Madrone-Nokomis Bridge Neighborhood Questions/Concerns- Response 4/17/18

Responses are in green.

The information below is provided in an effort to answer your questions to the best of our ability; however, these answers are not definitive and do not bind any party in any way. Many of the questions you raise can and will be answered during either the California Environmental Quality Act ("CEQA"), National Environmental Policy Act ("NEPA") evaluation for the Bridge projects ("Project") and/or community public meeting process and your participation in these processes is encouraged.

Flood Mitigation

- How exactly does heightening, widening and lengthening the Madrone and Nokomis bridges mitigate flood risk and our neighborhoods, and what are the affects downstream?

  The bridges block flow which raises the water level in the creek upstream causing water to overtop the creek banks for long distances upstream. By enlarging the bridge openings, these blockages are partially relieved and, hence, the water level in the creek upstream is lowered thereby lessening the overtopping upstream. And by enlarging the opening more flow stays in the creek channel passing beneath the bridges. The affects downstream are a small rise in water level in the creek channel downstream of BB2. For example, for the 25-year flood the rise just downstream of BB2 is about 8 inches and it gradually peters out at Barber. In the floodplain, floodwaters are generally lowered about 6 inches in downtown San Anselmo with some locations lowered by up to 2 feet.

  Other measures including the Center Bridge, Building Bridge 2 (BB2), etc. are being worked on and in conjunction will help keep the water in the creek for certain flood events such as the 25 year event.

  Please look at the Town website for information, links to town website are provided from District webpage below: http://www.marinwatersheds.org/resources/projects/bridge-projects-san-anselmo

  District information is also available from following webpages:
  http://www.marinwatersheds.org/resources/projects/hydrology-and-hydraulic-hh-modeling
  http://www.marinwatersheds.org/sites/default/files/2017-11/CIPStudyReportMay2011.pdf
  (See top of page 2, and Section 2.1.3 on page 14, and Table 5-2 on page 44)

- What other projects are planned downstream of the Nokomis? Madrone bridges?

  Potentially some retaining walls downstream, Center Boulevard and Bridge Street Bridges, BB2, Winship Bridge, Army Corp project.

- What is the construction schedule for the major flood mitigation projects south of the Madrone/Nokomis bridge projects?

  There are various schedules but Center Bridge 3-5 years, BB2 by the end of 2021.

  Please see the District project webpages, these are available from following webpage under 'Projects': http://www.marinwatersheds.org/creeks-watersheds/ross-valley#undefined3, and the downstream projects include 'USACE Corte Madera Creek Flood Risk Management Project and the Lower Corte Madera Creek Improvements which are downstream to the Madrone/Nokomis bridge projects.

- Does the construction schedule for all flood mitigation projects plan for construction to begin in the southernmost part of the Corte Madera creek and proceed north? If not, why not?

  No, because funding is coming from different sources but downstream affects will need to be mitigated.

  Please visit the District Hydrology and Hydraulics webpage from link below showing hydraulic modeling results throughout the watershed: http://www.marinwatersheds.org/resources/projects/hydrology-and-hydraulic-hh-modeling

- What is the construction schedule for any retention basins that remain on the list of viable flood mitigation projects?

  Sunnyside Nursery needs to be completed by the end of 2021 if the current project and grant proceeds. A construction schedule will not be finalized until CEQA review is completed for the Former Sunnyside Nursery Basin project.

  Please visit the Former Sunnyside Nursery Basin project webpage for latest information: http://www.marinwatersheds.org/resources/projects/san-anselmo-flood-risk-reduction-project

- Is dredging an option?

  Dredging is costly, can destabilize creek banks, and requires approval of the property owner. It is also difficult to get permitted from the environmental regulatory agencies. The creek is considered sensitive riparian and aquatic habitat and is home to steelhead trout, which is a protected species of fish under the State and Federal Endangered Species Acts. Regulatory agencies typically do not allow dredging in instances where a practicable alternatives are available; in this case, bridge replacement.

Dredging is being evaluated as part of the Lower Corte Madera Creek Levee Evaluation, please visit the project webpage link below:

http://www.marinwatersheds.org/resources/projects/lower-corte-madera-creek-levee-evaluation

Ross Valley Flood model

- Who designed the model?

  Stetson Engineers/San Rafael developed the model under contract to the Flood Control District Zone 9.
- What data was input to the model?

  Data input into the model included creek channel slope, creek channel cross sectional dimensions taken at intervals ranging from approximately 20 feet to 500 feet; bridge and culvert opening dimensions and lengths; fish ladders, overhanging buildings dimensions; creek channel roughness; floodplain topography and locations of building footprints; rainfall and runoff entering the creek from tributaries and the surrounding watershed; dimensions and operating rules for flood diversion and storage facilities; downstream tidal water levels. Data was also included from the 1982 and 2005 flood events.

- How was the data gathered?
  Data on the creek was gathered by surveying the creek channel, bridges and culverts, fish ladders, and overhanging buildings. Floodplain topography was gathered by aerial survey of the floodplain using LiDAR technology (light imaging, detection, and ranging). Locations of building footprints were gathered from County database based on aerial photography. Rainfall and runoff entering the creek was gathered from hydrological modeling using rainfall measurements from rain gages and streamflow measurements from streamflow gages for multiple flood event. Downstream tidal water levels were gathered from NOAA tidal station records.

- Who reviewed the data gathering and its input?
  All aspects of model development have been peer reviewed by the US Army Corps of Engineers.
- How much did it cost?
  Don't know. See below
- What level of accuracy is attributed to this type of modeling, generally, and to this model, specifically?

  Model accuracy and reliability is achieved through a process called model calibration and verification. During model calibration, the model is tested to determine how closely its output matches actual measurements made in the field. These measurements include creek water levels measured at streamflow gaging stations and "high water marks" measured in the floodplain and later surveyed for elevation. The model is run iteratively and, with each iteration, the model parameters are adjusted until the model output satisfactorily matches the actual measurements, at which point the model is judged "calibrated." Then the model is run for

different, new flood events and the model results are compared to actual measurements. If the model output satisfactorily matches the actual measurements for these different, new flood events without the need to adjust model parameters, then the model is judged calibrated *and verified*. As part of its peer review, the US Army Corps of Engineers reviewed the model calibration and verification procedures.

Please see the CIP link below that discusses the initial modeling effort.
http://www.marinwatersheds.org/sites/default/files/2017-11/CIPStudyReportMay2011.pdf

The cost is not available as it is a combination of multiple modeling efforts by multiple agencies. Please see the Hydrology and Hydraulics webpage for more information about more recent H&H modeling:
http://www.marinwatersheds.org/resources/projects/hydrology-and-hydraulic-hh-modeling

Current Regulations Affecting Bridge Size

- What are the current regulations affecting the following aspects of the bridge selection and placement for Madrone and Nokomis:
    - Bridge height
      The bridge height is dictated by water surface elevation for the design storm.
    - Slope of the bridge approaches
      The slopes are influenced by bridge height (see above), American Association of State Highway and Transportation Officials ("AASHTO") design guidelines and the desire to limit the footprint of the project and impacts to adjacent property owners.
    - Bridge width
      AASTHO has standards for bridge width based on the functional classification of the roadway and the traffic volumes on the roadway. The Town may elect to prepare a design exception to provide narrower bridges.
    - Sidewalk width
      AASHTO and ADA have standards for minimum sidewalk width of 4 feet (exclusive of curb stem) with 5-foot by 5-foot passing zones placed at 200-foot intervals.
    - Bridge Length
      Bridge length is mostly dictated by hydraulic opening needed in the creek.

  See attached bridge width justification memos for more details.
- What is the process and what are the criterion for determining improvements needed to individual properties adversely affected by the bridge replacement projects?

  Impacts to properties will be evaluated through the CEQA analysis. When a final bridge design is complete, necessary improvements in relation to street elevation changes etc. will be part of the project. The need for specific improvements will be communicated to the property owner. There may be an opportunity for the cost of physical changes to driveway conforms, entryways, etc. to be paid directly to the property owner who can contract directly with the contractor of their choice.

