2 Improvement Concepts

Summary
This section describes specific conceptual improvements to the three alternative bicycle and pedestrian routes to best accommodate bicyclists and pedestrians and avoid or minimize conflicts with other uses or resources. Each route improvements description is organized into a series of segments based on changes in facilities or conditions along the route. A detailed inventory and description of the routes is contained in Appendix I of the Study.

The Master Map Legend at right indicates features shown on the segment maps that follow in this section. The sign schedule on the following page provides more detail on signage design and placement concepts.

Inventory of existing conditions and design of conceptual improvements are as accurate and detailed as possible given the available base data. They include generalizations and assumptions typical to a planning-level study.

The total estimated improvement cost is listed for each segment or sub-segment. These are very preliminary planning-level cost estimates based on conceptual designs and a series of assumptions, as detailed in Section 4.

Study Objectives and Issues
Improving bicycle and pedestrian connectivity is the primary objective of the study. Avoiding or minimizing impact on adjacent land uses is a parallel objective. The alternative routes present many opportunities, and many challenging conditions and issues, associated with these objectives. The relevant issues are described in the introduction to the improvement concepts for each alternative route, and in specific segment descriptions where applicable. Improvement ideas and technical solutions were identified through research and public or agency comments, and detailed and analyzed through development of the route improvement concepts.

The alternatives evaluation section summarizes and contrasts the performance of each alternative route with respect to these issues. The Environmental Considerations Study highlights the primary environmental issues identified through a cursory evaluation and provides a general assessment of the significance of environmental issues. Formal analysis and response to environmental issues from a CEQA or NEPA (triggered with federal funding) standpoint is beyond the scope of the study, and would occur as part of future work to proceed with any of the alternatives.
Signage Concepts

There is an existing County system for designating, mapping, and signing bicycle routes. This system should be used and enhanced in conjunction with the improvement of any of the routes. The improvement concept maps show the location of existing route signs and indicate the location of proposed route signs, which should occur at each path juncture in locations that would be legible to users traveling in either direction.

Emergency services staff commented that there is a need for mileposts along the routes so that persons calling for assistance can identify their approximate location and emergency personnel can coordinate. The improvement concept maps and cost estimates assume that a trail mileage plaque similar to the illustration in Figure 2-1 below will be placed in conjunction with each route directional sign post and at 0.5 mile intervals along the route. This also could be achieved by painting the mileage and route numbers on the pavement.

Example of County bike route signage.

Figure 2-1: Trail Mileage Marker per Manual of Uniform Traffic Control Devices
Figure 2-2: Horse Hill Route Overview
Route Alternative A - Horse Hill Route

Overview

The Horse Hill Route, moving south to north, utilizes an existing Class I path built on the former railroad right-of-way leading to the Alto Tunnel. An existing path connects east to and through the parking lot of Maguire Elementary School. It follows Lomita Avenue, a local road that passes by the school and a single family residential neighborhood to the east, terminating at Highway 101 and Marin County’s Alto Bowl/Horse Hill Open Space Preserve. The route continues north on a Class I path built in the right-of-way of 101, and follows Casa Buena Drive, a frontage road of 101 with rural residential land uses to the south and commercial land uses to the north, to Sanford Street. Meadowsweet Drive offers an alternative route to Casa Buena on a winding road through a rural residential area, transitioning to denser residential development, and finally multi-family residential near Sanford Street. The route continues north along Madera Boulevard and Tamal Vista Boulevard to the eastern terminus to the existing Sandra Marker Trail, which is constructed on the same former railroad line as the Alto Tunnel. The portion north of Tamalpais is part of a concurrent study sponsored by the Transportation Authority of Marin (TAM).

This route consists of eight segments, plus an alternative route for one segment:

- **Segment 11A**: Crossing improvements on East Blithedale Avenue at Lomita Road, at the northern end of Mill Valley Sausalito Path.
- **Segment 1**: Functions as part of Alto Tunnel & Horse Hill route. From the northern end of Mill Valley-Sausalito Path at East Blithedale Avenue to Vasco Court (an existing facility).
- **Segment 2A**: From bike path at Edna Maguire Elementary School along Lomita Road to Greenfield Court.
- **Segment 2B**: From Greenfield Court along Lomita Road to Horse Hill bike path.
- **Segment 3**: Existing Class I bike path running from end of Lomita Drive parallel to Highway 101 to Meadowsweet Drive.
- **Segment 4A**: From the intersection with the northern end of the Horse Hill path and Meadowsweet Drive, along Meadowsweet Drive to Sanford Street (has North and South sub-segments).
- **Segment 4B** (Alternative to segment 4a): Casa Buena Drive from northern end of Horse Hill path to Sanford Street (has North and South sub-segments)
- **Segment 5**: Sanford Street from Meadowsweet Drive to Tamalpais Drive.
- **Segment 6**: From Tamalpais Drive to Wornum Way along Madera Boulevard and Tamal Vista Boulevard to the study end point.

Total length is 15,570 feet/2.9 miles following Segment 4A, or 15,330 feet/2.9 miles following the alternative Segment 4B.
Issues

Bicyclist safety, utility, and comfort

This is a designated County bike route. The improvement needs and opportunities for bike access are generally limited and site-specific. They are detailed in the segment improvement concept descriptions. They include options to improve the clarity and function of Class III shared routes, potentially to upgrade Casa Buena Drive to a Class II route with bike lanes, add parallel pedestrian connections, and address gaps and constraints in bicycle and pedestrian connections at several specific points. The Horse Hill Path along 101 is subject to noise and glare from the adjacent freeway. The route includes some steep hills – up to 10% on the Horse Hill Path, and 8% on Casa Buena. Options for improving these conditions are detailed in Segment 3 Improvement Concepts.

Pedestrian access

There are sidewalks along the western portion of Lomita Drive, and on the northern portions of Casa Buena and Meadowsweet, and the connections north along Madera and Tamal Vista. The existing Class I path portions offer adequate facilities for pedestrians as well as bicyclists at the current and projected use levels. The other portions of the route feature sidewalks at the northern end, but most other portions require pedestrians to walk on the shoulder, in many cases where there is minimal space outside the traffic lane. There is not a substantial amount of existing pedestrian use on this route, or desire for it expressed in public comment. Extension of a sidewalk or path along Lomita to the Horse Hill Path is proposed due to proximity to Maguire Elementary School and surrounding neighborhoods. Adding a sidewalk or path along the southern portion of Meadowsweet or Casa Buena is not proposed due to the steep terrain, adjacent development, and low projected pedestrian use.

Impact on adjacent land uses

For this route, the most sensitive adjacent land use is Maguire Elementary School, and other educational programs at this facility (see Segment 2a description for more detail), and the adjacent residential neighborhood along Lomita Avenue, and along Meadowsweet. Providing a continuous pedestrian path could result in impacts on the adjacent residential, commercial, and open space land. Public comments included a suggestion for an alternative route along Ashford Avenue that bypasses the school. The analysis of the route is beyond the scope of the current study, but it is described with Segment 2A for future consideration.
Segment 11A Improvement Concepts

Short connection along E. Blithedale Avenue from northern end of Mill Valley Sausalito Path to Camino Alto. Serves all three study routes.

Issues

- Bicycle access – East Blithedale is a very busy street and challenging to cross or follow. Bicyclists are connecting to or from the path in all directions.
- Pedestrian and access for persons with disabilities – same issue as for bikes, but less challenging because sidewalks are already provided.
- Impact on traffic flow – There is currently some congestion with bicycle traffic crossing and traffic flow during peak periods. The increased volumes anticipated if the Alto Tunnel route is opened may further impact traffic flow.

Improvement Concepts (see Figure 2-3)

- Install an angled curb ramp (bike ‘off ramp’) on south side of East Blithedale Avenue, just west of the Mill Valley-Sausalito Path to enable direct access to the southbound pathway for eastbound bicyclists. Installation of a curb ramp would substantially reduce the amount of right-hand U-turns made by bicyclists at the Lomita Avenue intersection and the number of bicyclists riding along the southern sidewalk between Camino Alto and Lomita Avenue. (see Figure 2-3)
- Widen existing curb ramps at the crosswalk (requires moving utility box on south side of East Blithedale).
- Relocate the crosswalk limit line on west side of East Blithedale/Lomita Avenue intersection two to three feet further to the west to reduce motorists crowding the crosswalk and to improve sight lines.
- Enlarge bicycle queuing space on the southwest and northwest corners of the East Blithedale Avenue/Lomita Avenue intersection along the Mill Valley to Sausalito path to allow more bicyclists to wait during red traffic signal phases and to reduce conflicts with other bicyclists and pedestrians. This will entail extending the headwall and railing on the west side of the creek
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.
- Crossing warning signs.
- Pedestrian/Bicycle-only signal cycles and timing could be further studied to enhance bicycle and pedestrian crossing efficiencies.

