

# Route 112 Corridor Update Study Saco, Maine

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# Executive Summary

Gorrill-Palmer Consulting Engineers, Inc. (GP) has been retained by the City of Saco to update a transportation study of the Route 112 corridor from Spring Street to Loudon Road. The original study was completed in September 2005. In addition, Industrial Park Road has been included in this update, as it plays a significant role in the travel patterns along the Route 112 corridor. A study area map is provided in Appendix A. The Route 112 corridor provides access from downtown Saco to the Buxton area, and is strongly influenced by a convergence of Route 5 in the vicinity of the neighborhoods around the Industrial Park Road intersection. In addition, Industrial Park Road provides access to Interstate 195 (and therefore, the Maine Turnpike), as well as Route 1 to the north of downtown Saco. Additionally, Route 5 and various local roads carry traffic between Biddeford and the Turnpike/western suburbs. These traffic patterns result in significant congestion at the Industrial Park Road intersection with Route 112 as well as at various neighborhood street intersections along Route 112. The purpose of this update is to re-evaluate existing and short term operational and safety deficiencies along the corridor and revisit the original mitigation measures to identify the progress that has been made as well as identification of potential additional mitigation. This update also identifies long-term traffic trends that can potentially be addressed by new connections to the interstate system and/or surface street interconnections.

The goal of this update was to examine current (2014) and future (2020) traffic patterns, and to develop a traffic plan to address identified deficiencies for this area. The major needs to be accommodated for this area include, but are not limited to the following:

- The study area experiences directional imbalances in peak hour traffic flows due to a large commuter component.
- Several unsignalized intersections along Route 112 have side street traffic either currently or forecast to experience long delays.
- Several locations meet turning lane warrants or have insufficient lanes based on capacity analysis.
- A significant amount of traffic cuts through local streets to get to Route 112 from Route 5 and vice-versa.
- Portions of Route 112 have no shoulder for bike traffic and limited accommodations for pedestrians.
- There are two high crash locations to be addressed within the study area.

It is important to note, that the intent of this update is to identify deficiencies and needs in the immediate study area, both those that can be implemented with minor effort and funds and those that may require more planning and significant funds.

### **Summary of Potential Alternatives:**

The following summarizes the potential alternatives and classifies them into Short Term, Long Term, or Monitor. Short Term alternatives are those which require less engineering and costs. Long Term alternatives are those which may require several years to go through the engineering and local / public approval process and may require more funds to complete. Monitoring refers to those situations that are border line for needing to be addressed in the future, but may not quite be there. The potential alternatives are listed in the approximate order of our preference (highest priority first); however, the City's priorities and available funding will have a significant impact on order of implementation. Some alternatives can be completed concurrently, while others may preclude other alternatives from being feasible. *It should be noted that the alternatives for addressing the congestion at the Route 112 / Industrial Park Road are listed under "Long Term Alternatives" because they are anticipated to require more planning and funds; however, they should be considered an issue that should be addressed as soon as possible.* For the monitoring, they are all considered equal.

### **Potential Short Term Alternatives:**

- Field adjust timing at the two signalized intersections within the study area
- Stripe Route 112 for a center turn lane from Spring Street to Tasker Street
- Construct exclusive northbound right turn lane on Industrial Park Road at the signalized eastbound I-195 ramp.
- Stripe Route 112 for a center turn lane from Jenkins Road to Middle School Entrance (Some roadway widening may be required)
- Restrict Garfield Street to right-in / right-out only (This alternative needs to be evaluated for its overall effect to the roadway network before implementation. Other mitigation throughout the study area may be required before this can be implemented)
- Stripe Tasker Street approach for separate left and right lanes
- Jenkins Road construction of an additional approach lane for a total of two
- Potential extension of Garfield approach lanes (Not needed if restricted to right-in / right-out)
- Signalize Franklin Street / Route 112
- Signalize Spring Street / Route 112
- Provide pedestrian accommodations at existing or future signalized intersections (This alternative should be moved up in priority if uses in the area are developed that have a high pedestrian draw)
- Continue sidewalk around from Route 112 along easterly edge of Industrial Park Road

### **Potential Long Term Alternatives:**

- If monitoring identifies issue, construct dual left turn lanes on I-195 EB ramp concurrent with improvements at signalized ramps
- Construct Roundabout at Route 112 / Industrial Park Road (This alternative should be considered with the "Connector Road" alternative. It would most likely be one alternative or the other, and not both.)

- Construct a connector road between Route 112 and Industrial Park Road
- Re-open the former I-95 northbound off-ramp
- Construct future connector road between Route 5 and Route 112
- Set up Tasker Street – Franklin Street as one-way pair
- Extension of I-195 to the west of I-95
- Construct direct between I-95 and Route 5 (***Not Recommended***)

**Monitoring:**

- Monitor the I-195 westbound ramp / Industrial Park Road intersection for potential signalization
- Monitor the I-195 eastbound ramp for capacity or queuing issues
- Monitor Route 112 / Jenkins for signalization
- Monitor the Route 112 / Lund Road intersection for signalization if development on Lund Road occurs or if the northbound off ramp is re-opened

**Funding:**

Funding for these improvements can be accomplished via several means, including the following:

- Impact fees for development
- Local funding (bonding)
- State funding
- Federal funding (including the BTIP process)
- Combination of entities including Maine Turnpike Authority, MaineDOT, Local Funded Projects

# Chapter 1

## Introduction

### **Project Background:**

Route 112, or North Street / Buxton Road, is a major east-west corridor providing a connection from downtown Saco to the Buxton area. It begins at Main Street in Saco, and continues northwesterly toward Buxton. This roadway, while historically rural in nature, has experienced significant residential growth in the past few decades. Traffic on Route 112 is also strongly influenced by a convergence of Route 5 in the vicinity of the neighborhoods around the Industrial Park Road intersection.

Gorrill-Palmer Consulting Engineers, Inc. (GP) completed a Corridor Study in September 2005 to identify existing and potential future deficiencies along the Route 112 Corridor from Spring Street to Louden Road. This study resulted in recommended mitigation. Since the completion of that study, the City has implemented many of the short term recommendations such as: increasing the radius and constructing separate left and right turn lanes on Garfield Street at Route 112; extending the left turn lane on Route 112 for the southeast approach to Industrial Park Road; construct geometric improvements at the intersection of Louden Road and Route 112 including a left turn lane on Route 112 and separate left and right lanes on Louden Road; constructed a slip lane for right turns from Route 112 onto Industrial Park Road; stripe Route 112 westbound approach to Industrial Park Road for separate right and through lanes. The purpose of this update is to reassess the corridor with the implemented improvements and current and future traffic volumes and update the recommendations.

### **Study Area:**

The corridor study includes Route 112 from Spring Street to Louden Road. In addition, due to prior concerns with capacity, the Industrial Park Road from Route 112 to the I-195 ramps has also been included. The overall study area is shown on Figure 1 in Appendix A, and includes the following intersections:

- Route 112 at Louden Road
- Route 112 at Saco Middle School
- Route 112 at Jenkins Road
- Route 112 at Lund Road (PM only)
- Route 112 at Garfield Street
- Route 112 at Industrial Park Road
- Route 112 at Tasker Street
- Route 112 at Franklin Street
- Route 112 at Spring Street
- Industrial Park Road at I-195 eastbound Ramps
- Industrial Park Road at I-195 westbound Ramps

**Project Goals:**

Traffic volumes, particularly on Route 112 northwest of Industrial Park Road, are such that existing and short-term volume increases will require roadway improvements. However, given the urban nature of Route 112 south of Industrial Park Road, constraints exist for these improvements. The project goals are the following:

- 1.) Minimize impacts by utilizing existing capacity and pavement whenever possible.
- 2.) Any course of action should seek to address the issue of cut-through traffic on the local streets that connect Route 112 and Route 5.
- 3.) Improvements should address safety as well as bicycle and pedestrian needs in addition to those of the motorist.