Traffic Volume and Impact on Bridge Design

Traffic volumes are looked at and taken into account and any information we have on these is attached.

- In what respects does traffic volume affect bridge design selection?
  AASHTO sets bridge width standards based on roadway classification and traffic volumes. See the attached bridge width justification memos for further info.
- When were traffic counts taken on Madrone? What were the results? Please provide a copy of the Town's analysis of the data, and any analysis done by Cal Trans.
  Traffic counts were done in 2014 by the Town's consultant. Traffic is projected to increase by a modest 0.3% annually to 1090 vehicles per day by 2037. See attached traffic memo.
- When were traffic counts taken on Nokomis? What were the results? Please provide a copy of the Town's analysis of the data, and any analysis done by Cal Trans.
  Traffic counts were done in 2014 by the Town's consultant. Traffic is projected to increase by a modest 0.3% annually to 740 by 2037. See attached traffic memo.
- What is the definitional difference between an Urban Minor Collector and an Urban Local Street?
  Streets and highways are grouped into classes according to the service they provide. Collectors generally distribute trips between local roads and arterial roads. Local roads generally don't carry through traffic movement. Madrone is classified as a major collector and Nokomis is classified as a local road by the Federal Highway Administration ("FHWA"). See the attached CRS map. See FHWA's website for additional info.
  https://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/section03.cfm#Toc336872985

Traffic Calming and Pedestrian Safety

Traffic Calming is a different subject than bridge replacement. This can be looked at separately under the traffic calming guidelines here http://www.townofsananselmo.org/DocumentCenter/View/5911.

- What is the Town's position on installing speed humps on Madrone and/or Nokomis in order to slow traffic?
- What is the Town's position on imposing a 15 MPH speed limit on Madrone and/or Nokomis?
- What is the Town's position on not allowing trucks on Madrone or Nokomis?
- What is the Town's position on making Madrone a one-way street?
- What is the Town's position on allowing parking on only one side of Madrone and/or Nokomis?
- What is the Town's position on staggered parking spaces as traffic calming measures?
- Is the Town planning to install ADA compliant sidewalks on both sides of the streets of Madrone and Nokomis? If so, will there be crosswalks installed where sidewalks end and pedestrians

need to cross the street, or will the crossings remain informal as they are now? What provisions are planned for avoiding the termination of sidewalks at blind curves?
The bridges will be designed to meet ADA

- Both currently proposed bridges end very close to the stop sign at the corner of Madrone and Nokomis. What provisions will be made to ensure that vehicles can and do stop at the stop sign?
  The same as is done currently and if there are issues with people stopping now or in the future this can be handled through enforcement or traffic calming measures (see above).

Schedule

- By what date must the Preferred Alternative be selected by the Town in order to comply with CEQA? Is there flexibility as to the date of the selection of the Preferred Alternative?
  There is no set date for this under CEQA, but the Town must show progress or it could lose funding.
- What are the time constraints on usage of the Cal Trans funding?
  See above
- When does the Town expect construction to begin and end?
  The plan is to try and complete the bridges in one summer season and construction is tentatively scheduled for 2020. Please refer to sananselmobridges.com for schedule questions.
- What are the beginning and ending dates for the periods that construction may take place in the creek bed?
  Typically summer months before the rainy season when the creek is running low but this will be determined with the various agencies such as the Army Corp, Fish and Game, Regional Water Quality Control Board, etc.
- How will the Town ensure that the contractor(s) adhere to the parameters of the construction schedule?
  This is typically spelled out in the specifications for a project of this type and the contractor will commit to following those specifications.
- How will residents be informed so that we may arrange for parking, noise, access etc. during construction?
  As with any project in the right of way, there will be public meetings, notices mailed, dropped off door to door, posted on Nextdoor, etc.

General Requests

- Can utilities be buried underground?
  This is not part of the Project and is a completely different subject which takes years to plan and fund.
- Heritage replacement trees (24" box trees rather than large box trees)?
  Typically 24" box trees grow faster than 42" box trees so most likely 24" box trees will be used.
- If there is a financial impact to homeowners for work they need to do in order to accommodate new bridge, how will that be handled?

The Town cannot speculate about the impact to property owners at this time, because the CEQA process has not been completed and there is no final design for the Project.

- If there is a decline in property value attributable to the bridge selection and placement, how will those impacted be compensated?
  Replacement of the bridges is to reduce flooding so property values should not be impacted negatively.
- How will the Town ensure that there is no unintended flooding of properties located adjacent to the ramps of the bridges?
  Through modeling and design. Again, this will be analyzed through the CEQA process so that potential flooding and other impacts can be mitigated.
- How will homes located adjacent to the bridge ramps be able to drive into and out of their driveways? Will garages and parking pads be raised to the level of the ramp?
  During construction, access may be limited but driveways will be repaired to conform to any infrastructure changes. This was previously shown to each potentially impacted property owner based on the current bridge design that is being reviewed.
- How will homes located adjacent to the ramps of the bridge be protected from the increased noise and exhaust pollution that may come with the reconfiguration?
  As discussed above, traffic is anticipated to increase by only .03% annually by 2037 and the rest of the road leading to and from the bridge is staying the same width etc. Air quality impacts will be analyzed as part of the CEQA process.
- Will old existing sewer laterals be replaced for all home located adjacent to the ramps of the bridges?
  We do not know if this will be needed at this time.

We Request Input from Experts in the following areas:

- Cost benefit analysis – expense, time, real estate loss from the replacement project?
  The bridges are identified as needing replacement due to the fact that they are structurally or functionally obsolete. A cost-benefit analysis is not required.
- Arborists – Tree impact on both bank protection and home value
  All trees will be reviewed by an arborist and trees protected and saved if they can be but some trees may require removal. Biological resources, including trees, will be analyzed through the CEQA process.
- Traffic Safety Flow Analysis (the wider the bridge the more traffic will come).
  Traffic impacts will be analyzed as part of the CEQA process.
- Real Estate Appraisers – Home value change due to new bridges
  We don't know, but no adverse impact is expected. For example, paving the road in front of any home usually has a positive impact on home value.
- Bio Engineers – are there more eco-friendly designs for bank erosion and bridge replacement
  The Town is working to insure that the bridges have minimal environmental impact and this will be required. The CEQA process is specifically intended to identify, analyze and mitigate environmental impacts.
- Engineering Experts to explain:

- How are the bridges choke points?
  See previous answers above but given the fact that the width, height and cross sectional area are all smaller than the creek less water can pass through it.

  Please visit the Stetson 2011 CIP for explanation of how bridges are constrictions to the creek and must be replaced:

  http://www.marinwatersheds.org/sites/default/files/2017-11/CIPStudyReportMay2011.pdf (See top of page 2, and Section 2.1.3 on page 14, and Table 5-2 on page 44)

  Also, this is further described in the Stetson 25-year flood

- Bank erosion (increased water in the creek will likely create bank erosion issues)
  This will be addressed with the design and to be determined with CEQA/NEPA and modeling.

Requests for Meetings with Town Officials and Engineers

How do we arrange for additional on-site meetings with town officials, engineers and other experts who have had input to the current bridge and flood plans?

Throughout the design and CEQA process the Town will hold public meetings, notify residents. etc.

Andy Chou
6/13/2017

Bridge Width Justification

1. FHWA Coding Guide

Whether or not a bridge is classified as "Functionally Obsolete" is based on certain codes found on a Bridge Inspection Report's Structure Inventory and Appraisal (SI&A) Report. Codes used on the SI&A Report are explained in the FHWA "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges" (Coding Guide). This document is available online (https://www.fhwa.dot.gov/bridge/mtguide.pdf). Codes that trigger a "Functionally Obsolete" classification are explained on the FHWA website (https://www.fhwa.dot.gov/bridge/0650dsup.cfm).

The current ADT of Madrone is 1,020 (year 2014). The future ADT is 1,090 (2037). The curb-to-curb width on the existing bridge is reported to be 5.5 meters (18 feet). Based on FHWA Guidelines, a bridge with a "Deck Geometry" code of 3 or less is considered "Functionally Obsolete" (FO). The current "Deck Geometry" code on the Caltrans SI&A form is a 2, making the bridge functionally obsolete.

