Traffic Impact Study – Final Report

Caliber Charter School

VALLEJO, CA

21 June 2016

Prepared for:

City of VALLEJO California

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EXECUTIVE SUMMARY

This report analyzed several scenarios for the proposed Caliber Charter School, consistent with the requirements found in the City's *Traffic Impact Analysis/Study Guidelines*. The with and without project scenarios were summarized in several tables and graphics in the body of this report. The study area consisted of several local roadways fronting the project parcel, as well as eleven (11) other intersections in the vicinity of the project.

The study area's existing roadway system and 11 study intersections currently operate at LOS C or better conditions for the Year 2015, for both the am and pm peak hour time periods. There are generally "free flow" traffic conditions with very little delay to motorists. There is reserve capacity in the system for additional growth and projects. This study examined a background growth impact based on the Solano Transportation Authority's traffic model for Year 2010 and 2040 conditions, as well as a pending Federal Post Office development to be built at the corner of Valle Vista Ave. and Couch / Napa Streets. This background growth plus the post office was always present in the base volumes used to also analyze the "plus charter school project" scenarios in this report. Overall, the addition of the project volumes never did exceed the HCM 2000 method LOS D condition in all scenarios from Year 2018 up to the Year 2035, with the exception of the intersection of Sonoma Blvd. at Couch St. during the Year 2035 pm peak hour. LOS E was the result without the project, and LOS F with the project. The simple mitigation for this condition was to add more signal time to the southbound approach (90 second "natural" signal cycle changed to 100 seconds, with 10 additional seconds added to SB approach).

Intersections exceeding the City's Threshold of Significant Impact. There were five (5) intersections that exceeded the City's criteria/threshold for significant impacts when the project traffic was added in. As a result, mitigation measures were explored to mitigate these intersections to acceptable conditions. The details of these mitigations are discussed in Section 3.9 of this report, Needed Mitigations. In short, the following intersections required mitigation with the addition of the project traffic:

- Int. #1: Nebraska St. at Broadway St., Mitigation: WBR added.
- Int. #2: Nebraska St. at Sonoma Blvd., Mitigation: WBR added.
- Int. #3: Couch St. at Sonoma Blvd., Mitigation: Signal Timing increase for SB approach.
- Int. #7: Redwood St. at Broadway St., Mitigation: WBL, EBR added.
- Int. #10: Valle Vista Ave. at Broadway St., Mitigation: Signal Timing increase for EB approach.

In addition, there are some left turn pocket queue overages for street segment considerations which have specific mitigations proposed in section 4 and 5 of this report.

1.0 INTRODUCTION

PRISM Engineering was retained as a *sub consultant* to Placeworks (currently under contract with the City of Vallejo), to prepare a traffic study for the proposed Caliber Charter School project in Vallejo, CA. The proposed charter school site is to be constructed on a four (4) acre site bounded by Valle Vista on the north, Napa Street on the west, and Oregon Avenue on the south.

Figure 1.1 Project Site Location and Study Intersections

The school will consist of ultimately 900 elementary school students and 400 high school students. Figure 1.1 shows the location of the project site in relation to the surround street system and 11 study intersections.

This traffic study scope and methodology was prepared based on discussions with City of Vallejo staff. This study closely follows the methodology and procedures outlined in the *City of Vallejo Public Works Department Traffic Impact Analysis/Study Guidelines* (TIA/SG). This study addresses the traffic and transportation effects of the proposed project in order to assist the project sponsor and the city in project planning and determining conditions of approval for the project.

2.0. Analysis Methodology

2.1. Development Conditions

The traffic study was based on the following development conditions:

- Existing (2015) conditions unmitigated (identify any existing deficiencies) – Based on current traffic counts in late 2015 and existing roadway geometry and traffic control.

- Project Opening Year (2018) Near-Term Base Traffic Condition (includes Post Office), unmitigated – Based on anticipated growth in baseline traffic volumes related to traffic added by approved and pending (but not yet completed) developments likely to occur at the time the project is constructed by the end of 2014. In addition, the adjacent post office project traffic was added in.

- Project Opening Year (2018) Base plus Other Projects (includes Post Office) plus Phase 1 Project Traffic Condition with Mitigation, if necessary

- Future Buildout Year Cumulative Long-Term (2040) Conditions, unmitigated – Based on 2040 future year traffic forecasts from the Solano Transportation Authority (STA) Travel Demand Forecast model. Future year will correspond with approximate buildout of City's General Plan. Future Buildout Year Cumulative Long-Term (2040) Conditions plus Phase 1 and Phase 2 of Project, unmitigated – Based on 2040 future year traffic forecasts from the Solano Transportation Authority (STA) Travel Demand Forecast model. Future year will correspond with approximate buildout of City's General Plan.

- Future Buildout Year Cumulative Long-Term (2040) Conditions, with Mitigation – Based on 2040 future year traffic forecasts from the Solano Transportation Authority (STA) Travel Demand Forecast model plus Phase 1 and 2 of project. Future year will correspond with approximate buildout of City's General Plan.

2.2. Operating Conditions and Criteria for Intersections

Analysis of significant environmental impacts at intersections is based on the concept of Level of Service (LOS). The LOS of an intersection is a qualitative measure used to describe operational conditions, and ranges from LOS A (best, minimal delay), to LOS F (worst, heavy delays) where the intersection is operating at or near its functional capacity. Levels of Service for this study were determined using the *Highway Capacity Manual, 2000* (HCM) methodologies which are implements in the *SynchroPro* (Version 9) traffic analysis software.[1] Table 2.1 relates the operational characteristics associated with each LOS category for signalized and unsignalized intersections.

Table 2.1 – Intersection Level of Service Definitions

Level of Service	Description	Avg. delay per vehicle, sec/veh	
		Signalized	Un-Signalized
A	Free flow with no delays. Users are virtually unaffected by others in the traffic stream	≤ 10	≤ 10
B	Stable traffic. Traffic flows smoothly with few delays.	> 10 – 20	> 10 – 15
C	Stable flow but the operation of individual users becomes affected by other vehicles. Modest delays.	> 20 – 35	> 15 – 25
D	Approaching unstable flow. Operation of individual users becomes significantly affected by other vehicles. Delays may be more than one cycle during peak hours.	> 35 – 55	> 25 – 35
E	Unstable flow with operating conditions at or near the capacity level. Long delays and vehicle queuing.	> 55 – 80	> 35 – 50
F	Forced or breakdown flow that causes reduced capacity. Stop and go traffic conditions. Excessive long delays and vehicle queuing.	> 80	> 50

Sources: Transportation Research Board, *Highway Capacity Manual 2000*, National Research Council, 2000.

PRISM Engineering obtained the existing intersection approach peak hour factors, signal phase configurations, etc. in the field during the data collection task for 11 study intersections in the City of Vallejo. We used this information in the analysis.

The HCM includes procedures for analyzing side-street stop controlled (SSSC), all-way stop-controlled (AWSC), and signalized intersections. The SSSC procedure defines LOS as a function

[1] The HCM 2000 methodology was used in this study because of backwards compatibility with intersection capacity analysis software in use today. Although a newer version of the Highway Capacity Manual was published in 2010; most traffic analysis software vendors including SynchroPro still include the analysis of U-Turns, shared lanes, unsignalized, etc. which cannot be analyzed in the 2010 methodology (errors occur). The 2010 method only works under very limited circumstances in SynchroPro 9, and was not used in this study. Therefore, Synchro 9 using the HCM 2000 setting was used for analysis.

of average control delay for each minor street approach movement. Conversely, the AWSC and signalized intersection procedures define LOS as a function of average control delay for the intersection as a whole. For SSSC intersections, level of service is report for the worst approach as well as for the intersection as a whole.

2.3. Thresholds of Significance

Mitigation measures are required for intersections that show a significant project impact per Table 2.2, and operate at LOS D or worse under near term plus project and long term plus project conditions. LOS with mitigations must be improved to LOS D or better.[2]

Table 2.2 – Volume-to-Capacity (V/C) thresholds for project impacts

LOS without project	Increase in V/C with project
C	> 0.04
D	> 0.02
E or F	> 0.01
Source: City of Vallejo Traffic Impact Analysis/Study Guidelines, 2008.	

Per the City of Vallejo Traffic Impact/Analysis Study Guidelines, significant impacts for City controlled intersections are created when traffic from the proposed project results in an increase in Volume-to-Capacity (V/C) of more than the allowable thresholds. For SSSC intersections, impacts were based on the V/C for the intersection as a whole, not for the worst approach. The V/C ratio represents the ratio of demand flow rate (volume) to capacity. A V/C over 1.00 is equivalent to LOS F and represents oversaturated conditions. Conversely, a V/C below 0.6 is equivalent to LOS A.

It is important to note that intersection LOS is based on delay as presented in Table 2.1. The V/C values presented at City intersections are for determination of significant impacts. Table 2.2 presents the V/C thresholds for significant impact as defined in the City's guidelines.

The effects of vehicle queuing were also analyzed and the 95th percentile queue is reported for all study intersections. The 95th percentile queue length represents a condition where 95 percent of the time during the peak period, traffic volumes and related queuing will be at, or less, than the queue length determined by the analysis. This is referred to as the "95th percentile queue." Average queuing is generally less. Queuing is considered a potentially significant impact since queues that exceed turn pocket length can create potentially hazardous conditions by blocking or disrupting through traffic in adjacent travel lanes. However, these potentially hazardous queues are typically associated with left-turn movements. Locations where the right

[2] City of Vallejo Traffic Impact Analysis/Study Guidelines.

turn pocket storage is exceeded is not considered potentially hazardous because the right turn movement will go at the same time as the through movement and the additional vehicles that spill out over the turn pocket will not be hindering or disrupting the adjacent through traffic as would be the case in most left turn pockets.[3] Thus, for purposes of this analysis, a queuing impact is considered to occur under conditions where project traffic causes the queue in a left turn pocket to extend beyond the turn pocket by 25 feet or more (i.e., the length of one vehicle) into adjacent traffic lanes that operate (i.e., move) separately from the left turn lane. Where the vehicle queue already exceeds that turn pocket length under pre-project conditions, a project impact would occur if project traffic lengthens the queue by 25 feet or more.

2.4. Study Intersections Included in Analysis

The proposed project will generate new vehicular trips that will increase traffic volumes on the nearby street network. To assess changes in traffic conditions associated with the project, the following intersections, illustrated in Figure 1, were selected in coordination with the City of Vallejo for evaluation in this traffic study:

1. Broadway St. at Nebraska St.
2. Sonoma Blvd. at Nebraska St.
3. Sonoma Boulevard and Couch Street
4. Sonoma Blvd. at Valle Vista Ave.
5. Redwood Street and Sonoma Boulevard
6. Redwood Street and Couch Street
7. Broadway St. at Redwood St.
8. Couch St. at Valle Vista Ave.
9. Napa St. at Valle Vista Ave.
10. Broadway St. at Valle Vista
11. Broadway St. at Oregon St.

In addition, the City has identified three street segment locations as needing analysis and assessment in the traffic study:

1. Napa St. (Valle Vista Ave. to Oregon St.)
2. Oregon St. (Napa St. to Broadway St.)
3. Valle Vista Ave. (Sonoma Blvd. to North Camino Alto)

These roadways will be studied in terms of traffic operations and queue lengths, etc.

[3] If a left turn movement operates (i.e. moves) at the same time as the through movement such as with split signal phasing, then a left turn queue that exceeds the turn storage is not considered an impact.

3.0 DOCUMENTATION OF ANALYSIS and FINDINGS

In this section, the existing conditions of the project study area intersections and roadways are documented in terms of roadway descriptions, and intersection capacity level of service analyses.

3.1 Existing Street Network and Transportation Systems

Existing Project Site Uses

The proposed charter school project will be constructed on a lot 4 acres in size and bounded by Valle Vista Avenue on the north, Napa Street on the west, and Oregon Avenue on the south. The east side is adjacent to another lot. The site has some existing abandoned use and will be complete redeveloped into a charter school campus for elementary and high school students.

Existing Roadway Network

Below is a description of the principal roadways included in this study.

Sonoma Boulevard (SR 29)

In the study area, Sonoma Blvd is a north south four lane arterial with left turn bays at signalized intersections south of Couch St., but then is a divided arterial with a large 26' partially landscaped median which allows for dual left turn bays at signalized intersections. This arterial is in a commercial district, but the speed limit is posted at 30 mph near Nebraska Street. The speed limit on this state highway is set at 40 mph just north of Sereno Drive in both the northbound and southbound directions. All major intersections are signalized along this corridor.

Broadway Street (Lincoln Highway)

Broadway Street is a north-south four lane arterial roadway in the study area with left turn bays at signalized intersections. At unsignalized intersections there are no left turn bays, but because the road width is generally the same, in these locations there is also on-street parking. This road is posted at 35 mph north of Nebraska and 30 mph to the south. This roadway's T-intersection with Oregon Avenue near the project site is unsignalized, does not have a left turn bay on Broadway St., and has stop sign control for Oregon Ave. traffic. All major intersections along this corridor are signalized control.

Redwood Street-Redwood Parkway

Redwood Street is an east-west arterial roadway connecting Sacramento Street to the west and the I-80 Interchange to the east and Columbus Parkway to the east. East of I80, it becomes Redwood Parkway and serves numerous residential neighborhoods in eastern Vallejo. Redwood Street is a 4 lane undivided roadway with a posted speed limit of 35 mph. Redwood Parkway is a 4 lane divided roadway with a posted speed limit of 30 mph.

Couch Street

Couch Street is a north-south four lane arterial roadway connecting with Sonoma Blvd on the south end and Broadway Street on the north end. In some segments it has a two-way left turn lane in the median area, with some left turn bays in others. Much of the centerline striping is also dual yellow no passing. The speed limit is set at 30 mph north of Sonoma Blvd.

Valle Vista Avenue

Valle Vista Ave. varies in width, but generally is a two lane east-west collector level roadway connecting to Sacramento Street on its west end and Tuolumne Street on its east end. To the west of Couch Street, it is a residential street with houses fronting on at least one side, but continually on both sides east of Broadway to Tuolumne. The speed limit is posted at 25 mph west of Broadway.

> **Roadway Analysis**: LOS B. *Current volumes on this street from Sonoma Blvd. to North Camino Alto during the am or pm peak hour do not create any queue lengths that overrun existing turn pockets or lanes. Level of service is generally LOS B or better conditions, since LOS B exists at Sonoma Blvd, and at Couch Street, and at Broadway Street.*

Napa Street

Napa Street is a north-south collector road that connects Valle Vista Ave. on the north with Oregon St. on the south. Napa St. connects to Oregon St. at a right angle and is a continuous roadway. Napa Street NB approach is stop controlled at its intersection with Valle Vista Ave. There is perpendicular and angled parking on both sides of the street where there are not driveways present. The street width is 60 feet from curb to curb, with one lane of travel in each direction. Speed limits are not posted on this street.

> **Roadway Analysis**: LOS A. *Current volumes on this street from Valle Vista Ave. to Oregon Street during the am or pm peak hour do not create any queue lengths that overrun existing turn pockets or lanes. Level of service is LOS A conditions throughout this street, since LOS A exists at Valle Vista (with LOS B for the NB stop sign), and LOS A exists at Oregon Street (which is currently an uncontrolled right angle intersection, a continuous connection).*

Oregon Avenue

Oregon Street is an east-west collector road that connects Napa St. on the west end with Broadway St. on the east end. Oregon St. connects to Napa St. at a right angle and is a continuous roadway. There is perpendicular and angled parking on both sides of the street where there are not driveways present. The street width is 60 feet from curb to curb, with one lane of travel in each direction. Oregon St. EB approach is stop controlled at its intersection with Broadway St. Speed limits are not posted on this street.

Roadway Analysis: LOS A. *Current volumes on this street from Napa Street to Broadway Street during the am or pm peak hour do not create any significant queue lengths at the stop controlled intersection approach at Broadway Street. Level of service is LOS A conditions throughout this street, since LOS A exists at Broadway Street (with LOS B for the EB stop sign), and LOS A exists at Napa Street (which is currently an uncontrolled right angle intersection, a continuous connection).*

Nebraska Street

Nebraska Street is an east-west collector level two lane roadway generally with a 36-foot curb to curb width. It connects to Sacramento Street on its west end and Slate St. on its east end. For the majority of its length it is a residential street with housing frontage on both sides of the road. It is classified as a residential district for prima facie speed limit purposes and is posted at 25 mph with regulatory signage.

Existing Transit Facilities

The charter school project site is served by transit service which passes along its north border on Valle Vista Avenue. Solano County Transit (SolTrans) provides bus service throughout the City, but Line 1 travels primarily north and south along Broadway Street and Sonoma Blvd. with the mid portion of the route traveling east-west on Valle Vista Avenue adjacent to the project site. Line 1 travels to and from the Vallejo Transit Center (VTC) where numerous transfers to other locations throughout the City can take place (1.8 miles away), and the Serrano Transit Center which is located approximately ¾ mile to the north from the project site. Figure 3.1 shows the location of the project SCHOOL site in relation to the transit network in the City.

Existing Bicycle and Pedestrian Facilities

Sidewalks currently provide walking facilities between the proposed charter school project site to nearby transit stops, and the adjacent residential and commercial land uses. These sidewalks also connect to the existing Sereno Transit Center at about 3,500 feet to the north of the school on Sereno Drive via Couch Street, however, one portion of Couch Street does not have sidewalks, but has a dirt shoulder upon which pedestrians can walk.

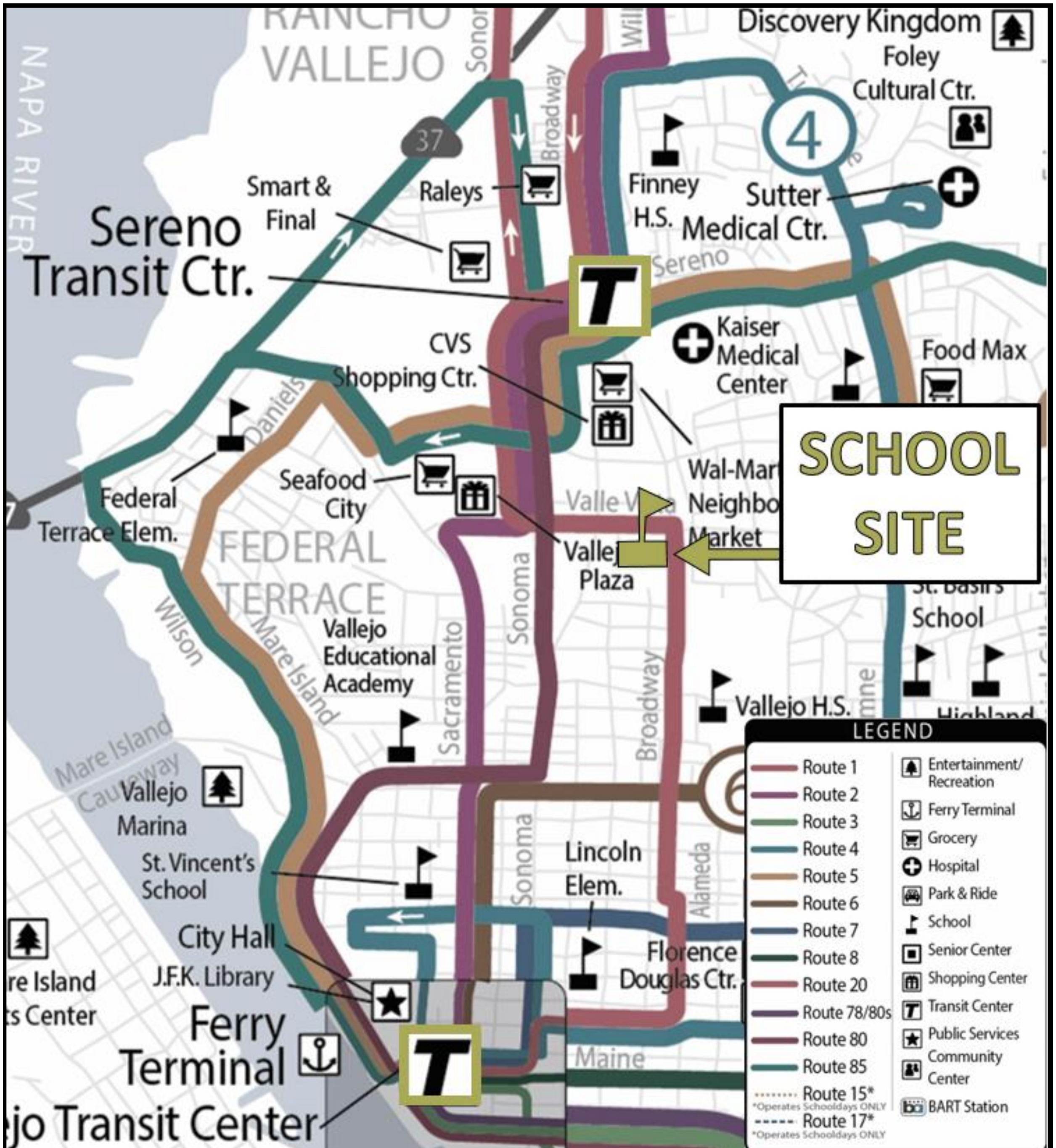


Figure 3.1 –Transit Lines and Centers in Relation to Project School Site

Source: SOLTRANS and PRISM Engineering

There are no bike lanes in the immediate vicinity of the school site (over a mile away to the nearest dedicated bike lane). Bike lanes can provide safe travel for cyclists who must share the roadway with motor vehicles. The challenge for the existing roadways in the vicinity of the project site is roadway width especially on Broadway Street or Sonoma Blvd. Within the project's vicinity, there is a designated Bike Route with signage along Valle Vista Avenue from Sacramento Street on the west to Tuolumne Street on the east end. However, there are no bike lanes striped on this road, no physical space dedicated for bike travel as there is not enough room. In such a case, cyclists must share the road's outer-most travel lane, and even when such a lane may be designated as Class III bike route, the speeds on roads such as Broadway Street and Sonoma Blvd. make it undesirable from a safety standpoint to ever see a Class III Bike Route installed.

A better idea would be to modify the lane striping to accommodate dedicated bike lanes (road diet). Bike Route signs are installed on Valle Vista Avenue, a two lane residential collector road with slower speeds (25 mph posted). Other "bicycle friendly" routes are located about a mile to the south of Valle Vista Avenue which include Tennessee Street and Louisiana Street. These are also east-west roadways, Tennessee being a four lane facility and Louisiana being a two lane collector. These roads do not have dedicated lane striping for bike lanes. They do feed potential bike traffic westerly into Mare Island Way which is a two lane arterial to the north of Hickborn Street, and four lanes to the south. Mare Island Way is a bike friendly facility, generally about 1 mile to the west of Napa Street and accessible via Valle Vista Avenue to Sacramento Street (which also has dedicated bike lane striping about 1/3 of a mile to the north of Valle Vista Ave.). Mare Island has dedicated striped bike lanes on each side of the road from Florida Street on the south to where it transitions into Sacramento Street on the north end. This north-south bike lane route is not proximate to the Charter School proposed site, and is about 1.5 miles to the west of the school site. There are no existing north to south roadways with bike lanes or bike routes that could serve the school site. On Sonoma Blvd. and Broadway Street (four lane arterial roadways) the outer-most lane is at the edge of gutter/curb, leaving no room for a striped bike lane. Cyclists would have to share the lane with motor vehicles, and the speeds on these roads are high enough to make this an unsafe condition for a cyclist.

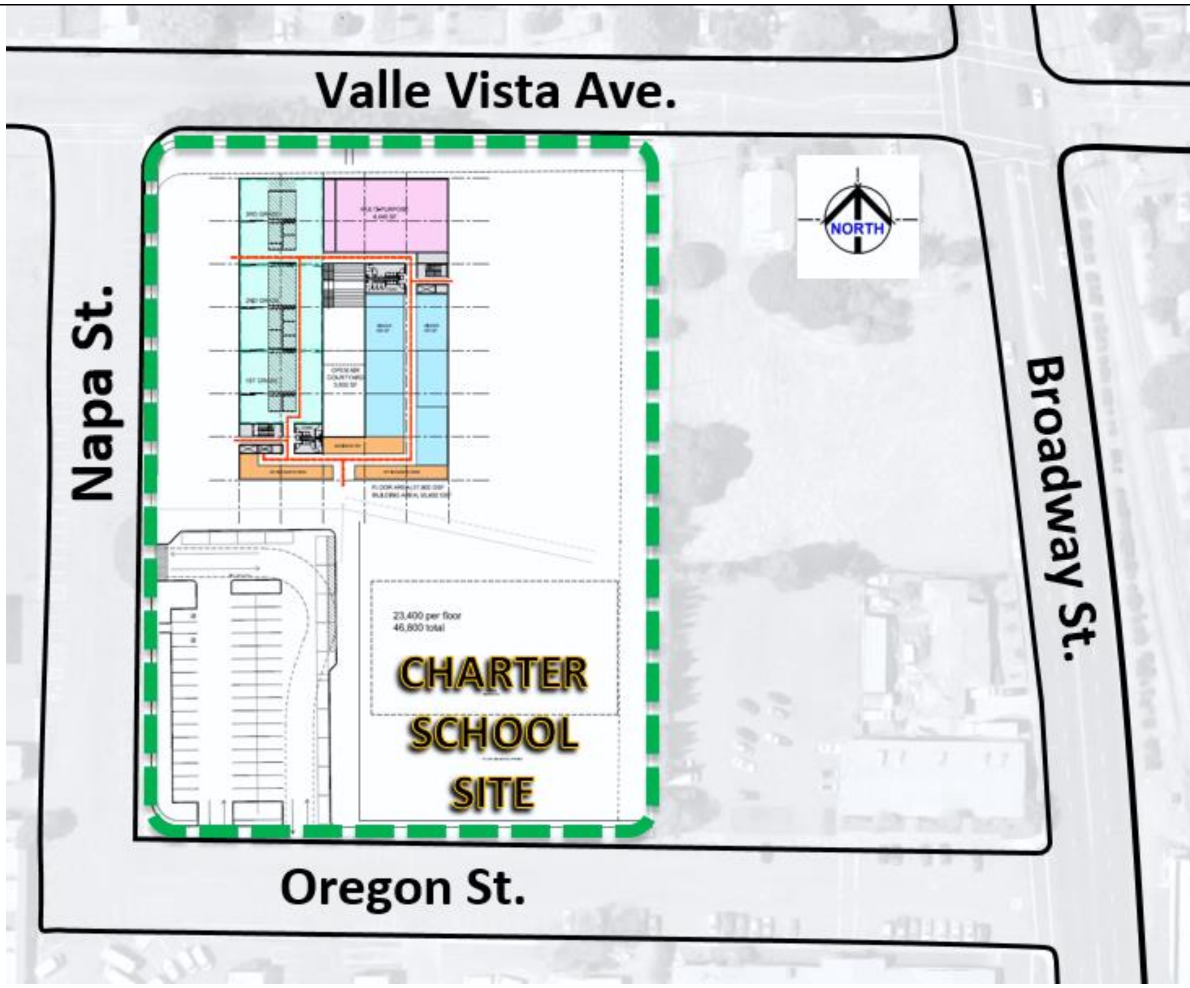
Sidewalks for pedestrians exist on both sides of all study streets and intersections, with the exception of the north side of Oregon Street at its west end where it connects with Napa Street having about 360 feet of curb only mixed with a long driveway opening currently used as parking spaces, but no sidewalk exists. All other study roads have complete sidewalks or a pedestrian walkable path or area safely off the traveled way of vehicles.