Improvement Cost: $84,000
Segment 11A Improvement Concepts

Figure 2-3

Segment Location Map
Grade Separated Bicycle/Pedestrian Crossing Option

Consider construction of a bike/pedestrian bridge or undercrossing. This is an alternative whether or not the Alto Tunnel is opened. In any case, the number of bicyclists and pedestrians crossing East Blithedale will increase significantly on this already congested intersection crossing. An option for future consideration is a bike/pedestrian overcrossing. To meet ADA, intersection crossing grades and provide adequate clearance over the road, the bridge would need to be on the order of 800’ long. An undercrossing would require less clearance below the road, and could be on the order of 500 to 600 feet long. The path would need to be redesigned at each end of the bridge or undercrossing to allow passage around the openings, which could impact the wetlands at the south end. Resolving specific design details or impacts of a bridge or undercrossing is beyond the scope of the current study. A conceptual cost estimate for bridge or undercrossing construction and associated costs is included in Section 4. A 20% contingency is added to the basic cost estimate to produce the range below, reflecting the uncertainties in the nature of the proposed improvements and requirements

**Improvement Cost:** $3.4 - $4 million
Figure 2-3: E. Blithedale Improvement Concept
Segment 1 Improvement Concepts

Functions as part of Alto Tunnel and Horse Hill route. From the northern end of Mill Valley-Sausalito Path to Vasco Court, 3,700 feet/0.7 mile; part is County bike route #5; City of Mill Valley jurisdiction, but maintained by Marin County Parks.

Issues

- Access for bicyclists, pedestrians, and people with disabilities – connection to Ashford.
- Impact on adjacent land use/private property – design and construction of Ashford ramp connection.

Improvement Concepts

- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.
- Ramp to Ashford Avenue (see Figure 2-4). Ashford Avenue is county bicycle route #10, extending east as a Class III route and as a westbound-only frontage road along E. Blithedale to Dorset Lane. There is an informal path connection from Lomita Avenue at Ashford to the existing path. Creation of a connection would require construction of a ramp, similar to the ramp near Maguire Elementary School. The Ashford ramp would need to be approximately 200’ long, plus landings, to climb the approximate 10’ grade from Lomita to the path.
- As increased use warrants, add a separate 8 foot wide pedestrian path parallel to the existing eight-foot paved path and designate the 8 foot path for bikes (see Figure 2-5).
- A high visibility crosswalk with warning signs on Lomita in conjunction with the Ashford ramp.

Estimated Improvement Cost: $926,000

Photo 1-1 View of informal path connection from Ashford to existing path.

Photo 1-2 View south along path near Edna Maguire Elementary School towards E. Blithedale.
Segment 1 Improvement Concepts
(see page 2-1 for Master Map Legend)
Figure 2-4: Ashford access improvements between MV-Sausalito Path and Lomita/Ashford intersection
Figure 2-5: Cross-section through existing MV-Sausalito bike path with new pedestrian path

Trim vegetation for horizontal and overhead clearance as needed

22' Emergency Access Corridor

8' 2' 10' 2'

New Pedestrian Path

Existing Bicycle Path

Shoulder

Shoulder
Segment 2A Improvement Concepts

From Segment 1 bike path at Edna Maguire Elementary School along Lomita Road to east of Greenfield Court; 1,550'/.29 miles; County bike route #5; unincorporated Marin County, except Lomita Avenue from Maguire Elementary south is in Mill Valley.

Issues

• Access for bicyclists, pedestrians, and people with disabilities – connection through school parking lot.
• Impact on adjacent land use/Maguire Elementary School – avoiding/minimizing conflict with school traffic; security concerns for school children. Edna Maguire has approximately 450 students. The private K-8 Ring Mountain School is located next door in a facility leased from the Mill Valley School District. Ring Mountain School has approximately 100 students who live throughout the area, resulting in a high percentage of cars for drop-off and pick-up. There are also two pre-schools on the site; one on either side of Edna Maguire School on District property; Marin Day School with approximately 150 kids on various schedules, and Robin’s Nest with less than 100 preschoolers. Crosswalk and ramp improvements across Lomita at the school entry were recently constructed as Mill Valley/TAM Safe Routes to School project.
• Continuing sidewalks or a pedestrian path past the generally steep and rural residential or open space areas would involve some significant expense and localized changes. The study presents options for where and how a sidewalk or path could be added along Lomita due to its proximity to the school.

Improvement Concepts

• Construct Class I path 8 feet wide bypassing Maguire school parking lot, on School District property, coordinated with District and adjacent property owner (see plan below).
• Construct approximately 50’ of sidewalk, driveway ramp, curb and gutter east of the school to close a gap in existing sidewalks along the north side of Lomita.
• Add four curb ramps at the existing sidewalk on Greenfield Court (a loop road with two connections to Lomita).
• On Lomita, shoulder striping outside curbside parking to delineate car lane and provide informal area on pavement for bicycles.
• Add “sharrows” – shared lane markings for bikes.
• Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Estimated Improvement Cost: $90,000
Photo 2-1 View East along Lomita Drive

Parking lot bypass improvement concept, see plan figure 2-6

Segment Location Map

Corte Madera

Open Space

Mill Valley

Unincorporated Area
Figure 2-6: Maguire School Bypass Path Concept
Alternative Bicycle Route

Public comments suggested an alternative route to Segment 2 along Lomita, using Ashford Avenue to connect east to Meadow Drive, then north and east on Meadow and Shell Road back to Lomita. The stated advantage is that this route bypasses Maguire School, which is a congested and sensitive area for a major regional bike route. The public comment concept included a connection to E. Blithedale along 101, rather than along neighborhood streets. However, no space was reserved for this connection in the recent off-ramp reconstruction project, so this would entail re-design and reconstruction of that portion of that facility. Also, private improvements along the north side of E. Blithedale between Dorset and Tower bar extension of a Class I path in that vicinity. Further resolution of details of this alternative is beyond the scope of the current study, but it is described here for future consideration.

This alternative route is beyond the scope of the current study, but is mentioned for future consideration. See figure 2-7 below for more information.

![Figure 2-7: Alternative bike route concept](image-url)
Segment 2B Improvement Concepts

From Lomita Drive at Greenfield Court along Lomita to Horse Hill bike path; 1,830’/.35 miles; County bike route #5; unincorporated Marin County.

Issues

- Bicycle access – making route clearer, safer.
- Access for pedestrians and people with disabilities – there is no sidewalk, path, or road shoulder on eastern portion.
- Existing drain ditches and private improvements in the right-of-way. Nine homes front Lomita on the north side beyond the open space. Steep slopes, driveways and other improvements in the right-of-way, along with a drainage ditch, are constraints to extending a path along this frontage.

Improvement Concepts

- Add 5’ wide A.C. pedestrian pathway on north side of Lomita to extend sidewalk east in road right-of-way along frontage of Open Space (see Figure 2-8). Part may require a low retaining wall above or below the trail.
- Replace the existing open ditch fronting three homes with a storm drain connecting to an existing inlet on the north side of Lomita west of Shell Road.
- Extend a sidewalk or pathway on the north side of Lomita from the open space frontage to Shell Road.
- Construct curb ramps for sidewalk on south side of Lomita at Shell Road and Plaza Drive (4 required).
- High visibility crosswalks on Lomita at Shell Road and Plaza Drive (3 required), with warning signs.
- Extend a sidewalk on the south and east side of Lomita from Shell to the Horse Hill path.
- Minor pavement widening on the north and west side of Lomita to compensate for space taken by sidewalk.
- Shoulder striping outside curbside parking to delineate space for bikes (not a formal bike lane, but acts as a traffic calming feature).
- Add “sharrows” shared lane markings for bikes.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Cost: $486,000
Figure 2-8: Plan view of Lomita/Shell intersection area
Figure 2-9: Section through Lomita Drive at open space frontage

Note: Right-of-way widths are approximate, per Marin County GIS data, and vary along the route.

Figure 2-10: Section through Lomita Drive at residential frontage
Segment 3 Improvement Concepts

Class I bike path from end of Lomita Drive parallel to Highway 101 to Meadowsweet Drive, 2,040'/0.4 miles; County bike route #5; Corte Madera jurisdiction, Caltrans right-of-way, maintained by Marin County Parks.

Issues

- Bicycle access – path adjacent to freeway is noisy, exposed to glare from oncoming headlights at night. The segment includes two steep hills, approximately 10% and 8%. The connection to path from Meadowsweet requires a sharp hairpin turn.
- Emergency access – the path is too narrow to accommodate emergency vehicles.
- Pedestrian and ADA access – same issues as bicycle access.
- Impact on adjacent land use/permit process – the path is in the state right-of-way and any improvements will require Caltrans approval, and must avoid impact on freeway, and conform to current standards, or an exception must be justified.
- The potential for aerially-deposited lead (ADL) on Caltrans right-of-way may need to be investigated.

Improvement Concepts

Widen the path to 12’ to better accommodate bicyclists and pedestrians, as well as emergency vehicles, and provide a better separation between the freeway and the path for safety, function, and aesthetics (see Figure 2-11, 2-12). This segment is in the Caltrans right-of-way and improvements would require their review, approval, design standards and construction process. Key elements include:

- Demolish existing fence, guardrail, and pavement.
- Construct retaining walls where needed due to adjacent slopes down to freeway.
- Widen existing A.C. paved path to 12’ with 2’ shoulders.
- Install K-rail with baffles for headlight glare.
- Install vinyl-coated chain link fence (6’).
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.
- Repaint path striping and marking.
- Some landscaping between the highway and the path may be feasible, but limited due to maintenance considerations, and because path visibility from highway is desirable to maintain for security purposes.
• Construct a connecting path from Meadowsweet to the north end of the Horse Hill Path to eliminate the hairpin turn that is currently necessary to make this connection (see Photo 3-1 and figure 2-13). With current conditions this connection and the path it connects to would have approximately 10% grade, and would not be ADA compliant, however a compliant 5% grade may be possible with the “sunken/raised” path alternative described in the following pages.