The Highway Bridge Program (HBP) will not fund a bridge replacement project that proposes a functionally obsolete bridge. In order to avoid the functionally obsolete classification, the bridge would need a "Deck Geometry" code of at least a "4." Based on the table found in the Coding Guide (page 49), a bridge would require a curb-to-curb width of at least 7.3 meters (24 feet) to avoid being classified as "Functionally Obsolete."

Item 68 - Deck Geometry (cont'd)

Table 2A & 2B. Rating by Comparison of ADT - Item 29 and Bridge Roadway Width, Curb-to-Curb - Item 51

TABLE 2A							TABLE 2B	
Deck Geometry Rating Code	Bridge Roadway Width 2 Lanes; 2 Way Traffic						Bridge Roadway Width 1 Lane; 2-Way Traffic	
	ADT (Both Directions)						ADT (Both Directions)	
	0-100	101-400	401-1000	1001-2000	2001-5000	>5000	0-100	>100
9	>9.8	>11.0	>12.2	>13.4	>13.4	>13.4	-	-
8	9.8	11.0	12.2	13.4	13.4	13.4	<4.9	-
7	8.5	9.8	11.0	12.2	13.4	13.4	4.6	-
6	7.3	8.5	9.1	10.4	12.2	13.4	4.3	-
5	6.1	7.3	7.9	8.5	10.4	11.6	4.0	-
4	5.5	6.1	6.7	7.3	8.5	9.8 (8.5)*	3.7	-
3	4.9	5.5	6.1	6.7	7.9	9.1 (7.9)*	3.4	<4.9
2	Any width less than required for a rating code of 3 and structure is open.							
0	Bridge Closed							

* Use value in parentheses for bridges longer than 60 meters.

2. AASHTO Green Book

Although the Coding Guide provides suggestions on bridge widths, the Coding Guide is not the official guidance on setting bridge and roadway widths. The governing document to provide guidance on bridge and roadway widths is AASHTO's "A Policy on Geometric Design of Highways and Streets" (Green Book). Bridge replacement projects funded by the HBP must meet Green Book minimum standards or document a design exception in order to maintain HBP funds.

Chapter 6 of the Green Book pertains to Collector Roads and Streets. Based on Table 6-5 of the Green Book, the minimum width of traveled way should be 20 feet for design speeds up to 30 mph. A 5 foot shoulder is also suggested for roads with average daily traffic (ADT) counts between 400 and 1500.

Table 6-5. Minimum Width of Traveled Way and Shoulders

Metric					U.S. Customary				
Design Speed (km/h)	Minimum Width of Traveled Way (m) for Specified Design Volume (veh/day[a])				Design Speed (mph)	Minimum Width of Traveled Way (ft) for Specified Design Volume (veh/day[a])			
	under 400	400 to 1500	1500 to 2000	over 2000		under 400	400 to 1500	1500 to 2000	over 2000
30	6.0[b]	6.0	6.6	7.2	20	20[b]	20	22	24
40	6.0[b]	6.0	6.6	7.2	25	20[b]	20	22	24
50	6.0[b]	6.0	6.6	7.2	30	20[b]	20	22	24
60	6.0[b]	6.6	6.6	7.2	35	20[b]	22	22	24
70	6.0	6.6	6.6	7.2	40	20[b]	22	22	24
80	6.0	6.6	6.6	7.2	45	20	22	22	24
90	6.6	6.6	7.2	7.2	50	20	22	22	24
100	6.6	6.6	7.2	7.2	55	22	22	24	24
					60	22	22	24	24
					65	22	22	24	24
	Width of Shoulder on Each Side of Road (m)					Width of Shoulder on Each Side of Road (ft)			
All Speeds	0.6	1.5[c]	1.8	2.4	All Speeds	2.0	5.0[c]	6.0	8.0

[a] On roadways to be reconstructed, a 6.6-m [22-ft] traveled way may be retained where the alignment is satisfactory and there is no crash pattern suggesting the need for widening.

[b] A 5.4-m [18-ft] minimum width may be used for roadways with design volumes under 250 veh/day.

[c] Shoulder width may be reduced for design speeds greater than 50 km/h [30 mph] provided that a minimum roadway width of 9 m [30 ft] is maintained.

Note: See text for roadside barrier and off-tracking considerations.

Table 6-6 of the Green Book pertains to minimum clear roadway widths for new and reconstructed bridges. Based on the Madrone Avenues ADT, Table 6-6 suggests that the bridge should have a total clear width of "Traveled way + 3 ft (Each side)." The "traveled way" width is referring to the value found in Table 6-5. Therefore, Table 6-6 suggests a minimum clear width of 26 feet (20' + 3' + 3').

Table 6-6. Minimum Roadway Widths and Design Loadings for New and Reconstructed Bridges

Metric			U.S. Customary		
Design Volume (veh/day)	Minimum Clear Roadway Width for Bridges[a]	Design Loading Structural Capacity	Design Volume (veh/day)	Minimum Clear Roadway Width for Bridges[a]	Design Loading Structural Capacity
400 and under	Traveled way + 0.6 m (each side)	HL 93	400 and under	Traveled way + 2 ft (each side)	HL 93
400 to 1500	Traveled way + 1 m (each side)	HL 93	400 to 1500	Traveled way + 3 ft (each side)	HL 93
1500 to 2000	Traveled way + 1.2 m (each side)[b]	HL 93	1500 to 2000	Traveled way + 4 ft (each side)[b]	HL 93
over 2000	Approach roadway (width)[b]	HL 93	over 2000	Approach roadway (width)[b]	HL 93

[a] Where the approach roadway width (traveled way plus shoulders) is surfaced, that surface width should be carried across the structures.

[b] For bridges in excess of 30 m [100 ft] in length, the minimum width of traveled way plus 1 m [3 ft] on each side is acceptable.

3. AASHTO Low Volume Design Guide

The Low Volume Design Guide applies to facilities with ADT less than 400. Therefore, the Low Volume Design Guide does not apply to Madrone Ave.

4. Existing roadway Approach Widths

West of the Madrone Avenue bridge, the roadway curb to curb width varies from 23' at the bridge to 24' near the intersection with Nokomis Avenue. East of the Madrone Avenue bridge, the roadway curb to curb width varies from 23' at the bridge and widens to 24 feet approximately 100 feet east of the bridge.

5. Summary

In summary, the Coding Guide requires a bridge clear width of at least 24' to avoid a Functionally Obsolete classification. The Green Book recommends a clear width of 26' for new bridges to meet standard. A width less than 26 ft would require a design exception. The Low Volume Design Guide does not apply to the Madrone Ave bridge.

Document	Min Bridge Clear Width	Notes
FHWA Coding Guide	24 feet	Coding Guide is not a roadway design standard.
AASHTO Green Book	26 feet	A width less than 26 ft would require a design exception.

AASHTO Low Volume Design Guide	N/A	N/A

***Note:** The values listed above are curb-to-curb widths and does not include sidewalk and barrier widths on the bridge. It is proposed that the bridge on Madrone Ave. will have a 4' sidewalk on each side of the bridge.

Andy Chou
6/13/2017

Bridge Width Justification

1. FHWA Coding Guide

Whether or not a bridge is classified as "Functionally Obsolete" is based on certain codes found on a Bridge Inspection Report's Structure Inventory and Appraisal (SI&A) Report. Codes used on the SI&A Report are explained in the FHWA "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges" (Coding Guide). This document is available online (https://www.fhwa.dot.gov/bridge/mtguide.pdf). Codes that trigger a "Functionally Obsolete" classification are explained on the FHWA website (https://www.fhwa.dot.gov/bridge/0650dsup.cfm).

The current ADT of Nokomis is 690 (year 2014). The future ADT is 740 (2037). The curb-to-curb width on the existing bridge is reported to be 5.5 meters (18 feet). Based on FHWA Guidelines, a bridge with a "Deck Geometry" code of 3 or less is considered "Functionally Obsolete" (FO). The current "Deck Geometry" code on the Caltrans SI&A form is a 3, making the bridge functionally obsolete.

