

AGENDA

Meeting of the San Marcos Traffic Commission

Meeting Date: October 3, 2018 | **Meeting Time:** 6:00 PM

Location: City Council Chambers, 1 Civic Center Drive, San Marcos CA 92069

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1. CALL TO ORDER - 6:00 P.M.

2. PLEDGE OF ALLEGIANCE

3. ROLL CALL

Anyone wishing to speak to the Commission on any item must first complete a Request to Speak form and turn it in to the secretary

4. ORAL COMMUNICATIONS

Persons wishing to speak on a matter not on the agenda may be heard at this time; however, no action will be taken until placed on a future agenda.

5. APPROVAL OF MINUTES

August 1, 2018

6. OLD BUSINESS

- a. None

7. NEW BUSINESS

- a. Installation of "KEEP CLEAR" pavement markings on Montiel Road (Plaza San Marcos – 730 Nordahl Road)
- b. Southbound Nordahl Road at Center Drive – Proposed Right-Turn Lane

8. REPORTS AND INFORMATION ITEMS

- a. Engineering Staff Updates
- b. San Diego County Sheriff's Department Traffic Collision Summary And Accident Investigation Log
- c. Traffic Commission Commentary
- d. Staff Commentary

ADJOURNMENT

AFFIDAVIT OF POSTING

STATE OF CALIFORNIA)
COUNTY OF SAN DIEGO) ss.
CITY OF SAN MARCOS)

I, Denise Avila, Secretary, San Marcos Traffic Commission, hereby certify that I caused the posting on September 26, 2018 of this agenda in the glass display case at the north entrance of City Hall.

DATED: September 26, 2018



Denise Avila,
Traffic Commission Secretary

MINUTES

Meeting of the San Marcos Traffic Commission

WEDNESDAY, AUGUST 1, 2018 | 6:00 PM

City Council Chambers, 1 Civic Center Drive, San Marcos, CA 92069

1. **CALL TO ORDER:** Chairman Hansen called the Traffic Commission Meeting to order at 6:03 p.m.

2. **PLEDGE OF ALLEGIANCE:** Led by Commissioner Collins

3. **ROLL CALL:**

PRESENT: MASTERSON, BRIDGE, MAKROGIANNIS, HANSEN, RICO, COLLINS, BUCKLEY

ABSENT: SAVOVIC, MUSGROVE

ALSO PRESENT: Senior Traffic Engineer, Mike Rafael; Principal Traffic Engineer, Nicholas Abboud; Sheriff Deputy, Nicholas Maryn; and Traffic Commission Secretary, Denise Avila.

4. **ORAL COMMUNICATIONS**

Resident Christine Uhring resides at 1155 Fulton Road, expressed concerns about speeding vehicles and the amount of continuous traffic that flows through Fulton Road near Woodland Parkway.

Ms. Uhring expressed that the area is posted with several SPEED LIMIT 25 signs but there is one posted sign that reads WHEN CHILDREN ARE PRESENT. She believes the posted sign implies if there are no kids drivers can go the speed they want. She is very concerned for her safety and the safety of her neighbors due to a recent near miss collision while turning into her driveway on Fulton Road. She believes the area has become very dangerous and needs to be looked into by the City.

5. **APPROVAL OF MINUTES – May 2, 2018**

Commissioner Rico makes a motion to accept the minutes as recorded. Commissioner Collins seconds the motion. Motion carries.

AYES: COMMISSIONERS: MASTERSON, BRIDGE, MAKROGIANNIS, HANSEN, RICO, COLLINS, BUCKLEY

NOES: COMMISSIONERS:

ABSTAINS: COMMISSIONERS:

6. OLD BUSINESS

- a. None

7. NEW BUSINESS

- a. Richland Road - Local Road/Residential Street Classification

Engineering staff has received numerous resident complaints of high cut-through traffic during morning peak hours and excessive vehicle speeds on Richland Road between Borden Road and Mission Road. Residents requested a flashing beacon with a WATCH DOWNHILL SPEED sign to help reduce vehicle speeds. Residents also requested the installation of a new NOT A THROUGH STREET sign on Felicia Lane and Linda Lane where they intersect with Richland Road to help where residents have observed a high volume of turnaround traffic.

The City's Transportation Engineering staff evaluated the existing roadway geometry, physical road features, and traffic characteristics of this 3-segment corridor (No. 1: Richland Road from Borden Road to Fulton Road, No. 2: Richland Road from Fulton Road to Rock Springs Road, and No. 3: Richland Road from Rock Springs Road to Mission Road). Staff collected existing traffic volumes, speed data, and collision history to evaluate existing traffic conditions. Based on their findings, staff discovered that roadway segments 1 and 2 are classified as major collector roads, which is inconsistent with the Mobility Element of the General Plan. Roadway segment 3 is classified as a local road.

Based on the California Vehicle Code (CVC) Sections 40802 and 515, roadway segments 1 and 2 meet the conditions to be classified as local roads. Staff recommends a change request of the Federal Highway Administration (FHWA) functional classification maps to reclassify Richland Road segments 1 and 2 as local roads. Staff also recommends that the posted speed limit of the corridor be reduced to 25 MPS, based on the criteria of the CVS as a residential street and local road.

In addition, staff recommends targeted speed enforcement by the Sheriff's department to encourage and promote compliance with the prima facie (25 MPH) speed limit, the installation of six (6) inch white edgeline striping on the west side of Richland Road between Fulton Road and Elizabeth Street, and the installation of double yellow centerline striping. Staff does not recommend the use of a flashing beacon and warning sign WATCH DOWNHILL SPEED as they are not appropriate devices for a residential street. Staff will monitor vehicular speeds on Richland Road based on the new 25 MPH speed limit zone and traffic calming roadway striping improvements for at least one (1) year. A reassessment of traffic conditions would be necessary before more aggressive options are considered and brought forth before the Traffic Commission. Additionally, staff does not recommend the installation of a NOT A THROUGH STREET warning sign on Linda Lane or Felicia Lane as both street segments are too short and the end of each street is visible from Richland Road.

Staff recommends the Traffic Commission to approve the submission of a resolution to City Council for approval of change. Staff will then submit a functional classification change request package to Caltrans for approval and forwarding to FHWA for update of California Road System (CRS) maps to reflect the classification change.

Commissioner Makrogiannis makes a motion to accept the proposed recommendations by engineering staff as presented. Commissioner Rico seconds the motion. Motion carries.

AYES: COMMISSIONERS: MASTERSON, BRIDGE, MAKROGIANNIS, HANSEN, RICO, COLLINS, BUCKLEY

NOES: COMMISSIONERS:

ABSTAINS: COMMISSIONERS:

8. REPORTS AND INFORMATION ITEMS

a. Engineering Staff Updates

- b. San Diego County Sheriff's Department Traffic Collision Summary And Accident Investigation Log
 - c. Traffic Commission Commentary
 - d. Staff Commentary
9. **ADJOURNMENT:** Chairman Hansen adjourned the meeting at 7:22 pm.

Michael Hansen, Chairman
Traffic Commission

ATTEST:

Denise Avila, Secretary
Traffic Commission

AGENDA REPORT

Meeting of the San Marcos Traffic Commission

MEETING DATE: October 3, 2018
AGENDA ITEM NO: 7A
SUBMITTED BY: Michael Rafael, P.E. – Senior Civil Engineer *MR*
APPROVED BY: Nic Abboud, P.E. – Principal Civil Engineer *NA*
SUBJECT: Installation of "KEEP CLEAR" pavement markings on Montiel Road (Plaza San Marcos – 730 Nordahl Road)

BACKGROUND:

A request was received for Engineering staff to review traffic conditions and site access at the southerly driveway of Plaza San Marcos shopping center on Montiel Road near Nordahl Road. Motorists expressed concerns regarding the backup of stopped vehicles on westbound Montiel Road blocking the existing driveway to Plaza San Marcos shopping center making it difficult for vehicles to enter and exit the driveway. Some residents have requested a new raised median and/or left turn restriction into the driveway from Montiel Road due to traffic safety concerns.

ANALYSIS:

Montiel Road is classified as a collector street with one lane in each direction and an approximate width of 67 feet, adjacent to the signalized intersection on Nordahl Road. The roadway width reduces significantly to the east at the City limits. The posted speed limit is 40 MPH. Montiel Road terminates at Nordahl Road to the west where it is signalized. At the traffic signal, there are dual left turn lanes to travel southbound on Nordahl Road and one right turn lane to travel northbound on Nordahl Road. Montiel Road has two eastbound through lanes at the traffic signal, after which it reduces to one lane eastbound. The Plaza San Marcos driveway is approximately 100 feet east of the signalized intersection. There is an existing double yellow centerline on Montiel Road which allows motorists to legally turn left into or out of the Plaza San Marcos' driveway.

Nordahl Road is classified as a major arterial and serves access to high volume commercial and retail businesses (Walmart, Kohl's and Costco). Nordahl Road is generally two lanes in each direction. The posted speed limit is 40 MPH. The corridor has (3) three existing traffic signals between Montiel Road and Center Drive where it regularly experiences heavy congestion and delays during the peak hours. There is an existing driveway to the Plaza San Marcos shopping center approximately 270 feet north of Montiel Road. The driveway allows for right-turn in and right-turn out movements only.

Field observations were made at this location in the early morning and early afternoon hours during a typical weekday. Traffic congestion was moderate-to-heavy at both times. It was observed that during peak travel times, traffic congestion on Montiel Road can cause delays for vehicles entering/exiting the Plaza San Marcos driveway (see photos).

Staff collected driveway counts for both inbound and outbound traffic. Staff also collected a 24-hour count of the number of left-turning vehicles attempting to enter or exit the driveway but were blocked by westbound Montiel traffic queues. Staff also captured a video of motorists making left turns in and out of the commercial driveway during peak hours. Based on staff's observations and the data collected, the queue for westbound traffic on Montiel Road during peak hours extended past the commercial driveway. The queue also blocked the driveway several times for every 15 minute interval during the peak hours. The queues would clear when the westbound traffic signal at Montiel Road and Nordahl Road would turn green. Vehicles were also observed making unsafe "circular" left/U-turns to enter the commercial driveway from eastbound Montiel Road. Staff also researched the collision history and reported only (1) collision event at this driveway location for the last 3 years.

The City's current guidelines for "KEEP CLEAR" zones states that markings are allowed for one lane of traffic in each direction and not considered for multi-lane roads with the exception of serving emergency facilities (Fire or police) or other traffic signal intersections subject to queued traffic from an adjacent traffic signal. Staff is requesting to modify this outdated guideline to recommend "KEEP CLEAR" zones on multi-lane roadways based on field reviews and engineering judgment. Motorists that enter a "KEEP CLEAR" zone on a multi-lane road to turn left are responsible to yield to oncoming through traffic to safely make the turn. Staff has revised the guidelines for the Traffic Commission to review (see attached).