*Improvement Cost: $2,300,000*
Segment 3 Improvement Concepts

(see page 2-1 for Master Map Legend)

Photo 3-2 View north at Hwy 101 path near Horse Hill parking area
Figure 2-11: Plan of modified Horse Hill multi-use path

Figure 2-12: Cross-section through modified Horse Hill multi-use path
Figure 2-13: Conceptual plan of new path connection to Meadowsweet
**Segment 3 Alternative: Sunken/Raised Path Concept**

Public comments suggested that the Horse Hill Route should be improved in preference to the more expensive and intrusive opening of the Alto Tunnel. In addition to the improvements outlined above, the steep gradient and noise and glare impacts of the adjacent freeway on the Horse Hill route could be somewhat reduced by rebuilding part of this segment in a trench, as illustrated in Figure 2-14.

To slightly reduce the steep grades on this portion of the Horse Hill Route and separate the path from the freeway, a concept is presented for locating the trail in an open trench as deep as seven feet on the southern portion, and fill up to twelve feet deep on the northern portion, with corresponding walls the length of this segment (see Figure 2-15). This would require careful engineering, especially given the route’s proximity to the freeway. The middle portion of the existing Horse Hill Path is up to 6’ higher elevation than the adjacent freeway, so there would only be a significant wall on the west side of the path. Drainage would need to be carefully resolved, as the sunken path would tend to collect water from the adjacent hillside and freeway. Day-to-day and long-term maintenance cost for this alternative would be significantly higher than for a path on the surface. A steep (8%) hill would still remain on the route along Casa Buena.

**Improvement Cost:** $6,980,000
Figure 2-15: Profile of Horse Hill Path
Segment 4A South Improvement Concepts

From northern end of the Horse Hill path along Meadowsweet Drive to the intersection with Conow Street; 4,270’/.8 miles; County bike route #5; Corte Madera jurisdiction/right-of-way.

Issues

- Bicycle access – There are minimal paved shoulders for much of the route. The segment includes one steep hill. Meadowsweet is longer than the Casa Buena route. Visibility ahead is reduced on many corners.
- Pedestrian and persons with disabilities access – Most of the route has no sidewalk or path, and road shoulders are narrow. Route includes a steep hill (8%). Adding a sidewalk or path along the southern portion of Meadowsweet is assumed to be infeasible due to the steep terrain and adjacent residential development, and not warranted by the relatively low demand for pedestrian through access.
- Impact on/constraints from adjacent land use – Generally there is no available space to widen in this rural residential area without construction of retaining walls.

Improvement Concepts

- Stripe street centerlines on curves.
- Stripe shoulders with white for better visibility.
- Add “sharrow” shared use lane markings.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Costs: $41,000

Photo 4-1 View south along Meadowsweet Drive.
Segment 4A North Improvement Concepts

Meadowsweet Drive from the intersection with Conow Street to Sanford Street; 1,640’/.31 miles; County bike route #5; Corte Madera jurisdiction/right-of-way.

Issues

Impact on/constraints from adjacent land uses – A mixed multi-family residential area that backs up to commercial uses to the north. The pavement width is 36’ with parking on both sides. There is not adequate width to stripe bike lanes, and widening of the roadway would require major improvements.

Improvement Concepts

- Add “sharrow” shared use lane markings.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Cost: $5,700

Photo 4-1 View north along Meadowsweet Drive near intersection with Laurel Drive.
Segment 4B South Improvement Concepts

Casa Buena Drive from northern end of Horse Hill path to Conow Street (a parallel alternative to Segment 4A South); 3,780’/.7 miles; Corte Madera jurisdiction/right-of-way.

Issues

- Bicycle access – There are minimal paved shoulders for much of the route. The segment includes one steep hill (8%).
- Bicyclist travel – the freeway ramp intersection at Meadow Valley.
- Pedestrian and persons with disabilities access – Most of the route has no sidewalk or path, and road shoulders are narrow. Route includes a steep hill (8%). Continuing sidewalks or a pedestrian path past the generally steep and rural residential or open space areas would involve some significant expense and localized changes. Widening the shoulders along the southern portion of Casa Buena is assumed to be an adequate level of improvement for pedestrians on this portion of the route.
- Impact on adjacent land use/permit process – the segment is adjacent to the State right-of-way and any improvements must avoid impact on freeway, and conform to current standards, or an exception must be justified.
- The potential for aerially-deposited lead (ADL) on Caltrans right-of-way may need to be investigated.
- The pavement on this portion is 28’ to 30’ wide, with no on-street parking. The pavement would need to be extended another 2’ to 4’ to accommodate the bike lanes (see Figure 2-17). This would entail utilizing a portion of the approximately 5’ wide vegetated area between the roadway and the existing fence. A portion of the roadway at the top of the hill south of Marin Joe’s restaurant is 36’ wide with parking on the west side.
- Casa Buena from Marin Joe’s to Sanford Street is typically 32’ wide, with parking on the east/south side. There is not adequate space for bike lanes, as curbside parking is currently used by adjacent businesses. About four additional feet of pavement could be created by utilizing most of the approximately 5’ wide the vegetated area between the curb and the existing fence (see Figure 2-18), but this would not provide enough space to provide designated bike lanes unless the existing sidewalk was reconstructed to provide an additional 2 feet of width. The GIS right-of-way information available for the Study is not detailed enough to determine if additional right-of-way would be needed. Casa Buena is adjacent to Highway 101, so this widening could entail Caltrans approval and may entail improvement requirement, such as a K-rail barrier.

Improvement Concepts

- Investigate whether STOP sign traffic control would be warranted for installation at Casa Buena Drive’s intersection with the on-ramp to southbound US 101 Meadow Valley to reduce conflicts between northbound bicyclists and southbound vehicles turning left onto the US 101 on-ramp (see Figure 2-14).
- Improve Shoulders. Extend the paved shoulders on the southern portion of Casa Buena.
- Sign and designate the segment as a Class III bike route.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

**Improvement Cost:** $1,160,000
Photo 4-2 View north along Casa Buena Drive.

Segment 4B South Improvement Concepts
(see page 2-1 for Master Map Legend)
Figure 2-16 Highway 101 on-ramp intersection improvements
Figure 2-17: Existing condition - section through southern portion of Casa Buena

Figure 2-18: Proposed condition - section through southern portion of Casa Buena

Note: Right-of-way widths are approximate, per Marin County GIS data, and vary along the route.
Figure 2-19: Existing condition - Section through northern portion of Casa Buena

Figure 2-20: Proposed condition - section through northern portion of Casa Buena

Note: Right-of-way widths are approximate, per Marin County GIS data, and vary along the route.
Segment 4B North Improvement Concepts

Casa Buena Drive from Conow Street to Sanford Street at Tamalpais Drive (a parallel alternative to Segment 4A North); 1,890'/ .4 miles; Corte Madera jurisdiction/right-of-way.

Issues

- Bicycle access – Pavement width is adequate from Conow Street to Sanford Street to provide bike lanes. The Town of Corte Madera recently striped bike lanes on the eastern portion of this segment. There is curb side parking only on the south. As discussed in more detail under Segment 4A North, for southbound bicyclists and pedestrians it would be preferred to use Meadowsweet rather than Casa Buena.
- Impact on adjacent land use/permit process – the segment is adjacent to the state right-of-way and any improvements must avoid impact on freeway.
- The potential for aerially-deposited lead (ADL) on Caltrans right-of-way may need to be investigated

Improvement Concepts

- Stripe, sign and designate the remainder of the segment as a Class II bike route.
- Additional crosswalk warning signs, route wayfinding signs, and milepost signs.

Improvement Costs: $31,000
Segment 4B North Improvement Concepts
(see page 2-1 for Master Map Legend)
Segment 5 Improvement Concepts

Sanford Street from Meadowsweet Drive to Tamalpais Drive, 60 feet/.01 miles, County bike route #5. Corte Madera jurisdiction/right-of-way. Corte Madera jurisdiction/right-of-way.

This area is under concurrent study by the Transportation Authority of Marin as part of the Highway 101 Greenbrae/Twin Cities Corridor Improvements Study. Figure 2-21 shows conceptual improvements from that study.

Issues

Bicyclist access – The tight intersection of Sanford, Casa Buena, and Meadowsweet is challenging for traffic movements and for bicyclists and pedestrians to navigate due to the multiple yields and lack of crosswalks. Using Casa Buena is preferred for northbound bicyclists and pedestrians because they don’t have to traverse the portion of this intersection where southbound cars are turning left onto Casa Buena from Sanford. Conversely, southbound bicyclists and pedestrians would be safer using Meadowsweet rather than Casa Buena.