The Highway Bridge Program (HBP) will not fund a bridge replacement project that proposes a functionally obsolete bridge. In order to avoid the functionally obsolete classification, the bridge would need a "Deck Geometry" code of at least a "4." Based on the table found in the Coding Guide (page 49), a bridge would require a curb-to-curb width of at least 6.7 meters (22 feet) to avoid being classified as "Functionally Obsolete."

Item 68 - Deck Geometry (cont'd)

Table 2A & 2B. Rating by Comparison of ADT - Item 29 and Bridge Roadway Width, Curb-to-Curb - Item 51

TABLE 2A							TABLE 2B	
Deck Geometry Rating Code	Bridge Roadway Width 2 Lanes; 2 Way Traffic						Bridge Roadway Width 1 Lane; 2-Way Traffic	
	ADT (Both Directions)						ADT (Both Directions)	
	0-100	101-400	401-1000	1001-2000	2001-5000	>5000	0-100	>100
9	>9.8	>11.0	>12.2	>13.4	>13.4	>13.4	-	-
8	9.8	11.0	12.2	13.4	13.4	13.4	<4.9	-
7	8.5	9.8	11.0	12.2	13.4	13.4	4.6	-
6	7.3	8.5	9.1	10.4	12.2	13.4	4.3	-
5	6.1	7.3	7.9	8.5	10.4	11.6	4.0	-
4	5.5	6.1	6.7	7.3	8.5	9.8 (8.5)*	3.7	-
3	4.9	5.5	6.1	6.7	7.9	9.1 (7.9)*	3.4	<4.9
2	Any width less than required for a rating code of 3 and structure is open.							
0	Bridge Closed							

* Use value in parentheses for bridges longer than 60 meters.

2. AASHTO Green Book

Although the Coding Guide provides suggestions on bridge widths, the Coding Guide is not the official guidance on setting bridge and roadway widths. The governing document to provide guidance on bridge and roadway widths is AASHTO's "A Policy on Geometric Design of Highways and Streets" (Green Book). Bridge replacement projects funded by the HBP must meet Green Book minimum standards or document a design exception in order to maintain HBP funds.

Chapter 5 of the Green Book pertains to Local Roads. Based on Table 5-5 of the Green Book, the minimum width of traveled way should be 20 feet for design speeds up to 40 mph. A 5 foot shoulder is also suggested for roads with average daily traffic (ADT) counts between 400 and 1500.

Table 5-5. Minimum Width of Traveled Way and Shoulders

Metric					U.S. Customary				
Design Speed (km/h)	Minimum Width of Traveled Way (m) for Specified Design Volume (veh/day)				Design Speed (mph)	Minimum Width of Traveled Way (ft) for Specified Design Volume (veh/day)			
	under 400	400 to 1500	1500 to 2000	over 2000		under 400	400 to 1500	1500 to 2000	over 2000
20	5.4	6.0[a]	6.0	6.6	15	18	20[a]	20	22
30	5.4	6.0[a]	6.6	7.2[b]	20	18	20[a]	22	24[b]
40	5.4	6.0[a]	6.6	7.2[b]	25	18	20[a]	22	24[b]
50	5.4	6.0[a]	6.6	7.2[b]	30	18	20[a]	22	24[b]
60	5.4	6.0[a]	6.6	7.2[b]	40	18	20[a]	22	24[b]
70	6.0	6.6	6.6	7.2[b]	45	20	22	22	24[b]
80	6.0	6.6	6.6	7.2[b]	50	20	22	22	24[b]
90	6.6	6.6	7.2[b]	7.2[b]	55	22	22	24[b]	24[b]
100	6.6	6.6	7.2[b]	7.2[b]	60	22	22	24[b]	24[b]
					65	22	22	24[b]	24[b]
All speeds	Width of graded shoulder on each side of the road (m)				All speeds	Width of graded shoulder on each side of the road (ft)			
	0.6	1.5[a,c]	1.8	2.4		2	5[a,c]	6	8

[a] For roads in mountainous terrain with design volume of 400 to 600 veh/day, use 5.4-m [18-ft] traveled way width and 0.6-m [2-ft] shoulder width.

[b] Where the width of the traveled way is shown as 7.2 m [24 ft], the width may remain at 6.6 m [22 ft] on reconstructed highways where there is no crash pattern suggesting the need for widening.

[c] May be adjusted to achieve a minimum roadway width of 9 m [30 ft] for design speeds greater than 60 km/h [40 mph].

Table 5-6 of the Green Book pertains to minimum clear roadway widths for new and reconstructed bridges. Based on the Nokomis Avenues ADT, Table 5-6 suggests that the bridge should have a total clear width of "Traveled way + 3 ft (Each side)." The "traveled way" width is referring to the value found in Table 5-5. Therefore, Table 5-6 suggests a minimum clear width of 26 feet (20' + 3' + 3').

Table 5-6. Minimum Clear Roadway Widths and Design Loadings for New and Reconstructed Bridges

Metric			U.S. Customary		
Design Volume (veh/day)	Minimum Clear Roadway Width for Bridges[a]	Design Loading Structural Capacity	Design Volume (veh/day)	Minimum Clear Roadway Width for Bridges[a]	Design Loading Structural Capacity
400 and under	Traveled way + 0.6 m (each side)	HL 93	400 and under	Traveled way + 2 ft (each side)	HL 93
400 to 2000	Traveled way + 1.0 m (each side)	HL 93	400 to 2000	Traveled way + 3 ft (each side)	HL 93
over 2000	Approach roadway width[b]	HL 93	over 2000	Approach roadway width[b]	HL 93

[a] Where the approach roadway width (traveled way plus shoulders) is surfaced, that surface width should be carried across the structures.

[b] For bridges in excess of 30 m [100 ft] in length, the minimum width of traveled way plus 1 m [3 ft] on each side is acceptable.

3. AASHTO Low Volume Design Guide

The Low Volume Design Guide applies to facilities with ADT less than 400. Therefore, the Low Volume Design Guide does not apply to Nokomis Ave.

4. Existing roadway Approach Widths

North of the Nokomis Avenue bridge, the roadway curb to curb width is 22'. The width tapers down to 18' within 50' of bridge. South of the bridge, the curb to curb widens from 18' at the bridge to 24' towards the intersection with Madrone Avenue.

5. Summary

In summary, the Coding Guide requires a bridge clear width of at least 22' to avoid a Functionally Obsolete classification. The Green Book recommends a clear width of 26' for new bridges to meet standard. A width less than 26 ft would require a design exception. The Low Volume Design Guide does not apply to the Madrone Ave bridge.

Document	Min Bridge Clear Width	Notes
FHWA Coding Guide	22 feet	Coding Guide is not a roadway design standard.
AASHTO Green Book	26 feet	A width less than 26 ft would require a design exception.
AASHTO Low Volume Design Guide	N/A	N/A

BRIDGE No. 27C0080 – Madrone Ave over San Anselmo Creek in San Anselmo, CA GENERAL INFORMATION	
Bridge Design Code	AASHTO LRFD Bridge Design Specifications, 2012 (Sixth Edition) **with** CA Amendments (AASHTO-CA BDS 6)
	If different note:
Bridge Loading	HL93 and CA Permit Design Load (P15) Additional Dead Load consisting of a 35 psf future wearing surface List special Loadings: •
Bridge Seismic Design Criteria	California Seismic Design Criteria Version 1.7
Bridge Design Manuals/References Used	Caltrans Manuals: • Bridge Memo To Designers (MTD) • Bridge Design Aids (BDA) • Bridge Design Practice (BDP) • Bridge Standard Detail Sheets (XS Sheets)
Additional General Information	• Railroad Coordination Required? ☒ No ☐ Yes • Flood Control or CVFPB Coordination Required? ☐ No ☒ Yes •

Note: Complete a Separate Summary Table for each bridge/structure on the project.

