
5.0 TRAFFIC AND CIRCULATION

5.1 Introduction

This section of the Background Report describes the existing transportation conditions in the Town of Corte Madera. It describes the various modes of the existing transportation system, the existing traffic volumes on area roadways, and current levels of service. Relevant planning documents and policies, and planned roadway improvements for the area are also described.

5.2 Functional Classifications

Streets and highways in the Town are described by their functional classification. These classifications identify the purpose of the streets and highways relative to their overall function in the distribution of different types of trips using the facilities. The classifications that are relevant to the Town are as follows:

Freeways. Freeways serve both inter-regional and intra-regional circulation needs. These facilities are typically accessed by collector or arterial roadways and have no at-grade crossings. These facilities have the highest carrying capacity with the maximum speed limits allowed by law.

Arterials. Arterials provide primary connections between major areas within the Town and also distribute traffic between adjacent communities. In addition, arterials provide considerable statewide and interstate circulation. Speed limits often range from 30 to 50 mph.

Collectors. Collectors typically serve intra-city rather than regional circulation needs. Their primary function is to provide access to adjacent properties and connections between local roads and other roadways that are higher in the hierarchy of classification. Travel speeds on collectors often range between 25 mph and 45 mph.

Local Streets. Rural local roads provide access to adjacent properties and distribute traffic to collectors. Travel speeds on local streets typically range from 25 to 35 mph.

5.3 Key Town Roadways

Major roadways in the town are described below and are depicted in **Figure 5.3.1**.

US (Highway) 101 is a north-south 8-lane freeway that bisects the town. It provides regional access to Marin County and points beyond. Full access to the Town is provided at an interchange with Tamalpais Drive. Southbound access is provided by slip ramps at Fifer Avenue and Madera Boulevard, and northbound access is available at slip ramps at Industrial Way. The posted speed limit on US 101 is 55 miles per hour (mph).

Figure 5.3.1

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Tamalpais Drive is an east-west 2-4 lane arterial that extends from Corte Madera Avenue to Redwood Highway. It has a full access interchange at US 101. The posted speed limit on Tamalpais Drive ranges from 30-40 mph.

Corte Madera Avenue is a north-south 2 lane collector that extends from Larkspur in the north as Magnolia Avenue and south into Mill Valley as Alto Camino. It acts as a “main street” in part of the older downtown area. The posted speed limit on Corte Madera Avenue is 30 mph.

Fifer Avenue is an east-west 2 lane collector that extends from the US 101 ramps to Lucky Drive. The posted speed limit on Fifer Avenue Drive is 30 mph.

Nellen Avenue is a north-south 2 lane collector that extends from Lucky Drive to Fifer Avenue. It also extends from Warnum Avenue north to a cul-de-sac just south of Fifer Avenue. The posted speed limit on Nellen Avenue is 30 mph.

Redwood Highway is a north south 2-4 lane collector that extends from Tamalpais Drive to Greenbrae Boardwalk, generally paralleling US 101 on the east side of the freeway. The posted speed limit on Redwood Highway is 30 mph.

Madera Boulevard is a north-south 2-4 lane arterial that extends from Casa Buena Drive to US 101. The posted speed limit on Madera Boulevard is 30 mph.

Tamal Vista Boulevard is a north-south 2 lane collector that extends form Madera Boulevard to Fifer Avenue. The posted speed limit on Tamal Vista Boulevard is 30 mph.

San Clemente Drive is a north-south 4 lane arterial that extends from Redwood Highway/Tamalpais Drive to Paradise Drive. The posted speed limit on San Clemente Drive is 30 mph.

Paradise Drive is an east-west 2-4 lane collector that extends from San Clemente Drive into Tiburon. The posted speed limit on Paradise Drive is 30 mph.

5.4 Level of Service Standards

The operating conditions experienced by motorists are described as “levels of service” (LOS). Level of service is a qualitative measure of the effect of a number of factors, including speed and travel time, traffic interruptions, freedom to maneuver, driving comfort, and convenience. Levels of service are designated “A” through “F” from best to worst, which cover the entire range of traffic operations that might occur. Levels of service “A” through “E” generally represent traffic volumes at less than roadway capacity, while LOS “F” represents over capacity and/or forced flow conditions. The Town of Corte Madera has identified level of service C as the minimum acceptable standard. **Table 5.4.1** provides a description of traffic operations under each level of service and **Table 5.4.2** shows the level of service thresholds and capacities for various roadway facilities.

