memorandum

Date: July 19, 2013

To: **Mr. T. Scott Kelly, P.E.**
LACO Associates

From: Steve Weinberger

Project: HUX052

Subject: Samoa Industrial Waterfront Transportation Access Plan

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Introduction

This memo describes the potential traffic impacts which would be expected to be generated by development in the Samoa Industrial Waterfront area. The impacts at five study intersections were evaluated using base traffic data from the Samoa Town Master Plan EIR. The traffic projections included the full development potential of the Samoa Town Master Plan.

Study Area

This traffic evaluation included an assessment of intersections located at the interface of Samoa and the adjacent highway system as well as intersections in Eureka. Five existing intersections were identified as locations which may be impacted by development of the Samoa Industrial Waterfront area. These intersections include:

1. New Navy Base Road/Samoa Pulp Lane (formerly LP Drive)
2. New Navy Base Road/Cookhouse Road
3. New Navy Base Road/SR 255
4. SR 255/4th Street (City of Eureka)
5. SR 255/5th Street (City of Eureka)

Traffic Analysis Scenarios

The following scenarios were evaluated:

- Existing 2013
- Future 2033
- Existing plus Samoa Town Plan
- Existing plus Samoa Town Plan plus Industrial Waterfront Development
- Future plus Samoa Town Plan
- Future plus Samoa Town Plan plus Industrial Waterfront Development

Following is a description of each of these components:

Existing (2013) – Existing traffic volumes for the study intersections were acquired from the Samoa Town Master Plan EIR and were factored forward to reflect Year 2013 conditions. The growth factor was based on the Caltrans District 1 20-year growth factors. These resulting traffic volumes for the five study area intersections are shown in Figure 1.

Future (2033) – Future 20-year horizon traffic volumes were obtained by taking the new Existing (2013) traffic volumes for the study and applying the Caltrans District 1 20-year growth factors. For US 101, Caltrans has determined that traffic volumes would be expected to increase by a factor of 1.3 over the next 20-year period. For SR 255, traffic volumes are expected to increase by a factor of 1.20 over the next 20 years. These factors were therefore applied to the existing traffic volumes in order to obtain projected future volumes. These resulting traffic volumes for the study area are shown in Figure 2.

Samoa Town Plan Traffic Volumes – These traffic volumes, which reflect buildout conditions for the Samoa Town Plan area, were acquired from the Samoa Town Master Plan EIR. In total, the Town Plan area was projected to generate 748 a.m. peak hour and 811 p.m. peak hour new external vehicle trips. These traffic volumes are shown in Figure 3.

Samoa Industrial Waterfront Traffic Volumes – These traffic volumes which were provided assume 10% build-out of parcels feeding into the Preferred Route of the Samoa Industrial Waterfront area. In total, the Industrial Waterfront area was projected to generate 633 a.m. peak hour and 697 p.m. peak hour new external vehicle trips. The Industrial Waterfront traffic volumes for the five study area intersections are shown in Figure 4.

Intersection Analysis Methodology

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. A unit of measure that indicates a level of delay generally accompanies the LOS designation.

The intersections included in this traffic evaluation were analyzed using methodologies from the *Highway Capacity Manual 2000*, Transportation Research Board, 2000. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle. The ranges of delay associated with the various levels of service are indicated in Table 1.

Table 1
Intersection Level of Service Criteria

LOS	Unsignalized and All-Way Stop-Controlled	Signalized
A	Delay of 0 to 10 seconds. Gaps in traffic are readily available for drivers exiting the minor street.	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
B	Delay of 10 to 15 seconds. Gaps in traffic are somewhat less readily available than with LOS A, but no queuing occurs on the minor street.	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
C	Delay of 15 to 25 seconds. Acceptable gaps in traffic are less frequent, and drivers may approach while another vehicle is already waiting to exit the side street.	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
D	Delay of 25 to 35 seconds. There are fewer acceptable gaps in traffic, and drivers may enter a queue of one or two vehicles on the side street.	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
E	Delay of 35 to 50 seconds. Few acceptable gaps in traffic are available, and longer queues may form on the side street.	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
F	Delay of more than 50 seconds. Drivers may wait for long periods before there is an acceptable gap in traffic for exiting the side streets, creating long queues.	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

Reference: *Highway Capacity Manual,* Transportation Research Board, 2000

Analysis of Signalized Intersections

The signalized methodology is used for intersections which are controlled by traffic signals and are based on factors including traffic volumes, green time for each movement, phasing, whether or not the signals are coordinated, truck traffic, and pedestrian activity. Average stopped delay in seconds per vehicle, which includes delay due to initial deceleration, queue move-up time, stopped delay, and final acceleration delay, is used as the basis for evaluation in this signalized LOS methodology.