In order to improve vehicle access and improve safety for left turning vehicles, it is recommended that "KEEP CLEAR" pavement markings be installed in the westbound travel lanes with limit lines on Montiel Road at the intersection of the Plaza San Marcos driveway. The criteria for "KEEP CLEAR" zones per the City's modified guidelines have also been satisfied due to the frequency of traffic queuing past the driveway. These marking will help provide a gap in the queue to allow motorists to easily turn onto Montiel Road. The "KEEP CLEAR" markings will not disrupt the traffic signal operations at the signalized intersection of Montiel Road and Nordahl Road based on staff's observations of queued westbound traffic. A minimum of (6) six vehicles would be able to stack in front of the proposed "KEEP CLEAR" markings and vehicles behind the markings would be able to close the gap once the traffic signal turns green. The City had inquired with the property owner of Plaza San Marcos about the possibility of restricting left turns into the driveway from Montiel Road. However, the owner had stated that the local businesses in the shopping center would be impacted financially due to the access change. The property owner supports the "KEEP CLEAR" zone as recommended by City staff.

CONCLUSION AND RECOMMENDATIONS:

Engineering staff recommends that the Traffic Commission approve the following:

- Installation of "KEEP CLEAR" pavement markings with limit lines in the westbound travel lanes of Montiel Road at the Plaza San Marcos' commercial driveway.
- Revision of the City's guidelines for "KEEP CLEAR" zones to include multi-lane roadways. "KEEP CLEAR" zones will be considered on a case by case basis and determined by engineering judgment.
- Periodic enforcement by the Sheriff's Department during AM and PM peak periods.

TRAFFIC DATA/ROADWAY INFORMATION:

Traffic Volumes:

Montiel Road between Nordahl Road and Deodar Road – 7,022 VPD (vehicles per day, 2017)

Nordahl Road between Montiel Road and Center Drive – 17,641 VPD (vehicles per day, 2017)

Speed Limit:

Montiel Road between Nordahl Road and East City Limits – 40 MPH posted (certified 1/18/18)

Nordahl Road between Montiel Road and Knob Hill Road – 40 MPH posted (certified 08/05/13)

Accident History (last 3 years):

05/26/17, 10:14 AM, at Montiel Road; Vehicle strikes fixed object southbound; Primary collision factor – traffic signals/signs, no injuries.

ATTACHMENT(S)

Vicinity Map

Bird's Eye View Map

Proposed Striping Improvements Exhibit

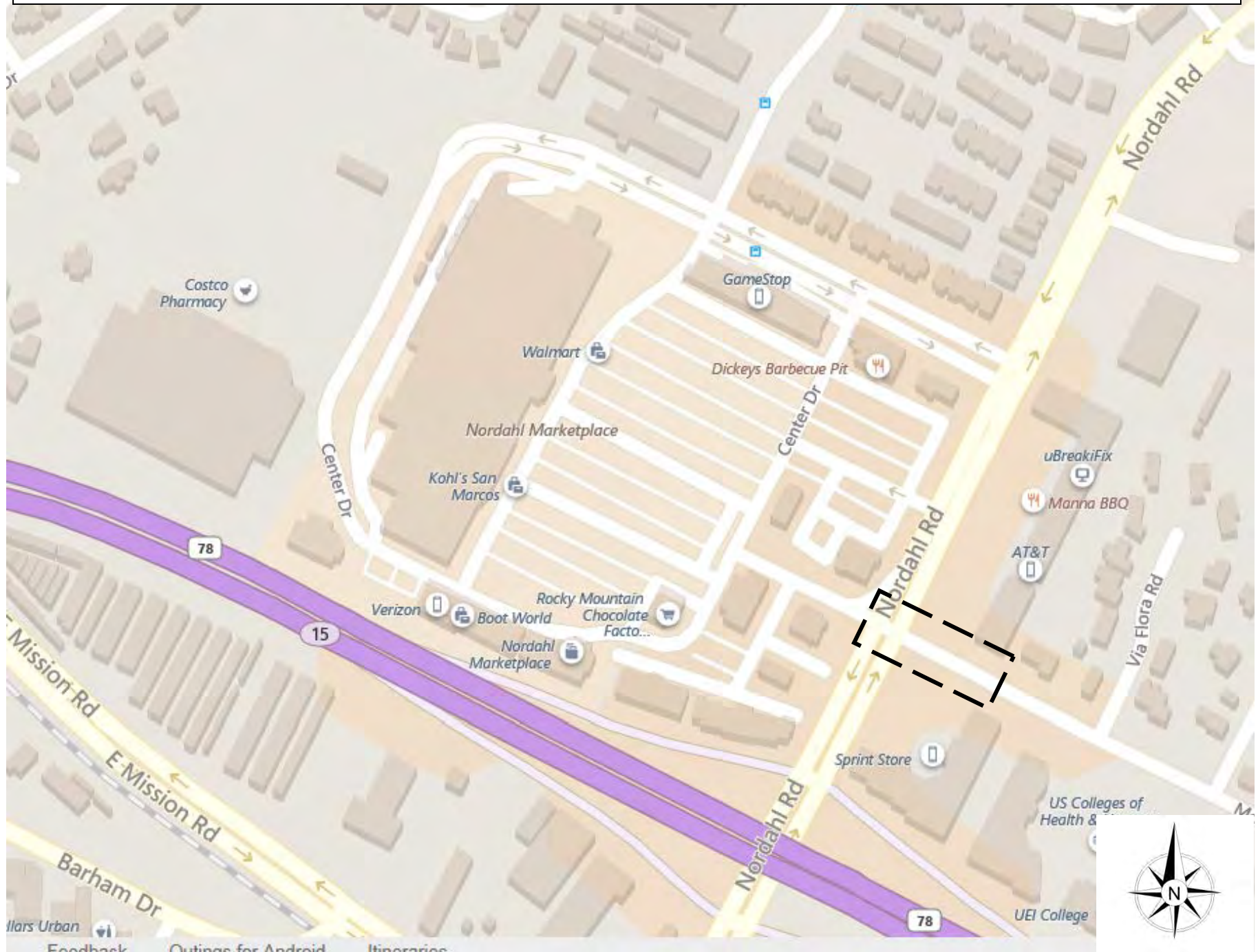
Traffic Data – Driveway Counts

Revised "KEEP CLEAR" guidelines

Original "KEEP CLEAR" guidelines

Photos

VICINITY MAP
INSTALLATION OF "KEEP CLEAR" PAVEMENT MARKINGS (MONTIEL RD.)
OCTOBER 3, 2018 - TRAFFIC COMMISSION (AGENDA #7A)



"BIRD'S EYE" VIEW (per BING Maps)
INSTALLATION OF "KEEP CLEAR" PAVEMENT MARKINGS (MONTIEL RD.)
OCTOBER 3, 2018 - TRAFFIC COMMISSION (AGENDA #7B)



PROPOSED STRIPING IMPROVEMENTS EXHIBIT
INSTALLATION OF "KEEP CLEAR" PAVEMENT MARKINGS (MONTIEL RD.)
OCTOBER 3, 2018 - TRAFFIC COMMISSION (AGENDA #7A)



CONSTRUCTION NOTES:

1. INSTALL "KEEP CLEAR" PAVEMENT LEGENDS AND LIMIT LINE PER CAMUTCD STANDARDS (FIG. 3B-23), GRIND/PAVE EXISTING CONFLICTING STRIPING



Driveway Inbound/Outbound Counts

Location: Shopping Center Dwy on Montiel Rd E/o Nordahl Rd
City: San Marcos

Date: 8/15/2018
Day: Wednesday

Time	15-Minute Summary				
	Inbound		Outbound		TOTAL
	EL	WR	SL	SR	
12:00 AM	0	0	0	3	3
12:15 AM	0	0	0	0	0
12:30 AM	0	0	0	0	0
12:45 AM	1	0	0	0	1
1:00 AM	0	0	0	0	0
1:15 AM	1	0	0	2	3
1:30 AM	0	0	0	1	1
1:45 AM	2	0	0	2	4
2:00 AM	0	0	0	0	0
2:15 AM	0	0	0	0	0
2:30 AM	0	0	0	0	0
2:45 AM	0	0	0	0	0
3:00 AM	0	0	0	1	1
3:15 AM	0	0	0	0	0
3:30 AM	0	0	0	0	0
3:45 AM	0	0	0	0	0
4:00 AM	0	0	0	0	0
4:15 AM	0	0	0	0	0
4:30 AM	0	0	0	0	0
4:45 AM	1	0	0	0	1
5:00 AM	0	0	0	0	0
5:15 AM	0	0	0	0	0
5:30 AM	0	0	0	0	0
5:45 AM	0	1	0	1	2
6:00 AM	1	0	0	1	2
6:15 AM	2	1	1	1	5
6:30 AM	0	1	1	0	2
6:45 AM	0	1	0	0	1
7:00 AM	2	0	0	1	3
7:15 AM	0	0	1	1	2
7:30 AM	1	3	1	2	7
7:45 AM	6	5	1	1	13
8:00 AM	4	5	1	7	17
8:15 AM	2	5	1	2	10
8:30 AM	6	1	1	3	11
8:45 AM	12	2	3	3	20
9:00 AM	7	4	2	4	17
9:15 AM	4	2	0	7	13
9:30 AM	8	1	1	10	20
9:45 AM	13	5	1	8	27
10:00 AM	9	4	2	14	29
10:15 AM	7	3	0	11	21
10:30 AM	13	0	2	12	27
10:45 AM	12	2	1	9	24
11:00 AM	14	6	1	9	30
11:15 AM	16	4	5	25	50
11:30 AM	11	4	0	14	29
11:45 AM	14	9	2	14	39
12:00 PM	14	7	2	15	38
12:15 PM	13	5	4	20	42
12:30 PM	12	5	9	32	58
12:45 PM	4	7	1	22	34
1:00 PM	14	6	4	16	40
1:15 PM	8	4	3	21	36
1:30 PM	14	3	1	13	31
1:45 PM	15	5	2	16	38
2:00 PM	8	3	5	18	34
2:15 PM	3	6	2	18	29
2:30 PM	9	5	2	15	31
2:45 PM	6	5	3	9	23
3:00 PM	9	3	3	9	24
3:15 PM	9	3	7	17	36
3:30 PM	10	10	3	11	34
3:45 PM	6	2	4	16	28
4:00 PM	9	5	1	8	23
4:15 PM	13	4	4	9	30
4:30 PM	18	2	2	20	42
4:45 PM	11	4	3	15	33
5:00 PM	11	3	2	19	35
5:15 PM	8	5	3	15	31
5:30 PM	9	1	3	12	25
5:45 PM	13	2	0	9	24
6:00 PM	22	3	1	11	37
6:15 PM	15	4	0	12	31
6:30 PM	16	4	0	14	34
6:45 PM	11	2	1	10	24
7:00 PM	15	5	1	15	36
7:15 PM	11	3	3	24	41
7:30 PM	6	2	3	19	30
7:45 PM	7	0	2	13	22
8:00 PM	6	2	0	24	32
8:15 PM	14	0	0	16	30
8:30 PM	8	0	2	14	24
8:45 PM	9	1	2	13	25
9:00 PM	5	0	0	12	17
9:15 PM	5	0	1	11	17
9:30 PM	1	1	0	11	13
9:45 PM	1	1	0	13	15
10:00 PM	4	0	2	12	18
10:15 PM	2	0	0	4	6
10:30 PM	1	0	0	3	4
10:45 PM	0	0	1	0	1
11:00 PM	0	1	0	0	1
11:15 PM	1	0	0	3	4
11:30 PM	1	0	0	1	2
11:45 PM	0	0	0	2	2
Grand Totals	576	203	120	801	1700