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Table 5.4.1: Level of Service Definitions

Level of Service	Description
A	Level of service A represents free flow. Excellent level of comfort, convenience and freedom to maneuver.
B	Level of service B is in the range of stable flow, but the presence of other road users in the traffic stream causes noticeable reductions of comfort, convenience, and maneuvering freedom.
C	Level of service C is in the range of stable flow, but the operation of individual users is significantly affected by others in the traffic stream.
D	Level of service D represents high-density, but stable flow. Users experience severe restriction in speed and freedom to maneuver, with poor levels of comfort and convenience.
E	Level of service E represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver is difficult, with users experiencing frustration and poor comfort and convenience. Unstable operations are frequent, where small increases or minor perturbations to the traffic flow can cause breakdown conditions.
F	Level of Service F is used to define forced or breakdown conditions. This condition exists wherever the amount of traffic approaching a point exceeds the amount that can traverse a point. Roadways store long queues behind such locations, with traffic advancing in stop-and-go “waves”.

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Table 5.4.2: Level of Service for Roadways / Freeways

Facility Type	Number of Lanes	Maximum Volume for Given Service Level				
		A	B	C	D	E
Rural, 2-lane highway	2	2,400	4,800	7,900	13,500	22,900
Residential collector	2	3,000	3,500	4,000	4,500	5,000
Arterial, low access control	2	9,000	10,500	12,000	13,500	15,000
	4	18,000	21,000	24,000	27,000	30,000
	6	27,000	31,500	36,000	40,500	45,000
Arterial, moderate access control	2	10,800	12,600	14,400	16,200	18,000
	4	21,600	25,200	28,800	32,400	36,000
	6	32,400	37,800	43,200	48,600	54,000
Arterial, high access control	2	12,000	14,000	16,000	18,000	20,000
	4	24,000	28,000	32,000	36,000	40,000
	6	36,000	42,000	48,000	54,000	60,000
Freeway	2	14,000	21,600	30,800	37,200	40,000
	4	28,000	43,200	61,600	74,400	80,000
	6	42,000	64,800	92,400	111,600	120,000
	8	56,000	86,400	123,200	148,800	160,000
<u>Facility Type Definition</u>	<u>Stops/Mile</u>	<u>Driveway</u>	<u>Speed</u>			
Arterial, low access control	4+	Frequent	25-35 MPH			
Arterial, moderate access control	2-4	Limited	35-45 MPH			
Arterial, high access control	1-2	None	45-55 MPH			
Source: Highway Capacity Manual						

5.5 Signalized Intersection Analysis

Signalized intersections (those controlled by traffic signals) were analyzed using a method described in the Transportation Research Board's *Highway Capacity Manual*, 2000. Capacity is evaluated in terms of the ratio of demand flow rate to capacity (v/c ratio), whereas LOS is evaluated on the basis of control delay per vehicle (in seconds per vehicle). **Table 5.5.1** presents the LOS criteria for signalized intersections.

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Table 5.5.1: Level of Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (in seconds)	Description
A	≤10	Very low delay. Occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	10-20	Generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS “A,” causing higher levels of average delay.
C	20-35	These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.
D	35-55	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	55-80	These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.
F	> 80	This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

Source: *Highway Capacity Manual*, Transportation Research Board, Washington, D.C., 2000.

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5.6 Existing Levels of Service

As part of this study, Average Daily Traffic (ADT) counts were collected on ten key roadway segments throughout the town and PM peak hour counts were taken at five key intersections. The corresponding levels of service on the roadways and at the intersections are shown in **Tables 5.6.1 and 5.6.2**, respectively.

Table 5.6.1: Existing Roadway Levels of Service

Roadway	Existing ADT	Existing LOS
US 101	173,000	F
Corte Madera Avenue	13,590	E
Fifer Avenue	11,600	C
Madera Boulevard	8,750	A
Nellen Avenue	400	A
Paradise Drive	14,080	A
Redwood Highway (south of Industrial Way)	13,990	C
Redwood Highway (north of Tamalpais Drive)	5,650	A
San Clemente Drive	21,360	C
Tamalpais Drive (east of Eastman Avenue)	18,540	B
Tamalpais Drive (west of US 101)	24,920	D
Tamalpais Drive (east of US 101)	29,330	E

All Town roads currently operate at acceptable levels of service C with the exception of Corte Madera Avenue north of Redwood Avenue, which operates at LOS E, and Tamalpais Drive immediately east and west of US 101, which operates at LOS E and D, respectively.

