TECHNICAL MEMORANDUM

Date:	February 17, 2021	Job No.: 7398
To:	Mr. Tom Kravitz, North Smithfield Town Planner	
Cc:	Mr. Paul Zwolenski, Town Administrator	
From:	Jaklyn Centracchio, PE, PTOE	
Subject:	Branch Village Industrial/Business Park – Pound Hill Road Site Access Alternatives	

BETA Group, Inc. (BETA) has been retained by the Town of North Smithfield to assist in the preliminary permitting process with the Rhode Island Department of Transportation (RIDOT) and the Federal Highway Administration (FHWA) relating to the potential for a secondary site access to the *Branch Village Industrial/Business Park,* situated off of Great Road. This undeveloped and wooded acreage is a subdistrict within the *Branch Village Revitalization* project area that has been under study by the Town of North Smithfield for a number of years. Refer to Figure 1 on the following page for the location of the project within the community.

The *Branch Village Revitalization* report, an economic development planning study prepared by the town over a decade ago, defined four separate subdistricts (*Village Center*, *Northwest Village*, *Industrial Park*, and *South of Rail Line*) within the village. As part of these subdistricts a mixture of land uses were defined for development potential consisting of; 180 residential units, 588,060 square feet (SF) of office space, 342,470 SF of industrial/manufacturing space, and 99,615 SF of small commercial space. The mixed-use combination of renovated and new building space resulted in over one million square feet of proposed development within the *Branch Village* area of North Smithfield.

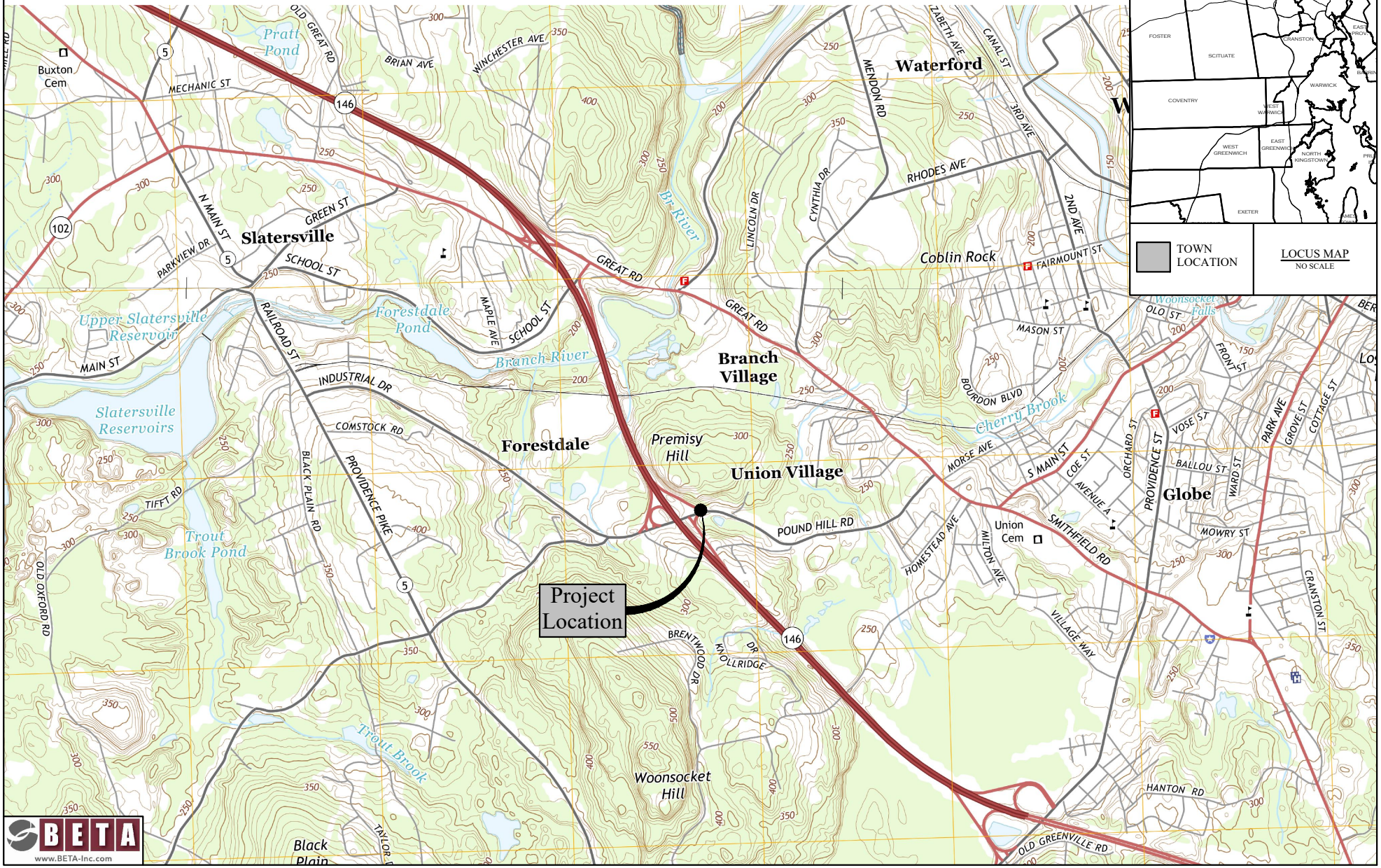
Great Road provides the only access to the 300 acre overall village area that flanks the Branch River. This section of town presently contains multiple properties containing residential and commercial uses and undeveloped wooded lots within the village as can be seen in Figure 2. Conceptual studies were completed that defined the development potential of the area as noted above, and the corresponding infrastructure improvements that would be necessary along Great Road to accommodate the traffic demands. To address the economic viability of the village revitalization plan that was restricted in scale due to the infrastructure limitations of Great Road, the potential for a secondary access from the south off of Pound Hill Road was investigated as part of the most recent studies. A secondary road would provide a separate access to the more commercial and higher traffic generating uses proposed within the southern district of the development. Providing an alternate means of access to this subdistrict would limit the traffic demand burden and resultant infrastructure modifications needed along Great Road and its major intersections within the historic village, therefore improving the economic viability of the revitalization proposal.

The current effort being completed by BETA for the Town of North Smithfield advances the most recent planning level traffic study that was prepared in 2019. This traffic study (Traffic Impact Study, Route 146 and Pound Hill Road) specifically reviewed the operational benefits to the existing roadway infrastructure including Great Road and Pound Hill Road resulting from a secondary southern access to the Branch Village area. The study assessed potential operations of a generic site access road intersection with Pound Hill Road that had been conceptually designed in 2017 for initial consideration by the RIDOT and FHWA.

Route 146 Interchange at Pound Hill Road

NORTH SMITHFIELD, RHODE ISLAND

Figure 1 - Project Vicinity Map



Route 146 Interchange at Pound Hill Road

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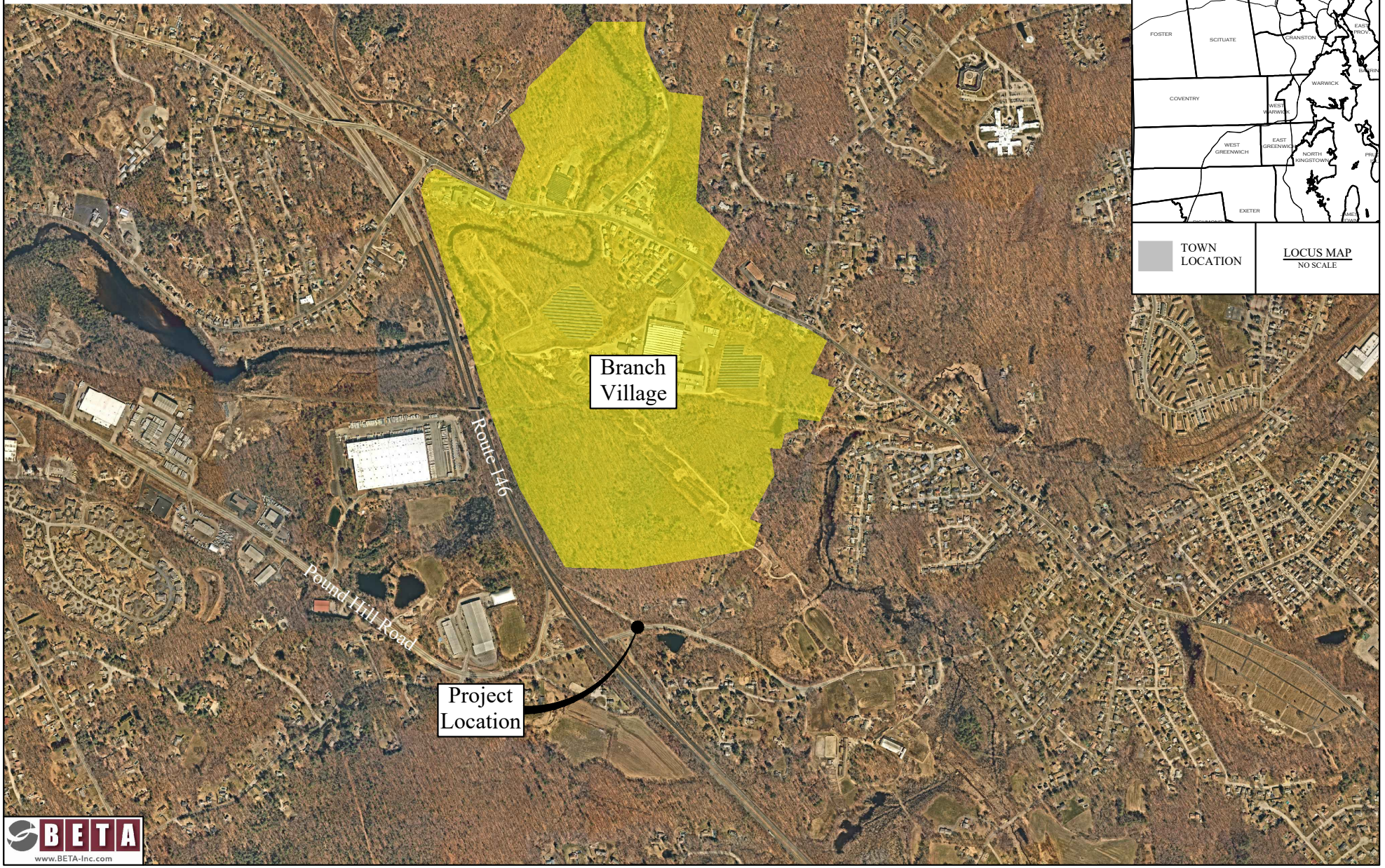
Figure 2 - Project Location Map



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The supplemental technical memorandum included herein, in combination with Preliminary 10% Roadway Improvement Plans, provide a more detailed highway/intersection design and operational analysis of two potential alternatives for an access road intersection with Pound Hill Road. This detailed design was requested by the RIDOT during the initial coordination effort to define the impact to the existing Route 146 Interchange. The design and analysis provided will allow the Department to determine if the modifications proposed would; not have an adverse impact the Route 146 Interchange, are necessary transportation improvements promoting economic development, provide safe and efficient access along the Pound Hill Road corridor, and could be advanced to final design through the formal Physical Alteration Permit (PAP) process, or at the request of the town, through the RIDOT's Transportation Improvement Program (TIP).

This memorandum summarizes the findings of our analysis for the section of Pound Hill Road between the Route 146 Northbound On-Ramp and the proposed access road for the *Branch Village Industrial/Business Park* site. As part of our analysis, the earlier studies that had been completed by the town, were used as a basis for the Branch Village development scenarios and resultant future traffic projections. These future condition estimates were utilized for the off-site mitigation design alternatives prepared for this study that would safely and efficiently accommodate the projected traffic demands.

The following Land Planning and Transportation studies prepared in previous years for the *Branch Village Revitalization* area were used as reference and have been included in part, in the Attachments to this document;

- Traffic Impact Study, Route 146 and Pound Hill Road, April 2019
  Prepared by McMahon Associates, Inc. (McMahon)

- Environmental Assessment – Route 146 and Pound Hill Road, May 2017
  Prepared by the Natural Resource Services, Inc.

- Branch Village Revitalization: Phase II – Buildout and Transportation Analysis, July 2008
  Prepared by the Pare Corporation

- Branch Village Revitalization – Final Report, November 2007
  Prepared by the Horsley Witten Group

These earlier studies have led to discussions with the RIDOT where currently, the Town of North Smithfield would like to advance the findings in the April 2019 Traffic Impact Study (TIS) and obtain conceptual approval of a secondary access from the RIDOT and FHWA. An alternative that requires modification to the Route 146 interchange with Pound Hill Road requires both federal and state approvals. The town completed intial coordination efforts with this information and received direction from the RIDOT in a February 3, 2020 letter included in the Attachments on additional documentation needed to permit realignment of the interchange ramps and construct the new access road to the *Branch Village Industrial/Business Park*. The following information included in this memorandum provides the requested documentation for consideration by the RIDOT and includes; a summary of existing conditions, access road alternative development, traffic signal warrant analysis, level of service analysis, queue analysis, stormwater treatment plans and cost estimates. The following is a summary of our findings:

EXISTING CONDITIONS

The project site is located on the northeast quadrant of the Route 146 interchange with Pound Hill Road. Pound Hill Road is a two-lane roadway that generally runs in the east-west direction. The roadway is classified as a major collector according to the State of Rhode Island Highway Functional Classification system presented in the Statewide Planning Program Technical Paper #165, and is posted at 35 mph. In the project area Pound Hill Road is approximately 38 feet wide with one 15-foot travel lane and one 4-foot-wide shoulder in each direction within the interchange proper. The Route 146 northbound ramps are configured in a diamond arrangement intersecting with Pound Hill Road to the east of Route 146. The off-ramp and on-ramp junctions are approximately 150 feet and 350 feet east of the Route 146 overpass respectively. Both ramps have large channelized right turn exit and entry lanes separating the left and right turning traffic. The alignment of the road is generally straight with a gradual incline from east to west through the interchange. The roadway becomes curvilinear beyond the interchange to both the east and west.

The April 2019 TIS further defines the project area and provided traffic data obtained in October 2018 for the base analysis. Due to the continued COVID-19 driven reduction in daily traffic volumes over the past year, additional data collection at this time would not be representative of average daily traffic conditions within the project area. Consistent with current policy, we have utilized the most recent pre-Covid traffic data provided in the April 2019 TIS to analyze the design alternatives as part of this study. No major developments in the area have been constructed since the 2018 data was obtained that would affect daily traffic conditions, and therefore the record data is assumed to be representative of average pre-Covid traffic conditions. If determined appropriate upon approval of the Preliminary PAP, additional data could be collected during the final design phase for the modified interchange, when traffic volumes return to normal once again, to insure proper design treatments for construction.

The existing operational conditions for the ramp intersections were analyzed as part of the April 2019 TIS and are not repeated in this memorandum. The TIS information is included in the Attachment for easy reference. The following section will focus on the future conditions associated with the proposed design alternatives developed by BETA in combination with the Branch Village development plan trip estimates from earlier studies.

ALTERNATIVES & ANALYSES

As noted earlier, a conceptual design alternative was developed by CDR in 2017 that was submitted to the RIDOT and FHWA for consideration of the feasibility of a freeway ramp modification. This plan resulted in the comment letters provided by RIDOT and which are included in the Attachments. The plan was a high level analysis based upon available USGS mapping at that time. The April 2019 TIS utilized this concept as part of their traffic analysis for the proposed secondary access to the Branch Village. BETA has used information from both the plans and report to review options that would minimize impacts to the interchange operations, stormwater system and environment. We have developed more detailed alternatives for the proposed access road, including the relocation of the Route 146 Northbound On-Ramps which are summarized below:

Alternative 1: This alternative provides a relocated Route 146 Northbound On-Ramp approximately 250 feet to the west of the existing location on Pound Hill Road. An exclusive 75 feet left turn lane will be provided on Pound Hill Road for vehicles turning left onto the Route 146 Northbound On-Ramp. The access road is proposed to intersect Pound Hill Road from the north at the location of the existing Route 146 Northbound On-Ramps. The lane configuration of the access road approach will consist of one 60-

foot exclusive left turn lane and an exclusive right turn lane. An exclusive 210-foot left turn lane will be provided on Pound Hill Road for vehicles turning left onto the access road. The Route 146 Northbound Off-Ramp will be reconstructed in place but will include removal of the large radius channelized right turn. The exclusive right turn lane will be reconfigured adjacent to the left turn lane to create a perpendicular, 2-lane T-type approach to Pound Hill Road. The left turn lane will remain at its present location. All study area intersections will continue to operate as unsignalized. The access road and Route 146 Northbound Off-Ramps approaches will be under stop control. This alternative is shown in Figure 3.

Alternative 2: This alternative provides the same relocated Route 146 Northbound on-ramp as Alternative 1 and the same exclusive left turn lane on Pound Hill Road. The access road is shifted to the west directly across from the Route 146 Northbound Off-Ramps to form an unsignalized four-way intersection. An exclusive 55-foot left turn lane will be provided on Pound Hill Road for vehicles turning left onto the access road. The Route 146 Northbound Off-Ramp lane configuration will consist of a shared left-turn/through lane and a 120-foot exclusive right turn lane. The access road and Route 146 Northbound Off-Ramps approaches are under stop control. This alternative is shown in Figure 4.

Alternative 2A: This alternative is the same as Alternative 2 in configuration but includes the signalization of the Pound Hill Road and Route 146 Northbound Off-Ramp/Access Road intersection. The signal configuration for this alternative is shown in Figure 5.

LEVEL OF SERVICE ANALYSIS

As requested by the RIDOT in the preliminary review of the CDR design concept, an analysis of the segment of Pound Hill Road between the Route 146 ramps and the proposed access road was performed. In order to evaluate traffic conditions for each of the alternatives, a capacity (level of service) analysis was performed for each alternative. This analysis was performed using methods of the *Highway Capacity Manual* published by the Transportation Research Board. For intersections, six levels of service, "A"-"F", have been established with "A" representing very good operation and "F" representing very poor operation. For signalized and unsignalized intersections, level of service is defined in terms of total delay and is computed for individual intersection turning movements. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time

Table 1: Level of Service Criteria

LOS	Unsignalized Intersection Criteria Average Total Delay (Seconds per Vehicle)	Signalized Intersection Criteria Average Total Delay (Seconds per Vehicle)	General Description
A	< 10.0	< 10.0	Free Flow
B	10.1 to 15.0	10.1 to 20.0	Stable flow (slight delays)
C	15.1 to 25.0	20.1 to 35.0	Stable flow (acceptable delays)
D	25.1 to 35.0	35.1 to 55.0	Approaching unstable flow (tolerable delay)
E	35.1 to 50.0	55.1 to 80.0	Unstable flow (intolerable delay)
F	> 50.0	> 80.0	Forced flow (jammed)

Route 146 Interchange at Pound Hill Road

NORTH SMITHFIELD, RHODE ISLAND

Figure 3 - Alternative 1

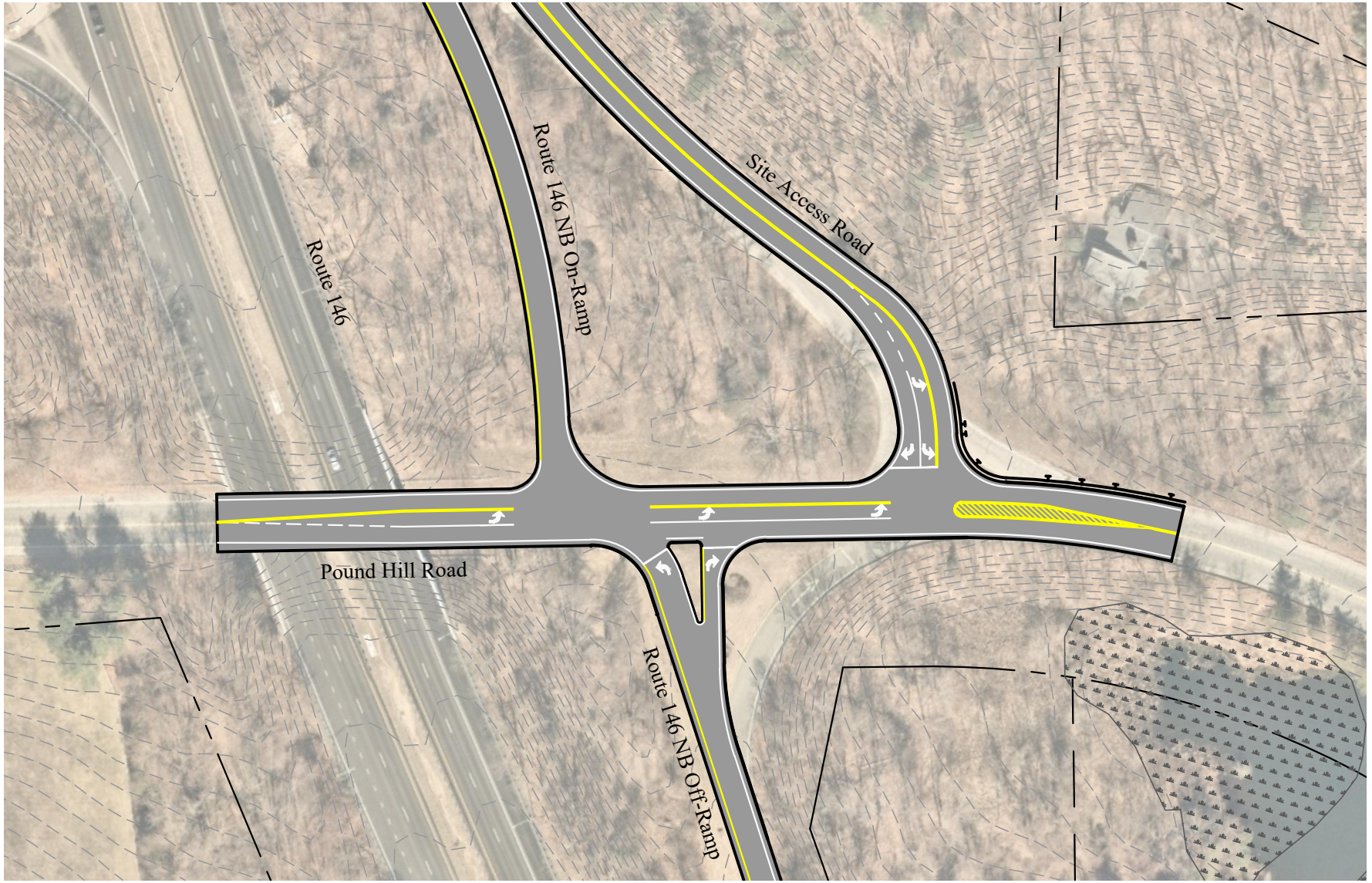

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Figure 4 - Alternative 2

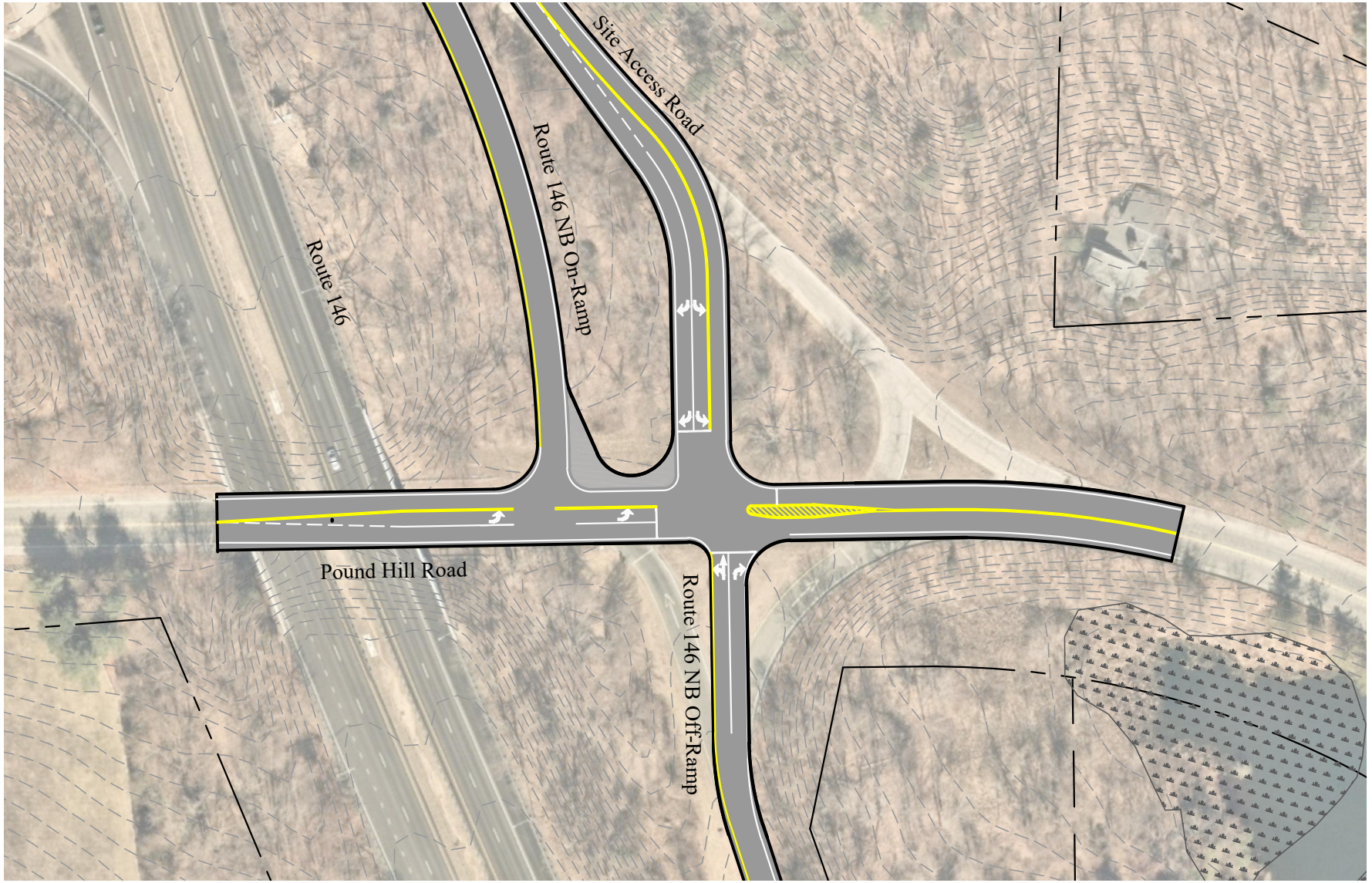

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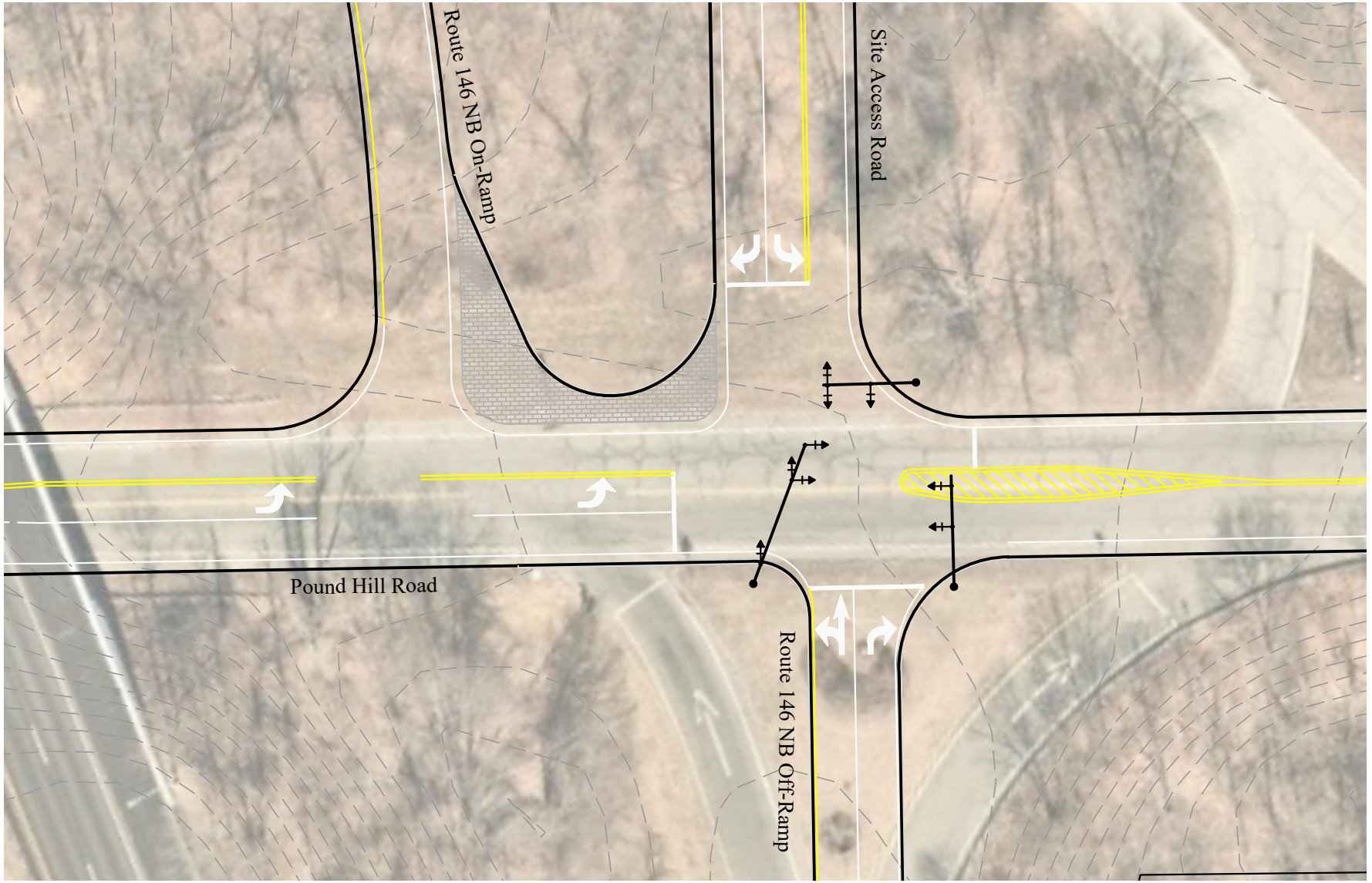
Figure 5 - Alternative 2A



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A level of service analysis was performed for the intersections using the Synchro software program for unsignalized and signalized operations. To understand the volume of traffic to be accommodated, Figures 6 and 7 have been provided and depict the AM and PM Peak Hour volumes at the study intersections for each alternative. The results of the analysis are provided in the Attachment and the AM and PM analysis results for these alternatives are summarized in Tables 2 and 3.

Table 2: Level of Service Results - AM Peak Hour

INTERSECTION	Alternative 1			Alternative 2			Alternative 2A		
	LOS	Delay*	v/c	LOS	Delay*	v/c	LOS	Delay*	v/c
Pound Hill Road and Route 146 NB On-Ramp									
Pound Hill Rd EB L	A	-	-	A	-	-	A	-	-
Route 146 Northbound Off-Ramp and Pound Hill Road									
Route 146 NB Ramp L	B	12.5	0.14	-	-	-	-	-	-
Route 146 NB Ramp R	B	14.7	0.56	-	-	-	-	-	-
Pound Hill Road and Site Access Road									
Pound Hill Rd EB L	A	9.0	0.37	-	-	-	-	-	-
Site Access Road SB L	E	47.0	0.20	-	-	-	-	-	-
Site Access Road SB R	A	9.6	0.15	-	-	-	-	-	-
Route 146 Northbound Off-Ramp/Site Access Road and Pound Hill Road (Signalized)									
Pound Hill Rd EB L	-	-	-	A	7.7	0.06	B	14.4	0.26
Pound Hill Rd EB T	-	-	-	-	-	-	B	13.6	0.27
Pound Hill Rd WB TR	-	-	-	-	-	-	B	11.1	0.29
Route 146 NB Ramp LT	-	-	-	F	115.5	1.14	A	9.2	0.51
Route 146 NB Ramp R	-	-	-	A	8.9	0.01	A	0.0	0.01
Site Access Road SB L	-	-	-	F	93.7	0.36	A	6.0	0.05
Site Access Road SB R	-	-	-	A	9.6	0.15	A	2.0	0.15
Overall	-	-	-			-	A	9.3	
* Delay is expressed in seconds per vehicle									

The analysis results for the AM peak hour under Alternative 1 indicate that the access road left turn movement would operate at LOS E with a delay of 47 seconds. Due to the low volume of this movement, no congestion (avg 1 to 2 vehicle queue) and acceptable operations would be realized. All other movements would operate at LOS B or better.

Under Alternative 2, the Route 146 northbound left turn/through movement would operate at LOS F with a delay of 115 seconds, and the Access road southbound left turn movement would also operate at LOS F with a 93.7 second delay. All other movements would operate at LOS A.

Alternative 2A addresses the Alternative 2 delays of the minor approach *Stop* control when full development is reached, and higher volumes are serviced. All movements under Alternative 2A with signalization would operate at LOS B or better and an overall intersection LOS A.

