lane	State	Arterial	55	100?	?	2	NB/SB	?	No	No	Shared	?
Cherry Lane to Hess Street	State	Arterial	55	100?	?	?	NB/SB	?	No	100?	Shared	?
Hwy 26 (continued)												
Hess Street to Earl Street	State	Arterial	55	100?	?	?	NB/SB	?	No	100?	Shared	?
Earl Street to Birch Road (Depot Lane	State	Arterial	55	150-200?	?	?	NB/SB	?	No	100?	Shared	?
Birch Road to Daisy Street	State	Arterial	55	200?	?	3	NB/SB	?	No	100?	Shared	?
Daisy Street to Jefferson Street	State	Arterial	55	150-200?	?	3	NB/SB	?	No	100?	Shared	?
Jefferson Street to Lee Street	State	Arterial	55	150?	?	3	NB/SB	?	No	100?	Shared	?
Lee Street to Cedar Street	State	Arterial	55	150?	?	3	NB/SB	?	No	100?	Shared	?
Cedar Street to Myrtle Street	State	Arterial	35	150?	?	3	NB/SB	?	No	100?	Shared	?
Myrtle Street to Plum Street	State	Arterial	35	150?	?	3	NB/SB	?	No	100?	Shared	?
Plum Street to Hwy 97/26 Junction	State	Arterial	35	90?	?	3	NB/SB	?	No	100?	Shared	?
Hwy 97												
UGB to Meadowlark Lane	State	Arterial	55	170?	?	2	NEB/SWB	?	No	No	Shared	?
Meadowlark Lane to Loukes Street	State	Arterial	55	170?	?	2	NEB/SWB	?	No	No	Shared	?
Loukes Street to Chestnut Street	State	Arterial	55	120-190?	?	2	NEB/SWB	?	No	No	Shared	?
Chestnut Street to Cedar Street	State	Arterial	55	100-190?	?	2	NEB/SWB	?	No	No	Shared	?
Cedar Street to Myrtle Street	State	Arterial	35	50-100?	?	2	NEB/SWB	?	No	No	Shared	?
Myrtle Street to Plum Street	State	Arterial	35	50?	?	2	NEB/SWB	?	No	No	Shared	?
Plum Street to Hwy 97/26 Junction	State	Arterial	35	50-70?	?	2	NEB/SWB	?	No	No	Shared	?
Hwy 97/26												
North Junction to Oak Street	State	Arterial	35	90?	?	?	NB/SB	?	No	No	Shared	?
Oak Street to 4th/5th Street Couplet	State	Arterial	35	70?	?	?	NB/SB	?	No	No	Shared	?
"K" Street to "L" Street	State	Arterial	35	100?	?	?	NB/SB	?	No	No	Shared	?
"L" Street to "M" Street	State	Arterial	45	100?	?	?	NB/SB	?	No	No	Shared	?
"M" Street to Bard Lane	State	Arterial	45	100?	?	?	NB/SB	?	No	No	Shared	?
Bard Lane to Fairgrounds Road	State	Arterial	45	100?	?	?	NB/SB	?	No	No	Shared	?
Fairgrounds Road to Brush Lane	State	Arterial	55	100?	?	?	NB/SB	?	No	No	Shared	?
Brush Lane to UGB	State	Arterial	55	100?	?	?	NB/SB	?	No	No	Shared	?
UGB to South Junction	State	Arterial	55	100?	?	?	NB/SB	?	No	No	Shared	?

Jefferson S

1994 MAJOR STREETS INVENTORY
Madras Transportation System Plan

Street Segment	Jurisdiction	Classification	Speed Limit (mph)	ROW Width (feet)	Street Width (feet)	# of Travel Lanes	Direction	Curbs	On-Street Parking	Sidewalks	Bikeway	Ride Quality
Hwy 97 to 7th Street	County?	?	25	60?	?	2	EB/WB	?	?	No	Shared	?
7th Street to 6th Street	County?	?	25	60?	?	2	EB/WB	?	?	No	Shared	?
6th Street to Hwy 26	County?	?	25	60?	?	2	EB/WB	?	?	No	Shared	?
Lee Street												
Commercial Street to 1st Street	County?	Collector	25	60?	?	2	EB/WB	?	?	No	Shared	?
1st Street to 2nd Street	County?	Collector	25	60?	?	2	EB/WB	?	?	No	Shared	?
2nd Street to 3rd Street	County?	Collector	25	60?	?	2	EB/WB	?	?	No	Shared	?
3rd Street to Hwy 26	County?	Collector	25	60?	?	2	EB/WB	?	?	No	Shared	?
Loukes Road												
Hwy 97 to 10th Street	County?	?	25	60?	?	2	EB/WB	?	?	No	Shared	?
10th Street to Lakeside Drive	County?	?	25	60?	?	2	EB/WB	?	?	No	Shared	?
Lakeside Drive to Jask Street	County?	?	25	60?	?	2	EB/WB	?	?	No	Shared	?
Jask Street to Chapel Street	County?	?	25	60?	?	2	EB/WB	?	?	No	Shared	?
Chapel Street to UGB	County?	?	25	60?	?	2	EB/WB	?	?	No	Shared	?
Marie Street												
Fairgrounds Road to End of Pavement	City	Collector	25	60	24	2	NB/SB	No	No	No	Shared	Fair
Mill Street												
Cherry Street to Adler Street	County?	Collector	25	80?	?	2	NB/SB	?	?	No	Shared	?
Oak Street												
5th Street to 6th Street	City	Collector	25	60	45	3	EB/WB	Yes	No	Intermittent	Shared	Good
6th Street to 7th Street	City	Collector	25	60	45	2	EB/WB	Yes	Yes	Intermittent	Shared	Good
7th Street to 8th Street	City	Collector	25	60	45	2	EB/WB	Yes	Yes	No	Shared	Good
8th Street to 9th Street	City	Collector	25	60	45	2	EB/WB	Yes	Yes	No	Shared	Good
9th Street to 10th Street	City	Collector	25	60	45	2	EB/WB	Yes	Yes	No	Shared	Good
10th Street to 11th Street	City	Collector	25	60	45	2	EB/WB	Yes	Yes	No	Shared	Good
11th Street to Cowden Drive	City	Collector	25	60	45	2	EB/WB	Yes	Yes	No	Shared	Good
Cowden Drive to 12th Street	City	Collector	25	60	45	2	EB/WB	Yes	Yes	No	Shared	Good
12th Street to Hillcrest Avenue	City	Collector	25	60	45	2	EB/WB	Yes	Yes	No	Shared	Good
Hillcrest Avenue to 16th Street	City	Collector	25	60	45	2	EB/WB	Yes	Yes	No	Shared	Very Good
16th Street to End of Pavement	City	Collector	25	60	54	2	EB/WB	No	Yes	No	Shared	Unpaved

1994 MAJOR STREETS INVENTORY
Madras Transportation System Plan

Street Segment	Jurisdiction	Classification	Speed Limit (mph)	ROW Width (feet)	Street Width (feet)	# of Travel Lanes	Direction	Curbs	On-Street Parking	Sidewalks	Bikeway	Ride Quality

Bikeway Definitions: Lane = A portion of a roadway which has been desinated by striping, signing, and pavement markings for the preferential or exclusive use by bicyclists.
Shared = A type of bikeway where bicyclists and motor vehicles share the same roadway.
Shoulder = A portion of a highway contiguous to the roadway that is primarily for use by pedestrians and bicyclists as well as vehicles stopped for emergency.

E. STATE HIGHWAY ACCCESS MANAGEMENT CRITERIA

ACCESS MANAGEMENT GUIDELINES FOR STATE HIGHWAYS IN JEFFERSON COUNTY

LOI	Access Treatment	Urban/ Rural	Intersection				Signal Spacing	Median Control
			Public Road		Private Drive			
			Type	Spacing	Type	Spacing		
Statewide	Limited Control (Expressway)	U	At grade/Intch	1/2-1 mi	Rt Turns	800′	1/2-1 Mi.	Partial
		R	At grade/Intch	1-3 mi	Rt Turns	1200′	None	Partial
Statewide/ Regional	Limited Control	U	At grade/Intch	1/4 mi	Lt/Rt Turns	500′	1/2 Mi.	Partial/ None
		R	At grade/Intch	1 mi	Lt/Rt Turns	1200′	None	Partial/ None
Regional/ District	Partial Control	U	At grade	1/4 mi	Lt/Rt Turns	300′	1/4 Mi.	None
		R	At grade	1/2 mi	Lt/Rt Turns	500′	1/2 Mi.	None
District	Partial Control	U	At grade	500′	Lt/Rt Turns	150′	1/4 Mi.	None
		R	At grade	1/4 mi	Lt/Rt Turns	300′	1/2 Mi.	None

F. DEMOGRAPHIC FORECAST

City of Madras

Transportation System Plan

Demographic Forecast

Prepared for:

City of Madras

Prepared by:

David Evans and Associates, Inc.

December 7, 1994

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I. INTRODUCTION

The City of Madras contracted David Evans and Associates, Inc. (DEA) to prepare the City's Transportation System Plan (TSP). Cities are required to prepare TSPs by the Oregon Transportation Planning Rule. The TSPs are used to assess transportation needs and improvements for a 20-year timeframe. To assist in completing the plan, DEA is using TModel 2, a computer transportation model. The computer model utilizes population, housing, employment, and transportation data to determine future transportation needs. In order to "run" the computer model, information describing the location of current and future population and employment centers within the study area must be incorporated into the model. The output from the computer helps predict where transportation improvements will be needed in the future.

This report contains a discussion of the methods and assumptions used to obtain estimates for the current population and employment in the study area, and forecasts for these data for the year 2015. Existing and projected numbers are presented in tabular form. Conclusions and limitations of the data are presented at the end of this report.

II. STUDY AREA

DEA selected a study area for the TSP that correlates with the limits of urbanization in Madras. (The map accompanying this report shows the study area boundary.) The study area boundary does not correspond to either the city limits or the city's urban growth boundary (UGB). The study area is actually larger than and encompasses the UGB. The study area was established in this way because urban area traffic movement goes beyond the UGB boundary.

It is important to note that, because the study area boundary differs from the city limits and UGB, the population and employment data included in this report should not be compared directly to existing data for the city or UGB, nor should the forecasted estimates for this study area be used in other studies associated with the city limits or UGB.

III. BASE CASE ESTIMATES AND METHODOLOGY

To start the analysis, DEA divided the study area into 35 transportation analysis zones (TAZs). Dividing the study area into zones enables the computer to analyze traffic movements between localized areas. TAZ boundaries typically are based on land use, major streets, topographical and natural constraints, and US Census blocks. All population and employment estimates for existing (base case) and forecasted conditions are divided according to the appropriate TAZs to enable the computer to track demographic change for different portions of the community.

Population and Housing

The estimated 1994 population of the study area is 8,122. The number of dwelling units in the study area is estimated at 2,085, of which 1,683 are single-family homes and 1,121 are multi-family units. Table 1 presents the 1990 census and 1994 estimated population and housing statistics for the study area.

Population and housing information is essential to transportation planning. These data provide a base to determine how many people are driving in a given area and where the trips originate. Historical data are used to calculate growth rates and development patterns which, in turn, can be used to predict future trends.

To begin this study, DEA obtained 1990 US Census population and housing data for the study area. Census blocks were then aggregated into TAZs for use in the transportation model. Census blocks, the smallest division of census data, contain information on population, race, age, dwelling units, etc. Using a geographic information system (GIS), census counts for population and single- and multi-family dwelling units were broken down by TAZ for further analysis.

Actual population counts for specific census blocks (on which TAZs are based) are only available for every 10-year US Census. Therefore, it was necessary to estimate existing population for each TAZ in the study area. Current (1994) population statistics for the City of Madras were estimated by calculating the average annual growth rate using 1990 census data and estimated 1993 data from the Center for Population Research and Census at Portland State University. Using this growth rate (approximately 2.56 percent), DEA estimated the 1994 population for each TAZ and the entire study area.

Current housing statistics were derived using 1990 census data and the 1994 population estimates for each TAZ. The total number of dwelling units for 1994 was calculated by computing the ratio of 1990 population to dwelling units, then applying the ratio to the estimated 1994 population for each TAZ. The number of single-family and multi-family dwelling units in 1994 was similarly determined. The 1990 proportions of single- and multi-family units in each TAZ were calculated, then applied to the 1994 estimated total dwelling units. The overall single-family/multi-family split is 60 percent single-family and 40 percent multi-family. The average household size, also obtained through the census, is approximately 2.9 persons per household.

Employment

According to DEA's estimates, there was an average of 2,459 non-agricultural jobs in the study area in 1994. Most of these jobs (44 percent) were in manufacturing. Commercial employment accounted for approximately 28 percent of total employment, while school, government, and medical jobs combined accounted for approximately 25 percent. Employment estimates for 1994 are shown in Table 2.

Table 1
Existing and Projected Housing and Population
Madras Study Area

	1990				1994				2015			
TAZ	Total du	SF du	MF du	Pop.	Total du	SF du	MF du	Pop.	Total du	SF du	MF du	Pop.
1	72	20	52	191	87	24	63	232	215	152	63	582
2	40	20	20	92	49	24	24	112	49	24	24	131
3	15	7	8	33	18	8	10	40	18	8	10	49
4	88	50	38	341	107	61	46	414	238	117	121	642
5	103	90	13	279	125	109	16	339	186	170	16	502
6	32	21	11	92	39	25	13	112	39	25	13	105
7	49	46	3	151	59	56	4	183	242	238	4	653
8	173	123	50	465	210	149	61	564	338	277	61	913
9	55	49	6	135	67	59	7	164	323	315	7	871
10	3	3	0	8	4	4	0	10	45	45	0	122
11	108	24	84	861	131	29	102	1,045	131	29	102	354
12	3	3	0	10	4	4	0	12	4	4	0	10
13	135	99	36	434	164	120	44	527	311	267	44	840
14	44	30	14	125	53	36	17	152	53	36	17	144
15	64	9	55	93	78	11	67	113	410	283	127	1,106
16	150	90	60	377	182	109	73	458	261	128	133	705
17	110	73	37	309	134	89	45	375	134	89	45	360
18	64	6	58	97	78	7	70	118	78	7	70	210
19	161	118	43	437	195	143	52	530	266	214	52	718
20	31	27	4	75	38	33	5	91	38	33	5	102
21	85	81	4	247	103	98	5	300	148	143	5	400
22	18	16	2	42	22	19	2	51	28	26	2	76
23	76	55	21	194	92	67	25	235	111	86	25	301
24	63	21	42	152	76	25	51	184	214	163	51	578
25	59	18	41	173	72	22	50	210	72	22	50	193
26	9	5	4	25	11	6	5	30	11	6	5	29
27	2	2	0	5	2	2	0	6	41	41	0	110
28	72	17	55	167	87	21	67	203	107	40	67	288
29	71	48	23	180	86	58	28	218	86	58	28	233
30	32	12	20	72	39	15	24	87	195	101	94	527
31	63	18	45	150	76	22	55	182	92	38	55	250
32	74	54	20	183	90	66	24	222	221	197	24	597
33	138	104	34	376	167	126	41	456	167	126	41	452
34	34	20	14	90	41	24	17	109	355	338	17	958
35	15	8	7	31	18	10	8	38	18	10	8	49
Total	2,311	1,387	924	6,692	2,805	1,683	1,121	8,122	5,244	3,858	1,386	14,160

Table 2
1994 Employment Estimates
Madras Study Area

TAZ	Total	Commercial	Office	Industrial	Warehouse	Medical	Fire	Government	School	Misc.		Students
1	1,124	38		1,079	2					5		
2	20	10	2					8				
3	0											
4	125	100						25				
5	0											
6	0											
7	6	6										
8	25	25										
9	0	0										
10	0											
11	30	15	5					10				
12	95	90	3	2								
13	175					175						
14	0											
15	0											
16	37	10	2					25				
17	0											
18	135	115	20									
19	322	35	2					95	190			1,702 *
20	93	45	3						45			449
21	25							25				
22	132	105	12					15				
23	0											
24	0											
25	0											
26	22	20	2									
27	4						4					
28	43	38	3	2								
29	8	8										
30	0											
31	30	30										
32	8	8										
33	0											
34	0											
35	0											
Total	2,459	698	54	1,083	2	175	4	203	235	5		2,151

Total Employment within Study Area = 2,459

* Includes 624 @ Madras Elementary, 364 @ Buff Elementary, and 715 @ Madras HS

The current population/employment ratio within the study area is approximately 3.3 to 1. This is high compared to most urban areas, where the ratio usually falls between 2.1 and 3.0. Lower ratios occur where almost all employment is contained within an urban area and is based primarily in manufacturing, commercial, and services. Higher ratios occur where many jobs in an area are resource-based, in agriculture, forest, mineral extraction, etc. Madras' ratio is not indicative of high unemployment; agricultural, forest, and jobs near Madras but outside the study area were not included in the employment estimate. Trips to these out-of-study-area locations are captured by traffic counts and/or Oregon Department of Transportation data. Agricultural jobs represent 20 to 30 percent of total employment in Jefferson County and certainly account for a significant share of employment in Madras. Many Madras residents commute to jobs in nearby Warm Springs, Culver, and Metolius. Major Jefferson County employers that are located near Madras but outside the study area are listed in Table 3. Also, many people employed in Madras live in other communities, but it appears as though fewer people commute into Madras than commute out of the city.

Table 3
Major Employers Near Madras but Outside Study Area

Business	City	Number of Employees
Confederated Tribes of Warm Springs	Warm Springs	721
Kah-Nee-Ta Resort	Warm Springs	250
Warm Springs Forest Products	Warm Springs	200
Seaswirl Boats	Culver	180
Logan International	Metolius	100
Total Employees		1,451

Source: Madras-Jefferson County Chamber of Commerce, April 1994

The location of employment centers in an area and their relation to population centers are particularly important in determining traffic patterns. Trips to and from work account for a large portion of an area's traffic, especially during the morning and evening peak periods.

To include employment counts and location information in the traffic model, DEA researched several sources. Most available employment statistics are for Jefferson County as a whole, although some information is also available for the City of Madras. However, because the information needed to be specific to the study area for computer analysis, it was necessary to estimate employment for each TAZ in the study area. Using the employment information, the traffic model estimates background traffic in different areas of the city to determine transportation needs.

DEA obtained employment statistics through document research and a visual inventory of the city. DEA gathered up-to-date information on major employers in Madras, their locations within the study area, and the number of people they employ. Sources for the information included the Madras Chamber of Commerce, Oregon Employment Department, and Oregon Economic Development Department. More detailed information was obtained through phone contacts with businesses and government offices. DEA also conducted a visual survey of the city to locate smaller businesses and estimate their employment. To verify accuracy, DEA compared the estimated employment totals with the Oregon Employment Department totals for Jefferson County. (Employment statistics for the City of Madras were unavailable.) The totals from the research and field inventory were aggregated into each TAZ.

IV. FORECAST

Population and Housing

As mentioned above, population and housing numbers were projected to the year 2015 to meet the 20-year planning outlook of the TSP. To calculate the 2015 projections, DEA derived the long-term average annual growth rate for the City of Madras (3.45 percent) using census counts from 1970 and 1990. This growth rate, which would be considered very high, reflects that Madras grew through annexation over the 20-year period. In 1988, Madras annexed more land, immediately adding 572 people to the city's population. Therefore, DEA adjusted the growth rate to compensate for the annexation. This rate (2.56 percent) was then used to establish total population and housing estimates for 2015. For comparison, Jefferson County's average annual growth rate over the same period was 2.26 percent. (See Table 4.)

Table 4
Population and Growth Rates
Jefferson County and City of Madras

	Jefferson County	City of Madras
Population		
1970	8,548	1,689
1990	13,676	3,443
1993 (estimated)	14,900	4,020
Growth Rate		
1970-1990	2.26%	3.45%
1970-1990 (adjusted)		2.56%
1990-1993	2.17%	3.95%

Population and housing growth will be concentrated in the TAZs most able to accommodate it. Some TAZs already contain housing and may be built-out with single- and/or multi-family

dwelling units. These TAZs will only accommodate infill or replacement units. For the projected 2015 population and housing estimates, only minimal increases in population and dwelling units were assigned to these TAZs.

TAZs that contain large areas of vacant land and are currently zoned for residential use (some are platted for development) can accommodate substantial growth. Therefore, in the 2015 estimates, they were assigned population and dwelling units to development capacity. Development capacity for each TAZ was assumed to be build-out at current minimum lot sizes for the existing zone designations. The minimum lot size for new development in the R1 zone is 7,500 square feet. DEA assumed a slightly larger average lot size to allow for development constraints and calculated an average density of four dwelling units per net acre. The R2 zone permits both single- and multi-family development. It was assumed that each would occupy half of the vacant R2 land, that single-family would develop at an average of four dwelling units per net acre, and that multi-family would develop at an average of ten dwelling units per gross acre. (The maximum multi-family density that can be developed in the R2 zone is approximately 15 dwelling units per gross acre.) The additional dwelling units developed were then added to the existing dwelling units in each TAZ to determine totals. Under the assumptions used in the calculations, the single-family/multi-family split would shift to 73 percent single-family and 27 percent multi-family.

Table 5 shows the number of housing units projected for each TAZ. All of the buildable land included in the table is currently within the UGB. As indicated by the table, the projected population growth could be accommodated within the existing UGB if the available residential areas are developed to capacity. It is important to note that the buildable residential acreage is estimated; an accurate inventory of buildable lands was not available at the time of the study.

The City expects most residential growth to occur on Madras' west side and plans to expand the UGB in that direction, if necessary, to accommodate growth. Development is restricted east of the city because much of the land is in federal ownership. However, the new middle school, scheduled to open in 1995 and located on the city's eastern boundary, may cause some residential development to occur in that area sooner than in other outlying areas.

Tables 1 and 5 also indicate projected population for each TAZ. Total 2015 population was calculated using the long-term growth rate. However, each TAZ within the study area will accommodate a different amount of growth. Additional population (added through development) was calculated for each TAZ by multiplying the number of dwelling units by an average household size. In general, the number of persons per household is decreasing in the United States. Therefore, DEA assumed a slightly smaller household size of 2.7 for forecasting future development. Existing (1994) households were adjusted in size from 2.9 (current size) to 2.7, then added to the additional population get the total for each TAZ.

Table 5
Projected Housing Units (2015)
Madras Study Area

	Est. Buildable Residential Acreage				New Dwelling Units		Total Dwelling Units		Population	
TAZ	Total	actual R1	R1	R2	SF	MF	SF	MF	Additional*	Total
1	32	40	32		128	0	152	63	346	582
2	0				0	0	24	24	0	131
3	0				0	0	8	10	0	49
4	20	10	8	12	56	75	117	121	354	642
5	15	19	15		61	0	170	16	164	502
6	0				0	0	25	13	0	105
7	46	57	46		182	0	238	4	492	653
8	32	40	32		128	0	277	61	346	913
9	64	80	64		256	0	315	7	691	871
10	10	13	10		42	0	45	0	112	122
11	0				0	0	29	102	0	354
12	0				0	0	4	0	0	10
13	37	46	37		147	0	267	44	397	840
14	0				0	0	36	17	0	144
15	73	79	63	10	272	60	283	127	896	1106
16	10			10	19	60	128	133	214	705
17	0				0	0	89	45	0	360
18	0				0	0	7	70	0	210
19	18	22	18		70	0	214	52	190	718
20	0				0	0	33	5	0	102
21	11	14	11		45	0	143	5	121	400
22	2	2	2		6	0	26	2	17	76
23	5	6	5		19	0	86	25	52	301
24	34	43	34		138	0	163	51	372	578
25	0				0	0	22	50	0	193
26	0				0	0	6	5	0	29
27	10	12	10		38	0	41	0	104	110
28	5	6	5		19	0	40	67	52	288
29	0				0	0	58	28	0	233
30	27	20	16	11	86	70	101	94	422	527
31	4	5	4		16	0	38	55	43	250
32	33	41	33		131	0	197	24	354	597
33	0				0	0	126	41	0	452
34	78	98	78		314	0	338	17	847	958
35	0				0	0	10	8	0	49
Total	565	653	522	42	2,174	265	3,858	1,386	6,586	14,160

* Population added through development of buildable land.

Note: Vacant lands outside the existing UGB were not included in the inventory.

Employment

The employment forecast for the TSP is not intended to be a full-sector (agricultural and non-agricultural) forecast. The employment projections do not include agricultural jobs because the TSP is for facilities and improvements within the study area. Agricultural-related trips have only minor impacts on traffic patterns within the study area.

The current population/employment ratio in the study area is approximately 3.3 to 1, though (as discussed above) this would be lower if agricultural and other nearby jobs were included in the job count. Over the next 20 years, however, the population/employment ratio should decrease.

Agricultural employment is in general decline nationwide, and, as Madras grows and urbanizes, manufacturing and commercial employment should increase and become even more important to the overall economy. Also, as more housing becomes available, many employees currently commuting to jobs in Madras would relocate to Madras. Therefore, a population/employment ratio of approximately 2.8 to 1 was used for the 20-year employment projections for the study area. This results in total employment of 5,049, more than double the current employment. (See Table 6.)

As discussed above, growth rates will vary in different parts of the city. Moderate employment growth is expected to occur in the downtown area, in which most commercial land is already built upon. Some residential land may be rezoned to commercial, but with other commercial land available in the city, rezoning should not occur to any great extent. DEA assumed that most of the employment growth will occur north and northwest of the city where there is an abundance of vacant land zoned for industrial use and future commercial expansion. Employment growth will also continue to occur along Highway 97, especially to the south of the city, where most of the city's vacant commercial land is located.

To project employment within each TAZ, several assumptions were made. It was assumed that medical and school employment would increase at approximately the same rate as population (70 percent). Employment in the downtown core areas was projected to increase by a maximum of 20 percent. Vacant land zoned for industrial and commercial development were assigned estimated employment based on average densities (Employees per Gross Acre) for the expected land use, contained in the Institute of Transportation Engineers' 1993 report, *Trip Generation*.[1]

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[1]Institute of Transportation Engineers, *Trip Generation*, 5th edition (Washington DC: Institute of Transportation Engineers, 1991).

Table 6
Projected Employment (2015)
Madras Study Area

TAZ	Total	Commercial	Office	Industrial	Warehouse	Medical	Fire	Government	School	Misc.		Students
1	2,090	164		1,807	114					5		
2	726	10	2	700				14				
3	0											
4	233	190						43				
5	0											
6	0											
7	6	6										
8	30	30										
9	0	0										
10	0											
11	41	18	6					17				
12	112	108	4									
13	298					298						
14												
15	0											
16	57	12	2					43				
17	0											
18	162	138	24									
19	452	36	6					162	248			2,893
20	134	54	4						77			763
21	43							43				
22	166	126	14					26				
23	0											
24	0											
25	0											
26	26	24	2									
27	7						7					
28	89	83	4	2								
29	8	8										
30	81	81										
31	208	208										
32	8	8										
33	0											
34	75								75			
35	0											
Total	5,049	1,304	68	2,509	114	298	7	345	400	5		3,657

Total Employment within Study Area = 5,049

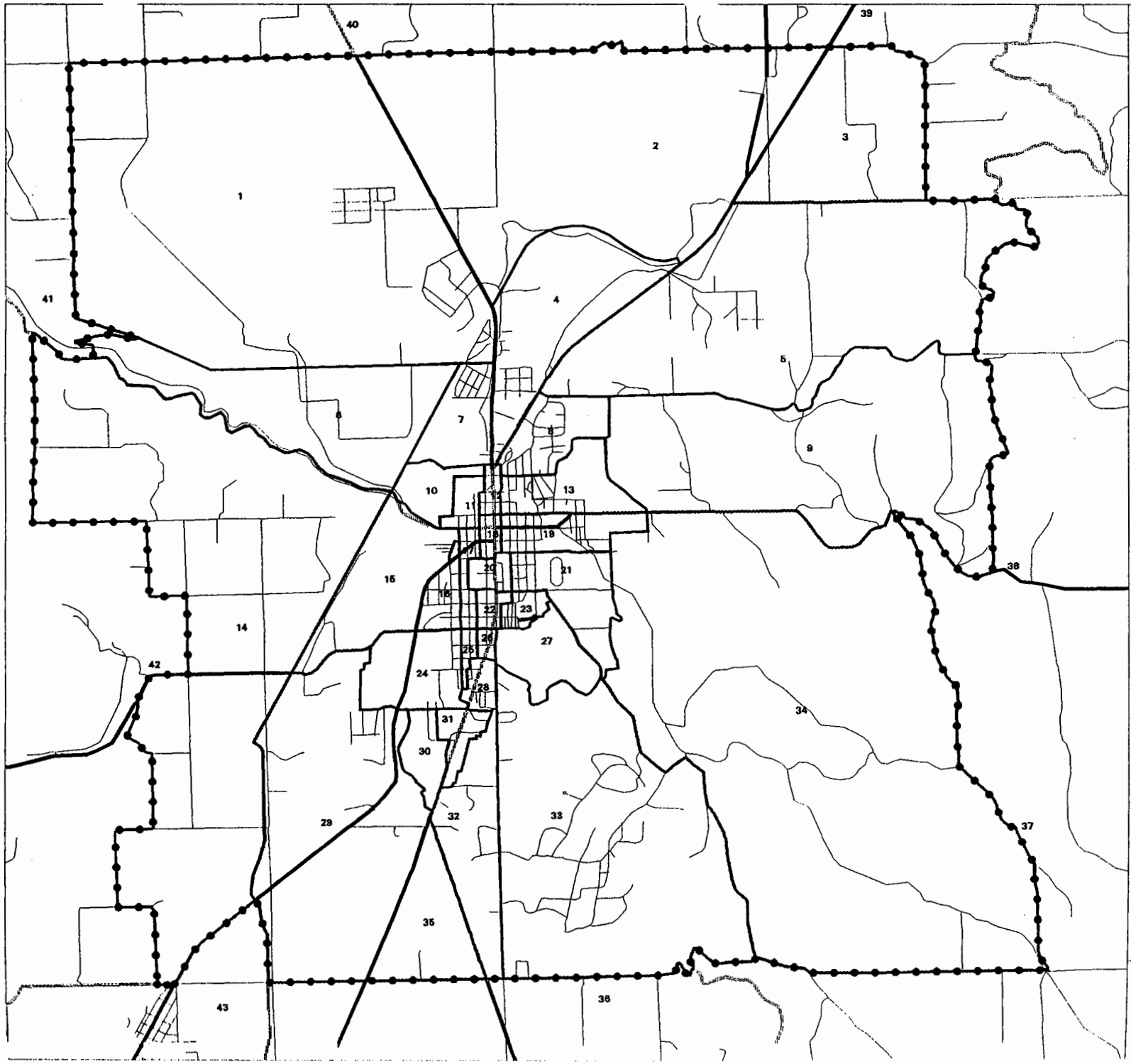
V. CONCLUSION

Assuming current trends continue, Madras will experience significant population and employment growth over the next 20 years. The amount of growth, and where it occurs, will affect traffic and transportation facilities in the city. This study was prepared to estimate current conditions and expected growth patterns within the study area which will be used in a computer model to determine future transportation needs. The study area was defined specifically for use with a computer model.

In preparing this report, DEA made several assumptions. First, DEA assumed that population growth trends would continue. The 20-year population growth rate (2.56 percent) used to project future population was based on a historical growth rate determined from U.S. Census data. Under this assumption, population is expected to increase by almost 75 percent over the next 20 years. It was also assumed that, following the national trend, household size would decrease. Both the increase in population and smaller households will create a need for more housing in the study area. DEA assumed that housing development would occur first within the city's UGB and would be built at densities close to the maximum allowed by the City's zoning ordinance. Since a current vacant land inventory was not available, DEA estimated the amount of buildable residential land in the study area based on the parcel base of the City's zoning map. According to the estimates, there is enough buildable residential land within the UGB to accommodate the projected population if housing is developed at allowed maximum densities.

