CHAPTER FOUR: CIRCULATION & TRANSPORTATION

4.1 OVERVIEW

This chapter provides a discussion of the existing and proposed circulation system for the Dunnigan Specific Plan (DSP). The circulation system includes a hierarchy of roadways, green modes circulation and public transit. The green modes circulation includes bicycles, Neighborhood Electric Vehicles (NEVs) and pedestrians. Emphasis is placed on ensuring connectivity between uses and on creating a safe and efficient circulation system that complies with Yolo County policies and allows for multiple transportation options. The circulation system has been designed to link with existing local Dunnigan and regional Yolo County systems.

4.2 CIRCULATION AND TRANSPORTATION GOALS

The *2030 General Plan* contains a number of goals and policies related to the DSP. These goals and policies guide development of the DSP land use and circulation components. The General Plan Circulation Element establishes ten goals, seven of which are relevant to the DSP and are identified below.

1. Comprehensive and coordinated transportation systems (Goal CI-1)

2. Mode and user equity (Goal CI-2)

3. Service thresholds (Goal CI-3)

4. Environmental impacts (Goal CI-4)

5. System integration (Goal CI-5)

6. Accessible transit (Goal CI-6)

7. Truck and rail operations (Goal CI-7)

These goals and their supporting policies influence land use and circulation network design in an effort to increase travel choices such as walking and bicycling by locating land uses in close proximity with a highly connected network. The basic concept is to create compact, mixed-use development forms that make it easier to access jobs, schools, shopping, entertainment, etc. without traveling long distances that require vehicles. For example, Policies CI-1.2, CI-3.2(C), and CI-3.15 require new development to utilize a grid pattern for roadways while Policy CI-2.3 requires that public transit, walking, and bicycling are viable and attractive travel choices. The DSP fulfills these requirements by keeping the overall development footprint compact with a fine-grained multi-modal grid network that makes it convenient to travel throughout the project by walking, bicycling, or NEV.

Some supporting policies of the General Plan are more challenging to meet because compliance cannot be fully determined at this time due to the need for ongoing monitoring of the project per the General Plan and the *Yolo County Transportation Impact Study Guidelines*. Policy CI-3.19, CI-3.20, and CI-3.21 address vehicle miles of travel (VMT) and mode split goals that must be measured over time. The DSP will build out over multiple years and these policies require monitoring of mode split and household VMT generation to ensure compliance with the following goals.

- VMT Target = 44 miles generated per household per weekday
- Mode Split[1] Goal = 20 percent non-auto

Chapter 4.10 describes the VMT reduction strategies in more detail.

Table 4.1 identifies key project features that substantiate General Plan consistency for each of the seven relevant goals.

Table 4.1: Key Project Features Consistent with the 2030 General Plan	
Comprehensive and Coordinated Transportation Systems (Goal CI-1)	• Fully-connected grid-based circulation system • I-5 / CR 6 interchange improvements and I-5 / CR 8 Interchange modifications • Comprehensive pedestrian, bicycle and NEV networks • Transportation Management Association (TMA) or County Service Area (CSA) formation • Speed management through design
Mode and User Equity (Goal CI-2)	• Consistent treatment to all modes of travel • Attractive and convenient transit, pedestrian and bicycle systems
Service Thresholds (Goal CI-3)	• Upgrade County roadways to be consistent with current standards • Roundabouts, multimodal connections and traffic calming • Intermodal station and transit center • VMT reduction strategies
Environmental impacts (Goal CI-4)	• VMT reduction through project design and commitment to additional VMT reduction strategies • Low emission or no-emission transportation options
System Integration (Goal CI-5)	• Off-street trail system • Integrated multi-modal facilities • Pedestrian design features and enhanced intersection treatments
Accessible Transit (Goal CI-6)	• Intermodal station and transit center • Upgraded transit amenities • Yolo County Transit District (YCTD) system expansion • Park and ride locations convenient for transit
Truck and Rail Operations (Goal CI-7)	• Accommodation of passenger and freight rail service • Preserve and enhance truck transportation corridors

[1] "Mode Split" is the percentage distribution of person travel by mode. The modes include autos, transit, bicycle, walk, and neighborhood electric vehicle (NEV).

4.3 EXISTING LOCAL AND REGIONAL TRANSPORTATION NETWORK

The Dunnigan project is located adjacent to a four and a half mile stretch of I-5 which will provide regional site access. I-5 is a four-lane freeway (two lanes in each direction) with two interchanges connecting to County Road (CR) 8 and CR 6 and one connection to a rest stop located north of CR 5. CR 99W forms the eastern boundary of the Plan Area. CR 5 forms the northern boundary for the majority of the new development. However, the existing rural area of Dunnigan north of CR 5 is included within the limits of the Specific Plan, which consists of various local roads with connection to CR 6 and CR 2. CR 6, a two-lane local road, bisects the northern portion of the Plan Area and extends from CR 99W west to the Tehama-Colusa Canal. Lesser paved and unpaved County and private roads exist throughout the remainder of the site.

This network does not include any dedicated features for public transit or bicycling. Sidewalks exist along portions of CR 6, CR 8, CR 99W, and Johns School Road within the Plan Area. The sidewalk system is discontinuous with most of it installed as part of frontage improvements to developed parcels.

4.4 INTERSTATE FREEWAY INFRASTRUCTURE

Two interchanges provide regional access for the DSP. The CR 6 and CR 8 interchanges are slightly less than two miles apart. Both interchanges operate acceptably now; however, proposed DSP build out will increase volumes and add bicycle and pedestrian trips to the interchanges, which will require interchange and mainline improvements. The General Plan anticipated that I-5 would ultimately be widened with northbound and southbound auxiliary lanes between CR 6 and CR 8 interchanges, which would not be precluded by the DSP. The need and timing for these lanes will depend on interchange improvements at CR 6 and CR 8. Capacity expansion at these interchanges will be needed to accommodate planned highway commercial uses near the interchanges plus new trips from the DSP community.

4.4.1 Interchange Modifications

4.4.1.1 I-5 / CR 8

The I-5/CR 8 interchange does not fully comply with current Caltrans design standards because of its close spacing to the I-505/I-5 freeway-to-freeway interchange, which is located approximately one mile south of the CR 8 interchange. This distance is less than the Caltrans standard of three miles between a local interchange (CR 8) and a system interchange (I-505) to provide adequate distance for weaving vehicles to complete merge and diverge movements. As a result, only minimal capacity-enhancing modifications to the CR 8 interchange are feasible. Potential improvements associated with the DSP are anticipated to Include signalizing the ramp terminals, isolated ramp widening, and enhancing bicycle and pedestrian movements across the interchange.

4.4.1.2 I-5 / CR 6

Given the constraints at CR 8, project vehicle traffic will be focused on the CR 6 interchange where more extensive capacity improvements are feasible. This interchange will also be designed for bicycles and pedestrians although the DSP includes a separate bicycle, pedestrian,

and NEV crossing of I-5 in the central portion of the plan that is intended to be the preferred crossing for these modes as explained in more detail below. Several interchange designs have been considered for I-5 / CR 6 including those presented in Exhibit 4.1. All current designs require widening or replacing the existing structure over I-5.

Concept 1: Diamond Interchange with Southbound Loop On-Ramp

Concept 2: Tight Diamond Interchange

Concept 3: Diverging Diamond Interchange

Source: Planning Company Associates and Kimley-Horn, 2009

Exhibit 4.1: Initial I-5/CR 6 Interchange Concepts

The ultimate interchange configuration will need to balance a variety of design objectives given that this interchange will serve passenger vehicles, heavy trucks, bicycles, and pedestrians. At a minimum, the following Caltrans design standards and guidelines will govern the design process.

- *Highway Design Manual*, Caltrans (http://www.dot.ca.gov/hq/oppd/hdm/hdmtoc.htm)
- *Design Information Bulletins*, Caltrans (http://www.dot.ca.gov/hq/oppd/dib/dibprg.htm)
- *Design Memoranda,* Caltrans (http://www.dot.ca.gov/hq/oppd/design/index.htm)
- *Deputy Directive (DD)-64-R1 – Complete Streets – Integrating the Transportation System* (http://www.dot.ca.gov/hq/tpp/offices/ocp/complete_streets_files/dd_64_r1_signed.pdf)

Key issues will include conflict areas where vehicles interact with pedestrians and bicyclists. The DSP places a priority on pedestrian and bicycle travel but recognizes the need to balance operational and safety tradeoffs for all interchange users.

For the CR 8 interchange, the DSP was designed to minimize traffic using this interchange with the intent to limit the potential improvements to minor ramp widening, signalization of the

ramp terminal intersections, and upgrades necessary to comply with the Americans with Disabilities Act (ADA). Some enhancements for bicyclists and pedestrians may also be included at this interchange although bicyclists and pedestrians needing to cross I-5 will be encouraged to use the separate bicycle and pedestrian crossing of I-5 located north of CR 8 and described in more detail below.

4.4.2 Pedestrian and Bicycle Connectivity

The DSP proposes a bicycle and pedestrian overcrossing between the two interchanges. The overcrossing will also be designed to accommodate shared use with NEVs. This connection will provide direct access between general commercial land uses east of I-5 and the proposed town center west of I-5. The overcrossing is strategically located as a direct continuation of a Class I bikeway and will greatly reduce pedestrian and bicycle travel times to and from the central plan area compared to travel across the CR 6 and CR 8 interchanges. While these interchanges will be upgraded from their current condition for bicyclists and pedestrians to comply with Caltrans guidelines such as *Deputy Directive 64-R1: Complete Streets – Integrating the Transportation System* and anticipated revisions to the *Highway Design Manual*, the bicycle and pedestrian overcrossing is an integral feature that maximizes mobility choices by increasing the convenience of bicycling, walking, or using an NEV. The crossing will be approximately one mile from the CR 6 and CR 8 crossings, which is similar to other bicycle and pedestrian friendly communities such as the City of Davis for connectivity across I-80.

4.5 ROADWAY INFRASTRUCTURE

Exhibit 4.2 displays the DSP roadway circulation plan, which includes primary, collector and local roadways. The circulation plan reflects the use of 17 different street cross-sections or designs, which were developed to accommodate multi-modal use and compliment adjacent land use. Exhibit 4.3 contains each of the street sections (Sections "A" through "Q") identified on the circulation plan. Roadway construction will be phased as described in the DSP Development Agreement(s). Landscaping standards, enhanced bridge designs and other design details are included in the DSP Design Guidelines. Key features of the street network are described below.

4.5.1 Primary Roadways

Primary streets are the backbone circulation routes that provide critical linkages between the existing town of Dunnigan, the DSP and the regional circulation system, including I-5. These roadways are typically four lanes with six-foot wide on-street bike lanes and landscape-separated sidewalks. The street section may have a landscaped center median. Parking is prohibited on primary roadways and access is controlled with limited driveway interruptions as allowed by County design standards. Applicable street sections are Sections A, B, C, D, E and Q with right-of-way requirements ranging from 81.5 feet to 130 feet. CR 6, CR 8 and CR 99W are all primary roadways. The main north-south roadway through the project is also a four-lane primary roadway near CR 6. Street Section P is specific to CR 99W as it transitions back to a rural roadway section.

