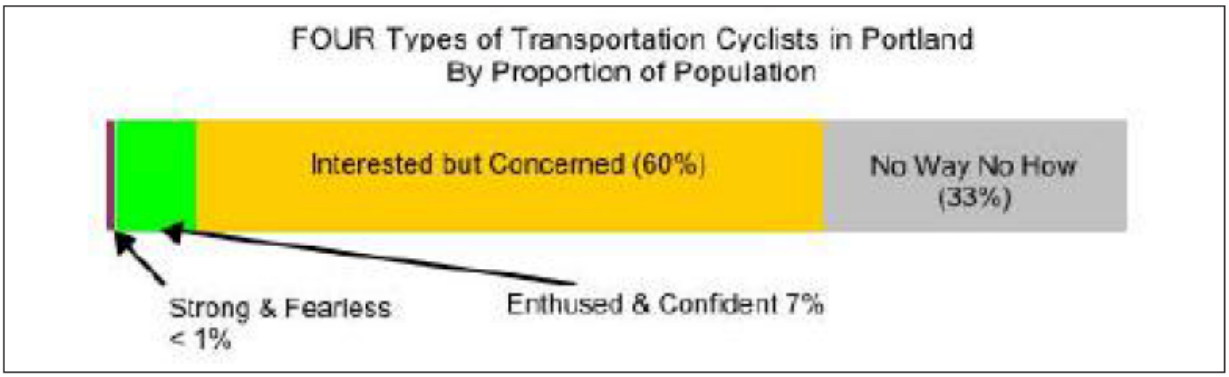
Would New Bike Facilities On El Camino Real Appeal To Many Cyclists?



Both convenience and comfort impact where cyclists choose to ride, and currently few use El Camino Real (State Highway 82) in Peninsula cities. Would the addition of either bike lanes or separate bike paths ("bike facilities") significantly increase their number in Menlo Park? This study uses the pioneering methodology described in *Low Stress Bicycling And Network Connectivity* to gauge how new bike facilities would appeal to cyclists based on their tolerance for riding in stressful settings and the availability of convenient alternatives.

Maaza C. Mekuria, Ph.D., P.E., PTOE, and co-author of *Low Stress Bicycling And Network Connectivity,* who graciously assisted me in this study. Thank you, Maaza.

Dana Hendrickson
Editor, Re-Imagine Menlo Park

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Re-Imagine Menlo Park

Re-Imagine Menlo Park is dedicated to Menlo Park residents who want our city to become a more beautiful, safe and vibrant community and believe that public investment in the areas defined in the Specific Plan should be based on facts, sound assumptions and solid reasoning, not ideology, intuition, and personal biases. The editor is a 30-year resident who raised his family here and considers Re-Imagine Menlo Park a personal investment in its future.

My objectives are

- To encourage residents to actively support efforts to make “downtown” a more appealing place to shop, dine, socialize, walk, and enjoy community activities.
- To educate myself and other residents on city policies and regulations as well as individual public investment opportunities.
- Encourage residents to develop their own well-informed positions re: potential public and private investments in Menlo Park.
- To share what I believe would make downtown and El Camino Real more valuable community resources.

Author

Dana Hendrickson, the editor of Re-Imagine Menlo Park, is an avid cyclist and ex-Silicon Valley executive who has enjoyed living in Central Menlo Park with his family since 1985. His wife Lisa is an active leader in the local nonprofit community and recently stepped aside from 15 years of service as the president of Avenidas, the Palo Alto senior service organization and Senior Day Care Facility. She is currently leading a large-scale effort to transform the main center facilities and add new services that will not only meet the needs of current seniors but also appeal to the next generation of tech-savvy individuals. Our son Brian works in strategic supply-chain management at Apple and lives with his wife Farrell in San Francisco; our son Mark is a contract chief technology officer and product management specialist for U.S. start-ups and lives in Barcelona Spain. For seven years Dana has supported the families of severely disabled Iraqi and Afghanistan veterans with a national non-profit that he founded in 2008, Dana has also built homes one-a-week on the Peninsula for five years with Habitat for Humanity, and currently assists seniors who can no longer drive. Re-imagine Menlo Park reflects his personal volunteer commitment to help residents make well-informed decisions about the future quality of life in our city.