Existing Site Access

Access to the project site is proposed from Napa Street and Oregon Avenue which front the project site. No access is proposed from Valle Vista Avenue on the north side. The proposed project site plan is shown in Figure 3.2 which shows proposed access to Napa Street and Oregon Street and an out of the proposed parking lot location on the southwest corner of the project site. The parking lot area is where school drop-off lanes will take place. The site plan shows a designated curb for student drop off along the driveway that enters from Oregon Street.

Existing (2015) Lane Configurations, Traffic Control, and Peak Hour Turning Movement Volumes

Existing intersection lane configurations, traffic controls, and weekday intersection turning movement volumes are illustrated in Figures 3.3 and 3.4 for the AM Peak Hour and PM Peak Hour, respectively.



Source: Caliber Charter School and PRISM Engineering

Figure 3.2 –Caliber Charter School Site Plan

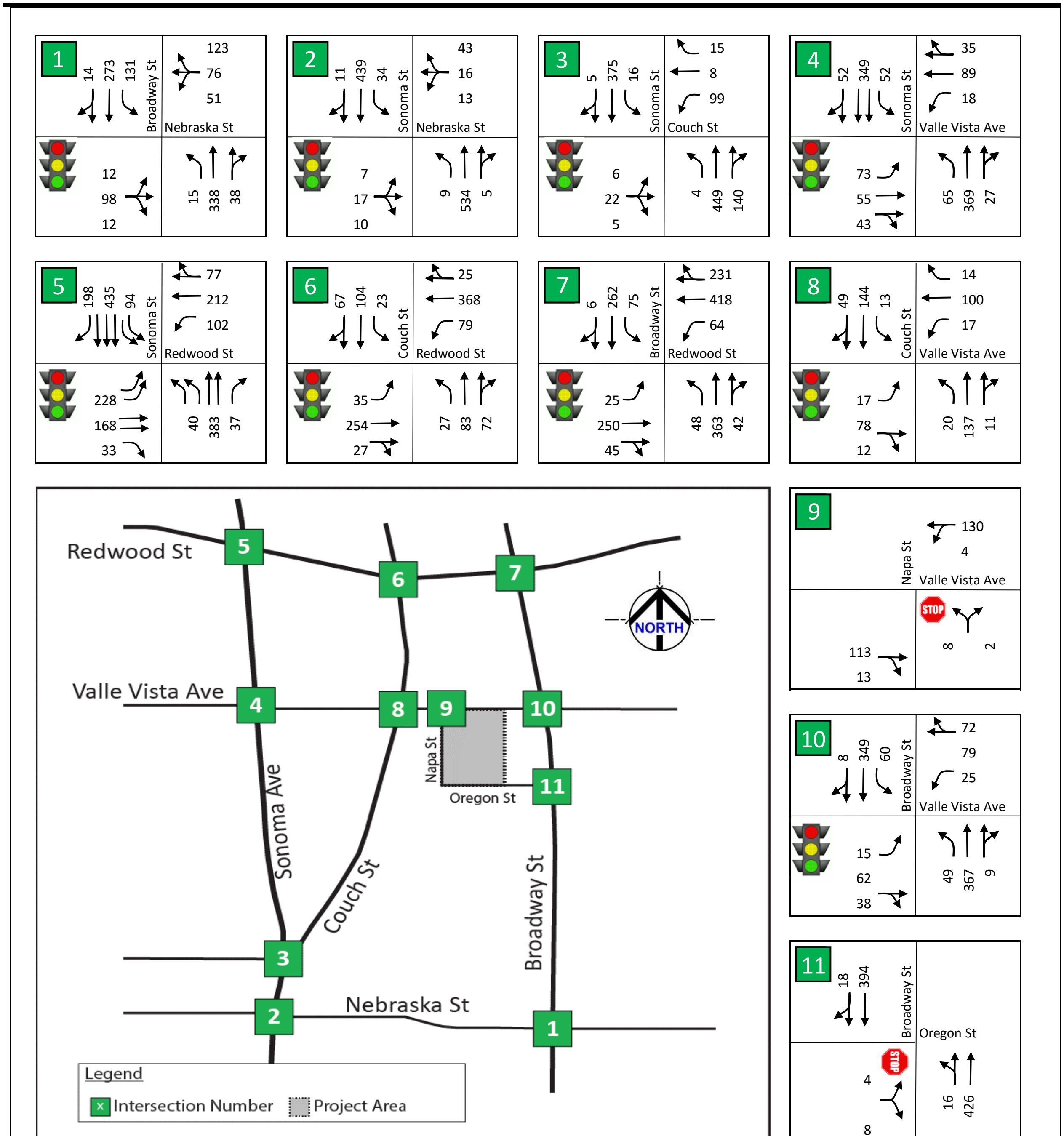


Figure 3.3 –Year 2015 AM Peak Hour Turning Movements, Existing Lanes

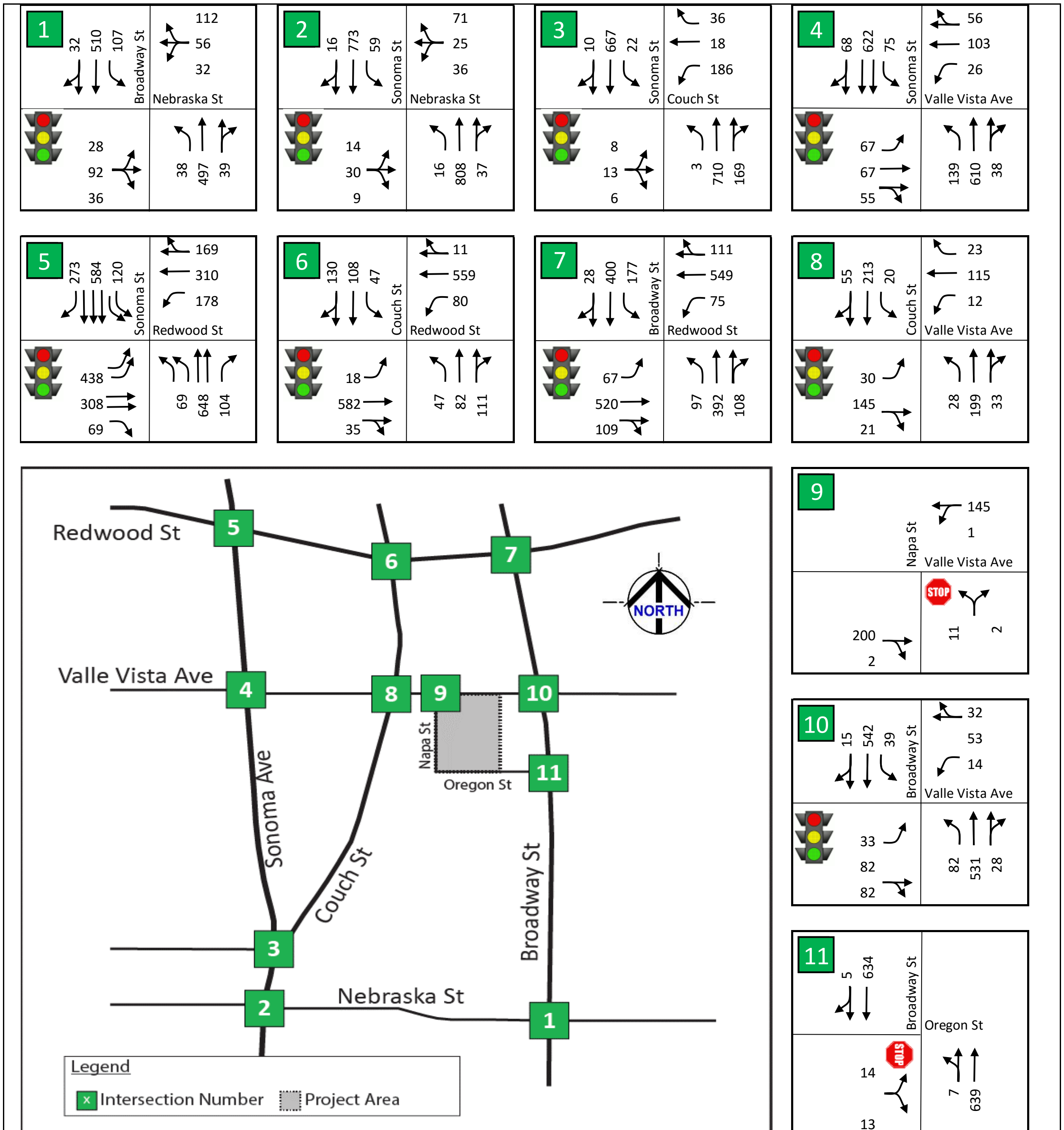


Figure 3.4–Year 2015 PM Peak Hour Turning Movements, Existing Lanes

Existing (2015) Levels of Service at Study Intersections

Traffic operations were evaluated at the study intersections under existing traffic conditions. The HCM methodology contained in SynchroPro was used for both signalized and unsignalized SSSC[4] conditions. Results of the analysis for the existing Year 2015 am and pm peak hour conditions are presented in Table 3.1. As shown in Table 3.1, all intersections operate at acceptable LOS C or better conditions during the AM and PM peak hours. Detailed capacity analysis worksheets are provided in the Appendix.

Table 3.1 – Existing (2015) Levels of Service Summary

		Type of	LOS	EXISTING YEAR 2015*					
				AM Peak Hour			PM Peak Hour		
	INTERSECTION LOCATION	Control	Target	LOS	Delay	V/C[1]	LOS	Delay	V/C[1]
1	**Nebraska St. and Broadway St.**	Signal	D	C	21.2	0.40	C	21.0	0.43
2	**Nebraska St. and Sonoma Blvd.**	Signal	D	B	18.0	0.30	C	20.1	0.51
3	**Couch St. and Sonoma Blvd.**	Signal	D	B	16.0	0.32	B	13.2	0.52
4	**Valle Vista St. and Sonoma Blvd.**	Signal	D	B	16.6	0.33	B	19.3	0.47
5	**Redwood St. and Sonoma Blvd.**	Signal	D	C	24.5	0.36	C	28.0	0.61
6	**Redwood St. and Couch St.**	Signal	D	B	15.4	0.24	B	15.7	0.35
7	**Redwood St. and Broadway St.**	Signal	D	C	23.9	0.47	C	29.3	0.65
8	**Valle Vista Ave. and Couch St.**	Signal	D	A	7.6	0.13	A	9.5	0.20
9	**Valle Vista Ave. and Napa St.**	*SSSC*	D	*A*	*0.5*	N/A	*A*	*0.4*	N/A
		NB Stop	D	*A*	*9.9*	N/A	*B*	*10.6*	N/A
10	**Valle Vista Ave. and Broadway St.**	Signal	D	B	18.4	0.28	B	15.4	0.37
11	**Oregon St. and Broadway St.**	*SSSC*	D	*A*	*6.7*	N/A	*A*	*0.3*	N/A
		EB Stop	D	*B*	*14.4*	N/A	*B*	*14.0*	N/A

**Note: AM and PM Peak Hour turning movement counts taken by Traffic Works, Thursday, November 19, 2015*
SSSC= Side Street Stop Control where side street only has a stop sign.
Source: PRISM Engineering and HCM calculation in SynchroPro

[4] SSSC = Side Street Stop Control, where only one approach of the intersection is stop controlled in a T-intersection. Such is the case in this study at intersections #9 at Napa Street and #11 at Oregon Street where the side street has a stop sign control, and the main street is free-flow uncontrolled traffic. This usually results in high delays for the side street traffic if traffic volumes are high. However, in this study the side street level of service is LOS B or better conditions both in am and pm peak hours.

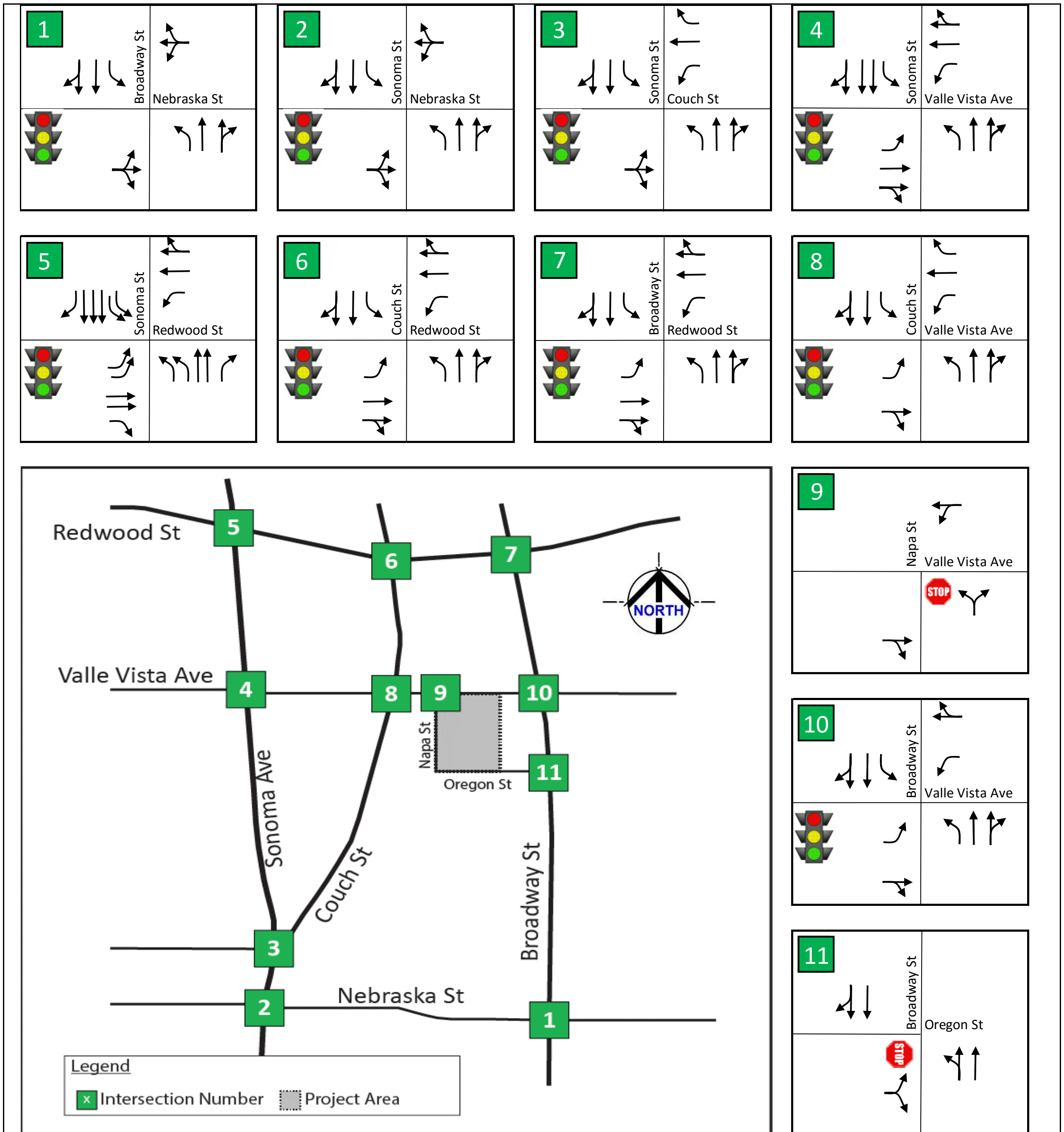


Figure 3.5 – Existing Lane Configurations and Traffic Control

Source: PRISM Engineering

Traffic signals in the study area are located at all study intersections with the exception of Valle Vista Avenue at Napa Street, and Broadway Street at Oregon Street. These two study locations have one approach with stop sign control as shown in these figures.

Weekday intersection turning movement volumes were collected at project study area intersections on November 19, 2015. Intersection turning movement volumes were collected by video during the AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak periods. Weekday counts were collected when local schools were in session and outside of holiday periods. Weekday AM and PM peak hour volumes are shown. Traffic volume data sheets are shown in the Appendix.

The study intersection geometry and traffic control shown for existing conditions is shown in Figure 3.5, and would likely remain the same into the future unless specific developments require different traffic control. Current existing levels of service in the study area as shown in Table 3.1 range from LOS A to LOS C conditions for the am peak hour or the pm peak hour. This indicates that traffic is in a free flow and mostly delay-free condition throughout the study area.

3.2. Near Term Future Year 2018 Conditions

Nearby Roadway and Development Projects

According to the City of Vallejo[5], there are no planned roadway improvements within the study area that are anticipated to be in place prior to or at the same time as the completion of the proposed project in 2018 or beyond.

Approved/Pending Development Projects in Project Vicinity

The City of Vallejo has indicated that there is a new Federal Post Office project planned and construction will be soon underway in the immediate vicinity and adjacent to the charter school project site. Napa Street will be shared by these two developments, the post office on the west and the school on the east side. The City has indicated that the post office traffic impacts need to be included in the background traffic of the traffic analysis. The post office traffic was added together with other background growth calculated from the Solano Transportation Authority (STA) Model growth projections and applied to existing turning movement volumes for both the am and pm peak hours.

The post office site will be bounded by Valle Vista Avenue on the north, Couch Street on the west, and Napa Street on the east as shown in Figure 3.6. Note that in the figure, Napa Street is a north-south collector street, and is the same street that the proposed Charter School will also have access to.

[5] Per email conversation with David Yatabe, City of Vallejo Consultant Traffic Engineer, January 8, 2015.

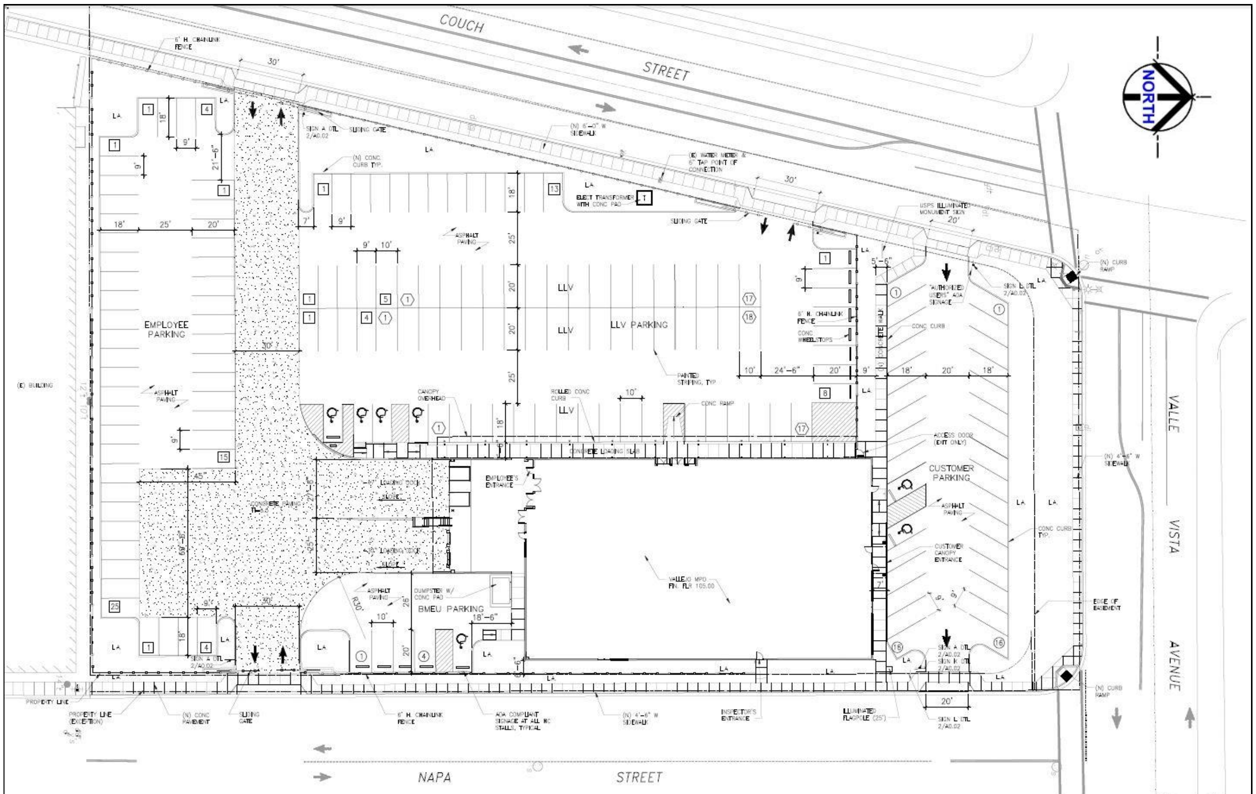


Figure 3.6 – Post Office Site Plan

Source: City of Vallejo, Federal Government US Postal Service

The post office architectural site plan provided to PRISM Engineering by the City of Vallejo Planning Department includes parking summary parameters about the post office that help to determine peak hour trip generation for the site. The site plan shows a total of 171 parking spaces, with 82 allocated for employees, 37 for customers, and 52 for long life vehicles. The location of the parking spaces helped to determine where traffic would enter and leave the site. The square footage of the main building is 16,500 SQFT. This known value of planned building square footage was used to determine the trip generation of the post office project for the am and pm peak hour time periods. Table 3.2 summarizes the trip generation rates and trip totals for the daily, am peak, and pm peak hour time periods, based on the square footage of the proposed building (16.5 KSF).

Table 3.2 - Post Office Project Trip Generation

		ITE	Trip Rate				Vehicle Trips		
Time Period	**Land Use**	**Code**	**Inbound**	**Outbound**	**Total**	**Quantity**	**Inbound**	**Outbound**	**Total**
Daily	Post Office	**732**	54.10	54.10	**108.19**	16.5 KSF	893	893	1785
AM Peak	Post Office	**732**	4.28	3.95	**8.23**	16.5 KSF	71	65	136
PM Peak	Post Office	**732**	5.72	5.50	**11.22**	16.5 KSF	94	91	185

Source: ITE Trip Generation Manual, and PRISM Engineering

The am peak hour ITE trip generation rate for post office is 8.23 trips/KSF and the pm peak hour rate is 11.22 trips/KSF. This information was used to calculate the amount of traffic that could be expected from the post office onto the adjacent street system. In addition to this post office project schedule to potentially be built and have traffic on the road system in approximately a year, there will also be other background growth in traffic that will increase existing traffic volumes along local streets in the project vicinity. This is due to projects that are in various stages of planning, approval, or development within other parts of the City of Vallejo and surrounding areas. This background growth is calculated from growth rates and applied to existing traffic volumes to represent existing and future projects underway or that are in the foreseeable future.

Calculation of Future Growth for Background Traffic.

PRISM Engineering obtained detailed output plots from the Solano Transportation Authority (STA) staff[6] from their Travel Demand Forecast Model. The model anticipates future development within the City of Vallejo and remaining areas of Solano County. We obtained model plots for the am and pm peak hour time periods, for the Year 2010 and the Year 2040 projections. We also obtained forecast information for larger city streets, as well as separate plots for freeway and state route roadways. The model output was used to develop a conservative growth rate to be used to adjust existing Year 2015 traffic count data to conform to the Year 2016 conditions as well as the Year 2040 conditions.

The volumes for major roads in the model in the vicinity of Vallejo near to the charter school project site, were summated for the year 2010 and year 2040 for am and pm peak hours. Using the two values as endpoints for a straight-line growth projection, an average growth rate was developed for the project area surface streets as well as the local freeways, as shown in Table 3.3. The worst case between freeway growth and local surface street growth was the surface street growth, and was used for this analysis.

Table 3.3 shows examples of how the growth rates were calculated for the pm peak hour surface streets, as well as some sample STA traffic model outputs for the study area. This same method was used for the am peak hour also, as well as for freeway segments. The results are shown in Table 3.3 for all four of these scenarios. Note that these volumes shown in the summary figures 3.3 and 3.4 also include the anticipated new post office projections as defined in Table 3.3.

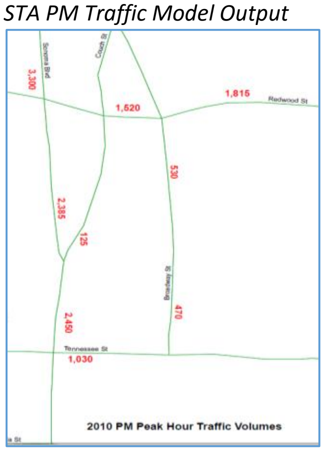
The surface streets in the model had an annual compounded growth rate of 1.15% for the am peak hour in the vicinity of the project site, and 1.00% per year for the pm peak hour time periods. Year 2018 Short Term turning movement volumes were calculated by applying the STA forecast model's calculated am and pm peak hour growth rates for local surface streets to the Year 2015 am and pm turning volumes (Furness adjustment) to reflect three years of background growth.