Analysis of Unsignalized Intersections

The Levels of Service for the intersections with side-street stop controls, or those which are unsignalized and have one or two approaches stop controlled, were analyzed using the "Two-Way Stop-Controlled" intersection capacity method from the HCM. This methodology determines a level of service for each minor turning movement by estimating the level of average delay in seconds per vehicle. Results are presented for individual movements together with the weighted overall age delay for the intersection.

Analysis of All-Way Stop Controlled Intersections

SR 255/New Navy Base Road is controlled with stop signs on two of the three approaches which are offset in a non-standard setup. Because the intersection operates with less capacity than an unsignalized, side street stop controlled intersection, it was analyzed using the "All-Way Stop-Controlled Intersection" methodology from the HCM. This methodology evaluates delay for each approach based on turning movements, opposing and conflicting traffic volumes, and the number of lanes. Average vehicle delay is computed for the intersection as a whole, and is then related to a Level of Service.

Traffic Operation Standards

The County of Humboldt does not have an adopted Level of Service (LOS) standard for traffic conditions. The County Department of Public Works has, however, set a goal of having all intersections operate at LOS C or better. This standard does not differentiate between signalized and unsignalized intersections, and application of the LOS C standard to individual movements at unsignalized intersections may lead to recommendations which create unnecessary delay or maintenance expenses.

For the purposes of this traffic evaluation, **t**he overall intersection operation was therefore compared to the LOS C standard to determine if mitigating measures such as a traffic signal should be recommended. For the individual movements at unsignalized, or two-way stop-controlled, intersections, LOS D operation was assumed to be the minimum acceptable. If operation fell below LOS C overall or LOS D for individual movements, improvements such as additional lanes, changes to the right-of-way controls, or installation of a traffic signal were considered.

The *Traffic Manual* (California Department of Transportation 1978) contains guidelines for determining the need for a traffic signal. Potential need for installing traffic signals at the unsignalized and all-way stop controlled study intersections was evaluated using Warrant 11, the Peak Hour Volume warrant, assuming urban conditions. Warrant 11 is met when there is undue delay to minor street traffic crossing or entering the major street. Although traffic signal warrants may be met for some conditions, the decision to install a traffic signal should also be based on the other traffic signal warrants which consider daily traffic volumes and accident experience, current traffic operations, and adjacent traffic controls.

Intersection Level of Service Results

The results of the intersection impact analysis for the six scenarios are summarized in Table 2 and detailed calculations are attached. Following is a summary of the results.