# Chapter 2

## Existing Conditions

As discussed in Chapter 1 of this update, the study focuses on Route 112 from Spring Street to Loudon Road, as well as Industrial Park Road from Route 112 to the I-195 ramps. The study area roadways are described as follows:

### **Route 112:**

Route 112 from Spring Street to Industrial Park Road is a two-lane roadway with travel lane width varying from thirteen to fifteen feet wide and paved shoulders varying from five to eight feet wide. The exception is in the vicinity of Industrial Park Road where the northwest bound width widens to allow for separate through and right turn lanes, and as such, minimal width remains for shoulders. This is an urban cross-section, with raised curbing and drainage. This portion of Route 112 has a varying width grassy esplanade and a bituminous sidewalk on each side of the roadway. South of Industrial Park Road, the posted speed is 30 mph, while north of this intersection, it is posted at 35 mph.

Between Industrial Park Road and the Middle School driveways (excluding the Industrial Park Road itself), shoulders are relatively wide (six to eight feet); however the travel lanes narrow slightly to approximately twelve feet in width. The roadway maintains the urban character of raised curbing, esplanades and bituminous sidewalks along each side to approximately Lund Road. To the north of Lund Road, Route 112 starts to take on more of a rural character, with less building and driveway density and a sidewalk only on the southwesterly side of the road.

From the Middle School driveways northerly toward Loudon Road the character of the area is rural in nature, with approximately five foot paved shoulders and eleven to twelve foot wide single travel lane in each direction. There is no curbing or sidewalks on either side of the road and closed drainage becomes open ditches. The posted speed limit increases to 45 mph to the northwest of the Middle School driveways.

### **Industrial Park Road:**

Industrial Park Road between Route 112 and the I-195 ramps is primarily a three lane cross section. Nearest the ramps, there is a single through lane in each direction with a center turn lane. Traveling from the ramps toward Route 112, the center turn lane transitions into a left turn lane for vehicles turning left onto route 112. The through lane becomes a right turn lane for vehicles turning onto Route 112. These separate left and right turn lanes are substantially long at approximately 2,000 feet. Traveling from the ramps toward Route 112, there is no striped shoulder, while traveling in the other direction there is an approximately eight foot wide paved shoulder.

## **Intersections:**

### *Route 112 at Spring Street and Goodale Avenue*

This unsignalized intersection has Spring Street as STOP controlled and consists of all single lane approaches; however, the width of Spring Street and Route 112 is such that vehicles can bypass left turning traffic depending on how the left turning vehicle positions themselves while waiting to turn. During the PM peak hour in particular, this location experiences a significant amount of congestion (discussed in more detail in Chapter 4) due to queuing for traffic exiting Spring Street onto Route 112.

### *Route 112 at Franklin Street*

An unsignalized location, Franklin Street is STOP controlled and has a single approach lane, as do the Route 112 approaches. The width of the Franklin Street approach is somewhat narrower than that at Spring Street, and right turning vehicles exiting the roadway typically do not bypass left turning vehicles. However, there are wear patterns on the gravel shoulder that indicates right turning vehicles are trying to turn adjacent to left turning vehicles. The width of the paved shoulders along Route 112, at six feet minimum, allow for a westbound through vehicles to bypass a left turning vehicles provided the turning vehicles position themselves closer to the center line.

### *Route 112 at Tasker Street*

This unsignalized intersection meets Route 112 at approximately a 70 degree angle and opposite Village Green Drive to form a four legged intersection with Tasker and Village Green STOP controlled. The roadway widens at the intersection which provides sufficient width for right turning vehicles approaching Route 112 to turn adjacent to left turning vehicles, providing that the left turning queue does not exceed two to three vehicles in length. Shoulders on Route 112, as with the other locations, allow for through vehicles to bypass a left turning vehicle provided the left turning vehicle is positioned closer to the center line.

### *Route 112 at Industrial Park Road*

One of only two signalized intersections in the study area, this “T” intersection has an exclusive lane for each turning movement. As both Route 112 and Industrial Park Road are not widened at this location, there are minimal paved shoulders. The left turn lane for eastbound traffic on Route 112 extends significantly (1,000 feet) from the intersection, which includes extending past Garfield Road. Similarly, the right turn lane for westbound traffic on Route 112 extends over 500 hundred feet. The separate left and right turn lanes for southbound traffic on Industrial Park Road are extremely long, at over 2,000 feet each.



### *Route 112 at Garfield Street*

This unsignalized “T” intersection has Garfield Street as STOP-controlled, with separate left and right turn lanes for an approximately 2-3 car queue. Route 112 includes two eastbound lanes (one through and one left turn lane) and one westbound lane. The queue for eastbound traffic from the signalized intersection of Route 112 / Industrial Park Road frequently extends past this intersection and can make left turns into and out of Garfield Street difficult during peak hours of the day.

### *Route 112 at Jenkins Road*

Jenkins Road intersects at Route 112 to form a “T” intersection which is slightly off-set from the intersection of Route 112 with Hillview Avenue. Jenkins Road and Hillview Avenue are both STOP-controlled. The width of Jenkins Road allows for a right turning vehicle to bypass a left turning vehicle provided the queue is not much longer than one vehicle. Shoulders on Route 112, as with other intersections within the corridor, are wide enough to allow for through vehicles to bypass left turning vehicles provided the left turning vehicle is positioned nearer the center line.

### *Route 112 at Saco Middle School and Rotary Drive*

The Middle School is set up as a “U” shaped driveway with the exit opposite Rotary Drive. This four-way intersection has a single lane approach on Rotary Drive and separate left and right turn lanes on the school exit. Rotary Drive and the school drive are STOP controlled. This configuration has changed since the 2005 study, when this single access served as the ingress and egress for the school, with a single egress lane. As with the other intersections discussed previously in this section, the paved shoulders on Route 112 allow for through traffic to bypass left turning traffic.

### *Route 112 at Louden Road*

This three-way, unsignalized intersection consists of a single lane on the STOP controlled Louden Road approach, single lane on the eastbound Route 112 approach, and a single through lane with left turn auxiliary lane on the westbound Route 112 approach.

### *Industrial Park Road at I-195 Eastbound Ramps*

This three-way signalized intersection provides access to I-195 and from the Maine Turnpike. The northbound approach of Industrial Park Road consists of a single through/right turn lane, while the southbound approach consists of an exclusive left turn lane as well as a through lane. The approach from the ramps consists of an exclusive left turn lane and a right turn slip lane on yield control.

### *Industrial Park Road at I-195 Westbound Ramps*

The geometry of this three-way unsignalized intersection is similar to that at the eastbound ramps, with identical lane uses. However, this ramp operates under stop control.

### *Traffic Volumes:*

This update study utilized turning movement data which was recently collected for the City at the following locations:

- Jenkins Road / Route 112 (January 2014)
- Franklin Street / Route 112 (January 2014)
- Spring Street / Route 112 (January 2014)
- Lund Road / Route 112 (April 2009, PM only)

In addition to the existing counts, Gorrill Palmer also collected AM peak hour and PM peak hour turning movement counts at the following locations:

- Industrial Park Road / Route 112 (August 2014)
- Industrial Park Road / Eastbound Ramp (August 2014)
- Industrial Park Road / Westbound Ramp (August 2014)
- Garfield Street / Route 112 (May 2014)
- Tasker Street / Route 112 (May 2014)
- Middle School Entrance & Exit / Route 112 (May 2014)

The volumes were seasonally adjusted and balanced, with the resulting volumes shown on Figures 1 & 2 in Appendix B.

It is important to note that the Middle School counts were completed when school was still in session, to ensure that these volumes were accounted for, particularly in the AM design period.

Adjustments and forecasts are discussed in the following chapter.

# Chapter 3

## Forecast Traffic Volumes

One of the goals of this update is to forecast traffic volumes along Route 112 for the years of 2014 and 2020 and then assess what improvements may be required to accommodate these volumes. This chapter discusses volume adjustments, traffic from other developments, and forecast volumes to 2020.