A Cycling Anecdote

Rules of the road: how to turn when there's a bicyclist to your right.

Source: San Jose Mercury, May 13, 2015

Cyclist:

Can you please remind drivers of the proper way to make a right hand turn when a bicyclist is present?

I am terrified when I bike toward an intersection and a driver (either) to my left or behind me waits until the last minute to make his move for a right hand turn, often cutting me off. In my cycling experience, **this is the single most dangerous habit of motorists that puts us cyclists at risk**. You would do us a service if you could remind motorists of how to behave when making right turns when there is a bike lane to their right.

Mr. Roadshow:

How to legally and safely make a right turn when a cyclist is present is the DMV test question motorists most frequently get wrong.

Drivers, here is the right way to do this.

- Merge into or cross the bike lane before the right hand turn, all the way to the curb. You can do this on all streets, whether they have a bike lane or not, within 200 feet of an intersection. Make sure you yield the right-of-way to cyclists.
- If you think there is a CHANCE that merging would not give a motorist behind you to (either) slow down or pass you on the left, then DON'T Do It.
- Slow down and merge BEHIND the rider to make your right turn. Treat cyclists as if they were motorists.
- DO NOT – I repeat do not - speed up to get in in front (of the cyclist); then turn across the bike lane at a right angle.

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SECTION 1

Would bike lanes on El Camino Real in Menlo Park solve the primary problems with our city's existing bike network and appeal to a significant number of residents including school age children? I believe the answers are clearly "no" and will share what I learned by performing a "cyclist stress analysis", a study that has also been funded by Menlo Park but not yet conducted by a transportation consultant hired as part of the current Menlo Park El Camino Corridor Study. So far, the limited public debate about bike lanes has been long on personal ideology, preferences and opinions and short on facts, well supported assumptions and solid logic. My study is designed for those residents who want their own positions to be based on an in-depth understanding of potential benefits, alternatives and trade-offs.

I. Executive Summary

- The existing Menlo Park bike network does NOT serve the needs of cyclists who want to ride to popular destinations either on the opposite side of El Camino or downtown. For example, the lack of bike lanes on Menlo, University and Oak Grove Avenues negatively impacts students who live on the west side and want to travel by bike to Encinal School, facilities at Burgess Park, and Menlo-Atherton High School (See Appendix A10). Also, all cyclists have limited safe and convenient options for riding to destinations on Santa Cruz Avenue between University and El Camino due to the lack of bike lanes on University and Menlo Avenues. Similarly, the majority of residents have poor bike access to the popular Safeway shopping mall. These limitations encourage many to use motor vehicles rather than bikes for their travel.

- Using a well-accepted bike network design methodology that uses "cyclist stress analysis" I estimate less than 1% of Menlo Park residents (320) would feel comfortable using bike lanes on El Camino Real IF it were the only convenient option and fewer would actually do so given existing and planned nearby less stressful streets. Of course, all of these cyclists would not be riding on any particular day. If 33% did, the maximum number would be about 110. Also, El Camino bike lanes would not be suitable for school age children. (Note: in 2014 the average daily number of *less than* 100 cyclists rode on El Camino Real.)

Specific Plan Recommendations

While the Menlo Park Specific Plan identified all these needs, after several years none have been addressed. The primary reason appears to be the reluctance to eliminate parking spots in exchange for bike lanes on these streets. The addition of bike lanes would eliminate about 150 spaces – a very large number. This policy decision means bike lanes will not happen until the larger problem of "downtown parking" is solved, and currently there is no concrete commitment to do so. So bike lanes remain indefinitely in limbo. (But as described in my recommendation this situation CAN be avoided)

