THE I-81 CHALLENGE

Draft Technical Memorandum #1:
Supplemental Information

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Introduction

The I-81 Corridor Study was conducted to ensure that the planning effort for the I-81 corridor considers the infrastructure needs in the context of its community and its users.

Two technical documents comprise the supportive information to The I-81 Corridor Study[1]. The first document referred to as Technical Memorandum #1 (TM#1) Physical Conditions Analysis[2], published in January 2011 detailed the physical conditions of the corridor. This document is an addendum to TM#1 with additional information not available at its publication date. The information not previously documented in TM#1 includes the 2040 No Build traffic conditions and ambient noise level readings for existing conditions at selected locations along the corridor.

The second technical memorandum (TM#2)[3] explores solutions to address the various needs within the corridor as well as, analyzes and evaluates potential transportation and infrastructure related strategies as compared to the corridor needs.

[1] The I-81 Corridor Study, July2013, http://thei81challenge.org/cm/ResourceFiles/resources/I-81 Corridor Study Report July 2013.pdf

[2] *Technical Memo #1: Physical Conditions Analysis; January 2011* *http://thei81challenge.org/cm/ResourceFiles/resources/Technical_Memorandum_s.pdf*

[3] Technical Memo #2: Strategy Development and Evaluation, July 26,2013 http://thei81challenge.org/cm/ResourceFiles/resources/TechnicalMemorandum2.pdf

Existing Conditions – Supplemental Information

This chapter documents information and analyses that supplement the existing conditions presented in Technical Memorandum #1. This chapter presents the results of regional travel demand model runs for Future Traffic – 2040 No Build conditions, a summary of the existing ambient noise level readings taken at locations around the corridor, as well as updated information on public involvement program elements that have occurred since TM#1 publication.

I. Future Traffic – 2040 No Build

The Syracuse Metropolitan Transportation Council (SMTC) Regional Travel Demand Model[4] was used to determine future travel conditions on the highway network serving the Syracuse area in 2040 under the No Build conditions. The No Build conditions assumes little to no change will occur in the transportation system, only minor changes planned for in the immediate future were included. This scenario is important to identify, if nothing is done to the system, what will happen. This scenario then becomes the baseline comparison used in the development of strategies.

This travel demand model is based on the use of land use data (employment centers, retail centers and residential areas) and other factors such as census data, projected community growth, and the travel network to estimate the number of regional vehicle trips. The regional trips were added to the road network and compared to "actual" regional volumes in order to validate the accuracy of the model. The SMTC model forecasts traffic for the year 2007 and 2035. To comply with NYSDOT procedures, this study assessed travel conditions in the years 2020 (Estimated Time of Completion-ETC) and 2040 (ETC+20), therefore the results of the SMTC model were extrapolated to reflect the projected traffic growth for these periods. The SMTC model forecasts were also used to identify changes in travel patterns (routes used between origins and destinations).

The SMTC travel demand model produces measures of effectiveness (MOE); factors such as: vehicle miles traveled (VMT), vehicle hours traveled, volume over capacity (on highways, arterials, local streets), average distance/travel time for various types of trips. These are measures used in evaluating the performance of varied transportation projects; hence, they will be used to

Measures of Effectiveness:

Vehicle Miles Traveled (VMT) - the total number of miles driven by all vehicles within a given time period and geographic area.

Volume over Capacity – often referred to as the V/C ratio which provides a measure of the volume passing through a point as compared to the road capacity. A V/C ratio exceeding 0.8 would suggest a road is approaching or at capacity conditions.

Vehicle Hours Traveled – the total hours driven by all vehicles within a given time period and geographic area. This is used as an indicator of congestion levels.

[4] SMTC Regional Modeling Summary Report; April 2012
http://thei81challenge.org/cm/ResourceFiles/resources/SMTCModel Version3.023 Documentation.pdf

compare each of the I-81 strategies. As the project evolves and there is a greater level of refinement and analysis performed for the range of feasible strategies for I-81, other MOEs may also be identified that can offer even more effective insight into how the final preferred strategy may perform.

Overall by the year 2040 if no changes were made to the existing transportation system (No Build scenario) traffic volumes in the Syracuse region is expected to grow slowly. Over a 33-year period, vehicle miles traveled for the entire network (highways, arterials and local street system) is forecast to increase by only 13%; and vehicle hours of travel is anticipated to increase by 11%. Expressway only vehicle miles traveled and vehicle hours traveled, however, are expected to increase by 18%. The average home based work trip is forecast to travel 0.1 miles farther and take 36 seconds longer; this means that in 2040, the average commuter will be traveling longer and farther to get to their work destination.

Table 1 presents the MOE's derived from the SMTC model and evaluated as discussed above. It also shows other variables including the percent of lane miles or vehicle miles traveled (VMT) experiencing volume to capacity ratios greater than 0.8. This means segments of either the freeways or approach links to signalized intersections are approaching capacity conditions. This measure is important to determine where congestion may be occurring and where potential improvements which may be necessary. These variables are shown for the morning and evening peak periods for the regional transportation system.

Table 1 - SMTC Regional Model Measures of Effectiveness- No Build 2040

Selection	Criterion	2007	2020	2040 NoBuild	% Change 2007-2040
Expressway, Ramps	VMT	5,115,684	5,517,051	6,039,061	18%
	VHT	88,545	95,496	105,019	19%
Aterials	VMT	3,791,550	3,913,701	4,058,805	7%
	VHT	131,324	135,650	141,404	8%
Collectors and Locals	VMT	3,980,197	4,162,243	4,411,956	11%
	VHT	151,031	157,550	166,796	10%
Expressway	% LM w AM VoC > .8	1.1%	1.2%	1.3%	21%
	% LM w PM VoC > .8	1.4%	1.7%	1.8%	25%
	% VMT w AM VoC > .8	5.1%	5.4%	5.5%	8%
	% VMT w PM VoC > .8	6.0%	6.6%	6.6%	9%
Approach Links to Signalized Intersections	% LM w AM VoC > .8	3.7%	4.5%	5.3%	42%
	% LM w PM VoC > .8	4.7%	5.0%	6.2%	31%
	% VMT w AM VoC > .8	10.8%	13.0%	14.7%	36%
	% VMT w PM VoC > .8	12.3%	12.7%	14.7%	20%
N/A	% Transit	1.2%	1.1%	1.1%	-8%

LM = Lane Miles VMT = Vehicle Miles Traveled
VoC = Volume over Capccity VHT = Vehicle Hours Traveled

The regional model produces projections of data changes on the transportation network from a regional basis. In order to better define the changes and operations at a local level or at a given spot location (intersections and ramp locations), a micro analysis was performed. The regional model outputs were converted to actual traffic volumes similar to the data used in the Existing Conditions[5] chapter of TM#1 to develop future local traffic volumes for the roadway system. To determine future travel, the percent change in local traffic volumes between the travel forecasts for 2007 and the two future years (2020 and 2040) was determined. This percent change was then applied to the base year local traffic volumes.