### **Forecast Traffic Volumes:**

The 2014 AM and PM peak hour traffic volumes as shown on Figures 1 & 2 were derived from both recent counts performed for this update, or recent counts completed for the City for other projects along the corridor. To identify an appropriate growth, our office examined historic traffic volumes along this section of Route 112 as compiled by MaineDOT since 2007. Based on this information, the traffic growth has either been flat or decreased since 2007. Based on this information, the annual traffic growth due to influences outside the study area was assumed to be flat. However, part of what also contributes to the traffic growth along the corridor is traffic generated from other development in the area. Based on a conversation with the City Planner, the following potential other development was identified:

- Mult-use building that revolves around sports (Ice Rink, Health/Fitness area, medical offices, physical therapy) – Located off the Lund Industrial Road – Figure 3
- Shopping Center (50,000 sf) – Located at the existing Public Works Building – Figure 4
- Jenkins Road Residential development – 92 Lots – Figure 5
- Residential Lots near Middle School – 28 Lots – Figure 6
- Horton Meadows – Located near the Buxton Town Line – 30 Lots – Figure 7

The traffic from these developments were added to the 2014 traffic volumes. The addition of this other development accounts for an approximately 0.5-1% increase in traffic volume for the corridor, which is slightly more than recent historical growth and is a good approximation for the 2020 volumes.

In comparison, the original 2005 Corridor Study had assumed the following:

- Route 112 southeast of Industrial Park Road = 1.5 % / year
- Route 112 northwest of Industrial Park Road = 2 % / year
- Industrial Park Road = 3 % / year

The following compares the forecasted 2010 total entering volumes (TEV) for the Route 112 / Industrial Park Road intersection in the original study to the 2014 traffic volumes that are based on actual counts:

	AM Peak Hour	PM Peak Hour
2010 TEV (orig Study)	2,960	3,339
2014 TEV (this Update)	2,548	2,960

As the comparison shows, the assumptions made in the original study ended up being conservative, primarily due to the decrease in growth associated with the recession that started approximately in 2007. Other factors may have also contributed to the low growth, but this low growth pattern is consistent with findings in other communities as well.

**Traffic Patterns:**

A review of existing traffic patterns shows that Route 112 and in particular Industrial Park Road experience a significant directional component to the traffic flow during the design hours. For example, Industrial Park Road north of Route 112 has approximately seventy percent of its traffic heading toward the I-195 ramps during the AM peak hour; this situation is almost reversed during the PM peak hour, with approximately sixty six percent of the traffic heading away from the ramps.

Similarly, Route 112 also experiences a directional imbalance during peak hours, especially northwest of Industrial Park Road. During the AM peak hour, seventy percent of traffic along Route 112 is traveling toward Industrial Park Road inbound, either toward downtown Saco or to Industrial Park Road. As with Industrial Park Road, this situation is almost reversed in the PM peak hour, with sixty one percent of traffic heading away from downtown Saco.

Route 112 southeast of the Industrial Park Road is more closely balanced during the AM and PM peak hours. In the AM peak hour, fifty three percent of the traffic is traveling inbound toward Saco center and in the PM, forty nine percent of the traffic is traveling outbound away from Saco center.

This pattern is due in large part to the importance of the connections that the I-195 ramps to Industrial Park Road provide to this portion of Saco as well as outer suburbs such as Buxton. While Industrial Park Road was envisioned as a route for truck traffic and other low-intensity developments, the use of the corridor for commuting to the western suburbs has resulted in heavy passenger vehicle traffic using the roadway. Because there are currently no direct connections from Route 112 (or Route 5) to I-95, cut-through traffic to and from local routes to the Interstate system via minor residential streets is a well-documented issue. As a result many side streets have significant traffic volumes, some of which contribute to deficient operations where they intersect Route 112.

# Chapter 4

## Operational Analysis and Potential Improvements

### Operational Analysis:

Prior to determining a course of action for a transportation corridor, it is important to understand the various capacity and safety issues associated with the intersections and roadway segments that form this corridor. Since capacity and safety issues can be related, the following evaluates both.

Although review of Access Management was not part of this update, it is critical to recognize that there are Access Management measures / regulations that the City can implement or enforce that can prolong their investment in the infrastructure, and help to improve the mobility, capacity, and safety of this corridor / intersections, as well as other corridors / intersections within the City. Access management could include requirements for driveway spacing as well as the number, width and location of driveways, etc.

The goal of this update was to examine current (2014) and future (2020) traffic patterns, and to develop a traffic plan to accommodate traffic needs for this area. The major needs to be accommodated for this area include, but are not limited to the following:

- The study area experiences directional imbalances in peak hour traffic flows due to a large commuter component. This is especially evident on the Industrial Park Road and on Route 112 northwest of the Industrial Park Road intersection.
- Several unsignalized intersections along Route 112 have side street traffic either currently or forecast to experience long delays. This is due in part from traffic cutting through neighborhoods to / from Route 112.
- Several locations meet turning lane warrants or have insufficient lanes based on lane warrant and capacity analysis.
- Crash history/safety deficiencies; as described in more detail in the following subsection, there are two high crash locations within the study area.

The following describes the safety and capacity of the study area in more detail:

### Crash History:

Gorrill-Palmer Consulting Engineers, Inc. obtained the crash data for the study area from MaineDOT for the period of 2011-2013.

In order to evaluate whether a location has a crash problem, MaineDOT uses two criteria to define a High Crash Location (HCL). Both criteria must be met in order to be classified as an HCL.

1. A critical rate factor of 1.00 or more for a three-year period. (A Critical Rate Factor {CRF} compares the actual crash rate to the rate for similar intersection in the state. A CRF of less than 1.00 indicates a rate of less than average) and:
2. A minimum of 8 crashes over the same three-year period.

Following is a review of the crash history within the study area, Route 112 from Spring Street to Loudon Road and Industrial Park Road from Route 112 to the I-195 ramps. Based on the review, it was determined that two locations were classified as HCL's by MaineDOT. These locations are as follows:

- Node 54830: Route 112 at Garfield Street (11 collisions; CRF of 1.68)
- Node 54829: Route 112 at Industrial Park Road (24 collisions; CRF of 1.15)

The individual police reports were obtained for the HCLs from MaineDOT and compiled into collision diagrams. The collision diagrams are then examined to see if there are any crash patterns that may be correctable. The collision diagrams are included in Appendix C with a more detailed description of the locations as follows:

**Garfield Street at Route 112:** This unsignalized intersection has a pattern of angle crashes (total of 5 crashes) between vehicles taking a left or right out of Garfield Street and those traveling through on Route 112. There does not appear to be a clear crash pattern of specific year, time of the year, or time of day. There is also a crash pattern (4 crashes) with vehicles turning left from Route 112 onto Garfield colliding with southbound through vehicles. Based on the information provided in the police reports, there does not appear to be consistent contributing factors for these two crash patterns. However, these patterns are not uncommon when there are two lanes traveling in one direction and a turning vehicle must cross both lanes to complete their turn.

This intersection was also a high crash location in the 2005 study with 19 crashes and a CRF of 3.15, so there has been some improvement. This could be a result of some restriping that occurred on Route 112 to extend the southbound left turn lane which would result in reducing the overall queue length for southbound vehicles. It should also be noted that since the 2005 Corridor Study, Garfield was widened slightly to provide separate left and right turn lanes, whereas in 2005 it was just a single lane approach.

**Industrial Park Road at Route 112:** This signalized intersection has one minor crash pattern (4 crashes) of Route 112 northwest bound rear-end crashes and a more significant Industrial Park Road rear-end crash pattern (11 crashes). The minor crash pattern of four crashes did not appear to have any clear consistent contributing factors.