Existing Bike Network Service Levels

	Network Rating			
Popular Destinations	**Point of Origin**		**Crossing ECR**	**Needed Improvements**
	On East Side	**On West Side**		
Schools				
Oak Knoll	n/a	Good	n/a	Bike route on **Middle** between Olive & University
Hillview	n/a	Good	n/a	Bike route on **Olive** between Middle & Santa Cruz Avenue
	Poor	n/a	Poor	Bike Lanes on **Menlo Avenue** and crossing tracks*
Encinal	Good	n/a	n/a	
Laurel	Good	n/a	n/a	
Menlo-Atherton	Good	Poor	Poor	
Burgess Park	Good	Poor	Poor	Bike Lanes on **Menlo Avenue** and crossing tracks*
Nealon Park	Poor	Good	Poor	Bike Lanes on **Menlo Avenue** and crossing tracks*
Library	Good	Poor	Poor	Bike Lanes on **Menlo Avenue** and crossing tracks*
City Government	Good	Poor	Poor	Bike Lanes on **Menlo Avenue** and crossing tracks*
Downtown	Poor	Fair	Poor	Bike Lanes on **Menlo Avenue** and crossing tracks*
				Bike Lanes on **University** between Middle and Menlo Avenue
El Camino	Poor	Fair	Poor	Bike Lanes on **Menlo Avenue** and crossing tracks*
				Bike Lanes on **University** between Middle and Menlo Avenue
				Note: Cyclists can ride to nearest ECR intersection using side streets and then walk bike on sidewalks to destination.
Safeway Shopping Mall	Poor	Fair	Poor	Bike route on **Middle** between Olive and Safeway driveway
				Bike Lanes on **Menlo Avenue** and crossing tracks*
				Bike Lanes on **University** between Middle and Menlo Avenue
Train Station	Good	Poor	Poor	Bike Lanes on **Menlo Avenue**

* Includes continuous bike lanes to Laurel

Bike Network Service Levels – My Recommended Improvements

Popular Destinations	Network Rating			Needed Improvements
	Point of Origin		Crossing ECR	
	On East Side	On West Side		
Burgess Park	Good	Good	Good	Bike Lanes on **Menlo Avenue** from Crane to ECR and crossing tracks Bike route on **Crane** from Menlo Ave to Live Oak
Nealon Park	Good	Good	Good	Bike Route on **Live Oak** between University and Crane Bike Lanes on **University** between Middle and Live Oak
Library	Good	Good	Good	Same as above
City Government	Good	Good	Good	Same as above
Downtown	Good	Good	Good	Same as above.
El Camino	Fair*	Fair*	Fair*	Same as above Note: Cyclists can ride to nearest ECR intersection using side streets and then walk bike on sidewalks to destination.
Safeway Shopping Mall	Good	Good	Good	Same as above Bike route on **Middle** from University to Safeway
Train Station	Good	Good	Good	Same as for downtown

* Still need to add bike lanes on Oak Grove from University to Laurel

View proposed street details in *Section IV. Recommendations*

II. Introduction

As part of the current Menlo Park El Camino Real Corridor Study ("ECR Corridor Study"), the City is considering whether to add either bike lanes or separate bike paths to its mile+ stretch of El Camino Real (ECR). It has completed a concept-level review of these options and determined that either bike facility could be built without a reduction in the number of existing vehicle lanes. The City Bike, Transportation and Planning Commissions have all expressed their support for bike lanes, and the City Council will soon decide whether to spend about $200,000 to complete a more in-depth analysis, an environmental impact report, and a construction plan and budget. If funded, the additional work would include a cyclist stress analysis similar to the one provided in this document. This study would estimate the appeal that bike lanes would likely have for cyclists based on their levels of tolerance for riding in stressful environments. While it might seem obvious that adding bike lanes would benefit cyclists without penalizing others, this is not the case, and this decision is actually quite complex. I undertook this analysis so our community had critical information BEFORE it investing additional funds in this project.

I recommend Menlo Park use the following criteria to evaluate the opportunity to add bike lanes to El Camino Real.

1. ***BEST RESOURCE USE:*** Bike lanes should NOT preclude more beneficial future uses of ECR, e.g., increased bus services. Menlo Park's one+ mile section of ECR should be viewed as potential important link in FOUR separate local transportation networks, one for motorists who use either four wheel vehicles or motorcycles/motorbikes, another for cyclists, a third for pedestrians, and a fourth for public transit.

2. **SIGNIFICANT BIKE USAGE.** A significant number of cyclists would actually use ECR. (Note: In 2014 a daily average of less than 100 cyclists – about 10 per hour- rode on ECR.)

3. **CYCLIST SAFETY**. Riding on ECR should NOT be significantly less safe than convenient alternative streets.