Expressway - 2040 No Build Traffic Operations

Each mainline section of the Interstate system (I-81, I-690 and I-481) was analyzed using the Highway Capacity Software (HCS)[6] based on Highway Capacity Manual[7] methodology to determine 2040 operations or Level of Service (LOS). The analysis identifies mainline sections and ramps that currently experience traffic operational problems. Note that using the HCM method analyzes the expressway sections in pure isolation. Thus, the impact of a downstream failing traffic condition is not reflected in the operation of an upstream section of the expressway. An example ramp operation that causes slowing or stopped traffic is the I-690 eastbound exit to I-81 southbound during the morning peak hour. The conditions at this ramp interfere with upstream I-690 eastbound and I-81 southbound mainline operations. This type of interference is not reflected in the mainline capacity analysis for this upstream section of the expressway. Hence, overall favorable operations may be reported using HCS. For the sections where this type of interference may be occurring, a traffic simulation model (VISSIM) was used. This simulation model identifies the effects on the network as a result of failing or slow moving sections, including the impact of at-grade intersection operations on the arterial network downstream of a ramp terminus.

Figures 1 through 4 present the 2040 No Build LOS operations throughout the entire expressway network for both commuter peak hours (AM and PM), and provides a detailed evaluation of the viaduct priority area. The viaduct priority area is I-81 from Hiawatha Blvd south to the viaduct and I-690 from West Street to Teall Avenue.

Level of Service (LOS) is an indicator of congestion or delay experienced by drivers on road segments and at intersections on a scale of A to F. Along an expressway segment, a rating of A indicates low vehicle density traveling at free flow speeds, while a rating of F indicates congestion, high vehicle density traveling at low speeds. The design criteria from the NYSDOT Highway Design Manual indicate that Interstate highway should function at LOS C or Better. LOS E is at capacity conditions.

In comparison to existing levels of operation, most of the expressway system outside of the general downtown area continues to provide good levels of operation. These segments are shown on the figures as "green" levels of operation that reflect LOS A, B or C. Approaching

[5] *Technical Memo #1: Physical Conditions Analysis; January 2011*
http://thei81challenge.org/cm/ResourceFiles/resources/Technical_Memorandum_s.pdf
[6] Highway Capacity Software, by McTrans
[7] Highway Capacity Manual, Transportation Research Board

capacity areas are shown in “orange” which indicate LOS D-E operations. Over capacity areas are shown in “red” which indicate Level F, or failing conditions.

Review of future travel conditions on the expressway system indicates that most of the future concerns will be concentrated on I-81 from north of Hiawatha Boulevard to south of the Harrison Street ramps (viaduct priority area), with additional capacity concerns near the I-81 northern interchange with I-481.

On I-690, most future capacity issues will generally start near the Route 695 interchange on the west, and will extend to the Thompson Road (Exit 16) interchange on the east. Currently, congestion on I-690 extends east only to the Midler Avenue (Exit 15) interchange.

Figure 1 - Regional Expressway Levels of Service (Morning Peak Hour)