Time	Hourly Summary				
	Inbound		Outbound		TOTAL
	EL	WR	SL	SR	
12:00 AM	1	0	0	3	4
1:00 AM	3	0	0	5	8
2:00 AM	0	0	0	0	0
3:00 AM	0	0	0	1	1
4:00 AM	1	0	0	0	1
5:00 AM	0	1	0	1	2
6:00 AM	3	3	2	2	10
7:00 AM	9	8	3	5	25
8:00 AM	24	13	6	15	58
9:00 AM	32	12	4	29	77
10:00 AM	41	9	5	46	101
11:00 AM	55	23	8	62	148
12:00 PM	43	24	16	89	172
1:00 PM	51	18	10	66	145
2:00 PM	26	19	12	60	117
3:00 PM	34	18	17	53	122
4:00 PM	51	15	10	52	128
5:00 PM	41	11	8	55	115
6:00 PM	64	13	2	47	126
7:00 PM	39	10	9	71	129
8:00 PM	37	3	4	67	111
9:00 PM	12	2	1	47	62
10:00 PM	7	0	3	19	29
11:00 PM	2	1	0	6	9
Grand Totals	576	203	120	801	1700

Driveway Inbound/Outbound Observations

Location: Shopping Center Dwy on Montiel Rd E/o Nordahl Rd
City: San Marcos

Date: 8/15/2018
Day: Wednesday

Time	15-Minute Summary		
	# of Blocked Vehicles (SL)	# of Blocked Vehicles (EL)	# of Vehicles That Make U-Turn Movement into Driveway
12:00 AM	0	0	0
12:15 AM	0	0	0
12:30 AM	0	0	0
12:45 AM	0	0	0
1:00 AM	0	0	0
1:15 AM	0	0	0
1:30 AM	0	0	0
1:45 AM	0	0	0
2:00 AM	0	0	0
2:15 AM	0	0	0
2:30 AM	0	0	0
2:45 AM	0	0	0
3:00 AM	0	0	0
3:15 AM	0	0	0
3:30 AM	0	0	0
3:45 AM	0	0	0
4:00 AM	0	0	0
4:15 AM	0	0	0
4:30 AM	0	0	0
4:45 AM	0	0	0
5:00 AM	0	0	0
5:15 AM	0	0	0
5:30 AM	0	0	0
5:45 AM	0	0	0
6:00 AM	0	0	0
6:15 AM	0	0	0
6:30 AM	0	0	0
6:45 AM	0	0	0
7:00 AM	0	0	0
7:15 AM	0	0	0
7:30 AM	0	0	0
7:45 AM	0	1	0
8:00 AM	0	0	0
8:15 AM	0	1	0
8:30 AM	0	0	0
8:45 AM	0	0	0
9:00 AM	1	3	0
9:15 AM	0	0	0
9:30 AM	0	2	0
9:45 AM	0	0	0
10:00 AM	1	1	0
10:15 AM	0	0	0
10:30 AM	0	6	0
10:45 AM	0	3	0
11:00 AM	0	1	0
11:15 AM	1	4	0
11:30 AM	0	2	0
11:45 AM	0	1	0
12:00 PM	0	0	0
12:15 PM	0	5	0
12:30 PM	1	6	0
12:45 PM	0	2	0
1:00 PM	0	2	3
1:15 PM	0	2	0
1:30 PM	0	1	0
1:45 PM	0	2	0
2:00 PM	0	1	0
2:15 PM	0	1	0
2:30 PM	0	4	0
2:45 PM	0	2	0
3:00 PM	0	0	0
3:15 PM	3	3	0
3:30 PM	0	0	0
3:45 PM	1	3	0
4:00 PM	0	0	0
4:15 PM	1	3	1
4:30 PM	0	3	0
4:45 PM	1	1	0
5:00 PM	1	5	1
5:15 PM	0	1	0
5:30 PM	2	2	0
5:45 PM	0	1	0
6:00 PM	0	5	0
6:15 PM	0	4	1
6:30 PM	0	4	0
6:45 PM	0	3	0
7:00 PM	0	1	0
7:15 PM	0	0	0
7:30 PM	0	0	0
7:45 PM	1	0	0
8:00 PM	0	0	0
8:15 PM	0	0	0
8:30 PM	0	0	0
8:45 PM	0	0	0
9:00 PM	0	0	0
9:15 PM	0	0	0
9:30 PM	0	0	0
9:45 PM	0	0	0
10:00 PM	0	0	0
10:15 PM	0	0	0
10:30 PM	0	0	0
10:45 PM	0	0	0
11:00 PM	0	0	0
11:15 PM	0	0	0
11:30 PM	0	0	0
11:45 PM	0	0	0
Grand Totals	14	92	6

Time	Hourly Summary		
	# of Blocked Vehicles (SL)	# of Blocked Vehicles (EL)	# of Vehicles That Make U-Turn Movement into Driveway
12:00 AM	0	0	0
1:00 AM	0	0	0
2:00 AM	0	0	0
3:00 AM	0	0	0
4:00 AM	0	0	0
5:00 AM	0	0	0
6:00 AM	0	0	0
7:00 AM	0	1	0
8:00 AM	0	1	0
9:00 AM	1	5	0
10:00 AM	1	10	0
11:00 AM	1	8	0
12:00 PM	1	13	0
1:00 PM	0	7	3
2:00 PM	0	8	0
3:00 PM	4	6	0
4:00 PM	2	7	1
5:00 PM	3	9	1
6:00 PM	0	16	1
7:00 PM	1	1	0
8:00 PM	0	0	0
9:00 PM	0	0	0
10:00 PM	0	0	0
11:00 PM	0	0	0
Grand Totals	14	92	6

GUIDELINE NO. 27

KEEP CLEAR ZONES

The principal purpose of a "KEEP CLEAR" zone is to provide a gap in traffic queued from a traffic signal or STOP sign. These zones are utilized to allow motorists to enter or exit from a side street or high volume driveway.

"KEEP CLEAR" zones will be considered on a case by case basis on those roadways that have sufficient travel width. Markings shall help alleviate problems for left turns only such as ingress into or egress out of the side street or driveway. Markings shall not be installed for right-turning traffic. to allow for only one lane of traffic in the direction that the zone is to be delineated. Other criteria to be considered when evaluating a proposed KEEP CLEAR site are:

1. Traffic volume of the major roadway, 10,000 vehicles per day minimum, and volume of the side street or driveway;
2. Accident history, 3 correctible in a 12 month period;
3. Frequency of traffic queuing past the side street or driveway, twice during a 15 minute period or 5 times in an hour; and
4. Whether a left turn restriction is feasible into or from the side street or driveway.

"KEEP CLEAR" pavement Markings will not be considered for multilane roads with the following exceptions: Locations exempt from meeting the above criteria are as follows:

1. At controlled or uncontrolled driveways or side streets directly serving emergency service facilities, i.e. fire stations, or other services where response time is critical.
2. At intersections that are controlled by a traffic signal and are subject to queued traffic from an adjacent controlled intersection blocking the intersection.

"KEEP CLEAR" zones on multilane roadways may provide a false sense of security for motorists crossing the gap through stopped traffic. This can lead to a significant increase in right angle accidents at these locations. Accidents usually occur when traffic in the closest lane is stopped allowing the motorist to cross that lane of traffic; however, the other lanes might still be flowing freely but the motorist does not have sufficient sight distance thus creating the potential for right angle accidents.

GUIDELINE NO. 27

KEEP CLEAR ZONES

The principal purpose of a "KEEP CLEAR" zone is to provide a gap in traffic queued from a traffic signal or STOP sign. These zones are utilized to allow motorists to enter or exit from a side street or high volume driveway.

"KEEP CLEAR" zones will be considered on a case by case basis on those roadways that have sufficient travel width to allow for only one lane of traffic in the direction that the zone is to be delineated. Other criteria to be considered when evaluating a proposed KEEP CLEAR site are:

1. Traffic volume of the major roadway, 10,000 vehicles per day minimum, and volume of the side street or driveway;
2. Accident history, 3 correctible in a 12 month period;
3. Frequency of traffic queuing past the side street or driveway, twice during a 15 minute period or 5 times in an hour; and
4. Whether a left turn restriction is feasible into or from the side street or driveway.

"KEEP CLEAR" pavement Markings will not be considered for multilane roads with the following exceptions:

1. At controlled or uncontrolled driveways or side streets directly serving emergency service facilities, i.e. fire stations, or other services where response time is critical.
2. At intersections that are controlled by a traffic signal and are subject to queued traffic from an adjacent controlled intersection blocking the intersection.

"KEEP CLEAR" zones on multilane roadways may provide a false sense of security for motorists crossing the gap through stopped traffic. This can lead to a significant increase in right angle accidents at these locations. Accidents usually occur when traffic in the closest lane is stopped allowing the motorist to cross that lane of traffic; however, the other lanes might still be flowing freely but the motorist does not have sufficient sight distance thus creating the potential for right angle accidents.



Plaza San Marcos Center driveway on Montiel Rd.



