HUDSON TOWNWIDE TRAFFIC STUDY

Prepared by the

Nashua Regional Planning Commission

2022-2023

TABLE OF CONTENTS

Cover Image: Sunset over Benson Park

LIST OF TABLES

LIST OF MAPS

LIST OF APPENDICES

1. INTRODUCTION

The Town of Hudson has requested that the Nashua Regional Planning Commission (NRPC) conduct a study of long-term impacts of planned and potential future development on the town's arterial highway network and potential spillover onto local streets. This study involves analysis of both existing and future conditions and includes the following tasks: data collection, traffic modeling, capacity analysis, reporting and mapping, conclusions, and recommendations. The study will offer a report on the current (2022) road capacity (level of service) on existing conditions and forecast two reports for future conditions – one for 2030 and another for 2045.

2. PROJECT SCOPE

The NRPC prepared a scope of services to the New Hampshire Department of Transportation (NHDOT) to conduct the study utilizing its Unified Planning Work Program (UPWP) funding under the Special Projects category. The following work scope provides the format for this study.

2.1 Existing Conditions Analysis

- **Study Background** – Previous studies will be reviewed, including the Litchfield-Hudson Transportation Study conducted by Vollmer Associates in 2003. This study included a forecast of traffic and operational conditions in 2025. More recent studies that will be reviewed and findings incorporated into the townwide study include the Hudson Master Plan update of 2020 and the traffic analysis conducted for the Hudson Logistics Center.

  The Hudson Boulevard project was not included in the scope of work for this study because the project was removed from the NRPC FY2019-2045 Metropolitan Transportation Plan (MTP) during Amendment 3 to the NRPC FY2021-2024 Transportation Improvement Program (TIP), which was adopted on December 15th, 2021. There is a discussion about the Hudson Boulevard project in the conclusions section later in this study.
- **Automatic Traffic Recorder Counts –** Automatic traffic recorder counts will be conducted on weekdays at the 18 State and local road segments that are detailed in **Table 1**.
- **Arterial Capacity Analysis** – Arterial volume-to-capacity ratios will be developed for study area arterials and several local roads.
- **Intersection Turning Movement Counts (TMCs) –** Turning movement counts will be conducted during the morning (7-9 AM) and afternoon (4-6PM) peak periods at the 21 locations that are detailed in **Table 1**.
- **Intersection Capacity Analysis** – Intersection analysis will be based on the Highway Capacity Manual (HCM) methodology. NRPC utilizes the SYNCHRO software to perform this analysis.
- **Existing Conditions Mapping** – Mapping of existing weekday counts, TMCs and congestion conditions.

2.2 Future Conditions Analysis

- **Model Run for 2030 & 2045 Projected Growth Scenario** – A TransCAD assignment run for 2030 & 2045 based on NRPC's current regional land use growth projection will be conducted and post-processed to convert arterial segment volumes to forecasts (applying model error from calibration run).

- **Develop Intersection 2030 & 2045 Volumes** – Arterial growth factors for 2020-2045 will be applied to each intersection approach to estimate 2030 & 2045 turning movement volumes for the baseline growth forecast.
- **Capacity Analysis** – Procedures used for baseline capacity analysis will be repeated for the 2030 & 2045 forecast year for the baseline and full development scenarios.
- **Future Conditions Mapping** – Mapping of weekday counts, TMCs and congestion conditions for the forecast year.
- **Conclusions & Recommendations** – NRPC will meet with town officials to review results, formulate conclusions regarding the impacts of future baseline and development growth, and develop recommendations for traffic improvements as needed. The impacts of improvements on arterials and intersection operations will be evaluated.

3. STUDY LOCATIONS

This study was focused on the following roadway segments and intersections:

Table 1: Road Segments and Intersections That Were Analyzed

State Route Road Segments:	Intersections:
A. NH 3A (Central Street) west of Library Street	1. NH 111 Ferry Street/NH102 Derry Street/NH 3A Chase Street
B. NH 3A (Central Street) east of Library Street	2. NH 111 Ferry Street/Library Street
C. NH 3A (Lowell Road) south of Central Street	3. NH 3A&102 Derry Street/Library Street/Highland Street
D. NH 3A (Lowell Road) south of Pelham Road	4. NH 111 Burnham Road/Central Street
E. NH 3A (Lowell Road) south of Wason Road	5. NH 111 Central Street/Kimball Hill Road/Greeley Street
F. NH 3A (Lowell Road) south of Rena Avenue	6. NH 102 Derry Road/NH 3A Elm Street
G. NH 3A (River Road) at Massachusetts State Line	7. NH 102/Page Road
H. NH 102 at Litchfield Town Line	8. NH 3A Central Street/Chase Street
I. NH 102 north of Easy Street	9. NH 3A Central Street/Library Street
J. NH 102/3A north of Ledge Road	10. NH 3A Lowell Road/Central Street
K. NH 111 (Ferry Street) east of Library Street	11. NH 3A Lowell Road/Pelham Road
L. NH 111 (Burnham Road) north of Central Street	12. NH 3A Lowell Road/Executive Drive
M. NH 111 (Central Street) west of Kimball Hill Road	13. NH 3A Lowell Road/Hampshire Drive/Oblate Drive
Local Street Segments	14. NH 3A Lowell Road/Flagstone Drive/Wason Road
N. Belknap Road south of Central Street	15. NH 3A Lowell Road/Sagamore Bridge (Circumferential Highway)
O. Kimball Hill Road south of NH 111	16. NH 3A Lowell Road/Walmart Boulevard
P. Dracut Road at Massachusetts State Line	17. NH 3A Lowell Road/Rena Avenue
Q. Wason Road east of NH 3A	18. NH 3A Lowell Road/Dracut Road/Steele Road/River Road
R. Bush Hill Road north of Wason Road	19. Dracut Road/Sherburne Road
	20. Kimball Hill Road/Bush Hill Road
	21. Central Street/Belknap Road
	22. Lowell & Fox Hollow Drive
	23. Lowell & Birch Street

4. ADDITIONAL CONSIDERATIONS

4.1 NRPC Traffic Study for the Hudson Master Plan Transportation Chapter – June 2020

NRPC conducted an in-house traffic study in mid-2020 as part of the effort in updating the Hudson Master Plan Transportation Chapter. The study consists of a Level of Service (LOS) analysis on road segments, comparing observed traffic volumes with the projected traffic volumes in 2045. Furthermore, the analysis also includes an alternative 2045 scenario in which Hudson Boulevard was constructed (more discussion in **Section 4.2** below).

The then-current traffic volumes (in Average Weekday Traffic Trips, or AWDT) collected between 2017 and 2019 are consistently higher than the traffic volumes observed presently (2022), as reflected in the AWDT comparison in **Table 3,** which can likely be attributed to the Covid pandemic (more discussion in **Section 6**). Consequently, the LOS in the 2020 study is generally worse (often by a letter grade) than the LOS identified in the present study. Furthermore, the traffic volumes for the two 2045 scenarios, and the corresponding LOS, are also based on projections from pre-pandemic traffic volumes.

Despite the differences in AWDT and LOS the congested segments identified in the 2020 study are consistent with those identified in the present study, which are discussed in **Section 8**.

4.2 Hudson Boulevard

The Hudson Boulevard has evolved as a scaled-down southern segment of what was formerly known as the Circumferential Highway. In contrast to the limited-access, high-speed expressway once envisioned, the boulevard is now seen as an approximate 40 mph, controlled access roadway along the southern Circumferential Highway right-of-way between NH 3A and NH111 with at-grade intersections, and a parallel, separated nonmotorized multi-use path. The estimated project cost is $54 million.

The Draft Hudson Master Plan Transportation Chapter includes a discussion about the Hudson Boulevard project. The roadway is projected to carry between 20,000-23,000 vehicles per day over most of its length in the year 2045. A 10% decrease in Taylor Falls Bridge traffic is forecasted, along with a 13% increase in Sagamore Bridge volume, due to a faster travel path to the turnpike and south Nashua via this route. Significant decreases in traffic on NH 3A and NH 111 are projected as the Boulevard diverts traffic away from the town center area. Wason Road and Bush Hill Road, which now provide a local road path near the right-of-way originally reserved for the southern segment of the Circumferential Highway, would experience significant traffic relief from constructing the Boulevard. See **Table 2** on the following page for more details.