The Yolo County General Plan identifies portions of CR 6 and CR 99W as potentially requiring up to four lanes. CR 6 was designated for a four-lane section between CR 99W and the Tehama Colusa Canal and CR 99W was designated for four lanes between CR 2 and CR 8. The DSP does not require four lanes throughout the full length of these sections to comply with the General Plan's LOS threshold. Sufficient right-of-way exists to accommodate four lanes if they are required in a timeframe beyond build out of the DSP.

4.5.2 Collector Streets

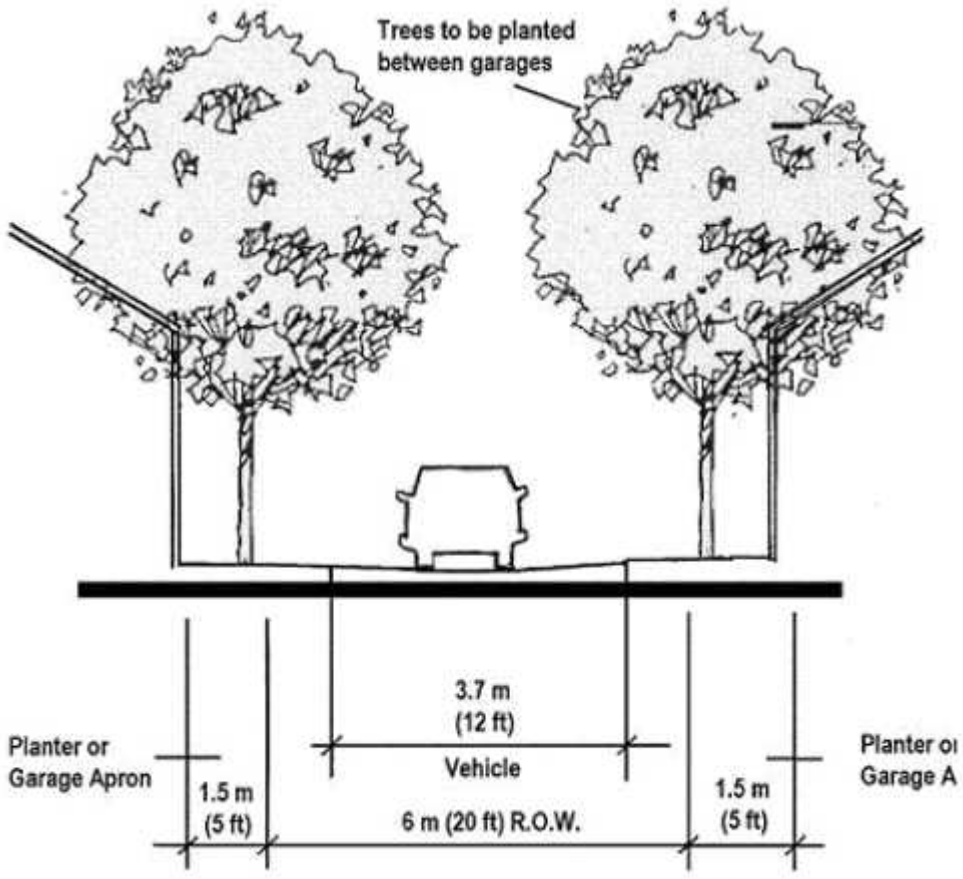
Collector streets are secondary circulation routes that distribute trips from the arterial or primary street system to the local street network. Collector streets are two-lane roadways with or without on-street parking and landscaping. All have sidewalks and vertical curbs. In some cases, landscaped parkways between the travel lane and sidewalks are replaced with intermittent parallel parking. The DSP also proposes back-in angled parking on roadway segments near the proposed town center and mixed-use development. Back-in angled parking is generally more bicycle-friendly than front-in angled parking (see picture below). Applicable street sections are Sections F, G, H, I, J and K.

4.5.3 Local Streets

Local streets provide direct access to adjacent land uses and connections to collector streets. These streets are integrated with the arterials and collectors as well as the Green Modes Network discussed in Section 4.6 to create a complete network that promotes walking, bicycling, NEV use and accommodate the movement and parking of vehicles. Local streets are loaded with driveways, include two travel lanes, and may include on-street parking and attached or detached sidewalks. Local streets do not contain bike lanes but in some instances will have Class III bike routes as depicted in Exhibit 4.4. Street Sections L, M, N and O are local streets.

Consistent with General Plan Policy CC-2.16G, the DSP requires the use of detached sidewalks and includes modified residential development standards to ensure their use. In addition, the DSP requires the use of single loaded roadways (i.e., parking only on one- side of the street) adjacent to walkways and open space areas, and the inclusion of entry elements at intersections with collector or arterial roadways. The pattern of local streets is largely bound by the detailed Circulation Plan layout in Exhibit 4.2, which is based on a grid pattern with short block lengths (i.e., less than 600 feet per General Plan Policy CC-2.16I), and will be finalized through the subdivision map for individual projects. The local street pattern should maximize connectivity and, to the extent feasible, eliminate barriers among residential uses and parks, schools, open space and service uses.

Where feasible, alleys may also be used to facilitate local circulation and access. If utilized, alleys will be identified through the subdivision map for individual projects. Alley cross sections can vary widely depending on whether they are used in residential, commercial, or mixed-use areas. The subdivision map shall provide cross-section details that will include the minimum specifications provided in the example below.



Source: http://www.fhwa.dot.gov/publications/research/safety/pedbike/05085/chapt5.cfm

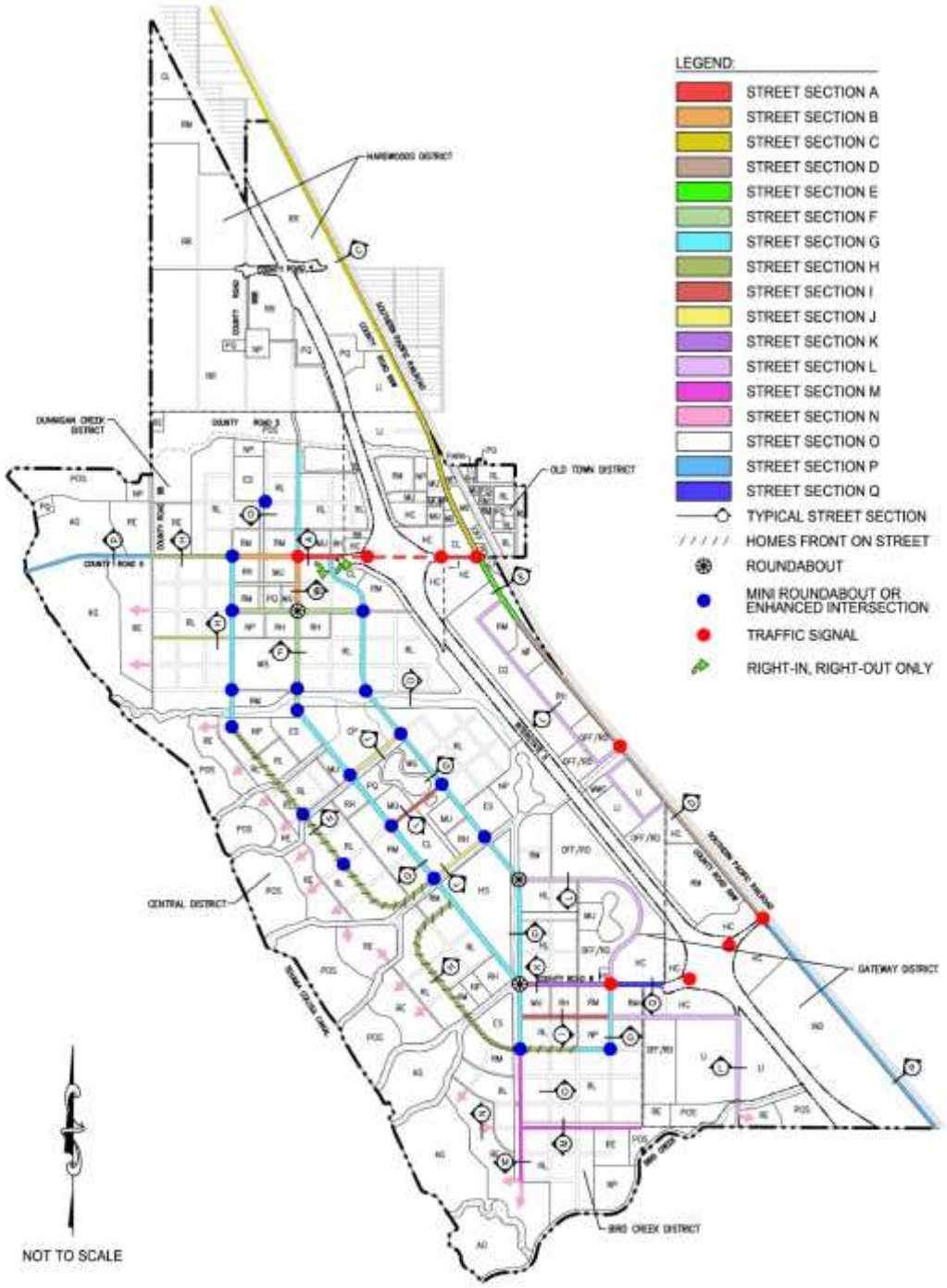
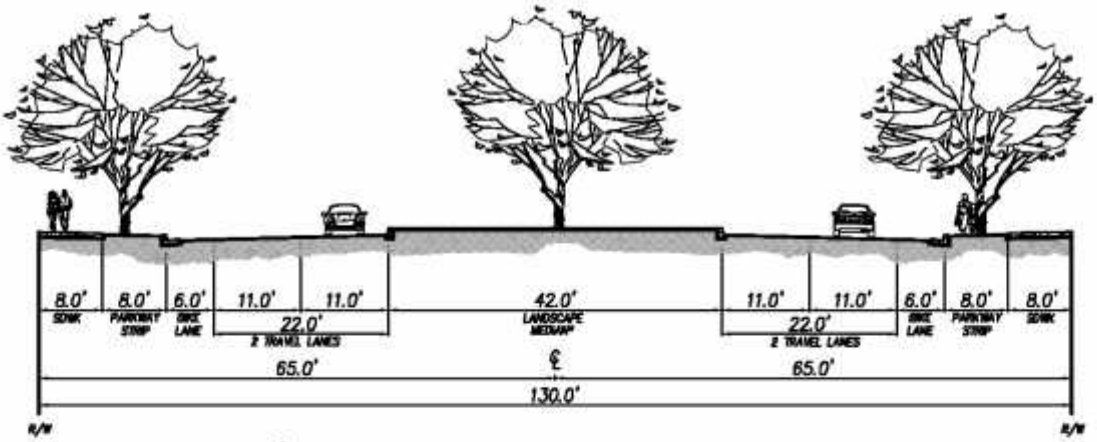
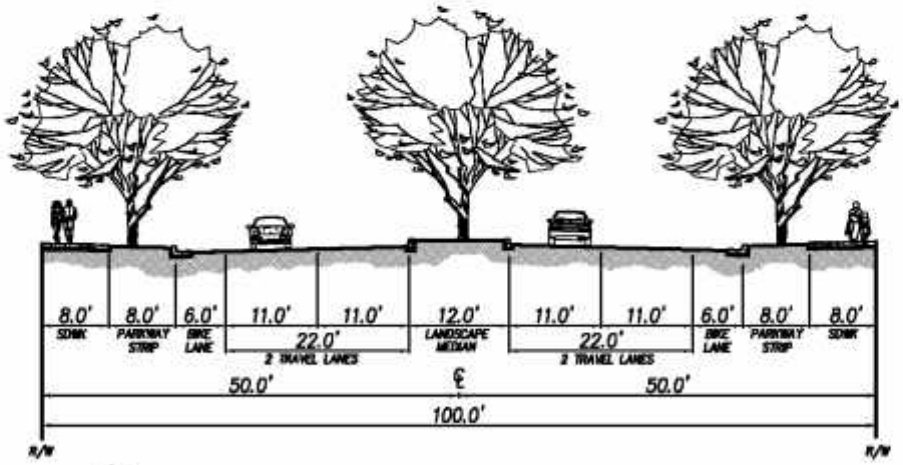