4. **IMPACT ON OTHER USERS.** Bike lanes should NOT significantly impact the comfort, convenience and safety of motorists and pedestrians nor reduce the service levels of public safety organizations, e.g., fire departments, police, emergency medical services.

5. **CONFLICT AVOIDANCE**. Cyclists and motorists often experience negative interactions due to distractions, poor judgment, ignorance of the "rules of the road", and decisions to ignore them. The addition of bike lanes should NOT intensify general hostilities and the frequency of unhealthy conflicts.

6. **DIVISIVENESS.** The addition of bike lanes could become a controversial community issue that pits cyclists against non-cyclists. Can this be avoided? Will a special ballot be required to determine what the majority of residents want?

7. **Best Bike Network Investments.** During the Specific Planning process Menlo Park identified a number of possible improvements to its existing bike network. Should an investment in bike lanes on ECR merit a higher priority than other ones?

#	Requirement	Potential Impact	
		Positive	Negative
1	Best Use Of ECR	?	?
2	Impact On Non-Cyclists*	?	?
3	Significant Bike Need/Usage	?	?
4	Cyclist Safety	?	?
5	Cyclist-Motorist Conflict	?	?
6	Divisive Community Issue	?	?
7	Best Biking Solution	?	?
	* Safety, convenience and comfort		

My study the gauges the likely appeal of bike networks and individual segments based on

(a) The tolerance cyclists have for riding in stressful vehicle traffic.

(b) The levels of stress produced by different riding environments.

(c) The convenience of less stressful bike routes.

This study uses the widely supported methodology described in *Low Stress Bicycling And Network Connectivity* (2012) and published by the Mineta Transportation Institute (MTI) at San Jose State University. The primary author, Maaka Mekuria, provided advice on how to apply this methodology to ECR in Menlo Park

III. El Camino Real Overview

ECR is primarily a heavily travelled highway used by few cyclists. The daily usage north and south of Ravenswood in 2014 are shown below.

	Estimated 2014 Average Daily Volume			
	Trips		Users	
	Vehicles	Bikes	Motorists	Cyclists
North of Ravenswood	34600	120	17300	60
South of Ravenswood	46700	175	23350	88

The # of users assumed to be equal to half of the # of trips.

Primary attributes:

- Main vehicle artery (State Highway 82) with largely commercial properties
- Distance between Encinal Avenue and Creek Drive: 1.13 miles
- Maximum speed limit: 35 mph
- Vehicle Lanes in each direction: 2 north and 3 south of Ravenswood/Menlo Avenues
- Seven signalized intersections with left (except Middle Avenue) and right turn lanes; Six right turn only intersections with no signals (Appendix A1)
- 60 public driveways including a dozen that are very busy, e.g. Safeway, gas stations, Ducky's car wash (Appendix A2)

IV. Menlo Park Bike Network

A community bike network provides create a web of riding options that includes (a) streets that are designated and marked for bike usage and (b) undesignated and unmarked ones. The designated bike network includes collectors and connectors that enable cyclists to reach popular destinations using streets shared with moderate to heavy vehicle traffic, and the undesignated streets provide safe links to this grid.

Bike Path (Class I Bikeway) provides a completely separate right-of-way and is designated for the exclusive use of bicycles and pedestrians with minimum vehicle and pedestrian cross-flow. There are no bike paths in Menlo Park.

Bike Lane (Class II Bikeway) provides a restricted right-of-way and is designated for the use of bicycles with a striped line on a street and highway. Bike lanes are general five feet wide. Adjacent parking is permitted. Vehicle and pedestrian cross-flow is permitted. These are the primary bike facilities in Menlo Park.

Bike Route (Class III Bikeway) provides for a right-of-way designated by signs or pavement

markings for shared use with pedestrians and vehicles. This type of bike facility is currently rare in Menlo Park.

Shareways are NOT considered bike facilities as they simply remind motorists that all cyclists have the right to ride in vehicle lanes when there are no alternatives. Shareways are currently used on the southern section of University Avenue and on Menlo Avenue.