The Hudson Boulevard project was not included in the scope of work for this study as explained earlier in this document. It was therefore not included in the future highway network scenarios that were developed for this study. As a result, the impacts this project would have on the road network have not been factored into the results of this study.

The Hudson Boulevard project has since been added back into the NHDOT FY 2023-2032 Ten-Year Plan and the NRPC FY2023-2026 TIP as a feasibility study only.

Table 2. Hudson Master Plan Transportation Chapter Table V-13: 2045 Forecasted Traffic with Hudson Boulevard

Table 10 #			2045 Base Vol.	2045 Build – Hud Blvd	Based to Build % Change
-	Hudson Blvd	NH 3A to Musquash Rd.	-	23,620	-
-	Hudson Blvd	Musquash Rd to Bush Hill Rd	-	21,740	-
-	Hudson Blvd	Bush Hill Rd to Kimball Hill Rd	-	20,380	-
-	Hudson Blvd	Kimball Hill Rd to NH 111	-	12,995	-
-	Taylor Falls Bridge	Hudson/Nashua CL	43,160	39,050	-10%
-	Sagamore Bridge	Hudson/Nashua CL	56,790	63,970	13%
-	NH 111 Central St.	E. of Kimball Hill Rd.	20,200	14,300	-29%
-	NH 111 Central St.	E. of Greeley St.	25,100	20,200	-20%
L	NH 111 Burnham Rd.	N. of Central St.	13,160	11,470	-13%
B	NH 111 Ferry St.	E. of Library St.	14,280	12,720	-11%
J	NH 3A/102 Derry St	N. of Ledge Rd.	28,280	27,320	-3%
-	NH 3A/102 Derry St	N. of Ferry St.	18,010	16,810	-7%
C	NH 3A Lowell Rd	S. of Central St.	23,390	21,220	-9%
D	NH 3A Lowell Rd	S. of Pelham Rd.	27,490	23,290	-15%
E	NH 3A Lowell Rd	S. of Wason Rd.	44,940	33,940	-24%
-	Library St.	N. of NH 3A Central St.	9,930	9,390	-5%
-	Speare Rd.	E. of Bush Hill Rd.	3,460	2,620	-24%
-	Greeley St.	N. of NH 111 Central St.	5,850	5,830	0%
-	Central St.	E. of Adelaide St.	6,290	3,950	-37%
-	Melendy Rd.	S. of Central St.	2,590	2,180	-16%
N	Belknap Rd.	S. of Central St.	6,220	5,620	-10%
-	County Rd.	E. of NH 3A	5,520	4,950	-10%
-	Kimball Hill Rd.	E. of Bush Hill Rd.	5,450	4,200	-23%
O	Kimball Hill Rd.	S. of NH 111 Central St.	9,280	8,490	-9%
R	Bush Hill Rd.	S. of Kimball Hill Rd.	6,330	2,550	-60%
-	Bush Hill Rd.	S. of Speare Rd.	8,330	3,340	-60%
-	Bush Hill Rd.	E. of Wason Rd.	2,990	1,670	-44%
-	Pelham Rd.	W. of Bush Hill Rd.	2,930	2,270	-23%
-	Burns Hill Rd.	N. of Wason Rd.	3,140	4,150	32%
-	Wason Rd.	E. of Musquash Rd.	13,870	6,570	-53%
Q	Wason Rd.	E. of NH 3A	12,650	7,410	-41%

Source: NRPC traffic model estimate

4.3 NRPC Litchfield-Hudson Traffic Study – March 2003

Vollmer Associates LLP was retained by the Nashua Regional Planning Commission (NRPC), under a contract between the NRPC and the NH Department of Transportation, to aid in evaluating traffic conditions for the Towns of Litchfield and Hudson, New Hampshire. The project was conducted as a collaborative effort between the two towns, the NRPC and Vollmer Associates.

The study predicted future (2025) afternoon peak period intersection capacity (measured in Level of Service) for 20 intersections in Hudson. The study incorporated the following proposed roadway projects into the 2025 modeling scenario:

- Planned construction of the preferred alternative of the Nashua-Hudson Circumferential Highway,
- Planned construction of the Manchester Airport Access Road,
- NH 102 widening in Hudson,
- NH 102/West Rd. intersection improvements in Hudson,
- NH 3A widening from Rena St. to Dracut Rd. in Hudson, and,
- NH 3A widening from Wason Rd. to Executive Dr. in Hudson.

While most of these improvements have been completed the preferred alternative to the Nashua-Hudson Circumferential Highway has not. It is therefore difficult to compare the 2025 modeling scenario from the 2003 study to current conditions in the study area.

4.4 Hudson Logistics Center

The land use assumptions and proposed roadway improvements from the logistics center proposal have been incorporated into the future modeling scenarios of this study.

5. DATA COLLECTION

Traffic data was collected from the following sources:

- For intersections, turning movement counts captured by the Town's traffic signal cameras.
- For intersections not within the camera's coverage, NRPC conducted manual turning movement counts during AM and PM peak hours.
- For segments, NRPC maintained a series of automatic traffic recording locations, several as part of the annual traffic counting program and others specifically for this study.

These data were processed and summarized on an Excel spreadsheet as a record and as input for the next steps.

6. TRAFFIC TRENDS

Table 3 provides a snapshot of traffic trends during approximately the past decade on the eighteen road segments that were included in this study. Between approximately 2013 and 2022 traffic volume decreased on eleven segments and increased on seven segments. The decrease in traffic volume can likely be attributed to the Covid pandemic, as the most recent traffic counts were conducted in 2022, when the region was emerging from the pandemic. The pandemic has at least temporarily changed traffic patterns and it remains to be seen if these changes are permanent.

Additionally, a recent (2022) NRPC traffic study in the Town of Merrimack noted flat to moderate growth in traffic volume over the past twenty years (as compared to significant growth in the 1980s and 1990s). It is unknown if this two-decade trend of flat to moderate traffic growth will continue.

Table 3: Traffic Trends on Various Roadway Segments

Table 10 #	Description	Year	AWDT*	Year	AWDT*	Year	AWDT*	% Change#
A	NH 3A (Central St) west of Library St	2013	9,090	2019	10,095	2022	9,894	9%
B	NH 3A (Central St) east of Library St	2014	20,273	2017	15,643	2022	19,912	-2%
C	Lowell Rd south of Central St	2014	23,562	2017	22,636	2022	21,915	-7%
D	Lowell Rd south of Pelham Rd	2014	24,773	2017	25,402	2022	24,233	-2%
E	Lowell Rd south of Wason Rd	2014	36,537	2017	21,549	2022	39,160	7%
F	Lowell Rd south of Rena Ave	2014	24,611	2017	n/a	2022	25,864	5%
G	River Rd at Mass State Line	2014	8,112	2017	7,710	2022	7,194	-11%
H	NH 102 at Litchfield Town Line	2013	16,783	2019	16,786	2022	14,208	-10%
I	NH 102 north of Easy St	2013	18,181	2019	16,595	2022	16,733	-8%
J	NH 102/3A north of Ledge Rd	2014	28,100	2017	26,311	2022	24,648	-12%
K	NH 111 (Ferry St) east of Library St	2013	13,975	2019	13,199	2022	13,534	-3%
L	NH 111 (Burnham Rd) north of Central St	2013	13,124	2019	12,547	2022	11,720	-11%
M	NH 111 (Central St) west of Kimball Hill Rd	2014	22,017	2017	23,406	2022	20,816	-5%
N	Belknap Rd south of Central Str	2013	5,467	2019	5,141	2022	4,879	-11%
O	Kimball Hill Rd south of NH 111	2013	7,262	2019	7,846	2022	7,299	1%
P	Dracut Rd at Mass State Line	2013	8,072	2019	9,685	2022	9,795	21%
Q	Wason Rd east of NH 3A	2012	8,288	2018	9,331	2022	8,744	6%
R	Bush Hill Rd north of Wason Rd	2014	5,931	2017	6,760	2022	6,579	11%

* = AWDT = Average Weekday Traffic (Monday – Friday)

= % change (oldest vs. most recent count)

7. LEVEL OF SERVICE ANALYSIS – INTERSECTIONS

Level of service (LOS) is a qualitative measure used to relate the quality of motor vehicle traffic service. LOS is used to analyze roadways and intersections by categorizing traffic flow and assigning quality levels of traffic based on performance measures like vehicle speed, density, and congestion.