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Figure 6 - Alternative 1 AM(PM) Peak Hour Volumes

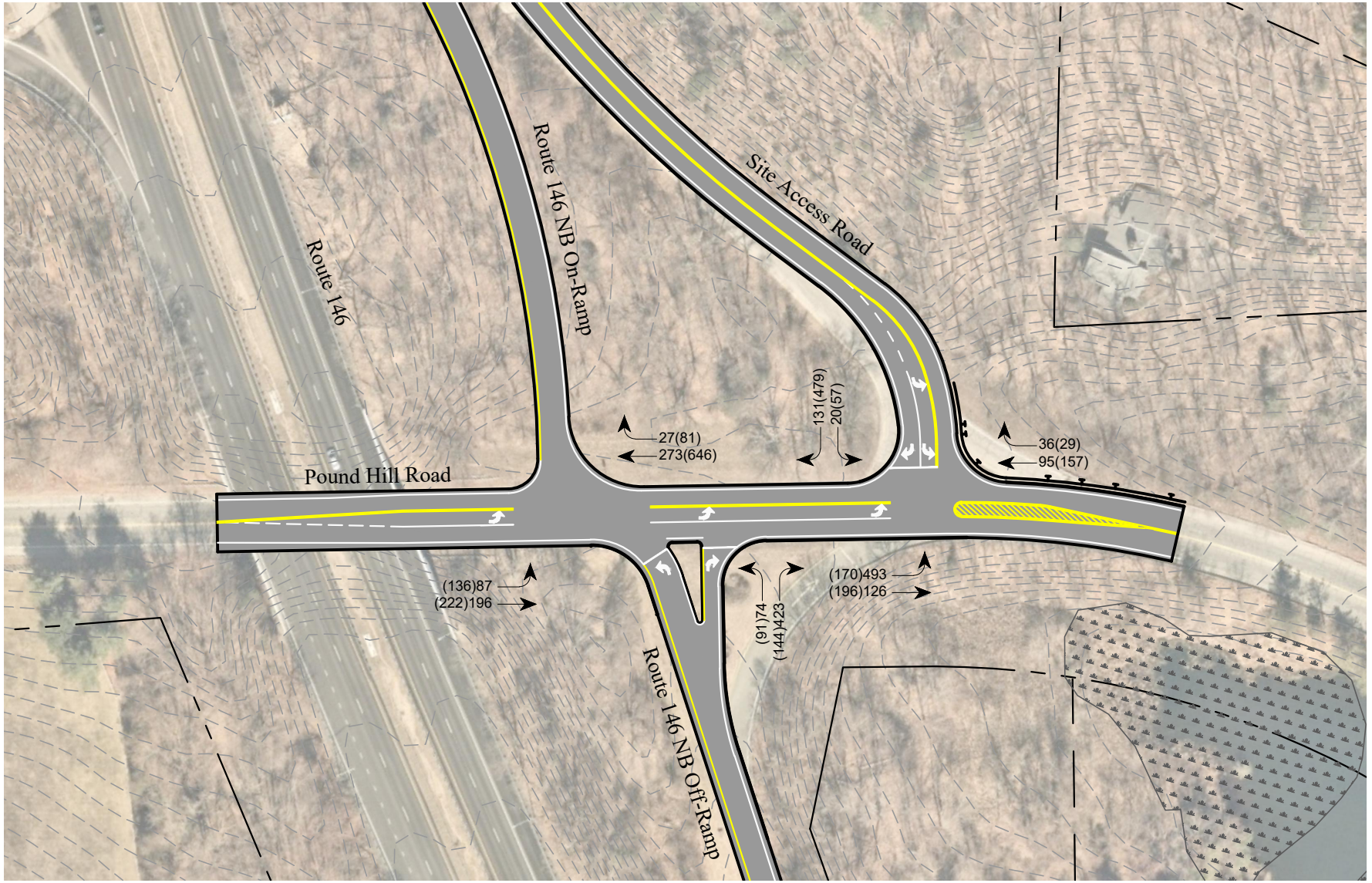

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Figure 7 - Alternative 2 AM(PM) Peak Hour Volumes

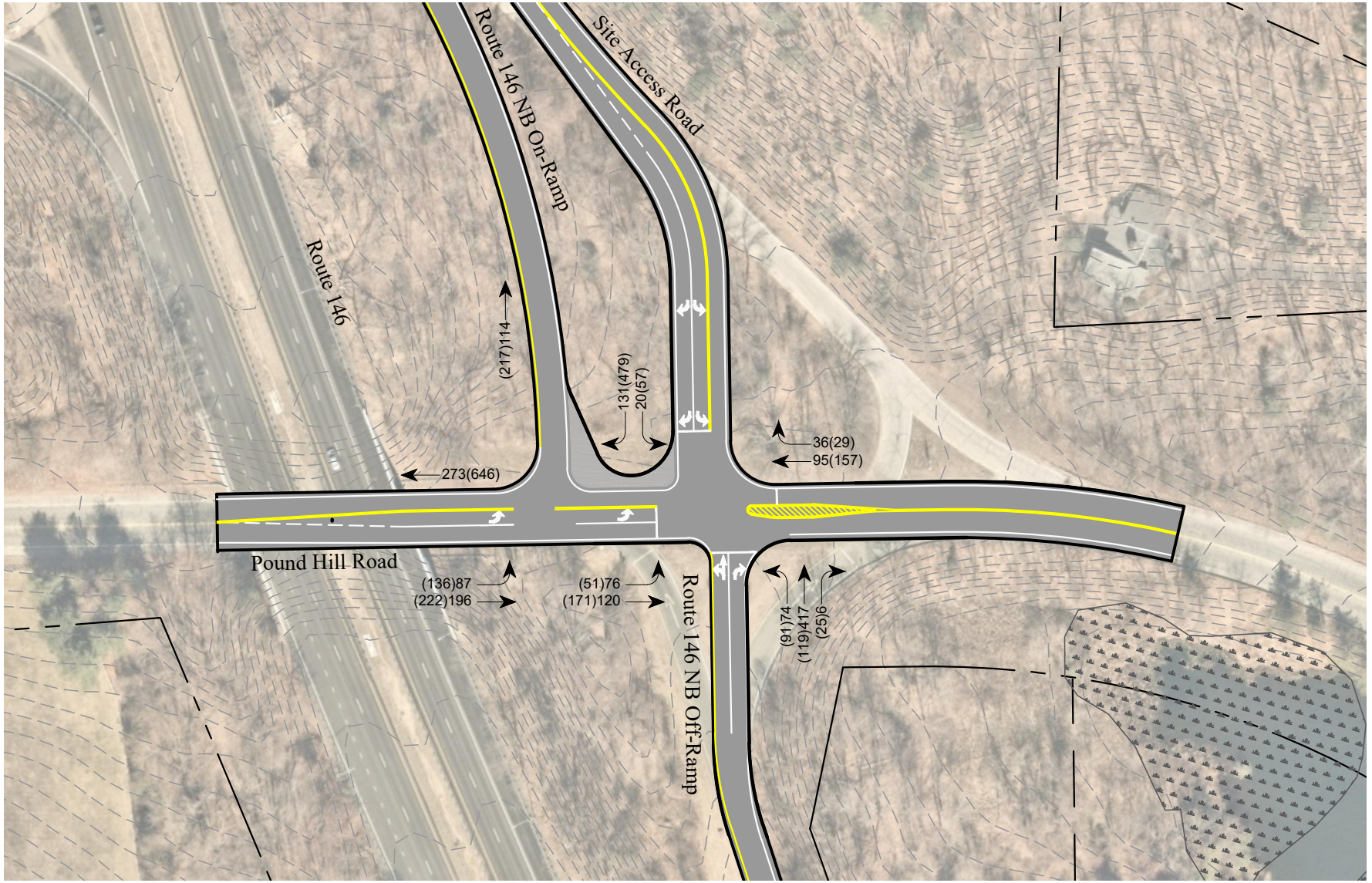

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Table 3: Level of Service Results - PM Peak Hour

INTERSECTION	Alternative 1			Alternative 2			Alternative 2A		
	LOS	Delay*	v/c	LOS	Delay*	v/c	LOS	Delay*	v/c
Pound Hill Road and Route 146 NB On-Ramp									
Pound Hill Rd EB L	A	-	-	A	-	-	A	-	-
Route 146 Northbound Off-Ramp and Pound Hill Road									
Route 146 NB Ramp L	D	27.4	0.38	-	-	-	-	-	-
Route 146 NB Ramp R	B	10.6	0.20	-	-	-	-	-	-
Pound Hill Road and Site Access Road									
Pound Hill Rd EB L	A	8.0	0.14	-	-	-	-	-	-
Site Access Road SB L	C	19.0	0.19	-	-	-	-	-	-
Site Access Road SB R	C	15.5	0.61	-	-	-	-	-	-
Route 146 Northbound Off-Ramp/Site Access Road and Pound Hill Road (Signalized)									
Pound Hill Rd EB L	-	-	-	A	7.7	0.04	A	9.1	0.15
Pound Hill Rd EB T	-	-	-	-	-	-	A	9.9	0.31
Pound Hill Rd WB TR	-	-	-	-	-	-	A	9.6	0.34
Route 146 NB Ramp LT	-	-	-	F	131.6	1.08	A	8.4	0.27
Route 146 NB Ramp R	-	-	-	A	9.3	0.03	A	2.7	0.04
Site Access Road SB L	-	-	-	C	18.9	0.19	A	7.8	0.12
Site Access Road SB R	-	-	-	C	15.5	0.61	A	3.1	0.51
Overall	-	-	-	-	-	-	A	6.6	
* Delay is expressed in seconds per vehicle									

The analysis results for the Alternative 1 PM peak hour indicate that all movements would operate at acceptable LOS D or better.

Under Alternative 2, the Route 146 northbound left turn/through movement would operate at LOS F with a delay of 131.6 seconds. All other movements would operate at LOS C or better.

Alternative 2A addresses the Alternative 2 delays of minor approach *Stop* control when full development is reached, and higher volumes are serviced. All movements under Alternative 2A with signalization would operate at LOS A or better and an overall intersection LOS A.

TRAFFIC SIGNAL WARRANT ANALYSIS

Based upon the level of service analysis presented in Tables 3 and 4, Alternative 1 was found to operate in an acceptable manner under stop controlled conditions with full buildout of the Branch Village. However, due to the design configuration of Alternative 2 that attempts to avoid potential eastbound left turn stacking overflow for vehicles turning into the access road due to high turning volumes, several movements were found to operate in a restrictive manner. Therefore, as part of the mitigation design

under the full build site conditions, Alternative 2A considered the potential for signalization and its impact on operations along this segment of Pound Hill Road and on the ramps. Signalization could be a long term alterative as the *Branch Village* is built out and volumes increase to the level of satisfying warrants for installation of a traffic signal.

In order to justify the installation of a traffic signal at an intersection, one or more of the signal warrants in the *Manual on Uniform Traffic Control Devices* (MUTCD) must be met. If one or more of the warrants is met and it is thought the installation of a signal would improve the overall safety and operation of the intersection, then installation or continued operation of a signal operation is justified.

Given that this is an estimated condition, the projected peak hour traffic volumes under the full build site conditions, Warrant 3 – Peak Hour was considered for the intersection of Pound Hill Road and Route 146 Northbound Off-Ramps/Access Road to support signalizing the intersection for Alternative 2A. Warrant 3 criteria is met for the signalization of the Alternative 2A access road intersection.

QUEUE ANALYSIS

The RIDOT also requested a queue analysis to demonstrate that there would be sufficient storage lengths along Pound Hill Road between the proposed reconfigured intersections as not to cause congestion at the intersection and backups onto the off-ramp. Therefore, the corridor intersections were analyzed using two programs, Synchro and SimTraffic. SimTraffic simulation software analyzes on a macroscopic level and considers the effect of storage lengths, blocking and spillback on queuing. The 50th and 95th percentile queues are presented as applicable in Tables 4 and 5. Available storage length refers to the length of proposed turning lanes.

As can be seen in the tables, the left lane queue storage lengths on Pound Hill Road as proposed would be sufficient for Alternatives 1, 2, and 2A under long term future full build traffic conditions. Queue storage would also be sufficient on all other approaches during the AM Peak and all approaches during the PM Peak except possibly for the access road southbound left turn lane under Alternative 2. The storage length provided for the left turn lane as designed is 190 feet with the 95th percentile queue showing the need for a 205-foot stacking length under unsignalized conditions. However, as noted this represents the long term full buildout condition of the site where volumes are such that delays become unacceptable under stop controlled conditions. As previously indicated this future full build condition would satisfy warrants for installation of a traffic signal and if installed the anticipated 95th percentile queue for this movement would be reduced to 55 feet, which is well within the design storage length. If Alternative 2A is implemented in the future when a signal is warranted, the storage length could be decreased if determined necessary or appropriate.

Table 4: Queue Summary - AM Peak

INTERSECTION	Storage Length	Alternative 1			Alternative 2			Alternative 2A			
		Synchro	SimTraffic		Synchro	SimTraffic		Synchro		SimTraffic	
		95th % Queue	50th % Queue	95th % Queue	95th % Queue	50th % Queue	95th % Queue	50th % Queue	95th % Queue	50th % Queue	95th % Queue
Pound Hill Road and Route 146 NB On-Ramp											
Pound Hill Rd EB L	75	-	25	60	-	15	40	-	-	20	55
Route 146 Northbound Off-Ramp and Pound Hill Road											
Route 146 NB Ramp L	0	15	30	30	-	-	-	-	-	-	-
Route 146 NB Ramp R	0	90	15	50	-	-	-	-	-	-	-
Pound Hill Road and Site Access Road											
Pound Hill Rd EB L	210	45	50	105	-	-	-	-	-	-	-
Pound Hill Rd WB TR	0	-	25	60	-	-	-	-	-	-	-
Site Access Road SB L	60	20	15	35	-	-	-	-	-	-	-
Site Access Road SB R	0	15	35	55	-	-	-	-	-	-	-
Route 146 Northbound Off-Ramp/Site Access Road and Pound Hill Road (Signalized)											
Pound Hill Rd EB L	55	-	-	-	5	10	25	15	45	30	50
Pound Hill Rd EB T	0	-	-	-	-	-	-	20	60	35	70
Pound Hill Rd WB TR	0	-	-	-	-	-	-	15	55	40	60
Route 146 NB Ramp LT	0	-	-	-	475	100	155	65	155	85	125
Route 146 NB Ramp R	120	-	-	-	0	-	-	0	0	-	-
Site Access Road SB L	190	-	-	-	35	10	25	2	10	10	25
Site Access Road SB R	0	-	-	-	15	35	50	0	20	40	80

Table 5: Queue Summary - PM Peak

INTERSECTION	Storage Length	Alternative 1			Alternative 2			Alternative 2A			
		Synchro	SimTraffic		Synchro	SimTraffic		Synchro		SimTraffic	
		95th % Queue	50th % Queue	95th % Queue	95th % Queue	50th % Queue	95th % Queue	50th % Queue	95th % Queue	50th % Queue	95th % Queue
Pound Hill Road and Route 146 NB On-Ramp											
Pound Hill Rd EB L	75	-	40	60	-	25	45	-	-	40	75
Route 146 Northbound Off-Ramp and Pound Hill Road											
Route 146 NB Ramp L	0	45	30	60	-	-	-	-	-	-	-
Route 146 NB Ramp R	0	20	10	35	-	-	-	-	-	-	-
Pound Hill Road and Site Access Road											
Pound Hill Rd EB L	210	15	45	60	-	-	-	-	-	-	-
Pound Hill Rd WB TR	0	-	-	-	-	-	-	-	-	-	-
Site Access Road SB L	60	20	40	50	-	-	-	-	-	-	-
Site Access Road SB R	0	105	75	100	-	-	-	-	-	-	-
Route 146 Northbound Off-Ramp/Site Access Road and Pound Hill Road (Signalized)											
Pound Hill Rd EB L	55	-	-	-	5	5	20	5	25	20	35
Pound Hill Rd EB T	0	-	-	-	-	-	-	20	60	50	70
Pound Hill Rd WB TR	0	-	-	-	-	-	-	20	60	75	135
Route 146 NB Ramp LT	0	-	-	-	260	85	105	25	65	75	120
Route 146 NB Ramp R	120	-	-	-	5	25	55	0	10	-	-
Site Access Road SB L	190	-	-	-	20	95	205	10	25	30	55
Site Driveway SB R	0	-	-	-	105	185	280	0	40	110	180

STORMWATER

A closed drainage system is proposed along the site access road under both design alternatives. Approximately half of the stormwater runoff generated from the new access road would be conveyed to a stormwater treatment unit located in the median area between the site access road and the Route 146 Northbound On-Ramp. The remaining half of the runoff would be directed towards the north and east into the future *Branch Village Industrial/Business Park* drainage system and treated accordingly. There would be no increase in stormwater runoff contributing to the existing drainage network for the water quality design storm. All water quality treatment practices would be in accordance with the Rhode Island Stormwater Design and Installation Manual (2015).

COST ESTIMATE

Preliminary cost estimates were prepared for each of the alternatives which designs are detailed in the Preliminary 10% Design Plans submitted in conjunction with this memorandum. Alternative 1 is estimated to cost approximately $3.1 million, Alternative 2 approximately $2.9 million, and Alternative 2A approximately $3.2 million. The preliminary cost estimate summaries for each alternative are provided in the Attachment for reference.

SUMMARY

The study and analysis completed as part of this memorandum has determined that a secondary access road to the *Branch Village Industrial/Business Park* is feasible from an operations and constructability perspective with negligible stormwater and environmental impacts. The two alternative configurations developed found that either option will provide acceptable traffic operations during the daily peak conditions estimated for full build of the *Branch Village Revitalization* plan.

It will be the determination of the RIDOT and FHWA as to which alternative is most desirable from a short and long term planning goal. The queue storage on Pound Hill Road for the alternatives would be sufficient during the AM and PM Peak periods which was a major concern of the initial review. Based upon overall operations, Alternative 1 allows for less disturbance beyond the current on/off ramp conditions and would operate efficiently for many years until the *Branch Village* is fully developed and occupied. Long term signalization of this alternative would be complicated and less efficient due to the offset nature of the intersections. Alternative 2 removes the potential for the stacking of high turning volumes on Pound Hill Road into the site access road by allowing the *Branch Village* bound traffic direct access at the off-ramp intersection. This alternative can also be easily modified for installation of a traffic signal when future volumes increase, or delays and safety concerns based upon the future vehicle mix, identify the potential need for additional control. Alternative 2A with simplified turning movements along this section of Pound Hill Road, which includes the signalization of the access road intersection, would provide the greatest level of safety.

Therefore, in summary the relocation of the Route 146 Northbound On/Off Ramps on Pound Hill Road necessitated by the addition of a new access road to the *Branch Village Industrial/Business Park,* could safely and efficiently be accommodated in the study area with implementation of either design alternative.

ATTACHMENT

A. Correspondence

B. Operational Analysis

C. Warrant Analysis

D. Record Studies

E. Cost Estimates

ATTACHMENT A – Correspondence

Initial Coordination Meeting

FHWA/RIDOT

Conceptual Submission Review

RIDOT

A

Initial Coordination Meeting

FHWA/RIDOT

Department of Transportation
Two Capitol Hill
Providence, RI 02903

Office 401-222-2450
Fax 401-222-3905
www.dot.ri.gov

February 5, 2018

Carlos C. Machado
Division Administrator
Federal Highway Administration
380 Westminster Street, Suite 547
Providence, Rhode Island 02903

Re: Route 146 & Pound Hill Road Interchange, North Smithfield

Dear Mr. Machado:

Thank you for meeting with me on Monday January 29th to discuss a conceptual modification to the interchange of Route 146 and Pound Hill Road that was proposed by the Town of North Smithfield. The Town's concept was to relocate the existing northbound on ramp and associated freeway line closer to Route 146 which would allow the Town to develop a future road to gain access to property further north along Route 146.

To summarize our discussion, FHWA before approving or denying such a modification would like to see a traffic analysis of the new interchange and the newly created intersection. Also, there could be environmental issues with the proposal that may need addressing. Finally, the Town would need to compensate the State fair market value for the acquisition of any state land.

I have attached a copy of the proposed concept and preliminary environmental investigation that was conducted by the Town.

Please contact me with any discrepancies noted in this letter.

Sincerely,

Robert Rocchio, P.E.
Chief Engineer

Attachments
cc: Gary Ezovski, North Smithfield Town Manager
Hollands, Pope, Pristawa, Rocchio, (all w/o attachments)
Town file (w/attachments)

A

Conceptual Submission Review

RIDOT

Department of Transportation
Two Capitol Hill
Providence, RI 02903

Office 401-222-2450
Fax 401-222-3905

February 3, 2020

Gary Ezovski
Town Manager
One Main Street
PO Box 248
Slatersville, RI 02876

RE: Branch River Revitalization, Pound Hill Road Access

Dear Mr. Ezovski:

Your letter of July 9, 2019 requested RIDOT to consider North Smithfield's proposed alteration to the Route 146 North on-ramp from Pound Hill Road to free up land for a new access road to the property on the north east side of the existing on-ramp. In turn, we sent the proposed modification to the Federal Highway Administration for their opinion since the proposal alters the ramp to a limited access facility. Based on their response and our review of the Town's proposal, the following items would need to be satisfied for the project to be acceptable to the State and FHWA.

1) A Physical Alteration Permit Application would need to be submitted to our Maintenance Division for this project. All RIDOT PAPA regulations and current design standards and specifications would need to be satisfied for all relocated ramps and the intersection of the proposed town road and Pound Hill Road.

2) As part of this work, the Town will need to ensure that all drainage from Route 146 remains functional (no negative impacts).

3) We request that the design by as maintenance friendly as possible, for example avoiding retaining walls and complex stormwater treatment units/ponds, etc.

4) The proposed town road shows a 10% profile grade towards Pound Hill Road. Mitigation improvements such as stormwater containment, erosion prevention, etc. will need to be included in the project.

5) An analysis will be needed for the segment of Pound Hill Road between 146 and the new town road. This area includes the Route 146 north off ramps (east and west), the proposed Route 146 on ramp, and the proposed town road. This analysis will need to demonstrate that there is

sufficient queue lengths on Pound Hill Road as well as demonstrating that the roadway will operate at acceptable levels of service and will not introduce safety issues.

6) All Federal NEPA requirements will be met.

7) Since federal funds were used for the construction of the Route 146/Pound Hill Road interchange, any request for RIDOT property to be transferred to the Town for the construction of the public right-of-way (proposed town road) would require approval by FHWA.

When the Town demonstrates that the above conditions are met, we will review the material and upon approval of the submission, we will recommend that the design process begin. Should you have any questions or require additional Information, please feel free to contact Steve Pristawa at 563-4207.

Sincerely,

Robert Rocchio

Robert Rocchio, P.E.
Chief Engineer - Infrastructure

cc: Bucci, Nascimento, Ouellette, Pristawa, Raymond, Rocchio; Town File.

ATTACHMENT B – Operational Analysis

Alternative 1

- Pound Hill Road at Site Access Road
- Pound Hill Road at Route 146 NB Off-Ramp
- Pound Hill Road at Route 146 NB On-Ramp

Alternative 2

- Pound Hill Road at Site Access Road/Route 146 NB Off-Ramp
- Pound Hill Road at Route 146 NB On-Ramp

B

Future Weekday AM / PM Peak Hour

Alternative 1

Pound Hill Road at Site Access Road

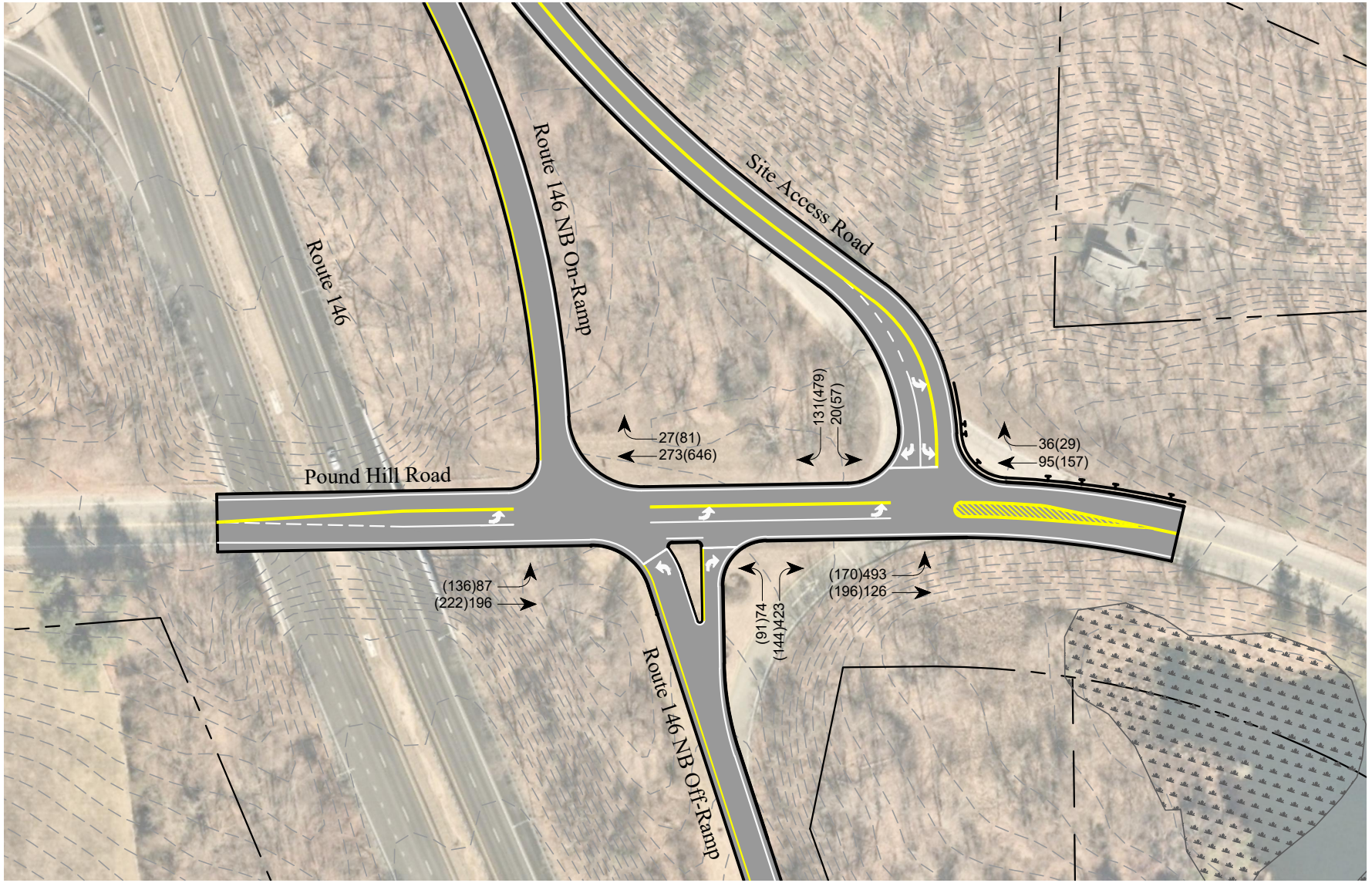
Pound Hill Road at Route 146 NB Off-Ramp

Pound Hill Road at Route 146 NB On-Ramp

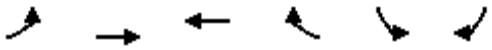
Route 146 Interchange at Pound Hill Road

NORTH SMITHFIELD, RHODE ISLAND

Alternative 1 AM(PM) Peak Hour Volumes



BETA
www.BETA-Inc.com



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	493	126	95	36	20	131
Future Volume (vph)	493	126	95	36	20	131
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			0	75	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.963			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1794	0	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1794	0	1770	1583
Link Speed (mph)		30	30		30	
Link Distance (ft)		215	99		554	
Travel Time (s)		4.9	2.3		12.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	536	137	103	39	22	142
Shared Lane Traffic (%)						
Lane Group Flow (vph)	536	137	142	0	22	142
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 47.8%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	7.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	493	126	95	36	20	131
Future Vol, veh/h	493	126	95	36	20	131
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	75	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	536	137	103	39	22	142

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	142	0	-	0	1332	123
Stage 1	-	-	-	-	123	-
Stage 2	-	-	-	-	1209	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1441	-	-	-	170	928
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	283	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1441	-	-	-	107	928
Mov Cap-2 Maneuver	-	-	-	-	107	-
Stage 1	-	-	-	-	566	-
Stage 2	-	-	-	-	283	-

Approach	EB	WB	SB
HCM Control Delay, s	7.1	0	14.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1441	-	-	-	107	928
HCM Lane V/C Ratio	0.372	-	-	-	0.203	0.153
HCM Control Delay (s)	9	-	-	-	47	9.6
HCM Lane LOS	A	-	-	-	E	A
HCM 95th %tile Q(veh)	1.7	-	-	-	0.7	0.5

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	196	0	0	226	74	423
Future Volume (vph)	196	0	0	226	74	423
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	1863	0	0	1863	1770	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1863	0	0	1863	1770	1583
Link Speed (mph)	30			30	30	
Link Distance (ft)	64			215	890	
Travel Time (s)	1.5			4.9	20.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	213	0	0	246	80	460
Shared Lane Traffic (%)						
Lane Group Flow (vph)	213	0	0	246	80	460
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 43.2%		ICU Level of Service A	
Analysis Period (min) 15			

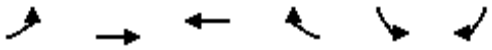
Intersection	
Int Delay, s/veh	7.8

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations	↑			↑	↰	↱
Traffic Vol, veh/h	196	0	0	226	74	423
Future Vol, veh/h	196	0	0	226	74	423
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	213	0	0	246	80	460

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	459	213
Stage 1	-	-	-	-	213	-
Stage 2	-	-	-	-	246	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	0	0	-	560	827
Stage 1	-	0	0	-	823	-
Stage 2	-	0	0	-	795	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	560	827
Mov Cap-2 Maneuver	-	-	-	-	560	-
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	795	-

Approach	EB	WB	NW
HCM Control Delay, s	0	0	14.4
HCM LOS			B

Minor Lane/Major Mvmt	NWLn1	NWLn2	EBT	WBT
Capacity (veh/h)	560	827	-	-
HCM Lane V/C Ratio	0.144	0.556	-	-
HCM Control Delay (s)	12.5	14.7	-	-
HCM Lane LOS	B	B	-	-
HCM 95th %tile Q(veh)	0.5	3.5	-	-



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	87	196	273	27	0	0
Future Volume (vph)	87	196	273	27	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.988			
Flt Protected	0.950					
Satd. Flow (prot)	1770	1863	1840	0	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	1863	1840	0	0	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		938	64		175	
Travel Time (s)		21.3	1.5		4.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	95	213	297	29	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	95	213	326	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		0	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 27.5%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection: 4: Pound Hill Road & Site Driveway

Movement	EB	WB	SB	SB
Directions Served	L	TR	L	R
Maximum Queue (ft)	98	51	30	55
Average Queue (ft)	48	23	12	35
95th Queue (ft)	101	56	35	51
Link Distance (ft)	149	39		519
Upstream Blk Time (%)		1		
Queuing Penalty (veh)		0		
Storage Bay Dist (ft)			75	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Route 146 NB Off-Ramp & Pound Hill Road

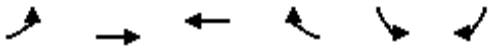
Movement	NW	NW
Directions Served	L	R
Maximum Queue (ft)	29	55
Average Queue (ft)	29	11
95th Queue (ft)	29	47
Link Distance (ft)	846	846
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: Pound Hill Road & Route 146 NB On-Ramp

Movement	EB	WB
Directions Served	L	TR
Maximum Queue (ft)	53	31
Average Queue (ft)	23	6
95th Queue (ft)	57	27
Link Distance (ft)	919	21
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	170	196	157	29	57	479
Future Volume (vph)	170	196	157	29	57	479
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			0	75	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.979			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1824	0	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1824	0	1770	1583
Link Speed (mph)		30	30		30	
Link Distance (ft)		215	99		554	
Travel Time (s)		4.9	2.3		12.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	185	213	171	32	62	521
Shared Lane Traffic (%)						
Lane Group Flow (vph)	185	213	203	0	62	521
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 46.4%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	9.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	170	196	157	29	57	479
Future Vol, veh/h	170	196	157	29	57	479
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	75	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	185	213	171	32	62	521

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	203	0	-	0	770	187
Stage 1	-	-	-	-	187	-
Stage 2	-	-	-	-	583	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1369	-	-	-	369	855
Stage 1	-	-	-	-	845	-
Stage 2	-	-	-	-	558	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1369	-	-	-	319	855
Mov Cap-2 Maneuver	-	-	-	-	319	-
Stage 1	-	-	-	-	731	-
Stage 2	-	-	-	-	558	-

Approach	EB	WB	SB
HCM Control Delay, s	3.7	0	15.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1369	-	-	-	319	855
HCM Lane V/C Ratio	0.135	-	-	-	0.194	0.609
HCM Control Delay (s)	8	-	-	-	19	15.5
HCM Lane LOS	A	-	-	-	C	C
HCM 95th %tile Q(veh)	0.5	-	-	-	0.7	4.2

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	222	0	0	727	91	144
Future Volume (vph)	222	0	0	727	91	144
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	1863	0	0	1863	1770	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1863	0	0	1863	1770	1583
Link Speed (mph)	30			30	30	
Link Distance (ft)	64			215	890	
Travel Time (s)	1.5			4.9	20.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	241	0	0	790	99	157
Shared Lane Traffic (%)						
Lane Group Flow (vph)	241	0	0	790	99	157
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 50.0%		ICU Level of Service A	
Analysis Period (min) 15			

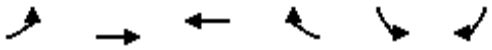
Intersection	
Int Delay, s/veh	3.4

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Vol, veh/h	222	0	0	727	91	144
Future Vol, veh/h	222	0	0	727	91	144
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	241	0	0	790	99	157

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	1031	241
Stage 1	-	-	-	-	241	-
Stage 2	-	-	-	-	790	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	0	0	-	258	798
Stage 1	-	0	0	-	799	-
Stage 2	-	0	0	-	447	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	258	798
Mov Cap-2 Maneuver	-	-	-	-	258	-
Stage 1	-	-	-	-	799	-
Stage 2	-	-	-	-	447	-

Approach	EB	WB	NW
HCM Control Delay, s	0	0	17.1
HCM LOS			C

Minor Lane/Major Mvmt	NWLn1	NWLn2	EBT	WBT
Capacity (veh/h)	258	798	-	-
HCM Lane V/C Ratio	0.383	0.196	-	-
HCM Control Delay (s)	27.4	10.6	-	-
HCM Lane LOS	D	B	-	-
HCM 95th %tile Q(veh)	1.7	0.7	-	-



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	136	222	646	81	0	0
Future Volume (vph)	136	222	646	81	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.985			
Flt Protected	0.950					
Satd. Flow (prot)	1770	1863	1835	0	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	1863	1835	0	0	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		938	64		175	
Travel Time (s)		21.3	1.5		4.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	148	241	702	88	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	148	241	790	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		0	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 53.1%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection: 4: Pound Hill Road & Site Driveway

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	54	46	96
Average Queue (ft)	44	36	72
95th Queue (ft)	61	50	97
Link Distance (ft)	149		519
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		75	
Storage Blk Time (%)			3
Queuing Penalty (veh)			2

Intersection: 6: Route 146 NB Off-Ramp & Pound Hill Road

Movement	NW	NW
Directions Served	L	R
Maximum Queue (ft)	50	39
Average Queue (ft)	31	8
95th Queue (ft)	61	33
Link Distance (ft)	846	846
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: Pound Hill Road & Route 146 NB On-Ramp

Movement	EB
Directions Served	L
Maximum Queue (ft)	53
Average Queue (ft)	40
95th Queue (ft)	57
Link Distance (ft)	919
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 2

B

Future Weekday AM / PM Peak Hour

Alternative 2

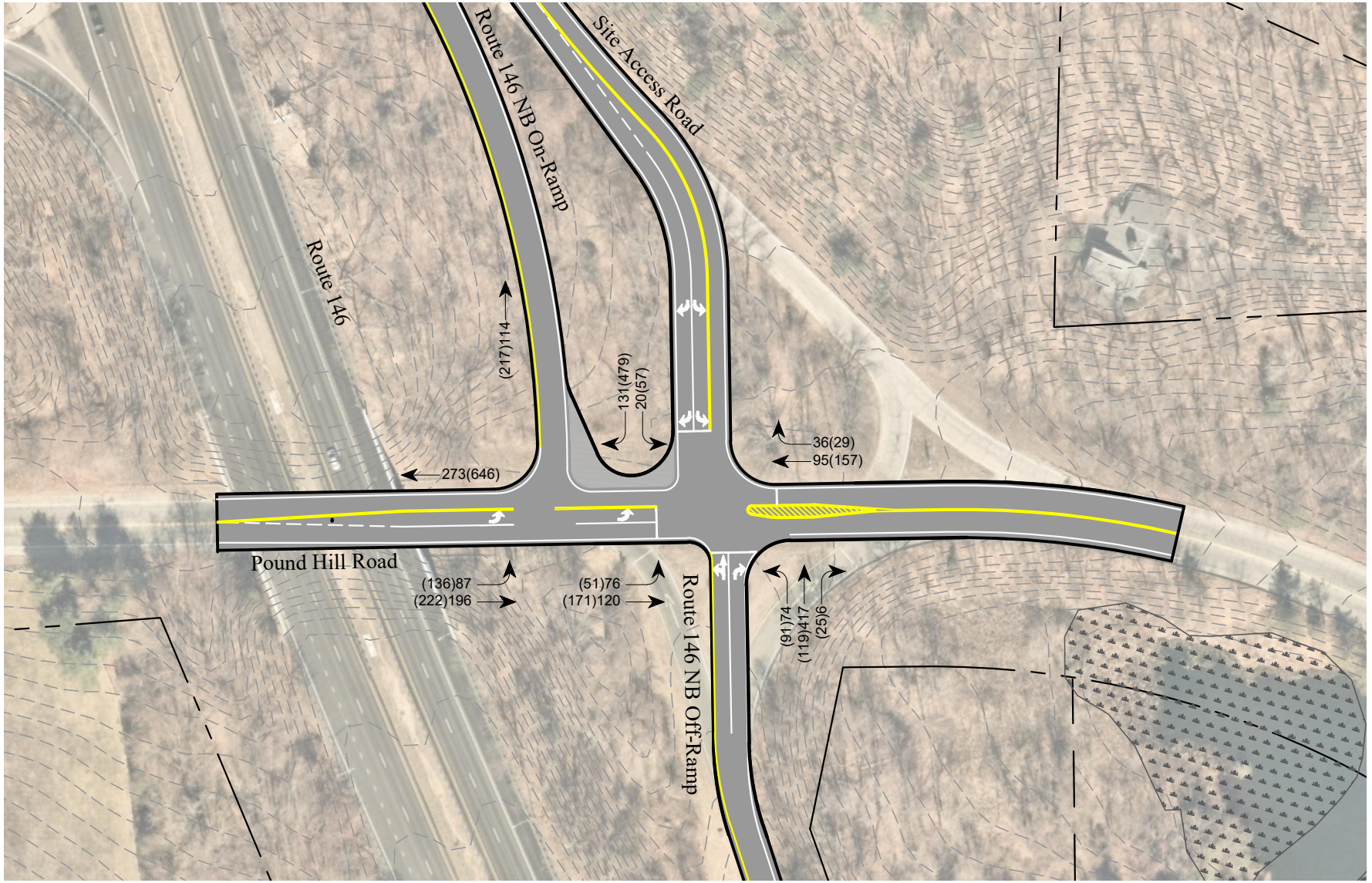
Pound Hill Road at Site Access Road/Route 146 NB Off-Ramp

Pound Hill Road at Route 146 NB On-Ramp

Route 146 Interchange at Pound Hill Road

NORTH SMITHFIELD, RHODE ISLAND

Alternative 2 AM(PM) Peak Hour Volumes



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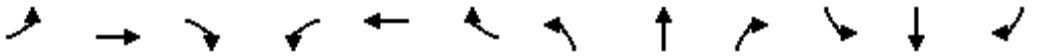


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	76	120	0	0	95	36	74	417	6	20	0	131
Future Volume (vph)	76	120	0	0	95	36	74	417	6	20	0	131
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		150	150		0
Storage Lanes	1		0	0		0	0		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.963				0.850			0.850
Flt Protected	0.950							0.993		0.950		
Satd. Flow (prot)	1770	1863	0	0	1794	0	0	1850	1583	1770	0	1583
Flt Permitted	0.950							0.993		0.950		
Satd. Flow (perm)	1770	1863	0	0	1794	0	0	1850	1583	1770	0	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		121			258			610			474	
Travel Time (s)		2.8			5.9			13.9			10.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	83	130	0	0	103	39	80	453	7	22	0	142
Shared Lane Traffic (%)												
Lane Group Flow (vph)	83	130	0	0	142	0	0	533	7	22	0	142
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 54.1%		ICU Level of Service A	
Analysis Period (min) 15			

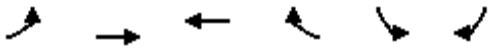
Intersection	
Int Delay, s/veh	62

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	76	120	0	0	95	36	74	417	6	20	0	131
Future Vol, veh/h	76	120	0	0	95	36	74	417	6	20	0	131
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	150	150	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	83	130	0	0	103	39	80	453	7	22	0	142

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	142	0	-	-	-	0	490	438	130	649	-	123
Stage 1	-	-	-	-	-	-	296	296	-	123	-	-
Stage 2	-	-	-	-	-	-	194	142	-	526	-	-
Critical Hdwy	4.12	-	-	-	-	-	7.12	6.52	6.22	7.12	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	-	-
Follow-up Hdwy	2.218	-	-	-	-	-	3.518	4.018	3.318	3.518	-	3.318
Pot Cap-1 Maneuver	1441	-	0	0	-	-	489	512	920	383	0	928
Stage 1	-	-	0	0	-	-	712	668	-	881	0	-
Stage 2	-	-	0	0	-	-	808	779	-	535	0	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1441	-	-	-	-	-	396	482	920	61	-	928
Mov Cap-2 Maneuver	-	-	-	-	-	-	396	482	-	61	-	-
Stage 1	-	-	-	-	-	-	671	629	-	830	-	-
Stage 2	-	-	-	-	-	-	684	779	-	140	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3	0	114.2	20.7
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	467	920	1441	-	-	-	61	928
HCM Lane V/C Ratio	1.143	0.007	0.057	-	-	-	0.356	0.153
HCM Control Delay (s)	115.5	8.9	7.7	-	-	-	93.7	9.6
HCM Lane LOS	F	A	A	-	-	-	F	A
HCM 95th %tile Q(veh)	18.9	0	0.2	-	-	-	1.3	0.5