The following summarizes in more detail the more significant crash pattern of 11 crashes:

- Year: two crashes in 2011, four crashes in 2012, five crashes in 2013 – Unfortunately, the pattern appears to be increasing.
- Months: Feb. 1 crash, April 1 crash, May 1 crash, June 2 crashes, July 1 crash, Aug. 1 crash, Oct. 2 crashes, Dec. 2 crashes – There does not appear to be a clear pattern of crashes in any particular season or time of year.
- Day of week: Although there was not a clear pattern for specific day of the week, 7 of the crashes occurred during the weekday, 2 on Saturday, and 2 on Sunday.
- Time of day: 2 crashes during AM peak hour (7-9 AM), 2 crashes during the mid-day peak hour (11 AM – 1 PM), 4 crashes during the PM peak hour (4-6 PM) and 3 at other times during the day. There tends to be more crashes during the PM peak hour, which coincides with the heaviest directional flow of traffic during the weekday.

In reading the police reports, it did not appear that there was a consistent contributing factor to the rear-end crashes other than drivers not paying attention. This pattern is not uncommon on approaches that are over capacity and experience long queues with “stop n go” traffic.

In reviewing the crash history for the overall study area, it was noted that for Route 112, there were no pedestrian crashes and five bicycle crashes. For Industrial Park Road, there were no pedestrian or bicycle crashes.

**Left Turn Lane Warrant Analysis:**

Route 112 at the unsignalized intersections within the study area consistently only have a single travel lane in each direction. While there is typically enough width on Route 112 for a through vehicle to maneuver around a left turning vehicle, it is dependent on how close the left turning vehicle is to the centerline and how comfortable the driver of the through vehicle is in using the shoulder to maneuver around the turning vehicle. GP evaluated the need for left turn lanes on Route 112 at several of the unsignalized intersections within the corridor for the 2020 condition. The evaluation is based on the MaineDOT Auxiliary Turning Lane chart. Often a right turn lane is also evaluated; however, a right turn lane at most of the locations would require impacts to adjacent property and is not as critical for the mobility of the corridor as a left turn lane. A left turn lane can fit within the existing pavement width with restriping; however, whether or not the existing shoulder can accommodate the full burden of through traffic should be evaluated prior to simply restriping. It should also be noted that restriping Route 112 without widening would reduce the existing shoulder width available to bicyclists. The following is a summary of the left turn lane warrant:

### Left Turn Lane Warrant

Location	Left Turn Lane Warrant Met	
	AM Peak Hour	PM Peak Hour
Left onto Spring (30 mph)	Yes	Yes
Left onto Franklin (30 mph)	Yes	Yes
Left onto Tasker (30 mph)	Yes	Yes
Left onto Garfield (35 mph)	Yes	Yes
Left onto Jenkins (35 mph)	Yes	Yes
Left into Middle School (35 mph)	Yes	Yes

As can be seen from the summarized results, Route 112 along much of the corridor within the study area does meet consideration for left turn treatment. See Appendix D for evaluation charts.

#### **Capacity Analysis without Mitigation:**

The capacity analysis was completed with the Synchro/SimTraffic analysis software. The results represent an average of 5 runs for each scenario. Levels of service rankings are similar to the academic ranking system where an ‘A’ represents little control delay and an ‘F’ represents significant delay. A level of service ‘D’ and higher is desirable for a signalized intersection. If an unsignalized intersection level of service falls below a “D”, it should be further investigated to determine if mitigation is feasible.

The following tables summarize the level of service associated with delay for both signalized and unsignalized intersections.

#### Level of Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (sec)
A	Up to 10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	Greater than 80.0

#### Level of Service Criteria for Unsignalized Intersections

Level of Service	Control Delay per Vehicle (sec)
A	Up to 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	Greater than 50.0



Route 112 Corridor Intersections:

The following is a summary of the level of service for the Route 112 study area intersections. For the approaches that had levels of service “E” or “F”, the delay is also provided so the impact can fully be evaluated.

**Level of Service Summary – Route 112**

Route 112 Intersection	Without Mitigation			
	2014 Condition		2020 Condition	
	AM	PM	AM	PM
Spring St (Unsig)				
Rt 112 NB	A	A	A	A
Rt 112 SB	A	A	A	A
Spring EB	<b>F (484)</b>	<b>F (615)</b>	<b>F (567)</b>	<b>F 809)</b>
Franklin St (Unsig)				
Rt 112 NB	A	A	A	A
Rt 112 SB	A	A	A	A
Franklin EB	<b>F (149)</b>	<b>E (41)</b>	<b>F (149)</b>	<b>F (100)</b>
Tasker St (Unsig)				
Rt 112 NB	A	A	A	A
Rt 112 SB	A	A	A	A
Tasker EB	<b>F (187)</b>	<b>F (55)</b>	<b>F (423)</b>	<b>F (68)</b>
Drive WB	<b>E (39)</b>	C	<b>E (39)</b>	D
Indust. Park Rd (Sig)				
Rt 112 NB	D	<b>E (59)</b>	D	<b>F (148)</b>
Rt 112 SB	B	B	B	B
Ind. Park Rd WB	C	<b>F (85)</b>	C	<b>F (150)</b>
Garfield St (Unsig)				
Rt 112 NB	A	C	B	C
Rt 112 SB	A	A	A	A
Garfield EB	C	<b>F (837)</b>	D	<b>F (1034)</b>
Lund Rd (Unsig)				
Rt 112 NB	---	A	---	A
Rt 112 SB	---	A	---	A
Lund WB	---	<b>E (45)</b>	---	<b>F (286)</b>
Driveway	---	C	---	C
Jenkins Rd (Unsig)				
Rt 112 NB	A	A	A	A
Rt 112 SB	A	A	A	A
Jenkins WB	<b>F (73)</b>	<b>F (70)</b>	<b>F (400)</b>	<b>F (317)</b>

Middle Sch Exit (Unsig)				
Rt 112 NB	A	A	A	A
Rt 112 SB	A	A	A	A
School EB	A	A	B	A
Middle Sch Ent. (Unsig)				
Rt 112 NB	A	A	A	A
Rt 112 SB	A	A	A	A
Louden Rd (Unsig)				
Rt 112 NB	A	A	A	A
Rt 112 SB	A	A	A	A
Louden EB	A	A	A	A

X (X) = Level of Service (Delay in Seconds)

As can be seen from the results, almost all of the side street approaches at the unsignalized intersections are forecast to operate at a low level of service during the peak hours, and generally are expected to decrease in level of service with time. This is not uncommon for unsignalized intersections on a major roadway; however, when the delay starts to become significant, drivers can start to take risks, and can also start to divert to other alternative routes. In a following section, potential mitigation is recommended that may improve the level of service of the intersections.

#### Industrial Park Road / I-195 Ramps:

The following is a summary of the level of service for the Industrial Park Road at both the signalized eastbound ramp as well as the unsignalized westbound ramp.

#### **Level of Service Summary – Industrial Park Road / Ramps**

Industrial Park Road Intersections	Without Mitigation			
	2014 Condition		2020 Condition	
	AM	PM	AM	PM
I-195 EB Ramp (Sig)				
Ramp NW	C	C	C	D
IPR NE	C	D	D	D
IPR SW	A	C	A	D
I-195 WB Ramp (Unsig)				
Ramp NW	D	C	E	D
IPR NB	B	A	B	A
IPR SB	B	A	B	A

As can be seen from the results, with the exception of the unsignalized westbound ramp in the 2020 condition, the intersection approaches operate at levels of service “D” or above. However, both the observed queues and forecast queues for the signalized ramp are extremely long, with the PM condition yielding queues of over 600 feet on Industrial Park Road and over 700 feet for the left turn off the ramp. The ramp queue is primarily back to the mainline of I-195.

Although a full signal warrant would be required to identify if the unsignalized intersection would warrant a traffic signal, in reviewing the forecast 2020 peak hour volumes, it appears that the unsignalized intersection could meet the peak hour volume warrant for signalization in the future, and potentially even more of the warrants once the study was completed.