Eastbound on Montiel Road



Traffic backing up on WB Montiel Road; SUV attempts to turn left



SUV turns left into driveway through gap in traffic



Traffic backing up on WB Montiel Road; vehicle attempts to turn left





Vehicles turns left into driveway through gap in traffic



Vehicle blocked by WB traffic on Montiel Rd.; can't turn left until traffic clears with green phase

AGENDA REPORT

Meeting of the San Marcos Traffic Commission

MEETING DATE: October 3, 2018
AGENDA ITEM NO: 7B
SUBMITTED BY: Michael Rafael, P.E. – Senior Civil Engineer 
APPROVED BY: Nic Abboud, P.E. – Principal Civil Engineer 
SUBJECT: Southbound Nordahl Road at Center Drive – Proposed Right Turn Lane

BACKGROUND:

The City has received several complaints on the traffic congestion and delay at the intersection of Nordahl Road and Center Drive. Residents have complained about southbound through traffic blocking right-turning traffic onto Center Drive. Traffic congestion frequently backups past Medical Centre Way to the north. Residents are requesting for a separate right turn lane on southbound Nordahl Road onto eastbound Center Drive.

ANALYSIS:

Nordahl Road is classified as a major arterial and serves access to the Nordahl Marketplace which consists of commercial and retail businesses such as Walmart, Kohl's and Costco. Nordahl Road consist of two lanes in each direction with a striped 5-foot bike lanes and sidewalks. The posted speed limit is 40 MPH. Northbound Nordahl Road is heavily congested during the peak periods as the primary access to Nordahl Marketplace. There are (3) existing traffic signals on the corridor within a 1,000 foot of roadway length. Southbound Nordahl Road offers an alternative route to access Nordahl Marketplace from the north via Center Drive. Center Drive is classified as a collector with two lanes in each direction. The posted speed limit is 25 MPH. Center Drive terminates to the west at the existing Costco site.

Per the latest Highway Design Manual (HDM), right-turn lanes at signalized intersections can be justified on the basis of the following factors:

- High volumes of right-turning traffic causing backup and delay on the through lanes.
- Pedestrians conflicting with right turning vehicles.
- Frequent rear-end and sideswipe accidents involving right-turning vehicles.

In addition, per Chapter 4D of the California Manual on Uniform Traffic Control Devices (CAMUTCD), an exclusive right-turn lane at a signalized intersection may be warranted when the right-turn volume exceeds 200 vehicles per hour (vph).

Intersection turning movement counts were conducted on a weekday to determine the traffic volume distribution at the signalized intersection. The following tables summarize the southbound Nordahl traffic volumes and approach percentages at the intersection:

SOUTHBOUND NORDAHL TRAFFIC VOLUMES

Peak Hour	SB Right (vph)	SB Thru (vph)
7:45 am - 8:45 am (AM)	234	390
11:30 am - 12:30 pm (Mid-Day)	299	210
5:00 pm - 6:00 pm (PM)	292	257

APPROACH PERCENTAGES at signalized intersection

Peak Period	SB Right (%)	SB Thru (%)
7:00 am - 9:00 am (AM)	35	65
11:00 am - 1:00 pm (Mid-Day)	59	41
4:00 pm - 6:00 pm (PM)	54	46

Traffic counts during the AM, mid-day, PM peak periods all exceed 200 vph for the southbound right turn movement (234, 299, and 257 vph, respectively). Field observations at the signalized intersection during peak periods indicate that right-turning traffic is blocked by southbound through movements on Nordahl Road.

Based on the data collected, longer traffic queues may be anticipated for southbound through traffic in the AM period if a new right turn lane is installed. However, field observations during the AM period indicate that the current traffic queues for southbound traffic on Nordahl Road did not extend beyond Medical Centre Way. Staff will continue to monitor this corridor during the AM period and consider adjusting signal timing and phasing to improve traffic flow and reduce congestion. Traffic queues during the mid-day and PM peak periods are expected to be shorter since the traffic volumes for the southbound right turn movement that benefits from the change, exceeds the thru movement.

The storage length for the new right-turn lane should be adequate with a total length of 200 feet from the intersection. Right turn on red operation for southbound traffic at the signalized intersection is allowable which would reduce the queue on Nordahl Road and help prevent spillback of traffic into the adjacent through lane. Southbound through traffic will need to merge to the left lane within 200 feet of the signalized intersection at Medical Centre Way. A new 5-foot bike lane will be striped left of the new right

turn lane in accordance with the CAMUTCD standards. A new bicycle detector loop will also be installed to accurately detect bicyclists approaching the intersection.

Staff researched the 3-year collision history at the intersection for southbound traffic on Nordahl Road. There were a total of (4) four collisions in the southbound direction (1 head-on, 3 broadside). There were no reported rear-end or sideswipe collisions. Pedestrian counts were observed to be relatively low at the signalized intersection during peak periods.

Based on staff's evaluation of the traffic volume data and field observations, a new right turn lane on southbound Nordahl Road at Center Drive is warranted per the HDM and CAMUTCD warrant criteria. A new right turn lane will improve the capacity, reduce green time for southbound traffic, reduce travel delay, and provide overall safety at the intersection.

CONCLUSION AND RECOMMENDATIONS:

Engineering staff recommends that the Traffic Commission approve the following:

- Conversion of the right lane currently used by through and right turn traffic on southbound Nordahl Road at Center Drive, to a new right turn lane, including a 5-foot bike lane per CAMUTCD Fig. 9C-109 (CA) and new traffic warning and regulatory signage (see attached exhibit).
- Installation of new vehicle and bike lane loop detectors on southbound Nordahl Road at Center Drive.

TRAFFIC DATA/ROADWAY INFORMATION:

Traffic Volumes:

Nordahl Road between Montiel Road and Center Drive – 17,641 VPD (vehicles per day, 2017)
Center Drive between Nordahl Road and Avenida Ricardo – 15,815 VPD (vehicles per day, 2017)

Speed Limit:

Nordahl Road between Montiel Road and Knob Hill Road – 40 MPH posted (certified 08/05/13)
Center Drive between Nordahl Road and Avenida Ricardo – 25 MPH posted (certified 01/17/18)

Accident History (last 3 years):

04/21/15, 4:23 PM, Head-on, V1 travels southbound on Nordahl Rd. collides with V2 making left turn lane; Primary collision factor (PCF) – unknown, one injury.
09/15/15, 6:14 PM, Broadside, V1 making left turn collides with V2 traveling east; PCF – Auto R/W violation, one injury.

12/12/16, 6:23 PM, Broadside, V1 travels southbound on Nordahl Rd. collides with V2 traveling north; PCF – Traffic signals/signs; no injury.

1/28/17, 9:30 PM, Broadside, V1 travels west collides with V2 traveling south; PCF – Traffic signals/signs; one injury.

ATTACHMENT(S)

Vicinity Map

Bird's Eye View Map

Proposed Striping Improvements Exhibit

Traffic Volume Data

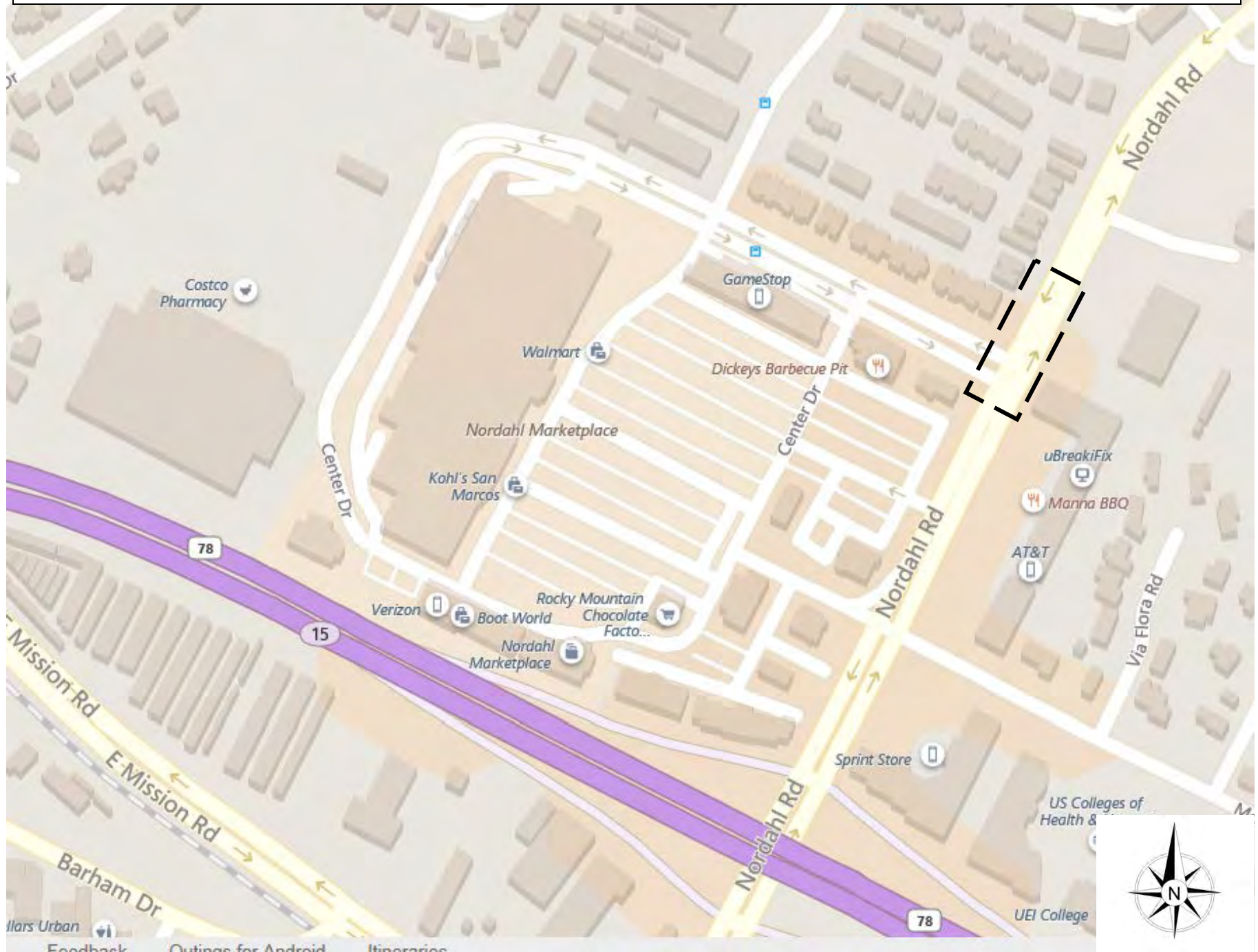
Highway Design Manual/CAMUTCD warrant criteria

CAMUTCD Figure 9C-109 (CA)