In recent years, Madras has experienced a great deal of employment growth, especially in manufacturing jobs. DEA assumed that this trend would continue. There is an abundance of vacant industrial land in the city with utility service or access to service. It was assumed that much of this land would be developed over the next 20 years. Central Oregon has become the specialty wood products center of the nation. Several wood products companies are located in Madras, Prineville, and Bend; as the industry continues to thrive, more companies will enter the market. Also, existing businesses will likely continue to expand. For example, Brightwood Corporation, located in Madras' industrial area, is the largest employer in Jefferson County and expects to add more employees in the near future. Currently, almost one-quarter of Brightwood's employees commute to work from other communities; many may relocate to Madras when more housing becomes available there. Housing prices are relatively low in the city, compared with larger Central Oregon communities. This, combined with increasing employment opportunities, will draw employees and their families to Madras. Finally, Central Oregon has been experiencing a great deal of population growth in recent years. People have been moving to the area because of the recreational opportunities, climate, and other "quality of life" issues. Some of this in-migration will likely affect Madras.

It should be noted that this study was designed specifically for use in developing Madras' Transportation System Plan. This report is not intended to provide an accurate economic forecast or housing analysis, and it should not be used for any purpose other than that for which it was designed.



Madras, Oregon

Census Tracts,
Block Groups and Blocks

SOURCES:
TIGER Line File
US Bureau of the Census
Population Data
PL94 1990 Census
Economic and Demograhic Data
STF-3A 1990 Census

DEA

DAVID EVANS AND ASSOCIATES, INC.
PORTLAND, OREGON

G. MADRAS BIKEWAY PROJECTS

City of Madras

INVENTORY, ANALYSIS AND RECOMMENDED BIKEWAY PROJECTS

Facility Inventory

Table 1 is an inventory of the existing street bikeway system. The system is comprised of the major streets and other selected streets located in the Madras urban area. The streets are sorted by classification: arterial, collector and local. Several features are listed, such as width and the presence of a sidewalk on at least one side of the street.

There are two specially designated bikeways within Madras:

- "B" St. from 1st St. to Kinkade has bike lanes (0.95 mi).
- A separated, multi-use path runs in two segments along Willow Creek (0.94 mi total) that are interrupted for about 0.4 mi by one end of the 4th–5th St. couplet. The eastern segment crosses "B" and "C" St.
- *Note:* Buff St. from 5th St. to 10th St. also has nonstandard, undesignated bike lanes (very wide on one side, narrow on the other, and no stencils) for about 0.25 mi.

Most streets are for local access, have relatively low traffic volumes, and generally lack sidewalks. Among the major streets, several support high traffic volumes (over about 5000 trips/day):

- "B" St. from 4th to 10th St.
- "D" St. (Culver Hwy.) from 3rd to 5th St.
- Oak St. from 5th to 7th St.
- Highways 26 and 97 (including 4th and 5th St. couplet).

Some sidewalks exist on these high-traffic streets but are typically unbuffered, intermittent and below ADA design standards.

A few unsheltered bicycle racks were noted. Although no inventory was taken, bicycle parking appeared to be sparse in all areas.

Table 1. Madras Streets Inventory

Street	From	To	length mi	width ft	outside lane ft	Side-walks	ADT
Arterials							
4th St	5th St	Pine St	.04	54	18	Yes	8600
4th St	Pine St	J St	.89	54	18	Yes	9700
4th St	J St	K St	.09	54	18	NO	7900
5th St	4th St	Pine St	.03	54	18	Yes	7900
5th St	Pine St	G St	.62		18	Yes	8600
5th St	G St	J St	.09	54	18	Yes	12000
5th St	J St	K St	.09	54	18	NO	6800
Culver Hwy (361)	Colfax Ln	Fairgrounds Rd	.26		12	NO	3200
Culver Hwy (361)	Fairgrounds Rd	G St	.79		12	NO	2700
Culver Hwy (361)	G St	Madison St	.25		12	NO	2600
Culver Hwy (361)	Madison St	3rd St	.20		12	NO	3200
D St	3rd St	5th St	.11		18	Yes	4228
Hwy 26	UGB	Birch Rd	1.60			NO	8500
Hwy 26	Birch Rd	Cedar St	.62			NO	10000
Hwy 26	Cedar St	Hwy 97	.20			NO	11000
Hwy 97	UGB	Cedar St	.30			NO	5600
Hwy 97	Cedar St	Hwy 26	.24			NO	4800
Hwy 97/26	North junction	Oak	.05			NO	16000
Hwy 97/26	Oak	4th/5th	.07			NO	16000
Hwy 97/26	K St	L St	.09			NO	12000
Hwy 97/26	L St	Fairgrounds Rd	.34			NO	12000
Hwy 97/26	Fairgrounds Rd	UGB	.45			NO	10000
			7.43			1.78	
Collectors							
10th St	Loucks Rd	Chestnut St	.19		15	NO	250
10th St	Chestnut St	Oak St	.32		15	NO	500
10th St	B St	G St	.40	44	15	Yes	250
10th St	G St	Buff St	.09	44	15	NO	196
12th St	Oak St	B St	.25	48	16	NO	1000
2nd St	B St	H St	.06	54	18	NO	376
2nd St	H St	J St	.18	54	18	NO	500
7th St	Oak St	Buff St	.74	54	18	NO	2000
Adams Dr	5th St	K St	.17			NO	2529
Adams Dr	K St	M St	.16			NO	2000
Adams Dr	M St	UGB	.51			NO	1500
Alder St	Mill St	Conroy St	.24			Yes	1500
B St	1st St	3rd St	.10	54	15	NO	2000
B St	3rd St	4th St	.07	54	15	Yes	2895
B St	4th St	8th St	.20	54	15	Yes	6508
B St	8th St	10th St	.09	54	15	Yes	5000
B St	10th St	Ashwood Rd	.24	44	16	NO	3500

Collectors (cont'd)

B St	Ashwood Rd	Kinkade Rd	.26	44	16	NO	2000
B St	Kinkade Rd	Claremont Dr	.24	34	12	NO	874
B St	Claremont Dr	UGB		30	12	NO	500
Bard Ln	Hwy 97	Adams Dr	.14	24	12	NO	250
Belmont Ln	Culver Hwy (361)	UGB	.23	24	12	NO	1000
Buff St	5th	7th	.10	38	13	Yes	1952
Buff St	7th St	10th St	.15	34	13	Yes	1500
Buff St	10th St	McTaggard Rd	.07	44	10	Yes	1250
C St	1st St	Grizzly Rd	.52	54	18	NO	2493
Canal St	Hess St	Alder St	.13			NO	1500
Canyon Rd	Straun Rd	C St	.32		12	NO	228
Cherry Ln	Airport Way	UGB	1.11			NO	1500
Chestnut St	Hwy 97	10th St	.06		12	Yes	500
Conroy St	Alder St	Earl St	.27			NO	1500
D St	5th St	10th St	.25		18	Yes	2179
E St	Culver Hwy (361)	5th St	.24	54	18	NO	1500
Earl St	Conroy St	Hwy 26	.21			NO	1588
Fairgrounds Rd	Culver Hwy (361)	Marie St	.20	24	12	NO	1200
Fairgrounds Rd	Marie St	Olive St	.05	44	22	NO	1400
Fairgrounds Rd	Olive St	Hart St	.09	24	12	NO	1600
Fairgrounds Rd	Hart St	S Hwy 97	.09	24	12	NO	1871
Grizzly Rd	C St	UGB	.87	24	12	NO	165
H St	Culver Hwy (361)	Madison St	.18	44	15	NO	250
H St	Madison St	2nd St	.12	44	15	NO	250
H St	2nd St	3rd St	.05	44	15	NO	250
H St	3rd St	4th St	.07	44	15	Yes	533
H St	4th St	5th St	.05	44	15	Yes	250
Hess St	Canal St	Hwy 26	.24			NO	1713
J St	Culver Hwy (361)	3rd St	.39	54	18	NO	1000
J St	3rd St	4th St	.07	54	18	NO	1203
J St	4th St	5th St	.02	54	18	Yes	1000
J St	5th St	Adams Dr	.02	36	11	NO	928
J St	Adams Dr	Wade St	.05	34	10	NO	550
J St	Wade St	Hull St	.05	34	10	NO	450
J St	Hull St	Allen St	.07	34	10	NO	350
J St	Allen St	Sun Dr	.04	34	10	NO	250
Lee St	Commercial St	Hwy 26	.21			NO	1500
Marie St	Fairgrounds Rd	End	.24	24	12	NO	250
McTaggard	Buff St	UGB	.29			Yes	452
Mill St	Cherry Ln	Alder St	.49			NO	1500
Oak St	5th St	6th St	.05	45	15	Yes	5417
Oak St	6th St	16th St	.53	45	15	NO	2500
Oak St	16th St	End	.06	54	19	NO	250
			12.89			2.11	

Local							
10th St	Oak St	A St	.15		15	NO	250
2nd St	J St	M St	.24	24	12	NO	791
7th St	Buff St	I St	.16	30+	15	NO	250
Buff St	McTaggard Rd	End	.28	44	10	Yes	250
C St	Grizzly Rd	16th St	.05	44	13	NO	250
E St	5th St	10th St	.24	54	18	Yes	734
Fairgrounds Rd	Overlook Dr	Culver Hwy (361)	.10	24	12	NO	1000
Jefferson St	Hwy 97	Hwy 26	.27			NO	1000
Loucks Rd	Hwy 97	UGB	.69	22+	11	NO	1500
			2.16			.52	
		Total mi.	22.48		Sidewalks	4.41	

Rural Access

The following roads extend outside the Madras Urban Growth Boundary (UGB) but provide access into the surrounding countryside. They are important to recreational cycling and to access destinations outside the UGB:

Hwy. 26 — Industrial Park, Airport and points north; Prineville south.
Hwy. 97 — Points north and south.
Adams Dr. — Rancho's and Hwy. 26.
Ashwood Rd. — Middle School and Juniper Hills Park.
Belmont Ln. — Lake Billy Chinook.
Canyon Rd. — Willow Canyon Trail.
Culver Hwy. — Metolius, Culver and Lake Billy Chinook.
Grizzly Rd. — Points southeast and loop to McTaggard Rd.
Loucks Rd. — Loop to Juniper Hills Park and Ashwood Rd.
McTaggard Rd. — Loop to Grizzly Rd.

Future Development

Besides the facilities mentioned above, several projects have been proposed that would provide opportunities for walkways and bikeways, including:

- Trail link from east end of "E" St. to Grizzly Rd.
- Trail link from east end of Buff St. to Willow Creek Trail.
- Development of 2nd St. (a local, partially unpaved street) as a north-south collector on the west side.

- Development of Kinkade St. (a local unpaved street) as a north-south collector on the east side.

- Extension of "J" St. (a collector) to Grizzly Rd. as an east-west collector on the south side.

Rating Index

To help provide consistent, bicycle-specific data for an entire street network, a formula was devised that has been successfully used in Florida and Tennessee (W. Davis and M. Horowitz, Assessing Roadway Conditions for Bicycle Suitability, paper presented at Conference Velo Mondiale, Montreal, Canada, Sept. 1992).

The formula evaluates how well a street accommodates cyclists based on recognized factors that affect bicycle operation and use. It comprises several standard street measurements (such as ADT), outside lane width, and various factors divided into 'pavement' and 'location' categories. By using primarily existing data, it provides a cost-effective way to quantify streets and to isolate deficiencies. The data are easily updated as conditions change.

The resulting number, called the Bicycle Rating Index, is an overall indication of the each street's condition. A refined version of this formula was used to inventory the Madras area's major streets.

A form was filled out for each street. Where a street changed conditions significantly, it was broken into segments and a form was filled out for each segment. The data were entered into a computerized data base which calculated the Bicycle Rating Index. The lower the number, the better the street for cycling.

The index depends on accurate traffic counts, lane widths and conditions. Where ADTs were not known, they were estimated.

The Bicycle Advisory Committee and Public Works Departments should gather the data necessary to keep the database up-to-date so as to identify future needs and to track progress.

The Index results were used to divide the streets into four categories: superior, good, fair and poor per Table 2. Results can be transferred to a map, so that gaps in the system can be demonstrated graphically.

Table 2. Bikeway Rating Index Summary

Rating	*Description*	*miles*	*Percent of total miles*
Superior (<3.00)	Conducive to bicycle use. Minor improvements, if any, needed.	7.72	34
Good (3.00–3.99)	Accommodates most cyclists. Minor improvements may elevate to superior rating.	4.79	21
Fair (4.00–4.99)	Usable by some cyclists but poses hazards. Improvements, such as shoulders or lanes, needed.	1.40	7
Poor (>4.99).	Significant hazards due to substandard conditions. Should be improved ASAP unless traffic levels are low.	8.50	38
	Total	22.41	100

The table shows that 55% of the paved roads are rated good or superior for cyclists, meaning that few improvements are necessary. These are mostly streets that have a good surface, ample width and relatively low traffic volumes. However, this does not take into account factors such as destinations, intersections, connectivity and pedestrian facilities. In other words, these roads may offer acceptable cycling conditions but may only be useful to neighborhood residents.

Many of the roads rated poor or fair (45% of the total) are arterials or collectors that serve the most users. These are the focus of the recommended projects. Note that (from Table 1) 19.1% of the 20.3 mi of arterials and collectors have sidewalks.

Table 3 lists streets in order of their index rating. Projects are noted by a number in brackets that corresponds to the description later in this section.

Table 3. Bikeway Rating Index List

Street	From	To	Classification	Rating Index			
				Total	Traffic	Pavement	Location
Superior							
B St	Ashwood Rd	Kinkade Rd	Collector	-2.35	-2.6	.75	-.5
B St	10th St	Ashwood Rd	Collector	-2.05	-2.3	.75	-.5
Fairgrounds Rd	Marie St	Olive St	Collector	-1.75	-3.00	.75	.5
B St	8th St	10th St	Collector	-.78	-1.28	.25	.25
B St	3rd St	4th St	Collector	-.70	-1.70	.75	.25
Buff St [2]	7th St	10th St	Collector	-.48	-1.48	1.25	-.25
Buff St [2]	5th	7th	Collector	-.39	-1.39	1.75	-.75
B St	1st St	3rd St	Collector	-.38	-1.88	.75	.75
B St	4th St	8th St	Collector	-.23	-.98	.25	.5
J St [4]	Culver Hwy (361)	3rd St	Collector	.16	-1.08	.25	1
Culver Hwy [13]	G St	Madison St	Arterial	.52	.52		0
2nd St [6]	B St	H St	Collector	.53	-1.21	.75	1
D St [14]	5th St	10th St	Collector	.65	-.84	.25	1.25
J St [4]	3rd St	4th St	Collector	.70	-1.04	.75	1
10th St	Loucks Rd	Chestnut St	Collector	.76	.26		.5
10th St	Oak St	A St	Local	.76	.26		.5
E St [11]	5th St	10th St	Local	.86	-1.13	.75	1.25
10th St	Chestnut St	Oak St	Collector	1.06	.31		.75
Culver Hwy [13]	Madison St	3rd St	Arterial	1.10	.35	.75	0
7th St [3]	Oak St	Buff St	Collector	1.11	-.88	.25	1.75
B St [1]	Kinkade Rd	Claremont Dr	Collector	1.17	.67		.5
Oak St	16th St	End	Collector	1.26	-1.73	2	1
D St [14]	3rd St	5th St	Arterial	1.30	-.44	.25	1.5
Culver Hwy [13]	Fairgrounds Rd	G St	Arterial	1.32	.82	.75	-.25
Oak St [5]	5th St	6th St	Collector	1.43	.93	.25	.25
E St	Culver Hwy (361)	5th St	Collector	1.51	-.98	.75	1.75
Chestnut St	Hwy 97	10th St	Collector	1.56	1.56		
Culver Hwy [13]	Colfax Ln	Fairgrounds Rd	Arterial	1.71	1.21	.75	-.25
2nd St [6]	H St	J St	Collector	1.81	-1.18	2	1
B St [1]	Claremont Dr	UGB	Collector	1.88	.88		1
12th St	Oak St	B St	Collector	1.91	-.08	1	1
Oak St [5]	6th St	16th St	Collector	1.96	.71	.25	1
J St [4]	4th St	5th St	Collector	2.16	-1.08	2.5	.75
10th St [9]	G St	Buff St	Collector	2.25	.25	1	1
10th St [9]	B St	G St	Collector	2.26	.26	1.25	.75
7th St	Buff St	I St	Local	2.76	.26	2	.5
Bard Ln	Hwy 97	Adams Dr	Collector	2.76	1.76	.5	.5
H St	Madison St	2nd St	Collector	2.76	.26	1.5	10

Good

H St	2nd St	3rd St	Collector	3.01	.26	1.75	1
H St	4th St	5th St	Collector	3.01	.26	2	.75
5th St [7]	4th St	Pine St	Arterial	3.18	.43	1.5	1.25
Fairgrounds Rd [15]	Culver Hwy (361)	Marie St	Collector	3.20	1.95	.75	.5
Fairgrounds Rd [15]	Olive St	Hart St	Collector	3.28	2.03	.75	.5
Fairgrounds Rd [15]	Hart St	S Hwy 97	Collector	3.33	2.08	.75	.5
Fairgrounds Rd	Overlook Dr	Culver Hwy (361)	Local	3.41	1.91	1	.5
Buff St	McTaggard Rd	End	Local	3.51	.26	3.5	-.25
H St	Culver Hwy (361)	Madison St	Collector	3.51	.26	2.25	1
Grizzly Rd [16]	C St	UGB	Collector	3.56	2.31	.75	.5
H St	3rd St	4th St	Collector	3.57	.32	2.5	.75
C St [10]	1st St	Grizzly Rd	Collector	3.71	-.78	2.75	1.75
Buff St	10th St	McTaggard Rd	Collector	3.71	.46	3.5	-.25
Loucks Rd [17]	Hwy 97	UGB	Local	3.76	2.51	.75	.5
Marie St	Fairgrounds Rd	End	Collector	3.76	1.76	1.5	.5
5th St [7]	Pine St	G St	Arterial	3.82	.57	1.5	1.75
Canyon Rd	Straun Rd	C St	Collector	3.83	2.33	.75	.75
Belmont Ln	Culver Hwy (361)	UGB	Collector	3.91	1.91	1.5	.5
5th St [7]	J St	K St	Arterial	3.96	.21	2	1.75

Fair

4th St [7]	Pine St	J St	Arterial	4.04	.79	1.5	1.75
4th St [7]	J St	K St	Arterial	4.18	.43	1.5	2.25
2nd St	J St	M St	Local	4.37	1.87	2	.5
5th St [7]	G St	J St	Arterial	4.75	1.25	1.5	2
J St	Adams Dr	Wade St	Collector	4.82	2.82	1	1
4th St [7]	5th St	Pine St	Arterial	4.82	.57	2.75	1.5

Poor

C St	Grizzly Rd	16th St	Local	5.01	1.26	2.75	1
J St	Hull St	Allen St	Collector	5.28	2.78	1.5	1
J St	5th St	Adams Dr	Collector	5.39	2.39	2	1
J St	Allen St	Sun Dr	Collector	6.26	2.76	2.5	1
J St	Wade St	Hull St	Collector	7.05	2.80	3.25	1
McTaggard [18]	Buff St	UGB	Collector	7.09	7.09		
Alder St	Mill St	Conroy St	Collector	8.01	8.01		
Jefferson St	Hwy 97	Hwy 26	Local	8.41	7.91		.5
Canal St	Hess St	Alder St	Collector	8.51	8.01		.5
Cherry Ln	Airport Way	UGB	Collector	8.51	8.01		.5
Conroy St	Alder St	Earl St	Collector	8.51	8.01		.5
Lee St	Commercial St	Hwy 26	Collector	8.51	8.01		.5

H. SECTION 660-12-045 OF THE OREGON TRANSPORTATION PLANNING RULE

OREGON TRANSPORTATION PLANNING RULE
SECTION 660-12-045: IMPLEMENTATION

(1) Each local government shall amend its land use regulations to implement the TSP.

(a) The following transportation facilities, services and improvements need not be subject to land use regulations except as necessary to implement the TSP and, under ordinary circumstances do not have a significant impact on land use:

(A) Operation, maintenance, and repair of existing transportation facilities identified in the TSP, such as road, bicycle, pedestrian, port, airport and rail facilities, and major regional pipelines and terminals;

(B) Dedication of right-of-way, authorization of construction and the construction of facilities and improvements, where the improvements are consistent with clear and objective dimensional standards;

(C) Uses permitted outright under ORS 215.213(1)(m) through (p) and ORS 215.283(1)(k) through (n), consistent with the provisions of 660-12-065; and,

(D) Changes in the frequency of transit, rail and airport services.

(b) To the extent, if any, that a transportation facility, service or improvement concerns the application of a comprehensive plan provision or land use regulation, it may be allowed without further land use review if it is permitted outright or if it is subject to standards that do not require interpretation or the exercise of factual, policy, or legal judgement.

(c) In the event that a transportation facility, service or improvement is determined to have a significant impact on land use or to concern the application of a comprehensive plan or land use regulation and to be subject to standards that require interpretation or the exercise of factual, policy or legal judgement, the local government shall provide a review and approval process that is consistent with 660-12-050. To facilitate implementation of the TSP, each local government shall amend its land use regulations to provide for consolidated review of land use decisions required to permit a transportation project.

(2) Local governments shall adopt land use or subdivision ordinance regulations, consistent with applicable federal and state requirements, to protect transportation facilities, corridors and sites for their identified functions. Such regulations shall include:

(a) Access control measures, for example, driveway and public road spacing, median control and signal spacing standards, which are consistent with the functional classification of roads and consistent with limiting development on rural roads to rural uses and densities;

(b) Standards to protect future operation of roads, transitways and major transit corridors;

(c) Measures to protect public use airports by controlling land uses within airport noise corridors and imaginary surfaces, and by limiting physical hazards to air navigation.

(d) A process for coordinated review of future land use decisions affecting transportation facilities, corridors or sites;

(e) A process to apply conditions to development proposals in order to minimize impacts and protect transportation facilities, corridors or sites;

(f) Regulations to provide notice to public agencies providing transportation facilities and services, MPOs, and ODOT of:

(A) Land use applications that require public hearings;

(B) Subdivision and partition applications;

(C) Other applications which affect private access to roads; and

(D) Other applications within airport noise corridors and imaginary surfaces which affect airport operations.

(g) Regulations assuring that amendments to land use applications, densities, and design standards are consistent with the functions, capacities and level of service of facilities identified in the TSP.

(3) Local governments shall adopt land use or subdivision regulations for urban areas and rural communities as set forth below. The purposes of this section are to provide for safe and convenient pedestrian, bicycle and vehicular circulation consistent with access management standards and the function of affected streets, to ensure that new development provides on-site streets and accessways that provide reasonably direct routes for pedestrian and bicycle travel in areas where pedestrian and bicycle travel is likely if connections are provided, and which avoids wherever possible levels of automobile traffic which might interfere with or discourage pedestrian and bicycle travel.

(a) Bicycle parking facilities as part of new multi-family residential developments of four units or more, new retail, office and institutional developments, and all transit transfer stations and park and ride lots.

(b) On-site facilities shall be provided which accommodate safe and convenient pedestrian and bicycle access from within new subdivisions, multi-family developments, planned developments, shopping centers, and commercial districts to adjacent residential areas and transit stops, and to neighborhood activity centers within one-half mile of the development. Single family residential developments shall generally provide streets and accessways. Pedestrian circulation through parking lots should generally be provided in the form of accessways.

(A) "Neighborhood activity centers" includes, but is not limited to, existing or planned schools, parks, shopping areas, transit stops or employment centers.

(B) Sidewalks shall be required along arterials, collectors and most local streets in urban areas, except that sidewalks are not required along controlled access roadways, such as freeways;

(C) Cul-de-sacs and other dead-end streets may be used as part of a development plan, consistent with the purposes set forth in this section.

(D) Local governments shall establish their own standards or criteria for providing streets and accessways consistent with the purposes of this section. Such measures may include but are not limited to: standards for spacing of streets or accessways; and standards for excessive out-of-direction travel.

(E) Streets and accessways need not be required where one or more of the following conditions exist:

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

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

(iii) Where streets or accessways would violate the provisions of leases, easements, covenants, restrictions or other agreements existing as of May 1, 1995 which preclude a street or accessway connection.

(c) Where off site road improvements are otherwise required as condition of approval, they shall include facilities accommodating convenient pedestrian and bicycle travel, including bicycle ways along arterials and major collectors.

(d) For the purposes of subsection (b) "safe and convenient" means bicycle and pedestrian routes, facilities and improvements which:

(A) Are reasonably free from hazards, particularly types or levels of automobile traffic which would interfere with or discourage pedestrian or cycle travel for short trips;

(B) Provide a direct route of travel between destinations such as between a transit stop and a store; and

(C) Meet the travel needs of cyclists and pedestrians considering destination and length of trip; and considering that the optimum trip length of pedestrians is generally ¼ to ½ mile.

(e) Internal pedestrian circulation within new office parks and commercial development shall be provided through clustering of buildings, construction of accessways, walkways and similar techniques.

[Sections 4 and 5 do not apply to cities with populations of less than 2,500 or counties with populations of less than 25,000.]

(6) In developing a bicycle and pedestrian circulation plan as required by 660-12-020(2)(d), local governments shall identify improvements to facilitate bicycle and pedestrian trips to meet local travel needs in developed areas. Appropriate improvements should provide for

more direct, convenient and safer bicycle or pedestrian travel between residential areas and neighborhood activity centers (i.e., schools, shopping, transit stops). Specific measures include, for example, constructing walkways between cul-de-sacs and adjacent roads, providing walkways between buildings, and providing direct access between adjacent uses.

(7) Local governments shall establish standards for local streets and accessways that minimize pavement width and total right-of-way consistent with the operational needs of the facility. The intent of this requirement is that local governments consider and reduce excessive standards of local streets and accessways in order to reduce the cost of construction, provide for more efficient use of urban land, provide for emergency vehicle access while discouraging inappropriate traffic volumes and speeds, and which accommodate convenient pedestrian and bicycle circulation. Not withstanding subsection (1) or (3) of this section, local street standards adopted to meet this requirement need not be adopted as land use regulations.

I. REFINEMENT PLAN FOR THE HIGHWAY 97/26 INTERSECTION

BACKGROUND

The junction of Highways 97 and 26 at the north end of Madras has been identified by ODOT and by Madras as a problem area for many years. Portions of the intersection currently function at a LOS E, and further degradation is expected in the future. The highways are heavily used by trucks. The junction is very difficult and dangerous to cross on foot or by bicycle, and is also difficult for motorized cross traffic.

An ODOT design team, working with the City of Madras, the TAC, the public, stakeholders, and the Madras Planning Commission, has developed a number of concepts for improving the Highway 97/26 intersection. These are summarized in Table I-1, below. Most of these concepts have been rejected due to unacceptable performance levels and cost. The various concepts are discussed in the following text and are illustrated at the end of this Appendix. The two alternatives that best meet the operational and safety goals for the intersection are called alternatives 5A and 10B, and are also discussed in Chapter 6 of this TSP. Public comments were taken on the various alternatives at several public meetings, including a public hearing before the City Council on September 23, 1997. At that hearing, there was general support for Option 5-A.

Table I-1. Summary Intersection Improvement Concepts

CONCEPT	COST	2015 LOS
Signalization (Recommended Alternative 5A; see Chapt. 6)	$1,500,000	C
Hwy 26 Realignment w/3rd St Connection (Recommended Alternative 10B; see Chapter 6)	$3,900.000	C-D
Jefferson St. Grade Separation (ODOT Concept 5C)	$5,200,000	D
Cedar St. Grade Separation (ODOT Concept 6)	$3,900,00	D
Folded Loop w/Stop Sign (ODOT Concept 7A)	$4,500,000	D
Folded Loop w/Ramp (ODOT Concept 7B)	$4,500,000	D
Grade separation w/3rd St Connection (ODOT Concept 8A)	$5,400,000	D
Grade separation w/o 3rd St Connection (ODOT Concept 8B)	$5,400,000	D
Hwy 26 Realignment w/o 3rd St Connection (ODOT Concept 10A)	$3,900.000	C

Alternative 5A: At-Grade Signalization (Recommended Option):

Overview: Reroute Highway 97 traffic onto 6th Street to connect with Highway 26 at a signalized intersection north of Pine Street where the 4th/5th Street couplet begins (Figure 6-3). This improvement would divert Highway 97 traffic down the present 6th Street right-of-way and go through the existing ODOT maintenance facility to make a connection at the north junction of 4th and 5th streets. The section of highway located between 6th Street and Highway 26 would be abandoned after this improvement was in place. This option would require the acquisition of store the ODOT maintenance facility that is used to equipment and rock. A traffic signal would be constructed at the couplet intersection of the rerouted Highway 97 and the junction of 4th and 5th.

Operations Analysis: Traffic modeling and analysis of Option A shows a substantial improvement in operations. The major shift in traffic would be the southbound left turns from Highway 97. Because the traffic from Highway 97, which currently experiences long delays, would be able to merge easily at the signalized intersection, delays would be significantly reduced. Movements which are currently near failure, and would certainly fail over the next 20 years, would improve from LOS F to LOS C.

A second smaller shift of traffic making westbound left turns from Oak Street would also shift onto the new highway alignment to use the signalized intersection. An added benefit of this option would be the improvement in operations from LOS F to LOS B at the Oak Street intersection. Depending on projected traffic volumes at the time of construction, Oak Street will be cul-de-saced either initially or later.

This intersection configuration would also be safer than the current intersection configuration for two reasons. First, it would eliminate the risks associated with turning from either Highway 97 or Oak Street into the oncoming Highway 26 traffic stream. Second, pedestrians and bicyclists would have the protection of crossing Highway 97/26 at a signalized intersection.

This analysis assumes that the City of Madras would allow Highway 97 to be rerouted along 6th Street, between Highway 97 and a point north of Pine Street; and that ODOT would abandon the existing state highway maintenance facility, located at the intersection of 4th and Oak Streets.

The advantages of Alternative 5A are as follows:

- Signal location at the intersection of Highways 97 and 26 is on a level grade.
- Need for change of access to most businesses on along Highway 26 is minimized.
- Accident potential is minimized by eliminating left turns at the existing intersection of the two highways.
- The proposed local street improvement plan is accommodated by allowing the connection of Oak St. to 3rd St.
- The need to take right-of-way is minimized by using the existing ODOT maintenance facility property.

- Large trucks and emergency vehicles are accommodated.
- Projected LOS meets State standards.

The disadvantages of Alternative 5A are as follows:

- The intersection has unconventional geometry and circulation pattern, potentially creating driver confusion.
- The cul-de-sac on Oak St. creates out-of-direction east-west travel.
- A raised median necessary north of the signalized intersection eliminates access for service stations for north-bound travel on 5th St./Highway 26.
- Emergency vehicle circulation will be out-of-direction from south-bound Highway 26 to Oak St. because of cul-de-sac.
- Service station access requires a separate signal phase.
- There are potential noise impacts to residences on 6th St.

Cost: **The estimated cost of the Signalized alternative is $1,500,000.**

■ Alternative 10B: Highway 26 Realignment with Oak St Connection to 3rd St. (Recommended Option)

This alternative eliminates the existing left turn at the Highway 97/26 intersection. The existing 4th/5th St. couplet will be extended by lengthening the northbound leg of 5th St. and the southbound leg of 4th St. to Jefferson St. The intersection of Cedar St./5th St. will be signalized, as will the intersection of Oak Street and Highway 26. An additional southbound travel lane will be added on the 4th St. couplet extension, and an additional northbound travel lane will be added north of Pine St. to the existing Safeway market. This alternative will have right-of-way needs for 15.7 acres of vacant land and 3 single family residences. In the design year 2015, the LOS will be C at the Oak St./Highway 126 intersection (northbound), C-D at the intersection of the new highway and Oak St (southbound), and B at the intersection of Cedar St. and Highway 26 (northbound).