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	87	196	273	27	0	0
Future Volume (vph)	87	196	273	27	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100			0	0	0
Storage Lanes	1			0	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.988			
Flt Protected	0.950					
Satd. Flow (prot)	1770	1863	1840	0	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	1863	1840	0	0	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		938	121		175	
Travel Time (s)		21.3	2.8		4.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	95	213	297	29	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	95	213	326	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		0	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 27.5%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection: 6: Route 146 NB Off-Ramp/Site Driveway & Pound Hill Road

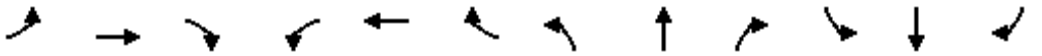
Movement	EB	NB	SB	SB
Directions Served	L	LT	L	R
Maximum Queue (ft)	18	154	28	55
Average Queue (ft)	7	99	6	35
95th Queue (ft)	21	155	24	51
Link Distance (ft)	55	571		437
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			150	
Storage Blk Time (%)		2		
Queuing Penalty (veh)		0		

Intersection: 9: Pound Hill Road & Route 146 NB On-Ramp

Movement	EB
Directions Served	L
Maximum Queue (ft)	31
Average Queue (ft)	12
95th Queue (ft)	37
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	100
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	51	171	0	0	157	29	91	119	25	57	0	479
Future Volume (vph)	51	171	0	0	157	29	91	119	25	57	0	479
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		150	150		0
Storage Lanes	1		0	0		0	0		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.979				0.850			0.850
Flt Protected	0.950							0.979		0.950		
Satd. Flow (prot)	1770	1863	0	0	1824	0	0	1824	1583	1770	0	1583
Flt Permitted	0.950							0.979		0.950		
Satd. Flow (perm)	1770	1863	0	0	1824	0	0	1824	1583	1770	0	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		121			258			610			474	
Travel Time (s)		2.8			5.9			13.9			10.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	186	0	0	171	32	99	129	27	62	0	521
Shared Lane Traffic (%)												
Lane Group Flow (vph)	55	186	0	0	203	0	0	228	27	62	0	521
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 61.0%		ICU Level of Service B	
Analysis Period (min) 15			

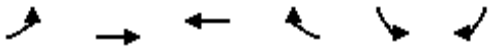
Intersection	
Int Delay, s/veh	31.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	51	171	0	0	157	29	91	119	25	57	0	479
Future Vol, veh/h	51	171	0	0	157	29	91	119	25	57	0	479
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	150	150	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	55	186	0	0	171	32	99	129	27	62	0	521

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	203	0	-	-	-	0	744	499	186	561	-	187
Stage 1	-	-	-	-	-	-	296	296	-	187	-	-
Stage 2	-	-	-	-	-	-	448	203	-	374	-	-
Critical Hdwy	4.12	-	-	-	-	-	7.12	6.52	6.22	7.12	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	-	-
Follow-up Hdwy	2.218	-	-	-	-	-	3.518	4.018	3.318	3.518	-	3.318
Pot Cap-1 Maneuver	1369	-	0	0	-	-	331	473	856	438	0	855
Stage 1	-	-	0	0	-	-	712	668	-	815	0	-
Stage 2	-	-	0	0	-	-	590	733	-	647	0	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1369	-	-	-	-	-	125	454	856	321	-	855
Mov Cap-2 Maneuver	-	-	-	-	-	-	125	454	-	321	-	-
Stage 1	-	-	-	-	-	-	684	641	-	782	-	-
Stage 2	-	-	-	-	-	-	231	733	-	480	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.8	0	118.6	15.9
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	212	856	1369	-	-	-	321	855
HCM Lane V/C Ratio	1.077	0.032	0.04	-	-	-	0.193	0.609
HCM Control Delay (s)	131.6	9.3	7.7	-	-	-	18.9	15.5
HCM Lane LOS	F	A	A	-	-	-	C	C
HCM 95th %tile Q(veh)	10.3	0.1	0.1	-	-	-	0.7	4.2



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	136	222	556	81	0	0
Future Volume (vph)	136	222	556	81	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100			0	0	0
Storage Lanes	1			0	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.983			
Flt Protected	0.950					
Satd. Flow (prot)	1770	1863	1831	0	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	1863	1831	0	0	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		938	121		175	
Travel Time (s)		21.3	2.8		4.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	148	241	604	88	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	148	241	692	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		0	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 48.4%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection: 6: Route 146 NB Off-Ramp/Site Driveway & Pound Hill Road

Movement	EB	NB	NB	SB	SB
Directions Served	L	LT	R	L	R
Maximum Queue (ft)	18	100	49	174	237
Average Queue (ft)	4	82	21	91	182
95th Queue (ft)	16	104	52	204	280
Link Distance (ft)	55	571			437
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			150	150	
Storage Blk Time (%)					21
Queuing Penalty (veh)					12

Intersection: 9: Pound Hill Road & Route 146 NB On-Ramp

Movement	EB	WB
Directions Served	L	TR
Maximum Queue (ft)	31	31
Average Queue (ft)	24	18
95th Queue (ft)	44	42
Link Distance (ft)		55
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 12

B

Future Weekday AM / PM Peak Hour

Alternative 2A

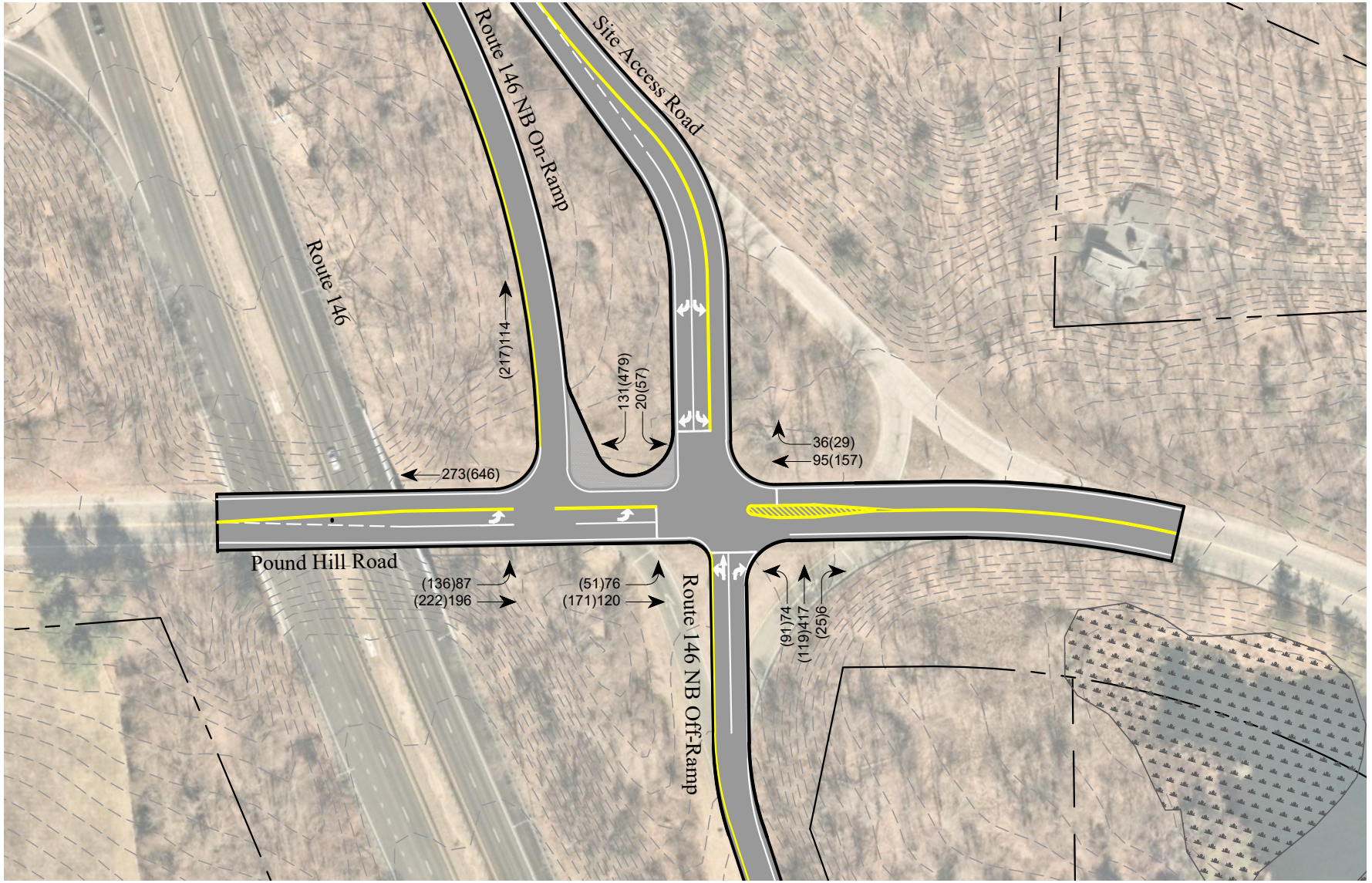
Pound Hill Road at Site Access Road/Route 146 NB Off-Ramp

Pound Hill Road at Route 146 NB On-Ramp

Route 146 Interchange at Pound Hill Road

NORTH SMITHFIELD, RHODE ISLAND

Alternative 2A AM(PM) Peak Hour Volumes



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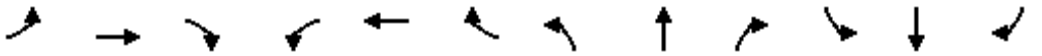
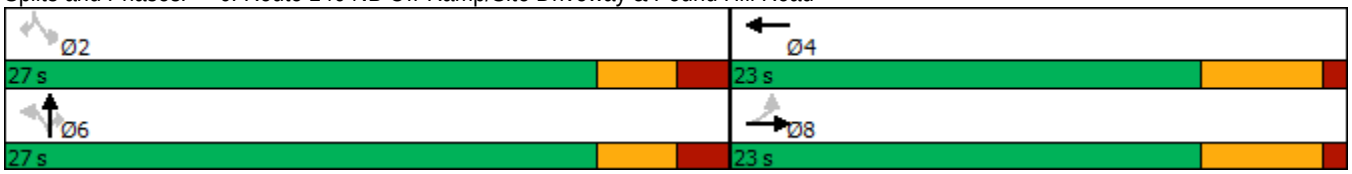


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	76	120	0	0	95	36	74	417	6	20	0	131
Future Volume (vph)	76	120	0	0	95	36	74	417	6	20	0	131
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	60		0	0		0	0		150	150		0
Storage Lanes	1		0	0		0	0		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.963				0.850			0.850
Flt Protected	0.950							0.993		0.950		
Satd. Flow (prot)	1770	1863	0	0	1794	0	0	1850	1583	1770	0	1583
Flt Permitted	0.666							0.993		0.406		
Satd. Flow (perm)	1241	1863	0	0	1794	0	0	1850	1583	756	0	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					39				55			142
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		121			258			610			474	
Travel Time (s)		2.8			5.9			13.9			10.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	83	130	0	0	103	39	80	453	7	22	0	142
Shared Lane Traffic (%)												
Lane Group Flow (vph)	83	130	0	0	142	0	0	533	7	22	0	142
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2		1	2	1	1		1
Detector Template	Left	Thru			Thru		Left	Thru	Right	Left		Right
Leading Detector (ft)	20	100			100		20	100	20	20		20
Trailing Detector (ft)	0	0			0		0	0	0	0		0
Detector 1 Position(ft)	0	0			0		0	0	0	0		0
Detector 1 Size(ft)	20	6			6		20	6	20	20		20
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0		0.0	0.0	0.0	0.0		0.0
Detector 1 Queue (s)	0.0	0.0			0.0		0.0	0.0	0.0	0.0		0.0
Detector 1 Delay (s)	0.0	0.0			0.0		0.0	0.0	0.0	0.0		0.0
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type	Perm	NA			NA		Perm	NA	Perm	Perm		Perm
Protected Phases		8			4			6				
Permitted Phases	8						6		6	2		2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	8	8			4		6	6	6	2		2
Switch Phase												
Minimum Initial (s)	8.0	8.0			8.0		6.0	6.0	6.0	6.0		6.0
Minimum Split (s)	22.5	22.5			22.5		22.5	22.5	22.5	22.5		22.5
Total Split (s)	23.0	23.0			23.0		27.0	27.0	27.0	27.0		27.0
Total Split (%)	46.0%	46.0%			46.0%		54.0%	54.0%	54.0%	54.0%		54.0%
Maximum Green (s)	17.5	17.5			17.5		22.0	22.0	22.0	22.0		22.0
Yellow Time (s)	4.5	4.5			4.5		3.0	3.0	3.0	3.0		3.0
All-Red Time (s)	1.0	1.0			1.0		2.0	2.0	2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0	0.0	0.0		0.0
Total Lost Time (s)	5.5	5.5			5.5			5.0	5.0	5.0		5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0		3.0
Recall Mode	None	None			None		Min	Min	Min	Min		Min
Act Effct Green (s)	9.0	9.0			9.0			19.6	19.6	19.6		19.6
Actuated g/C Ratio	0.26	0.26			0.26			0.56	0.56	0.56		0.56
v/c Ratio	0.26	0.27			0.29			0.51	0.01	0.05		0.15
Control Delay	14.4	13.6			11.1			9.2	0.0	6.0		2.0
Queue Delay	0.0	0.0			0.0			0.0	0.0	0.0		0.0
Total Delay	14.4	13.6			11.1			9.2	0.0	6.0		2.0
LOS	B	B			B			A	A	A		A
Approach Delay		13.9			11.1			9.1			2.5	
Approach LOS		B			B			A			A	

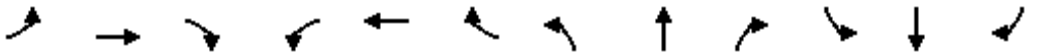
Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 34.7			
Natural Cycle: 50			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.51			
Intersection Signal Delay: 9.3		Intersection LOS: A	
Intersection Capacity Utilization 59.9%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 6: Route 146 NB Off-Ramp/Site Driveway & Pound Hill Road



Lane Group	EBL	EBT	WBT	NBT	NBR	SBL	SBR
Lane Group Flow (vph)	83	130	142	533	7	22	142
v/c Ratio	0.26	0.27	0.29	0.51	0.01	0.05	0.15
Control Delay	14.4	13.6	11.1	9.2	0.0	6.0	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.4	13.6	11.1	9.2	0.0	6.0	2.0
Queue Length 50th (ft)	12	19	15	65	0	2	0
Queue Length 95th (ft)	43	58	53	153	0	10	18
Internal Link Dist (ft)		41	178	530			
Turn Bay Length (ft)	60				150	150	
Base Capacity (vph)	644	967	950	1276	1109	521	1135
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.13	0.15	0.42	0.01	0.04	0.13

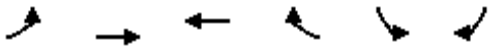
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	76	120	0	0	95	36	74	417	6	20	0	131
Future Volume (vph)	76	120	0	0	95	36	74	417	6	20	0	131
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5			5.5			5.0	5.0	5.0		5.0
Lane Util. Factor	1.00	1.00			1.00			1.00	1.00	1.00		1.00
Frt	1.00	1.00			0.96			1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00			0.99	1.00	0.95		1.00
Satd. Flow (prot)	1770	1863			1794			1849	1583	1770		1583
Flt Permitted	0.67	1.00			1.00			0.99	1.00	0.41		1.00
Satd. Flow (perm)	1241	1863			1794			1849	1583	756		1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	83	130	0	0	103	39	80	453	7	22	0	142
RTOR Reduction (vph)	0	0	0	0	31	0	0	0	3	0	0	69
Lane Group Flow (vph)	83	130	0	0	111	0	0	533	4	22	0	73
Turn Type	Perm	NA			NA		Perm	NA	Perm	Perm		Perm
Protected Phases		8			4			6				
Permitted Phases	8						6		6	2		2
Actuated Green, G (s)	7.0	7.0			7.0			18.4	18.4	18.4		18.4
Effective Green, g (s)	7.0	7.0			7.0			18.4	18.4	18.4		18.4
Actuated g/C Ratio	0.19	0.19			0.19			0.51	0.51	0.51		0.51
Clearance Time (s)	5.5	5.5			5.5			5.0	5.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	241	363			349			947	811	387		811
v/s Ratio Prot		c0.07			0.06							
v/s Ratio Perm	0.07							0.29	0.00	0.03		0.05
v/c Ratio	0.34	0.36			0.32			0.56	0.00	0.06		0.09
Uniform Delay, d1	12.5	12.5			12.4			6.0	4.3	4.4		4.5
Progression Factor	1.00	1.00			1.00			1.00	1.00	1.00		1.00
Incremental Delay, d2	0.9	0.6			0.5			0.8	0.0	0.1		0.0
Delay (s)	13.3	13.1			12.9			6.8	4.3	4.5		4.5
Level of Service	B	B			B			A	A	A		A
Approach Delay (s)		13.2			12.9			6.7			4.5	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	35.9	Sum of lost time (s)	10.5
Intersection Capacity Utilization	59.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	87	196	273	27	0	0
Future Volume (vph)	87	196	273	27	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100			0	0	0
Storage Lanes	1			0	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.988			
Flt Protected	0.950					
Satd. Flow (prot)	1770	1863	1840	0	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	1863	1840	0	0	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		938	121		175	
Travel Time (s)		21.3	2.8		4.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	95	213	297	29	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	95	213	326	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		0	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 27.5%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection: 6: Route 146 NB Off-Ramp/Site Driveway & Pound Hill Road

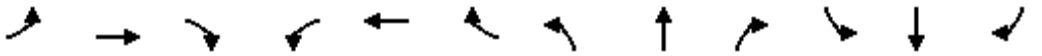
Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	T	TR	LT	L	R
Maximum Queue (ft)	48	57	50	120	29	72
Average Queue (ft)	27	32	39	84	6	36
95th Queue (ft)	46	69	60	122	25	76
Link Distance (ft)		56	180	571		437
Upstream Blk Time (%)	1	1				
Queuing Penalty (veh)	0	2				
Storage Bay Dist (ft)	60				150	
Storage Blk Time (%)	1	1				
Queuing Penalty (veh)	1	1				

Intersection: 9: Pound Hill Road & Route 146 NB On-Ramp

Movement	EB	EB	WB
Directions Served	L	T	TR
Maximum Queue (ft)	51	31	29
Average Queue (ft)	16	6	6
95th Queue (ft)	51	27	25
Link Distance (ft)		918	56
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	100		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 4

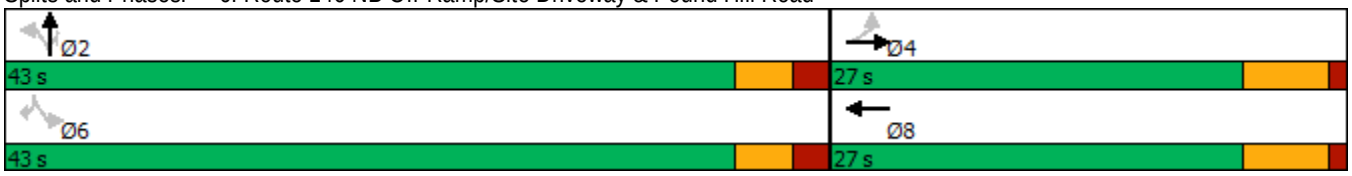


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	51	171	0	0	157	29	91	119	25	57	0	479
Future Volume (vph)	51	171	0	0	157	29	91	119	25	57	0	479
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	60		0	0		0	0		150	150		0
Storage Lanes	1		0	0		0	0		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.979				0.850			0.850
Flt Protected	0.950							0.979		0.950		
Satd. Flow (prot)	1770	1863	0	0	1824	0	0	1824	1583	1770	0	1583
Flt Permitted	0.630							0.979		0.616		
Satd. Flow (perm)	1174	1863	0	0	1824	0	0	1824	1583	1147	0	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					14				39			521
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		121			258			610			474	
Travel Time (s)		2.8			5.9			13.9			10.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	186	0	0	171	32	99	129	27	62	0	521
Shared Lane Traffic (%)												
Lane Group Flow (vph)	55	186	0	0	203	0	0	228	27	62	0	521
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2		1	2	1	1		1
Detector Template	Left	Thru			Thru		Left	Thru	Right	Left		Right
Leading Detector (ft)	20	100			100		20	100	20	20		20
Trailing Detector (ft)	0	0			0		0	0	0	0		0
Detector 1 Position(ft)	0	0			0		0	0	0	0		0
Detector 1 Size(ft)	20	6			6		20	6	20	20		20
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0		0.0	0.0	0.0	0.0		0.0
Detector 1 Queue (s)	0.0	0.0			0.0		0.0	0.0	0.0	0.0		0.0
Detector 1 Delay (s)	0.0	0.0			0.0		0.0	0.0	0.0	0.0		0.0
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type	Perm	NA			NA		Perm	NA	Perm	Perm		Perm
Protected Phases		4			8			2				
Permitted Phases	4						2		2	6		6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4			8		2	2	2	6		6
Switch Phase												
Minimum Initial (s)	8.0	8.0			8.0		6.0	6.0	6.0	6.0		6.0
Minimum Split (s)	23.5	23.5			23.5		23.0	23.0	23.0	23.0		23.0
Total Split (s)	27.0	27.0			27.0		43.0	43.0	43.0	43.0		43.0
Total Split (%)	38.6%	38.6%			38.6%		61.4%	61.4%	61.4%	61.4%		61.4%
Maximum Green (s)	21.5	21.5			21.5		38.0	38.0	38.0	38.0		38.0
Yellow Time (s)	4.5	4.5			4.5		3.0	3.0	3.0	3.0		3.0
All-Red Time (s)	1.0	1.0			1.0		2.0	2.0	2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0	0.0	0.0		0.0
Total Lost Time (s)	5.5	5.5			5.5			5.0	5.0	5.0		5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0		3.0
Recall Mode	None	None			None		Min	Min	Min	Min		Min
Walk Time (s)	7.0	7.0			7.0		7.0	7.0	7.0	7.0		7.0
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0	11.0	11.0		11.0
Pedestrian Calls (#/hr)	0	0			0		0	0	0	0		0
Act Effct Green (s)	9.1	9.1			9.1			13.3	13.3	13.3		13.3
Actuated g/C Ratio	0.32	0.32			0.32			0.47	0.47	0.47		0.47
v/c Ratio	0.15	0.31			0.34			0.27	0.04	0.12		0.51
Control Delay	9.1	9.9			9.6			8.4	2.7	7.8		3.1
Queue Delay	0.0	0.0			0.0			0.0	0.0	0.0		0.0
Total Delay	9.1	9.9			9.6			8.4	2.7	7.8		3.1
LOS	A	A			A			A	A	A		A
Approach Delay		9.7			9.6			7.8			3.6	
Approach LOS		A			A			A			A	

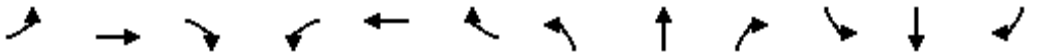
Intersection Summary			
Area Type:	Other		
Cycle Length: 70			
Actuated Cycle Length: 28.3			
Natural Cycle: 50			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.51			
Intersection Signal Delay: 6.6		Intersection LOS: A	
Intersection Capacity Utilization 63.9%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 6: Route 146 NB Off-Ramp/Site Driveway & Pound Hill Road



Lane Group	EBL	EBT	WBT	NBT	NBR	SBL	SBR
Lane Group Flow (vph)	55	186	203	228	27	62	521
v/c Ratio	0.15	0.31	0.34	0.27	0.04	0.12	0.51
Control Delay	9.1	9.9	9.6	8.4	2.7	7.8	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.1	9.9	9.6	8.4	2.7	7.8	3.1
Queue Length 50th (ft)	5	19	20	23	0	6	0
Queue Length 95th (ft)	22	56	59	61	7	22	36
Internal Link Dist (ft)		41	178	530			
Turn Bay Length (ft)	60				150	150	
Base Capacity (vph)	915	1452	1425	1824	1583	1147	1583
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.13	0.14	0.13	0.02	0.05	0.33

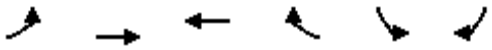
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	51	171	0	0	157	29	91	119	25	57	0	479
Future Volume (vph)	51	171	0	0	157	29	91	119	25	57	0	479
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5			5.5			5.0	5.0	5.0		5.0
Lane Util. Factor	1.00	1.00			1.00			1.00	1.00	1.00		1.00
Frt	1.00	1.00			0.98			1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00			0.98	1.00	0.95		1.00
Satd. Flow (prot)	1770	1863			1823			1823	1583	1770		1583
Flt Permitted	0.63	1.00			1.00			0.98	1.00	0.62		1.00
Satd. Flow (perm)	1174	1863			1823			1823	1583	1148		1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	186	0	0	171	32	99	129	27	62	0	521
RTOR Reduction (vph)	0	0	0	0	11	0	0	0	16	0	0	309
Lane Group Flow (vph)	55	186	0	0	192	0	0	228	11	62	0	212
Turn Type	Perm	NA			NA		Perm	NA	Perm	Perm		Perm
Protected Phases		4			8			2				
Permitted Phases	4						2		2	6		6
Actuated Green, G (s)	7.0	7.0			7.0			12.0	12.0	12.0		12.0
Effective Green, g (s)	7.0	7.0			7.0			12.0	12.0	12.0		12.0
Actuated g/C Ratio	0.24	0.24			0.24			0.41	0.41	0.41		0.41
Clearance Time (s)	5.5	5.5			5.5			5.0	5.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	278	442			432			741	643	466		643
v/s Ratio Prot		0.10			c0.11							
v/s Ratio Perm	0.05							0.13	0.01	0.05		c0.13
v/c Ratio	0.20	0.42			0.45			0.31	0.02	0.13		0.33
Uniform Delay, d1	9.0	9.5			9.6			5.9	5.2	5.5		6.0
Progression Factor	1.00	1.00			1.00			1.00	1.00	1.00		1.00
Incremental Delay, d2	0.4	0.6			0.7			0.2	0.0	0.1		0.3
Delay (s)	9.4	10.2			10.3			6.2	5.2	5.6		6.3
Level of Service	A	B			B			A	A	A		A
Approach Delay (s)		10.0			10.3			6.1			6.2	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	7.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	29.5	Sum of lost time (s)	10.5
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	136	222	556	81	0	0
Future Volume (vph)	136	222	556	81	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100			0	0	0
Storage Lanes	1			0	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.983			
Flt Protected	0.950					
Satd. Flow (prot)	1770	1863	1831	0	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	1863	1831	0	0	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		938	121		175	
Travel Time (s)		21.3	2.8		4.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	148	241	604	88	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	148	241	692	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		0	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 48.4%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection: 6: Route 146 NB Off-Ramp/Site Driveway & Pound Hill Road

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	T	TR	LT	L	R
Maximum Queue (ft)	26	62	137	112	50	164
Average Queue (ft)	17	50	74	74	27	109
95th Queue (ft)	32	70	133	119	53	180
Link Distance (ft)		56	180	571		437
Upstream Blk Time (%)		6				
Queuing Penalty (veh)		13				
Storage Bay Dist (ft)	60				150	
Storage Blk Time (%)		6				2
Queuing Penalty (veh)		3				1

Intersection: 9: Pound Hill Road & Route 146 NB On-Ramp

Movement	EB	EB	WB
Directions Served	L	T	TR
Maximum Queue (ft)	72	72	31
Average Queue (ft)	36	14	6
95th Queue (ft)	75	61	26
Link Distance (ft)		918	56
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	100		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 17

ATTACHMENT C – Warrant Analysis

Alternative 2A

Pound Hill Road at Site Access Road/Route 146 NB Off-Ramp

C

Alternative 2A

Pound Hill Road at Site Access Road/Route 146 NB Off-Ramp

BETA GROUP, INC. **Signal Warrant Summary**

Town: North Smithfield **Location: Pound Hill Road at Rte 146 NB Offramp**

Hour	Main Street vph 2 Directions	Side Street vph 1 Direction	Warrant 1 Condition A 600 / 150 vph	Condition B 900 / 75 vph	Combination A/B A 480/120 B 720/60 vph
7 - 8 AM			no	no	no
8 - 9	327	497	no	no	no
9 - 10			no	no	no
10 - 11			no	no	no
11 - 12			no	no	no
12 -1 PM			no	no	no
1 - 2			no	no	no
2 - 3			no	no	no
3 - 4			no	no	no
4 - 5			no	no	no
5 - 6	408	536	no	no	no
6 - 7					

Summary of Warrants

☐ WARRANT 1
Eight-Hour Vehcicular Volume
Must Meet Minimum Volumes For Eight Hours on Both The Main and Side Streets

☐ WARRANT 2
Four-Hour Vehicular Volume
Refer to Figure 4C-1

■ WARRANT 3
Peak Hour
Refer to Figure 4C-3

☐ WARRANT 4
Pedestrian Volume

☐ WARRANT 5
School Crossing

☐ WARRANT 6
Coordinated Signal System

☐ WARRANT 7
Crash Experience

☐ WARRANT 8
Roadway Network

Summary of Roadway Data

Accidents:

Accidents Correctable by Signalization

n/a	Year:	Total:	n/a	n/a	Correctable
n/a	Year:	Total:	n/a	n/a	Correctable
n/a	Year:	Total:	n/a	n/a	Correctable

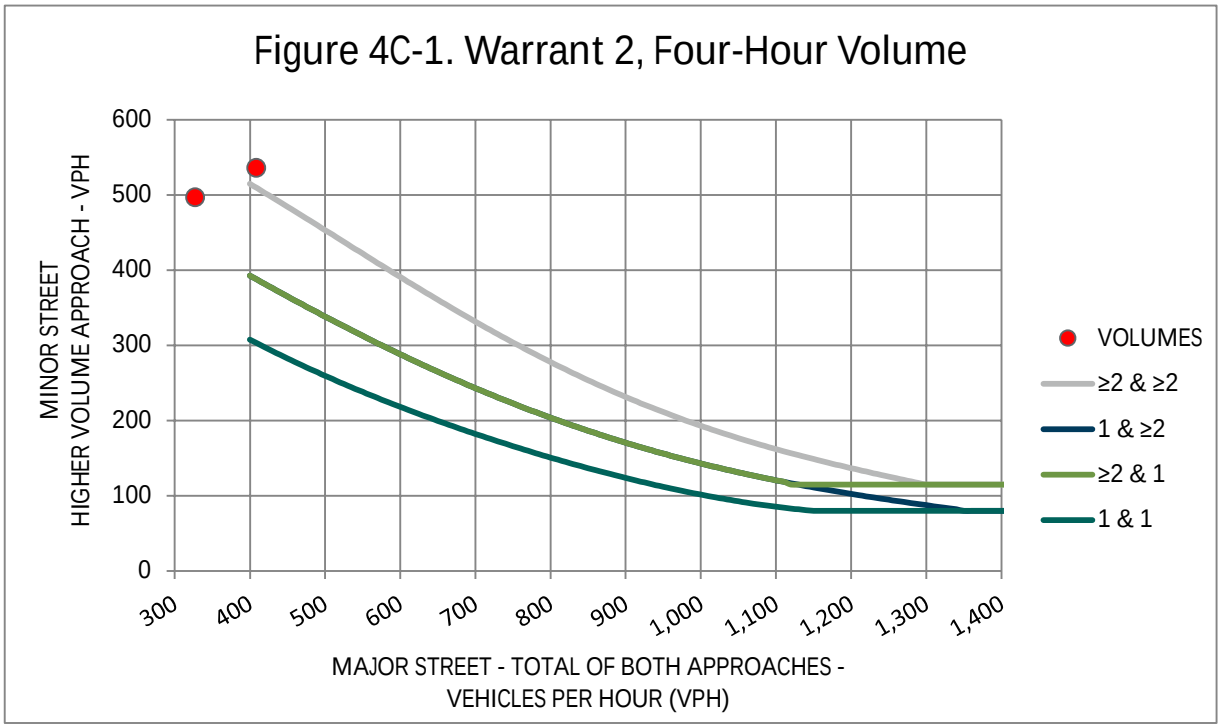
Roadway Features:

Major Road	2 lanes
Minor Road	2 lanes
Speed	S > 40 mph
Population	P < 10,000

www.BETA-Inc.com

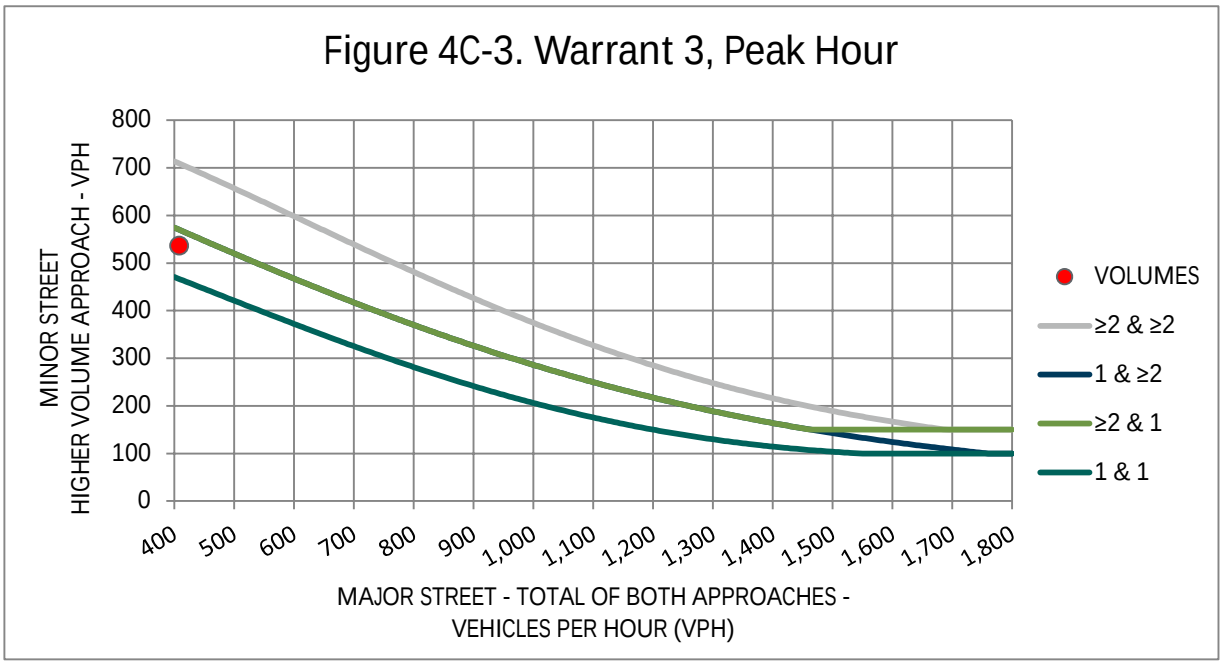
MUTCD 2009 Signal Warrant Worksheet

Job Name:	Branch Village Revitalization
Job No:	7398
Location:	North Smithfield
Calculated by:	JCC
Date:	02/19/21



Lower Limits:

115 vph = Minor Street with ≥2 lanes 80 vph = Minor Street with 1 lane



Lower Limits:

150 vph = Minor Street with ≥2 lanes 100 vph = Minor Street with 1 lane

ATTACHMENT D – Record Studies

Traffic Impact Study – Route 146 and Pound Hill Road
McMahon Transportation Engineers and Planners, April 2019

Conceptual Interchange Modifications
CDR Maguire, October 2017

Environmental Assessment – Route 146 and Pound Hill Road
Natural Resource Services, Inc., May 2017

Branch Village Revitalization: Phase II – Buildout Transportation Analysis
Pare Corporation, July 2008

Branch Village Revitalization, Final Report
Horsley Witten Group, November 2007

D

Traffic Impact Study – Route 146 and Pound Hill Road

McMahon Transportation Engineers and Planners, April 2019

McMAHON
TRANSPORTATION ENGINEERS & PLANNERS

Traffic Impact Study

Route 146 and Pound Hill Road

North Smithfield, RI

Prepared by
McMahon Associates, Inc.
14 Breakneck Hill Road
Lincoln, RI 02865
401.648.7200

Prepared for
The Town of North Smithfield

April 2019

TABLE OF CONTENTS

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INTRODUCTION

McMahon Associates has reviewed the existing traffic operations and potential traffic impacts associated with the proposed Branch Village, a multi-use development in North Smithfield, Rhode Island. The purpose of this study is to evaluate existing and projected traffic operational and safety conditions in the vicinity of the site and identify if mitigating measures to offset potential project-related traffic impacts on the surrounding roadways are necessary.

The assessment presented in this document is based on a review of current traffic volumes and the anticipated traffic generating characteristics of the proposed development, based on the "Branch Village Revitalization: Phase II Buildout and Transportation Analysis" report, prepared by Pare Corporation in July 2008. This study examines existing and projected traffic operations (both with and without the proposed development) at key intersections in the vicinity of the project site. The study area was chosen based on a review of the surrounding roadway network, anticipated traffic generating characteristics of the proposed development, and input from the Town of North Smithfield. This study provides a detailed analysis of traffic operations during the weekday morning and weekday afternoon peak hours, when the combination of adjacent roadway volumes and potential traffic increases associated with the project would be greatest.