Table 2
Peak Hour Intersection Levels of Service

Study Intersection *Approach*	Existing 2013 Conditions				Future 2033 Conditions				Existing plus Samoa Town Plan				Existing plus Samoa Town Plan plus Industrial Waterfront Development				Future plus Samoa Town Plan				Future plus Samoa Town Plan plus Industrial Waterfront Development			
	AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. New Navy Base Rd/ Samoa Pulp Rd	4.8	A	1.9	A	4.9	A	1.9	A	6.1	A	5.3	A	4.0	A	4.4	A	6.1	A	5.1	A	4.1	A	4.4	A
Northbound Approach	*9.1*	*A*	*8.9*	*A*	*9.3*	*A*	*9.0*	*A*	*9.3*	*A*	*9.6*	*A*	*10.1*	*B*	*13.4*	*B*	*9.5*	*A*	*9.7*	*A*	*10.3*	*B*	*13.9*	*B*
Westbound Left	*7.4*	*A*	*7.5*	*A*	*7.4*	*A*	*7.5*	*A*	*7.7*	*A*	*7.5*	*A*	*8.3*	*A*	*8.9*	*A*	*7.8*	*A*	*7.6*	*A*	*8.4*	*A*	*9.0*	*A*
2. New Navy Base Rd/ Cookhouse Dr	2.9	A	1.7	A	2.9	A	1.7	A	6.1	A	10.9	B	4.5	A	**95.5**	**F**	6.1	A	11.6	B	4.6	A	**106.2**	**F**
Northbound Approach	*9.0*	*A*	*9.2*	*A*	*9.1*	*A*	*9.3*	*A*	*10.6*	*B*	*21.2*	*C*	*12.3*	*B*	**	***F***	*10.9*	*B*	*23.7*	*C*	*12.8*	*B*	**	***F***
Westbound Left	*7.5*	*A*	*7.4*	*A*	*7.5*	*A*	*7.5*	*A*	*8.6*	*A*	*8.6*	*A*	*9.5*	*A*	*12.2*	*B*	*8.7*	*A*	*8.7*	*A*	*9.6*	*A*	*12.4*	*B*
With Traffic Signal													20.5	C	42.1	D	21.4	C	27.3	C	21.2	C	43.8	D
3. New Navy Base Rd/ Hwy 255	11.4	B	16.6	C	13.2	B	26.	D	38.0	E	28.3	D	**	**F**	**78.4**	**F**	48.6	E	**51.6**	**F**	**	**F**	**108.0**	**F**
With Traffic Signal													28.9	C	32.4	C	24.1	C	27.9	C	31.0	C	36.7	D
12. Hwy 255/Fourth St	14.0	B	14.9	B	21.1	C	21.0	C	18.5	B	25.6	C	21.8	C	58.9	E	32.2	C	52.7	D	140.9	D	**100.0**	**F**
SB Lane Change													19.2	B	21.2	C	21.3	C	22.0	C	28.2	C	34.1	C
13. Hwy 255/Fifth St	6.2	A	5.3	A	6.5	A	6.2	A	6.2	A	6.5	A	6.0	A	7.5	A	6.5	A	7.4	A	6.6	A	8.5	A

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in italics; ** = delay greater than 120 seconds; Shaded cells = conditions with recommended improvements

Existing 2013

All of the study intersections are currently operating acceptably at LOS C or better, either overall or at the stop-controlled side street approaches.

Future 2033

Under Future Conditions with general background growth described above and without development of either the Samoa Town Plan or the Industrial Waterfront area, the majority of the study intersections would operate acceptably at LOS C or better, either overall or on the stop-controlled side street approaches. The exceptions include the following.

- SR 255/New Navy Base Road is expected to deteriorate to LOS D under PM peak hour conditions

Existing plus Samoa Town Plan

Under Existing Conditions with development of the Samoa Town Plan, the majority of the study intersections would continue to operate acceptably at LOS C or better, either overall or on the stop-controlled side street approaches. The exception includes the following.

- SR 255/New Navy Base Road is expected to deteriorate to LOS E under AM peak hour conditions

Existing plus Samoa Town Plan plus Industrial Waterfront Development

Under Existing Conditions with development of the Samoa Town Plan and the Industrial Waterfront area, the following intersections would be expected to operate with unacceptable conditions:

- New Navy Base Road/Cookhouse Drive is expected to deteriorate to LOS F under PM peak hour conditions
- SR 255/New Navy Base Road is expected to deteriorate to LOS F under both AM and PM peak hour conditions
- SR 255/Fourth Street is expected to deteriorate to LOS E under PM peak hour conditions

Future plus Samoa Town Plan

Under Future Conditions with development of the Samoa Town Plan, the majority of the study intersections would continue to operate acceptably at LOS C or better, either overall or on the stop-controlled side street approaches. The exceptions include the following.

- SR 255/New Navy Base Road is expected to deteriorate to LOS F under the PM peak hour conditions
- SR 255/Fourth Street is expected to deteriorate to LOS D under PM peak hour conditions

Future plus Samoa Town Plan plus Industrial Waterfront Development

Under Future Conditions with development of the Samoa Town Plan and the Industrial Waterfront area, the following intersections would be expected to operate with unacceptable conditions:

- New Navy Base Road/Cookhouse Drive is expected to deteriorate to LOS F under PM peak hour conditions
- SR 255/New Navy Base Road is expected to deteriorate to LOS F under both AM and PM peak hour conditions
- SR 255/Fourth Street is expected to deteriorate to LOS F under PM peak hour conditions

Mitigation Measures

Due to the unacceptable conditions at three of the study intersections, the following mitigation measures would be necessary to allow for acceptable operations.

