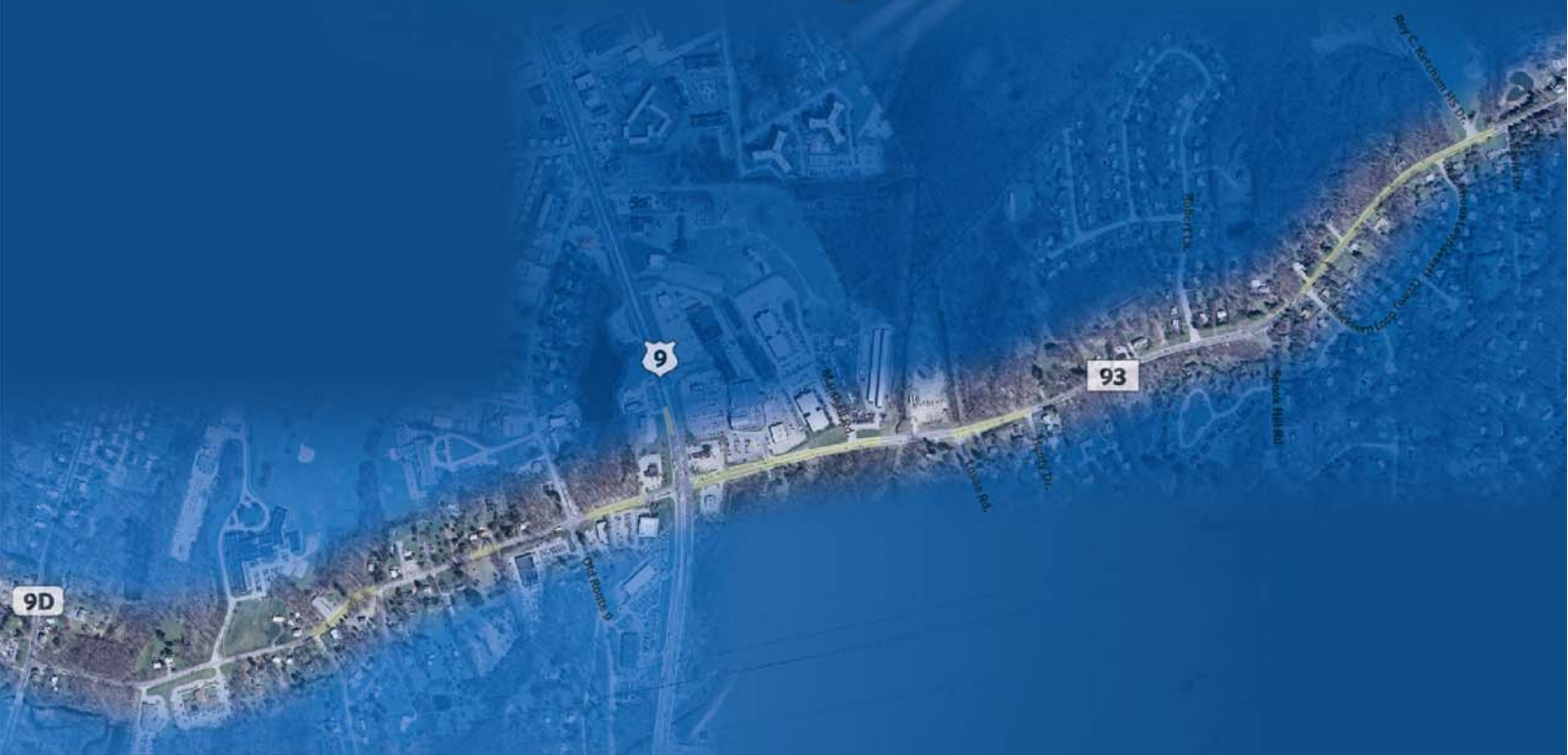
Technical Memorandum 2

# Corridor Build-Out and Capacity

## CR 93 Corridor Management Plan




PDCTC

Poughkeepsie-Dutchess County Transportation Council

Technical Memorandum 2

# Corridor Build-Out and Capacity

## CR 93 Corridor Management Plan

Prepared for

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# EXECUTIVE SUMMARY

This Technical Memorandum focuses on future land use and zoning, existing and future traffic simulation results, and analysis of future transportation conditions in the study area.

The future conditions analysis identifies needs and deficiencies in the corridor. The following is a list of issues and observations based on the future conditions analysis.

| Issue | Observations |
|---|---|
| Future Land Use | • Approximately 20 percent of the analysis areas in the corridor are expected to experience high growth by 2020. However, this growth consists of only a few major developments.<br>• Cranberry Hills is the largest residential development anticipated to be complete by 2020.<br>• The Laerdal property is the largest office development expected by 2020 in the corridor. The existing vacant space in two of its buildings is anticipated to be mostly occupied by 2020. |
| Future Growth | • Traffic growth is estimated to range between 0.3 to 1.6 percent per year in the corridor.<br>• Higher growth is anticipated in the eastern portion of the corridor. |
| Congestion/Delays | • 4 of the 6 signalized intersections are anticipated to operate at LOS E or worse either overall or for certain movements in 2020.<br>• 9 of the 14 un-signalized intersections are anticipated to operate at LOS F for the side street left turn movement in 2020.<br>• The CR 93/Route 9 intersection is anticipated to experience significant delays and queuing in 2020, thereby impacting adjacent intersections including Old Route 9, Hannaford Plaza, and Marshall Road.<br>• The CR 93/CR 94 intersection is anticipated to experience significant delays and queuing during the P.M. peak hour.<br>• Losee Road, Spook Hill Road, Kent Road, Ervin Drive, Blackthorn Loop West, Myers Corners Elementary School driveway, and Major MacDonald Way experience LOS F during peak periods. |
| Safety | • The projected higher volumes, congestion and delays in the future are likely to create unsafe conditions. At stop-controlled intersections, drivers making left turns may be overly aggressive due to the lack of gaps in traffic. At signalized intersections, drivers may follow vehicles too closely to try to avoid delays at the signal. |
| | |

## Next Steps

- Identify focus areas for analysis and recommendations based on the identified deficiencies under existing and future conditions such as poor traffic operations (levels of service), limited walking, bicycling, and transit infrastructure, and overall safety conditions in the corridor.

- Develop a series of travel improvement strategies that may include:

    - Intersection improvements such as turn lanes, traffic signal timing changes, and/or roundabouts.
    - New sidewalk connections and wider shoulders.
    - Transit improvements such as pull-off areas for buses based on future planned routes.
    - Suggest alternate truck routes and recommend off-peak activity.
    - Anticipated changes in school bus routes based on discussions with the Wappinger Central School District (WCSD).

- Evaluate travel improvement strategies, provide recommendations for short and long term improvements, develop conceptual costs, and establish implementation timelines.

- Discuss strategies and recommendations with the Advisory Committee and at public meetings.

- Develop a corridor management plan.

# 1 INTRODUCTION

## *1.1 Review of Existing Conditions*

***Technical Memorandum # 1, titled "Existing Conditions Report"*** documented results from a detailed analysis of existing land use and zoning, transportation, safety, and alternative transportation conditions in the study area. The following provides a summary of the issues and observations resulting from the existing conditions analysis:

| Issues | Observations |
|---|---|
| | |
| Future Growth | • 27 percent of the study area is undeveloped.<br>• 85 percent of the undeveloped land in the study area is zoned residential.<br>• 70 percent of the undeveloped land in the study area is between Route 9 and CR 94. |
| Congestion/Delays | • 7 of the 20 study intersections operate at a poor level of service (LOS F), either overall or for certain movements.<br>• Of the seven intersections, one is a signalized intersection and the remaining six are un-signalized or stop-controlled.<br>• Three intersections operate at LOS F during the A.M. peak hour and six intersections operate at LOS F during the P.M. peak hour. Three intersections operate at LOS F during the Saturday mid-day peak hour. |
| Safety | • At ten locations (8 intersections and 2 segments), the crash rate exceeds the statewide average crash rate for similar facilities.<br>• There is a high percentage of rear-end crashes in the corridor. |
| Alternative Transportation (bicycling, walking, and transit) | • There is limited infrastructure for non-vehicular modes (walking and bicycling) in the corridor.<br>• There is limited transit service in the corridor. |

## *1.2 Contents of Technical Memorandum #2*

Technical memorandums will be developed throughout the Corridor Management Plan study. These memorandums provide information on the current status of work and ensure progress toward development of the draft and final Corridor Management Plan.

This memorandum contains information on the future land use and zoning, existing and future traffic simulation results, and analysis of future transportation conditions within the study area. The document is divided into three sections covering the following main topics:

1. Future land use and zoning under current zoning and under Draft Comprehensive Plan zoning.
2. Traffic simulation modeling – use of TransModeler, modeling assumptions, calibration process, and future traffic operational deficiencies in the study area.
3. Summary of future conditions, issues and observations, and next steps.

Each of these sections presents data that will be used in the next phase to:

- Identify focus areas for analysis and recommendations
- Develop a series of travel improvement strategies
- Evaluate travel improvement strategies, provide recommendations, and establish implementation timelines
- Facilitate discussion with the Advisory Committee and at public meetings

The information provided in the following sections of this Technical Memorandum will be updated through the course of the study and any new information will be incorporated into the final report.