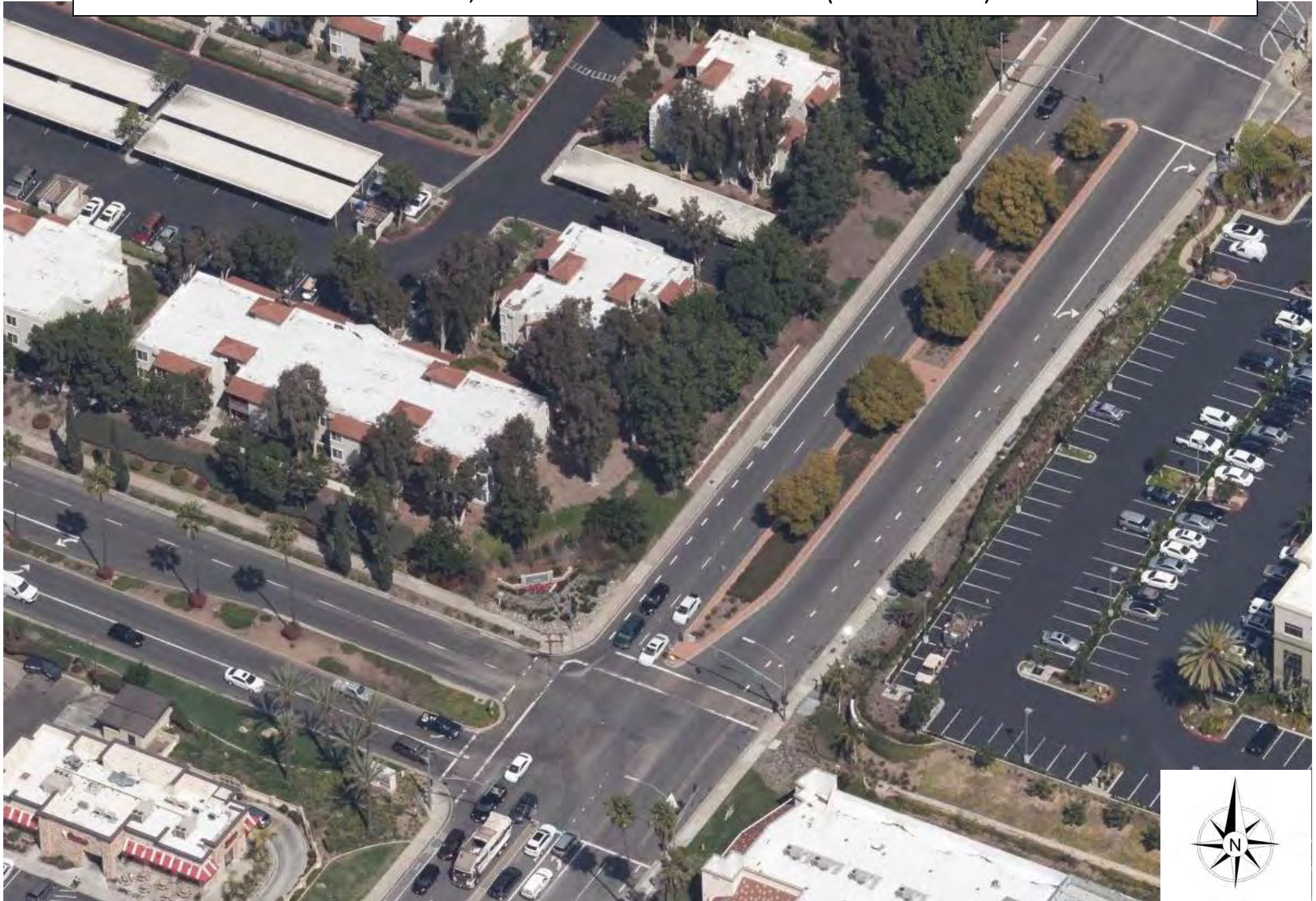
Photos

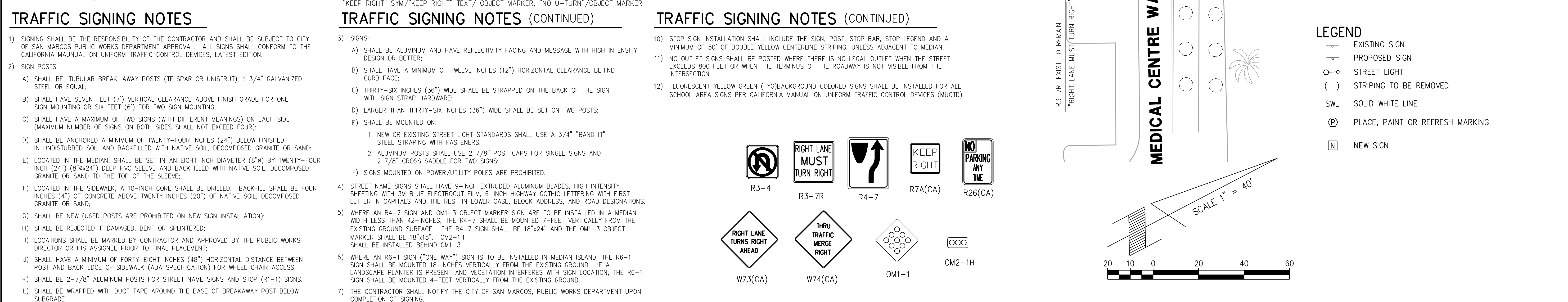
VICINITY MAP

SB NORDAHL ROAD AT CENTER DRIVE - PROPOSED RIGHT-TURN LANE
OCTOBER 3, 2018 - TRAFFIC COMMISSION (AGENDA #7B)



"BIRD'S EYE" VIEW (per BING Maps)
SB NORDAHL ROAD AT CENTER DRIVE - PROPOSED RIGHT-TURN LANE
OCTOBER 3, 2018 - TRAFFIC COMMISSION (AGENDA #7B)





- 1) SIGNING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE SUBJECT TO CITY OF SAN MARCOS PUBLIC WORKS DEPARTMENT APPROVAL. ALL SIGNS SHALL CONFORM TO THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
- 2) SIGN POSTS:
 - A) SHALL BE, TUBULAR BREAK-AWAY POSTS (TELSPAR OR UNISTRUT), 1 3/4" GALVANIZED STEEL OR EQUAL;
 - B) SHALL HAVE SEVEN FEET (7') VERTICAL CLEARANCE ABOVE FINISH GRADE FOR ONE SIGN MOUNTING OR SIX FEET (6') FOR TWO SIGN MOUNTING;
 - C) SHALL HAVE A MAXIMUM OF TWO SIGNS (WITH DIFFERENT MEANINGS) ON EACH SIDE (MAXIMUM NUMBER OF SIGNS ON BOTH SIDES SHALL NOT EXCEED FOUR);
 - D) SHALL BE ANCHORED A MINIMUM OF TWENTY-FOUR INCHES (24") BELOW FINISHED IN UNDISTURBED SOIL AND BACKFILLED WITH NATIVE SOIL, DECOMPOSED GRANITE OR SAND;
 - E) LOCATED IN THE MEDIAN, SHALL BE SET IN AN EIGHT INCH DIAMETER (8"ø) BY TWENTY-FOUR INCH (24") (8"øx24") DEEP PVC SLEEVE AND BACKFILLED WITH NATIVE SOIL, DECOMPOSED GRANITE OR SAND TO THE TOP OF THE SLEEVE;
 - F) LOCATED IN THE SIDEWALK, A 10-INCH CORE SHALL BE DRILLED. BACKFILL SHALL BE FOUR INCHES (4") OF CONCRETE ABOVE TWENTY INCHES (20") OF NATIVE SOIL, DECOMPOSED GRANITE OR SAND;
 - G) SHALL BE NEW (USED POSTS ARE PROHIBITED ON NEW SIGN INSTALLATION);
 - H) SHALL BE REJECTED IF DAMAGED, BENT OR SPLINTERED;
 - I) LOCATIONS SHALL BE MARKED BY CONTRACTOR AND APPROVED BY THE PUBLIC WORKS DIRECTOR OR HIS ASSIGNEE PRIOR TO FINAL PLACEMENT;
 - J) SHALL HAVE A MINIMUM OF FORTY-EIGHT INCHES (48") HORIZONTAL DISTANCE BETWEEN POST AND BACK EDGE OF SIDEWALK (ADA SPECIFICATION) FOR WHEEL CHAIR ACCESS;
 - K) SHALL BE 2-7/8" ALUMINUM POSTS FOR STREET NAME SIGNS AND STOP (R1-1) SIGNS.
 - L) SHALL BE WRAPPED WITH DUCT TAPE AROUND THE BASE OF BREAKAWAY POST BELOW SUBGRADE.

- 3) SIGNS:
 - A) SHALL BE ALUMINUM AND HAVE REFLECTIVITY FACING AND MESSAGE WITH HIGH INTENSITY DESIGN OR BETTER;
 - B) SHALL HAVE A MINIMUM OF TWELVE INCHES (12") HORIZONTAL CLEARANCE BEHIND CURB FACE;
 - C) THIRTY-SIX INCHES (36") WIDE SHALL BE STRAPPED ON THE BACK OF THE SIGN WITH SIGN STRAP HARDWARE;
 - D) LARGER THAN THIRTY-SIX INCHES (36") WIDE SHALL BE SET ON TWO POSTS;
 - E) SHALL BE MOUNTED ON:
 1. NEW OR EXISTING STREET LIGHT STANDARDS SHALL USE A 3/4" "BAND IT" STEEL STRAPPING WITH FASTENERS;
 2. ALUMINUM POSTS SHALL USE 2 7/8" POST CAPS FOR SINGLE SIGNS AND 2 7/8" CROSS SADDLE FOR TWO SIGNS;
 - F) SIGNS MOUNTED ON POWER/UTILITY POLES ARE PROHIBITED.
- 4) STREET NAME SIGNS SHALL HAVE 9-INCH EXTRUDED ALUMINUM BLADES, HIGH INTENSITY SHEETING WITH 3M BLUE ELECTROCUIT FILM, 6-INCH HIGHWAY GOTHIC LETTERING WITH FIRST LETTER IN CAPITALS AND THE REST IN LOWER CASE, BLOCK ADDRESS, AND ROAD DESIGNATIONS.
- 5) WHERE AN R4-7 SIGN AND OM1-3 OBJECT MARKER SIGN ARE TO BE INSTALLED IN A MEDIAN WIDER LESS THAN 42-INCHES, THE R4-7 SHALL BE MOUNTED 7-FEET VERTICALLY FROM THE EXISTING ROAD SURFACE. THE R4-7 SIGN SHALL BE 18"x24" AND THE OM1-3 OBJECT MARKER SHALL BE 18"x18". OM2-1H SHALL BE INSTALLED BEHIND OM1-3.
- 6) WHERE AN R6-1 SIGN ("ONE WAY") SIGN IS TO BE INSTALLED IN MEDIAN ISLAND, THE R6-1 SIGN SHALL BE MOUNTED 18-INCHES VERTICALLY FROM THE EXISTING GROUND. IF A LANDSCAPE PLANTER IS PRESENT AND VEGETATION INTERFERES WITH SIGN LOCATION, THE R6-1 SIGN SHALL BE MOUNTED 4-FEET VERTICALLY FROM THE EXISTING GROUND.
- 7) THE CONTRACTOR SHALL NOTIFY THE CITY OF SAN MARCOS, PUBLIC WORKS DEPARTMENT UPON COMPLETION OF SIGNING.
- 8) EXISTING SIGNS SHALL BE SALVAGED AND DELIVERED TO THE PUBLIC WORKS DEPARTMENT LOCATED AT 201 MATA WAY.
- 9) STOP SIGN INSTALLATION SHALL INCLUDE THE SIGN, POST, STOP BAR, STOP LEGEND AND A MINIMUM OF 50' OF DOUBLE YELLOW CENTERLINE STRIPING, UNLESS ADJACENT TO MEDIAN.