- New Navy Base Road/Cookhouse Drive - A traffic signal or roundabout should be installed. If a traffic signal were installed, the northbound approach should include a separate lane for both left and right-turn movements. The LOS results with this mitigation are shown in Table 2. This mitigation would not be needed until approximately 50 to 75 percent of the anticipated combined development is completed from the Samoa Town Plan area and the Industrial Waterfront.

- SR 255/New Navy Base Road – A traffic signal or roundabout should be installed. The LOS results with this mitigation are shown in Table 2. This mitigation would not be needed until approximately 25 percent of the anticipated combined development is completed from the Samoa Town Plan area and the Industrial Waterfront.

- SR 255/Fourth Street – The southbound approach should be restriped to include one right-turn lane and one combined through/right-turn lane. The appropriate pavement markers to guide the new double right turn lane onto Highway 101 should be completed. This mitigation would not be needed until approximately 50 percent of the anticipated combined development is completed from the Samoa Town Plan area and the Industrial Waterfront.

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Attachments: Figure 1 Existing 2013 Traffic Volumes
Figure 2 Future 2033 Traffic Volumes
Figure 3 Samoa Town Plan Traffic Volumes
Figure 4 Industrial Waterfront Development Traffic Volumes
Attachment A – Level of Service Calculations

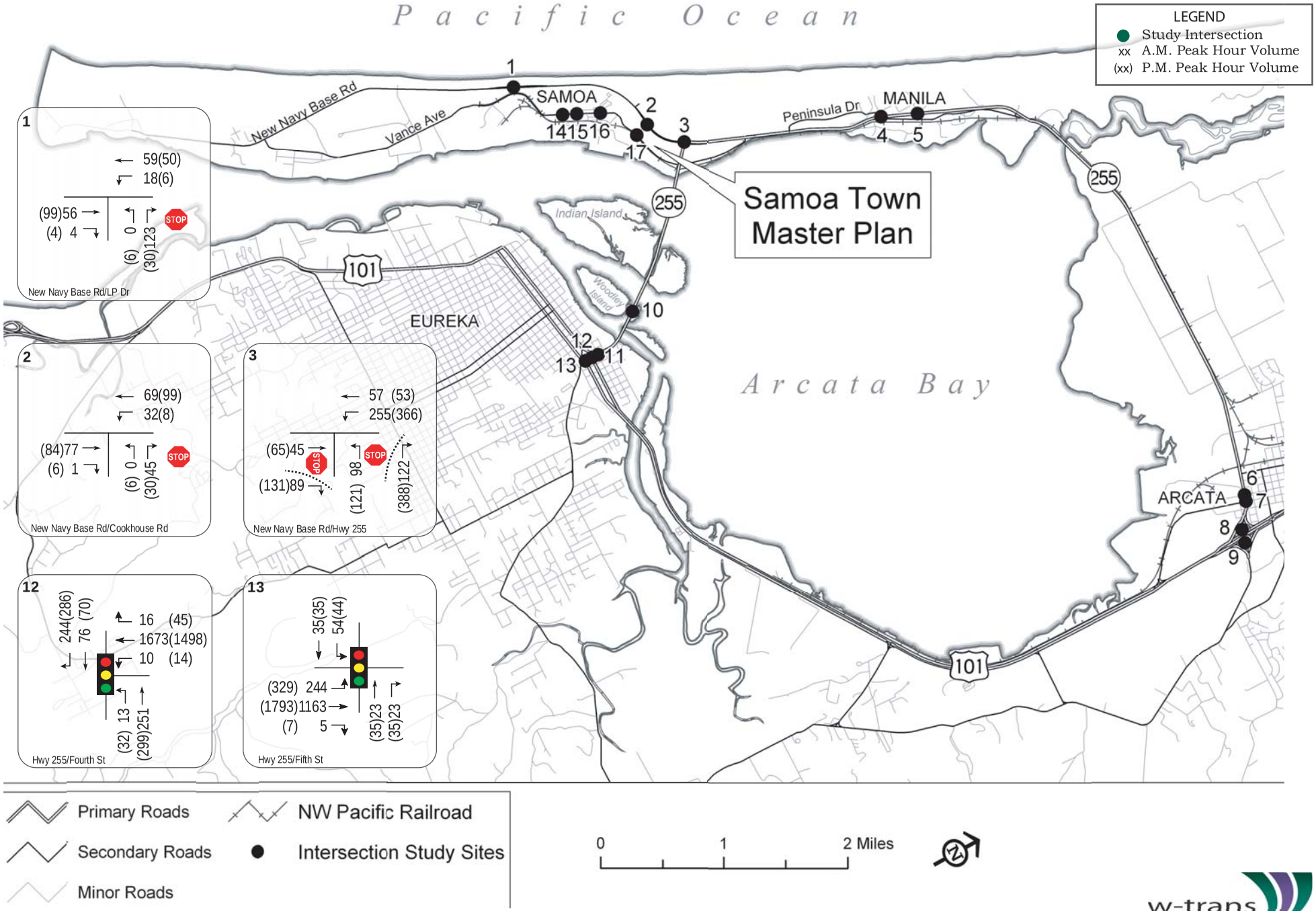

Figure 1 Existing 2013 Traffic Volumes

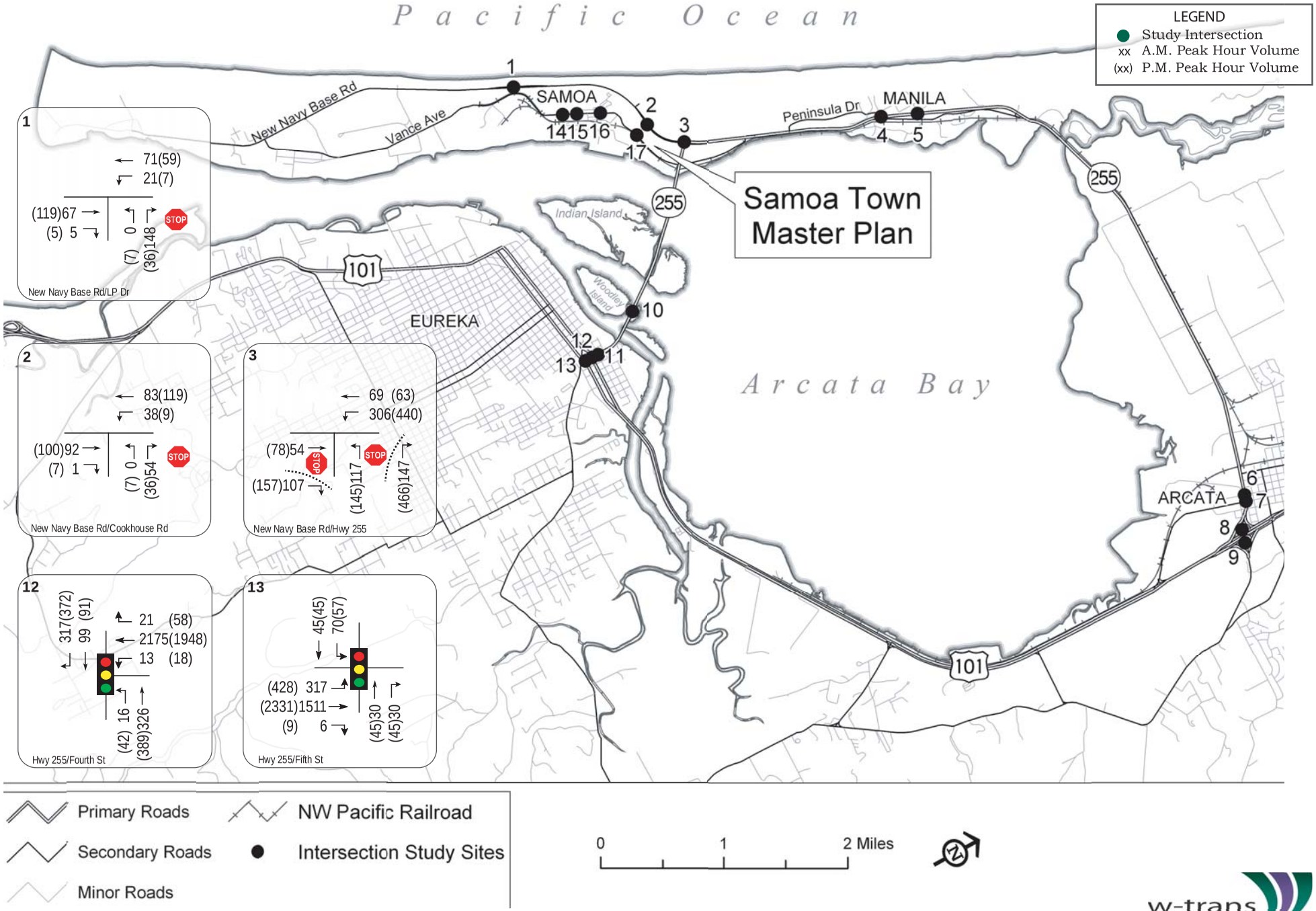

Figure 2 Future 2033 Traffic Volumes

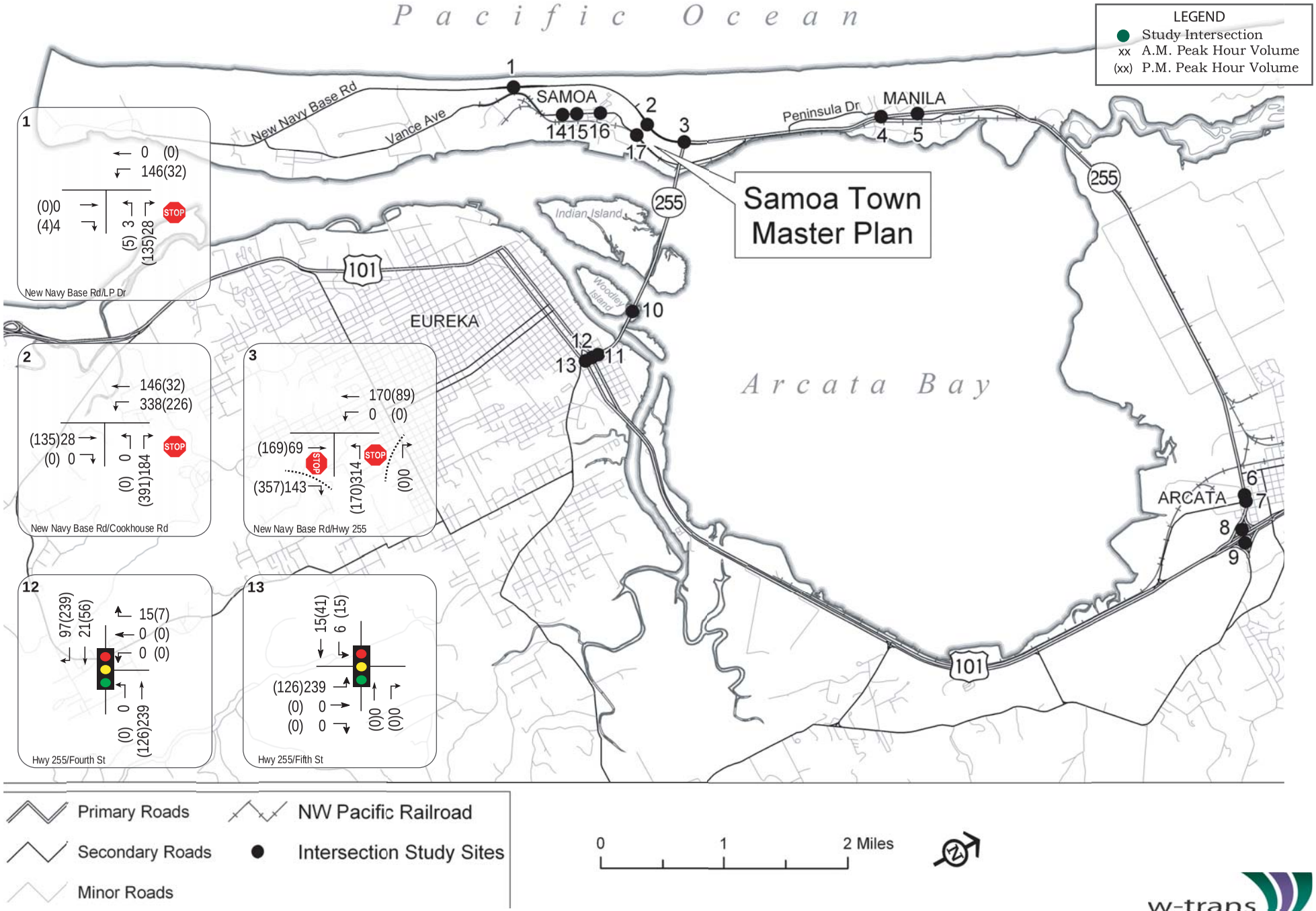

Figure 3 Samoa Town Plan Traffic Volumes

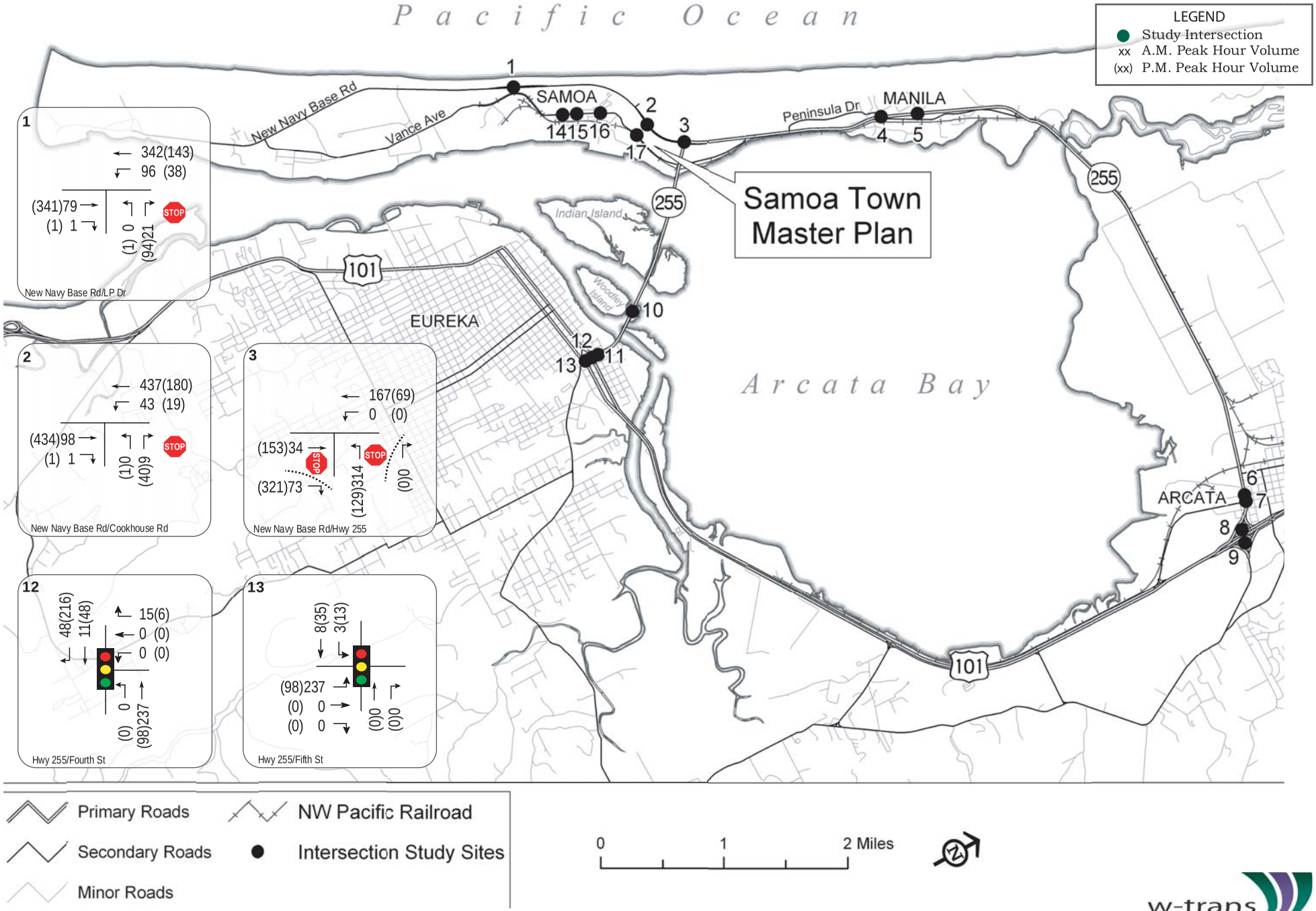

Figure 4 Industrial Waterfront Development Traffic Volumes