The advantages of Alternative 10B are summarized as follows:

- One-way movement with 2-phase signals along 5th and 4th St. will improve intersection operation and capacity and reduce delay.
- Minimizes accident potential by eliminating left turn at the existing intersection of Highway 97/26 intersection.
- Provides opportunity to develop local access management plan.
- Accommodates the proposed local street improvement plan.
- Accommodates emergency vehicle circulation to the hospital.
- Accommodates large trucks.
- Has a reduced construction cost, since it does not require a grade-separated structure on Highway 26.

- Provides long-term operational and safety benefits along entire segment of highway due to one-way movement.

The disadvantages of Alternative 10B are summarized as follows:

- Signalized intersection at the 5th St./Highway 26 and Cedar St. is on a +5% grade.
- Southbound traffic must travel out-of-direction to businesses on 5th St. north of Pine St.
- Requires large right-of-way taking on the west side of Highway 26.
- Access management requirements may limit movements to existing businesses or may move existing access points.
- Requires significant earthwork cuts into the hillside west of Highway 26.
- Requires the closure of Lee St. at Highway 26.
- Some residences along the new alignment may experience increased noise.

***Cost:* The estimated cost of Alternative 10B is $3,900,000.**

? Conclusion and Recommendation for Highway 97/26 North Junction

In conclusion, either Alternative 5A, the at-grade signal, or Alternative 10B, the realignment of Highway 26 with connection to 3rd St., would meet intersection operational goals for the planning period. These two alternatives are supported by the City of Madras pending further environmental analysis, public involvement, and City review at the time of construction design. Alternative 5A would have some noise impacts to residences, but is the most cost-effective solution. Alternative 10B would be more expensive and have greater impacts to existing businesses from the loss of access by southbound traffic, but would provide some longer term operational advantages due to the one-way traffic circulation. Once funding is secured for construction of the project, further developmental work, including environmental analysis, will need to be completed in order to select between Alternatives 5A and 10B.

Concept 5C: Modified Jefferson St. Grade Separation

This concept will grade-separate the through movements on Highway 97, eliminate the left turn at the intersection of Highway 97 and Highway 26, provide signals at the Oak/5th Street and Oak/Highway 97 intersections, accommodate the local street improvement plan, and add an a north-bound travel lane north of Pine Street to the existing Safeway market. The right-of-way needs for this alternative include 10 acres of vacant land and 3 single-family residences. In the design year 2015 the LOS would be D for the intersection of Oak St./Highway 26, LOS F at the intersection of the new highway section and Oak Street (southbound), and LOS F in the weave section from the 4th Street couplet/new Highway 97 to the "B" Street signal.

The advantages of Concept 5C are as follows:

- Eliminates the left turn at the Highway 97/26 intersection.
- Minimizes accident potential by eliminating left turn.
- Provides the opportunity to develop an access management plan that balances the accessibility to services and considerations to the long-term transportation system hierarchy.
- Minimizes right-of-way taking of improved property.
- Accommodates proposed local street improvement plan.
- Accommodates emergency vehicle circulation to the existing hospital.
- Takes advantage of topography to achieve grade-separation.
- Accommodates bicycle and pedestrian circulation.
- Accommodates large trucks.

The disadvantages of Concept 5C are summarized as follows:

- Poor or unacceptable LOS at all signal locations.
- Spacing between signals on Oak Street creates operational and safety problems:
  - ◊ Storage distances exceed distance between intersections.
  - ◊ Accessibility and location of businesses next to signals
- Weave area from Pine Street to "B" Street not long enough to provide an acceptable LOS.
- New Highway 97 will be routed behind a residential area.
- Requires the closure of Lee Street at Highway 26.
- The existing connection of Highway 97 to Jefferson Street will be closed because of close proximity to the new highway.
- No access to business along new Highway 97 route west of the Highway 26.
- Significant earthwork cut into hillside west of Highway 26 requires large right-of-way taking.
- Significant cost to benefit.

Cost: The estimated cost of Concept 5C is $4.2 million.

Concept 6: Cedar St. Grade Separation

This concept will grade-separate the through movements on Highway 97, eliminate the left turn at the intersection of Highway 97 and Highway 26, provide signals at the Oak/5th Street and Oak/Highway 97 intersections, and adds an a north-bound travel lane north of Pine Street to the existing Safeway market. The right-of-way needs for this alternative include 5.8 acres of vacant land, 3 single-family residences, and one business. In the design year 2015 the LOS would be D for the intersection of Oak St./Highway 26, LOS F at the intersection of the new highway section and Oak Street (southbound), and LOS F in the weave section from the 4th Street couplet/new Highway 97 to the "B" Street signal.

The advantages of Concept 6 are as follows:

- Eliminates the left turn at the Highway 97/26 intersection.
- Minimizes accident potential by eliminating left turn.
- Provides the opportunity to develop an access management plan that balances the accessibility to services and considerations to the long-term transportation system hierarchy.
- Accommodates proposed local street improvement plan.
- Accommodates emergency vehicle circulation to the existing hospital.
- Takes advantage of topography on Cedar Street to achieve grade-separation.
- Accommodates bicycle and pedestrian circulation.
- Accommodates large trucks.

The disadvantages of Concept 6 are summarized as follows:

- Poor or unacceptable LOS at all signal locations.
- Spacing between signals on Oak Street creates operational and safety problems:
  - ◊ Storage distances exceed distance between intersections.
  - ◊ Accessibility and location of businesses next to signals (on Oak Street between 5th Street and 3rd Street extension).
- Change of access to the existing Safeway market on Cedar Street.
- Requires the closure of Lee Street at Highway 26.
- No access to business along new Highway 97 route west of the Highway 26.
- Significant earthwork cut into hillside west of Highway 26 requires large right-of-way taking.
- Significant cost to benefit.

Cost: The estimated cost of Concept 6 is $3.9 million.

Concept 7A: Folded Loop with Stop Sign

This concept will change the existing left-hand turns from Highway 97 to Highway 26 to right-hand turns, improving operations and safety. A signal will be installed at the intersection of Oak St. and 5th St./Highway 26. An additional south-bound travel lane will be added north of the existing Juniper Hotel, and an additional north-bound travel lane will be added between Pine St. and the existing Safeway market. The number of access points along the new portion of Highway 97 and 26 will be limited. The right-of-way needs for this alternative include 14.4 acres of vacant ground and 2 single-family residences. In the design year 2015 the LOS would be D for the intersection of Oak St, and 5th St./Highway 26, and LOS F at the loop ramp intersection with Highway 26.

The advantages of Concept 7A are as follows:

- Minimizes accident potential by eliminating left turns at the existing 97/26 intersection.
- Signal location at the 5th St./Highway 26 intersection and Oak St. is on level grade.
- Provides access management opportunity.
- Minimizes right-of-way taking of improved property.
- Accommodates proposed local street improvement plan.
- Accommodates emergency vehicle circulation to the existing hospital.
- Does not bypass the existing business corridor at the north end of Madras.
- Is the most cost-effective grade-separated concept.

The disadvantages of Concept 7A are summarized as follows:

- Level of service will fail at intersection of loop ramp and Highway 26.
- Loop ramp will create large cut into the hillside.
- Median treatment at the ramp terminal on Highway 26 will change access to the existing Hoffy's restaurant by eliminating the southbound left turn into the restaurant.
- Creates out-of-direction travel for residences on the west side of Highway 26.
- Existing drive-through access to Oak St. for McDonald's restaurant may be too close to signalized intersection.
- Lee St. will be closed at Highway 26.
- Increasing safety and operational problems on Highway 26 due to numerous accesses and high traffic volumes.

Cost: The estimated cost of Concept 7A is $4.5 million.

Concept 7B: Folded Loop with Ramp

This alternative will provide a free flow of traffic from Highway 97 to Highway 26. The intersection of Oak St and 5th St./Highway 26 3 will be signalized. An additional southbound lane will be added north of the existing Juniper Hotel, and an additional northbound land will be added between Pine St. and the existing Safeway market. This alternative will have a right-of-way need of 14.4 acres of vacant land and 2 single family residences. In the design year 2015 the LOS would be D for the intersection of Oak St and 5th St./Highway 26, and LOS B at the loop entrance ramp to Highway 26.

The advantages of Concept 7B are as follows:

- Free flow of traffic movement from Highway 97 to Highway 26.
- Signal location at intersection of 5th St./Highway 26 and Oak St. is on level grade.
- Provides opportunity to develop access management plan.
- Minimizes right-of-way taking to improved property.
- Minimizes accident potential by eliminating left turn at the existing intersection of Highway 97/26 intersection.
- Accommodates the proposed local street improvement plan.
- Accommodates emergency vehicle circulation to the hospital.
- Does not bypass the existing business corridor at the north end of town.
- Is the most-cost-effected grade-separated concept (with Alternative 7A).
- The disadvantages of Concept 7B are summarized as follows:

- Loop ramp will create a large cut into the hillside.
- Median treatment at ramp terminal on Highway 26 will change access to existing Hoffy's restaurant.
- Out-of-direction travel is created for residences on the west side of Highway 26.
- Requires the closure of Lee St. at Highway 26.
- Results in turn restrictions to a number of businesses along Highway 26.

Cost: The estimated cost of Alternative 5F (ODOT Concept 7B) is $4.5 million.

Alternative Concept 8A: Highway 97/26 Grade Separation with Oak St. Connection to 3rd St.

This alternative will provide a free flow of traffic from Highway 97 to Highway 26. The intersection of Oak St and 5th St./Highway 26 3 will be signalized. A southbound lane will be eliminated south of the existing Juniper Hotel, an additional northbound land will be added between Pine St. and the existing Safeway market, and an additional southbound lane will be added north of Jefferson St. This alternative will have a right-of-way need of 15.6 acres of vacant land and 2 single family residences. In the design year 2015 the LOS would be D for the intersection of Oak St and Highway 26, and LOS B at the intersection of the new highway and Oak St.

The advantages of Concept 8A are summarized as follows:

- Free flow of traffic movement from Highway 97 to Highway 26.
- Minimizes right-of-way taking to improved property.
- Minimizes accident potential by eliminating left turn at the existing intersection of Highway 97/26 intersection.
- Signal location at the Highway 26/Oak St. intersection is on level grade.
- Accommodates the proposed local street improvement plan.
- Accommodates emergency vehicle circulation to the hospital.
- Accommodates the circulation of large trucks.
- Provided opportunity to develop an access management plan.

- Eliminates the curve on Highway 26 at Willow Creek.
- Accommodates all modes of transportation: pedestrians, bicyclists, and motorists.

The disadvantages of Concept 8A are summarized as follows:

- Majority of southbound traffic will bypass the existing business area north of Pine St.
- Requires large right-of-way taking on the west side of Highway 26.
- Existing McDonald's restaurant drive-through access to Oak St. may be too close to signalized intersection.
- Requires the closure of Lee St. at Highway 26.
- Some residences along the new alignment will experience increased noise.

Cost: The estimated cost of ODOT Concept 8A is $5.4 million.

Concept 8B: Highway 97/26 Grade separation without Oak St Connection to 3rd St.

This alternative will provide a free flow of traffic from Highway 97 to Highway 26. The intersection of Oak St and 5th St./Highway 26 will be signalized. A southbound lane will be eliminated south of the existing Juniper Hotel, an additional northbound land will be added between Pine St. and the existing Safeway market, and an additional southbound lane will be added north of Jefferson St. This alternative will have a right-of-way need of 15.6 acres of vacant land and 2 single family residences. In the design year 2015 the LOS would be D for the intersection of Oak St and Highway 26, and LOS B at the intersection of the new highway and Oak St.

The advantages of Concept 8B are summarized as follows:

- Free flow of traffic movement from Highway 97 to Highway 26.
- Minimizes right-of-way taking to improved property.
- Minimizes accident potential by eliminating left turn at the existing intersection of Highway 97/26 intersection.
- Signal location at the Highway 26/Oak St. intersection is on level grade.
- Provides opportunity to develop local access management plan.
- Accommodates emergency vehicle circulation to the hospital.
- Accommodates all modes of transportation: pedestrians, bicyclists, motorists, and large trucks.
- Removes signal phase at the Oak St./Highway 26 intersection west of 5th St., to reduce intersection delays and storage distances.
- Eliminates the curve on Highway 26 at Willow Creek.

The disadvantages of Concept 8B are summarized as follows:

- Majority of southbound traffic will bypass the existing business area north of Pine St.
- Requires large right-of-way taking on the west side of Highway 26.
- Existing McDonald's restaurant drive-through access to Oak St. may be too close to signalized intersection.
- Access management requirements on Oak St. may limit business access to right in/right out.
- Does not accommodate the proposed local street improvement plan (does not connect Oak St. to 3rd St.)
- Requires the closure of Lee St. at Highway 26.

Cost: The estimated cost of Concept 8B is $5.4 million.

Concept 10A: Highway 26 Realignment without Oak St Connection to 3rd St.

This alternative eliminates the existing left turn at the Highway 97/26 intersection. The existing 4th/5th St. couplet will be extended by lengthening the northbound leg of 5th St. and the southbound leg of 4th St. to Jefferson St. The intersection of Cedar St./5th St. will be signalized. The northbound Cedar St./5th St. intersection will be signalized, as will the southbound intersection of Oak St. and the new portion of Highway 26. An additional southbound travel lane will be added on the 4th St. couplet extension, and an additional northbound travel lane will be added north of Pine St. to the existing Safeway market. This alternative will have right-of-way needs for 15.7 acres of vacant land and 3 single family residences. In the design year 2015, the LOS will be C at the Oak St./Highway 126 intersection (northbound), B at intersection of the new highway and Oak St (southbound), and B at the intersection of Cedar St. and Highway 26 (northbound).

The advantages of Concept 10A are summarized as follows:

- One-way movement with 2-phase signals along 5th and 4th St. will improve intersection operation and capacity and reduce delay.
- Minimizes accident potential by eliminating left turn at the existing intersection of Highway 97/26 intersection.
- Provides opportunity to develop local access management plan.
- Accommodates emergency vehicle circulation to the hospital.
- Accommodates large trucks.
- Has a reduced construction cost, since it does not require a grade-separated structure on Highway 26.

The disadvantages of Concept 10A are summarized as follows:

- Signalized intersection at the 5th St./Highway 26 and Cedar St. is on a +5% grade.
- Does not accommodate proposed local street improvement plan to connect Oak St. to 3rd St.
- Southbound traffic must travel out-of-direction to businesses on 5th St. north of Pine St.
- Requires large right-of-way taking on the west side of Highway 26.
- Access management requirements may limit movements to existing businesses or may move existing access points.
- Requires significant earthwork cuts into the hillside west of Highway 26.
- Requires the closure of Lee St. at Highway 26.

Cost: The estimated cost of Concept 10A is $3.9 million.

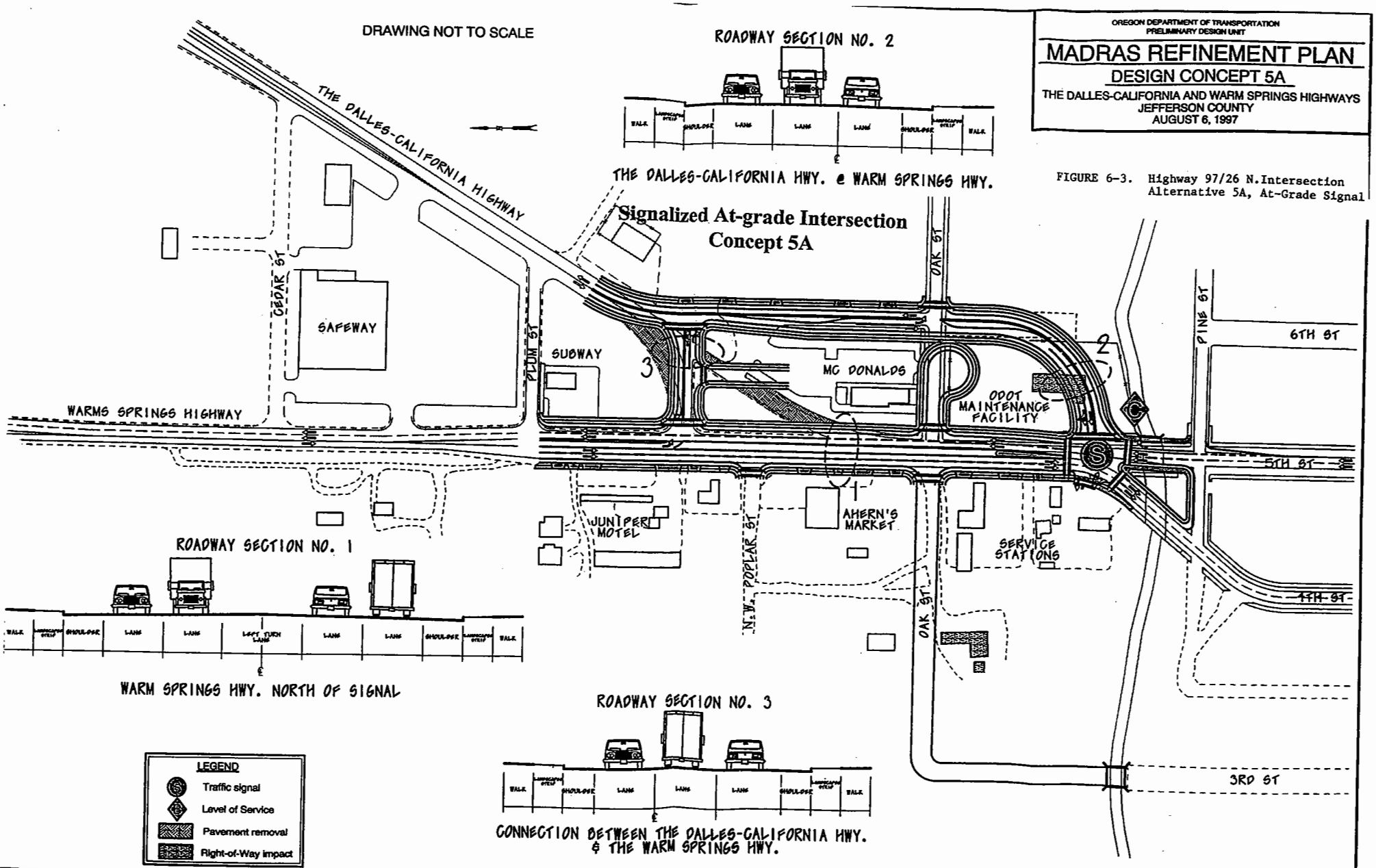


FIGURE 6-3. Highway 97/26 N.Intersection
Alternative 5A, At-Grade Signal

DRAWING NOT TO SCALE

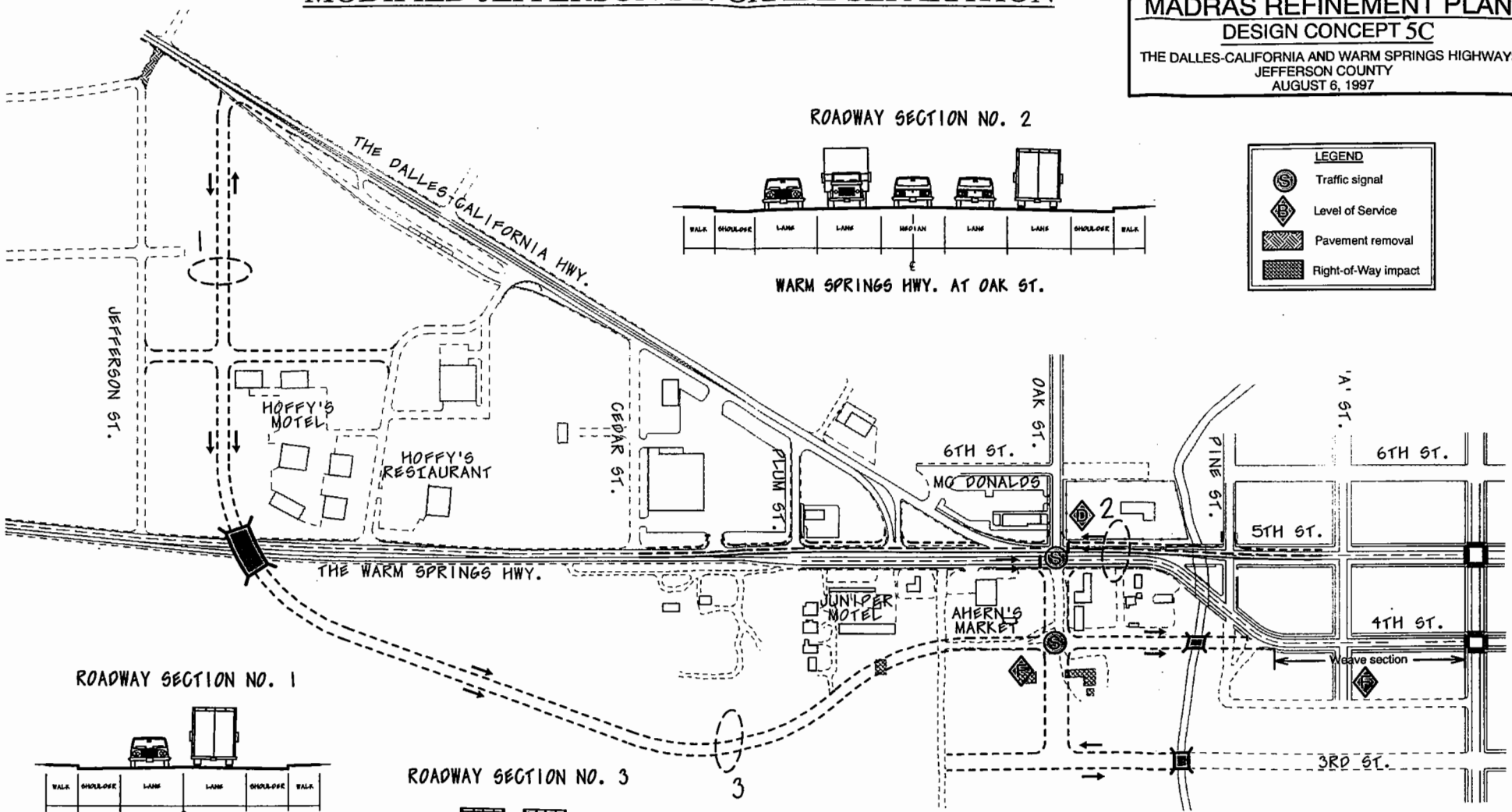
MODIFIED JEFFERSON ST. GRADE SEPARATION

OREGON DEPARTMENT OF TRANSPORTATION
PRELIMINARY DESIGN UNIT

MADRAS REFINEMENT PLAN

DESIGN CONCEPT 5C

THE DALLES-CALIFORNIA AND WARM SPRINGS HIGHWAYS
JEFFERSON COUNTY
AUGUST 6, 1997



ROADWAY SECTION NO. 2

WARM SPRINGS HWY. AT OAK ST.

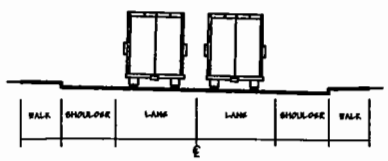
LEGEND

- Traffic signal
- Level of Service
- Pavement removal
- Right-of-Way impact

ROADWAY SECTION NO. 1

JEFFERSON ST.

ROADWAY SECTION NO. 3



APPROACHING OAK ST. ON NEW HWY. 97

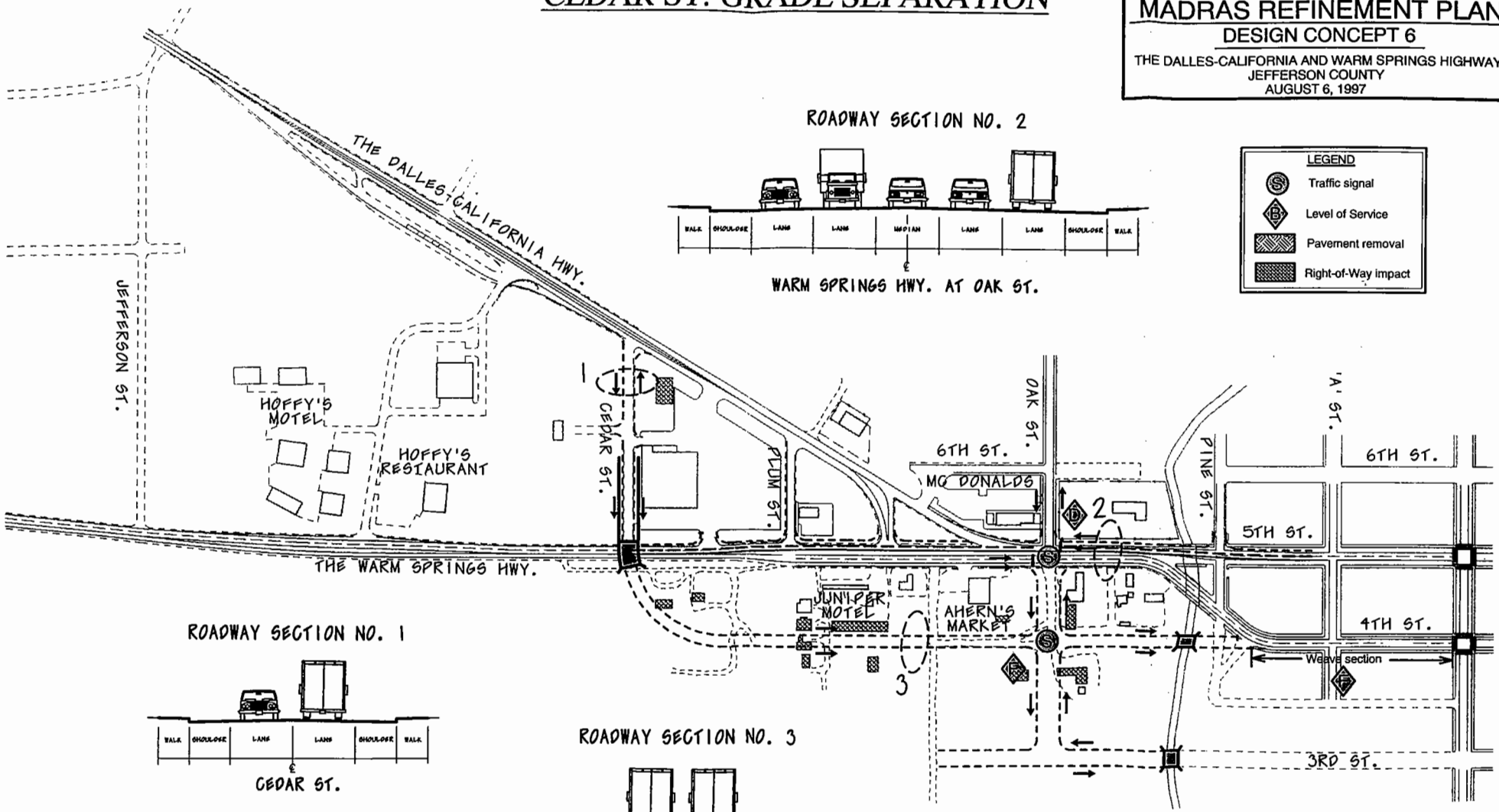
DRAWING NOT TO SCALE

CEDAR ST. GRADE SEPARATION

OREGON DEPARTMENT OF TRANSPORTATION
PRELIMINARY DESIGN UNIT

MADRAS REFINEMENT PLAN
DESIGN CONCEPT 6

THE DALLES-CALIFORNIA AND WARM SPRINGS HIGHWAYS
JEFFERSON COUNTY
AUGUST 6, 1997



ROADWAY SECTION NO. 2

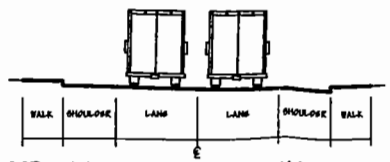
℄
WARM SPRINGS HWY. AT OAK ST.

LEGEND
- Traffic signal
- Level of Service
- Pavement removal
- Right-of-Way impact

ROADWAY SECTION NO. 1

℄
CEDAR ST.

ROADWAY SECTION NO. 3



℄
APPROACHING OAK ST. ON NEW HWY. 97

DRAWING NOT TO SCALE

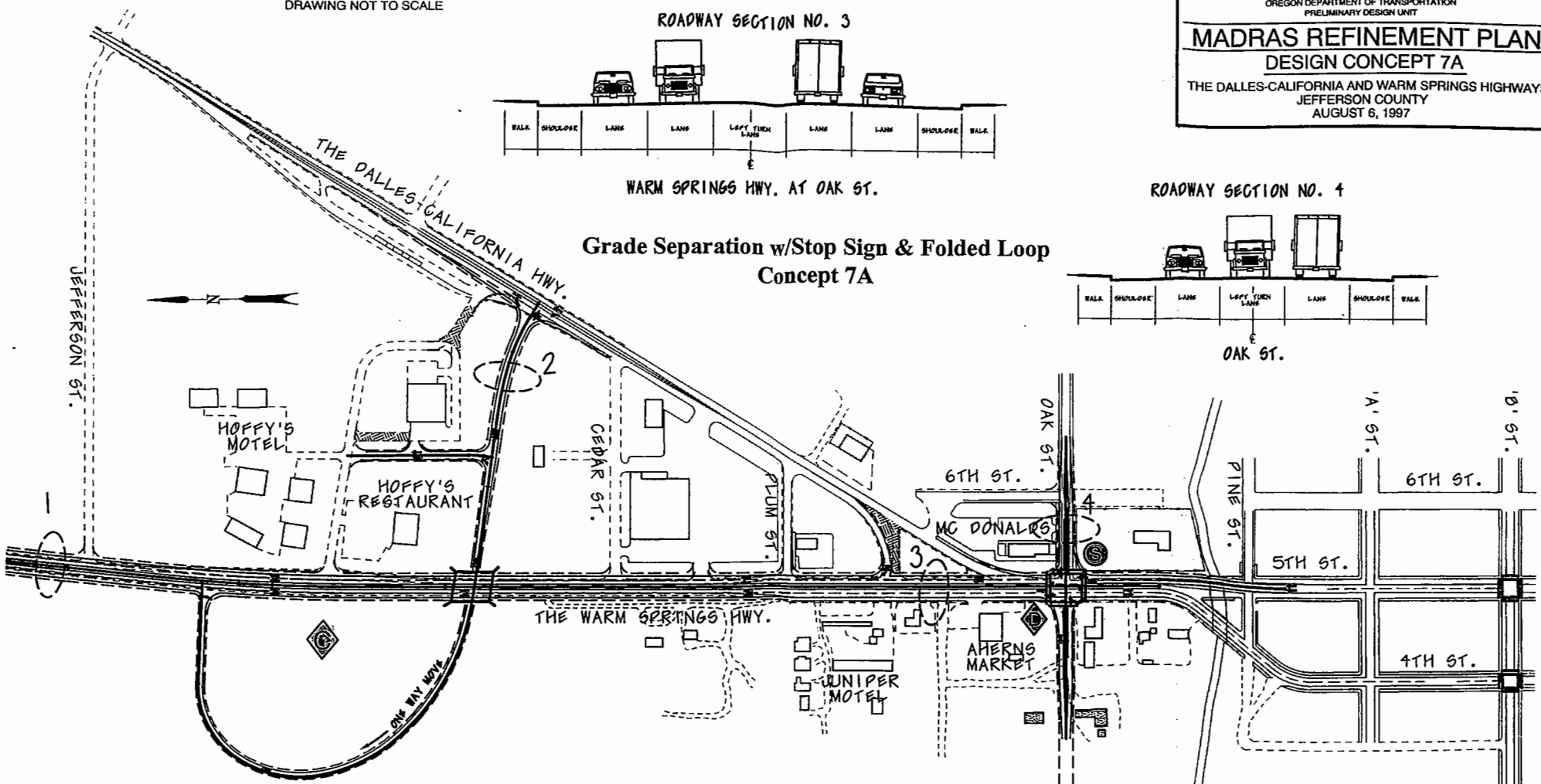
OREGON DEPARTMENT OF TRANSPORTATION
PRELIMINARY DESIGN UNIT

MADRAS REFINEMENT PLAN

DESIGN CONCEPT 7A

THE DALLES-CALIFORNIA AND WARM SPRINGS HIGHWAYS
JEFFERSON COUNTY
AUGUST 6, 1997

Grade Separation w/Stop Sign & Folded Loop
Concept 7A



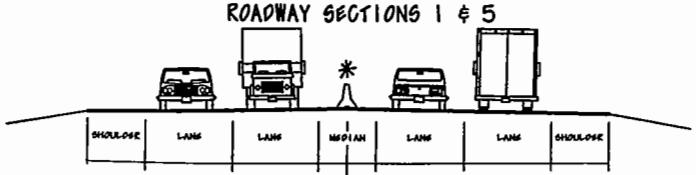
ROADWAY SECTION NO. 3

WARM SPRINGS HWY. AT OAK ST.

