JERSEY CITY REGIONAL WATERFRONT ACCESS AND DOWNTOWN CIRCULATION STUDY

FINAL REPORT

July 10, 2007

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1.0 Introduction

The Jersey City Hudson River Waterfront has grown drastically over the past 10 years and will continue to grow in the foreseeable future. As a regional employment center of over 40,000 employees and the home to 30,000 residents, assuring reliable and sufficient multi-modal access is critical to the economic health of the region. Meanwhile, the 2003 NJDOT Bergen Arches Best Use Study determined that transportation improvements in downtown Jersey City are needed to ensure local mobility while maintaining regional access. In order to ensure mobility and access to employment, recreation, cultural resources, and residences within downtown Jersey City, Stantec Consulting, Inc., in association with AKRF, Inc., Stump/Hausman, and Medina Consultants was commissioned by the Jersey City Division of City Planning with funding provided in part by the North Jersey Transportation Planning Authority to prepare the 'Regional Waterfront Access and Downtown Circulation Study.' This study is intended to identify specific deficiencies in the transportation network and opportunities for mobility improvements and make recommendations for specific transportation projects that will facilitate regional and local access and mobility to employment, recreational, and residential development in downtown Jersey City.

1.1 PROJECT OVERVIEW

The Jersey City Downtown Regional Waterfront Access and Downtown Circulation Study is intended to identify specific deficiencies in the multi-modal transportation network in the waterfront and downtown areas that includes roadway, mass transit, bicycle, and pedestrian accommodations as well as identify regional access deficiencies to the downtown and waterfront areas. This will be accomplished by collecting information on existing conditions, planned developments and infrastructure improvements and projecting conditions in the year 2020. The future conditions projections are used to identify the need for infrastructure and planning improvements and recommend the best way to have these improvements implemented.