Exhibit 4.2: Circulation Plan

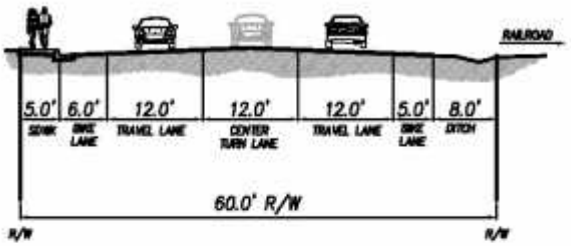


A COUNTY ROAD 6 AT INTERSTATE 5
SEPARATED SIDEWALKS, CL II BIKE LANES, MEDIAN*
NOT TO SCALE
* MEDIAN RESERVED FOR TURN LANES



B 4 LANE - DISTRICT CENTER
SEPARATED SIDEWALKS, CL II BIKE LANES, LANDSCAPE MEDIAN
NOT TO SCALE

Exhibit 4.3: Street Sections

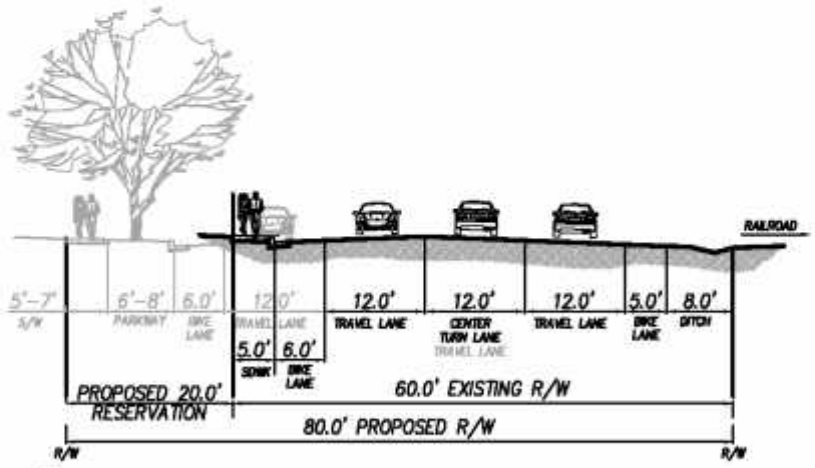


C

3 LANE - COUNTY ROAD 99W

ATTACHED SIDEWALK, CLASS II BIKE LANES, CENTER TURN LANE

NOT TO SCALE



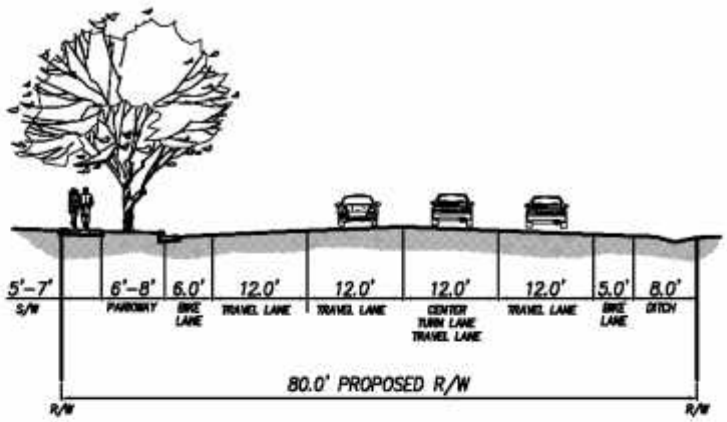
D

3 LANE - COUNTY ROAD 99W W/RESERVE

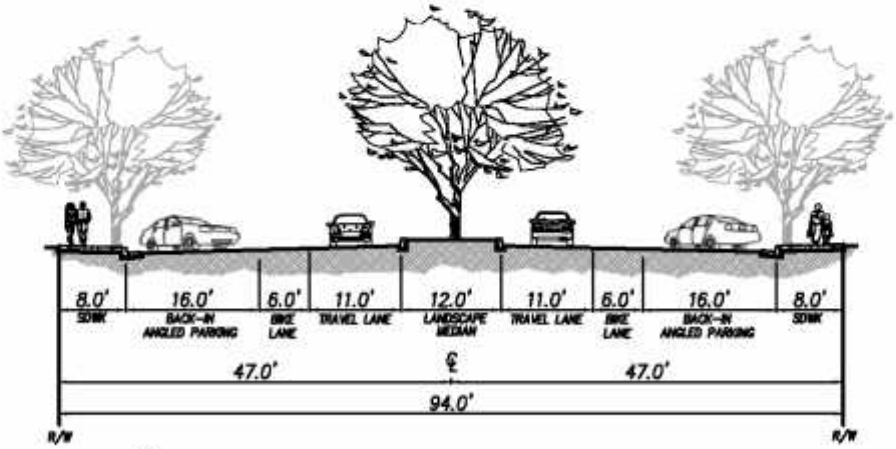
ATTACHED SIDEWALK, CLASS II BIKE LANES, CENTER TURN LANE
20' ROW RESERVATION FOR FUTURE 4-LANE EXPANSION

NOT TO SCALE

Exhibit 4.3: Street Sections

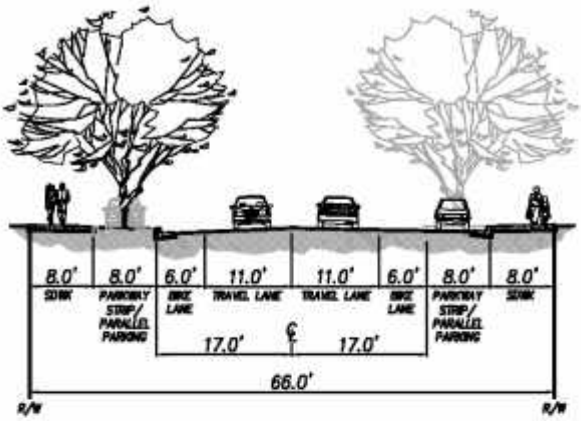


E **4 LANE - COUNTY ROAD 99W**
SEPARATED SIDEWALK, CL II BIKE LANES
NOT TO SCALE

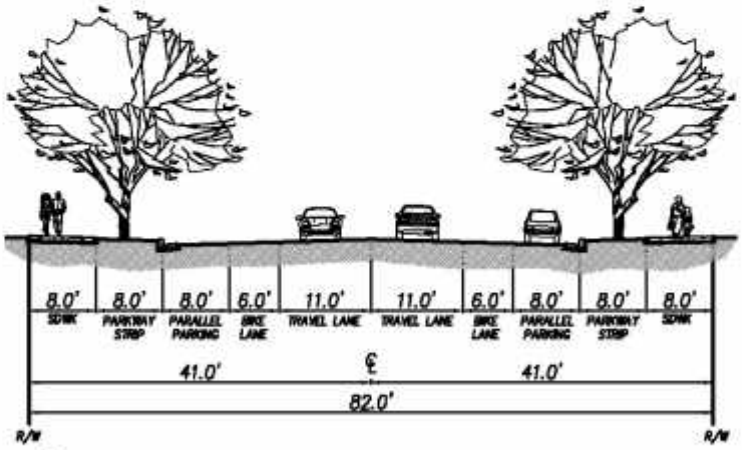


F **2 LANE - DUNNIGAN CREEK DISTRICT**
ATTACHED SIDEWALKS, CL II BIKE LANES,
BACK-IN ANGLED PARKING, LANDSCAPE MEDIAN
NOT TO SCALE

Exhibit 4.3: Street Sections

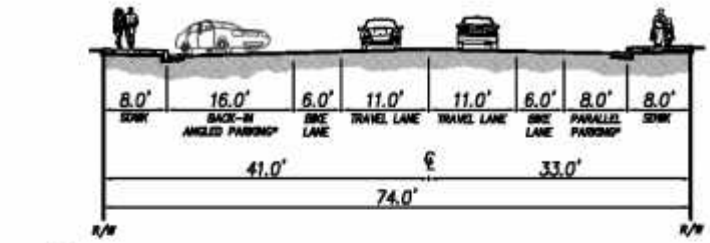


G 2 LANE - MAIN CORRIDOR
ATTACHED & DETACHED SIDEWALKS, CL II BIKE LANES, PARALLEL PARKING
NOT TO SCALE



H 2 LANE - MAIN RESIDENTIAL CORRIDOR
DETACHED SIDEWALKS, CL II BIKE LANES, PARALLEL PARKING
NOT TO SCALE

Exhibit 4.3: Street Sections



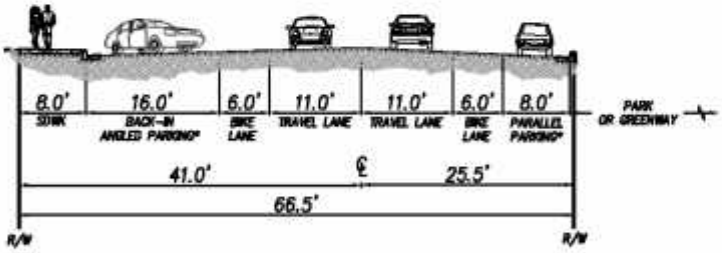
I

2 LANE - DISTRICT CENTER

ATTACHED SIDEWALKS, 6' BIKE LANE AND ON-STREET PARKING

NOT TO SCALE

* NO PARKING ADJACENT TO POS OR NP LAND USE.
BACK-IN ANGLED ADJACENT TO MU, RH, RM EXCEPT AT POS.