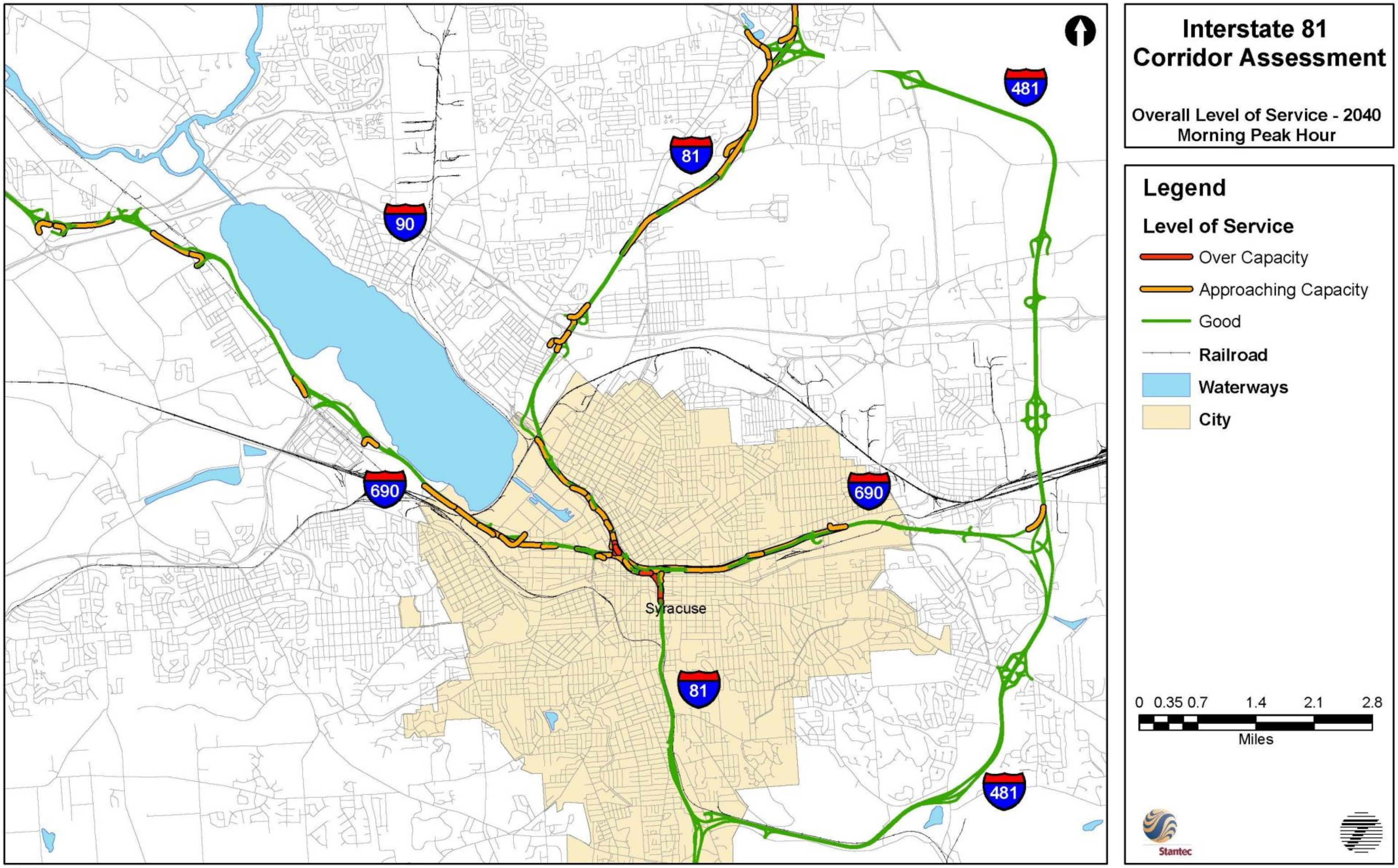


Figure 2 - Regional Expressway Levels of Service (Evening Peak Hour)

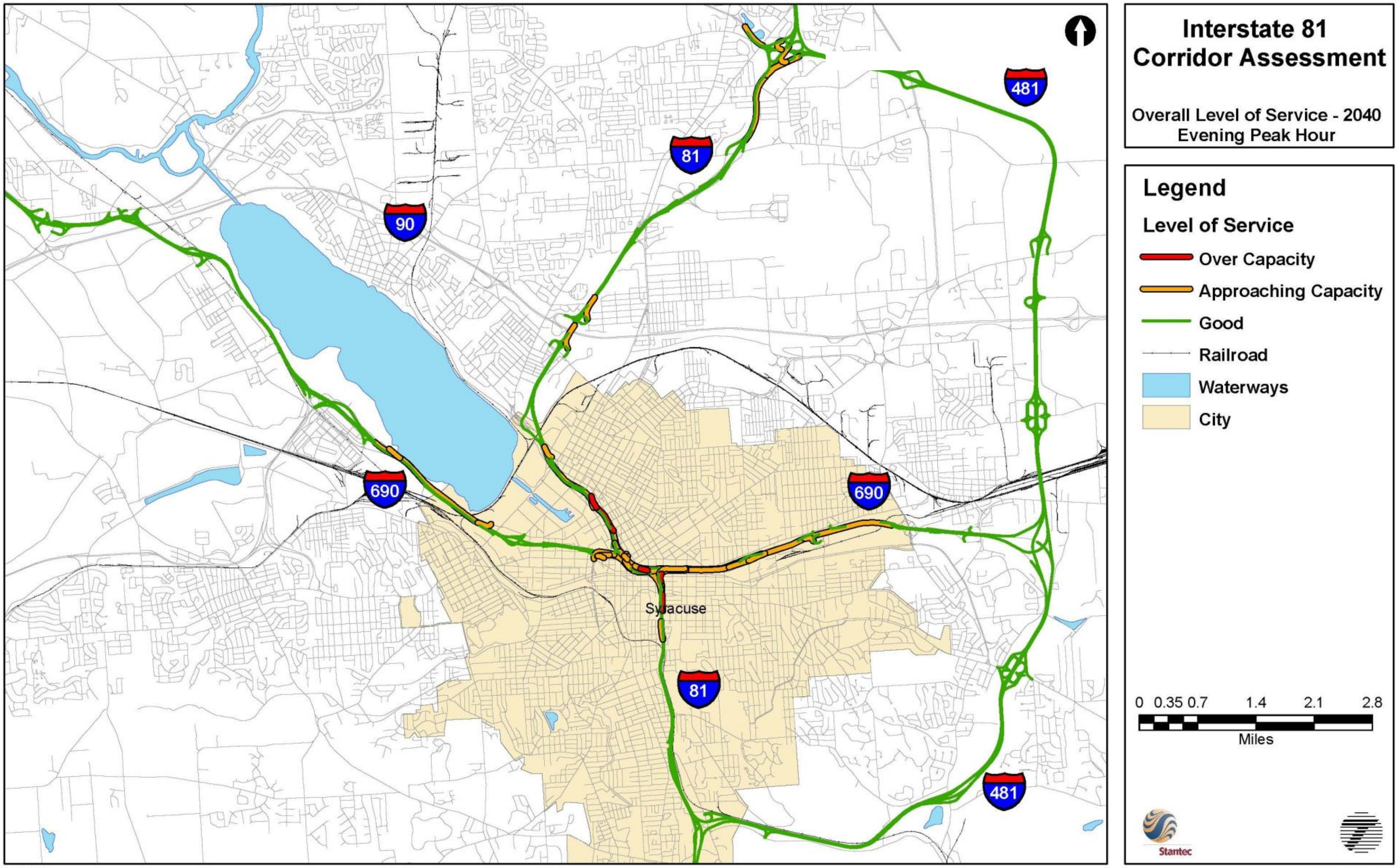


Figure 3 - Viaduct Priority Area Expressway Levels of Service (Morning Peak Hour)