[6] Model plots received from STA's traffic model consultant Srinath Ravulaparthy on 12/14/2015

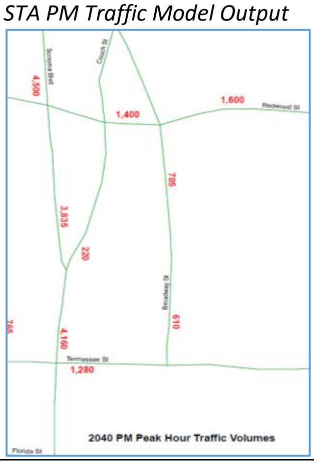
Table 3.3 - Calculation of Growth for Background Traffic using STA Traffic Model

	Local Surface Streets in STA model			Freeway and State Routes in model		
Peak Hour	**Year 2010**	**Year 2040**	**Annual Growth Rate**	**Year 2010**	**Year 2040**	**Annual Growth Rate**
AM	8,350	11,740	**1.15%/year**	49,840	54,850	**0.35%/year**
PM	9,125	12,325	**1.0%/year**	47,900	51,550	**0.25%/year**

STA PM Traffic Model Output



STA PM Traffic Model Output



Sample calculation:

	PM Peak Hour			
	2010	**2040**	**Growth**	
Sonoma North	3300	4500	1.363636	
Broadway	530	785	1.481132	
Tennesee	1030	1280	1.242718	
Sonoma South	2450	4160	1.697959	
Redwood	1815	1600	0.881543	
totals	**9125**	**12325**	**1.35068**	avg
		for	30 years	
1% growth per yea	1.0^30=	1.347849	**<<<use this, governs**	

Source: STA Year 2010 and 2040 Traffic Model output and Growth Calcs for Vallejo, and PRISM Engineering.

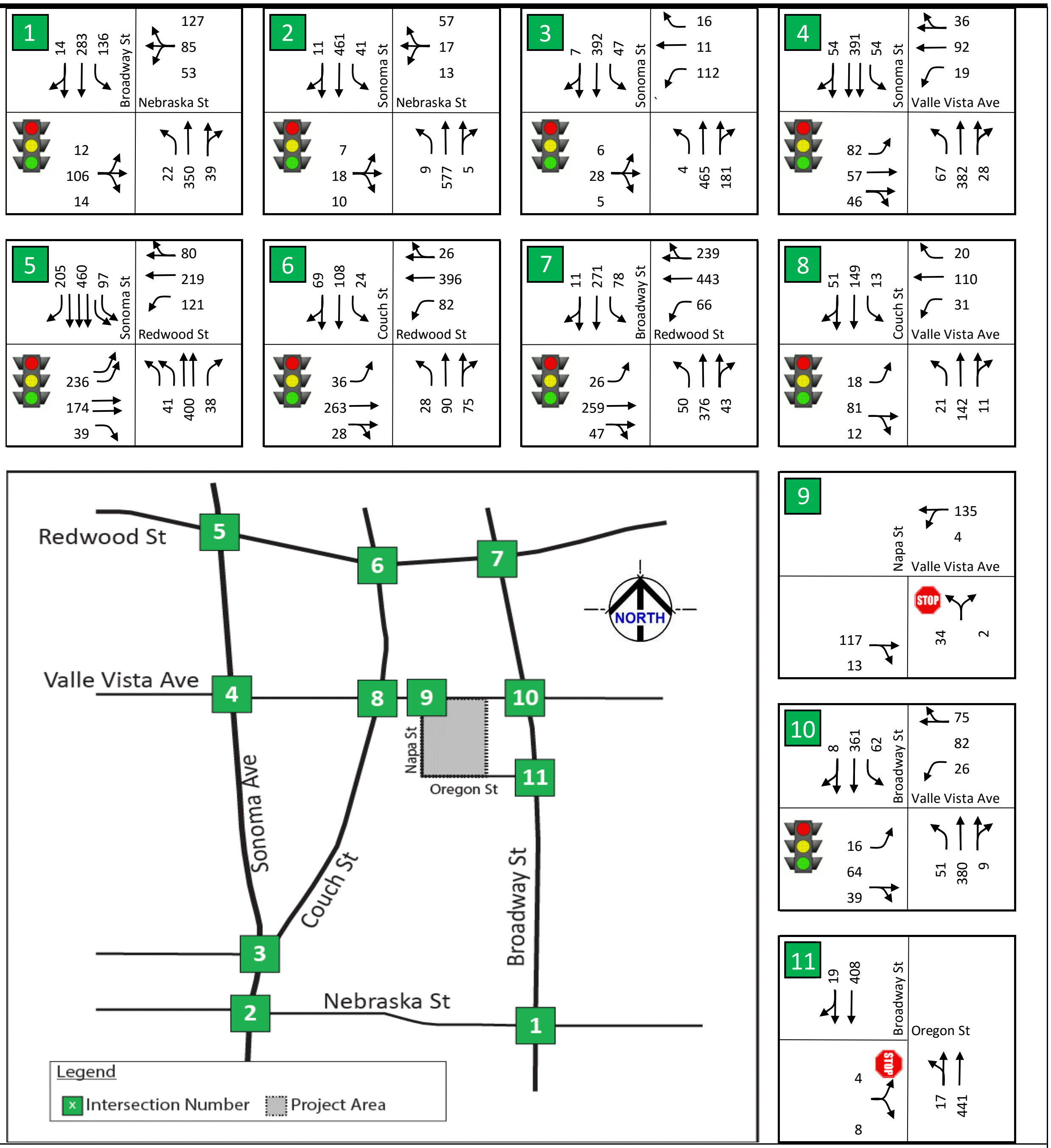


Figure 3.3 – Year 2018 AM Peak Growth Projections (includes post office)

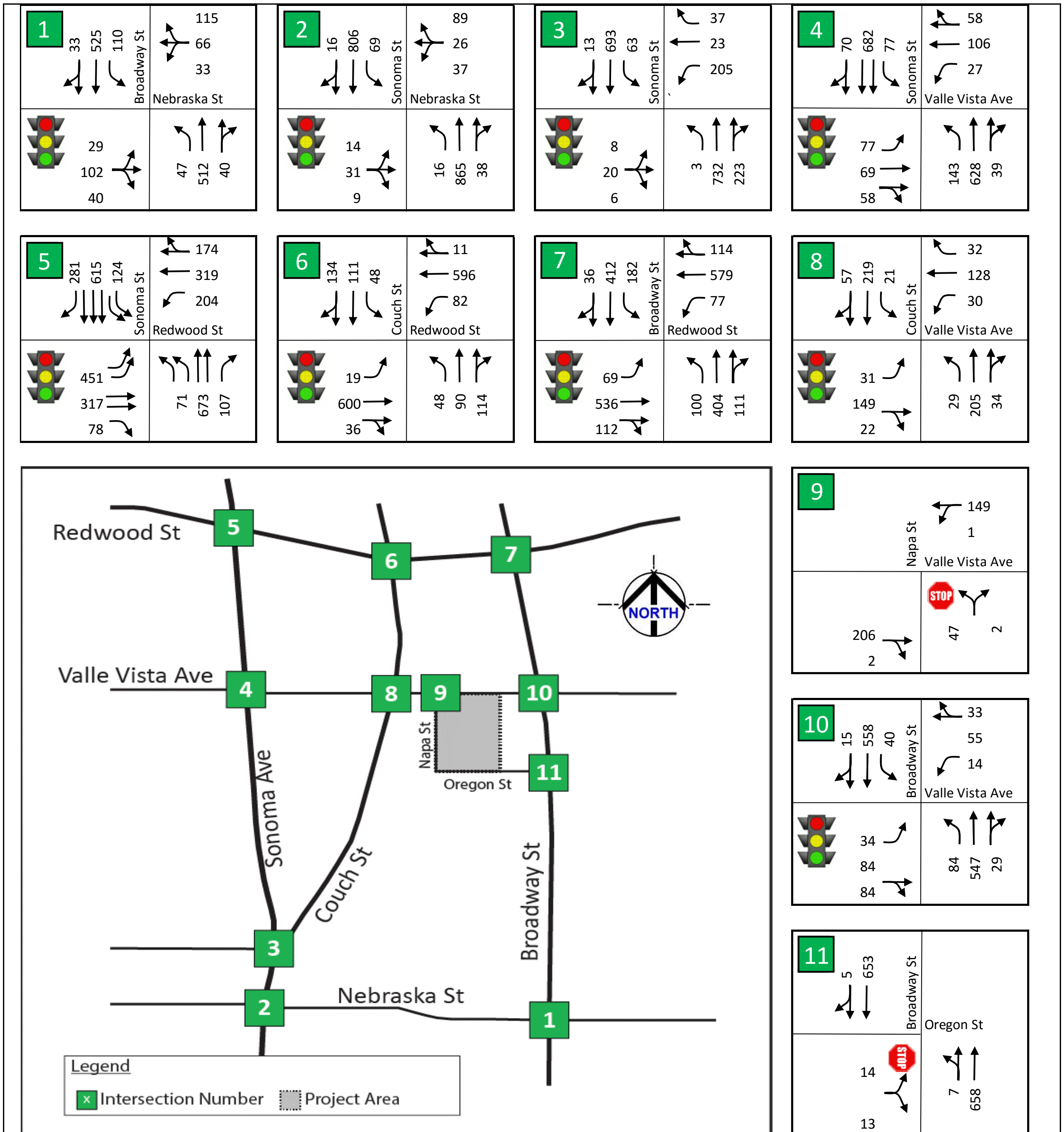


Figure 3.4 – Year 2018 PM Peak Growth Projections (includes post office)

The Year 2035 volumes (20-year window) were calculated using the same methodology. This equates to a three-year growth factor of 1.0349 applied to existing Year 2015 am peak volumes. For the pm peak hour this factor was 1.0303 applied to existing Year 2015 volumes. This does not include the post office traffic, as the post office traffic was added in separately and in addition to the STA growth volumes. The Year 2018 No Project background volumes at the 11 study intersections are shown in Figure 3.3 for weekday AM peak hour, and Figure 3.4 for weekday PM peak hour conditions.

3.3 Proposed Project and Trip Generation

Proposed Site Uses

The project is a charter school to be located on a four-acre parcel bounded by Napa Street on the immediate west, Valley Vista on the immediate north, Oregon Avenue on the immediate south. The school is initially planned to have 900 elementary/middle school students in attendance for Phase 1 by Year 2018, and additional 400 high school age students to join attendance in a Phase 2 around the Year 2020. It was assumed for the purpose of this analysis that the Phase 1 elementary school of 900 students would be fully in attendance by the Year 2018 (worst case), and the Phase 2 High School of 400 students would be complete by Year 2020 (worst case).

Project Trip Generation

Trip generation for development projects is typically calculated based on rates contained in the Institute of Transportation Engineer's publication, *Trip Generation 9th Edition*[7]. *Trip Generation* is a standard reference used by jurisdictions throughout the country for the estimation of trip generation potential of proposed developments. Sometimes a custom trip generation rate is used when trip generation data is not available. In these cases, similar developments are identified and surveyed to see what kind of trip generation takes place. Charter School is not s specific ITE Trip Generation Category. PRISM Engineering conducted some research to see what is being used in California and throughout the United States for trip generation for a Charter School. A repeating pattern was that "Charter Schools" generate traffic very similar to a "Private School" and many traffic studies that had done trip generation surveys for charter schools had identified this similarity in traffic volumes. For this reason, PRISM Engineering utilized the ITE Trip Generation Rate for Private Schools in this study to quantify and predict the future traffic for the Caliber Charter School in Vallejo, as explained in more detail in this section.

PRISM Engineering conducted a conservative analysis using typical industry standards, where the worst-case impacts of traffic on the surrounding street network were calculated for the am and pm peak hour time periods. For schools, the am peak hour is typically more critical than the pm peak. In addition, school traffic typically arrives at a school site at or near the starting time, in a period of time much shorter than one hour. This often creates long traffic queues if not properly managed through effective traffic control or onsite vehicle queue storage.

This project consists of a charter school, and like private and public elementary/middle schools, many if not most of the students will be driven to and from school by a parent or guardian using an automobile. In the case of private schools, a bus system is often not available since it typically involves public funding to have this service. A charter school most closely simulates the traffic and trip generation characteristics of a private school. ITE Trip Generation Rate code 534 was

[7] *Trip Generation, 9th Edition*, Institute of Transportation Engineers, 2012.

used for the project in this study because it closely matches much of the more recent charter school trip generation studies (typically about 1.0 trip ends per student in am peak hour). The much lower ITE Trip Generation Rate code 520 for elementary public schools is based on older and outdated surveys where a higher percentage of school bus ridership used to take place decades ago, as well as higher percentages of children walking and/or riding bikes to school. This has significantly changed in recent years where significantly higher percentages of parents are opting to drive their children to school, and in many cases, the schools are encouraging it for perceived safety reasons. Specific examples of these differences follow in the paragraphs below.

The ITE Trip Generation Rate (national average) for an Elementary School is 0.45 trips per student in the am peak hour. If an elementary school has 1000 students, this would calculate to 450 trip ends, which represents only 225 cars coming to the school, for 1000 students. A trip is defined in *Trip Generation* as a single or one-directional vehicle movement with either the origin or destination at the project site. In other words, a trip can be either "to" or "from" the site. In addition, a single vehicle visit to a site is counted as two trips (i.e., one to and one from the site).

The ITE Trip Rate also shows that in the am peak hour, on the average 55% of these 450 hypothetical trip ends are inbound arriving vehicles (248 cars inbound), and 45% are outbound (202 cars outbound) during that hour. This means that 248-202=46 cars stayed on site (and presumably parked). These are likely school employees and visitors who will stay and not leave right away. It can be assumed that the remainder (202 cars) are primarily parents/guardians who leave right after dropping of the student(s) in the car. The directionality of 55% inbound vehicles and 45% outbound vehicles is the national average and was used for this study. Since this hypothetical example was for a school with 1,000 students, and there were 202 vehicles were outbound during the am peak hour, it can be assumed that this is the typical number of vehicles used to transport students who were driven.

Vehicle Occupancy. Table 3.4 summarizes potential vehicle occupancy information for the Caliber Charter School. The projected vehicle occupancy of the project charter school is estimated to be 1.28 students/car based on actual numbers of students per household[8] (assumed to travel together to school in the same vehicle). 61% of the project's charter school households have only one child in the program. This means that the remaining 39% of the households who drive will be carrying two or more students (with siblings). The Caliber Charter School may have as high as 21% of vehicles carrying two or more students (assuming that there is only one car per household that transports students). The remaining 79% of vehicles will be carrying a single student. *Mode Split: Walk, Bike, Car*. National surveys have shown that less than 13% of K-8 students today walk or bike to school,[9] indicating that most students are being driven to school or are riding a school bus or transit. In 1969, 48% of K-8 students walked or rode a bike to school

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[8] Enrollment Data provided by Caliber Charter School Administration, Rui Bao, 12/18/2015

[9] US DOT / FHA, Center for Urban Transportation Research, Carpooling Without the Car CUTR

when it was presumably safer to do so (crime lower, traffic congestion lower), and where families lived closer to schools.

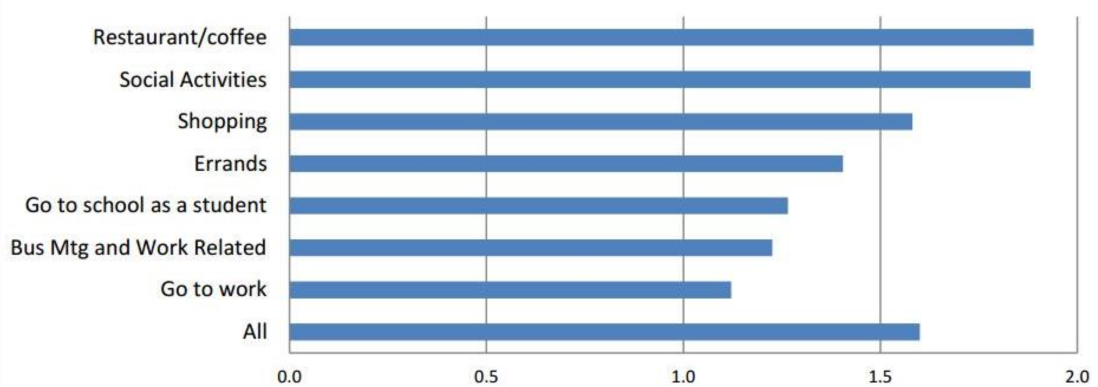
Table 3.4 - Caliber Charter School Vehicle Occupancy Calculation

Category	Households in Category	Occupancy Rate per Car	No. of Cars in Category	No. of Students in Category	% of Students in Category
households with 1 applicant	217	1.0	217	217	61%
households with 2 applicants	49	2.0	49	98	28%
households with 3 applicants	6	3.0	6	18	5%
households with 4 applicants	1	4.0	1	4	1%
households with 5 applicants	2	5.0	2	10	3%
households with 6 applicants	1	6.0	1	6	2%
	276		**276**	**353**	**100%**
353 students / 276 cars =	**1.28**	**= average number of students per car**			

Source: Caliber Charter School and PRISM Engineering

This vehicle occupancy rate for the charter school closely mirrors the National Household Travel Survey of 2009, which was 1.3 students per car traveling to and from schools. Table 3.5 shows the national average vehicle occupancy statistics which includes school/student traffic.

Table 3.5 -Average Vehicle Occupancy by Purpose of Travel, NHTS 2009



	All	Go to work	Bus Mtg and Work Related	Go to school as a student	Errands	Shopping	Social Activities	Restaurant /coffee
Mean Veh Occy	1.6	1.1	1.2	1.3	1.4	1.6	1.9	1.9

Source: NHTS 2009

*Distance to school***.** Up through the 1960s, many schools were located in the center of most communities[10]. On average, 41% of students between kindergarten and 8th grade lived within one mile of school in 1969 (USDOT, 1972) and 88% of students walked or biked to school. In 2009, this has progressively decreased to only 31% of students between kindergarten and 8th grade living within one mile of school, and only 35% walking or riding a bike. This change is due a number of reasons in addition to distance, including traffic congestion, safety, crime, etc.

Today, 69% of students in the USA live more than one mile away from their local school. A similar situation will exist with the Caliber Charter School students, because it is known that approximately 81% will live more than one mile away from the proposed campus (a 12% higher difference in the total). Table 3.6 shows the summary of trip generation for the Caliber Charter School project for the various time periods analyzed in this study. There is currently no specific land use category for charter schools in ITE's Trip Generation Manual, 9th Ed. However, based on several known trip generation surveys for charter schools throughout the United States[11] including California and San Jose in particular, the ITE (534) trip rate for "Private Schools" closely matches some of these more recent studies. Since ITE has not summarized these charter school trip generation studies officially yet, this study relies on the reasonable ITE (534) Private School trip rate for K-8 elementary schools in the short term analysis, and the ITE (536) K-12 Private School trip rate for elementary/high schools for the long term.

Project Trip Generation

The charter school project's trip generation is broken down into two parts, namely, the Phase 1 development of the project which consists of an elementary school, and a Phase 2 part of the project where a high school component comes on board. We divided this into two tables, Table 3.6 and 3.7. Table 3.6 summarizes the trip generation calculations and totals for Phase 1 (900 K-8 elementary school students) for the daily, am peak hour, and pm peak hour time periods. Table 3.7 summarizes the trip generation calculations and totals for Phase 1 and 2 combined (1,300 K-

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[10] Source: Safe Routes to School, National Center for Safe Routes to School
http://guide.saferoutesinfo.org/introduction/the_decline_of_walking_and_bicycling.cfm

[11] FDOT Trip Generation Recommendations for charter schools, 0.99 trips/student, 2014

Los Angeles Charter School K-6 and 840 students, 0.93 trips/student, 2015

Boise Village Charter School K-6 and 300 students, 0.91 trips/student 2014

ACE Charter School, Mayfair Campus Project, 0.99/student, 2011

Tamarac Charter School, Florida, 0.95 trips/student, 2011

12 students) for the daily, am peak hour, and pm peak hour time periods. The trip rates differ for each configuration as shown in the two tables.

Table 3.6 - Project Trip Generation for Phase 1, K-8 School (Year 2018)

	Time Period	Land Use	ITE Code	Trip Rate Inbound	Trip Rate Outbound	Trip Rate Total	Quantity	Vehicle Trips Inbound	Vehicle Trips Outbound	Vehicle Trips Total
PHASE 1	Daily	Caliber K-8 Elem School	534	1.38*	1.38	**2.76**	900 STU	**1242**	**1242**	**2484**
	AM Peak	Caliber K-8 Elem School	534	0.50	0.41	**0.90**	900 STU	**446**	**365**	**810**
	PM Peak	Caliber K-8 Elem School	534	0.09	0.10	**0.19***	900 STU	**80**	**91**	**171**

**calculated by linear interpolation using ITE code 536 daily rate for Private School, and ratios between peak hour rates between ITE 534 and 536*

Source: ITE Trip Generation Manual, and PRISM Engineering

Once the charter school expands to Phase 2 to also include high school age students, the trip generation rate is slightly lower as shown from the trip generation data surveys. This is probable because of the occupancy rate in vehicles increasing as the demographic of students in the cars is inclusive of high school as well. There will be a higher vehicle occupancy when siblings ride to school together in the same car. Table 3.6 shows the project trip generation for the short term Year 2018 when the Phase 1 Elementary School portion of the project is expected to develop. Table 3.7 shows the new trip generation totals when the High School is added into the mix, and is assumed to happen by the Year 2020 for the purposes of this analysis.

Table 3.7 - Project Trip Generation for Phase 1&2, K-12 School (Year 2020)

	Time Period	Land Use	ITE Code	Trip Rate Inbound	Trip Rate Outbound	Trip Rate Total	Quantity	Vehicle Trips Inbound	Vehicle Trips Outbound	Vehicle Trips Total
PHASE 1 & 2	Daily	Caliber K-12 School	536	1.24	1.24	**2.48**	1300 STU	**1612**	**1612**	**3224**
	AM Peak	Caliber K-12 School	536	0.49	0.32	**0.81**	1300 STU	**642**	**411**	**1053**
	PM Peak	Caliber K-12 School	536	0.08	0.09	**0.17**	1300 STU	**104**	**117**	**221**

Source: ITE Trip Generation Manual, and PRISM Engineering

Table 3.6 communicates that in Phase 1 (Year 2018) there will be 446 vehicles inbound to the school site during the am peak hour and 365 outbound vehicles (for school traffic, most of these vehicles inbound are also counting as an outbound vehicle in the totals within the peak hour). The am peak hour is the highest project peak time, and is over four (4) times higher than the pm peak hour school traffic, which is insignificant by comparison. By the Year 2020 Phase 2 will be complete with the addition of 400 high school students, and will add 243 more am peak hour trips, for a grand total of 1053 am peak hour inbound and outbound trip ends (approximately 500 vehicles arriving and leaving).

3.4 Project Trip Distribution and Circulation Alternatives

Figure 3.5 shows the trip distribution map developed from a geo-coded database of Caliber Charter School participants' household locations.

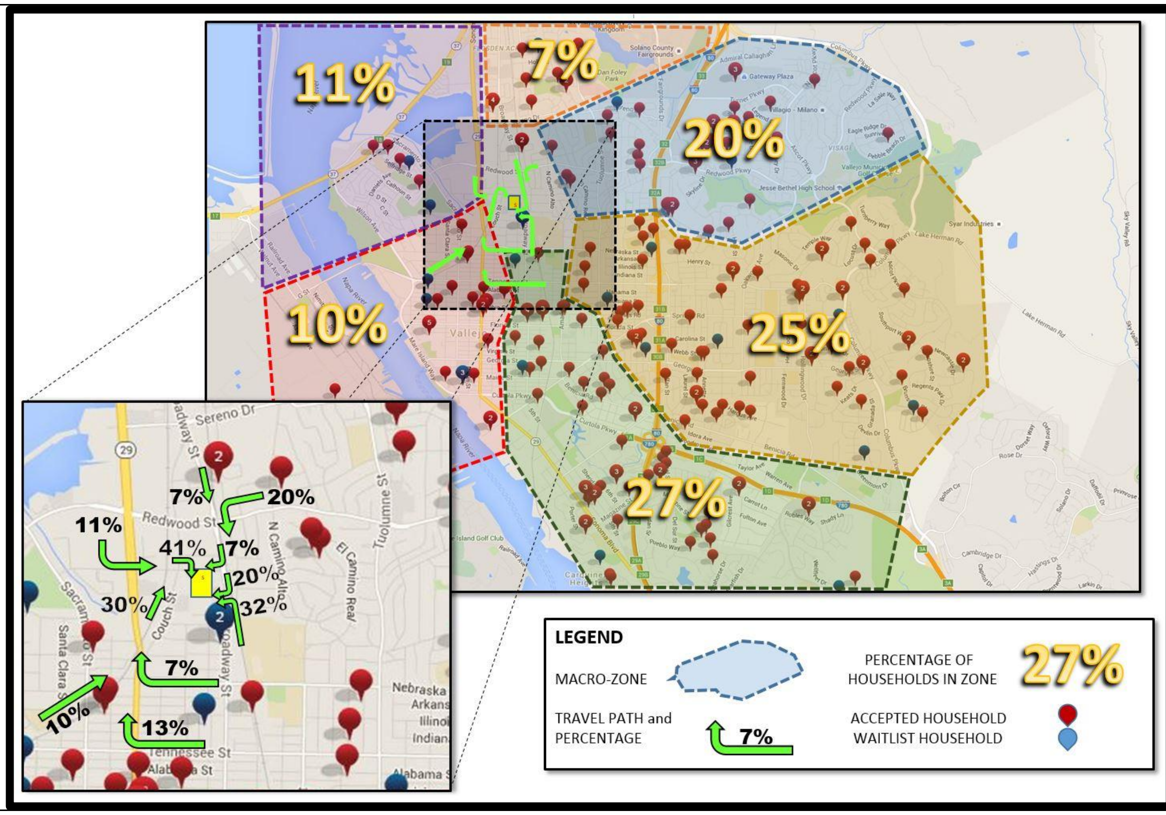


Figure 3.5 – Trip Distribution Pattern for Caliber Charter School

The nature of this charter school project is such that the household locations of all future participants is generally known, and so the origin location of all trips in the trip distribution of traffic can be determined at a macro level. This is helpful in developing an accurate trip distribution pattern for all project trips coming from homes to the school campus site, and helps to eliminate vague assumptions about where traffic will come from. There are two arterial streets immediately adjacent to the project site which would naturally carry traffic to the project site and these are primarily Broadway Street and to a lesser extent, Valle Vista Avenue. Because the origin locations of trips are known, it can be determined if school traffic will come in via Broadway Street from north of Oregon Avenue or from the south. The same can be determined for Valle Vista Avenue at Napa Street, to know the percentage of homes that exist to the west, east, south, or north of this intersection.

