Fremont Bridge Approach Project
Phase II Study (PS&E)

Traffic Analysis Support
Final Technical Memorandum

Submitted to:
City of Seattle Department of Transportation (SDOT)

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1. EXECUTIVE SUMMARY

The Fremont Bridge Plans Specifications & Estimates (PS&E) Study builds on the previous work conducted for the Fremont Bridge Type Size & Location (TS&L) Study and describes, in further detail, the various design / construction elements for the north and south approach structures. The traffic analysis tasks associated with the PS&E phase mainly focus on long-range traffic impacts and operational conditions and are intended to support the environmental review process and design tasks. The primary goal of this traffic analysis work is to address specific issues related to traffic operations during the bridge approach reconstruction period. For the PS&E-stage of analysis, partial closure of the bridge was assumed for 9-months of the overall 18-month construction period (beginning in 2005) under which a single travel lane in each direction would be provided across the bridge. However, before and after this construction period, the existing four-lane bridge cross section was assumed to be maintained.

For the purposes of the traffic analysis, the year-of-opening (2007) defined the reference horizon year for which all mid-range comparisons were made. Long-range impacts were captured in the Year 2025 analysis. In addition to the existing conditions assessment, three year-of-opening scenarios and two long-range scenarios were evaluated for the AM & PM peak hours translating to a total of 12 possible evaluation scenarios. These are listed below:

1) 2001 Existing Conditions (AM & PM)
2) 2007 No-Action (AM & PM)
3) 2007 Construction Phase (AM & PM)
4) 2007 Post-Construction (AM & PM)
5) 2025 No-Action (AM & PM)
6) 2025 Post-Construction (AM & PM)

The future 2007 & 2025 No-Action scenarios assume that the existing roadway / intersection system is intact and no major transportation improvements have been implemented. For the Construction-Phase analysis, several mitigation measures were assumed to be in place to minimize the impacts of traffic diversion to alternative routes (due to the bridge capacity reduction) in the local and outlying areas. The Post-Construction scenarios include the same mitigation measures used for the Construction-Phase but assume that the original traffic patterns (prior to bridge reconstruction) and peak hour volumes have been re-established. The study area for this PS&E analysis expands upon area identified and used in the TS&L phase and includes several additional arterial roadways and intersections not evaluated previously. This ensures that the traffic analysis results for this phase of the study fully capture the area-wide impacts of the 18-month construction period.

This technical memorandum documents existing (2001) and future (2007 & 2025) peak hour traffic conditions in the general vicinity of the bridge and along key diversion routes to assess potential traffic-related impacts before, during, and after the construction period. The various mitigation measures identified in the TS&L study are also evaluated and described in this document. For descriptions of transit routes, freight movements, accident rates, and the impacts of a full-bridge closure event, refer to the TS&L technical memorandum.

1.1. CONSTRUCTION-PHASE IMPACTS

During reconstruction of the bridge approach structures, the existing four-lane bridge deck would be narrowed to a two-lane section (one travel lane in each direction) for 9 months, thereby reducing the traffic capacity of the bridge by approximately 50 percent. The congestion impacts of this "partial closure" scenario would result in a natural redistribution of traffic movements to alternative routes such as the Aurora Ave Bridge (SR-99), Ballard Bridge (15th Ave NW), and potentially Eastlake Ave on the east side of Lake Union. To address these anticipated impacts, various mitigation measures were identified in the TS&L study for specific arterials and intersections that would be expected to carry the majority of the diversion traffic. These mitigation measures, ranging from left turn restrictions to traffic signal installations, were tested for effectiveness at the PS&E stage assuming the redistribution of Fremont Bridge construction-phase traffic. The result of this work was a set of measures that defined the critical mitigation components needed to attain reasonable levels of congestion and mobility during the construction period. This set of measures is described below along with a brief summary of the accompanying traffic analysis results. In addition to these discussions, a description of non-motorist impacts and potential mitigation strategies to address these impacts is given.

1.1.1. Mitigation Plan

As described above, a variety of mitigation measures were tested to assess their overall effectiveness in maintaining current network congestion levels during the construction phase of the project. To simplify the evaluation process, the various mitigation measures were tested simultaneously in an incremental approach with each measure modified according to the results of consecutive analysis runs. As each analysis run was completed, the results were examined, modifications to the specific measure (such as signal retiming or lengthening of a turn pocket) were made, and the analysis was repeated. The result of this effort was a set of mitigations that includes the full array of measures initially taken from the TS&L study.

Table 1 - Mitigation Measures by Scenario

Mitigation Measure	Exist	2007 NA	2007 Constr	2007 Post	2025 NA	2025 Post
1. Prohibit NB LT at Fremont Ave/N 34th St (Peak Hrs)	X	X	√	√	√	√
2. Prohibit EB LT at Fremont Ave N/N 35th St	X	X	√	√	X	√
3. Extend EB LT at Fremont Pl/Evanston/N 36th St	X	X	√	√	X	√
4. Add new signal at Fremont Place/Evanston/N 36th St	X	X	√	√	X	√
5. Convert Evanston to two-way operations	X	X	X	√	X	√
6. Add new signal at Fremont Ave N/N 36th St	X	X	√	√	X	√
7. Add new signal at SR-99 NB Off-Ramp/Bridge Way	X	X	√	√	X	√
8. Add new signal at SR-99 SB On-Ramp/Bridge Way	X	X	X	X	X	√
9. Add NB left turn at Stone Way & Bridge Way N	X	X	√	√	X	√

X = Not included, √ = Included

Exist = Existing Conditions; NA = No Action (assumes existing street network); Constr = Construction Phase; Post = Post Construction Scenario (assumes same mitigation as Construction Phase)

All mitigation measures taken from the previous TS&L work and evaluated for this study were deemed critical to maintaining reasonable congestion levels when bridge capacity is reduced during construction. Additional measures were added due to the expanded study area to capture impacts outside of the original study boundaries. The final mitigation plan highlighting the set of core measures is shown in Table 1 on the previous page.

1.1.2. Traffic Operations

Operational impacts from the anticipated construction period (2005 - 2007) and the subsequent reduction in bridge capacity were based on two influencing factors: 1) traffic diversion to alternative routes and 2) the various mitigation measures required to address the impacts of these changes in travel patterns. Diversion patterns and volumes used in the Construction-Phase analysis were based on data taken from a car-following study conducted by Heffron Transportation Inc. as part of the Fremont Downtown Circulation Study (2001). Using these data in combination with the Fremont Bridge volume reductions (due to the narrower bridge) given in the TS&L report, the expected changes in peak hour turning movement volumes along Fremont Ave N and alternative routes were developed.

This process involved the use of anticipated diversion paths across routes such as SR-99 and the Ballard Bridge (15th Ave NW). Of particular emphasis were the specific diversion volumes to the SR-99 on- and off-ramps at N 38th St near Bridge Way based on the evidence in the car-following study that drivers commonly use the Aurora Bridge to access Fremont Ave N and the Fremont downtown area. Origins and destinations were first highlighted to identify the primary diversion routes. Expected changes in turning movement volumes were then developed by tracking vehicle groups through these routes and using proportional redistributions and percentages based on the car-following data.

Ultimately, the resulting traffic volume shifts / changes were applied to the 2007 No-Action intersection volumes, along with the proposed mitigation measures discussed previously, to arrive at a Construction-Phase scenario. AM and PM peak hour impacts for this Construction-Phase were then evaluated and documented using the simulation model.

The results of the Construction-Phase analysis indicate the following:

1) A significant amount of traffic volume would shift to diversion routes such as SR-99 (Aurora Ave) and the Ballard Bridge (15th Ave NW) during the construction period.
2) Despite the benefits of the various mitigations assumed, overall congestion levels for the 2007 Construction-Phase would be somewhat higher than for the comparable 2007 No-Action scenario where the existing four-lane bridge is maintained and no traffic diversion is assumed.
3) Queues that develop at the north and south bridge approaches (to Fremont Ave N / N 34th St & Fremont Ave N / Nickerson / Westlake) may extend to the opposite side of the bridge during the critical AM & PM peak hour periods.

4) The proposed signal at the SR-99 off-ramp (N 38th St) would reduce delays for vehicles accessing the Fremont area via SR-99 while the proposed signal at Fremont Ave N / N 36th St would improve traffic circulation within the downtown Fremont area.

5) At the intersection of Fremont Ave N & N 39th St / Fremont Way (5-way), the proposed NW-bound left turn from Fremont Way to SB Fremont Ave N (sharp left turn) would improve access to downtown Fremont but result in additional delays at this location.

6) The proposed signal at N 36th St & Evanston Ave improves circulation and access in the downtown Fremont and does not significantly affect vehicle delays or congestion.

1.1.3. Non-Motorized Routes

Moderate to severe impacts to pedestrian and bicyclist routes are expected on a short-term basis during the Construction-Phase of the project. The Burke-Gilman Trail multi-use path, which crosses under the north bridge approach, would be closed-off due to construction activity associated with materials delivery and demolition. Alternative routes for the Burke-Gilman have been developed that rely on the Fremont Ave N / N 34th St intersection as the primary gateway for reconnecting pedestrians / bicyclists traveling EB or WB along the path.

Non-motorized travel across the Fremont Bridge would also be impacted to some degree. During reconstruction of the bridge approaches, only one sidewalk section would be provided for north-south non-motorist travel depending on the section of bridge under reconstruction (either the east or west portion of the bridge deck). Alternative routes, such as SR-99, are to be used as temporary substitutes for Fremont Bridge bicycle commuters due to the direct access provided via the Bridge Way ramps to / from outlying areas of Fremont and Wallingford.

1.2. POST-CONSTRUCTION TRAFFIC OPERATIONS

Post-Construction operational conditions would reflect the re-establishment of traffic patterns prior to construction as well as future No-Action baseline volume levels. An underlying assumption for the two Post-Construction scenarios (2007 & 2025) is that, similar to existing conditions, four lanes are again provided across the Fremont Bridge with two lanes in each direction. Another key assumption is that the various mitigation measures implemented as part of the Construction-Phase are retained with the goal of providing long-term benefits for the street network with respect to reduced delays and enhanced mobility compared to the No-Action scenarios (where no significant mitigation is provided). The results of the operational analysis for the two Post-Construction scenarios are summarized below.

1.2.1. Year 2007 Post-Construction Traffic Conditions

The various mitigation measures described previously are expected to reduce overall delays for the 2007 Post-Construction scenario compared to the 2007 No-Action scenario. For No-Action conditions, several traffic-related deficiencies were identified by the analysis results that the Post-Construction mitigation measures address. Examples include:

1) Congestion at Fremont Ave N / N 35th St (addressed by a left turn restriction).
2) Heavy queuing at the SR-99 NB off-ramp to Bridge Way (addressed by a new signal).
3) Long EB / WB delays at Fremont Ave N / N 36th St (addressed by a new signal)

The Synchro/SimTraffic analysis results comparing the No-Action and Post-Construction scenarios show that vehicular delays could be reduced for a number of intersection locations such as N 35th St/Fremont Ave N and N 36th St/Fremont Ave N assuming that the mitigation measures from the 2007 Construction-Phase are carried over into the Post-Construction Phase. However, the results also indicate that some *increases* in delay may occur in specific cases where revised signal phasing patterns may potentially reduce overall intersection capacity. One case-in-point is the N 39th St/Fremont Ave N intersection where additional delays in the Post-Construction scenario are caused by the proposed signal phasing pattern that would add a protected phase for NW-bound left turns. This new phase would reduce the available green time for other phases thereby increasing delays overall.

Other examples of increased delay in the 2007 Post-Construction scenario vs. No-Action are shown in the analysis results. However, delay "sacrifices" such as these are common in order to enhance accessibility, improve corridor-level traffic flow, and benefit the overall street network. In fact, based on the analysis results, overall system delays are noticeably reduced in the 2007 Post-Construction scenario versus the 2007 No-Action case.

1.2.2. Year 2025 Post-Construction Traffic Conditions

Similar patterns of improvement in the 2007 Post-Construction scenario compared to the 2007 No-Action case are shown for the long-range 2025 scenarios, though not as clearly conveyed. Based on the 2025 No-Action analysis results, significant delays could be expected for several intersections such as the SR-99 off-ramp at N 38th St and N 36th St/Evanston Ave (PM peak hour). With the new traffic signals proposed at the SR-99 off-ramp and at N 36th St/Evanston Ave, delays are significantly reduced. As with the 2007 comparison, some cases where delays increase are also likely to occur, particularly when adjacent intersection movements are negatively impacted by a mitigation measure. Nonetheless, overall system delays are noticeably reduced for the 2025 Post-Construction scenario versus the 2025 No-Action case.

2. INTRODUCTION

The Type Size & Location (TS&L) study for the Fremont Bridge Approach Replacement Project documented the basic steps required for the anticipated approach-reconstruction work and outlined the local impacts anticipated during the 18-month construction period. For the traffic analysis element of the TS&L study, two separate scenarios were evaluated to assess potential impacts: 1) a full-closure scenario where the bridge would be completely closed to general traffic, and 2) a partial-closure scenario assuming one travel lane remains open in each direction for general traffic, even during the construction period.

The Plans Specifications & Estimates (PS&E) phase of the Fremont Bridge Approach Replacement Project builds on this earlier traffic analysis work but highlights, in greater detail, the full spectrum of peak hour impacts that would accompany an assumed partial bridge closure during 9 months of the overall 18-month construction sequence. The full-bridge closure scenario was not evaluated as part of this work. However, it should be noted that temporary full closures would occur periodically during the construction sequencing. To the extent possible, full closures would be arranged to occur only during lower-volume traffic periods so as to minimize impacts on local access. A traffic mitigation plan that summarizes specific strategies to address transportation deficiencies (during construction) is also outlined and discussed in this phase of the project evaluation.

The study area for the PS&E phase (see *Figure 1*) was expanded beyond the area assumed in the TS&L report in order to capture several additional streets and intersections that would be affected by traffic diverting when the bridge approaches are under construction. This expansion of the study area also served to integrate on-going work being conducted for the adjacent Bridge Way and Stone Way corridors. To assess both short-term and long-range traffic impacts, two horizon years were targeted: 2007 and 2025. In support of the environmental review process that maintains consistency with regional review standards, a 2030 preliminary analysis was also conducted. For simplicity, the 2007 horizon year was used as the basis for three analysis scenarios that collectively compared traffic conditions before (No-Action), during (Construction-Phase), and after (Post-Construction) the bridge approach reconstruction. Only the No-Action and Post-Construction scenarios were examined for the long-range 2025 horizon. A set of six (6) analysis scenarios was investigated for both the AM & PM peak periods for a total of twelve (12) scenarios.

The various data items collected for this phase of the project are discussed in Chapter 3 and are followed by a brief description of the existing conditions analysis results in Chapter 4. Future 2007 and 2025 conditions, including a description of the proposed Mitigation Plan, are described in Chapters 5 and 6, respectively. Final conclusions and recommendations are given in Chapter 7.

3. EXISTING CONDITIONS

This chapter describes existing traffic conditions for the roadways and intersections included in the expanded study area. Emphasis is given on the specific arterials added to the original street network evaluated in the TS&L study, traffic volumes at key intersections, non-motorist traffic patterns, and peak hour level-of-service (LOS) results from the existing conditions analysis.

3.1. EXPANDED STUDY AREA

The existing street system surrounding the north and south Fremont Bridge approaches was described previously in the TS&L report and included the following roadways: Fremont Ave N, Nickerson St, N 34th St, and N 35th St. Due to the expanded study area assumed for the PS&E phase of the project (see *Figure 1*), several new streets and intersections were added to the original analysis zone. The primary added roadways are listed and described below.

Bridge Way N

This NE-SW arterial lies NW of the Fremont Bridge and serves as a connecting link between Stone Way and the SR-99 on/off ramps at N 38th St. The roadway is comprised of two wide lanes (one in each direction) with parking provided on both sides. The speed limit is posted at 30 MPH and grades are generally moderate (between 2 and 5 percent). Two NE-bound left turn lanes are provided at Stone Way. Bridge Way was identified as one of the primary diversion routes assumed during the reconstruction of the Fremont Bridge approaches.

Evanston Avenue N

Evanston Avenue N is a north-south collector arterial that lies west of Fremont Ave N and currently serves as a viable backdoor route into the downtown Fremont area. The posted speed limit is 25 MPH and one travel lane is provided in each direction. Grades on Evanston are moderate to significant, particularly near the N 39th St intersection.

Fremont Way N

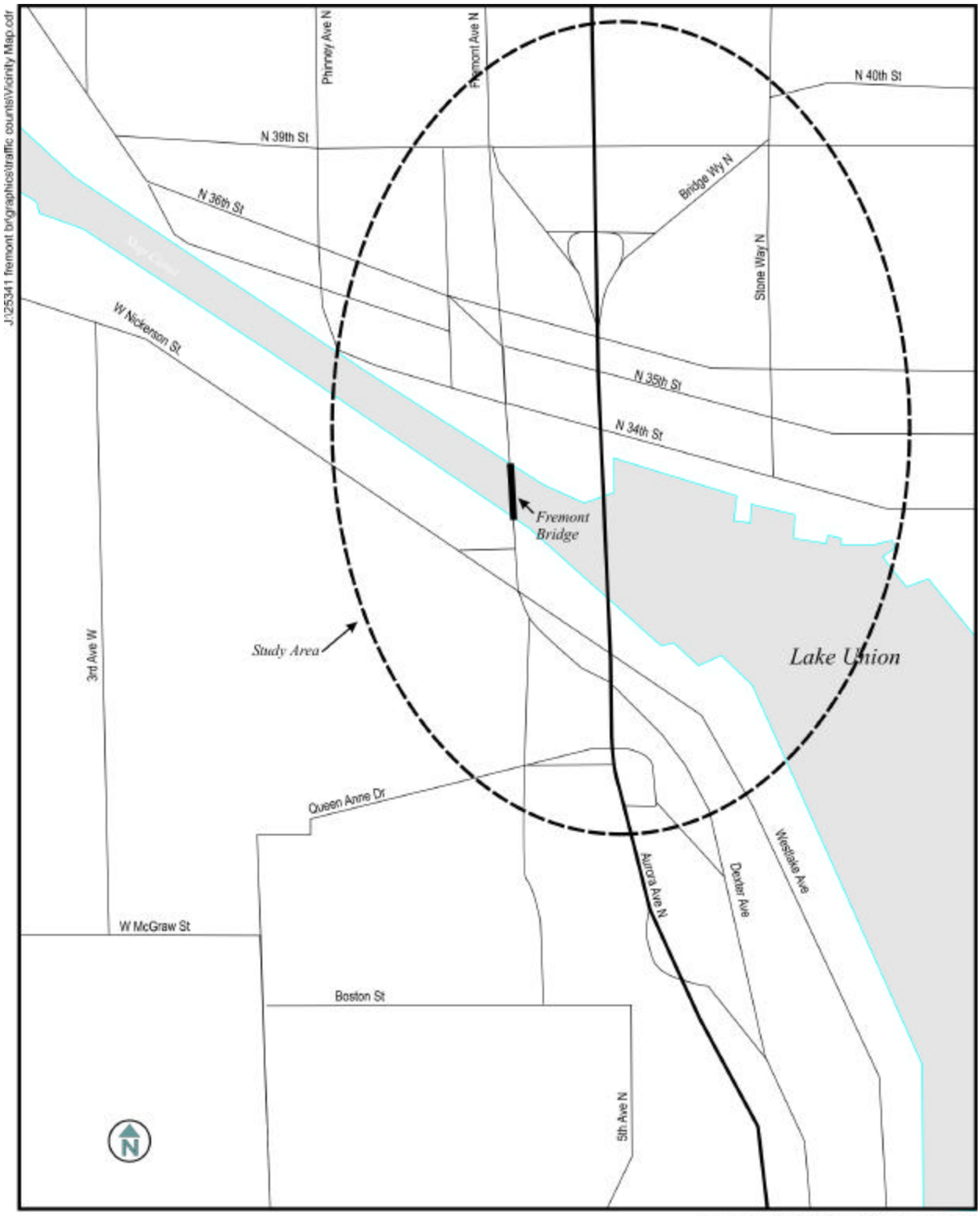
Fremont Way N is a NW-SE arterial that lies west of SR-99 and opposes Bridge Way, providing a connection between the SR-99 ramps and Fremont Ave N. This arterial consists of two wide travel lanes and moderate grades of 3 to 6 percent. A NW-bound right turn lane is provided at Fremont Ave N where NW-bound left turns are restricted. No posted speeds are given.