Menlo Park has an extensive bike network consisting of a grid of busy streets either with bike lanes or marked as bike routes and dozens of neighborhood streets with little vehicle traffic. To simplify descriptions this study views El Camino Real as running north-to--south and Ravenswood, east-to-west.

- Each bike network street serves one or more roles for cyclists: a primary east-west connector, a primary north-south connector, access to downtown, access to destinations on El Camino. Streets with bike facilities are in boldface and most have bike lanes.

- The popular north-south streets starting in the west side are **Alameda de Las Pulgas**, Olive/Hillview, San Mateo/Hillsdale, Fremont, University, **Alma, Laurel, and Middlefield.**

- The popular east-west streets are **Encinal, Valparaiso**/Glenwood, Oak Grove **Ravenswood**/Menlo, and Middle.

    Appendix A3. Map of Existing Formal & Informal MP Bike Network - Map

    Appendix A4: Roles of Existing Formal & Informal MP Bike Network Streets

- The Menlo Park Specific Plan includes proposed improvements to the formal bike network. These are not prioritized nor are they included in the current 2014-2015 budget. These include adding bike lanes to both sections of University, El Camino Real, Oak Grove, Menlo, and Middle between University and El Camino. Bike routes are recommended on Crane between Menlo and Valparaiso, on Oak Grove between Laurel and Middlefield; on Middle west of University; and on a combination of Alma, private property at 1300 ECR and Garwood Way.

Appendix A5: Map of Bike Network Improvements Recommended in Specific Plan

Appendix A6: Roles of Bike Network Improvements Recommended in Specific Plan

SECTION 2

V. Analysis of the Potential Appeal of Bike Lanes on El Camino

The appeal of a particular link in a bike network depends on a cyclist's tolerance for traffic stress, the level of stress produced by the link itself, and the amount of detour (inconvenience) associated with using lower stress alternatives. That is, cyclists will choose links that offer acceptable levels of traffic stress and detours.

Cyclist Categories

Since 2012 bike network designers have embraced the idea that stress tolerance appears to be a better gauge than skill level for categorizing cyclists. MTI suggests there are three primary rider types, and it assumes that one-third of the total population consists of "no way, no how" individuals who simply avoid cycling.

- Strong & Fearless (< 1.5% of cyclists)
- Enthused & Confident (< 10.5% of cyclists)
- Interested but Concerned (< 90% of cyclists)

Network Links Stress Levels

MTI has identified multiple components that contribute to the overall stress level of individual links in a bike network, and the stress level of a network link is equal to the highest stress level of any component that contributes to rider stress.

NOTE: MTI views a network link as the stretch of a street that runs between two intersections. **Since ECR has many intersections it has been treated as THIRTEEN bike network links each having its own stress level rating.**

- *Network link stress* factors in the number of thru vehicle lanes in each direction, the existence of traffic medians, the width of bike lanes, maximum vehicle operating speed, and the frequency of bike lane blockages that forces cyclists out of bike lanes.

- *Mixed traffic stress* factors in the total number of vehicle lanes and vehicle operating speed.

- *Intersection Approach* stress factors in the way cyclists and motorists interact at intersections and public driveways.

Cyclist Stress Categories

MTI also classifies bike network segments based on the stress they can produce on different type riders.

"Bikeways that are physically separated from motor traffic have the lowest level of traffic stress between intersections, LTS 1. They include standalone paths as well as those that run alongside a road that may be called cycle tracks, side paths, or segregated lanes. Means of

physical separation from motor traffic include, but are not limited to, curbs, raised medians, parking lanes, and flexible bollards."

"Bike lanes are space on the roadway designated by markings for exclusive use by bicycles, except for possible *occasional* encroachment by motor vehicle to access parking places or intersecting streets and driveways. "

"Bike lanes can exhibit the full range of traffic stress. Where they have ample width and are positioned on a road whose traffic is slow and simple (a single lane per direction), they can offer cyclists a low-stress riding environment. However, bike lanes can also present a high-stress environment when positioned on roads with highway speeds or turbulent traffic, or next to high-turnover parking lanes without adequate clearance. The way bike lanes are treated on intersection approaches, often forcing cyclists to merge with motor traffic, can also add considerably to the stress they impose on riders. The following categories are used to gauge Levels of Traffic Stress (LTS) for individual bike Network segments.

