5.0 TRANSPORTATION 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 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 1

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.

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.

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".

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

Facility Type Definition	Stops/Mile	Driveway	Speed
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.

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 5.5.1: 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.

Table 5.6.1: Existing Roadway Levels of Service

Roadway	Existing ADT	Existing LOS
US 101	173,000	F
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 with the exception of 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
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 levels, LOS C or better.

5.7 Safety Records

According the Yearly Traffic Report 2000, there were a total of 301 reported traffic accidents (involving two or more vehiclces) 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 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 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 well 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.

Bicycle and pedestrian paths and trails are further addressed in Section 6.0.

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.

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.