Based on the analysis presented in this study, the project-related traffic expected to be generated by the proposed development would have a minimal effect on the study area roadways. This report documents the findings of the analysis.

Project Description

The proposed project site is located in the northeast quadrant of North Smithfield, Rhode Island, and consists of the area north of Pound Hill Road and south of School Street between Route 146 and Great Road (Route 146A) as shown in Figure 1. This area currently consists of mixed residential, commercial, and industrial lane uses. While maintaining the current buildings on the site, the project calls for the revitalization of this area with new residential, commercial, and industrial developments, split into four development regions, Village Center, Northwest of Village Center, Industrial Park, and South of Rail Line. Each region is proposed to include a mix of residential, commercial, office, and industrial land uses. In addition to the existing driveway to the project site located on Great Road, two additional full access driveways are proposed to be included. One is proposed to be located on Great Road, approximately 650 feet south of the existing driveway, and the other is proposed to be located on Pound Hill Road, east of the Route 146 Northbound ramps. As part of the construction of the proposed driveway on Pound Hill Road, the Route 146 Northbound on ramp is proposed to be relocated west to align with the Route 146 Northbound off ramp.

McMAHON
TRANSPORTATION ENGINEERS & PLANNERS

Figure 1
Project Location
Route 146 at Pound Hill Road
North Smithfield, RI

Study Methodology

This study evaluates existing and projected traffic operations at the study area intersections during the weekday morning and weekday afternoon peak hour traffic conditions, when the combination of adjacent roadway volumes and potential traffic increases associated with the project would be greatest.

The study was conducted in three steps. The first step involved an inventory of existing traffic conditions in the vicinity of the site. As part of this inventory, traffic counts were collected at key intersections during the weekday morning and weekday afternoon peak periods. Crash data was obtained from the Town of North Smithfield to evaluate existing traffic operations and safety conditions within the study area.

The second step of the study builds upon data collected in the first step and established the basis for evaluating the transportation impacts associated with the project implementation. The build conditions were developed utilizing 2018 traffic volumes.

The final step evaluated if measures were necessary to improve traffic operations or minimize potential traffic impacts, to provide efficient access to the project site.

Study Area Intersections

The area identified for detailed analysis in this study was determined based on a review of the anticipated traffic generating characteristics of the proposed project, a review of the surrounding roadway network serving the project site, and input from the Town of North Smithfield. The study area intersections include:

- Great Road (Route 146A) at existing northern site driveway
- Great Road (Route 146A) at proposed southern site driveway
- Pound Hill Road at Route 146 Northbound Ramps
- Pound Hill Road at the proposed site driveway

The traffic impact study presented in this report documents the existing and build conditions for the study area intersections noted above.

EXISTING CONDITIONS

Effective evaluation of potential traffic impacts associated with the proposed development requires a thorough understanding of the existing traffic conditions on the roadways and intersections serving the project site. The assessment of existing conditions consists of an inventory of the roadway and intersection geometries and traffic control devices, collection of peak-period traffic volumes, and a review of recent crash history. A discussion of this information is presented below.

Roadway Network

A brief description of the principal roadways serving the project site is presented below.

Pound Hill Road

Pound Hill Road is a two lane, two-way roadway that generally runs in the east/west direction through North Smithfield. Pound Hill Road is classified as a major collector under Town of North Smithfield jurisdiction and provides access to residential and commercial land uses. In the vicinity of the project site, Pound Hill Road has a posted speed limit of 35 mph and provides a 20-foot wide travel lane in either direction with no marked shoulders. To the west of the proposed driveway, in the vicinity of the Route 146 interchange, Pound Hill Road consists of a 16-foot wide travel lane in either direction, with a four-foot wide shoulder on either side of the roadway.

Great Road (Route 146A)

Great Road (Route 146A) is a two lane, two-way roadway, classified as a minor arterial under the Rhode Island Department of Transportation (RIDOT) jurisdiction, providing access to residential, institutional, and commercial land uses. The existing Branch Village driveway operates under stop control at its intersection with Great Road (Route 146A), but does not have a stop sign or stop bar pavement marking. The driveway opening at Great Road (Route 146A) is wide enough to allow two exiting lanes, effectively operating as right- and left-turn lanes.

In the vicinity of the existing Branch Village driveway, Great Road (Route 146A) provides a 13-foot wide travel lane in both directions, with shoulders varying from five to seven feet in width on either side of the roadway. Great Road (Route 146A) is serviced by the Rhode Island Public Transit Authority (RIPTA) North Smithfield/Lincoln Mall Park-n-Ride bus route (route 59X), with stops along the corridor including a stop adjacent to the Branch Village driveway. The posted speed limit on Great Road (Route 146A) is 35 mph.

Existing Traffic Volumes

Traffic volumes were collected manually at key locations within the study area during the weekday morning and weekday afternoon peak periods.

Existing Peak Hour Traffic Volumes

To assess peak hour traffic conditions, manual turning movement counts were conducted at the unsignalized intersections of Pound Hill Road at the Route 146 Northbound Ramps and Great Road (Route 146A) at the existing Branch Village Driveway. The counts were conducted on Thursday, October 18, 2018 from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM. The results of the turning movement counts are tabulated by 15-minute periods in Appendix A. The four highest consecutive 15-minute intervals during each of these count periods constitute the peak hours that are the basis of this traffic analysis.

Based on a review of the traffic count data, the weekday morning network peak hour occurs between 7:15 AM and 8:15 AM and the weekday afternoon network peak hour occurs between 4:30 PM and 5:30 PM.

Seasonal Variation

According to RIDOT's 2017 Monthly Average Daily Traffic Factors, traffic volumes for urban major collectors and urban minor arterials, collected during the month of October are both shown to be on average 2% lower than traffic volumes for the average month. Therefore, to provide a conservative analysis, the counted peak hour traffic volumes were increased by 2% to represent an average month condition. The peak hourly traffic flows are depicted in Figures 2 and 3 for the weekday morning and weekday afternoon peak hours, respectively.

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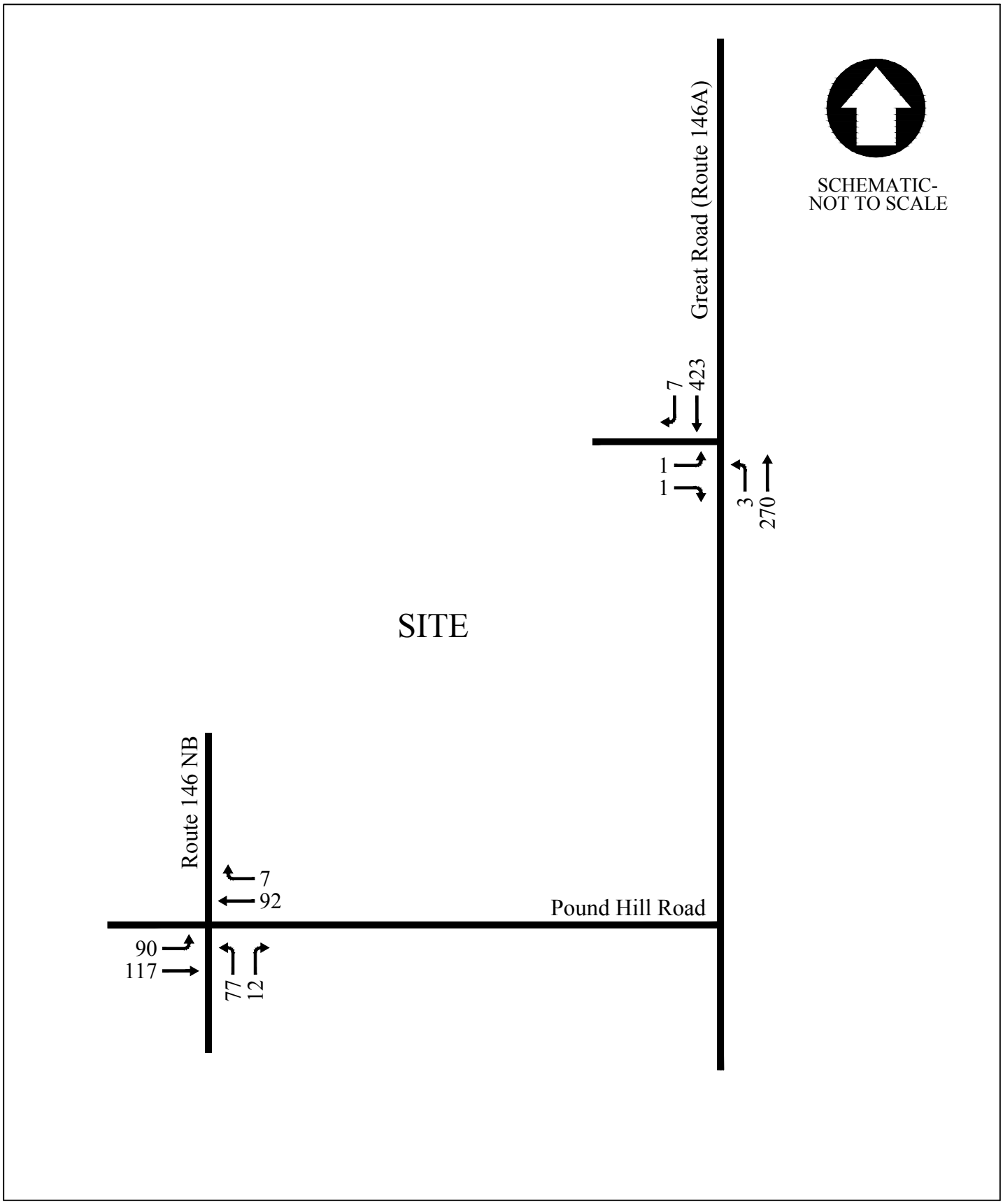

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Figure 2
2018 Existing Weekday Morning
Peak Hour Traffic Volumes
Branch Village Development
North Smithfield, RI

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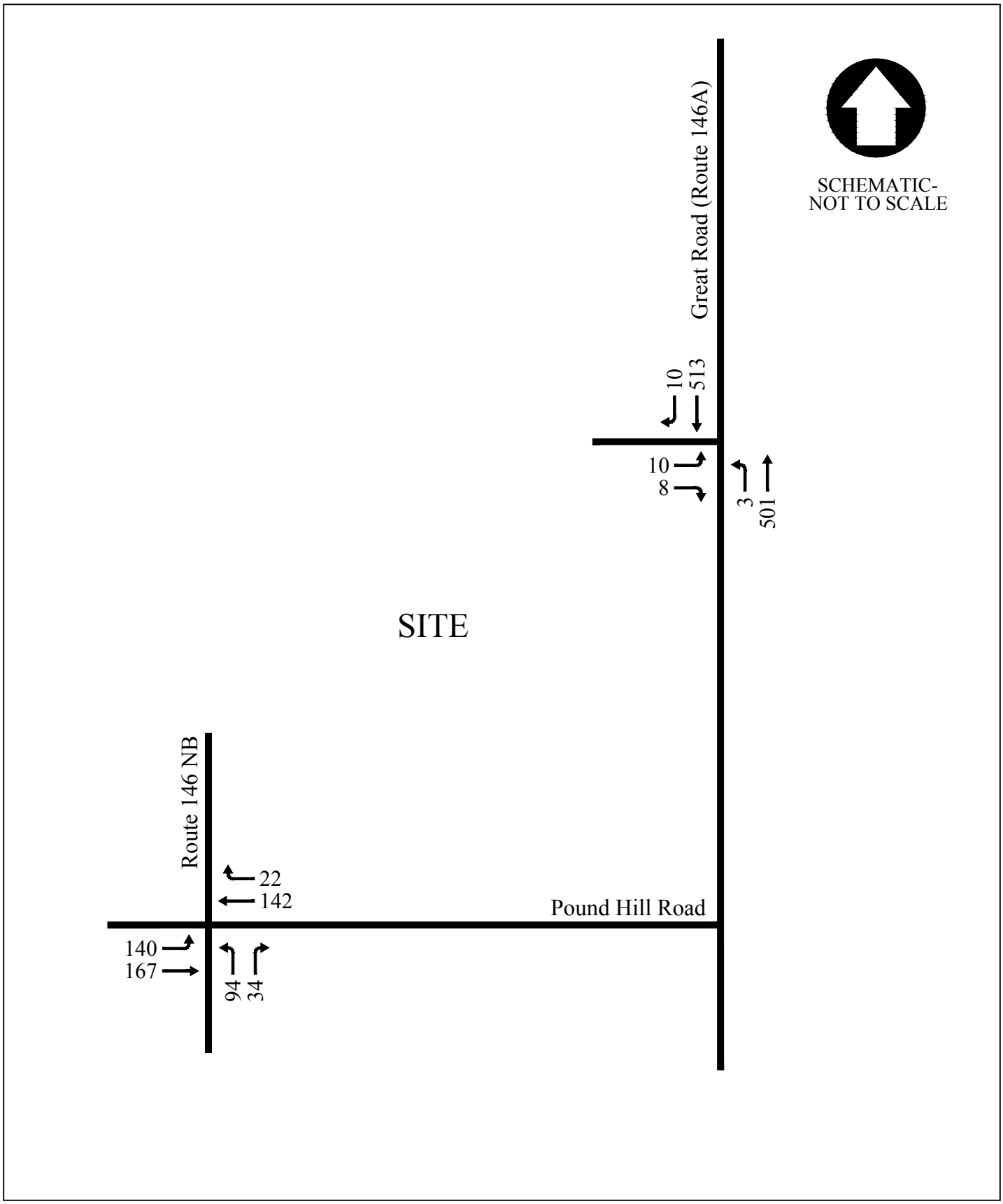

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Figure 3
2018 Existing Weekday Afternoon
Peak Hour Traffic Volumes
Branch Village Development
North Smithfield, RI

Crash Summary

Crash data for the study area was obtained from the Town of North Smithfield for the last year, which includes a complete crash summary for all of 2017. A summary of the crash data is presented in Appendix B.

During 2017, the intersection of Pound Hill Road at the Route 146 Northbound ramps had a total of three reported crashes, all reported to have occurred at the off-ramp intersection. Two of these crashes were angle collisions, and the third was a single-vehicle crash. It is important to note that the single-vehicle crash occurred as a result of the driver having a medical emergency, and cannot necessarily be attributed to the geometry of the off-ramp intersection. The single-vehicle crash and one of the angle crashes resulted in personal injury, while the remaining angle crash resulted in property damage only. All three of the reported crashes were reported to occur outside of the typical peak periods.

The unsignalized intersection of Great Road (Route 146A) at the existing Branch Village Driveway had no reported crashes during the last year. In the vicinity of the driveway there was one reported angle collision resulting in property damage only. This crash occurred when a vehicle exited the parking lot of the adjacent flower shop and collided with a southbound vehicle on Great Road.

Similarly, there were no reported crashes on Great Road (Route 146A) in the vicinity of the proposed southern driveway during 2017.

Based on a review of the available crash data, the study area intersections do not appear to have any existing safety deficiencies.

BUILD CONDITIONS

To determine future traffic demands on the study area roadways, the anticipated traffic increases associated with the proposed development were then added to the 2018 Existing volumes to reflect the 2018 Build (with project) traffic conditions. A more detailed description of the development of the 2018 Build traffic volumes follows and the development of the volumes is shown in the Traffic Projection Model found in Appendix C of this report.

Site-Generated Traffic

In order to establish 2018 Build volumes, vehicle trips projected to be generated by the proposed development were estimated.

The Institute of Transportation Engineers (ITE) is a national research organization of transportation professionals. Their publication, *Trip Generation Manual*, 10th *Edition*, provides traffic generation information for various land uses compiled from studies conducted by members nationwide. Vehicle trip estimates for the proposed multi-use development were developed based on data presented in this publication for Land Use Code (LUC) 140 (Manufacturing), LUC 221 (Multi-Family Housing, Mid-Rise), LUC 710 (General Office Building), and LUC 820 (Shopping Center) based on the Full Buildout Scenario 1 presented in the "Branch Village Revitalization: Phase II Buildout and Transportation Analysis" report, prepared by Pare Corporation in July 2008. These references establish vehicle trip rates based on actual traffic counts conducted at similar existing developments.

Table 1 presents the projected future trip generation volumes of the proposed development during the weekday morning and weekday afternoon peak hours.

Table 1
Vehicular Trip Generation Data

Location	Description	Land Use Code	Quantity		Weekday AM Peak Hour In	Weekday AM Peak Hour Out	Weekday AM Peak Hour Total	Weekday PM Peak Hour In	Weekday PM Peak Hour Out	Weekday PM Peak Hour Total
Village Center	Residential[1]	221	67	d.u.	6	17	**23**	18	12	**30**
	Commercial[2]	820	78,825	s.f.	119	73	**192**	219	237	**456**
	Office[3]	710	89,570	s.f.	95	15	**110**	16	86	**102**
	Industrial[4]	140	0	s.f.	0	0	**0**	0	0	**0**
				Subtotal	**220**	**105**	**325**	**253**	**335**	**588**
Northwest Village	Residential	221	48	d.u.	4	12	**16**	13	9	**22**
	Commercial	820	20,790	s.f.	101	62	**163**	82	88	**170**
	Office	710	66,460	s.f.	77	12	**89**	12	65	**77**
	Industrial	140	30,000	s.f.	14	4	**18**	6	14	**20**
				Subtotal	**196**	**90**	**286**	**113**	**176**	**289**
Industrial Park	Residential	221	65	d.u.	17	23	**40**	18	11	**29**
	Commercial	820	0	s.f.	0	0	**0**	0	0	**0**
	Office	710	172,030	s.f.	162	26	**188**	30	160	**190**
	Industrial	140	52,470	s.f.	25	7	**32**	11	24	**35**
				Subtotal	**204**	**56**	**260**	**59**	**195**	**254**
South of Rail	Residential	221	0	d.u.	0	0	**0**	0	0	**0**
	Commercial	820	0	s.f.	0	0	**0**	0	0	**0**
	Office	710	260,000	s.f.	233	38	**271**	45	237	**282**
	Industrial	140	260,000	s.f.	124	37	**161**	54	120	**174**
				Subtotal	**357**	**75**	**432**	**99**	**357**	**456**
Total	Residential	221	180	d.u.	27	52	**79**	49	32	**81**
	Commercial	820	99,615	s.f.	220	135	**355**	301	325	**626**
	Office	710	588,060	s.f.	567	91	**658**	103	548	**651**
	Industrial	140	342,470	s.f.	163	48	**211**	71	158	**229**
				Grand Total	**977**	**326**	**1,303**	**524**	**1,063**	**1,587**

(1) Based on ITE Land Use Code 221 (Multi-Family Housing, Mid Rise)

(2) Based on ITE Land Use Code 820 (Shopping Center)

(3) Based on ITE Land Use Code 710 (General Office Building)

(4) Based on ITE Land Use Code 140 (Manufacturing)

Due to the mixed-use nature of the proposed project, a portion of the vehicles trips shown in Table 1 are considered to be internal trips, that would be shared between different land uses on the project site. Internal trips between the proposed retail land use, office buildings, and residential units were determined using ITE methodologies outlined in the *Trip Generation Manual*. The

resulting external trip generation for the proposed project for the weekday morning and weekday afternoon peak hours are shown in Table 2 below. Detailed trip generation calculations are shown in Appendix D of this report

Table 2

Internal Capture Trip Calculations

	Weekday AM Peak Hour			Weekday PM Peak Hour		
Description	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Residential	27	52	79	49	32	79
Internal Capture	8	24	32	14	15	29
Subtotal	**19**	**28**	**47**	**35**	**17**	**52**
Commercial	220	135	234	301	325	234
Internal Capture	136	38	174	187	91	278
Subtotal	**84**	**97**	**181**	**114**	**234**	**348**
Office	567	91	658	103	548	658
Internal Capture	34	20	54	6	121	127
Subtotal	**533**	**71**	**604**	**97**	**427**	**524**
Industiral	163	48	211	71	158	211
Internal Capture	0	0	0	0	0	0
Subtotal	**163**	**48**	**211**	**71**	**158**	**229**
	799	**244**	**1,043**	**317**	**836**	**1,153**

(1) Based on ITE Land Use Code 221 (Multi-Family Housing, Mid Rise)

(2) Based on ITE Land Use Code 820 (Shopping Center)

(3) Based on ITE Land Use Code 710 (General Office Building)

(4) Based on ITE Land Use Code 140 (Manufacturing)

Not all trips to retail lane uses are "new" trips. In fact, a significant portion of the total trips attracted to retail uses are "pass-by" trips. Since pass-by traffic is already on the adjacent roadways, this portion of the total development traffic is reflected in the existing, base traffic volumes, and does not represent additional traffic on the roadway network. Therefore, the total proposed development traffic volume associated with the commercial land use is reduced by the pass-by volume to estimate the "new" traffic generated by the proposed development, i.e., that traffic which will be added to the study area roadways and intersections. According to ITE, for the land use category "Shopping Center," approximately 34 percent of the total weekday morning and weekday afternoon trips are attributed to pass-by trips. The vehicle trips expected to be generated

by the proposed commercial land uses are separated into pass-by vehicle trips and "new" vehicles trips, as shown in Table 3.

Table 3
Commercial Pass-By Trips

Description	Land Use Code	Quantity		Weekday AM Peak Hour In	Out	Total	Weekday PM Peak Hour In	Out	Total
Commercial	820	99,615	s.f.	84	97	181	114	234	348
- Pass-By Trips[1]				29	33	62	39	80	118
Commercial New Trips				**55**	**64**	**119**	**75**	**154**	**230**

(1) Based on ITE Land Use Code 820, 34% of the weekday morning, 34% of the weekday afternoon peak hour trips are attributed to "pass-by" trips.

The total resulting trips that are expected to be generated by the site are shown in Table 4.

Table 4
Final Vehicular Trip Generation

Description	Land Use Code	Quantity		Weekday AM Peak Hour In	Out	Total	Weekday PM Peak Hour In	Out	Total
Residential	221	180	d.u.	19	28	**47**	35	17	**52**
Commercial	820	99,615	s.f.	55	64	**119**	75	154	**229**
Office	710	588,060	s.f.	533	71	**604**	97	427	**524**
Industrial	140	342,470	s.f.	163	48	**211**	71	158	**229**
		Grand Total		**770**	**211**	**981**	**278**	**756**	**1,034**

(1) Based on ITE Land Use Code 221 (Multi-Family Housing, Mid Rise)

(2) Based on ITE Land Use Code 820 (Shopping Center)

(3) Based on ITE Land Use Code 710 (General Office Building)

(4) Based on ITE Land Use Code 140 (Manufacturing)

As shown in Table 4, the peak hour trip generation of the proposed multi-use development is estimated to result in an increase of approximately 981 "new" vehicle trips (770 vehicles entering, 211 vehicles exiting) during the weekday morning peak hour and an increase of approximately 1,034 "new" vehicle trips (278 vehicles entering, 756 vehicles exiting) during the weekday afternoon peak hour.

Project Trip Distribution and Assignment

Distribution percentages for the residential and office related site-generated traffic were established based on the 2010 Census Journey-to-Work data available for the Town of North Smithfield. The Journey-to-Work data is provided in Appendix E. All commercial and industrial project related trips were distributed onto the study area roadways based on the existing travel patterns of the adjacent roadways. New trips to the site were assigned to the site driveways based on the most convenient means of access. The resulting arrival and departure patterns are presented in Figure 4.

2018 Build Peak Hour Traffic Volumes

To establish the 2018 Build peak hour traffic volumes, the project-related traffic was assigned to the surrounding roadway network based on the project distribution patterns presented above. The circulation of the new project trips within the study area roadways are shown in Figure 5 for the weekday morning and weekday afternoon peak hours. These project trips were then added to the 2018 Existing peak hour traffic volumes to reflect the 2018 Build peak hour traffic volumes. The resulting 2018 Build weekday morning and weekday afternoon peak hour traffic volumes are presented in Figures 6 and 7, respectively.

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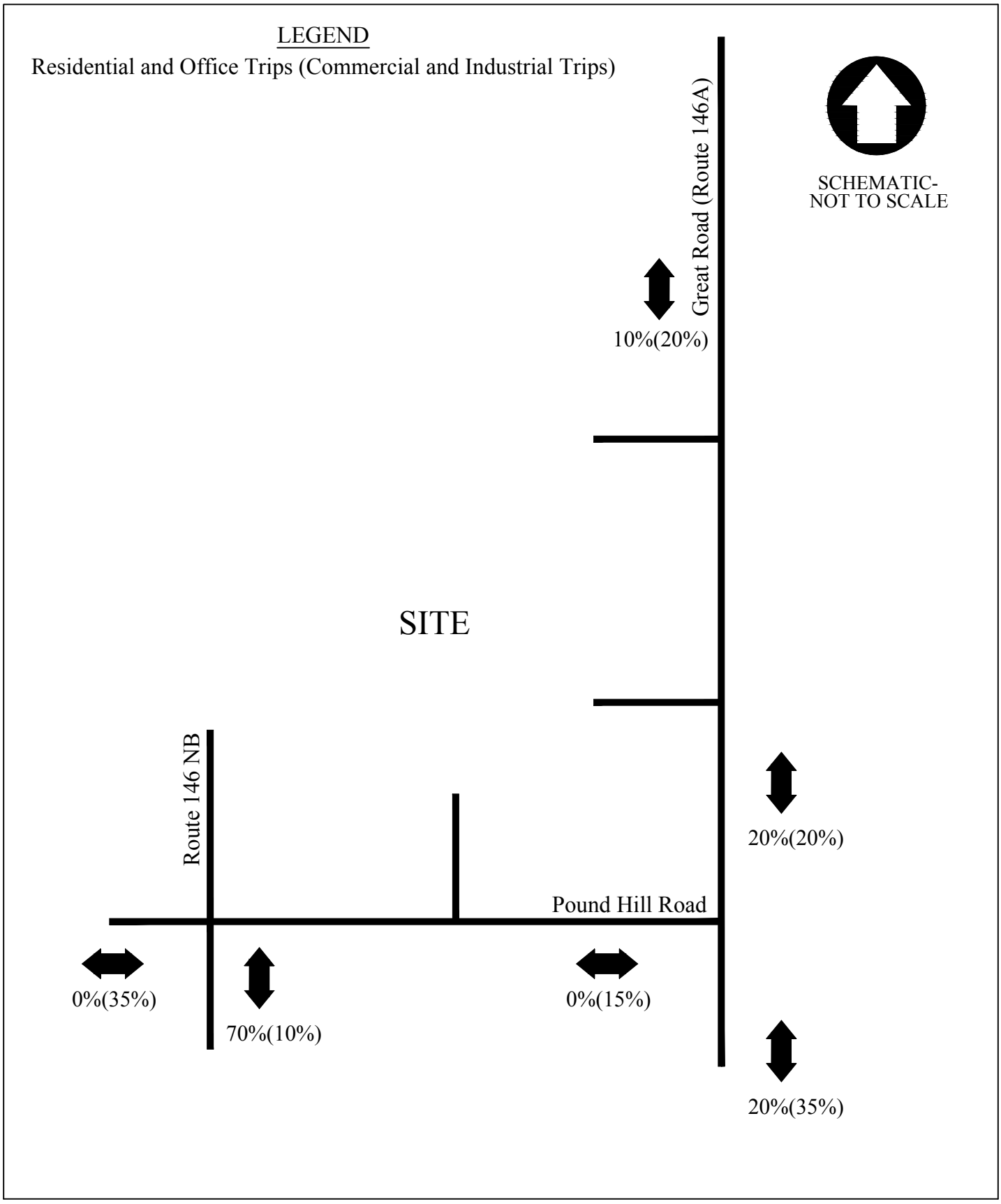

McMAHON
TRANSPORTATION ENGINEERS & PLANNERS

Figure 4
Direction of Arrivals and Departures
Branch Village Development
North Smithfield, RI

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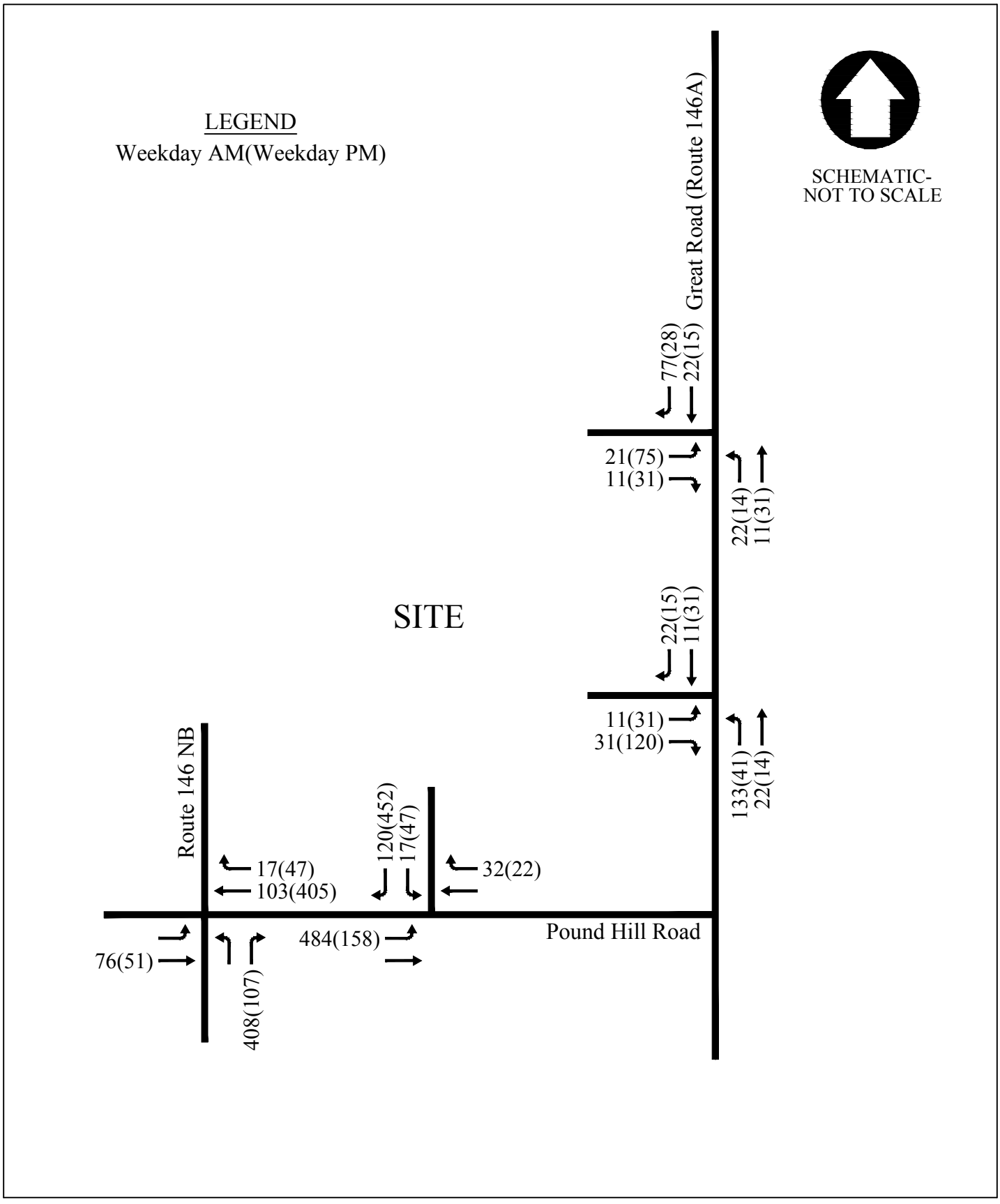

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Figure 5
New Project Trips
Branch Village Development
North Smithfield, RI

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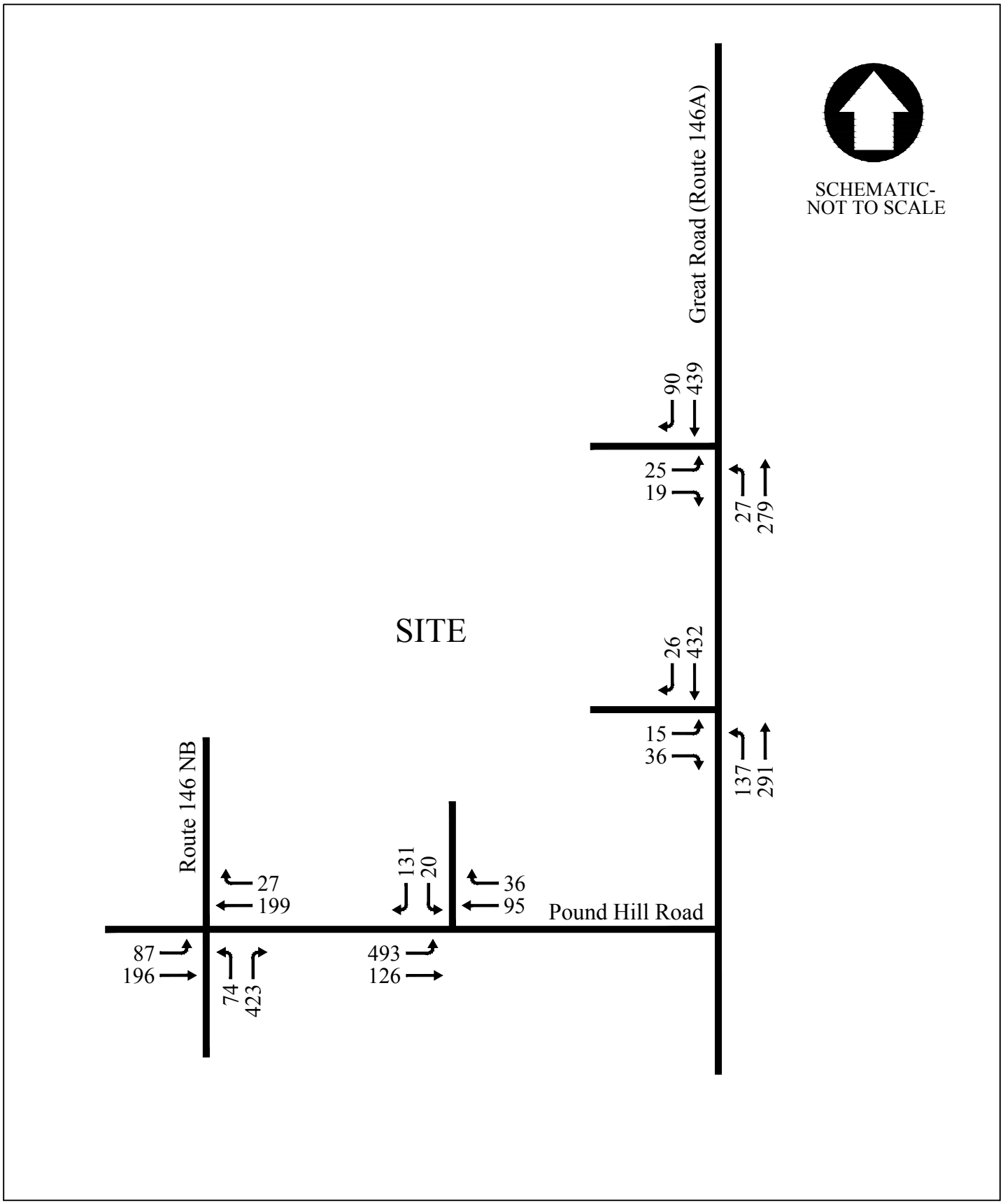

McMAHON
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Figure 6
2018 Build Weekday Morning
Peak Hour Traffic Volumes
Branch Village Development
North Smithfield, RI

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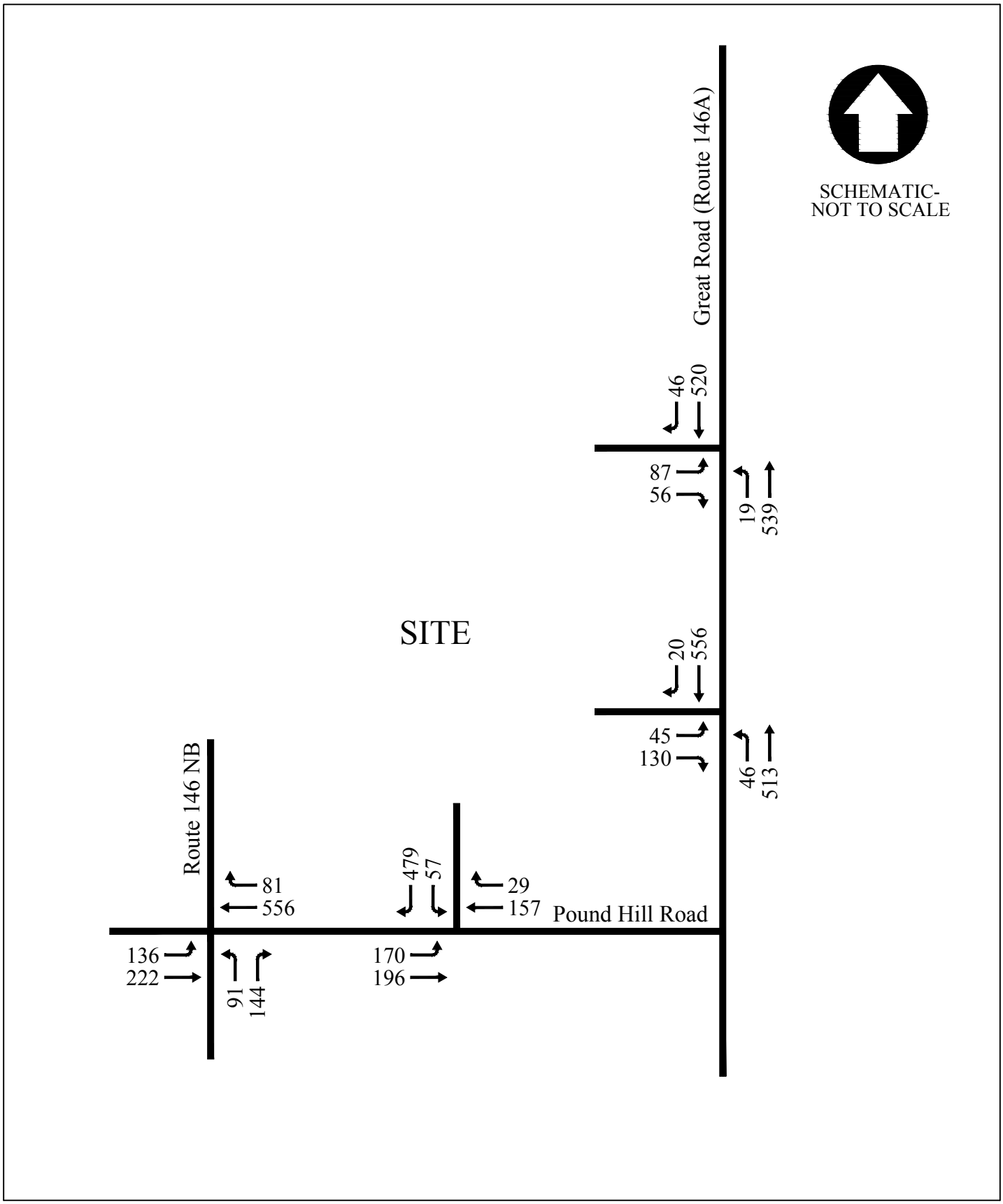

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Figure 7
2018 Build Weekday Afternoon
Peak Hour Traffic Volumes
Branch Village Development
North Smithfield, RI

TRAFFIC OPERATIONS ANALYSIS

In previous sections of this report, the quantity of traffic on the study area roadways was described. The following section describes the quality of traffic flow at the study area intersections for the given travel demands. As a basis for this assessment, intersection capacity analyses were conducted using Synchro analysis software for the study area intersections under the 2018 Existing and 2018 Build peak hour traffic conditions. This analysis is based on Synchro capacity analysis methodology and procedures contained in the *Highway Capacity Manual* (HCM) which are summarized in Appendix F. A discussion of the evaluation criteria and a summary of the results of the capacity analyses are presented below.