J

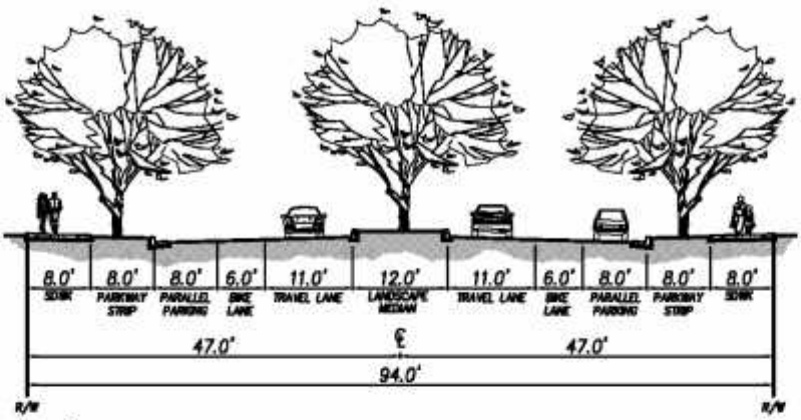
2 LANE - DISTRICT RECREATION

ATTACHED SIDEWALKS, CL II BIKE LANES,
BACK-IN ANGLED PARKING

NOT TO SCALE

* BACK -IN ANGLED PARKING ADJACENT TO MU,PQ,CL AND RH LAND USES
PARALLEL PARKING ADJACENT TO PARKS OR GREENWAYS

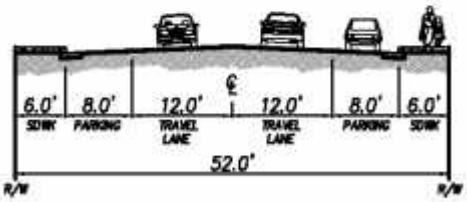
Exhibit 4.3: Street Sections



K 2 LANE - GATEWAY DISTRICT

SEPARATED SIDEWALKS, CL II BIKE LANES, PARALLEL PARKING, LANDSCAPE MEDIAN

NOT TO SCALE

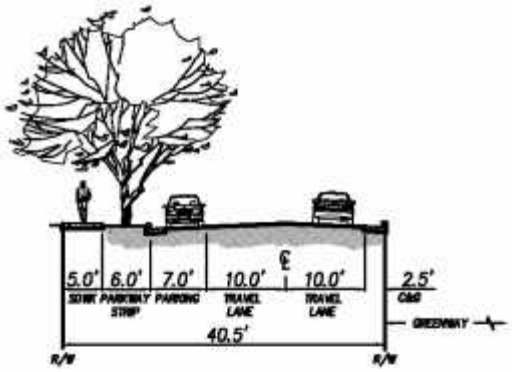


L 2 LANE -OFFICE/COMMERCIAL/INDUSTRIAL

ATTACHED SIDEWALKS, PARALLEL PARKING

NOT TO SCALE

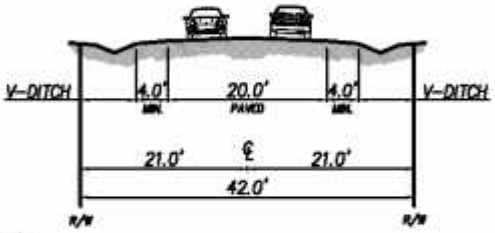
Exhibit 4.3: Street Sections



M

2 LANE - GREENWAY

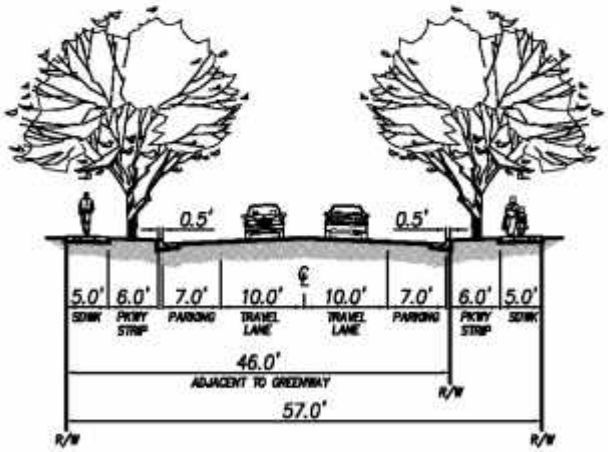
ATTACHED SIDEWALK , PARALLEL PARKING
ADJACENT TO NEIGHBORHOOD PARKS AND GREENWAYS
NOT TO SCALE



N

2 LANE - RURAL RESDIENTIAL

UNPAVED SHOULDERS
NOT TO SCALE

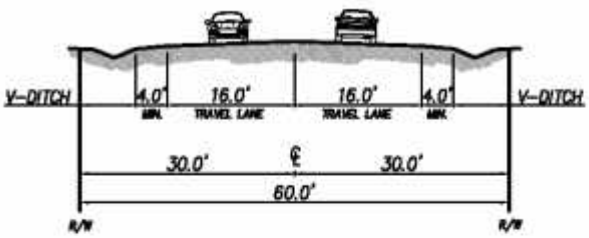


O

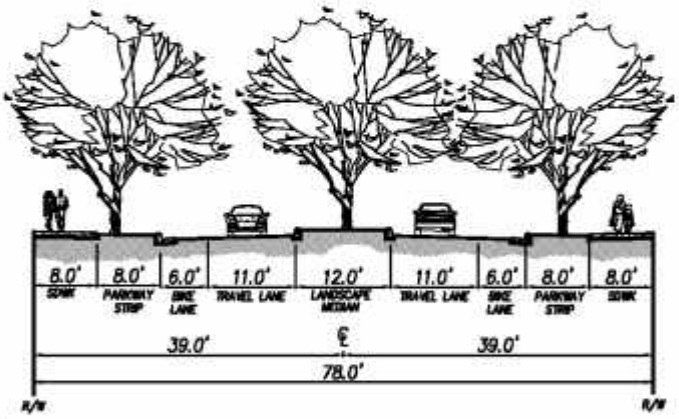
2 LANE- RESIDENTIAL

SEPARATED SIDEWALKS, PARALLEL PARKING
NOT TO SCALE

Exhibit 4.3: Street Sections



P 2 LANE YOLO CO. RURAL STREET SECTION
PAVED SHOULDERS
NOT TO SCALE



Q COUNTY ROAD 8 AT INTERSTATE 5
SEPARATED SIDEWALKS, CL II BIKE LANES, LANDSCAPE MEDIAN
NOT TO SCALE

Exhibit 4.3: Street Sections

4.6 GREEN MODES NETWORK

Exhibit 4.4 displays the DSP's "green modes" network, which consists of designated corridors for bicycles and pedestrians and compliments the street network where vehicles, NEVs, bicycles, and pedestrians will all mix. This multimodal network is an important component for connectivity and promoting non-vehicular travel in the DSP. The green modes network has been designed to allow intuitive and efficient movement throughout the Plan Area and provide linkages to the existing Dunnigan community and includes the following features.

- Sidewalks
- On-street Class II and Class III bikeways
- Off-street Class I bike paths
- Trails

As described in Section 4.6.3, NEVs will be accommodated within roadway travel lanes, which are intended to be posted for speeds of 35 miles per hour or less to allow full NEV access throughout the Plan Area.

4.6.1 Pedestrian Network

A primary objective of the DSP is the provision of a pedestrian-friendly, walkable community. Mobility for pedestrians is provided through a complete network of sidewalks and paths throughout the Plan Area. Nearly all street sections accommodate pedestrians with either attached or landscape-separated sidewalks. Exceptions occur for rural roadway sections where limited pedestrian activity is anticipated. Where attached, sidewalks are adjacent to vertical curb, which offers a higher degree of safety than rolled curb. Sidewalk width varies from five to eight feet, depending on the propensity of adjacent land uses to attract pedestrian trips. The DSP is designed with a consistent 600-foot grid roadway network intended to provide superior access for all modes and balance vehicle traffic across multiple streets. Pedestrians will also have full access to Class I bikeways described in Section 4.6.2. Pedestrian access will be focused across I-5 at the CR-6 interchange and via an exclusive pedestrian / bicycle / NEV overcrossing mid-way between the two interchanges.

4.6.2 Bicycle Network

Bikeways are classified as one of three categories illustrated in Exhibit 4.5. The Class I bikeway system provides off-street connectivity within the Plan Area for both cyclists and pedestrians. In addition, the paths accommodate emergency and maintenance vehicle access to open space areas. The Class I system has been designed to minimize barriers and reduce potential travel disruptions. The DSP promotes frequent connections between the Class I system and adjacent uses. Where a street is adjacent to open space, a park or a walkway, the Class I bike path (separated from the street) may replace the standard sidewalk. Where a cul-de-sac or loop street, multi-family or non-residential project is adjacent to the Class I path, a paved connection will be provided. The Class I system within an open space area may meander to minimize environmental impacts and create visual interest. Barriers (e.g., bollards, rail fence, post and cable, posts, etc.) will be provided along bike paths within open space areas. The barriers shall comply with any federal or state permits regarding use of the open space area, and with Yolo County design, maintenance and public safety requirements. Bicycle access will be focused

across I-5 at the CR-6 interchange and via an exclusive pedestrian / bicycle / NEV overcrossing mid-way between the two interchanges.

Class II bike lanes are designated on-street bike routes, six-feet wide delineated with signage and striping. Bicycle traffic is allowed along all local streets, with some designated as Class III bicycle routes. The figure below provides photos of each bikeway classification.

Class I Bikeway (Bike Path)

Class II Bikeway (Bike Lanes)

Class III Bikeway (Bike Route)

Bikeway Examples

4.6.3 Neighborhood Electric Vehicles

NEVs are small, electric-powered personal vehicles, and are suitable vehicles for short local trips. While they may look like a golf cart, NEVs are actually motor vehicles that can be driven on public streets with certain restrictions which include: a driver's license, Vehicle Identification Number (VIN), registration, insurance, and adherence to vehicle safety standards. In 1994, the Federal Department of Transportation defined the street-legal Low Speed Vehicle (LSV) in the Code of Federal Regulations. NEVs are a federally-recognized sub-class of LSV. NEVs are limited to 25 miles per hour (mph) by federal requirements, and may be driven on streets with speed zones of 35 mph or less. NEVs do not produce vehicle emissions and trips are considered as "green" VMT. The energy required to operate an NEV is less than one-fifth when compared to a conventional vehicle.

The NEV concept is not new to Yolo County. In 2009, The County of Yolo, the City of Davis, and the City of Woodland sponsored a public outreach and planning process to jointly develop the Davis-Woodland Alternative Transportation Corridor Feasibility Study which evaluated pedestrian, bicycle and NEV alternatives.

The DSP encourages NEV use within the DSP by providing infrastructure consistent with NEV travel and amenities that make travel convenient. Specific design standards that shall apply to the DSP are listed below.

a) All DSP roadways are intended to have posted speeds at or below 35 mph (exceptions may include portions of CR 6 and CR 99W).
b) The pedestrian and bicycle I-5 overcrossing described in Section 4.4.2 will be designed to accommodate NEVs.
c) A minimum of three charging stations capable of charging NEV and electric passenger vehicles will be provided within the Plan Area as shown in Exhibit 4-4. Since vehicle and charging technology is evolving quickly, the charging station could use fixed equipment as in the example above or possibly wireless technology that relies on pads or in-pavement components such as the example, which may also create the opportunity for more locations.
d) All charging stations shall conform to applicable Yolo County electrical design standards.