## **Potential Improvements:**

This section describes the potential improvements within the corridor, both for roadway segments as well as individual intersections.

### **Roadway Segments:**

The following describes potential mitigation for the roadway segments within the study area.

#### *Route 112 from Spring Street to Industrial Park Road*

This portion of Route 112 is approximately 44 feet in width, with fourteen-foot travel lanes and eight-foot shoulders. Left turn maneuvers both to and from Route 112 are frequent within this area.

Recommendation: Recommended for this portion of Route 112 is a three-lane section with two eleven foot travel lanes, an eleven to twelve-foot two-way left turn lane to accommodate left turns from both directions, and four to five-foot shoulders. Although this would prevent on-street parking from taking place, on-street parking on this portion of Route 112 appears uncommon, except for times of activities at the athletic fields. This portion of Route 112 currently has a daily traffic volume of approximately 15,500 vehicles per day. Typically, the maximum vehicles per day on a roadway with a center two way left turn lane is approximately 20,000 to 24,000 vehicles. Therefore, this corridor still has room to grow before reaching the maximum capacity.

The benefits of a three lane section are greater capacity and better mobility for through traffic. The potential for rear-end and angle collisions is also reduced. In addition, left turning traffic from unsignalized side streets and driveways will be able to utilize the center turn lane for two-stage exits, reducing delay for exiting left turns. The retention of four to five-foot shoulders and a sidewalk provides adequate facilities for both bicycles and pedestrians. For the intersections that may become signalized, the center turn lanes can transition into formal left turn lanes without requiring through traffic to shift.

*Route 112 from Industrial Park Road to Lund Road*

This section of roadway currently includes a three lane cross-section for much of the segment, with a single westbound lane and a thru lane and left turn lane for the eastbound direction. The extensive left turn lane length is needed to accommodate the vehicles waiting to turn left onto the Industrial Park Road. Unless the Industrial Park Road is reconfigured to significantly reduce the queues on this approach, we would not recommend the center turn lane on this section of Route 112.

*Route 112 from Lund Road to east of Jenkins Road*

This section of roadway has minimal locations to turn left and includes the overpass over I-95. We do not recommend any changes to this existing cross-section.

*East of Jenkins Road to west of Middle School Entrance*

Recommendation: This section of roadway is narrower (less than 40 feet) than other sections of Route 112. We recommend the three lane section (single travel lane each direction with center turn lane) be carried through this section. In order to provide a minimum 4 to 5 foot shoulder for bicycles, this section of roadway may need to be widened in places. This three lane configuration is easily adaptable should Jenkins Road meet warrants for signalization in the future and a traffic signal installed.

*Industrial Park Road from Route 112 to Westbound Ramp*

There are no recommended changes to the existing cross-section along Industrial Park Road. This corridor should continue to be monitored and if a future connection is made between Route 112 and Industrial Park Road, mitigation will be required.

**Intersections:**

The following describes potential improvements for the individual study area intersections.

**Previously Evaluated Route 112 Unsignalized Intersections for PACTS Application:**

In 2014, GP had previously evaluated three intersections on behalf of the City for possible submittal of PACTS applications for the 2016-2018 Work Program. The three intersections were Route 112 with Jenkins Road, Franklin Street, and Spring Street. The purpose of the evaluations and applications was to secure funding to signalize the intersections. The following is a more detailed description of the data collected and evaluations made.

In evaluating these intersections for signalization, one of the first considerations is to determine if the controlled approach has two approach lanes. Since it is typically the left turn or thru movement onto the major road that creates the low level of service, having two lanes will ensure the left or thru traffic is not preventing the right turns from making their movement.

Once geometric improvements have been explored, the next item to evaluate is to determine if the intersection meets warrants for signalization. In February 2014, GP evaluated the following intersections for signalization, on behalf of the City, to complete and submit PACTS applications for potential future funding:

- Spring / Goodale Ave / Route 112
  - Franklin Street / Route 112
  - Jenkins Road / Hillview Ave / Route 112
- Franklin Street / Route 112: Vehicles exiting Franklin Street onto Route 112 experience significant delays (see subsection Capacity Analysis). This intersection met MUTCD signal Warrant 1 (Eight Hour Vehicular Volume) and Warrant 2 (Four Hour Vehicular Volume). In addition, Warrants 5 (School Crossing) and Warrant 7 (Crash Experience) were marginally met.

Recommendation: GP recommends that the intersection be signalized, with the proposed center left turn lane discussed in the “Roadway Segments” section transitioning into formal left turn lanes at the intersection. The conceptual design in Appendix D shows signalization of the intersection as included in the PACTS application, prior to incorporating the center left turn lane but providing formal left turn lanes on Route 112. The Capacity Analysis subsection summary table shows the level of service that may be expected if the intersection were signalized.

- Spring / Goodale Ave / Route 112: Exiting traffic from Spring Street at this location experiences significant delay with current volumes (see subsection Capacity Analysis). Future volumes show extensive delay and queuing that could interfere with operations at Central Street and Mechanic Street. This problem can be partially alleviated by separate left and right turn lanes, but even with these improvements side-street operations are still at low levels of service. In addition, forecast left turn volumes are such that through traffic on Route 112 can be held up by a queue of left turning traffic turning onto Spring Street. (see subsection Lane Warrant Analysis).

Twelve hour turning movement counts were collected and this intersection was evaluated using the Manual on Uniform Traffic Control Devices (MUTCD) signal warrants. This intersection met MUTCD signal Warrant 2 (Four Hour Vehicular Volume), with Warrants 1 (Eight Hour Vehicular Volume) and 3 (Peak Hour) being marginal.

Recommendation: GP recommends that the intersection be signalized, with the proposed center left turn lane discussed in the “Roadway Segments” section transitioning into formal left turn lanes at the intersection. The conceptual design in Appendix D shows signalization of the intersection as included in the PACTS application, prior to incorporating the center left turn lane but providing formal left turn lanes on Route 112. The Capacity Analysis subsection summary table shows the level of service that may be expected if the intersection were signalized.

- Jenkins Road / Hillview Ave / Route 112: This intersection did not meet any of the MUTCD signal warrants when the PACTS application was evaluated and therefore an application was never filed. Widening Jenkins Road to provide two separate approach lanes (left/thru & right) does improve the intersection level of service, but the approach still has a low level of service. The Route 112 pavement width through that intersection allows thru vehicles to by-pass left turning vehicles, but not without encroaching onto the shoulder. With the implementation of the Route 112 center turn lane, as discussed in “Roadway Segments”, this should allow Route 112 left turning vehicles to pull out of the thru vehicle traffic stream and to remain in their lane. This turn lane can be converted to formal left turn lanes with minimal effort should the intersection become signalized in the future.

Recommendation: Monitor for future signalization

Unsignalized Intersections not Included in previous PACTS Applications:

The following are the remaining unsignalized intersections that operated at low levels of service but were not included previously in PACTS applications. Although a formal Signal Warrant Analysis would require 12 hours of turning movement counts and was outside of the scope of this update, there are some initial conclusions that can be made by reviewing the peak hour volumes and crash history.

- Tasker Street / Route 112
  - Garfield Street / Route 112
  - Lund Road / Route 112
- Tasker Street / Route 112: In reviewing the peak hour volumes and comparing them to the MUTCD Signal Warrants, it is not expected that this intersection would meet the warrants for signalization. Tasker Street currently has enough width for two separate approach lanes, and GP recommends that it be striped as such. The center left turn lane discussed in “Roadway Segments” should also improve the level of service of this intersection by both pulling Route 112 left turns out of the thru traffic stream as well as providing an area for left turns out of Tasker Street to perform a partial left turn lane with a gap in traffic for one direction and complete the turn when there is a sufficient gap in the other direction, typically referred to as “two stage gap acceptance” In addition, we anticipate that signalization of Franklin Street would result in the diversion of traffic from this intersection to Franklin Street, thereby improving the capacity deficiency.