Level-of-Service Criteria

Average total vehicle delay is reported as level-of-service (LOS) on a scale of A to F. LOS A represents delays of 10 seconds or less and LOS F represents delays in excess of 50 seconds for unsignalized movements.

Capacity Analysis Results

Intersection capacity analyses were conducted for the study area intersections to evaluate the 2018 Existing and 2018 Build peak hour traffic conditions. The capacity analysis results for the 2018 Existing and 2018 Build conditions are presented in Appendix G and Appendix H, respectively. A summary of the results of the unsignalized intersection capacity analyses are presented in Table 5 below.

Table 5
Peak Hour Intersection Capacity Analysis Results

			2018 Existing						2018 Build					
			Weekday AM			Weekday PM			Weekday AM			Weekday PM		
Intersection	**Movement**		**LOS[1]**	**Delay[2]**	**V/C[3]**	**LOS**	**Delay**	**V/C**	**LOS**	**Delay**	**V/C**	**LOS**	**Delay**	**V/C**
Pound Hill Road at	EB	LT	A	3.4	0.07	A	3.7	0.12	A	2.4	0.07	A	3.9	0.18
Rte 146 NB Off-Ramp	WB	TR	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
	NB	L	B	11.6	0.15	B	13.9	0.21	C	17.2	0.24	F	>50.0	0.73
		R	A	9.1	0.02	A	9.3	0.04	C	17.7	0.66	B	10.6	0.20
Great Road (Route 146A) at	EB	L	B	14.8	0.00	C	22.4	0.06	C	18.4	0.11	E	49.5	0.59
Northern Branch Village Driveway		R	B	11.0	0.00	B	12.2	0.02	B	11.7	0.04	B	13.6	0.14
	NB	LT	A	0.1	0.00	A	0.1	0.00	A	0.8	0.03	A	0.3	0.02
	SB	TR	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00
Great Road (Route 146A) at	EB	LR	n/a	n/a	n/a	n/a	n/a	n/a	C	16.8	0.15	D	32.4	0.60
Southern Branch Village Driveway	NB	LT	n/a	n/a	n/a	n/a	n/a	n/a	A	2.8	0.15	A	0.7	0.05
	SB	TR	n/a	n/a	n/a	n/a	n/a	n/a	A	0.0	0.00	A	0.0	0.00
Pound Hill Road at	EB	LT	n/a	n/a	n/a	n/a	n/a	n/a	A	7.2	0.39	A	3.8	0.14
Branch Village Driveway	WB	TR	n/a	n/a	n/a	n/a	n/a	n/a	A	0.0	0.00	A	0.0	0.00
	SB	L	n/a	n/a	n/a	n/a	n/a	n/a	F	>50.0	0.24	C	20.0	0.21
		R	n/a	n/a	n/a	n/a	n/a	n/a	A	9.6	0.15	C	16.4	0.63

1 Level-of-Service
2 Average vehicle delay in seconds
3 Volume to capacity ratio
n/a Not Applicable

A more detailed summary of the level-of-service results and queue analysis for the unsignalized intersections within the study area during the weekday morning and weekday afternoon peak hours can be found in Appendix I. The specific capacity analysis results of the study area intersections are discussed below.

Route 146 Northbound Ramps at Pound Hill Road

Under the 2018 Existing conditions, the stop-controlled northbound left-turn approach from the Route 146 Northbound off-ramp at its intersection with Pound Hill Road is shown to operate at a LOS B during both the weekday morning and weekday afternoon peak hours, while the northbound right-turn movement is shown to operate at LOS A during both peak hours. Under the 2018 Build conditions it is expected that the **northbound left-turn approach would drop from LOS B to LOS C during the weekday morning peak hour and from LOS B to LOS F during the weekday afternoon peak hour, while operating under capacity**. The northbound right-turn movement is expected to drop from LOS A to LOS C during the weekday morning peak hour, and from LOS A to LOS B during the weekday afternoon peak hour under the 2018 Build conditions. Under the 2018 Build conditions, the queues for the northbound left-turning vehicles are expected to extend to approximately 105 feet (approximately five vehicles). The left-turn queue is not expected to block right-turning vehicles and is not expected to extend back onto Route 146.

All movements on Pound Hill Road are expected to operate at LOS A under all conditions analyzed.

Great Road (Route 146A) at Existing Northern Site Driveway

Based on the capacity analysis results, the existing Branch Village driveway on Great Road (Route 146A) operates at LOS B for both left- and right-turning vehicles during the weekday morning peak hour and LOS C and LOS B for left- and-right turning vehicles, respectively, during the weekday afternoon peak hour. With the proposed project in place under the 2018 Build conditions, this driveway is expected to drop from LOS B to LOS C for left turning vehicles, while continuing to operate at LOS B for right-turning vehicles during the weekday morning peak hour. During the weekday afternoon peak hour, it is expected that the left-turning movement will drop from LOS C to LOS E, and the right-turning movement is expected to continue to operate at LOS B. The left turn out of the driveway is expected to operate under capacity and the queue is expected to extend approximately 80 feet (approximately four cars). However, drivers turning left to travel north trying to reach Route 146 could also utilize the southern driveway on Great Road (Route 146A) or the driveway on Pound Hill Road to reduce delay and queueing. **Any delay experienced by vehicles turning onto Great Road (Route 146A) from the site would not be expected to affect the operations on Great Road (Route 146A),** as both the northbound and southbound approaches are expected to operate at LOS A under both conditions analyzed.

Great Road (Route 164A) at Proposed Southern Site Driveway

The proposed southern driveway on Great Road (Route 146A) would consist of a shared left- and right-turn approach. The driveway is expected to operate at LOS C during the weekday morning peak hour and LOS D during the weekday afternoon peak hour, while operating under capacity. **The queues for vehicles exiting the driveway during the weekday morning and weekday afternoon peak hours are not expected to exceed 85 feet (approximately four vehicles).**

Pound Hill Road at Proposed Site Driveway

The site driveway on Pound Hill Road is proposed to consist of separate left and right turn lanes. The driveway is expected to operate at LOS F, and under capacity, for left-turning vehicles and LOS A for right-turning vehicles during the weekday morning peak hour. During the weekday afternoon peak hour, the driveway is expected to operate at LOS C for both left-turning and right-turning vehicles under the 2018 Build conditions. **The queues for vehicles exiting the driveway are not expected to exceed 113 feet (approximately five vehicles) during either of the peak hours analyzed. Any delay experienced by vehicles turning into Pound Hill Road from the site would not be expected to affect the operations on Pound Hill Road.**

All movements on Pound Hill Road are expected to operate at LOS A.

Based on the trip distribution patterns, it is expected that a majority of the traffic would be accessing the site from Route 146. As there are Route 146 Interchanges located on Great Road (Route 146A) and on Pound Hill Road, it can be expected that if the left–turn movements at either of the Great Road (Route 146A) driveways results in queuing, it is likely that drivers will then exit the site on Pound Hill Road, turning right to access Route 146. Likewise, vehicles traveling east have the choice of turning right out of the site onto Great Road (Route 146A), or turning left onto Pound Hill Road out of the site, as the two roadways intersect less than a mile southeast of the site. The ability for drivers to utilize either Great Road (Route 146A) or Pound Hill Road to access the site would likely improve site circulation and minimize delays at the site driveways.

Sight Distance

A field review of the available sight distances was conducted for both the existing and proposed site driveways on Great Road (Route 146A) and at the proposed site driveway on Pound Hill Road. Both Great Road (Route 146A) and Pound Hill Road have a posted speed limit of 35 mph.

The American Association of State Highway and Transportation Officials' (AASHTO) publication, *A Policy on Geometric Design, 2011 Edition*, defines minimum sight distances at intersections. The minimum sight distance is based on the required stopping sight distance (SSD) for vehicles traveling along the main road According to AASHTO, "If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight

distance for the major road, then drivers have sufficient time to anticipate and avoid collisions." The following table summarizes the available sight distances at the proposed project site driveways and the corresponding required stopping sight distance.

Table 6
Sight Distance Requirements

Intersection	Direction	Posted Speed[1] (mph)	SSD Required[2] (ft)	Sight Distance Measured (ft)	Meets Requirements
Existing Northern Site Driveway on Great Road	Looking Left (North)	35	250	720	Yes
	Looking Right (South)	35	250	760	Yes
Proposed Southern Site Driveway on Great Road	Looking Left (North)	35	250	710	Yes
	Looking Right (South)	35	250	750	Yes
Proposed Site Driveway on Pound Hill Road	Looking Left (East)	35	250	300	Yes
	Looking Right (West)	35	250	1030	Yes

1 Based on posted speed limit.
2 Based on AASHTO requirements for stopping sight distance (see AASHTO Equation 3-2).

As shown in Table 6, the sight distance looking in both directions along Great Road (Route 146A) from both the existing northern and proposed southern site driveways, as well as looking in both directions along Pound Hill Road from the proposed site driveway, exceeds the SSD requirements for the posted speed limits. Therefore, vehicles are projected to be able to exit the project site driveways safely.

RECOMMENDATIONS

To reduce delay at the proposed driveways, and optimize internal site circulation, it is recommended that the site driveway on Pound Hill Road be two exiting lanes, one for left turning vehicles, and one for right turning vehicles. Although the existing northern driveway on Great Road (Route 146A) operates as a two lane approach, it is suggested that the driveway be slightly widened to formalize the two exiting lanes and provide the appropriate pavement markings and signage. Making the Pound Hill Road and norther Great Road driveways two lanes would reduce queuing, and allow for travel pattern flexibility. Providing the two exiting lanes at each driveway location would also allow for right-turning vehicles to avoid the left-turn queues.

Although the site driveways are expected to operate under capacity, the left turns out of the Pound Hill Road driveway are shown to operate at LOS F during the weekday morning peak hour, and the left turn movement out of the northern Great Road (Route 146A) driveway is shown to operate at LOS E during the weekday afternoon peak hour. A gap study at the existing Great Road (Route 146A) driveway would provide additional traffic volume data that could increase the accuracy of the capacity analysis. Furthermore, a traffic signal warrant analysis is recommended to determine if there is a need for a traffic signal at either of the proposed site driveways.

Sensitivity Analysis

A sensitivity analysis was conducted at the study area intersections to estimate the maximum amount of site generated traffic that could be added to the surrounding roadway network, before the recommended widening of the driveways as well as other intersection improvements may be needed to allow for adequate operations. Typically LOS D operations at unsignalized intersections are considered to be adequate. Therefore as a basis of the sensitivity analysis, a LOS D was considered to be the maximum LOS allowed before the recommended improvements would be required.

When analyzing the northern site driveway on Great Road (Route 146A) as a one lane approach with a shared left and right turn lane, traffic volumes exiting the site would need to be reduced by approximately 30% to result in a LOS D during the weekday afternoon peak hour. No reduction in the weekday morning peak hour volumes would be needed at this site driveway, as it is shown to operate at a LOS C as a one lane approach. Therefore it can be assumed that up to 70% of traffic expected to be generated by the identified build program would be accommodated within the existing driveway width. Build out beyond 70% of the identified build program would require widening at the driveway to provide a two lane approach in order to obtain adequate LOS.

The southbound left-turn lane exiting the site at the proposed Pound Hill Road driveway is shown to operate at LOS F during the weekday morning peak hour, while the southbound right-turn lane is shown to operate at LOS A. If the Pound Hill Road driveway were analyzed as a one lane approach serving both left and right turning vehicles, the movement is shown to operate at LOS C during the weekday morning peak hour. However, providing the proposed two lanes at the Pound Hill driveway would reduce the delay of the right-turning vehicles, because they would not be waiting behind left-turning vehicles. When all the movements are constrained to one lane, the combined delay of all vehicles is lower than the LOS F shown to be experienced by the left-turn lane, but providing a separate right-turn lane would improve the overall operations of the approach. If the site generated volumes were reduced by 20%, the left-turn lane existing the site onto Pound Hill Road would be expected to operate at LOS D.

The expected site generated trips along Pound Hill Road at the Route 146 northbound ramps are shown to affect the operations of the northbound left turn movement at the Route 146 northbound off-ramp, as it is shown to operate as at a LOS F during the weekday afternoon peak hour. A sensitivity analysis was conducted for the eastbound and westbound through movements at this intersection to understand what reduction in site generated traffic that is conflicting with the northbound left-turn movement would be needed to achieve an adequate LOS D. Based on this sensitivity analysis, a LOS D can be achieved for the northbound left-turning movement with an approximate 30% reductions in both eastbound and westbound through traffic, similar to the sensitivity analysis results for the Great Road (Route 146A) northern driveway.

CONCLUSION

The proposed Branch Village project is located in the northeast quadrant of North Smithfield, Rhode Island, and proposes to redevelop the area with over one million square feet of residential, commercial, and industrial land uses. In addition to the existing driveway to the project site located on Great Road (Route 146A), an additional driveway is proposed to be located on Great Road (Route 146A) approximately 650 feet south of the existing driveway, and a driveway is proposed to be located on Pound Hill Road, east of the Route 146 Northbound ramps.

Under the current build program, the development is projected to result in an increase of approximately 981 "new" vehicle trips (770 vehicles entering, 211 vehicles exiting) during the weekday morning peak hour and an increase of approximately 1,034 "new" vehicle trips (278 vehicles entering, 756 vehicles exiting) during the weekday afternoon peak hour.

The capacity analysis indicates that the proposed development would not have a significant impact on the operations of mainline traffic along Great Road (Route 146A) and Pound Hill Road. The existing northern site driveway on Great Road (Route 146A) is expected to drop from a LOS B to a LOS C during the weekday morning peak hour and from a LOS C to a LOS E during the weekday afternoon peak hour for left-turning vehicles. Both left-turn and right-turn movements are **expected to operate under capacity and the delays at this approach are expected to remain internal to the site.** Right-turning vehicles at this approach are expected to **operate at LOS C or better**.

The proposed southern site driveway on Great Road (Route 146A) is **expected to operate at LOS C during the weekday morning peak hour and LOS D during the weekday afternoon peak hour. The southern driveway is shown to operate under capacity.**

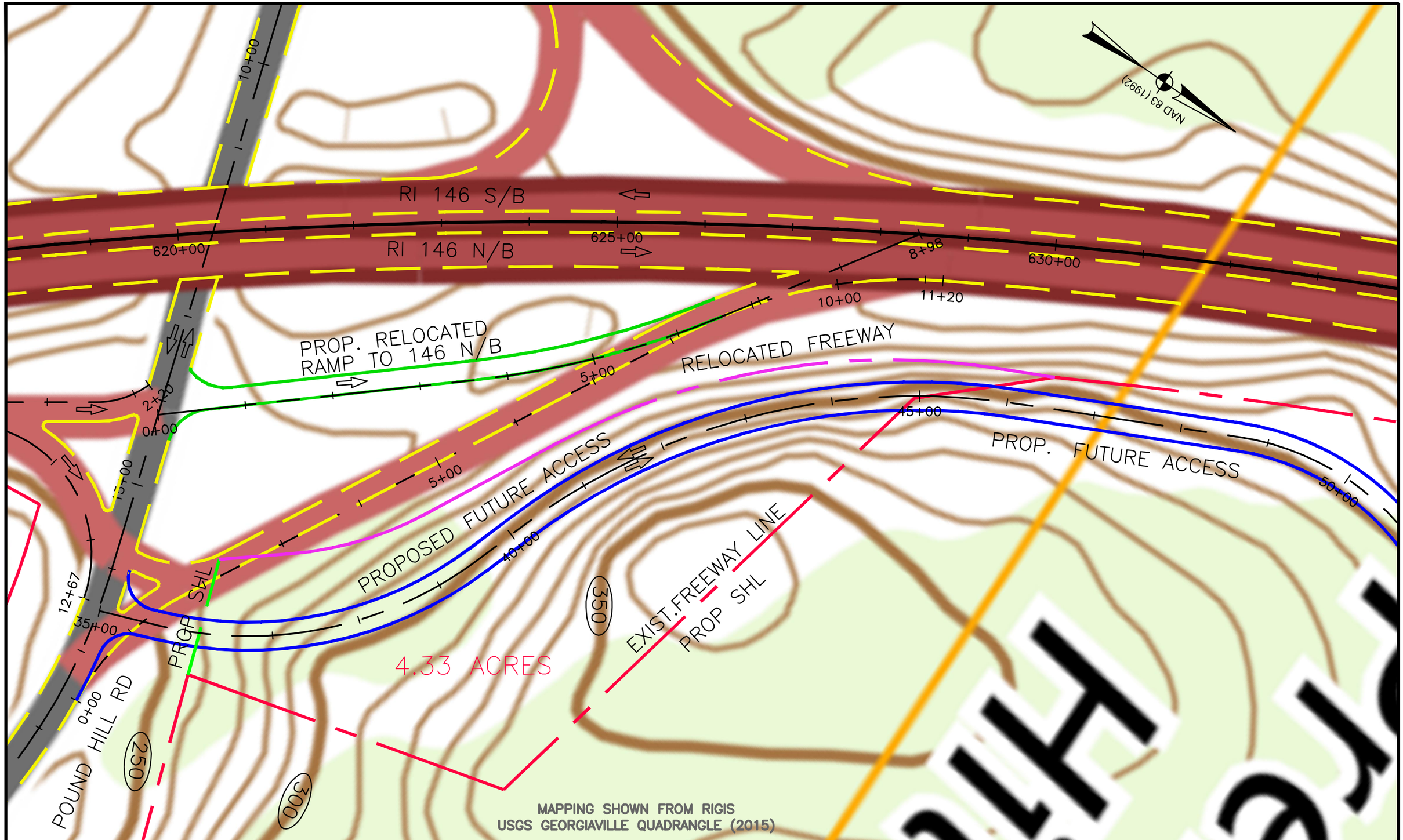
The **proposed site driveway on Pound Hill Road is shown to operate under capacity** at LOS F for left-turning vehicles and LOS A for right-turning vehicles during the weekday morning peak hour, and LOS C for both left-turning and right-turning vehicles during the weekday afternoon peak hour. **The addition of the proposed driveway on Pound Hill Road is expected to provide more direct access to Route 146, minimizing the impacts to the traffic operations along the Great Road (Route 146A) corridor as well as other town owned roadways.**

Based on the analysis results presented in this report, the surrounding roadway network is not expected to be greatly affected with the proposed development in place. Although the proposed site driveway operations are shown to operate at LOS F for vehicles turning left out of the site, all delays are expected to remain internal to the project site. Based on the sensitivity analysis results, it is expected that 70% of traffic expected to be generated by the identified build program scenario would result in adequate LOS for all movements at the study area intersections without requiring additional intersection improvements or roadway widening for auxiliary turning lanes. Further field calibration and a traffic signal warrant analysis is recommended for the proposed site driveways.

D

Conceptual Interchange Modifications

CDR Maguire, October 2017



CDR MAGUIRE

0 100' 200'

SCALE: 1"=100'

REVISIONS		
NO.	DATE	BY

SCALE: 1"=100'

DESIGNED BY: DATE: OCT 3, 2017

CHECKED: SHEET 1 OF 2

POUND HILL RD & RTE 146 NB INTERCHANGE
NORTH SMITHFIELD, RI

PROPOSED RAMP ACCESS RELOCATION

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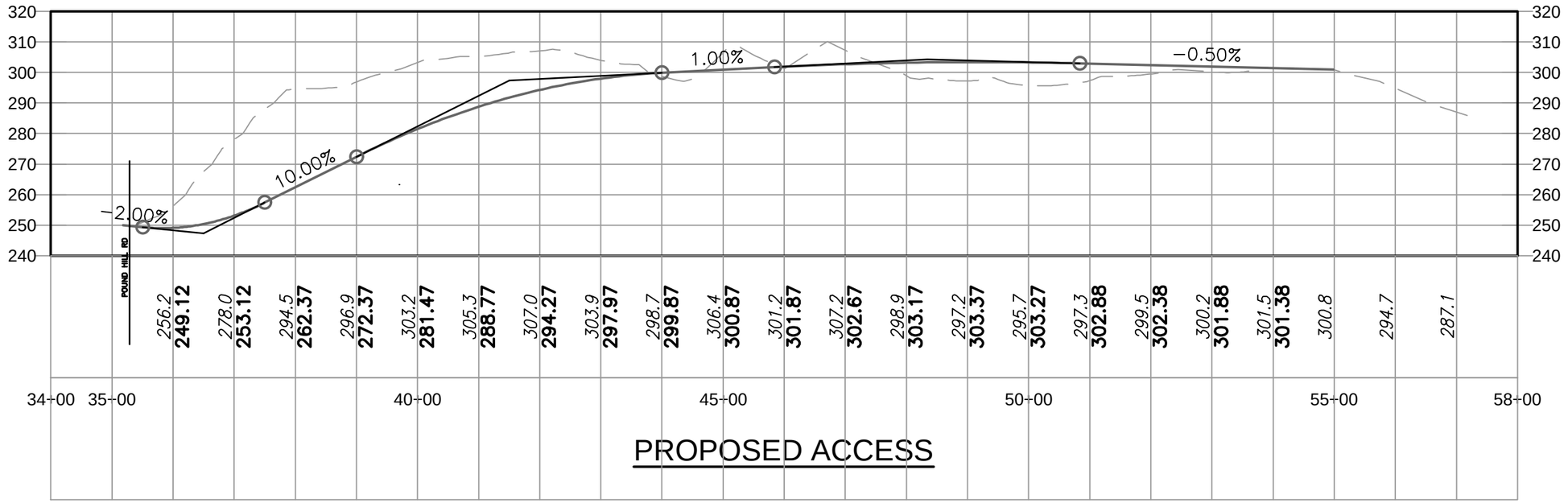
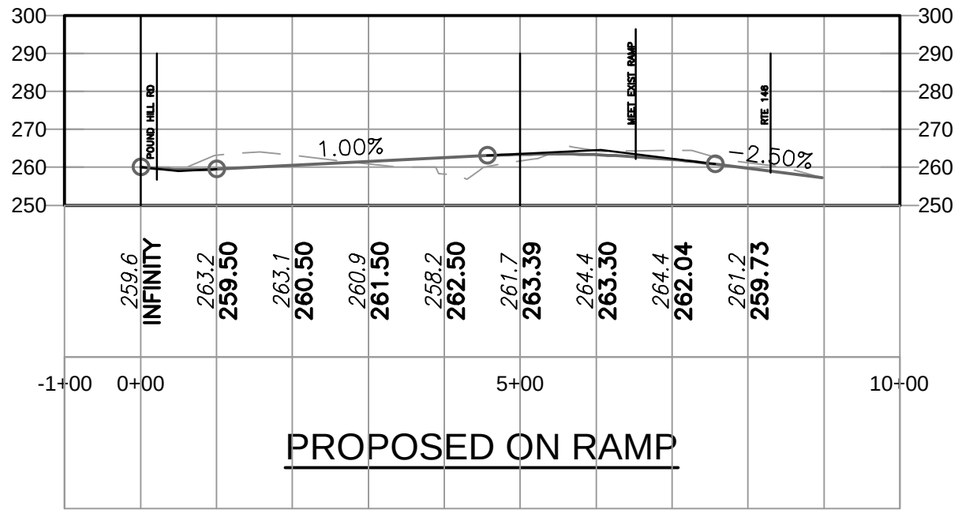


PROPOSED ACCESS



PROPOSED ON RAMP

CDR MAGUIRE

REVISIONS		
NO.	DATE	BY

SCALE:

HORZ.: 1"=40'
VERT.: 1"=8'

DESIGNED BY:
DATE: OCT 3, 2017
CHECKED:
SHEET 1 OF 2

POUND HILL RD & RTE 146 NB
INTERCHANGE
NORTH SMITHFIELD, RI

PROPOSED PROFILES

S:\PROJECTS\19721.00-Proposed_Access_Relocation_Rte_146\TECHNICAL FILES\ACAD\DESIGN_FILES\Highway_Layout.dwg, 10/6/2017 8:43:42 AM, Josh_McGinn

D

Environmental Assessment – Route 146 and Pound Hill Road

Natural Resource Services, Inc., May 2017

Natural Resource Services, Inc.

May 26, 2017

Joseph Cardello, PE
CDR Maguire
225 Chapman Street 4th Floor
Providence, RI 02905

RE: Wetland Consulting Services
North Smithfield Proposed Access Relocation
Route 146 at Pound Hill Road, North Smithfield, Rhode Island

Dear Mr. Cardello:

Natural Resource Services, Inc. (NRS) has obtained information regarding the species listed in the natural heritage area database pertaining to the assessment area being reviewed as part of the highway relocation for the Town of North Smithfield. The attached graphic depicts the area which NRS inspected. This information was provided by the Rhode Island Natural History Survey (RINHS). The RINHS is a partner organization with the RI Department of Environmental Management (DEM), the University of Rhode Island (URI) and The Nature Conservancy; these four entities are responsible for cataloging and providing information on rare and endangered species in the State of Rhode Island.

According to the RINHS, two plant species listed with the natural heritage database are present proximate to the assessment area. These include: maidenhair spleenwort *(Asplenium trichomanes)* and blood-root *(Sanguinaria canadensis*). Both species are considered "species of special concern" by the DEM. This designation indicates that the species are not so limited as to qualify as "rare" or "endangered" but that these species may merit conservation action in order to protect the populations.

The RINHS data comes with the caveat that the categorization of natural heritage areas "should not be considered a definitive statement on the presence, absence, or condition of ecological resources in a particular area." The RINHS did provide some field information regarding the two listed species on the subject property:

The presence of maidenhair spleenwort was described by the RINHS as "quite close to the ramp from Pound Hill Road to north-bound Rt. 146…on shaded limestone outcrops." The documentation from a field survey is provided as "PPASPO21K0, site 009" for maidenhair spleenwort.

The presence of blood-root was described by the RINHS as "about 1,000 meters northeast of the intersection…growing in an open area surrounded by woods of sugar maple and

P.O. Box 311 Harrisville, RI 02830 401-568-7390 FAX 401-568-7490

white ash." The documentation of this species is given as "PDPAP0M010, site 016" for blood-root.

Maidenhair spleenwort *(Asplenium trichomanes)* is a perennial evergreen fern that is a member of the spleenwort family *(Aspleniaceae)*. It reproduces via spores and does not produce flowers. In New England, the species is only found in upland sites. It typically grows in moist stony locations or bluffs. Maidenhair spleenwort has dark brown leaf stalks and light green compound leaves typically 1-9 inches in length that grow in small clusters.

Maidenhair spleenwort, (image via plants.usda.gov, copyright Al Schneider)

Blood-root *(Sanguinaria canadensis)* is a perennial herbaceous plant of the poppy family (*Papaveraceae*). The herb grows in shaded woodlands, reaching approximately 6-10 inches high; each flower stalk develops from a single lobed basal leaf. The plant produces white to light pink 8-10 petaled flowers. Blood-root typically blooms between March and May. The plant typically becomes dormant by mid-summer, re-emerging in the spring. The name blood-root refers to the orangey-red sap that is visible when the leaves, stalks, or rhizome are cut.

Blood-root, (image via plants.usda.gov, copyright Jennifer Anderson)

NRS staff biologist Carolyn Decker conducted a site visit May 25th, 2017. Neither species were found within the assessment area. However, the shaded limestone outcrops described by RINHS are present extending along the east of the Rt. 146 northbound on-ramp on the subject property. The most likely place that maidenhair spleenwort could be present on the property is in the crevices of these stony outcrops. The described location of blood-root approximately 1000 feet northeast of the intersection of Pound Hill Road and Route 146 appears to be well outside of the assessment area to the northeast.

The assessment area is thickly vegetated in the canopy and understory. It contains very steep sections, particularly where the limestone outcrops rise up adjacent to the northbound on-ramp. There does appear a portion of wetland in the southeast corner of the site along Pound Hill Road. Depending on its contiguity with off-site wetland areas, this may be considered either a forested wetland or a swamp.

Vegetation within the assessment area is dominated by common trees such as red maple *(Acer rubrum)*, white oak *(Quercus alba)*, red oak *(Quercus rubra)*, mockernut hickory *(Carya tomentosa)*, shagbark hickory *(Carya ovata),* white pine *(Pinus strobus)*, sweet birch *(Betula lenta)*, gray birch *(Betula populifolia)*, and white ash *(Fraxinus americana)*. Dominant shrubs include high bush blueberry *(Vaccinium corymbosum)*, low bush blueberry *(Vaccinium* angustifolium) spicebush *(Lindera benzoin)*, and witch hazel *(Hamamelis virginiana)*. Herbs and ferns such as New York fern *(Parathelypteris novaborecensis)*, rock polypody *(Polypodium virginianum)*, eastern hay-scented fern (*Dennstaedtia punctilobula*), bedstraw *(Galium spp)*, stinging nettle *(Urtica dioica)*, and Canada mayflower *(Maianthemum canadense)* are present. Among vines, grapevine *(Vitis labrusca)*, and oriental bittersweet *(Celastrus orbiculatus)* are present. While these are among the dominant species, these should not be considered the only species present within the assessment area.

I hope that the information provided is of assistance to you. Please do not hesitate to contact my office if you have any questions or require additional information.

Very truly yours,

Scott P. Rabideau, PWS
Principal

enclosures

Assessment Area for Proposed Access Relocation Route 146 at Pound Hill Rd

North Smithfield, RI

Approximate Site Location

Natural Heritage Area per RIGIS database

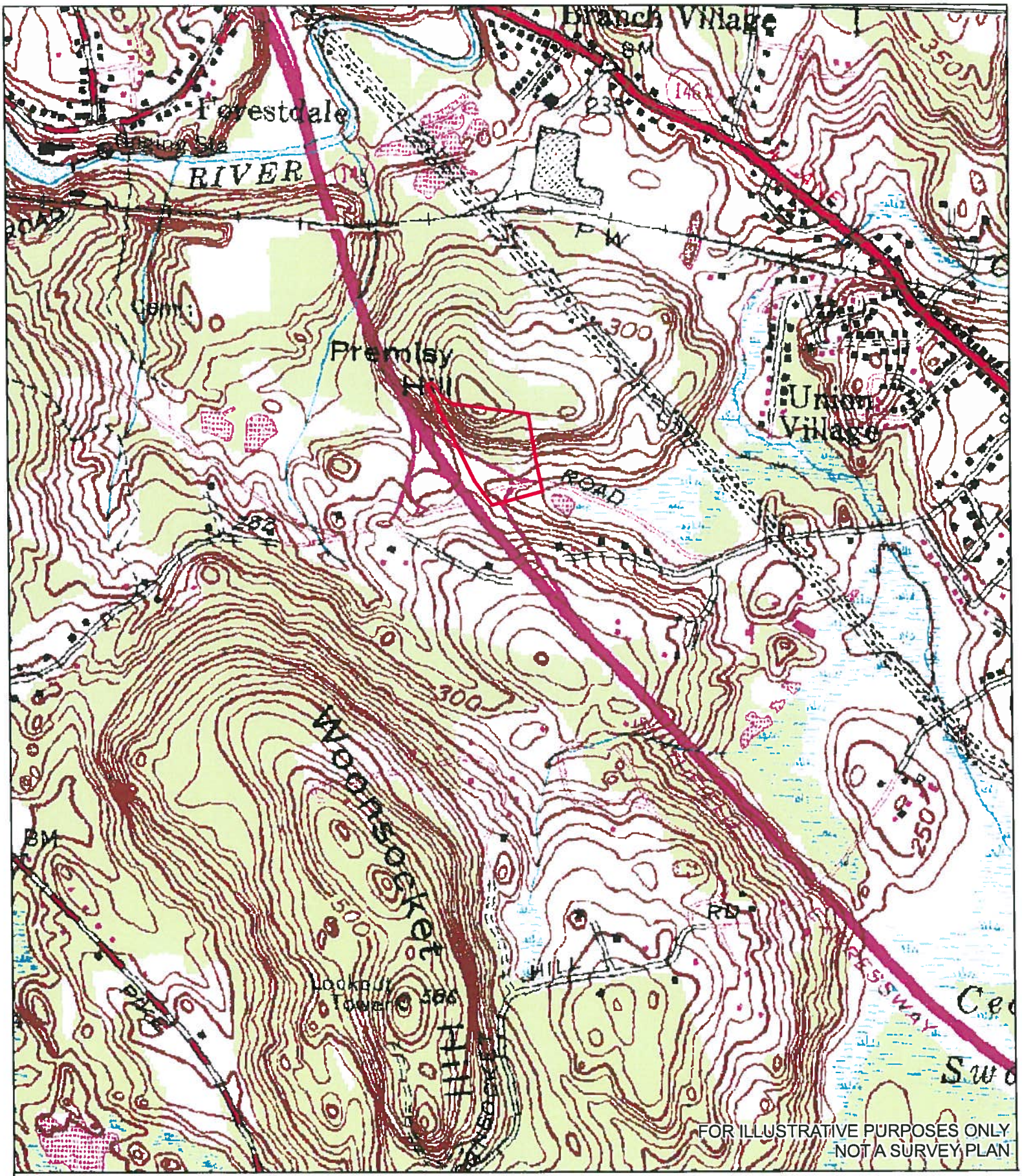
Feet

0 350 700 1,400

RIGIS

April 3, 2017 aerial photo (c) nearmap

Natural Resource Services, Inc.
PO Box 311
180 Tinkham Lane
Harrisville, RI 02830
p (401) 568-7390
f (401) 568-7490



Approximate Site Location

USGS Topographic Map
Route 146 at Pound Hill Rd

North Smithfield, RI

0 500 1,000 2,000 Feet

N W E S

RIGIS

Natural Resource Services, Inc.
PO Box 311
180 Tinkham Lane
Harrisville, RI 02830
p (401) 568-7390
f (401) 568-7490

D

Branch Village Revitalization: Phase II – Buildout Transportation Analysis

Pare Corporation, July 2008

Branch Village Revitalization: Phase II
Buildout and Transportation Analysis

Town of North Smithfield
Branch Village Task Force
Memorial Town Building
1 Main Street
Slatersville, RI 02876

Prepared by:
Pare Corporation
8 Blackstone Valley Place
Lincoln, RI 02865
Pare Project No. 08123.00

July 8, 2008

Branch Village Revitalization: Phase II
Buildout and Transportation Analysis

Table of Contents

Branch Village Revitalization: Phase II
Buildout and Transportation Analysis

Executive Summary

Background

The Town of North Smithfield and the Branch Village Task Force have continued their efforts to revitalize Branch Village, a mill village focused on the historical assets of Branch River and Great Road. The existing village core of mixed residential, commercial, and industrial activities, as well as its auto-dependent character, conflicts with the notion of a pedestrian-oriented, neighborhood-based economy. The town is proactively planning for more sustainable development that will benefit the local economy. Municipal planning efforts for Branch Village are in accordance with the 2006 update of the town's Comprehensive Community Plan recommending that the area be considered as a future "Growth Center" or priority investment area. The Governor's Growth Planning Council defines growth centers as "dynamic and efficient centers for development and redevelopment that have a core of commercial and community services, residential development, and natural and built landmarks and boundaries that provide a sense of place." The first initiative for revitalization efforts was completion of a Phase I visioning exercise and development of a Concept Plan. This report presents findings of the Phase II Buildout and Transportation Analysis.

Phase I planning for Branch Village revitalization was initiated in January 2007 when the North Smithfield Town Administrator convened a diverse group of community stakeholders. This task force was charged with considering the town's role in establishing a vision for its future and to identify and prioritize any public improvements and regulatory reform necessary to attract a level of private investment that enhances the financial position of the town and that earns the support of the North Smithfield Town Council.