The source of this map information was Caliber Charter School and PRISM Engineering, where we created a Trip Distribution using GIS Geocoding of Households. This map was subdivided into six macro-zones created by PRISM Engineering that have dividing lines based on the arterial roadways that could reasonably carry traffic to and from the project site. Each macro-zone was tallied to determine the percentage of households in each zone. These percentages are used in this study to assign the appropriate amount of charter school traffic to each study roadway and intersection. This traffic distribution assignment, however, only represents one of the possibilities of where traffic will go, since it is possible to predetermine the charter school incoming paths through a Transportation Demand Management (TDM) plan where parents of students could be directed and instructed on how to travel to the school.

Additional Trip Distribution and Circulation Alternatives

Additional alternatives for traffic assignment were also studied and considered in this report to possibly better channel and direct traffic (constrain) in order to minimize traffic impacts at difficult-to-mitigate intersections such as Broadway Street at Oregon Street. This intersection, for instance, would be difficult to mitigate because if allowed, the charter school traffic would create a traffic pattern that would significantly impact this intersection, requiring a new left turn pocket for the NB approach, removal of parking, changing of striping, and the installation of a new signal since the warrants would be met. This new signal would need to coordinate/interconnect the operation of the existing signal at Broadway and Valle Vista Ave. because of its close proximity. Therefore, this report also examined alternatives that would change traffic patterns and eliminate the NB approach impact by assigning that traffic to come in elsewhere, so certain parents would need to adjust travel paths.

One of these ***constrained*** alternatives examined directing all school traffic along a specific pathway and providing raised medians and channelization to accomplish mostly right turn movements through intersections immediately surround the project site.

These alternatives are discussed later in the report as a specific analysis, and levels of service were calculated and summarized. Because the project is a charter school, there is opportunity for a guided transportation demand management option for parents dropping of their kids to the school campus. It is possible to design a specific pathway for incoming traffic through an enforcement of inbound traffic at the school's driveway(s).

The resulting ultimate ***unconstrained*** Phase 1 plus Phase 2 charter school project traffic turning movements at each of the 11 study intersections are shown for the am peak hour in Figure 3.6, and for the pm peak hour in Figure 3.7. These volumes were added to the background growth and post office traffic to get the full scenario impact volume for analysis purposes.

The pm peak hour school volumes represent a small fraction of the am peak hour volumes, and as a result are not critical factors in this report's analyses for the pm peak hour. The pm peak hour charter school volumes are approximately 221 vehicles per hour (vph), but in the am peak hour they are 1053 vph (see Table 3.7). The pm is therefore approximately 1/5 the volume of the am peak hour project traffic (ratio = 221/1053 = 0.21 or 21%). This much smaller pm peak hour school volume has little to no impact to study intersections as shown later in this report.

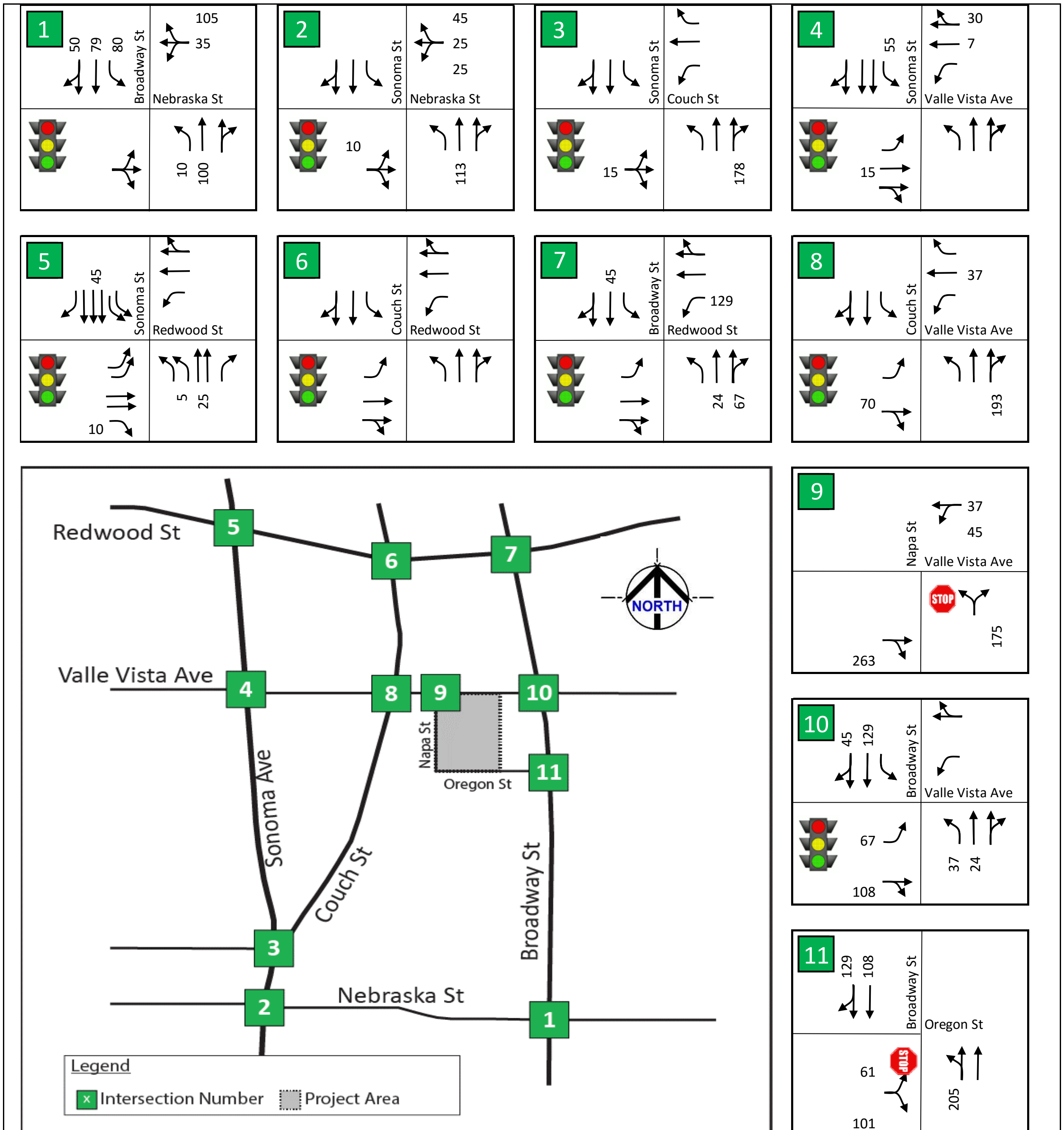


Figure 3.6 –Charter School ONLY, AM Peak Hour Unconstrained Turning Moves

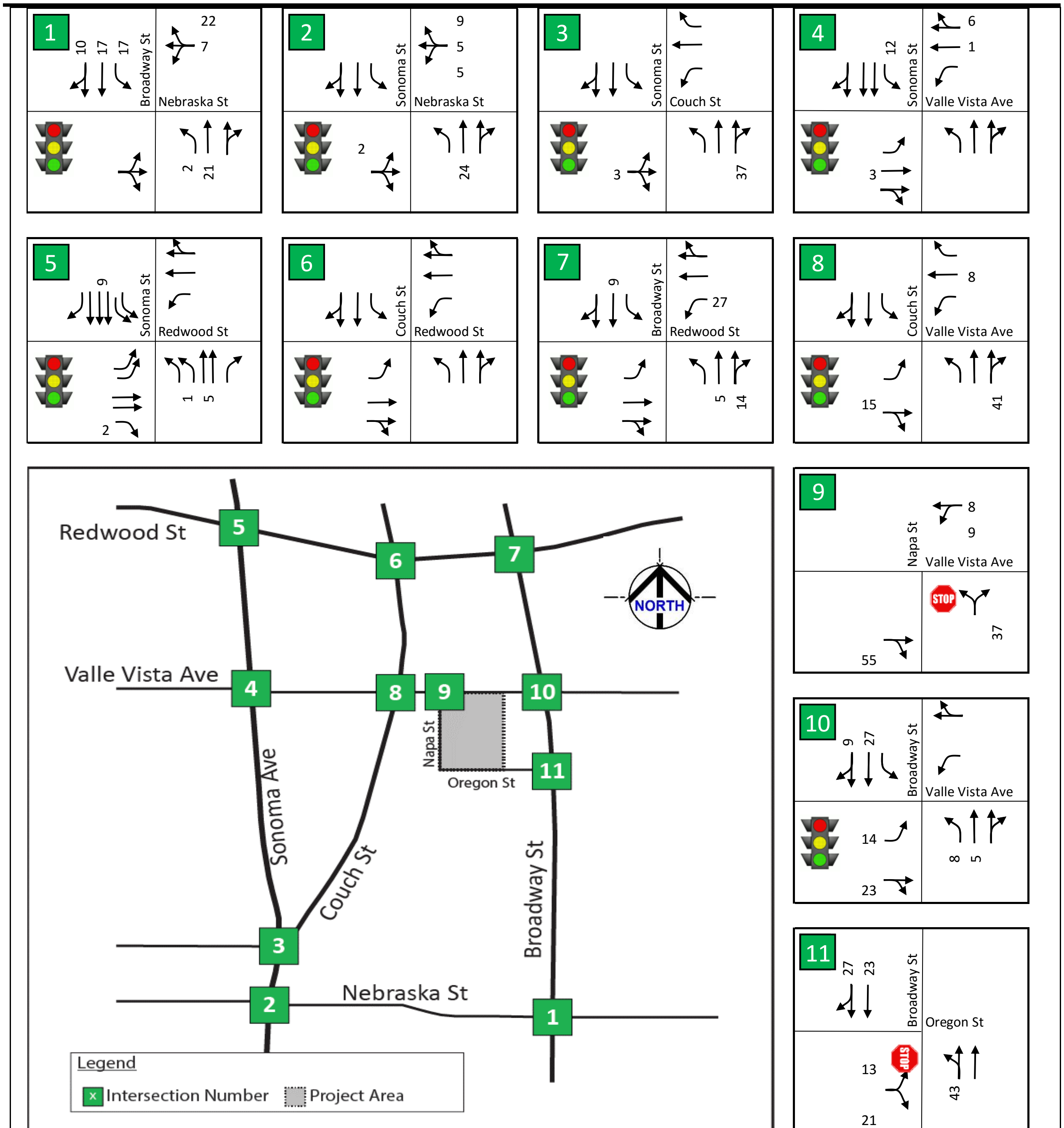


Figure 3.7 –Charter School ONLY, PM Peak Hour Unconstrained Turning Moves

Table 3.8 summarizes the trip distribution percentages immediately around the project site, to illustrate how traffic will be coming to the site and where they will likely return.

Table 3.8 – Trip Distribution Pattern for Caliber Charter School, Phase 1 & 2, UnConstrained

Travel Route Near Project Site	Percent of Total
Broadway Street to/from south of Oregon Avenue	32%
Broadway Street to/from north of Oregon Avenue	20%
Valle Vista Avenue to/from west of Napa Street	41%
Valle Vista Avenue to/from east of Napa Street	7%
TOTAL	**100%**
Entering at Napa Street	*48%*
Entering at Oregon Avenue	*52%*
TOTAL	***100%***

Source: PRISM Engineering using GIS and Household Location Data

With school traffic unconstrained, Napa Street would serve 48% of the project total traffic and Oregon Avenue is estimated at 52% of total. With other scenario alternatives also examined in this report, traffic assignments will follow a more specific incoming route as part of a transportation demand management scenario to be administered by the school to all school participants who drive or are driven to school. Table 3.8 represents the unconstrained trip distribution pattern. Several figures illustrate the modified trip distribution pattern later in this section.

3.5 Proposed Project Lane Geometry

Figure 3.8 shows the charter school geocode generated traffic pattern for project traffic, inbound flows (in black) and outbound flows (in red). The project site is four acres in size and borders directly onto Valle Vista Avenue on the north, Napa Street on the west, and Oregon Avenue on the south. Driveway access to and from the school site will only be taken from Oregon Street and Napa Street as shown on Figure 3.2.

Although there was a driveway on Valle Vista from the previous use at the site, this driveway will be eliminated and no vehicle access will be possible to the site from Valle Vista Avenue between Napa Street and Broadway Street.

Note that this is the unconstrained traffic assignment entirely based on shortest path and based on point of origin (since the general location of each future charter school participant's home location is known). It can be seen from the figure that the trip distribution demand into the school site is 52% of the project traffic trying to enter Oregon Street primarily from Broadway Street south. The remaining 48% would likely enter via Napa Street from Valle Vista Avenue from both directions. The proposed Post Office traffic and assignment is also shown on Figure 4.4 for the am peak hour time period. The totals of traffic and turning movements shown on this figure correspond directly to the totals in trip generation Table 3.7 shown previously.

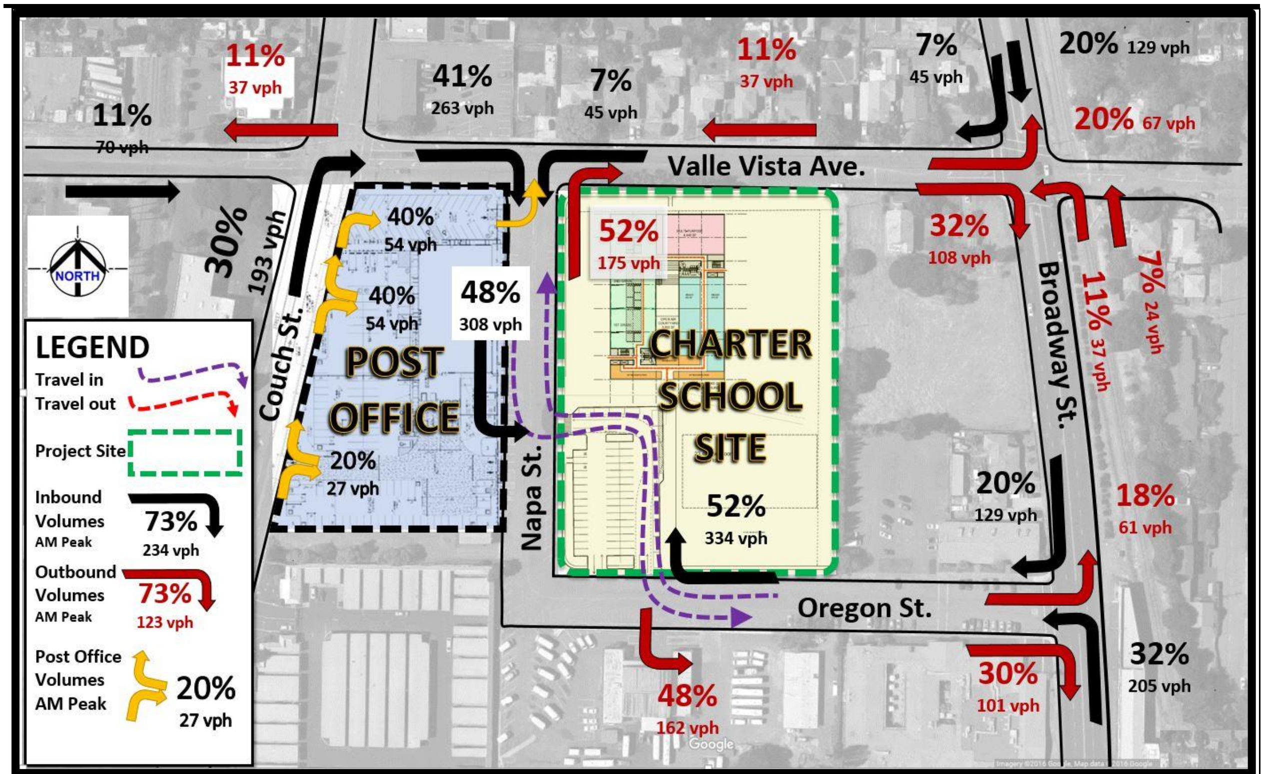


Figure 3.8 – Charter School Project Traffic, Unconstrained Free-flow Trip Distribution, AM Peak Hour Phase 1 & 2 Totals

The inbound volumes are higher than the outbound volumes (as shown in Table 3.7 which shows am peak hour project volumes of 642 vph inbound and 411 vph outbound). This is because a certain percentage of incoming traffic will stay (employees) or may have other business at the school. Certain recommendations for traffic control are implied in this distribution of traffic. In order to maintain adequate levels of service on Valle Vista Avenue between Couch Street and Broadway Street, certain restrictions to turning movements along Valle Vista Avenue in the vicinity of the project are necessary. The Post Office and Charter School traffic volumes will be significant, and the Post Office site plan shows outbound traffic entering Napa Street very near to Valle Vista Avenue. This traffic movement needs some mitigation to minimize conflicts with the school traffic.

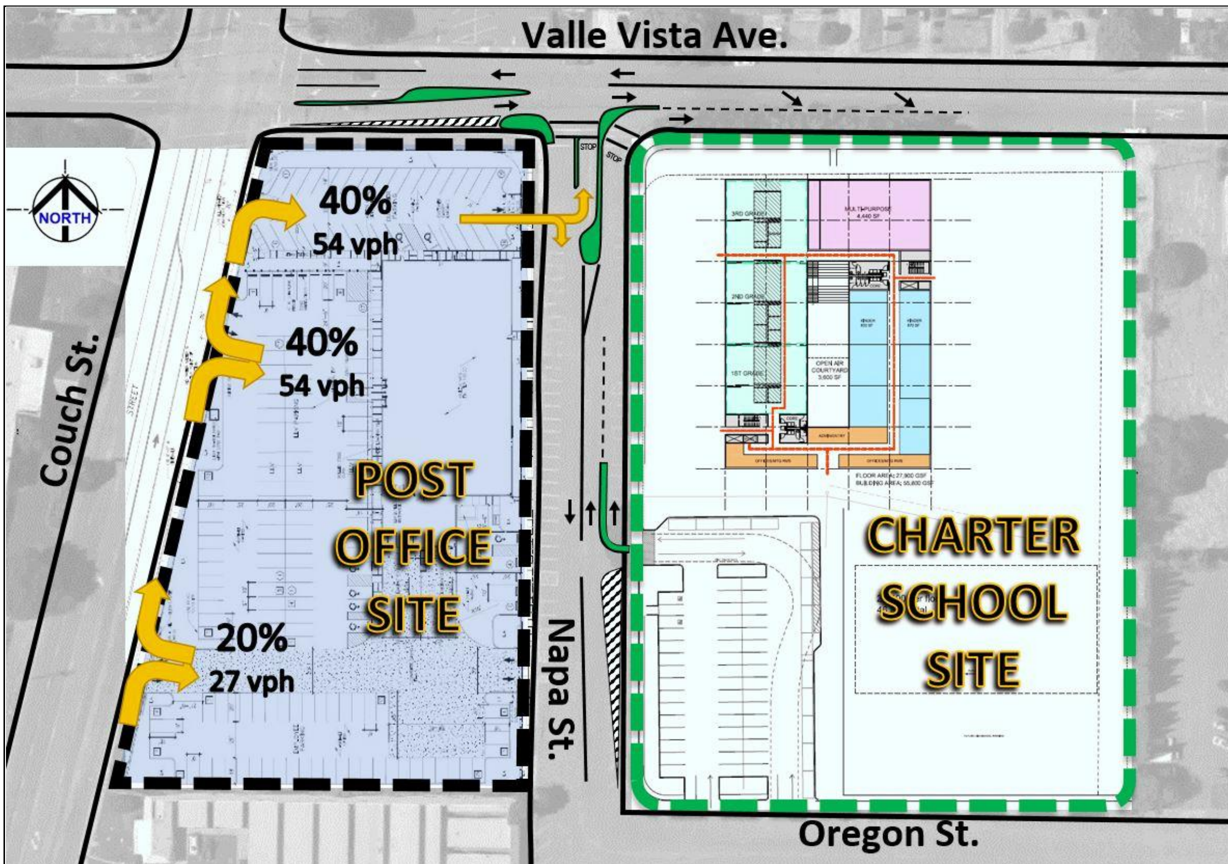
Valle Vista and Napa Street Modification

Because the proposed Federal Post Office will have exiting traffic flows right at the intersection of Napa Street and Valle Vista Ave., there would be significant traffic operations impact with the combination of the predicted school traffic flows headed northbound on Napa Street. In order to minimize the traffic impact from the school traffic at this intersection, the raised island and median concepts shown in Figure 3.9 have been developed. All school traffic coming out of the school site is forced to turn right with a raised median and will go north towards Valle Vista Ave. and will not directly conflict with the post office traffic.

The post office traffic cannot be conditioned by the City, and because the public post office traffic would be sent directly to Napa Street from the parking lot, this traffic would need to be directly channelized with its own left/right lane, separated by raised median from the northbound charter school traffic, as shown in Figure 3.9.

Another raised island at the intersection with Valle Vista Ave. is proposed to channelize the school traffic to force a right turn onto Valle Vista and then traffic can disperse to the north or south along Broadway Street. This proposed raised median system minimizes the anticipated traffic conflicts that would otherwise take place between the school and the post office traffic. The school traffic on Napa at Valle Vista would be forced by raised median to turn right only in an exclusive lane which has a stop sign control at the intersection with a pedestrian cross walk.

Afterwards this movement has a free flow EB lane for easy merging onto Valle Vista with little to no delay.



Source: PRISM Engineering

Figure 3.9 – Raised Island Channelization for Napa Street, Valle Vista Ave. Needed Improvements for Satisfactory Traffic Operations and Safety

Intersection of Valle Vista Ave. and Broadway Street Modification

The only other intersection that would need some minor modification to make this right turning system for school traffic work properly, would be to modify the eastbound approach of the Valle Vista / Broadway intersection to have an exclusive EB right turn lane, and to eliminate the EB left turn pocket there. This will create two lanes eastbound which extend from Napa Street. The intersection currently operates with the signal phasing that allows the eastbound and westbound approaches to move at the same time. Since the EB approach does not have a specific left turn pocket phase (even though there is a left turn pocket), then the signal operation will not need to change. By adding the right turn lane the traffic operations will be possible to move the large volume of traffic from the school, primarily anticipated to turn right onto Broadway Street.

These improvements and changes were assumed to be in place when the comparative analyses were being made, to have this common denominator for comparison purposes.

3.6 Alternatives for Charter School Traffic Circulation, Traffic ONLY enters via Oregon Street from SB Broadway Street, Phases 1 and 2 complete.

The traffic volumes for the Charter School mingled with the significant impact of the proposed Post Office on the corner of Couch/Valle Vista sending traffic to Napa Street, requires additional mitigation above and beyond the traditional capacity enhancement ideas (such as widening to add lanes, installation of a traffic signal, etc.). This is because there is limited room or effectiveness for many of those kind of improvements (driveway locations of post office located poorly near to Valle Vista Ave. on Napa St., for instance). As an alternative to traditional capacity enhancing mitigations, this study also looked a various forms of Travel Demand Management and traffic control techniques or programs to help guide and manage the traffic impacts away from critical impact locations or movements. These alternatives looked at specific routing and/or management of school traffic in the following three alternatives:

Alternative 1.

- Examine traffic entering from Broadway headed south and turning right into Oregon Street. All traffic existing school site onto Napa Street heads north and turns right on Valle Vista. Traffic is free to conflict with Post Office traffic on Napa Street. This alternative assumes that there are no raised islands or median treatments on Napa at and near Valle Vista Ave. Stop sign control would remain for Napa Street NB approach at Valle Vista Ave.

Alternative 2.

- Similar in assignment as Alternative 1 but with a specific raised median and island treatment as shown in Figure 3.9. The post office traffic is separated from the school traffic and would have its own NB approach lane on Napa at Valle Vista with stop sign control. The school traffic would also have its own lane and a specific forced NB right turn movement at Napa and Valle Vista to prevent serious traffic congestion that could otherwise occur if left turns were allowed. This also prevents conflicts with the post office site.

Alternative 3.

- Same as Alternative 2 but with reduced hourly volumes because of an assigned staggered start time program[12] at school for the students to arrive at different times depending on their grade level and various class start times. This transportation demand management scheme is enforceable because it generally correlates with the times that the student will start class.

Alternative 1 traffic assignment is depicted in Figure 3.10 and shows am peak Phase 1 & 2 traffic entering from Broadway headed south and turning right into Oregon Street.