Typical NEV Charging Station

Example of Wireless Charging Station

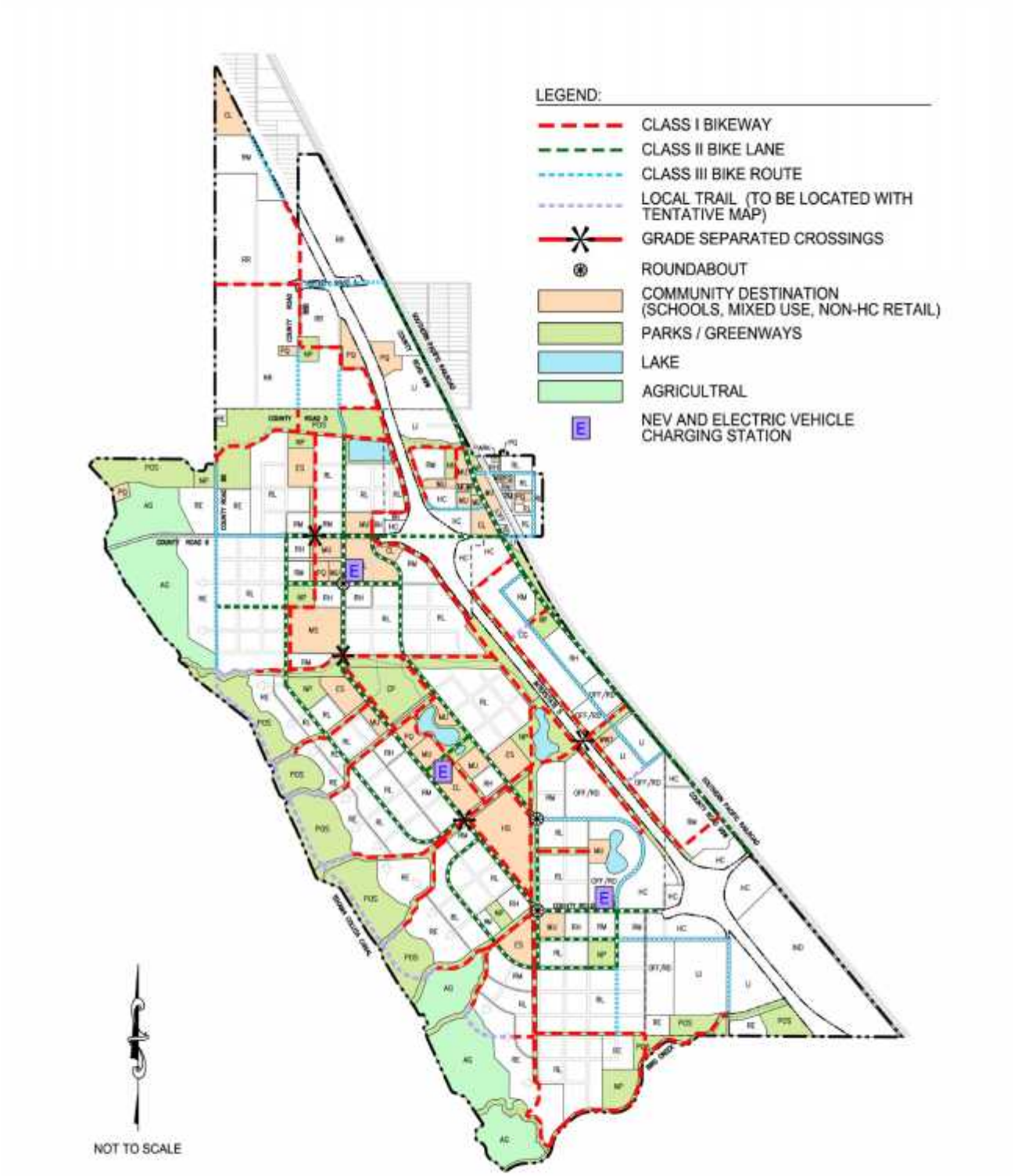
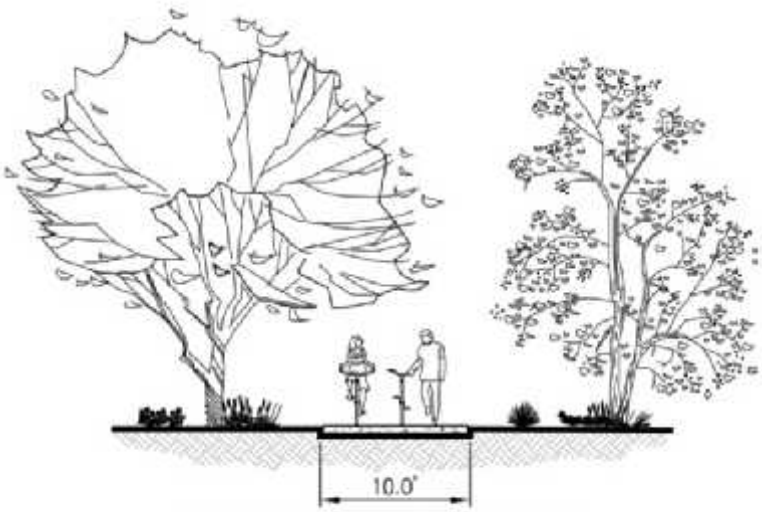


Exhibit 4.4: Green Modes Plan



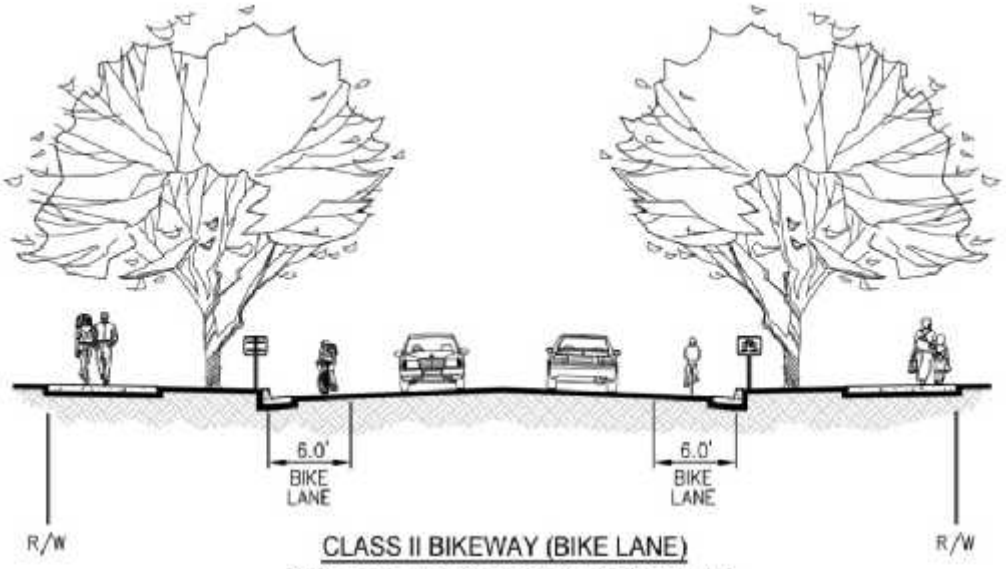


Exhibit 4.5: Bikeway Classifications

4.7 INTERSECTION DESIGN AND OPERATIONS

Intersections within the DSP rely on a variety of traffic controls and design features to accommodate all users. For key intersections, the traffic controls include traffic signals, roundabouts, mini-roundabouts, and stop signs. Where possible, the DSP will limit the use of all-way stop control and traffic signals in favor of roundabout control. All-way stop control will be considered as a temporary measure before traffic signal installation, or permanently, at locations where roundabout control is not desirable due to constraints such as geometrics, site constraints, or costs. Installing unwarranted stop controls can lead to non-compliance. For this reason, the DSP proposes to leave the majority of internal intersections within low-density residential areas as uncontrolled intersections until actual conditions suggest that control is warranted. Side-street stop controls will be used on minor street approaches to major roadways not otherwise controlled by a roundabout or signal.

4.7.1 Signalized Intersections

Based on the proposed roadway cross-sections and planning-level traffic analysis, ten signalized intersections are proposed within the DSP. At build out, these locations are expected to experience the highest levels of conflicting traffic volumes and require signalization. All signalized intersections will be constructed in accordance with Yolo County Improvements Standards or as otherwise required by the Public Works Director for specific projects. During initial project phases, it is reasonable to install temporary all-way stop control at some locations until the traffic signal operation is warranted.

4.7.2 Enhanced Intersections

Select intersections, which are identified on Exhibit 4.2, shall have enhanced streetscape treatments. The actual intersection treatment will be location-specific in response to traffic volumes, adjacent land use, and the physical environment. Roundabouts and mini-roundabouts will be used to serve the dual purpose of traffic control and traffic calming through speed management. These and other intersection treatments are described below.

4.7.2.1 Roundabouts

Exhibit 4.2 identifies three standard roundabout intersections and up to 19 other intersections that qualify for mini-roundabouts or enhanced treatments. At locations where roundabouts are proposed, adequate right-of-way, which is typically more than at traditional intersection, must be provided in the initial planning stages. The roundabout design shall include all the features displayed in the sample layout shown in Exhibit 4.6. Roundabouts, as opposed to mini-roundabouts described in the next section, shall be used for major roadways where traffic demand and potential truck traffic necessitates enhanced treatment and where consistent maneuvering speed is essential for safe and efficient travel through the intersection.

Exhibit 4.6: Typical Compact Roundabout
Source: Fehr & Peers, 2011

- The final roundabout designs shall conform to Yolo County design standards.

Intersections near schools and other land uses associated with high pedestrian traffic should be designed with traditional roundabout features including non-mountable splitter islands with an adequate pedestrian refuge area and landscape-separated sidewalks adjacent to the roundabout. Roundabouts are also an effective treatment at skewed-angle intersections or locations were a geometric design issue may not be resolved with convention intersection design.

The preference for roundabouts within the DSP is due to research indicating that roundabouts are both safer and more efficient than conventional intersection control (e.g., traffic signals or stop signs). The following benefits have been realized and are supported by extensive research on U.S. roundabouts:

- *Safety* – Research indicates that collisions occur less frequently and are less severe than at signalized intersections.

  - The number of possible conflict points between vehicles decreases from 32 at a four-way intersection, to 8 conflict points at a roundabout.
  - Vehicle speeds at roundabouts are much lower, generally less than 20mph. Lower speeds equate to shorter required braking distances.
  - Roundabout design eliminates right angle and head-on collisions, which are typically the most severe.
- *Cost Savings* – Construction costs are generally less than or equal to a signalized intersection. Maintenance costs are typically lower.
- *Reduced Delay* – By yielding at the entry rather than stopping, vehicle delay is typically reduced.
- *Capacity* – A roundabout may accommodate more vehicles than a signal given the same right-of-way. In particular, intersections with a high volume of left turns may be accommodated better by a roundabout than a multi-phased traffic signal.
- *Environment* – Roundabouts generally operate with fewer delays. A reduction in delay corresponds to a decrease in fuel consumption, air pollution, and greenhouse gases.
- *Aesthetics* – The central island and splitter islands provide an opportunity to provide landscaping. Roundabouts can also serve as gateway features.