Stone Way N

Stone Way N is a north-south arterial that lies east of SR-99 and serves as a major arterial through the Wallingford neighborhood. This arterial consists of four travel lanes (two in each direction) and a northward positive grade of 3 to 6 percent. The posted speed limit is 35 mph.

Queen Anne Drive N

Queen Anne Ave is an east-west arterial in the north Queen Anne Hill area that provides an alternative route to the Fremont Bridge via SR-99. This arterial connects to SR-99 in both directions (NB & SB) and also provides access to Dexter Ave and Westlake Ave to the east. The two travel lanes are relatively narrow (10 to 11 feet lane widths) and no turn pockets are provided at the six-way stop-controlled intersection with Ray St and 4th Ave N.



Fremont Bridge Study PS&E
Figure 1 - Vicinity Map

North 36th Street

N 36th St is a principal arterial west of Evanston Ave N and a local street east of Evanston Ave N (although the connector to Fremont Ave N N is part of the City's truck route system). This east-west facility consists of two travel lanes with parking on both sides. The N 36th St intersections at Fremont Ave N and Fremont Place / Evanston Ave are controlled by stop signs and no turn pockets are provided (a sub-standard EB left turn lane is provided at Evanston Ave. Grades near Fremont Ave N are moderate and rise noticeably toward SR-99 (up to 10 percent). The speed limit east of Fremont Ave N N is 25 MPH. With the future mitigation measures proposed at Fremont Ave N and Evanston Ave (new traffic signals), N 36th St is expected to handle increased traffic, particularly routes to from the north on Fremont Ave N.

North 38th Street

N 38th St is the east-west connecting street between the SR-99 on and off ramps and also provides a connection under the SR-99 mainline. This roadway is comprised of two wide lanes (15 to 20 feet each) with no signalized traffic control in the vicinity of the SR-99 ramps (the ramps are controlled by stop or yield signs). The speed limit is 30 MPH and grades are modest.

North 39th Street

N 39th St is a collector arterial that serves as a major connector between Leary Way and Fremont Ave N. This roadway creates a five-way intersection with Fremont Ave N and Fremont Way and transitions into Fremont Way to provide access to / from the SR-99 ramps. N 39th St is assumed to be a viable diversion route when the bridge approaches are under construction. Posted speeds are 30 MPH and grades are rolling west of Fremont Ave N.

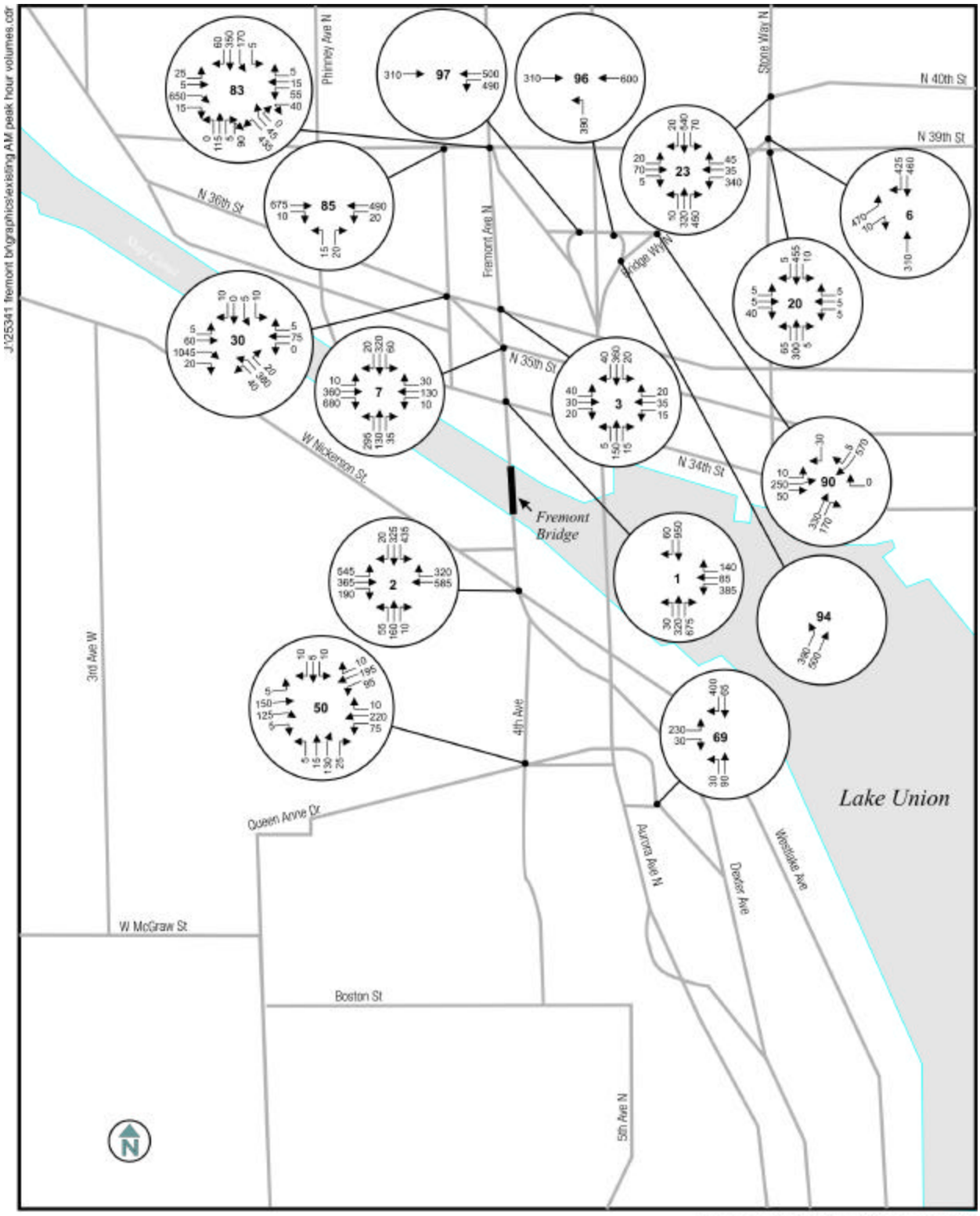
North 40th Street

N 40th St is a two-lane collector arterial that serves as a critical east-west connecting route east of Stone Way toward the Wallingford and University District neighborhoods. The roadway terrain east of Stone Way is rolling with grades of up to 10 percent (particularly near Stone Way). The posted speed limit is 30 MPH and a designated left turn lane is provided for the WB approach at N 40th St / Stone Way intersection.

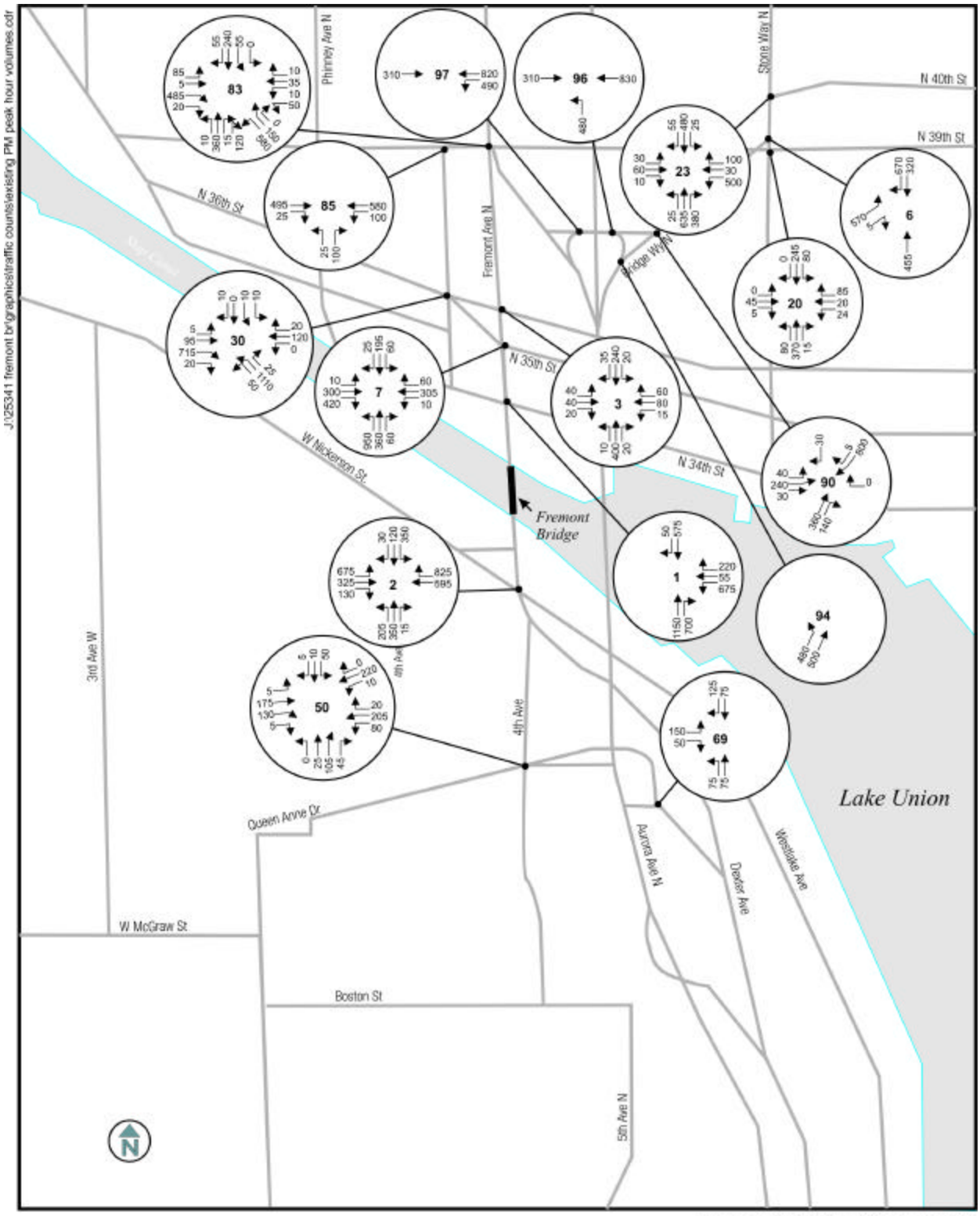
3.2. NON-MOTORIZED TRAFFIC PATTERNS

Non-motorized traffic patterns near and across the Fremont Bridge vary depending on the specific mode in question. For pedestrian-related traffic, recreational jogging / running trips appear to comprise the majority of cross-bridge movements while localized walking trips (internal downtown circulation trips) are primarily concentrated to the downtown Fremont area near Fremont Ave N / N 34th St and Fremont Ave N / N 35th St and along Fremont Place.

Peak hour traffic counts at Fremont Ave N / N 34th St indicate that approximately 160 to 180 pedestrians cross in the EB and WB directions (combined) during the PM peak hour period with similar volumes for the NB and SB directions. Based on field observations (taken on 06 / 03 / 04 & 06 / 05 / 04), jogging / running trips in the area also use the Fremont Ave N / N 34th St and Fremont Ave N / N 35th St intersections and cross the bridge in both the northbound and southbound directions. A large proportion of these trips, in the order of 100 pedestrians during the PM peak hour, also utilize the Burke-Gilman Multi-Use Trail (connecting under the north bridge approach).



Fremont Bridge Study PS&E
Figure 2 - Existing AM Peak Hour Volumes



Fremont Bridge Study PS&E
Figure 3 - Existing PM Peak Hour Volumes

Bicyclist traffic levels are relatively high during the AM & PM peak hour commute periods, particularly on Fremont Ave N and across the Fremont Bridge in the SB direction for the AM peak and in NB direction for the PM peak. Peak hour non-motorized traffic counts show up to 150 bicyclists crossing the bridge during the AM or PM (vehicular) peak hours. EB-WB bicyclist volumes on the Burke-Gilman Trail and along N 34th St are similar to the bridge counts.

Non-motorized traffic in surrounding areas such as the N 38th St interchange (near Bridge Way) and the Stone Way triangle near N 40th St are generally moderate. Field observations of AM peak hour pedestrian and bicyclist activity near Stone Way, for example, indicated a total of 20 bicycle movements and 24 pedestrian crossings (all directions included).

3.3. PEAK HOUR TRAFFIC VOLUMES

Existing peak hour traffic volume data for the core study area (downtown Fremont) were taken from information given in the Downtown Fremont Circulation Study final report (May 2001) conducted by Heffron Transportation Inc as well as count data supplied by the City of Seattle Department of Transportation (SDOT). These data consisted of turning movement volumes for 16 of the 18 study intersections and represented turning movement counts conducted in late 2001 to mid-2003. Required traffic volume data not given in the Circulation Study report or not available from SDOT were collected manually through field counts taken in August of 2004.

To ensure reasonable consistency between intersections (i.e. traffic exiting = traffic entering), minor volume balancing was performed for critical intersections that were closely spaced. The AM and PM peak hour data used for this study are representative of typical peak traffic periods from 7 to 9 AM and from 4 to 6 PM, respectively. Figures 2 and 3 shown on the previous pages provide a summary of the AM and PM peak hour turning movement volumes for the following critical intersections in the study area (identified by an asterisk):

Table 1 – Complete List of Study Intersections

• N 34th St & Fremont Ave N*	• Halladay St & Queen Anne Dr*
• Nickerson St & Fremont Ave N*	• N 39th St & Fremont Ave N*
• N 36th St & Fremont Ave N*	• N 39th St & Evanston Ave*
• N 35th St & Fremont Ave N*	• N 38th St & Bridge Way*
• Florentia St & Fremont Ave N	• N 38th St & SR-99 Off*
• N 36th St & Evanston Ave*	• N 38th St & SR-99 On*
• Raye St & Queen Anne Dr*	• SR-99 On-W & SR-99 On-E
• N 40th St & Stone Way*	• N 39th St & Stone Way N*
• Bridge Way N & Stone Way*	• N 39th St & Bridge Way N

* Intersections for which turning movement volumes and analysis results are reported

3.4. LEVEL OF SERVICE

Level of service (LOS) calculations were made to assess existing congestion levels within the expanded study area that included several new intersection locations not evaluated in the previous TS&L phase. A total of 18 intersections were targeted for this analysis (vs. three in the TS&L study) in order to appropriately capture the potential diversion patterns and impacts that

may develop as part of the bridge reconstruction and traffic capacity reduction across the bridge. The Bridge Way and Stone Way analysis intersections (incorporated from on-going studies) were included as part of the study area and comprised a total of three intersections.

To maintain consistency with the TS&L traffic analysis, the Synchro/SimTraffic traffic analysis and micro-simulation package (version 5.0) was used to assess intersection-level congestion levels and system-wide delays. A summary of the LOS analysis results, reflecting intersection average delays, corresponding LOS, and total system delay, is provided in Table 2 below.

Table 2 – Existing Conditions Level of Service

		AM Peak Hour		PM Peak Hour	
#	Intersection	Delay	LOS	Delay	LOS
1	N 34th Street & Fremont Ave	18.4	B	49.6	D
2	Nickerson Street & Fremont Ave	35.6	D	53.8	D
3	N 36th Street & Fremont Ave*	4.9	A	74.2	F
7	N 35th Street & Fremont Ave	21.9	C	47.4	D
30	N 36th Street & Evanston Ave*	2.1	A	14.0	B
50	Raye St & Queen Anne Dr*	>180	F	>180	F
83	N 39th Street & Fremont Ave	57.0	E	34.6	C
85	N 39th Street & Evanston Ave*	3.6	A	3.8	A
90	N 38th Street & Bridge Way N*	6.7	A	4.9	A
96	N 38th Street & SR-99 Off*	28.6	D	49.4	E
99	SR-99 On & Fremont Way*	2.9	A	1.7	A
23	N 40th Street & Stone Way	16.9	B	24.9	C
20	N 39th Street & Stone Way*	2.8	A	9.3	A
6	Bridge Way N & Stone Way	12.6	B	13.9	B
Total System Average Delay		184.0		276.2	

* Unsignalized Intersections

Note 1: Delays given in seconds per vehicle as given by SimTraffic results
Note 2: Node numbers are shown as a reference to the various traffic volume figures

As shown in the above table, analysis results for the targeted intersections vary noticeably depending on the specific location of interest. Higher-delay intersections include Nickerson St/Fremont Ave N and N 39th St/Fremont Ave N (AM) as well as the unsignalized intersections of N 36th St/Fremont Ave N (PM) and the SR-99 NB off ramps at N 38th St (PM). The Queen Ann Dr/Raye St intersection also experiences significant delays during the peak hour periods. Results for remaining intersections show modest levels of congestion generally in the LOS A to LOS C range. Overall average delays for vehicles traveling through the roadway system are higher during the PM peak hour (~ 275 sec/veh) than during AM conditions (~ 185 sec/veh). Detailed LOS results that show movement-level delays/LOS are provided in the appendix along with a comprehensive summary comparing the six evaluation scenarios.