# 2 LAND USE AND ZONING

This chapter discusses growth in the study area anticipated by 2020 under current and Draft Comprehensive Plan zoning.

## *2.1 Overview of Existing Land Use and Zoning*

***Technical Memorandum # 1, titled "Existing Conditions Report"*** documented findings from a detailed review of existing land use and zoning conditions in the study area. Below is list of key points relevant to the corridor built-out potential:

- Residential is the predominant land use in the study area. Single family housing comprises of 46 percent of the land use in the study area.
- Approximately 27 percent of the study area is undeveloped. This generates a potential for future growth.
- Approximately 70 percent of the undeveloped land in the study area is located between Route 9 and CR 94.
- The Cranberry Hills (TAZ No. 224) and Brookvale (TAZ No. 270) properties account for the largest portion of vacant area in the corridor (please refer to **Figure 2.1).**
- Based on current zoning, approximately 85 percent of the undeveloped land in the study area is zoned residential.
- Of the undeveloped land zoned residential, approximately 96 percent is zoned for single family residential (R-20, R-40, and R-20/40).
- Approximately 77 percent of the area zoned "Conservation Commercial" is vacant.
- The Wappinger Central School District (WCSD) anticipates a decline in student enrollment throughout the district of about 3 percent over the next ten years.

## *2.2 Future Land Use and Zoning*

Based on discussions with the project team and advisory committee, a future year of 2020 was identified for evaluating the corridor build-out. A study area was defined for the land use analysis by identifying areas that may have a direct impact on the CR 93 corridor. These areas were defined as Traffic Analysis Zones (TAZs). The selected study area consists of 61 TAZs. To further understand growth patterns in the study area, the TAZs were characterized as low, medium, or high growth areas using the following definitions:

***Low growth:*** 0-10 percent increase in population or employment from 2009 to 2020
***Medium growth:*** 10-25 percent increase in population or employment from 2009 to 2020
***High growth*****:** more than 25 percent increase in population or employment from 2009 to 2020

**Figure 2.1** shows low, medium, and high growth TAZs within the study area based on anticipated future build-out by 2020. As indicated in the figure, there are few TAZs that show high growth between 2009 and 2020.

Zoning changes could significantly alter the potential for growth in vacant portions of the study area. Therefore, corridor build-out was estimated under two zoning conditions – existing zoning and Draft Comprehensive Plan zoning. The following sections detail the differences in corridor build-out by 2020 between current and Draft Comprehensive Plan zoning.

### 2.2.1 Future Land Use under Current Zoning

**Table 2.1** lists the anticipated high growth TAZs in the study area under current zoning:

**Table 2.1: High Growth Traffic Analysis Zones - Current Zoning**

| TAZ No. | Name | Anticipated Development – 2009 to 2020 |
|---|---|---|
| 218 | Opposite DeGarmo Hills Road on CR 93 | Increase in retail employment from 0 to 11. (1) |
| 221 | Laerdal Property | Increase in office employment from 350 to 634. This is mainly due to vacant office space available in two buildings on the site. |
| 223 | The Preserve | Increase in residential dwelling units from 2 to 40. |
| 224 | Cranberry Hills | Increase in residential dwelling units from 1 to 233. |
| 232 | Northeast corner of CR 93/CR 94 | Increase in residential dwelling units from 13 to 17. (1) |
| 233 | Opposite Major MacDonald Way on CR 93 | Increase in residential dwelling units from 34 to 44. (1) |
| 235 | Northeast corner of CR 93/Route 9D | Increase in residential dwelling units from 17 to 23. (1) |
| 240 | DCH Toyota<br>Spooge<br>Elgin Office Building | Increase in retail employment at DCH Toyota from 61 to 146. Increase in non-retail employment at Spooge and Elgin office building from 92 to 120. |
| 250 | Riverbend II | Increase in residential dwelling units from 124 to 178. |
| 261 | Hudson Valley Cerebral Palsy Association | Increase in non-retail employment from 2 to 9. |
| 270 | Brookvale | Increase in residential dwelling units from 3 to 57. |
| 272 | La Fonda Del Sol | Increase in retail employment from 0 to 50. Increase in non-retail employment from 0 to 15. |
| 297 | Overcreek Property | Increase in residential dwelling units from 3 to 38. |
| | | |

Note: (1) Growth is based on general growth projections.
Source: Wilbur Smith Associates

# Future Land Use Growth Areas

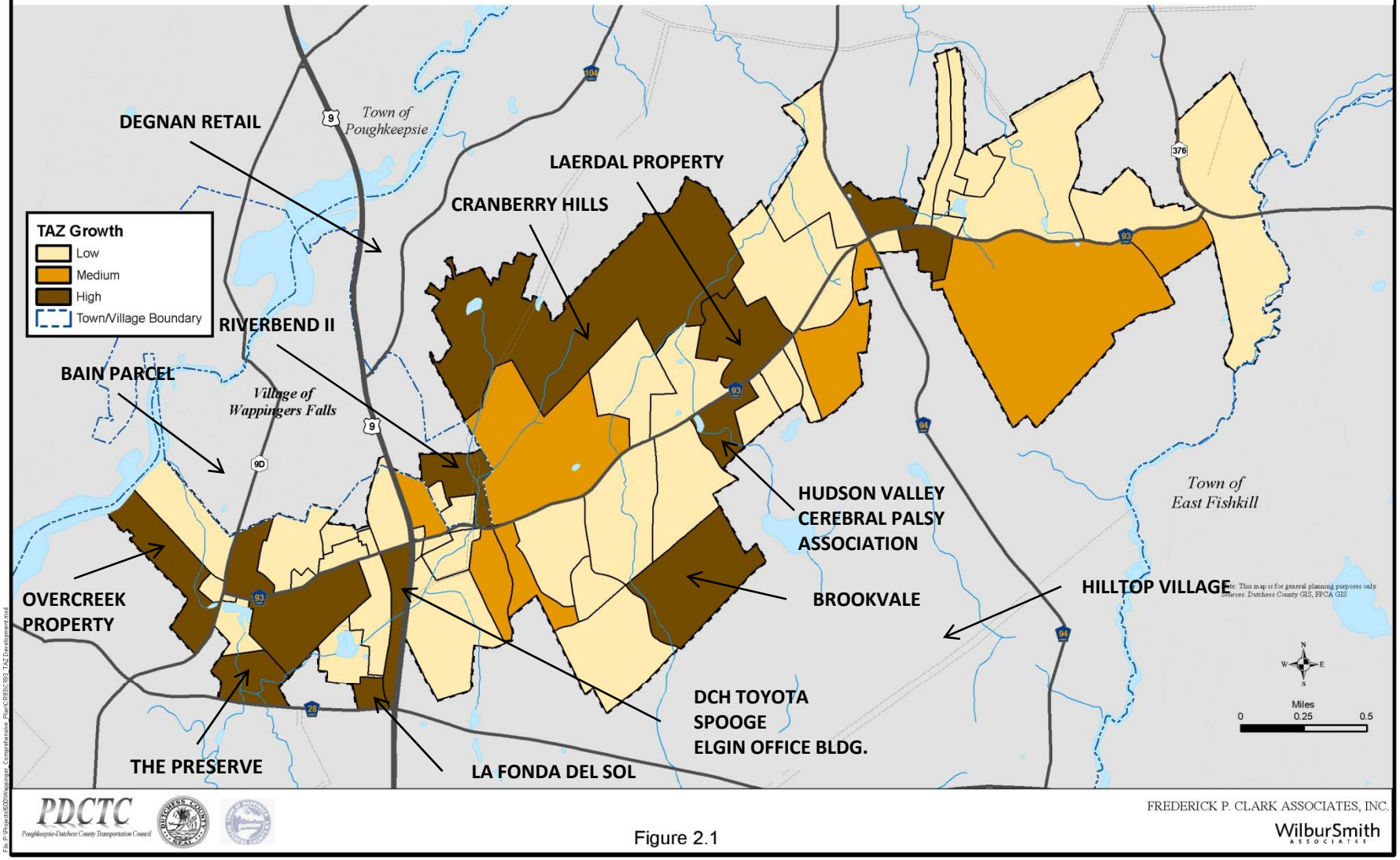



Figure 2.1

In addition, there are three developments outside the study area with high growth anticipated by 2020:

- **Bain Parcel** – Proposed 20-unit residential development spread between 5 four-plexes. Also, potential active recreational use at Temple Fields.

- **Degnan Retail site** – Proposed 24,500 S.F. retail and 3,000 S.F. restaurant in addition to existing 16,000 S.F. retail and 4,000 S.F. office use.

- **Hilltop Village**- Proposed 228 active adult units west of All Angels Hill Road at Hilltop Drive.

### 2.2.2 Future Land Use under Draft Comprehensive Plan Zoning

There is only one minor difference in the anticipated development under the Draft Comprehensive Plan zoning: Cranberry Hills would have a lower intensity of development in 2020. The number of dwelling units would increase from 1 in 2009 to 103 in 2020 (130 units fewer than under current zoning).