This study focuses on twenty-three intersections in Hudson. Turning movement counts were conducted for the morning (7-9 am) and afternoon (4-6 pm) peak periods. For the highest hour of traffic volume for each peak period, intersection capacity (measured in LOS) analysis was conducted utilizing the methods of the *Highway Capacity Manual 2003* as replicated by the *Synchro Traffic Signal Timing Software.* For **signalized intersections**, LOS is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS (**Table 4**) is stated in terms of average control delay per vehicle (in seconds) during a specified time-period (generally weekday AM or PM peak hours). Control delay is a complex measure based on many variables, including signal phasing and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity and resulting queues.

For **unsignalized intersections**, LOS criteria can be reduced to three intersection types: all-way stop, two-way stop, and roundabout control (**Table 5**). All-way stop and roundabout control intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way, stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. This approach is because major street through vehicles are assumed to experience zero delays, a weighted average of all movements results in a very low overall average delay, and this calculated low delay could mask deficiencies of minor movements.

Table 4: Level of Service Criteria for Signalized Intersections

LOS	Intersection Delay (seconds)
A	≤10
B	10 to 20
C*	*20 to 35*
D	35 to 55
E	55 to 80
F	>80

Source: Highway Capacity Manual
* LOS C is the target LOS for intersections

Table 5: Level of Service Criteria for Unsignalized/Stop-Controlled Intersections

LOS	Intersection Delay (seconds)
A	≤10
B	10 to 15
C*	*15 to 25*
D	25 to 35
E	35 to 50
F	>50

Source: Highway Capacity Manual
* LOS C is the target LOS for intersections

NRPC uses the Synchro Studio 11 software (hereafter Synchro) by Cubic Transportation Systems to model and analyze the collected traffic data for intersections. The key feature of Synchro is a methodological approach in calculating road capacity (measured in LOS) based on traffic delays modeled with traffic counts and a myriad of variables such as the layout of intersections and lanes and traffic signal settings (detection, phasing, and timing). Within Synchro, NRPC built a partial roadway model of Hudson covering all study locations. NRPC gathered the necessary information from the Town Engineer, as well as made field visits as necessary. By entering the collected traffic data into the completed model, Synchro calculates the road capacity (LOS), which is exported into a report appended to this study.

Another feature of Synchro is a visual simulation of the modeled road network that shows how virtual traffic traverses the virtual network. The simulation helps visualize the modeled intersection layout, traffic signal settings, and traffic flow. NRPC used this simulation feature at a meeting with the Town Engineer to verify the Synchro model against known conditions.

Table 6, **Map 1** and **Map 2** present information about existing (2022) and future (2030 & 2045) intersection delays and LOS for the twenty-three intersections that were analyzed in this study. **Appendix A** provides a more detailed summary of the LOS analysis, including intersection delay (seconds) and LOS for each intersection.

7.1 Existing (2022) Conditions – Intersections

During the morning (AM) Peak period, the following four intersections operate below LOS C:

- 111-102-3A (Ferry/Chase) – LOS F
- Burnham Rd & Central St – LOS D
- Central-Kimball-Greeley – LOS F
- Lowell Rd & Wason Rd – LOS D

During the afternoon (PM) Peak Period, the following nine intersections operate below LOS C:

- 111-102-3A (Ferry/Chase) – LOS F
- Library St & Highland St – LOS D
- Burnham Rd & Central St – LOS D
- Central-Kimball-Greeley – LOS F
- Lowell Rd & Pelham Rd – LOS D
- Lowell Rd & Wason Rd – LOS D
- Lowell Rd & Sagamore Br – LOS E
- Lowell Rd-Dracut Rd-Steele Rd-River Rd – LOS F
- Dracut Rd & Sherburne Rd – LOS F

7.2 Future (2030, 2045) Conditions – Intersections

Future conditions analysis for intersections involves using the NRPC regional travel demand model to predict future traffic growth. The predicted future traffic volumes are then inserted into the Synchro traffic software to predict the future LOS for the twenty-three intersections that were studied. Projected growth scenarios for the years 2030 and 2045 were used for this study.

7.3 Regional Traffic Modelling

The Nashua Regional Planning Commission maintains a regional travel demand model for the general purposes of transportation planning and air quality analysis. NRPC uses the software package TransCAD, the leading traffic demand modeling and GIS software package in the U.S. which is produced by the Caliper Corporation in Needham, MA. There are two key components to the model: the supply side, and the demand side. The supply side is a coded highway network with attributes such as roadway length, travel direction, number of travel lanes in each direction, posted speed, roadway functional classification, and area type. NRPC's model network consists of all arterials, collectors, and some local roads (over 1,480 miles of roadway segments) and major routes outside of the region to account for external travel.

The demand side inputs are employment and household data and are summarized by Transportation Analysis Zone (TAZ). The 13 NRPC communities are divided into 2,371 TAZs. Also, the model includes 52 external TAZs. External TAZs are used to aid in calculating trips with one end of the trip outside of NRPC, or trips that pass through NRPC.

Each TAZ contains totals of households, residents, and employees. Employees are by industry classification and include retail, manufacturing, professional services, finance, real estate, and others. Households are defined by household size and the number of vehicles available to household members. The base year model was calibrated to traffic counts conducted by NRPC along all arterials and other facilities. The model utilizes U.S. Census data and employment data from the State of New Hampshire.

The model uses a traditional three-step modeling process: trip generation, trip distribution, and trip assignment. A fourth step, mode choice, is not used by the NRPC model since travel other than by automobile represents a small fraction of the total traffic on the regional road network.

In step one, trip generation, the model uses the Institute of Transportation Engineers, and National Cooperative Highway Research Program trip generation rates applied to TAZ-based data. The product of this step is a summary of the number of trips produced by or attracted to a zone.

In step two, trip distribution, the model takes the expected number of trips produced and attracted by each zone and matches them with destinations, subject to other considerations such as average trip length in travel time and distance. NRPC uses a “gravity model” to distribute the trips, meaning that the likely destination of a trip is based on the size and separation of the destination zone, compared to all other zones and their size and distance from the location of where the trip is produced, subject to additional considerations such as the existing average travel times and distance for travel in the NRPC region. The model uses Census journey to work time and distance survey data to determine the appropriate percentage of trips distributed within each time and distance category. For example, if survey and Census data show that 60% of all work trips take between 20 and 30 minutes, the model will match that ratio.

Once the model determines the origins and destinations of the trips, trip assignment is the final step. The model begins by sending every trip via the shortest path possible path (in terms of time). Then, because of capacity constraints, it uses an iterative process to reassign certain trips along alternate routes. The assignment process continues to iterate until no trip would change its travel route as all alternative routes have similar travel times.

The three-step process results in future traffic forecasts based on anticipated future land use patterns, population projections, projected housing units, employment, and school enrollment. The projected growth in land use was made in consultation with local planners from the Nashua Region, and through a review of present and proposed zoning, physical constraints, and assumptions made regarding future area-wide growth rates.

To better reflect future conditions the model is updated with future supply-side conditions and demand-side conditions. On the supply side, foreseeable roadway and intersection projects are used to update the highway network. On the demand side, foreseeable development in the region and, specifically, the Town is used to update the household and employment data.

Once completed, for each of the two future conditions (2030 and 2045), a series of projected turning movement counts were exported onto an Excel spreadsheet like the one summarizing the collected counts for the existing conditions analysis, and then entered into the Synchro Road network model. Within Synchro, roadway layout, intersection layout, and traffic signal settings were modified to include proposed future roadway and intersection improvement projects. The key improvements include:

- Signalization of two previously unsignalized intersections
  - NH102/Page Rd
  - Dracut Rd/Sherburne Rd
- A series of roadway and intersection improvements on Lowell Road from Dracut Road to Wason Road.
  - NH 3A Lowell Rd/Dracut Rd/Steele Rd/River Rd
  - NH 3A Lowell Rd/Rena Ave
  - NH 3A Lowell Rd/Walmart Blvd
  - NH 3A Lowell Rd/Sagamore Br
  - Lowell Rd/Wason Rd

7.4 Future (2030) Conditions – Intersections

Table 6, Map 1 and **Map 2** present information about 2030 intersection delay and LOS for the twenty-three intersections that were analyzed in this study.