4. YEAR 2007 TRAFFIC CONDITIONS

Descriptions of future 2007 traffic conditions and congestion levels are provided in this chapter along with a comparison of the primary analysis scenarios reflected in this future horizon year. As discussed previously, three analysis scenarios were evaluated for the 2007 timeframe:

1) No-Action (Pre-Construction) Phase
2) Construction Phase (9-months out of the total 18-month duration)
3) Post-Construction Phase

4.1. ASSUMED ROADWAY NETWORKS

The 2007 No-Action scenario assumes that the existing street network is retained and that only traffic volume changes would occur due to background growth over the six-year time frame (2001-2007). This "true" No-Action scenario also omits any planned roadway improvements that are expected for Bridge Way that would modify or enhance connections to/from the SR-99 corridor (via N 38th St) or any changes to major arterials in the downtown Fremont area such as Fremont Ave N or N 34th St. Signal phasing and timing data, however, were modified and optimized for the No-Action scenario in order to reflect a suitable phasing/timing scheme.

Changes to the street network for the 2007 Construction Phase reflect the list of mitigation measures developed in the TS&L phase and discussed previously in this report. These mitigation measures were deemed necessary to compensate for the reduction in traffic capacity across the Fremont Bridge during reconstruction of the two bridge approaches. The focus of this mitigation was on alleviating congestion on the various diversion routes that would absorb the majority of traffic attempting to avoid the bridge during the construction period. As part of the mitigation plan, new traffic signals were assumed at the following locations:

1) SR-99 NB Off-Ramp & Bridge Way/N 38th St
2) N 36th St & Fremont Ave N
3) N 36th St/Fremont Place & Evanston Ave

In addition to these new signals, various roadway modifications were made to intersections near the bridge to reflect the temporary lane reduction on the bridge deck. For example, the two WB right turn lanes from Westlake Ave to the Fremont Bridge were reduced to one lane while a similar two-lane to one-lane reduction was applied to the EB-to-SB right turn from Fremont Place (N 35th St) to the bridge at a point west of Evanston Ave. One WB lane on N 34th St was also removed west of the Aurora Bridge to accommodate a designated bike lane during the Construction phase. This temporary bike lane would replace a general purpose lane thereby removing one of the EB left turn lanes at N 34th St & Fremont Ave N. To allow for more direct access from the NB SR-99 alternative route to the downtown area, left turns were allowed for NW-bound to SB left turns from Fremont Way to Fremont Ave N (at N 39th St).

Conversion of Evanston Ave from a one-way to two-way arterial (south of Fremont Place) was also included in the 2007 Construction Phase scenario to accompany the proposed signal at this location. This intersection reconfiguration would allow NB movements to the northwest and southeast on Fremont Place and to the east on N 36th St. NB movements directly through to

Evanston Ave (north of Fremont Place) were restricted in an effort to minimize neighborhood cut-through traffic. SB traffic from Evanston Ave would be restricted to a right-turn-only movement controlled by a stop sign. A summary of the mitigation measures is shown below.

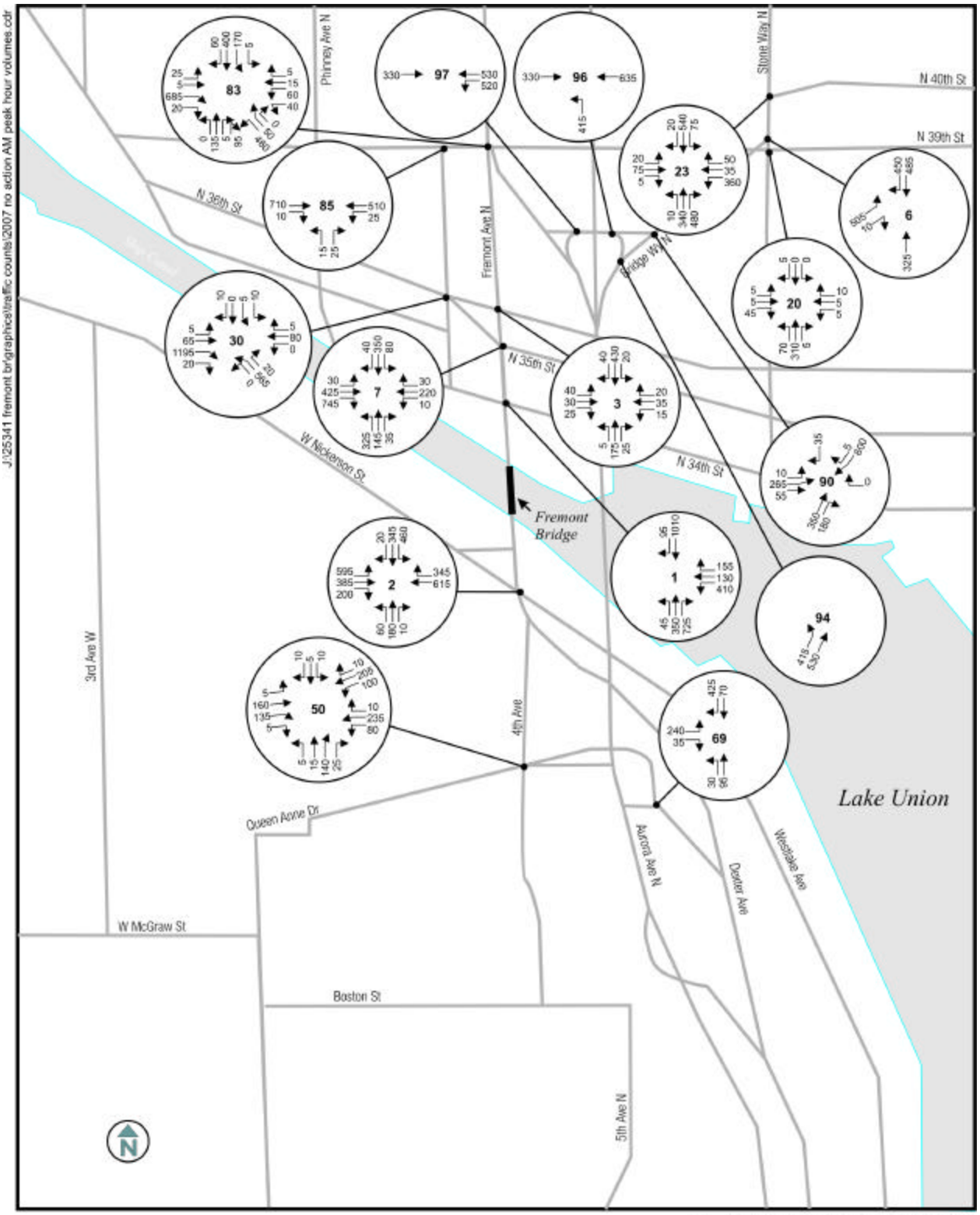
1) Prohibit NB LTs at N 34th St & Fremont Ave N (AM & PM peak periods)
2) Prohibit EB LTs at N 35th St & Fremont Ave N
3) Extend EB LT at N 36th St & Fremont Place / Evanston Ave
4) Add signal at N 36th St & Fremont Place / Evanston Ave (with turn restrictions)
5) Add signal at N 36th St & Fremont Ave N
6) Remove one WB left turn lane at Fremont Ave N / N 34th St
7) Remove one EB right turn lane at Fremont Ave N / N 35th St
8) Remove one WB lane on N 34th St east of Aurora bridge
9) Add signal at SR-99 NB Off-Ramp at Bridge Way / N 38th St
10) Add NW-bound LT movement at Fremont Ave N / Fremont Way / N 39th St
11) Add NB left turn movement at Stone Way / Bridge Way

The roadway network used for the Post-Construction analysis is similar to the one assumed for the Construction Phase with the exception of the Fremont Bridge cross-section and various lane and signal revisions. For the Post-Construction scenario, the original 4-lane cross-section is restored vs. the two lanes assumed in the Construction Phase. Original configurations for the various intersection approaches impacted during construction were also restored such as the EB approach (Fremont Place) at Fremont Ave N / N 35th St and the WB approach at Fremont Ave N / N 34th St. NW-left turns at Fremont Ave N / N 39th St are also removed for the Post-Construction scenario. One additional modification was the reconfiguration of Evanston Ave south of N 36th St to accommodate two-way traffic. Otherwise, the same mitigation measures used for the Construction Phase are retained for the Post-Construction analysis. This is due to the long-term traffic capacity and safety needs for the area as well as the benefits of the various measures as established in the TS&L and Downtown Fremont Circulation studies.

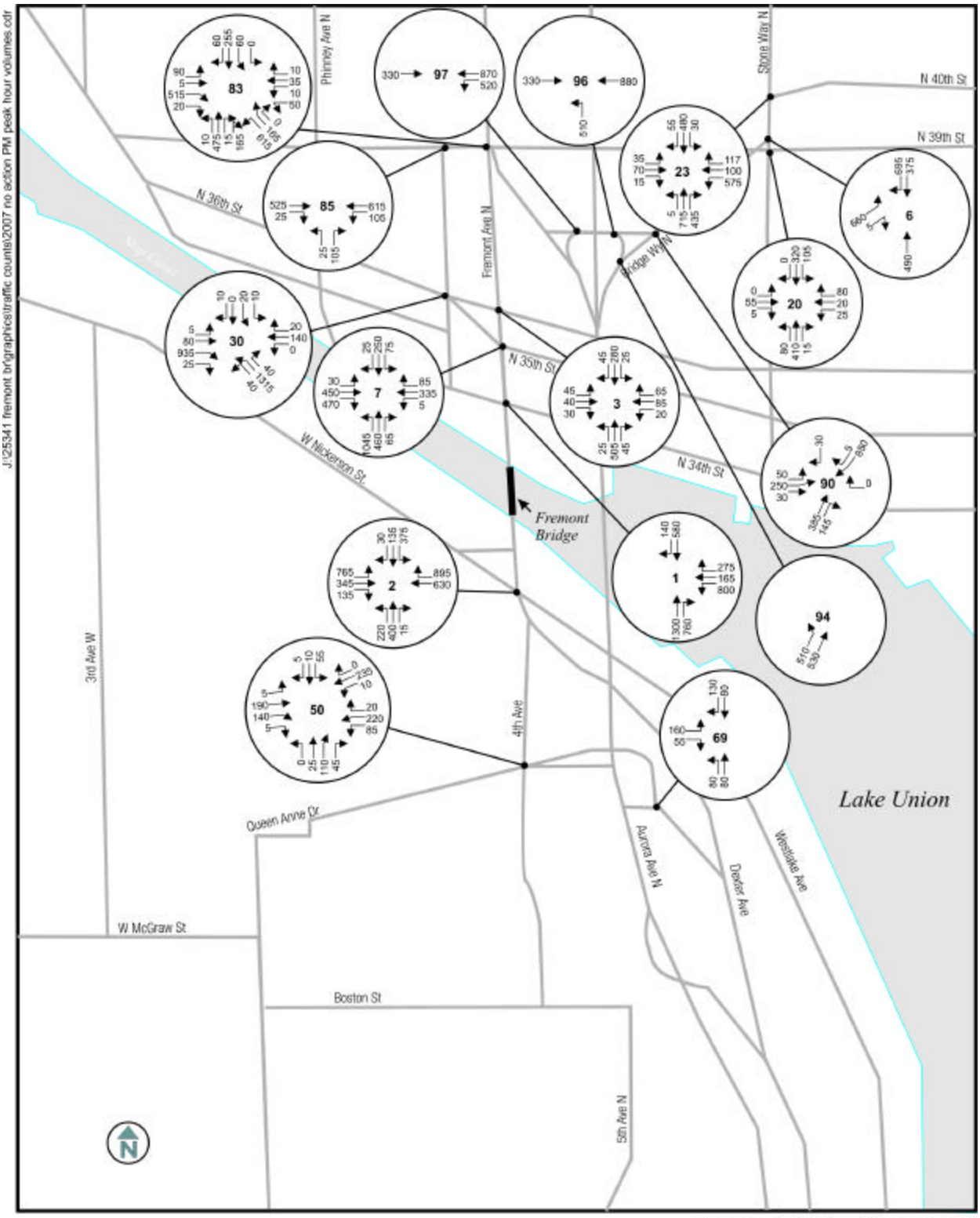
4.2. NON-MOTORIZED TRAFFIC

Non-motorized traffic patterns for the future 2007 No-Action scenario would be similar to existing conditions. Pedestrian-related traffic would be mostly comprised of recreational jogging / running trips on the Burke-Gilman trail and across the bridge itself. Bicyclist traffic volumes would continue to be high during the AM & PM peak hour commute periods along Fremont Ave N and also along the Burke-Gilman trail. Future non-motorized traffic levels for the No-Action scenario would be higher than for existing conditions due to general background growth in recreational activity and non-motorized commute volumes. This growth assumption is also appropriate due to the anticipated expansion of the bicycle network and trail system.

During the Construction-Phase, non-motorized traffic across the bridge (north-south) will be impacted due to consolidation of pedestrian and bicycle trips to a single 10-foot multi-use lane. Also, Burke-Gilman trail access under the northerly bridge approach will be closed-off to accommodate temporary construction-staging activity under the bridge approach. As such, alternative non-motorist routes will be used for existing routes, especially for E-W trips. To maintain E-W non-motorized access, N 34th St will be designated as the alternative route to the Burke-Gilman trail. One WB lane (between Stone Way and Fremont Ave N) will be converted



Fremont Bridge Study PS&E
Figure 4 - 2007 No Action AM Peak Hour Volumes



Fremont Bridge Study PS&E
Figure 5 - 2007 No Action PM Peak Hour Volumes

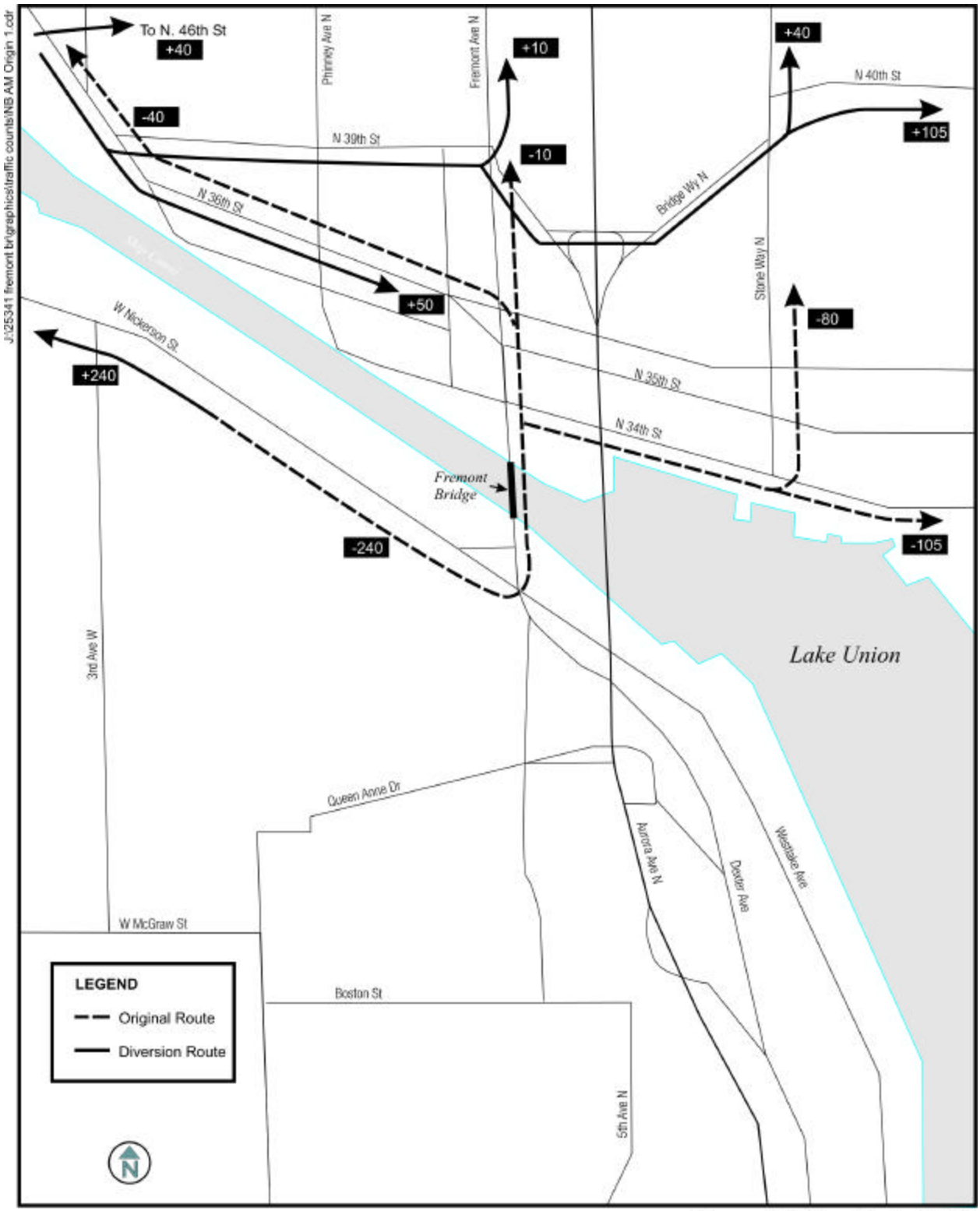
to a bicycle-only lane to complement the EB bike path already provided. Other concepts will include a temporary NB holding area at the intersection of Fremont Ave N / N 34th St, a NB curb ramp just north of the bridge structure to allow more convenient bicycle access to the NB travel lanes, and the use of vertical "wands" to separate SB bicyclists from vehicles. After the bridge approaches are reconstructed, the original pedestrian and bicycle patterns on Fremont Ave N, N 34th St, and the Burke-Gilman Trail are expected to be re-established. Some of the temporary non-motorized improvements discussed above may be maintained as long-term concepts, however. These may include the vertical "wands" used to separate motorists and bicyclists on and the designated holding area at the NB approach to Fremont Ave N / N 34th St.