Recommendation: Stripe Tasker Street for separate left and right turn lanes.

The proposed improvements for Franklin and Tasker streets at Route 112 could result in more northeast traffic along Franklin Street, and more southwest traffic along Tasker Street. The City may wish to consider conversion of Tasker and Franklin to a one-way pair, with Franklin toward Route 112 and Tasker away from Route 112. Conversion could allow some narrowing of these residential streets and provide opportunities for bicycle lanes and space for pedestrians. However, it is recommended that this only be implemented following the signalization of Franklin

Street, as it is important that the exiting traffic volumes from this roadway onto Route 112 as a one-way road do not become so high that they result in a further capacity deficiency.

Potential Recommendation: One-Way Pair for Tasker and Franklin Streets

- Garfield Street / Route 112: Based on the left turn lane warrant analysis described previously, left turns from Route 112 westbound to Garfield Street suggest an exclusive left turn lane for forecast volumes is warranted. However, as the southbound approach toward Industrial Park Road queues, to have an exclusive left turn lane as well as a through lane for westbound Route 112 traffic would result in a four-lane section, and a difficult crossing maneuver for left turns out of Garfield Street. Therefore, a left turn lane on Route 112 for vehicles turning onto Garfield Street is not recommended at this time.

For the Garfield Road approach, the existing left turn lane is only two to three cars in length, and left turns from Garfield are forecast to interfere with the much higher right turn movement in the PM peak hour based on 2020 projections. This suggests that the existing two approach lanes may need to be lengthened.

In reviewing the peak hour volumes and comparing them to the MUTCD Signal Warrants, it is not expected that this intersection would meet the warrants for signalization.

As identified previously, this intersection was identified as a high crash location with a crash pattern of angle crashes. Angle crashes are a crash pattern that can typically be addressed through signalization. The first item in signal Warrant 7, “Crash Experience” is that an “Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency”. This intersection has not satisfied this criterion in that other alternatives have not been implemented and observed.

It should be noted that other alternatives discussed in this update study, such as a roundabout at the Industrial Park Road Intersection or potential by-pass roads, may help to alleviate some of the issues associated with this intersection by reducing the traffic volumes and / or queue lengths on Route 112 through this intersection.

One of the reasons this intersection experiences such high traffic volumes, is that it is a cut-through street between Route 5 and Route 112.

Recommendation:

It is our opinion that Garfield Street be explored further for the potential to restrict the movements to right-in / right-out only. This will have more global impacts to the area since traffic would then divert to other streets.

GP evaluated this intersection in the larger context of traffic traveling between Route 112 and Route 5. From the east, cut through traffic uses Tasker and Franklin Streets among others, with additional spillover traffic using Garfield. From the west Louden Road and Garfield Street appear to be the primary route for traffic oriented toward the Turnpike from Route 5. GP recommends that this cut through traffic be routed to the most appropriate locations. Given the proximity of Garfield Street to Industrial Park Road and the classification as a high crash location, Garfield is not the desirable route. Recent improvements completed at the Louden Road intersection since the last study, as well as the recommended improvements for the Franklin Street intersection should accommodate the redirected traffic. The Franklin Street approach should be monitored to determine if an additional approach lane (to provide separate left and right lanes) is needed.

This intersection needs to be evaluated based on both the global impacts of what mitigation to other intersections would have on this intersection as well as what impacts mitigating this intersection would have on the surrounding intersections. Before any mitigation is completed at this intersection, the City should decide what other mitigation in the area is to be completed and in what order. For example, if a roundabout will be constructed at the Industrial Park Road intersection, than mitigation at this intersection may not be necessary, or modified as needed. If this intersection is to be right-in / right-out only, than the intersection of Franklin Street at Route 112 should be signalized first and perhaps consider the one-way pair with Tasker Street.

- Lund Road / Route 112: This intersection would not be expected to meet the warrants for signalization under current conditions. However, should a significant use be constructed on this road, this intersection should be reevaluated to determine if mitigation is required, including but not limited to signalization. The presence or absence of a second access to potential future development, such as one directly to the Industrial Park Road, is a significant factor of whether or not this intersection would require mitigation, and to what degree.
- Middle School / Route 112: The entrance and exit intersections associated with the Middle School shows acceptable levels of service and therefore no mitigation is recommended specifically for the driveways. However, the recommended center turn lane through this roadway segment should further improve traffic flow through the area. It should be noted that for the 2005 study, there was only one school driveway that included both ingress and egress at that one location. Since that study, the school has separated ingress and egress into two separate driveways.
- Louden Road / Route 112: The unsignalized intersection of Route 112 / Louden Road has benefited from previous MaineDOT improvements that included a formal westbound left turn lane on Route 112 and currently operates and is forecast to continue to operate at acceptable levels of service. These improvements were recommended in the 2005 Corridor Study.



- Industrial Park Road / WB I-195 Ramp: The capacity analysis forecast this intersection to operate at an acceptable level of service and the crash history does not classify this intersection as a high crash location. The 2005 Corridor Study recommended the following mitigation:
  - Signalization of the intersection
  - Construct a northbound right turn lane on Industrial Park Road
  - Extend the Ramp right turn lane to 200 feet

GP explored why there may be a difference in the 2005 Corridor Study and the evaluation for this study. Based on a review of the design hour volumes for the previous study and this study, this studies design hour volumes are 30-35 % less. This is most likely a reflection of the recession that occurred after the 2005 study and prior to this study.

Recommendation: Continue to monitor this intersection for potential future signalization.

#### Signalized Intersections:

The following describes the existing two signalized intersections within the study area.

- Route 112 / Industrial Park Road: Route 112 within the study area currently only has one signalized intersection; Route 112 / Industrial Park Road. This intersection has been reviewed previously because it experiences significant volumes of traffic resulting in low levels of service and significant queuing. Previous reviews and evaluations have resulted in upgrades to geometry (including a slip right turn lane from Route 112 onto Industrial Park Road) as well as phasing and timing changes. As can be seen from the summary table, the AM peak hour operates at acceptable levels of service (but still has queuing issues); however, the intersection continues to experience low levels of service with associated queuing issues during the PM peak hour.

In a previous review of this intersection performed by GP for the City, this intersection was evaluated to determine what physical impacts a roundabout would have on this intersection. A conceptual layout is provided with this update in Appendix D. It should be noted that a roundabout at this location would require the acquisition of the adjacent property in the northeast corner of the intersection. Although a formal roundabout evaluation has not been completed, and outside of the scope of this update, it is anticipated the conceptual design shown would result in significant improvements to both level of service as well as reducing queuing.

In the 2005 corridor study, adding an additional approach lane on both Industrial Park Road as well as southbound on Route 112 was recommended. This would require widening of both Route 112 and Industrial Park Road. These additional lanes would provide dual left turn lanes on each of the two approaches. The drawback with this alternative is not only the widening on the approaches, but that

both Route 112 and Industrial Park Road would also need to be widened to provide two receiving lanes. This widening would need to be carried for 750 to 1,000 feet before merging back to a single lane in order to obtain appreciable lane utilization at the intersection. Since the previous 2005 study, a right turn slip lane from northbound Route 112 onto Industrial Park Road was constructed, which would make the dual left turn movements onto Industrial Park Road more difficult.

- Industrial Park Road / EB I-195 Ramp: This signalized intersection is where the I-195 eastbound on / off ramp intersects with Industrial Park Road. In both the AM and PM peak hours, there is a higher volume of traffic exiting I-195 than entering. This intersection is forecast to operate at an overall acceptable level of service in the year 2020; however, the queue lengths are significant with the ramp queue forecast to extend back to the I-195 mainline.