ROADWAY SECTION NO. 4

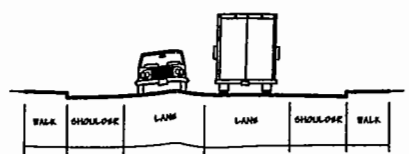
OAK ST.

ROADWAY SECTIONS 1 & 5



WARM SPRINGS HWY. NORTH OF HOFFY'S
* SOUTH OF JEFFERSON ST. TO BRIDGE

ROADWAY SECTION NO. 2



NEW HWY. 97 TO HWY. 26 CONNECTION

LEGEND

- Traffic signal
- Level of Service
- Pavement removal
- Right-of-Way Impact

DRAWING NOT TO SCALE

OREGON DEPARTMENT OF TRANSPORTATION
PRELIMINARY DESIGN UNIT

MADRAS REFINEMENT PLAN

DESIGN CONCEPT 7B

THE DALLES-CALIFORNIA AND WARM SPRINGS HIGHWAYS
JEFFERSON COUNTY
AUGUST 6, 1997

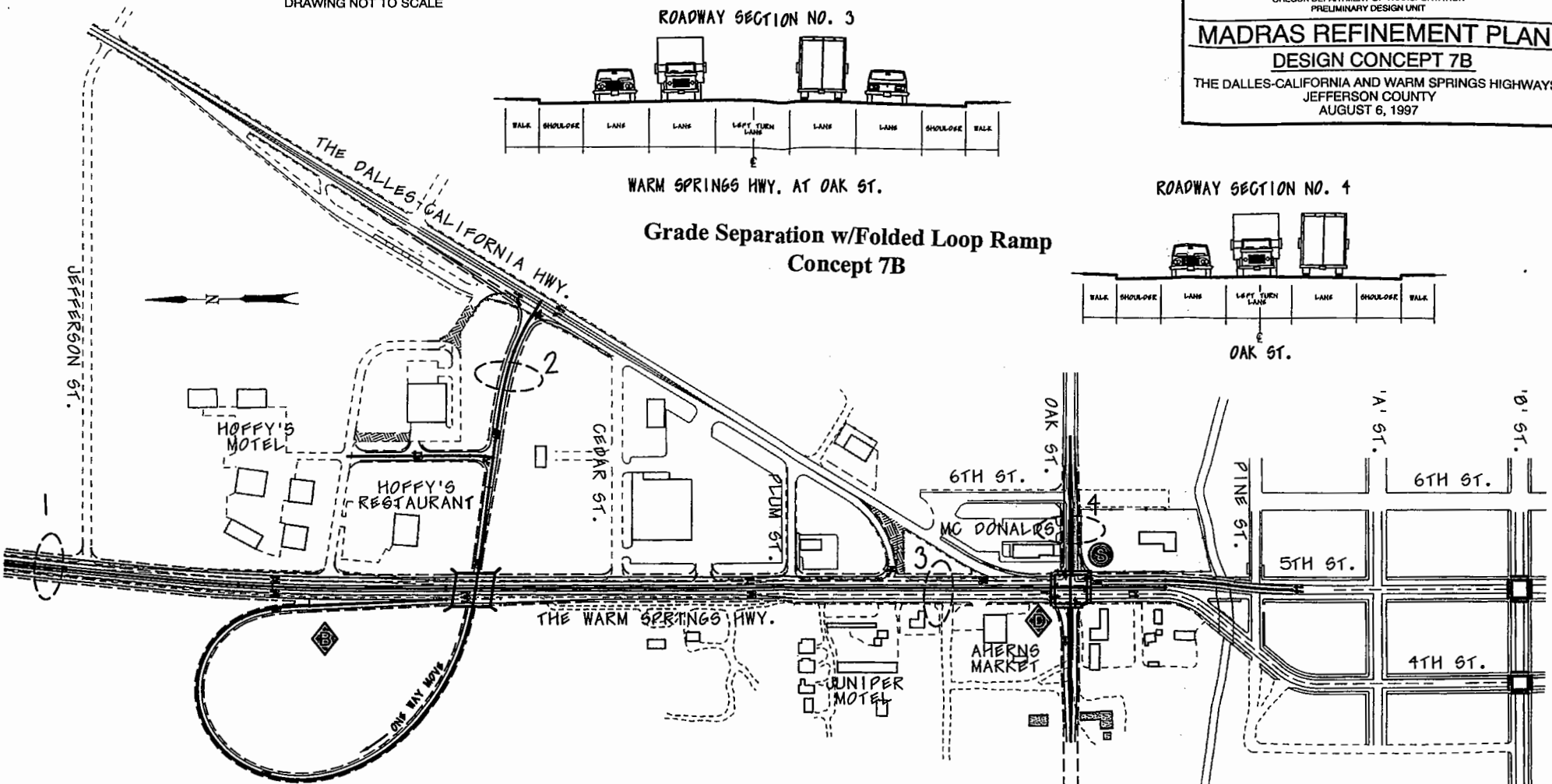
Grade Separation w/Folded Loop Ramp
Concept 7B

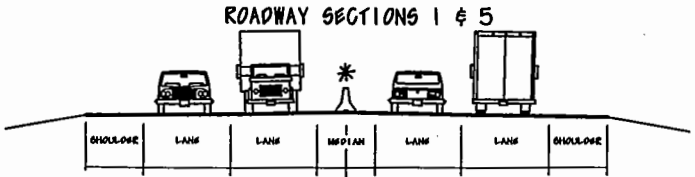
ROADWAY SECTION NO. 3

WARM SPRINGS HWY. AT OAK ST.

ROADWAY SECTION NO. 4

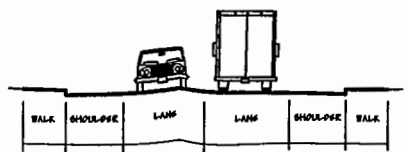
OAK ST.





ROADWAY SECTIONS 1 & 5

WARM SPRINGS HWY. NORTH OF HOFFY'S
* SOUTH OF JEFFERSON ST. TO BRIDGE

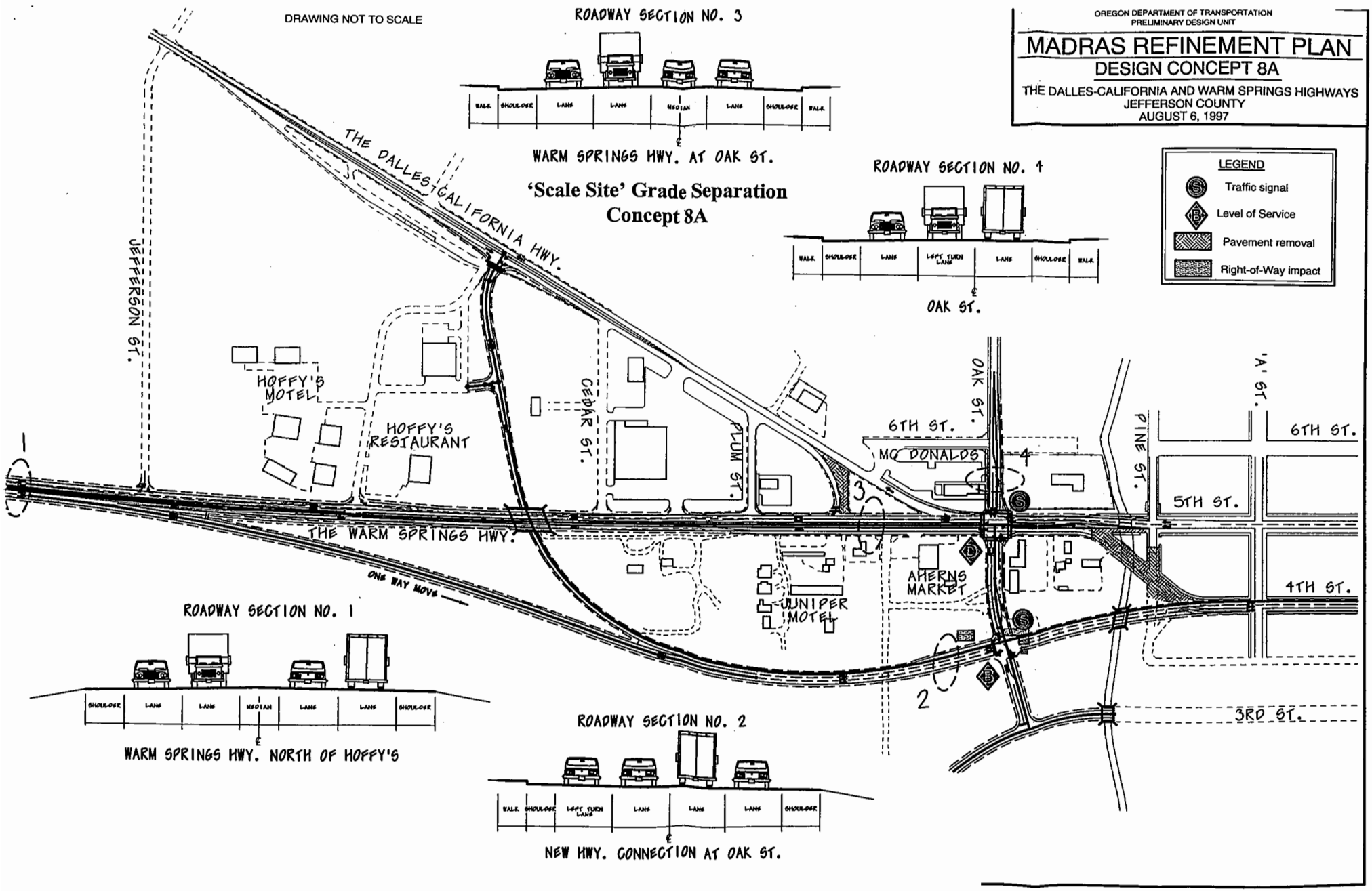


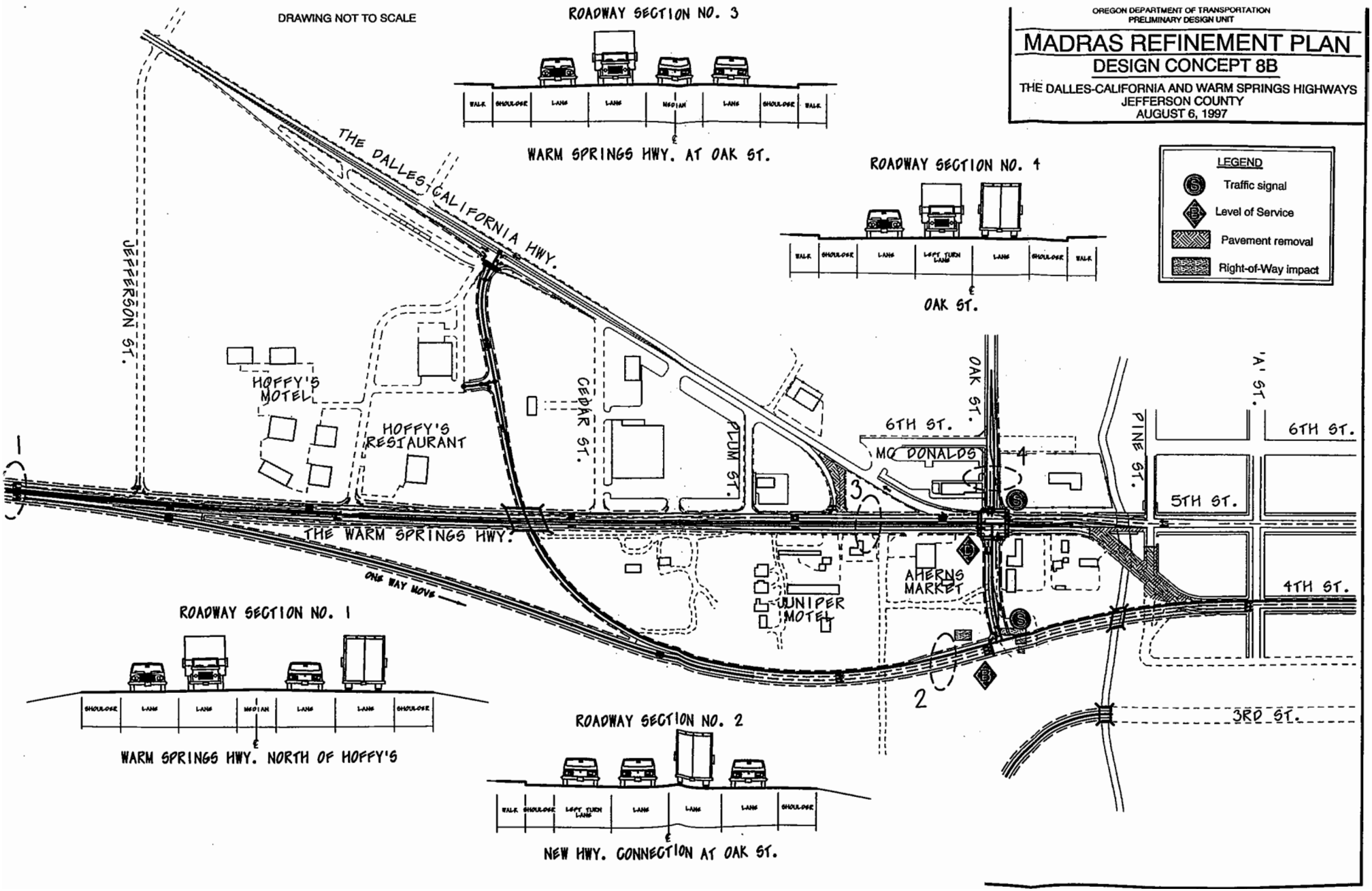
ROADWAY SECTION NO. 2

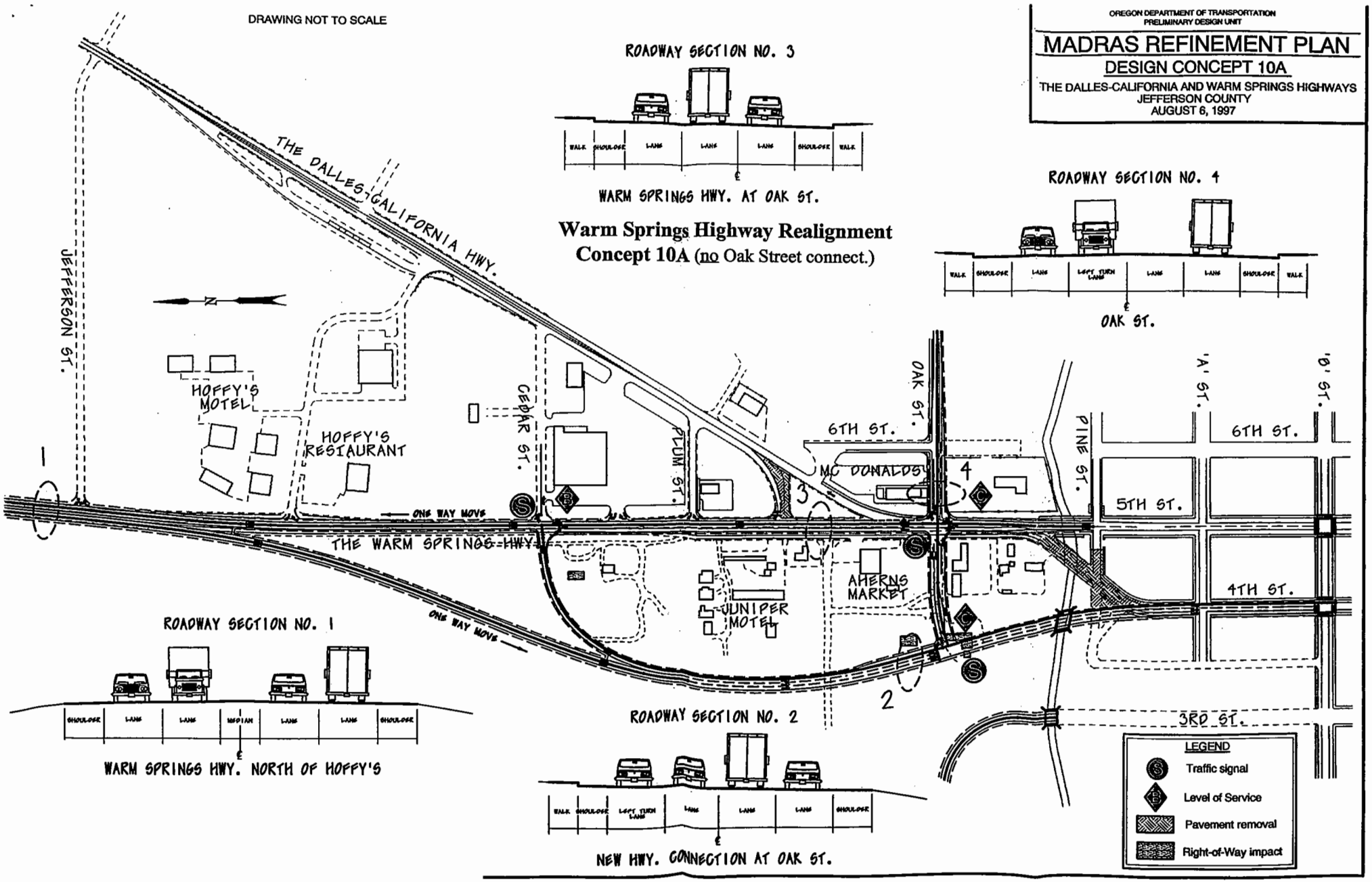
NEW HWY. 97 TO HWY. 26 CONNECTION

LEGEND

- Traffic signal
- Level of Service
- Pavement removal
- Right-of-Way impact


DRAWING NOT TO SCALE
ROADWAY SECTION NO. 3
WALK SHOULDER LANE LANE MEDIAN LANE SHOULDER WALK
WARM SPRINGS HWY. AT OAK ST.
'Scale Site' Grade Separation
Concept 8A
ROADWAY SECTION NO. 4
WALK SHOULDER LANE LEFT TURN LANE LANE SHOULDER WALK
OAK ST.
OREGON DEPARTMENT OF TRANSPORTATION
PRELIMINARY DESIGN UNIT
MADRAS REFINEMENT PLAN
DESIGN CONCEPT 8A
THE DALLES-CALIFORNIA AND WARM SPRINGS HIGHWAYS
JEFFERSON COUNTY
AUGUST 6, 1997
LEGEND
Traffic signal
Level of Service
Pavement removal
Right-of-Way impact
THE DALLES-CALIFORNIA HWY.
JEFFERSON ST.
HOFFY'S MOTEL
HOFFY'S RESTAURANT
CEDAR ST.
PLUM ST.
OAK ST.
6TH ST.
MC DONALDS
'A' ST.
PINE ST.
5TH ST.
4TH ST.
3RD ST.
THE WARM SPRINGS HWY.
ONE WAY MOVE
JUNIPER MOTEL
AHERNS MARKET
1
2
3
4
ROADWAY SECTION NO. 1
SHOULDER LANE LANE MEDIAN LANE LANE SHOULDER
WARM SPRINGS HWY. NORTH OF HOFFY'S
ROADWAY SECTION NO. 2
WALK SHOULDER LEFT TURN LANE LANE LANE LANE SHOULDER
NEW HWY. CONNECTION AT OAK ST.


DRAWING NOT TO SCALE
ROADWAY SECTION NO. 3
WALK SHOULDER LANE LANE MEDIAN LANE SHOULDER WALK
WARM SPRINGS HWY. AT OAK ST.
OREGON DEPARTMENT OF TRANSPORTATION
PRELIMINARY DESIGN UNIT
MADRAS REFINEMENT PLAN
DESIGN CONCEPT 8B
THE DALLES-CALIFORNIA AND WARM SPRINGS HIGHWAYS
JEFFERSON COUNTY
AUGUST 6, 1997
ROADWAY SECTION NO. 4
WALK SHOULDER LANE LEFT TURN LANE LANE SHOULDER WALK
OAK ST.
LEGEND
Traffic signal
Level of Service
Pavement removal
Right-of-Way impact
THE DALLES-CALIFORNIA HWY.
JEFFERSON ST.
HOFFY'S MOTEL
HOFFY'S RESTAURANT
CEDAR ST.
PLUM ST.
OAK ST.
6TH ST.
MC DONALDS
PINE ST.
'A' ST.
6TH ST.
5TH ST.
4TH ST.
3RD ST.
THE WARM SPRINGS HWY.
ONE WAY MOVE
AHERNS MARKET
JUNIPER MOTEL
1
2
3
4
ROADWAY SECTION NO. 1
SHOULDER LANE LANE MEDIAN LANE LANE SHOULDER
WARM SPRINGS HWY. NORTH OF HOFFY'S
ROADWAY SECTION NO. 2
WALK SHOULDER LEFT TURN LANE LANE LANE LANE SHOULDER
NEW HWY. CONNECTION AT OAK ST.


DRAWING NOT TO SCALE
OREGON DEPARTMENT OF TRANSPORTATION
PRELIMINARY DESIGN UNIT
MADRAS REFINEMENT PLAN
DESIGN CONCEPT 10A
THE DALLES-CALIFORNIA AND WARM SPRINGS HIGHWAYS
JEFFERSON COUNTY
AUGUST 6, 1997
Warm Springs Highway Realignment
Concept 10A (no Oak Street connect.)
THE DALLES-CALIFORNIA HWY.
JEFFERSON ST.
HOFFY'S MOTEL
HOFFY'S RESTAURANT
CEDAR ST.
PLUM ST.
OAK ST.
6TH ST.
MC DONALDS
PINE ST.
'A' ST.
'B' ST.
5TH ST.
4TH ST.
3RD ST.
THE WARM SPRINGS HWY.
ONE WAY MOVE
ONE WAY MOVE
AHERNS MARKET
JUNIPER MOTEL
ROADWAY SECTION NO. 1
SHOULDER LANE LANE MEDIAN LANE LANE SHOULDER
WARM SPRINGS HWY. NORTH OF HOFFY'S
ROADWAY SECTION NO. 2
WALK SHOULDER LEFT TURN LANE LANE LANE LANE SHOULDER
NEW HWY. CONNECTION AT OAK ST.
ROADWAY SECTION NO. 3
WALK SHOULDER LANE LANE LANE SHOULDER WALK
WARM SPRINGS HWY. AT OAK ST.
ROADWAY SECTION NO. 4
WALK SHOULDER LANE LEFT TURN LANE LANE LANE SHOULDER WALK
OAK ST.
LEGEND
Traffic signal
Level of Service
Pavement removal
Right-of-Way impact

DRAWING NOT TO SCALE

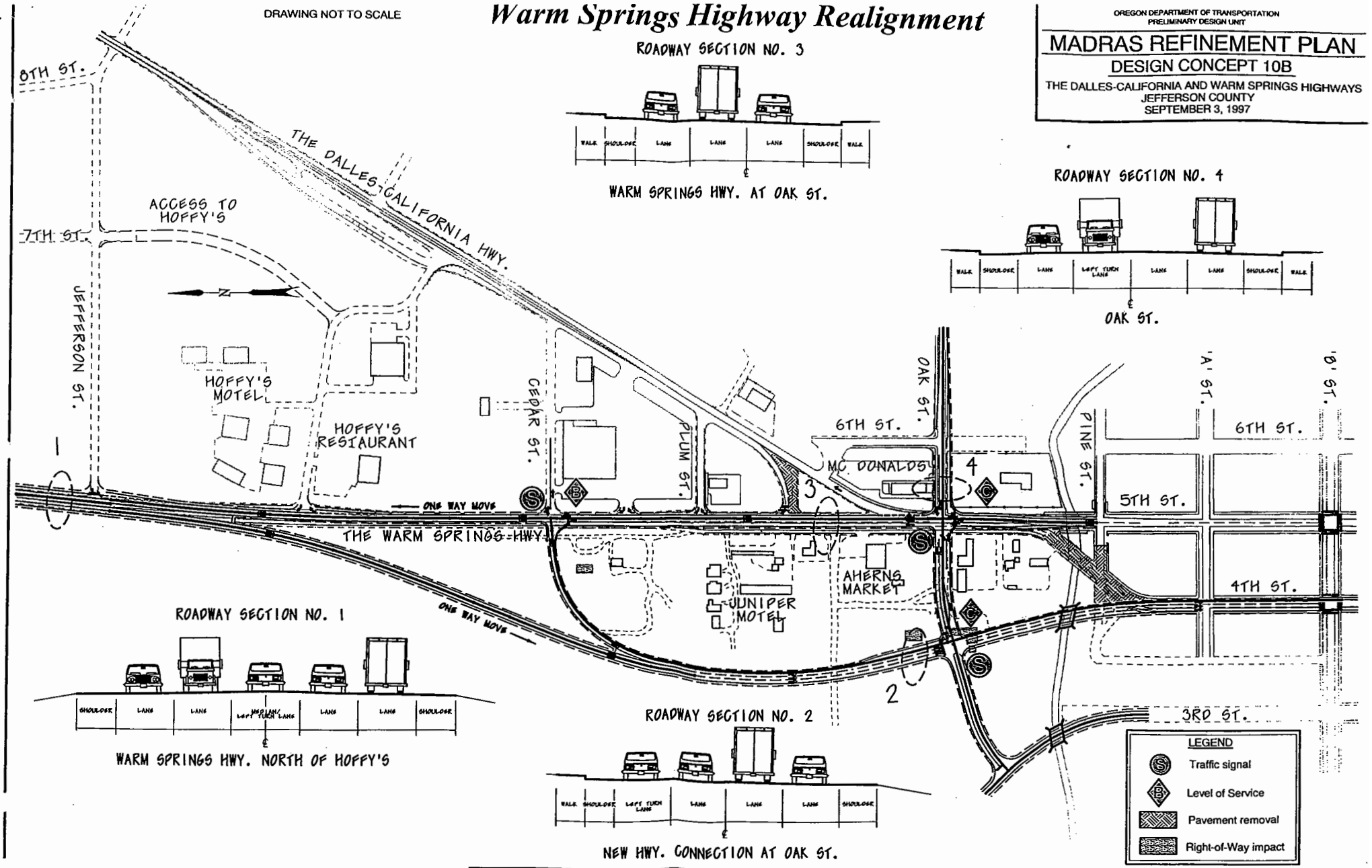
Warm Springs Highway Realignment

OREGON DEPARTMENT OF TRANSPORTATION
PRELIMINARY DESIGN UNIT

MADRAS REFINEMENT PLAN

DESIGN CONCEPT 10B

THE DALLES-CALIFORNIA AND WARM SPRINGS HIGHWAYS
JEFFERSON COUNTY
SEPTEMBER 3, 1997



J. RECOMMENDED ZONING AND SUBDIVISION ORDINANCE AMENDMENTS

Recommended Zoning and Subdivision Ordinance Amendments

Standards for Transportation Projects

Uses Permitted Outright

A. Acquisition of right-of-way for public roads, highways, and other transportation projects identified in the TSP, other than those that partition land located in exclusive farm use zones, are permitted outright and are exempted from the land partition regulations of this ordinance.

B. Normal operation, maintenance, repair, and preservation activities associated with transportation facilities.

C. Installation, repair, or replacement of culverts, pathways, rest areas, weigh stations, temporary storage and processing sites, control signs, fencing, guardrails, median barriers, lighting, and similar types of improvements that take place within the existing right-of-way.

D. Projects specifically identified in the TSP as not requiring further land use regulation.

E. Landscaping as part of a transportation facility.

F. Emergency measures necessary for the safety and protection of property

Conditional Uses Permitted

A. Construction, reconstruction, or widening of highways, roads, bridges or other transportation projects that are: (1) not specifically identified in the TSP as requiring no additional land use regulation, or (2) not designed and constructed as part of a subdivision or planned development subject to site plan and/or conditional use review, shall comply with the TSP and applicable standards, and shall address the following criteria. For State projects that require an EIS or EA, the draft EIS or EA shall be reviewed and used as the basis for findings to comply with the following criteria:

   1. Compatibility with existing land use and social patterns, including noise generation, safety, and zoning.

   2. Avoidance or mitigation of environmental impacts, including wildlife habitat, air and water quality, and cultural resources.

3. Retention of scenic quality, including tree preservation.

4. Means to preserve or improve the safety and function of the facility, including access control, "traffic calming" design, or other design features.

5. Provision for non-motorized traffic.

B. If review under this Section indicates that the use or activity is inconsistent with the TSP, the procedure for a plan amendment, including any necessary goal exceptions, shall be undertaken in conjunction with the conditional permit review.

Time Limitation on Transportation-Related Conditional Use Permits

Authorization of a conditional use shall be void after a period specified by the applicant as reasonable and necessary based on season, right-of-way acquisition, and other pertinent factors. This period shall not exceed three years.

Site Plan Review Requirements

A. The proposed use shall not have an adverse impact on the public transportation system. For developments that are likely to generate more than 200 average daily motor vehicle trips (ADTs), the applicant shall provide adequate information, such as a traffic impact study or traffic counts, to demonstrate the level of impact to the surrounding street system.

B. The determination of impact or effect should be coordinated with the provider of the affected transportation facility.

Conditions such as the following should be included in the Site Plan Review sections, to be applied in the event that a proposed project is demonstrated to potentially have an adverse affect on the transportation system. These conditions are in addition to the conditions imposed by the recommended Access Management Ordinance included previously.

C. Dedication of land shall be required for the creation or improvement of streets, transit facilities, sidewalks, bikeways, paths, or accessways where the existing transportation system will be impacted by or is inadequate to handle the additional traffic caused by the proposed use.

D. Improvements, including but not limited to paving, curbing, installation or contribution to traffic signals or transit facilities, and the construction of sidewalks, bikeways, accessways, paths, or streets that serve the proposed use shall be required as a condition of development where the existing transportation system is not adequate to accommodate the proposed use.

Public Notice Requirements

Amend the Zoning and Subdivision Ordinances to provide for Notice to ODOT regarding any land use action that could potentially affect a State facility. Similarly, all actions by a city or county potentially affecting another jurisdiction's road should require notice to that jurisdiction's public works department. In addition, the policy should be to notice providers of public transit and special interest transportation groups such as truckers, railroad, bicyclists, pedestrians, and the disabled on any roadway or other transportation project.

Information that should be conveyed to reviewers includes:

- Project location.
- Proposed land use action.
- Location of access point(s) on both sides of the road, where applicable;
- Distances to neighboring constructed access points, median openings, traffic signals, intersections, and other transportation features on both sides of the property;
- Number and direction of lanes to be constructed on the driveway, plus striping plans;
- All planned transportation features (lanes, signals, bikeways, sidewalks, crosswalks, etc.);
- Trip generation data or appropriate traffic studies;
- Parking (motor vehicle and bicycle) and internal circulation plans for vehicles and pedestrians;
- Plat map showing property lines, right-of-way, and ownership of abutting properties; and
- A detailed description of any requested variance.