***Recognizing that the Town intends to adopt a new Comprehensive Plan in the near future, the project team and PDCTC agreed to base the future (2020) corridor build-out on the draft comprehensive plan zoning.***

**Summary Points**

- The anticipated corridor build-out based on the Draft Comprehensive Plan zoning was used to evaluate future traffic conditions.
- Approximately 20 percent of the analysis areas in the corridor are expected to experience high growth by 2020. However, this growth consists of only a few major developments.
- Cranberry Hills is the largest residential development anticipated to be complete by 2020.
- The Laerdal property is the largest office development expected by 2020 in the corridor. The existing vacant space in two of its buildings is anticipated to be mostly occupied by 2020.

# 3 TRAFFIC SIMULATION MODELING

This chapter describes the traffic models, the calibration process, and analysis of future conditions.

## *3.1 Overview of TransModeler*

### 3.1.1 Definition

TransModeler is a traffic simulation model which tracks the flow of vehicles in a given roadway network (local streets, urban arterials, freeways, and ramps). These vehicles travel between an origin and a destination specified in the roadway network. TransModeler can model complex roadway systems, different vehicle types, and various driving characteristics. TransModeler can also generate a variety of statistics which is useful in comparing alternatives.

### 3.1.2 Purpose

The purpose of using TransModeler is to determine the traffic operational deficiencies of an entire roadway system, rather than an individual roadway segment or intersection. TransModeler can also demonstrate the benefits of making a traffic operational improvement on that roadway system. These benefits can be quantified through a variety of statistics generated by the model. Some of the common statistics are delay, travel time, and vehicle queue length.

### 3.1.3 Interaction between TransCAD and TransModeler

TransCAD is a software tool used to forecast travel demand and predict changes in travel patterns in response to changes in land use and demographics. As part of the TransCAD modeling process, the study area is subdivided into TAZs (as described in Section 2.2) based on the roadway network and the land use characteristics of each zone. Employment and housing data for each TAZ is used to determine the number of trips generated in that zone. Traffic that originates in one zone is either destined to another zone within the study area or to a zone outside the study area. Trips between zones are identified by using a matrix known as the Origin-Destination (O-D) matrix. An O-D matrix is essentially a table with rows representing origins and columns representing destinations. This O-D matrix is an essential piece linking TransCAD and TransModeler.

TransCAD generates trips and distributes the trips based on land use data. The distributed trips are summarized in an O-D matrix, which serves as an input for TransModeler. In TransModeler, the initial O-D matrix is adjusted to reflect traffic counts collected in the study area. This process creates a new matrix which is used to create the existing conditions model in TransModeler.

## *3.2 Calibration of Existing (2009) Conditions*

### 3.2.1 Model Setup and Assumptions

For this project, a TransModeler network was created based on an existing TransCAD model. A TransCAD model is represented by links (to show roadways) and nodes (to show intersections). Link parameters include length, speed, travel time, and volume. Nodes represent an intersection of two or more links. The TransCAD network for the study area was refined in TransModeler by adding following elements:

- ***Side streets***
  The TransModeler network was expanded to include side streets in the study area that were not part of the TransCAD network. Side streets that were added include Major MacDonald Way, Hannaford Plaza Drive, Marshall Road, Losee Road, Robert Lane, Blackthorn Loop West, Blackthorn Loop East, Roy C. Ketcham High School driveway, Ervin Drive, Myers Corners Elementary School driveway, Laerdal Drive, DeGarmo Hills Road and Montfort Road.

- ***Traffic control (traffic signals, stop signs)***
  Traffic signals and stop signs were added at study area intersections in TransModeler. TransModeler can model traffic signal operations based on signal timing and phasing data collected in the field.

- ***Turning lanes (left or right turn lane, storage length)***
  Left or right turn lanes were added on approaching links to an intersection where applicable. The storage length of the turn lanes was also added based on field measurements.

- ***Road segment data (number of lanes, speed)***
  The portion of a link between two intersections constitutes a segment. Segment information (i.e. number of lanes and travel speed) was verified in TransModeler to reflect proper roadway geometry and speeds based on field conditions.

- ***Centroids and centroid connectors***
  Traffic generation within a TAZ is identified by a centroid. Centroids can be origins (where a trip originates in the zone) or destinations (where a trip is destined in a zone). Centroids are connected to a roadway link using a centroid connector. Centroids and centroid connectors were created in TransModeler consistent with those in the TransCAD model.

For this project, A.M. and P.M. existing conditions models were developed in TransModeler. Traffic volumes, signal timings and phasing, and time period-specific data was input into the model. The following assumptions were made in the modeling process:

- Traffic conditions at the intersection represent the worst one-hour during the A.M. and P.M. peak periods.
- Traffic volumes reflect peak 15 minute periods. To reflect this, traffic volumes at each intersection were adjusted by a peak hour factor before inputting them into the model.
- Based on the traffic counts collected, Saturday mid-day peak hour traffic volumes along the corridor are lower than A.M. or P.M. peak hour volumes. Therefore, a Saturday mid-day peak hour model was not developed.

### 3.2.2 Calibration Process

Calibration is an essential element of a transportation modeling process. The calibration process tries to achieve a traffic simulation model that reflects observed field conditions as closely as possible. Typically, traffic simulation models are calibrated based on field measurements of delay and vehicle queues at intersections. For this project, calibration was based on traffic counts, field observations of vehicle queues, and feedback from the Dutchess County Department of Public Works (DCDPW) and New York State Department of Transportation (NYSDOT). Additionally, the results of the SYNCHRO model analysis reported in Technical Memo #1 provided an estimate of delay at each intersection under existing conditions that was used in the calibration process.

### 3.2.3 Calibration Results

The existing A.M. and P.M. peak hour simulation models were run multiple times adjusting the traffic simulation parameters to reflect observed field conditions as closely as possible. Intersection delays were obtained from TransModeler and compared to the delays obtained in the SYNCHRO analysis for the existing A.M. and P.M. peak hour conditions. Additionally, vehicle queues observed in the field during peak hours were used to adjust the model.

**Table 3.1** summarizes vehicle delays (measured in seconds per vehicle) obtained from TransModeler at the study area intersections under existing (2009) conditions. Overall intersection delay is listed for signalized intersections and side street delay is listed for un-signalized or stop-controlled intersections. Delay at stop-controlled intersections is prone to variation in TransModeler because one left turning vehicle can hold up traffic while waiting for a gap in opposing traffic. In the real world, right turners or through traffic in the queue may pull around these left turners in the shoulder or in the same lane if there is adequate width. Simulation models are typically less accurate at simulating stop-controlled intersections than signalized intersections, so the average delays at stop-controlled intersections may not be a true representation of actual field conditions.

The table also compares the TransModeler and SYNCHRO model delays. ***However, it should be noted that the TransModeler and SYNCHRO models have different characteristics and capabilities and results can vary significantly.***

SYNCHRO and TransModeler compute average delays differently. SYNCHRO analyzes each intersection separately and not as a system. When SYNCHRO computes average delay at an intersection, it does not take into account traffic conditions at adjacent intersections in the corridor. On the other hand, TransModeler follows a system approach by taking into consideration traffic conditions at adjacent intersections and along the corridor. Therefore, the average delay in TransModeler differs from SYNCHRO when there is congestion in the corridor such as in the vicinity of Route 9.

**Table 3.1: Comparison of Existing (2009) TransModeler and SYNCHRO Delays**

| Intersection | Average delay (expressed in seconds per vehicle) | | | |
|---|---|---|---|---|
| | AM Peak | | PM Peak | |
| | TransModeler | SYNCHRO | TransModeler | SYNCHRO |
| **Route 9D** | **33.2** | **29.2** | **31.6** | **47.3** |
| Major MacDonald Way | 84.7 | 109.6 | 114.8 | 151.4 |
| **Old Route 9** | **21.3** | **22.6** | **25.8** | **20.4** |
| **Route 9** | **39.4** | **51.6** | **62.9** | **98.0** |
| Hannaford Plaza driveway | 22.0 | 41.3 | 434.9 | 870.7 |
| **Marshall Road** | **10.4** | **9.6** | **17.6** | **15.4** |
| Losee Road | 84.5 | 108.4 | 182.3 | 332.2 |
| Roberts Lane | 23.6 | 16.7 | 29.0 | 25.4 |
| Spook Hill Road | 32.2 | 38.6 | 182.5 | 212.6 |
| Blackthorn Loop West | 29.2 | 24.8 | 42.7 | 43.2 |
| Blackthorn Loop East | 20.2 | 27.7 | 16.9 | 21.6 |
| **Roy C. Ketcham High School driveway** | **20.0** | **28.9** | **12.0** | **13.7** |
| Ervin Drive | 30.8 | 29.2 | 58.6 | 66.2 |
| Kent Road | 37.1 | 78.8 | 48.7 | 34.9 |
| Myers Corners Elementary School driveway | 38.9 | 45.2 | 27.2 | 23.6 |
| **Laerdal Drive** | 19.3 | 24.4 | **12.2** | **9.9** |
| **CR 94** | **26.4** | **26.0** | **52.9** | **48.5** |
| DeGarmo Hills Road | 16.1 | 13.1 | 15.7 | 17.1 |
| Montfort Road | 9.2 | 13.0 | 7.4 | 18.8 |
| Route 376 | 21.7 | 22.5 | 15.8 | 38.7 |

Note: Signalized intersections are shown in bold.
Source: Wilbur Smith Associates

The results of the calibration process indicate that average delays from the TransModeler and SYNCHRO models are similar at many intersections in the study area.