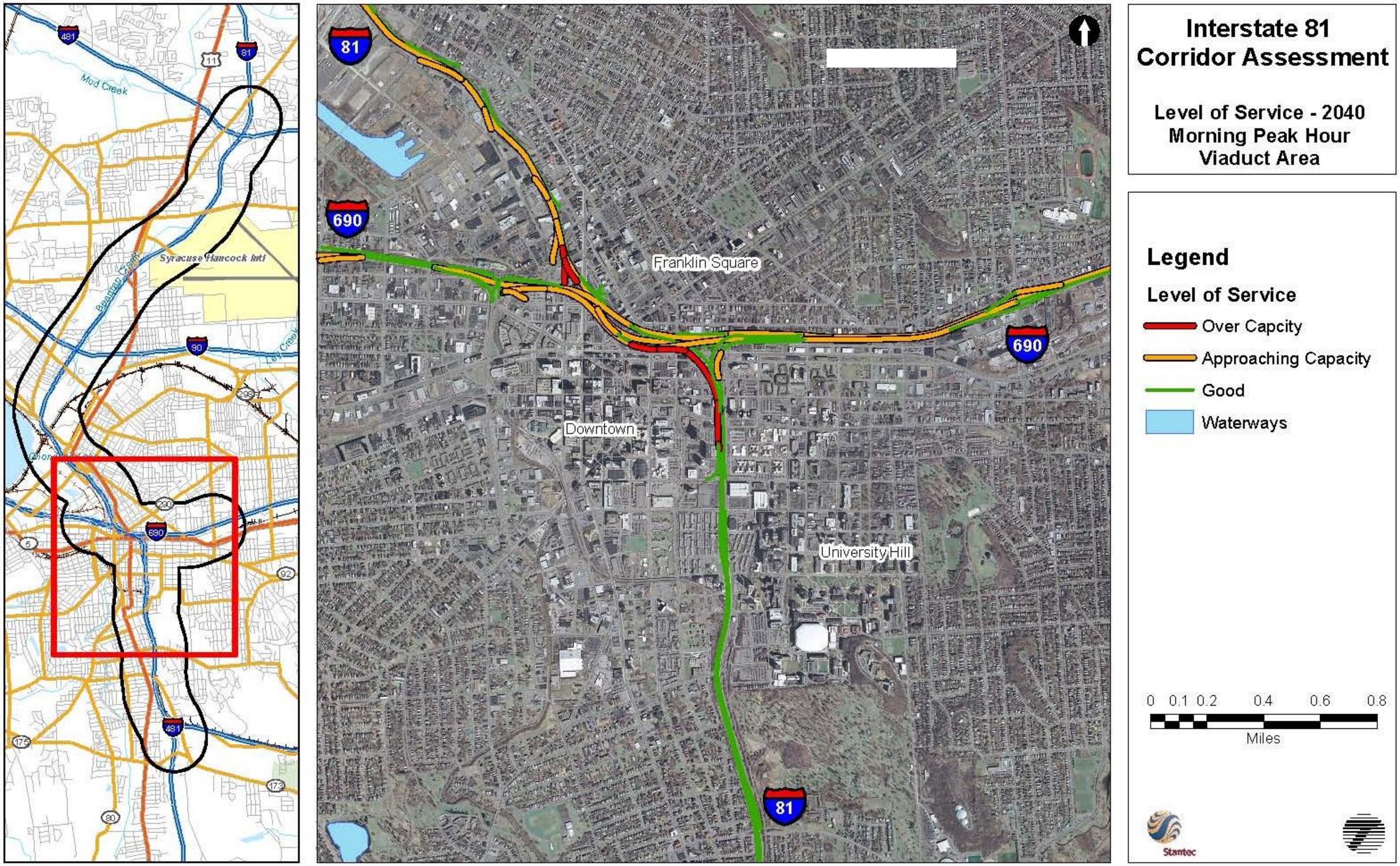
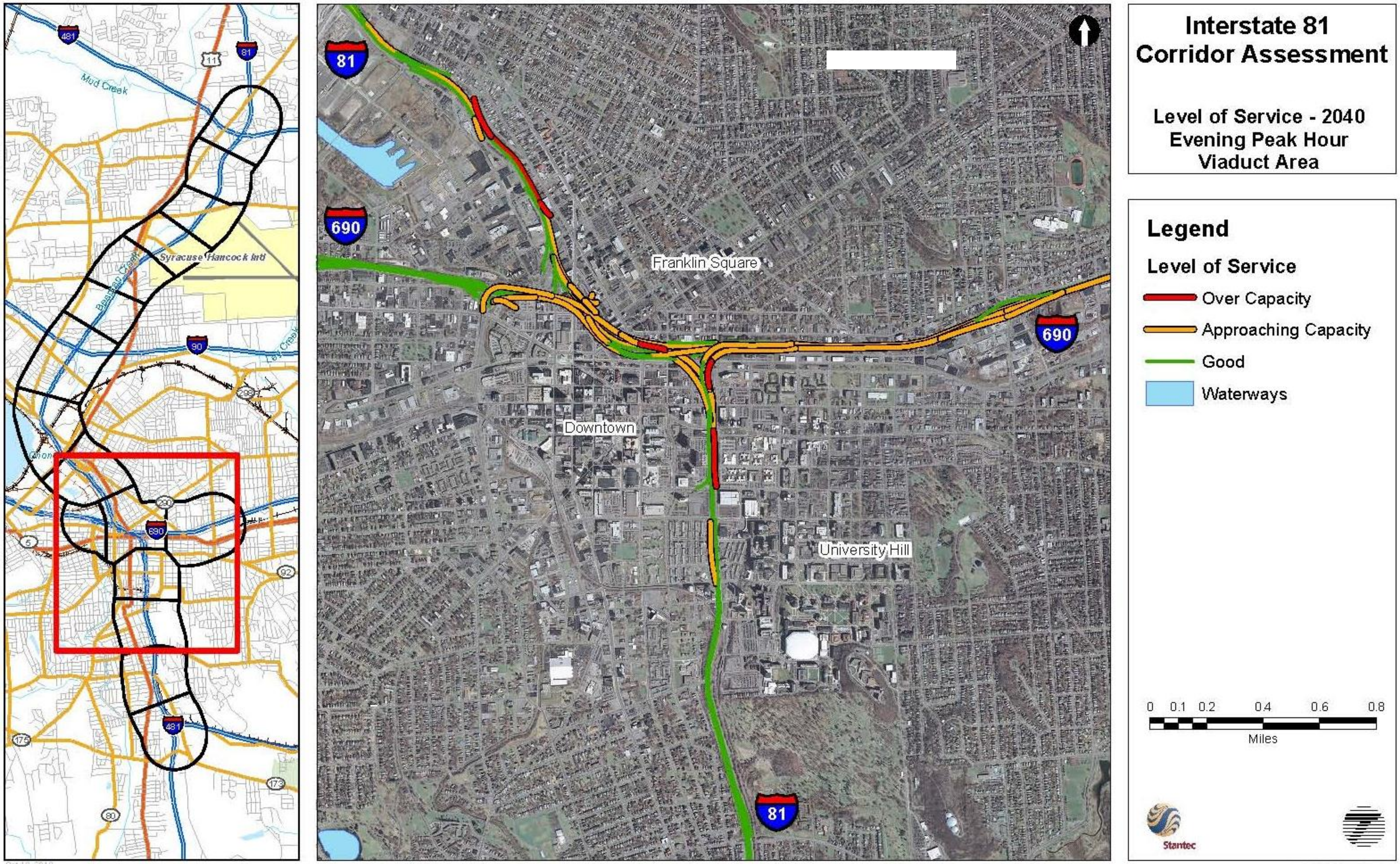