The Concept Plan approved by Town Council in November 2007 as part of Phase I of Branch Village revitalization efforts represents a significant opportunity for the Town of North Smithfield to reinvent the area as a vibrant, pedestrian-oriented destination for both residents and visitors through increased density and enhanced site design. This is an important step in transforming this underutilized and automobile-oriented linear corridor into a thriving 300-acre mixed-use district with a separate and distinct identity or sense of place in North Smithfield. The Phase I Concept Plan presents a vision statement based on municipal and community input, the work of the Branch Village Revitalization Task Force, and smart growth/low-impact development criteria.

Branch Village Revitalization Task Force's Broad Municipal Goals:

- *Increase tax base*
- *Improve the appearance and function of the district*
- *Better utilize assets including proximity to Route 146, natural and cultural resources, underutilized existing buildings, existing infrastructure and infill opportunities*
- *Enhance and update existing infra-structure (water, sewer, roadways, utilities) through new private investment to minimize municipal costs*
- *Improve opportunities for supporting efficient mass transit options*

The Phase I Branch Village Plan outlined development concepts for each of five pods:

1. Village Center focal point at the Great Road/Saint Paul Street intersection with a pedestrian oriented, human-scale mixed-use development with first floor retail and upper level office and residential use. Parking would be located to the rear. Design would replicate the pattern of development typical of many New England villages that evolved prior to dominance of the automobile and implementation of zoning which focused on separating (potentially incompatible) uses.
2. Northwest of Village Center, located west of Branch River, with consolidated redevelopment of the ATP facility and/or replacement with several mixed-use structures, retention of open space, and similar street and sidewalk treatments.
3. Industrial Park phased expansion of campus-style development for high-end office and residential development that capitalizes on adjacent open space and views.
4. Rail line redevelopment as a recreational rail trail.
5. South of Rail Line, best suited to land banking as open space with long-term opportunity for industrial park expansion.

Phase II: Buildout and Transportation Analysis

Pare Corporation has taken the vision developed during Phase I and provided information on what the vision actually means to the community in terms of employment, property tax revenue, number of residents (including school aged children), sewer flow, and traffic. The second phase includes two components: buildout analysis and traffic analysis. By refining the broad vision developed during Phase I, two more focused buildout scenarios have been identified for Branch Village. Recommendations were also developed for both short term and long term transportation improvements. Implementation of these public improvements will serve as a catalyst for private investment in the village.

Findings were presented at milestone meetings with the Branch Village Task Force, at a public workshop with the Town Council, and with meetings of the Planning Board. Sections 1 through 4 summarize the meeting process. Section 5 presents recommended transportation improvements and Section 6 presents the preliminary opinion of probable costs for these improvements. The following summarizes the public participation process and study recommendations.

Meeting 1: April 8, 2008

A draft buildout methodology was presented at the kick-off meeting on April 8. This methodology was reviewed and fine-tuned to consider the impact of developing the proposed vision statements fully with construction of 51 buildings with various footprints, number of stories, and distribution of uses.

An overview of existing traffic conditions was presented. Key findings include:

- The existing Great Road / Saint Paul Street intersection has extensive uncontrolled curb cuts, lacks access control and pedestrian facilities, and has poor intersection recognition.
- The limited width of the two-lane Branch River bridge, scheduled for replacement by the Rhode Island Department of Transportation in the coming decade, limits the ability to provide geometric improvements to the Great Road/Saint Paul Street intersection to handle future traffic volumes.
- The Mendon Road intersection with Great Road has poor horizontal and vertical alignment.

- Based on close spacing of the Pound Hill Road and School Street intersections on Route 146, there is no opportunity for a new interchange to serve the Industrial Park.

Although the existing town-owned Providence and Worcester (P&W) Railroad alignment had been considered as a potential bike path connecting Branch Village and Slatersville, this is not feasible. The freight line through Branch Village is a single-track right-of-way (ROW). As such, one track is generally centered in the right-of-way. Sufficient ROW is not available for an active rail line and a bike path (on alignments where only one track remains of a double track, there may be more opportunity for a bike path). Generally a 25-foot setback must be maintained from the centerline of an active rail line to the edge of a bike path. Although the Town of North Smithfield owns the right-of-way in fee, P&W reserves a perpetual right to operate. An abandonment process is a very lengthy and drawn out process. Currently the rail is used about once per month with shipments to or from the steel mill (Denman & Davis). In the past it was used daily for shipments to and from Denman & Davis, Organics, and several plastics operators in Slatersville. The Town of North Smithfield has invested in the upgrade of the Steel Street at-grade crossing within the past few years. More importantly, active freight rail service is an important marketing tool for warehouse and light manufacturing use in the industrial park, providing an attractive and fuel-efficient option to truck transport via local roads and state highways. Although an off-road bike facility would be safest and most attractive for cyclists, Great Road, Saint Paul Street, and School Street are identified in RIDOT's *A Guide to Cycling in the Ocean State, 2005-2006* as suitable roads for cycling.

Further information and comments received are presented in **Section 1: April 6, 2008 Task Force Meeting**.

Meeting 2: May 6, 2008

Information was presented on the impacts of full implementation of the Phase I vision for Branch Village at the second Task Force meeting. The objective of the buildout is to determine the range of costs and benefits to the Town of North Smithfield with development of a mixed-use village at Branch Village. Further detail is presented in **Section 2: May 6, 2008 Task Force Meeting**.

As indicated in Table 1, approximately 1.2 million square feet of development is proposed in Branch Village with full development of the Phase I vision. Total projected population for 180 residential units would be 473, including 117 seniors and 11 of school age. Over 3,500 jobs would be projected, including 193 in commercial, 1,938 in office, and 1,372 in industrial use.

To determine the impact of the projected residential population (including seniors and school aged population), net municipal expenditures for education, general government, financial administration, public works, and public safety were projected based on use and gross floor area. Regional project examples were used to project worst-case costs and municipal revenues to the community. Based on information presented, a $3.2 million annual net surplus could be anticipated with full buildout at Branch Village. Information was presented on projected wastewater generation and water demand for proposed development. Total wastewater demand is approximately 113,660 gallons per day (GPD) with water demand estimated at 133,365 GPD.

Traffic projections were also prepared assuming full buildout is attained in ten years (2018), with a typical background level of traffic growth in the area. Level of Service projections are presented in Table 2. Delay and congestion are reflected in the Level of Service; Levels of Service A through D are considered acceptable for peak hour traffic. The Great Road/Saint Paul Street intersection would operate at an acceptable delay during the morning peak period in 2018. In the afternoon peak hour (3:30 to 4:30 PM), however, the intersection would fail (Level of Service F), regardless of signal optimization efforts.

Table 1: Scenario Summary

Full Buildout Scenario (May 6, 2008 Meeting)

Sub District	Popu-lation	Res Units	Res GFA (sf)	Com GFA (sf)	Office GFA (sf)	Total Ind GFA (sf)	Mfg GFA (sf)	Distrib ution	Bio-Tech	GFA (sf)	Municipal Revenue (Surplus)
Village Center	176	67	74,800	78,825	89,570					243,131	$606,796
Northwest Village	126	48	47,250	20,790	66,460	30,000	30,000			164,500	$406,551
Industrial Park	171	65	65,500		172,030	52,470	52,470			290,000	$799,451
South of Rail		0			260,000	260,000	260,000			520,000	$1,355,249
Total	**473**	**180**	187,550	99,615	588,060	342,470	342,470			**1,217,631**	**$3,168,048**
Distribution			15%	8%	48%		29%				
										Total	
Jobs Created				193	1,938	1,372	1,372			**3,503**	
Wastewater Generation (GPD)			39,560	10,740	35,620	27,740				**113,660**	
Water Use (GPD)			45,541	12,635	41,906	32,283				**132365**	

GPD = Gallons Per Day
Industrial Sewer/Water calculated for Manufacturing. Bio-Tech was not considered for the full buildout scenario.

Scenario 2: Industrial Focus (May 27, 2008 Meeting)

Sub District	Popu-lation	Res Units	Res GFA (sf)	Com GFA (sf)	Office GFA (sf)	Total Ind GFA (sf)	Mfg GFA (sf)	Distrib ution GFA (sf)	Bio-Tech GFA (sf)	Total GFA (sf)	Municipal Revenue (Surplus)
Village Center	199	73	74,800	78,825	89,570	0				243,195	$654,946
Northwest Village					40,000	124,500	37,350	87,150		164,500	$256,701
Industrial Park	27	10	10,000		35,000	164,000	11,700	27,300	125,000	209,000	$325,426
South of Rail					90,000	270,000	90,000	180,000		360,000	$565,108
Total	**226**	**83**	84,800	78,825	254,570	558,500	139,050	294,450	125,000	**976,695**	**$1,802,181**
Distribution			9%	8%	26%		14%	30%	13%		
										Total	
Jobs Created				127	827	879	232	147	500	**1,833**	
Wastewater Generation (GPD)			18,050	6,624	12,015	7,580			219,810	**264,079**	
Water Use (GPD)			21,241	7,793	14,135	8,917			258,600	**310,686**	

GPD = Gallons Per Day (Average Day)
Industrial Sewer/water calculated for Manufacturing and Distribution. Bio-Tech calculated separately.

Scenario 3: Office Focus (May 27, 2008 Meeting)

Sub District	Popu-lation	Res Units	Res GFA (sf)	Com GFA (sf)	Office GFA (sf)	Total Ind GFA (sf)	Mfg GFA (sf)	Distrib ution GFA (sf)	Bio-Tech GFA (sf)	Total GFA (sf)	Municipal Revenue (Surplus)
Village Center	199	73	74,800	78,825	89,570	0				243,195	$661,685
Northwest Village					76,000	88,500	61,950	26,550		164,500	$259,436
Industrial Park	79	30	29,500		54,500	125,000			125,000	209,000	$316,134
South of Rail					240,000	240,000	168,000	72,000		480,000	$748,529
Total	**278**	**103**	104,300	78,825	460,070	453,500	229,950	98,550	125,000	**1,096,695**	**$1,985,784**
Distribution			10%	7%	42%		21%	9%	11%		
										Total	
Jobs Created				127	1,598		384	49	500	**2,658**	
Wastewater Generation (GPD)			22,195	6,624	23,130	8,660			219,810	**280,419**	
Water Use (GPD)			26,112	7,793	35,447	10,188			258,600	**338,140**	

GPD = Gallons Per Day (Average Day)
Industrial Sewer/water calculated for Manufacturing and Distribution. Bio-Tech calculated separately.

Table 2: Great Road / Saint Paul Street Overall Intersection Level of Service with Signal Optimization

	Level of Service (Delay/Vehicle in Seconds)	
	AM Peak - 7:30 to 8:30 AM	**PM Peak – 3:30 to 4:30 PM**
Existing - 2008	A (7.7)	A (9.0)
Full Buildout – 2018	C (21.5)	F (119.8)
Scenario 2 – 2018	B (14.0)	D (41.9)
Scenario 3 – 2018	B (16.1)	D (51.3)

Level of Service (LOS) criteria for a signalized intersection:

- LOS A – less than 10 seconds delay per vehicle
- LOS B – between 10 and 20 seconds delay per vehicle
- LOS C – between 20 and 35 seconds delay per vehicle
- LOS D – between 35 and 55 seconds delay per vehicle
- LOS E – between 55 and 80 seconds delay per vehicle
- LOS F – more than 80 second delay per vehicle (typically more than one signal cycle)

Traffic congestion would improve to acceptable limits at all approaches other than northbound on Great Road with a double lane roundabout at this intersection. Sufficient right-of-way is not available, however, for a double lane roundabout and the location of existing buildings would preclude right-of-way acquisition for this traffic solution with the current pattern of development.

Based on feedback from the Task Force, two reduced development scenarios were recommended to assure a level of development that would maximize economic development with an appropriate density within a village centered at the Great Road/Saint Paul Street. It should be noted that market demand was not used to develop the reduced buildout scenarios. Reduced buildout scenarios should reflect the following:

- Level of Service D shall not be exceeded in the peak hour at the Great Road/Saint Paul Street intersection in 2018.
- Five mixed-use (residential/commercial) buildings in Northwest Village should be considered as industrial use (light manufacturing/ distribution).
- Four buildings in the Industrial Park should be eliminated.
- Industrial use should include 70% warehouse /distribution and 30% light manufacturing.
- Both scenarios should include biotechnology development to determine maximum sewer and water demand.

Meeting 3: May 27, 2008

The third committee meeting was held to present findings of impacts assuming two reduced buildout scenarios were implemented. Table 1 summarizes information for scenarios as refined during the project and presented at the Town Council Workshop on June 23, 2008. Further detail on these scenarios is presented in **Section 3: May 27, 2008 Task Force Meeting** (as revised for the workshop). Projected level of service (with signal optimization) at the Great Road/Saint Paul Street intersection is presented in Table 2 for the two reduced buildout scenarios (Scenarios 2 and 3). As indicated, an acceptable delay would be anticipated in ten years, assuming each scenario is fully implemented.

Between 1.0 and 1.1 million square feet of development would be possible with either the Industrial or the Office Focus scenarios. Both scenarios include 73 residential units in the Village Center and between 10 (Office Focus) and 30 (Industrial Focus) in the Industrial Park. Between 1,800 (Industrial Focus) and 2,700 (Office Focus) jobs would be created. Both include a biotech

manufacturer at the Industrial Park to project maximum water and wastewater demand. Water demand would range from 310,000 (Industrial Focus) to 340,000 gallons per day (Office Focus) with wastewater demand ranging from 265,000 (Industrial Focus) to 280,000 (Industrial Focus) gallons per day. Annual municipal revenue surplus at full buildout of the Industrial and Office Focus scenarios would range from $1.8 million to $1.9 million, respectively, when fully implemented.

Several transportation improvements were presented to improve pedestrian and traffic safety along the corridor and to support a walkable, vibrant streetscape. Chief among these is to construct continuous sidewalks and curbing to reduce the expansive pavement that extends from the road, through adjacent parking lots, to storefronts. Design concepts are described in detail in **Recommended Transportation Improvements,** below. The project team was directed to prepare a parking layout for Lil General to assure that adequate on-site parking would be available if curb cuts were reduced in front of this popular Branch Village business.

Town Council Public Workshop: June 23, 2008

A summary of findings was presented at a public workshop held at the June 23, 2008 Town Council meeting. See **Section 4: June 23, 2008 Public Workshop** for the PowerPoint presentation. This information was also presented at a June 26, 2008 Planning Board meeting. Support for the project was demonstrated at both meetings.

Recommended Transportation Improvements

Transportation improvements are recommended to create a vibrant mixed-use village that is attractive and safe for pedestrians and also meets current and projected traffic demand. Roadway improvements are proposed for Great Road for construction during upcoming sewer installation. **See Section 5: Graphics** for recommended traffic improvements.

The proposed concept plan reduces the expansive curb cuts in Branch Village, especially at the signalized intersection. By providing not more than two curb cuts per parcel (or potentially one with access management opportunities between parcels), a more pedestrian-oriented atmosphere will be created and vehicular and pedestrian safety will be enhanced. A proposed off-street parking layout is provided for 17 vehicles at Lil General. With an estimated 1,400 square feet of floor space devoted to sales and two employees per shift, the required parking for retail use at this property is 19 spaces. As an existing use in this building, the owner would not be required to provide the required number of off-street parking unless a change in use or expansion were proposed.

Right-of-way along Great Road varies in width with a minimum of 50 feet. Two 12-foot travel lanes, two 8-foot parking lanes for on-street parking, and two 5-foot sidewalks could be accommodated within the minimum 50-foot right-of-way. Where the right-of-way widens, wider sidewalks and additional grass strips or landscaping could be provided to create an attractive streetscape. A two-lane northbound approach on Great Road and a two-lane eastbound approach on Saint Paul Street are proposed as indicated in the Branch Village Signalized Intersection graphic in Section 5. Pedestrian refuges or median islands are proposed to improve pedestrian safety. In the future, bus stops may be added as demand (and RIPTA resources) warrant. By including continuous sidewalks, access to bus stops will be enhanced.

Parallel on-street parking for approximately 90 vehicles is proposed along one or both sides of Great Road and along a limited section of Saint Paul Street. On-street parking will calm or slow down traffic, increase pedestrian safety and comfort by creating a buffer to adjacent sidewalks,

and provide convenient parking for adjacent shops. It is not feasible to provide on-street parking on the northbound side of Great Road (adjacent to Lil General) as this would require removing the existing right-turn lane. The current overall Level of Service A for the Great Road / Saint Paul Street intersection could not be achieved if this right turn lane were eliminated. Two typical cross sections were presented for Great Road (see Section 5). Section A-A, located approximately 400 feet south of the intersection, includes on-street parallel parking. Section B-B, located immediately south of the intersection (facing south), includes two northbound travel lanes and one southbound travel lane with no on-street parking.

Operation of the Great Road/Saint Paul Street signalized intersection would be enhanced if the Branch River bridge were to be replaced with a four-lane structure (adding an additional travel lane in each direction).

Although a two-lane roundabout had been considered for the Great Road / Saint Paul Street intersection, this is not recommended for immediate implementation due to right-of-way constraints. A 150-foot right-of-way would be required. The right-of-way could affect land use on the south side of the intersection although it would not require acquisition of any of the adjacent buildings on any side of the roundabout. Limited landscaping could be possible in the roundabout although a mountable pavement is required to accommodate truck-turning movements. Pedestrian crossings would be located on the approaches to the roundabout.

Preliminary Opinion of Probable Costs

The opinion of probable costs for roadway and transportation improvements is $3.6 million (2008 dollars). This includes construction along 4,000 linear feet of Great Road (Route 146A) and 2,300 linear feet of Saint Paul Street, assuming that the roadway pavement is suitable for re-use. Costs have been included to cold plane the surface and resurface with two inches of new surface course following the installation of curbing and drainage. Sidewalks will be constructed of concrete. Decorative surface treatment or use of unit pavers would result in additional costs. The opinion does not include costs associated with undergrounding utilities, acquisition or easements, police details during construction, and any unanticipated subsurface conditions or unknowns such as hazardous materials. **See Section 6: Preliminary Opinion of Probable Costs** for further detail.

Next Steps

Any plan that streamlines permitting, provides nearby amenities (mixed-use), and accommodates flexible development requirements helps build the Town's reputation as being business friendly. The Town of North Smithfield is currently preparing zoning amendments to facilitate approval of mixed-use development in Branch Village and other industrial villages in Town. Phase II Buildout and Transportation Analysis information will be used to help craft this amendment.

Wastewater demand identified for projected Branch Village development will be utilized to size the collection system for the proposed extension of sewers. Construction is anticipated to begin in the fall of 2008 on sections of this project.

Transportation concepts and the preliminary opinion of probable costs will be used to secure federal and state funding. By constructing roadway improvements concurrent with sewer installation, traffic disruption can be minimized and project efficiencies may likely be gained.

The Town of North Smithfield is encouraged to request that RIDOT replace the existing Branch River bridge with a wider structure to remove the current constraint for the southbound approach

to the Great Road / Saint Paul Street intersection. Two southbound lanes will be required to accommodate future traffic demand. Bridge replacement is on the Transportation Improvement Project in the Study and Development stage, with replacement slated for 2013.

The Town may consider reserving the footprint for future construction of a two-lane roundabout at the Great Road/Saint Paul Street intersection as adjacent parcels are redeveloped.

The Town of North Smithfield is encouraged to coordinate with National Grid regarding potential opportunities to bury electrical lines, especially in the heart of the village center at the Great Road / Saint Paul Street intersection. Undergrounding must also include telephone, cable, and any other aerial communication cables. Locations must be identified (and easements negotiated, as necessary) for placement of surface transformers. Property owners may be required to upgrade any electrical service that does not meet current codes and could incur costs for undergrounding to their buildings. Alternatively, the Town many consider relocating utility poles to the rear of parcels in the village center. This would minimize the visual image of poles, wiring, and transformers with reduced costs and burden to property owners compared to undergrounding. It is recognized that easements would be required for relocation of these poles. Decorative street lighting could be installed to replace existing pole mounted cobra-head street lighting under either option.

This project also advances Branch Village as one of the designated "Growth Centers" identified in *Land Use 2025*, State Guide Plan Element 121. The Town is encouraged to continue coordination with the RI Statewide Planning Program and the RI Economic Development Corporation throughout revitalization and development of mixed use in Branch Village.

Branch Village Revitalization - Phase II

Public Workshop June 23, 2008

Branch Village II Buildout and Transportation Findings

Public Workshop

Town Council

June 23, 2008

PARE

Branch Village Revitalization - Phase II

Public Workshop June 23, 2008

Broad Goals

- Increase tax base
- Improve appearance of village
- Capitalize on assets
- Update infrastructure
- Support transit

PARE

Branch Village Revitalization - Phase II

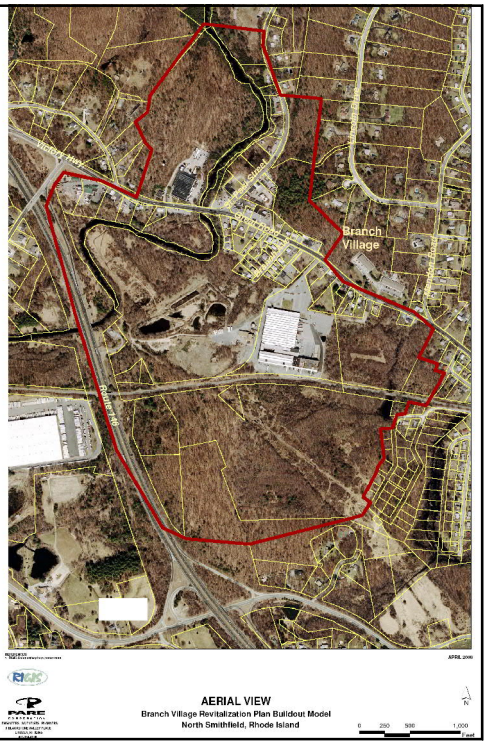
Public Workshop June 23, 2008

Phase II Process

- April 8, 2008 Kickoff Meeting
- May 6, 2008 – Scenario 1
  - Buildout
  - Traffic implications
- May 27, 2008 – Reduced buildout, Scenarios 2 & 3
- June 23, 2008 – Public Workshop
- July 3, 2008 – Final submission

PARE

Branch Village Revitalization - Phase II



Public Workshop June 23, 2008

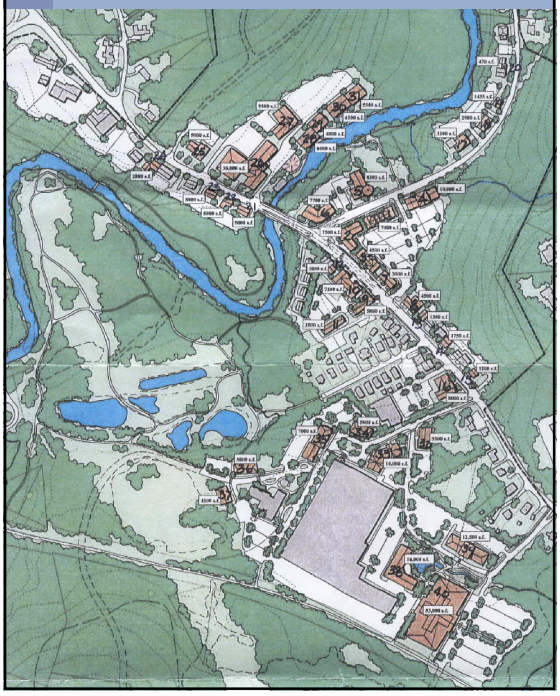
Branch Village Revitalization - Phase II

Phase I Vision

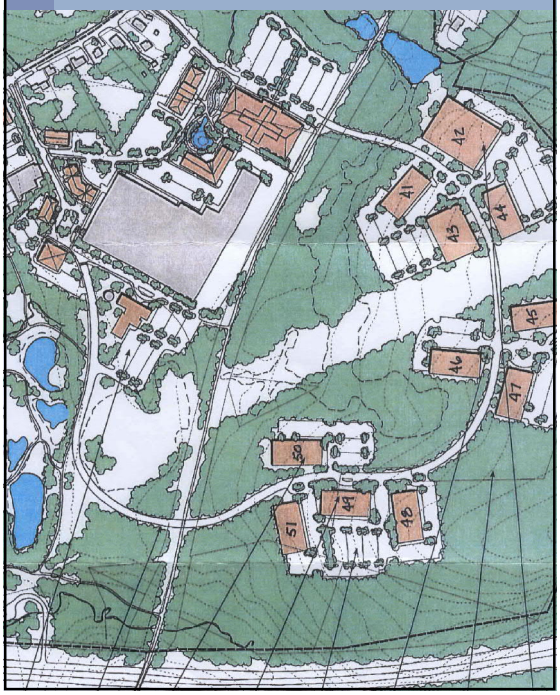
- Village Center: mixed use, pedestrian oriented
- Northwest of Village Center: ATP redevelopment, residential
- Industrial Park: Phased industrial, office, and residential mixed use
- Rail line: bike path potential.
- South of Rail. Industrial park expansion

PARE

Public Workshop June 23, 2008



Public Workshop June 23, 2008



Public Workshop June 23, 2008

Branch Village Revitalization - Phase II

Phase II

- What does it mean?
  - Employment
  - Property tax revenue
  - Population / school aged
  - Sewer flow
  - Traffic
- Traffic improvements
  - Great Road
  - Transit opportunities
  - Bike
  - Freight rail

PARE

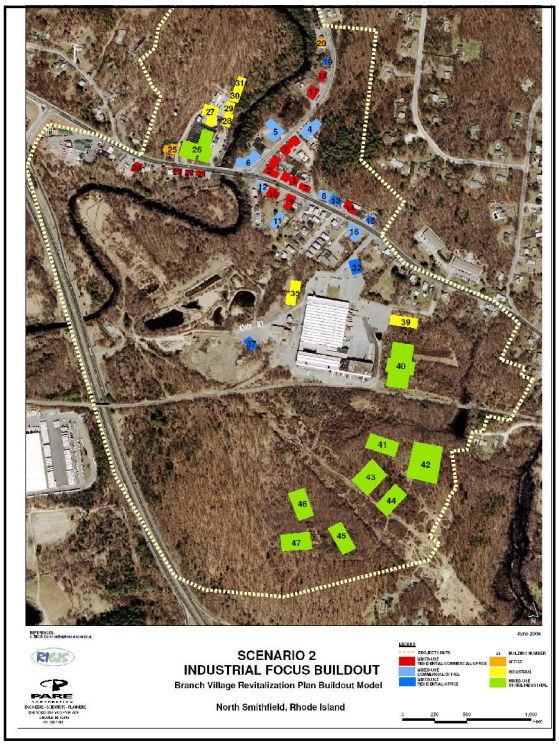
Branch Village Revitalization - Phase II

Public Workshop June 23, 2008

Scenario 1: Full Buildout

- 1.2 million SF mixed use
- 3,500 jobs created
- $3.2 million tax revenue surplus
- 133,000 gpd water demand
- 114,000 gpd sewer flow
- Great Road/St. Paul St. intersection: Level of Service F

PARE



Branch Village Revitalization - Phase II

Public Workshop June 23, 2008

Scenario 2: Industrial Focus

- 83 residential units
  - Village Center predominantly
- Under 1 million SF mixed use
  - 9% residential
  - 8% retail
  - 26% office

PARE

Branch Village Revitalization - Phase II

Public Workshop June 23, 2008

Scenario 2: Industrial Focus

- 57% light industrial
  - 30% warehouse / distribution
  - 14% manufacturing
  - 13% biotech

PARE

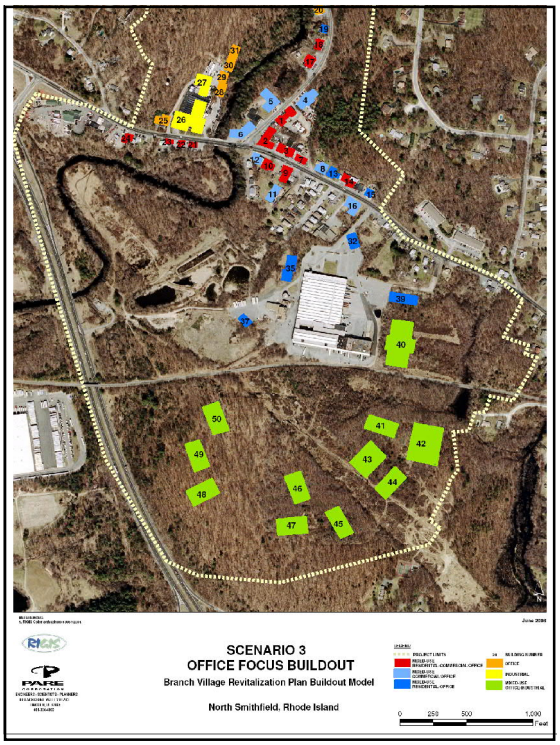
Branch Village Revitalization - Phase II

Public Workshop June 23, 2008

Scenario 2: Industrial Focus

- 57% light industrial
  - 30% warehouse / distribution
  - 14% manufacturing
  - 13% biotech
- Summary
  - 1,800 jobs created
  - $1.8 million tax revenue surplus
  - 310,000 gpd water demand
  - 265,000 gpd sewer flow
  - Great Road/St. Paul St. LOS D

PARE



Branch Village Revitalization - Phase II

Public Workshop June 23, 2008

Scenario 3: Office Focus

- 103 residential units
  - Village Center
  - Industrial Park
- 1.1 million SF mixed use
  - 10% residential
  - 7% retail
  - 42% office

PARE

Branch Village Revitalization - Phase II

Public Workshop June 23, 2008

Scenario 3: Office Focus

- 41% light industrial
  - 9% warehouse / distribution
  - 21% manufacturing
  - 11% biotech
- Summary
  - 2,600 jobs created
  - $1.9 million tax revenue surplus
  - 340,000 gpd water demand
  - 280,000 gpd sewer flow
  - Great Road/St. Paul St. LOS D

PARE

Public Workshop June 23, 2008

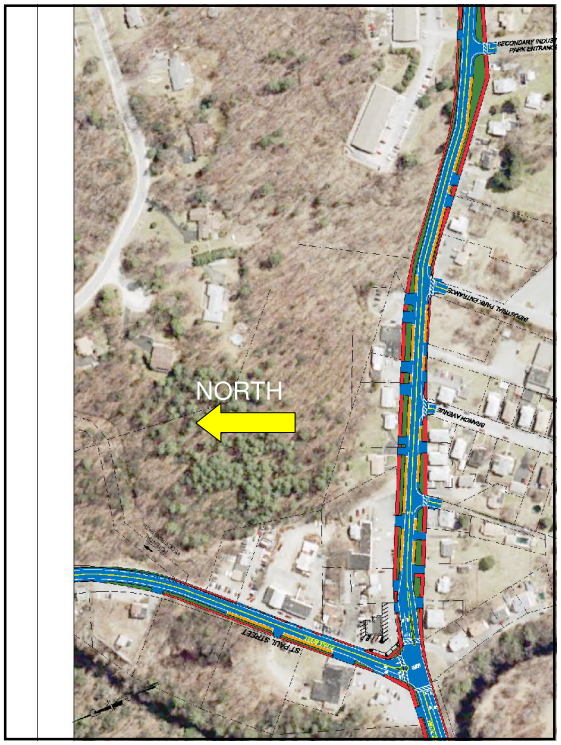
Branch Village Revitalization - Phase II

Transportation

Traditional downtown

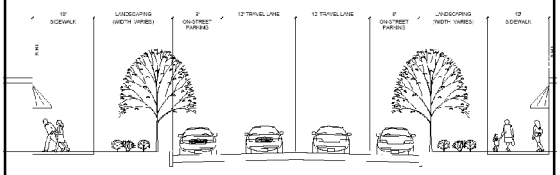
- Pedestrian-friendly, transit-supportive
  - 5 to 10 foot sidewalks
- On-street parking – 90 spaces
- Great Road/St. Paul Street
  - Signal Optimization
  - 2-lane Roundabout right-of-way
- Bike path feasibility

PARE



Public Workshop June 23, 2008

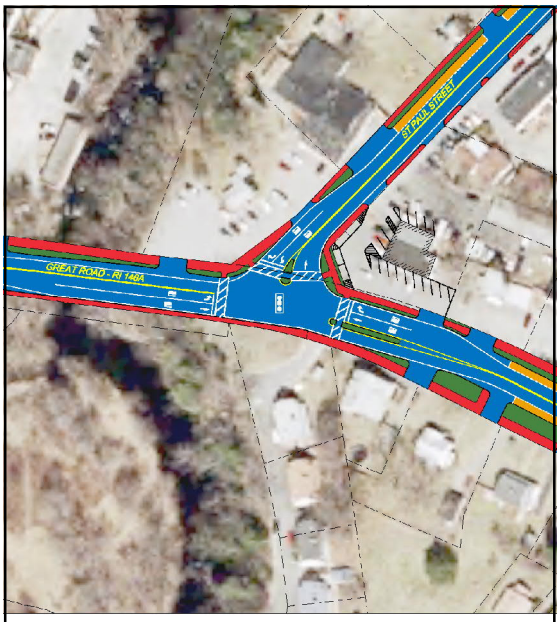
Phase II



BRANCH VILLAGE
TYPICAL SECTION A-A

On-street Parking

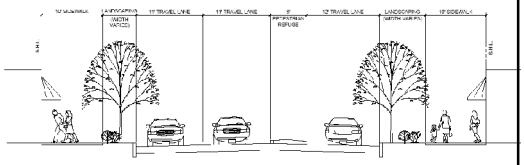
PARE



GREAT ROAD / ST PAUL ST
SIGNALIZED INTERSECTION
Branch Village Revitalization Plan

Public Workshop June 23, 2008

- Phase II



BRANCH VILLAGE
TYPICAL SECTION B-B

PARE

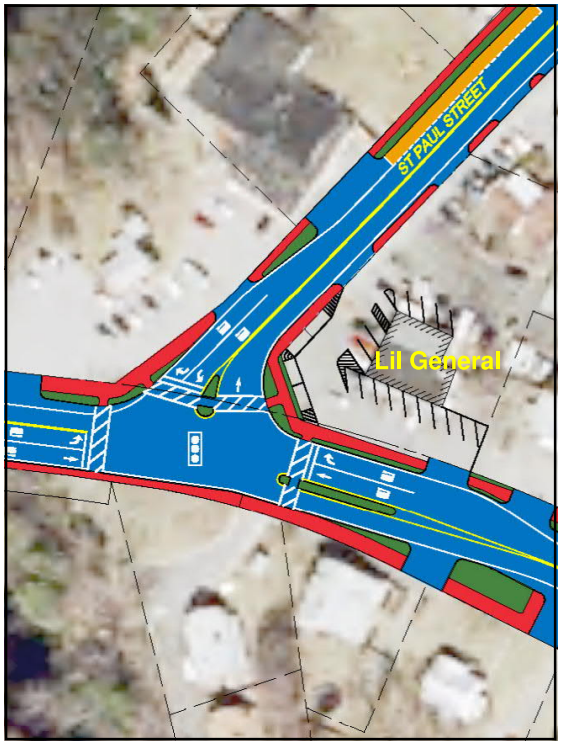
Pedestrian Median, Right Turn Lane

Public Workshop June 23, 2008

Branch Village Revitalization - Phase II

- Lil General access

PARE



Public Workshop June 23, 2008

Branch Village Revitalization - Phase II

Transportation

- Branch River bridge constraints

PARE

Public Workshop June 23, 2008

Branch Village Revitalization - Phase II

Transportation

- P&W RR
  - Freight rail asset
  - Too narrow for bike path

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Branch Village Revitalization - Phase II

Transportation

- Bike Facility Options

View west on School Street looking east towards Slatersville

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Public Workshop June 23, 2008

Branch Village Revitalization - Phase II

Transportation

- Direct Route 146 ramp access not feasible
- Opinion of Probable Cost: $3.6 million, not including the following:
  - Utility undergrounding
  - Police details
  - Unknowns such as hazardous materials
  - Easements or right of way acquisition

PARE

Next Steps

- Submit findings
- Approval by Town Council and Planning Board
- Sewer flow input for design contract
- Roadway and streetscape funding requests

PARE

D

Branch Village Revitalization, Final Report

Horsley Witten Group, November 2007

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Phone - 508-833-6600 • Fax - 508-833-3150 • *www.horsleywitten.com*

Branch Village Revitalization

Final Report

November 2, 2007

Prepared for:

Branch Village Revitalization Task Force

Submitted by:

Horsley Witten Group
370 Ives Street
Providence, RI 02906

Dodson Associates Ltd.
463 Main Street
Ashfield, Massachusetts 01330

Mullin Associates Inc.
206 North Valley Road
Pelham, MA 01002

BRANCH VILLAGE REVITALIZATION TASK FORCE
NORTH SMITHFIELD, RHODE ISLAND

BRANCH VILLAGE REVITALIZATION FINAL REPORT

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This report documents the process undertaken by the Branch Village Revitalization Task Force in developing a vision for Branch Village and describes the vision that will help guide future municipal and private sector efforts in the district. This report also contains deliverables that describe the vision that will help to guide future municipal and private sector efforts in revitalizing the district. Branch Village is located within the Town of North Smithfield, RI, and is best characterized as a small village center with a mix of residential, commercial, and manufacturing activities. The village exhibits significant cultural and natural resources, however concerns exist over current development patterns and the urban environment that is emerging. In an effort to define a new vision for Branch Village, the task force first allocated funds to hire an outside planning consult. With consultant support, the project began with an evaluation of development opportunities and constraints, moved on to include a public charrette, and concluded with the refinement of the vision and development of final products. The final products for this project include this final report, a series of Visual Statements providing an illustrative guide to revitalization, and planning level cost estimates for public improvements. The Visual Statements and planning level cost estimates are included in the appendix of this report.