In addition to SYNCHRO delays, vehicle queuing observed in the field was used to calibrate the TransModeler model.

## *3.3 Future (2020) Conditions*

This section details the modeling process for the future (2020) conditions and the results of the level of service analysis from TransModeler for the A.M. and P.M. peak hours.

### 3.3.1 Future Travel Demand Model

The future year travel demand model was based on the future land use and background growth anticipated in the study area. As discussed in the earlier chapter, some TAZs are expected to have relatively high growth by 2020 while most TAZs will experience low to moderate growth, based on the town's Draft Comprehensive Plan zoning. The TransCAD model was used to estimate future traffic in the corridor based on regional growth and growth within the study area. Regional growth is associated with areas outside the study area that would contribute traffic to the CR 93 corridor.

### 3.3.2 Model Setup – Matrix Development

The TransCAD model provides a future (2020) O-D matrix for zones in the study area based on future land use (housing and employment data). The difference between the future (2020) and the existing (2009) TransCAD O-D matrices represents actual growth in traffic in the study area. This difference, when added to the existing (2009) TransModeler O-D matrix, results in a future (2020) O-D matrix that serves as an input to the 2020 TransModeler model. Separate O-D matrices were developed for the 2020 A.M. and P.M. TransModeler models based on the TransCAD model results.

No roadway or traffic signal changes were assumed to occur in the study area by 2020. Therefore, the existing (2009) model network was used for the future (2020) model network.

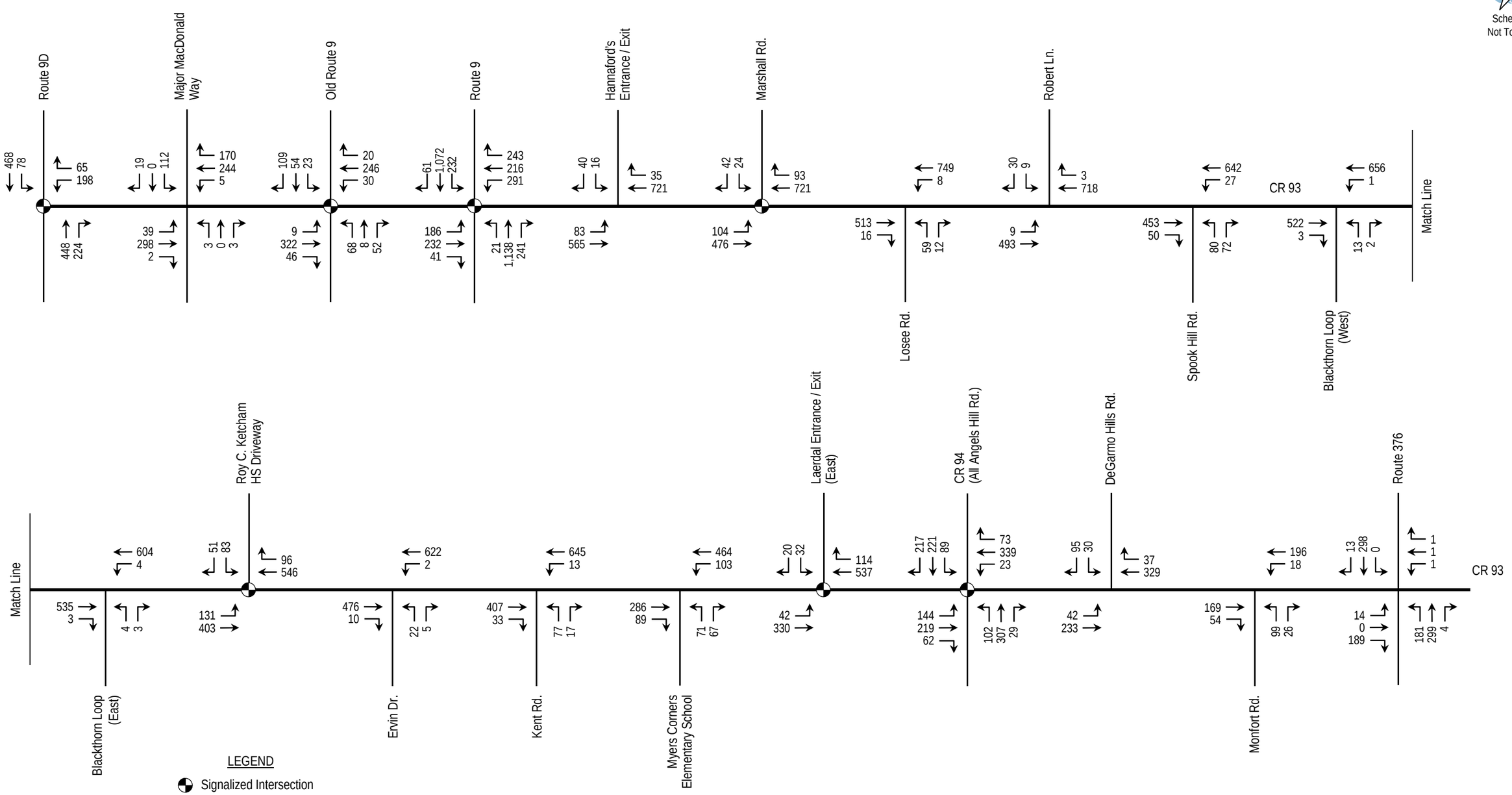
### 3.3.3 2020 Under Draft Comprehensive Plan Zoning

Future (2020) traffic simulation models were created to represent 2020 traffic conditions in the A.M. and P.M. peak hours under Draft Comprehensive Plan zoning. Future (2020) A.M. and P.M. O-D matrices served as inputs into TransModeler to generate future traffic volumes and levels of service in the study area.

**Figure 3.1**and **Figure 3.2** illustrate future (2020) A.M. and P.M. peak hour traffic volumes at the study area intersections. **Table 3.2** summarizes the anticipated growth in traffic volume in the study area along CR 93, Route 9D, Route 9, CR 94, and Route 376.

# CR 93 Corridor Management Plan

Schematic
Not To Scale

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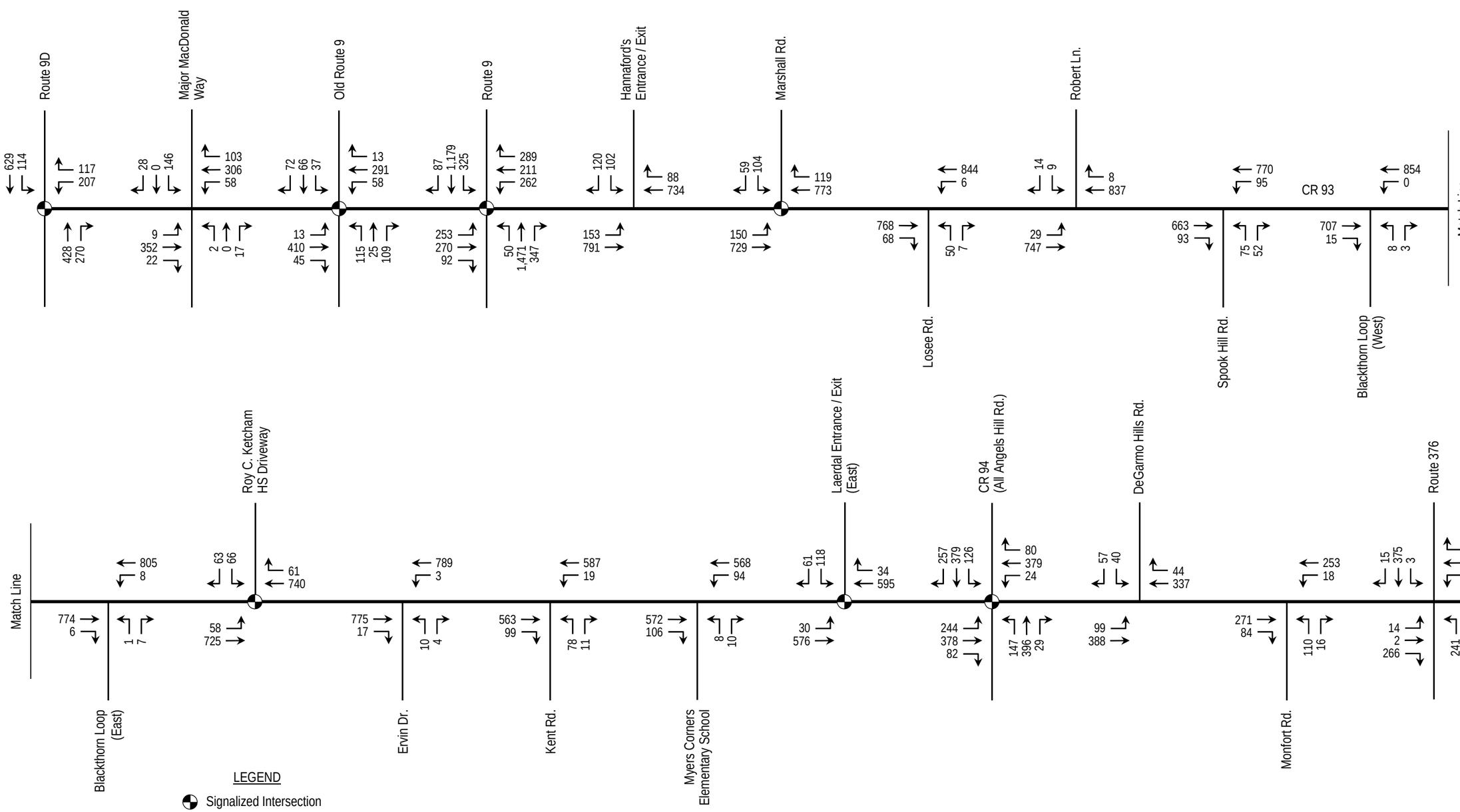
## FUTURE (2020) WEEKDAY A.M. PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.1