Improvement Concepts

- Minor curb, gutter and sidewalk reconstruction within the existing right-of-way to provide clearance for bike lanes along Sanford Street.
- Provide a crosswalk on north side of Meadowsweet at Sanford.
- Add bike detector loops to signals.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Costs: See Segment 6 - estimated in TAM Highway 101 Greenbrae/Twin Cities Corridor Improvements Study

Photo 4-3 View north from Meadowsweet across Sanford Street and Tamalpais Drive.
Figure 2-21: Greenbrae/Twin Cities Corridor Improvements Study

Detail of Sanford Street intersection improvements
(north is at top)
Segment 6 Improvement Concepts

From Tamalpais Drive to Wornum Way along Madera Boulevard and Tamal Vista Boulevard to the study end point; 3,620'/0.69 miles, County bike route #5; Corte Madera jurisdiction/right-of-way.

This area is addressed by a concurrent study by the Transportation Authority of Marin – the Highway 101 Greenbrae/Twin Cities Corridor Improvements Study.

Issues

- Bicycle access – Currently bike lanes exist on Madera Boulevard from Tamalpais Drive to where Madera turns to the east, but they end at Tamal Vista north of the Town Center shopping area.
- Sidewalk upgrades may be needed to meet current standards.

Improvement Concepts

- Reconfigure Madera Boulevard’s intersection with Tamalpais Drive to improve channelization and provide simultaneous north-south traffic signal phases.
- Stripe and sign for Class II bike lanes from Tamal Vista north.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.
- Potential future ADA upgrades to sidewalks and driveways (not in current project cost).

Improvement Costs: **$434,000** per Jacobs Associates estimate prepared for the Highway 101 Greenbrae/Twin Cities Corridor Improvements Study – includes improvements cost for segment 5, Sanford Street.
Segment 6 Improvement Concepts
(see page 2-1 for Master Map Legend)

Photo 6-1 View north along Tamal Vista Blvd.

Segment Location Map

Corte Madera
Open Space
Mill Valley
Unincorporated Area
Figure 2-22: Alto Tunnel Route Overview
Route Alternative B - Alto Tunnel Route

Overview

The Alto Tunnel Route is the most technically challenging of the three alternative routes. The southern portion of the route is an existing Class I path built on the railroad right-of-way leading to the Alto Tunnel. This portion is shared with the Horse Hill Route. Beyond Vasco Court the path continues as an informal unpaved route that terminates in dense brush prior to the tunnel. The tunnel itself is a partially collapsed and filled former rail tunnel with a deteriorating wood support structure. North of the tunnel, the former rail line is overgrown with an informal path, but more accessible than the south portal. This transitions to a wide, well-used gravel path, and finally to a wide sidewalk near Tamalpais Drive, passing through the downtown area of Corte Madera. The bicycle and pedestrian connection to the south end of the existing Sandra Marker Trail north of Redwood Avenue follows Montecito Drive, a residential connector street that has perpendicular parking on the east side.

This route consists of six major segments:

- **Segment 11A**: Crossing improvements on East Blithedale Avenue at Lomita Road, at the northern end of Mill Valley Sausalito Path.
- **Segment 1**: Functions as part of Alto Tunnel & Horse Hill route. From the northern end of Mill Valley-Sausalito Path to Vasco Court.
- **Segment 7**: Old railroad bed from Vasco Court to Alto Tunnel.
- **Segment 8**: Alto Tunnel.
- **Segment 9**: From northern end of Alto Tunnel to Redwood Avenue at Montecito Drive (has North and South sub-segments – 9A and 9B).
- **Segment 10**: Connection along Montecito Drive north of Redwood Avenue to the existing Sandra Marker Trail, and along the existing Sandra Marker Trail from Tamalpais Drive north and east to Wornum Way at Tamal Vista Ave.

Total length is 6,620 feet/3.1 miles

Issues

**Ability to reconstruct the tunnel to provide a safe structure.** Modern tunnel engineering and construction techniques can provide a structurally safe tunnel. Rehabilitation of the tunnel to provide bicycle and pedestrian access would stabilize the tunnel.

**Tunnel rehabilitation impacts.** Adjacent property owners have concerns about construction activities. The concerns are associated with ground vibration, settlement, potential instability, noise, dust, traffic, and other typical construction impacts. The Tunnel Feasibility Analysis indicates that excavation of the existing backfill concrete plug in the tunnel would not require blasting. Excavation could be performed by roadheader or hydraulic hammer, which would either scrape or chip the concrete away in a controlled manner, with minimal vibration felt at the ground surface. Excavated materials can be handled by traditional earth moving equipment (e.g., buck loaders), or in the case of a roadheader, by an apron loader that transfers muck onto a short conveyor. The roadheader conveyor dumps the material into muck cars or haul trucks for transport out of the tunnel. The
entire roadheader cutter, boom, frame, apron, and conveyor assemblies are usually mounted on either crawler tracks or rubber tires for propulsion. To address concerns of settlement and stability during construction, building protection measures are possible for residential structures above the tunnel alignment in the portal areas that are within the zone of influence of tunnel rehabilitation activities. Such potential protection measures include structural underpinning, grouting, ground reinforcement, and other measures to protect surface structures from ground movement associated with construction. Geotechnical instrumentation and monitoring can be implemented to monitor ground and structure movements and to verify that building protection measures are working effectively. Ground movement threshold limits can be set to trigger additional remedial measures to prevent damage to structures above the tunnel. This is a pro-active approach to protect surface structures and prevent damage before it occurs, and such protective and monitoring measures are included in the cost estimate.

Native trees and vegetation within the rail corridor. Construction of a multi-use path, along with a 20’ wide emergency access corridor, and parking/turnarounds for emergency vehicles near the tunnel portals, would require removal of native trees and shrubs that have grown in the corridor since rail use was discontinued. In addition there may be visual changes to the rural and wooded character of the route. These issues could be minimized and addressed through careful design.

Right-of-way ownership for the tunnel and rail line. Parcels on the route are in a variety of ownerships. These issues are discussed in more detail in the Right-of-Way Conditions Analysis. A scope and budget to fully evaluate the property records and ownership issues is provided in the cost estimate.

Use levels and impacts. The Use Counts and Projections Study estimates that approximately 2,330 bicyclists and pedestrians per day would use the Alto Tunnel Route if it were improved as envisioned. Specific concerns raised by neighboring property owners include security, privacy, and noise. Particular concern was expressed regarding the safety and security impacts on the adjacent Maguire Elementary school campus. The study includes improvement and operation concepts to address security and safety, modeled after specific measures and agreements developed for the Cal Park Tunnel multi-use path project, and refined with input from local emergency services and maintenance staff.

Safety for users. The 2,172 foot tunnel presents concerns for user comfort and safety, and for maintenance and emergency services response. The tunnel has a slight curve, so users will not be able to see the entire length of the tunnel. The tunnel is not wide enough to accommodate conventional emergency response vehicles, such as an ambulance or fire truck. The Cal Park Tunnel multi-use path project provides a model of the specific potential solutions for these issues. Specific issues and solutions are analyzed and addressed in the Emergency Response Analysis and the Tunnel Feasibility Analysis, and summarized in this improvement concepts section.

Conflict with traffic. If the Alto Tunnel is opened, the volume of bicyclists and pedestrians would require at least minor improvements to the East Blithedale/Lomita Avenue intersection. A separated crossing of East Blithedale for bicyclists and pedestrians may be desirable.

Moving the large projected volumes of bicycle and pedestrian users associated with the potential reopening of the Alto Tunnel through downtown Corte Madera will also involve careful examination and improvement of existing path, road, parking and landscape improvements.
**Drainage.** Seasonally wet areas are located at both portals of the Alto Tunnel, and water apparently draining from the tunnel at the south end. The Drainage Analysis investigated the sources of this water, and identified conceptual solutions, which are detailed in the Improvement Concepts.

**Cultural Resources.** The Alto Tunnel alignment and vicinity is sensitive for both archaeological and historic resources. Archaeological and historic resources have been mapped in the project area.
Segment 11A Improvement Concepts

From the northern end of Mill Valley-Sausalito Path across East Blithedale Avenue and along East Blithedale to Camino Alto (serves Horse Hill, Alto Tunnel, and Camino Alto/Corte Madera Avenue routes); Mill Valley jurisdiction and right-of-way.

*Shared with Horse Hill Route – see prior section for map and description*

Segment 1 Improvement Concepts

Functions as part of Alto Tunnel & Horse Hill route. From the northern end of Mill Valley-Sausalito Path to Vasco Court; 3,590 feet/0.68 miles; part is County bike route #5.

*Shared with Horse Hill Route – see prior section for map and description*

Segment 7 Improvement Concepts:

Old railroad bed running from Vasco Court to Alto Tunnel portal; 1,280’/.24 miles; Mill Valley jurisdiction, owned by Marin County.

**Issues**

- **Adjacent land use** – Public comments included concerns about construction of the path and tunnel, and the addition of large volumes of bicyclists and pedestrians, on the adjacent residential neighborhoods and Edna Maguire Elementary School campus.

- **Native trees and vegetation** – Mature native trees and shrubs have grown in the approaches to both tunnel portals. Construction of an improved multi-use path and emergency vehicle access will require trimming and some tree removal.