4.3. PEAK HOUR TRAFFIC VOLUMES

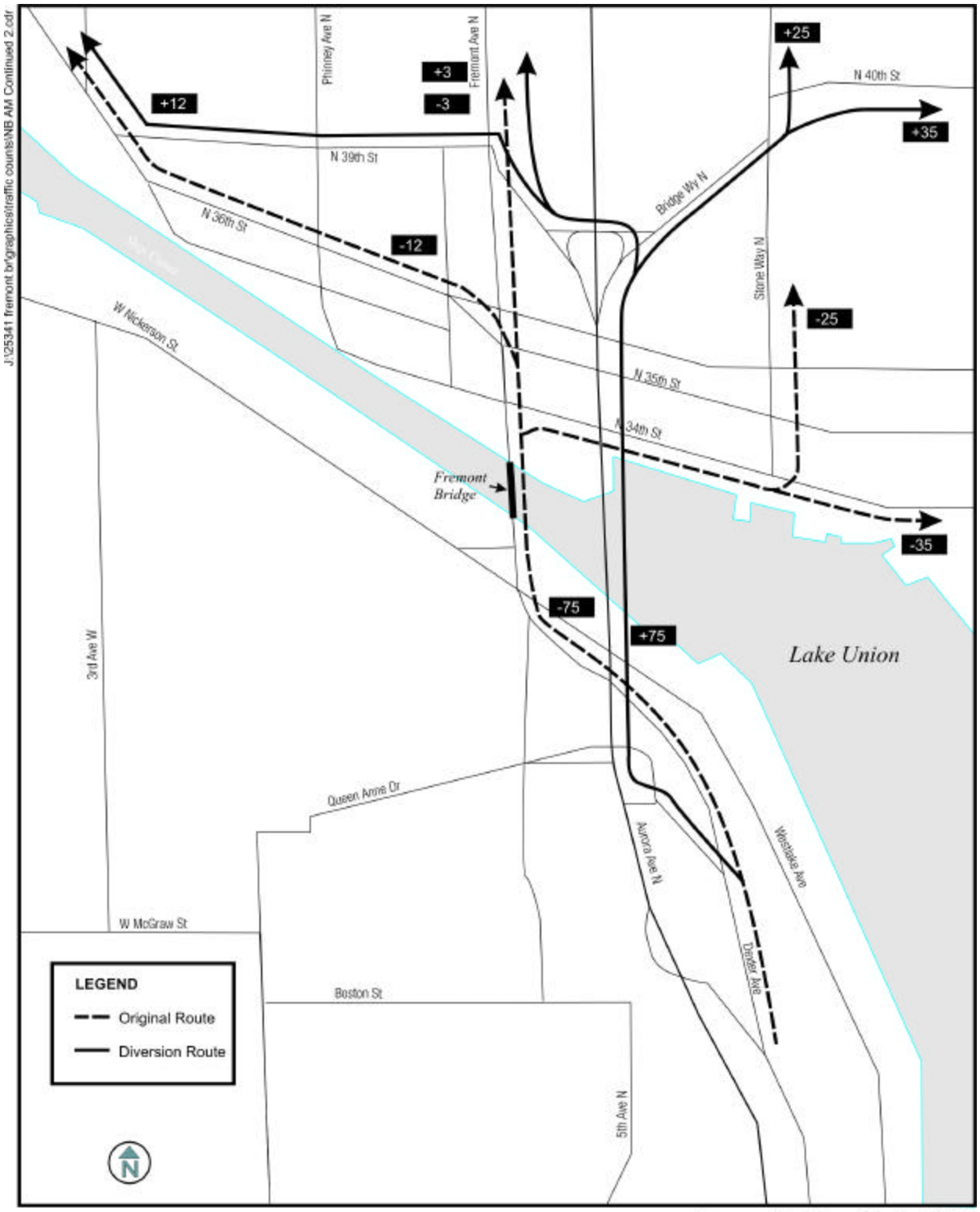
Traffic volumes for the Year 2007 No-Action scenario are summarized in Figures 4 & 5 on the following pages. These peak-hour turning movement volumes reflect background growth rates taken from Year 2006 peak hour volumes given in the Downtown Fremont Circulation Study. Where traffic volume data were not available (not all study locations were evaluated in the downtown circulation study), existing AM or PM peak hour counts were used as the basis for developing corresponding future volumes. Growth rates applied to these existing counts reflected those used for the downtown circulation study, however. To obtain future Year 2007 volumes, a universal 2 percent growth rate was applied to all 2006 volumes.

Year 2007 Construction-Phase traffic volumes were developed based on car-following data given in the Downtown Fremont Circulation Study conducted by Heffron Transportation Inc. The car-following data revealed basic proportions of trips across the Fremont Bridge for various origin-destination pairs and routes. Using these proportions in combination with the assumed level of traffic reduction on the bridge (due to the lane reduction) described in the TS&L study, the movement-level changes in traffic volumes were developed through a detailed spreadsheet that captured all pertinent movements impacted by the various traffic shifts. The magnitude of traffic shifted away from the Fremont Bridge, based on the TS&L study, was approximately 350 NB trips / 400 SB trips during the AM peak hour and 1,000 NB trips / 700 SB trips during the PM peak hour. The traffic diversion patterns assumed for the Construction Phase are captured in *Figures 6 through 17* on the following pages. These figures highlight the original (No-Action) travel paths and corresponding diversion travel paths for each of the origin and destination points within the study area. Summaries of the final Construction-Phase volumes incorporating these travel patterns are given in *Figure s 18 & 19*.

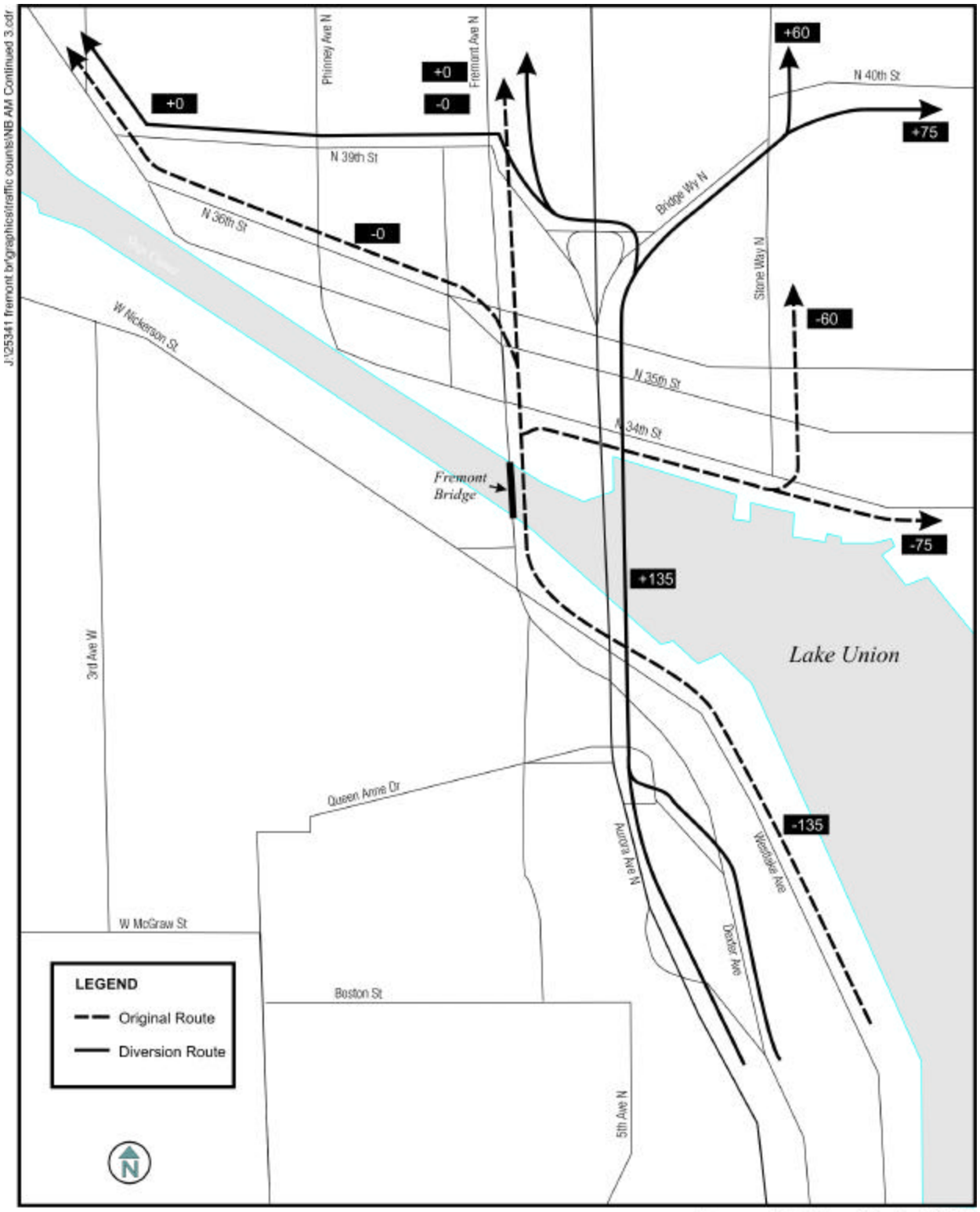
For the Post-Construction phase, traffic volumes were assumed to return to steady-state or equilibrium conditions where the original No-Action AM & PM peak hour traffic levels and travel patterns are re-established. It is acknowledged that some attraction to alternative routes to the bridge may be induced due to the improvements assumed as part of the mitigation measures that would remain from the Construction Phase. For example, some volume redistribution to / from the SR-99 ramps at N 38th St may remain even after the Bridge approaches are reconstructed. Nonetheless, the assumption that pre-construction volumes would be re-established is likely to provide a worst-case scenario from a bridge operations perspective. Post-Construction volumes are summarized in *Figures 20 & 21*.



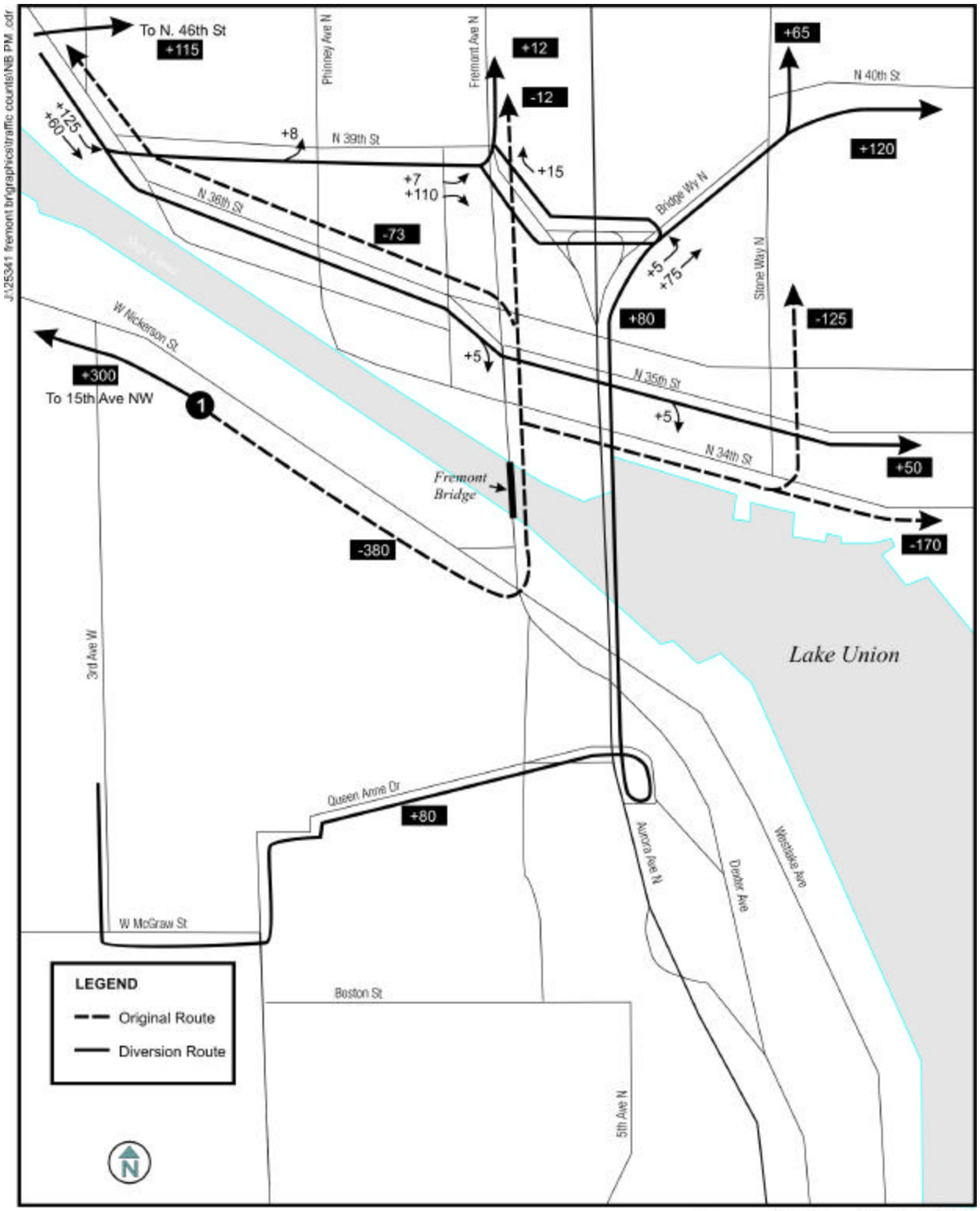
Fremont Bridge Study PS&E
2007 Construction Phase Diversion Route / Volumes
Figure 6 - NB AM Peak Hour



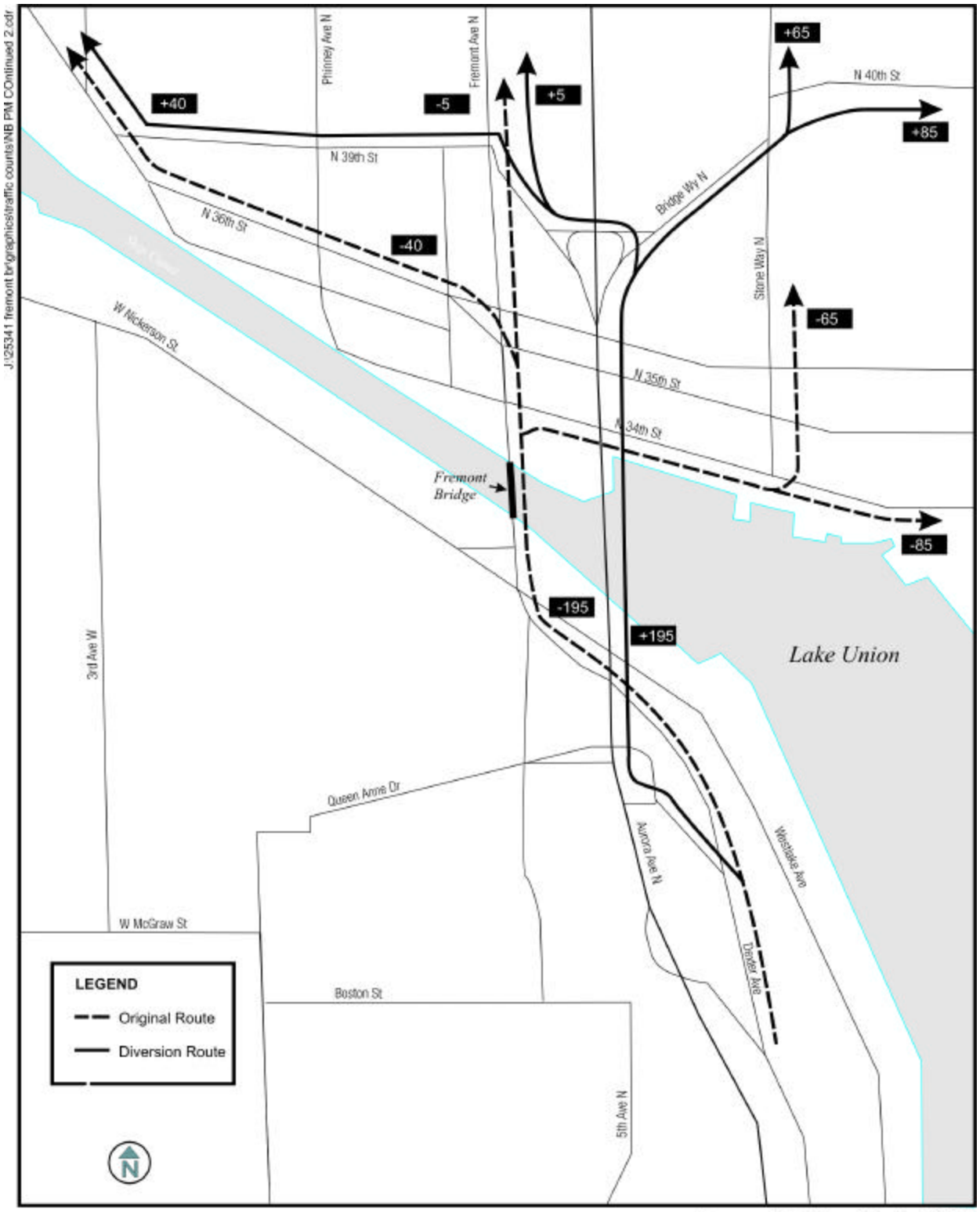
Fremont Bridge Study PS&E
2007 Construction Phase Diversion Route / Volumes
Figure 7 - NB AM Peak Hour (Continued)



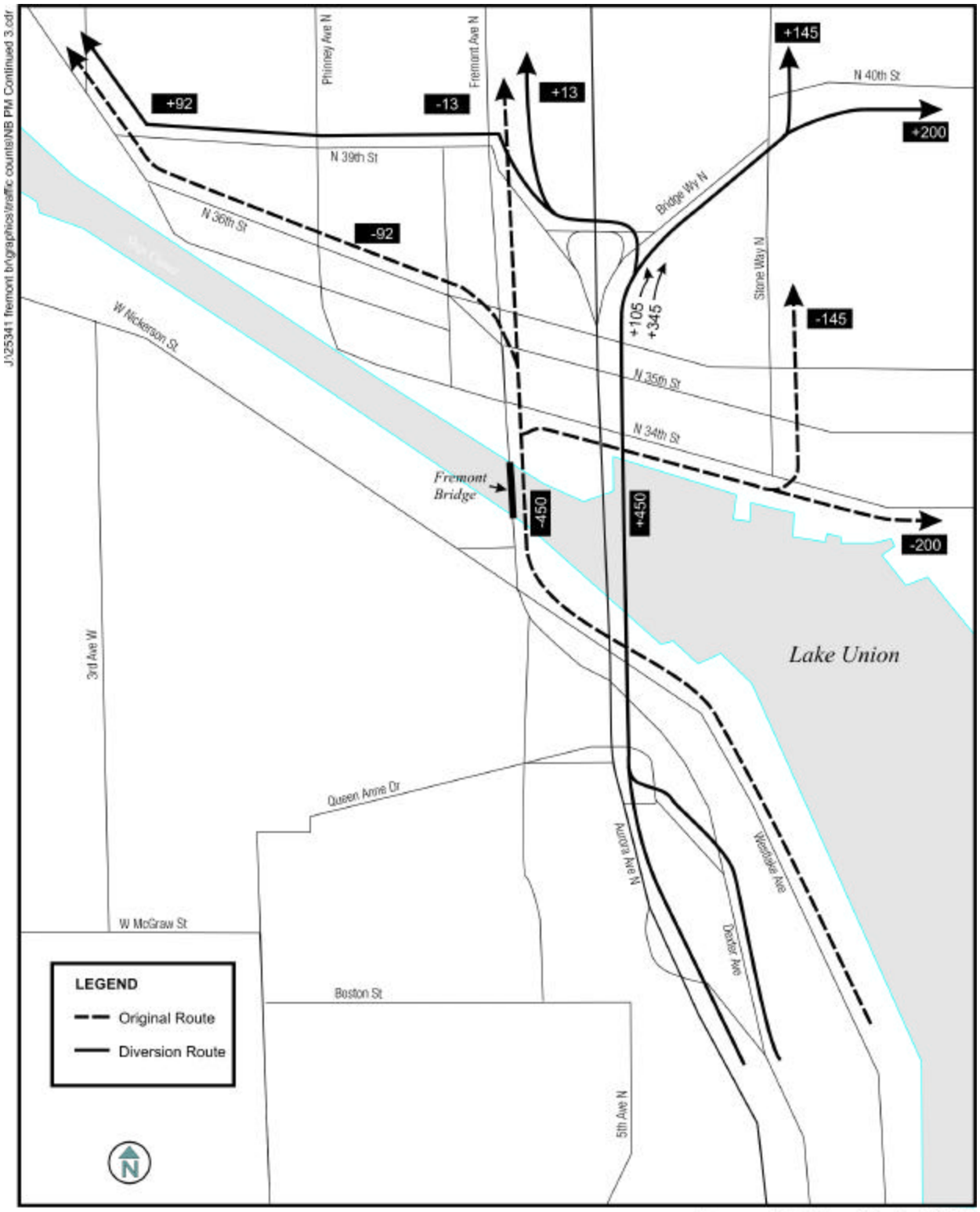
Fremont Bridge Study PS&E
2007 Construction Phase Diversion Route / Volumes
Figure 8 - NB AM Peak Hour (Continued)