- 10) STOP SIGN INSTALLATION SHALL INCLUDE THE SIGN, POST, STOP BAR, STOP LEGEND AND A MINIMUM OF 50' OF DOUBLE YELLOW CENTERLINE STRIPING, UNLESS ADJACENT TO MEDIAN.
- 11) NO OUTLET SIGNS SHALL BE POSTED WHERE THERE IS NO LEGAL OUTLET WHEN THE STREET EXCEEDS 800 FEET OR WHEN THE TERMINUS OF THE ROADWAY IS NOT VISIBLE FROM THE INTERSECTION.
- 12) FLUORESCENT YELLOW GREEN (FYG) BACKGROUND COLORED SIGNS SHALL BE INSTALLED FOR ALL SCHOOL AREA SIGNS PER CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)






SIGN DETAILS

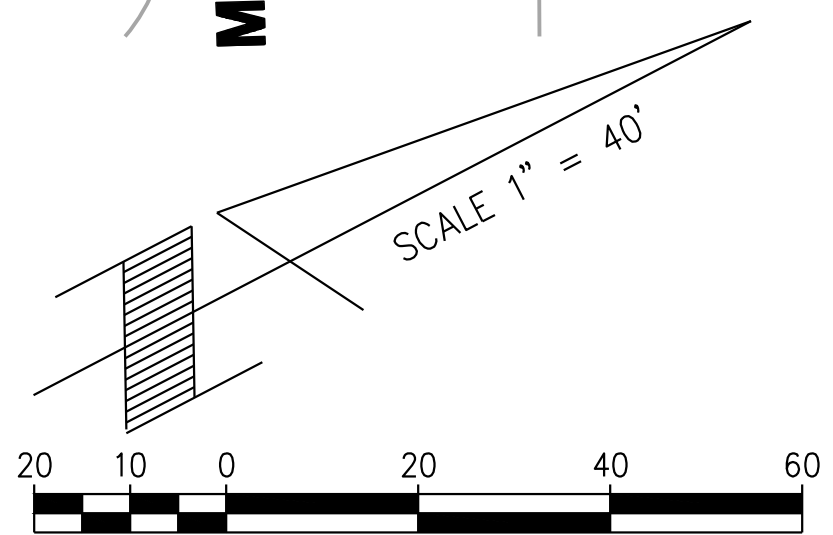
NO SCALE

- 9) RAISED PAVEMENT MARKER (RPMs) SHALL BE CERAMIC OR ABS (ACRYLONITRILE-BUTADIENE-STYRENE) PLASTIC. APPROVED RPM TYPES ARE AS FOLLOWS:
 - A) TYPE A AND AY CERAMIC - 4" Ø (WHITE OR YELLOW);
 - B) 1 OR 2-WAY REFLECTIVE ABS - 4" x 4" SQUARE.MINIMUM RPM THICKNESS SHALL BE 15 MILS.
- RPMs SHALL BE AFFIXED WITH MACHINE APPLIED HOT BITUMEN OR STANDARD SET EPOXY (PART A AND B).
- 10) THE CONTRACTOR SHALL REMOVE ALL CONFLICTING PAINTED LINES, MARKINGS AND PAVEMENT LEGENDS BY SAND BLASTING WITHIN 24 HOURS OF CONFLICT. GRINDING MAY BE USED IF EQUIPMENT AND METHODOLOGY IS APPROVED BY THE CITY. SANDBLASTING OR GRINDING DEBRIS SHALL BE REMOVED AS SOON AS POSSIBLE, BUT NO LATER THAN BEFORE THE END OF EACH WORK DAY. "BLACKING OUT" OF EXISTING STRIPING OR PAVEMENT MARKINGS ARE TO BE REMOVED BY SANDBLASTING OR GRINDING. THE PAVEMENT SHALL ALSO BE PATCHED AND SLURRY SEALED (TYPE II SLURRY) AT THE DISCRETION OF THE CITY INSPECTOR. THE CONTRACTOR SHALL NOTIFY THE CITY OF SAN MARCOS' PUBLIC WORKS DEPARTMENT UPON COMPLETION OF STRIPING.
- 11) TWO COATS OF PAINT SHALL BE APPLIED ON NEW SURFACES AND ONE ON EXISTING SURFACES.
- 12) SIGNALIZED INTERSECTIONS SHALL HAVE MARKED PEDESTRIAN CROSSWALKS. ALL CROSSWALKS, LIMIT LINES, STOP BARS, PAVEMENT ARROWS, SCHOOL LEGENDS, AND PAVEMENT LEGENDS, OTHER THAN BICYCLE LEGENDS AND SPEED LIMITS, SHALL BE INSTALLED WITH THERMOPLASTIC, UNLESS OTHERWISE NOTED ON THE PLAN.
- 13) ALL NEW CROSSWALKS SHALL BE "CONTINENTAL" STYLE MARKED CROSSWALKS WITH A LIMIT BAR SETBACK 0-4 FEET MINIMUM.
- 14) A MINIMUM OF 100 FEET DOUBLE YELLOW CENTERLINE SHALL BE STRIPED ALONG ALL KNUCKLES AND HORIZONTAL CURVATURES WITH A RADIUS OF 100 FEET OR LESS. RED CURB OR "NO PARKING ANYTIME" SIGNS SHALL BE INSTALLED ON THE INSIDE OF THE ROADWAY CURVATURE.
- 15) ALL CALTRANS DETAIL 40 AND DETAIL 41 WITHIN INTERSECTIONS SHALL BE INSTALLED WITH THERMOPLASTIC, UNLESS OTHERWISE NOTED ON THE PLANS.

- 16) U-TURNS SHALL BE RESTRICTED WHERE LESS THAN 44 FEET EXISTS BETWEEN THE RIGHT LANES AND THE LEFT TURN LANE AND THE FACE OF CURB FOR THE OPPOSING DIRECTION OF TRAVEL FOR SINGLE LEFT TURN LANES, WHERE LESS THAN 36 FEET EXISTS BETWEEN THE LEFT EDGE OF THE INSIDE LEFT TURN LANE TO THE FACE OF CURB FOR THE OPPOSING DIRECTION OF TRAVEL FOR DUAL TURN LANES, OR AS REQUIRED BY THE CITY ENGINEER.
- 17) ROUNDABOUT SIGNAGE FOR ONE-LANE, TWO-LANE AND MINI-ROUNDABOUT TYPES SHALL CONFORM TO CHAPTER 2B REGULATORY SIGNS, BARRICADES AND GATES) OF THE 2014 CAMUTCD. ROUNDABOUT MARKINGS FOR ONE-LANE, TWO-LANE, AND MINI-ROUNDABOUT TYPES SHALL CONFORM TO CHAPTER 3C (ROUNDABOUT MARKINGS) OF THE 2014 CAMUTCD.
- 18) IF IT IS NECESSARY OR DESIRABLE TO PROHIBIT CERTAIN PEDESTRIAN MOVEMENTS AT A TRAFFIC SIGNAL INTERSECTION, A PEDESTRIAN BARRIER IN CONFORMANCE TO THE CITY OF SAN DIEGO PEDESTRIAN BARRICADE STANDARD (SDE-103). IF IT IS NOT PRACTICAL TO INSTALL SUCH BARRIER, THEN THE "NO PEDESTRIAN CROSSING (R9-3) SIGNS SHALL BE USED.

1. A TRAFFIC CONTROL PLAN, INCLUDING THE LAYOUT OF CONSTRUCTION WARNING AND DETOUR SIGNS, SHALL BE SUBMITTED TO THE PUBLIC WORKS DEPARTMENT FOR APPROVAL A MINIMUM OF 14 CALENDAR DAYS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. TRAFFIC CONTROL SHALL BE IMPLEMENTED BEFORE ANY WORK IS STARTED.
2. BEFORE EXCAVATING, THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF UNDERGROUND FACILITIES OF THE FOLLOWING UTILITIES BY CONTACTING THE UNDERGROUND SERVICE ALERT AT 1-800-227-2600:
 - AT&T
 - SAN DIEGO GAS & ELECTRIC
 - VALLECITOS WATER DISTRICT
 - COX COMMUNICATIONS
 - BUENA SANITATION DISTRICT
 - SAN DIEGO COUNTY WATER AUTHORITY
 - VISTA IRRIGATION DISTRICT

- | | |
|---|---------------------------------|
|  | EXISTING SIGN |
|  | PROPOSED SIGN |
|  | STREET LIGHT |
| () | STRIPING TO BE REMOVED |
| SWL | SOLID WHITE LINE |
|  | PLACE, PAINT OR REFRESH MARKING |
|  | NEW SIGN |