Figure 4 - Viaduct Priority Area Expressway Levels of Service (Evening Peak Hour)



Two mainline I-81 sections are expected to operate at failing levels of service (LOS F) by 2040; these include the I-690 eastbound on-ramp to I-81 southbound to Exit 18 (Harrison/East Adams Street) during the morning peak period as well as I-81 northbound between the Butternut/State Street (Exit 19) to Hiawatha Blvd (Exit 22).

In 2040, several ramps will also be operating at failing levels of service (LOS F) including:

Failing Ramp Operations - Morning Peak Hour

- I-81 Southbound off-ramp to Harrison Street/Almond Street
- I-81 Southbound off-ramp to North Salina/North Clinton Street
- I-690 Eastbound off-ramp to I-81 Southbound

Failing Ramp Operations - Evening Peak Hour

- Harrison Street on-ramp to I-81 Northbound
- I-81 Northbound off-ramp to I-690 Eastbound
- I-81 Northbound off-ramp to I-690 Westbound
- State Street/Butternut Street on-ramp to I-81 Northbound
- Pearl Street on-ramp to I-81 Northbound
- I81 Northbound off-ramp to Court Street (Exit 22) – NEW by 2040

Under existing conditions, there are several expressway mainline sections and ramp sections approaching failing level of service conditions (LOS D/E) within the corridor. As traffic continues to increase by the year 2040, several new mainline sections and ramp sections are anticipated to approach capacity levels:

Mainline Near Capacity Operations - Morning Peak Hour

- Most of I-81 Southbound from Hiawatha Boulevard to Harrison Street/Almond Street including most of the southbound on/off ramps from Court Street to Salina Street.
- I-690 Eastbound from east of the West Street on-ramp to the I-81 Southbound off-ramp
- I-81 Southbound off-ramp to Butternut Street
- I-90 on-ramp to I-81 Southbound
- I-81 Southbound off-ramp to 7th North Street
- Rte. 370 on-ramp to I-81 Southbound
- I-690 Eastbound off-ramp to Hiawatha Boulevard
- I-81 Southbound between Exit 20 and Exit 19 – NEW by 2040
- I-690 Eastbound between Willis on-ramp and Exit 8 – NEW by 2040
- I-81 Southbound on-ramp from Route 298 (Bear Street) – NEW by 2040
- I-690 Eastbound off-ramp to Route 695 (Exit 6) – NEW by 2040
- I-690 Eastbound on-ramp from North Geddes Street – NEW by 2040

Mainline Near Capacity Operations - Evening Peak Hour

- I-81 Northbound from the Butternut Street on-ramp to the Court Street on-ramp
- I-690 Eastbound from the I-81 Southbound on-ramp to the McBride Street on-ramp

- I-690 Eastbound from the I-81 on-ramp to the Teall Avenue off-ramp
- I-690 Westbound off-ramp to West Street
- I-690 Westbound off-ramp to Rte. 695
- I-690 Westbound Exit 11 and Exit 12 – NEW by 2040
- I-481 Southbound to I-81 Northbound on-ramp (I-81/I-481N) – NEW by 2040
- I-690 Westbound on-ramp from Spencer Street/State Fair Boulevard – NEW by 2040

Future Year (2040) At -grade Intersection Operations

Similar to the expressway system, the SMTC Regional Travel Forecasting model was also used to determine the projected growth in traffic between existing volumes and the year 2040 at the 92 intersections analyzed for existing conditions. Overall the model shows very little growth (approximately 1 to 2%) in traffic volumes at the intersections over the time period. Traffic volumes at 43 intersections in the morning peak hour and 29 intersections in the evening peak hour actually remain the same or will experience a decrease in traffic volumes.

Only eight intersections are forecast to experience increased traffic volumes of approximately 90 vehicles per hour or more, which could decrease level of operations. Most of these intersections are along N. Clinton Street. The decrease in LOS would be a result of removal of the I-81 southbound off-ramp to Franklin Street, as well as effects to the intersections at the I-81 ramps to or from Almond Street (i.e. Harrison Street and East Adams Street). The removal of the I-81 southbound off-ramp to Franklin Street is a current SMTC Long Range Transportation Plan improvement which is modeled and evaluated in the No Build scenario only. Thus the LOS at the majority of the intersections would remain the same as existing conditions and in some cases improve. Intersections with notable increase in traffic volumes were analyzed to determine the change in operations with the growth and minor system modifications.

Review of the capacity analysis for the signal controlled intersections (with projected 2040 traffic volumes) indicate that nearly all those intersections would operate at overall good LOS C or better during peak hours. No additional signalized intersections would degrade in addition to those previously identified under existing conditions. Existing signalized intersections with poor levels of operation would continue to degrade by 2040. These include:

Signalized Intersection Operations - Weekday Morning Peak Hour

- Almond Street @ I-81 Southbound off-ramp- ramp approach is Failing, Level F
- Almond Street @ Harrison Street – northbound left turns – Level D
- Almond Street @ East Adams Street –
    - Almond Street northbound right turns - Level F
    - Almond Street southbound left turns – Level F
- East Adams Street @ Sarah Loguen Street – eastbound approach – Level F
- West Genesee Street @ North Clinton Street – southbound through traffic – Level F

Existing storage and queuing concerns were observed along the Almond Street corridor between the above noted intersections and would continue to degrade to the year 2040.