Assuring Consistancy of Comprehensive Plan and Zoning Ordinance Amendments with the TSP

A statement should be added to the local ordinance and policy language governing zone changes and plan amendments as contained in Appendix J.

1. Amendments to acknowledged comprehensive plans and land use regulations which significantly affect a transportation facility shall assure

that allowed land uses are consistent with the identified function, capacity, and level of service of the facility. This shall be accomplished by either:

(a) Limiting allowed land uses to be consistent with the planned function of the transportation facility;

(b) Amending the TSP to provide transportation facilities adequate to support the proposed land uses consistent with the requirement of this division; or,

(c) Altering land use designations, densities, or design requirements to reduce demand for automobile travel and meet travel needs through other modes.

Recommended Ordinances for Bicycle Parking

Amend Article 4, Section 4.5 to add the following:

A. In addition to the existing language of 8.4.5(2), a minimum of 2 parking spaces per use (one sheltered and one unsheltered) shall be required.

B. The following Special Minimum Standards shall be considered as supplemental requirements for the number of required bicycle-parking spaces.

1. **Multi-Family Residences**. Every residential use of 4 or more dwelling units shall provide at least one sheltered bicycle parking space for each unit. In those instances in which the residential complex has no garage or other easily accessible storage unit, the required bicycle parking spaces shall be sheltered under an eave, overhang, independent structure, or similar cover.

2. **Parking Lots**. All public and commercial parking lots and parking structures shall provide a minimum of one bicycle parking space for every 10 motor vehicle parking spaces.

3. **Schools**. Elementary, middle, and high schools, both private and public, shall provide one bicycle parking space for every 10 students and employees, all of which shall be sheltered under an eave, overhang, independent structure, or similar cover.

4. **Colleges**. Colleges, universities, and trade schools shall provide one bicycle parking space for every 10 motor vehicle spaces plus one space for every dormitory unit. Fifty percent of the bicycle parking spaces shall be sheltered under an eave, overhang, independent structure, or similar cover.

5. **Downtown Areas**. In downtown areas with on-street parking, bicycle parking for customers shall be provided along the street at a rate of at least one space per use. Spaces may be clustered

to serve up to six bicycles; at least one cluster per block shall be provided. Bicycle parking spaces shall be located in front of the stores along the street, either on the sidewalks on in specially constructed areas such as pedestrian curb extensions. Inverted "U" style racks are recommended (see illustration Note: not supplied with this draft). Bicycle parking shall not interfere with pedestrian passage, leaving a clear area of at least 5 feet between the parked bicycle and the storefront. Customer spaces are not required to be sheltered. Sheltered parking (within a building, or under an eave, overhang, or similar structure) shall be provided at a rate of one space per 10 employees, with a minimum of one space per store.

6. **Rural Schools, Service Centers, and Industrial Parks**. Where a school, service center, or industrial park is located 5 or more miles from the closest urban area or rural residential subdivision with a density of more than one dwelling unit per 20 acres, a minimum of two bicycle parking spaces per use shall be required.

C. The following formulas for calculating the Number of Required Bicycle Parking Spaces are recommended.

1. Fractional numbers of spaces shall be rounded up to the next whole space.

2. For facilities with multiple uses (such as a commercial center), the bicycle parking requirements shall be calculated by using the total number of motor vehicle parking spaces required for the entire development.

3. "... and provides long-term security" should be added to the section discussing the requirements for covered bicycle parking facilities (8.4.5(4)).

Bicycle and Pedestrian Circulation and Access

A. It may be necessary to include all or some of the following definitions to bring the Zoning or Subdivision Code up to date:

1. **Access Corridor**. A separate travel way for pedestrians and bicyclists to minimize travel distances within and between subdivisions, planned unit developments, residential areas, transit stops (if appropriate), or within and between nearby neighborhood activity centers such as schools, parks, and services.

2. **Bicycle**. A vehicle designed to operate on the ground on wheels, propelled solely by human power, upon which any person or

persons may ride, and with two tandem wheels at least 14 inches in diameter. An adult tricycle is considered a bicycle.

3. **Bicycle Facilities**. A general term denoting improvements and provisions made to accommodate or encourage bicycling, including parking facilities and all bikeways.

4. **Bikeway**. Any road, path, or way that is some manner specifically open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are shared with other transportation modes. The five types of bikeways are:

    a. **Path**. A paved 10 to 12-foot wide way that is physically separated from motorized vehicular traffic; typically shared with pedestrians, skaters, and other users.

    b. **Lane**. A 4 to 6-foot wide portion of the roadway that has been designated by permanent striping and pavement markings for the exclusive use of bicycles.

    c. **Shoulder Bikeway**. The paved shoulder of a roadway that is 4 to 6 feet wide; typically shared with pedestrians in rural areas.

    d. **Shared Roadway**. A travel lane that is at least 14 feet wide and is shared by bicyclists and motor vehicles.

    e. **Trail**. An unpaved path that accommodates all-terrain bicycles; typically shared with pedestrians.

5. **Pedestrian Facilities**. A general term denoting improvements and provisions made to accommodate or encourage walking, including sidewalks, accessways, crosswalks, ramps, paths, and trails.

B. Required elements for a site plan should include the design and location of bicycle parking and bicycle and pedestrian circulation elements such as accessways, walkways, and transit facilities. The following language should be added to Article 4, Section 4.2 of the Madras Land Use regulations:

    1. Bicycle Parking. The development shall include the number and type of bicycle parking facilities required in the Off-Street Parking and Loading section of this Title. The location and design of bicycle parking facilities shall be indicated on the site plan.

2. Pedestrian Access and Circulation.

    a) Article 4, Section 4.2 (1) should include the following: internal pedestrian circulation shall be provided in new commercial, office, and multi-family residential developments through the clustering of buildings, construction of hard surface walkways or similar techniques.

3. The following Commercial Development Standards should be considered for adoption by the City, especially for the downtown core:

    a) New commercial buildings along pedestrian ways shall be sited at the front yard setback line for lots with one frontage, and at both front yard setback lines for corner lots. For lots with more than two front yards, the building(s) shall be oriented to the two busiest streets. The building(s) shall have an entrance oriented toward the street.

    b) An increase in the front yard setback may be allowed by the Hearings Body or Planning Director if the applicant can demonstrate that one or more of the following factors make it impractical to site the new building at the minimum setback:

        i) Existing development on the site;

        ii) Lot configuration;

        iii) Topography of the lot;

        iv) Significant trees or other vegetation to be retained;

        v) Location of existing driveway accesses.

        Such an increase in the front yard setback shall be the minimum necessary to accommodate the reason for the increase.

    c) Off-street motor vehicle parking for new commercial developments shall be located at the side or behind the building(s).

The City of Madras and Jefferson County Subdivision Ordinances should be improved to reflect the intent of the TPR by adding the following provision to development requirements.

C. Approval of Subdivision Tentative Plans and Final Plats. Information required should include the location and design of all proposed pedestrians and bicycle facilities, including access corridors.

The City of Madras and Jefferson County should consider upgrading the Design Standards to include a section such as the following:

D. Pedestrian and Bicycle Circulation within Subdivision.

1. The tentative plan for a proposed subdivision shall include bicycle and pedestrian facilities and improvements within the subdivision, including accessways as necessary to provide more direct connections through the subdivision. The tentative plan shall demonstrate how the subdivision's internal pedestrian and bikeway system provides safe and convenient connections to the surrounding street system.

Section 8.6(6) of the City of Madras Subdivision Ordinance and Section 719 within the Jefferson County Subdivision Ordinance should incorporate the following language into the existing requirements for cul-de-sac design.

2. Cul-de-Sacs and Accessways.

a) Cul-de-sacs or permanent dead-end streets (not including temporary stubs) shall be allowed where, due to severe topographical or environmental constraints or incompatible existing abutting street patterns, a street connection is determined by the Hearings Body or the Planning Director to be infeasible. In such instances, where feasible, there shall be an access corridor for pedestrians and bicyclists connecting the ends of cul-de-sacs to streets or neighborhood activity centers on the opposite side of the block.

b) Access corridors for pedestrians and bicyclists shall be provided at mid-block where the block is longer than 1,000 feet and the addition of such a corridor would reduce out-of-direction travel for pedestrians and bicyclists.

c) Access corridors for pedestrians and bicyclists shall not be more than 200 feet long and shall be as straight as possible. The access corridor shall be a minimum of 10 feet wide, located within a 20-foot-wide right of way or easement. If the streets within the subdivision are lighted, the accessways shall also be lighted.

d) The Hearings Body or Planning Director may determine, based upon evidence in the record, that an access

corridor is inappropriate or impracticable. Such evidence may include but is not limited to:

1) The nature of abutting existing development makes the construction of an access corridor impracticable;

2) The access corridor would cross a natural area with significant habitat, and construction of the access corridor would be incompatible with the protection of natural values;

3) The access corridor would cross topography where slopes exceed 30% or the corridor grade would exceed an 18% grade; or

4) A cul-de-sac or dead-end street abuts rural resource land at the urban growth boundary, except where the adjoining land is designated as urban reserve.

Street Standards

Urban Streets

1. **Urban Arterials**. All arterials shall include marked and signed 6-foot wide bike lanes on both sides of the street. Arterials shall include 8-foot wide sidewalks on both sides of the street, buffered from the street with a planting strip of at least 5 feet located between the sidewalk and the street. In downtown core areas, the sidewalk shall be 12 feet wide with no buffer required.

2. **Urban Collectors**. All collectors shall include bike lanes at least 5 feet wide. Collectors shall include a 6-foot wide sidewalk with a planting strip of at least 5 feet located between the street and the sidewalk.

3. **Urban Local Streets**. Bikeways are not needed on local streets, since motor vehicle speeds are slow. All local streets shall include a 5-foot wide sidewalk buffered from the street with a planting strip of at least 5 feet.

Rural Streets

1. **Rural Arterials**. All rural arterials should include shoulders (see Table 9-2). In rural areas where rural subdivisions, schools, or commercial centers attract pedestrians, the shoulder should be 6 feet, regardless of ADTs.

2. **Rural Collectors**. All rural collectors should include shoulders (see Table 9-2). In rural areas where rural subdivisions, schools, or commercial centers attract pedestrians, the shoulder should be 6 feet, regardless of ADTs.

3. **Rural Local Streets**. Local streets may include shoulders (see Table 9-2); however, bikeways typically are not needed on rural local streets, since motor vehicle speeds should be slow and population densities are low. If rural subdivision densities are greater than one dwelling per acre, or if a school or other neighborhood attraction is located within walking or bicycling distance of a rural subdivision, then either sidewalks, 6-foot shoulders on both sides of the roadway or a separated 10-foot-wide path should be provided.

Table J-1
RECOMMENDED SHOULDER WIDTHS

Road Classification	ADT under 400	ADT 400-DHV* 100	DHV 100-200	DHV 200-400	DHV over 400
Rural Arterials	4 feet	6 feet	6 feet	8 feet	8 feet
Rural Collectors	2 feet	4 feet	6 feet	8 feet	8 feet
Rural Local	2 feet	4 feet	6 feet	6 feet	8 feet

* DHV (Design Hour Volume) is the expected traffic volume in the peak design hour (usually at commuter times), usually 13 to 25% of ADT.

K. ACCESS MANAGEMENT ORDINANCE

Access Management Ordinance

Section 1. Intent and Purpose

The intent of this ordinance is to provide and manage access to land development, while preserving the regional flow of traffic in terms of safety, capacity, and speed. Major thoroughfares, including highways and other arterials, serve as the primary network for moving people and goods. These transportation corridors also provide access to businesses and homes and have served as the focus for commercial and residential development. If access systems are not properly designed, these thoroughfares will be unable to accommodate the access needs of development and retain their primary transportation function. This ordinance balances the right of reasonable access to private property, with the right of the citizens of the (city/county) and the State of Oregon to safe and efficient travel.

To achieve this policy intent, state and local thoroughfares have been categorized by function and classified for access purposes based upon their level of importance, with highest priority on the Oregon Highway System and secondary priority on the primary network of regional arterials. Regulations have been applied to these thoroughfares for the purpose of reducing traffic accidents, personal injury, and property damage attributable to poorly designed access systems, and to thereby improve the safety and operation of the roadway network. This will protect the substantial public investment in the existing transportation system and reduce the need for expensive remedial measures. These regulations also further the orderly layout and use of land, protect community character, and conserve natural resources by promoting well-designed road and access systems and discouraging the unplanned subdivision of land.

Section 2. Applicability

This ordinance shall apply to all arterials and selected collectors within (city/county) and to all properties that abut these roadways. The access classification system and standards of the Oregon Department of Transportation shall apply to all roadways on the State Highway System.

Section 3. Conformance with Plans, Regulations, and Statutes

This ordinance is adopted to implement the access management policies of the (city/county) as set forth in the TSP.

Section 4. Definitions

1. **Access**. A way or means of approach to provide vehicular or pedestrian entrance or exit to a property.

2. **Access Classification**. A ranking system for roadways used to determine the appropriate degree of access management. Factors considered include functional classification; the appropriate local governments adopted plan for the roadway, subdivision of abutting properties, and existing level of access control.

3. **Access Connection**. Any driveway, street, turnout or other means of providing for the movement of vehicles to or from the public roadway system.

4. **Access Management**. The process of providing and managing access to land development while preserving the regional flow of traffic in terms of safety, capacity, and speed.

5. **Access Management Plan (Corridor)**. A plan illustrating the design of access for lots on a highway segment or an interchange area that is developed jointly by the state, the metropolitan planning organization, and the affected jurisdiction(s).

6. **Connecting Space**. The distance between connections, measured from the closest edge of pavement of the first connection to the closest edge of pavement of the second connection along the edge of the traveled way.

7. **Corner Clearance**. The distance from an intersection of a public or private road to the nearest access connection, measured from the closest edge of the pavement of the intersecting road to the closest edge of the pavement of the connection along the traveled way.

8. **Corridor Overlay Zone**. Special requirements added onto existing land development requirements along designated portions of a public thoroughfare.

9. **Cross Access**. A service drive providing vehicular access between two or more contiguous sites so the driver need not enter the public street system.

10. **Deed**. A legal document conveying ownership of real property.

11. **Directional Median Opening**. An opening in a restrictive median that provides for specific movements and physically restricts other movements. Directional median openings for two opposing left or "U-turn" movements along a road segment are considered one directional median opening.

12. **Easement**. A grant of one or more property rights by a property owner to or for use by the public, or another person or entity.

13. **Oregon Highway System**. The specially designated statewide system of limited access and controlled access facilities, as designated by ODOT and adopted by the legislature that allows for high-speed and high-volume traffic movement within the state.

14. **Frontage Road**. A public or private drive, which generally parallels a public street between the right-of-way and the front building setback, line. The frontage road provides access to private properties while separating them from the arterial street. (See also Service Roads)

15. **Full Median Opening**. An opening in a restrictive median that allows all turning movements from the roadway and the intersecting road or access connection.

16. **Functional Area (Intersection)**. That area beyond the physical intersection of two controlled access facilities that comprises decision and maneuver distance, plus any required vehicle storage length, and is protected through corner clearance standards and driveway connection spacing standards.

17. **Functional Classification**. A system used to group public roadways into classes according to their purpose in moving vehicles and providing access.

18. **Joint Access (or Shared Access)**. A driveway connecting two or more contiguous sites to the public street system.

18. **Lot**. A parcel, tract, or area of land whose boundaries have been established by some legal instrument, which is recognized as a separate legal entity for purposes of transfer of title, has frontage upon a public or private street, and complies with the dimensional requirements of this code.

19. **Lot, Corner**. Any lot having at least two (2) contiguous sides abutting upon one or more streets, provided that the interior angle at the intersection of such two sides is less than one hundred thirty-five (135) degrees.

20. **Lot Depth**. The average distance measured from the front lot line to the rear lot line.

21. **Lot, Flag**. A large lot not meeting minimum frontage requirements and where access to the public road is by a narrow, private right-of-way line.

22. **Lot, Nonconforming**. A lot that does not meet the dimensional requirements of the district in which it is located and that existed before these requirements became effective.

23. **Lot, Through**. (Also called a double frontage lot). Lots that front upon two parallel streets or that front upon two streets that do not intersect at the boundaries of the lots.

24. **Lot Frontage**. That portion of a lot extending along a street right-of-way line.

25. **Lot of Record**. A lot or parcel that exists as shown or described on a plat or deed.

26. **Lot Width**. The horizontal distance between side lot lines measured parallel to the front lot line at the minimum required front setback line.

27. **Manual of Uniform Traffic Control Devices (MUTCD)**. A Federal document adopted by the Oregon Department of Transportation that provides standards for traffic control devices.

28. **Minor Subdivision**. A subdivision of land into not more than two (2) lots where there are no roadways, drainage, or other required improvements.

29. **Nonconforming Access Features**. Features of the access system of a property that existed prior to the date of ordinance adopting and does not conform with the requirements of this code.

30. **Nonrestrictive Median**. A median or painted centerline that does not provide a physical barrier between traffic traveling in opposite directions or turning left, including continuous center turn lanes and undivided roads.

31. **Outparcel**. Parcels of land abutting and external to the larger, main parcel, which is under separate ownership and has roadway frontage.

32. **Parcel**. A division of land comprised of one or more lots in contiguous ownership.

33. **Plat**. An exact and detailed map of the subdivision of land.

34. **Private Road**. Any road or thoroughfare for vehicular travel which is privately owned and maintained and which provides the principal means of access to abutting properties.

35. **Public Road**. A road under the jurisdiction of a public body that provides the principal means of access to an abutting property.

36. **Reasonable Access**. The minimum number of access connections, direct or indirect, necessary to provide safe access to and from the thoroughfare, as consistent with the purpose and intent of this code and any applicable plans and policies of the (city/county).

37. **Restrictive Median**. A physical barrier in the roadway that separates traffic traveling in opposite directions, such as a concrete barrier or landscaped island.

38. **Right-of-Way**. Land reserved, used, or to be used for a highway, street, alley, walkway, drainage facility, or other public purpose.

39. **Service Road**. A public or private street or road, auxiliary to and normally located parallel to a controlled access facility, that maintains local road continuity and provides access to parcels adjacent to the controlled access facility.

40. **Significant Change in Trip Generation**. A change in the use of the property, including land, structures or facilities, or an expansion of the size of the structures or facilities causing an increase in the trip generation of the property exceeding 10 percent more trip generation (either peak or daily) and 100 vehicles per day more than the existing use for all roads under local jurisdiction; or exceeding 25 percent more trip generation (either peak or daily) and 100 vehicles per day more than the existing use for all roads under state jurisdiction, as defined in 335.18, F.S.

41. **Stub-out (Stub-street)**. A portion of a street or cross access drive used as an extension to an abutting property that may be developed in the future.

42. **Subdivision**. Is the process and the result of any of the following:

    a. The platting of land into lots, building sites, blocks, open space, public areas, or any other division of land;

    b. Establishment or dedication of a road, highway, street or alley through a tract of land, by the owner thereof, regardless of area;

    c. The re-subdivision of land heretofore subdivided (however, the sale or exchange of small parcels of land to or between adjoining property owners, where such sale or exchange does not create additional lots and does not result in a nonconforming lot, building, structure or landscape area, shall not be considered a subdivision of land);

    d. The platting of the boundaries of a previously unplatted parcel or parcels.

43. **Substantial Enlargements or Improvements**. A 10 percent increase in existing square footage or 50 percentage increase in assessed valuation of the structure.

44. **Temporary Access**. Provision of direct access to the controlled access facility until that time when adjacent properties develop, in accordance with a joint access agreement or frontage road plan.

Section 5. Corner Clearance

1. Corner clearance for connections shall meet or exceed the minimum connection spacing requirements for that roadway.

2. New connections shall not be permitted within the functional area of an intersection or interchange as defined by the connection spacing standards of this code, unless:

    a. No other reasonable access to the property is available, and

    b. The (permitting department) determines that the connection does not create a safety or operational problem upon review of a site-specific study of the proposed connection prepared by a registered engineer and submitted by the applicant.

3. Where no other alternatives exit, the (permitting department) may allow construction of an access connection along the property line farthest from the intersection. In such cases, directional connections (i.e. right in/out, right in only or right out only) may be required.

4. In addition to the required minimum lot size, all corner lots shall be of adequate size to provide for required frontyard setbacks and corner clearance on street frontage.

Section 6. Joint and Cross Access

1. Adjacent commercial or office properties classified as major traffic generators (i.e. shopping plazas, office parks), shall provide a cross access drive and pedestrian access to allow circulation between sites.

2. A system of joint use driveways and cross access easements shall be established wherever feasible along arterials and the building site shall incorporate the following:

    a. A continuous service drive or cross access corridor extending the entire length of each block served to provide for driveway separation consistent with the access management classification system and standards.

b. A design speed of 10 mph and sufficient width to accommodate two-way travel aisles designated to accommodate automobiles, service vehicles, and loading vehicles;

c. Stub-outs and other design features to make it visually obvious that the abutting properties may be tied in to provide cross-access via a service drive;

d. A unified access and circulation system plan that includes coordinated or shared parking areas is encouraged wherever feasible.

3. Shared parking areas shall be permitted a reduction in required parking spaces if peak demand periods for proposed land uses do not occur at the same time periods.

4. Pursuant to this section, property owners shall:

a. Record an easement with the deed allowing cross access to and from other properties served by the joint use driveways and cross access or service drive;

b. Record an agreement with the deed that remaining access rights along the thoroughfare will be dedicated to the (city/county) and pre-existing driveways will be closed and eliminated after construction of the joint-use driveway;

c. Record a joint maintenance agreement with the deed defining maintenance responsibilities of property owners.

5. The (permitting department) may reduce required separation distance of access points where they prove impractical, provided all of the following requirements are met:

a. Joint access driveways and cross access easements are provided wherever feasible in accordance with this section.

b. The site plan incorporates a unified access and circulation system in accordance with this section.

c. The property owner shall enter a written agreement with the (city/county), recorded with the deed, that pre-existing connections on the site will be closed and eliminated after construction of each side of the joint use driveway.

6. The (permitting department) may modify or waive the requirements of this section where the characteristics or layout of abutting properties would make a development of a unified or shared access and circulation system impractical.

Section 7. Access Connection and Driveway Design

1. Driveway width shall meet the following guidelines:

    a. If the driveway is a one way in or one way out drive, then the driveway shall be a minimum width of 16 feet and shall have appropriate signage designating the driveway as a one way connection.

    b. For two-way access, each lane shall have a width of 12 feet and a maximum of three lanes shall be allowed. Whenever more than two lanes are proposed, entrance and exit lanes shall be divided by a median. The median shall be 10 feet wide.

    c. Driveways that enter the major thoroughfare at traffic signals must have at least two outbound lanes (one for each turning direction) of at least 12 feet width, and one inbound lane with a 14 feet width.

2. Driveway approaches must be designed and located to provide an exiting vehicle with an unobstructed view. Construction of driveways along acceleration or deceleration lanes and tapers shall not be allowed unless there is no reasonable alternative access.

3. Driveway width and flair shall be adequate to serve the volume of traffic and provide for rapid movement of vehicles off of the major thoroughfare, but standards shall not be so excessive as to pose safety hazards for pedestrians, bicycles, or other vehicles. (Suggested standards appear in Table 9-1).

Table K-1: Suggested Access Connection Design

Trips/Day	1-20		21-600		601-4000	
Trips/Hour	or 1-5		or 6-60		or 61-400	
	Urban Section	Rural Section	Urban Section	Rural Section	Urban Section	Rural Section
Connection Width (2-way)	12' min 24' max	12' min 24' max	24' min 36' max	24'min 36'max	24' min 36' max	24' min 36' max
Flare (Drop Curb)	10' min	N/A	10' min	N/A	N/A	N/A
Returns (Radius)	N/A	15' min 25' std 30' max	small radii may be used	25' min 50' std 75' max	25' min 50' std 75' max	25' min 50' std (or 3 curves)
Angle of Drive			60'-90'	60'90'	60'-90'	60-90'
Divisional Island			4'-22 wide	4'-22' wide	4'22' wide	4'22' wide

Source: Florida Department of Transportation Standard Index, Roadway and Traffic Design Standards. 1992.

***Note: These standards are not intended for major access connections carrying over 4,000 vehicles per day.**

5. The length of driveways shall be designed in accordance with the anticipated storage length for entering and exiting vehicles to prevent vehicles from backing into the flow of traffic on the public street or causing unsafe conflicts with on-site circulation.

Section 8. Requirements for Outparcels and Phased Development Plans

1. In the interest of promoting unified access and circulation systems, development sites under the same ownership or consolidated for the purposes of development and comprised of more than one building site shall not be considered separate properties in relation to the access standards of this code. The number of connections permitted shall be the minimum number necessary to provide reasonable access to these properties, not the maximum available for that frontage. All necessary easements, agreements, and stipulations shall be met. This shall also apply to phased development plans. The owner and all lessees within the affected area are responsible for compliance with the requirements of this code and both shall be cited for any violation.

2. All access to the outparcel must be internalized using the shared circulation system of the principle development or retail center. Access to outparcel shall be designed to avoid excessive movement across

parking aisles and queuing across surrounding parking and driving aisles.

Section 9. Emergency Access

1. In addition to minimum side, front, and rear yard setback and building spacing requirements specified in this code, all buildings and other development activities such as landscaping, shall be arranged on site so as to provide safe and convenient access for emergency vehicles.

Section 10. Transit Access

1. In commercial or office zoning districts where transit service is available or is planned to be available; provisions shall be made for adequate transit access.

Section 11. Nonconforming Access Features

1. Permitted access connections in place as of **(date of adoption)** that do not conform with the standards herein shall be designated as nonconforming features and shall be brought into compliance with applicable standards under the following conditions:

    a. When new access connection permits are requested;

    b. Substantial enlargements or improvements;

    c. Change in use; or

    d. As roadway improvements allow.

Section 12. Reverse Frontage

1. Access to double frontage lots shall be required on the street with the lower functional classification.

3. When a residential subdivision is proposed that would abut an arterial, it shall be designed to provide through lots along the arterial with access from a frontage road or interior local road. An access easement shall be recorded with the deed on the lots adjacent to the arterial. The access easement shall be dedicated to the (city/county).

4. If a berm or buffer yard is required adjacent to the arterial, the berm or buffer yard shall not be located with the public right-of-way.

Section 13. Flag Lot Standards

1. Flag lots shall not be permitted when their effect would be to increase the number of properties requiring direct and individual access connections to the State Highway System or other major thoroughfares.

2. Flag lots may be permitted for residential development, when deemed necessary to achieve planning objectives, such as reducing direct access to thoroughfares, providing internal platted lots with access to a residential street, or preserving natural or historic resources, under the following conditions:

    a. Flag lot driveways shall be separated by at least twice the minimum frontage requirement of that zoning district.

    b. The flag lot driveway shall have a minimum width of 20 feet and maximum width of 32 feet.

Section 14. Lot Width-to-Depth Ratios

1. To provide for proper connectivity via block size and distance between local streets, the depth of any lot or parcel shall not exceed 3 times its width (or 4 times its width in rural areas).

Section 15. Shared Access

1. Development with frontage on the State Highway System shall be designed to provide for shared access points to and from the highway.

Section 16. Connectivity

1. The street system of a proposed subdivision shall be designed to coordinate with existing, proposed, and planned streets outside of the subdivision as provided in this Section.

2. Wherever a proposed development abuts unplatted land or a future development phase of the same development, street stubs shall be provided as deemed necessary by the (city/county) to provide access to abutting properties or to logically extend the street system into the surrounding area. All street stubs shall be provided with a temporary turn-around or cul-de-sac unless specifically exempted by the Public Works Director, and the restoration and extension of the street shall be the responsibility of any future developer of the abutting land.

3. Collector Street shall intersect with collector or arterial streets at safe and convenient locations.

4. Subcollector and local residential access streets shall connect with surrounding streets to permit the convenient movement of traffic

between residential neighborhoods or facilitate emergency access and evacuation. Such connections shall not be permitted where the effect would be to encourage the use of such streets by through traffic.

Section 17. Subdivisions

1. A subdivision shall conform to the following standards:

    a. Each proposed lot must be buildable in conformance with the requirements of this Code and all other applicable regulations.

    b. Each lot shall abut a public or private street for the required minimum lot frontage for the zoning district where the lots are located and meet the minimum spacing requirements for private access drives.

    c. If any lot abuts a street right-of-way that does not conform to the design specifications of this Code, the owner may be required to dedicate one-half the right-of-way width necessary to meet minimum design requirements and construct half-street improvements.

2. Further subdivision of the property shall be prohibited unless applicants submit a plat or development plan in accordance with requirements in this Code.

Section 18. Private Roads

1. Private roads may be permitted in accordance with the requirements of this Section and the following general standards shall apply:

    a. All private roads shall be constructed to public specifications and be contained inside an easement of sufficient width to contain the travelway and any utilities required by the development, except as otherwise provided in this Section.

    b. Private roads shall have all traffic control features, such as striping or markers, in conformance with the Manual or Uniform Traffic Control Devices.

    c. The minimum distance between private road outlets on a single side of a public road shall be consistent with the access classification and standards for state roads and local thoroughfares.

    d. All properties served by the private road shall provide adequate access for emergency vehicles and shall conform to the approved local street numbering system.

e. All private roads shall be designated as such and will be required to have adequate signage indicating the road is a private road and not publicly maintained.

f. All private roads shall have a posted speed limit not to exceed twenty miles an hour.

2. Private roads in rural and semi-rural areas may be permitted reductions in easement and roadway width and pavement standards to retaining the rural character of the landscape and design flexibility. At a minimum, the private road shall meet the (city/county) construction specifications. Other standards shall apply in accordance with the following schedule:

   a. A private road serving up to 2 lots shall have a minimum easement width of 30 feet and a 12 foot travelway.

   b. A private road serving 3 to 6 lots shall have a minimum easement width of 30 feet and a 16 foot travelway.

   c. A private road serving 7 to 12 lots shall have a minimum easement width of 66 feet and a 20 foot travelway. Paving shall be required for all areas with grades of greater than three (3%) percent. Such pavement shall be a minimum of 18 feet in width.

   d. A private road serving 13 to 24 lots shall have a minimum right-of-way easement of 66 feet, a roadbed of at least 24 feet and shall be paved.

   e. A private road serving 25 or more lots or parcels shall provide at least two access connections to a public road and shall meet the minimum design requirements for public roads.

3. Applications for subdivision approval that includes private roads shall include a drainage plan and road construction plan, prepared by a registered engineer. The (city/county) Public Works Official shall review private road plans for conformance with this Code.

4. Construction permits are required for connection to public roads. Application for road construction shall be made concurrent with the creation of a lot that does not have frontage on a public road. A road construction permit shall be issued after approval of the private road plan and the entire length of the road shall be inspected during construction and upon completion. If found in conformance, a final use permit shall be issued.

5. No building permit shall be issued for any lot served by a private road until the private road has been constructed and approved.

6. A road maintenance agreement, shall be recorded with the deed of each property to be served by a common private road. The agreement shall provide for:

    a. A method to initiate and finance a maintenance program to keep the private road in good condition;

    b. A method of apportioning maintenance costs to current and future property owners;

    c. A provision that the (city/county) may inspect, and if necessary, require that repairs be made to the private road to ensure that safe access is maintained for emergency vehicles. If required repairs are not made within six months of date of notice, the (city/county) may make the necessary repairs and assess owners of parcels included in the road maintenance agreement the cost of all improvements plus an administrative fee, not to exceed 25 percent of total costs;

    d. A provision that the majority vote of all property owners on the road shall determine how the road is maintained except in the case of emergency repairs as outlined above;

    e. A statement that no public funds shall be used to construct repair of maintains the road;

    f. A provision requiring mandatory upgrading of the roadway if additional parcels are added to reach the thresholds specified above; and

    g. A provision that property owners along that road are prohibited from restricting or in any manner interfering with normal ingress and egress by any other owners or persons needing to access properties with frontage on that road.