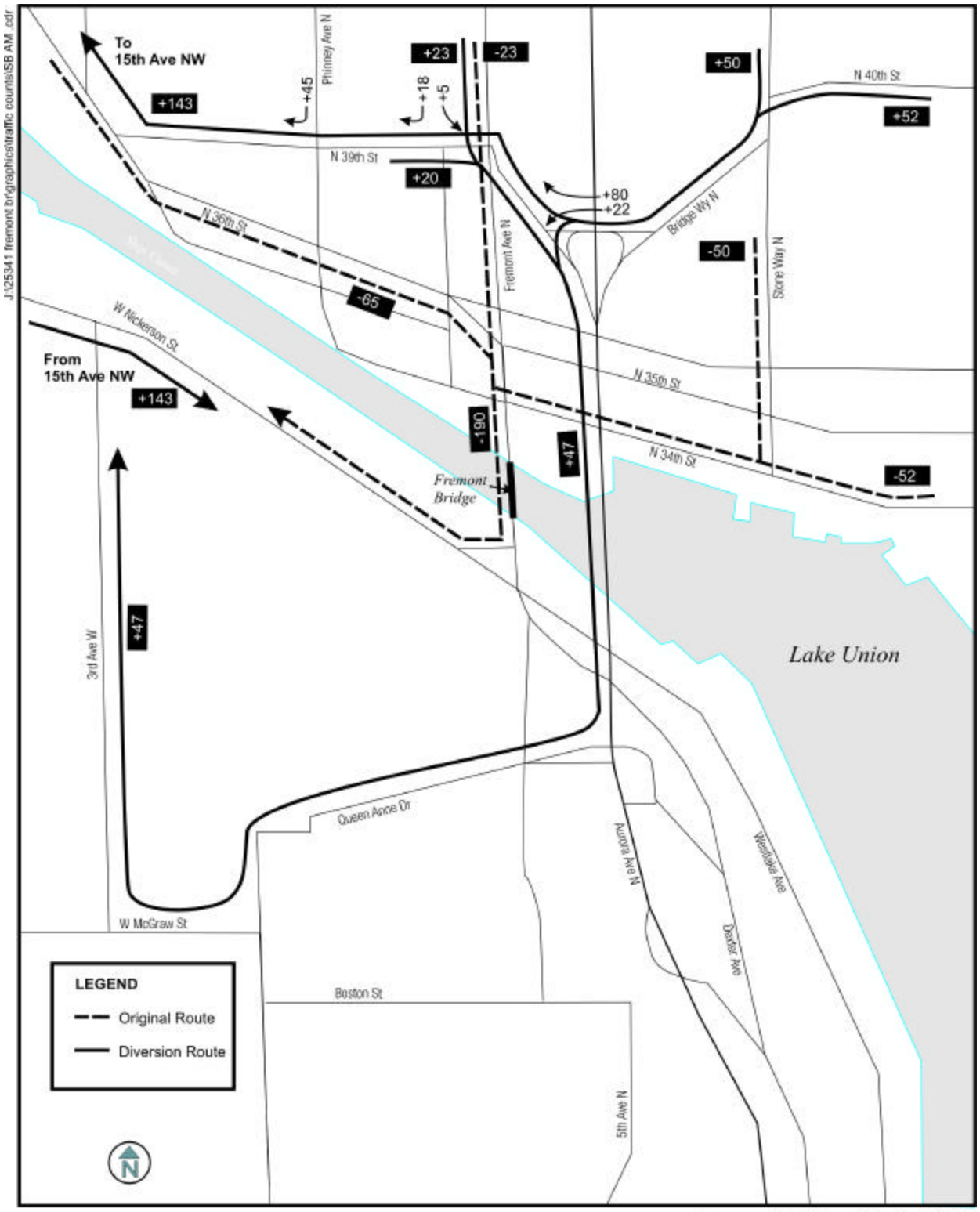
Fremont Bridge Study PS&E
2007 Construction Phase Diversion Route / Volumes
Figure 9 - NB PM Peak Hour



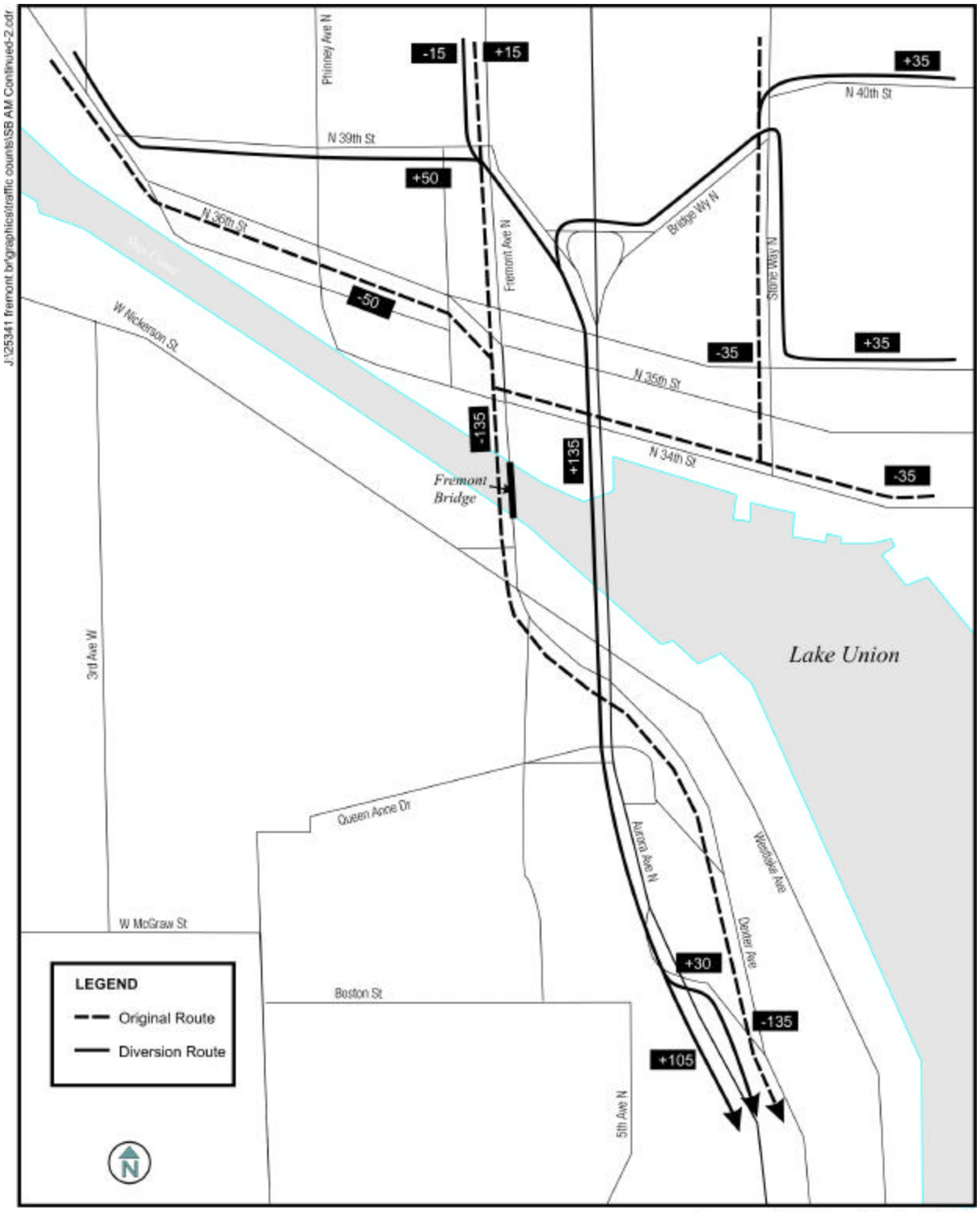
Fremont Bridge Study PS&E
2007 Construction Phase Diversion Route / Volumes
Figure 10 - NB PM Peak Hour (Continued)



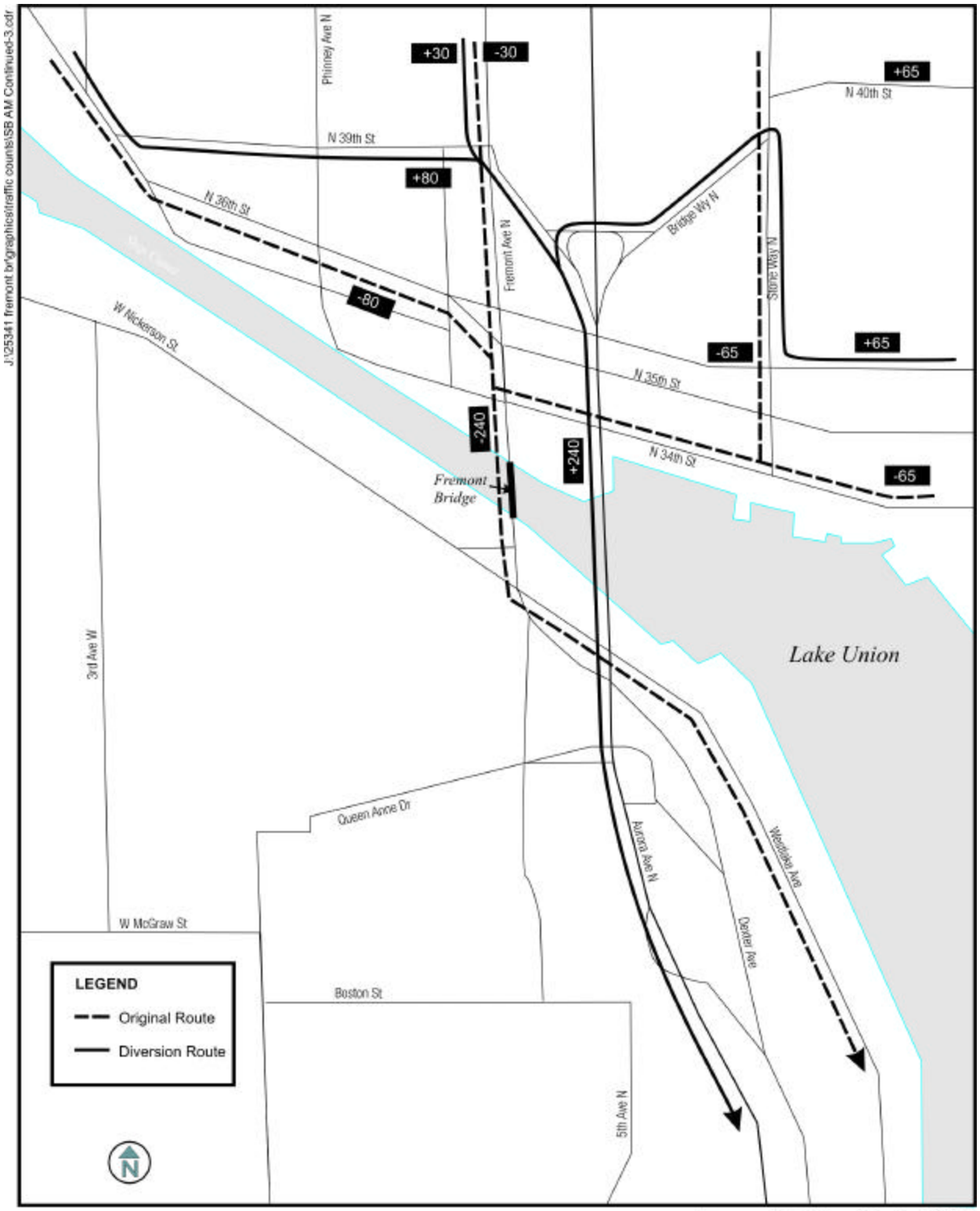
Fremont Bridge Study PS&E
2007 Construction Phase Diversion Route / Volumes
Figure 11 - NB PM Peak Hour (Continued)



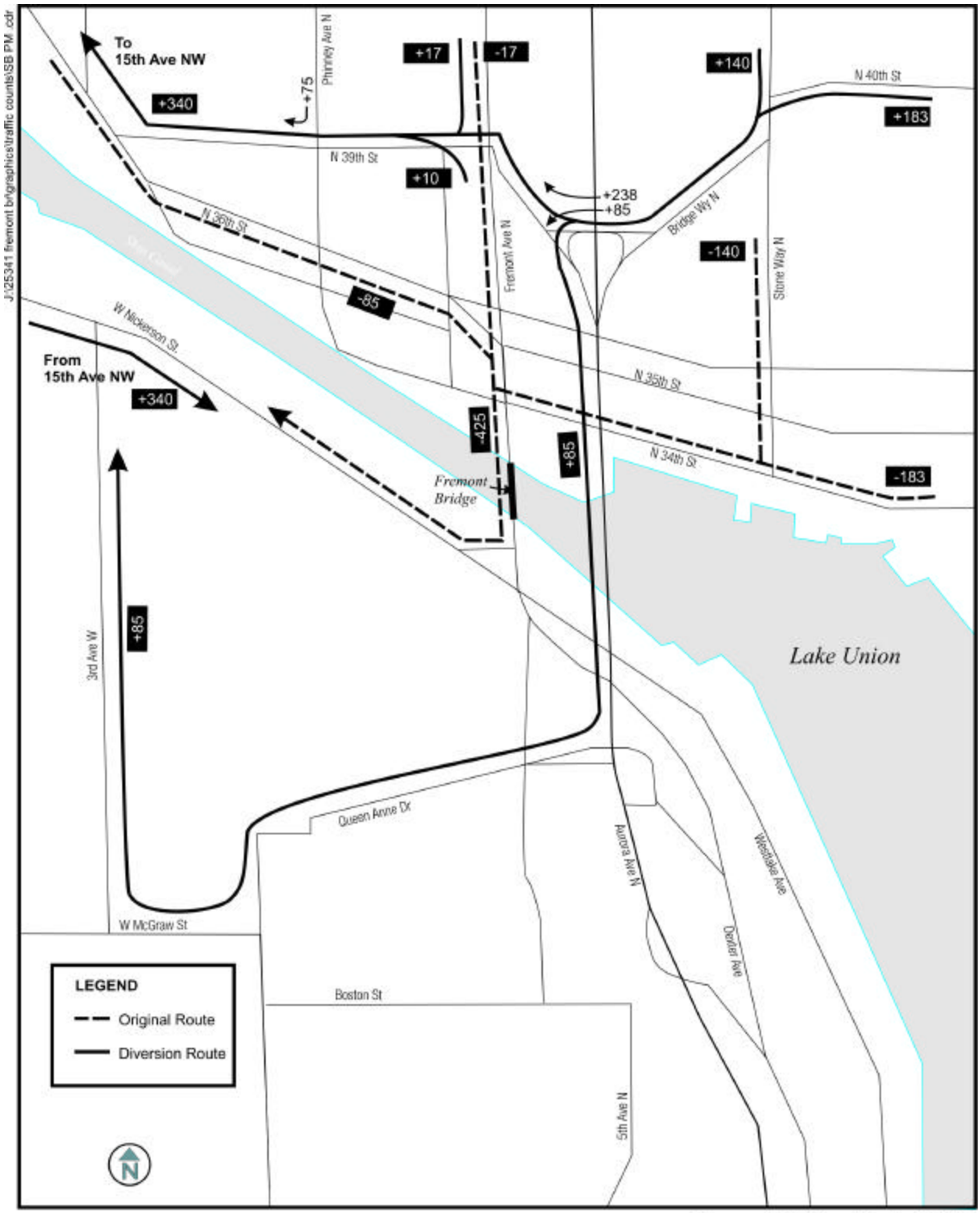
Fremont Bridge Study PS&E
2007 Construction Phase Diversion Route / Volumes
Figure 12 - SB AM Peak Hour



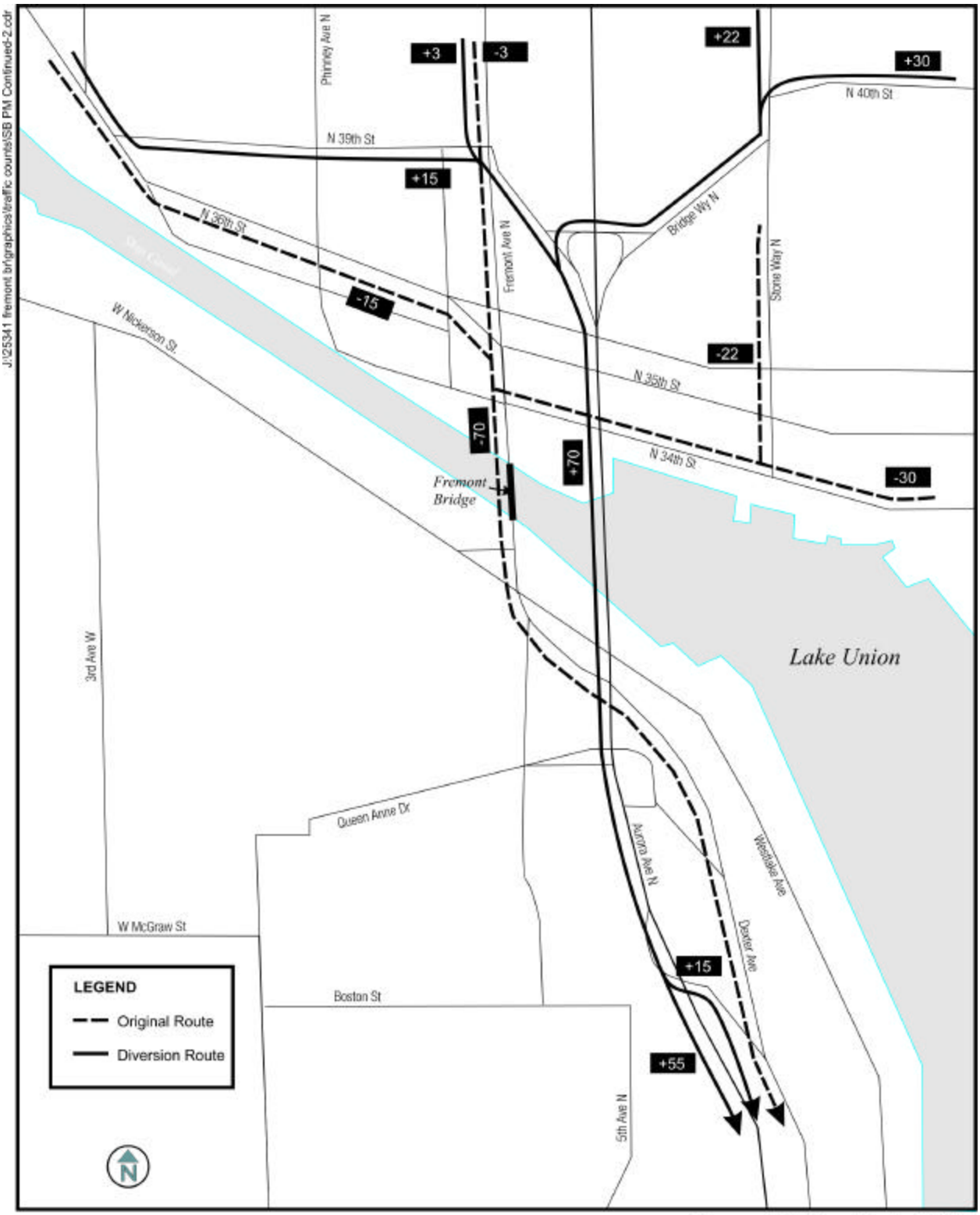
Fremont Bridge Study PS&E
2007 Construction Phase Diversion Route / Volumes
Figure 13 - SB AM Peak Hour (Continued)