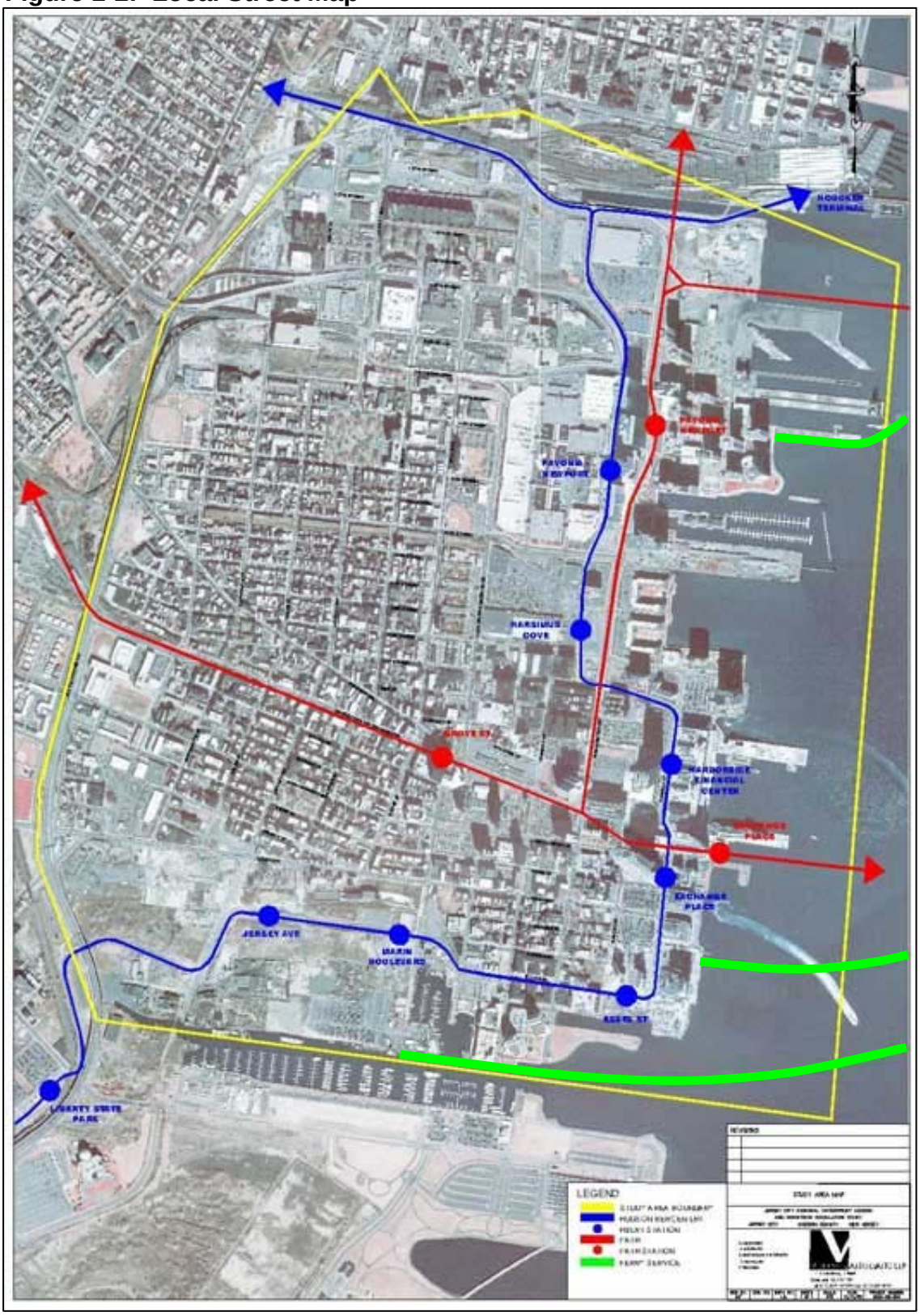
1.2 STUDY AREA DESCRIPTION

1.2.1 Study Area Boundary

The study area for this project extends from the Hudson River west to the New Jersey Turnpike Extension and from Liberty State Park north to the Jersey City border with Hoboken. The study also considers potential improvements to highways, rail and ferry service outside the immediate study area such as increased ferry, Port Authority Trans-Hudson (PATH), and Hudson Bergen Light Rail (HBLRT) access and ridership. Figures 1-1 and 1-2 illustrate the location and boundaries of the study area, respectively.

Figure 1-1: Regional Map

Figure 1-2: Local Street Map



1.2.2 Roadway Network

The roadway network in the study area consists of approximately 42 miles of roadway. There are 11 automobile routes in and out of the study area: Specifically:

- Holland Tunnel Entrance & Exit
- New Jersey Turnpike/Route 139 Entrance & Exit
- New Jersey Turnpike Exit 14C
- Marin Boulevard
- Grove Street
- Jersey Avenue
- Newark Avenue
- Montgomery Street
- Bright Street
- Grand Street
- Pacific Avenue

1.2.3 Mass Transit Options

The study area is fortunate to have a wide variety of mass transit options for residents and workers in addition to automobile dependent travel. The study area is served by:

- 7 Hudson Bergen Light Rail Stations
- 3 PATH Stations
- 3 Ferry Terminals
- Numerous Private and New Jersey Transit Bus Service Routes

1.3 PROJECT METHODOLOGY

As mentioned previously, the intent of this project is to project and identify existing and future deficiencies in the transportation system into and within the study area. To complete the project, the following tasks are considered:

1.3.1 Data Collection

This task includes gathering available information on the existing transportation system[1] such as roadway geometries, traffic signal plans, traffic counts, mass transit schedules, and ridership estimates. It also includes the collection of the work done to date by Jersey City and other consultants to identify planned developments and identify existing and future deficiencies. This information is collated to provide an overall picture of the study area.

[1] *All conditions as of 2006*

1.3.2 Transportation and Development Models

The information culled in the data collection task was used to create a series of models for the study area. The transportation model is created first for existing conditions and calibrated to new and historical traffic data to ensure it accurately estimates current conditions. This model is then of use in the future as a method of determining the effects of various developments and infrastructure improvements on the study area transportation system. The development model utilizes available population and employment estimates for the study area in conjunction with available development information to determine anticipated developments for the future. The results of the development model are fed back into the transportation model to obtain projections of future transportation conditions. New Jersey Transit maintains a transit model of mass transit options throughout the state, including the study area, and the results of the development model were provided to New Jersey Transit as well to determine anticipated future transit usage in the study area.

Additional information on the development of the transportation and development models can be found in subsequent sections of this report.

1.3.3 Identification of Future Deficiencies

To identify future deficiencies, the transportation network volumes produced by the future conditions transportation model are analyzed using the existing roadway and transportation networks with committed improvements assumed to be in place by the year 2020. Locations that operate poorly are identified.

1.3.4 Determination of Improvements

Once the locations that operate poorly in the future conditions, (as well as those that operate poorly under existing conditions) are identified, improvements are suggested. These improvements range from intersection level improvements such as improved signal timings and minor roadway reconfiguration to major infrastructure improvements such as new roadways and access configurations.

1.3.5 Analysis of Improvements

Of course, an improvement is only useful if it works, and this task entails analyzing the recommended improvements to determine their effect on the transportation system. This will be completed by calculating anticipated volumes and levels of service for each improvement and comparing the results to the baseline future conditions models (with no proposed improvements in place). Using this information, worthwhile improvements can be further considered.

1.3.6 Concept Design of Improvements

A conceptual design of major improvements will be done as part of this project to establish the real work costs and benefits to constructing the improvement, such as dollar cost, environmental impact, and community impact.

1.3.7 Ranking of Improvements

The ranking of the improvements is done to determine which improvements are most important and should be considered first by the administration as they move forward.