Table 5.6.2: Existing Intersection Level of Service

Intersection	Delay	LOS
Tamalpais Dr./Madera Blvd.	25.2	C
Tamalpais Dr./San Clemente Dr.	20.9	C
Corte Madera Ave./Redwood Ave.	25.9	D
Paradise Dr./Harbour Dr.	14.8	B
Madera Blvd./Town Center Dr.	15.0	B
Tamal Vista Blvd./Fifer Ave.	30.3	C

All intersections studied currently operate at acceptable LOS C or better, with the exception of the Corte Madera Avenue/Redwood Avenue intersection, which operates at LOS D during the peak hour.

5.7 Safety Records

According to the Yearly Traffic Report 2000, there were a total of 301 reported traffic accidents (involving two or more vehicles) reported traffic accidents in Corte Madera. Of these, 183 occurred on Town (public) streets. There were 116 traffic collisions (single-car accidents), compared to 89 in 1999 and 87 in 1998. Enforcement actions (for

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DUIs, arrests and moving citations) decreased by 25 percent in 2000 compared to 1999, from 1,060 incidents down to the 792.

The majority of the injury collisions took place on the Tamalpais Drive overcrossing at Highway 101 (28.5 percent of all incidents), followed by the roadway segments of Tamalpais Drive (16.6 percent) and Corte Madera Avenue (11.9 percent).

The year 2001 saw the addition of two full-time motorcycle officers assigned to enforcement actions. These are intended to be “highly visible” officers in the community, with an anticipated reduction in the number of traffic violators.

5.8 Bikeways and Pedestrian Systems

Approximately five miles of dedicated bike lanes/paths are currently in the Town. These include facilities along Paradise Drive, San Clemente Drive, Tamalpais Drive, Redwood Highway, Tamal Vista Boulevard, Corte Madera Avenue, and Lakeside Drive. In July of 2001, the Town Adopted the *Bicycle Transportation Plan*, which provides a complete inventory of existing bike facilities and recommendations for future improvements. That document is incorporated by reference as a detailed source of information on the Town’s bikeway system and plans.

The Town’s pedestrian opportunities are served by having sidewalks on major streets and connectivity to most areas in Corte Madera. US 101 does act as a barrier to connectivity between the east and west areas of the Town, with pedestrian access limited to the Tamalpais Drive interchange and the Nellen Avenue pedestrian overcrossing. As discussed in Section 6.5 (Hiking Trails), the Town also has a number of unpaved hiking trails in its hillside areas, including in the Ring Mountain, Chapman Hill and Christmas Tree Hill areas.

In certain instances, pedestrian and bicycle paths are combined (in joint use) along paved paths, sometimes creating hazardous situations where bicyclists and pedestrians can collide (such as along paths around and north of Town Park or along Bayside Trail Park.) Likewise, there is a hazardous situation presented by the mingling of automobile and bicycle traffic along portions of major roadways in the Town (such as Tamalpais Drive, Paradise Drive and Corte Madera Avenue) where bicycle lanes are narrow or unstriped.

Corte Madera is home to a number of avid bicycle riders. There are mountain biking opportunities on local trails (in places such as Regional open space preserves, the Marin Municipal Water District and Mt. Tamalpais State Park) and for bicyclists wanting to tour the open country of Marin County along roadways, paths and lanes. In recognition of the importance of bicycling in Corte Madera, the Town Council adopted the Bicycle Transportation Plan in July 2001. The Plan identifies existing bicycle facilities, bike lane standards, bicycle parking, multi-modal connections for bicyclists, as well as future bike lane improvement projects and potential funding sources.

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The Bicycle Transportation Plan distinguishes between bikeways as follows:

- A *Bike Path* is also known as a Class I Bikeway. It provides for pedestrian and bicycle use on a paved right-of-way separate from any street or highway. Under Caltrans standards, it must be at least eight feet wide for a two-way path.
- A *Bike Lane* is also known as a Class II Bikeway. It provides for a striped and stenciled lane for one-way travel on a street or highway. A Bike Lane has a minimum standard width of four feet.
- A *Bike Route* is also known as a Class III Bikeway. It provides for shared use of a street with pedestrians or motor vehicle traffic, and may be identified only by signing. They usually are used and posted to connect other bike lane segments.

Bicyclists using roadways and paved lanes and paths have the following bikeway facilities in the Town, summarized in **Table 5.8.1** and shown on **Figure 5.8.1**. Most of the existing bikeway facilities do not conform to Caltrans design standards.

The Bicycle Transportation Plan notes that the Town spends approximately \$50,000 per year on bikeway improvements. Recent improvements included resurfacing and maintenance of existing paths, and installation of landscaping. The primary large project identified by the Town is a bicycle/pedestrian Highway 101 overpass south of Tamalpais Drive, estimated to cost \$2,000,000. This would allow cyclists to avoid using the existing but high-volume vehicular Tamalpais Drive overcrossing.