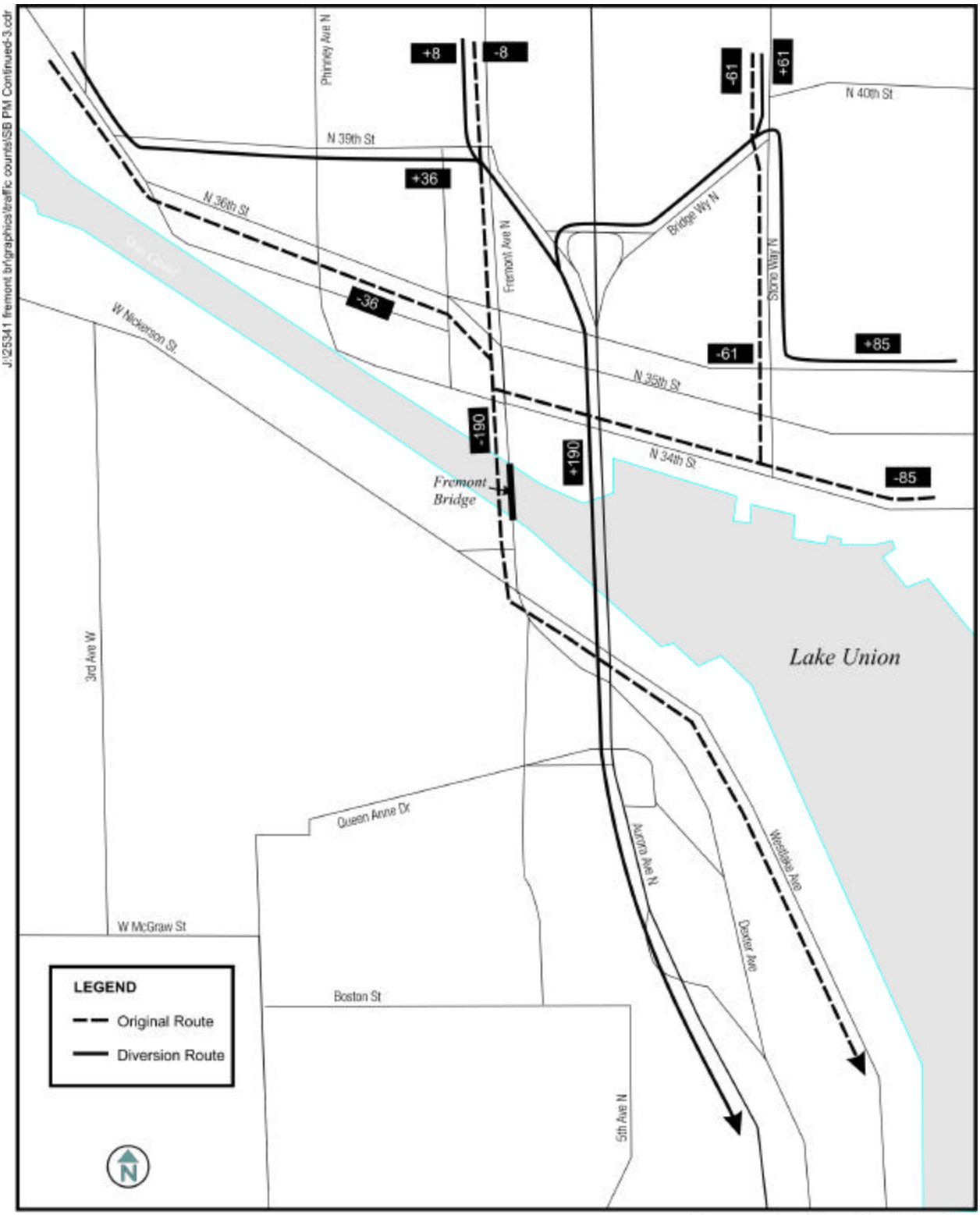
Fremont Bridge Study PS&E
2007 Construction Phase Diversion Route / Volumes
Figure 14 - SB AM Peak Hour (Continued)



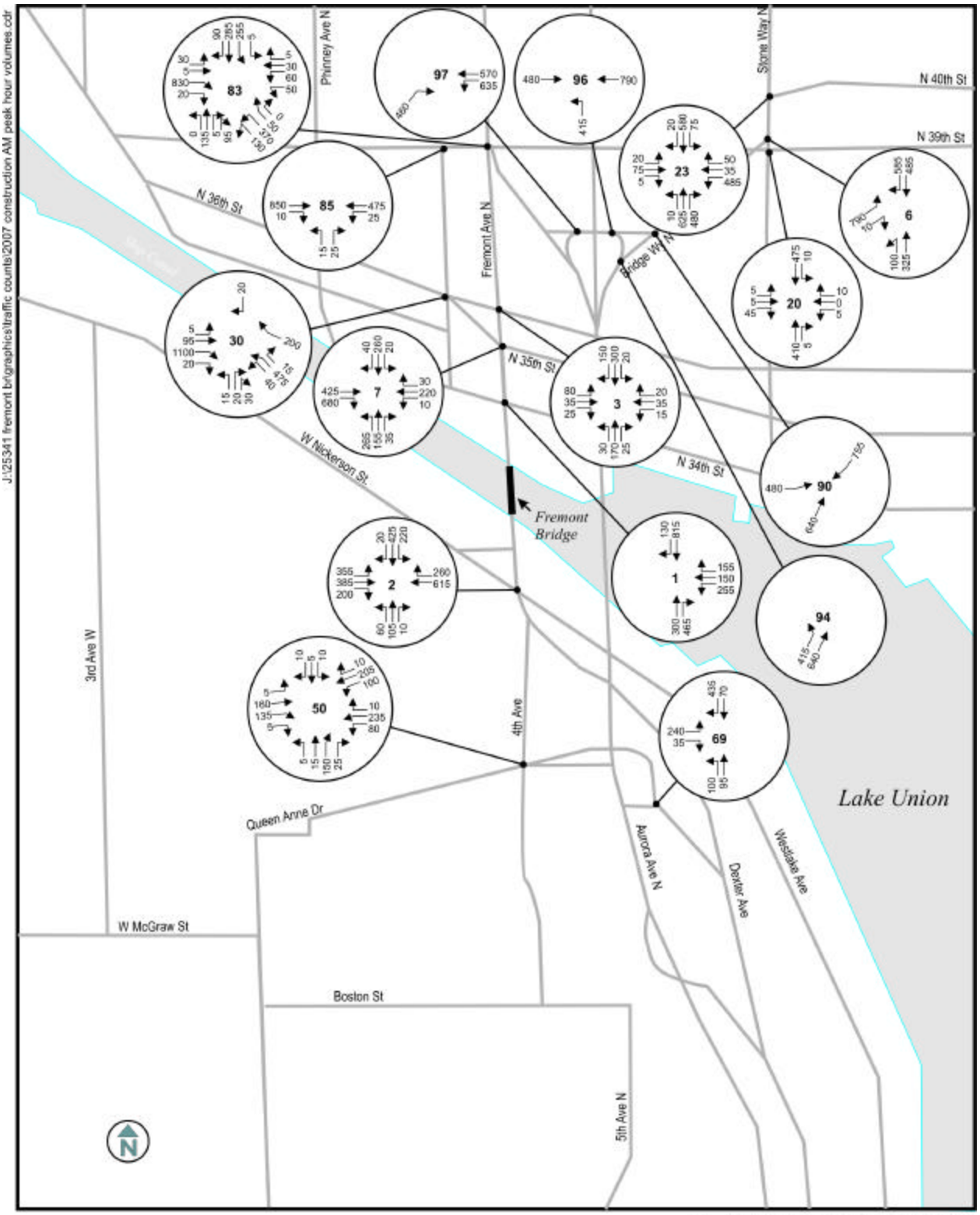
Fremont Bridge Study PS&E
2007 Construction Phase Diversion Route / Volumes
Figure 15 - SB PM Peak Hour



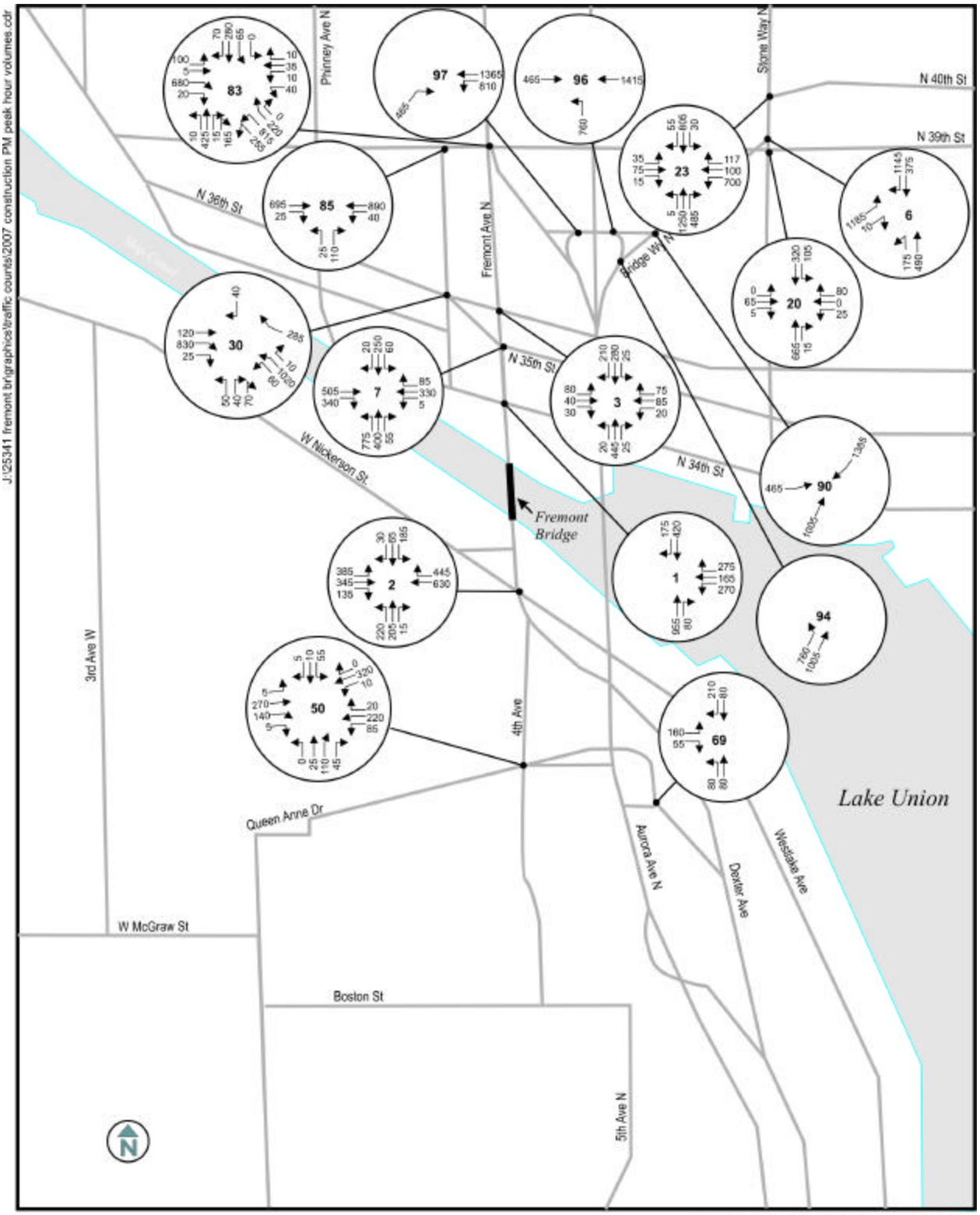
Fremont Bridge Study PS&E
2007 Construction Phase Diversion Route / Volumes
Figure 16 - SB PM Peak Hour (Continued)



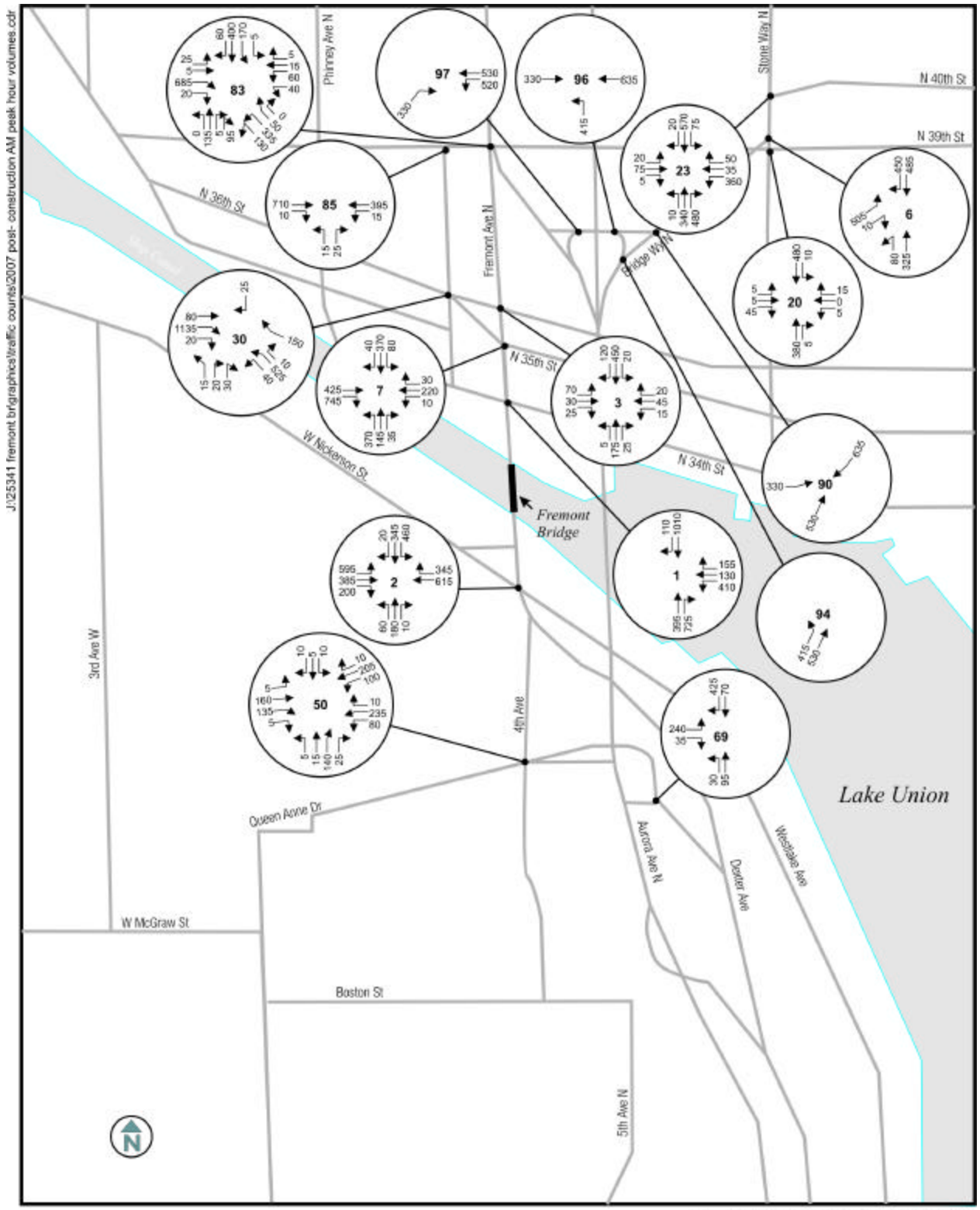
Fremont Bridge Study PS&E
2007 Construction Phase Diversion Route / Volumes
Figure 17 - SB PM Peak Hour (Continued)



Fremont Bridge Study PS&E
Figure 18 - 2007 Construction Phase AM Peak Hour Volumes