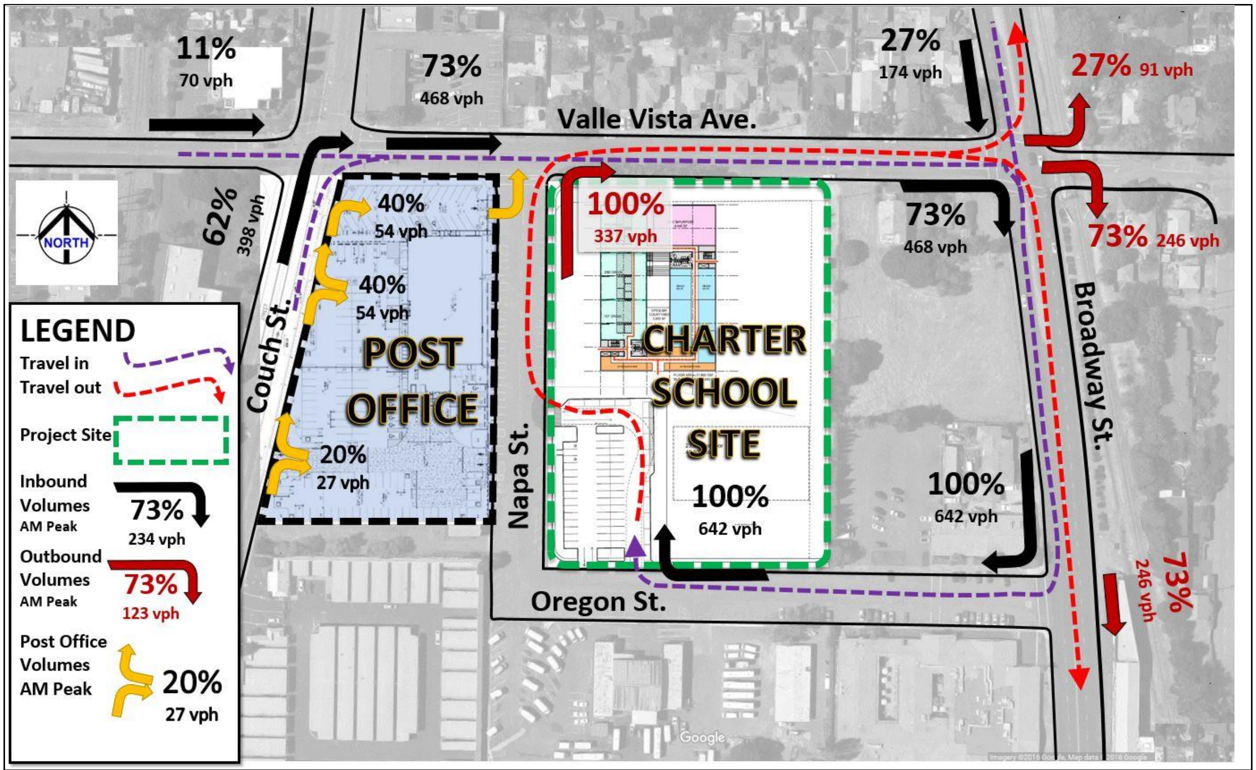


Figure 3.10 –Charter School Traffic: *ALTERNATIVE 1,* AM Peak Phase 1 & 2

All traffic existing school site onto Napa Street heads north and turns right on Valle Vista. Traffic is free to conflict with Post Office traffic on Napa Street. This alternative assumes that there are no raised islands or median treatments on Napa at and near Valle Vista Ave. Stop sign control would remain for Napa Street NB approach at Valle Vista Ave. The result for this unsignalized

[12] Start time is 7:30 for grades 5-8, 7:45 for grades 1-4 and 8:00 am for TK-Kinder.

intersection is LOS E with 48.2 seconds of average delay for the NB approach on Napa Street[13]. Valle Vista approaches are uncontrolled (this is a SSSC[14] intersection) and would operate at LOS A conditions with no delay. In addition to LOS E delays, there would also be conflicts with Napa Street NB traffic from the school and the EB Post Office parking lot traffic exiting and trying to turn left to go north, a potential safety issue.

Alternative 2 traffic assignment is depicted in Figure 3.11 and also shows am peak Phase 1 & 2 traffic entering from Broadway headed south and turning right into Oregon Street. Figure 3.12 shows the turning movements for this alternative at each study intersection.

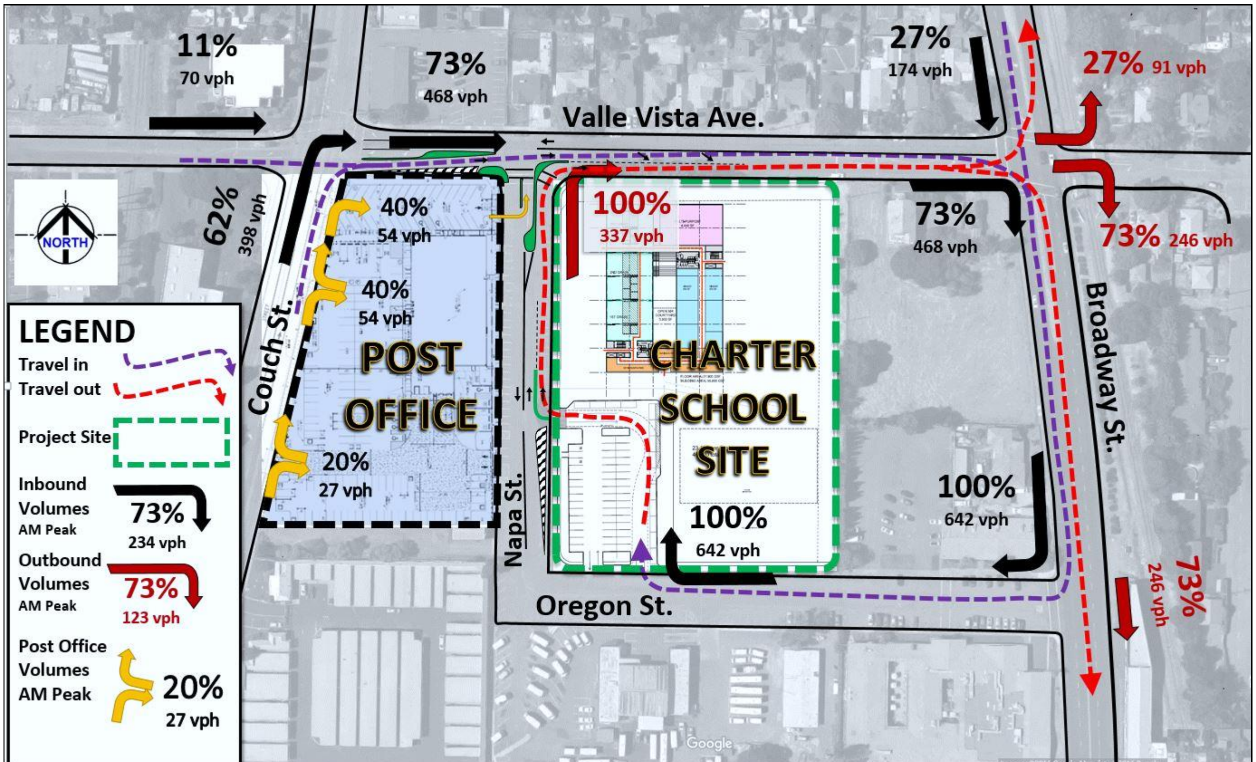


Figure 3.11 –Charter School Traffic: *ALTERNATIVE 2*, AM Peak Phase 1 & 2

All traffic exiting the school site onto Napa Street heads also north and turns right on Valle Vista, but the traffic in this scenario is controlled by raised medians, etc. at the intersection of Napa Street and Valle Vista Avenue, as defined in Figure 3.9.

[13] See Appendix for calculation sheet

[14] SSSC=Side Street Stop Control

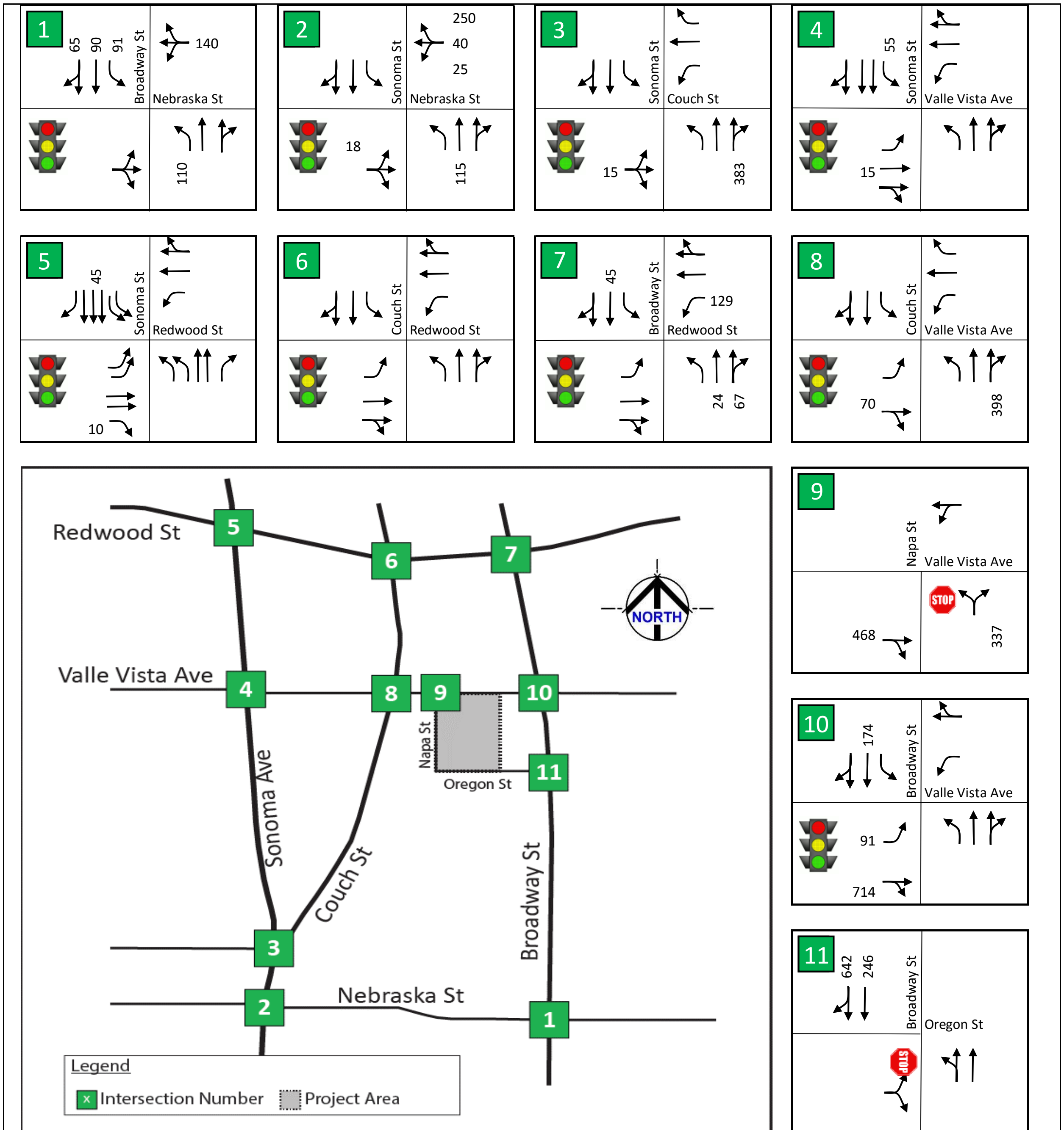


Figure 3.12 – Project ONLY, *ALTERNATIVE 2*, AM Peak Phase 1 & 2

The result for this unsignalized but channelized intersection is LOS D with 32.7 seconds of average delay for the NB approach on Napa Street for school traffic only on the right turn lane, but LOS C conditions (19.6 secs) for the left turn pocket that would serve the Post Office traffic. Valle Vista approaches are still uncontrolled (this is still technically an SSSC intersection) and would operate at LOS A conditions with no delay. There would be no conflicts on Napa Street between the NB school traffic and the EB Post Office parking lot traffic because of the raised median and exclusive left turn pocket as shown in Figure 3.9.

Alternative 3 traffic assignment is depicted in Figure 3.13 and also shows am peak Phase 1 & 2 traffic entering from Broadway headed south and turning right into Oregon Street.

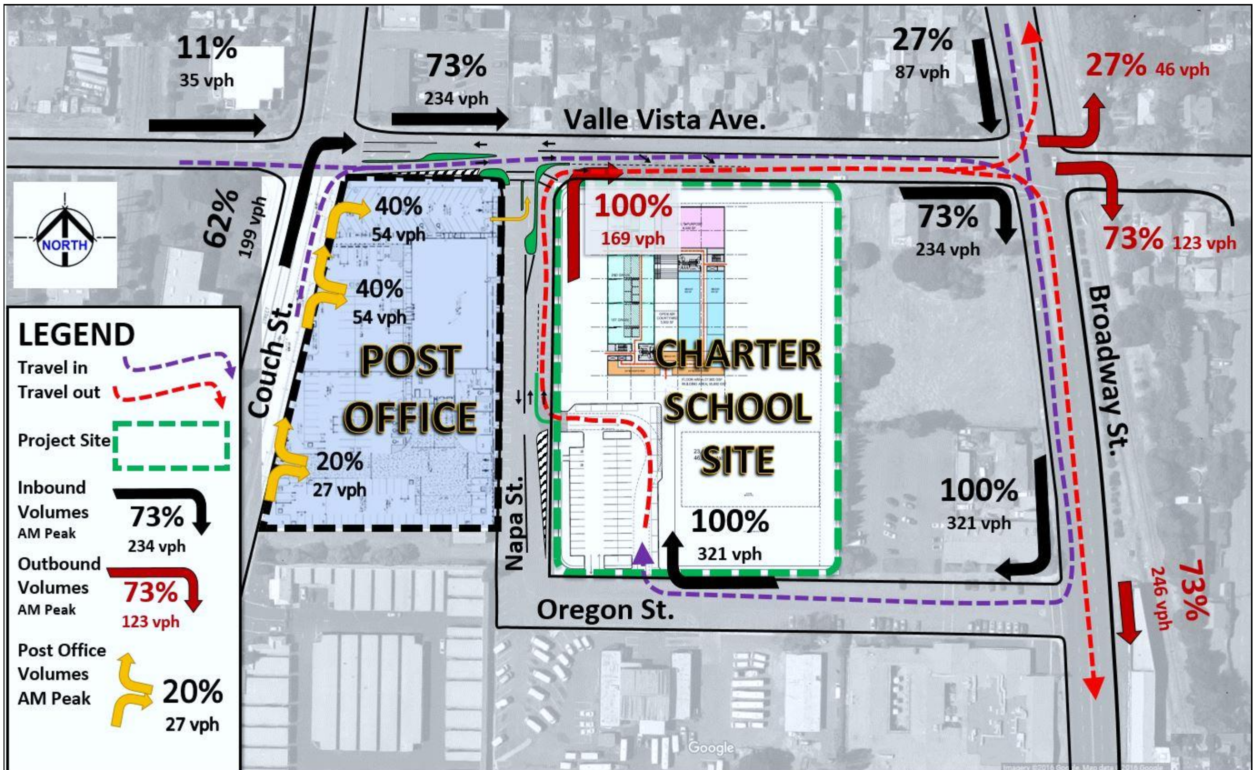


Figure 3.13 – Charter School with TDM: *ALTERNATIVE 3*, AM Peak Phase 1 & 2

The difference in this scenario versus the Alternative 2 scenario is that the volumes are reduced (estimated at one half of the Alternative 2 scenario) based on staggered start times for classes, a Transportation Demand Management (TDM) benefit which spreads the arrival times of vehicles by an additional 30 minutes. Instead of a typical 20 minute peak arrival of traffic resulting in long lines and queues, this will be stretched to a total of 50 minutes. This Alternative 3 scenario examines the effect of the reduction in peak impact where slightly more than 50% of the school traffic will miss the peak hour time period window.

3.7 Analysis of Near-Term (2018) Traffic Level of Service

Traffic operations were evaluated in this section for· Near-Term (2018) Traffic Conditions (without project), and for · Near-Term (2018) Plus Project Traffic Conditions (for various scenarios of “project”). Four different charter school project traffic volume scenarios were considered in this traffic study. These included:

- A. the unconstrained scenario where school traffic arrives according to shortest and most convenient pathway from home to school

- B. the constrained scenario where charter school members are required to drive a specific pathway to insure entry on Oregon Street from the north on Broadway Street (to avoid any left turns into Oregon Street from Broadway Street). In addition, school traffic would not be allowed to enter from Napa Street. However, there are no raised medians to help guide traffic on Napa Street at Valle Vista Ave.
- C. the constrained scenario as in B above, but with raised medians to guide post office traffic away from school traffic, and guide all school traffic north on Napa Street to turn right only onto Valle Vista Ave.
- D. the constrained scenario as in B and C above, but with a 50% reduced volume for am peak hour charter school traffic so that only half of the students arrive at the first peak hour time period. This traffic demand management scenario

Preferred Charter School Traffic Circulation Alternative

A Preferred Alternative was able to surface from comparing analyses of these three circulation scenarios. A comparison of the levels of service and impacts to the surround street system were made, as well as examining the severity of impacts to traffic operations and need for and magnitude of mitigation.

If ultimate school traffic (includes high school) is ***unconstrained*** and 32% of the inbound traffic (as shown in Figure 3.8) were to use the NB left turn pocket (not yet existing) of Broadway Street at Oregon Street, then a MUTCD signal warrant #4 for Peak Hour Traffic is met for the Year 2020 plus project scenario, albeit marginally. The signal warrant is not met for Phase 1 of the project. Without the full unmitigated impact of unconstrained school traffic, this signal warrant would never be met for any future foreseeable future condition, because the side street (Oregon Street) volume would be too low. Even with the full school traffic, it would only marginally meet the MUTCD Peak Hour Warrant #4. Since this warrant is not met at all for Year 2018 plus Phase 1 of the project, no mitigation would be needed for opening day of school no matter which circulation alternative is implemented. All intersections would operate at LOS C or better conditions. However, by the year 2020 this signal would be needed if Alternatives 1, 2, or 3 are not implemented in the school traffic assignment.

The eventual installation of a traffic signal at this location (Broadway and Oregon) is not recommended because of the following reasons:

1. The “Staggered Start Times” (Alternative 3 scenario) effectively reduces the “trigger” volume for side street traffic on Oregon Street at Broadway Street for the MUTCD Signal Warrant #4.
2. The project traffic for Year 2020, with full unconstrained impact, only marginally triggers the signal warrant in a worst-case scenario that not represent the current project description:
    a. The school will have staggered start times starting at 7:30, then 7:45 and finally 8:00 am. This essentially spreads the school peak an additional 30 minutes,

reducing the peak hour impact effect by approximately 50%, and as a result, the peak hour warrant will not be met and a signal is not recommended.

3. If a High School is not built, then the signal warrant cannot be met in any scenario.

If however, the staggered start times program is not conditioned upon the school, and the high school is also built, then the signal warrant will be met if there is no constraint on arrival pathway. If a signal were to be installed, it would have to be coordinated and inter-connected with the existing signal at Broadway and Valle Vista, and parking would need to be removed in the vicinity of Oregon Street along Broadway to allow for a restriping of the road to make room for a left turn pocket turning into Oregon Street. Because this is the worst case condition of traffic, and does not truly represent the charter schools staggered start time program or expectation of traffic, this line of mitigation is not recommended in this report, but only illustrates what would be needed if other solutions were not pursued and there was no constraint on school traffic flows and staggered start times. Table 3.9 shows the capacity and delay analysis results for the worst-case unconstrained circulation alternative. Again, these volumes are not high enough to cause any unacceptable levels of service at the study intersections, and will not trigger any signal warrants at the unsignalized intersections.

Table 3.9 Near Term Year 2018 Level of Service Summary, Unconstrained Circulation for Phase 1 of Project

(includes growth AND Post Office traffic)

				NEAR TERM YEAR 2018						NEAR TERM YEAR 2018 plus Phase 1							
				AM Peak Hour			PM Peak Hour			AM Peak Hour				PM Peak Hour			
	INTERSECTION LOCATION	Control	Target LOS	LOS	Delay	V/C[1]	LOS	Delay	V/C[1]	LOS	Delay	V/C[1]	ΔV/C	LOS	Delay	V/C[1]	ΔV/C
1	Nebraska St. and Broadway St.	S	D	C	21.5	0.42	C	21.3	0.45	C	24.8	0.57	0.15	C	21.8	0.49	0.04
2	Nebraska St. and Sonoma Blvd.	S	D	C	25.0	0.31	C	20.4	0.53	C	20.7	0.41	0.10	C	21.0	0.55	0.02
3	Couch St. and Sonoma Blvd.	S	D	C	24.9	0.36	B	14.8	0.56	B	11.8	0.41	0.05	B	15.4	0.58	0.02
4	Valle Vista St. and Sonoma Blvd.	S	D	C	23.3	0.36	B	19.2	0.49	B	15.1	0.38	0.02	B	19.1	0.49	0.00
5	Redwood St. and Sonoma Blvd.	S	D	C	26.4	0.40	C	28.8	0.63	C	23.3	0.39	-0.01	C	29.1	0.63	0.00
6	Redwood St. and Couch St.	S	D	B	15.1	0.26	B	16.0	0.37	B	15.1	0.26	0.00	B	16.0	0.37	0.00
7	Redwood St. and Broadway St.	S	D	C	23.5	0.52	C	29.7	0.67	C	25.3	0.52	0.00	C	30.1	0.67	0.00
8	Valle Vista Ave. and Couch St.	S	D	A	7.6	0.14	A	9.2	0.21	A	8.7	0.18	0.04	A	9.2	0.22	0.01
9	Valle Vista Ave. and Napa St.	*ST*	D	*A*	1.0	N/A	*A*	0.8	N/A	*A*	*3.2*	*N/A*	N/A	*A*	*1.6*	*N/A*	N/A
		NB		*B*	10.2	N/A	*B*	10.9	N/A	*B*	*10.9*	*N/A*	N/A	*B*	*10.7*	*N/A*	N/A
10	Valle Vista Ave. and Broadway St.	S	D	B	16.7	0.29	B	15.0	0.38	B	18.7	0.36	0.07	B	14.9	0.39	0.01
11	Oregon St. and Broadway St.	ST	D	A	2.9	N/A	*A*	0.4	N/A	A	3.7	*N/A*	N/A	A	0.9	*N/A*	N/A
		EB		*B*	12.2	N/A	*B*	*14.4*	N/A	*C*	*22.7*	*N/A*	N/A	*C*	*16.1*	*N/A*	N/A

Control: S=Signal, ST=Stop Sign Side Street, NB=NB approach Stop

Notes: [1] V/C ratio is only shown where needed for significance criteria.

Impacts are considered to be significant when the change in V/C ratio between the with and without project conditions are exceeded for the following LOS criteria:

LOS	Δ V/C
C	> 0.04
D	> 0.02
E,F	> 0.01

Table 3.10 shows the capacity and delay analysis results for the preferred circulation alternative, Alternative 2. It can be seen by comparison that Alternative 2 solves as a mitigation many of the problems and challenges with the unconstrained scenario.

Figures 3.14 and 3.15 show the am and pm peak hour turning movements of the volumes used in the “Near Term Year 2018 Level of Service Summary, Unconstrained Circulation for Phase 1 of Project” scenario reported in Table 3.9.

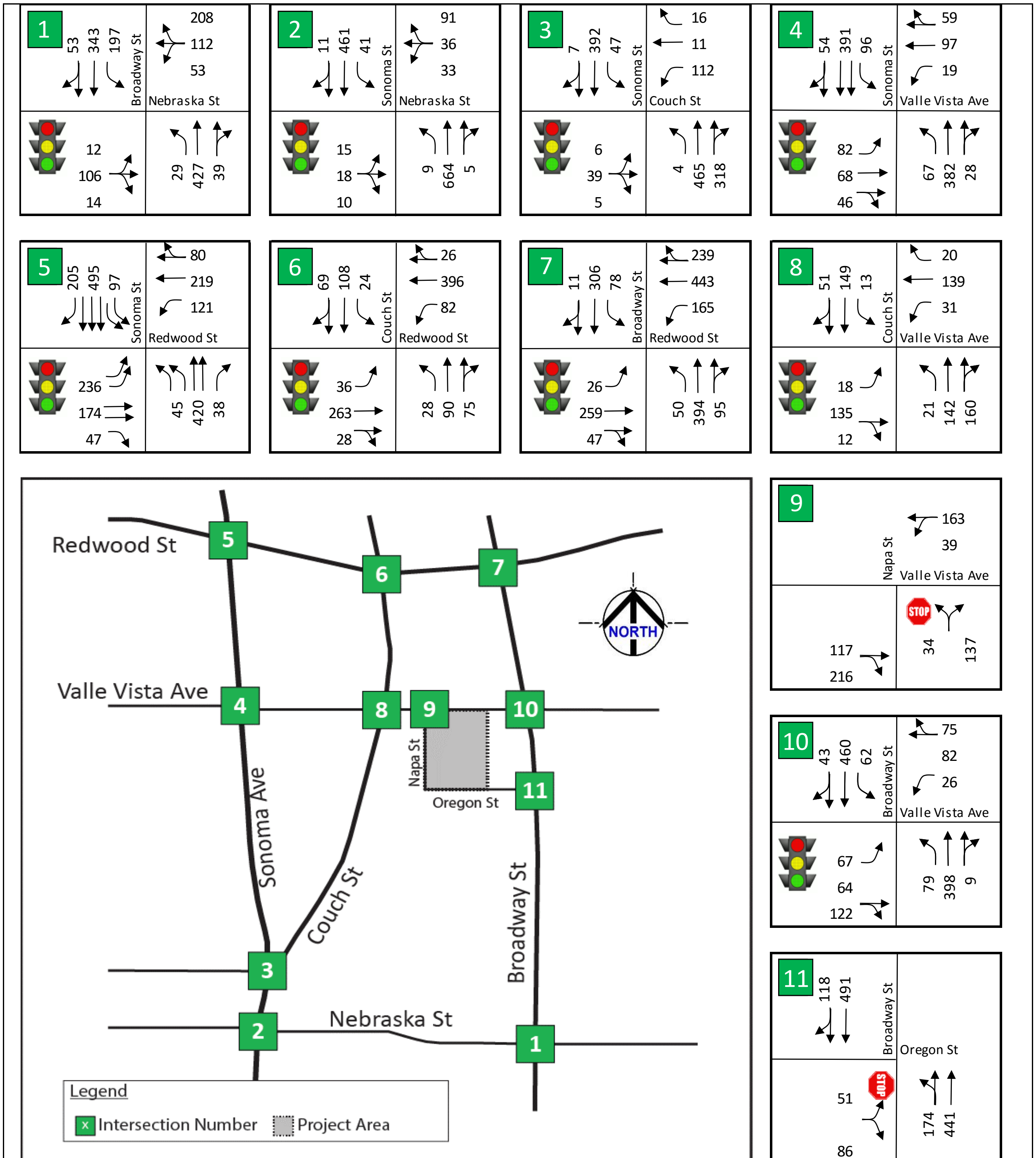


Figure 3.14 – Year 2018 plus Unconstrained Project Phase 1, AM Peak Hour

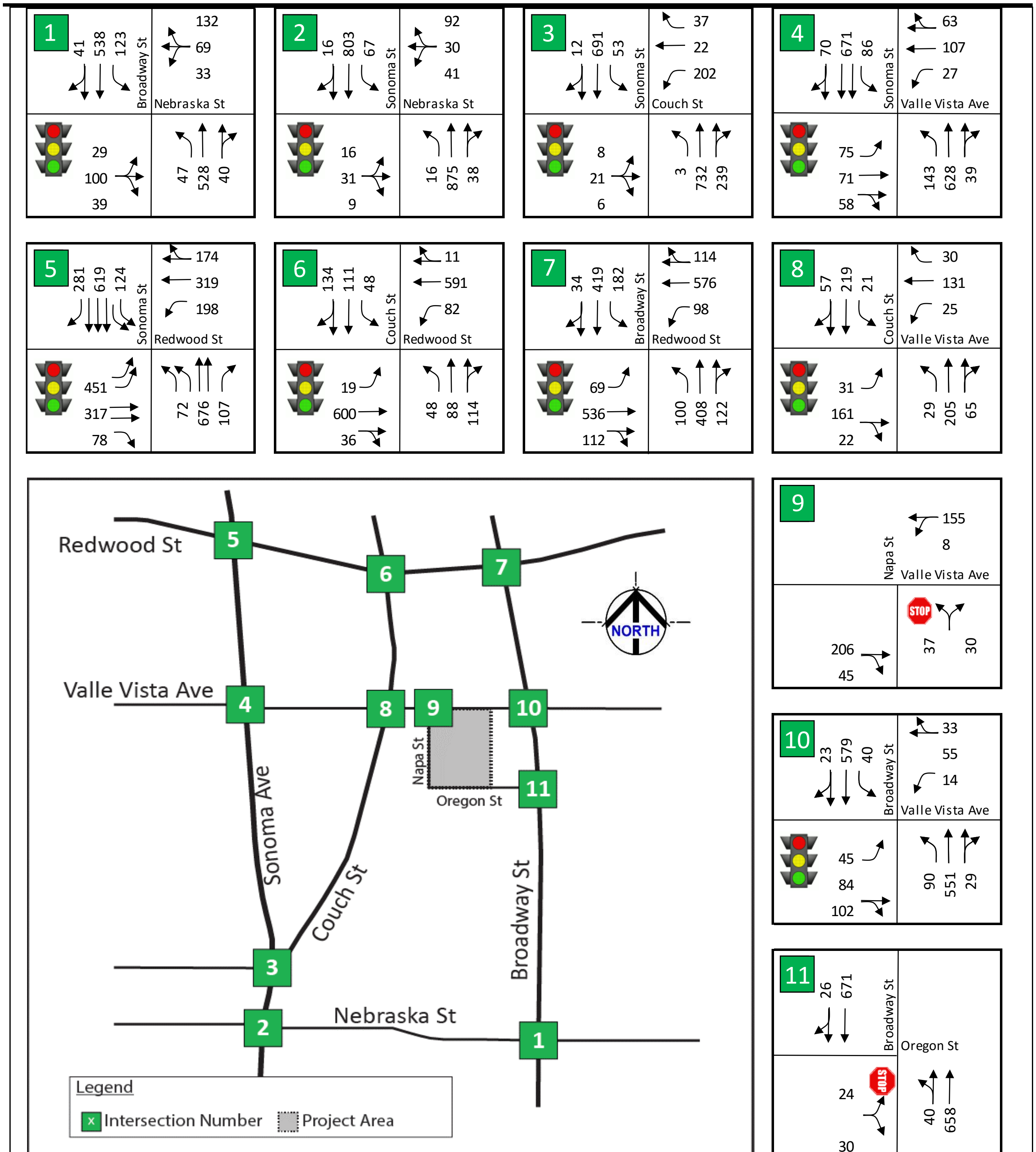


Figure 3.15 – Year 2018 plus Unconstrained Project Phase 1, PM Peak Hour

Table 3.9 shows that in the "plus project" scenario, there are two intersections which cross the significance threshold, having an increased V/C ratio (as defined in the footnote of Table 3.9). The delta v/c ratio at Nebraska and Broadway for instance, increased from 0.42 for Year 2018 am peak hour conditions, to 0.57 for the Year 2018 plus Phase 1 Project scenario, an increase of 0.15.