During the morning (AM) Peak period in 2030, eighteen intersections are predicted to operate at LOS C or better (nineteen intersections operated at LOS C or better in 2022). The following intersections experience a LOS below C:

- 111-102-3A (Ferry/Chase) – LOS F (LOS F in 2022)
- Library St & Highland St – LOS D (LOS C in 2022)
- Burnham Rd & Central St – LOS E (LOS D in 2022)
- Central-Kimball-Greeley – LOS F (LOS F in 2022)
- Lowell Rd & Wason Rd – LOS D (LOS D in 2022)

During the Afternoon (PM) Peak period in 2030, fifteen intersections are predicted to operate at LOS C or better (fourteen intersections operated at LOS C or better in 2022). The following intersections experience a LOS below C:

- 111-102-3A (Ferry/Chase) – LOS F (LOS F in 2022)
- Library St & Ferry St – LOS D (LOS C in 2022)
- Library St & Highland St – LOS D (LOS D in 2022)
- Burnham Rd & Central St – LOS D (LOS D in 2022)
- Central-Kimball-Greeley – LOS F (LOS F in 2022)
- Lowell Rd & Pelham Rd – LOS E (LOS D in 2022)
- Lowell Rd & Wason Rd – LOS D (LOS D in 2022)
- Lowell Rd & Sagamore Br – LOS D (LOS E in 2022)

7.5 Future (2045) Conditions – Intersections

Table 6, Map 1 and **Map 2** present information about 2045 intersection delays and LOS for the twenty-three intersections that were analyzed in this study. During the morning (AM) Peak period in 2045, seventeen intersections are predicted to operate at LOS C or better (nineteen intersections operated at LOS C or better in 2022). The following intersections experience a LOS below C:

- 111-102-3A (Ferry/Chase) – LOS F (LOS F in 2022 & 2030)
- Library St & Highland St – LOS D (LOS C in 2022, LOS D in 2030)
- Burnham Rd/Central St – LOS E (LOS D in 2022, LOS E in 2030)
- Central-Kimball-Greeley – LOS F (LOS F in 2022 & 2030)
- Lowell Rd & Executive Dr – LOS D (LOS C in 2022, LOS C in 2030)
- Lowell Rd & Wason Rd – LOS D (LOS D in 2022, LOS D in 2030)

During the Afternoon (PM) Peak period in 2045, fourteen intersections are predicted to operate at LOS C or better (fourteen intersections operated at LOS C or better in 2022).

- Library St & Ferry St – LOS C (improves from LOS D in 2030)

The following intersections experience a LOS below C:

- 111-102-3A (Ferry/Chase) – LOS F (LOS F in 2022 & 2030)
- Library St & Highland St – LOS D (LOS D in 2022 & 2030)
- Burnham Rd/Central St – LOS D (LOS D in 2022 & 2030)
- Central St/Kimball/Greeley – LOS F (LOS F in 2022 & 2030)
- Lowell Rd & Pelham Rd – LOS E (LOS D in 2022, LOS E in 2030)
- Lowell Rd & Wason Rd – LOS D (LOS D in 2022, LOS D in 2030)
- Lowell Rd & Sagamore Br – LOS E (LOS E in 2022, LOS D in 2030)
- Lowell Rd – Dracut Rd – Steele Rd – River Rd – LOS F (LOS F in 2022, LOS C in 2030)
- Lowell Rd & Fox Hollow Dr – LOS D (LOS C in 2022 & 2030)

Table 6: Level of Service – Study Area Intersections

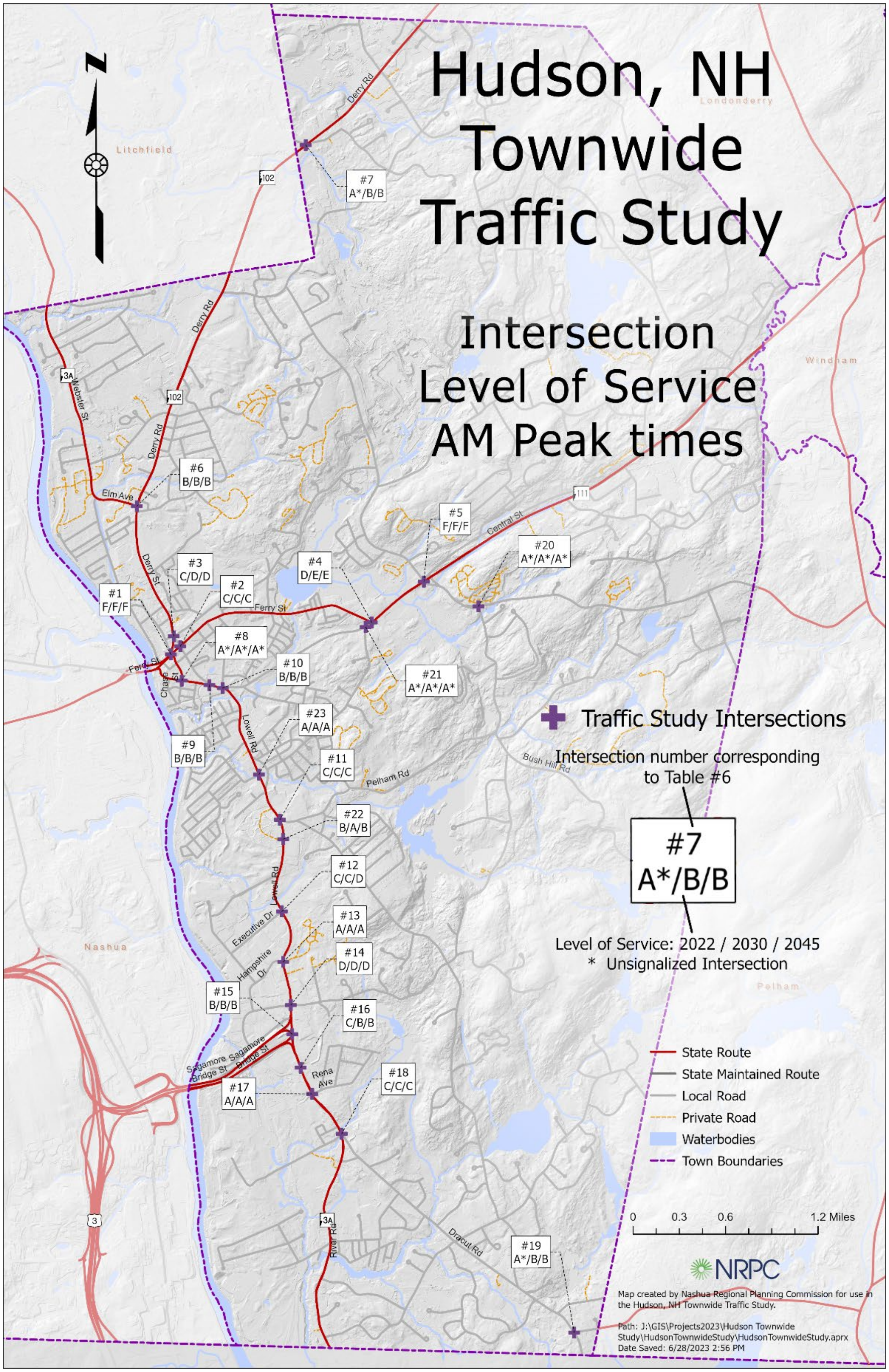
#	Intersection	AM Peak 2022 LOS	AM Peak 2030 LOS	AM Peak 2045 LOS	PM Peak 2022 LOS	PM Peak 2030 LOS	PM Peak 2045 LOS
1	111-102-3A (Ferry & Chase)	F	F	F	F	F	F
2	Library St & Ferry St	C	C	C	C	D	C
3	Library St & Highland St	C	D	D	D	D	D
4	Burnham Rd & Central St	D	E	E	D	D	D
5	Central-Kimball-Greeley (Rt.111 & Greeley)	F	F	F	F	F	F
6	NH102 & Elm Ave	B	B	B	B	B	B
7	NH 102 & Page Rd#	A*	B	B	A*	B	B
8	Central St & Chase St	A*	A*	A*	A*	A*	A*
9	Central St & Library St	B	B	B	C	B	B
10	Lowell Rd & Central Rd	B	B	B	C	C	C
11	Lowell Rd & Pelham Rd	C	C	C	D	E	E
12	Lowell Rd & Executive Dr	C	C	D	B	C	C
13	Lowell Rd-Hampshire Dr-Oblate Dr	A	A	A	A	A	A
14	Lowell Rd & Wason Rd#	D	D	D	D	D	D
15	Lowell Rd & Sagamore Br#	B	B	B	E	D	E
16	Lowell Rd & Walmart Blvd#	C	B	B	C	C	C
17	Lowell Rd & Rena Ave#	A	A	A	B	B	B
18	Lowell Rd/Dracut Rd/Steele Rd/River Rd#	C	C	C	F	C	F
19	Dracut Rd & Sherburne Rd#	A*	B	B	F*	B	B
20	Kimball Hill Rd & Bush Hill Rd	A*	A*	A*	A*	A*	A*
21	Central St & Belknap Rd	A*	A*	A*	A*	A*	A*
22	Lowell Rd & Fox Hollow Dr	B	A	B	C	C	D
23	Lowell Rd & Birch St	A	A	A	B	B	B

* Unsignalized intersection in various configurations.