1.3.8 Public Outreach Process

The public outreach effort for this project consists of a two part process to ensure that the project follows an open public process format. The steering committee represents the first part of the public outreach and was created to guide the project, help to collect information, and obtain input from major stakeholders and concerned organizations. The steering committee includes representatives from various organizations, including several municipal and county departments, state transportation agencies, the business and development community, and local neighborhood groups.

The second part of the public outreach process includes a series of four public meetings for the project at key milestones to inform the general public of the project and obtain input and comments. A project website has also been created, www.downtownjcras.com to inform the general public of the project and disseminate information on the progress of the project.

2.0 EXISTING CONDITIONS ANALYSIS

2.1 DATA COLLECTION

To collect all of the required information for the project, the project team employed a multi-faceted approach to the data collection process.

2.1.1 Existing Reports

The first step collecting data for the project was to request reports for previous work in and around the study area. A wide variety of existing reports were reviewed as part of the data collection process including traffic impact studies for area developments, study area redevelopment plans, and other area studies such as the Bergen Arches Best Use Study.

2.1.2 Historical Data

Due to budgetary and time constraints, traffic counts could not be performed at all intersections in the study area. To provide as large a picture of existing conditions as possible, historical counts were collected and used throughout the study area. Figure 2-1 illustrates the locations of counts obtained throughout the project.

In addition to the historical traffic count data, ridership information from New Jersey Transit and the Port Authority of New York and New Jersey was also reviewed and incorporated into the existing conditions models.

2.1.3 New Data

In addition to historical counts, the project team performed peak hour traffic counts at key locations throughout the study area in January 2006. These locations included:

- Grand Street & Marin Boulevard
- York Street & Marin Boulevard
- Christopher Columbus Drive & Brunswick Street
- Christopher Columbus Drive & Monmouth Street
- Christopher Columbus Drive & Coles Street
- Christopher Columbus Drive & Jersey Avenue
- Christopher Columbus Drive & Grove Street
- Christopher Columbus Drive & Marin Boulevard
- Christopher Columbus Drive & Washington Street
- Washington Street & 2nd Street
- Montgomery Street & Brunswick Street
- 18th Street & Manila Avenue

- 18th Street & Marin Boulevard
- Newark Street & Brunswick Street
- NJ Route 139 & Jersey Ave (including the Newport Parkway Ramp)

In addition to the manual traffic counts, field visits to the study area were used to confirm lane geometry, signal timings, and identify operational issues throughout the corridor.

Figure 2-1: Count Locations

2.2 TRANSPORTATION MODELING

2.2.1 Methodology

Transportation modeling is the process by which future land use forecasts are utilized to estimate future traffic volumes and the infrastructure improvements necessary to mitigate their impacts.

The transportation modeling process will be performed utilizing the standard four-step paradigm of trip generation, trip distribution, mode split and route assignment.

Data sources include existing and new traffic counts, 2000 U.S. Census Journey-to-work data, and the North Jersey Regional Transportation Model (NJRTM) of the North Jersey Transportation Planning Authority.

Data used from the Census has the advantage that it is from a survey and therefore is relatively accurate. This data also has several drawbacks. The first is that it only considers one type of trip – the journey-to-work trip, or home-based-work, trip. Also, the census data only provides existing data that has not been updated since 2000, and does not provide forecast data for future years.

The data available from the NJRTM has the advantage of including all types of trips, including home-based shopping, home-based other, and non-home based trips. The NJRTM also provides data for more recent years than the Census, and also provides data for forecast years. However, the data from the NJRTM has been synthesized from several sources and cannot be considered “real world” data like the census data, and is therefore inherently less accurate. Also, as a model covering the entire region of northern New Jersey, the model may include assumptions that are not as accurate for the Jersey City study, particularly assumptions that pertain to mode choice.

Following standard practice, an Existing Conditions model will first be calibrated. The Existing Conditions model attempts to recreate as accurately as possible the traffic conditions in the base year. This model will then be adjusted to include traffic growth (both background growth and trips generated by specific planned developments) and infrastructure improvements.

2.2.2 Modeling Assumptions

It was assumed that the origin –destination trip table could be estimated using the census data as a starting point and this would be adjusted based on the observed traffic volumes.