- **Emergency and maintenance access** – the long approaches along the rail corridor, and the long, narrow tunnel, present access and staging challenges. Mill Valley and Corte Madera emergency services staff have reviewed and commented on the conditions and improvement concepts for the tunnel. At this stage of study, they have requested an evaluation of a 20’ emergency access corridor. This would be further reviewed in the environmental review, right-of-way analysis, and final design stage of any project undertaken.

- **Drainage** – The tunnel portals areas both have standing water during wet conditions, and the tunnel itself is expected to be wet due to surface runoff and/or groundwater. The tunnel would need a subsurface path drain that connects into the drainage improvements outside the portal. The original ditches that drained the railroad grade have become partially filled and clogged with vegetation. At the south portal area, the majority of off-site runoff is separated from the path area and has its own conveyance to the Sutton Manor Branch Creek. A minor amount of off-site runoff, approximately 2 acres, flows to the path alignment from residential areas. The fill of any waters of the U.S. or State would trigger regulatory agency permitting and mitigation requirements.
• Bicycle and pedestrian access, conflicts – Ultimately separate bike and pedestrian facilities would be preferred due to the broad range of user types on the path. Transitions to existing pathway segments that are not separated, and to the combined path in the tunnel, would need to be carefully resolved. The separate path configuration requires more vegetation removal than a combined path, but a 20’ wide emergency access corridor could also require vegetation removal.
• The Alto Tunnel alignment and vicinity is sensitive for both archaeological and historic resources.

**Improvement Concepts**

• Add high visibility crosswalk and curb ramps on Vasco Court, bollards and stop signs on the adjacent trail, and crossing warning signs on the street.
• Clear and trim existing vegetation. Types and estimated quantities are detailed in the Environmental Considerations Study. A 20’ wide clear corridor to the tunnel is included.
• Remove rails and salvage to permit path construction.
• Construct A.C. paved paths – 10’ wide for bikes with 2’shoulders, 8’ wide for pedestrians (see Figure 2-23).
• Construct emergency vehicle parking and turn-around as illustrated in Figures 2-24 and 2-25, near the tunnel portal. Retaining walls would be required.
• Provide fire hydrants (1,000 GPM) at portal side of emergency access turnarounds.
• Extend water line for fire hydrant at turnaround, and up to tunnel portal for connection to wet-standpipe system in tunnel. A 10” water line was required for the Cal Park Tunnel.
• Install bollards to restrict unauthorized vehicle entry (location TBD between path entry and tunnel portal).
• Construct drainage improvements as detailed in the Drainage Analysis, including:
  o Improve and relocate drainage swale on west side of path. This may be designed as a vegetated swale to minimize habitat loss.
  o A drainage culvert under the path to the east to connect to Sutton Manor Branch Creek, which flows to the east.
• Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

**Improvement Cost:** $1,380,000
Figure 2-23: Section through Multi-Use Path

Trim vegetation for horizontal and overhead clearance as needed

20’ Emergency Access Corridor

Relocate and improve drainage swale

Existing Shallow Swale

8’ 2’ 10’ 2’

Pedestrian Path

Bicycle Path

Shoulder

Shoulder
Figure 2-24: South Portal Emergency Vehicle Turnaround Plan

Figure 2-25: South Portal Emergency Vehicle Turnaround Section

Note: Right-of-way widths are approximate, per Marin County GIS data, and vary along the route.
Segment 8 Improvement Concepts

Alto Tunnel

2,250’/.42 miles; Mill Valley jurisdiction, southern 2/3; Corte Madera jurisdiction, northern 1/3; Marin County ownership except southern portion is N.W. Pacific Railroad – see Appendix G, Right of Way Conditions Study, for ownership details.

Issues (discussed in detail in Route overview)

- Emergency and maintenance access. Mill Valley and Corte Madera emergency services staff have reviewed and commented on the improvement concepts for the tunnel.
- Ability to reconstruct the tunnel to provide a safe structure.
- Tunnel rehabilitation impacts.
- Tunnel conditions and proposed improvements are detailed in Appendix B, Tunnel Feasibility Analysis, prepared by Jacobs Associates. These are summarized below.

Improvement Concepts

- Remove fill and debris from the tunnel portals.
- Excavate the concrete plugs, gravel and soil fill in the tunnel using roadheader and traditional earthmoving equipment (no blasting anticipated), and placing steel and shotcrete support to replace the existing timbers as excavation advances.
- Line the tunnel with steel or rock-bolt support and shotcrete (no timber or other combustibles). Backfill any substantial voids in the tunnel. Provide clear interior dimensions of approximately 13 feet wide by 16 feet tall (see Figure 2-25).
- Protect existing structures. Underpinning, retaining structures, or grouting and monitoring.
- Remove rails (and salvage) and ballast, prepare subgrade, place aggregate base for path, and provide wall drains and subsurface path drain.
- Pave the tunnel to provide a minimum 12’ wide multi-use shared pathway for bicycles, pedestrians and smaller maintenance and emergency vehicles (standard pickup size, maximum).
- Provide safety and security features. A Memorandum of Understanding (MOU) between agencies could address specific operation and maintenance arrangements. Conceptual improvements and arrangements are modeled on the Cal Park Tunnel MOU. Besides the emergency access corridor, parking/turnaround, bollards and fire hydrants outside the portals, security and safety features and measures at the portals and within the tunnel could include:
  - Lockable gates at each end, with specific hours of operation.
  - Extend electrical service 1300’ to tunnel portal.
  - A lighting system with emergency backup.
  - Emergency call and fire alarm stations at regular (approximately 200’) intervals including at portals and tunnel midpoint.
  - Video surveillance similar to Cal Park Tunnel.
  - “Leaky wire” system for radio communication, and if possible, cell phone.
  - Fire hose connections every 200’.
o Sprinkler system throughout.
  o Regulatory signs at portals - traffic control, hours, alternate route(s). System for user notice when maintenance vehicle or other blockage is in tunnel (signboard at each end that can be locked open or closed).
  o Ventilation system.
  o Access control to prevent unauthorized vehicle entry.
  o Protective graffiti coating on tunnel walls.
  o Noise, dust, and traffic control during construction.
  o Building protection measures and settlement monitoring of residential structures along the tunnel alignment near portals.

**Improvement Cost**

The cost for the tunnel improvements is expressed as a range. Costs are based on extrapolation of actual costs for the nearby Cal Park Tunnel Improvements, as detailed in Appendix B, the Tunnel Feasibility Study, and Section 4 of this Report. They include a “placeholder” allocation of costs for right-of-way research, negotiation and acquisition discussed in Appendix G, the Right-of-Way Conditions Analysis.

Low: $40,625,000    High: $50,550,000
Figure 2-26: Cross-Section through Tunnel
The Baker-Barry Tunnel between Sausalito and Ft. Baker is comparable in size, shape, and length to the Alto Tunnel. Formerly a military tunnel connecting Fort Baker and Fort Cronkhite, the half-mile tunnel serves as an important gateway to the Marin Headlands portion of the Golden Gate National Recreation Area. The tunnel has one lane for vehicles, and bike lanes in both directions. It is closed to pedestrians. The traffic signal alternates every 5 minute to allow the opposing direction of vehicle traffic to proceed. Bikes may proceed at any time, and a flashing beacon can be activated by cyclists to warn motorists that there are bikes in the tunnel.
Segment 9A Improvement Concepts
From northern end of Alto Tunnel to Montecito Avenue and beginning of existing paved path near Tamalpais Drive; 2,310’/.4 miles; Corte Madera jurisdiction; ownership is Marin County and various private parcels. See Appendix G, ROW Conditions Study, for ownership discussion

Issues
Conditions and issues on the north side of the Alto Tunnel are similar to the south side, except that a larger off-site area drains to the portal area, and it has more riparian vegetation. Issues are detailed in the Segment 7 description.

Improvement Concepts
Improvement concept details are the same as Segment 7, except for drainage improvements, as noted below:
- Clear and trim existing vegetation. Types and estimated quantities are detailed in the Environmental Considerations Study. A 20’ wide clear corridor to the tunnel is included.
- Remove rails and salvage to permit path construction.
- Construct A.C. paved paths – 10’ wide for bikes with 2’ shoulders, 8’ wide for pedestrians (see Figure 2-27).
- Construct emergency vehicle parking and turn-around as illustrated in Figure 2-28, near the tunnel portal. Retaining walls would be required.
- Provide fire hydrants (1,000 GPM) at portal side of emergency access turnarounds.
- Extend water line for fire hydrant at turnaround, and up to tunnel portal for connection to wet-standpipe system in tunnel. A 10’’ water line was required for the Cal Park Tunnel.
- Install bollards to restrict unauthorized vehicle entry (location TBD between path entry and tunnel portal).
- Construct drainage improvements. Off-site runoff from an approximately 60-acre area discharges to the north portal from above the tunnel portal, a 15-inch pipe from Montecito Avenue, and a 12-inch pipe from Tunnel Lane, as well as other minor off-site flows. Specific drainage improvements include:
  - Install a down drain to convey drainage flow from above the tunnel (approximately 25 acre area).
  - Install a drain system under the path designed to handle to 10 year storm. Larger storm events would potentially inundate the path.
  - Install storm water discharge upstream of the existing 36-inch pipe at Stetson Avenue, which conveys runoff north to Corte Madera Creek.