BRIDGE LAYOUT AND TYPE SELECTION

Considerations	Description	Comments
Traffic Handling Requirements (staged construction, detour, etc.)	Road closed, traffic detoured, one stage bridge construction	One or two seasons TBD
Existing Bridge Removal? ☐ No ☐ N/A ☒ Yes		
Architectural Treatments (description and relevant dimensions)	Special Railing and possibly vertical face (wall) formliner treatment	TBD with Town
Utilities on Bridge (high risk or large?)	6" Water, PG&E 2" gas	A number of overhead lines too.
Shoring Required? ☐ No ☒ Yes	Existing homes on east side of creek likely will require shoring for wall construction along channel	
Sidewalk? ☐ No ☒ Yes	Widths: 4.5' on each side	
Pedestrian/Bicycle Railing? ☐ No ☒ Yes	Railing Type: TBD	
Anticipated Abutment Scour Depth and Proposed Countermeasures	TBD – possible 5' and RSP (1/4 Ton, Method B)	CA Bank and Shore RSP Design Manual
Anticipated Pier Scour Depth and Proposed Countermeasures	N/A	

BRIDGE LAYOUT AND TYPE SELECTION

Criteria	Dimension / Elev or Value Chosen	Standard	Standard Variance (Yes/No)	Comments (Required if "Yes" is checked on "Standard Variance")
Bridge Clear Width	24'-0"	AASHTO Guideline and Bridge Coding Guide	☐ No ☒ Yes	Width justification memo available
Barrier Type and Widths	Type Texas C411 (1'-2" Ea.) Design Speed = 45 mph	TL-2		
Proposed Bridge Type	CIP/PS Conc Slab	AASHTO LRFD v6	☒ No ☐ Yes	
Proposed Typical Section	35'-4" total width with sidewalks	Width justification memo available	☒ No ☐ Yes	
Proposed Span Configuration and Total Length	56′	N/A		
Depth to Span Ratio	0.035	AASHTO LRFD v6 BDA 10	☒ No ☐ Yes	
Skew	0 degrees	AASHTO LRFD v6		

BRIDGE LAYOUT AND TYPE SELECTION

Criteria	Dimension / Elev or Value Chosen	Standard	Standard Variance (Yes/No)	Comments (Required if "Yes" is checked on "Standard Variance")
Minimum Permanent Vertical Clearance	2' over 50 yr WSE 0' over 100 yr WSE	LAPM 11.2 - Statewide Design Standards for Local Assistance Projects	☒ No ☐ Yes	TBD
Minimum Temporary Vertical Clearance (F/W)	N/A	BDA 10	☐ No ☐ Yes	
Minimum Temporary Horizontal Opening (F/W)	N/A	BDA 10	☐ No ☐ Yes	
Minimum Horizontal Clearance to Abutments / Columns	N/A	BDA 10 MTD 17	☐ No ☐ Yes	
Governing Hydraulic Required Elevation	50 yr storm +2' or Q100 whichever controls = TBD	LAPM 11.2 or CVFPB	☒ No ☐ Yes	Various flood control improvement conditions are being considered
Minimum Actual Soffit Elevation	TBD	LAPM 11.2	☒ No ☐ Yes	
Bridge Deck Drainage	N/A	MTD 18	☐ No ☐ Yes	

BRIDGE DESIGN CONSIDERATIONS

SUPERSTRUCTURE and SUBSTRUCTURE

Criteria	Dimension or Value Chosen	Standard	Standard Variance (Yes/No)	Comments (Required if "Yes" is checked on "Std Variance")
Freeze-Thaw Environment/Area?	Non-Freeze-Thaw Area	MTD 8-2 & AASHTO LRFD v6 (Chapter 5)	☒ No ☐ Yes	Normal concrete covers and allowable tension values
Wingwall Layout	Cantilever using Std Plan w/ 8' cover length	BDA 10 & BDD 6-80		
Special or Non-Standard Bearings?	Elastomeric Bearing	MTD 7		
Joint Seal Assembly Required?	N/A	MTD 7		
Girder Spacing (if Applicable)	N/A			
Deck Overhang Length (if Applicable)	N/A	≤ 6′	☐ No ☐ Yes	
Corrosive Soil or Water?	3"	AASHTO LRFD v6 (CT Amendments)		Non corrosive soil

BRIDGE DESIGN CONSIDERATIONS

FOUNDATIONS

Description	Foundation Type (and pile spacing if applicable)	Driven Piles		Drilled Piles		Spread Footing	
		Pile Type	Overhead Clearance?	Inspection Tubes?	Pile Wet Spec Anticipated?	Scour Evaluated?	Type D Excavation?
Abutment Foundation Type	24" CIDH Concrete Piles		☐ No ☐ Yes	☐ No ☒ Yes	☐ No ☒ Yes	☐ No ☐ Yes	☐ No ☐ Yes
Pier/Bent Foundation Type	N/A		☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes

Description	Existing Bridge Site Potential?	Additional Information and Comments
Liquefaction Potential?	☒ No ☐ Yes	
Lateral Spreading Potential?	☒ No ☐ Yes	

Submitted By:

_____ Date _____
Design Engineer

Approvals:
Quincy Engineering, Inc.

Mario Quest Date May 2017
Project Engineer

_____ Date _____
Project Manager

_____ Date _____ Revised _____
Principal in Charge

HYDRAULIC CRITERIA - TBD

BRIDGE No. 27C0153 – Nokomis Ave over San Anselmo Creek in San Anselmo, CA GENERAL INFORMATION	
Bridge Design Code	AASHTO LRFD Bridge Design Specifications, 2012 (Sixth Edition) **with** CA Amendments (AASHTO-CA BDS 6)
	If different note:
Bridge Loading	HL93 and CA Permit Design Load (P15) Additional Dead Load consisting of a 35 psf future wearing surface List special Loadings: •
Bridge Seismic Design Criteria	California Seismic Design Criteria Version 1.7
Bridge Design Manuals/References Used	Caltrans Manuals: • Bridge Memo To Designers (MTD) • Bridge Design Aids (BDA) • Bridge Design Practice (BDP) • Bridge Standard Detail Sheets (XS Sheets)
Additional General Information	• Railroad Coordination Required? ☒ No ☐ Yes • Flood Control or CVFPB Coordination Required? ☐ No ☒ Yes •

Note: Complete a Separate Summary Table for each bridge/structure on the project.

BRIDGE LAYOUT AND TYPE SELECTION

Considerations	Description	Comments
Traffic Handling Requirements (staged construction, detour, etc.)	Road closed, traffic detoured, one stage bridge construction	One or two seasons TBD
Existing Bridge Removal? ☐ No ☐ N/A ☒ Yes		
Architectural Treatments (description and relevant dimensions)	Special Railing and possibly vertical face (wall) formliner treatment	TBD with Town
Utilities on Bridge (high risk or large?)	4" water, PG&E 8" gas, 6" sewer	A number of overhead lines too.
Shoring Required? ☐ No ☒ Yes	Excavation near existing private retaining wall will require shoring	
Sidewalk? ☐ No ☒ Yes	Widths:4.5' on each side	
Pedestrian/Bicycle Railing? ☐ No ☒ Yes	Railing Type: TBD	
Anticipated Abutment Scour Depth and Proposed Countermeasures	TBD – possible 5' and RSP (1/4 Ton, Method B)	CA Bank and Shore RSP Design Manual
Anticipated Pier Scour Depth and Proposed Countermeasures	TBD	CA Bank and Shore RSP Design Manual

BRIDGE LAYOUT AND TYPE SELECTION

Criteria	Dimension / Elev or Value Chosen	Standard	Standard Variance (Yes/No)	Comments (Required if "Yes" is checked on "Standard Variance")
Bridge Clear Width	22'-0"	AASHTO Guideline and Bridge Coding Guide	☐ No ☒ Yes	Width justification memo available
Barrier Type and Widths	Type Texas C411 (1'-2" Ea.) Design Speed = 45 mph	TL-2		
Proposed Bridge Type	CIP/RC Conc Slab	AASHTO LRFD v6	☒ No ☐ Yes	
Proposed Typical Section	33'-4" total width with sidewalks	Width justification memo available	☒ No ☐ Yes	
Proposed Span Configuration and Total Length	42.33′ – 42.33′ = 84.66′	N/A		
Depth to Span Ratio	0.04	AASHTO LRFD v6 BDA 10	☒ No ☐ Yes	
Skew	20 degrees	AASHTO LRFD v6		