4.7.2.2 Mini-roundabouts

Mini-roundabouts can generally fit within typical intersection right-of-way footprints when street cross sections (measured from the face of curb) are 34 feet or larger. It is possible to accommodate a mini-roundabout on a narrow street; however, intersection widening or curb realignment may be required. With the exception of DSP street Sections M, N and Q, all local street cross sections can accommodate a mini-roundabout strictly based on dimension. According to *Roundabouts: An Informational Guide*, FHWA, 2000, mini-roundabout feasibility should not just be based on physical dimensions but should also consider traffic volumes. The mini-roundabouts are feasible at locations with a total entering daily volume of 15,000 or less, which would apply to all the proposed intersections shown in Exhibit 4.2. Also, the minor street traffic needs to provide at least 10 percent of the daily volume so that major street drivers do not become conditioned to no cross traffic. The mini-roundabout design shall include all the features displayed in the sample layout shown in Exhibit 4.7.

4.7.2.3 Other Intersection Streetscape Enhancements

The DSP will benefit from other enhanced streetscape treatment, which can aid in reducing pedestrian crossing times, lowering vehicle speeds, and improving intersection visibility. The intersection treatments illustrated in Exhibit 4.8 are examples of roadway narrowing (e.g., curb extensions, medians), pedestrian safety (e.g., refuge islands, enhanced crosswalks) and aesthetic treatments (e.g., colored/textured roadway) that all signify a special roadway condition warranting slower speeds and driver attention. All measures are intended to compliment intersection traffic controls and provide traffic calming.

Many of the measures described previously as intersection streetscape enhancements can be augmented for use at mid-block locations. Raised crosswalks are also effective traffic calming measures that provide additional emphasis at key crossings. Chicanes or lateral shifts in the

roadway are useful for visually "breaking up" long stretches of roadway. Both strategies may be appropriate to use in the DSP, especially near greenway Class I bike trail crossings. Care must be taken to assess the impact such features may have on parking and drainage.

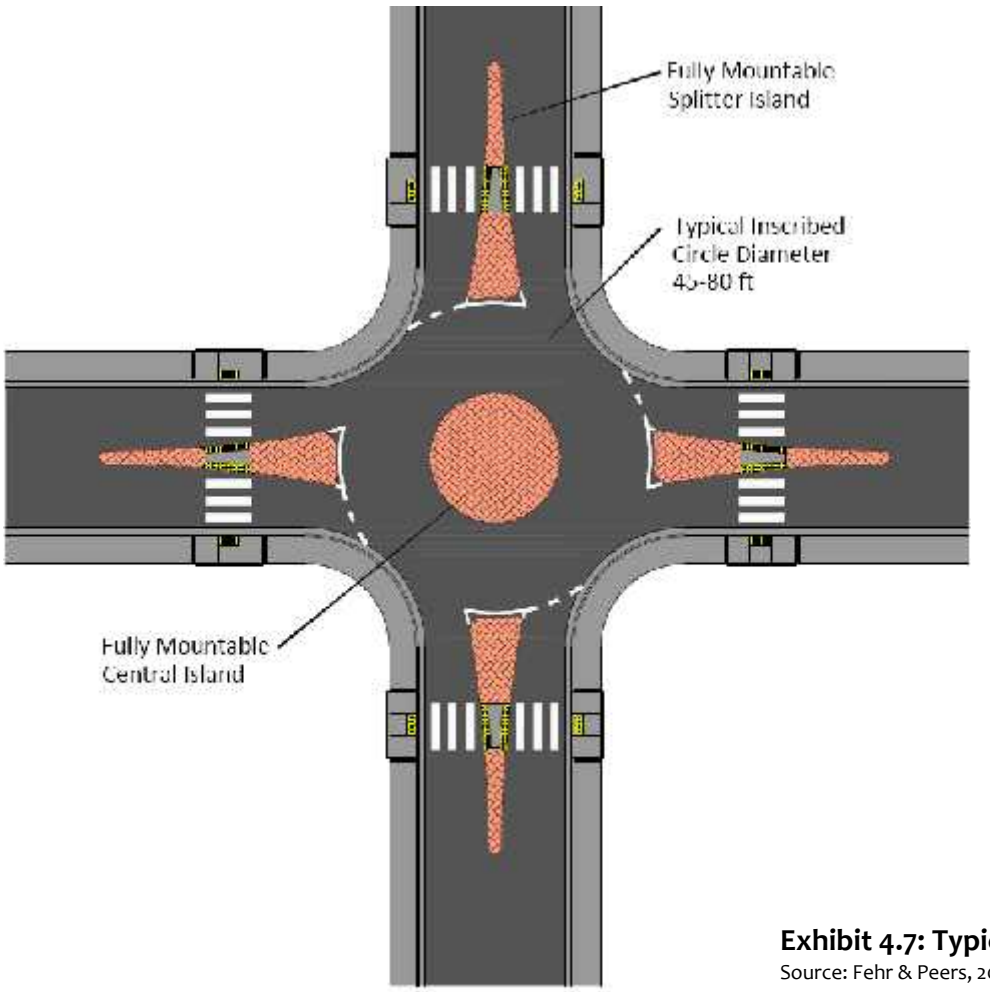


Exhibit 4.7: Typical Mini Roundabout
Source: Fehr & Peers, 2011

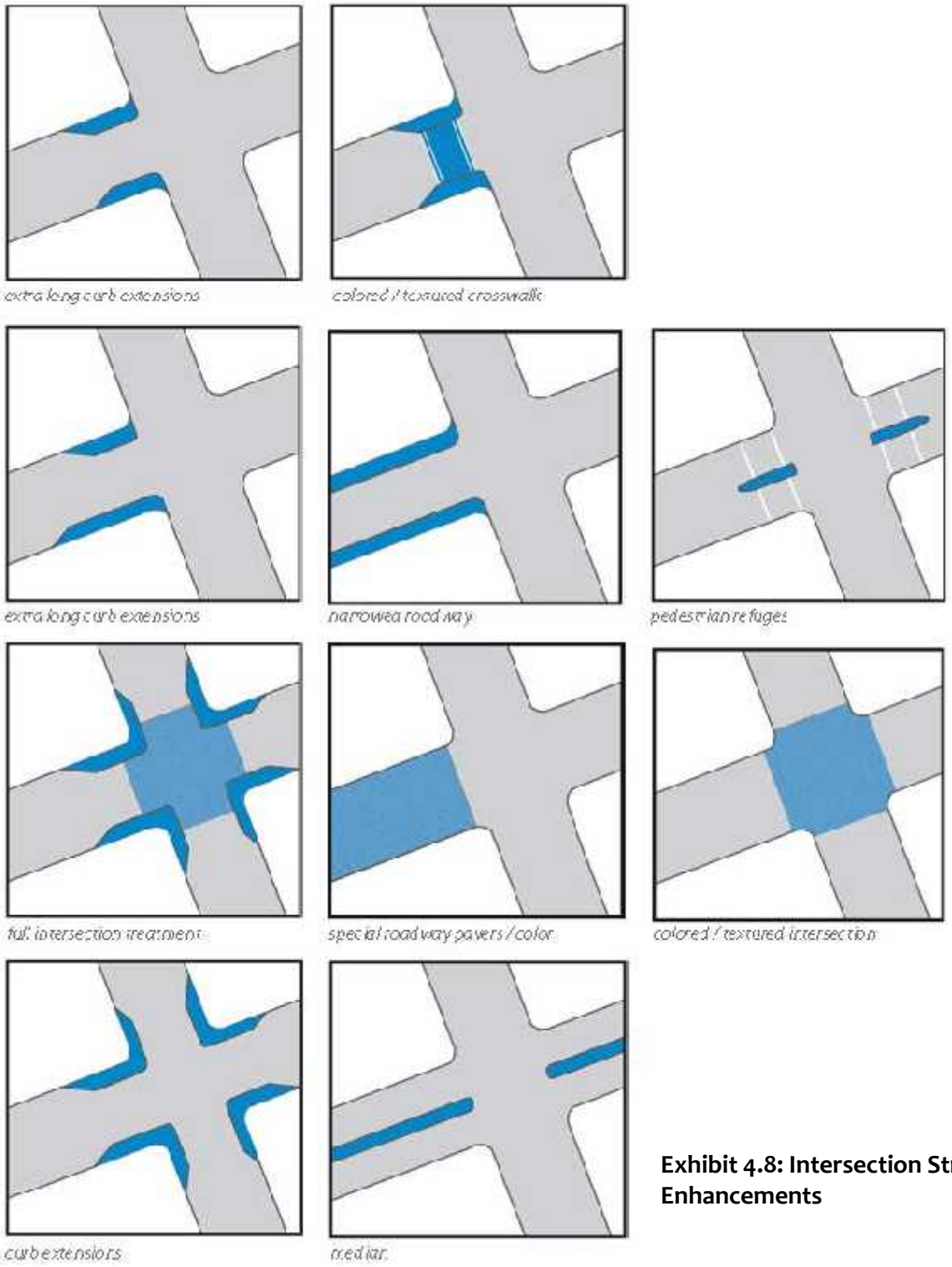


Exhibit 4.8: Intersection Streetscape Enhancements

Source: Good Design. Urban Design, Streetscape, and Sustainable Development, Best Practices for Downtown Olympia, April 2009.

4.8 PUBLIC TRANSIT

The Yolo County Transit District (YCTD) is the sole provider of public transportation (Yolobus) in the area and presently offers limited serve to Dunnigan. The current Yolobus route 217, operates between the County Fair Mall Transit Center in Woodland, located on East Street, and Campers Inn Golf Resort in Dunnigan, located on County Road 88 north of County Road 4. There are two other stops in Dunnigan along County Road 99W - at the Dunnigan Mobile Home Park and the Dunnigan Post Office. Route 217 provides one morning and one afternoon trip Monday and Thursday only. The DSP transit plan is based on an evolving expansion of YCTD service to Dunnigan as the DSP develops over time and transit funding allows. As required by the Yolo County General Plan Action CI-A6, the key transit service targets are as follows:

- Target 1 – Offer vanpool service.
- Target 2 - Expand current transit service to daily service with hourly headways.

Targets will be assessed for each phase of the DSP and through household travel surveys as specified by General Plan Action CI-A6.

To facilitate the expansion and use of transit, the highest intensity land uses in the DSP have been located within close proximity to major transportation corridors and are prime locations for potential transit stops. These uses include high density residential and employment supported by a comprehensive pedestrian network.

For transit to best serve Dunnigan as a reliable and attractive transportation mode, the following investments will be required: increase frequency of intercity service; expand routing through the DSP; provide strategic connections to existing multimodal transit centers and, present attractive transit amenities and fleet vehicles. Providing effective transit service is important to the DSP and consistent with YCTD Draft Short Range Transit Plan top priorities: to increase service to primarily infill and new development areas; ensure service levels and improvement projects are fiscally sustainable; and, to meet special transportation needs, especially those of senior and disabled citizens.

Residents and businesses with the Plan Area will provide transit funding through the payment of sales and fuel taxes. To provide additional support for transit service within the DSP, the project financing plan will include a special district or similar financing mechanism to cover the costs of capital, operations, and maintenance consistent with Yolo County General Plan Policies CI-3.3B5, CI-3.12, CI-4.3, CI-6.1, CI-6.4, and Action CI-A22. The project's contribution towards transit service financing should consider the contribution project residents and businesses will make through conventional transit funding programs that rely on gas or sales taxes.

