Scenario Modeling Process

Westside Mobility Strategy

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1 Background and Modeling Process

1.1 Background on the Westside Mobility Strategy

The Westside Mobility Strategy Project aims to achieve balanced mobility for the west side Vancouver transportation network. The primary source of mobility discord is the heavy east-west volume of freight travel conflicting with north-south commuter travel. This results in unreliable freight travel with uncomfortable delay experienced by north-south travelers. A successful outcome of this project involves a balanced network that reflects the core values of transportation in the west side of Vancouver. These core values of the Westside Mobility Strategy include:

1. Improved transportation safety for all network users
2. Improved connectivity for bikes and pedestrians
3. Improved east-west reliability for freight
4. Preserve high-quality neighborhoods through the management of traffic and freight to sustain long-term value and multi-modal accessibility

A series of network management scenarios were developed for the project to test the differences and similarities between combinations of potential network improvement strategies. Each scenario incorporates a different combination of network improvement strategies designed to address the project's core values. The scenarios were evaluated using Dynamic Traffic Assignment (DTA), a mesoscopic travel demand model that tests traffic volume shifts as a result of changes in the transportation network.

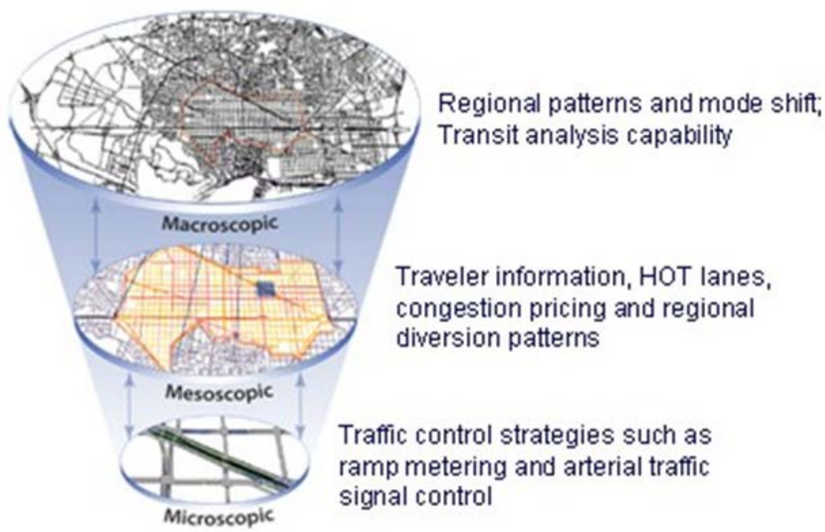
1.2 Purpose of the Scenario Modeling Process

The existing and future conditions analysis and community outreach for the Westside Mobility Strategy Project found traffic diversion to be a significant factor hampering west Vancouver's overall mobility. In order to address these mobility issues, several improvements were identified with the potential to significantly affect traffic patterns and mobility conditions through the westside transportation network. To identify specific effects of these improvements, the project team, in collaboration with staff from the Southwest Washington Regional Transportation Council (RTC), utilized DTA to assess the impacts of different combinations of transportation network improvements. DTA can accurately test the effectiveness of potential improvement strategies in reducing traffic diversion. A key benefit of DTA is its capability to consider the spatial and temporal effects of congestion in determining route choice, especially diversion. DTALite, a DTA software application, was utilized for this project due to its applicability in assessing strategy effectiveness.

Five "packages" of improvements were identified to be tested using DTA, and four individual scenarios were developed to test the differences and similarities between combinations of these improvement strategies. Each scenario incorporated a different combination of network improvement strategies to highlight its effectiveness and demonstrate how well different improvements work with one another. The project team identified five key themes that emerged from the overall scenario modeling process. These findings illustrate the changes in traffic patterns that can be anticipated given different combinations of improvement strategies that may be implemented over time.

1.3 Overview of Traffic Modeling Tools

There are three primary types of traffic analysis tools available for transportation professionals; 1) Macroscopic, 2) Microscopic, and 3) Mesoscopic. Macroscopic modeling (e.g., RTC's Regional Travel Demand Model) is most appropriate for the development of regional travel demand forecasts based on the long-term trends of population, employment, and system capacity. Microscopic modeling is intended for intersection operational analysis and requires a high level of data investment to accurately assess traffic conditions with highly detailed analysis results. Mesoscopic modeling (e.g., DTA) involves an intermediate level of detail and is best used for testing volume shifts as a result of changes in capacity, congestion, and/or corridor signal timing. DTA is best applied to sub-regional analysis, similar to the Westside Mobility Strategy study area, as opposed to regional or intersection level analysis.