BRIDGE LAYOUT AND TYPE SELECTION

Criteria	Dimension / Elev or Value Chosen	Standard	Standard Variance (Yes/No)	Comments (Required if "Yes" is checked on "Standard Variance")
Minimum Permanent Vertical Clearance	2' over 50 yr WSE 0' over 100 yr WSE	LAPM 11.2 - Statewide Design Standards for Local Assistance Projects	☒ No ☐ Yes	TBD
Minimum Temporary Vertical Clearance (F/W)	N/A	BDA 10	☐ No ☐ Yes	
Minimum Temporary Horizontal Opening (F/W)	N/A	BDA 10	☐ No ☐ Yes	
Minimum Horizontal Clearance to Abutments / Columns	N/A	BDA 10 MTD 17	☐ No ☐ Yes	
Governing Hydraulic Required Elevation	FC 5: 50 yr storm +2' or Q100 whichever controls = TBD	LAPM 11.2 or CVFPB	☒ No ☐ Yes	Various flood control improvement conditions are being considered
Minimum Actual Soffit Elevation	57.77'	LAPM 11.2	☒ No ☐ Yes	
Bridge Deck Drainage	N/A	MTD 18	☐ No ☐ Yes	

BRIDGE DESIGN CONSIDERATIONS

SUPERSTRUCTURE and SUBSTRUCTURE

Criteria	Dimension or Value Chosen	Standard	Standard Variance (Yes/No)	Comments (Required if "Yes" is checked on "Std Variance")
Freeze-Thaw Environment/Area?	Non-Freeze-Thaw Area	MTD 8-2 & AASHTO LRFD v6 (Chapter 5)	☒ No ☐ Yes	Normal concrete covers and allowable tension values
Wingwall Layout	Cantilever using Std Plan w/ 8' cover length	BDA 10 & BDD 6-80		
Special or Non-Standard Bearings?	N/A	MTD 7		
Joint Seal Assembly Required?	N/A	MTD 7		
Girder Spacing (if Applicable)	N/A			
Deck Overhang Length (if Applicable)	N/A	≤ 6′	☐ No ☐ Yes	
Corrosive Soil or Water?	3"	AASHTO LRFD v6 (CT Amendments)		Non corrosive soil

BRIDGE DESIGN CONSIDERATIONS

FOUNDATIONS

Description	Foundation Type (and pile spacing if applicable)	Driven Piles		Drilled Piles		Spread Footing	
		Pile Type	Overhead Clearance?	Inspection Tubes?	Pile Wet Spec Anticipated?	Scour Evaluated?	Type D Excavation?
Abutment Foundation Type	24" CIDH Concrete Piles		☐ No ☐ Yes	☐ No ☒ Yes	☐ No ☒ Yes	☐ No ☐ Yes	☐ No ☐ Yes
Pier/Bent Foundation Type	24" CIDH Concrete Piles		☐ No ☐ Yes	☐ No ☒ Yes	☐ No ☒ Yes	☐ No ☐ Yes	☐ No ☐ Yes

Description	Existing Bridge Site Potential?	Additional Information and Comments
Liquefaction Potential?	☐ No ☐ Yes	TBD
Lateral Spreading Potential?	☐ No ☐ Yes	TBD

Submitted By:

_____ Date _____
Design Engineer

Approvals:
Quincy Engineering, Inc.

Mario Quest Date May 2017 _____ Date _____
Project Engineer Project Manager

_____ Date _____ Revised _____
Principal in Charge

KITTELSON & ASSOCIATES
155 GRAND AVENUE, SUITE 900
OAKLAND, CA 94612
P 510.839.1742 F 510.839.0871

MEMORANDUM

Date: June 20, 2017

Project #: 137940

To: Michele Johnson, P.E.
Quincy Engineering
2950 Buskirk Avenue, Suite 122
Walnut Creek, CA 94597

From: Mike Aronson, P.E.

Project: San Anselmo Bridges Replacement

Subject: Daily Traffic Volumes

The daily traffic volumes on bridges crossing San Anselmo Creek have been estimated based on available traffic counts.

PEAK HOUR TRAFFIC COUNTS

Peak period intersection turn movement counts were collected at 14 intersections in San Anselmo and Ross at the beginning of this analysis in 2014. The AM and PM peak hour intersection turn movements were compiled from these counts (Figures 1 and 2).

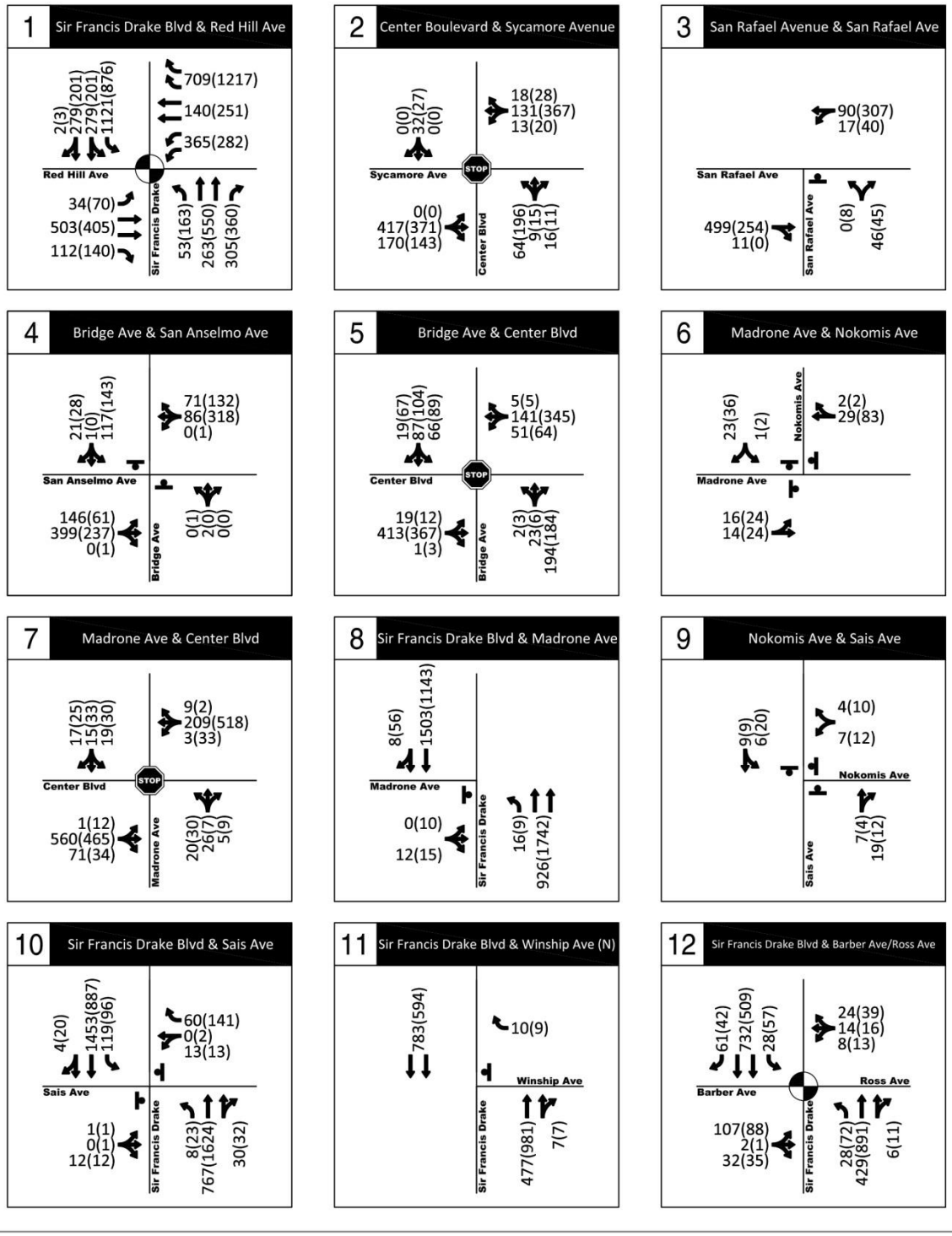
PEAK HOUR FACTORS

Daily 24-hour traffic counts were available on four road segments in the study area. These locations were used to identify the relationships between peak hour and daily traffic volumes (Table 1).