4.8.1 Initial Transit/Vanpool Service

Section 4.8.2 describes the ultimate transit service plan envisioned for the DSP. This system will evolve over time as the project phases are completed. During the earliest phases of the project, YCTD is expected to provide a phased, demand-based approach for providing transit services within the DSP. The routing would be similar, but service would be offered less frequently and possibly using vans or shuttles until demand warranted additional capacity.

According to YCTD, offering vanpool service will be a likely first step in developing full-service daily transit. This service would be supported by development in the initial phases and would be provided in coordination with the SACOG vanpool incentive program. This program currently (June 2012) pays $300 per month for six consecutive months (up to $1,800) for each qualifying vanpool. To qualify for the incentive program, one of two authorized vanpool vendors must be used: Enterprise or VPSI and a minimum of 6 passengers (including the driver) are required. The total annual cost depends on the number of passengers and number of vanpools, but would range from about $7,000 to $18,000 per vanpool. To ensure this service is promoted and understood by residents, a local Transportation Management Agency (TMA) or County Service Area (CSA) will be created within the Plan Area.

4.8.2 Intercity Service with Community Circulator (Ultimate Service Plan)

The DSP intends to mimic both intercity and local transit service currently offered within the Cities of Woodland and Davis. As Dunnigan grows as a regional population center, intercity service will link Dunnigan residents through YCTD service with major regional employment centers and Sacramento International Airport. For intercity service to be attractive to potential riders, travel times and convenience must be competitive with private vehicles. The ultimate intercity transit service will meet the following performance standards.

- Based on current transit service, existing Yolobus routes 42 and 42R (or their future equivalent) will be augmented to offer a direct connection between Dunnigan and the County Fair Mall Transit Center in Woodland. This service would likely replace or expand upon the existing route 217 with ultimate service being provided daily with hourly headways.
- Intercity routing will be based on Exhibit 4.9: Transit Plan and will utilize the CR 6 / I-5 interchange.
- One major transit center will be constructed as shown in Exhibit 4.9. The center will include a bus turnout adjacent to the roadway lane that includes sufficient space for at least three buses or a minimum of 200' with a concrete parking apron. The center will include a shelter, a minimum of five bicycle lockers, and lighting in compliance with Yolo County and YCTD design guidelines.

The intercity service route will be developed to also act as a community circulator within Dunnigan. Within Dunnigan, this local portion of the intercity service follows a clockwise route that is approximately five miles as shown in Exhibit 4.9: Transit Plan. This routing is subject to refinement especially with regards to the feasibility of left-turn movements onto Jones School Road that will be determined as part of future CR 6 interchange design studies. This local bus service will link residential neighborhoods to local trip generators such as retail, office and school uses. Neighborhood-oriented transit routes will provide convenient access to the new town center, Old Town Dunnigan, major office / research & development centers and commercial properties east of I-5. Operating similarly to a traditional community circulator, bus service within Dunnigan will utilize collector streets in addition to primary roadways. Medium- to high-density residential developments constitute the target market for this service. Bus stops will be conveniently located within these target areas with the majority of the Plan Area, having access to a route within ¼ mile as shown in Exhibit 4-9.

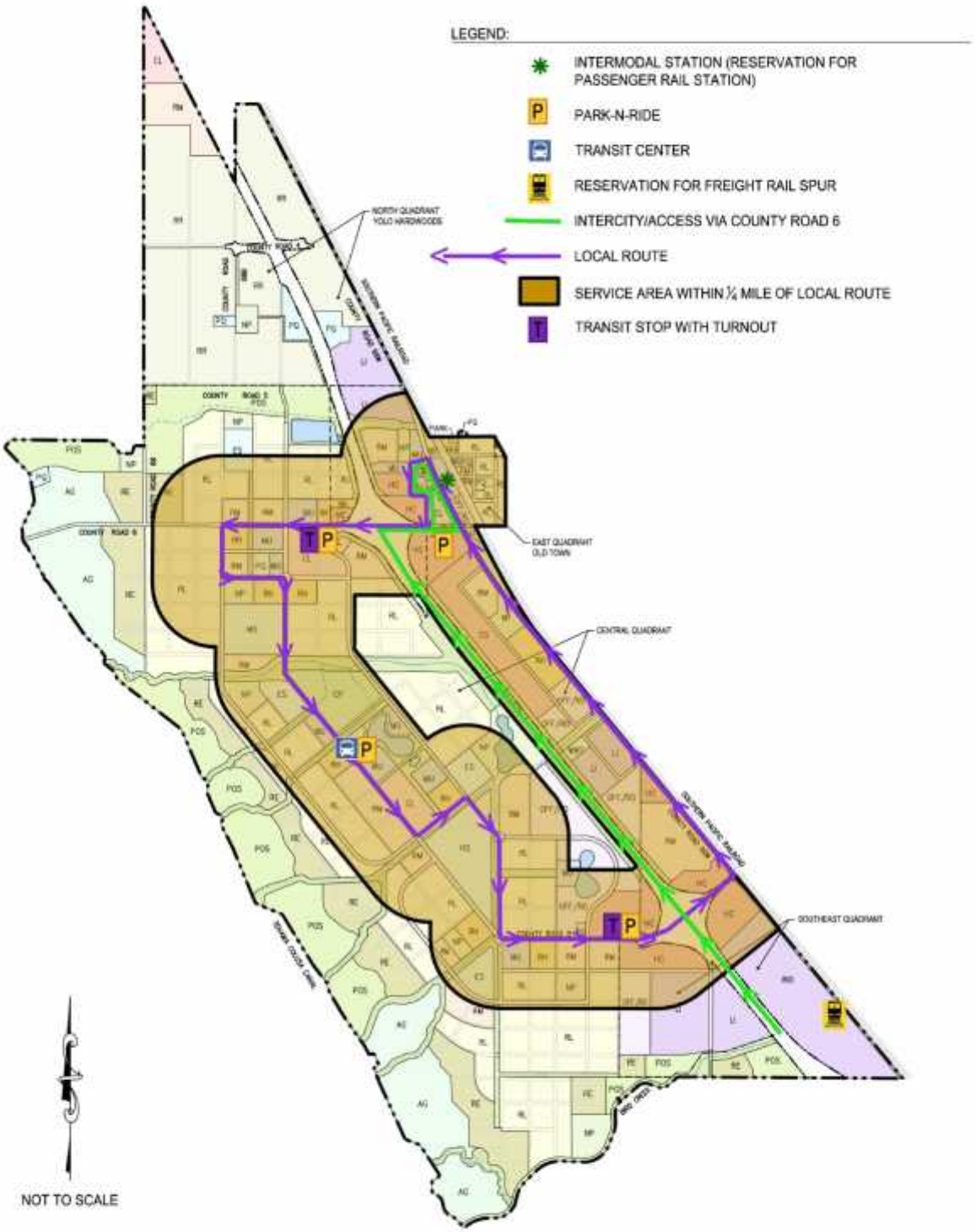


Exhibit 4.9: Transit Plan

4.8.3 Intermodal Station and Transit Center

The DSP provides convenient transit connections to local and regional multimodal facilities. Within Dunnigan, the historic downtown site is proposed as an intermodal station with the potential for passenger rail service and a transit center is proposed at the town center. Both facilities are intended to serve higher transit demand than a typical bus stop; therefore, more extensive infrastructure is required. The intermodal station will be designed to facilitate transfers between modes including commuter rail and bus transfer activity.

Both locations will be designed to accommodate bus layovers and passengers comfortably. Both locations are adjacent to mixed-use properties which have a high likelihood of providing attractive, supporting services. Long-term, secure bike parking should be provided at both locations. NEV charging stations shall also be prominent and convenient. Both locations will be in close proximity to park and ride lots and designed with passenger drop-off areas.

4.8.4 Bus Stops

Bus turnouts and bus stops shall be located consistent with General Plan Policy CI-6.11 (such as near neighborhood focal points and activity centers) and constructed in accordance with Yolo County Improvements Standards, YCTD requirements, or as otherwise required by the Public Works Director for specific projects. At a minimum, the project will construct the one major transit center and the two transit stops shown on Exhibit 4.9. These locations were identified in consultation with YCTD. Additional stops may be added and the locations of these stops are subject to change if future development patterns change. All stops will provide upgraded amenities including shelter, seating and lighting. Examples of an existing YCTD transit center and bus stop are shown below.

YCTD Bus Stop

YCTD Transit Center

4.8.5 Fleet Vehicles

A combination of vanpools, shuttles and full-size buses will be utilized. Vanpools have space for 9 to 15 passengers while shuttles typically accommodate 16 passengers, and full-size buses have room for up to 50 passengers. All newer vehicles have similar features, including low floors for easy boarding and wheelchair lifts or ramps.

4.8.6 Park and Ride

Park and ride lots provide parking for commuters to leave their vehicles to meet carpools, vanpools or access transit. In the DSP, a total of four formal park and ride lots are dispersed throughout the Plan Area in strategically-located commercial and office locations with freeway and transit access while also be adjacent to transit stops (refer to Exhibit 4.9: Transit Plan and Table 4.2). A Park and ride lot needs to be clearly visible from the surrounding area and major transportation access routes to encourage use, alleviate personal security concerns and decrease the potential for theft and vandalism.

Each of the following designated locations assumes the inclusion of joint-use park and ride spaces and a minimum of 5 secure bicycle lockers. Park and ride lots and spaces will be installed with project development and designed in accordance with Yolo County standards. Park and ride lots shall be available from sun-up to sundown on a daily basis. Caltrans offers maintenance and leasing agreements with local entities or private land-owners through the District 3 Park-N-Ride Program.

Table 4.2: Park and Ride Locations	
PNR1:	Commercial Local (CL) near CR 6 west of I-5
PNR2:	Highway Commercial (HC) adjacent to CR 6 east of I-5
PNR3:	Office/Research Development (O/RD) adjacent to CR 8 east of I-5
PNR4:	Urban Core Transit Center

4.9 RAIL TRANSIT

The DSP accommodates both commuter passenger and freight rail to enhance mobility and facilitate economic development. The DSP will reserve right-of-way for a passenger rail station on the east side of CR 99W in Old Town Dunnigan near the proposed mixed-use development. The DSP will also reserve right-of-way for a freight rail spur for future industrial development south of CR 8.

4.10 VEHICLE MILES OF TRAVEL (VMT) REDUCTION STRATEGIES

The DSP includes the objective to achieve the 44 VMT generated per household per weekday target set by Policy CI-3.19 of the General Plan through a combination of project design features and vehicle trip reduction programs. By providing an integrated and "complete" community, the DSP envisions a high degree of trip internalization (i.e., multiple trip types can be satisfied locally as opposed to requiring travel outside the Plan area) as a key strategy in achieving this target. In addition to designing a complete community that provides a full range of opportunities for employment, schools, shopping, and recreation, the project seeks to have a relatively high percentage of residents working within the project, telecommuting, or using transit.[2]

[2] The American Communities Survey (2007-2011) estimated that less than forty percent (40%) of residents in the cities of Gilroy, Hollister, Los Banos, Orland, and Williams (and less than thirty percent (30%) of residents in Dixon and Winters) were employed within the City limits. In the Cities of Corcoran, Davis and Woodland, less than fifty percent (50%) of residents were employed within the City limits. (See Appendix Q, Table 3.)