1.4 Why use DTA?

DTA is a tool for effectively assessing how driver route choice varies when faced with traffic delay or congestion. The diversion that occurs during congested periods is one of the major issues discovered within the existing westside Vancouver roadway network. DTA provides a platform to assess driver reaction to strategies intended to reduce diversion. In westside Vancouver, especially during the AM time periods, many travelers avoid freeway congestion by diverting onto the local street network, which results in higher than anticipated traffic volumes on roads not meant to handle those traffic levels.

1.5 Why use DTA Lite?

DTALite is an open-source DTA model software based on a mesoscopic simulation-assignment framework that can account for signal timing, roadway capacity, and traffic volume. DTALite is the application RTC selected after an assessment of the data and professional needs to simulate several different DTA platforms. DTALite is relatively simple to use, unlike other mesoscopic model platforms; the data needed to run the model are regularly available to transportation professionals in the Portland-Vancouver Metropolitan Region. This tool has yet to be tested in the region, and the Westside Mobility Strategy offers an ideal test case application of the tool.

2 Scenario Development Process

2.1 Development of Network Improvement Strategies

The network improvement strategies were developed to meet current and future transportation needs for all transportation modes that rely on the network for everyday mobility purposes. The network improvement strategies are combinations of improvements to address the project core values, as discussed above. The identified network improvements strategies are detailed individually in Table 1.

Table 1. Network Improvement Strategies Summary

Network Improvement Strategy	Description
Mill Plain Boulevard Optimization*	Coordination and optimization of traffic signals to create more reliable east-west travel times Improvements to Mill Plain Boulevard/I-5 interchange to expand ramp capacity and improve traffic flow
Main Street Safety Improvements	Road reallocation from four to three lanes with center turn lane and on-street parking or bike lanes between Fourth Plain Boulevard and approximately 50th Avenue Stop controlled intersection with pedestrian crosswalks on Main Street at West 20th Ave
39th Street and Fourth Plain Boulevard Safety Improvements	Traffic control and pedestrian/bike crossing improvements in select locations to calm traffic volumes and speeds
32nd Avenue Extension and Fruit Valley Road Bridge Replacement	New westside limited-access north-south roadway that connects Lower River Road/Port of Vancouver/industrial areas to 78th Street Replacement of Fruit Valley Road bridge over BNSF railroad tracks Improvements to Lakeshore Road/78th Street intersection
Columbia River Bridge and I-5 Corridor Improvements	Traffic control and pedestrian/bike crossing improvements in select locations to calm traffic volumes and speeds

**This is a funded project through the 2015 Connecting Washington Transportation Bill*

2.2 Development of Network Management Scenarios

The four scenarios developed represent different potential investment packages to achieve balanced mobility in Vancouver's west side transportation network. These scenarios were modeled using a DTA tool to understand how different packages support or conflict with one another. Each scenario allowed an assessment of the overall network improvement strategy by showing the results of the combinations, as well as the differences. This assessment demonstrated the interaction between network management scenarios to ensure investments will support one another, as opposed to one improvement counteracting the benefits of another. The combinations of network improvement strategies included in the scenarios are shown in Table 2.

Table 2. Network Management Scenarios Summary

Strategy	Scenario 1: Main Street and Mill Plain Boulevard	Scenario 2: Neighborhood Streets	Scenario 3: I-5 and Mill Plain Boulevard	Scenario 4: Kitchen Sink
Mill Plain Boulevard Optimization*	■	■	■	■
Main Street Safety Improvements	■	■		■
39th Street and Fourth Plain Intersection and Safety Improvements		■		■
32nd Avenue Extension and Fruit Valley Road Bridge		■		■
Columbia River Bridge and I-5 Interchange Improvements			■	■

**This is a funded project through the 2015 Connecting Washington Transportation Bill*

2.3 Network Management Scenarios Details

2.3.1 Scenario Evaluation #1

Scenario Evaluation #1 optimizes Mill Plain Boulevard to improve mobility for freight travel and improves I-5 to divert traffic off Main Street, which allows improvements to the bicycle and pedestrian experience.

2.3.1.1 What does this include?

- Road capacity reallocation on Main Street from Fourth Plain Boulevard to approximately 50th Street
- Pedestrian and bicycle improvements, as well as speed reduction on Main Street
- Optimizing east-west travel on Mill Plain Boulevard with improved signal timing

2.3.1.2 What Strategies does this address?

- Improved transportation safety for all network users
- Improved connectivity for bikes and pedestrians on Main Street
- Reduction of severe crashes with proposed speed reduction
- Reduction of bicycle and pedestrian crashes with bicycle and pedestrian improvements

2.3.1.3 What questions does this scenario address?

- Can an optimized Mill Plain Boulevard corridor reduce eastbound and westbound freight traffic on other east and west arterials?
- Can an optimized Mill Plain Boulevard corridor more effectively serve higher volumes of freight traffic?