In the 2005 corridor study, this intersection was identified as needing additional lanes on each of the three approaches in order to provide an acceptable level of service. GP explored why there may be a difference in the 2005 Corridor Study and the evaluation for this study. Based on a review of the design hour volumes for the previous study and this study, this studies design hour volumes are 25-36 % less. This is most likely a reflection of the recession that occurred after the 2005 study and prior to this study.

Recommendation: GP recommends the first course of action to optimize the timing in the field during the weekday AM and PM peak hours of traffic during peak times of the year. If the queuing is still longer than desired, the next alternative could be the construction of dual left turn lanes on the ramp and/or an exclusive right turn lane on Industrial Park Road. Construction of the dual turn lanes would require the construction of dual receiving lanes on Industrial Park Road where there is currently only one. The construction of dual turn lanes on the ramp was also one of the recommended mitigation items identified in the 2005 Corridor Study. The exclusive right turn lane on Industrial Park Road would not require any additional receiving lanes on the ramp. Construction of a through/right lane on Industrial Park Road was identified in the 2005 Corridor Study.

### **Capacity Analysis with Mitigation:**

The following summarizes the capacity analysis of the intersections recommended for mitigation. For ease of review and comparison, the results without mitigation (2020 condition) are repeated:

**2020 Level of Service Summary – Route 112**

	W/O Mitigation		With Mitigation	
	AM	PM	AM	PM
Spring St (Unsig / Sig.)				
Rt 112 NB	A	A	D	C
Rt 112 SB	A	A	C	B
Spring EB	<b>F</b>	<b>F</b>	E	C
Franklin St (Unsig / Sig.)				
Rt 112 NB	A	A	A	B
Rt 112 SB	A	A	B	A
Franklin EB	<b>F</b>	<b>F</b>	B	B
Jenkins Rd (Unsig)				
Rt 112 NB	A	A	A	A
Rt 112 SB	A	A	A	A
Jenkins WB	<b>F (400)</b>	<b>F (317)</b>	<b>F (332)</b>	<b>F (99)</b>

X (X) = Level of Service (Delay in seconds)

As can be seen from the summary, the two intersections that met warrants for signalization, would improve in Level of Service with signalization.

For the Jenkins Road improvement, although both the “with” and “without” scenarios show a level of service “F”, it can be seen from the delays that the approach would benefit from the recommended improvements by reducing the delay.

Although the benefits of all the combinations of the potential improvements is outside the scope of this update, qualitatively all the improvements would be expected to improve the capacity, mobility and safety of the corridor.

**Other Potential Alternatives:**

The following alternatives would all be considered long range plans that would involve a significant amount of planning and evaluation prior to implementation but could potentially result in long term mitigation of the issues that the study area currently experiences.

**Connector between Route 112 and Industrial Park Road:**

An alternative to help address the deficiencies at the Industrial Park Road / Route 112 intersection as well as the associated queuing issues on both Route 112 and Industrial Park Road would be to provide a connector between Route 112 and the Industrial Park Road. This connector would result in reduced volumes of eastbound traffic on Route 112 turning left onto Industrial Park Road, as well as the reverse right-turn movement from Industrial Park Road. This may also reduce the extent of mitigation required at the

Route 112 / Industrial Park Road intersection, such as additional lanes or the need for a roundabout.

What appears to be the most logical location for the connector road to intersect Route 112 is via the Lund Road. This would put the connector across from what could be at least an I-95 northbound off ramp which would most likely be signalized, especially if development occurs off Lund Road. This would also locate the connection approximately 1,400 feet from the Industrial Park Road / Route 112 intersection, which should allow for queuing between the two intersections. A second potential intersection location for Route 112 could be using the existing Saco Public Works property frontage. (See attached overall plan)

On Industrial Park Road, the connector road would most likely intersect across from the I-195 eastbound on / off ramp. The location across from the I-195 ramps is the preferred location since it would be anticipated to attract the most use. However, due to existing development and natural environmental features, it may be difficult to construct a roadway through this area. A connector through this area may also need to cross RR tracks.

Regardless of where the connector intersects either of the roadways, the key to its success is that it be a quicker more convenient route than other routes. This could be accomplished through roadway geometrics and signal timing / phasing to favor the preferred movements.

*Route 112 at Former I-95 Northbound Ramps:*

Currently, the former I-95 northbound ramps are still active, but only allow for a connection to a hotel/convention center. Our office recommends the reopening of the northbound off-ramp to general traffic. This would reduce the amount of traffic utilizing the Industrial Park Road ramps as well as Industrial Park Road itself. An EZ-Pass sensor could be installed at this ramp to maintain proper toll collection.

Based on a preliminary review of the reopening of this off-ramp, it appears that its use, while not precluding the need for the other recommendations in this plan, would reduce volumes, particularly on Industrial Park Road, to the extent where the proposed improvement plan would be viable for a longer period of time. As it would incur little cost to complete, it is recommended for further study. It is anticipated that the intersection of Route 112 and the ramp could satisfy peak-hour signal warrants. The intersection should be monitored for signalization. It is recommended that this off-ramp not be opened until the intersection of Industrial Park Road / Route 112 operates at a level of service such that queuing of vehicles do not extend back to this intersection.

Although reopening the northbound on-ramp would further improve operations along Industrial Park Road, our office cannot recommend its use for general traffic. The merge and weave distance from this ramp to the I-195 ramp is insufficient for general traffic and could result in a collision problem. This is consistent with the finding of a recent Preliminary Interchange Justification Report prepared by GP in September 2013, when exploring other options in evaluating a potential interchange further north.

### Connector Road Between Route 5 and Route 112:

Many of the issues experienced by the unsignalized intersections along Route 112 to the east of the I-95 overpass are thought to be created, at least in part, by cut through traffic from Route 5 wanting to use Industrial Park Road and access I-95. One alternative to partially address that specific issue, and capture those drivers to west, is to provide a connector between Route 5 and Route 112. This would be expected to not only reduce cut through traffic on the existing neighborhood streets, but could also spur commercial and residential growth both along the connector (however we recommend limited driveways on the connector) but also along Route 5 in the vicinity.

### Future Connections to I-195:

Another potential alternative considered is the extension of I-195 to the west of I-95, with its terminus in the vicinity of Jenkins Road. This new connection would serve to reduce traffic volumes on Industrial Park Road. This alternative would have an impact on existing development in the area of the connector road constructions, and would also require upgrading Jenkins Road, especially between the new connector intersection to Route 112.

### Direct Connection from I-95 to Route 5:

Another potential alternative evaluated to relieving the concentration of traffic within the study area would be the construction of an interchange from I-95 to Route 5. For this to occur, the former I-95 northbound ramps to Route 112 would have to be discontinued. As a result, the separation between this proposed interchange and the I-195 interchange would be sufficient for adequate merge and weave distance.

In addition to closing the former I-95 ramp (which has a hotel access located on it), development has encroached on much of the land that would be required for the construction of the ramps, including the approval of a 60 unit residential development in the southwest corner. Therefore construction of a full or even partial interchange would result in significant property and structural impacts. Therefore, this option is not recommended for further investigation.

### Pedestrian and Bicycle Accommodations:

#### Route 112

The easterly end of Route 112 within the study area, from Spring Street to Shadagee Road, is currently well suited to accommodate pedestrians and bicycles with sidewalks on each side and wide paved shoulders. GP recommends a minimum of four feet of width be provided for constrained areas without curbing and a minimum of five feet of width provided for areas adjacent to curbing. Approaching Industrial Park Road the shoulders are limited or non-existent because additional lanes are added to accommodate vehicular traffic. Sidewalks continue to be provided on each side of Route 112 near the intersection; however, there are no crosswalks or pedestrian accommodations at the Route 112 / Industrial Park Road intersection. From the intersection with Industrial Park Road westerly to Nottingham Drive, there continues

to be sidewalks on each side of Route 112, but the paved shoulders vary in width from non-existent to eight feet. From this location further westerly, Route 112 shoulders start to increase in width to approximately eight feet and the sidewalk continues along the southerly side to its terminus at the Middle School. The westerly most end of Route 112 does not have pedestrian accommodations; however, it does not appear to experience significant pedestrian activity.