7. No private road shall be incorporated into the public road system unless it is built to public road specifications. The property owners shall be responsible for bringing the road into conformance.

8. All private roads shall have a sign and name meeting (city/county) standards and shall include the following notice: "Private Road" "Not maintained by the (city/county)."

9. The Director of Public Works will establish an application and annual fee to cover administrative, processing, and inspection costs.

10. All purchasers of property served by a private road shall, prior to final sale, be notified that the property receives access from a private road. The notice shall also state that the road shall be maintained collectively by all property owners along that road. The property owner shall be

informed that the (city/county) shall not be held responsible for maintaining or improving the private road. Finally, the property owner shall be informed that an easement to provide access to the property has been recorded with the deed for that property.

Section 19. Regulatory Flexibility

1. The Hearings Body may permit departure from dimensional lot, yard, and bulk requirements of the zoning district where a subdivision or other development plan is proposed to encourage creativity in site design, protect natural resources, and advance the access objective of this Code.

Section 20. Site Plan Review Procedures

1. Applicants shall submit a preliminary site plan for review by the Planning Department. At a minimum, the site plan shall show:

    a. Location of access point(s) on both sides of the road where applicable;

    b. Distances to neighboring constructed or permitted access points, median openings, traffic signals, intersections, and other transportation features on both sides of the property;

    c. Number and direction of lanes existing or to be constructed on the driveway plus striping plans;

    d. All planned transportation features (such as auxiliary lanes, signals, etc.);

    e. Trip generation data or appropriate traffic studies;

    f. Parking and internal circulation plans;

    g. Plat map showing property lines, right-of-way, and ownership of abutting properties; and

    h. A detailed description of any requested variance and the reason the variance is requested.

2. Subdivision and site plan shall not be approved unless it meets the following requirements:

    a. The road system is designed to meet the projected traffic demand and is consistent with the hierarchy of roads and is designed according its functional classification.

b. Access meets minimum sight distance, driveway spacing, and other related considerations, including opportunities for joint and cross access. Entry roads shall be clearly visible from the major arterials.

c. Automobile movement shall be accommodated internal to the site without having to use the peripheral road network.

d. The road system shall provide direct and convenient access to buildings for residents, visitors, deliveries, emergency vehicles, and garbage collection.

g. Sidewalks shall be provided alongside all roads, and shall be set back a minimum of 5 feet from the edge of pavement.

h. Pedestrian paths shall link buildings with parking areas, entrances to the development, open space and recreational and other community facilities.

3. The (city/county) reserves the right to require traffic and safety analysis where the proposed development will generate 200 or more vehicular trips per day, safety is an issue, or where significant problems already exist.

5. Upon review of the access application, the (permitting department) may approve the access application, approve with conditions, or deny the application.

5. The Oregon Department of Transportation shall review any application that involves access to the State Highway System for conformance with state access management standards. Where the applicant is also requesting other land use approvals, such as a zoning change, subdivision or site plan review, development review shall be coordinated with the Oregon Department of Transportation, as follows:

a. ODOT traffic operations shall review the application as it relates to access and access related impacts of the development on the State Highway system. ODOT may require the applicant to submit additional information necessary to adequately review the access request. Information required of the applicant may vary depending upon the size and timing of the development, but shall at a minimum meet the requirements of this section.

b. Upon review of the application, ODOT shall advise the Planning Department whether the access application will be approved, approved with conditions, or denied.

1. If the application is approved with conditions, the applicant shall resubmit the plan with the conditional changes made. The plan, with submitted changes, will be reviewed and either approved or rejected.

8. If the access permit is denied, the (city/county) shall provide a letter detailing why the application has been rejected.

9. All applicants whose application is approved, or approved with conditions, have 10 days to accept the permit. Applicants whose permits are rejected or approved with conditions have 10 days to appeal.

Section 21. Variance Standards

1. The granting of a variation from the standards shall only be approved if the request is consistent with the purpose and intent of these regulations and shall not be considered until it has been determined that there is no reasonable alternative to the proposed access.

2. Applicants for a variance from these standards must provide proof of unique or special conditions that make strict application of the provisions impractical. This shall include proof that:

    a. Indirect or restricted access cannot be obtained;

    b. No engineering or construction solutions can be applied to mitigate the condition; and

    c. No alternative access is available from a street with a lower functional classification than the primary roadway.

3. A variance may be granted if it is determined that not granting the variance would deny all reasonable access, endanger public health, welfare or safety, or cause an exceptional and undue hardship on the applicant. **No variance shall be granted where such hardship is self-created.**

L. ACCESS MANAGEMENT ORDINANCE

AIRPORT OVERLAY ZONE

SECTION 1. Purpose.

In order to carry out the provisions of (this/these) overlay zone(s), there are hereby created and established certain zones which include all of the land lying beneath the Airport Imaginary Surfaces as they apply to the Madras Airport in the City of Madras and Jefferson County. Such zones are shown on the current Airport Airspace and Runway Protection Zone drawings prepared by _____ and dated _____.

Further, this overlay zone is intended to prevent the establishment of airspace obstructions in airport approaches and surrounding areas through height restrictions and other land use controls as deemed essential to protect the health, safety, and welfare of the people of the City of Madras and Jefferson County.

SECTION 2. Special Definitions.

1. **Utility Runway**. A runway that is constructed for and intended to be used by propeller driven aircraft of 12,500 pounds maximum gross weight or less.

2. **Visual Runway**. A runway that is intended solely for the operation of aircraft using visual approach procedures with no instrument approach procedures has been approved, or planned, or indicated on an FAA or state planning document or military service airport planning document.

3. **Nonprecision Instrument Runway**. A runway having an existing instrument approach procedure utilizing air navigation facilities with only horizontal guidance, or area type navigation equipment, for which a straight-in nonprecision instrument approach procedure has been approved, or planned, or indicated on an FAA or state planning document or military service airport planning document.

4. **Precision Instrument Runway**. A runway having an existing instrument approach procedure utilizing an Instrument Landing System (ILS), Microwave Landing System (MILS), Global Positioning Satellite (GPS) or a Precision Approach Radar (PAR). It also means a runway for which a precision approach system is planned and is not indicated by a FAA approved airport layout plan; any other FAA or state planning documents, or military service airport-planning document.

5. **Airport Imaginary Surfaces**. Those imaginary areas in space which are defined by the Approach Surface, Transitional Surface, Horizontal Surface, and Conical Surface and in which any object extending above these imaginary surfaces is an obstruction.

6. **Airport Hazard**. Any structure, trees, or use of land which exceeds height limits established by the Airport Imaginary Surfaces.

7. **Approach Surface**. A surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the Primary Surface. The inner edge of the approach surface is the same width as the Primary Surface and extends to a width of: 1,250 feet for utility runway having only visual approaches; 1,500 feet for a runway other than a utility runway having only visual approaches; 2,000 feet for a utility runway having a nonprecision instrument approach; 3,500 feet for a nonprecision instrument runway other than utility, having visibility minimums greater than three-fourths of a statute mile; 4,000 feet for a nonprecision instrument runway having visibility minimums as low as three-fourths statute mile; and 16,000 feet for precision instrument runways. The Approach Surface extends for a horizontal distance of 5,000 feet at a slope of 20 feet outward to each foot upward (20:1) for all utility and visual runways; 10,000 feet at a slope of 34 feet outward for each foot upward (24:10 for all nonprecision instrument runways other than utility; and for all precision instrument runways extends for a horizontal distance of 10,000 feet at a slope of 50 feet outward for each foot upward (50:1); thence slopes upward 40 feet outward for each foot upward (40:1) an additional distance of 40,000 feet.

8. **Primary Surface**. A surface longitudinally centered on a runway. When the runway has a specially prepared hard surface, the Primary Surface extends 200 feet beyond each end of that runway. When the runway has no specially prepared hard surface, or planned hard surface, the Primary Surface ends at each end of that runway. The width of the primary Surface is 250 feet for utility runways having only visual approaches, 500 feet for utility runways having nonprecision instrument approaches, 500 feet for other than utility runways having only visual approaches or nonprecision instrument approaches with visibility minimums greater than three-fourths of a mile and 1,000 feet for nonprecision instrument runways with visibility minimums of three-fourths of a mile or less and for precision instrument runways.

9. **Transitional Surface**. Extend seven feet outward for each one foot upward (7:1) beginning on each side of the Primary Surface which point is the same elevation as the runway surface, and form the sides of the approach surfaces thence extending upward to a height of 150 feet above the airport elevation (Horizontal Surface).

10. **Horizontal Surface**. A horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs of 5,000 feet from the center of each end of the Primary Surface of each visual or utility runway and 10,000 feet from the center of each end of the Primary Surface of all other runways and connecting the adjacent arcs by lines tangent to those arcs.

11. **Conical Surface**. Extends 20 feet outward for each one foot upward (20:1) for 4,000 feet beginning at the edge of the horizontal surface (5,000 feet from the center of each end of the Primary Surface of each visual and utility runway or 10,000 feet for all nonprecision instrument runways other than utility at 150 feet above and airport elevation) and upward extending to a height of 350 feet above the airport elevation.

12. **Runway Protection Zone (RPZ)**. An area off the runway end (formerly the clear zone) used to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape and centered about the extended runway centerline. It begins 200 feet (60 m) beyond the end of the arcs usable for takeoff or landing. The RPZ dimensions are functions of the type of aircraft and operations to be conducted on the runway.

13. **Airport Approach Safety Zone**. The land that underlies the approach surface, excluding the RPZ.

14. **Noise Sensitive Area**. Within 1,500 feet of an airport or within established noise contour boundaries exceeding 55 DNL.

15. **Place of Public Assembly**. Structure of place which the public may enter for such purposes as deliberation, education, worship, shopping, entertainment, amusement, awaiting transportation, or similar activity.

SECTION 3. Permitted uses within the Runway Protection Zone (RPZ).

While it is desirable to clear all objects from the RPZ, some uses are permitted, provided they do not attract wildlife, are below the approach surface and do not interfere with navigational aids.

1. Agricultural operations (other than forestry or livestock farms).

2. Golf courses (but not clubhouses).

3. Automobile parking facilities.

SECTION 4. Conditional uses within the Airport Approach Safety Zone.

1. A structure or building accessory to a permitted use.

2. Single family dwellings, mobile homes, duplexes, and multifamily dwellings, when authorized in the primary zoning district, provided the landowner signs and records in the deed and mortgage records of Jefferson County a Hold Harmless Agreement and Aviation and Hazard Easement and submits them to the airport sponsor and the City of Madras and Jefferson County Planning Departments.

3. Commercial and industrial uses, when authorized in the primary zoning district, provided the use does not result in:

    a. Creating electrical interference with navigational signals or radio communication between the airport and aircraft.

    b. Making it difficult for pilots to distinguish between airport lights and lighting from nearby land uses.

    c. Impairing visibility.

    d. Creating bird strike hazards.

    e. Endangering or interfering with the landing, taking off or maneuvering of aircraft intending to use airport.

    f. Attracting a large number of people.

4. Buildings and uses of public works, public service, or public utility nature.

SECTION 5. Procedures.

An applicant seeking a conditional use shall follow procedures set forth in the urban growth management plan/agreement between the City of Madras and Jefferson County. Information accompanying the application shall also include the following:

1. Property boundary lines as they relate to the Airport Imaginary Surfaces.

2. Location and height of all existing and proposed buildings, structures, utility lines, and roads.

In accordance with OAR Chapter 738 Division 100, City of Madras or Jefferson County Planning Authority shall notify the owner of the airport and Oregon Department of Transportation, Aeronautics Section on land use permits or zone changes within 5,000 feet of a visual and 10,000 feet of instrument airport so as to provide Oregon Department of Transportation, Aeronautics Section an opportunity to review and comment.

SECTION 6. Limitations.

1. To meet the standards established in FAA Regulations, Part 77 and OAR Chapter 738 Division 70, no structure shall penetrate into the Airport Imaginary Surfaces as defined above.

2. No place of public assembly shall be permitted in the Airport Approach Safety Zone or RPZ.

3. No structure or building shall be allowed within the RPZ.

4. Whenever there is a conflict in height limitations prescribed by this overlay zone and the primary zoning district, the lowest height limitation fixed shall govern; provided, however, that the height limitations here imposed shall not apply to such structures customarily employed for aeronautical purposes.

5. No glare producing materials shall be used on the exterior of any structure located within the Airport Approach Safety Zone.

6. In noise sensitive areas (within 1,500 feet of an airport or within established noise contour boundaries of 55 DNL and above for identified airports) where noise levels are a concern, a declaration of anticipated noise levels shall be attached to any building permit, land division appeal, deed, and mortgage records. In areas where the noise level is anticipated to be 55 DNL and above, prior to issuance of a building permit for construction of noise sensitive land use (real property normally used for sleeping or normally used as schools, churches, hospitals, or public libraries) the permit applicant shall be required to demonstrate that a noise abatement strategy will be incorporated into the building design which will achieve an indoor noise level equal to or less than 55 DNL. The planning and building department will review building permits or noise sensitive developments.

7. No development that attracts or sustains hazardous bird movements from feeding, watering, or roosting across the runways and/or approach and departure patterns of aircraft. Planning authority shall notify Oregon Aeronautics of such development (e.g., waste disposal sites and wetland enhancements) within the airport overlay zone so as to provide Oregon Aeronautics Section an opportunity to review and comment on the site in accordance with FAA AC 150/5200-33.

M. MIXED-USE LAND USE ORDINANCE

MIXED-USE LAND USE ORDINANCE

The following is an example ordinance for mixed-use development, with an emphasis on providing **"village"** type amenities. Many of the standards included in this ordinance are oriented towards establishing a particular **"aesthetic vision"** for a community. However, this level of design control may be undesirable in some communities, or may be covered within existing ordinances such as site development, sign ordinances, street standards, or off-street requirements.

Section 1. Legislative Intent

The intent of this article is to:

1. Encourage residential and commercial mixed-use developments so that housing demands can be met by greater variety in type, design, and layout of dwellings. For example: a mix of residential dwelling types, a range of lot sizes, and mixed-use structures with offices or apartments above ground level retail uses.

2. Provide opportunities for traditional community living, working, housing, and recreation.

3. Encourage an efficient use of land and public services.

4. Provide a procedure that relates the type, design, and layout of residential development to a particular site's characteristics.

5. Insure that the increased flexibility and design specificity of regulations encourages the disposition of proposals for land development without undue delay.

6. Preserve rural, historic, and agricultural characteristics of the community through appropriate design guidelines.

7. Encourage land development practices that promote public health, safety, and welfare, such as traditional neighborhoods and mixed-use developments.

8. Reduce excessive sprawl and the segregation of land uses, such as large lot suburban subdivisions and strip commercial developments, since these practices result in an inefficient use of land and other resources.

9. Discourage the development of drive-through and drive-to facilities that encourage the excessive use of private automobiles, thereby contributing to traffic congestion.

10. Promote the creation of new neighborhoods and developments that exhibit the design features of existing traditional neighborhoods and small towns in the City of Madras and Jefferson County.

11. Promote the creation of places that are oriented to the pedestrian, and that promote citizen security and social interaction.

Section 2. Applicability

1. The provisions of this Article are a furtherance of the land use and development codes of City of Madras and Jefferson County.

2. This article shall not affect any of the provisions of the City of Madras and Jefferson County subdivision and this zoning ordinance as they apply to City of Madras and Jefferson County as a whole.

3. After a development plan is duly filed, approved, and recorded under the provisions of this article, the land area included in the development plan shall be governed entirely by the provisions of this article. Other provisions of the City of Madras and Jefferson County subdivision and zoning ordinance specifically referenced within this article shall apply.

4. Consideration for approval or disapproval of a mixed-used development shall be based on the effects of the development on the Comprehensive Plan of the City of Madras and Jefferson County. The effects of the development on the use of the property adjacent to and in close proximity to the mixed-use development shall also be considered.

5. This article shall not be construed to mean that the developer of a mixed-use development can by right merely meet the standards set herein. These standards and requirements are minimums only. The City of Madras and Jefferson County may require more stringent standards, based on the specific and unique nature of the site and the surrounding areas. In cases where additional standards are necessary for a specific site, the zoning ordinance and the subdivision ordinance shall apply until the proposed development plan has been filed, approved, and recorded.

Section 3. Modifications

The City of Madras and Jefferson County may, by conditional use approval, permit the modification of the provisions of this article, including but not limited to provisions relating to the percentage of types of dwelling units and the amount of commercial development, in order to encourage mixed-use development. Any conditional use to permit a modification of the requirements of this article shall be subject to the following standards:

1. The design of the modified mixed-use development shall be consistant with the purpose and intent of this article.

2. The design of the modified mixed-use development shall enhance the streetscape and neighborhood, or in any case not have an adverse impact on the streetscape and the neighborhood.

3. The modified mixed-use development shall not result in any danger to the public health, safety, or welfare by blocking reasonable access of emergency vehicles, depriving adjoining properties of adequate light and air, or violating the other purposes for which zoning ordinances are to be enacted.

If the City of Madras and Jefferson County determine that the landowner has met their burden of proof, it may grant a modification of the requirements of this article. In granting modifications, the City of Madras and Jefferson County may impose such conditions as will, in its judgment, secure the objectives and purposes of this article.

Section 4. Applicability of Development Standards and Guidelines

1. The City of Madras and Jefferson County may approve, deny, conditionally approve, or request modifications to a development plan that is deemed to be inconsistent with the development standards and guidelines or the purposes of this article in accordance with the provisions of Section 4 herein.

2. This article contains both development standards, which are normative and set forth as specific requirements, and development guidelines, which define a framework and are only indicative. However, both standards and guidelines shall be interpreted with flexibility. The City of Madras and Jefferson County shall view such standards and guidelines as tools, since exceptional situations requiring unique interpretations can be expected. When applying such standards and guidelines, City of Madras and Jefferson County shall carefully weigh the specific circumstances surrounding each application, and strive for development solutions that best promote the spirit, intent and purposes of this article.

3. The development standards and guidelines contained in this article shall be used as the minimum requirements for evaluating a mixed-use development. However, such standards and guidelines are not intended to restrict creativity, and an applicant may request a modification or exception from any development standard or guideline. The City of Madras and Jefferson County in accordance with Section 4 herein shall approve modifications to the design guidelines and standards contained in this Section.

Section 5. Definitions

Unless otherwise stated, the following words shall, for the purpose of this article, have the meaning herein indicated. Any word used in this article that is not defined herein and which is defined in the City of Madras and Jefferson County zoning ordinance or subdivision ordinance shall, for the purpose of this article, have the meaning defined therein.

1. **Accessory Dwelling**. A year-round housing unit not exceeding 900-square feet, with cooking facilities, sanitary facilities and an independent means of access, either attached to a single-family unit or located on the same lot as a single-family unit.

2. **Alley**. A narrow thoroughfare through the middle of a block giving access to the rear of lots or buildings.

3. **Blank Wall**. An exterior building wall with no openings and generally constructed of a single material, uniform texture and on a single plane.

4. **Boulevard**. A major road with a planted median in the center of two lanes generally with landscaped greenways along both outside edges.

5. **Buffer**. An area within a property or site, generally adjacent to and parallel with the property line, either consisting of existing natural vegetation or created by the use of trees, shrubs, berms, walls, and fences, and designed to limit views and sounds from the development tract to adjacent properties and vice versa.

6. **Build-up Line**. An alignment that dictates an average height to the roof edge line on a street or space.

7. **Building Coverage**. That portion of a lot that is permanently occupied by a permanent structure requiring a building permit to construct.

8. **Building Scale**. The relationship between the mass of a building and its surroundings, including the width of street, open space, and mass of surrounding buildings.

9. **Caliper**. The diameter of a tree trunk measured in inches, four feet above ground level.

10. **Common Open Space**. A parcel, or parcels, of land, an area of water, or a combination of land and water, including floodplain and wetland areas within a development site designed and intended for the use and enjoyment of residents of the development and, where designated, the community at large, and under the common ownership of the residents of the development. The area of parking facilities serving the activities in the common open space may be included in the required area computations. Common open space shall not include:

a. The land area of lots allocated for single family detached dwellings, single family semi-detached dwellings, and duplex dwellings, front yards, side yards, and rear yards, whether or not the dwellings are sold or rented.

b. The land area of lots allocated for apartment and townhouse dwelling construction, including front yards, side yards, rear yards, interior yards, and off street parking facilities whether or not the dwellings are sold or rented.

c. The land area of lots allocated for total commercial use, including front yard, side yards, rear yards, and parking facilities whether or not the commercial facilities are sold or rented.

d. The land use of lots allocated for public and semi-public uses, community clubs and community facilities, including open space for playgrounds and athletic fields which are a part of the principal uses; and front yards, side yards, rear yards, and other open space around the buildings; and parking facilities whether or not the schools and churches are sold or rented.

e. Street rights-of-way, planting strips, driveways, off street parking, and service areas, except the landscaped central median of boulevards.

11. **Elderly Day Care Center**. A building or space in a building and grounds used for the day care of senior citizens. However, it does not provide daily health-related care or services of any kind.

12. **Elevation**. An exterior facade of a structure, or its head-on view, or representation drawn with no vanishing point, and used primarily for construction.

13. **Environmental Constraints**. Features, natural resources or land characteristics that are sensitive to improvements and may require conservation measures or the application of creative development techniques to prevent degradation of the environment, or may require limited development, or in certain instances may preclude development.

14. **Facade**. A building face or wall.

15. **Gable.** The part of the end wall of a building between the eaves and a pitched or gambrel roof.

16. **Gateway**. A principal point of entrance into a district or neighborhood.

17. **Lintel**. A horizontal beam over an opening in a masonry wall, either structural or decorative.

18. **Main Street (Downtown Commercial Area)**. A street containing a mix of uses, including the planned small community greatest concentration of commercial development. If included within a planned small community, the Main Street commercial area, together with the community green, shall form the focus of the neo-traditional neighborhood.

19. **Masonry**. Wall building material, such as brick or stone, which is laid up in small units.

20. **Mass**. The three-dimensional bulk of a structure: height, width and depth.

21. **Modified Grid Street Pattern**. An interconnected system of streets which is primarily rectilinear grid in pattern, however, modified in street layout and block shape as to avoid a monotonous repetition of the basic street/block grid pattern. Streets are limited to a maximum length of 1,000 feet.

22. **Neighborhood Motor Vehicle Service Station or Garage**. A motor vehicle service station or garage that is limited in the intensity of use to serve primarily the immediately surrounding neighborhood. Such facilities shall be limited to two fuel dispensers serving no greater than four motor vehicles at any one time and/or two indoor service bays servicing any greater than two motor vehicles at any one time.

23. **Pilaster**. A column partially embedded in a wall, usually non-structural.

24. **Pitch**. The angle of slope of a roof or berm.

25. **Planting Strip**. A landscaped strip located between the sidewalk and the roadway.

26. **Public Viewshed**. That which is reasonably visible, under average conditions, to the average observer located on any public land or right-of-way, or any semi-public or private space which is normally accessible to the general public.

27. **Sidewalk**. A paved path provided for pedestrian use and usually located at the side of a road within a right-of-way or easement, separated from traffic lanes by a planting strip.

28. **Sidewalk Display**. The outdoor display of merchandise for sale by a commercial establishment. The displayed merchandise must be similar to the merchandise sold within the establishment.

29. **Sign, Graphic**. A sign that illustrates, by its shape and graphics, the nature of the business conducted within.

30. **Signable Area**. The area or areas on a commercial building facade where signs may be placed without disrupting facade composition. The signable area will often include panels at the top of show windows, transoms over storefront doors and windows, signs on fascias and areas between the top of the storefront and the sills of second story windows.

31. **Street Furniture**. Functional elements of the streetscape, including but not limited to benches, trash receptacles, planters, telephone booths, kiosks, sign posts, street lights, bollards, and removable enclosures.

32. **Streetscape**. The built and planted elements of a street which define its character.

33. **Viewshed**. (See Public Viewshed.)

34. **Visually Impervious**. A buffering or screening device which partially (80%) or totally blocks the view to, or from adjacent sites.

Section 6. Permitted Principal Uses

The following uses are permitted in a mixed-use development, subject to all the applicable development standards and requirements.

1. The following residential uses:

    a. Single-family detached dwellings

    b. Duplex dwellings

    c. Townhouse dwellings

    d. Apartment dwellings

    e. Accessory dwellings

2. Public and semi-public uses, including parks and playgrounds and structures typically constructed as part of this type of facility

3. Community clubs

4. Community facilities

5. Day care centers

6. Elderly day care center

7. Churches

8. The following commercial uses:

a. Banks and other financial institutions (drive-through facilities permitted when access is off an alley)

b. Offices, including medical offices

c. Retail sales of goods and services

d. Restaurants, except drive-through facilities

e. Neighborhood motor vehicle service station or garage

9. Golf courses

10. Agricultural uses

11. Public and semi-public recreational uses

12. Equestrian uses, limited to horses for the personal use of residents of the development

13. Cemeteries

14. Bed and Breakfast establishments

Section 7. Permitted Accessory Uses

The following uses are permitted in a mixed use development, subject to all the applicable development standards and requirements:

1. All residential accessory uses shall comply with the Residential Accessory Use Regulations of this Zoning Ordinance, except as modified in this article

2. Home-based offices, providing the following conditions apply:

    a. The home-based office is located in a single-family detached dwelling.

    b. The primary use of the dwelling is as a residence.

    c. In addition to the family occupying the dwelling containing the home office, there shall not be more than one outside employee in the home office.

    d. The employees and clients shall park in on-street curbside parking spaces and shall not park on the lot containing the home office.

    e. Permitted signage area is limited to one facade or freestanding sign not exceeding 2-square feet.

f. The home office shall not exceed 1,000-square feet or 30% of the total square footage of the dwelling or can be located in an accessory building not to exceed 500-square feet.

g. All exterior aspects of the home office operation shall not disrupt the residential character of the area.

3. Accessory uses, buildings or structures for all other non-residential uses as approved by the City of Madras or Jefferson County.

Section 8. Minimum Area

The minimum area required for a mixed-use development shall be 5 acres.

Section 9. Utility Services

Mixed-use developments shall be required to connect to municipal water and sewer. Where a phased approach is required, the site should be engineered for standard sewer lines and the community treatment plant employed until such time that the municipal facilities can accommodate the generated effluent. At such time the treatment plant can be converted to a pump station.

Section 10. Common Open Space

1. Not less than 35% of the gross project area of a mixed-use development shall be allocated to and shall remain in common open space in perpetuity.

2. Common open space shall be deed restricted to prohibit future subdivision or development, except for agricultural, recreational, golf course, equestrian, and cemetery uses, which may be permitted with the approval of the City of Madras and Jefferson County.

3. Common open space shall be used for social and recreational purposes, or to preserve the natural environment.

4. Uses authorized must be appropriate to the character of the common open space, including its topography, size, and vegetation.

5. Common open space uses must be compatible with the character of the development, including its size and density, and the number and type of dwellings to be provided.

6. The minimum size for a common open space within a mixed-use development, with the exception of the central open space described in Item 10-7, shall be 500 square feet.

7. Open space containing existing attractive or unique natural features, such as streams, creeks, ponds, rock outcrops, woodlands, specimen trees and other areas of vegetation worthy of preservation may be left unimproved and in a natural state. As a general principle, the preservation of undeveloped open space in its natural state or farm usage is encouraged.

8. To the greatest extent possible, open space shall include all environmentally sensitive areas, including area with slopes greater than 20%, 100-year floodplains, wetlands, areas of seasonally high water and other such critical areas as may be determined by the City of Madras and Jefferson County. Existing man-made features, such as farmsteads and stone walls, may be preserved through incorporation in common open space.

9. Certain improvements, such as the cutting of trails for walking or jogging and the provision of picnic areas, may be made. In addition, City of Madras and Jefferson County may require a developer to make other improvements such as removal of dead or diseased trees, thinning of trees or other vegetation to encourage more desirable growth and grading and seeding.

10. Open space areas, excepting the central open space discussed in Item 10-7, may be used for golf courses, and public and semi-public recreation purposes with the approval of the City of Madras and Jefferson County.

11. Recreational facilities shall be required to serve the anticipated needs of the residents of the development, taking into account the anticipated characteristics and demographic profile of the development's population, the recreational facilities available in neighboring developments and the relevant provisions regarding recreational facilities contained in the comprehensive plan. Recreation facilities may include soccer, baseball, football and other field sports that require open, unlit fields.

12. Cemeteries may be permitted in open space areas with the approval of the City of Madras and Jefferson County.

13. The buildings, structures and improvements permitted in the common open space shall be appropriate to the authorized uses and shall conserve and enhance the amenities of the common open space with regard to its topography and unimproved condition.

14. A central open space, or "community green," "village common," "town square," or urban park should be included in each mixed-use development. The central open space should be:

    a. A minimum area of 10,000 square feet for developments of 5 acres or greater.

b. Streets should bound this open space with curbside parking at least two sides or a minimum of 50% of its perimeter.

c. The central open space shall be landscaped or left in a natural state such that a minimum of 75% of the area is covered with trees, shrubs, lawn and groundcover.

d. The shape and design of the central open space should be appropriate for concerts, outdoor exhibits, and community gatherings based on the number of residents expected in the development.

e. Public restrooms, public telephones, and police/fire call boxes should be provided in each community green.

f. The community green should be located in an area with a concentration of high density development, including commercial, residential, and public and semi-public uses, community clubs and community facilities.

If the mixed-use development includes a downtown commercial area, the central open space should:

g. Either front upon the main street,

h. The main street should terminate at the central open space, or the main street and the community green should otherwise be incorporated into a combined community focus for the development.

Nothing herein precludes a large tract from containing two separate developments with two separate community greens.

15. The construction schedule of the development shall coordinate the improvement of the common open space with the construction of residential dwellings. At no time in the development of various phases of the mixed-use development may the total area of common open space in the developed phases be less than 15% of the gross area of the developed lands. The location or size of this reserved common open space on remaining land may be altered or changed upon the approval and recording of the development plan of an additional phase of development.

16. The City of Madras and Jefferson County shall approve the method utilized for ownership, administration and maintenance of common open space.

a. The ownership, administration and maintenance of common open space shall be arranged in accordance with one or more of the following:

(1) The City of Madras and Jefferson County may accept dedication of common open spaces or any interest therein for public use and maintenance, with no consideration to be paid by the City of Madras and Jefferson County. Unless waived by the City of Madras and Jefferson County at time of approval, the City of Madras and Jefferson County shall have the option to accept all or any portion of the common open space at any time within ten years of the recording of the final subdivision plan for the development. The final plan shall contain a note, in language acceptable to the City of Madras and Jefferson County, that the common open space is irrevocably dedicated to the City of Madras and Jefferson County for a period of ten years from the date of the recording of the final plan. Said note shall also state that the City of Madras and Jefferson County shall have no duty to maintain or improve the dedicated common open space unless and until it has been accepted by formal action of the council or commission.

(2) The landowner may establish an automatic-membership property owners' association made up of the owners of property in the mixed-use development, as a non-profit corporation for the purpose of owning, administering and maintaining common open space; provided however, the association shall not be dissolved nor shall it dispose of the common open space by sale or otherwise (except to an organization conceived and established to own, administer and maintain common open space approved by the City of Madras and Jefferson County without first offering the common open space for dedication to the City of Madras and Jefferson County. The property owner's association shall be empowered to levy and collect assessments from the property owners of the mixed-use developments to cover replacements, working capital, operating expenses, insurance against casualty, liability and contingencies.