2.3.2 Scenario Evaluation #2

Scenario Evaluation #2 optimizes Mill Plain Boulevard to improve mobility for freight travel, improves I-5 to divert traffic off Main Street (allowing improvements to the bicycle and pedestrian experience), and improves 32nd Avenue by diverting traffic off Fruit Valley Road.

2.3.2.1 What does this include?

- Road capacity reallocation on Main Street from Mill Plain Boulevard to approximately 50th Street
- Pedestrian and bicycle improvements, as well as speed reduction on Main Street
- 32nd Avenue extension and bridge improvements
- 39th Street and Fourth Plain Boulevard roadway improvements for pedestrian and bicycle, as well as safety intersection improvements
- Optimizing east-west travel on Mill Plain Boulevard with improved signal timing

2.3.2.2 What Strategies does this address?

- Improved transportation safety for all network users
- Improved connectivity for bikes and pedestrians
- Reduction of severe crashes with proposed speed reduction
- Reduction of bicycle and pedestrian crashes with bicycle and pedestrian improvements

2.3.2.3 What questions does this scenario address?

- If trucks were regulated on 39th Street and Fourth Plain Boulevard, can freight traffic be absorbed by optimizing Mill Plain Boulevard and a new 32nd Avenue corridor connecting to 78th Street?
- What are the impacts from adjusting the signal timing on Main Street to make it less desirable as an I-5 diversion route?
- What are the network impacts as a result of a road reallocation on Main Street?
- Can improvements on the local arterials resolve network conflicts without addressing I-5 congestion?

2.3.3 Scenario Evaluation #3

Scenario Evaluation #3 assumes Columbia River Crossing (CRC) is built and diverts traffic to I-5 from Main Street (allowing improvements to the bicycle and pedestrian experience) and optimizes Mill Plain Boulevard to improve mobility for freight travel.

2.3.3.1 What does this include?

- Road capacity reallocation on Main Street from Fourth Plain Boulevard to approximately 50th Street
- Pedestrian and bicycle improvements, as well as speed reduction on Main Street
- Optimizing east-west travel on Mill Plain Boulevard with improved signal timing

2.3.3.2 What Strategies does this address?

- Improved transportation safety for all network users
- Improved connectivity for bikes and pedestrians on Main Street
- Reduction of severe crashes with proposed speed reduction
- Reduction of bicycle and pedestrian crashes with bicycle and pedestrian improvements

2.3.3.3 What questions does this scenario address?

- Would this scenario address 2035 capacity constraints along Fruit Valley Road up to 78th Street?
- How much diversion could be reduced on Main Street and other west side arterials by improving other routes in the study area?

2.3.4 Scenario Evaluation #4

Scenario Evaluation #4 assumes CRC is built, optimizes Mill Plain Boulevard to improve mobility for freight travel, improves I-5 to divert traffic from Main Street (allowing improvements to the bicycle and pedestrian experience), and improves 32nd Avenue to divert traffic off Fruit Valley Road.

2.3.4.1 What does this include?

- Road capacity reallocation on Main Street from Mill Plain Boulevard to approximately 50th Street
- Pedestrian and bicycle improvements, as well as speed reduction on Main Street
- 32nd Avenue extension and bridge improvements
- 39th Street and Fourth Plain Boulevard roadway improvements for pedestrian and bicycle, as well as safety intersection improvements.
- Optimizing east-west travel on Mill Plain Boulevard with improved signal timing

2.3.4.2 What Strategies does this address?

- Improved transportation safety for all network users
- Improved connectivity for bikes and pedestrians
- Reduction of severe crashes with proposed speed reduction
- Reduction of bicycle and pedestrian crashes with bicycle and pedestrian improvements

2.3.4.3 What questions does this scenario address?

- Are all major network issues addressed by completing improvements together?
- Are there any unresolved network problems after implementing all potential improvements? If so, what would be needed to address the remaining issues?