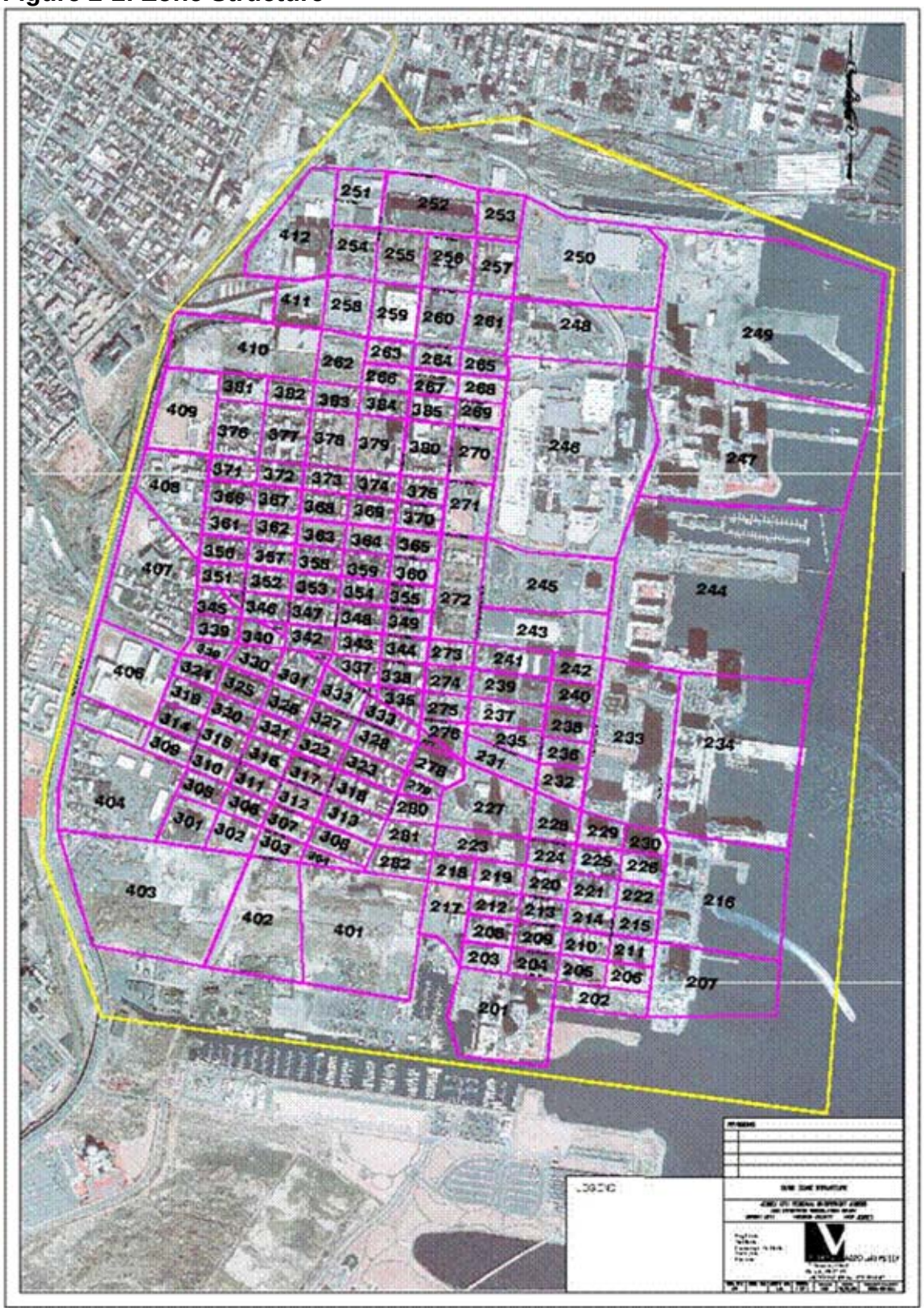
2.2.3 Zone Structure

The study area has been divided into 182 zones, as shown in Figure 2-2. The zones can range in size from a single city block in densely developed parts of the study area to the equivalent of 5 to 6 blocks in more lightly developed sections of the study area. The zones have been numbered according to the following scheme:

1) Zones 201-282 represent mainly commercial areas east of Grove Street/Manila Ave.
2) Zones 301-285 represent mainly residential areas west of Grove Street/Manila Ave.
3) Zones 401-415 represent mainly industrial areas on the periphery of the study area.

Zone numbers in the 100 series are reserved for external stations; these items are discussed in subsequent sections.

Figure 2-2: Zone Structure



2.2.4 Calibration Process

In order to manage the complexity of the calibration of such a large network, six screenlines were established along major thoroughfares. The screenlines allowed an analysis of the total traffic into and out of the 15 subregions within the study area. Screenlines are generally chosen to coincide with major changes in land use within the study area. An additional seventh screenline was established around the perimeter of the study area to estimate the total volume.

The seven designated screenlines and their directional orientation are:

1) Washington Street (north-south)
2) Marin Boulevard (north-south)
3) Christopher Columbus Drive (east-west)
4) 6th Street (east-west)
5) 12th Street (east-west)
6) 14th Street (east-west)
7) New Jersey Turnpike Extension / 18th Street / Holland Tunnel (study area perimeter)

The locations of the screenlines and subregions are detailed in Figure 2-3.