(3) The landowner may establish a deed or deeds of trust, approved by the City of Madras and Jefferson County, for the purpose of owning, administering and maintaining common open space, with the trustee empowered to levy and collect assessments from the property owners of the mixed-use development to cover replacements, working capital, operating expenses, insurance against casualty, liability, and contingencies.

(4) With permission of the City of Madras and Jefferson County and with appropriate deed restrictions in favor of the City of Madras and Jefferson County, the

developer may transfer the fee simple title in the common open space or at portion thereof to a private, non-profit organization among whose purposes is the conservation of open space land and/or natural resources; provided that:

A. The organization is acceptable to the City of Madras and Jefferson County and is a bona fide conservation organization with a perpetual existence.

B. The conveyance contains appropriate and definitive provisions for proper retransfer in the event that the organization becomes unable to continue to carry out its functions.

C. A maintenance agreement acceptable to the City of Madras and Jefferson County is entered into by the developer, organization and City of Madras and Jefferson County.

(5) If a portion of the common open space is to be used for agricultural purposes, that portion of the common open space may be transferred to a person or other entity that will farm the land. Prior to the transfer of any common open space for agricultural purposes, a permanent conservation easement in favor of the City of Madras and Jefferson County, in language acceptable to the City of Madras and Jefferson County, shall be imposed against such land. The conveyance shall contain appropriate provisions for the retransfer or reverter to the City of Madras and Jefferson County or any association or trustee holding the remainder of the common open space in the event the land ceases to be used for agricultural purposes.

(6) If a portion of the common open space is to be used for cemetery purposes, that portion of the common open space may be transferred to a religious organization, cemetery corporation or other similar entity that will operate or maintain the cemetery. Prior to the transfer of any common open space for cemetery purposes, a permanent deed restriction in favor of the City of Madras and Jefferson County, in language acceptable to the City of Madras and Jefferson County, shall be imposed against such land. The conveyance shall contain appropriate provisions for the retransfer or reverter to the City of Madras and Jefferson County or any association or trustee holding the remainder of the common open space in the event the land is not used for cemetery purposes.

17. In the event that the organization established to own and maintain common open space, or any successor organization, shall at any time after the establishment of the mixed-use development fail to maintain the common open space in reasonable order and condition in accordance with the development plan:

    a. The City of Madras and Jefferson County may serve written notice upon such organization or upon the owners of the mixed-use development setting forth the manner in which the organization has failed to maintain the common open space in reasonable condition, and

    b. Said notice shall include a demand that such deficiencies of maintenance by corrected with 30 days thereof, and shall state the date and place of a hearing thereon which shall be held within fourteen days of the notice. At such hearing the City of Madras and Jefferson County may modify the terms of their original notice as to the deficiencies and may give an extension of time within which they shall be corrected.

    c. If the deficiencies set forth in the original notice or in the modifications thereof shall not be corrected within said 30 days or any extension thereof, the City of Madras and Jefferson County, may enter upon the common open space and maintain the same for a period of one year.

    d. Said maintenance by the City of Madras and Jefferson County, as directed by the City of Madras and Jefferson County, shall not constitute a taking of said common open space, nor vest in the public any rights to use the same.

    e. Before the expiration of said year, the City of Madras and Jefferson County shall, upon its initiative or upon the request

of the organization theretofore responsible for the maintenance of the common open space, call a public hearing.

f. Upon notice of public hearing to such organization by the City of Madras and Jefferson County, the organization or the residents of the planned small community shall show **cause why** such maintenance by the City of Madras and Jefferson County, shall not, at the option of the City of Madras and Jefferson County, continue for a succeeding year.

g. If the City of Madras and Jefferson County, or its designated agency, shall determine that such organization is ready and able to maintain the common open space in reasonable condition, the City of Madras and Jefferson County shall cease to maintain said open space at the end of said year.

h. If the City of Madras and Jefferson County or its designated agency determines that such organization is not ready and able to maintain said common open space in a reasonable condition, the City of Madras and Jefferson County may, in its discretion, continue to maintain said common open space during the next succeeding year and, subject to a similar hearing and determination, in each year thereafter.

i. The decision of the City of Madras and Jefferson County shall be subject to appeal to court in such manner, and within the same time limitation as is provided for zoning appeals by the State of Oregon.

j. The cost of maintenance of such common open space by the City of Madras and Jefferson County shall be assessed ratably against the properties within the mixed-use development that have a right of enjoyment of the common open space, and shall become a lien on said properties.

k. The City of Madras and Jefferson County, at the time of entering upon said common open space for the purpose of maintenance, shall file a notice of lien, upon the properties affected by the lien with the mixed-use development.

Section 11. Blocks

1. **BLOCK SIZE**. The street shall be designed to create blocks that are generally rectilinear in shape, a modified rectilinear shape or another distinct geometric shape. Amorphously shaped blocks are generally discouraged, except where topographic or other conditions necessitate such a configuration. To the greatest extent possible, blocks shall be designed to have a maximum length of 200 feet. Alleys shall be permitted to bisect blocks.

2. **FRONT YARD SETBACK**. Each block shall be designated with a build-to line that establishes the front yard setback. Buildings shall be allowed to vary back from the setback line no greater than 75% of the distance from the right-of-way to setback line for residential, and forward of the setback line by no greater than 25% of the distance between the right-of-way and the setback line.

3. **VARIATION OF LOT WIDTH AND AREA**. Lot areas and lot widths shall vary at random to the greatest extent possible, in order to eliminate the appearance of a standardized subdivision. To the extent possible, no more than two lots in a row shall have the same width. Lot widths shall vary by a minimum of five-foot increments.

4. **FLAG LOTS**. A maximum of 5% of all lots for single family detached dwelling may be flag lots.

Section 12. Streets

1. The street layout shall be a modified grid street pattern adapted to the topography and other unique natural features or environmental constraints of the tract. The street layout shall:

    a. Take into consideration the location of the community focus; such as the central open space areas or other gateways and vistas.

    b. A minimum of two interconnections with the existing public street system rated as an arterial or collector shall be provided where possible.

    c. Adjacent developments and neighborhoods shall be linked to the mixed-use development with multi-use paths provided where possible.

2. The use of cul-de-sacs and other roadways with a single point of access shall be minimized. When cul-de-sacs are justified by environmental constraints, a bicycle and/or pedestrian accessway shall be provided to connect the cul-de-sac to an adjacent street.

3. To the greatest extent possible, streets shall be designed to have a maximum length of 600 feet, from intersection to intersection, and, to the greatest extent possible, shall either continue through an intersection, or terminate in a "T" intersection opposite the center of a building of an open space area, or similar of interest view.

4. The street layout shall incorporate a hierarchy of street types as specified in the Subdivision Code and summarized as follows: The arterial shall be used for the primary access to the mixed-use development.

5. Within the mixed-use development, a combination of arterial and downtown commercial streets, as appropriate, will serve commercial and civic streets with the mixed-use development.

6. A combination of collectors and residential streets shall be used for the residential streets. Alleys are required for certain uses and may be used to provide service access; any lot having access from a lane shall additionally front upon one of the other types of streets.

    a. ALLEY.

        (1) Adjacent Land Uses:

            i. Garages

            ii. Parking lots (Landscaped edges)

            iii. Accessory units above garage

            iv. Story height: 1 to 2 stories

            v. Build-to line: 3 feet

            vi. Finished ground floor level: On grade

        (2) An alley may be a private street or easement and not be dedicated to the (City, County). Such streets or easements may be dedicated to the property owners' association of the mixed-use development may be dedicated as common easements across the rear portions of lots.

        (3) Minimum paved width: 16 feet

        (4) Width of easement or right-of-way: 20 feet

        (5) Buildings or fences set back a minimum of 3 feet

        (6) Curbing shall not be required except at corners of intersections with other street types. At such corner locations, curbing shall be required for the entire corner radius and 5 feet preceding it. Such curbing shall not extend more than 6 inches above the finished pavement

        (7) Lane or alley lighting shall be provided on all garages or on poles adjacent to parking areas. Lighting fixtures

and poles shall be of consistent architectural style and shall complement the predominant architectural theme

(8) Design speed shall not exceed 15 mph

b. LOCAL RESIDENTIAL STREET.

(1) Adjacent Land Uses:

i. Small and medium single family lots

ii. Duplex Units

iii. Townhouses

iv. Multi-family

v. Large lot single family with large setbacks

(2) Setback Line: 10 to 15 feet

(3) Story Height: 2 - 3 stories

(4) Finished ground floor level: 2 to 4 feet above sidewalk

(5) Right-of-way width: 50 feet

(6) Paved width: 28 feet

(7) Curbside parking shall be permitted on both sides of the road.

(8) Sidewalks shall be provided on both sides of the road, a minimum of five feet in width.

(9) Curbing shall be required.

(10) Street lamps, a maximum of 12 feet in height shall be provided on both sides of the street, at minimum spacing of 80 feet on-center, and at intersections.

(11) Shade trees shall be planted in five-foot landscape strip on both sides of the street at a minimum spacing of 25 feet on-center.

(12) Design speed shall not exceed 25 mph.

(13) Bicycles can use street without a separate path or lane.

c. DOWNTOWN COMMERCIAL.

(1) Adjacent Land Uses:

i. Community Commercial, Office or Retail/Residential

ii. Mixed Use

(2) Story Height: 2 - 3 stories

(3) Setback line: 5 feet

(4) Finished Ground Floor Level: On grade with sidewalk grade

(5) Right-of-way width: 74 feet

(6) Paved width: 48 feet

(7) Parallel parking shall be provided on both sides of the street. Diagonal head-in parking may be permitted along the front of commercial uses and/or the community green, in which case no parking shall be permitted on the other side of the street. Curbside parking shall not be permitted within 25 feet of an intersection.

(8) Planted landscape strips with a minimum width of 5 feet may be provided; however, tree wells are acceptable where the full 12 feet of sidewalk are provided. Sidewalks shall have a minimum width of 12 feet along commercial uses. At corners, handicapped ramps shall be provided and sidewalks shall be continued across street surfaces using paving materials or similar method to delineate crosswalks.

(9) Lighting shall be provided at a minimum interval of eighty (80) feet and at intersections. Light poles shall form a 40 foot staggered pattern when measured using both sides of the street. Lighting fixtures and poles shall be no higher than 12 feet and constructed from steel, cast iron or aluminum, with poles and fixtures complementing the architectural character of the development. Lighting fixtures and poles shall be of consistent architectural style throughout the zone and shall complement the predominant architectural theme.

(10) Street trees with a minimum of 3-inch caliper or 12-feet high at the time of planting shall be planted at a

minimum of 24 foot intervals. Bottom branches shall be trimmed to a minimum of 12 feet from the ground to allow pedestrian passage in commercial areas. Street trees shall be planted on both sides of the street, in the landscape strip or appropriate tree wells between the curb and the sidewalk if such exists. Existing trees shall be used where possible.

(11) Design speed shall not exceed 25 mph.

d. ARTERIAL.

(1) Adjacent Land Uses:

i. Agricultural

ii. Open space/environmentally sensitive

iii. Large lot single family estates (6 to 25 acres)

(2) Story Height: 2 - 3 stories

(3) Setback line: 150 to 250 feet

(4) Finished ground floor level: not applicable

(5) Right-of-way width: 76 feet

(6) Paved width: 46 feet

(7) An 8-foot wide sidewalk and 6-foot wide landscape strip shall be provided on both sides of the road.

(8) A 6-foot wide bicycle lane shall be located on both sides of the road.

(9) Street trees shall be located in the landscape strips along both sides of this roadway at a minimum of 24-foot intervals. Existing vegetation shall be incorporated wherever possible.

(10) Only uses allowed in the peripheral open spaces should front upon or have access from this road.

(11) Curbside parking shall not be permitted.

(12) Design speed shall not exceed 45 mph.

(13) Street lamps, not exceeding 16 feet in height, shall be provided at a minimum interval of eighty (80) feet and at intersections.

Section 13. Residential Development

1. The maximum allowable number of units and corresponding non-residential uses shall be determined by a capacity of the current base zoning. To the extent possible, the largest number of contiguous and adjacent parcels should be used to create a mixed-use development.

2. A range of residential dwelling types shall be provided in the mixed-use development. The number of single family detached dwellings shall be a maximum of 50% of the total residential units. The remaining number of units shall be a mix of duplexes, townhouses, apartments or accessory dwellings.

3. A mix of dwelling unit types shall be distributed throughout the development. Smaller lots and higher net density dwellings should generally located closer to the main street or downtown commercial area or other central focus. The segregation of different dwelling unit types is discouraged and different types of dwelling units may be mixed in any distribution within any single block, if desired. However, building heights and facades with similar appearance should face each other across a local residential street.

4. Buildings containing dwelling units shall be designed in conformance to the selected design vocabulary (see Section 28 of this Ordinance). Building designs shall vary in terms of footprint, architectural elevations, window design, and type of roof, height, and front entrance and porch locations. Colors, materials and architectural details should be limited in number, compatibility and repetition throughout the neighborhood. Buildings containing dwelling units should vary in appearance but share a common design vocabulary.

5. Accessory dwellings include apartments integrated within single family dwellings, or those located in detached accessory dwellings, such as above garages or agricultural-type outbuildings, located on the same lot as single family dwellings. Accessory dwellings shall be limited to 900 square feet in floor area. There shall not be more than one accessory dwelling located on a lot in addition to the single-family dwelling.

6. Apartment dwellings shall be allowed on upper floors above commercial uses. No more than two units can share a common entrance stair from the ground floor. Elevator access shall be provided for eight or more units in a single building.

7. All residential units shall be raised above the level of the adjacent sidewalk as specified for the various street types. Residential units shall

be raised above ground level at the front of the building by a minimum of two feet.

8. A minimum of 50% of all dwelling units, excluding accessory dwellings and apartment dwellings located on upper floors, shall have a clearly defined front yard using landscaping, hedging, fencing or a brick or stone wall, none of which shall exceed three feet in height. Front yards of attached duplexes or townhouses may be unified into one common yard treated as a single front yard for the entire building.

9. A minimum of 50% of dwelling units, except apartments, shall have a front entrance with a covered front entry porch. Front porches shall generally be located on the front of the dwelling facing the sidewalk. The size of front entry porches shall be a minimum of five-feet deep from the front wall of the dwelling to the enclosing porch rail and ten-feet long.

10. All dwelling units except apartments shall have a private yard or patio a minimum of 400 square feet in area. Ground floor apartments shall have a private yard or patio a minimum of 200 square feet in area. A masonry wall, wooden fence, trellis or lattice, evergreen hedge, vines or some combination shall enclose the yard or patio thereof. The height of such yard or patio enclosure shall not exceed 6 feet and shall be suitable to provide privacy and screen views of neighboring uses.

11. Each upper floor apartment dwelling shall be provided with a terrace consisting of a minimum of 64 square feet, recessed inside the exterior building wall of the dwelling or a balcony of 72 square feet projecting on the outside of the building wall. If a terrace or balcony is not provided for upper floor apartment, each dwelling shall be provided with direct access to a common space, park or green that is a part of or directly adjacent to the apartment building. This common space shall include an additional 100-square feet of area above the required internal open space for each apartment lacking a terrace or balcony. Such additional space shall be designed as outdoor rooms with hard surfaces and places for grills, movable chairs and tables.

Section 14. Commercial Development

1. The commercial density of a mixed-use development shall range from a minimum of 125 square feet of commercial floor area per residential dwelling unit to a maximum of 300 square feet of commercial floor area per dwelling unit. Local convenience retail component should be provided at 250 square feet per dwelling unit.

2. The commercial component of a mixed-use development shall be mandatory and shall be constructed prior to the commencement of construction of the final 25% of the dwellings in the development. If build-out of a mixed-use development is phased, then the minimum amount of commercial use shall be in proportion to the number of residential units constructed during that phase. For the purposes of

calculating the commercial uses, accessory dwellings and apartment dwellings located on upper floor above a commercial use shall be counted as one dwelling unit each.

3. At no time in the development of a mixed-use development shall the commercial density in the developed section be cumulatively less than or greater than the above permitted density.

4. The commercial component shall consist of a minimum of 50% commercial uses that are primarily oriented to serve both the residents of the mixed-use development and those of the immediately surrounding area. The remaining commercial uses may consist of any permitted commercial uses, including other types of retail and service uses.

5. Commercial uses shall be integrated with dwelling units and public and semi-public uses, community clubs, and community facilities. The greatest concentration of commercial development shall be located around a main street commercial area, if such is provided.

6. Commercial uses shall be contained in multi-story, mixed-use structures with commercial/retail uses on the ground level and apartment dwellings or offices on the upper levels. Such buildings shall vary in terms of footprint and architectural elevations. The maximum ground level footprint of a commercial building shall be 5,000-square feet. In a three-story building, the second floor may contain either apartment dwellings or commercial uses.

7. Corner stores may be located in residential areas of the mixed-use development. Corner store buildings shall be designed to appear as a residential building and shall be limited to one ground level commercial use in a not to exceed 1,000-square feet in gross floor area with apartment dwellings on the upper level(s). The commercial use in a corner store shall be primarily oriented to service the residents of the immediately surrounding neighborhood. A corner store building in a primarily residential area will be served by on street parking only.

8. Restaurants shall be permitted to operate outdoor cafes on sidewalks, including areas within the public right-of-way and in courtyards, provided that pedestrian circulation and access to store entrances shall not be impaired. The following standards and guidelines are applicable:

    a. To allow for pedestrian circulation, a minimum of 5 feet of sidewalk along the curb and leading to the entrance to the establishment shall be maintained free of encumbrances.

    b. Planters, posts with ropes, or other removable enclosures are encouraged and shall be used as a way of defining the area occupied by the cafe.

c. Extended awnings, canopies or large umbrellas shall be permitted to provide shade.

d. Outdoor cafes shall be required to provide additional outdoor trash receptacles.

e. Tables, chairs, planters, trash receptacles and other elements of street furniture shall be compatible with the architectural character of the building where the establishment is located.

f. The operators of outdoor cafes shall be responsible for maintaining a clean, litter-free and well-kept appearance within and immediately adjacent to the area of their activities.

9. Commercial uses shall be permitted to have sidewalk displays of retail merchandise. The following standards and guidelines are applicable.

    a. Sidewalk displays shall be permitted in front of an establishment, provided that at least 5 feet of clearance is maintained on the sidewalks and at the storefront entrance for pedestrian access.

    b. Sidewalk displays shall be permitted only during normal business hours and shall be removed at the end of the business day.

    c. Sidewalk displays shall maintain a clean, litter-free and well-kept appearance at all times.

Section 15. Public and Semi-Public Uses

1. A minimum of 2% of the gross tract or 450 square feet per dwelling unit, whichever is less, shall be dedicated as sites for public and semi-public uses, such as community clubs or recreational facilities, churches and religious institutions, day care, libraries, and other institutional uses.

2. Sites for such uses shall be located around the central open space or within a downtown commercial area.

3. Such uses shall occupy prominent buildings that employ additional mass and height, civic architectural design or other distinguishing features.

4. Parking for such uses shall utilize on-street parking to the extent possible. If additional off-street parking is required, it shall be located in the rear of the building or structure and screened from the viewshed of the street.

Section 16. Sidewalks and Bikeways

1. A pedestrian network shall be provided throughout the mixed-use development that interconnects all dwelling units with other units, non-residential uses and common open space.

2. Sidewalks or paved paths shall promote pedestrian activity within each site and throughout the development; they shall be separate and distinct from motor vehicle circulation to the greatest extent possible, provide a pleasant route for users, promote enjoyment of the development, and encourage incidental social interaction among pedestrians.

3. Sidewalks or paved paths shall be of barrier-free design to the greatest extent possible. The pedestrian circulation system should include gathering/sitting areas and provide benches, landscaping and other street furniture where appropriate.

4. Sidewalks shall be a minimum of 5 feet in width, expanding to 6 to 8 feet along major streets; sidewalks in commercial areas shall be at least 12 feet in width.

5. Sidewalks should be constructed of concrete, colored or textured concrete pavers, concrete containing accents of brick, or some similar combination. The functional, visual and tactile properties of the paving materials shall be appropriate to the proposed functions of pedestrian circulation. Paved pathways are addressed in Item 16-5.

6. Walkways shall be raised and curbed along buildings and within parking lots, or treated with similar differentiating technique that creates an obvious pedestrian space.

7. Pedestrian street crossings shall be delineated by some combination of change in pavement color, texture, or elevation.

8. All sidewalks and other pedestrian walkways shall have appropriate lighting, using poles and fixtures consistent with the overall design theme for the development.

9. Bikeways shall be provided to link open space areas and residential and commercial areas. Paved paths are addressed in Item 16-5.

10. Bikeways do not have to be marked on local residential streets with an average daily motor vehicle traffic less than 200.

11. Bike lanes are required on collectors, arterials, and downtown commercial streets.

12. Bike lanes shall be a minimum of 5 feet wide.

13. Bike racks shall be provided in front of commercial and community buildings and at open space areas and recreation areas in the peripheral open space.

14. Adequate space for secure, indoor bicycle parking for at least 2 bicycles per dwelling unit shall be provided for all apartments, multi-family dwellings, and accessory dwellings.

15. Paved paths may be provided in addition to sidewalks and bike lanes to link destinations or to provide more convenient routes for pedestrians and cyclists.

16. Paths shall be designed to be multi-functional, 10 feet wide, and paved with asphalt concrete, concrete, paves, or some other suitable material.

Section 17. Area and Bulk Regulations

1. LARGE LOT SINGLE FAMILY DETACHED DWELLINGS.

    a. Lot area: maximum of 20,000 square feet

    b. Minimum lot width at front yard setback line: 65 feet

    c. Minimum lot depth: 120 feet

    d. Minimum yard setbacks:

        (1) Front yard: 20 feet (maximum of 30 feet)

        (2) Side yard (each side): 10 feet

        (3) Rear yard: 30 feet

    e. Build-up line: 2½ stories; first finished floor level must be a minimum of 2 feet above sidewalk grade

    f. Maximum building coverage: 25%

    g. Minimum open space: 50%

h. Rear or side yard garage required; alley optional

i. Bulk standards for accessory dwellings: an accessory dwelling located on the same lot as a large lot single family dwelling, whether attached or detached to same, shall additionally comply with the bulk standards as specified above without modification, except that a detached accessory dwelling shall be limited to a maximum building height of 25 feet

j. Area and bulk standards for flag lots: flag lots shall comply with the above-specified area and bulk standards, except that minimum lot width at the front yard setback line shall be 15 feet and the minimum yard dimensions for all yards shall be 50 feet.

2. SMALL LOT SINGLE FAMILY DETACHED DWELLINGS.

a. Lot area: maximum of 10,000 square feet

b. Lot width at front yard setback line: minimum of 50; maximum of 65 feet

c. Minimum yard setbacks:

(1) Front yard: 10 feet (maximum of 20 feet)

(2) Side yard (each side): minimum of 5 feet

(3) Rear yard: minimum of 20 feet

d. Build-up line: 2 stories, first finished floor level must be a minimum of 2 feet above sidewalk grade

e. Maximum building height: 35 feet

f. Maximum building coverage: 40%

g. Minimum open space: 50%

h. Rear yard parking required; alley encouraged but optional

i. Additional standards for accessory dwellings: an accessory dwelling located on the same lot as a small lot, detached single family dwelling, whether attached or detached to same, shall additionally comply with the standards as specified above without modification, except that a detached accessory dwelling shall be limited to a maximum building height of 25 feet

j. Area and bulk standards for flag lots: flag lots shall comply with the above-specified area and bulk standards, except that minimum lot width at the street line and the minimum lot width at front yard setback line shall be 15 feet and the minimum yard dimensions for all yards shall be 25 feet.

3. DUPLEX DWELLINGS.

a. Lot area: minimum of 3,000 square feet per dwelling unit and a maximum of 5,000 square feet per dwelling unit

b. Lot width at front yard setback line: minimum of 30 feet per dwelling unit, maximum of 50 feet per dwelling unit

c. Minimum lot depth: 100 feet

d. Minimum Yard setbacks:

(1) Front yard: 10 feet (maximum of 20 feet)

(2) Side yard (one side): 5 feet

(3) Rear yard: 20 feet

e. Build-up line: 2 stories, first finished floor level must be a minimum of 2 feet above sidewalk grade

f. Maximum building height: 35 feet

g. Maximum building coverage: 50%

h. Minimum open space: 40%

i. Rear yard parking and alley required

4. TOWNHOUSE (ROWHOUSE) DWELLINGS.

a. Lot area: minimum of 1,800 square feet per dwelling unit and a maximum of 4,500 square feet per dwelling unit

b. Lot width at front yard setback line: minimum of 20 feet per dwelling unit and a maximum of 30 feet per dwelling unit

c. Minimum lot depth: 100 feet

d. Minimum Yard setbacks:

(1) Front yard: 5 feet (maximum of 20 feet)

(2) Side yard (one side): 5 feet

(3) Rear yard: 20 feet

e. Build-up line: 2½ stories, first finished floor level must be a minimum of 2 feet above sidewalk grade

f. Maximum building height: 35 feet

g. Maximum building coverage: 60%

h. Minimum open area: 30%

i. Maximum building size: 4 dwelling units in a row and 100 feet in length

j. Minimum interior yards (open space between buildings on the same lot): 30 feet

k. Rear yard garage and alley required

5. APARTMENT DWELLINGS.

a. Minimum lot area: 8,800 square feet

b. Lot width: a maximum of 115 feet

c. Minimum lot depth: a maximum of 150 feet

d. Minimum Yard Setbacks:

(1) Front yard: 10 feet (maximum of 20 feet)

(2) Side yard (each side): 10 feet

(3) Rear yard: 55 feet

e. Build-up line: 3 stories, first finished floor level must be a minimum of 2 feet above sidewalk grade

f. Maximum building height: 42 feet

g. Maximum building coverage: 60%

h. Minimum non-impervious area: 30%

i. Maximum building size: 8 dwelling units in a building and 95 feet in length

j. Rear yard parking and alley access are required

6. COMMERCIAL USES AND MIXED-USE BUILDINGS.

    a. Lot area: minimum of 2,500 square feet and a maximum of 16,000 square feet

    b. Lot width at front yard setback line: a maximum of 100 feet

    c. Minimum lot depth: 100 feet

    d. Minimum Yard Setbacks:

        (1) Front yard: 0 feet (maximum of 10 feet)

        (2) Side yard (each side): 0 feet, if attached to an adjacent building; 5 feet if not attached to an adjacent building

        (3) Rear yard: 55 feet (one row of parking)

    e. Build-up line: 3 stories, finished first floor level must be level with sidewalk

    f. Maximum building height: 45 feet

    g. Maximum building coverage: 70%

    h. Minimum non-impervious area: 10%

    i. Maximum building size: 100 feet in length, including adjacent lots if attached thereto

    j. Minimum interior yards (open space between buildings on the same lot): 15 feet

    k. All off-street parking must be in rear yards. Alleys are recommended.

7. COMMUNITY, INSTITUTIONAL, AND RELIGIOUS BUILDINGS.

    a. Lot area: a minimum of 10,000 square feet and a maximum of 40,000 square feet

    b. Lot width at front yard setback line: minimum of 80 feet and a maximum of 150 feet

    c. Minimum lot depth: 110 feet

    d. Minimum Yard Setbacks:

        (1) Front yard: 15 feet

        (2) Side yard (each side): 15 feet

(3) Rear yard: 75 feet

e. Build-up line: 3 stories

f. Maximum building height: 45 feet

g. Steeples or decorative towers: 75 feet

h. Maximum building coverage: 70%

i. Minimum non-impervious area: 20%

j. Maximum building size: 100 feet in length, including adjacent buildings or lots if attached thereto

k. Minimum interior yards (open space between buildings on the same lot): 15 feet

l. All off-street parking must be in rear yards. Alleys are recommended.

Section 18. Required Off-Street and On-Street Parking

1. Off-street parking shall be provided according to minimum requirements as specified below:

USE	MINIMUM REQUIRED PARKING
Single family*	1 garage space per unit
Townhouse and duplex	1 garage or off-street space per dwelling
Apartment dwellings	1 garage or off-street space per dwelling
Accessory dwellings	1 garage or off-street space per dwelling
Retail*	1 space for the first 1,000-square feet and 1 space for each additional 750 square feet
Office uses*	1 space for each 500-square feet of gross floor area
Institutional/Churches/ Community	1 space for each 4 seats

* Additional spaces needed for such uses will be provided with on-street parking. Total on-street and off-street parking for retail and offices shall not exceed one car per 450-square feet for retail and one space per 300 square feet for offices.

2. Off-street parking for commercial uses shall be sufficient to provide parking for the employees of all proposed uses as well as long-term customer parking (over 2 hours).

3. Off-street parking lots shall be prohibited in any front yard setback area, shall be located at the rear of buildings on the interior of lots, and shall be accessed by means of common driveways, preferably from side streets or alleys.

4. Parking lots shall have a maximum of 25 parking spaces. Cross-access easements for adjacent lots with interconnected parking lots shall be required. Common, shared parking facilities are encouraged, where possible.

5. In addition to the off-street parking requirements specified above, on-street parking shall be provided wherever possible to serve short-term customers of commercial uses.

6. Commercial on-street parking shall be provided as curbside, parallel, parking located along both sides of the streets on all blocks upon which commercial use front. Angle parking is discouraged.

7. Parking for all dwelling units shall be prohibited in front yard setback areas. Driveways shall be prohibited in any front yard area, with the exception of detached single family dwellings and duplexes. For other dwelling types driveway access shall be provided from alleys.

8. Driveways and parking areas shall be setback a minimum of three feet from the side of dwelling units and 20 feet from the rear of dwelling units. Driveways shall be setback a minimum of three feet from any side property line, unless such driveway is shared by dwellings on two adjacent lots in which case the driveway may be located with the driveway centerline on the common one on the common side lot line.

9. Parking for townhouses shall be provided in a common off-street parking area or in garages or parking spaces with access from a rear lane. Private driveways for townhouses shall connect to alleys only and not to streets. However, a common driveway serving a minimum of eight units and not exceeding 18 feet in width may be permitted from a street.

10. Parking for apartments may be located in common parking lots located on a lot other than that containing the apartment building. If access to a garage is provided from a street, the front entrance of such a garage shall be setback 15 feet further than the front wall of the dwelling unit. The location of a garage shall be setback a minimum of 5 feet from side or rear property line.

11. Bicycle Parking.

[See Recommended Bicycle Parking Ordinances, page 32]

12. Pedestrian Access.

    a. Lots for apartment and non-residential uses shall not reduce or discourage pedestrian access.

    b. Pedestrian access shall be planned into all parking lots.

    c. Transition areas between parking and civic, commercial or residential uses shall be designed with textured paving, landscaping and street furniture.

    d. Parking lot layout shall take into consideration pedestrian circulation.

    e. Pedestrian crosswalks shall be provided in a manner convenient and attractive to pedestrians.

    f. Pedestrian crosswalks and access ways across parking lots shall be continuous, raised, and distinguished by textured paving, and shall be integrated into the wider network of pedestrian walkways.

13. Parking Lot Landscaping, Buffering, and Screening.

    a. Parking lot layout, landscaping, buffering and screening shall prevent direct views of parked vehicles from streets and sidewalks, avoid spillover light, glare, noise, or exhaust fumes onto adjacent properties.

    b. Parking lots exposed to view shall be surrounded by a minimum of a 5-foot high, year-round visually impervious screen, hedge or wall.

    c. The height of any required screen, hedge or wall shall decrease where driveways approach sidewalks or walkways, in order to provide adequate visibility of pedestrians from motor vehicles, and shall not interfere with clear sight requirements.

    d. The interior of all parking lots shall be landscaped to provide shade and visual relief by planting islands or peninsulas within the parking lot. Parking lots with 10 or less spaces may not require interior landscaping if the City of Madras and Jefferson County determines that there is adequate perimeter landscaping.

    e. A minimum of one deciduous shade tree shall be planted for every 6 parking spaces in parking lots with 10 or less spaces where perimeter landscaping is found to be inadequate, and in all parking lots with 11 or more spaces. A 6-foot-square planting diamond or equivalent planter is required.

f. Choice of plant materials, buffer width, type of screening, location and frequency of tree planting shall be flexible, provided these objectives are substantially satisfied.