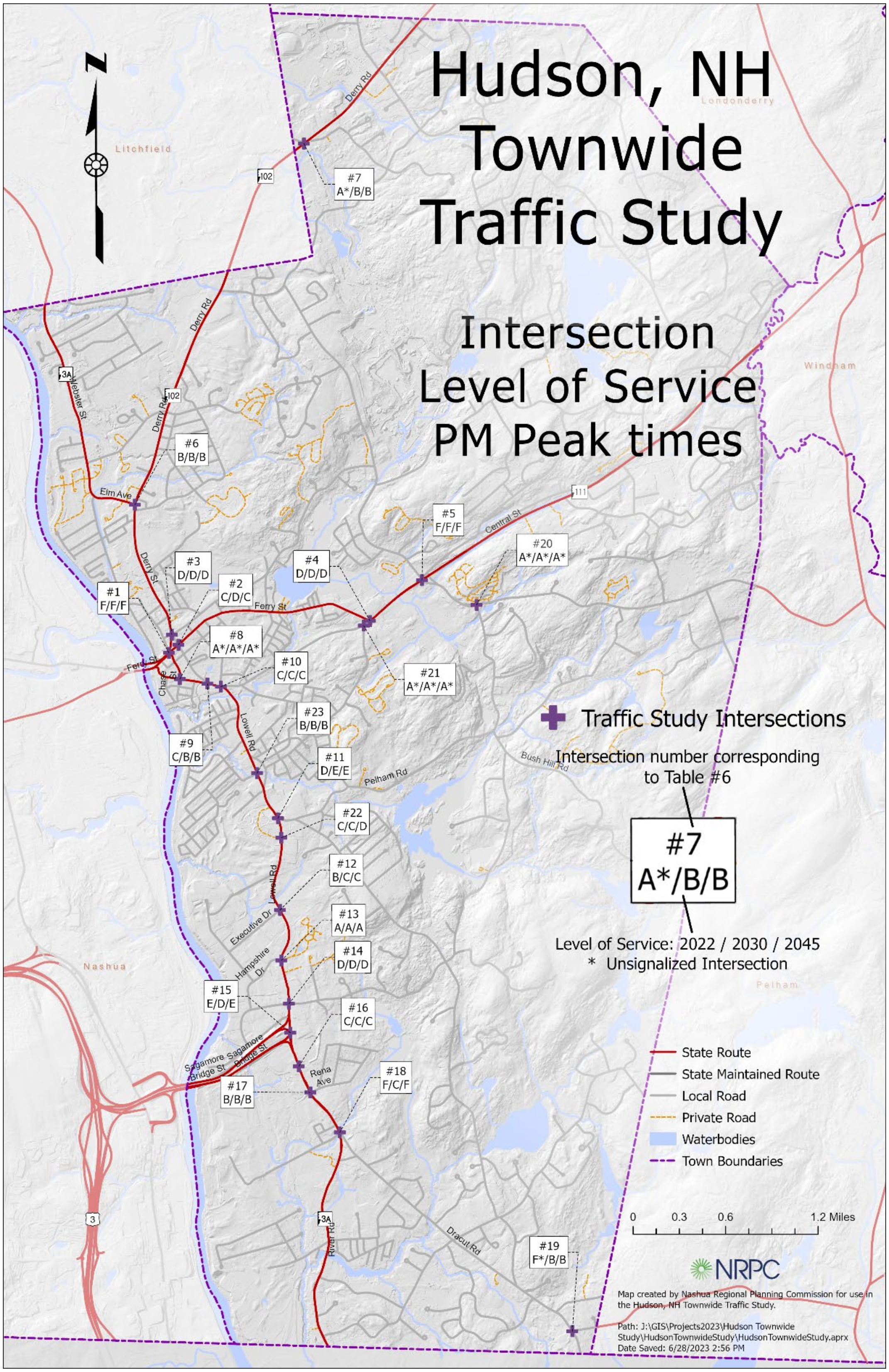
Improvement made to the intersection in 2030 and 2045

Blue LOS indicates an improvement In LOS and Red LOS indicates a decline in LOS

Map 1: Intersection Level of Service AM Peak Times



Map 2: Intersection Level of Service PM Peak Times



8. LEVEL OF SERVICE ANALYSIS – ROAD SEGMENTS

Existing conditions for road segments were modeled differently than intersections. Rather than using the Synchro analysis software, NRPC converted the collected traffic count data from average total weekday vehicle counts to peak hour counts (AM and PM) per direction and per lane via an Excel spreadsheet. The directional split was assumed to be 50/50. The converted counts were then classified by Volume to Capacity ratio and the resulting LOS according to the corresponding road segment class, as shown below:

Table 7: Freeways & Controlled Access

	Limited Access 60-70 MPH		Controlled Access 50-59 MPH	
LOS	V/C	VPL/Hr	V/C	VPL/Hr
A	0.40	920	0.40	800
B	0.50	1150	0.50	1000
C	0.70	1610	0.70	1400
D	0.85	1950	0.85	1700
E	1.00	2300	1.00	2000
F	>1	>2300	>1	>2000

Table 8: Single-Lane Arterials Uninterrupted Flow

	Ave Speed = 50		Ave Speed = 40		Ave Speed = 30	
LOS	V/C	VPL/Hr	V/C	VPL/Hr	V/C	VPL/Hr
A	0.30	480	0.30	420	0.30	360
B	0.40	640	0.40	560	0.40	480
C	0.60	960	0.60	840	0.60	720
D	0.80	1280	0.80	1120	0.80	960
E	1.00	1600	1.00	1400	1.00	1200
F	>1	>1600	>1	>1400	>1	>1200

Table 9: Signalized Arterials

	<2 signal int/mi.		2-4 signal int/mi.		>4 signal int/mi.	
LOS	V/C	VPL/Hr	V/C	VPL/Hr	V/C	VPL/Hr
A	..	..	..	..	..	..
B	0.40	420	0.40	360	..	..
C	0.60	630	0.60	540	0.60	450
D	0.80	840	0.80	720	0.80	600
E	1.00	1050	1.00	900	1.00	750
F	>1	>1050	>1	>900	>1	>750

Table 10, Map 3 and **Map 4** present information about existing (2022) and future (2030 & 2045) Volume to Capacity (V/C) and LOS for the eighteen road segments that were analyzed in this study.

During the morning (AM) Peak period in 2022, twelve road segments operate at LOS C or better. The following road segments experience a LOS below C:

- Lowell Road south of Central St – LOS E
- Lowell Road south of Pelham Rd – LOS D
- Lowell Road south of Wason Rd – LOS D
- NH 102/3A north of Ledge Rd – LOS D
- NH 111 (Burnham Road) north of Central Street – LOS D
- NH 111 (Central Street) west of Kimball Hill Road – LOS E

During the afternoon (PM) Peak period in 2022, seven road segments operate at LOS C or better. The following road segments experience a LOS below C:

- NH 3A (Central St) west of Library St – LOS D
- NH 3A (Central St) east of Library St – LOS D
- Lowell Road south of Central St – LOS F
- Lowell Road south of Pelham Rd – LOS D
- Lowell Road south of Wason Rd – LOS E
- Lowell Rd south of Rena Ave – LOS D
- NH102 N. of Easy St – LOS D
- NH 102/3A north of Ledge Rd – LOS E
- NH 111 (Burnham Road) north of Central Street – LOS D
- NH 111 (Central Street) west of Kimball Hill Road – LOS E
- Wason Rd east of NH3A – LOS E

8.1 Future Conditions Analysis – Road Segments

Future conditions analysis for road segments involved using the NRPC regional travel demand model to predict future traffic growth on those segments in 2030 and 2045. The change in traffic volume that was predicted for each segment was then added to the actual 2022 traffic volumes. The totals for each analysis year were then converted from total weekday counts to peak hour counts (AM and PM) per direction and per lane via an Excel spreadsheet. The directional split was assumed to be 50/50. The converted counts were then classified by Volume to Capacity ratio and the resulting LOS according to the corresponding road segment class, as described below.