Table 1: Daily Traffic Counts and Peak Hour Factors

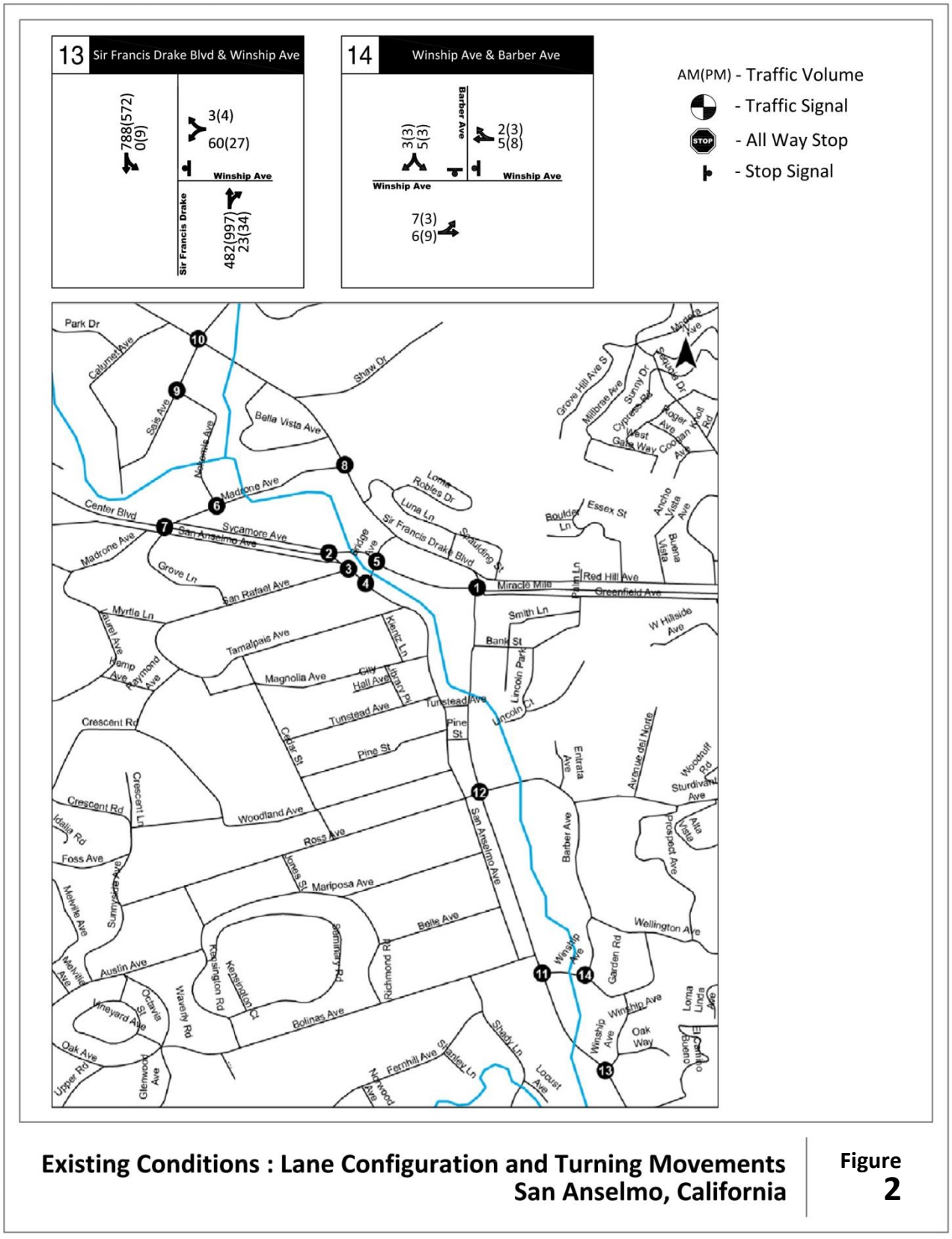
Street	Location	Midweek ADT	AM Pk Hour	AM %	PM Pk Hour	PM %	ADT/(AM +PM)
Red Hill	w/o Ancho Vista	40,240	3,066	7.6%	3,250	8.1%	6.37
Center	W/o Redwood	10,561	747	7.1%	930	8.8%	6.30
Sir Francis Drake	Maricopa-Bell	19,448	1,344	6.9%	1,541	7.9%	6.74
Sir Francis Drake	San Anselmo-Broadmoor	27,850	2,038	7.3%	2,191	7.9%	6.58
Average				**7.2%**		**8.2%**	**6.50**

Source: Traffic counts from November, 2013 provided by City of San Anselmo.



Existing Conditions : Lane Configuration and Turning Movements
San Anselmo, California

Figure 1



Existing Conditions : Lane Configuration and Turning Movements
San Anselmo, California

Figure 2

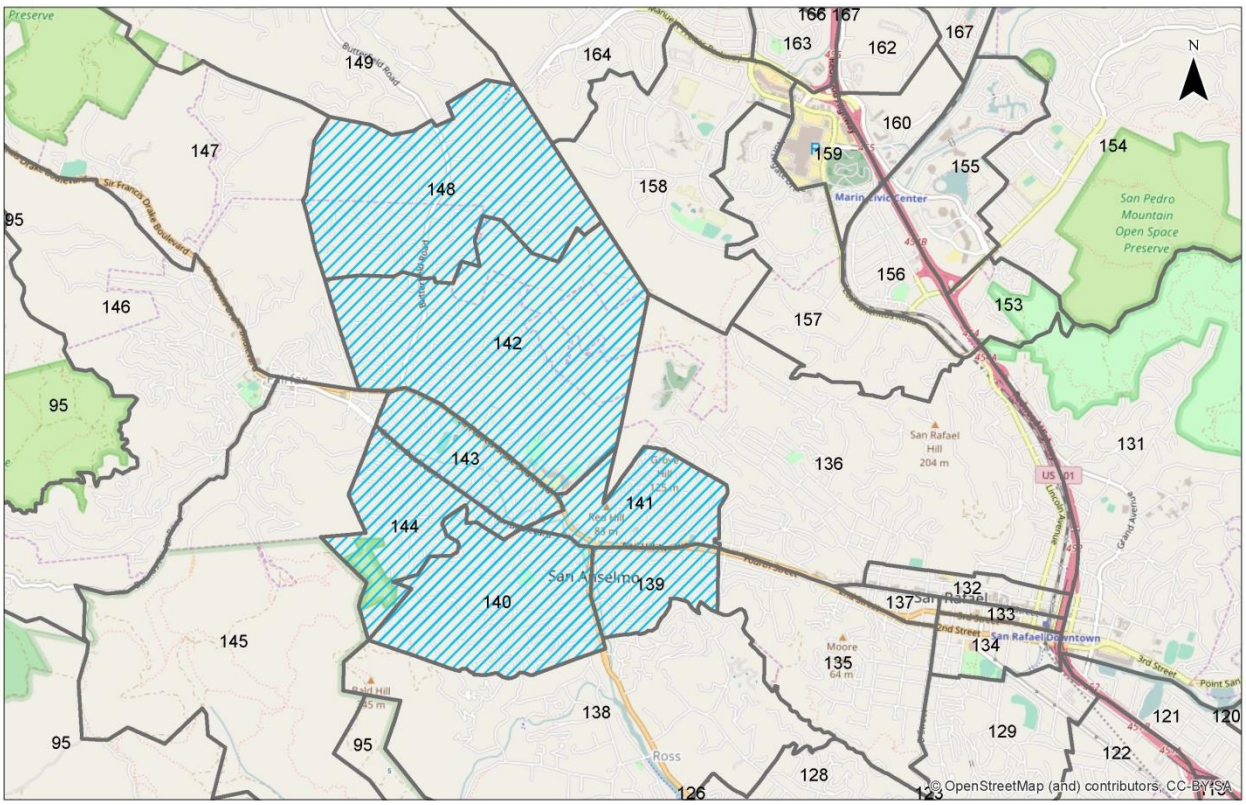
The traffic counts at each location were available for seven days, disaggregated by direction and by 15-minute periods. The midweek average traffic volumes were calculated as the average of the Tuesday, Wednesday and Thursday counts. The average daily traffic volume is the sum of the midweek averages by time period. The AM peak hour volume was identified as the highest hourly volume between 6:00 and 10:00 AM, and the PM peak hour volume is the highest hourly volume between 3:00 and 7:00 PM.