Schematic
Not To Scale

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## FUTURE (2020) WEEKDAY P.M. PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.2

**Table 3.2: Anticipated Average Annual Traffic Growth in the Study Area**

| Location | AM Peak | | | PM Peak | | |
|---|---|---|---|---|---|---|
| | Two-way traffic volume | | **Average Annual Traffic Growth (%) [1]** | Two-way traffic volume | | **Average Annual Traffic Growth (%) [1]** |
| | 2009 | 2020 | | 2009 | 2020 | |
| **CR 93** | | | | | | |
| East of Major MacDonald Way | 794 | 828 | **0.4%** | 948 | 982 | **0.3%** |
| East of Marshall Road | 1,154 | 1,306 | **1.1%** | 1,661 | 1,724 | **0.3%** |
| East of Robert Lane | 1,075 | 1,223 | **1.2%** | 1,526 | 1,601 | **0.4%** |
| East of Kent Road | 983 | 1,082 | **0.9%** | 1,124 | 1,181 | **0.5%** |
| East of DeGarmo Hills Road | 544 | 629 | **1.3%** | 773 | 810 | **0.4%** |
| **Route 9D** | | | | | | |
| North of CR 93 | 949 | 1,059 | **1.0%** | 1,232 | 1,288 | **0.4%** |
| South of CR 93 | 1,214 | 1,337 | **0.9%** | 1,459 | 1,534 | **0.5%** |
| **Route 9** | | | | | | |
| North of CR 93 | 2,558 | 2,865 | **1.0%** | 3,433 | 3,604 | **0.4%** |
| South of CR 93 | 2,508 | 2,801 | **1.0%** | 3,215 | 3,401 | **0.5%** |
| **CR 94** | | | | | | |
| North of CR 93 | 976 | 1,039 | **0.6%** | 1,424 | 1,482 | **0.4%** |
| South of CR 93 | 704 | 716 | **0.1%** | 1,020 | 1,057 | **0.3%** |
| **Route 376** | | | | | | |
| North of CR 93 | 527 | 625 | **1.6%** | 655 | 766 | **1.4%** |
| South of CR 93 | 816 | 971 | **1.6%** | 1,117 | 1,252 | **1.0%** |
| | | | | | | |

Note: (1) Average annual growth rates incorporate compounding.
Source: Wilbur Smith Associates

As indicated in the above table, average annual traffic growth varies between 0.3 to 1.6 percent in the corridor. **Figure 3.3** illustrates the two-way traffic volumes along CR 93 in 2009 and 2020. The larger developments (Cranberry, Brookvale, Laerdal) are located in the middle of the study area; therefore, a slightly higher average annual growth is seen on CR 93 between Marshall Road and DeGarmo Hills Road. Route 376 has the highest growth rate due to an increase in traffic volumes along the corridor associated with background growth.

### 3.3.4 Future Levels of Service

Level of Service (LOS) is a qualitative measure describing driver satisfaction based on factors that are influenced by the degree of traffic congestion. These factors include

speed and travel time, traffic interruption, freedom of maneuverability, safety, driving comfort and convenience, and delay.

In general, there are six levels of service describing traffic flow conditions. **LOS A** describes a condition of "free flow", with low volumes and high speeds. **LOS B** represents a stable traffic flow with operating speeds beginning to be restricted somewhat by traffic conditions. **LOS C** describes stable traffic operations. **LOS D** reflects a condition of more restricted movements for motorists as congestion becomes more noticeable. **LOS E** is representative of the actual capacity of the roadway or intersection and involves delay to all motorists due to congestion. **LOS F** is described as "force flow" and is characterized by volumes greater than what the roadway can handle. This causes a "breakdown" condition on the roadway. Therefore, LOS F is considered an unacceptable traffic operating condition. NYSDOT designs roads to meet a goal **LOS D** with **LOS E** considered acceptable.

**Table 3.3** and **Table 3.4** highlight the LOS criteria for signalized and un-signalized intersections respectively. The level of service criteria for signalized and un-signalized intersections is based on control delay per vehicle measured in seconds. Control delay is defined as the amount of time a vehicle has to wait at an intersection due to a stop sign or a traffic signal.

**Table 3.3: Level of Service Criteria for Signalized Intersections**

| **Level of Service** | **Control Delay Per Vehicle** (seconds) |
|---|---|
| A | ≤10 |
| B | >10 and ≤20 |
| C | >20 and ≤35 |
| D | >35 and ≤55 |
| E | >55 and ≤80 |
| F | > 80 |

Source: 2000 Highway Capacity Manual, Transportation Research Board

**Table 3.4: Level of Service Criteria for Un-signalized Intersections**

| **Level of Service** | **Control Delay Per Vehicle** (seconds) |
|---|---|
| A | ≤10 |
| B | >10 and ≤15 |
| C | >15 and ≤25 |
| D | >25 and ≤35 |
| E | >35 and ≤50 |
| F | > 50 |

Source: 2000 Highway Capacity Manual, Transportation Research Board

# Existing and Future Two-Way Peak Hour Traffic Volumes

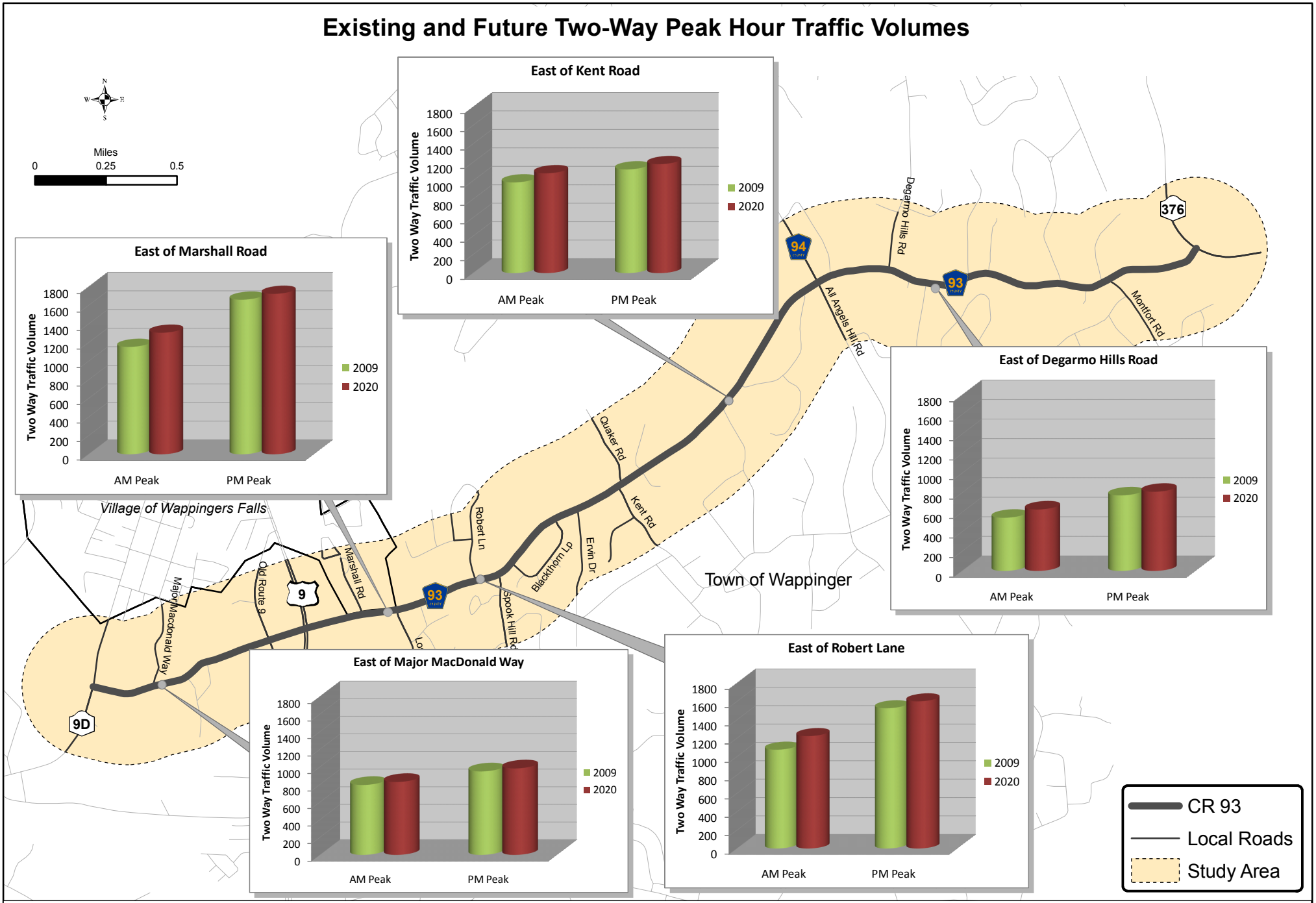


Figure 3.3

A level of service analysis was conducted using TransModeler for the study area intersections under existing (2009) and future (2020) conditions. A comparison of existing (2009) and future (2020) levels of service for the signalized intersections is presented in **Table 3.5**. Overall intersection level of service and delay represents the operating condition of the entire intersection while the approach level of service and delay represents the condition of the individual (northbound, southbound, eastbound or westbound) approach. Overall intersection delay is a weighted average of the delays associated with each traffic movement at the intersection.