Proximity to jobs and regional retail significantly impact VMT. For rural communities like Dunnigan, the distance to employment and shopping centers presents a significant challenge to achieving a lower VMT. The estimate of current weekday VMT generated by existing households in the Dunnigan-Knight's Landing area is approximately 88.[3] This is largely due to the long distance to the nearest major employment and regional shopping centers in Woodland, Davis, and Sacramento. Similar VMT rates can be expected in the DSP in early phases until sufficient employment plus local and regional shopping destinations are available within the Plan Area.

The DSP will allow future population and employment growth in northern Yolo County to occur in close proximity and within a community that has been designed to emphasize and encourage walking, bicycling, NEV use, and transit use. Table 4.3 compares year 2035 projections of VMT per household for DSP and communities throughout the region. These forecasts account for variety of urban design variables such as density, diversity of land use, and network design that help to reduce VMT. A contributing VMT factor is also the project's location. While being located farther away from other urban areas creates longer trip lengths for trips that leave the community, this longer distance also discourages people from making those longer distance trips if they can satisfy their desired activity within the community. The DSP has been designed as a full service community to reduce the need for external travel off-site. Similar communities in California were evaluated to determine how this combination of factors influenced the community's ability to internally capture trips. According to Census and American Community Survey (ACS) travel data, rural, isolated communities internalized between about 20 and 50 percent of their home-to-work trips. The actual performance of DSP is expected to be at the higher end of this range by build out but a variety of economic factors outside the control of the project and the County will influence performance over time. Hence, it is not possible to guarantee the project's VMT performance but the following outcomes have a relatively high level of confidence.

- The DSP will improve current weekday household generated VMT performance (88) for the larger Dunnigan-Knight's Landing area.
- The DSP will have less household generated VMT over time as the project matures and becomes a full service community.
- Trip reduction strategies can help to reduce DSP household generated VMT, but these strategies should be evaluated over time as part of ongoing monitoring or as part of each project phase. The most effective VMT reduction strategies for achieving the General Plan target of 44 will likely depend on specific circumstances associated with future conditions such as fuel costs and other factors that are outside of the County's regulatory control and would be difficult to predict at this time.

[3] Source: SACSIM07 regional travel demand simulation model, SACOG, 2009.

Table 4.3 Year 2035 Projected Weekday VMT Generated Per Household without DSP Vehicle Trip Reduction Programs (1)	
Dunnigan Specific Plan (DSP) (2,3)	**53**
Dunnigan–Knights Landing (without DSP)	84
Woodland	44
Davis	44
Winters	52
North Natomas	49
Elk Grove	57

Source: SACOG, 2009 and Fehr & Peers

DSP forecast is based on the Dunnigan Travel Forecasting Model developed by Dowling Associates and modified by Fehr & Peers. All other forecasts are based on SACSIM07 regional travel demand simulation model for SACOG 2007 Regional Analysis Districts.

Notes:

(1) DSP forecast is based on the Dunnigan Travel Forecasting Model developed by Dowling Associates and modified by Fehr & Peers. All other forecasts are based on SACSIM07 regional travel demand simulation model for SACOG 2007 Regional Analysis Districts

(2) This forecast accounts for the location and urban design characteristics of the DSP, but not potential program-related VMT reduction strategies. A variety of VMT reduction strategies has been included in the DSP, but which ones are implemented and their level of effectiveness will depend on conditions in the future that cannot be accurately predicted at this time.

(3) This forecast does not account for differences in future vehicle fleet or fuel mix that have occurred since the VMT target was created in the Yolo County General Plan.

As noted above, the DSP forecast of 53 VMT generated per household is largely the result of strategies that are reflected in the project's physical design and represented by the land use and circulation plans of the DSP. The project's isolated location is also a contributing factor. A summary of key design features that contribute towards the DSP forecast are listed in Table 4.4.

Table 4.4: VMT Reduction Strategies Included in the DSP Through Project Design Features	
VMT Gap Reduction Measure	**Description**
Land Use Diversification	
Balanced mix of residential and non-residential land uses to minimize the potential for residents to travel off-site	Residential development in the DSP are designed to meet the demand that would be generated from non-residential development; Sufficient retail land use is provided to accommodate all local serving retail needs plus community-level retail needs; Schools are sized to accommodate all the K-12 students that would be generated by the project
Community Enhancement	
Pedestrian Network Improvements	Comprehensive pedestrian network consisting of paths, sidewalks, and roadway crossing treatments; Well-connected internal network linking land use and free of barriers; Connections to pedestrian facilities external to the site
Traffic Calming Measures	Roadway environments designed to promote reduced speeds and encourage pedestrian and bicycle trips; Project may include curb extensions, speed humps or tables, raised intersections, median islands, traffic circles and tight corner radii
Neighborhood Electric Vehicle Network	Comprehensive neighborhood electric vehicle network provided through a combination of roadways with a maximum posted speed limit of 35mph and designated off-street paths
Bike Parking in Non-Residential Projects	Short-term and long-term bicycle parking; Project may include a combination of bike racks, bike lockers, or secure, bike stations
Bike Lane Street Design (On-Site)	Comprehensive bicycle network consisting of bicycle lanes, routes and shared-use paths; Well-connected internal network linking land use and transit facilities; Connections to bicycle facilities external to the site
Bike Parking in Multi-Unit Residential Projects	Short-term and long-term bicycle parking; Project may include a combination of bike racks, bike lockers, or secure, bike stations
Electric Vehicle Parking	Provision of accessible electric vehicle parking
Dedicated Land for Bike Trails	Designated right-of-way for planned off-street bikeways consist with adopted comprehensive bicycle master plan
Complete Streets	Policy and design directing access and accommodation for all modes of travel and ability levels
Park and Ride Lots	Designated parking lots and spaces within larger lots intended as a convenient place to leave one or more vehicles for rideshare purposes; Location is usually proximate to freeway access
Live-Work Design and Zoning	Live-work elements in housing products; High-speed internet access; Permit and build secondary or accessory development units; Access to business services within neighborhoods.

Table 4.4: VMT Reduction Strategies Included in the DSP Through Project Design Features	
VMT Gap Reduction Measure	**Description**
End of Trip Facilities	Provision of showers, changing rooms, lockers and secure bike parking
Preferential Parking	Convenient, reserved parking for employees who rideshare
Transit System Improvements	
Transit Network	Comprehensive transit network with convenient and proximate access to project site; Well-connected internal network linking land use and activity centers; Connections to transit facilities external to the site
Bike Parking Near Transit	Short-term and long-term bicycle parking; Project will include a combination of bike racks, bike lockers, or secure, bike stations
Transit Access Improvements	Pedestrian and bicycle facilities are planned to connect to high quality transit stops and centers

To reach the General Plan target of 44 VMT generated per household, the DSP will provide transportation services through a Transit Management Agency (TMA) or as a community service provided by the CSA. Depending upon VMT performance, the DSP may also need to implement other programs such as those listed in Table 4.5. These programs are designed to reduce vehicle trips that leave the Plan Area beyond what would be expected through the project's design features alone. Whether these programs will be required will be determined by market acceptance, feasibility, and VMT monitoring that will occur over time as required by Policy CI-3.19 and Action CI-A67. Monitoring is important because VMT can be influenced by market forces and a number of other factors outside the control of the project proponents or Yolo County. Further, a number of the strategies cannot be quantified at this time based on available data and research.

Table 4.5: Strategies for the DSP to Reduce the Projected VMT Gap	
VMT Gap Reduction Measure	**Description (2)**
Jobs – Housing Programs	An employee-based housing program within the plan area that includes residential units that are dedicated for employees that work within the plan area. (1)
Employer-Based Transit	A dedicated transit service that connects DSP residents to major employers such as Cache Creek Casino and UC Davis. This service would be provided by DSP in cooperation with the major employers (1).
Car Sharing	On-demand access to a fleet of shared-vehicles; User fees are typically collected through an annual membership, mileage and hourly rates

Table 4.5: Strategies for the DSP to Reduce the Projected VMT Gap	
VMT Gap Reduction Measure	**Description (2)**
Transportation Management Association (TMA) (3)	Formalized organization to oversee transportation options and incentives; TMAs typically provide service within a specific geographic area and are supported by a member fee
Voluntary Commute Trip Reduction Program (3)	Employee assistance and incentives to reduce single occupant vehicle travel; Program consists of ride-matching, preferential carpool parking, flexible work schedules for carpools, part-time transportation coordinator; bike end of trip facilities; Program does not require monitoring or reporting
Mandatory Commute Trip Reduction Program	Employee assistance and incentives to reduce single occupant vehicle travel; Program consists of ride-matching, preferential carpool parking, flexible work schedules for carpools, part-time transportation coordinator; bike end of trip facilities; Program requires monitoring and reporting
Subsidized Transit Program	Discounted daily or monthly public transit passes
Telecommuting and Alternative Work Schedules	Flexible schedules, compressed work weeks or working remotely at or closer to home; Strategies to reduce the number of commute trips
Employer Sponsored Vanpool/Shuttle	Purchased or leased vans for commute use and the formation of vanpools; Shuttles providing employees direct access to transit stations and other primary destinations
Ridesharing Programs (3)	Formal rideshare matching service within organization or through TMA; Designated preferential parking
Trip Reduction Marketing (3)	New employee orientations, event promotions and publications regarding commute trip reduction measures
School-Pool Program	Incentivized rideshare matching for students
School Bus Program	Restore or expand school bus service

Notes:
(1) The actual number of housing units or resident participants in the transit service will depend on VMT performance of the DSP based on monitoring
(2) More information regarding each of these measures, including their potential effectiveness in reducing VMT, is provided in the California Air Pollution Control Officers Association (CAPCOA), *Quantifying Greenhouse Gas Mitigation Measures*, August 2010
(3) Proposed as an early implementation measure

Many of the strategies in Table 4.5 focus on home-based work trips, which tend to be the most easily defined and predictable daily VMT generator. However, VMT is most often affected by home-based "other" trips. For example, home-to-work trips represent only about 20 percent of all daily travel. Home to shopping and other destinations such as school, recreation, etc., represent a much higher percentage ranging from 50-60 percent of all daily trips. Therefore, it is imperative to look at the effect of all trip types on VMT during the monitoring process and suggest relevant reduction strategies that can be most effective and suitable to the project.

Unique to the DSP, the project will also reduce regional VMT by satisfying unmet demand for housing and services along the I-5 corridor. For example, a resident in Arbuckle may currently need to travel to Woodland for shopping. By offering comparable services in the DSP, this trip can be intercepted resulting in a VMT reduction for a trip originating outside the Plan Area. The DSP will also provide opportunities for existing workers in Yolo County who commute long distances to reside closer to their jobs. For example, many Cache Creek Casino and UC Davis employees live far outside of Yolo County often due to affordability issues. By providing a range of housing in the DSP, current long distance work trips may be shortened.