LTS 1 Suitable for everyone including well-trained children.

LTS 2 Suitable for most adult cyclists. Low vehicle-bike speed differential.

LTS 3 Suitable for adults comfortable with moderate vehicle speeds; generally single lane vehicle traffic.

LTS 4 More stress than LTS 3

LTS 1	Presenting little traffic stress and demanding little attention from cyclists, and attractive enough for a relaxing bike ride. Suitable for almost all cyclists, including children trained to safely cross intersections. On links, cyclists are either physically separated from traffic, or are in an exclusive bicycling zone next to a slow traffic stream with no more than one lane per direction, or are on a shared road where they interact with only occasional motor vehicles (as opposed to a stream of traffic) with a low speed differential. Where cyclists ride alongside a parking lane, they have ample operating space outside the zone into which car doors are opened. Intersections are easy to approach and cross.
LTS 2	Presenting little traffic stress and therefore suitable to most adult cyclists but demanding more attention than might be expected from children. On links, cyclists are either physically separated from traffic, or are in an exclusive bicycling zone next to a well-confined traffic stream with adequate clearance from a parking lane, or are on a shared road where they interact with only occasional motor vehicles (as opposed to a stream of traffic) with a low speed differential. Where a bike lane lies between a through lane and a right-turn lane, it is configured to give cyclists unambiguous priority where cars cross the bike lane and to keep car speed in the right-turn lane comparable to bicycling speeds. Crossings are not difficult for most adults.
LTS 3	More traffic stress than LTS 2, yet markedly less than the stress of integrating with multilane traffic, and therefore welcome to many people currently riding bikes in American cities. Offering cyclists either an exclusive riding zone (lane) next to moderate-speed traffic or shared lanes on streets that are not multilane and have moderately low speed. Crossings may be longer or across higher-speed roads than allowed by LTS 2, but are still considered acceptably safe to most adult pedestrians.
LTS 4	A level of stress beyond LTS3.

Cyclist Stress Tolerance

This table illustrates how different categories of cyclists generally tolerate the stress levels of specific network links.

	Distribution		Stress Tolerance Level			
Category	**Total Population**	**Cyclist Community**	**LTS 1**	**LTS 2**	**LTS 3**	**LTS 4**
Strong & Fearless	**< 1%**	**< 1.5%**				✔
Enthused & Confident	**< 7%**	**< 10.5%**			✔	
Interested But Concerned*	**> 59%**	**> 88%**	☑	✔		
No Way, No How	**33%**	**n/a**				

* Children should be restricted to LTS 1 network links

Network Segment Stress Level Criteria For Bike Lanes Without Adjacent Parking

The bike lanes being considered along El Camino Real would not run along a parking lane The criteria for bike lanes without adjacent parking spaces four dimensions: street width (i.e., number of lanes), bicycle operating space, speed limit or prevailing speed, and bike lane blockage, i.e., where vehicles obstruct the lane. For any given segment, these criteria aggregate following the weakest link principle: the dimension with the worst level of stress governs the rating for the entire street segment.

	LTS ≥ 1	LTS ≥ 2	LTS ≥ 3	LTS ≥ 4
Street width (through lanes per direction)	1	2, if directions are separated by a raised median	more than 2, or 2 without a separating median	(no effect)
Bike lane width (includes marked buffer and paved gutter)	6 ft. or more	5.5 ft. or less	(no effect)	(no effect)
Speed limit or prevailing speed	30 mph or less	(no effect)	35 mph	40 mph or more
Bike lane blockage (may apply in commercial areas)	rare	(no effect)	frequent	(no effect)

Note: (no effect) = factor does not trigger an increase to this level of traffic stress.

Street width is measured in number of through traffic lanes in each direction. The number of lanes directly affects the traffic environment. Multilane streets, in contrast to those with a single lane per direction, promote higher traffic speeds, and their traffic is more "turbulent" in the sense of being less confined and predictable. A multilane environment decreases a cyclist's noticeability to left turning and cross vehicle traffic at driveways and intersections.

For bike lanes not alongside a parking lane, operating space is the bike lane width. Width should be measured from the curb (or street edge) to the outside travel lane, including gutter and any marked buffer as well as the bike lane itself.