Signalized Intersection Operations - Weekday Evening Peak Hour

- Almond Street @ East Adams Street –
    - East Adams Street - eastbound right turns - Level F
    - East Adams Street - eastbound left turns - Level D, with queuing concerns
- Almond Street @ Harrison Street - westbound approach - Level E, resulting in vehicle queues blocking other lanes. Thus, the overall level of intersection operations cannot be achieved and the intersection appears to be failing.

Capacity analysis indicates most intersections in the Downtown and University Hill areas provide good levels of service if no major changes or travel patterns occur. The analysis indicates most of the future morning and evening traffic operational issues would continue to be associated with the Almond Street intersections under the I-81 viaduct section as they occur today. During the morning peak travel period, poor traffic operations at these intersections would continue to cause traffic to back up on the I-81 off-ramps to the point that it affects I-81 and I-690 mainline operations.

II. Existing Ambient Noise Level Readings

Changes to the noise environment were considered for this study as an element of the environmental impact screening. Changes in traffic volumes and patterns due to transportation projects can result in unacceptable increases in noise experienced by people in proximity to a roadway. Noise is often described as unwanted sound. Factors affecting the level of noise as perceived by the human ear are:

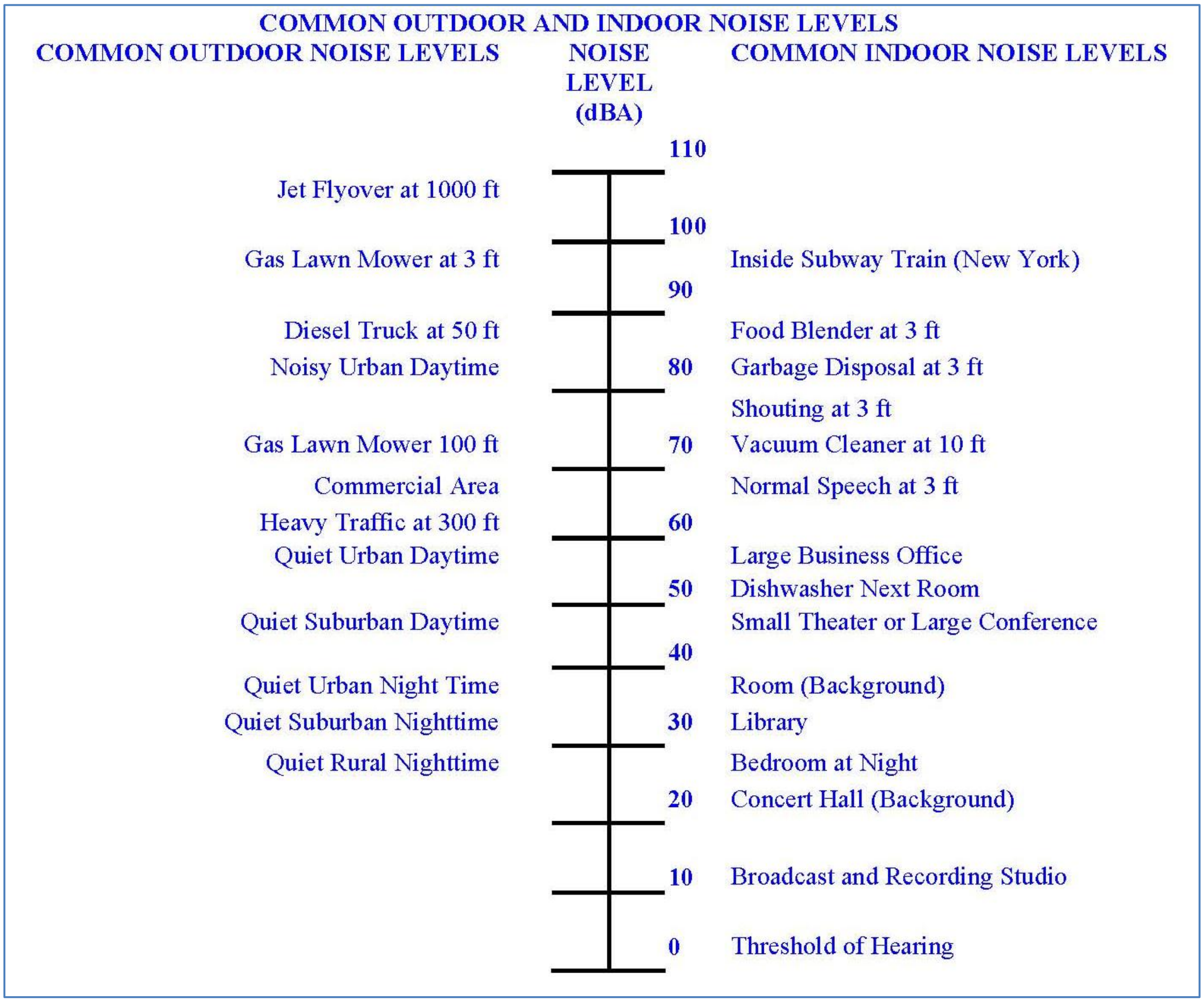
- Actual level of the sound (perceived loudness);
- Distribution of sound energy among individual frequency bands in the audible range;
- Period of exposure; and,
- Changes or fluctuations in sound levels during the period of exposure.

The human ear does not perceive all sound frequencies equally well; as a consequence, measured sound levels are adjusted or weighted to more closely correspond to noise perceived by human hearing. The adjusted noise metric that most closely duplicates human perception of noise is known as the A-weighted decibel (dBA). Community noise levels in urban areas usually range between 45 dBA and 85 dBA, with 45 dBA being the approximate daytime noise level in a typical quiet living room, and 85 dBA being the approximate daytime noise level near a sidewalk adjacent to heavy traffic. Figure 5 shows Common Indoor and Outdoor Noise Levels - illustrating noise levels from typical fluctuating and non-fluctuating (steady) noise sources, based on this A-weighted decibel measure of noise.

The average person's ability to perceive changes in noise levels is well documented. Generally, changes in noise levels of less than 3 dBA would barely be perceived by most people, whereas a 5 dBA change is readily noticeable and a 10 dBA change is perceived as a doubling (or halving) of noise levels. Noise acceptability criteria are generally based on the change in noise that would cause annoyance when it intrudes upon the existing noise from all other sources; annoyance depends upon the noise that exists before the introduction of a new noise-generating source or a modification of an existing source.