Figure 2-3: Screenline Locations

The calibration process was done to ensure that the model was adequately replicating the total traffic volume entering and exiting the 15 subareas and the total area. General guidelines for calibration are readily available for regional models. These guidelines require greater accuracy for high volume facilities and lesser accuracy for low volume facilities. These guidelines were modified to reflect the lower traffic volumes on the Jersey City local streets and are summarized in Table 2-1 following.

Table 2-1: Calibration Guidelines

Guideline – Regional Model (2)	Guideline – Local Area Model
75% of major arterial link volumes with 10,000 vehicles per day with in ± 30%	75% of local street link volumes with 100 vehicles in peak hour within ± 30%
50% of major arterial link volumes with 10,000 vehicles per day with in ± 15%	50% of local street link volumes with 100 vehicles in peak hour within ± 15%

Guideline – Regional Model (1)	Guideline – Local Area Model
% difference for daily link volume < 1,000 ≤ 200%	% difference for peak hour link Volume > 100 ≤ 25%
% difference for daily link volume < 2,500 ≤ 100%	% difference for peak hours screenline volume > 1,000 ≤ 15%
% difference for daily link volume < 5,000 ≤ 50%	
% difference for daily link volume < 10,000 ≤ 25%	
% difference for daily link volume < 25,000 ≤ 20%	
% difference for daily link volume < 50,000 ≤ 15%	
% difference for daily link volume > 50,000 ≤ 10%	

Table 2-1: Calibration Guidelines (continued)

Guideline – Regional Model (2)	Guideline – Local Area Model
% RMSE[3] for daily link volume < 5,000 ≤ 116%	% RMSE for peak hour link volume > 100 ≤ 25%
% RMSE[3] for daily link volume < 10,000 ≤ 43%	
% RMSE[3] for daily link volume < 20,000 ≤ 28%	
% RMSE[3] for daily link volume < 40,000 ≤ 25%	
% RMSE[3] for daily link volume > 40,000 ≤ 20%	

Sources:
(1) Model Validation and Reasonableness Checking Manual 7.0 Assignment Procedures Travel Model Improvement Program, USDOT.
(2) A Manual of Regional Transportation Modeling Practice for Air Quality Analysis for the Natural Association of Regional Councils, Washington, DC, July 1993
(3) RMSE – Root Mean Squared Error - It is a measure of the difference between the expected value (the traffic count) and the estimated value (the Jersey City traffic model).

The results of the morning and evening peak hour calibration assignments are summarized in the following tables. As shown in Tables 2-2, 2-3, 2-4 and 2-5, almost 80 percent of assigned key link volumes, defined as link volumes with peak hour volumes greater than 100 vehicles, are within 30 percent and approximately 50 percent of assigned key link volumes, are within 15 percent.

Table 2-2: Screenline Locations and Peak Hour Traffic Counts

External Screenline

Inbound	**Location**	**AM Count**	**PM Count**
Pacific Street	101	1,300	620
Grand Street	102	1,125	695
Bright Street	103	206	159
Christopher Columbus Drive	104	1,007	417
NJ Turnpike – Interchange 14C	105	2,622	1,914
Newark Avenue	106	458	448
Jersey Avenue	107	1,493	1,178
Grove Street	108	480	501
Marin Boulevard	109	435	343
NJ Route 139	110	3,213	2,818
Holland Tunnel	112	2,386	2,454
Total		**14,725**	**11,547**
Outbound	**Location**	**AM Count**	**PM Count**
Pacific Street	101	375	835
Grand Street	102	635	815
Bright Street	103	110	88
Christopher Columbus Drive	104	641	1,444
NJ Turnpike – Interchange 14C	105	519	1,546
Newark Avenue	106	428	463
Jersey Avenue	107	860	794
Grove Street	108	153	400
Marin Boulevard	109	494	640
NJ Route 139	110	4,485	5,293
Holland Tunnel	112	2,787	2,453
Total		**11,487**	**14,771**

Table 2-2: Screenline Locations and Peak Hour Traffic Counts (Cont)

Screenline 1 - East Side of Marin Boulevard

Eastbound		**AM Count**	**PM Count**
18th Street		728	432
12th Street		2,787	2,453
Thomas Gangemi Drive		624	470
1st Street		88	43
Christopher Columbus Drive		583	213
Montgomery Street		733	327
York Street		262	95
Grand Street		675	239
Total		**6,480**	**4,272**
Westbound		**AM Count**	**PM Count**
18th Street		372	870
14th Street		2,699	2,997
Thomas Gangemi Drive		264	710
Christopher Columbus Drive	182	575	
Montgomery Street		327	733
Grand Street		445	596
Total		**4,289**	**6,481**