Section 19. Required Loading and Service areas

1. When required, loading docks, solid waste facilities, recycling facilities and other service areas shall be placed to the rear or side of buildings in visually unobtrusive locations.

2. Screening and landscaping shall prevent direct views of the loading areas and their driveways from adjacent properties or from the public right-of-way. Screening and landscaping shall also prevent spillover glare, noise or exhaust fumes. Screening and buffering shall be achieved through walls, fences and landscaping, shall be a minimum of 5 feet tall and visually impervious. Recesses in the building or depressed access ramps may be used.

Section 20.Floodplain Control

All floodplain areas shall comply with the requirements of the Department of Environmental Quality and (City, County) Code. Floodplain areas may be utilized in meeting open space requirements.

Section 21.Signs

1. EXEMPT SIGNS.

    a. Temporary civic, cultural and public service window posters, when posted inside commercial establishments, provided they do not, individually or combined, occupy more than 25% of the total area of said window or 5 square feet, whichever is less. Temporary window signs are permitted on ground floor windows only.

    b. Temporary promotional or special sales signs when erected in conjunction with a commercial establishment provided they do not, individually or combined with other window signs, exceed 25% of the total area of the display window or 16-square feet, whichever is less.

    c. Temporary signs advertising a business opening or change in ownership shall not exceed an area of 16 square feet, and shall require a temporary permit specifying the date of removal.

    d. All temporary signs shall have the date of removal printed clearly on the lower right hand corner, as viewed from the exterior, and shall be permitted for a period not to exceed 30 days. Temporary promotional signs are permitted on ground floor windows only.

2. PROHIBITED SIGNS.

a. Signs employing mercury vapor, low pressure and high pressure sodium and metal halide lighting; plastic panel rearlighted signs

b. Signs on roofs, dormers and balconies

c. Billboards

d. Signs painted or mounted upon the exterior side or rear walls of any principal or accessory building or structure, except as otherwise permitted hereunder

3. PERMITTED SIGNS.

a. Wall-mounted or painted signs are permitted in a mixed-use development, provided the following standards are met:

(1) The sign shall be affixed to the front facade of the building, and shall project outward from the wall to which it is attached no more than 6 inches.

(2) The area of the signboard shall not exceed 5% of the ground floor building facade area or 24 square feet, whichever is less.

(3) The maximum permitted height is 15 feet above the front sidewalk elevation, and shall not extend above the base of the second floor windowsill, parapet, and eave or building facade.

(4) The height of the lettering, numbers or graphics shall not exceed 8 inches.

(5) The sign shall be granted to commercial uses occupying buildings facing on public streets only and shall not be allocable to other uses.

(6) Limited to one sign per business.

b. One wall-mounted sign, not exceeding 6-square feet in area, shall be permitted on any side or rear entrance open to the public. Such wall signs may only be lighted during the operating hours of the business.

c. Wall-mounted building directory signs identifying the occupants of a commercial building, including upper story business uses, provided the following standards are met:

(1) The sign is located next to the entrance.

(2) The sign shall project outward from the wall to which it is attached no more than 6 inches.

(3) The sign shall not extend above the parapet, eave or building facade.

(4) The area of the signboard shall not exceed 3-square feet, with each tenant limited to 1-square foot.

(5) The height of the lettering, numbers or graphics shall not exceed 4 inches.

d. Applied letters may substitute for wall-mounted signs, if constructed of painted wood, painted cast metal, bronze, brass or black anodized aluminum. Applied plastic letters shall not be permitted. The height of applied letters shall not exceed 8 inches.

e. Projecting signs, including graphic signs, mounted perpendicular to the building wall, provided the following standards are met:

(1) The signboard shall not exceed an area of 6 square feet.

(2) The distance from the ground to the lower edge of the signboard shall be 10 feet or greater.

(3) The height of the top edge of the signboard shall not exceed the height of the wall from which the sign projects.

(4) The distance from the building wall to the signboard shall not exceed 6 inches.

(5) The width of the signboard shall not exceed 3 feet.

(6) The height of the lettering, numbers or graphics shall not exceed 8 inches.

(7) Limited to one sign per business. Projecting signs are not permitted in conjunction with wall-mounted, freestanding or applied letter signs.

f. Painted window or door signs, provided that the following standards are met:

(1) The sign shall not exceed 10% of the window or door area or 4-square feet, whichever is less.

(2) The sign shall be silk screened or hand painted.

(3) The height of the lettering, numbers or graphics shall not exceed 4 inches.

(4) Limited to one sign per business painted on either the window or the door, but not on both.

(5) May be in addition to any one of the following: a wall-mounted sign, a free-standing sign, an applied letter sign, a projecting sign or a valance awning sign.

g. Awning signs, for ground floor uses only, provided that the following standards are met:

(1) If acting as the main business sign, it shall not exceed 10-square feet in area and the height of the lettering, numbers or graphics shall not exceed 8 inches.

(2) If acting as an auxiliary business sign, it shall be located on the valance only, shall not exceed 4 square feet in area and the height of the lettering, numbers or graphics shall not exceed 4 inches.

(3) Limited to two such signs per business, on either awning or valance, but not on both.

(4) If acting as the main business sign, it shall not be in addition to a wall-mounted sign.

h. One free-standing sign, provided that the following standards are met:

(1) The building, where the business to which the sign refers is located, shall be set back a minimum of 5 feet from the street line.

(2) The area of the signboard shall not exceed 3 square feet.

(3) The height of the lettering, numbers or graphics shall not exceed 4 inches.

(4) The height of the top of the signboard, or of any posts, brackets or other supporting elements shall not exceed 6 feet from the ground.

(5) The signboard shall be constructed of wood, with wood or cast iron brackets, and shall be architecturally compatible with the style, composition, materials, colors and details of the building.

(6) The signboard shall not be illuminated after 10:00 p.m.

(7) The sign shall be located within 4 feet of the main entrance to the business and its location shall not interfere with pedestrian or vehicular circulation.

(8) Limited to one sign per building and shall not be in addition to wall-mounted applied letters or projecting signs.

i. Businesses located in corner buildings are permitted one sign for each street frontage.

j. Businesses with service entrances may identify these with one sign not exceeding 2 square feet.

k. One directional sign, facing a rear parking lot. This sign may be either wall-mounted or freestanding on the rear facade, but shall be limited to 3 square feet in area.

l. In addition to other signage, restaurants and cafes shall be permitted the following, limited to one sign per business, except for corner businesses, which may have one sign on each side:

(1) A wall-mounted display featuring the actual menu as used at the dining table, to be contained within a shallow wood or metal case, and clearly visible through a glass front. The display case shall be attached to the building wall, next to the main entrance, at a height of approximately 5 feet, shall not exceed a total area of 2-square feet, and may be lighted.

(2) A sandwich board sign, as follows:

i. The area of the signboard shall not exceed 5 square feet.

ii. The signboard shall be constructed of wood, chalkboard and/or finished metal.

iii. Letters can be painted or handwritten.

iv. The sign shall be located within 4 feet of the main entrance to the business and its location shall not interfere with pedestrian or vehicular circulation.

v. The information displayed shall be limited to daily specials and hours of operation.

vi. The sign shall be removed at the end of the business day.

m. Each business shall identify the number of its address within the signboard with a minimum of one sign facing each street or parking lot.

4. DESIGN STANDARDS FOR SIGNS.

   a. Signs affixed to the exterior of a building shall be compatible with the style, composition, materials, colors and details of the building, as well as with other signs used on the building or its vicinity.

   b. Signs shall fit within the existing facade features and be confined to signable areas, and shall not interfere with door and window openings, conceal architectural details or obscure the composition of the facade where they are located.

   c. Wood and painted metal are the preferred materials for signs. Flat signs should be framed with raised edges.

   d. Signs shall be either spotlighted or backlighted with a diffused light source. Spotlighting shall require complete shielding of all light sources; light shall be contained within the sign frame and shall not significantly spill over to other portions of the building, or site.

Section 22. Mixed-Use Design Standards and Guidelines

1. Exterior public and semi-public spaces, such as courtyards or plazas, shall be designed to provide amenities for users, in the form of textured paving, landscaping, lighting, street trees, benches, trash receptacles and other items of street furniture, as appropriate.

2. Buildings shall be located to face toward and relate to public streets, both functionally and visually. Buildings shall not be oriented to face toward a parking lot.

3. On a lot with multiple buildings, those located on the interior of the site shall front towards and relate to one another, both functionally and visually. A lot with multiple buildings may be organized around features such as courtyards or greens that encourage pedestrian activity and incidental social interaction among users. Buildings shall be located to allow for adequate fire and emergency access.

4. Walls and fences shall be compatible with the style, materials and colors of the principal building on the same lot. Stone or brick walls with a stone or cast stone cap; wood, decorative metal, or cast iron fences; masonry or stucco walls; and stone piers shall be encouraged. Solid wooden fences are permitted in rear and side yards only. Highway-style guardrail, stockade or contemporary security fencing such as wire mesh, chain link, barbed wire or razor wire are prohibited.

Section 23. Landscaping

1. Landscaped area. All areas of a site not occupied by buildings, parking lots, other improvements such as pavers shall be planted with trees, shrubs, hedges, ground covers, or grasses, unless such area consists of existing vegetation or other natural features to be retained. Perennials and annuals are encouraged. Mulch ground covers may be used to cover bare ground between trees, shrubs and other plantings.

2. Landscape plans. Landscaping plans shall be prepared by a certified Landscape Architect.

3. Litter removal. All stumps and other tree parts, litter, brush, weeds, excess or scrap building materials or other debris and trash shall be removed from the area of the site to be constructed and disposed of appropriately. Areas that are to remain as natural undeveloped open space shall be cleaned of all trash.

4. Protection of existing plantings. Maximum effort should be made to preserve and protect existing mature or significant trees and shrubs. No material or temporary soil deposits shall be placed within 4 feet of shrubs or within 2 feet of the drip line of trees designated to be retained. Protective barriers shall be installed at the drip line around each plant or group of plants that are to be retained.

5. Slope plantings. Landscaping of the area of all cuts, fills, or terraces shall be sufficient to prevent erosion, and all roadway slopes steeper than one foot vertically to three horizontally shall be planted with ground covers appropriate for the purpose, soil conditions, water availability and environment.

6. Additional landscaping. In addition to the required screening and street trees, additional plantings or landscaping elements may be required throughout the mixed-use development as necessary for climate control, privacy, or aesthetics.

7. Planting specifications. Deciduous trees shall have at least a 3-inch caliper at the time of planting. All trees, shrubs and ground covers shall be planted according to accepted horticultural standards. The plant species selected should be hardy for the particular climatic zone in which the development is located and appropriate in terms of function and size.

8. Plant replacement. The developer shall replace Two years from the time of planting, all dead or dying plants. Trees or other vegetation that die after the second year shall be replaced and maintained by the property owner or property owner's association.

9. Garbage and recycling areas. Garbage collection, recycling areas and other utility areas shall be screened around their three sides of their

perimeter by wood, brick, or masonry walls with a gate or door on the fourth side. Such a wall shall be capped on the top, and may be roofed.

Section 24. Detention Basins

Detention basins, headwalls, outlet structures, concrete flow channels, riprap channels and other drainage improvements shall be screened with plant material and/or berms. Such drainage structures, as appropriate, shall be situated in the least visible location or, if visible, incorporated into the natural curves of the land.

In lieu of peripheral fencing, detention basins edges shall be contoured and shaped to form low angles at primary water line, providing greater pedestrian safety.

Section 25. Lighting

1. Streetlights shall be compatible with the architectural style of the mixed-use development.

2. Streets and sites shall provide lighting while minimizing adverse impacts, such as glare and overhead sky glow, on adjacent properties and the public right-of-way. Light shields shall be provided where the lighting fixture abuts a residential use.

3. Along all commercial or mixed-use streets, parking areas, sidewalks, walkways, courtyards, community greens and interior open spaces in a mixed-use development, 12-foot-high lamp posts shall be provided at intervals spaced at no greater than 80 feet on center on both sides of a commercial or main street. Lighting on residential streets should be confined to intersection corners and mid-block where blocks are longer than 200 feet. Lighting standards should be consistent or similar throughout the development.

4. In parking lots, lamppost heights may be extended to a maximum of 16 feet.

5. Use of minimum wattage metal halide or color corrected sodium light sources is encouraged. Non-color corrected low-pressure sodium and mercury vapor light sources are prohibited.

Section 26. Architectural Design Standards and Guidelines

1. Buildings should generally relate in scale and design features to the surrounding buildings, i.e., maintaining the building scale, front yard setbacks, se of front porches on residential buildings, extension of horizontal lines of windows and by echoing architectural styles and details, design themes, building materials and colors used in surrounding buildings.

2. Buildings on corner lots shall be considered significant structures, since they have at least two front facades visibly exposed to the street. If deemed appropriate by the Hearings Body or Planning Director, these buildings may be designed with additional height and architectural embellishments, such as corner towers, to emphasize their location.

3. Buildings should avoid creating long, monotonous, uninterrupted walls or roof planes with adjoining buildings. Wall offsets, including projections; recesses and changes in floor level should be used in order to add architectural interest and variety. Similarly, roofline offsets should be provided.

4. The exterior of duplexes, townhouses, or apartment buildings may be designed to appear as a single building, such as a large single-family detached dwelling.

5. The facades of buildings that face a public street or internal open space shall be architecturally emphasized through windows, entrance treatments, and details. Buildings with more than one facade facing a public street or internal open space shall be required to provide front facade treatments for each facade.

6. Elements of the architectural treatment of the front facade should be continued, in its major features, on all visible sides of a building.

7. Blank walls visible from the public viewshed are prohibited, except where the construction of a windowless wall visible from the public viewshed is necessitated by building codes. Where a blank wall is unavoidable, visual interest should be provided through the provision of blank window openings trimmed with frames, sills and lintels, or, if the building is occupied by a commercial use, by using recessed or projecting display window cases. Landscaping may also serve to add interest to a blank wall.

8. All visible sides of a building shall have an articulated base course and cornice. The cornice shall terminate or cap the top of a building wall, may project horizontally from the vertical building wall plane, and may be ornamented with moldings and other details. The middle section of a building may be horizontally divided with similar treatment.

9. Gable roofs with a minimum pitch of 3/4 should be used to the greatest extent possible. Where hipped roofs are used, it is recommended that the minimum pitch be 1/2. Both gable and hipped roofs should provide overhanging eaves extending a minimum of one foot beyond the building wall on all sides. Flat roofs should be avoided on all buildings.

10. All entrances to a building shall be defined by architectural elements such as lintels, columns, porches, overhangs, railings, balustrades, awnings, etc., where appropriate.

11. Ground floor retail, service, and restaurant uses shall have large pane display windows. Such windows shall be framed by the surrounding wall and shall not exceed 75% of the total ground level facade area. Buildings with multiple storefronts should be unified through the use of compatible materials, colors, details, awnings, and signage and lighting fixtures.

12. Fixed or retractable awnings are permitted at ground floor level and on upper levels where appropriate.

13. The type of light source used on the exterior of buildings, signs, parking areas, pedestrian walkways and other areas of a site shall be the same or compatible; and shall be consistent with the style of the building. Facades shall be lit from the exterior, and, as a general rule, lights should be concealed through shielding or recessed behind architectural features. The use of low-pressure sodium, fluorescent or mercury vapor lighting either attached to buildings or to light the exterior of buildings shall be prohibited.

14. All air conditioning units, HVAC systems, exhaust pipes or stacks, elevator housing and satellite dishes and other telecommunications receiving devices shall be thoroughly screened from view from the public right-of-way and from adjacent properties by using walls, fencing, roof elements, penthouse-type screening devices or landscaping.

15. Fire escapes shall not be permitted on building's front facade. In buildings requiring a second means of egress pursuant to the local building codes, internal stairs or other routes of egress shall be used.

16. Solid metal security gates or solid roll-down metal windows shall not be permitted. Link or grill type security devices with emergency releases shall be permitted only if installed from within the window or doorframes. If installed on the outside, the coil box shall be recessed and concealed behind the building wall. Security grills shall be recessed and concealed during normal business hours. Models that provide a sense of transparency, such as light colors, are encouraged. Other types of security devices fastened to the exterior walls are not permitted.

Section 27. Specific Design Guidelines

A guideline for the general design qualities should be established for each mixed-use development. The design guidelines should relate to the general and specific design standards as specified in this ordinance. These must be presented at preliminary and final plan phases. A listing of significant features that will be incorporated into the design of the buildings and streetscape of a mixed-use development should be prepared. Photographs, colored images and drawings may be used. The following features should be described:

1. Building mass and styles

2. Types, materials, colors, and pitches of roofs

3. Types, materials, textures, and colors of facade treatment
4. Door openings and entry treatments
5. Window types
6. Eaves, porches, and awnings
7. Decorative building elements
9. Gutters
10. Chimneys
11. Frontyard and sideyard walls, fences and hedges
14. Driveway and pavement materials and textures
17. Curb Treatment
18. Streetlights
19. Street signs
20. Street furniture

N. MODEL TRAFFIC IMPACT STUDY ORDINANCE

MODEL TRAFFIC IMPACT STUDY ORDINANCE

Section 1- Intent.

City of Madras and Jefferson County recognizes the direct correlation between land use decisions and traffic operations. The intent of this section is to permit accurate evaluation of expected impacts of proposed projects to assist in decision-making. This ordinance is further intended to help achieve the following objectives:

1. Provide a standard set of analytic tools and format for preparing traffic impact studies.

2. Allow the community to assess the effects that a proposed project may have on the community by outlining information needed and evaluation procedures to be used.

3. Help ensure safe and reasonable traffic operating conditions on streets and intersections after development of the proposed use.

4. Reduce the negative traffic impacts created by individual developments, and which may negatively impact such developments, by helping to ensure the transportation system can accommodate the expected traffic safely and efficiently.

5. Evaluate if proposed rezoning is timely and, if inconsistent with the Comprehensive Plan, if the rezoning would be a logical alternative to the Comprehensive Plan.

6. Realize a comprehensive approach to the overall impacts of various developments along a corridor or within part of a community rather than a piecemeal approach.

7. Provide direction to community decision-makers, road agencies and developers of expected impacts of a project.

8. Alert the community, transportation agencies, and developers of improvements or modifications needed to the roadway, access or site design.

9. Protect the substantial public investment in the existing street system.

Section 2- Definitions.

The following terms used in this ordinance shall be defined as follows:

1. **Development:** A site plan, subdivision tentative preliminary plat, condominium project, mobile home park, redevelopment, reuse or expansion of a use or building.

2. **Average Day:** A Tuesday, Wednesday, or Thursday for most uses. The average day may be a Saturday for uses that have higher peakhour traffic volumes on a Saturday rather than mid-week.

3. **Comprehensive Plan:** The plan adopted by the City of Madras and Jefferson County Planning Commission that illustrates the intended future land use pattern and may also describe roadway functional classifications and intended improvements to the transportation system.

4. **Gap (critical gap):** The median time headway (in seconds) between vehicles in a major traffic stream which will permit side-street vehicles at STOP or YIELD controlled approach to cross through or merge with the major traffic stream under prevailing traffic and roadway conditions.

5. **Level of service:** A qualitative measure describing operational conditions within a traffic stream; generally described in terms of such factors as speed and travel time, delay, freedom to maneuver, traffic interruptions, comfort and convenience, and safety.

6. **Peak Hour:** A one hour period representing the highest hourly volume of traffic flow on the adjacent street system during the morning (a.m. peak hour), during the afternoon or evening (p.m. peak hour); or representing the hour of highest volume of traffic entering or exiting a site (peak hour of generator).

7. **Study Area:** The geographic area containing those critical arterial intersections (and connecting roadway segments) which are expected to be affected by the site-traffic generated by a development.

8. **Traffic Impact Study:** The analysis of the potential traffic impacts generated by a proposed project. This type of study and level of analysis will vary dependent upon the type and size of the project - Traffic Impact Assessment, Rezoning Traffic Impact Study, Traffic Impact Statement, and Regional Traffic Impact Study.

9. **Trip (i.e., directional trip):** A single or one-direction vehicle movement with either the origin or the destination (exiting or entering) inside a study site.

Section 3 - Applicability.

A traffic impact study shall be required and shall be submitted by a petitioner for a rezoning, site plan or subdivision plan under any of the following situations. The type of study required shall be dependent upon the type and scale of the proposed use and existing traffic conditions.

1. A "Rezoning Traffic Impact Study" for the following Rezoning and Master Plan amendment requests:

    a. A proposed rezoning consistent with the community's long range land use plan, but when the timing of the change may not be appropriate due to traffic issues. This threshold applies when a rezoning would permit uses that could generate 100 or more directional trips during the peak hour, or at least 1000 more trips per day, than the majority of the uses that could be developed under current zoning.

    b. A proposed rezoning which is inconsistent with the community master plan when permitted uses could generate at least one hundred (1 00) directional trips during the peak hour of the traffic generator or the peak hour on the adjacent streets or over seven hundred fifty (750) trips in an average day.

    c. A site along any corridor identified as critical in the TSP.

    d. Proposed amendments to the Comprehensive Plan that would recommend uses which would generate higher traffic volumes.

2. Development Proposals: site plans, plats, and mobile home parks and condominium projects

    a. A Traffic Impact Study shall be required for any proposed development that would be expected to generate over one hundred (100) directional trips during the peak hour of the traffic generator or the peak hour on the adjacent streets, or over seven hundred fifty (750) trips in an average day.

    b. A Traffic Impact Study shall be required for any proposed development along a corridor identified in the TSP as a critical corridor (segments which currently experience, or are projected to experience, significant congestion or relatively high crash rates) that would be expected to generate over fifty (50) directional trips during the peak hour of the traffic generator or the adjacent streets, or over five hundred (500) trips in an average day.

    c. A Traffic Impact Study based on the thresholds in 1 and 2 above shall be required for new phases or changes to a development where a traffic study is more than two (2) years old and roadway conditions

have changed significantly (volumes increasing more than 2 percent annually).

d. A Traffic Impact Study shall be required for a change or expansion at an existing site where the increased land use intensity is expected to increase traffic by at least 100 directional trips in the peak-hour.

e. Conditional land uses, planned unit developments, and other uses that are specifically required to provide a traffic impact study in the zoning ordinance. The type of study shall be based on the thresholds in Items 1 and 2.

f. A change in a Planned Unit Development (PUD) to a more intense use (Note: on a case-by-case basis or using thresholds similar to those above).

g. Where required by the affected transportation agency to evaluate access issues.

Section 4 - Traffic Impact Study Contents:

1. Description of the site, surroundings, and study area; including illustrations and a narrative that describes the characteristics of the site and adjacent roadway system (functional classification, lanes, speed limits, etc.). This description should include surrounding land uses, expected development in the vicinity that could influence future traffic conditions, special site features and a description of any committed roadway improvements. The study should define and justify the study area selected for analysis.

2. Description of the requested zoning or use

    a. Traffic study for a rezoning or Plan amendment request: a description of the potential uses that would be allowed, compared to those allowed under current zoning. If the use is not consistent with the community's master plan, an explanation of the difference should be provided.

    b. Traffic study for a site plan review, mobile home park, condominium project or subdivision tentative preliminary plat, or specified Conditional Uses: a description of factors such as the number and types of dwellings units, the gross and usable floor area, the number of employees and shift change factors. Intended phasing or future expansion should also be noted.

3. Description of existing traffic conditions

    a. Traffic counts: Existing conditions including existing peak-hour traffic volumes (and daily volumes if applicable) on street(s) adjacent to the site. Existing counts and levels of service for intersections in the

vicinity that are expected to be impacted, as identified by at a pre-application conference or discussion, should be provided for projects requiring a Traffic Impact Study. Traffic count data shall not be over two (2) years old, except the community or road agency may permit 24 hour counts up to three (3) years old to be increased by a factor supported by documentation or a finding that traffic has increased at a rate less than two percent (2%) annually in the past three to five years.

Traffic counts shall be taken on a Tuesday, Wednesday or Thursday of non-holiday weeks. Additional counts (i.e. on a Saturday for a proposed commercial development) may also be required in some cases. The traffic counts shall be obtained during average or higher than average volume conditions (i.e. regarding weather or seasonal variations and in consideration of any construction or special events) for the area under study.

b. Roadway characteristics shall be described and illustrated, as appropriate. Features to be addressed include lane configurations, geometrics, signal timing, and traffic control devices, posted speed limits, average running speeds and any sight distance limitations. Existing levels of service shall be calculated for intersections included within the study area.

c. Existing driveways and potential turning movement conflicts in the vicinity of the site shall be illustrated and described.

d. The existing right-of-way shall be identified along with any planned or desired expansion of the right-of-way requested by the applicable road agency.

e. Traffic crash data and analysis covering the most recent three (3) years for the study area or proximity to site access points may be required by the community, particularly for sites along roadways identified as Critical or Congested Corridors. (Note: crash analyses are not generally appropriate for a Rezoning Traffic Study or a Traffic Impact Assessment)

4. Background Traffic Growth: For any project requiring a Traffic Impact Study with a completion date beyond one (1) year at the time of the traffic study, the analysis shall also include a scenario analyzing forecast traffic at date of completion along the adjacent street network using a forecast based on a network traffic assignment model (it available), historic annual percentage increases and/or future development in the area which has been approved.

5. Trip Generation.

a. Forecasted trip generation of the proposed use for the a.m. (if applicable) and p.m. peak hour and average day. The forecasts shall

be based on the data and procedures outlined in the most recent edition of Trip Generation published by the Institute of Transportation Engineers (ITE). The applicant may use other commonly accepted sources of data or supplement the standard data with data from at least three (3) similar projects in Michigan.

b. For rezoning requests where a traffic study is required, the study should contrast the traffic impacts of typical uses permitted in the requested zoning district with uses permitted in the current zoning district. The (Planning Commission, Planning Director, etc.) shall make the determination of typical uses. For Traffic Impact Assessments, Statements, or Regional Traffic Analyses, the rates for the specific use(s) proposed should be used.

c. Any trip reduction for pass-by trips, transit, ridesharing, other modes, internal capture rates, etc. shall be based both on ITE findings and documented survey results acceptable to the agency reviewers.

d. For projects intended to be developed in phases, the trip generation by phase shall be described.

6. Trip Distribution: The projected traffic generated shall be distributed (inbound v. outbound, left turn v. right turn) onto the existing street network to project turning movements at site access points, and nearby intersections where required. Projected turning movements shall be illustrated in the report. A description of the application of standard engineering procedures for determining the distribution should also be attached (trip distribution model, market studies, counts at existing driveways, etc.).

7. Impact Analysis

   a. Level of service or "capacity" analysis at the proposed access points using the procedures outlined in the most recent edition of the Highway Capacity Manual published by the Transportation Research Board. For projects requiring a Traffic Impact Study, before and after capacity analyses shall also be performed for all street intersections where the expected traffic generated at the site will comprise at least five percent (5%) of the existing intersection capacity, and/or for roadway sections and intersections experiencing congestion or a relatively high crash rate, as determined by the community or applicable road agency.

      Option: Level of service analysis for intersections identified at the pre-application conference.

   b. Gap studies for unsignalized intersections where applicable.

c. The community may require a regional traffic study which evaluates the impact on the street network over a wide area and/or for up to 20 years for a project of regional significance, if a network model is available.

8. Access design/Access management standards: The report shall include a map and description of the location and design of proposed access (driveways or new street intersections) including: any sight distance limitations, dimensions from adjacent driveways and intersections within 250 feet on either side of the main roadway, data to demonstrate that the number of driveways proposed is the fewest necessary, support that the access points will provide safe and efficient traffic operation and be in accordance with the standards of (community name) and the applicable road agency (not required for a Rezoning Traffic Study).

9. Other study items

   The traffic impact study shall include:

   a. Need for, or provision of, any additional right-of-way where planned or desired by the applicable road agency.

   b. Changes that should be considered to the plat or site plan layout.

   c. Description of any needed non-motorized facilities.

   d. If the use involves a drive-through facility, the adequacy of the queuing area shall be evaluated.

   e. If a median crossover is desired, separate analysis should be provided.

   f. If a traffic signal is being requested, the relationship of anticipated traffic to traffic signal warrants in the Manual of Uniform Traffic Control Devices. Analysis should also be provided on the impacts to traffic progression along the roadway through coordinated timing, etc.

   g. Description of site circulation and available sight distances at site driveways.

10. Mitigation/Alternatives: The study shall outline mitigation measures and demonstrate any changes to the level of service achieved by these measures. Any alternatives or suggested phasing of improvements should be described. The mitigation measures may include items such as roadway widening, need for bypass lanes or deceleration tapers/lanes, changes to signalization, use of access management techniques or a reduction in the proposed intensity of use. Proposed mitigation measures should be discussed with the applicable road agency. The responsibility and timing of roadway improvements shall be described.

11. Qualifications.

    A. Preparer. The preparation of a thorough traffic impact study requires extensive background and experience in traffic-related analyses. Therefore, the experience of the preparer best defines his or her ability to provide a technically sound analysis. Recommended preparer requirements are outlined below.

        1. Three or more years of recent experience in the preparation of traffic impact studies.

        2. The developments of impact studies (and similar intersection and/or corridor analyses) comprise a major component of the preparer's recent professional experience. This requires ongoing experience and familiarity with the Highway Capacity Manual techniques as well as the computer software (Highway Capacity software and others) that provide level of service results and other analysis findings needed to fully assess potential impacts.

        3. Specific education, training, and/or professional coursework in traffic impact analysis.

        4. The preparer shall be an associate (or higher) member of one or more professional transportation-related organizations, particularly the Institute of Transportation Engineers (ITE) or the Transportation Research Board (TRB). This helps ensure that the preparer is maintaining their knowledge as new research is published and analysis techniques are changed or refined.

        5. The preparer should have one of the following professional qualifications: A registered engineer (PE); AICP certification; or training as a professional transportation planner.

        6. Any study involving roadway or traffic signal design work shall be prepared by or under the supervision of a registered engineer (PE) with specific training in traffic engineering.

    B. Reviewer. Review of the study is important to ensure that the analysis and recommendations are based on accepted practices. The ITE recommends that the traffic impact study be reviewed by "trained traffic engineers or transportation planners." The qualifications of the reviewers should parallel those of the preparers as outlined above.

Section 5 - Procedures.

1. The applicant shall discuss or meet with (community planner/zoning administrator/engineer, etc. as designated by community) to determine if a study is needed, what type of study are needed and specific items to be addressed.

2. The applicant submits traffic impact study to the community, with the request for rezoning or development proposal. A revised study may be required as the scope and details of the request change.

3. The community distributes the traffic impact study to the appropriate road agencies, and adjacent community, if appropriate. A copy may also be submitted to the metropolitan planning organization, transit agency, etc. as appropriate for projects of regional significance or along critical corridors.

4. Road and other review agencies provide community with comments prior to any action on the project.

Section 6 - Waiver of Study Requirements.

The requirement for a traffic impact study, or the study elements listed in Sec. 104 "Traffic Impact Study Contents," may be waived/modified following consultation with a representative of the road agency by the (Municipal (Traffic) Engineer, Planning Director, Zoning Administrator, Planning Commission or Board of Appeals). Reasons for the waiver or modification shall be documented. Factors to be considered include:

1. Roadway improvements are scheduled which are expected to mitigate any impacts associated with the proposed project.

2. The existing level of service along the roadway is not expected to drop below C due to the proposed project.

3. The existing level of service is not expected to be significantly impacted by the proposed project due to specific conditions at this location.

4. A similar traffic study was previously prepared for the site and is still considered applicable.