Highway traffic noise originates from three primary sources: truck exhaust stacks, vehicle engines, and tires interacting with pavement. Highway traffic noise levels are, therefore, dependent on: (1) the volume of the traffic, (2) the speed of the traffic, and (3) the number of trucks in the flow of the traffic. Traffic noise levels generally increase with higher traffic volumes, higher speeds, and a greater number of trucks. Traffic noise levels are also affected by ground type, atmospheric absorption, the shielding effect of barriers, berms, ground, buildings and trees, and changes in source-receptor distances. This may be an important factor in evaluating noise impacts near new system connections, new ramps and other highway system changes. Changes in elevation which cause motor vehicle engines to exert additional energy to climb a hill or braking to slow descent would increase traffic noise levels.

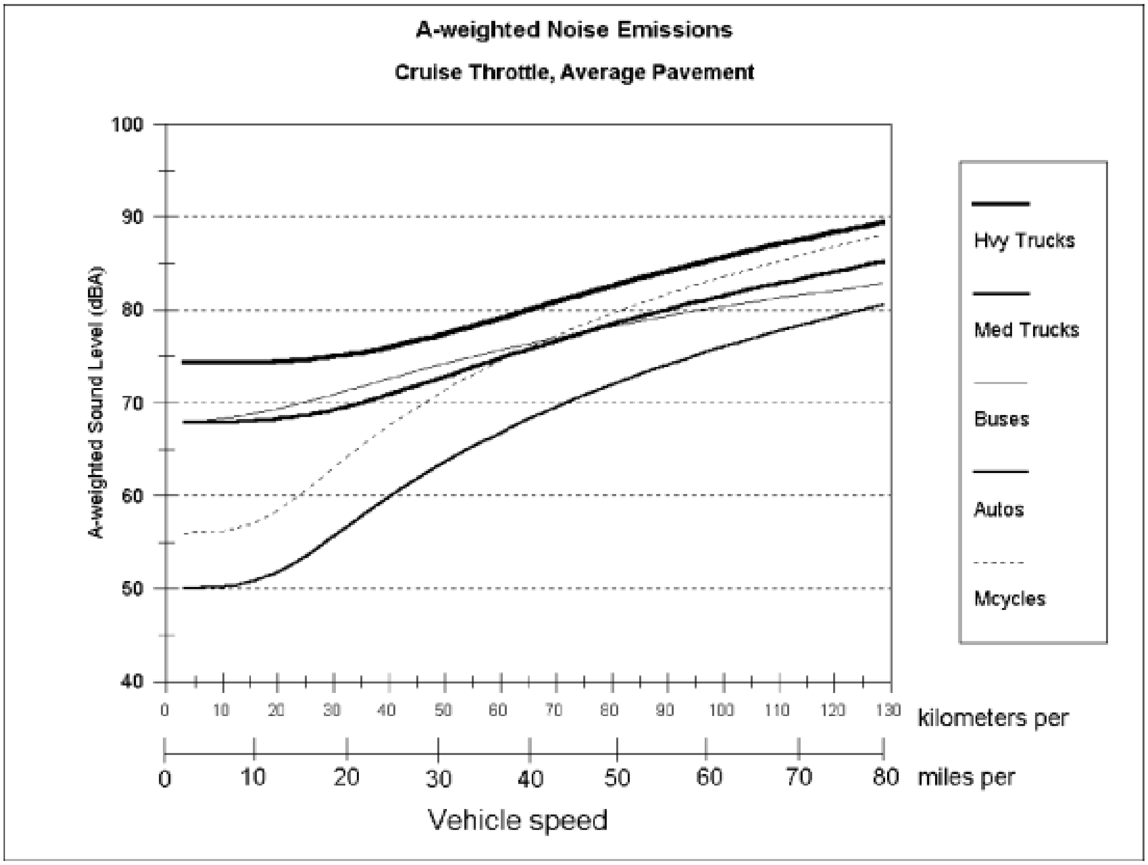
Figure 5 - Common Indoor and Outdoor Noise Levels



Noise from autos is dominated by tire-pavement noise, whereas noise from heavy trucks includes noise from tires on pavement, engine, and exhaust. Heavy trucks contribute approximately 10 dBA greater noise levels than autos, small trucks and other "light" vehicles[8]. Figure 6 depicts noise emissions levels as a function of speed for different vehicles types. As shown on the figure, noise emissions increase with an increase in vehicle speed, and heavy trucks emit a higher noise level than autos, buses, and medium trucks at all speeds.

[8] California Department of Transportation (CALTRANS) Technical Noise Supplement. Page 5-17. November 2009. http://www.dot.ca.gov/hq/env/noise/pub/tens_complete2009RedlineScreenProcess.pdf

Figure 6 - A-Weighted Noise Emissions



Source: http://www.fhwa.dot.gov/environment/noise/traffic_noise_model/old_versions/tnm_version_10/tech_manual/TNM10TechManual.pdf

Reverberation of noise in enclosed spaces, such as tunnels or highways with built up walls is also a source of highway noise. Reverberation is the persistence of sound caused by multiple reflections of the sound within a closed space. Barriers cause multiple reflections of roadway noise from across the roadway, and traffic noise levels would be highest at locations adjacent to the right of way. In a tunnel, sound rays reverberate throughout the length of the tunnel and are emitted at tunnel exit or entrance areas, known as tunnel portals.

Existing noise levels along the I-81 Corridor were monitored at a number of noise-sensitive receptors, including at schools, parks and residences, on March 28, 29, 30, 31, and April 6, 2011. Noise monitoring was performed for a minimum of 20 minutes during the peak noise hour at each location, and for a 24-hour period at a select number of locations. Noise measurement locations and existing monitored noise levels are shown below. As shown on Figure 7, the noise levels along the I-81 viaduct ranged between 65.8 dBA and 79.5 dBA. These noise levels exceed exterior noise levels established by the Federal Highway Administration (FHWA), shown in the Table 2, for the need to consider abatement of highway noise for new roadways for residential land uses, parks, and other noise sensitive land uses.