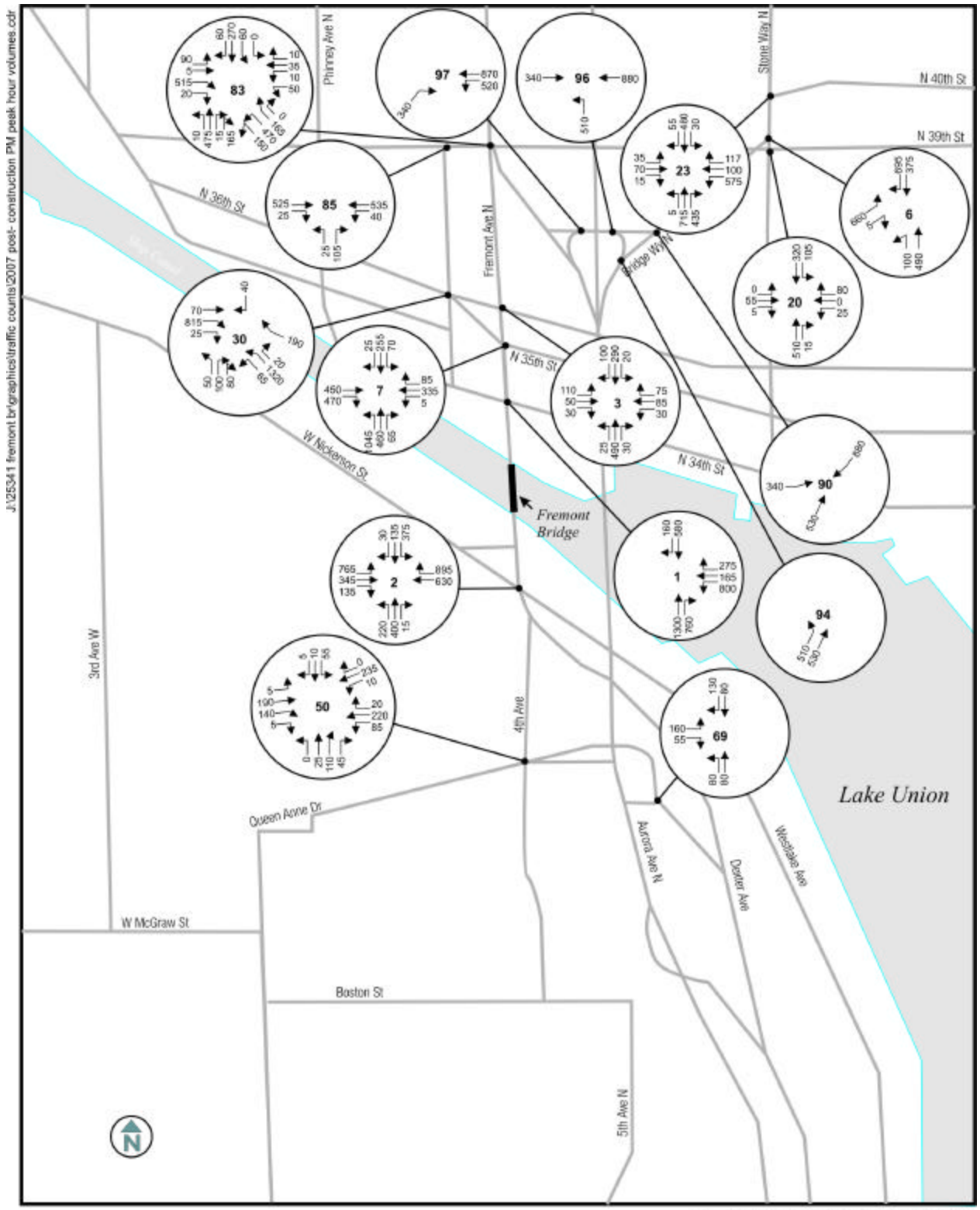


Fremont Bridge Study PS&E
Figure 19 - 2007 Construction Phase PM Peak Hour Volumes



Fremont Bridge Study PS&E

Figure 20 - 2007 Post-Construction Phase AM Peak Hour Volumes



Fremont Bridge Study PS&E

Figure 21 - 2007 Post-Construction Phase PM Peak Hour Volumes

Table 3 – Future 2007 Level of Service by Scenario

		2007 No-Action				2007 Construction				2007 Post-Construction			
		AM		PM		AM		PM		AM		PM	
#	Intersection	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	N 34th Street & Fremont Ave	20.0	B	84.3	F	58.4	E	111.5	F	19.7	B	93.1	F
2	Nickerson Street & Fremont Ave	41.9	D	66.4	E	74.4	E	>180	F	35.2	D	>180	F
3	N 36th Street & Fremont Ave**	5.7	A	>180	F	44.2	D	58.1	E	12.7	B	42.0	D
7	N 35th Street & Fremont Ave	25.2	C	65.8	E	45.4	D	35.4	D	26.3	C	37.1	D
30	N 36th Street & Evanston Ave**	3.9	A	57.7	F	16.8	B	14.1	B	3.7	A	13.3	B
50	Raye St & Queen Anne Dr*	>180	F	>180	F	>180	F	>180	F	>180	F	>180	F
83	N 39th Street & Fremont Ave	33.0	C	36.8	D	113.2	F	72.0	E	70.5	E	59.1	E
85	N 39th Street & Evanston Ave*	8.1	A	11.8	B	>180	F	95.8	F	32.4	D	30.5	D
90	N 38th Street & Bridge Way N**	7.5	A	9.5	A	11.8	B	10.8	B	12.2	B	15.0	B
96	N 38th Street & SR-99 Off**	49.0	E	72.9	F	23.6	C	48.6	D	19.6	B	34.9	C
99	SR-99 On & Fremont Way**	3.3	A	1.8	A	18.7	B	13.3	B	12.1	B	11.9	B
23	N 40th Street & Stone Way	16.3	B	26.5	C	36.1	D	96.0	F	27.4	C	29.6	C
20	N 39th Street & Stone Way**	1.8	A	8.1	A	6.4	A	52.1	D	6.7	A	18.2	B
6	Bridge Way N & Stone Way	12.1	B	13.5	B	20.5	C	29.4	C	21.7	C	18.6	B
Total System Average Delay		279.4		436.3		285.2		617.1		164.9		290.0	

* Unsignalized intersection

** New signal in Construction & Post-Construction scenarios

Note 1: Delays given in seconds per vehicle as represented in SimTraffic results

Note 2: Node numbers (#) are shown for as a reference to the various traffic volume figure

4.4. PEAK HOUR LEVEL OF SERVICE (LOS)

Level of service (LOS) calculations for the future 2007 analysis scenarios were made to assess mid-term congestion levels for the expanded study area that included the 14 intersections described previously. The Synchro/SimTraffic traffic operations simulation package (version 5.0) was used to assess intersection-level congestion levels for 2007 conditions. A summary of the LOS analysis results showing average vehicle delays and LOS is provided in Table 3 on the previous page. As shown in Table 3, delays for the 2007 No-Action scenarios (AM & PM peak hours) again vary significantly depending on the intersection in question. Locations with the highest delays during the AM peak hour include Nickerson St/Fremont Ave N/Westlake Ave (node 2), N 39th St/Fremont Ave N (node 83), and the SR-99 NB off ramp at N 38th St. For the PM peak hour, additional high-delay intersections include N 36th St/Fremont Ave N, N 36th St/Evanston Ave, and N 34th St/Fremont Ave N. As with the existing conditions scenario, delay results for the Queen Ann Dr/Raye St intersection show severe congestion levels (LOS F) for both peak periods. Overall system average delays (i.e. what a driver would typically experience in the study area) would be roughly 280 seconds/vehicle for the AM peak hour and around 440 seconds/vehicle for the PM peak hour.

Analysis results for the future 2007 Construction scenarios (AM & PM) indicate higher congestion levels than for No-Action conditions due primarily to the redistribution of traffic to alternative routes. Even with the proposed mitigation measures provided during construction, the majority of intersections show increases in delay and a drop in LOS. For the AM peak hour, 12 of the 14 reported locations would experience a drop in LOS while only two intersections would show no change. For the PM peak hour, 9 intersections are expected to show a drop in LOS with 3 showing an LOS improvement and 2 indicating no change. Of particular interest are results for the intersections of N 39th St/Evanston Ave, N 39th St/Stone Way N, and N 40th St/Stone Way N, which show a potential drop in level of service during construction. The added congestion levels are expected, however, due to the substantial volume shifts to SR-99 (across the Aurora Bridge) and the Bridge Way/Stone Way corridors as potential alternative routes to the Fremont Bridge. The Queen Ann Drive/Raye St intersection continues to operate at high levels of congestion regardless of the time period.

Results for the 2007 Post-Construction scenario show a drop in LOS for several intersections compared to the No-Action scenario. However, noticeable improvements are expected in terms of system-wide delays and congestion levels, revealing that the efficiency of the overall network would improve. Compared to the No-Action scenario, the AM peak hour Post-Construction scenario shows 8 intersections falling in LOS and 6 with no change. For the PM peak hour, 3 intersections show an improvement in LOS, 7 locations drop in LOS, and 4 show no change. For both time periods, intersections that show a drop in LOS are generally the result of minor delay increases (but still crossing the letter grade threshold). For example, a five second per vehicle increase in average delay, though relatively minor, could lead to a letter grade change (e.g. from LOS B to LOS C). Nonetheless, overall system average delays for Post-Construction conditions would be reduced compared to either the No-Action or Construction scenarios. For the AM & PM peak hours, total average delays for Post-Construction conditions are roughly 165 sec/veh and 290 sec/veh, respectively. This translates to sizeable delay reductions for the two critical time periods of the day.

5. FUTURE 2025 TRAFFIC CONDITIONS

Long-range future 2025 traffic conditions and congestion levels are described in this chapter including a detailed comparison of the primary analysis scenarios reflected in this future horizon year. The two analysis scenarios evaluated for the 2025 timeframe included:

1) No-Action Phase
2) Post-Construction Phase

5.1. ASSUMED ROADWAY NETWORKS

As with the 2007 No-Action scenario, the 2025 No-Action scenario assumes that the existing street network remains largely unchanged in terms of the basic intersection geometry, arterial lane widths, length of turn lanes, street connections, etc. Future peak hour traffic growth is the primary anticipated change for the No-Action scenario compared to existing conditions or the 2007 No-Action scenario. This growth is based on general background increases in population & employment over the 18-year timeframe from 2007 to 2025. Growth estimates were taken from data given in the Downtown Fremont Circulation Study (Heffron) and reflect an average annual traffic increase of approximately 0.8 percent per year in addition to the build out of two major development proposals. The 2025 No-Action scenario omits any roadway improvements that are planned for Bridge Way to improve connections to/from SR-99 (via N 38th St) or any significant geometric changes to Fremont Ave N or N 34th St. Signal phasing and timing data were modified and optimized, however, for the 2025 No-Action scenario in order to reflect a suitable signal phasing/timing scheme for the future traffic volume increases.

Changes to the street network for the 2025 Post-Construction Phase reflect the list of mitigation measures developed in the TS&L phase and those added to the list due to the expanded study area (as discussed previously). These proposed mitigation measures are deemed necessary to address future anticipated congestion problems in the study area due to deficiencies in the No-Action street system. The key long-term mitigation elements for the Post-Construction scenario include new traffic signals, lane restrictions, and potential widening, as reiterated below:

1) Prohibit NB LTs at N 34th St & Fremont Ave N (AM & PM peak periods)
2) Prohibit EB LTs at N 35th St & Fremont Ave N
3) Extend EB LT at N 36th St & Fremont Place/Evanston
4) Add signal at N 36th St & Fremont Place/Evanston (with turn restrictions)
5) Add signal at N 36th St & Fremont Ave N
6) Add signal at SR-99 NB Off-Ramp at Bridge Way/N 38th St
7) Add NW-bound LT movement at Fremont Ave N/Fremont Way/N 39th St
8) Add NB left turn movement at Stone Way/Bridge Way

These improvements are similar to the mitigation measures assumed for the 2007 Post-Construction scenario where the original 4-lane bridge cross-section is maintained. As noted in the 2007 Post-Construction discussion, the various future traffic improvements were tested individually and were found to be critical (collectively) for maintaining acceptable traffic circulation within the study area. As such, they were carried over into the 2025 Post-Construction phase from the previous 2007 Post-Construction analysis work.

5.2. NON-MOTORIZED TRAFFIC

Non-motorized traffic patterns for the future 2025 No-Action scenario would be similar to 2007 No-Action conditions but with general background growth in pedestrian / bicyclist traffic volumes incorporated. Pedestrian traffic would primarily be recreational-based on the Burke-Gilman trail and across the bridge, along with a (relatively) modest proportion of walk-to-work commuters. Bicyclist traffic would be concentrated to mainly the AM & PM peak commute periods along Fremont Ave N, N 34th St, and the Burke-Gilman trail and would be comprised of recreational and school-related trips during non-commute periods.

For future mitigated conditions in 2025 (i.e. the Post-Construction phase) the same basic pedestrian and bicycle paths and non-motorized traffic levels would remain on Fremont Ave N, N 34th St, and the Burke-Gilman Trail as in the 2025 No-Action scenario. Some long-range safety improvements would be pursued for non-motorized traffic that focus on bicycle conflicts on the bridge (particularly the NB & SB directions) and pedestrian movements at Fremont Ave N / N 34th St and Fremont Ave N / N 35th St. However, these enhancements would not likely result in any major shifts in non-motorized traffic patterns.

5.3. PEAK HOUR TRAFFIC VOLUMES

Year 2025 No-Action peak hour traffic volumes were developed by extrapolating the Year 2007 No-Action peak hour volumes described previously. Growth rates applied to these existing counts reflected those used for the Downtown Fremont Circulation Study. To obtain the No-Action volumes, a universal 0.8 percent growth rate was applied to 2007 volumes. Year 2025 No-Action Volumes (AM & PM) are summarized in *Figures 22 & 23* on the following pages.

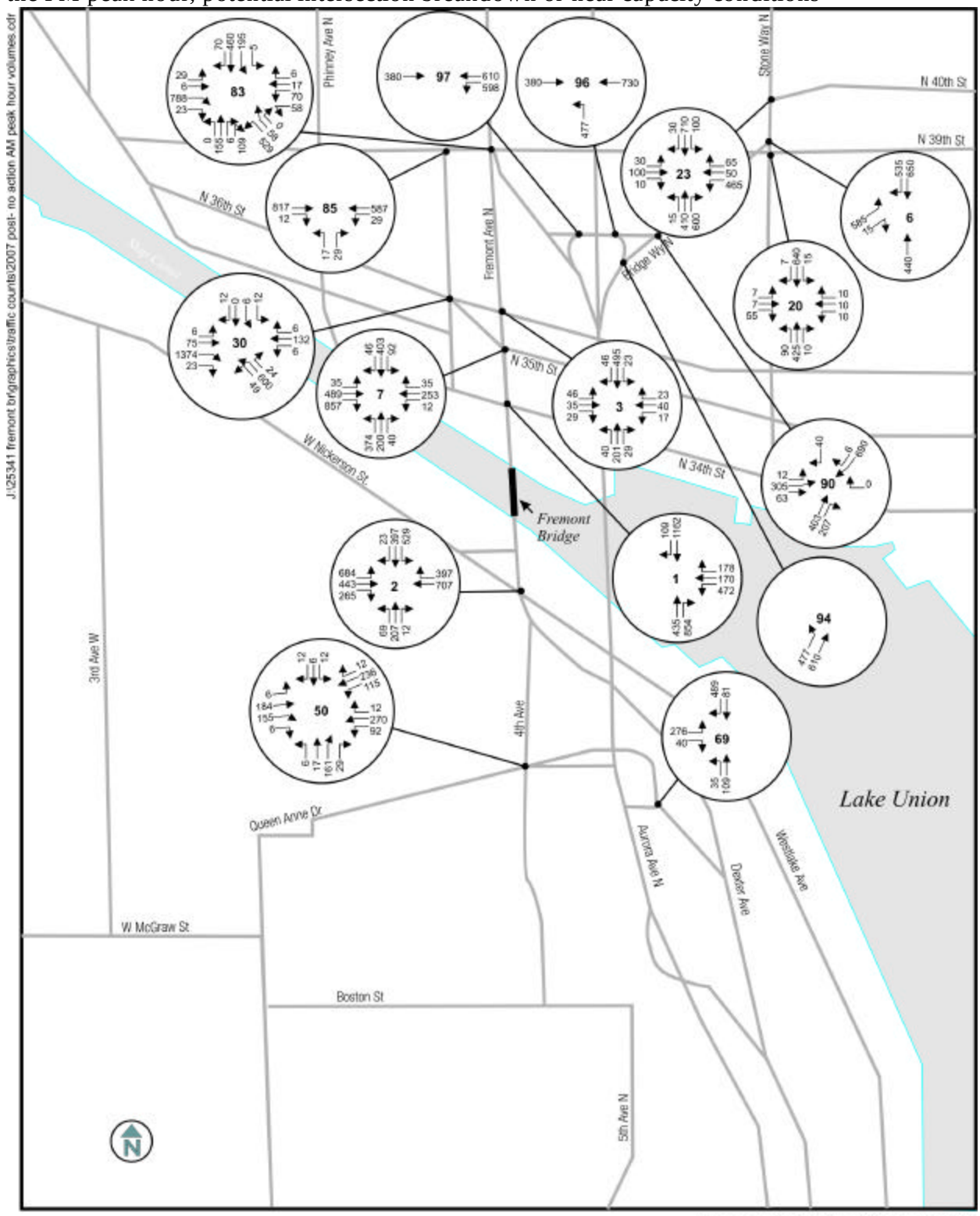
For the Post-Construction phase, traffic volumes were assumed to be similar to No-Action peak hour traffic levels. As stated previously, it is acknowledged that some attraction to alternative routes to the bridge may be induced due to the improvements assumed as part of the long-range mitigation plan. For example, some volume redistribution to / from the SR-99 ramps at N 38th St may occur due to the anticipated signals at the on- and off-ramps. Nonetheless, the assumption that No-Action volumes would remain constant even with the mitigation measures in place is likely to provide a worst-case scenario from a traffic operations perspective. Future 2025 Post-Construction intersection volumes are summarized in *Figures 24 & 25*.