Although this is technically a significant change as per the definition, the level of service remains at LOS C conditions, which is well under the City's target LOS D cap, so that no mitigation would be necessary. The same is true for all other locations, no mitigation is required.

Table 3.10 shows that there are four intersections which cross the significance threshold of an increased V/C ratio as defined in the footnote of Table 3.10. The delta v/c ratio at Nebraska and Broadway for instance, increased from 0.42 for Year 2018 am peak hour conditions, to 0.57 for the Year 2018 plus Phase 1 Project scenario, an increase of 0.16. Although these four locations had significant change in v/c ratio, the intersection level of service remains at LOS C conditions for all four intersections. No mitigation would be necessary because this is below the City's target LOS D cap.

Table 3.10 Near Term Year 2018 Level of Service Summary, Alternative 2 Phase 1

(includes growth AND Post Office traffic)

				NEAR TERM YEAR 2018						NEAR TERM YEAR 2018 plus Phase 1							
				AM Peak Hour			PM Peak Hour			AM Peak Hour				PM Peak Hour			
	INTERSECTION LOCATION	Control	Target LOS	LOS	Delay	V/C[1]	LOS	Delay	V/C[1]	LOS	Delay	V/C[1]	ΔV/C	LOS	Delay	V/C[1]	ΔV/C
1	Nebraska St. and Broadway St.	S	D	C	21.5	0.42	C	21.3	0.45	C	25.6	0.58	0.16	C	23.4	0.46	0.01
2	Nebraska St. and Sonoma Blvd.	S	D	C	25.0	0.31	C	20.4	0.53	C	24.7	0.51	0.20	C	22.7	0.58	0.05
3	Couch St. and Sonoma Blvd.	S	D	C	24.9	0.36	B	14.8	0.56	B	13.8	0.45	0.09	B	19.6	0.58	0.02
4	Valle Vista St. and Sonoma Blvd.	S	D	C	23.3	0.36	B	19.2	0.49	B	15.6	0.36	0.00	B	15.7	0.52	0.03
5	Redwood St. and Sonoma Blvd.	S	D	C	26.4	0.40	C	28.8	0.63	C	23.8	0.38	-0.02	C	28.1	0.63	0.00
6	Redwood St. and Couch St.	S	D	B	15.1	0.26	B	16.0	0.37	B	15.1	0.26	0.00	B	16.0	0.37	0.00
7	Redwood St. and Broadway St.	S	D	C	23.5	0.52	C	29.7	0.67	C	25.6	0.52	0.00	C	34.8	0.74	0.07
8	Valle Vista Ave. and Couch St.	S	D	A	7.6	0.14	A	9.2	0.21	B	11.2	0.21	0.07	A	9.6	0.22	0.01
9	Valle Vista Ave. and Napa St.	*ST*	D	*A*	1.0	N/A	*A*	0.8	N/A	*A*	*6.8*	*N/A*	N/A	*A*	*1.6*	*N/A*	N/A
		NB		*B*	10.2	N/A	*B*	10.9	N/A	*C*	*23.3*	*N/A*	N/A	*B*	*10.7*	*N/A*	N/A
10	Valle Vista Ave. and Broadway St.	S	D	B	16.7	0.29	B	15.0	0.38	C	24.8	0.46	0.17	B	17.9	0.41	0.03
11	Oregon St. and Broadway St.	ST	D	A	2.9	N/A	*A*	0.4	N/A	A	0.3	*N/A*	N/A	A	0.9	*N/A*	N/A
		EB		*B*	12.2	N/A	*B*	*14.4*	N/A	*B*	*14.7*	*N/A*	N/A	*C*	*16.1*	*N/A*	N/A

Control: S=Signal, ST=Stop Sign Side Street, NB=NB approach Stop

Notes: [1] V/C ratio is only shown where needed for significance criteria.
Impacts are considered to be significant when the change in V/C ratio between the with and without project conditions are exceeded for the following LOS criteria:

LOS	Δ V/C
C	> 0.04
D	> 0.02
E,F	> 0.01

Figures 3.16 and 3.17 show the am and pm peak hour turning movements of the volumes used in the "Near Term Year 2018 Level of Service Summary, Alternative 2 Circulation for Phase 1 of Project" scenario reported in Table 3.10.

Table 3.11 shows that there are five intersections which cross the significance threshold of an increased V/C ratio as defined in the footnote of Table 3.11. The delta v/c ratio at Nebraska and Broadway for instance, increased from 0.43 for Year 2020 am peak hour conditions, to 0.66 for the Year 2020 plus Phase 1 & 2 Project scenario, an increase of 0.23. Although these five locations had significant change in v/c ratio, the intersection level of service remains at or under the target

LOS D conditions for all five intersections. No mitigation would be necessary because this is below the City's target LOS D cap.

Table 3.11 Near Term Year 2020 Level of Service, Phase 1 & 2 of School

PREFERRED ALTERNATIVE 2 Circulation (includes background growth and Post Office traffic)

				NEAR TERM YEAR 2020						NEAR TERM YEAR 2020 plus Phase 1&2, Alt2							
				AM Peak Hour			PM Peak Hour			AM Peak Hour				PM Peak Hour			
	INTERSECTION LOCATION	Control	Target LOS	LOS	Delay	V/C[1]	LOS	Delay	V/C[1]	LOS	Delay	V/C[1]	ΔV/C	LOS	Delay	V/C[1]	ΔV/C
1	Nebraska St. and Broadway St.	S	D	C	21.7	0.43	C	21.5	0.47	C	30.0	0.66	0.23	C	22.8	0.51	0.04
2	Nebraska St. and Sonoma Blvd.	S	D	C	29.6	0.32	C	20.6	0.54	D	35.1	0.56	0.24	C	22.6	0.59	0.05
3	Couch St. and Sonoma Blvd.	S	D	C	30.9	0.39	B	15.8	0.58	C	33.4	0.49	0.10	B	15.6	0.61	0.03
4	Valle Vista St. and Sonoma Blvd.	S	D	C	27.8	0.38	B	19.1	0.50	C	29.9	0.42	0.04	C	24.3	0.50	0.00
5	Redwood St. and Sonoma Blvd.	S	D	C	27.7	0.42	C	29.4	0.64	C	27.5	0.42	0.00	C	25.4	0.63	-0.01
6	Redwood St. and Couch St.	S	D	B	15.2	0.27	B	16.2	0.39	B	15.2	0.27	0.00	B	16.2	0.39	0.01
7	Redwood St. and Broadway St.	S	D	C	23.2	0.55	C	29.9	0.68	D	43.9	0.68	0.13	C	31.8	0.69	0.01
8	Valle Vista Ave. and Couch St.	S	D	A	7.6	0.15	A	9.0	0.21	B	10.0	0.25	0.10	A	9.9	0.23	0.02
9	Valle Vista Ave. and Napa St.	*ST*	D	*A*	*1.3*	N/A	*A*	*1.1*	N/A	*B*	*11.0*	N/A	N/A	*A*	*2.3*	*N/A*	N/A
		NB		*B*	*10.4*	N/A	*B*	*11.1*	N/A	*D*	*32.7*	N/A	N/A	*B*	*11.3*	*N/A*	N/A
10	Valle Vista Ave. and Broadway St.	S	D	B	15.5	0.29	B	14.7	0.38	D	47.2	0.75	0.46	C	22.3	0.40	0.02
11	Oregon St. and Broadway St.	ST	D	A	0.3	N/A	A	0.4	N/A	A	0.3	N/A	N/A	A	0.4	*N/A*	N/A
		EB		*B*	*10.8*	N/A	*B*	*14.7*	N/A	*C*	*17.1*	N/A	N/A	*C*	*16.7*	*N/A*	N/A

Control: S=Signal, ST=Stop Sign Side Street, NB=NB approach Stop

Notes: [1] V/C ratio is only shown where needed for significance criteria.

Impacts are considered to be significant when the change in V/C ratio between the with and without project conditions are exceeded for the following LOS criteria:

LOS	Δ V/C
C	> 0.04
D	> 0.02
E,F	> 0.01

Figures 3.18 and 3.19 show the am and pm peak hour turning movements of the volumes used in the "Near Term Year 2020 Level of Service Summary, Alternative 2 Circulation for Phase 1 & 2 of Project" scenario reported in Table 3.11.

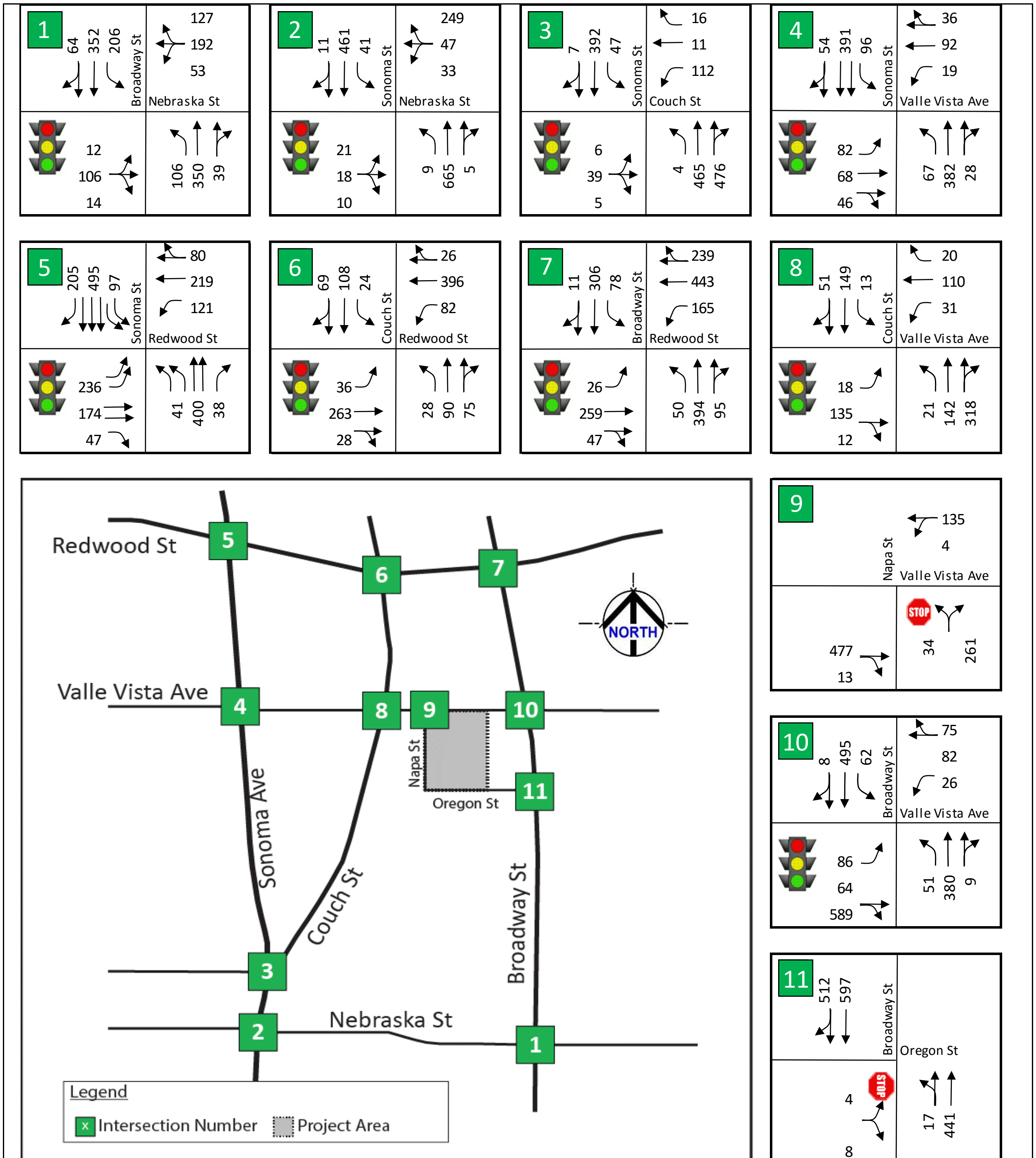


Figure 3.16 – Year 2018 plus Alternative 2 Project Phase 1, AM Peak Hour

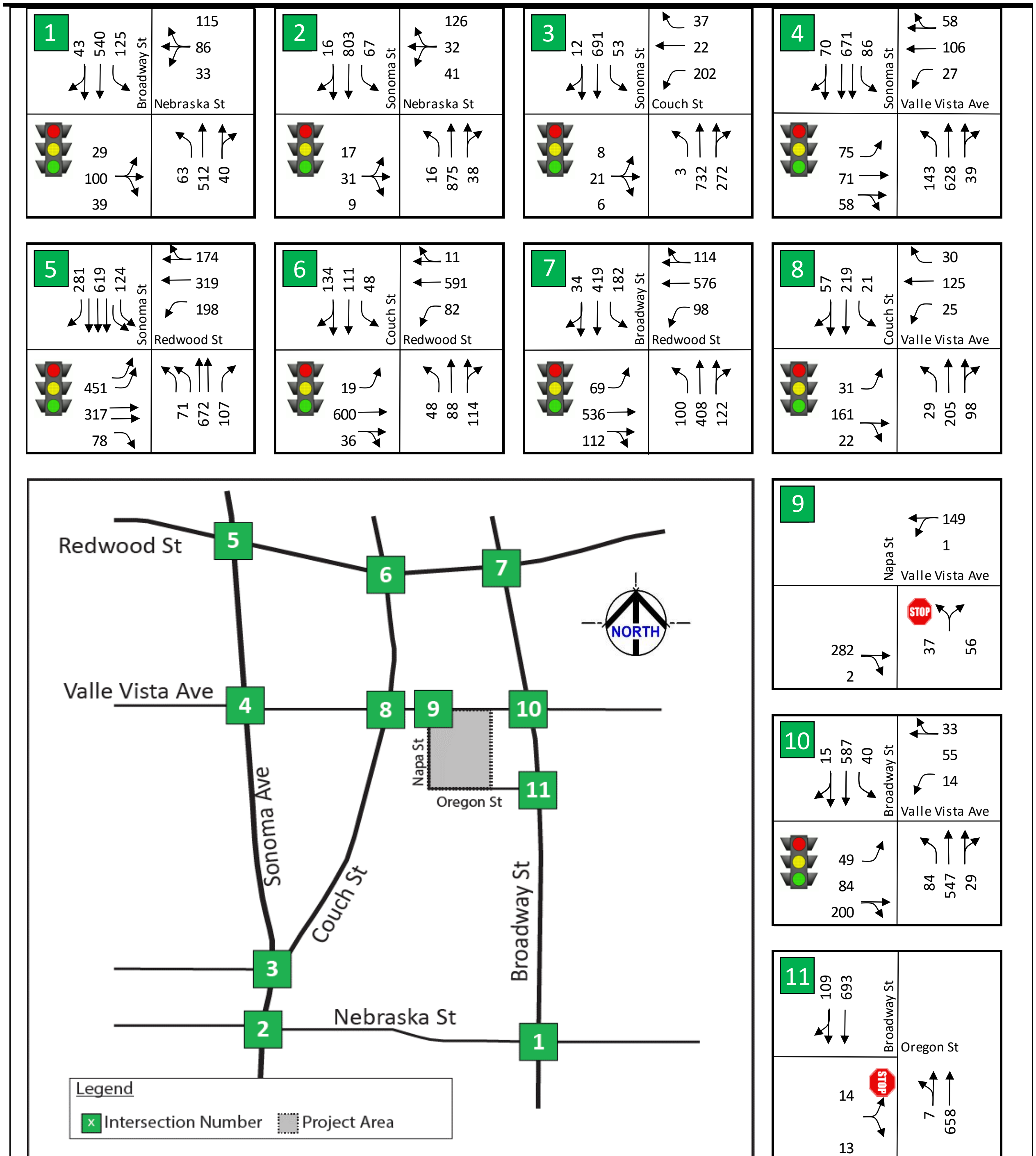


Figure 3.17 – Year 2018 plus Alternative 2 Project Phase 1, PM Peak Hour

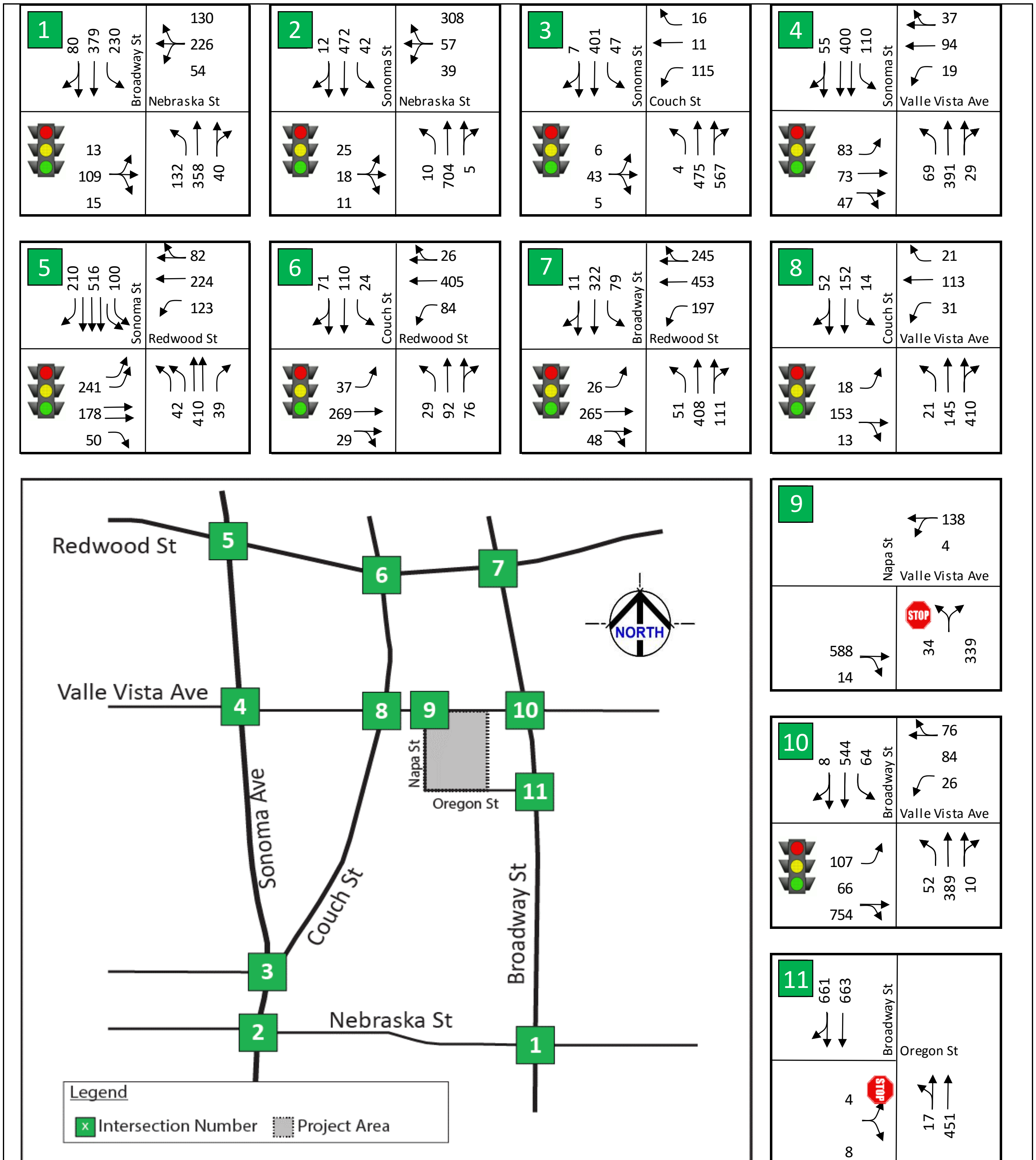


Figure 3.18 – Year 2020 plus Alternative 2 Project Phase 1 & 2, AM Peak Hour

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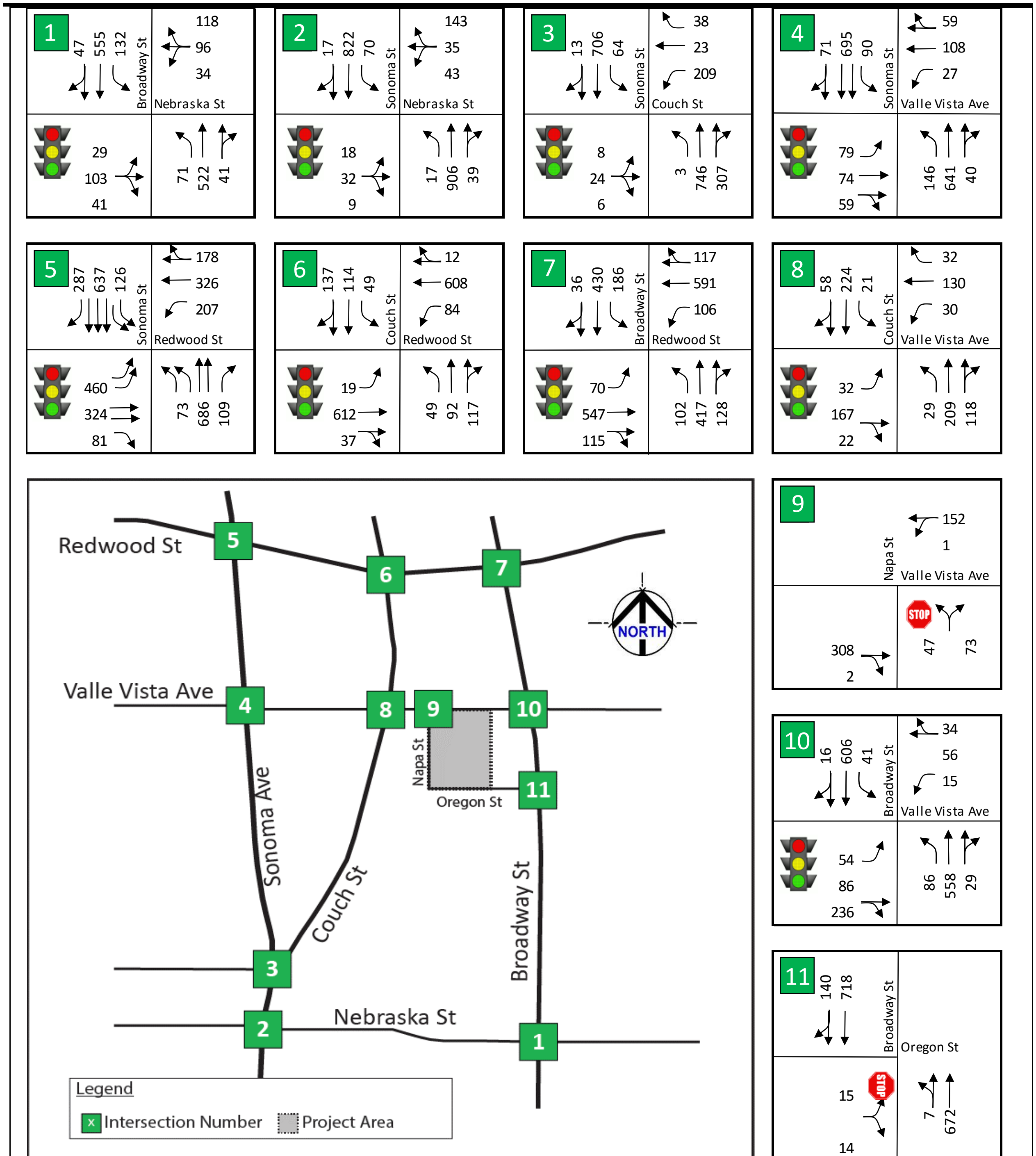


Figure 3.19 – Year 2020 plus Alternative 2 Project Phase 1 & 2, PM Peak Hour

3.8 LONG-TERM (2035) CONDITIONS

Long-Term (2035) Lane Configurations and Traffic Control

Transportation improvements are not anticipated by City staff for the study area intersections for the year 2035. All of the study intersections remain the same as compared to existing conditions, as shown in Figure 3.1.