Table 2 – Noise Abatement Criteria

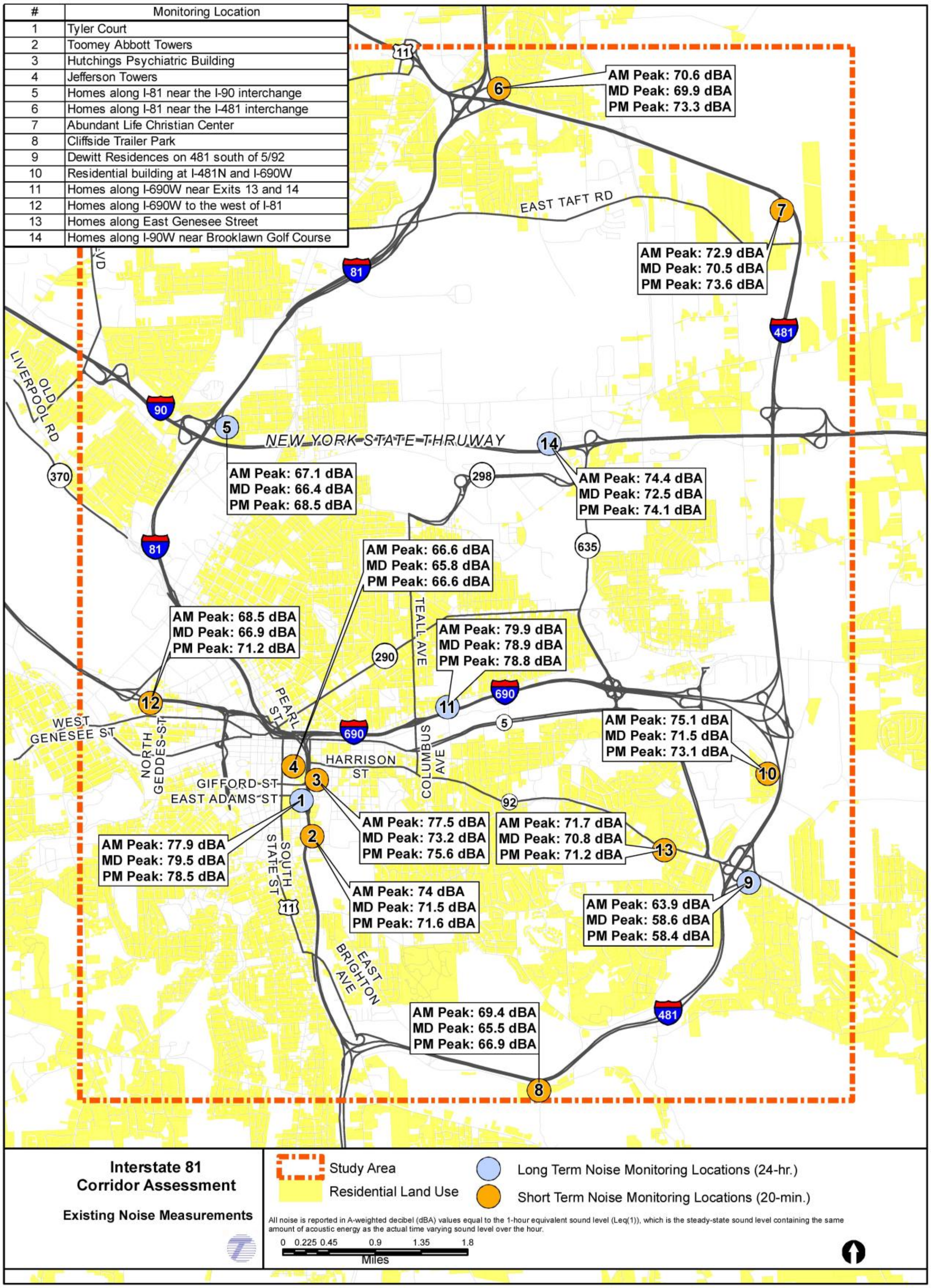
Noise Abatement Criteria (23 CFR Part 772) [Hourly A-Weighted Sound Level decibels (dBA) [(1)]]				
Activity Category	Activity Criteria [(2)] Leq (h)	L10 (h)	Evaluation Location	Activity Description
A	57	60	Exterior	Lands on which serenity and quiet are of extraordinary significant and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B [(2)]	67	70	Exterior	Residential
C [(2)]	67	70	Exterior	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails and trail crossings.
D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places or worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools and television studios.
E [(2)]	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	--	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, railyards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	--	--	--	Undeveloped lands that are not permitted.

Notes:
[(1)] Either Leq(h) or L10(h) (but not both) may be used on a project.
[(2)] The Leq(h) or L10(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.
[(3)] Includes undeveloped lands permitted for this activity category.

Additionally, there are four measurement locations along I-481, a location on I-690 (near S. Midler Avenue) and the New York State Thruway (I-90 near Carrier Circle) where measurements indicate existing noise exceeds the FHWA criteria for acceptable noise levels without shielding. These areas would require further study in subsequent project phases:

- I-81/I-481 North Interchange: sensitive receptors include residential areas in most quadrants of the interchange and parks.
- I-481 (near E. Taft Road): various sensitive receptors including Abundant Life Christian Fellowship, Maxwell Park, Cicero Swamp and other church, park and residential areas.
- NYS Thruway (near Carrier Circle): sensitive receptors include sports area and scattered residential areas.
- I-690 East (at S. Middler Avenue): sensitive receptors include residential, parks and education facilities.
- E. Genesee Street (just east of St. Mary's Cemetery): sensitive receptors include residential and a cemetery.
- I-481 (just north of Kinne Rd): sensitive receptor includes residential areas.

Figure 7 – Existing Noise Levels



#	Monitoring Location
1	Tyler Court
2	Toomey Abbott Towers
3	Hutchings Psychiatric Building
4	Jefferson Towers
5	Homes along I-81 near the I-90 interchange
6	Homes along I-81 near the I-481 interchange
7	Abundant Life Christian Center
8	Cliffside Trailer Park
9	Dewitt Residences on 481 south of 5/92
10	Residential building at I-481N and I-690W
11	Homes along I-690W near Exits 13 and 14
12	Homes along I-690W to the west of I-81
13	Homes along East Genesee Street
14	Homes along I-90W near Brooklawn Golf Course