Screenline 2 - East Side of Washington Boulevard

Eastbound		**AM Count**	**PM Count**
11th Street		165	268
2nd Street		307	177
Christopher Columbus Drive	798	150	
Montgomery Street		621	299
York Street		307	91
Grand Street		213	95
Total		**2,421**	**1,080**
Westbound		**AM Count**	**PM Count**
11th Street		85	186
2nd Street		160	175
Christopher Columbus Drive	132	834	
Montgomery Street		269	361
Grand Street		178	363
Sussex Street		20	20
Total		**844**	**1,939**

Table 2-2: Screenline Locations and Peak Hour Traffic Counts (Cont)

Screenline 3 - South Side of 6th Street

Northbound		**AM Count**	**PM Count**
Washington Street		685	861
Marin Boulevard		555	921
Erie Street		484	353
Monmouth Street		335	257
Total		**2,059**	**2,392**
Southbound		**AM Count**	**PM Count**
Washington Street		664	409
Marin Boulevard		224	215
Grove Street		436	431
Coles Street		276	290
Brunswick Street		203	214
Total		**1,803**	**1,559**

Screenline 4 - North Side of Christopher Columbus Drive

Northbound		**AM Count**	**PM Count**
Washington Street		0	102
Warren Street		100	100
Marin Boulevard		678	631
Erie Street		100	100
Jersey Avenue		500	452
Monmouth Street		804	633
Total		**2,288**	**2,018**
Southbound		**AM Count**	**PM Count**
Washington Street		0	144
Warren Street		100	100
Marin Boulevard		442	439
Grove Street		499	572
Jersey Avenue		318	492
Coles Street		261	298
Brunswick Avenue		513	498
Total		**2,217**	**2,543**

Table 2-2: Screenline Locations and Peak Hour Traffic Counts (Cont)

Screenline 5 - South Side of 12th Street

Northbound		**AM Count**	**PM Count**
Washington Street		414	1,281
Marin Boulevard		667	641
Erie Street		601	710
Monmouth Street		253	163
Total		**1,935**	**2,795**
Southbound		**AM Count**	**PM Count**
Washington Street		545	455
Marin Boulevard		224	215
Grove Street		355	270
Jersey Avenue		986	590
Total		**2,113**	**1,539**

Screenline 6 - North Side of 14th Street

Northbound		**AM Count**	**PM Count**
Washington Street		206	778
Marin Boulevard		313	258
Erie Street		240	167
Jersey Avenue		1,072	1,203
Total		**1,831**	**2,406**
Southbound		**AM Count**	**PM Count**
Washington Street		552	417
Marin Boulevard		166	221
Grove Street		488	641
Jersey Avenue		1,187	1,149
Total		**2,393**	**2,428**

Table 2-3: Screenline Link Traffic Volume Summary – AM Peak Hour

Screenline	Number of Links	Links within 30%	% Links within 30%	Links within 15%	% Links within 15%
External – Inbound	11	11	100%	10	91%
External– Outbound	11	8	73%	5	45%
1 – Eastbound	7	5	71%	2	29%
1 - Westbound	6	5	83%	4	67%
2 – Eastbound	6	2	33%	1	17%
2 - Westbound	4	4	100%	3	75%
3 – Northbound	4	3	75%	2	50%
3 - Southbound	5	2	40%	2	40%
4 – Northbound	5	1	20%	0	0%
4 - Southbound	6	5	83%	4	67%
5 – Northbound	4	4	100%	2	50%
5 - Southbound	4	3	75%	1	25%
6 – Northbound	4	4	100%	1	25%
6 - Southbound	4	4	100%	3	75%
Total	**81**	**61**	**75%**	**40**	**49%**

Table 2-4: Screenline Link Traffic Volume Summary – PM Peak Hour

Screenline	Number of Links	Links within 30%	% Links within 30%	Links within 15%	% Links within 15%
External – Inbound	11	11	100%	10	91%
External– Outbound	10	8	80%	4	40%
1 – Eastbound	6	3	50%	2	33%
1 - Westbound	6	5	83%	2	33%
2 – Eastbound	4	3	75%	2	50%
2 - Westbound	5	4	80%	2	40%
3 – Northbound	4	3	75%	2	50%
3 - Southbound	5	2	40%	1	20%
4 – Northbound	6	3	50%	1	17%
4 - Southbound	7	5	71%	5	71%
5 – Northbound	4	4	100%	3	75%
5 - Southbound	4	4	100%	3	75%
6 – Northbound	4	3	75%	1	25%
6 - Southbound	4	4	100%	3	75%
Total	**80**	**62**	**78%**	**41**	**51%**