Improvement Cost: $2,560,000
Figure 2-27: Section through Multi-Use Path
Figure 2-28: North Portal Emergency Vehicle Turnaround Plan

Figure 2-29: North Portal Emergency Vehicle Turnaround Section
Segment 9B Improvement Concepts

Along Montecito Drive from beginning of existing paved path near Tamalpais Drive to Redwood Avenue; 352’/.06 miles; Corte Madera jurisdiction; Corte Madera road right-of-ways; rail right-of-way is Marin County and various private parcels. See Appendix G, ROW Conditions Study, for ownership discussion.

Issues

• Bicycle access – Redwood Avenue is a very busy street and challenging to cross or follow. Bicyclists are connecting to or from the route in all directions. There are separate routes for pedestrians and bicyclists. The current bicycle access follows Montecito Drive, which functions as a residential street connector, as well as a downtown parking area, with perpendicular parking on the east side.

• Traffic flow – The Town of Corte Madera recently reconstructed this portion of Redwood Avenue and adjacent roads. Generally the roads, intersections, parking and paths are working well. However, if the Alto Tunnel route is opened, improvements for north-south bicycle and pedestrian connections to this segment to accommodate up to 2,740 average daily users will be important to consider.

• Adjacent land uses/improvements – From the informal unpaved path on the railroad right-of-way, north of this segment, there is an existing approximate 8’ wide concrete path paralleling Tamalpais Drive. It passes through a decorative bus stop shelter just south of Tamalpais. There is a matching shelter north of Redwood Avenue. The shelters are part of the overall park, streetscape and landscape improvements that enhance downtown Corte Madera.

Improvement Concepts

• Construct a 12 foot wide Class I multi-use pathway from Segment 9A to Redwood Avenue by widening or replacing the existing 8 foot path south of Redwood Avenue (requires transitioning from the separate 6 foot wide pedestrian path and 10 foot wide bike path proposed to the south). Either construct a segment bypassing the existing bus shelter to the west, requiring the removal of a few parking spaces, or relocate the bus shelter to the landscape area to the east.

• Construct a path connecting to First Street to accommodate travel to the west and northwest.

• Montecito Bike Route Alternative. An on-street alternative to the above multi-use path would be to route bicycles north on Montecito, through the perpendicular parking area south of Redwood Avenue. Conflicts between bicyclists and vehicles would need to be carefully considered in final design.

Photo 9-2 View north across Redwood Avenue.
If this alternative is implemented, consider reconfiguring the head-in 90-degree parking on Montecito Drive to back-in angled parking to enable improved sight lines between parking motorists and bicyclists. Back-in angled parking has been utilized in a number of downtown settings to improve visibility and reduce crashes from cars backing out into traffic.

- Improve Redwood Avenue Crossing. Replace the standard crosswalk across Redwood Avenue at Montecito Drive with a high-visibility crosswalk to increase awareness of the crosswalk. Add high-visibility advance crosswalk and crosswalk signing. Other improvements that could be considered to facilitate bike and pedestrian movements (not included in the cost estimates) include:
  - Consider extending the curb on the north side of Redwood Avenue at Montecito Drive to reduce the crosswalk’s length and improve visibility between approaching motorists and pedestrians and bicyclists using the crosswalk. The curbs could be extended across the bus lane to create an enlarged bus stop. The curb could have a rolled edge so the bus and large trucks could drive across it if necessary.
  - Consider raising Redwood Avenue’s intersection with Montecito Drive to create a “speed table” to encourage slower vehicle travel speeds through the intersection.
  - Consider removing the westbound-to-southbound left-turn lane from Redwood Avenue into Montecito Avenue to create a center refuge island for crossing pedestrians and bicyclists. Designate the southern leg of Montecito Drive intersection with Redwood Avenue as an exit only. Entrance and exit would remain available at First Street.

- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

**Improvement Cost:** $216,000
Segment 9B and 10 Improvement Concepts

- Existing Sandra Marker Trail
- Reconstruct planter, re-stripe parking to provide space for 12' multi-use path - see figure 2-30
- Figure 2-31
- Existing bus shelter structures
- Bike path to bypass bus shelter (eliminates a few parking spaces)

High vis. crosswalk
On street bike route alternative
Widen existing 8' pathway to 12' multi-use path

Segment Location Map

Corte Madera
Open Space
Mill Valley
Unincorporated Area
Segment 10 Improvement Concepts

Connection along Montecito Drive north of Redwood Avenue to the existing Sandra Marker Trail, and along the Sandra Marker Trail north and east to Tamal Vista Boulevard at Wornum Way; 6,638’/1.4 miles; County bike route # 15 and 16; Corte Madera jurisdiction and road right-of-ways; Sandra Marker Trail is owned by Marin County and maintained by Marin County Parks.

Issues

• Access for bicyclists, pedestrian and persons with disabilities – along Montecito Drive north of Redwood Avenue there is no path, and pedestrians as well as bicyclists mix with cars on the residential street/downtown parking lot to reach the Sandra Marker Trail.
• Pathway capacity to carry additional traffic; potential conflicts between bicyclists and pedestrians.

Improvement Concepts

• Construct a Class I pathway connection north of Redwood Avenue by re-striping the adjacent parking areas on either side of the existing 12’ wide planting strip a few feet away. Use the resulting 16’ wide space for a 4’ planter and a 12’ multi-use path (see Figure 2-30), to extend north to connect to the existing Sandra Marker Trail. Requires two high-visibility crosswalks where the path crosses the parking access road. Montecito Bike Route Alternative.
• An on-street alternative to the above multi-use path would be to route bicycles north on Montecito Drive, through the perpendicular parking area north of Redwood Avenue. Conflicts between bicyclists and vehicles would need to be carefully considered in final design.
• If this alternative is implemented, consider reconfiguring the head-in 90-degree parking on Montecito Drive to back-in angled parking to enable improved sight lines between parking motorists and bicyclists. Back-in angled parking has been utilized in a number of downtown settings to improve visibility and reduce crashes from cars backing out into traffic.
• As increased use warrants, add a separate 8 foot wide pedestrian path parallel to the existing eight-foot paved path and widen existing 8 foot path to 10 feet, and designate for bikes (see Figure 2-31).
• Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Cost: $164,000
Segment 10 Improvement Concepts
(see page 2-1 for Master Map Legend)
Figure 2-30: Plan View of Improvements near Redwood/Montecito Intersection
Figure 2-31: Section through Re-Constructed Planter and New Path

Figure 2-32: Section through Existing Sandra Marker Path with New Pedestrian Path
Route Alternative C - Camino Alto/Corte Madera Avenue Route

Overview

This winding route passes through hilly terrain, following Camino Alto north through the city of Mill Valley, and transitioning to Corte Madera Avenue in the Town of Corte Madera at the city limit line. The southern portion of Camino Alto is mainly suburban in character, with adjacent commercial and residential uses. As the route continues north the terrain becomes steeper and more wooded, with low density residential properties backing up to the road on the east, and Marin County’s Camino Alto Open Space Preserve on the west. Beyond the open space preserve, the northern portion of Corte Madera Avenue is an older residential neighborhood, with many residences with driveways, fences, parking walls, and other improvements adjacent to the roadway. The north end of the route continues along Corte Madera Avenue, east on Redwood Road through adjacent commercial uses in the older downtown area, then along Montecito Drive, to its connection at the existing Sandra Marker Trail. Many bicyclists continue north on Corte Madera Avenue to Magnolia Avenue, College Avenue and Kent Avenue to access the Upper Ross Valley, which in turn leads to destinations and routes in rural areas of West Marin.

This route consists of four major segments:

- **Segment 11/11A**: Short connection along E. Blithedale Avenue from northern end of Mill Valley-Sausalito Path to Camino Alto, including improvements to the E. Blithedale crossing.

- **Segment 12**: Along Camino Alto from the intersection of E. Blithedale Avenue to Mill Valley/Corte Madera city limit (has North and South sub-segments – 12A and 12B).

- **Segment 13**: From Mill Valley/Corte Madera city limit along Corte Madera Avenue to Redwood Avenue in Corte Madera, and along Redwood Avenue east to Montecito Drive (has North and South sub-segments – 13A and 13B).

- **Segment 10**: Connection along Montecito Drive north of Redwood Avenue to the existing Sandra Marker Trail, and along the Sandra Marker Trail north and east to Wornum Way at Tamal Vista Ave.

Total length is 19,430 feet/3.7 miles

Issues

**Bicycle conflict with vehicles.** This route is heavily used by bicyclists, and many have stated that they would use the route even if the Alto Tunnel was opened because they enjoy its scenic and challenging qualities. Bicycles traveling slowly uphill frequently impede vehicle traffic on this busy road.