5.4. PEAK HOUR LEVEL OF SERVICE (LOS)

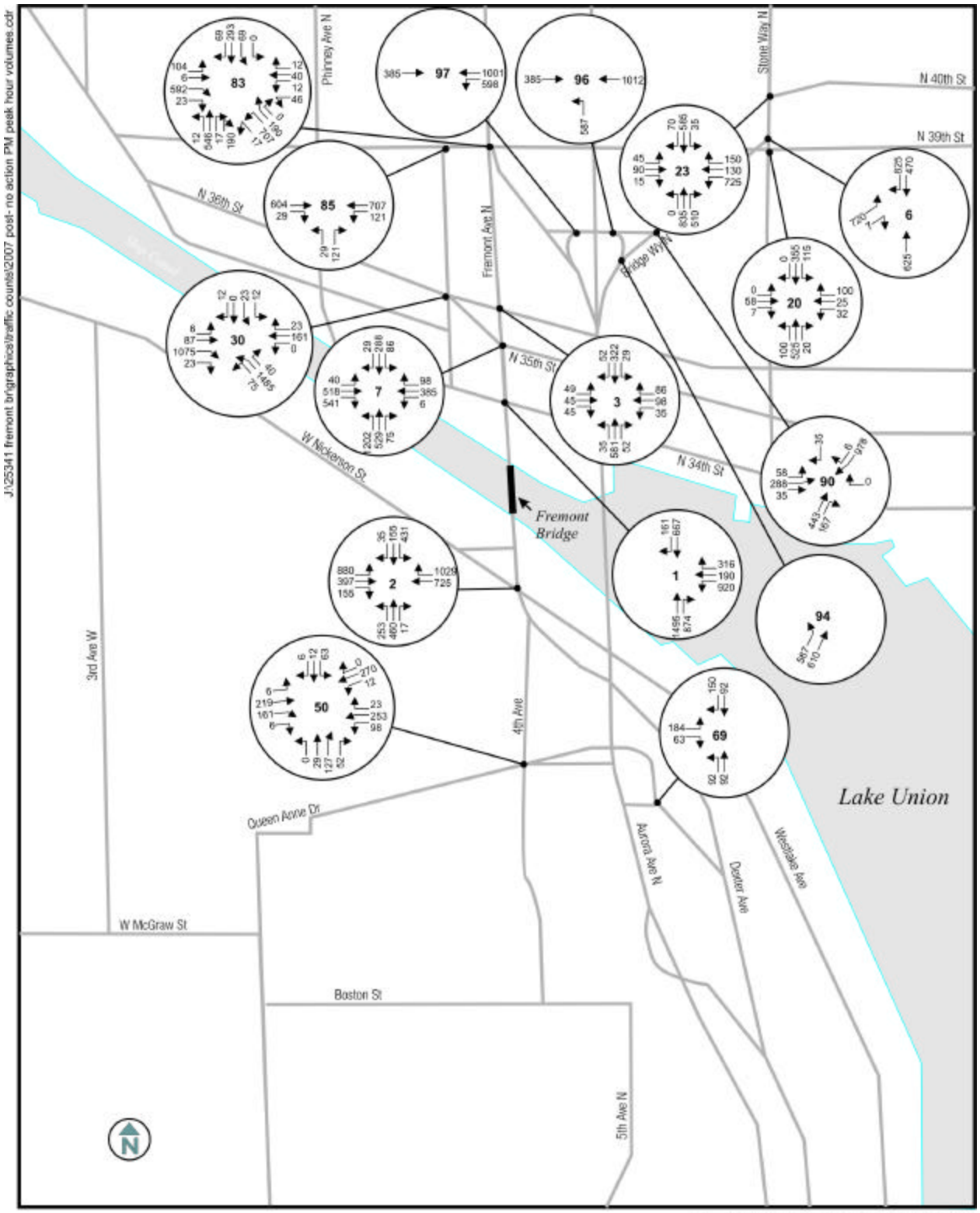
Using the forecasted traffic volumes developed for the 2025 scenarios along with the street network elements previously described, intersection level of service (LOS) estimates for the long-range 2025 No-Action and 2025 Post-Construction analysis scenarios were determined using the Synchro / SimTraffic simulation package (version 5.0). A summary of the LOS analysis results is provided in Table 3 following the peak hour intersection volume figures.

As shown in Table 3, delays for the 2025 No-Action peak hour scenarios vary noticeably between the AM and PM peak periods. Locations with the highest delays during the AM peak hour include the SR-99 off-ramp diverge leading up to 38th St and Bridge Way (Node 96), N 38th St / Bridge Way (90), N 39th St / Evanston Ave (30), and Fremont Ave N / N 39th St. Total system

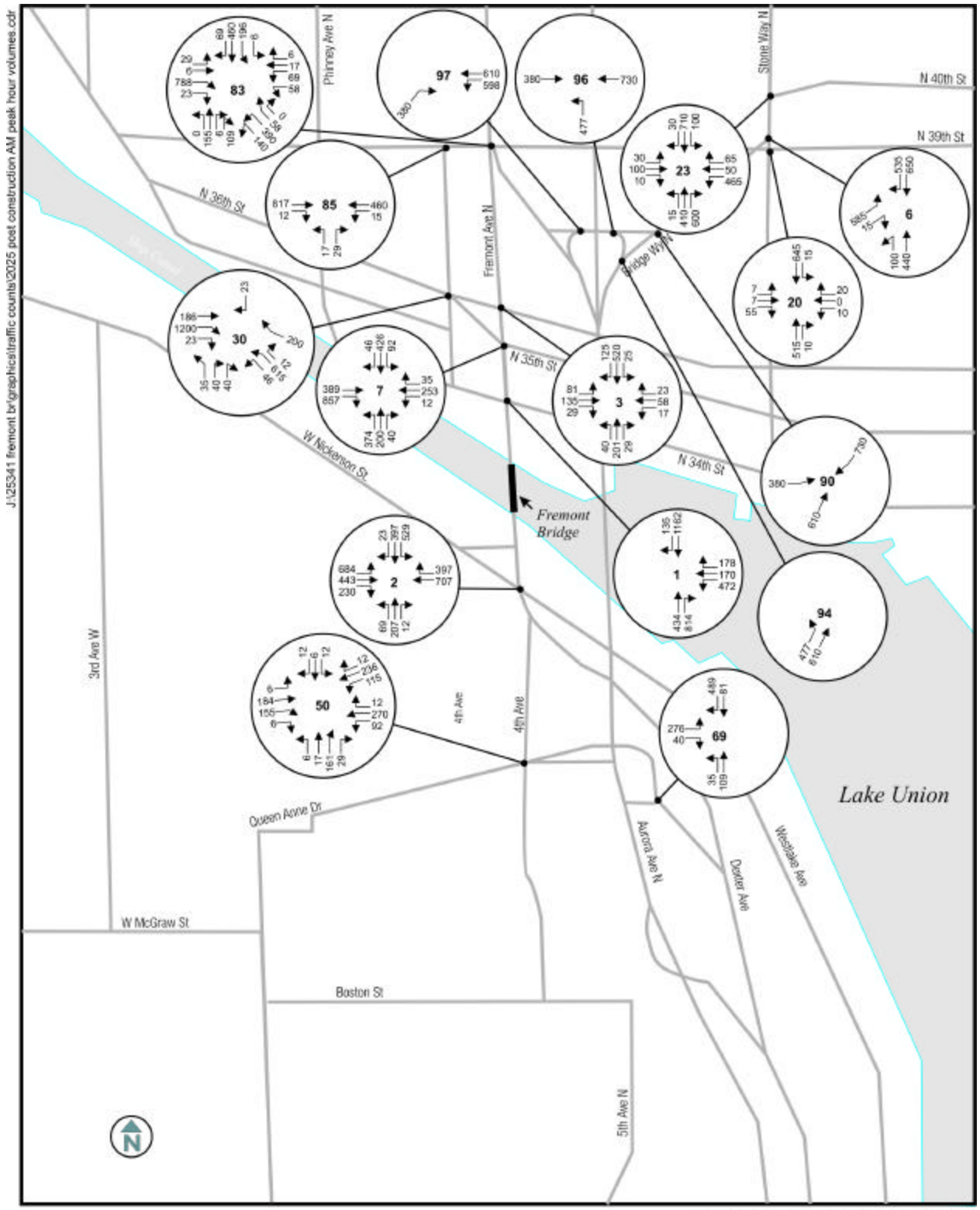
average delays for the AM peak hour are expected to be roughly 470 seconds per vehicle. For the PM peak hour, potential intersection breakdown or near-capacity conditions



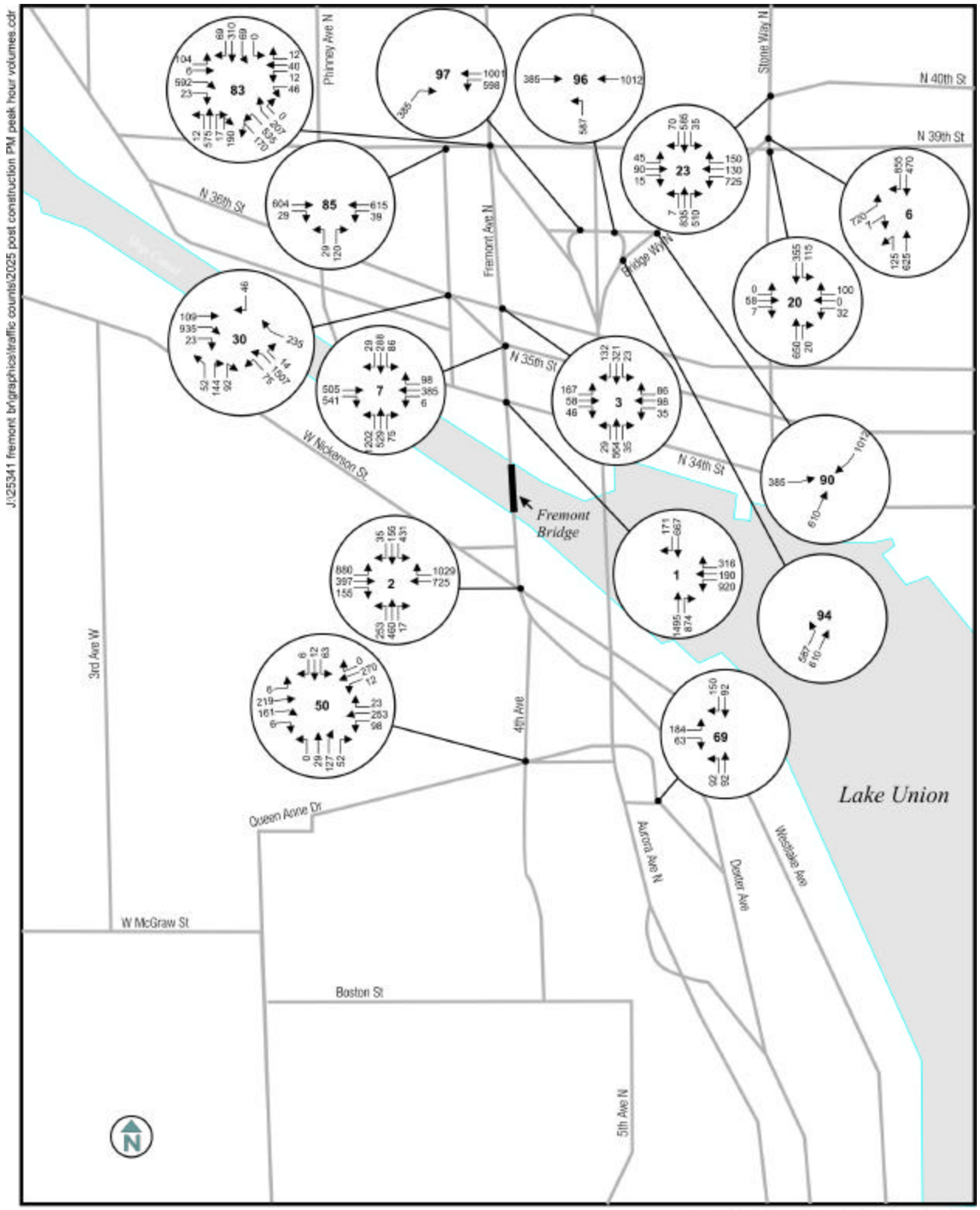
Fremont Bridge Study PS&E
Figure 22 - 2025 No Action AM Peak Hour Volumes



Fremont Bridge Study PS&E
Figure 23 - 2025 No Action PM Peak Hour Volumes



Fremont Bridge Study PS&E
Figure 24 - 2025 Post-Construction AM Peak Hour Volumes



Fremont Bridge Study PS&E
Figure 25 - 2025 Post-Construction PM Peak Hour Volumes

Table 3 – Future 2025 Level of Service by Scenario

#	Intersection	2025 No-Action				2025 Post-Construction			
		AM		PM		AM		PM	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	N 34th Street & Fremont Ave	19.1	B	>180	F	29.2	C	111.9	F
2	Nickerson Street & Fremont Ave	51.5	D	>180	F	48.3	D	>180	F
3	N 36th Street & Fremont Ave**	20.1	C	>180	F	27.9	C	26.3	C
7	N 35th Street & Fremont Ave	41.3	D	85.9	F	41.0	D	105.7	F
30	N 36th Street & Evanston Ave**	23.1	C	57.7	F	7.8	A	66.1	E
50	Raye St & Queen Anne Dr*	>180	F	>180	F	>180	F	>180	F
83	N 39th Street & Fremont Ave	60.3	E	42.6	D	>180	F	60.0	E
85	N 39th Street & Evanston Ave*	54.7	F	38.2	E	108.9	F	89.9	F
90	N 38th Street & Bridge Way N**	60.2	F	10.7	B	20.5	C	9.1	A
96	N 38th Street & SR-99 Off**	>180	F	112.7	F	44.0	D	22.2	C
99	SR-99 On & Fremont Way**	3.8	A	2.0	A	38.4	D	19.7	B
23	N 40th Street & Stone Way	51.4	D	33.7	C	42.6	D	31.3	C
20	N 39th Street & Stone Way**	5.4	A	42.8	E	7.9	A	20.0	B
6	Bridge Way N & Stone Way	16.1	B	14.3	B	18.8	B	18.5	B
Total System Average Delay		471.3		926.6		304.2		518.4	

* Unsignalized Intersection

** New Signal in Post-Construction Scenario

Note 1: Delay given in seconds per vehicle as represented in SimTraffic results

Note 2: Node numbers (#) are shown for as a reference to the various traffic volume figures

could be expected for locations such as Fremont Ave N / N 34th St, Fremont Ave N / Nickerson, Fremont Ave N / N 35th St, Fremont Ave N / N 36th St, and Fremont Ave N / N 39th St among others. PM peak hour results show 9 of the 14 study locations operating at LOS E or LOS F and total system average delays (i.e. the average amount of delay experienced by drivers traveling through the study area) at nearly 930 seconds per vehicle. These high delay conditions for the 2025 No-Action scenarios are due to several operational deficiencies in the roadway network that become most evident for 2025 conditions under heavy traffic. The key operational deficiencies noted for No-Action conditions are highlighted in Table 4.

Table 4 - Potential 2025 No-Action Scenario Operational Deficiencies

• Insufficient traffic control at SR-99 off ramp	• Traffic/ped safety issues at SR-99 on ramp
• Insufficient lane capacity at Fremont/39th	• Insufficient traffic control at Fremont/36th
• Lack of EB vehicle gaps at 39th/Evanston	• EB left turn movements at Fremont/35th
• Insufficient capacity at Fremont/Nickerson	• Insufficient capacity at Fremont/34th

With the various mitigation measures implemented for the 2025 Post-Construction AM and PM peak hour scenarios, delays for individual intersections both increase and decrease based on the specific mitigation in question. Compared to 2025 No-Action conditions, analysis results for the Post-Construction AM peak hour show 3 intersections that improve in LOS, 3 that show a drop in LOS, and 8 with no change. Results for the Post-Construction PM scenario indicate an LOS improvement for 5 locations, a total of 3 locations that degrade by one or more letter grade, and 6 that show little to no change.

Some of the delay increases and worsening of LOS can be explained by future signal phasing revisions that would add new phases to accommodate protected movements. A clear example of this is the N 39th St / Fremont Ave N intersection where a NW-bound protected left turn is proposed to allow for better access from SR-99 to the downtown Fremont core. This additional phase reduces the available green time for competing phases (such as the heavy-volume EB movements) and thereby increases overall delays to some degree. For the AM peak hour, this increase is particularly noticeable with average delays increasing from 60 seconds / vehicle, for No-Action conditions, to over 180 seconds / vehicles for the Post-Construction scenario.

Despite the various increases in delay at some locations, however, the overall benefits of the various mitigation measures would be realized at the macroscopic level by addressing some of the key operational deficiencies described in Table 4. This is reflected in the lower system average delay results that show substantial reductions in overall network delay. In fact, analysis results for the 2025 AM peak hour scenarios indicate that system average delays would be reduced from approximately 470 seconds / vehicle for No-Action conditions to roughly 305 seconds / vehicle for the Post-Construction scenario. Corresponding PM peak hour delays would be reduced from approximately 930 sec / veh to 520 sec / veh.

6. CONCLUSIONS

The Plans Specifications & Engineering (PS&E) phase of the Fremont Bridge Approach Reconstruction Transportation Study builds upon previous work conducted for the Type Size & Location (TS&L) study and determines, in greater detail, the impacts of the anticipated 9-month partial closure period (of the overall 18-month construction schedule) on traffic circulation within the study area. The primary goal of this evaluation was to assess the effectiveness of various mitigation measures for the critical Construction Phase where north-south bridge traffic capacity would be reduced to a single lane in each direction (vs. two-lanes in each direction). A secondary objective was the assessment of Post-Construction conditions where bridge capacity is restored along with the original pre-construction travel patterns. In addition to an existing conditions assessment of traffic circulation, the 2007 and 2025 horizon years were captured in this comprehensive evaluation.

For the 2007 time frame, the No-Action, Construction-Phase, and Post-Construction scenarios were examined and reflected the AM & PM peak hour periods. The 2025 horizon year analysis included the No-Action and Post-Construction scenarios only. A total of 18 intersections were analyzed using the Synchro / SimTraffic package of which 14 were selected for comparison purposes in terms of peak hour delays and level of service.

Highlights of the transportation analysis and evaluation are summarized below.

- Analysis results for *existing conditions* show reasonably low congestion levels during the AM& PM peak hour periods with only one or two intersections operating at-capacity.

- Year 2007 travel patterns for the Construction Phase were taken from car-following data given in the Downtown Fremont Circulation Study and indicate that drivers would likely gravitate toward alternative routes to the Fremont Bridge such as the Aurora Ave Bridge (SR-99) and Ballard Bridge (15th Ave NW).

- By the 2007 horizon year, intersection delays would increase for the No-Action and Construction Phase scenarios (vs. existing conditions) while Post-Construction delays would be significantly lower due to the proposed mitigation measures and the re-establishment of original travel patterns across the Fremont Bridge.

- Non-motorized traffic patterns for the 2007 No-Action and Post-Construction scenarios would be similar to existing conditions but with higher activity levels due to general background growth and assumed expansion of the trail system. During the 18-month construction period, pedestrian / bicyclist traffic would be consolidated to a single 10-foot wide multi-use lane on the bridge to serve both NB and SB trips. Temporary full-closure events would eliminate pedestrian / bicyclist access for short periods of time (intermittent weekends). Also, the Burke Gilman Trail would be closed-off during construction to accommodate heavy vehicles and equipment staging. However, suitable mitigation measures would be implemented to ensure that reasonable non-motorized alternatives to the bridge are provided until the bridge reopens to full capacity (i.e. four lanes).

- Long-range 2025 traffic congestion levels for the No-Action scenarios are expected to be high based on the analysis results. Total system average delays for the AM & PM peak hours will be 3 to 4 times greater than for existing conditions. For 2025 Post-Construction conditions, delays for certain intersections may actually increase slightly. However, total system average delays for the Post-Construction scenario would be reduced by 30 to 40 percent for the AM & PM peak hour periods compared to No-Action conditions. As such, the mitigation measures identified and assumed in the 2025 Post-Construction analysis (and the 2007 mitigated scenarios) would show significant operational and safety benefits.

- The proposed mitigation measures for Construction and Post-Construction conditions are intended to enhance accessibility and circulation in the downtown Fremont area. While these measures achieve this goal for the sub-area overall, some additional delays at specific intersection locations may increase due to revisions to signal phasing patterns (i.e. Fremont Ave N / N 39th St), the implementation of new signals, or macroscopic traffic volume shifts. Nonetheless, with the measures incorporated, system-wide congestion levels would be reduced noticeably compared to No-Action conditions.