Year 2035 Forecast

Future (Year 2035) AM and PM peak hour traffic volumes are based on future year traffic forecasts obtained from the STA Travel Demand Forecast model (we obtained Year 2010 and Year 2040 output). PRISM Engineering used the methodology outlined previously in this report to determine Year 2035 volumes, namely, linear interpolation of growth between the two scenarios in the STA model to determine a growth rate, and then applying this growth rate to the existing turning movement volumes.

Several scenarios were analyzed for this Year 2035 time period including:

- Year 2035 am peak hour
- Year 2035 plus Project Phase 1 & 2 am peak hour
- Year 2035 pm peak hour
- Year 2035 plus Project Phase 1 & 2 pm peak hour

The following four figures show the traffic forecasts with and without the project for Year 2035 for these four scenarios.

- Figure 3.20 shows the study intersection volumes for the Year 2035 am peak hour without the project.
- Figure 3.21 shows the study intersection volumes for the Year 2035 am peak hour plus Phase 1 & 2 of the project.
- Figure 3.22 shows the study intersection volumes for the Year 2035 pm peak hour without the project.
- Figure 3.23 shows the study intersection volumes for the Year 2035 pm peak hour plus Phase 1 & 2 of the project.

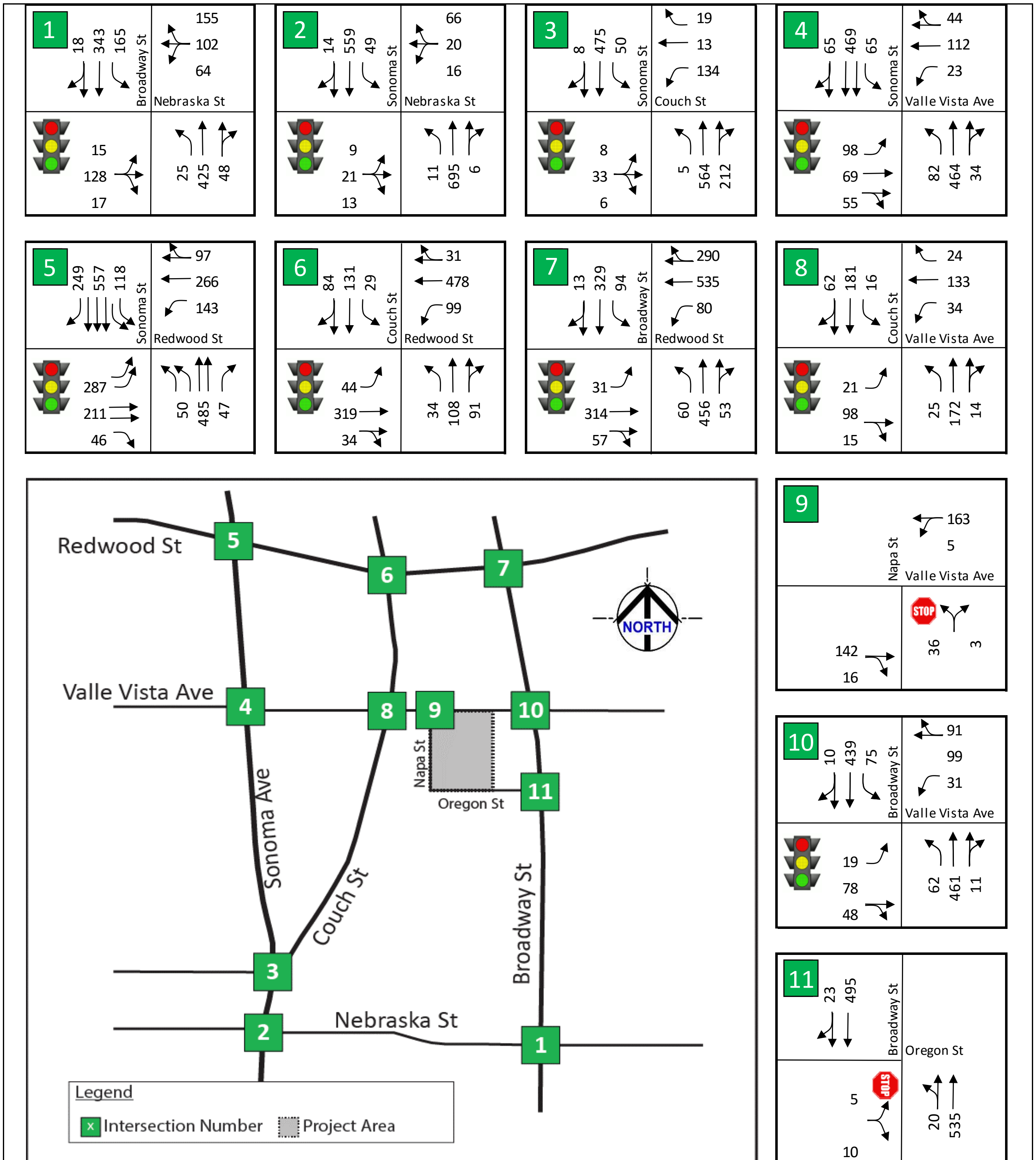


Figure 3.20– Year 2035 AM Peak, No Project

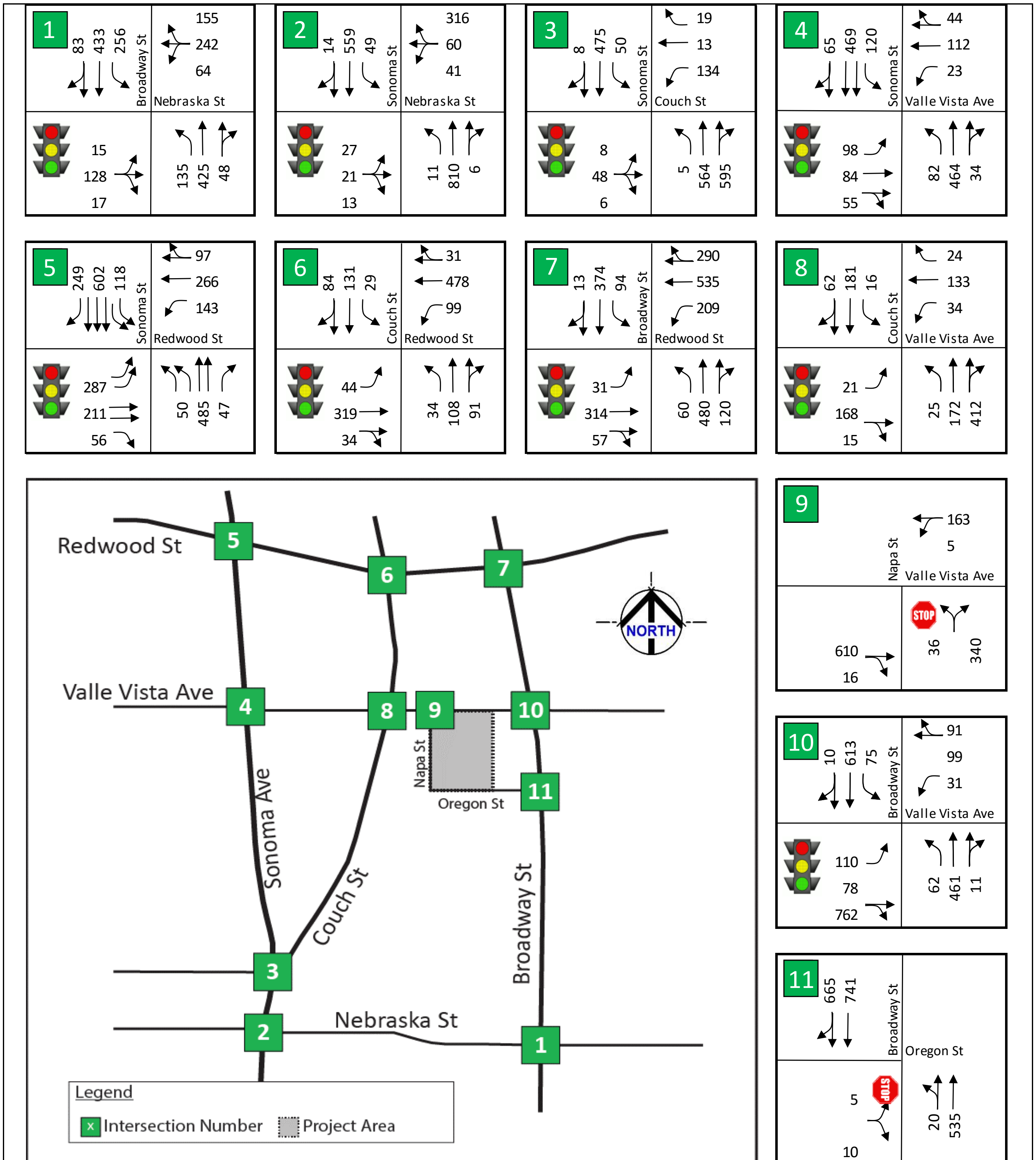


Figure 3.21 – Year 2035 plus Alternative 2 Project Phase 1 & 2, AM Peak Hour

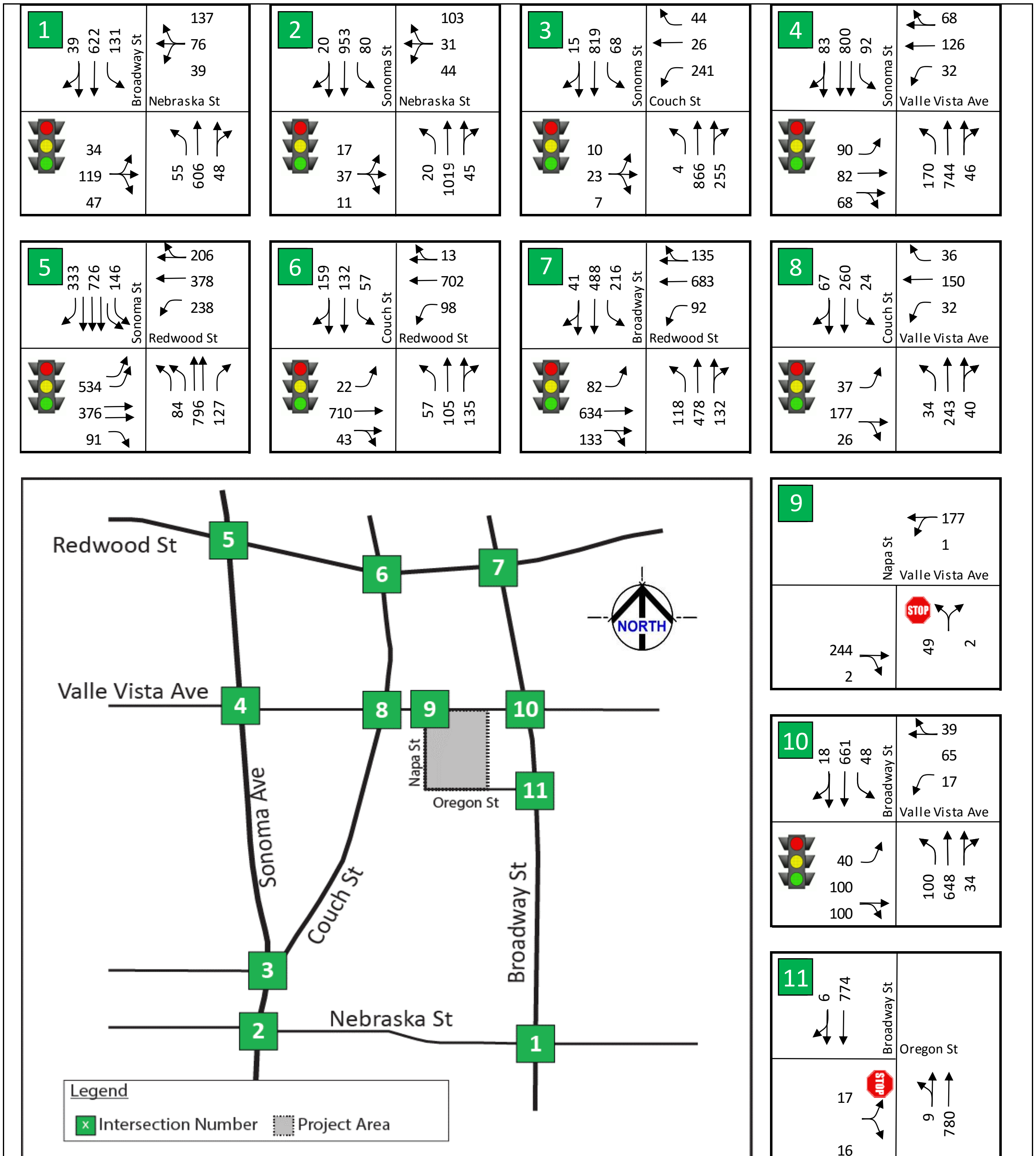


Figure 3.22– Year 2035 PM Peak without Project

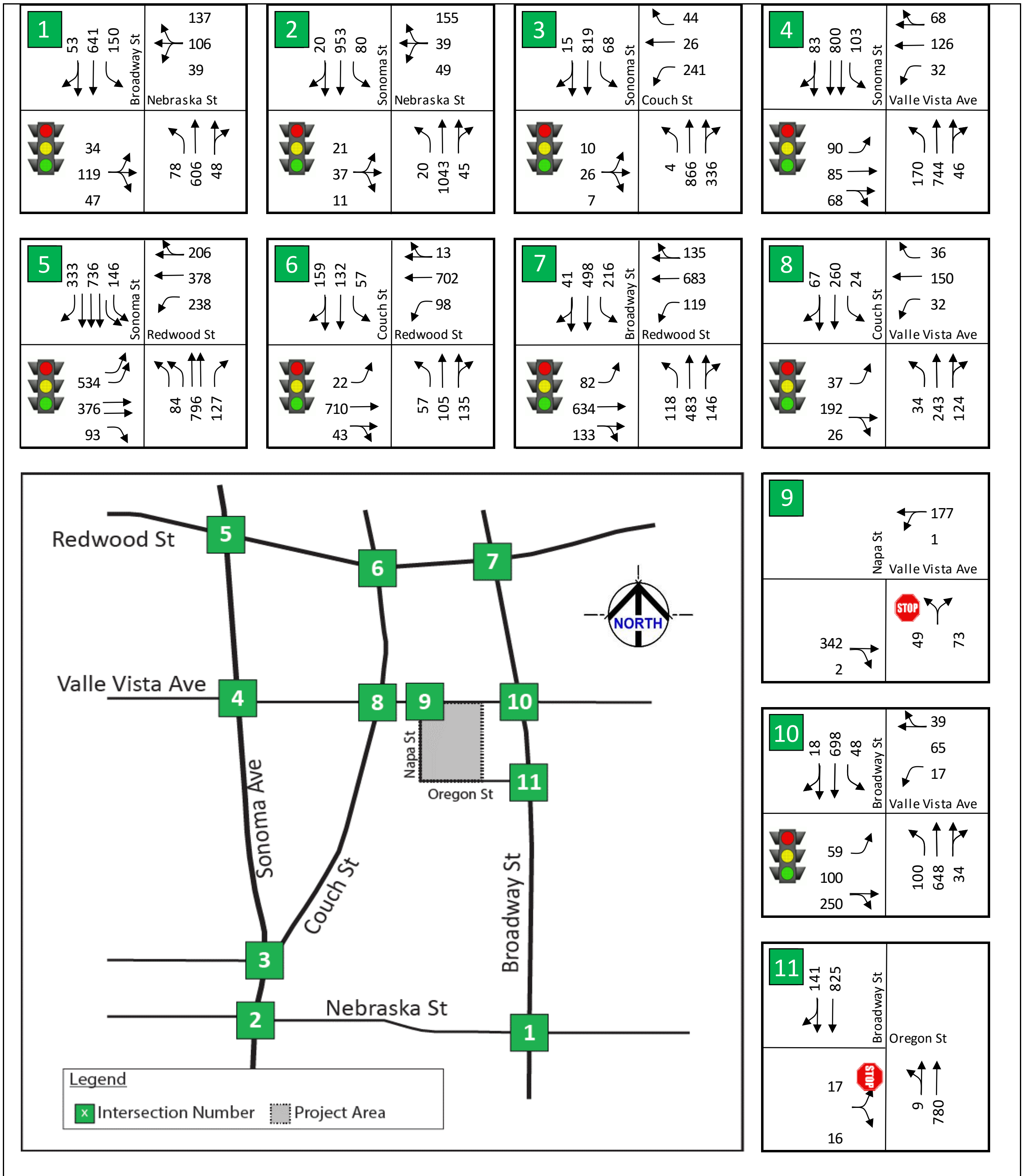


Figure 3.23 – Year 2035 plus Alternative 2 Project Phase 1 & 2, PM Peak Hour

The 2035 projection represents a 20 year window long-term cumulative forecast of traffic levels expected to occur near the buildout of the Vallejo General Plan and surrounding vicinity. A similar process for calculating these volumes from existing counts using a Furness process as described previously in the Near-term analysis section was used to generate the Long-term (2035) volumes.

LONG-TERM (2035) LOS TRAFFIC CONDITIONS

Table 3.12 Long Term Year 2035 Level of Service, Phase 1 & 2 of School

PREFERRED ALTERNATIVE 2 Circulation (includes background growth and Post Office traffic)

				LONG TERM YEAR 2035						LONG TERM YEAR 2035 plus Phase 1&2. Alt2							
				AM Peak Hour			PM Peak Hour			AM Peak Hour				PM Peak Hour			
	INTERSECTION LOCATION	Control	Target LOS	LOS	Delay	V/C[1]	LOS	Delay	V/C[1]	LOS	Delay	V/C[1]	ΔV/C	LOS	Delay	V/C[1]	ΔV/C
1	Nebraska St. and Broadway St.	S	D	C	23.3	0.52	C	23.4	0.53	D	37.5	0.75	0.23	C	24.5	0.59	0.06
2	Nebraska St. and Sonoma Blvd.	S	D	C	32.8	0.37	D	39.8	0.60	D	42.2	0.63	0.26	D	41.7	0.65	0.05
3	Couch St. and Sonoma Blvd.	S	D	C	33.2	0.46	E	79.5	0.71	D	39.9	0.57	0.11	F	89.2	0.72	0.01
4	Valle Vista St. and Sonoma Blvd.	S	D	C	29.0	0.46	C	28.4	0.64	C	31.4	0.49	0.03	C	28.6	0.64	0.00
5	Redwood St. and Sonoma Blvd.	S	D	C	31.7	0.50	C	32.4	0.78	C	31.5	0.50	0.00	C	32.4	0.78	0.00
6	Redwood St. and Couch St.	S	D	B	15.9	0.32	B	17.6	0.49	B	15.9	0.32	0.00	B	17.6	0.49	0.00
7	Redwood St. and Broadway St.	S	D	C	25.9	0.66	D	36.3	0.79	D	47.4	0.80	0.14	D	37.2	0.82	0.03
8	Valle Vista Ave. and Couch St.	S	D	A	8.0	0.17	A	9.2	0.25	B	11.3	0.27	0.10	A	9.8	0.27	0.02
9	Valle Vista Ave. and Napa St.	*ST*	D	*A*	*1.3*	N/A	*A*	*1.3*	N/A	*A*	*1.0*	N/A	N/A	*A*	*2.2*	*N/A*	N/A
		NB		*B*	*10.8*	N/A	*B*	*11.9*	N/A	*C*	*21.0*	N/A	N/A	*B*	*11.8*	*N/A*	N/A
10	Valle Vista Ave. and Broadway St.	S	D	B	16.1	0.35	B	18.0	0.46	D	50.6	0.80	0.45	B	18.0	0.50	0.04
11	Oregon St. and Broadway St.	ST	D	A	0.3	N/A	A	0.4	N/A	A	0.3	N/A	N/A	A	0.4	*N/A*	N/A
		EB		*B*	*11.3*	N/A	*C*	*16.9*	N/A	*C*	*19.0*	N/A	N/A	*C*	*19.4*	*N/A*	N/A

Control: S=Signal, ST=Stop Sign Side Street, NB=NB approach Stop

Notes: [1] V/C ratio is only shown where needed for significance criteria.

Impacts are considered to be significant when the change in V/C ratio between the with and without project conditions are exceeded for the following LOS criteria:

LOS	Δ V/C
C	> 0.04
D	> 0.02
E,F	> 0.01

All intersections except one remained at LOS D or better conditions[15] with this Year 2035 am and pm peak hour scenarios. The City of Vallejo also measures impacts as significant and needing mitigation if the change in V/C ratio at an intersection exceeds the value shown in the notes section below each table (see above). For example, if an intersection is at LOS C and the project traffic causes the V/C ratio to increase by more than 0.04, then the impact is considered significant and requires mitigation. Mitigation measures must be identified for intersections that show a significant project impact (significant change in V/C ratio), and operate at LOS D or worse under Future Build-out Year Cumulative Base plus Project Traffic Condition, or Project Opening (Near – Term)Year Base plus Other Projects plus Project Traffic Condition.

[15] As measured by HCM methodology for average delay

3.9 NEEDED INTERSECTION MITIGATIONS

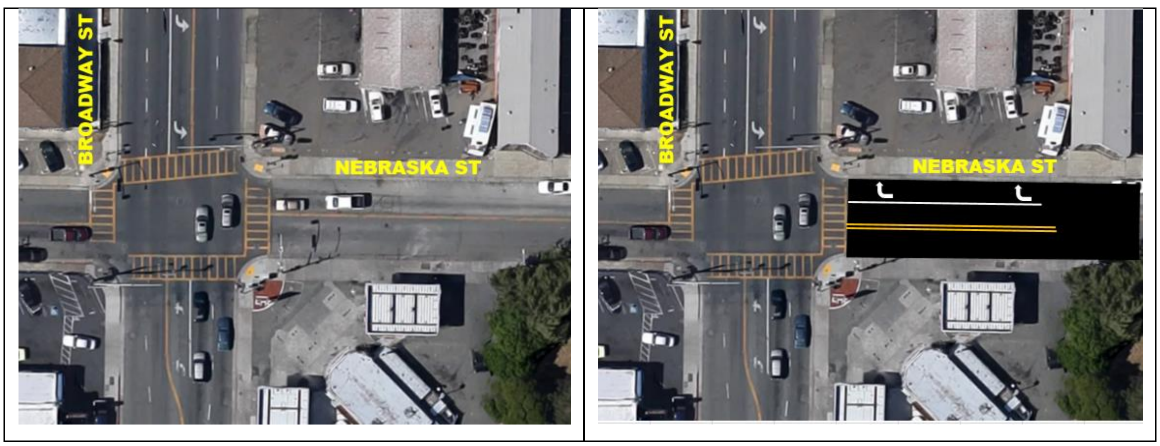
A total of five (5) intersections met the City's criteria for mitigation. These intersections included the following locations:

Int. #1: Nebraska St. at Broadway St., change in LOS C V/C ratio = 0.23 for am peak hour
Int. #2: Nebraska St. at Sonoma Blvd., change in LOS C V/C ratio = 0.26 for am peak hour
Int. #3: Couch St. at Sonoma Blvd., change in LOS C V/C ratio = 0.11 for am peak hour
Int. #7: Redwood St. at Broadway St., change in LOS C V/C ratio = 0.14 for am peak hour
Int. #10: Valle Vista Ave. at Broadway St., change in LOS C V/C ratio = 0.45 for am peak hour

Int. #1: Nebraska St. at Broadway St., Mitigation

Problem: Westbound approach is at LOS E and needs additional capacity. WB right turn is heavy at 155 vph. Overall intersection LOS is D with 50.6 seconds of average delay.

Mitigation: Add WB right turn pocket. Restripe centerline to accommodate shift. Some minor loss of parking near intersection on WB approach.



Result: *Satisfactory LOS C condition with 24.9 seconds of average delay.*

Int. #2: Nebraska St. at Sonoma Blvd., Mitigation

Problem: Westbound approach is at LOS D. WB right turn is heavy at 316 vph and needs additional capacity. Overall intersection LOS is D with 42.2 seconds of average delay.

Mitigation: Add WB right turn pocket. Restripe centerline to accommodate shift. Some minor loss of parking near intersection on WB approach. Change signal timing from split phase for E-W approaches to a permissive phasing. Shorten signal cycle accordingly as capacity is increased.