**Table 3.5: Level of Service at Signalized Intersections**

| | Existing (2009) | | Future (2020) | |
|---|---|---|---|---|
| Intersection | AM Peak | PM Peak | AM Peak | PM Peak |
| **CR 93/Route 9D** | | | | |
| Overall | **C(33.2)** | **C(31.6)** | **D(43.4)** | **C(31.7)** |
| *CR 93 approach* | D(53.0) | E(77.7) | E(67.2) | E(72.7) |
| *Route 9D NB approach* | B(13.0) | B(14.8) | B(13.2) | B(14.5) |
| *Route 9D SB approach* | D(47.9) | C(26.1) | E(65.5) | C(30.7) |
| **CR 93/Old Route 9** | | | | |
| Overall | **C(21.3)** | **C(25.8)** | **C(23.4)** | **C(33.2)** |
| *CR 93 EB approach* | B(15.6) | B(15.9) | B(16.3) | B(19.7) |
| *CR 93 WB approach* | C(23.0) | C(28.2) | C(28.9) | C(32.9) |
| *Old Route 9 NB approach* | D(33.8) | D(42.1) | D(34.3) | E(58.2) |
| *Old Route 9 SB approach* | C(21.9) | C(24.9) | C(22.0) | C(33.8) |
| **CR 93/Route 9** | | | | |
| Overall | **D(39.4)** | **E(62.9)** | **D(44.4)** | **E(78.9)** |
| *CR 93 EB approach* | D(45.6) | E(62.7) | D(49.7) | E(75.6) |
| *CR 93 WB approach* | D(48.0) | E(60.0) | E(59.2) | E(66.8) |
| *Route 9 NB approach* | C(33.5) | D(42.9) | D(35.7) | D(43.4) |
| *Route 9 SB approach* | C(37.7) | F(88.0) | D(42.4) | F(127.5) |
| **CR 93/Marshall Road** | | | | |
| Overall | **B(10.4)** | **B(17.6)** | **B(11.6)** | **C(25.3)** |
| *CR 93 EB approach* | A(6.5) | A(9.3) | A(7.4) | A(9.5) |
| *CR 93 WB approach* | B(12.2) | C(22.4) | B(13.8) | D(37.5) |
| *Marshall Road approach* | C(21.7) | C(29.6) | C(22.5) | C(32.2) |

Note: Delay (in seconds per vehicle) is based on TransModeler analysis and is indicated in parenthesis.
Source: Wilbur Smith Associates

**Table 3.5: Level of Service at Signalized Intersections**

| Intersection | Existing (2009) | | Future (2020) | |
|---|---|---|---|---|
| | AM Peak | PM Peak | AM Peak | PM Peak |
| **CR 93/Laerdal driveway [(1)]** | | | | |
| Overall | **-** | **B(12.2)** | **-** | **B(13.1)** |
| *CR 93 EB approach* | - | B(12.6) | - | B(13.6) |
| *CR 93 WB approach* | - | A(9.1) | - | A(9.7) |
| *Laerdal driveway approach* | - | B(14.9) | - | B(16.9) |
| **CR 93/Ketcham HS driveway** | | | | |
| Overall | **B(20.0)** | **B(12.0)** | **C(20.6)** | **B(12.1)** |
| *CR 93 EB approach* | C(21.2) | A(8.9) | C(21.2) | A(9.1) |
| *CR 93 WB approach* | B(14.7) | B(11.7) | B(15.8) | B(11.7) |
| *Roy C. Ketcham High School Drive approach* | C(34.9) | C(23.4) | C(35.9) | C(24.1) |
| **CR 93/CR 94** | | | | |
| Overall | **C(26.4)** | **D(52.9)** | **C(31.1)** | **F(96.2)** |
| *CR 93 EB approach* | C(21.7) | E(74.4) | C(24.3) | F(128.6) |
| *CR 93 WB approach* | B(19.2) | D(54.0) | C(21.5) | F(154.6) |
| *CR 94 NB approach* | D(44.2) | D(46.6) | E(56.3) | D(48.8) |
| *CR 94 SB approach* | B(19.2) | D(36.5) | C(20.8) | E(64.2) |
| | | | | |

Note: Delay (in seconds per vehicle) is based on TransModeler analysis and is indicated in parenthesis.
(1) CR 93/Laerdal Driveway intersection operates as a regular traffic signal between 12 Noon and 8 P.M.
Source: Wilbur Smith Associates

The following intersections are expected to operate at an overall or individual movement LOS E or worse in 2020:

- **CR 93/Route 9D –** This intersection is anticipated to deteriorate from LOS D to LOS E in 2020 on the CR 93 and Route 9D southbound approaches during the A.M. peak hour. During the P.M. peak hour, the CR 93 approach continues to operate at LOS E in 2020. The poor level of service is due to an increase in traffic volumes and inadequate capacity at the intersection. Currently, there are no turning lanes existing or planned at this intersection.

- **CR 93/Old Route 9 –** The northbound approach of Old Route 9 is anticipated to deteriorate from LOS D to LOS E during the P.M. peak hour. Based on the traffic simulation model, traffic operation at this intersection is affected by vehicle queuing and delays at the CR 93/Route 9 intersection during the P.M. peak hour.

- **CR 93/Route 9 –** This intersection operates at LOS E during the P.M. peak hour with several movements operating at LOS E or worse. By 2020, level of service is expected to deteriorate with increasing delays and longer vehicle queues during the P.M. peak hour. The Route 9 southbound approach operates at LOS F with a high delay in 2020 mainly due to inadequate capacity on the left turn movement resulting in significant delays and queue. The traffic simulation model indicates that the longer delays and vehicle queues would impact adjacent intersections on CR 93 at Old Route 9 and at Hannaford Plaza Drive.

- **CR 93/CR 94 –** This intersection is anticipated to deteriorate from LOS D to E on the northbound approach in 2020 during the A.M. peak hour. During the P.M. peak hour, the eastbound left, through, and right turn movements; westbound left, through, and right turn movements; and the southbound left turn movement are all anticipated to operate at LOS E or worse by 2020. The traffic simulation model indicates that the left turn movements on CR 93 and CR 94 have insufficient green time to handle the anticipated increase in traffic volumes, and the longer delays and vehicle queues would impact adjacent intersections. The CR 93 westbound approach deteriorates from LOS D to LOS F in 2020 during P.M. peak hour because the eastbound and northbound left turn movements require more green time.

**Table 3.6** compares the existing (2009) and future (2020) levels of service for un-signalized intersections. For un-signalized intersections, the overall performance is measured by the side-street left turn, which is the "critical" movement. Side-streets are controlled by a stop sign while the major street is under no traffic control. Therefore, the side-street left turn movement yields to all movements on the major street and is most affected by congestion, making it the "critical" movement at the intersection.

**Table 3.6: Level of Service for Un-signalized Intersections**

| | Existing (2009) | | Future (2020) | |
|---|---|---|---|---|
| Intersection | AM Peak | PM Peak | AM Peak | PM Peak |
| **CR 93/Major MacDonald Way** | | | | |
| *CR 93 EB left* | B(12.0) | A(9.6) | B(12.1) | A(8.6) |
| *CR 93 WB left* | B(11.0) | B(12.1) | B(11.1) | B(12.3) |
| *Town Hall Drive NB approach* | C(20.9) | C(21.4) | C(24.1) | C(21.0) |
| *Major MacDonald Way SB approach* | **F(84.7)** | **F(114.8)** | **F(135.5)** | **F(118.1)** |
| **CR 93/Hannaford Plaza Drive** | | | | |
| *CR 93 EB left* | B(13.2) | C(19.3) | C(15.6) | D(25.4) |
| *Hannaford's Plaza Drive left* | D(34.8) | **F(448.2)** | **F(55.5)** | **F(1096.5)** |
| *Hannaford's Plaza Drive right* | C(15.6) | **F(422.6)** | D(32.6) | **F(1082.1)** |

Note: Delay (in seconds per vehicle) is based on TransModeler analysis and is indicated in parenthesis.
Source: Wilbur Smith Associates