3 Scenario Modeling Findings

3.1 Key Findings – All Scenarios

The key findings consistent across all or multiple scenarios are outlined below:

1. **Improvements shift traffic from the network core to periphery**. The model showed that improving major north-south throughways on the periphery of the study area (I-5 and the 32nd Avenue extension) reduced traffic diversion to other interior north-south arterials through the study area, particularly Main Street and Fruit Valley Road. The reduction of traffic on Main Street and Fruit Valley Road will shift some traffic away from Kauffman Avenue, Columbia Street, and other collector or lower level roads as capacity becomes available on Main Street and Fruit Valley Road.
2. **Shifts are more substantial during AM peak hours.** The model showed improvements have a more substantial effect on the pattern of AM peak hour traffic volumes across the network than PM peak hour traffic. There is more congestion on I-5 through the study area in the AM, so diversion through the network is greater. In scenarios #3 and #4, the modeled improvements shift some traffic back to I-5 in the AM peak. There is less traffic diversion to shift in the PM peak.
3. **Short-term improvements can have a significant effect while long-term capital projects are under development.** Additional intersection traffic controls or optimization of traffic calming strategies can affect traffic patterns—even in the absence of projects that expand capacity—by encouraging the traffic behavior to better align with the intended function of the roadway and surrounding context. These improvements also support safety for people walking or biking. Examples of short-term improvements could include a designated crosswalk at 25th and Main Street, new traffic control strategy at 39th Street and Lincoln Avenue, and optimization of traffic signals on Mill Plain Boulevard to enhance reliability for freight. These improvements will be consistent with the longer-term improvements to be developed later.
4. **All scenarios reduce westbound traffic volumes on 39th Street during the AM peak hour.** In addition, scenarios #2 and #4 show traffic volumes on 39th Street decreasing in both directions during the AM and PM peak hours, likely a result of I-5 corridor improvements and reduced diversion on Main Street partly caused by safety improvements that reduce traffic speeds and volumes. This indicates that travelers would rather use other routes if the travel delay on those routes was reduced.
5. **Some scenarios lead to increased traffic volumes on 78th Street.** Scenarios #2 and #4 show slight increases of traffic volumes on 78th Street, particularly in the westbound direction, likely due to the extension of 32nd Avenue in both scenarios. The effect these traffic increases will have on the function of the roadway are yet to be determined.