Operating speed is a gauge of the actual top vehicle speed not the average calculated speed and clearly affects cyclist comfort. Speed limit can be an adequate surrogate if a city systematically adjusts the speed limit to the prevailing speed or uses systematic means such as speed cameras or traffic calming to make actual speeds comply with the speed limit. In other cities, speed limit may not be a good indicator of operating speed.

On some street segments – particularly those in commercial areas – bike lanes are frequently blocked by double-parked cars, cars maneuvering into parking places, people getting out of their parked cars, and similar factors, forcing cyclists to merge into the adjacent travel lane.

Network Segment Stress Rating for ECR Bike Lanes => LTS 4

- Street width: 2 north of Ravenswood; 3 to the south
- Bike lane width: 6 feet or more
- Speed limit: 35 mph
- Bike Lane blockage: rare

Stress Level Criteria for Mixed Streets

The level of stress when riding in **mixed traffic** depends on the prevailing traffic speed and street width (number of lanes). In multilane traffic with speeds of 30 mph or greater, level of traffic stress is LTS4. LTS 2 can be achieved with mixed traffic only on streets with one lane per direction. The number of lanes refers to the total number of street lanes including turn lanes at intersections in each direction.

	Street Width		
Speed Limit	2-3 lanes	4-5 lanes	6+ lanes
Up to 25 mph	LTS 1[a] or 2[a]	LTS 3	LTS 4
30 mph	LTS 2[a] or 3[a]	LTS 4	LTS 4
35+ mph	LTS 4	LTS 4	LTS 4

Note: [a] Use lower value for streets without marked centerlines or classified as residential and with fewer than 3 lanes; use higher value otherwise.

Multilane street stress rating for ECR bike lanes => n/a

Not applicable because bike facilities would separate bikes and motor vehicles.

Stress Level Criteria for Signalized Intersection Approaches

Where streets approach signalized intersections, auxiliary turn lanes are often added. The effect on cyclists of added right-turn lanes challenge a cyclist's normal position and create a weaving conflict. The stress level associated with an intersection approach should be aggregated with the stress level already assigned to a segment following the "weakest link" logic.

Where there is an auxiliary right lane and no bike lane, either because the street has no bike lanes or where the bike lane is dropped in order to devote space to an auxiliary lane, bicyclists will be in a high-stress situation unless the right-turn lane is so little used and has such low traffic speeds that cyclists can share it with right-turn cars as a *de facto* bike lane.

Configuration	Level of Traffic Stress
Single right-turn lane with length ≤ 75 ft. and intersection angle and curb radius limit turning speed to 15 mph.	(no effect on LTS)
Single right-turn lane with length between 75 and 150 ft., and intersection angle and curb radius limit turning speed to 15 mph.	LTS ≥ 3
Otherwise.	LTS = 4

Signalized intersection stress ratings for ECR bike lanes => LTS 3

- Assumes vehicle right turn speeds are limited to 15 mph

Stress Level Criteria for Intersections Lacking Signals And For Public Driveways

Both Intersections lacking signals and public driveways with no turn lanes, high volumes of vehicle traffic and vehicle turning speeds greater than 15 mph should be rated a LTS 4; lower turning speeds (15 mph or less) merit a lower rating. Both can be mitigated if an abrupt bike pocket lane is provided AND the cyclist right-of-way is clearly marked. Then, right-hand turn approaches do not increase stress beyond a signalized intersection rating. Busy pubic driveways are rated above unsignalized intersections.

Intersection & public driveway stress ratings ECR bike lanes.

- Intersections => LTS 1 – LTS4 depending on turning speed and vehicle traffic
- Driveways => LTS1 to LTS4 depending on turning speed and vehicle traffic

Stress Level Criteria for Left Turn Lanes

Left hand turns provide cyclists a few options with different delays and stress levels.

- With a red light some will perform a two-stop left turn.
- With a green light they can either cross the intersection, stop and wait for a light change or merge with left turn vehicles to avoid any stops. Then they must leave a bike lane, cross multiple vehicle lanes, and merge with left turning vehicle traffic.

MTI recommends counting left turn lanes as another vehicle lane when determining the multilane traffic stress rating.