**Table 3.6: Level of Service for Un-signalized Intersections**

| Intersection | Existing (2009) | | Future (2020) | |
|---|---|---|---|---|
| | AM Peak | PM Peak | AM Peak | PM Peak |
| **CR 93/Losee Road** | | | | |
| *CR 93 WB left* | B(14.0) | C(19.9) | B(15.5) | E(46.9) |
| *Losee Road approach* | **F(84.5)** | **F(182.3)** | **F(325.1)** | **F(567.4)** |
| **CR 93/Robert Lane** | | | | |
| *CR 93 EB left* | C(16.3) | C(23.6) | C(18.5) | D(35.0) |
| *Robert Lane approach* | C(23.6) | D(29.0) | D(26.6) | E(41.3) |
| **CR 93/Spook Hill Road** | | | | |
| *CR 93 WB left* | A(8.9) | C(17.7) | B10.8) | C(21.5) |
| *Spook Hill Rd. approach* | D(32.2) | **F(182.5)** | **F(69.5)** | **F(573.1)** |
| **CR 93/Blackthorn Loop West** | | | | |
| *CR 93 WB left* | A(5.4) (1) | A(5.5) (1) | A(7.0) (1) | B(12.6) (1) |
| *Blackthorn Loop West approach* | D(29.2) | E(42.7) | D(32.5) | **F(64.9)** |
| **CR 93/Blackthorn Loop East** | | | | |
| *CR 93 WB left* | B(10.5) | B(11.1) | B(12.1) | B(11.7) |
| *Blackthorn Loop East approach* | C(20.2) | C(16.9) | C(21.3) | C(17.9) |
| **CR 93/Ervin Drive** | | | | |
| *CR 93 WB left* | D(25.2) | C(18.4) | **F(63.5)** | C(20.2) |
| *Ervin Dr. approach* | D(30.8) | **F(58.6)** | **F(50.6)** | **F(73.6)** |
| **CR 93/Kent Road** | | | | |
| *CR 93 WB left* | A(9.5) | B(12.8) | B(12.4) | B(14.6) |
| *Kent Rd. approach* | D(37.1) | E(48.7) | **F(318.1)** | **F(75.9)** |
| **CR 93/Myers Corners Elem. School** | | | | |
| *CR 93 WB left* | B(12.5) | C(23.1) | B(13.8) | C(25.5) |
| *Myers Corners Elem. School approach* | D(38.9) | D(27.2) | **F(70.7)** | D(31.9) |
| **CR 93/Laerdal driveway (2)** | | | | |
| *CR 93 EB left* | C(20.3) | - | C(21.5) | - |
| *Laerdal Dr. approach* | C(19.3) | - | C(21.7) | - |
| **CR 93/DeGarmo Hills Road** | | | | |
| *CR 93 EB left* | A(6.7) | A(8.6) | A(7.1) | A(9.7) |
| *DeGarmo Hills Rd. approach* | C(16.1) | B(15.7) | C(18.0) | B(17.8) |

Note: Delay (in seconds per vehicle) is based on TransModeler analysis and is indicated in parenthesis.

(1) Left turn movement delay not reported by the traffic simulation model because no left turn volume reported in the model. Therefore, CR 93 westbound through movement delay is shown.

(2) CR 93/Laerdal Driveway intersection operates as a flashing traffic signal during the A.M. peak period and as a regular traffic signal between 12 Noon and 8 P.M.

Source: Wilbur Smith Associates

**Table 3.6: Level of Service for Un-signalized Intersections**

| Intersection | Existing (2009) | | Future (2020) | |
|---|---|---|---|---|
| | AM Peak | PM Peak | AM Peak | PM Peak |
| **CR 93/Montfort Road** | | | | |
| *CR 93 WB left* | A(9.3) | A(10.0) | A(10.0) | B(10.5) |
| *Montfort Rd. approach* | A(9.2) | A(7.4) | A(9.8) | B(16.7) |
| **CR 93/Route 376** | | | | |
| *Route 376 NB left* | A(7.2) | A(8.7) | A(7.8) | A(9.9) |
| *Route 376 SB left* | A(7.2) | A(7.9) | A(7.2) | A(7.8) |
| *CR 93 approach* | C(22.5) | B(15.8) | D(30.3) | C(23.6) |
| *Business driveway approach* | B(13.4) | D(35.2) | C(22.8) | **F(63.0)** |

Note: Delay (in seconds per vehicle) is based on TransModeler analysis and is indicated in parenthesis.
Source: Wilbur Smith Associates

The following intersections are LOS F under existing conditions and are anticipated to continue to operate at LOS F in 2020 with higher delays on the side street left turn movements.

- **CR 93/Major MacDonald Way/Town Hall driveway** – The left turn movement from Major MacDonald Way is anticipated to continue to operate at LOS F with higher delays during the A.M. and P.M. peak hours.

- **CR 93/Hannaford Plaza Drive**–At the Hannaford Plaza Drive, exiting left and right turn movements is anticipated to continue to operate at LOS F with increased delays during the P.M. peak period in 2020. The traffic simulation model indicates that vehicle queuing at the CR 93/Route 9 intersection extends past the Hannaford Plaza Drive and blocks the intersection. Therefore, left and right turn movements from Hannaford Plaza drive are unable to exit for long periods of time creating higher delays at this intersection.

- **CR 93/Losee Road** – The left turn movement from Losee Road is anticipated to continue to operate at LOS F with increased delays during the A.M. and P.M. peak hours.

- **CR 93/Spook Hill Road** – The left turn movement from Spook Hill Road is anticipated to continue to operate at LOS F with higher delays during the P.M. peak hour. Higher volumes on CR 93 force left turning drivers from Spook Hill Road to wait longer at the intersection for a gap in traffic.

- **CR 93/Ervin Drive** – During the P.M. peak hour, the left turn movement from Ervin Drive is anticipated to continue to operate at LOS F.

The following intersections are anticipated to deteriorate in level of service to LOS F in 2020 with increases in traffic volumes on the major street:

- **CR 93/Hannaford Plaza Drive**– The left turn movement from Hannaford Plaza to eastbound CR 93 is anticipated to deteriorate from LOS D to F during the A.M. peak hour due to the increase in traffic volumes on CR 93.

- **CR 93/Spook Hill Road** – The left turn movement from Spook Hill Road is anticipated to deteriorate from LOS D to F during the A.M. peak hour due to the increase in traffic volumes on CR 93.

- **CR 93/Blackthorn Loop West** – The left turn movement from Blackthorn Loop West to westbound CR 93 is anticipated to deteriorate from LOS E to F during the P.M. peak hour due to the increase in traffic volumes on CR 93.

- **CR 93/Ervin Drive** – The left turn movements from Ervin Drive to CR 93 and CR 93 to Ervin Drive are anticipated to deteriorate from LOS D to F during the A.M. peak hour. The traffic simulation model indicates that vehicle queuing at the Roy C. Ketcham High School driveway extends past Ervin Drive and blocks left turn movements exiting Ervin Drive resulting in a poor level of service for the left turn movements in the future.

  The left turn movement from CR 93 to Ervin Drive deteriorates in level of service for two reasons: Higher volumes on CR 93 create fewer gaps for left turn movements from CR 93 to Ervin Drive, and delay approaching the intersection increases due to the vehicle queues from the Roy C. Ketcham High School driveway extending past the Ervin Drive intersection.

- **CR 93/Kent Road** – The left turn movement from Kent Road is anticipated to deteriorate from LOS D to LOS F during the A.M. peak hour with a high delay caused by vehicle queuing at the Roy C. Ketcham High School driveway. During the P.M. peak hour, the left turn movement from Kent Road is anticipated to deteriorate from LOS E to F due to the higher volumes on CR 93.

- **CR 93/Myers Corners Elementary School driveway**– The left turn movement from Myers Corners Elementary School driveway is anticipated to deteriorate from LOS D to LOS F during the A.M. peak hour due to the increase in traffic volumes on CR 93.

- **CR 93/Route 376** – The business driveway approach (on the east side of Route 376) is anticipated to deteriorate from LOS D to F during the P.M. peak hour due to the increase in traffic volumes on Route 376.

**Figure 3.4** and **Figure 3.5** show a comparison of the levels of service for the study area intersections under existing (2009) and future (2020) conditions during the weekday A.M. and P.M peak hours.

### 3.3.5 Future Safety Conditions

It is impossible to quantify an anticipated number of crashes in the study area in 2020. However, typically, increases in traffic volumes tend to deteriorate safety conditions. At signalized intersections, the number of rear-end collisions tends to increase when there is more congestion and delay. Under these conditions, drivers become more aggressive and maintain a smaller gap between their vehicle and the vehicle in front. This causes rear-end collisions when the vehicle in front brakes at a traffic signal. At stop-controlled intersections, right-angled and sideswipe collisions tend to increase with increases in traffic volume on the major street because drivers tend to make left turns without having an appropriate gap in the opposing traffic.

**Summary Points**

- The anticipated average annual traffic volume growth ranges between 0.3 and 1.6 percent along the corridor.
- 4 of 6 signalized intersections are anticipated to operate at LOS E or worse in 2020 (2 overall, 2 individual movements only) due to increased traffic volumes at the intersection.
- 9 of 14 stop-controlled intersections are anticipated to operate at LOS F in 2020 due to increases in traffic volumes and in some cases, such as Hannaford Drive and Ervin Drive, because the left turn movements exiting the side streets are blocked by vehicle queues on CR 93.
- With the projected increase in traffic congestion and delays, safety conditions are anticipated to deteriorate in the future.