Restriping of Route 112 to provide a center turn lane will, in most places along the corridor, should provide the minimum shoulder width recommended to accommodate bicycles. Although the preferred approach is to provide wider shoulder widths for bicycles, providing “Share the Road” signs and pavement marking sharrows along the corridor where shoulder width is narrower than the recommended widths, may be an interim option until the roadway can be widened.

### Industrial Park Road

There are no pedestrian accommodations along Industrial Park Road; however, there is a worn path along the easterly side of Industrial Park Road leading from Route 112 where the sidewalk terminates, to the athletic fields on Industrial Park Road. We recommend that any future signalization of unsignalized intersections, or reconstruction of existing signalized intersections, incorporate pedestrian accommodations such as push buttons, crosswalks, and countdown pedestrian heads. These accommodations should also be considered when widening either Route 112 or Industrial Park Road.

### *Summary of Potential Alternatives:*

The following summarizes the potential alternatives and classifies them into Short Term, Long Term, or Monitor. Short Term alternatives are those which require less engineering and costs. Long Term alternatives are those which may require several years to go through the engineering and local / public approval process and may require more funds to complete. Monitoring refers to those situations that are border line for needing to be addressed, but may not quite be there. The potential alternatives are listed in the approximate order of our preference (highest priority first); however, the City’s priorities and available funding will have a significant impact on order of implementation. Some alternatives can be completed concurrently, while others may preclude other alternatives from being feasible. It should be noted that the alternatives for addressing the congestion at the Route 112 / Industrial Park Road are listed under “Long Term Alternatives” because they are anticipated to require more planning and funds; however, they should be considered an issue that should be addressed as soon as possible. For the monitoring, they are all considered equal.

### *Potential Short Term Alternatives:*

- Field adjust timing at the two signalized intersections within the study area
- Stripe Route 112 for a center turn lane from Spring Street to Tasker Street
- Construct exclusive northbound right turn lane on Industrial Park Road at the signalized eastbound I-195 ramp.
- Stripe Route 112 for a center turn lane from Jenkins Road to Middle School Entrance (Some roadway widening may be required)

- Restrict Garfield Street to right-in / right-out only (This alternative needs to be evaluated for its overall effect to the roadway network before implementation. Other mitigation throughout the study area may be required before this can be implemented)
- Stripe Tasker Street approach for separate left and right lanes
- Jenkins Road construction of an additional approach lane for a total of two
- Potential extension of Garfield approach lanes (Not needed if restricted to right-in / right-out)
- Signalize Franklin Street / Route 112
- Signalize Spring Street / Route 112
- Provide pedestrian accommodations at existing or future signalized intersections (This alternative should be moved up in priority if uses in the area are developed that have a high pedestrian draw)
- Continue sidewalk around from Route 112 along easterly edge of Industrial Park Road

*Potential Long Term Alternatives:*

- If monitoring identifies issue, construct dual left turn lanes on I-195 EB ramp concurrent with improvements at signalized ramps
- Construct Roundabout at Route 112 / Industrial Park Road (This alternative should be considered with the “Connector Road” alternative. It would most likely be one alternative or the other, and not both.)
- Construct a connector road between Route 112 and Industrial Park Road
- Re-open the former I-95 northbound off-ramp
- Construct future connector road between Route 5 and Route 112
- Set up Tasker Street – Franklin Street as one-way pair
- Extension of I-195 to the west of I-95
- Construct direct between I-95 and Route 5 (***Not Recommended***)

*Monitoring:*

- Monitor the I-195 westbound ramp / Industrial Park Road intersection for potential signalization
- Monitor the I-195 eastbound ramp for capacity or queuing issues
- Monitor Route 112 / Jenkins for signalization
- Monitor the Route 112 / Lund Road intersection for signalization if development on Lund Road occurs or if the northbound off ramp is re-opened

***Funding:***

Funding for these improvements can be accomplished via several means, including the following:

- Impact fees for development
- Local funding (bonding)
- State funding
- Federal funding (including the BTIP process)
- Combination of entities including MTA, MaineDOT, Local Funded Projects

# Chapter 5

## Conclusions

GP has evaluated existing traffic operations and forecast 2020 conditions for the Route 112 corridor from Spring Street to Loudon Road and the Industrial Park Road from Route 112 to the I-195 westbound ramps. The purpose of this update was to primarily identify existing and potential operational and safety deficiencies along the corridors and recommend mitigation measures to address these conditions. These alternatives are modifications to the existing transportation network. This study also identifies long-term traffic trends to be addressed by follow-up studies of potential new connections to the interstate system and/or surface street interconnections. Based on this update study, GP has identified the following needs:

### **Summary of Potential Alternatives:**

The following summarizes the potential alternatives and classifies them into Short Term, Long Term, or Monitor. Short Term alternatives are those which require less engineering and costs. Long Term alternatives are those which may require several years to go through the engineering and local / public approval process and may require more funds to complete. Monitoring refers to those situations that are border line for needing to be addressed, but may not quite be there. The potential alternatives are listed in the approximate order of our preference (highest priority first); however, the City's priorities and available funding will have a significant impact on order of implementation. Some alternatives can be completed concurrently, while others may preclude other alternatives from being feasible. It should be noted that the alternatives for addressing the congestion at the Route 112 / Industrial Park Road are listed under "Long Term Alternatives" because they are anticipated to require more planning and funds; however, they should be considered an issue that should be addressed as soon as possible. For the monitoring, they are all considered equal.

### **Potential Short Term Alternatives:**

- Field adjust timing at the two signalized intersections within the study area
- Stripe Route 112 for a center turn lane from Spring Street to Tasker Street
- Construct exclusive northbound right turn lane on Industrial Park Road at the signalized eastbound I-195 ramp.
- Stripe Route 112 for a center turn lane from Jenkins Road to Middle School Entrance (Some roadway widening may be required)
- Restrict Garfield Street to right-in / right-out only (This alternative needs to be evaluated for its overall effect to the roadway network before implementation. Other mitigation throughout the study area may be required before this can be implemented)
- Stripe Tasker Street approach for separate left and right lanes
- Jenkins Road construction of an additional approach lane for a total of two
- Potential extension of Garfield approach lanes (Not needed if restricted to right-in / right-out)



- Signalize Franklin Street / Route 112
- Signalize Spring Street / Route 112
- Provide pedestrian accommodations at existing or future signalized intersections (This alternative should be moved up in priority if uses in the area are developed that have a high pedestrian draw)
- Continue sidewalk around from Route 112 along easterly edge of Industrial Park Road

Potential Long Term Alternatives:

- If monitoring identifies issue, construct dual left turn lanes on I-195 EB ramp concurrent with improvements at signalized ramps
- Construct Roundabout at Route 112 / Industrial Park Road (This alternative should be considered with the “Connector Road” alternative. It would most likely be one alternative or the other, and not both.)
- Construct a connector road between Route 112 and Industrial Park Road
- Re-open the former I-95 northbound off-ramp
- Construct future connector road between Route 5 and Route 112
- Set up Tasker Street – Franklin Street as one-way pair
- Extension of I-195 to the west of I-95
- Construct direct between I-95 and Route 5 (**Not Recommended**)

Monitoring:

- Monitor the I-195 westbound ramp / Industrial Park Road intersection for potential signalization
- Monitor the I-195 eastbound ramp for capacity or queuing issues
- Monitor Route 112 / Jenkins for signalization
- Monitor the Route 112 / Lund Road intersection for signalization if development on Lund Road occurs or if the northbound off ramp is re-opened

Funding:

Funding for these improvements can be accomplished via several means, including the following:

- Impact fees for development
- Local funding (bonding)
- State funding
- Federal funding (including the BTIP process)
- Combination of entities including Maine Turnpike Authority, MaineDOT, Local Funded Projects