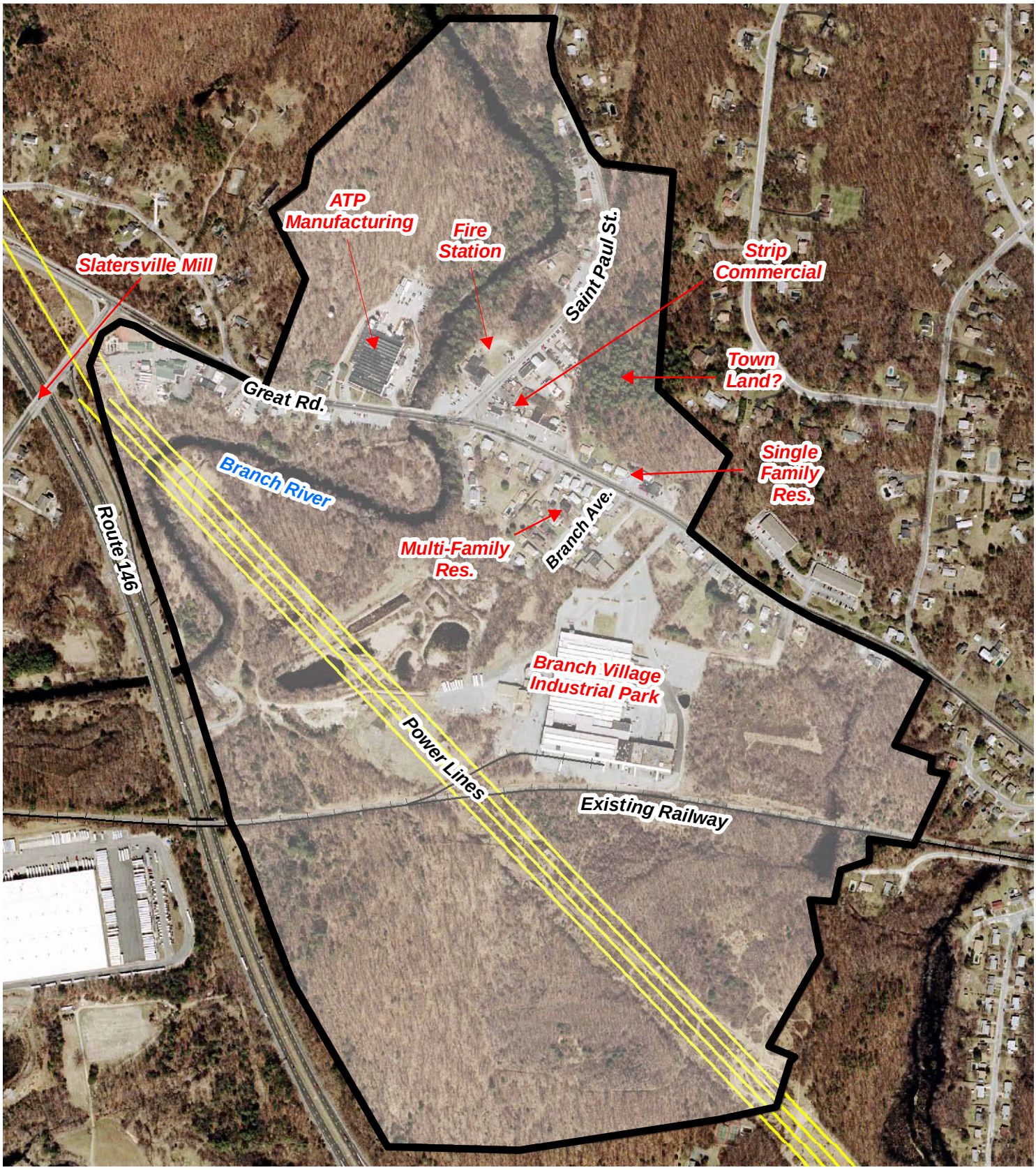
UNDERSTANDING AND APPROACH

Branch Village is a small, mill-based village that emerged in the 18th century as a satellite operation of the nearby Slatersville Mill complex (Figure 1). The settlement's early development as a mill village established the foundation for its existing built environment. Branch Village's mill complex lies in the region's valley near the river, while the original housing was built in close proximity to the mills. As the village grew, housing began to concentrate along the major roadways such as Route 146A and Saint Paul Street. The boundaries and direction of growth in the settlement have been largely dictated by the region's heavily sloped terrain. With steep slopes and wetland areas serving as natural building constraints, the village has developed in a relatively compact manner.

The current patterns of development in Branch Village represent a mix of residential, small-scale commercial, and selected reuse of existing mill buildings. The commercial uses consist of service-oriented operations that serve the surrounding neighborhoods as well as patrons traveling along Great Road (also Route 146A). Two unique re-use opportunities have taken place in this neighborhood at the ATP Manufacturing facility directly adjacent to the Branch River and the Branch Village Industrial Park further to the south.

Branch Village exhibits significant potential for new development in terms of increasing density and enhancing site design. Although the village core exhibits a balanced mix of residential and commercial activities, its auto-dependent nature indicates that a vibrant neighborhood-based economy is not quite achievable within the existing framework. Improvements in site design to increase pedestrian access and appeal along with regulating for a mixed-use village core are two potential strategies for creating a lively, walkable environment. The first step in preparing for a new development vision for Branch Village is to assess the current conditions for existing opportunities and constraints. The current opportunities and constraints analysis will guide an evaluation of the district in terms of development feasibility. A public charrette was held on June 28, 2007 to gather community feedback regarding the specific land uses, density, and urban form desired for Branch Village. The final step of the process was a series of workshop meetings by the Branch Village Revitalization Task Force to refine the vision and develop materials for guiding further planning and development efforts.

Auto-dependent development along Great Road



Legend

- Branch Village District
- Railroad Rights of Way
- Electrical Transmission Lines

*GIS Data: RIGIS, Rhode Island Geographic System

N

Feet

600

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phone: 508-833-6600
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Existing Conditions
Branch Village District
North Smithfield, RI

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Figure 1

OPPORTUNITIES AND CONSTRAINTS

Opportunities:

Although this is far from a comprehensive list, the following elements make up the primary opportunities within Branch Village:

Historical Culture: The mill operations in Branch Village have formed the foundation for its economy and culture. Recognizing the cultural significance of the mill buildings is a critical first step to consider when determining redevelopment options. Additionally, as an off-shoot of the Slatersville Mill Village, the cultural connection between the two villages remains intact and can be used to help define a vision for Branch Village.

Established Housing: A small, well-maintained residential community still calls Branch Village "home" and represents a solid neighborhood foundation upon which to build a new vision for the future.

Successful and Expanding Re-use: Two large industrial buildings have experienced adaptive re-use along with successful remediation of hazardous wastes. The buildings will continue to serve as economic anchors in the community. Re-use efforts have continued with a third site that will offer tenancy to a medical office operation in the near future.

Potential exists for a rail-trail conversion

Transportation Options: Route 146 provides easy access to other communities including the economic centers of Providence and Worcester. Existing town-owned rail lines may provide opportunities to establish bike trails to connect the historic Slatersville Village to the existing and highly successful Blackstone Valley Bike Trail. Although plans to develop trails in the immediate area have been abandoned in the past, redevelopment of the Slatersville Mill will certainly create a renewed interest in this idea.

Community Development Trends: The redevelopment of Slatersville Mill occurring today is injecting approximately $40 million of private investment into the area and will include over 200 new units of housing. This showcase project can serve as an economic anchor for revitalization elsewhere within the Town.

Constraints:

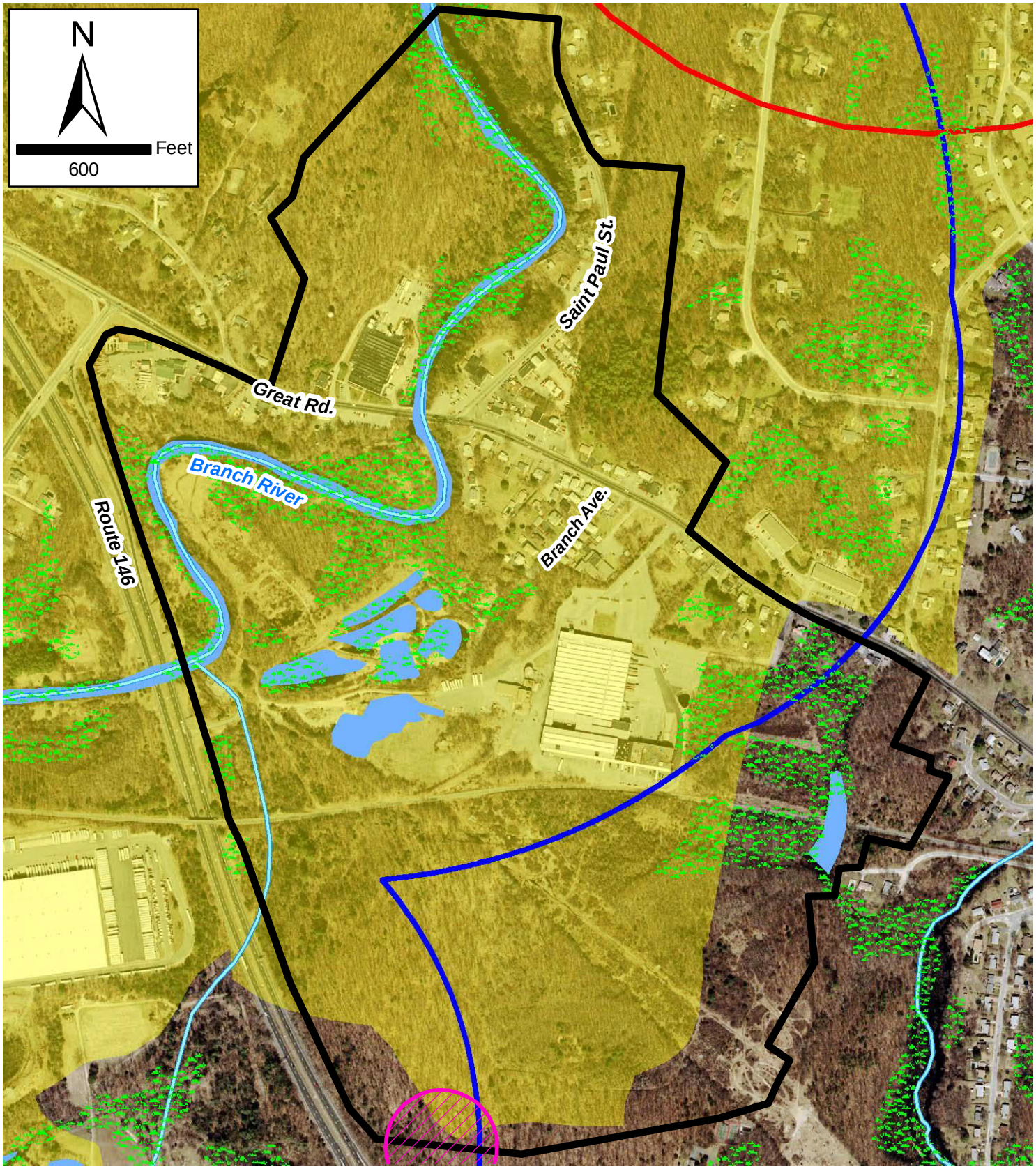
Terrain: Branch Village experiences a change in elevation of approximately 180 feet over a very small area, with slopes sometimes exceeding grades of 40%. This difficult terrain has necessitated creative site development strategies in the past and will require careful attention to appropriate land use and design in the present.

Infrastructure: Centralized wastewater and water supply exist in the area but may require expansion to accommodate significant levels of new development. Power lines cut through one of the largest remaining tracts of undeveloped land in the study area that is not constrained by excessively steep slopes. Stormwater systems are outdated and discharge untreated runoff directly to the Branch River.

Stormwater draining directly into Branch River

Resource Protection: Data from readily available Rhode Island Geographic Systems (RIGIS) sources suggests that several resource protection issues will require a high level of attention when developing a vision for the village (Figure 2). Aside from the obvious wetland and surface water protection issues, groundwater protection will be an important consideration as a large portion of the site lies within DEM-approved wellhead protection areas and a groundwater recharge area to a larger significant aquifer system. A small piece of land in the southerly portion of the study area also may contain habitat for rare species.

Traffic and Circulation: The existing roadway system in Branch Village has some limitations in terms of efficiency and access. The lack of turning lanes at the primary intersection of Great Road and Saint Paul Street can result in longer wait times and reduced level of service. Additionally, areas in the village that appear to exhibit potential for new development in terms of available land—such as the Branch Village Industrial Park site—may not be equipped with adequate roadway access to accommodate the additional traffic.



Legend

**GIS Data: RIGIS, Rhode Island Geographic System*

- Branch Village District
- Rare Species
- Wetlands
- Community Wellhead Protection Areas
- Streams
- Non-Community Well Head Protection Areas
- Ponds
- Groundwater Recharge Areas

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Resource Constraints
Branch Village District
North Smithfield, RI

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Figure 2

Summary of Opportunities and Constraints:

The variety of opportunities and constraints associated with Branch Village can easily create the perception that several priorities are competing within the vision or that the road blocks toward implementation are simply too large to overcome. One goal of this project to help residents and stakeholders navigate these issues in a way that is both balanced and well-informed. For example, the idea that economic development and environmental protection are mutually exclusive goals can be effectively addressed through the presentation of innovative land use techniques such as low impact development and integrated water management. Further, ideas surrounding what is often perceived to be the prohibitive costs associated with infrastructure improvements may also arise and can be addressed through discussion of innovative tax programs, impact fees and public-private partnerships. Also typical to these discussions is the idea that local regulations simply cannot provide the framework to allow for the density and mix of uses required for a self-contained village-scale economy. An objective of this project is to effectively outline different zoning and subdivision frameworks that answer to these concerns in a way that is informed and transparent.

To assist the community and stakeholders in understanding the concepts for a new vision, it is important to employ a strong visual element to presentations and final products. A series of Visual Statements—illustrative guidance documents that will guide future planning efforts—will be developed as a final deliverable of this project. Regardless of the scale at which discussions are taking place, well-designed visualizations can help community groups grasp the functional elements that connect the village as a whole, as well as the site specific designs that depict the architectural character that is suitable for future redevelopment.

The diverse planning framework surrounding the future revitalization of Branch Village spans issues of market forces, environmental protection, engineering and site design, community character, local culture, housing and urban form. This project is intended to address the wide breadth of concerns that will arise during the visioning process through comprehension of site opportunities and constraints, and application of innovative planning techniques. The project's approach included a public charrette as well as a series of internal work-sessions to develop consensus regarding the scale, form, function and land use profile desired for the village center. The vision for Branch Village that was developed was then used to identify Action Items that will clearly guide the community into concrete measures to realize this vision.

OVERVIEW OF PUBLIC CHARRETTE

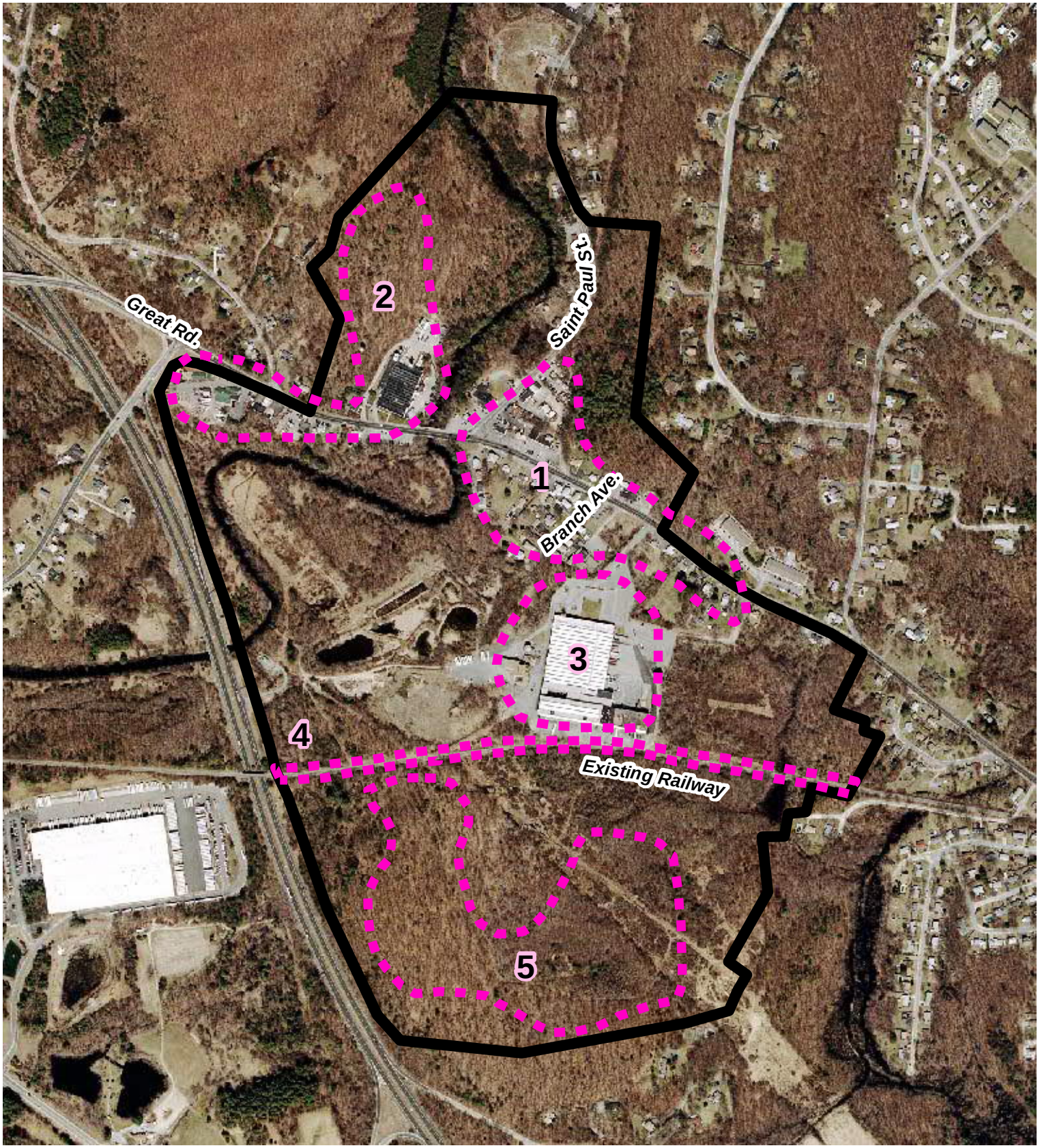
Charrette Structure:

A public design charrette for the revitalization of Branch Village was held on June 28th, commencing at 6:30pm with attendance estimated at 43 individuals. The charrette began with a presentation by Nathan Kelly of Horsley Witten Group describing the current conditions in Branch Village and the redevelopment process, followed by a public feedback session facilitated by John Mullin of Mullin Associates. The feedback session was formatted such that individuals were divided into five separate groups of 7 - 10 participants. Each group was asked to address the following issues:

1. What land uses would you like to see in Branch Village?
2. At what density would you like to see these land uses?
3. At what scale and urban form would you like to see these land uses? (ie: village center, strip development, etc.)

The participants were asked to apply these three questions to five specific land areas identified by Horsley Witten Group as the areas most likely to be developed (Figure 3). The five identified "development pods" were:

1. The current village center focused around the intersection of Great Road and Saint Paul Street.
2. The area northwest of the intersection of Great Road and Saint Paul Street including the ATM manufacturing facility and the forested area north of it.
3. The industrial park south of Great Road.
4. The rail line and surrounding properties.
5. The forested area south of the rail line.



Legend

- Branch Village District
- Development Pods

N

Feet

700

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phone: 508-833-6600
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Identified Development Pods
Branch Village District
North Smithfield, RI

11/1/07 ec
J:\7067 No_Smithfield\GIS

Figure 2

Public Feedback:

The community input regarding the desired outcome of these five "development pods" is summarized as follows:

1. Village Center:

The predominate vision expresses for the village center was to reinforce this area as the village's core focal point through increased density, mixed uses, and improved site design. A goal discussed by the group was to increase housing and job opportunities within a compact, walkable district. The desired mix of uses includes commercial, residential, civic, and office space. In the typical "top-of-the-shop" fashion, commercial and office spaces would be located along the lower floors while upper floors could be delegated for residential units. The envisioned density was expressed principally as a measure of building height, and ranged from 2-3 story buildings. Three story buildings would be concentrated in the district's core at intersection of Great Road and Saint Paul Street, with density levels tapering out to two and one story buildings towards the edge of the district.

Much of the discussion on the village center was focused on scale and site design issues. While commercial space is desirable, a clear signal was sent that big box retail would not be the preferred scale for new development. Ideally, the community would like to see a mix of small-scale businesses such as restaurants, coffee shops, bookstores, retail shops, and service industries. In terms of site design, public feedback encouraged the implementation of design guidelines that contribute to a lively, pedestrian friendly streetscape. It was repeatedly mentioned that the village center should not merely function as an activity center but should create an appealing, human-scaled environment that defines an identity for Branch Village and provides it with a sense of place. This should be accomplished through site design elements that follow Smart Growth principles such as improving pedestrian amenities, locating parking in the rear of buildings, and public gathering places. The district should also take advantage of its proximity to the Branch River by increasing access though pedestrian connections.

2. Northwest of Village Center:

The area northwest of the planned village center exhibits significant development potential due to its proximity to the village center and the Branch River. This development pod can be best categorized by two areas, the land abutting Great Road extending west from the village center, and the large swath of undeveloped land extending north from the ATP facility. The consensus for the land abutting Great Road was for this to serve as an extension of the village center in both use and design. To this end, the desired uses include residential, office, retail and services. The desired density was declared to be not quite as high as the core of the village center itself, and the prevailing thought was for the density to gradually decrease with distance from the village center. In terms of design, the concepts of bringing buildings to the edge of the street and placing parking in the back, along with improving streetscape conditions for

pedestrians are to be applied here similarly to the village center. In addition to the design and use of buildings, another major concept supported by the community was increasing access to the river from this particular portion of Great Road as the shoreline is already hardened and disturbed by historic development patterns.

The area north of the ATP and along the banks of the Branch River currently consists of undeveloped open space. There was a range of ideas expressed for the potential future of this area ranging from: conserved open space, planned recreational/park space, residential, and office uses. Although there was not complete consensus among the community members on desired uses, one key theme amongst all the participants was the importance of the river in this area. If development of structures should occur, it should be done with care to ensure the natural aesthetics and environmental quality of the river bed are not negatively effected. The importance of increasing access to the river was also noted, with the specific ideas such as a riverside park or linear green spaces connecting to the village center and Great Road being suggested.

3. Industrial Park:

The redeveloped mill building with the industrial park currently houses a light manufacturing company. Ideas for new uses ranged widely, but there was a strong desire to effectively reuse the existing building. While it is unclear the extent to which different uses may be feasible for the adaptive reuse of the existing mill, the community input regarding uses for the space included: large-scale offices, continued light manufacturing or clean industry, incubator space for businesses, retail, and perhaps residential or live/work artist lofts. It was generally noted that the development should seek to create a pleasant atmosphere that draws from the village center's foundation of an atrractive, human-scaled environment. The industrial park should not seek to utilize an identical urban form and streetscape treatment as the village center, because that approach would be a poor fit in an industrial park setting. However, the industrial park should take advantage of its close proximity to the village center by integrating pedestrian infrastructure to encourage walking between the two areas.

4. Rail Line:

Many questions were generated during the discussion of future of the rail line. It was clear that additional studies would be needed to determine the existing conditions and best use for this area. The primary discussion revolved around the community's desire to either keep or remove the rail infrastructure. Given the current lack of accurate information about current conditions, much of the discussion involved a great deal of speculation. Options discussed include the possibility of rehabilitating the rail infrastructure to serve as a commuter line to Providence. Additionally, the rail line could provide freight transport and aid the economic development of the area if manufacturing or light industry uses continue in mill district.

Those in support of removing the rail line had a variety of concepts for possible new uses. The most common suggestion for a new use was to revitalize the rail line as a

recreational pathway connecting to the surrounding communities. This concept drew support from community members who felt the village needs more quality recreational options and accessible open space. A related notion that was well received by many community members was the thought of creating an easily accessible, direct connection between the recreational path and village center. Additional ideas for reusing the rail line included mixed uses for commercial and recreational space. Adding commercial uses to this area could build off of the potential new recreational amenity by taking advantage of the additional pedestrian activity.

5. South of Rail Line:

This large expanse of forested space is currently undeveloped. The area is partially constrained by the existence of wetlands that lie predominantly in the eastern portion of the land as well as moderate to steep slopes dispersed across the area. In addition to land's natural constraints, there are also access constraints because there is currently only one roadway that reaches the area and there are limited opportunities to create new access points from outside the area. In terms of potential land use, the two primary suggestions from the community were to keep the land as open space, or reuse the area for office or light industrial uses. With the amount of space available, the redevelopment of this area into a job center has potential to significantly increase the Town's tax base.

While each notion of keeping the land as open space or developing it for office or light industrial businesses was discussed, there was no definitive consensus as to what should be done in this area. Several participants commented they would like to see solid information on the development impacts of this area before making a decision on the desired outcome. Gathering information such as traffic impact studies and market analyses of the potential for office/light industry, would be useful to inform the decision making process before moving forward.

MAJOR FINDINGS

Development Potential within Regional Context

In developing a vision for Branch Village, it is important to understand how successful village centers function in relation to the larger regions around them. Village centers are mixed-use compact communities that offer basic consumer services and activities for nearby residents. Villages can draw shoppers and employees from the surrounding area, but they are not the primary regional shopping or employment centers. In suburban areas, new village centers will be distinguished from surrounding development by a more cohesive development form and closer proximity between residential and non-residential uses.

Rhode Island Growth Centers:

There is significant potential for the Branch Village center to apply for status as a Rhode Island Growth Center. At this point, North Smithfield has identified the Branch Village area as a growth center within its comprehensive plan, however the Town has yet to apply for status with the applicable Rhode Island State agencies. Earning standing as a State sanctioned growth center would grant Branch Village higher priority in selection for funding, technical assistance, and other incentive programs. The incentives offered by the State are designed to encourage the identification of growth centers and to promote patterns of development that are consistent with smart growth. Focusing development into growth centers not only helps to draw pressure away from critical natural resources, it also creates the critical density needed to support walkable, mixed-use districts with alternative transportation options

The concepts being proposed for the revitalization of Branch Village are comparable to the criteria for the establishment of a growth center. The State's Growth Center Program provides guidelines for the establishment of growth centers, and within these guidelines they spell out eight specific criteria to be used in the evaluation of potential growth centers. They are as follows:

1. Strengthen and encourage growth in existing centers.
2. Scale new infrastructure to support compact growth.
3. Include mixed land uses.
4. Create a range of housing opportunities and choices.
5. Protect and enhance critical environmental resources.
6. Provide a variety of transportation choices.
7. Promote community design that contributes to a sense of place.
8. Encourage growth in appropriately scaled centers.

Each of the above eight criteria is consistent with the concepts guiding the current Branch Village revitalization plan making the village an likely candidate for approval by the State as a growth center.

Strategic Geographic Location:

The development concepts proposed for Branch Village entail a significant amount of growth in terms of its employment base. It is reasonable to question if the existing labor force in the area is large enough to meet the needs of Branch Village's expansion. A basic geographical assessment of the area suggests that Branch Village's close proximity to Worcester, MA and Providence, RI, will provide a nearby supply of potential labor force and help stimulate Branch Village's economic growth. With populations ranging between 170,000 – 180,000, Worcester and Providence are the second and third largest cities in New England respectively. These cities simultaneously serve as job centers and sources of labor for the regions around them.

Branch Village's strategic location along the Route 146 corridor between these two cities provides relatively easy transportation access to each. The standard used to determine an employment center's typical commuter-shed is defined as a 30-minute travel time under normal driving conditions. This driving range places Providence well within Branch Village's commuter-shed at 20 minutes away (15 miles), and Worchester lies just beyond the typical commuter-shed limit at 35 minutes (24 miles). These numbers are significant as they indicate that Branch Village is in the enviable position of having access to both these economic centers.

Slatersville Mill Redevelopment:

The nearby redevelopment of the Slatersville Mill provides additional support to the revitalization of Branch Village. Being that Branch Village was initially an off-shoot of the Slatersville Mill complex, these two areas have long been connected in terms of their economic upheavals and downfalls. Now, as the Slatersville Mill complex is being redeveloped into 228 units of new housing, a new standard is being set for the revitalization of these two areas. With an influx of $40 million of private investment in Slatersville, there is added incentive for developers to explore opportunities in surrounding areas to build on this economic momentum. Additionally, the increase of residents in close proximity to Branch Village will undoubtedly lead to an increase in demand for local jobs, services and goods.

Of particular significance to Branch Village is the potential precedent being established by Slatersville in the marketable reuse of aging industrial structures. Redeveloping mill buildings is often a complex and risky process, and a big portion of that risk comes from the uncertainty that the finished product will be marketable to the local public. With the Slatersville Mill breaking the ice in terms of gauging local demand for these types of units, developers in Branch Village will be able to observe the outcome of the Slatersville project before committing to action. This local market knowledge can be particularly useful when financing a project through local lending agencies.

Development Concepts for Each Pod:

Building from the input gathered during the public charrette, a series of development concepts began to take shape for each of the five development pods. After the public charrette, the Branch Village Revitalization Task Force set up two internal workshop meetings on August 14, 2007 and September 13, 2007 to incorporate the results of the charrette and refine the vision for Branch Village. The goal of these internal meetings was to establish clear development concepts for Branch Village and to develop corresponding Visual Statements. The Visual Statements are illustrative guidance documents that serve to guide future planning efforts in an area.

It should be clearly noted that the development concepts expressed here, as well as the concepts within the Visual Statement, are not intended to be a prescriptive redevelopment plan. These concepts are best understood as guidelines that illustrate potential development opportunities and should by no means be interpreted as a final plan for the redevelopment of the village. The elements depicted in the renderings accurately reflect the scale and density discussed at the charrette and also incorporate some specific design elements. The Visual Statements will serve as a valuable reference when revised zoning language is drafted to direct development toward patterns consistent with the vision.

1. Village Center:

The village center would serve as the focal point for the surrounding area. It would provide Branch Village with an identity and sense of place in the form of a traditional village model. The major shift in design would occur through the relocation of buildings to the street's edge and the placement of parking facilities in the rear of buildings. This fundamental shift allows the street's edge to be rediscovered for pedestrian use and contributes to an attractive, human-scaled environment. Buildings along the street would be 2-3 stories in height, with retail on the ground floor and professional offices, studios or residential units on the upper floors. Large shared parking lots on the interior of each block would provide parking for surrounding businesses, which would have entrances on both sides of the building for the convenience of customers.

The Visual Statements illustrate street and sidewalk improvements for the reconstruction of Great Road and the potential reconstruction of the Saint Paul Street intersection. Street improvements would be designed to improve traffic circulation and safety through added turning lanes. Additional space would be allocated for on-street parallel parking within the village core. Sidewalk improvements would be designed to enhance the pedestrian experience and include continuous sidewalks, shade trees and other landscaping, decorative lighting, signage and benches. The use of a consistent design framework for sidewalk elements and façade treatment would provide a varied but cohesive look for the entire village center.

In terms of recommendations for specific properties, the Fire Department site could be considered for redevelopment, including partial civic use such as a community center and adjacent park. A park in this area would provide visual access to the river, and physical

access to a potential boat launch site. The site of Kennedy's Lunch could potentially be redeveloped as a larger mixed use building to anchor that corner of the intersection. In general, the area near the intersection of Great Road and Saint Paul Street should maximize opportunities for pedestrian access to the river due to its close proximity to the river banks and the village center. Similarly, the southern end of Branch Avenue should seek to connect to river through a planned network of park space and trail systems. This connection would also serve to provide a more direct walking route to Great Road businesses from the railroad bed and industrial park.

2. Northwest of Village Center:

The area along Great Road west of the village core would serve as extension of the village center. There would be consistency with village center design concepts in terms of use, street improvements and sidewalk improvements. The ATP facility would be redeveloped and/or replaced with new mixed-use structures. Large buildings in this area would be divided into smaller masses and stepped along the river bank to take advantage of views. Consolidation of building footprints, parking and driveways would help to limit site impacts to reduced impacted open space and allow for comprehensive stormwater treatment. Structures could step down the slope to create terraces for parking and pedestrian plazas overlooking the river.

In the area south of Great Road, similar to the village center, buildings would be relocated to the street's edge and parking placed in the rear. Open space behind these buildings would be utilized for connections to a network of walking trails. A pedestrian bridge would connect to the south side of the river and to a scenic open space area with wetlands and ponds. The connection to this trail network would increase recreational opportunities, public access to the river, and connections to other areas of the Branch Village.

3. Industrial Park:

The Branch River Industrial Park would be expanded in phases, beginning with infill development to the north and west. Buildings would be clustered, campus-style, around shared open space amenities, with parking located to the side and rear of structures. A public square would be established in front of the existing clock tower, and new buildings would be lined up around and connected with sidewalks and landscaped areas. New mixed-use buildings at the west side of the industrial park would take advantage of the adjacent open space and views to cater to high-value office and residential tenants. Structures in the new "South Campus" would face onto a common park space that would also serve as a stormwater treatment area. The stormwater park would use natural processes to store and filter rain water, enhances wildlife habitat, and provide a beautiful view from the surrounding offices.

The existing roadway entrance would remain as the primary access point to the industrial park, with a second entrance further to the east created to provide direct access to the southeast side. Interior roadways would be separated from parking areas and defined by

planted islands and landscaped areas. This would help to extend the traditional village streetscape into the industrial park. Parking and loading areas for the existing mill building would be left largely intact. Coordination of deliveries and shipping schedules would help to reduce conflicts with tenants of adjoining mixed-use buildings.

Nearby wetlands, floodplains, ponds and the utility corridor would be utilized as community open space with walking trails, picnic areas and boat launches. Site planning for new roads, buildings and parking areas in the industrial park would take advantage of the public park by preserving view corridors, providing trail heads and path connections, and providing weekend parking for park users. Former mill settling ponds and surrounding open space would be managed for wildlife habitat. Invasive species would be removed and eroded areas would be stabilized and replanted. Mowing and maintenance program would be established to expand and maintain native grassland habitat.

4. Rail Line:

The rail line right of way would be redeveloped for use as a recreational rail trail. Selected paved or compacted surface trails would provide links to the industrial park and Great Road businesses. Public ownership of the rail way would preserve the possibility of use as a shared bike/transit corridor if needed at some time in the future. A potential rail line crossing could be considered near the existing industrial park for vehicles to access the areas south of the rail line should that land be developed.

5. South of Rail Line:

At this point, no definite development concepts exist for the area south of the rail line. Options were discussed, but it was decided that this section of Branch Village is currently best suited as open space with the potential to be developed as secondary phases of growth from the abutting the industrial park. A future road corridor and development sites should be reserved for the potential expansion of the industrial park site. In the interim, woodlands should be managed to enhance wildlife habitat and passive recreation potential.

Summary of Visual Statements:

The Visual Statements, located in Appendix A, were developed by consultants Dodson Associates with donated support from North Smithfield resident John O'Hearne from O'Hearne Associates. The Visual Statements are designed to be illustrative guidance documents that correspond to the development concepts listed above. The Visual Statements can be viewed as stand alone documents that parallel the development concepts described in this text, yet also expand on particular points to create a fuller vision for Branch Village. Whereas the development concepts illustrated here are expressed in a brief narrative format, the Visual Statements are graphic interpretations of these concepts that illustrate one possible rendition of the principles and design elements discussed at the charrette. It is important to note that the Visual Statements are not to be

interpreted as a prescriptive master plan. The Visual Statement documents are best understood as guidelines for potential development opportunities.

ACTION ITEMS

Invite Public to View Visual Statements and Final Report:

A major objective of the Branch Village revitalization process is to be transparent and receptive to public input. Through incorporating a public charrette early in the process, the project was able to integrate public feedback from the outset. As the charrette process nears its final submission stages, it is important to reinforce the transparency of the process by making the final products as accessible to the public as possible. In addition to access, there should be avenues for public feedback so potential changes can be considered. One suggestion is for task force members to continue to utilize the informative website—www.branchvillage.com—as a means for accomplishing public viewings and feedback.

Conduct a Transportation Impact Analysis:

A transportation impact analysis is a study which assesses the effects that a proposed development will have on the transportation network in a particular study area. These studies vary in their range of detail and complexity depending on the type, size and location of the development. With regard to Branch Village, the breadth of changes being considered will undoubtedly have some impact on the community's existing roadways and possibly the existing rail right of way. It is imperative to gain a better understanding of the demands that will be placed on Branch Village's transportation network so the feasibility of the development concepts can be assessed. Understanding transportation impacts has become increasing important as budgets for public facility and infrastructure improvements have become increasingly strained.

Transportation impact studies help communities to:

- Forecast additional traffic associated with new development, based on accepted practices;
- Determine the improvements that are necessary to accommodate the new development;
- Assist communities in land use decision making;
- Assist in allocating scarce resources to areas which need improvements;
- Identify potential problems with the proposed development which may influence the developer's decision to pursue it;
- Allow the community to assess the impacts that a proposed development may have;
- Help to ensure safe and reasonable traffic conditions on streets after the development is complete;
- Reduce the negative impacts created by developments by helping to ensure that the transportation network can accommodate the development;
- Provide direction to community decision makers and developers of expected impacts;
- Protect the substantial community investment in the street system; and
- Review and evaluate alternative transportation options such as rail, bike, bus, etc.