Schematic
Not To Scale

Route 9D
Major MacDonald Way/ Town Hall Driveway
Old Route 9
Route 9
Hannaford's Entrance / Exit
Marshall Rd.
Losee Rd.
Robert Ln.
Spook Hill Rd.
Blackthorn Loop (West)
Match Line

Match Line
Blackthorn Loop (East)
Roy C. Ketcham HS Driveway
Ervin Dr.
Kent Rd.
Myers Corners Elementary School
Laerdal Entrance / Exit (East)
CR 94 (All Angels Hill Rd.)
DeGarmo Hills Rd.
Monfort Rd.
Route 376

LEGEND

Signalized Intersection

Future
Existing

SB
EB OV WB
NB

EB – Eastbound approach level of service.
WB – Westbound approach level of service.
NB – Northbound approach level of service.
SB – Southbound approach level of service.
OV – Overall intersection level of service.

(1) For un-signalized intersections, LOS represents level of service for left turning vehicles.
(2) Level of service based on TransModeler results.
(3) Left turn movement delay not reported by the traffic simulation model. Therefore, CR 93 westbound through movement delay is shown.

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COMPARISON OF EXISTING (2009) AND FUTURE (2020) WEEKDAY A.M. PEAK HOUR LEVELS OF SERVICE

FIGURE 3.4

Schematic
Not To Scale


LEGEND

Signalized Intersection

Future

Existing

SB
EB OV WB
NB

EB – Eastbound approach level of service.
WB – Westbound approach level of service.
NB – Northbound approach level of service.
SB – Southbound approach level of service.
OV – Overall intersection level of service.

(1) For un-signalized intersections, LOS represents level of service for left turning vehicles.
(2) Level of service based on TransModeler results.
(3) Left turn movement delay not reported by the traffic simulation model. Therefore, CR 93 westbound through movement delay is shown.

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COMPARISON OF EXISTING (2009) AND FUTURE (2020) WEEKDAY P.M. PEAK HOUR LEVELS OF SERVICE

FIGURE 3.5

# 4 SUMMARY OF CORRIDOR BUILD-OUT AND CAPACITY

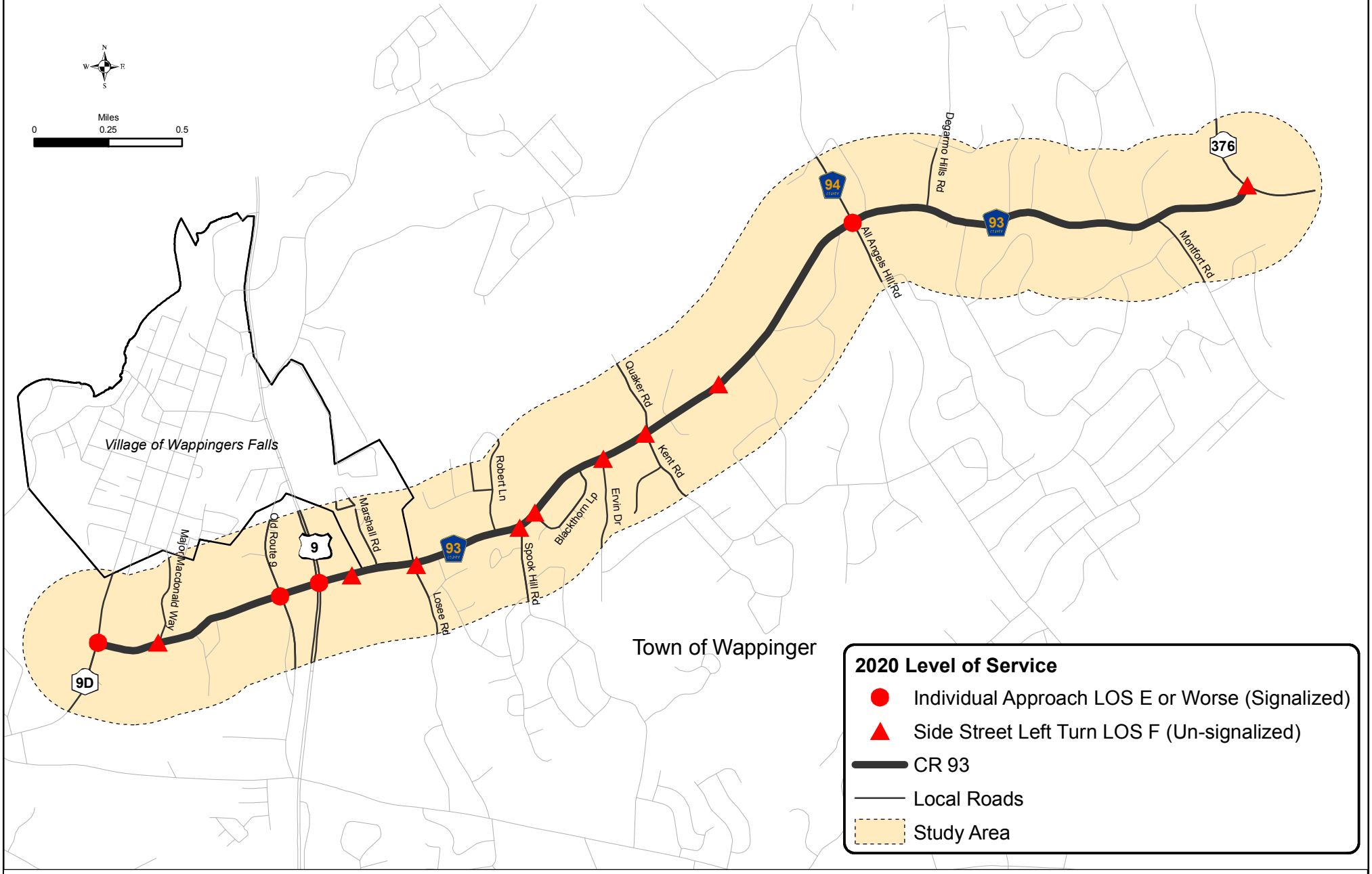
## *4.1 Issues and Observations*

The future conditions analysis identifies needs and deficiencies in the corridor. The following is a list of issues and observations based on the future conditions analysis.

| Issue | Observations |
|---|---|
| Future Land Use | • Approximately 20 percent of the analysis areas in the corridor are expected to experience high growth by 2020. However, this growth consists of only a few major developments.<br>• Cranberry Hills is the largest residential development anticipated to be complete by 2020.<br>• The Laerdal property is the largest office development expected by 2020 in the corridor. The existing vacant space in two of its buildings is anticipated to be mostly occupied by 2020. |
| Future Growth | • Traffic growth is estimated to range between 0.3 to 1.6 percent per year in the corridor.<br>• Higher growth is anticipated in the eastern portion of the corridor. |
| Congestion/Delays | • 4 of the 6 signalized intersections are anticipated to operate at LOS E or worse either overall or for certain movements in 2020.<br>• 9 of the 14 un-signalized intersections are anticipated to operate at LOS F for the side street left turn movement in 2020.<br>• The CR 93/Route 9 intersection is anticipated to experience significant delays and queuing in 2020, thereby impacting adjacent intersections including Old Route 9, Hannaford Plaza, and Marshall Road.<br>• The CR 93/CR 94 intersection is anticipated to experience significant delays and queuing during the P.M. peak hour.<br>• Losee Road, Spook Hill Road, Kent Road, Ervin Drive, Blackthorn Loop West, Myers Corners Elementary School driveway, and Major MacDonald Way experience LOS F during peak periods. |
| Safety | • The projected higher volumes, congestion and delays in the future are likely to create unsafe conditions. At stop-controlled intersections, drivers making left turns may be overly aggressive due to the lack of gaps in traffic. At signalized intersections, drivers may follow vehicles too closely to try to avoid delays at the signal. |
| | |

**Figure 4.1** indicates key intersections in the CR 93 corridor which are anticipated to operate at poor levels of service under future conditions.

# Future Traffic Operational Deficiencies in the CR 93 Corridor




PDCTC
Poughkeepsie-Dutchess County Transportation Council

Figure 4.1

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## *4.2 Next Steps*

- Identify focus areas for analysis and recommendations based on the identified deficiencies under existing and future conditions such as poor traffic operations (levels of service), limited walking, bicycling, and transit infrastructure, and overall safety conditions in the corridor.

- Develop a series of travel improvement strategies that will include:

    - Intersection improvements such as turn lanes, traffic signal timing changes, and/or roundabouts.
    - New sidewalk connections and wider shoulders.
    - Transit improvements, such as pull-off areas for buses based on future planned routes.
    - Suggest alternate truck routes and recommend off-peak activity.
    - Anticipated changes in school bus routes based on discussions with the Wappinger Central School District (WCSD).

- Evaluate travel improvement strategies, provide recommendations for short and long term improvements, develop conceptual costs, and establish implementation timelines.

- Discuss strategies and recommendations with the Advisory Committee and at public meetings.

- Develop a corridor management plan.