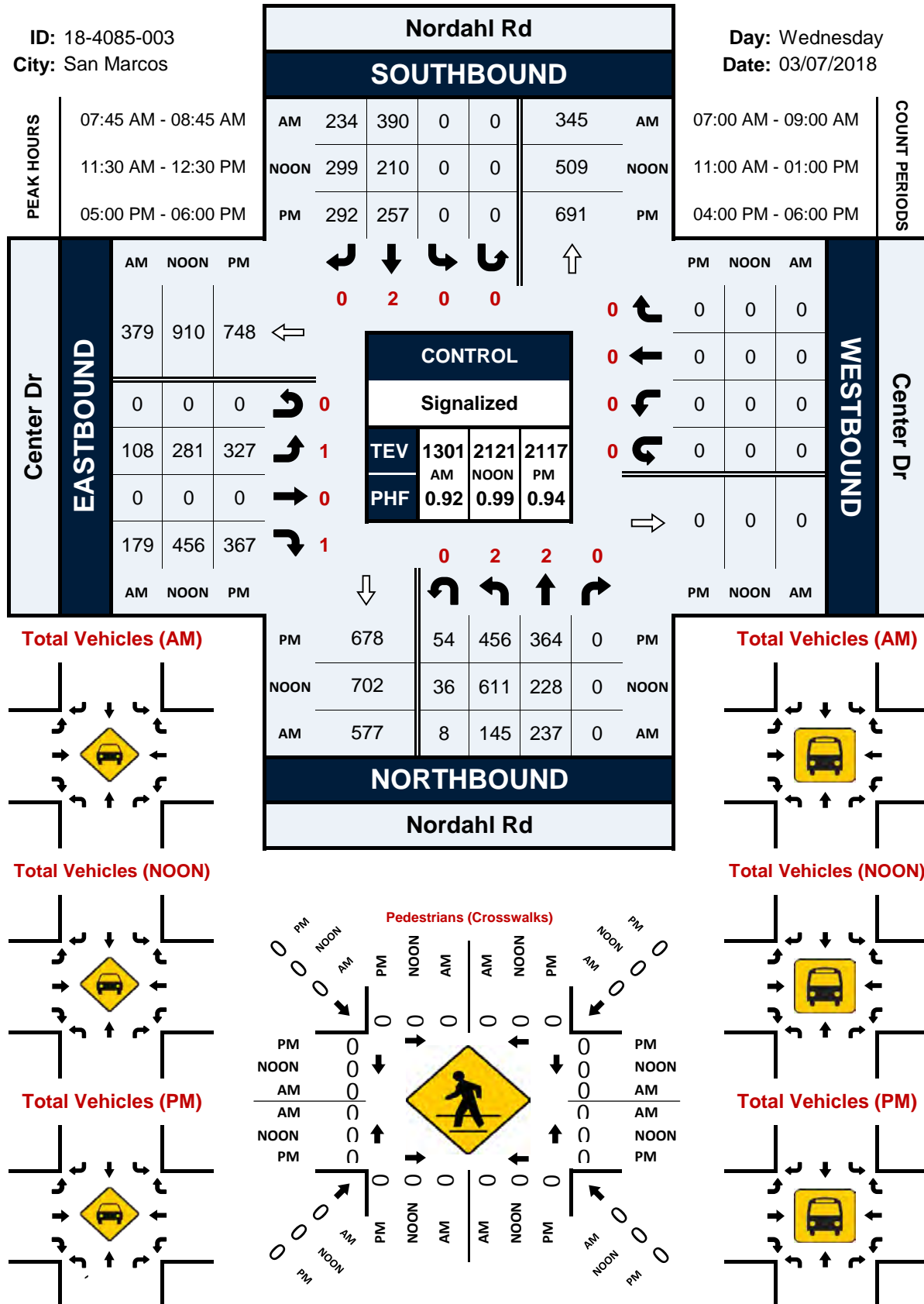
RESTRIPING SB NORDAHL ROAD MEDICAL CENTRE WAY TO CENTER DRIVE

Nordahl Rd & Center Dr

Peak Hour Turning Movement Count

ID: 18-4085-003
City: San Marcos

Day: Wednesday
Date: 03/07/2018



National Data & Surveying Services

Intersection Turning Movement Count

Location: Nordahl Rd & Center Dr
City: San Marcos
Control: Signalized

Project ID: 18-4085-003
Date: 3/7/2018

Total

NS/EW Streets:	Nordahl Rd				Nordahl Rd				Center Dr				Center Dr				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				TOTAL
	2 NL	2 NT	0 NR	0 NU	0 SL	2 ST	0 SR	0 SU	1 EL	0 ET	1 ER	0 EU	0 WL	0 WT	0 WR	0 WU	
7:00 AM	31	30	0	0	0	78	37	0	26	0	48	0	0	0	0	0	250
7:15 AM	20	40	0	0	0	110	40	0	16	0	27	0	0	0	0	0	253
7:30 AM	28	51	0	3	0	108	55	0	21	0	39	0	0	0	0	0	305
7:45 AM	25	58	0	2	0	104	57	0	33	0	27	0	0	0	0	0	306
8:00 AM	44	69	0	2	0	86	52	0	26	0	42	0	0	0	0	0	321
8:15 AM	33	64	0	3	0	112	71	0	18	0	54	0	0	0	0	0	355
8:30 AM	43	46	0	1	0	88	54	0	31	0	56	0	0	0	0	0	319
8:45 AM	42	36	0	6	0	94	51	0	20	0	37	0	0	0	0	0	286
TOTAL VOLUMES :	NL 266	NT 394	NR 0	NU 17	SL 0	ST 780	SR 417	SU 0	EL 191	ET 0	ER 330	EU 0	WL 0	WT 0	WR 0	WU 0	TOTAL 2395
APPROACH %'s :	39.29%	58.20%	0.00%	2.51%	0.00%	65.16%	34.84%	0.00%	36.66%	0.00%	63.34%	0.00%					
PEAK HR :	07:45 AM - 08:45 AM																TOTAL
PEAK HR VOL :	145	237	0	8	0	390	234	0	108	0	179	0	0	0	0	0	1301
PEAK HR FACTOR :	0.824	0.859	0.000	0.667	0.000	0.871	0.824	0.000	0.818	0.000	0.799	0.000	0.000	0.000	0.000	0.000	0.916
	0.848				0.852				0.825								

NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				TOTAL
	2 NL	2 NT	0 NR	0 NU	0 SL	2 ST	0 SR	0 SU	1 EL	0 ET	1 ER	0 EU	0 WL	0 WT	0 WR	0 WU	
11:00 AM	122	47	0	6	0	56	61	0	62	0	138	0	0	0	0	0	492
11:15 AM	119	50	0	13	0	54	82	0	65	0	74	0	0	0	0	0	457
11:30 AM	164	57	0	9	0	38	73	0	64	0	124	0	0	0	0	0	529
11:45 AM	142	61	0	11	0	71	79	0	68	0	106	0	0	0	0	0	538
12:00 PM	159	54	0	8	0	51	75	0	62	0	120	0	0	0	0	0	529
12:15 PM	146	56	0	8	0	50	72	0	87	0	106	0	0	0	0	0	525
12:30 PM	132	46	0	9	0	43	72	0	75	0	114	0	0	0	0	0	491
12:45 PM	110	43	0	13	0	46	63	0	67	0	105	0	0	0	0	0	447
TOTAL VOLUMES :	NL 1094	NT 414	NR 0	NU 77	SL 0	ST 409	SR 577	SU 0	EL 550	ET 0	ER 887	EU 0	WL 0	WT 0	WR 0	WU 0	TOTAL 4008
APPROACH %'s :	69.02%	26.12%	0.00%	4.86%	0.00%	41.48%	58.52%	0.00%	38.27%	0.00%	61.73%	0.00%					
PEAK HR :	11:30 AM - 12:30 PM																TOTAL
PEAK HR VOL :	611	228	0	36	0	210	299	0	281	0	456	0	0	0	0	0	2121
PEAK HR FACTOR :	0.931	0.934	0.000	0.818	0.000	0.739	0.946	0.000	0.807	0.000	0.919	0.000	0.000	0.000	0.000	0.000	0.986
	0.951				0.848				0.955								

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				TOTAL
	2 NL	2 NT	0 NR	0 NU	0 SL	2 ST	0 SR	0 SU	1 EL	0 ET	1 ER	0 EU	0 WL	0 WT	0 WR	0 WU	
4:00 PM	119	87	0	9	0	48	63	0	93	0	81	0	0	0	0	0	500
4:15 PM	112	95	0	13	0	58	74	0	77	0	73	0	0	0	0	0	502
4:30 PM	111	91	0	10	0	60	65	0	101	0	107	0	0	0	0	0	545
4:45 PM	114	93	0	14	0	59	79	0	86	0	82	0	0	0	0	0	527
5:00 PM	111	80	0	16	0	70	72	0	71	0	99	0	0	0	0	0	519
5:15 PM	104	84	0	19	0	66	67	0	69	0	83	0	0	0	0	0	492
5:30 PM	113	103	0	11	0	61	79	0	97	0	79	0	0	0	0	0	543
5:45 PM	128	97	0	8	0	60	74	0	90	0	106	0	0	0	0	0	563
TOTAL VOLUMES :	NL 912	NT 730	NR 0	NU 100	SL 0	ST 482	SR 573	SU 0	EL 684	ET 0	ER 710	EU 0	WL 0	WT 0	WR 0	WU 0	TOTAL 4191
APPROACH %'s :	52.35%	41.91%	0.00%	5.74%	0.00%	45.69%	54.31%	0.00%	49.07%	0.00%	50.93%	0.00%					
PEAK HR :	05:00 PM - 06:00 PM																TOTAL
PEAK HR VOL :	456	364	0	54	0	257	292	0	327	0	367	0	0	0	0	0	2117
PEAK HR FACTOR :	0.891	0.883	0.000	0.711	0.000	0.918	0.924	0.000	0.843	0.000	0.866	0.000	0.000	0.000	0.000	0.000	0.940
	0.938				0.967				0.885								

Table 405.2B
Deceleration Lane Length

Design Speed (mph)	Length to Stop (ft)
30	235
40	315
50	435
60	530

- (e) **Storage Length**--At unsignalized intersections, storage length may be based on the number of turning vehicles likely to arrive in an average 2-minute period during the peak hour. As a minimum, space for 2-passenger cars should be provided at 25 feet per car. If the peak hour truck traffic is 10 percent or more, space for one passenger car and one truck should be provided.

At signalized intersections, the storage length may be based on one and one-half to two times the average number of vehicles that would store per signal cycle depending on cycle length, signal phasing, and arrival and departure rates. As a minimum, storage length should be calculated the same manner as unsignalized intersection. The District Traffic Branch should be consulted for this information.

When determining storage length, the end of the left-turn lane is typically placed at least 3 feet, but not more than 30 feet, from the nearest edge of shoulder of the intersecting roadway. Although often set by the placement of a crosswalk line or limit line, the end of the storage lane should always be located so that the appropriate turning template can be accommodated.

- (3) **Double Left-turn Lanes.** At signalized intersections on multilane conventional highways and on multilane ramp terminals, double left-turn lanes should be considered if the left-turn demand is 300 vehicles per hour or more. The lane widths and other design elements of left-turn lanes given under Index 405.2(2) apply to double as well as single left-turn lanes.

The design of double left-turn lanes can be accomplished by adding one or two lanes in the median. See "Guidelines for Reconstruction of Intersections", published by Headquarters, Division of Traffic Operations, for the various treatments of double left-turn lanes.