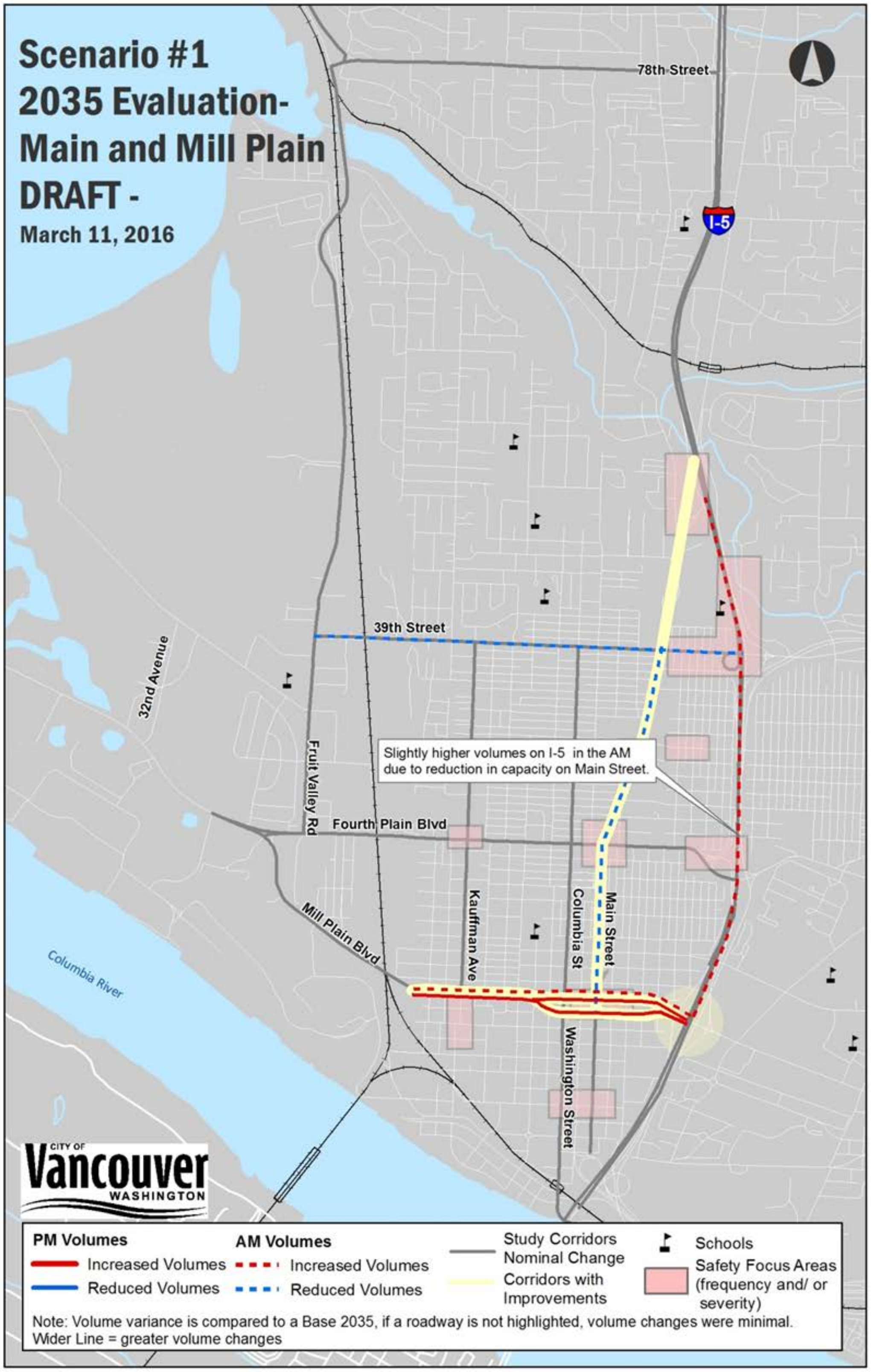
3.2 Detailed Findings for Each Scenario

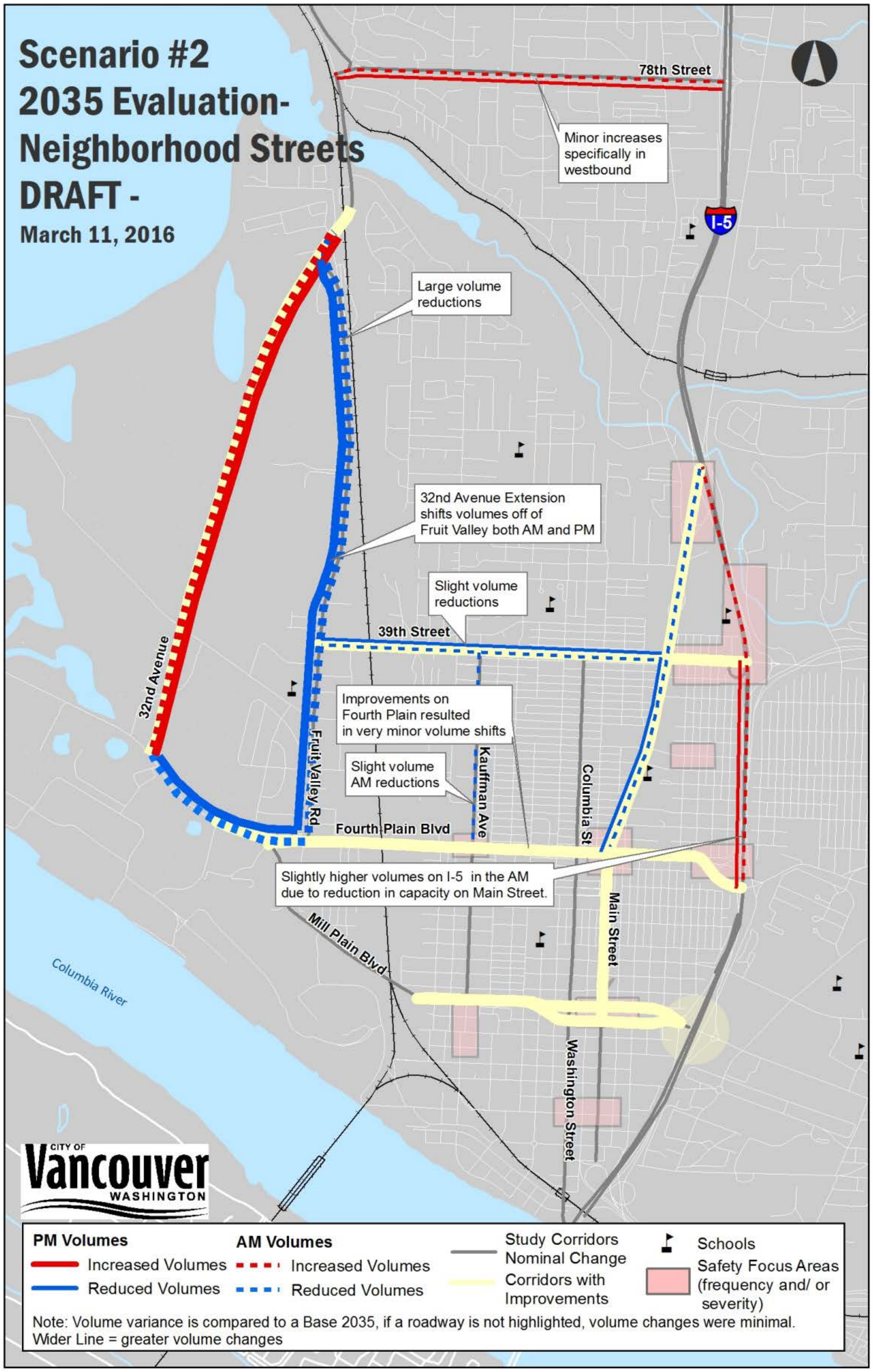
Table 3 summarizes the important changes observed under each scenario. Maps that illustrate these changes are provided following the table.