**Bicycle access.** This route exposes bicyclists to traffic on steep hills and sharp curves, often with little or no shoulder. There are two improvement concepts to better accommodate bicycles on this route:

1) **Bicycle climbing lane.** Ideally, a 5’-7’ wide bicycle climbing lane would be constructed adjacent to the travel lane, on the uphill side of the route (east side on Camino Alto, where
some shoulder already exists most of the way, and west side on Corte Madera Avenue, where there is currently little or no shoulder). Bicycles could continue to share the traffic lane on the downhill side (west side on Camino Alto and east side on Corte Madera Avenue), where they generally are able to travel at the same speed as traffic. This arrangement has proved successful in similar settings in other communities, especially when right-of-way width is limited.

2) **Bike lanes.** Bike lanes are an alternative to climbing lanes because they provide a space on the downhill side for bicyclists, including children and parents with children, who are not comfortable sharing lanes with traffic on such a busy road. On Camino Alto there is sufficient space that bike lanes are generally an interchangeable option to the climbing lane, due to the available width of the right-of-way. Corte Madera Avenue generally has minimal shoulders, steeper side slopes, more trees, and, on the northern portion, several residences with driveways, fences, parking walls, and other improvements adjacent to the roadway. It would be far more feasible to create one climbing lane than bike lanes on both side on this highly constrained road.

**Pedestrian access.** Pedestrian facilities on this route are discontinuous and have minimal current use. Providing a continuous pedestrian path or sidewalk along this route would be challenging due to right-of-way constraints, topography, native trees and vegetation, and existing improvements, such as drainage and privately-constructed improvements, within the right-of-way. Continuing sidewalks on the southern portion of Camino Alto would not involve major expense or impact due to the gentler terrain and more suburban setting, but the northern portion of Camino Alto and southern portion of Corte Madera Avenue are very steep, rugged, and wooded. Adding a sidewalk or path would be challenging. The study investigates options for where and how a sidewalk or path could be added. It also acknowledges the desire, expressed in public comments, for a crossing of the route near the city limit line to connect open space trails on either side.

**Drainage.** A number of significant natural drainages, as well as some man-made drainage systems, cross the route in culverts under the roadway. The drainages are likely to require extension in conjunction with widening. Public comments noted that the roadway is sometimes flooded when culverts overflow during storms. Study of the drainage area, capacity, or condition of the culverts is beyond the scope of this study, and the minor widening proposed will add negligible increased runoff.

**Native trees and vegetation within the right-of-way.** Widening of the roadway to provide bike lanes or a climbing lane, and to provide sidewalks or a pedestrian pathway would require the removal of some native trees and vegetation, and some ornamental trees and shrubs. In addition, there would be visual changes to the rural and wooded character of the route. These changes can be minimized and addressed through careful design.

**Cultural resources.** This alignment is sensitive for both archaeological and historic resources. Archaeological and historic resources have been mapped in the project area.
Segment 11/11A Improvement Concepts

Short connection along E. Blithedale Avenue from northern end of Mill Valley Sausalito Path to Camino Alto, 570’, .11 miles, County bike route #5. Includes improvements to E. Blithdale that could serve all three study routes.

See improvements description under Horse Hill Route.

Segment 12A Improvement Concepts

Along Camino Alto from E. Blithedale Avenue to Overhill Road; 3,430’, .65 miles; Mill Valley jurisdiction and road right-of-way.

Issues (discussed in detail in Route overview)

• Bicycle conflict with traffic.
• Bicycle access – climbing lane or bike lanes. Either option (two bike lanes 4-5 feet wide or a climbing lane 8’ wide with a 2’ shoulder on the opposite side) could be accommodated with a pavement section approximately 34 feet wide, as shown in Figure 2-34. By policy, the City of Mill Valley prefers bike lanes so that there is space for bikes outside the motor vehicle lanes in both directions. The determination of the preferred option could be made later without significantly changing the improvement concepts and costs outlined below for widening the road.
• Pedestrian access – Widening for bike lanes would improve access for pedestrians to some extent. An option would be to construct a sidewalk on the west side of the road to connect to the existing west side pathway on Corte Madera Avenue, as shown in Figure 2-35.
• Drainage improvement requirements.
• Impact on native trees and vegetation within the right-of-way.

Improvement Concepts

The first 400 lineal feet (l.f.) of the segment has an existing 55’-wide paved section, including right turn and merge lanes. There is room to re-stripe for bike lanes or a climbing lane. There are sidewalks on both sides for the first 315’.

• Re-stripe centerline and shoulders for bike lane or climbing lane.
• Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

A new bike detector loop is to be installed in the left turn lane of the East Blithedale/Camino Alto intersection as part of and NTPP capital project.

The next 1100 l.f., up to Azalea Drive typically has an approximate 28’ paved section – two 11’ lanes and typically an approximately 6’ wide paved shoulder on the east side, except from Azalea Drive to just north of Kite Hill Lane, where there is very little shoulder on the east, adjacent to a steep slope.
with groves of eucalyptus trees. Typically there is a curb on the west side. An additional 4 - 6’ of pavement width would be required to construct the uphill climbing lane or the bike lanes for this 1100’ segment. Generally, widening could occur on the west side of the road.

There is existing sidewalk on the west from Azalea Drive to Kite Hill Lane. This would have to be rebuilt in conjunction with widening.

Specific improvement elements for this 1100 foot segment include:

- Trimming and clearing of vegetation (mostly ornamental shrubs; potentially several eucalyptus trees on east side north of Kite Hill Lane need to be removed to accommodate widening).
- Grading for widening, primarily on the west side. Extend 4 existing culverts and provide new inlet on uphill side, or new discharge structure on downhill side.
- Relocate two utility poles and one fire hydrant.
- Construct retaining walls, average 3’ high, primarily on the west side.
- A.C. paving, approximately 6 feet additional width.
- Re-stripe centerline and shoulders for bike lane or climbing lane.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.
- An option is to construct 5’ sidewalk, curb and gutter on west side from 400’ north of East Blithedale to connect to the reconstructed existing sidewalk opposite Vasco Court (1,100 l.f. in this portion). Retaining wall height would need to be constructed or increase an average of about 2’ along this portion.

From Azalea Drive to Overhill Road (approximately 2,000 lineal feet) the lane widths remain 11’ but the shoulder is narrower – typically from 3’ to 6’ wide on the east, but in some locations virtually zero. The side slopes are steeper than the section to the south, requiring higher retaining walls, and the adjacent vegetation is mixed grassland and oak bay woodland. Typically the road would need to be widened by 4’ to 10’ to provide room for bike lanes or a climbing lane. About ½ of this portion, or 1,000 l.f., could be constructed with minor grading and vegetation removal. Approximately 1/3 of the remainder, or 333 l.f. would require major grading and vegetation removal, including some small oaks and bays. Approximately 2/3, or 666 l.f. will require construction of a 4’ to 6’ high retaining wall, primarily on the west/uphill side of the road to provide space for widening. The retaining wall construction may require removal of a few trees, but could generally avoid trees.

It would generally not be feasible to widen this portion to provide a sidewalk without significant additional expense in height of walls as well as impact on vegetation. Construction of a sidewalk in this segment is not proposed due to relatively low existing and projected pedestrian use relative to the potential impact and expense of construction. Providing the climbing lane or bike lane improvements will provide some informal improvement for pedestrian access.

Specific improvement elements include:

- Trimming and clearing of vegetation.
- Grading, cut and fill for widening and retaining walls.
• Reconstruct approximately 340’ of existing 5’ sidewalk, curb and gutter on west side from Overhill Road to Vasco Court. Retaining wall height would need to increase an average of about 2’ along this portion.

• Retaining walls – approximately 4’ to 6’ high, average of 5’.

• A.C. paving, approximately 6 feet additional width.

• Extend 4 existing culverts and provide new inlet on uphill side, or discharge structure on downhill side.

• Re-stripe centerline and shoulders for bike lane or climbing lane.

• Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

• An option is to construct 5’ sidewalk, curb and gutter on west side from 400’ north of E. Blithedale to connect to the reconstructed existing sidewalk opposite Vasco Court (1,660 l.f. in this portion). Retaining wall height would need to be constructed or increase an average of about 2’ along this portion.

**Improvement Cost:** $1,390,000

Optional sidewalk extension to Overhill Road, add: $821,000
This section of Camino Alto could also be configured to have a 5 foot bike lane on each side rather than an 5-7' foot climbing lane and 2 foot shoulder.

Note: Right-of-way widths are approximate, per Marin County GIS data, and vary along the route.

Figure 2-34: Section at Southern Portion Camino Alto
Figure 2-35: Camino Alto Improvements Between Azalea Drive and Kite Hill Lane
Figure 2-36: Camino Alto Improvements between Kite Hill Lane and Overhill Road
Segment 12B Improvement Concepts

Along Camino Alto from Overhill Road to Mill Valley/Corte Madera city limit; 3850’, .7 miles; Mill Valley jurisdiction and road right-of-way.

Issues (discussed in detail in Route overview and Segment 12A)

- Bicycle conflict with traffic.
- Bicycle access – climbing lane or bike lanes. By policy, the City of Mill Valley prefers bike lanes so that there is space for bikes outside the motor vehicle lanes in both directions.
- Pedestrian access – As with the northern portion of Segment 12A, it is assumed that the relatively low existing and projected pedestrian use does not justify the cost and impact of a separate sidewalk or path. The climbing lane or bike lane improvements will provide some informal improvement for pedestrian access.
- Drainage improvement requirements.
- Impact on native trees and vegetation within the right-of-way.
- Open Space Trail Crossing and Connection - just south of the city limit line, trails from the adjacent open space preserves intersect Camino Alto. Public comments indicated that it is desirable to establish a safer crossing for trail users, including equestrians. The Bob Middagh Trail intersects from the east, and the Camino Alto Fire Road intersects from the west.