8.2 Future (2030) Conditions – Road Segments

Table 10, Map 3 and **Map 4** present information about 2030 Volume to Capacity (V/C) and LOS for the eighteen road segments that were analyzed in this study.

During the morning (AM) Peak period in 2030, eleven road segments operate at LOS C or better.

- NH 111 (Burnham Road) north of Central Street – improved to LOS C (LOS D in 2022)

The following road segments experience a LOS below C:

- NH 3A (Central St) east of Library St – LOS D (LOS C in 2022)
- Lowell Road south of Central St – LOS E (LOS E in 2022)
- Lowell Road south of Pelham Rd – LOS D (LOS D in 2022)
- Lowell Road south of Wason Rd – LOS D (LOS D in 2022)

- NH 102/3A north of Ledge Rd – LOS D (LOS D in 2022)
- NH 111 (Central Street) west of Kimball Hill Road – LOS E (LOS E in 2022)

During the afternoon (PM) Peak period in 2030, seven road segments operate at LOS C or better. The following road segments experience a LOS below C:

- NH 3A (Central St) west of Library St – LOS D (LOS D in 2022)
- NH 3A (Central St) east of Library St – LOS D (LOS D in 2022)
- Lowell Road south of Central St – LOS F (LOS F in 2022)
- Lowell Road south of Pelham Rd – LOS D (LOS D on 2022)
- Lowell Road south of Wason Rd – LOS E (LOS E in 2022)
- Lowell Rd south of Rena Ave – LOS D (LOS D in 2022)
- NH102 N. of Easy St – LOS D (LOS D in 2022)
- NH 102/3A north of Ledge Rd – LOS E (LOS E in 2022)
- NH 111 (Burnham Road) north of Central Street – LOS D (LOS D in 2022)
- NH 111 (Central Street) west of Kimball Hill Road – LOS F (LOS E in 2022)
- Wason Rd east of NH3A/Lowell Rd – LOS E (LOS E in 2022)

8.3 Future (2045) Conditions – Road Segments

Table 10, Map 3 and **Map 4** present information about 2045 Volume to Capacity (V/C) and LOS for the eighteen road segments that were analyzed in this study.

During the morning (AM) Peak period in 2045, eleven road segments operate at LOS C or better.

- NH 111 (Burnham Road) north of Central Street – improved to LOS C (LOS D in 2022, LOS C in 2030)

The following road segments experience a LOS below C:

- NH 3A (Central St) east of Library St – LOS D (LOS C in 2022 & LOS D in 2030)
- Lowell Road south of Central St – LOS F (LOS E in 2022 & 2030)
- Lowell Road south of Pelham Rd – LOS D (LOS D in 2022 & 2030)
- Lowell Road south of Wason Rd – LOS D (LOS D in 2022 & 2030)
- NH 102/3A north of Ledge Rd – LOS D (LOS D in 2022, & 2030)
- NH 111 (Central Street) west of Kimball Hill Road – LOS E (LOS E in 2022 & 2030)

During the afternoon (PM) Peak period in 2045, eight road segments operate at LOS C or better.

- NH 111 (Burnham Road) north of Central Street – improved to LOS C (LOS D in 2022 & 2030)

The following road segments experience a LOS below C:

- NH 3A (Central St) west of Library St – LOS D (LOS D in 2022 & 2030)
- NH 3A (Central St) east of Library St – LOS E (LOS D in 2022 & 2030)
- Lowell Road south of Central St – LOS F (LOS F in 2022 & 2030)
- Lowell Road south of Pelham Rd – LOS E (LOS D in 2022 & 2030)
- Lowell Road south of Wason Rd – LOS F (LOS E in 2022 & 2030)
- Lowell Rd south of Rena Ave – LOS D (LOS D in 2022 & 2030)
- NH102 N. of Easy St – LOS D (LOS D in 2022 & 2030)
- NH 102/3A north of Ledge Rd – LOS E (LOS E in 2022 & 2030)
- NH 111 (Central Street) west of Kimball Hill Road – LOS F (LOS E in 2022 & LOS F in 2030)
- Wason Rd east of NH3A/Lowell Rd – LOS F (LOS E in 2022 & 2030)

Table 10: Segment Volume-to-Capacity Ratio and Level of Service (LOS)

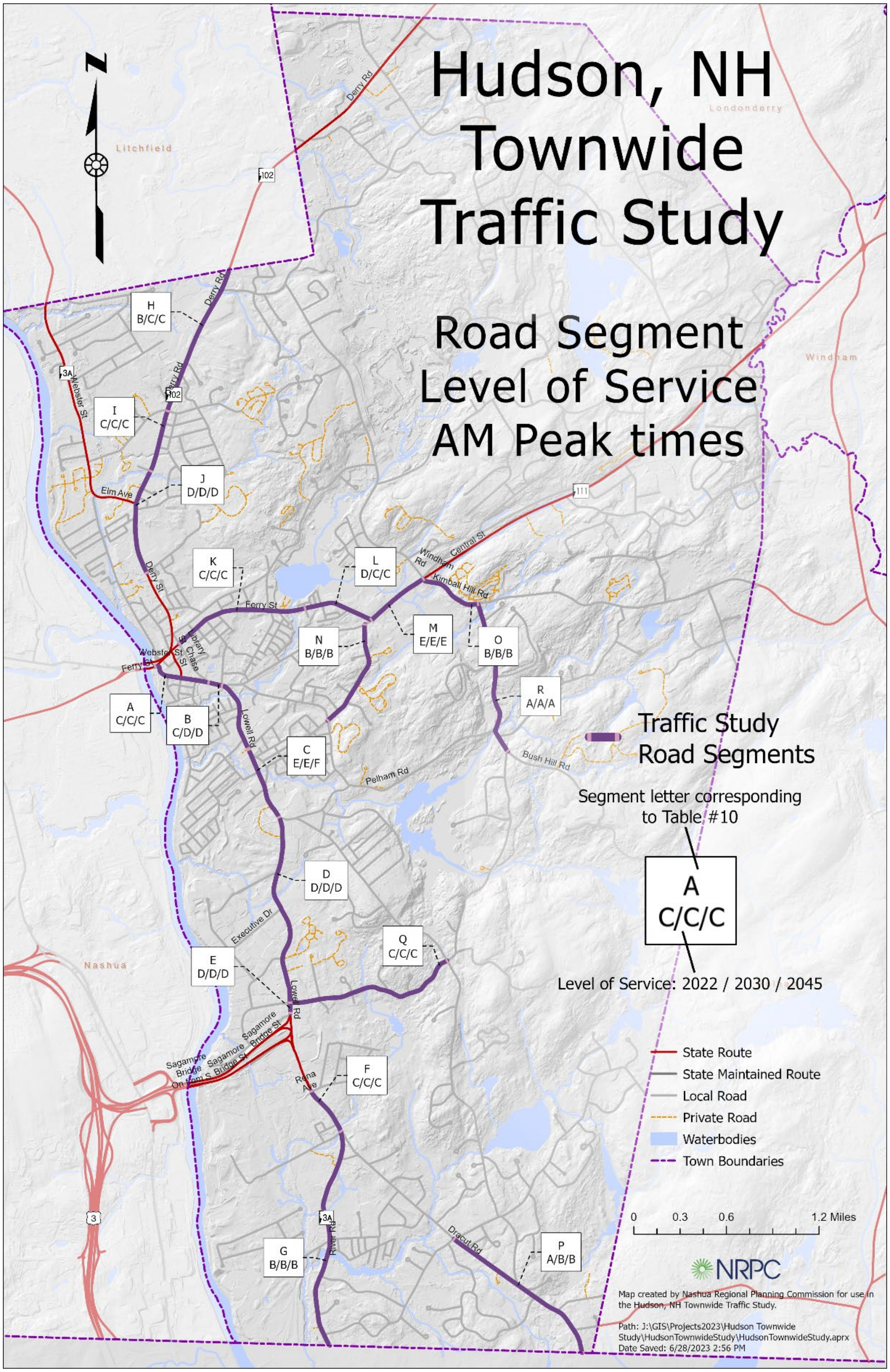
#	Segment	AM Peak						PM Peak					
		2022		2030		2045		2022		2030		2045	
		V/C	LOS	V/C	V/C	LOS	V/C	V/C	LOS	V/C	LOS	LOS	V/C
A	NH 3A (Central St) west of Library St	0.4	C	0.5	C	0.5	C	0.6	D	0.7	D	0.7	D
B	NH 3A (Central St) east of Library St	0.5	C	0.6	D	0.6	D	0.7	D	0.8	D	0.8	E
C	Lowell Rd south of Central St	0.9	E	1.0	E	1.0	F	1.1	F	1.2	F	1.3	F
D	Lowell Rd south of Pelham Rd	0.7	D	0.7	D	0.7	D	0.8	D	0.9	D	0.9	E
E	Lowell Rd south of Wason Rd#	0.6	D	0.7	D	0.8	D	0.8	E	1.0	E	1.0	F
F	Lowell Rd south of Rena Ave#	0.5	C	0.5	C	0.5	C	0.7	D	0.6	D	0.7	D
G	River Rd at Mass State Line	0.2	B	0.3	B	0.3	B	0.3	B	0.4	B	0.4	C
H	NH 102 at Litchfield Town Line#	0.3	B	0.5	C	0.5	C	0.4	B	0.6	C	0.6	C
I	NH 102 north of Easy St	0.5	C	0.5	C	0.6	C	0.7	D	0.7	D	0.7	D
J	NH 102/3A north of Ledge Rd	0.7	D	0.7	D	0.7	D	0.9	E	0.9	E	0.9	E
K	NH 111 (Ferry St) east of Library St	0.4	C	0.5	C	0.5	C	0.5	C	0.5	C	0.5	C
L	NH 111 (Burnham Rd) north of Central St	0.5	D	0.5	C	0.5	C	0.6	D	0.6	D	0.6	C
M	NH 111 (Central St) west of Kimball Hill Rd	0.8	E	0.9	E	0.9	E	0.9	E	1.0	F	1.0	F
N	Belknap Rd south of Central St	0.2	B	0.2	B	0.2	B	0.2	B	0.3	B	0.3	B
O	Kimball Hill Rd south of NH 111	0.3	B	0.4	B	0.4	B	0.4	B	0.4	C	0.4	C
P	Dracut Rd at Mass State Line#	0.2	A	0.2	B	0.2	B	0.3	B	0.4	C	0.4	C
Q	Wason Rd east of NH 3A	0.4	C	0.4	C	0.4	C	1.0	E	1.0	E	1.0	F
R	Bush Hill Rd north of Wason Rd	0.2	A	0.2	A	0.2	A	0.3	A	0.4	B	0.4	B