Table 5.8.1: Existing Bikeway Facilities in Corte Madera

Bicycle Lane/Path Segment	Type of Facility	Length (Miles)
Alto Hill Trail (Lomita Drive in Mill Valley to Casa Buena Drive)	Path	.3
High Canal Path (Town Park to Lucky Drive)	Path	.9
Madera Boulevard (Madera Boulevard to Tamalpais Drive)	Lane	.3
Northwestern Pacific ROW (High Canal to Tamal Vista)	Path	.1
Northwestern Pacific ROW (Tamalpais Drive to Town limit)	Path	.8
Paradise Drive – south side (Prince Royal to Westward)	Path	.3
Paradise Drive – south side (Prince Royal to El Camino)	Lane	.1
Paradise Drive – south side (San Clemente to Madera del Presidio)	Lane	.1
Redwood Highway (Tamalpais Drive to Town limit)	Path	.7
San Clemente Drive (Tamalpais Drive to Paradise Drive)	Path	.5
Tamalpais Drive (to San Clemente at Bayside Trail)	Path	.2
Town Park (west and north periphery)	Path	.4
Wornum Drive (Redwood Highway to Tamal Vista)	Path	.2
Total:		4.9 Miles

Figure 5.8.1

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Regionally, bicycle trails extend well beyond the borders of Corte Madera, connecting to open space areas and to paved bicycle paths along public roads and along trail systems. Marin County prepared a *Bicycle and Pedestrian Master Plan* in June 2001 addressing County-wide bicycle and pedestrian systems. The Plan addresses various goals and objectives for maintaining existing systems as well as possible construction or upgrades to improve the system to meet the needs of County bicyclists and pedestrians. The Plan identifies that improvements to bicycle and pedestrian systems would create expanded opportunities for non-vehicular travel in the area through greater interconnectivity between the various cities in the County. A number of possible improvement projects are identified in and around Corte Madera, including:

- Reopening of the Alto Tunnel (a former Northwestern Pacific Railroad tunnel running from the terminus of Tunnel Lane in Corte Madera south to near Underhill Road in Mill Valley). The tunnel is partially collapsed, and would require substantial work to reopen. An estimated 800 people per day would use the tunnel if reopened.
- Construction of a Corte Madera Creek Trestle, linking Corte Madera and Larkspur near the Greenbrae Boardwalk.
- Construction improvements for the Cal Park Hill Tunnel linking Larkspur and San Rafael further north of the Greenbrae Boardwalk.

5.9 Other Modes of Transportation

Transit. The Golden Gate Bridge Highway and Transit District provides transit service in the Town of Corte Madera. Local service is provided on Lucky Drive, Tamal Vista Boulevard, Tamalpais Drive, and to the Village shopping center. Commuter service to other parts of Marin County and into San Francisco, including connections to ferry service, is also available on Tamal Vista Boulevard, Tamalpais Drive, Redwood Highway, San Clemente Drive, and Paradise Drive.

Rail Service. There are no rail facilities or service in Corte Madera or the adjacent communities.

Airports. The Town does not have a commercial or general aviation airport. The nearest general aviation facility is in San Rafael. Commercial service is available at the San Francisco and Oakland international airports.

Private Transportation Services. A number of operators provide taxi service in the Town and adjacent communities. There is no private bus service in the Town, but a Greyhound bus station is in nearby San Rafael.

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5.10 Current Transportation Plans

There are several documents that identify future transportation improvements in the Town of Corte Madera and surrounding area.

The existing *Town of Corte Madera General Plan*, 1989, provides guiding and implementation policies related to all modes of transportation. The plan proposes only two major changes to the street network: the extension of Nellen Avenue to Tamal Vista Boulevard and the reconstruction of the Nellen Avenue interchange.

The *Town of Corte Madera Development Impact Fees for Townwide Public Facilities*, 1999, identified the following transportation improvements: signalization of Corte Madera Avenue and Redwood Avenue; general improvements on San Clemente Drive; widening part of Paradise Drive, and; widening of the Warnum Drive/Tamal Vista Boulevard intersection.

The Town's 2001 *Capital Improvement Plan* identifies several relatively minor transportation projects, including a traffic safety study of the Tamalpais Drive/US 101 interchange, and improvements and signal interconnects at the Tamal Vista Boulevard/Wornum Drive intersection.

The Metropolitan Transportation Commission's *2001 Regional Transportation Plan* identifies transportation improvements in the entire 9 county region. It identifies the need for improvements to the Tamalpais Drive/US 101 interchange in the Town. It also identifies regional improvements that may impact the Town, including adding HOV lanes on US 101 in San Rafael and expanding the regional express bus program.