Result: *Satisfactory LOS B condition with 17.5 seconds of average delay.*

Int. #3: Couch St. at Sonoma Blvd., Mitigation

Problem: Couch St. at Sonoma Blvd. went to LOS F conditions during the pm peak hour with the addition of the full project in this Year 2035 scenario, namely, Sonoma Blvd. at Couch St. where the impact was primarily in the southbound approach. It is important to note that this was only a 0.01 increase to V/C ratio, and marginally passed the significance threshold. The Year 2035 without project traffic projections were already unsatisfactory according to the limited HCM 2000 methodology of capacity analysis, calculating at LOS E conditions with 79.5 seconds of average delay. When the project traffic was added in this overall average delay increased to 89.2 seconds. PRISM Engineering also conducted a microsimulation analysis of this scenario for this intersection for the pm peak hour to determine what the microsimulation methodology capacity analysis result would be. By comparison, the microsimulation result was LOS D and the HCM result was LOS F. Table 3.13 shows the microsimulation results for this intersection for the pm peak hour which had this significance threshold exceeded in the HCM method.

Table 3.13 Long Term Year 2035 Level of Service, SimTraffic Microsimulation
Phase 1 & 2 of School PREFERRED ALTERNATIVE 2 Circulation

SimTraffic Performance Report
Year 2035 PM Peaek Hour 4/11/2016

3: Mississippi St/Couch St & Sonoma Ave Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	33.9	2.4	37.8	38.6	14.8	50.5	21.9	12.1	97.1	61.3	45.9	35.8

Source: SimTraffic and PRISM Engineering

The output results from SimTraffic show that the overall delay (last column in table) for the intersection is only 35.8 average seconds of delay per vehicle, but that there is an LOS F condition for the SBL movement (97.1), and LOS E condition for the SBT movement (61.3). All other movements are at LOS D or better conditions. Overall the average is LOS

D. This result differs from the HCM 2000 methodology. Typically, microsimulation is also performed when traffic operations are at capacity in order to check the more generalized results of the HCM 2000 methods. Microsimulation also takes into consideration the traffic operations factors not considered in the HCM 2000 methods, such as roadway speeds, specialized signal phasing, etc.

Mitigation: This signalized intersection of Sonoma Blvd. at Couch St. can be mitigated to LOS D conditions with a simple increase in the signal cycle timing to better accommodate the additional time needed to clear the critical SB approach volumes. By increasing the natural signal cycle from 90 seconds to 100 seconds and adding this additional 10 seconds of time to the SBT phase, the level of service overall for the intersection improves from LOS F to LOS D conditions. No changes to the road system or intersection geometry are needed to accomplish this.

Result: *Satisfactory LOS D condition with 39.9 seconds of average delay.*

Int. #7: Redwood St. at Broadway St., Mitigation

Problem: Westbound approach left turn is at LOS F with the project (296 secs avg. delay for WBL and 83.6 for the entire approach).

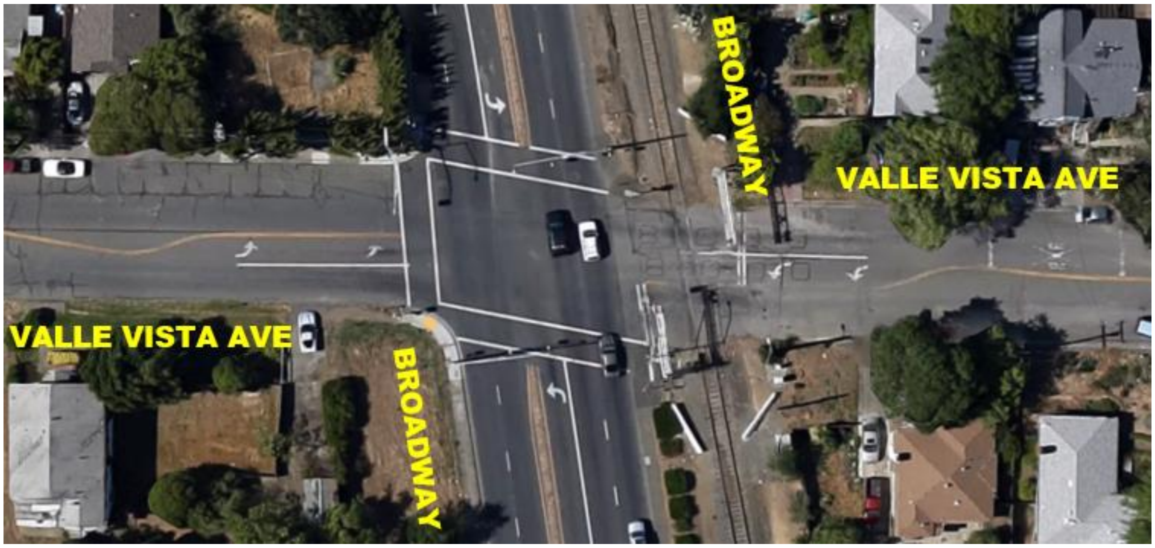
Without the project these values are at LOS C with only 31 seconds of average delay for the WB approach. The WB approach needs additional capacity. In addition, there is a closely spaced intersection just to the west of Broadway Street at Alameda Street which is only 200 feet away (curb to curb), and because of the railroad tracks, only has 150 feet of storage back of the stop line. This short distance is insufficient to move 209 cars through the WB left turn pocket in the am peak hour. Generally, one foot of left turn pocket storage is needed for each vehicle in the peak hour.

Mitigation: Add WB left turn pocket so that WBL becomes a dual left turn pocket. The effective length of this WBL dual pocket is over 225 feet in length. Move median 12 feet south from centerline to accommodate the additional WB approach lane, resulting in only one eastbound lane. Change EB approach to have only one through lane to correspond with this change. The EB through movement is already aligned with the single EB receiving lane on Redwood St. The EB approach will be comprised of one left turn lane, one through lane, and one right turn pocket. Advance warning signage with MUTCD "through traffic merge left" for EB approach. Also overhead regulatory signage for EB approach should be used to guide traffic and prevent vehicles from right turn lane advancing forward.

Result: *Satisfactory LOS C condition with 27.3 seconds of average delay overall, and the EB Through lane will not be impacted resulting in LOS C with 26.2 seconds of average delay.*

Int. #10: Valle Vista Ave. at Broadway St., Mitigation

Problem: Eastbound approach is at LOS F with 101.9 seconds of average delay with the project. The EB right turn lane is at LOS F (122 secs. avg. delay) because of the heavy turning movement (762 vph), and requires signal timing mitigations to accommodate the increase in volume from the 48 vph without the project (LOS B). This volume of 700 additional vehicles per hour (charter school) will cause a net increase of 0.45 in the intersection V/C ratio for the am peak hour.



Mitigation: Increase the timing of the EB signal green time to approximately 40 seconds, allowing for more time for the right turn lane to clear. Total signal cycle time of 80 seconds (pretimed) will yield LOS C conditions with an average delay of 32.1 seconds. No restriping or geometry changes are needed in this mitigation.

Result: *Satisfactory LOS C condition with 32.1 seconds of average delay.*

4.0 OTHER CONSIDERATIONS

Potential Effects on Transit, Bicycle, and Pedestrian Mobility

The project was evaluated to determine if it would likely conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks) or generate pedestrian, bicycle, or transit travel demand that would not be accommodated by transit, bicycle, or pedestrian facilities and plans.

Students or parents of students have the option of driving, taking transit, walking or bicycling to and from the proposed charter school location. For those taking transit, they can reach the site via SolTrans Routes 1 along Valle Vista Avenue and there is a stop directly alongside the northern boundary of the school site, which has an existing sidewalk along Valle Vista Avenue connecting to Napa Street. Valle Vista Avenue is designated as a Class III Bike Route, and as such a cyclist must share the lane with an automobile as there are no bike lanes present. Sidewalks for pedestrians exist on both sides of nearly all study area streets. The project does not conflict with these systems.

Queues on Study Intersections

The traffic analysis worksheets from SynchroPro using the HCM 2000 methodology were reviewed to determine if any significant impacts to queues took place for any scenario, or if through lanes were blocked in any way. This is based on an examination of the 95th percentile queue for all study intersections. The 95th percentile queue length represents a condition where 95 percent of the time the queue reported would take place, and this queue length is compared to the storage length to see if say, a left turn pocket length is exceeded. If the queues that exceed turn pocket length it can create potentially hazardous conditions by blocking or disrupting through traffic in adjacent travel lanes in the same travel direction. A queuing impact is considered to occur when the queue in a left turn pocket extends 25 feet or more beyond the turn pocket (one vehicle in length). Where the vehicle queue already exceeds that turn pocket length under pre-project conditions, a project impact would occur if project traffic lengthens the queue by 25 feet or more. Table 4.1 is a summary of the worst case am peak hour queues at the study intersections for the Year 2015 to 2020 years, with and without the preferred project (note: does not include TDM reduced volumes, assumes higher non-TDM project volumes for Alternative 2). Table 4.2 summarizes the Year 2035 scenarios.

Table 4.1 Year 2015-2020 Queue Analysis Summary for 95th Percentile

		AM Peak Hour				AM Peak Hour			
		2015	2018	Proj	2020	Year 2020+Proj			
INTERSECTION LOCATION		Over?	Over?	Over?	Over?	Over?	Where	Pocket	Queue
1	Nebraska St. and Broadway St.	no	no	no	no	**yes**	**SBL**	**80**	**219**
2	Nebraska St. and Sonoma Blvd.	no	no	no	no	no			
3	Couch St. and Sonoma Blvd.	no	no	no	no	no			
4	Valle Vista St. and Sonoma Blvd.	no	no	no	no	no			
5	Redwood St. and Sonoma Blvd.	no	no	no	no	no			
6	Redwood St. and Couch St.	no	no	no	no	no			
7	Redwood St. and Broadway St.	no	no	no	no	no			
8	Valle Vista Ave. and Couch St.	no	no	no	no	no			
9	Valle Vista Ave. and Napa St.	no	no	no	no	no			
		no	no	no	no	no			
10	Valle Vista Ave. and Broadway St.	no	no	no	no	no			
11	Oregon St. and Broadway St.	no	no	no	no	no			
		no	no	no	no	no			

Source: SynchroPro 9 and PRISM Engineering

Table 4.2 Year 2035 Queue Analysis Summary for 95th Percentile

		Year 2035				Year 2035+Proj			
	INTERSECTION LOCATION	Over?	Where	Pocket	Queue	Over?	Where	Pocket	Queue
1	Nebraska St. and Broadway St.	yes	SBL	80	132	yes	SBL	80	251
2	Nebraska St. and Sonoma Blvd.	no				no			
3	Couch St. and Sonoma Blvd.	no				yes	WBL	75	137
4	Valle Vista St. and Sonoma Blvd.	yes	EBL	60	110	yes	EBL	60	110
5	Redwood St. and Sonoma Blvd.	no				no			
6	Redwood St. and Couch St.	no				no			
7	Redwood St. and Broadway St.	yes	WBL	60	90	yes	WBL	60	227
8	Valle Vista Ave. and Couch St.	no				no			
9	Valle Vista Ave. and Napa St.	no				no			
		no				no			
10	Valle Vista Ave. and Broadway St.	no				no			
11	Oregon St. and Broadway St.	no				no			
		no				no			

Source: SynchroPro 9 and PRISM Engineering

Year 2020 Queue Problem and Solution.

It can be seen from these tables that there are some minor queue problems that are projected to take place first in the Year 2020 plus project scenario at the intersection of Broadway Street at Nebraska Street for the southbound left turn pocket (SBL) which is expected to have a queue 219 feet in length. The existing striped pocket is only 80 feet in length. However, the street is wide enough to allow for the lengthening of this left turn pocket to be longer. Since the ultimate Year 2035 volume would expect to see a queue length of 251 feet at this same left turn pocket (see Table 4.2), it is recommended to install a 250 foot left turn pocket at this location, which can be accomplished through restriping of the lanes. This would mean extending the left turn pocket all the way back to Texas Street since the curb-to-curb width of Broadway Street is the same there as it is at Nebraska Street (60 feet). This means that there is room to accomplish this striping change without widening of the street. Centerline striping will also need to be adjusted on Broadway Street just north of Texas Street to accommodate the transition of through lanes to their new location south of Texas Street (shifted 12 feet).

MITIGATION: *Install a 250-foot southbound left turn pocket at this location between Texas and Nebraska Streets. This can be accomplished through restriping of the lanes since there is room for a five lane cross-section here. This would mean extending the left turn pocket all the way back to Texas Street since the curb-to-curb width of Broadway Street is the same there as it is at Nebraska Street (60 feet, or five 12 foot lanes). This means that there is room to accomplish this striping change without widening of the street. Centerline striping will also need to be adjusted on Broadway Street just north of Texas Street to accommodate the transition of through lanes to their new location south of Texas Street.*

Year 2035 Queue Problem and Solution.

In the Year 2035 three locations in addition to the Broadway/Nebraska intersection have some queue problems projected. These are the intersections of Sonoma at Couch (WBL), Sonoma at Valle Vista (EBL), and at Broadway and Redwood (WBL). It is important to note that two of these additional locations would have a problem without the project from background growth volumes only (Sonoma/Valle Vista and Broadway/Redwood).

Couch and Sonoma Blvd. This location shows a queue problem at the WBL movement which has a 70-foot pocket, and an additional extended pocket. However, when reviewing the intersection geometry, it can be seen that the WBL pocket length is broken into two parts totaling over 150 in length/storage. No mitigations are recommended here since the queue overage (137 feet) is within this range of the two left turn storage areas (shared with Mississippi St.).

Valle Vista and Sonoma Blvd. This location has a projected overage of 50 feet beyond the 60 foot striped left turn EBL pocket. However, this left turn pocket does not have a beginning taper and merely extends into the existing two-way left turn lane. Vehicles are already using this ability to extend the left turn pocket to essentially lengthen the left turn pocket beyond 60 feet.

> **MITIGATION***: It is recommended that the EBL left turn pocket be restriped to a 110-foot distance to accommodate future volumes. No widening is necessary, as the left turn pocket can extend into the available two-way left turn lane.*

Redwood Street and Broadway Street. This location will have an overage on the WBL movement, a movement that does serve the project traffic to some degree. It also will have a queue overage even without the project by about one vehicle in length. When the project traffic is added in, there will be 7 cars that will not fit in the WBL left turn pocket. The left turn bay needs to be lengthened to about 230 feet to accommodate Year 2035 traffic projections. There is a traffic operations problem with this change because of the close proximity of the intersection of Redwood and Alameda Street which is only 200 feet away. It is not possible to fit a 230-foot pocket in that length.

There are at least two possible solutions for this situation:

1. Make Alameda Street right in and right out only by installing a median that extends on Redwood Street easterly through the entire intersection, and then this longer left turn pocket can be accommodated with existing striping and intersection configuration at Redwood and Broadway.
2. Modify the EB approach of Redwood Street at Broadway to change two through lanes to one through lane and one right turn only lane. Move the raised median on Redwood Street east of Broadway Street to the south 12 feet to make room for a dual left turn pocket extending back about 140 feet to the Alameda Street intersection. Current left turn pocket length is 60 feet.

We recommend the second solution because it will allow the full access now enjoyed at the Alameda Street intersection to continue without disruption. It also allows for a dual left turn pocket. The first solution is the easiest engineering solution and has the benefit to traffic operations by eliminating the closely spaced intersection between Alameda and Broadway Streets (only 150 feet apart). However, closing long standing access is highly controversial and will be unlikely to achieve with local resident's opposition.

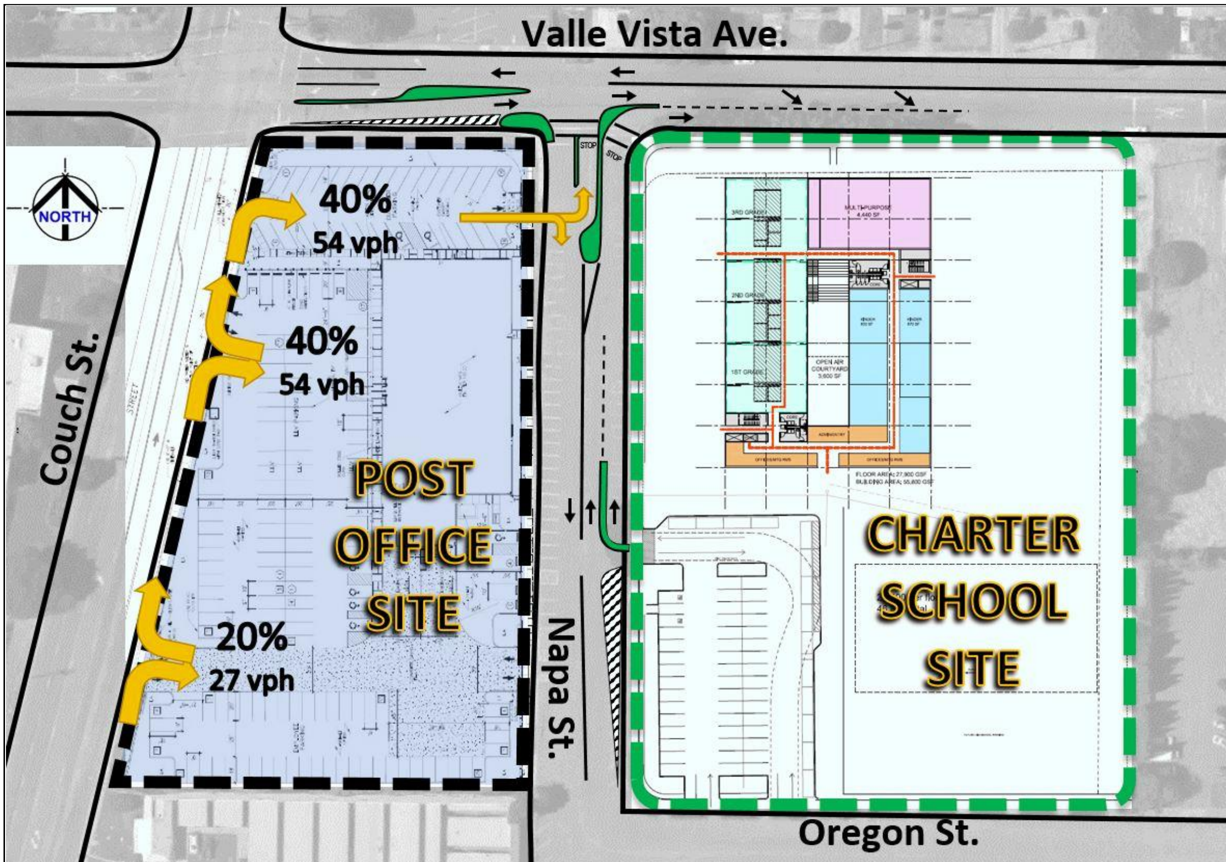
MITIGATION:

- *Modify the EB approach of Redwood Street at Broadway to change two through lanes to one through lane and one right turn only lane.*
- *Move the raised median on Redwood Street east of Broadway Street to the south 12 feet to make room for a dual left turn pocket additional lane*
- *Extend left turn pocket back about 140 feet to the Alameda Street intersection.*
- *Accommodate EBL left turn 50-foot pocket into Alameda Street on reverse side of this WBL dual left turn pocket.*
- *Redwood Street just east of Broadway Street is a single travel lane for eastbound traffic until Alameda Street, then transitions to two through EB lanes again.*
- *Restripe Redwood Street just west of Broadway Street, for the EB approach, needs to be restriped to only have one through EB lane. Right-most lane is converted into a right turn pocket, and inside through lane is already directed at the single receiving lane because of the slight change in direction (skew) for Redwood Street after Broadway Street.*

5.0 SUMMARY OF IMPACTS AND RECOMMENDED MITIGATION

Traffic Operations Evaluation of Oregon Street and Napa Street Charter School Parking Lots Access Driveway

The nature of any school with a 1000 or more students is that the am peak hour arrival time is typically condensed into a short amount of time (15-20 minutes), and long lines of traffic and delay result. It is typical that these lines will form with a composite queue length total corresponding to about 1 foot per student enrollment. A quarter mile of total queue length is not uncommon at many public elementary schools and can be even worse for private schools where bus systems are less effective or unavailable. Some schools can have a staggered start time program so that students will end up arriving at different times corresponding to start times of class. The result of this transportation demand management (TDM) is to spread out the inbound traffic flow, essentially cutting traffic arrival queues in half and lower impacts at intersections. The project's site plan and PRISM Engineering' proposed street improvements and circulation plan are shown in Figure 4.1 shows the project site and proposed local circulation needed to minimize impact to Napa St. at Valle Vista Ave. This figure is the same as Figure 3.9 and is shown here for convenience.



Source: PRISM Engineering

Figure 4.1 – Raised Island Channelization for Napa Street, Valle Vista Ave. Needed Improvements for Satisfactory Traffic Operations and Safety

What this figure shows is how traffic will need to be managed once it leaves the school site and enters Napa Street to head north (forced by raised median). School traffic is then forced again to turn right at Valle Vista Avenue (forced by raised median). This helps to minimize the turning movement conflict that would otherwise take place with the proposed US Post Office at the corner of Napa and Valle Vista Ave where 54 vph would exit there in the am peak hour.

What this figure does not show is the specific arrival queue that would form on Oregon Street. This is because there are several possibilities for what this queue might be depending on whether it is for the short term Phase 1 scenario, or the longer term Phase 2 scenario (add High School). In addition, there is the possibility that the charter school arrival queue would be reduced by a staggered start time program where parents bring their child to school at a time corresponding with the start times of classes for various grade levels. Traffic for the school will ideally be arriving via Oregon Street coming from Broadway Street (SB Broadway only). This forced arrival pattern minimizes impacts and keeps most turning movements are right turn only in the local vicinity. Right turns are much more easily accommodated than left turn movements. However, since there is only 525 feet from the opening of the first school driveway on Oregon Street and Broadway Street, if queues back up beyond that distance there is the potential to block traffic operations for southbound Broadway Street at the intersection of Oregon Street.

Charter School Arrival Queue.

The distance between the ***exit*** driveway of the project site and Oregon Street / Broadway Street intersection is about 900 feet, so that it could provide storage "as is" for the school up to about 900 students (see Figure 4.1). This is based on the worst-case scenario where there is no staggered start time program in place, and where all students arrive at the typical condensed arrival situation. This is storage capacity is marginally short of the approximately 1320 feet (¼ mile) needed to store vehicles before they back up onto Broadway Street and block traffic. There are two possibilities to mitigate this shortage: Reduce the school traffic through a staggered start time program, or lengthen the amount of on-site storage for the queue (to remove them more quickly from Oregon Street). In the paragraphs that follow, these scenarios are explained in more detail.

Staggered Start Time Mitigation Option.

One mitigation to this is the Caliber Charter School's proposed staggered start time program, where a portion of the students would have class start times different from other students in the school. The charter school proposed staggered start time program would break the students into three groups as follows:

1. Classes start at 7:30 for grades 5-8
2. Classes start at 7:45 for grades 1-4 and
3. Classes start at 8:00 am for TK-Kinder

Since the children will be graded on attendance and punctuality, this staggered start time method is enforceable. A certain portion of the students will arrive before the peak hour[16] at 7:30 am, and remainder will the other half would arrive during the peak hour 30 minutes later.

This splitting or spreading of the total traffic into separate parts by grade groups starting at different times would change the queue length for arrivals accordingly. With such a Transportation Demand Management (TDM) program in place, the required queue length needed would only be about 700 feet (about half of the original needed ¼ mile estimate). If the staggered start time TDM program were in effect, the resulting arrival queue would be well within the existing proposed 900 feet total length available with the proposed site plan.

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[16] The am "Peak Hour" for the 11 study intersections varies from 7:30 am to 8:30 am, 7:45 to 8:45, and 8:00 to 9:00 am. If the average is considered 7:45 am to 8:45 am then a portion of the school traffic would arrive before this time, estimated to be 50%.

Site Plan Mitigation Option.

However, if the staggered start time program is not in place or not approved as a mitigation by the City or is not verifiable, then the site plan would need to be revised to allow a longer queue length on site. With the current proposed site plan prepared by the architect, there is only 350 feet of onsite storage possible within the parking lot area, as school arrival traffic wends through dropping off students and then exiting onto Napa Street to turn right and go north on Napa Street. If TDM is not implemented, an additional 500 feet of queue storage would be needed on-site in order to ensure that school traffic does not back up all the way to Broadway Street and cause a blockage of Broadway Street traffic in the southbound direction. This additional 500 feet of onsite storage could be accomplished with a modified site design that had additional lanes (expand parking lot area) for drop off purposes which could run in parallel to each other (double the drop off capacity). This solution would be needed if the staggered start time program is not implemented or accepted by the City. Since a portion of the charter school site (SE quadrant) is not being used, this drop off lane expansion concept could be provisioned to allow more traffic storage on site to help keep Oregon Street clear. This is only needed if the staggered start time program is not in force.

Bus Turnout on Valle Vista Avenue.

Figure 4.1 shows the recommended improvements to the Napa St. and Valle Vista Ave. intersection, and shows an additional EB lane to accommodate the increase in flow coming out from Napa St. attributable to the charter school. Because there is an existing SolTrans bus stop on the northern border of the project site for Line 1, the school site should dedicate additional right-of-way to accommodate a bus turnout for this line since any bus stop there with the proposed new routing of future charter school traffic would potentially block through traffic operations, whereas in the existing condition, there is room for a bus to stop and not block through traffic. Figure 5.1 shows a similar bus stop configuration already in existence in the City of Vallejo along Sereno Drive east of Broadway Street in front of Kaiser at the Kaiser Entrance Street. Figure 5.2 shows the project boundary in green dash, and the proposed bus turnout location in yellow dash line. This proposed bus turnout is similar in size and scope to the existing bus stop installed at Sereno and Kaiser Entrance. The bus turnout will increase safety in traffic operations along Valle Vista Avenue and help prevent unsafe passing maneuvers around a stopped bus.

Figure 5.1 Existing SolTrans Bus Stop along Sereno Drive at Kaiser Entrance

Figure 5.2 Recommended Bus Stop Turnout on Valle Vista east of Napa Street

Mitigation of Year 2035 Cumulative Traffic at Sonoma Blvd. and Couch St.

The intersection of Sonoma Blvd. at Couch St. during the Year 2035 pm peak hour is projected to operate at LOS E without the project, and LOS F with the project. The simple mitigation for this condition was to add more signal time to the southbound approach. Adding 10 more seconds to the signal cycle's natural cycle length of 90 seconds to 100 seconds instead results in LOS C conditions overall. This additional 10 seconds would be added to the SB approach.

APPENDIX