* Unsignalized intersection in various configurations.

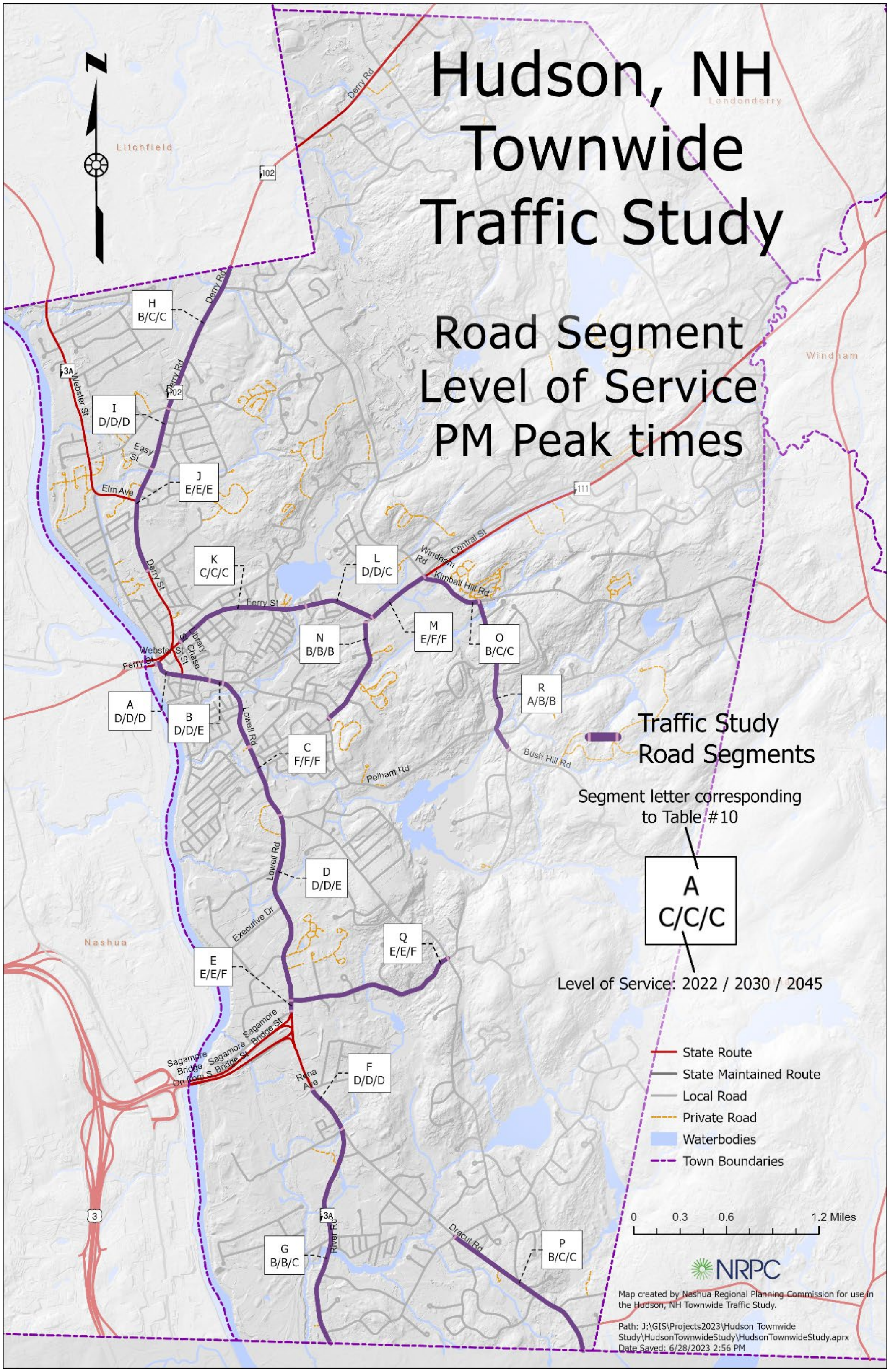
Improvement made to the intersection in 2030 and 2045

Blue LOS indicates an improvement In LOS and Red LOS indicates a decline in LOS

Map 3: Road Segment Level of Service AM Peak Times



Map 4: Road Segment Level of Service PM Peak Times



9. CONCLUSIONS

Level of service (LOS) is a qualitative measure used to relate the quality of motor vehicle traffic service. LOS is used to analyze roadways and intersections by categorizing traffic flow and assigning quality levels of traffic based on performance measures like vehicle speed, density, congestion, and other measures. Though not necessarily a universal view, LOS C is the target LOS for most intersections and roadways.

This study has shown that there are areas in Hudson where the intersection and road segment LOS is currently below LOS C or will be in the future. The following intersections are discussed because they each exhibit a LOS of D or worse either currently, or in future scenarios.

9.1 Intersections

Ferry St/Chase St (NH111/NH102/NH3A) – this multi-legged intersection exhibits LOS F for all three analysis years during both the morning and afternoon peak periods. Without roadway improvements, increasing traffic volume in the future will result in continued poor LOS and potentially longer delays in the afternoon peak period, particularly in 2045.

Mitigation Strategies to Consider:

- Further optimization of traffic signal timing to account for future traffic patterns.
- Coordinate with the City of Nashua to optimize traffic flow on Taylor Fall’s Bridge between the City of Nashua and Hudson.
- Reconfigure the intersections to improve traffic flow.
- Update GridSmart cameras to accommodate the unique geometry of this intersection.

Central St (NH111)/Kimball Hill Rd/Greeley St – this multi-legged intersection exhibits LOS F for all three analysis years during both the morning and afternoon peak periods. There are several protected signal turn phases that, coupled with high traffic volume, result in long delays for other turning movements. This intersection also accommodates traffic that uses the shortcut through Wason Rd/Pelham Rd/Kimble Hill Rd/Bush Hill Rd.