This intersection occurs on a relatively long straight portion of Camino Alto, approximately 550 l.f. Heading north there is approximately 180 l.f. of sight distance to the trailhead on the east side, 145 feet from that trail to the trail on the west side, and 225 feet of sight distance heading south to the west side trail. The stopping sight distance standard for a 30 m.p.h. road is 200 l.f., while the posted speed limit on this road is 25 m.p.h. Addressing this issue is outside the scope of the current study. The conceptual climbing lane or bike lane improvements would provide some level of benefit to pedestrians traveling between the two trailheads, but the bike lane(s) will also need to be defended by signing and enforcement to prevent unauthorized trail user parking from blocking them.
Improvement Concepts

From Overhill Road to the city limits (approximately 3,850 lineal feet), the road shoulder would need to be widened the entire length to provide width for bicyclists. Approximately 1,925 l.f. has sufficient, relatively level space to widen with minor grading. Approximately 1,925 l.f. would require a retaining wall, primarily on the west/uphill side of the road. Specific improvement elements include:

- Trimming and clearing of vegetation.
- Grading, cut and fill for widening and retaining walls.
- Retaining walls – approximately 2’ to 6’ high, average of 4’.
- A.C. paving, approximately 6 feet additional width.
- Extend 2 existing culverts and provide new inlet on uphill side, or discharge structure on downhill side.
- Re-stripe centerline and shoulders for bike lanes or uphill climbing lane. Due to topographic constraints and adjacent native trees, either two 4’ bike lanes or one 5’ to 7’ climbing lane plus a 1’ to 2’ shoulder widening are envisioned, transitioning from the wider facilities to the south.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Cost: $1,360,000

Figure 2-37: Section near Top of Camino Alto

Note: Right-of-way widths are approximate, per Marin County GIS data, and vary along the route.
Figure 2-38: Camino Alto Improvements between Overhill Road and City Limits

- Re-stripe centerline
- Existing guard rail
- Widen road (6’) to accommodate 5-7’ climbing lane or two 4’ bike lanes
- Construct retaining walls where needed
- Existing edge of pavement
Segment 13A Improvement Concepts

Along Corte Madera Avenue from the Mill Valley/Corte Madera city limit, near Chapman Drive, to the open space preserve boundary and beginning of the existing pedestrian path on west side; 2570’, .5 miles; Corte Madera jurisdiction and road right-of-way.

Issues (discussed in detail in Route overview and Segment 12A description)

- Bicycle conflict with vehicular traffic. Corte Madera Avenue is narrow and winding, passing through steep terrain, with an approximately 24’ wide roadway and 0’ to 3’ paved shoulders.
- Bicycle access – uphill climbing lane. The Town of Corte Madera Bicycle Plan calls for a climbing lane on Corte Madera Avenue. Due to steep topography, trees, driveways and structures near the roadway, it would be feasible to add only one 4 – 5 foot climbing lane and not two bike lanes or one wider climbing lane as is envisioned on Camino Alto.
- Pedestrian access; existing and potential pedestrian usage – Extension of the existing pathway that terminates at the north end of this segment would be a significant project, involving traversing slopes ranging from 2:1 to as steep as 1:1 or more. Creating space for a parallel sidewalk or pedestrian path would require much higher and more extensive retaining walls, and a corresponding increase in the removal of native trees and other vegetation. It is assumed that the relatively low existing and projected pedestrian use does not justify the cost and impact of a separate sidewalk or path. The climbing lane or bike lane improvements will provide some informal improvement for pedestrian access.
- Drainage improvement.
- Adjacent land use – There are no immediately adjacent structures, but there are approximately six residential driveways on the east side toward the north end.
- Native trees and vegetation within the right-of-way - this segment is primarily oak woodland bordered by open space.

Improvement Concepts

The entire segment could be widened by an increment of 2 to 5 feet to provide an uphill climbing lane on the west side. Approximately one third, or 850 l.f., has sufficient relatively level space to widen with minor grading. Approximately two thirds, or 1,700 l.f. would require a retaining wall either on the west/uphill side of the road or on the downhill/east side of the road to widen. Specific improvement elements could include:

- Trimming and clearing of vegetation (including removal of approximately 6 mature oaks and redwoods).
- Grading, cut and fill for widening and retaining walls.
- Retaining walls – approximately 2’ to 6’ high, average of 4’.
- Modifications to approximately six driveways that connect to the widened road.
- Extend 4 existing culverts and provide new inlet on uphill side, or discharge structure on downhill side.
- A.C. paving, approximately 4 feet additional width.
- Re-stripe centerline and shoulders for a climbing lane. To allow bikes to reach speed to share the downhill lane with traffic, the climbing lane should continue beyond the crest of the hill.
into segment 13A, overlapping with the climbing lane extending south from 13A on the west side.

- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

**Improvement Cost: $761,000**
Figure 2-39: Southern Portion of Corte Madera Avenue Improvements
Segment 13B Improvement Concepts

Along Corte Madera Avenue from the open space preserve boundary and beginning of the existing pedestrian path on the west side to Redwood Avenue, and along Redwood Avenue to Montecito Drive; 2,710’, 0.5 miles; Corte Madera jurisdiction and road right-of-way.

Issues (discussed in detail in Route overview and Segment 13A description)

- Bicycle conflicts with vehicle traffic - this segment of Corte Madera Avenue is similar to 13A – a narrow and winding, passing through steep terrain, with an approximately 24’ wide roadway and 0’ to 3’ paved shoulders.

- Bicycle access – climbing lane or bike lanes. A modest pavement widening by an increment of 2 to 5 feet could provide a 5’-wide uphill climbing lane for bikes on the east side without major changes to adjacent private improvements, and with minimal loss (e.g. 2 to 3 spaces) of the approximately 12 roadside parking spaces that exist along this portion.

- Pedestrian access – The existing pedestrian path is approximately 4’ wide. It is interrupted in some places, and the materials, width and condition vary. Improvement or reconstruction of the path would greatly improve access. It is assumed that any shoulder widening that replaced the existing east side pathway is not desirable, and that a paved shoulder would be a less desirable facility for pedestrians because the existing path is separated from the road by curbs, grades, and trees in some cases.

- Drainage improvement requirements.

- Impact on adjacent land use – This segment is flanked by houses on both sides and many driveways, shoulders used for parking, and walls, fences and landscaping in the right-of-way. Improvements would need to be carefully designed given existing private improvements, including approximately 30 driveways.

- Native trees and vegetation within the right-of-way.

Improvement Concepts

- Trimming and clearing of vegetation (some small bays and oaks, one large bay, and one large redwood may need to be removed).

- Grading, cut and fill for widening and retaining walls.

- Retaining walls – approximately 1’ to 3’ high, average of 2’, in selected locations on approximately half of the 2,200 l.f. steep portion of the segment.

- Modifications to approximately 30 driveways to conform to the widened road and/or path.

- Extend 4 existing culverts and provide new inlet on uphill side, or discharge structure on downhill side.

- Add A.C. paving, approximately 3 feet additional width, average.

- Re-stripe centerline and shoulders for a bike climbing lane. To allow bikes to reach speed to share the downhill lane with traffic, the climbing lane should continue beyond the crest of the hill into segment 12B, overlapping with the climbing lane extending north from 12B on the east side.

- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

- Reconstruct/improve existing A.C. or concrete path.
Along the last 500 feet of the segment on Corte Madera Avenue, the roadway straightens, widens to 38 feet, and has sidewalks on both sides. There are striped shoulders outside of curbside parking, providing marginal space for bikes – approximately 10’ feet total, rather than the 12’ recommended for combined parking/bike lanes. Potentially the traffic lanes could be narrowed to provide the space for bike lanes, or an uphill climbing lane added on the east side.

The route then turns east along Redwood Avenue. Specific improvement elements for this portion include:

- Re-stripe centerline and shoulders for bike lane or an uphill climbing lane.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

**Improvement Cost:** $877,000
Reconstruct existing informal path/sidewalk in this section

Figure 2-41

Segment Location Map

Corte Madera

Opin Spooq

Mill Valley

Unincorporated Area

Segment 13B Improvement Concepts

Match Line, Segment 13b
Match Line, Segment 13c

Redwood Ave.

Tolvaledge Drive

0 250 500 Feet
Figure 2-40 Section through Corte Madera Avenue

Note: Right-of-way widths are approximate, per Marin County GIS data, and vary along the route.
Figure 2-41: Northern Portion of Corte Madera Avenue Improvements
Segment 10: Connection along Montecito Drive north of Redwood Avenue to the existing Sandra Marker Trail, and along the Sandra Marker Trail north and east to Tamal Vista Boulevard at Wornum Way; 6,638'/1.4 miles.

(see Route B, Alto Tunnel, for description of Segment 10 improvements)