The average AM peak hour percent of daily traffic at the four locations was 7.2 percent, and the average PM peak hour percent of daily was 8.2 percent. An average factor of 6.5 times the sum of the AM and PM peak hour volumes was calculated to estimate daily traffic volumes.

FUTURE GROWTH

Future traffic growth was estimated using population and employment forecasts from the Marin County travel model maintained by the Transportation Agency of Marin (TAM). Population and employment values were compiled for the 2010 base year and 2040 forecast year for the transportation analysis zones (TAZs) in the San Anselmo study area (Figure 3).

Figure 3: Marin County Travel Model TAZs



The total population and employment in the study area were projected to increase by nine to ten percent between 2010 and 2040 (Table 2). This is equivalent to an annual growth rate of 0.3 percent.

Table 2: Population and Employment from Marin County Travel Model

	2010	2040	Percent Change	Annual Growth
Population	15,251	16,549	+8.5%	+0.3%
Employment	5,717	6,298	+10.2%	+0.3%

DAILY VOLUME ESTIMATES

The base year daily volumes were estimated by applying a 6.5 factor to the sum of the AM and PM peak hour volumes on each street segment (Table 3). The peak hour segment volumes were calculated as the sum of the peak hour intersection turn volumes at each end of the segment. For Nokomis Avenue and Madrone Avenue, there are two estimates based on the traffic volumes at the intersections on either end of the street segment containing the San Anselmo Creek bridge. It is recommended that the higher of the two estimates be used for analysis.

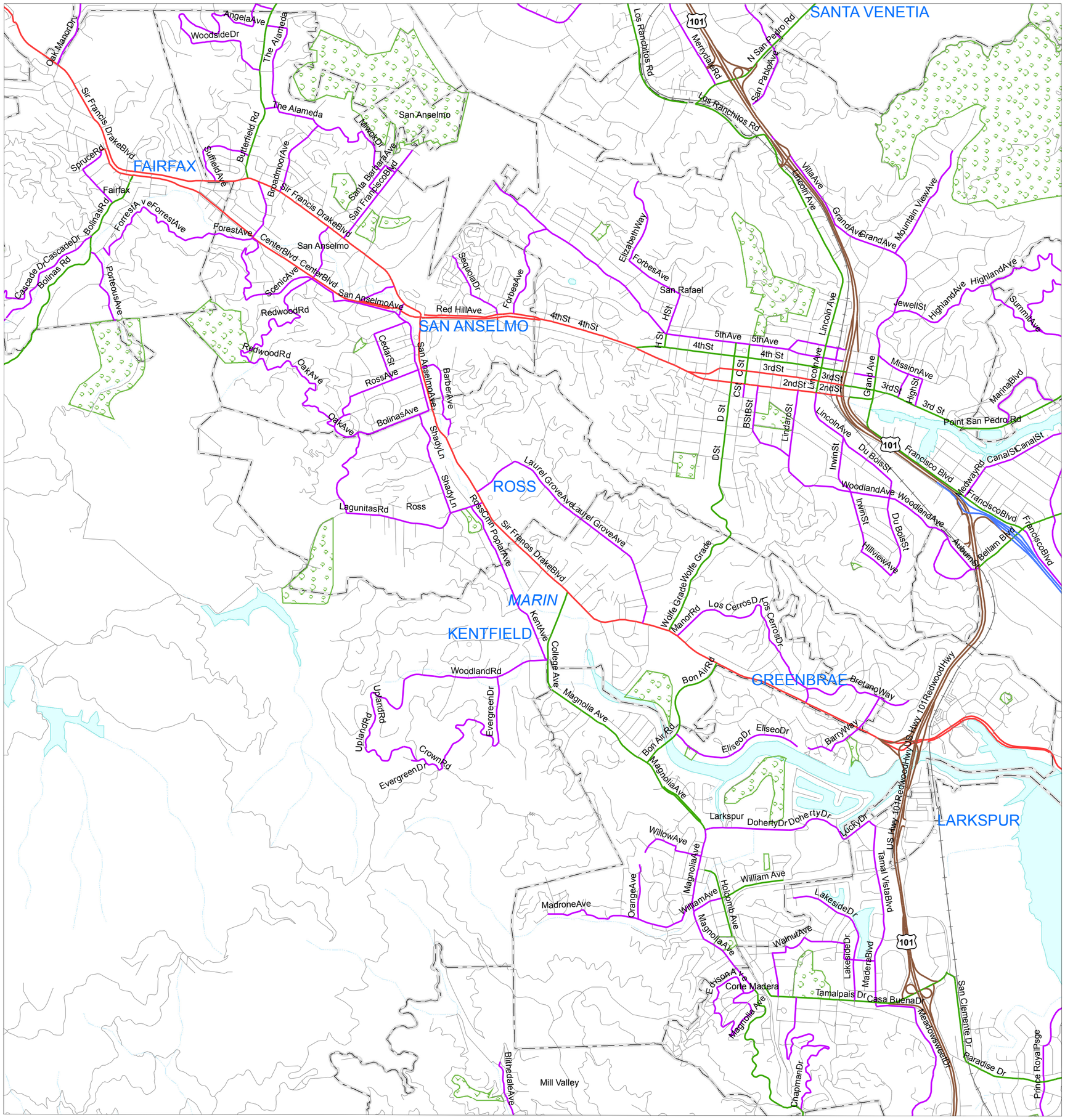
Table 3: Daily Volume Estimates

Street	Location	2014 AM Pk Hr	2014 PM Pk Hr	2014 ADT	Annual Growth	2037 ADT
Winship Avenue	e/o Sir Francis Drake	17	16	210	0.3%	220
Nokomis Avenue	s/o Sais Avenue	36	54	580	0.3%	620
Nokomis Avenue	n/o Madrone Avenue	42	64	690	0.3%	740
Madrone Avenue	e/o Nokomis Avenue	46	111	1,020	0.3%	1,090
Madrone Avenue	w/o Sir Francis Drake	36	90	820	0.3%	880
Center Boulevard	w/o Bridge Avenue	595	797	9,050	0.3%	9,670

SEE MAP 4K45

SEE MAP 4K54

SEE MAP 5K51



SEE MAP 4L15

APPROVED Date 8/5/11
FEDERAL HIGHWAY ADMINISTRATION
FOR: VINCENT P. MAMMANO
DIVISION ADMINISTRATOR

0 0.25 0.5 0.75 1 Mile
0 1,000 2,000 3,000 4,000 5,000 Feet

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
In Cooperation With The
FEDERAL HIGHWAY ADMINISTRATION
AND LOCAL AGENCIES

N

Caltrans

COUNTY BOUNDARY
CITY BOUNDARY
RAILROAD

SIGN ROUTES
INTERSTATE
U.S.
STATE
COUNTY

FUNCTIONAL CLASSIFICATION SYSTEM

INTERSTATE	1
OTHER FWY OR EXPWY	2
OTHER PRINCIPAL ARTERIAL	3
MINOR ARTERIAL	4
MAJOR COLLECTOR	5
MINOR COLLECTOR	6
LOCAL	7

MAP 4K55

Marin CALIFORNIA ROAD SYSTEM