Mitigation Strategies to Consider:

- Further optimization of traffic signal timing to account for future traffic patterns.
- Reconfigure the intersection to improve traffic flow.
- The Hudson Boulevard concept could potentially divert traffic away from this intersection.
- Update GridSmart cameras to accommodate intersections with more than 4 legs and include the channelized turns in both directions on NH111 and from Hamblett Avenue.

Library St/Highland St – the existing (2022) LOS at this signalized intersection is C during the morning peak period and D in the afternoon peak period. The LOS degrades to E (morning peak period) and D (afternoon peak period) in future scenarios.

Mitigation Strategies to Consider:

- Further optimization of traffic signal timing to account for future traffic patterns.

Burnham Rd/Central St – the existing (2022) LOS at this signalized intersection is D during the morning and afternoon peak periods. The LOS degrades to D in all future scenarios.

Mitigation Strategies to Consider:

- Further optimization of traffic signal timing to account for future traffic patterns.
- The Hudson Boulevard concept could potentially divert traffic away from this intersection.

Lowell Rd/Pelham Rd – the existing (2022) LOS at this signalized intersection is C during the morning and D during the afternoon peak period. The afternoon LOS degrades to E in future scenarios.

Mitigation Strategies to Consider:

- Further optimization of traffic signal timing to account for future traffic patterns.
- The Hudson Boulevard concept could potentially divert traffic away from this intersection.

Lowell Rd/Executive Dr, Lowell Rd/Hampshire Dr/Oblate Dr – the existing (2022) LOS at these intersections is acceptable at LOS C or better. Future LOS on Lowell Rd/Executive Dr, however, degrades to LOS D in 2045 due to gradual development and resultant traffic to and from the Sagamore Industrial Park.

Mitigation Strategies to Consider:

- Further optimization of traffic signal timing to account for future traffic patterns.
- Reconfigure the intersections to improve traffic flow.
- Collaborate with businesses on Transportation Demand Management (TDM) measures.

Lowell Rd/Wason Rd – this intersection exhibits LOS D in both morning and afternoon peak periods and in both existing (2022) and future scenarios. This will be true even with the planned additional southbound right turn lane from Lowell Road onto the Sagamore Bridge.

Mitigation Strategies to Consider:

- Further optimization of traffic signal timing to account for future traffic patterns.
- The Hudson Boulevard concept could potentially divert traffic away from this intersection.

Lowell Rd/Sagamore Bridge – this intersection exhibits an acceptable LOS during the morning peak period currently and in the future planning years. The current afternoon peak period LOS is E, improving to D in 2030 and then regressing to LOS E in 2045. This suggests that the intersection improvements associated with the Hudson Logistics Center are generally adequate in the near to mid-term, but the LOS E predicted in 2045 is cause for concern.

Mitigation Strategies to Consider:

- Further optimization of traffic signal timing to account for future traffic patterns.
- The Hudson Boulevard concept would impact this intersection.

Lowell Rd/Steele Rd/Dracut Rd/River Rd – this intersection exhibits an acceptable LOS during the morning peak period currently and in the future planning years. The current afternoon peak period LOS is F, improving to C in 2030 and then regressing to LOS F in 2045. This will be true even with the planned additional southbound left turn lane from Lowell Road onto Dracut Road.

Mitigation Strategies to Consider:

- Further optimization of traffic signal timing to account for future traffic patterns.
- Update GridSmart cameras to accommodate intersections with more than 4 legs.

Dracut Rd/Sherburne Rd – this intersection exhibits an acceptable LOS during the morning peak period currently and in the future planning years. The current afternoon peak period LOS is F, improving to B in both 2030 and 2045. The improvement is the result of the planned signalization of this intersection.

9.2 Road Segments

Central St/Kimble Hill Rd/ Bush Hill Rd/Pelham Rd/Wason Rd – these road segments carry traffic from across the Mass State Line (Dracut Rd & River Rd) or from the Sagamore Bridge to communities east of Hudson that is attempting to bypass the congestion on Lowell Rd between Wason Road and the downtown area of Hudson. This two-lane route passes through residential areas and must navigate several heavily traveled intersections (Lowell Rd/Sagamore Br & NH111/Kimble Hill Rd). The LOS for this corridor generally degrades in future analysis years.

Mitigation Strategies to Consider:

- Explore potential alternative corridors such as the Hudson Boulevard concept.
- TDM measures that reduce traffic volume in general.

NH3A (Central St) west of Library Street – this segment exhibits LOS C during the current and future morning peak periods. The segment exhibits LOS D in the current and future year afternoon peak periods.

Mitigation Strategies to Consider:

- TDM measures that reduce traffic volume in general.

NH3A (Central St) east of Library Street – this segment exhibits LOS C during the current morning peak period and degrades to LOS D in future morning peak periods. The segment exhibits LOS D in the current 2030 afternoon peak periods and degrades to LOS E in 2045.

Mitigation Strategies to Consider:

- TDM measures that reduce traffic volume in general.

Lowell Road south of Central Street – this segment exhibits LOS E during the current morning peak period, and LOS E (2030) and LOS F (2045) in future morning peak periods. The segment exhibits LOS F in the current and future year afternoon peak periods.

Mitigation Strategies to Consider:

- TDM measures that reduce traffic volume in general.
- Explore potential alternative corridors such as the Hudson Boulevard concept.

Lowell Road south of Pelham Rd – this segment exhibits LOS D during the current and future morning peak periods. The segment exhibits LOS D in the current and 2030 afternoon peak periods and LOS E in 2045.

Mitigation Strategies to Consider:

- TDM measures that reduce traffic volume in general.
- Explore potential alternative corridors such as the Hudson Boulevard concept.

Lowell Road south of Wason Road (between Wason Road and the Sagamore Bridge) – this segment exhibits LOS D during the current and future morning peak periods. The segment exhibits LOS E in the current and 2030 afternoon peak periods, and LOS F in 2045.

Mitigation Strategies to Consider:

- Explore potential alternative corridors such as the Hudson Boulevard concept.
- TDM measures that reduce traffic volume in general.
- Capacity improvements.

Lowell Road between Sagamore Bridge and Rena Avenue – traffic to the future Hudson Logistics Center will travel on this road segment. It is therefore notable that this segment of roadway exhibits LOS C in the current and future morning peak periods, and LOS D in the current in future afternoon peak periods. This suggests that future roadway improvements associated with the logistics center will accommodate the impacts of this future development.

NH102 north of Easy Street – this segment exhibits LOS C during the current and future morning peak periods. The segment exhibits LOS D in the current and future afternoon peak periods.

Mitigation Strategies to Consider:

- TDM measures that reduce traffic volume in general.

NH102 north of Ledge Road – this segment exhibits LOS D during the current and future morning peak periods. The segment exhibits LOS E in the current and future afternoon peak periods. This segment of the road has numerous retail businesses, and it is a significant arterial roadway.

Mitigation Strategies to Consider:

- TDM measures that reduce traffic volume in general.
- Further optimization of traffic signal timing at the various nearby intersections.

NH111 (Burnham Rd) north of Central St – this segment exhibits LOS C during the current and future morning peak periods. The segment exhibits LOS D in the current and 2030 afternoon peak periods and improves to LOS C in the 2045 afternoon peak period.

Mitigation Strategies to Consider:

- Continue with current measures.

9.3 Transportation Demand Management (TDM)

Transportation demand management (TDM) is defined as a set of strategies aimed at maximizing traveler choices. Traditionally, TDM has been narrowly defined as commuter ridesharing and its planning application restricted to air quality mitigation (conformity analysis), development mitigation (reducing trip generation rates and parking needs), or efforts to increase multi-modalism in transportation plans. A more contemporary definition of TDM consists of maximizing travel choices, as stated in the definition provided in an FHWA report on TDM:

> *Managing demand is about providing travelers, regardless of whether they drive alone, with travel choices, such as work location, route, time of travel and mode. In the broadest sense, demand management is defined as providing travelers with effective choices to improve travel reliability.*

Measures can include, but are not limited to, public transportation (transit), alternative modes (walk & bike), carpool/vanpool, remote work, flexible work hours, staggered schedules, and other measures.

Transportation Demand Management is most effective when partnering with major employers, local businesses, institutions, transit agencies, nonprofits, and other stakeholders.

Resources:

- CommuteSmartNH
- Federal Highway Administration (FHWA) TDM Definition
- Mobility Lab