- (4) **Two-way Left-turn Lane (TWLTL).** The TWLTL consists of a striped lane in the median of an arterial and is devised to address the special capacity and safety problems associated with high-density strip development. It can be used on 2-lane highways as well as multilane highways. Normally, the District Traffic Operations Branch should determine the need for a TWLTL.

The minimum width for a TWLTL shall be 12 feet (see Index 301.1). The preferred width is 14 feet. Wider TWLTL's are occasionally provided to conform with local agency standards. However, TWLTL's wider than 14 feet are not recommended, and in no case should the width of a TWLTL exceed 16 feet. Additional width may encourage drivers in opposite directions to use the TWLTL simultaneously.

405.3 Right-turn Channelization

- (1) **General.** For right-turning traffic, delays are less critical and conflicts less severe than for left-turning traffic. Nevertheless, right-turn lanes can be justified on the basis of capacity, analysis, and accident experience.

In rural areas a history of high speed rear-end accidents may warrant the addition of a right-turn lane.

In urban areas other factors may contribute to the need such as:

- High volumes of right-turning traffic causing backup and delay on the through lanes.
- Pedestrians conflicting with right turning vehicles.
- Frequent rear-end and sideswipe accidents involving right-turning vehicles.

(2) *Design Elements.*

- (a) **Lane and Shoulder Width--The basic lane width for right-turn lanes shall be 12 feet. Shoulder width shall be a minimum of 4 feet.** Whenever possible, consideration should be given to increasing the shoulder width to 8 feet to facilitate the passage of bicycle traffic and provide space for vehicle breakdowns. Although not desirable, lane and shoulder widths less than those given above can be considered for right-turn lanes under the following conditions and with the approval of a design exception pursuant to Index 82.2.

- On high speed rural highways or moderate speed suburban highways where width is restricted, consideration may be given to reducing the lane width to 11 feet with approval of a design exception.
- On low to moderate speed roadways in severely constrained situations, consideration may be given to reducing the minimum lane width to 10 feet with approval of a design exception.
- Shoulder widths may also be considered for reduction under constricted situations. Whenever possible, at least a 2-foot offset should be provided where the right-turn lane is adjacent to a curb. Entire omission of the shoulder should only be considered in the most severely constricted situations and where an 11-foot lane can be constructed. Gutter pans can be included within a shoulder, but cannot be included as part of the lane width.

Additional right of way for a future right-turn lane should be considered when an intersection is being designed.

- (b) **Tapers--Approach tapers** are usually unnecessary since main line traffic need not be shifted laterally to provide space for the right-turn lane. If, in some rare instances, a lateral shift were needed, the approach taper would use the same formula as for a left-turn lane.

Bay tapers are treated as a mirror image of the left-turn bay taper.

- (c) **Deceleration Lane Length--**The conditions and principles of left-turn lane deceleration apply to right-turn deceleration. Where full deceleration is desired off the high-speed through lanes, the lengths in Table 405.2B should be used. Where partial deceleration is permitted on the through lanes because of limited right of way or other constraints, average running speeds in Table 405.2B may be reduced 10 mph to 20 mph for a lower entry speed. For example, if the main line speed is 50 mph and a 10 mph deceleration is permitted on the through lanes, the deceleration length may be that required for 40 mph.
- (d) **Storage Length--**Right-turn storage length is determined in the same manner as left-turn storage length. See Index 405.2(2)(e).
- (3) **Right-turn Lanes at Off-ramp Intersections.** Diamond off-ramps with a free right turn at the local street and separate right-turn off-ramps around the outside of a loop will cause problems as traffic volumes increase. Serious conflicts occur when the right-turning vehicle must weave across multiple lanes on the local street in order to turn left at a major cross street close to the ramp terminal. Also, rear-end accidents can occur as right-turning drivers slow down or stop waiting for a gap in local street traffic. Free right turns usually end up with yield, stop, or signal controls thus defeating their purpose of increasing intersection capacity.

Free right turns should generally be avoided unless there is room for a generous acceleration lane or a lane addition on the local street. See Index 504.3(2) for additional information.

405.4 Traffic Islands

A traffic island is an area between traffic lanes for control of vehicle movements or for pedestrian refuge. An island may be designated by paint, raised pavement markers, curbs, pavement edge, or other devices. Examples of traffic island designs are shown on Figure 405.4.

YELLOW ARROW signal indication, and signal faces, if any, that exclusively control U-turn traffic that conflicts with the protected right-turn movement (see Item F.1 in Section 4D.05) shall simultaneously display steady U-turn **RED ARROW** signal indications. If pedestrians crossing the lane or lanes used by the protected right-turn movement to depart the intersection are controlled by pedestrian signal heads, the pedestrian signal heads shall display a steady **UPRAISED HAND** (symbolizing **DONT WALK**) signal indication during the protected right-turn movement.

⁰⁵ A protected only mode right-turn movement that does not begin and terminate at the same time as the adjacent through movement shall not be provided on an approach unless an exclusive right-turn lane exists.

⁰⁶ A yellow change interval for the right-turn movement shall not be displayed when the status of the right-turn operation is changing from permissive to protected within any given signal sequence.

⁰⁷ If the operating mode changes among the protected only mode and/or the protected/permissive mode and/or the permissive only mode during different periods of the day or as traffic conditions change, the requirements in Sections 4D.22 through 4D.24 that are appropriate to that mode of operation shall be met, subject to the following:

A. The **CIRCULAR GREEN** and **CIRCULAR YELLOW** signal indications shall not be displayed when operating in the protected only mode.

B. The right-turn **GREEN ARROW** and right-turn **YELLOW ARROW** signal indications shall not be displayed when operating in the permissive only mode.

Option:

⁰⁸ Additional static signs or changeable message signs may be used to meet the requirements for the variable right-turn mode or to inform drivers that right-turn green arrows will not be available during certain times of the day.

Support:

⁰⁹ Sections 4D.21 through 4D.24 describe the use of the following two types of signal faces for controlling right-turn movements:

A. Shared signal face – This type of signal face controls both the right-turn movement and the adjacent movement (usually the through movement) and can serve as one of the two required primary signal faces for the adjacent movement. A shared signal face always displays the same color of circular indication that is displayed by the signal face or faces for the adjacent movement.

B. Separate right-turn signal face – This type of signal face controls only the right-turn movement and cannot serve as one of the two required primary signal faces for the adjacent movement (usually the through movement) because it displays signal indications that are applicable only to the right-turn movement. If a separate right-turn signal face is mounted overhead at the intersection, it is positioned over the extension of the right-turn lane. In a separate right-turn signal face, a flashing right-turn **YELLOW ARROW** signal indication or a flashing right-turn **RED ARROW** signal indication is used to control permissive right-turning movements.

¹⁰ Section 4D.13 contains provisions regarding the lateral positioning of signal faces that control right-turn movements.

¹¹ It is not necessary that the same mode of right-turn operation or same type of right-turn signal face be used on every approach to a signalized location. Selecting different modes and types of right-turn signal faces for the various approaches to the same signalized location is acceptable.

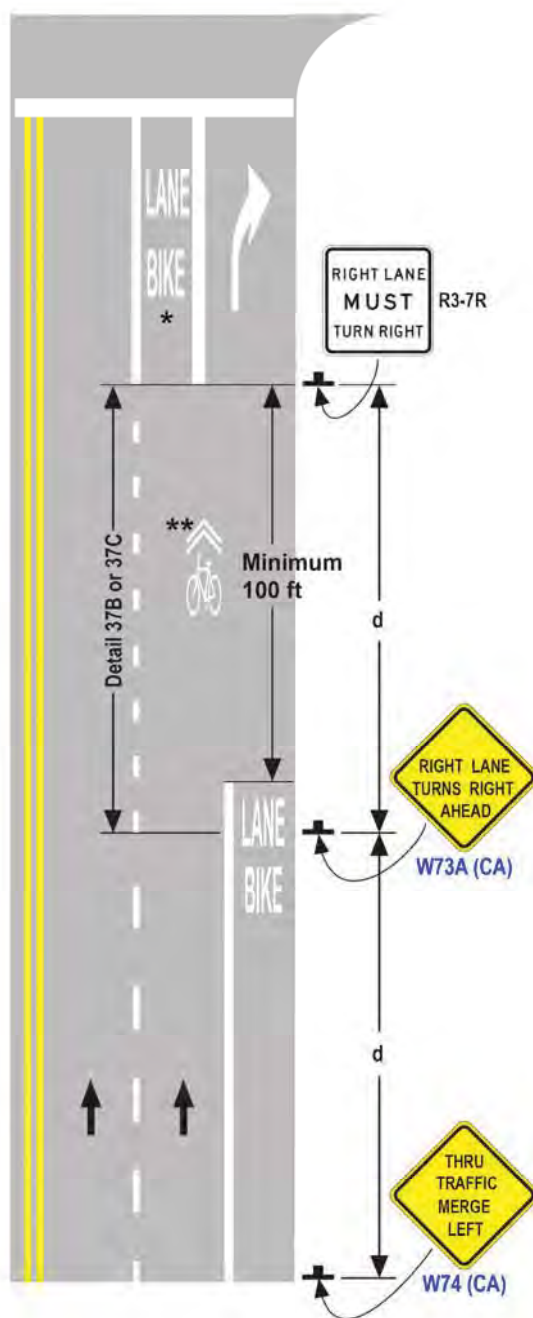
Option:

¹² A signal face that is shared by left-turning and right-turning traffic may be provided for a shared left-turn/right-turn lane on an approach that has no through traffic (see Section 4D.25).

Guidance:

¹³ A right-turn green arrow should be considered for use only when there is an exclusive right-turn lane or it is the only movement that traffic is permitted to make or when the right-turn volume exceeds 200 vehicles per hour.

Figure 9C-109 (CA). Example of Shared Lane Marking While Approaching an Intersection



* 4 ft minimum width, 6 ft minimum width for posted speed greater than 40 mph.
 ** The shared lane markings are appropriate to assist bicyclists with positioning, with or without a bicycle lane at the intersection. More than one shared lane marking may be placed.
 d = Advance Placement Distance (See Section 2C.05)

LEGEND
 → Direction of Travel NOT TO SCALE



AM peak period - Traffic queue on SB Nordahl Rd



AM peak period - Traffic queue on SB Nordahl Rd



AM peak period - Traffic queue on SB Nordahl Rd



PM peak period - Traffic queue on SB Nordahl Rd



PM peak period - Traffic queue on SB Nordahl Rd
Right turning vehicles blocked by thru traffic



Looking northbound on Nordahl Rd at Center Drive