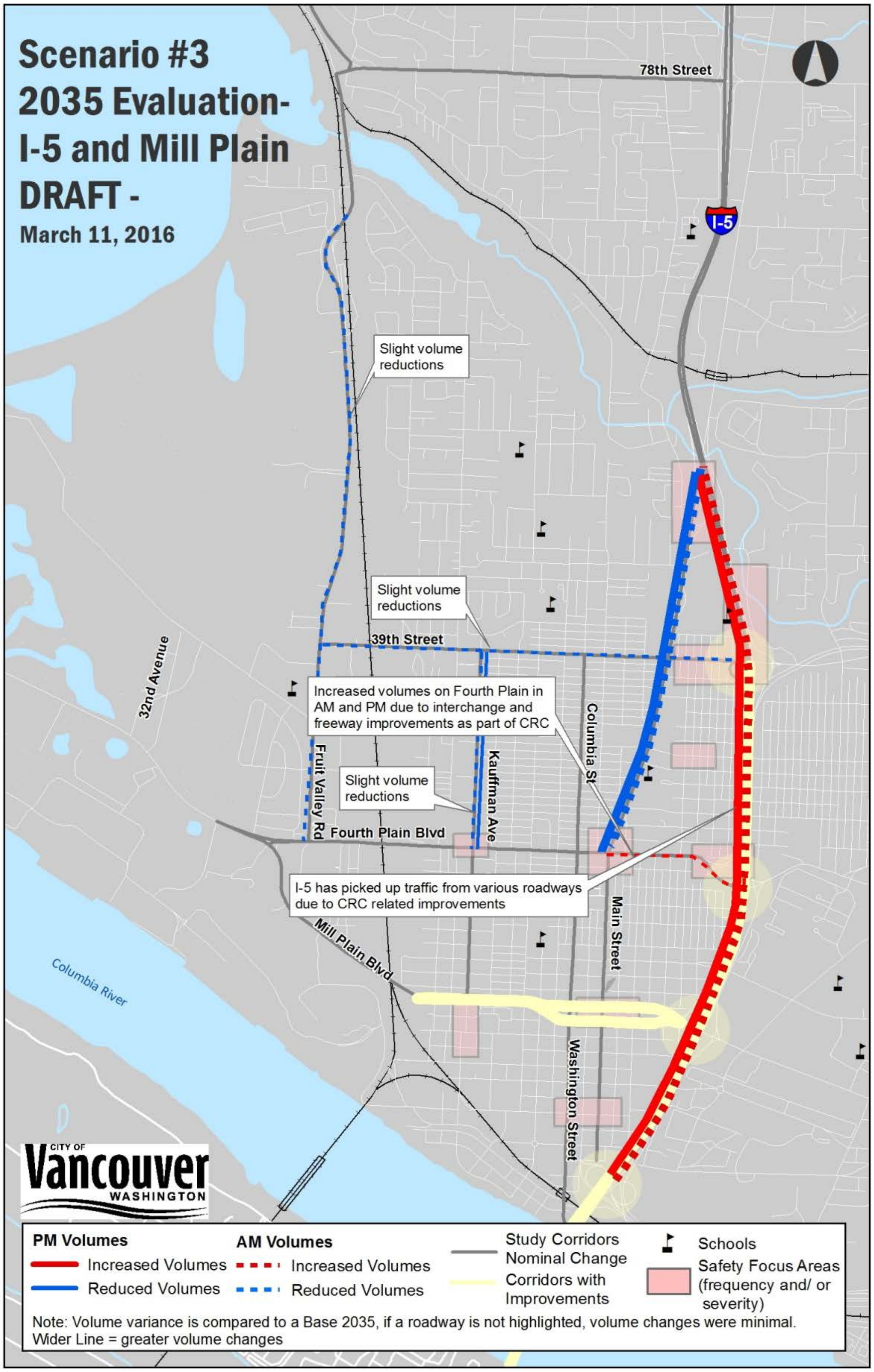
Table 3. Detailed Scenario Observations

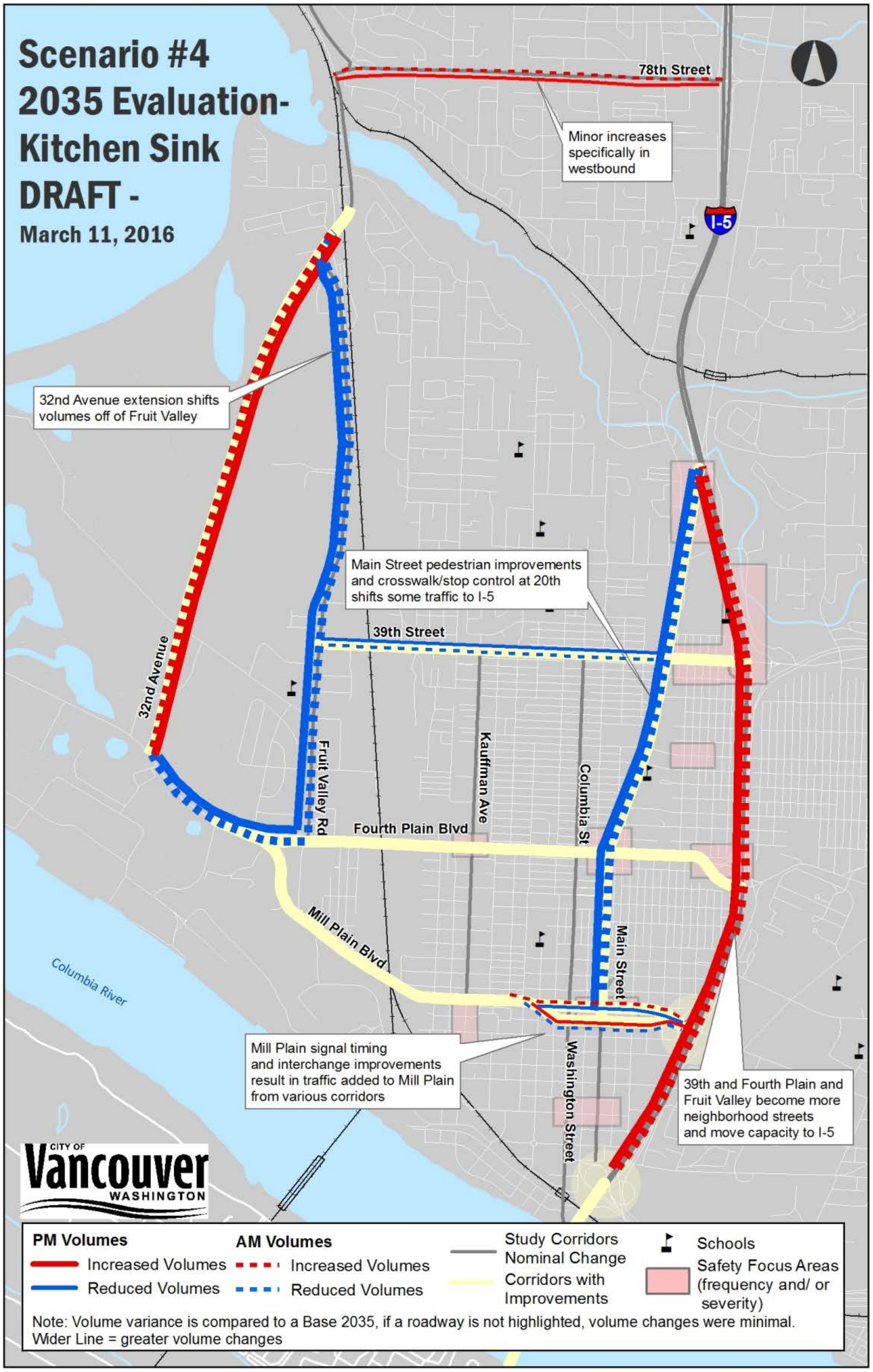
Scenario Evaluation	Detailed Observations
Scenario #1: Focus - Main Street and Mill Plain Boulevard	• Improvements to the I-5/Mill Plain Boulevard interchange and Mill Plain corridor will increase AM and PM peak hour volumes along Mill Plain Boulevard. • The I-5/Mill Plain interchange improvements reduce traffic diversion to Main Street during the AM peak hour. This will likely enhance safety in this high crash corridor, particularly for people walking or biking. The I-5 improvements also reduce diversion of AM traffic to 39th Street. • The I-5/Mill Plain interchange and Mill Plain corridor improvements complement the Main Street safety improvements. The Main Street safety improvements will deter some I-5 diversion traffic, but I-5 will operate more effectively with higher traffic as a result of the I-5/Mill Plain interchange improvements.
Scenario #2: Focus - Neighborhood Streets	• Main Street safety improvements will divert north-south traffic volumes to I-5 north of Fourth Plain Boulevard. • Mill Plain/I-5 interchange improvements will reduce traffic diversion to 39th Street during the AM and PM peak hours. • The 32nd Avenue extension will divert traffic from Fruit Valley Road, improving both safety and neighborhood livability conditions on this neighborhood-serving roadway. The extension will also result in minor increases to 78th Street traffic, particularly in the westbound direction. • The reduction of traffic on both Main Street and Fruit Valley Road will shift some traffic from parallel north-south neighborhood streets, such as Kauffman Avenue and Columbia Street, as capacity becomes available on Main Street and Fruit Valley Road.
Scenario #3: Focus - I-5 and Mill Plain Boulevard	• I-5/Columbia River bridge and I-5 corridor improvements will increase AM and PM peak hour volumes on I-5 within the study area. • The bridge and I-5 corridor improvements will also reduce AM and PM peak hour traffic diversion to Main Street, Kauffman Avenue, Fruit Valley Road, and 39th Street. This is likely to reduce demand on these roadways allowing for conditions more conducive for people walking or biking.
Scenario #4: Focus - Kitchen Sink	• 32nd Avenue extension shifts volumes off Fruit Valley Road • Main Street pedestrian improvements and crosswalk/stop control at 20th shifts from traffic to I-5 • Mill Plain signal timing and interchange improvements result in traffic added to Mill Plain from various corridors • 39th and Fourth Plain become more neighborhood-oriented streets and move capacity to I-5 • Minor traffic increase on 78th Street, specifically in the westbound direction