Table 2-5: Screenline Traffic Volume Summary – AM & PM Peak Hour

		Percent Difference		Percent RMSE	
Screenline	**Number of Links**	**AM Peak Hour**	**PM Peak Hour**	**AM Peak Hour**	**PM Peak Hour**
External – Inbound	11	0.6%	2.3%	9%	7%
External– Outbound	10	1.9%	1.7%	14%	19%
1 – Eastbound	6	8.0%	13.2%	24%	27%
1 - Westbound	6	5.4%	16.8%	10%	16%
2 – Eastbound	4	-18.7%	-5.7%	40%	63%
2 - Westbound	5	6.9%	-16.6%	21%	55%
3 – Northbound	4	0.6%	11.4%	19%	15%
3 - Southbound	5	0.9%	9.6%	57%	56%
4 – Northbound	6	-3.9%	-16.0%	61%	26%
4 - Southbound	7	-11.6%	-8.5%	16%	18%
5 – Northbound	4	11.4%	5.8%	14%	15%
5 - Southbound	4	3.9%	4.2%	24%	14%
6 – Northbound	4	-15.4%	-16.7%	23%	25%
6 - Southbound	4	4.8%	-9.3%	13%	17%
Total	**80**	**0.8%**	**2.2%**	**18%**	**19%**

2.3 EXISTING TRAFFIC VOLUMES

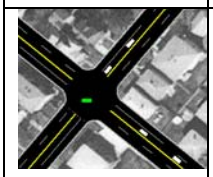
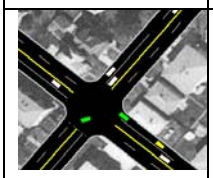
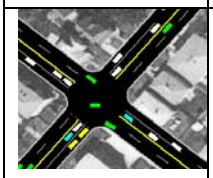
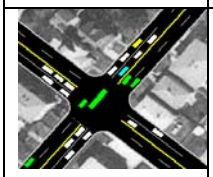
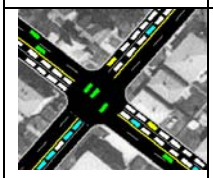
Projected existing turning movement traffic volumes are shown on attached fold out plans. For reference, the blue 'dots' indicated on the figures refer to unsignalized intersections and tan 'dots' refer to signalized intersections.

2.4 SYNCHRO ANALYSIS / LEVEL OF SERVICE RESULTS

The existing operation of the intersections within the study area was determined using a software program known as Synchro, version 6.0. Synchro utilizes the methodology contained in the Transportation Research Board's Highway Capacity Manual 2000 to determine operation of intersections based on a calculation of the anticipated average delay a vehicle experiences or would experience at a given intersection. Information such as lane geometry, lane width, traffic signal timing, traffic volume, truck percentages, and turning restrictions are entered into the program to reflect traffic conditions. The resulting average delays are categorized by the HCM into Levels of Service. Table 2-6 below illustrates the ranges of Level of Service for signalized and unsignalized intersections.

Level of Service 'D' is generally considered the acceptable limit for delay in an urban setting.

Table 2-6: LOS Criteria for Signalized & Unsignalized Intersections

	Level-of-Service (LOS)	Signalized Delay Range (avg. control delay, in sec/veh)	Unsignalized Delay Range (avg. control delay in sec/veh)
	A	≤ 10	≤ 10
	B	> 10 and ≤ 20	> 10 and ≤ 15
	C	> 20 and ≤ 35	> 15 and ≤ 25
	D	> 35 and ≤ 55	> 25 and ≤ 35
	E	> 55 and ≤ 80	> 35 and ≤ 50
	F	> 80	> 50

Source: *2000 Highway Capacity Manual (Exhibits 16-2 and 17-2)*

The traffic volumes from the existing conditions travel demand model were analyzed by Synchro to determine the Levels of Service for each of the study locations. Figures 2-4 and 2-5 provide an overall view of which signalized intersections are operating at Levels of Service F under existing conditions. The following intersections operate at an overall Level of Service 'F' under existing conditions:

During the Morning Peak Hour:
- Jersey Avenue at 12th Street
- Montgomery Street and Grove Street
- Montgomery Street and Marin Boulevard

During the Evening Peak Hour:
- Jersey Avenue at 14th Street

Detailed Level of Service results for each movement and intersection in the study area are attached in the Technical Appendix.

Figure 2-4: Existing Conditions Morning Intersections at LOS F

Legend:

Intersection operates at LOS F

Figure 2-5: Existing Conditions Evening Intersections at LOS F

Legend:

Intersection operates at LOS F

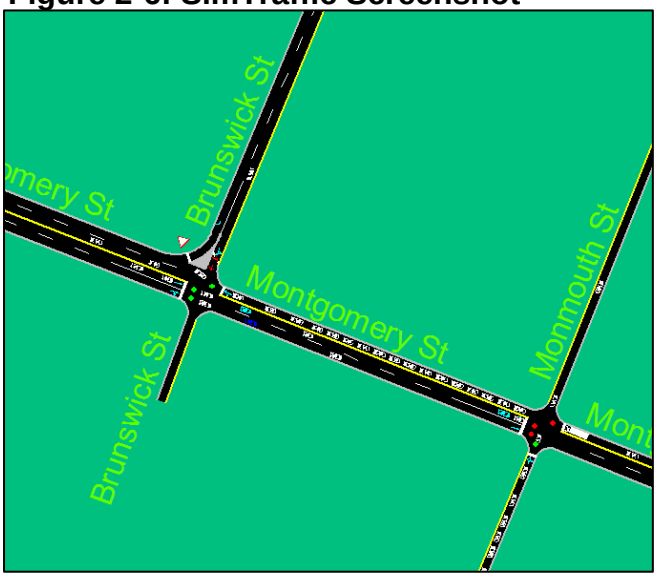
2.5 SIMTRAFFIC ANALYSIS

One of the immediate observations one makes after reviewing the results of the Synchro analysis, and comparing that to real world observations, is that many more intersections appear to operate at poor levels of service than Figures 2-4 and 2-5 indicate. This is primarily due to queuing between intersections. In short there is typically one intersection along a corridor that is the 'bottleneck' which meters traffic along the roadway. This causes other intersections along the corridor to back up as traffic cannot travel through the intersection due to downstream problems. A good example of this phenomena is when say car 'A' is waiting at a traffic signal and the signal turns green, but the driver cannot travel through the intersection due to cars waiting on the other side of the intersection. The traffic signal car 'A' is waiting at is not necessarily operating at a poor level of service; it is the signal downstream which is causing the backup.

To help determine when this is the case in a traffic network, the companion program to Synchro, known as SimTraffic is used to model the traffic in real time and identify locations where bottlenecks are occurring and where vehicles are queuing on the roadway network. Figure 2-6 shows a typical screenshot of the SimTraffic program.

The SimTraffic program was utilized on the Downtown Jersey City network to observe the queuing conditions along the corridor. In general, the results of the SimTraffic analysis support the Synchro results, that there are key intersections along major corridors in the study area which operate at poor Levels of Service and cause traffic to queue along adjacent intersections.

Figure 2-6: SimTraffic Screenshot



2.6 OPERATIONAL OBSERVATIONS

In addition to the Level of Service Analysis performed as described above, a walking tour of the study area was completed to identify the types of operational problems which are present within the study area, not only from a vehicular standpoint, but from a pedestrian and bicycle view as well. This list is by no means an exhaustive list of problems, but is intended to show the types of deficiencies identified in the study area.

Worn / Missing Crosswalks – At a variety of locations within the study area, the painted crosswalks have faded or paved over without replacement. This severely reduces their effectiveness as a safety measure. In locations without crosswalks, consideration should be given to their installation especially at locations where drop curbs are already present.

Figure 2-7: Worn Crosswalk Example

Figure 2-8: Missing Crosswalk Example

Uneven Pavement – Uneven pavement causes a number of circulation problems, from increased vehicle wear and tear to increased roadway diversions and erratic driving. While uneven pavement can be desirable to act as a traffic calming measure to slow vehicles and discourage use, uneven pavement on major roadways increases congestion and inhibits the flow of traffic.

Figure 2-9: Uneven Pavement Example

Skewed Crosswalks – When crosswalks are not perpendicular to the roadway, they increase pedestrian crossing times and decrease the likelihood of pedestrians crossing at marked crosswalks. Relocating crosswalks to locations where crossings can be safely made perpendicular to the roadway will increase pedestrian safety and improve pedestrian / vehicular interactions.

Figure 2-10: Skewed Crosswalk Example

Blocked Sidewalks – Another impediment to pedestrian flow occurs when signs and other traffic equipment is installed in sidewalk areas, many times forcing pedestrians into the road. Relocating equipment outside of the pedestrian right of way or raising and cantilevering signs to reduce sidewalk blockage will improve pedestrian safety and help keep pedestrians out of the roadway.

Figure 2-11: Blocked Sidewalk Example

Figure 2-12: Blocked Sidewalk Example

Figure 2-13: Unstriped Road Example

Wide Unstriped Roadways – Manila, North of 10th Street is a perfect example of where striping can be used to aid in traffic calming. This section of roadway is posted at 25 mph, and is a single wide lane. Adding shoulder striping to narrow the travel lane will help to keep vehicles to the posted speed limit without limiting the use of the roadway for parking. A more aggressive approach to traffic calming in the area could include the use of planters or curb extensions.

Signals Without Pedestrian Heads – A number of the predominately older traffic signals in the study area do not have pedestrian head indications even though crosswalks are present at the intersection. The use of pedestrian heads, particularly with countdown timers, will increase pedestrian safety at these intersections.

Figure 2-14: No Pedestrian Head Example

Uneven Sidewalks – Another pedestrian safety issue is the presence of uneven crosswalks. Improved sidewalk maintenance will improve pedestrian safety and help to promote pedestrian usage.

Figure 2-15: Uneven Sidewalk Example