3.3 Scenario Findings Maps




Scenario #2
2035 Evaluation-
Neighborhood Streets
DRAFT -
March 11, 2016
78th Street
Minor increases specifically in westbound
I-5
Large volume reductions
32nd Avenue Extension shifts volumes off of Fruit Valley both AM and PM
Slight volume reductions
39th Street
32nd Avenue
Improvements on Fourth Plain resulted in very minor volume shifts
Slight volume AM reductions
Fruit Valley Rd
Kauffman Ave
Columbia St
Fourth Plain Blvd
Slightly higher volumes on I-5 in the AM due to reduction in capacity on Main Street.
Main Street
Mill Plain Blvd
Columbia River
Washington Street
City of Vancouver Washington
PM Volumes
Increased Volumes
Reduced Volumes
AM Volumes
Increased Volumes
Reduced Volumes
Study Corridors Nominal Change
Corridors with Improvements
Schools
Safety Focus Areas (frequency and/ or severity)
Note: Volume variance is compared to a Base 2035, if a roadway is not highlighted, volume changes were minimal.
Wider Line = greater volume changes


Scenario #3
2035 Evaluation-
I-5 and Mill Plain
DRAFT -
March 11, 2016
78th Street
I-5
Slight volume reductions
Slight volume reductions
39th Street
32nd Avenue
Increased volumes on Fourth Plain in AM and PM due to interchange and freeway improvements as part of CRC
Columbia St
Fruit Valley Rd
Kauffman Ave
Slight volume reductions
Fourth Plain Blvd
I-5 has picked up traffic from various roadways due to CRC related improvements
Main Street
Mill Plain Blvd
Columbia River
Washington Street
City of Vancouver Washington
PM Volumes
Increased Volumes
Reduced Volumes
AM Volumes
Increased Volumes
Reduced Volumes
Study Corridors Nominal Change
Corridors with Improvements
Schools
Safety Focus Areas (frequency and/ or severity)
Note: Volume variance is compared to a Base 2035, if a roadway is not highlighted, volume changes were minimal.
Wider Line = greater volume changes


Scenario #4
2035 Evaluation-
Kitchen Sink
DRAFT -
March 11, 2016
78th Street
Minor increases specifically in westbound
I-5
32nd Avenue extension shifts volumes off of Fruit Valley
Main Street pedestrian improvements and crosswalk/stop control at 20th shifts some traffic to I-5
39th Street
32nd Avenue
Fruit Valley Rd
Kauffman Ave
Columbia St
Fourth Plain Blvd
Mill Plain Blvd
Main Street
Columbia River
Washington Street
Mill Plain signal timing and interchange improvements result in traffic added to Mill Plain from various corridors
39th and Fourth Plain and Fruit Valley become more neighborhood streets and move capacity to I-5
City of Vancouver Washington
PM Volumes
Increased Volumes
Reduced Volumes
AM Volumes
Increased Volumes
Reduced Volumes
Study Corridors Nominal Change
Corridors with Improvements
Schools
Safety Focus Areas (frequency and/ or severity)
Note: Volume variance is compared to a Base 2035, if a roadway is not highlighted, volume changes were minimal.
Wider Line = greater volume changes