(Source: Community Guide to Development Impact Analysis)

Explore Funding from Rhode Island Department of Transportation:

The Rhode Island Department of Transportation's (RIDOT) Transportation Enhancement Program is designed to provide funding projects that meet the program criteria. The program is design to encourage non-traditional transportation improvements with a link to the intermodal transportation system. Enhancements serve to integrate a transportation facility into the surrounding community and natural environment. The project must fall into one of twelve different categories. The categories that potentially apply to the Branch Village revitalization include:

- Rehabilitation and Operation of Historic Transportation Buildings, Structures, or Facilities (including historic railroad facilities and canals);
- Preservation of Abandoned Railway Corridors (including the conversion and use for pedestrian and bicycle trails);
- Landscaping and Scenic Beautification;
- Bicycle and Pedestrian Facilities;
- Safety and Educational Activities for Pedestrians and Bicyclists; and
- Environmental Mitigation to Address Water Pollution due to Highway Runoff or to Reduce Vehicle Wildlife Mortality while maintaining Habitat Connectivity.

Applications for projects that fall within one or more of these 12 categories will be accepted from all 39 of Rhode Island's cities and towns.

(Source: Rhode Island Department of Transportation)

Apply to Rhode Island KeepSpace Communities Program:

This ground-breaking initiative is designed to address Rhode Island's current housing deficit while fostering a healthy economy, environment, infrastructure and culture. By design, it will create mutually beneficial partnerships between developers, municipalities, Realtors and funders. KeepSpace Communities will not only help address Rhode Island's deficit of 13,000 affordable homes, but will also stimulate a new approach to neighborhood development and site design in every city and town throughout the state. These sustainable-design and site-development projects will be ecologically based and economically sound; promote alternative transportation; and conserve energy and water resources. This enlightened approach will facilitate government, business and civic partnerships that will result in replicable models of living and working space.

The founding partner of KeepSpace, Rhode Island Housing, has issued a request for proposals (RFP) to developers and is prepared to invest up to $10 million to support the development of the first 3-5 KeepSpace Communities. While the criteria for winning proposals is somewhat vague, the program has stated that KeepSpace Communities will incorporate the following elements:

- Mixed use and mixed income.
- Safe, attractive homes and apartments that work force can afford.
- Efficient and creative use of land, infrastructure and other development resources.

- Neighborhoods with schools, libraries, daycare, parks, open space, and other services within walking distance.
- Compliments the character of the area.
- Public transit is incorporated into planning.
- Environmentally sensitive practices and preserved open space.
- Conservation-minded practices directed toward developing existing communities (reuse first).
- Culturally and economically diverse communities.
- Healthy, green and energy efficient practices.
- Integrate smart planning practices.

(Source: KeepSpace RFP Workshop Presentation)

With Branch Village's focus on revitalization through compact, infill development, as well as preserving open space, it is clear that the project would make for a very competitive proposal. Although the KeepSpace funding will be limited to just three to five winning proposals, the sizable funding that would be received makes the application process well worth the investment of time.

(Source: Rhode Island Housing)

Explore Use of Tax Increment Financing (TIF):

Tax Increment Financing (TIF) is a financing tool available to all Rhode Island municipalities via state enabling legislation. TIF is a way for local governments to help finance needed infrastructure improvements or capital projects to jumpstart private investment within a targeted development or redevelopment district. It can be a particularly useful tool for overcoming obstacles that might otherwise stall or prevent the investment of private capital into a troubled district or site, such as contamination or lack of necessary infrastructure. A municipality may borrow the resources needed to fund infrastructure improvements and repay the loan with a portion of the incremental increase in property taxes generated as a result of the ensuing private investment.

(Source: Grow Smart Rhode Island)

Consider Zoning Approaches:

It is clear the current zoning of the Branch Village district is not adequate to meet the vision outlined through this project. Choosing an appropriate zoning approach for a redevelopment project can be challenging, as communities will need to balance the desire for control over certain site plan elements with the desire to attract better development through flexibility or incentives. An integral piece to understanding which techniques will best suit a community or a particular district is a well developed Comprehensive Plan. Branch Village is in the fortunate position of having both a Comprehensive Plan and the guidance documents resulting from this project to utilize on when moving forward to consider zoning options. These planning documents will specifically address the desired uses and urban form for the Branch Village district and will guide the decisions used in drafting zoning.

The key elements to address in any new zoning language will include:

- Allowing mixed-use in a by right context;
- Changing the orientation of buildings to activate the street edge;
- Providing innovative shared and off-site parking allowances;
- Modest site and building design standards to create a varied but coherent streetscape;
- Requiring alternative access and circulation routes for automobiles; and
- Making pedestrian mobility a focal point for site design.

SUMMARY STATEMENT

Branch Village exhibits tremendous potential for revitalization within the context of a village center development model. The village's compact nature, as established through its historic development patterns, is an asset that can be built upon in establishing a dense, mixed-use core. In terms of its building stock, Branch Village has many structures with impressive cultural and historic qualities that can add to the character of the village as it moves forward with new development. Branch Village also contains many overlooked environmental assets such as the Branch River, several small ponds and wetlands, and acres of forested open space—all exhibiting potential for improved quality and access. As efforts to revitalize Branch Village move forward, it should not be lost that this is a place with many positive qualities that are providing a solid foundation for improvements in the future.

The development concepts established within this report, and the adjoining Visual Statements, respond to concerns over current development patterns by defining a new vision for Branch Village. This vision evolved through a comprehensive and inclusive process and represents a considerable amount of time, effort and creative energy from the Branch Village community and Town officials. The end products created through this process will provide critical guidance for determining future actions, plans, and land use regulations in the village. Due to its long-term vision, the fruits of this project may take time in coming to bear, however, the future planning efforts in Branch Village will be better off as a result of this important work.

APPENDEIX A:

VISUAL STATEMENTS

Developed by consultant Dodson Associates, with donated support by North Smithfield resident John O'Hearne from O'Hearne Associates.

Branch Village Revitalization Plan: Overview

Streetscape improvements installed as part of rebuilding of Great Road and the potential reconstruction of the Saint Paul Street intersection. Include continuous sidewalks, shade trees and other landscaping, decorative lighting, signage and benches.

ATP facility redeveloped and/or replaced with new mixed-use structures. Large buildings divided into smaller masses and stepped along the river bank to take advantage of views. Consolidation of building footprints, parking and driveways helps to limit site impacts while allowing for comprehensive stormwater treatment.

Reconstruction of the core of the village follows a traditional village model, with attractive 2-3 story buildings lining the street, on-street parking, and additional parking behind the buildings in shared lots.

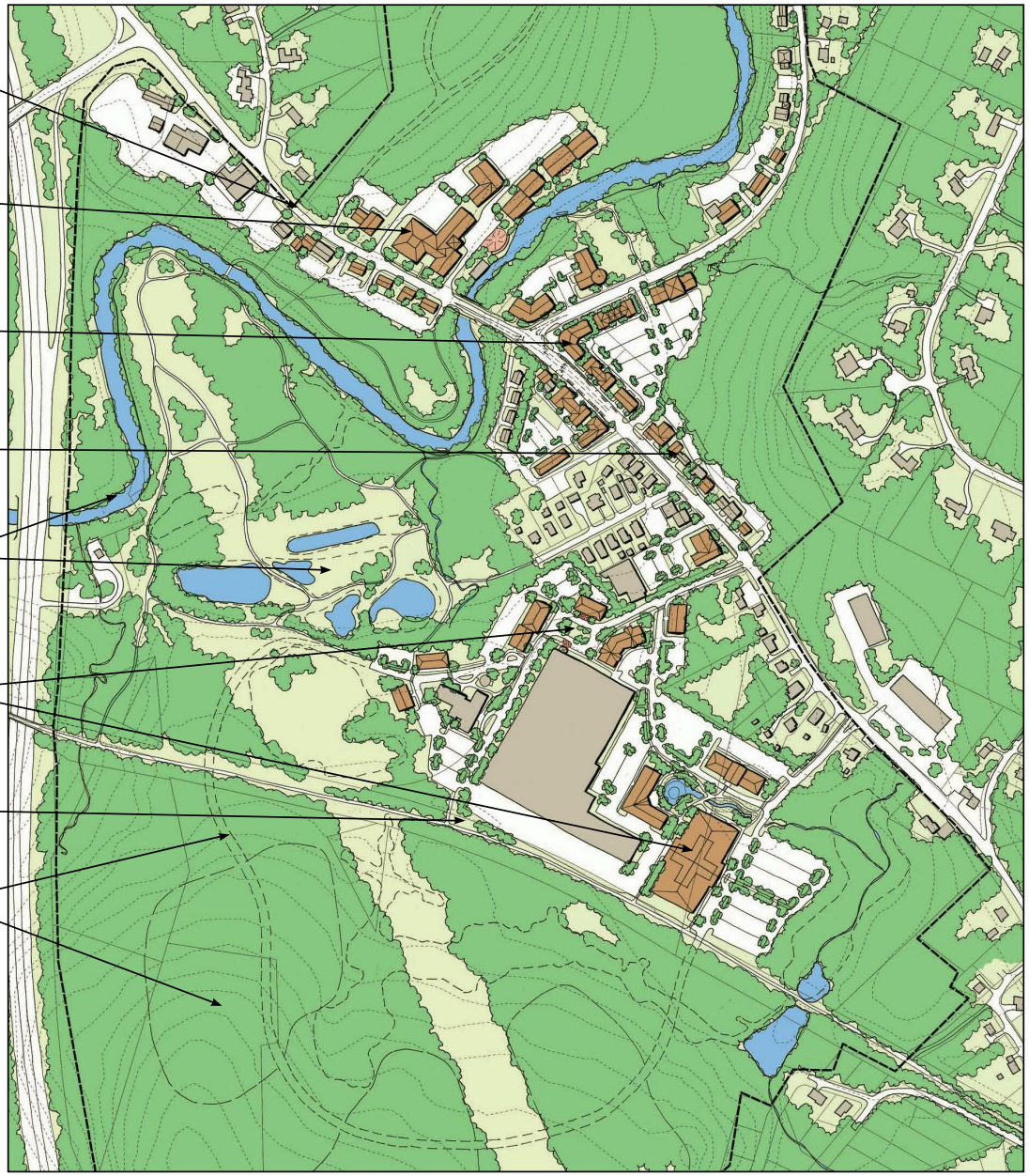
Existing mixed-use and residential structures further east along Great Road remain in present uses. To accommodate business expansion or mixed-use redevelopment, encourage expansion of existing structures rather than replacement, in order to retain residential character.

Branch River corridor preserved as a greenway. Wetlands, floodplains, ponds and the utility corridor redeveloped as a community park with walking trails, picnic areas and boat launches.

Branch River Industrial Park expanded in phases, beginning with infill development to the north and west. Buildings are clustered, campus-style, around shared open space amenities, with parking located to the side and rear of structures.

Town-owned rail right-of-way easement reclaimed for recreational rail trail and potential future public transit use.

Future road corridor and development sites on the slope to the south reserved for future development phases. In the interim, woodlands managed to enhance wildlife habitat and passive recreation potential.



Great Road Design Concepts

ATP facility redeveloped and/or replaced with new mixed use structures. Buildings divided into smaller masses that parallel the riverbank. Structures step down the slope to create terraces for parking and pedestrian plazas overlooking the river.

Fire Department property considered for redevelopment, including partial civic use such as a community center and adjacent park. A park could provide visual access to the river, and physical access to a potential boat launch site. Site of Kennedy's Lunch potentially redeveloped as a larger mixed use building that helps to anchor the corner of the intersection.

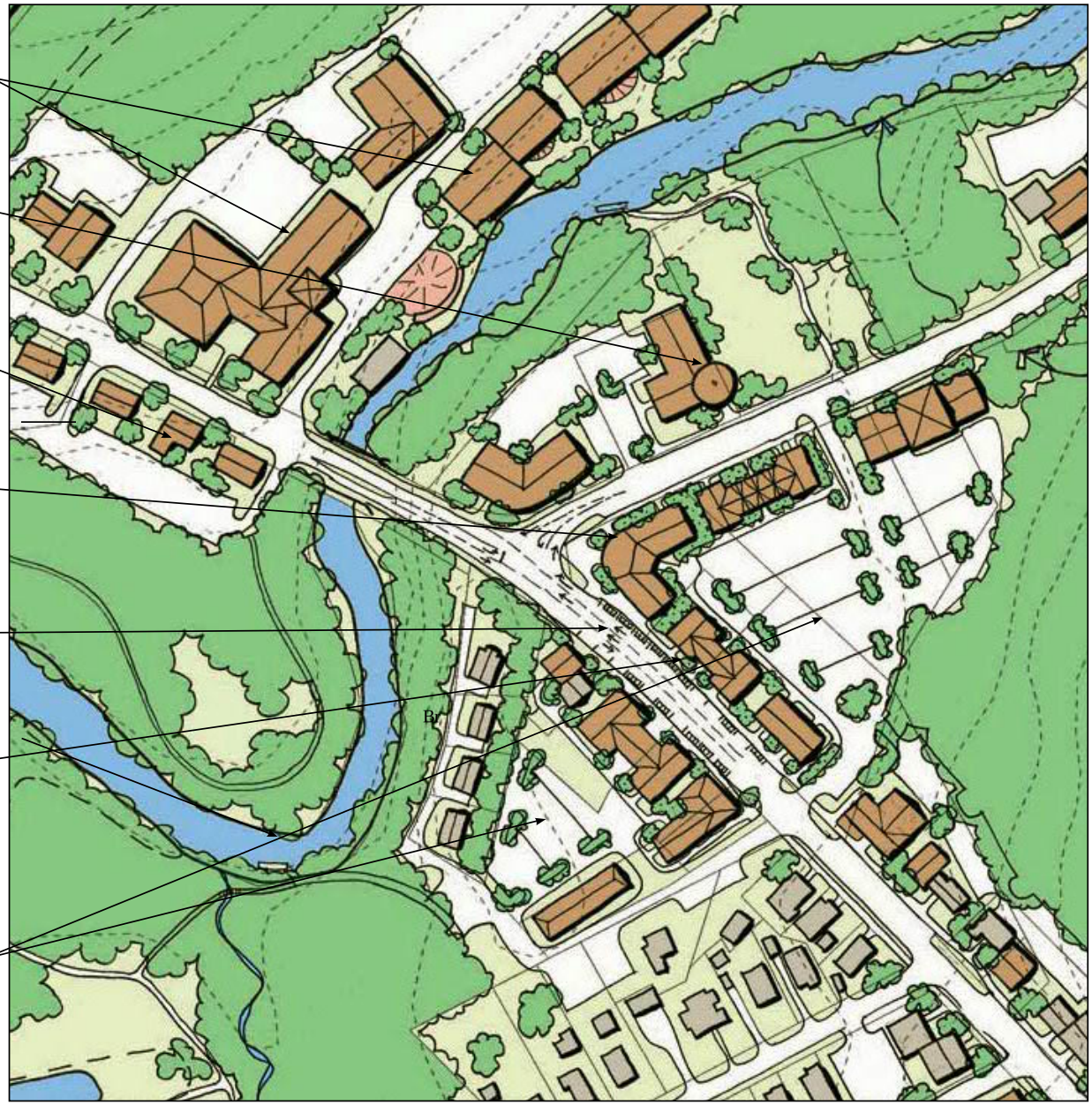
New mixed-use structures along the south side of Great Road continue the residential scale of existing buildings. Shared parking behind the buildings steps down the slope, with shared driveways limiting the need for additional curb cuts onto Great Road.

New mixed-use structures allowed to replace existing single use structures in the core of the district, with a landmark building serving as the new home of the Li'l General Convenience Store. Buildings are 2-3 stories, with retail on the ground floor and professional offices, studios or residential units on the upper floors.

Great road reconfigured to provide two travel lanes and a third lane for turns onto Saint Paul Street. Making better use of existing pavement allows for parallel on-street parking in the proposed commercial core.

Broad sidewalks shaded by large trees provide a comfortable place for pedestrians and room for outdoor sales displays and cafe seating. Consistent design standards for street furnishings, signage, facade treatments, lighting and landscaping provide a unified look. Continuous sidewalks, safe cross walks with pedestrian-activated crossing signals, and high quality design get people out of their cars and walking around the district.

Large shared parking lots on the interior of each block provide parking for surrounding businesses, which can have entrances on both sides of the building for the convenience of customers. Shared parking allows for the most efficient use of space, leaving more room for trees and landscaping, and simplifying circulation for both cars and pedestrians. The parking areas can be conveniently accessed from a few points, improving the streetscape and reducing accidents.



Industrial Park Design Concepts

The existing entrance remains as the primary access point to the industrial park, with a second entrance further to the east providing direct access to the southeast side.

Interior roadways are separated from parking areas and defined by planted islands and landscaped areas. This helps to extend the traditional village streetscape into the industrial park.

A public square is established in front of the existing clock tower, and new buildings are lined up around and connected with sidewalks and landscaped areas. Parking is provided to the side and rear of buildings where possible.

New mixed-use buildings at the west side of the industrial park can take advantage of the adjacent open space and views to cater to high-value office and residential tenants.

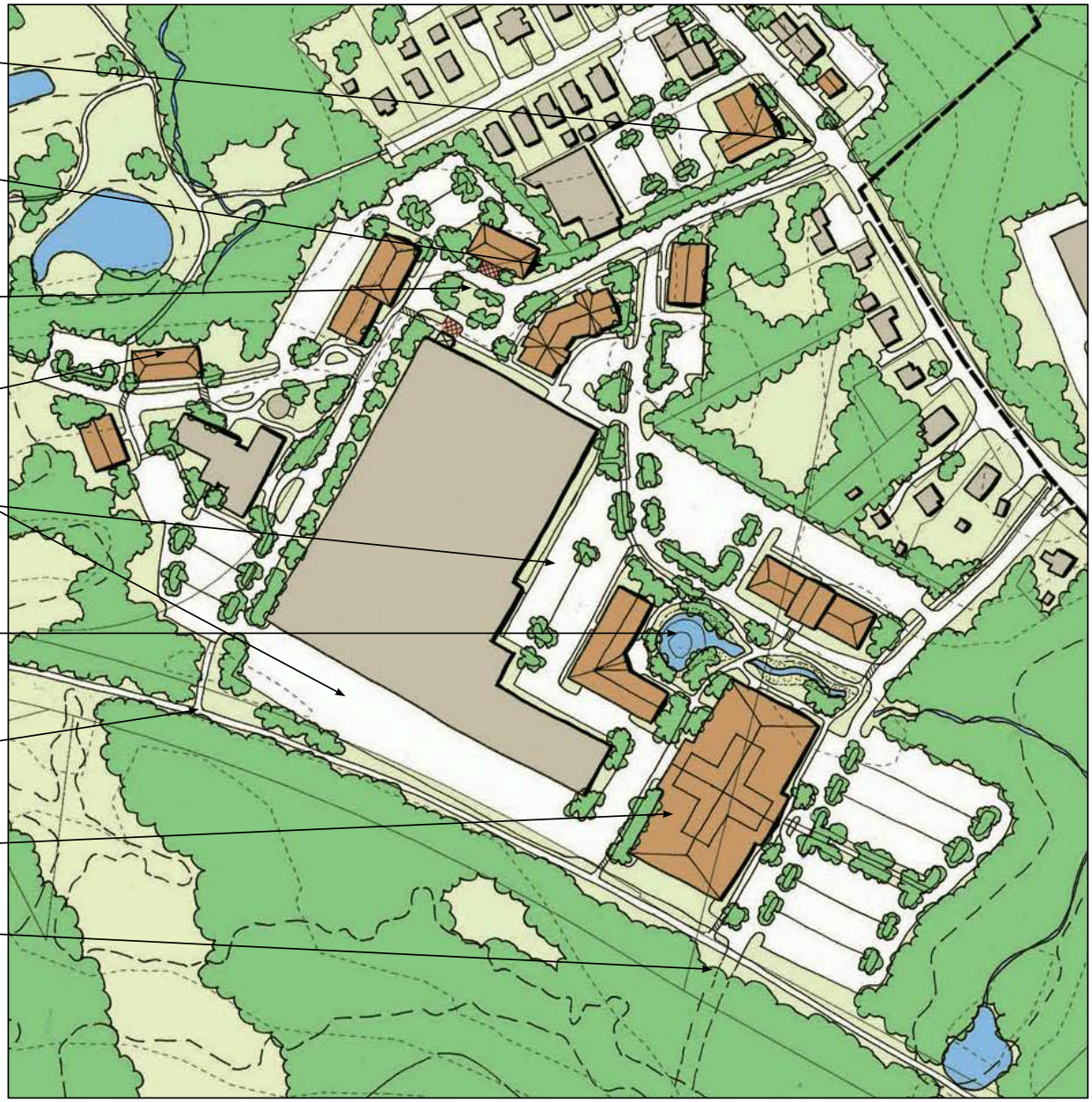
Parking and loading areas for the existing mill building are left largely intact. Coordination of deliveries and shipping schedules helps to reduce conflicts with tenants of adjoining mixed-use buildings.

Structures in the new South Campus face onto a common park space that also serves as a stormwater treatment area. The “stormwater park” uses natural processes to store and filter rain water, enhances wildlife habitat, and provides a beautiful view from the surrounding offices.

Use of town-owned railroad right of way secured for recreational rail trail and potential future public transit use. Paved extensions link the rail trail to the industrial park’s pedestrian network.

Larger industrial or office uses can easily be accommodated in the South Campus, with parking lots on the east side.

A road stub provides for future extension of a roadway loop to serve the south part of the industrial park.



Park Planning Concepts

Existing cleared area under the electric transmission line improved as a picnic site overlooking the river bend. Stabilization of the riverbank allows for viewing and fishing access. Clearing of invasive species and selective pruning of native trees and shrubs opens up river views.

Walking trail network developed by improving surfaces and drainage of existing trails and establishing new loops and extensions as needed. Boardwalks provide access over wetlands and seasonal floodplains, while a pedestrian bridge connects to the north side of the river.

Trails curve to avoid wetland impacts and cross at the narrowest part of wetland and stream corridors.

Former mill settling ponds and surrounding open space managed for wildlife habitat. Invasive species removed. Eroded areas stabilized and replanted. Mowing and maintenance program established to expand and maintain native grassland habitat.

Boat launch established with access from rear of commercial parking lots behind the Great Road redevelopment area. Compacted stone dust ramp provides for boat-cart access from parking lot, with water access from stabilized bank or floating dock.

Pedestrian access to the park and trail system provided from several areas along Great Road, including the end of Branch Avenue. This also serves to provide a more direct walking route to Great Road businesses from the industrial park.

Site planning for new roads, buildings and parking areas in the industrial park takes advantage of the public park by preserving view corridors, providing trail heads and path connections, and providing weekend parking for park users.

Railroad right of way reclaimed for use as a recreational rail trail. Selected paved or compacted surface trails provide links to the industrial park and Great Road businesses. Public ownership preserves the possibility of use as a shared bike/transit corridor if needed at some time in the future.

Industrial Park Alternatives and Future Phases

If uses in the existing industrial park buildings require more parking, some of the proposed buildings shown on the masterplan could be built south of the rail trail, leaving more room for parking adjacent to existing structures.

Vehicular circulation follows a primary loop road that winds through the site to avoid wetlands and reduce grades in sloping areas.

This plan shows 11 buildings with a total floor area of 520,000 square feet south of the rail trail (two story buildings, total footprint would be 260,000 s.f.), with parking for 1440 cars. Buildings are arranged in three clusters to avoid wetlands and utility corridors and take advantage of the topography of the site.

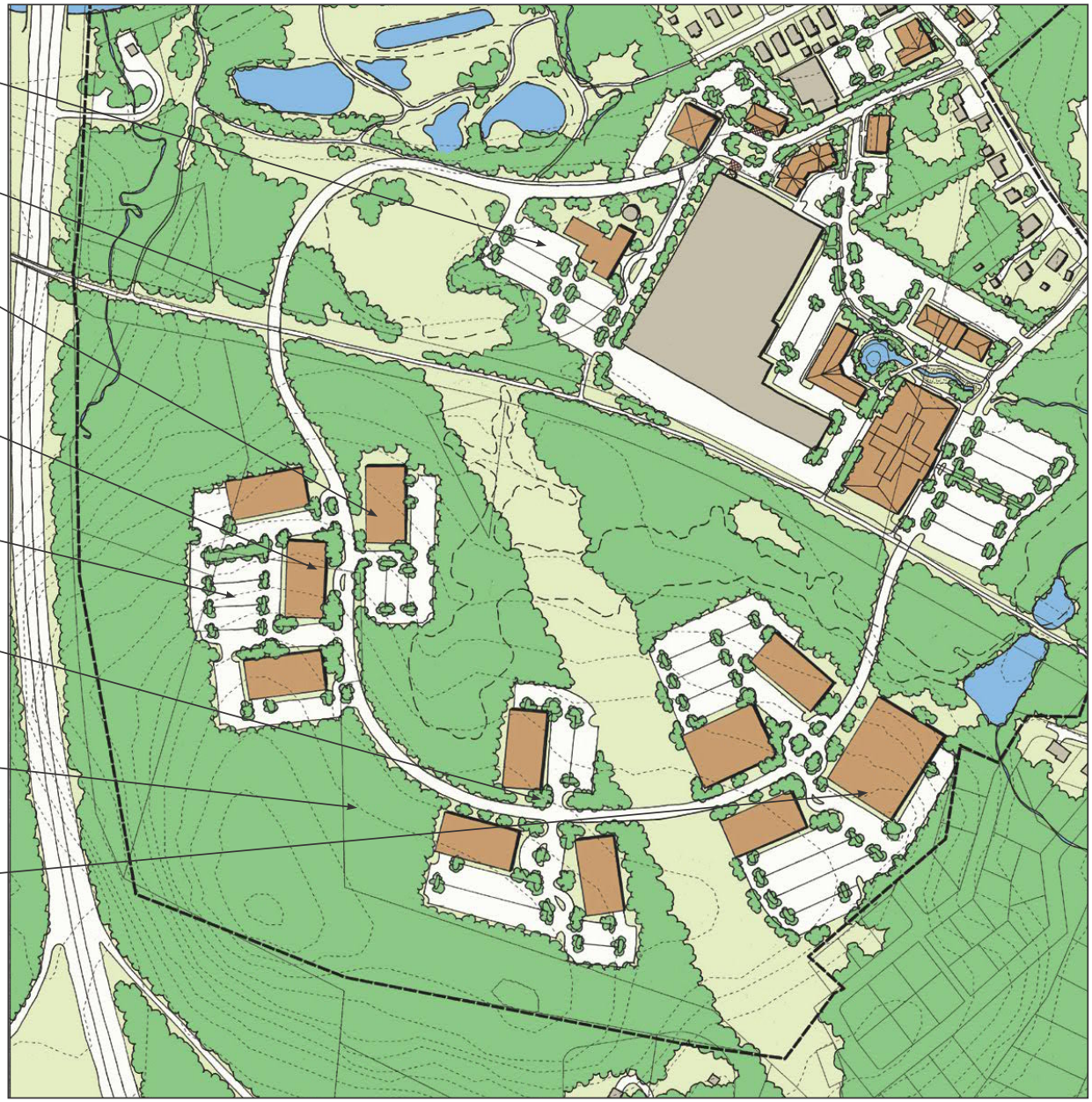
Buildings are placed fairly close to the road with parking located to the side and rear. This reduces the length of access roads and creates an attractive campus effect.

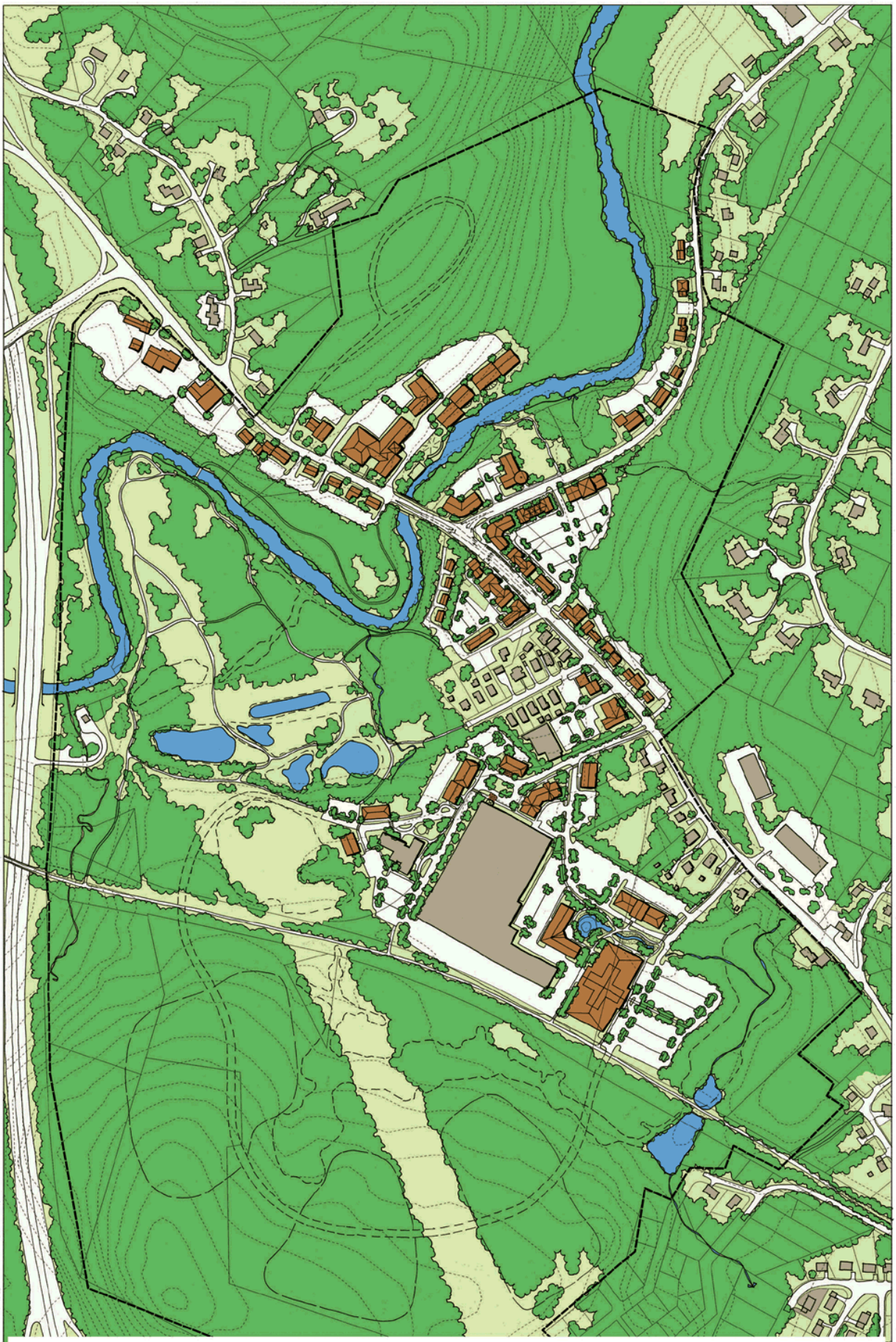
Parking lots are constructed to serve more than one building, minimizing wasted space, simplifying circulation patterns, and allowing for efficiencies through sharing of parking spaces and balancing of demand between uses.

Building entrances and visitor parking is clustered close to the main road, allowing for landscaping around each building to contribute to a common park-like environment.

Fingers of open space separate each of the three main building clusters, reducing the overall visual impact of the development and encouraging a separate sense of identity for each “neighborhood.”

Most of the buildings shown are 100’ x 200’, totalling 40,000 s.f. on two floors. They can easily be laid out as larger or smaller structures. Largest shown totals 100,000 s.f.





Branch Village Revitalization Plan

North Smithfield, Rhode Island

Conceptual Masterplan

Prepared for:
Branch Village Revitalization Task Force

Prepared By:
Dodson Associates, Ltd.
Landscape Architects & Planners
Ashfield, Massachusetts
with
Horsley Witten Group
Sandwich, Massachusetts

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0 100 200 300 400 500 Feet

ATTACHMENT E – Cost Estimates

Alternative 1

Alternative 2

Alternative 2A

E

Alternative 1

ROUTE 146 INTERCHANGE AT POUND HILL ROAD
NORTH SMITHFIELD, RHODE ISLAND
ALTERNATIVE 1 - COST ESTIMATE

Item No.	Qty.	Unit	Item Description	Unit Price	Amount
201.0302	0	EACH	CUTTING AND DISPOSING ISOLATED TREES AND STUMPS (24" OR PLUS)	$ 2,000.00	$ -
201.0321	28,500	SY	CLEARING AND GRUBBING	$ 10.00	$ 285,000.00
201.0409	3,200	SY	REMOVE AND DISPOSE FLEXIBLE PAVEMENT	$ 10.00	$ 32,000.00
201.0450	1,200	LF	REMOVE AND STOCKPILE ON SITE GRANITE CURB	$ 9.00	$ 10,800.00
202.0100	7,000	CY	EARTH EXCAVATION	$ 15.00	$ 105,000.00
202.0700	9,400	CY	COMMON BORROW	$ 25.00	$ 235,000.00
204.0100	28,300	SY	TRIMMING AND FINE GRADING	$ 4.00	$ 113,200.00
205.0240	0	CY	TRENCH ROCK EXCAVATION (0-7')	$ 100.00	$ -
206.0301	0	LF	COMPOST FILTER SOCK	$ 6.00	$ -
209.0200	0	EACH	SACK INSERT CATCH BASIN INLET PROTECTION	$ 200.00	$ -
212.2100	0	LS	MAINTENANCE AND CLEANING OF EROSION AND POLLUTION CONTROLS	$ 9,000.00	$ -
302.0100	4,300	CY	GRAVEL BORROW SUBBASE COURSE	$ 25.00	$ 107,500.00
401.1000	2,650	TON	CLASS 19.0 HMA	$ 90.00	$ 238,500.00
401.2000	1,700	TON	CLASS 12.5 HMA	$ 100.00	$ 170,000.00
403.0300	33,300	SY	ASPHALT EMULSION TACK COAT	$ 0.50	$ 16,650.00
601.0300	30	CY	CLASS A PORTLAND CEMENT CONCRETE	$ 160.00	$ 4,800.00
701.0412	1,459	LF	REINFORCED CONCRETE PIPE M 170 CLASS III 12 INCH	$ 75.00	$ 109,425.00
701.0415	487	LF	REINFORCED CONCRETE PIPE M 170 CLASS III 15 INCH	$ 75.00	$ 36,525.00
702.0605	10	EACH	PRECAST CATCH BASIN 4' DIAMETER STANDARD 4.4.0	$ 2,300.00	$ 23,000.00
702.0630	10	EACH	PRECAST MANHOLE 4' DIAMETER STANDARD 4.2.0	$ 3,000.00	$ 30,000.00
702.9901	1	LS	WATER TREATMENT BMP	$ 30,000.00	$ 30,000.00
808.0800	540	CY	CONCRETE RETAINING WALL CLASS HP 3/4" STANDARD 10.3.0	$ 875.00	$ 472,500.00
901.0191	2	EACH	GUARDRAIL STEEL BEAM ANCHORAGE TRAILING END SECTION STANDARD 34.3.4	$ 2,600.00	$ 5,200.00
902.0100	1,070	LF	STEEL BACKED TIMBER GUARDRAIL STANDARD 34.4.0	$ 250.00	$ 267,500.00
902.0200	2	EACH	STEEL BACKED TIMBER GUARDRAIL TERMINAL SECTION TYPE 1 STANDARD 34.4.1	$ 3,900.00	$ 7,800.00
905.9901	0	CY	STAMPED AND COLORED CEMENT CONCRETE	$ 600.00	$ -
906.0110	370	LF	GRANITE CURB, QUARRY SPLIT STRAIGHT, STANDARD 7.3.0	$ 45.00	$ 16,650.00

ROUTE 146 INTERCHANGE AT POUND HILL ROAD
NORTH SMITHFIELD, RHODE ISLAND
ALTERNATIVE 1 - COST ESTIMATE

Item No.	Qty.	Unit	Item Description	Unit Price	Amount
906.0111	320	LF	GRANITE CURB, QUARRY SPLIT CIRCULAR, STANDARD 7.3.0	$ 55.00	$ 17,600.00
906.0602	2,420	LF	BITUMINOUS BERM STANDARD 7.5.1	$ 2.50	$ 6,050.00
932.0100	200	LF	CUTTING AND MATCHING ASPHALT	$ 4.00	$ 800.00
932.0200	0	LF	FULL-DEPTH SAWCUT OF BITUMINOUS PAVEMENT	$ 2.00	$ -
935.0400	3,000	SY	REMOVING BITUMINOUS PAVEMENT BY MICRO MILLING	$ 3.00	$ 9,000.00
L01.0102	18,200	SY	LOAM BORROW 4 INCHES DEEP	$ 5.00	$ 91,000.00
L02.0102	18,150	SY	RESIDENTIAL SEEDING (TYPE 2)	$ 2.00	$ 36,300.00
L11.0102	0	EACH	TREE PLANT PROTECTION DEVICE STANDARD 51.1.0	$ 220.00	$ -
L11.0103	0	LF	SHRUB PLANT PROTECTION DEVICE STANDARD 51.2.0	$ 6.00	$ -
T01.9901	0	LS	TRAFFIC SIGNAL	$ 200,000.00	$ -
T15.0100	280	SF	DIRECTIONAL REGULATORY AND WARNING SIGNS	$ 35.00	$ 9,800.00
T15.1000	9	EACH	STREET SIGN ASSEMBLY STD. 24.6.1	$ 225.00	$ 2,025.00
T20.2404	7,350	LF	4 INCH WHITE FINAL EPOXY RESIN PAVEMENT MARKINGS	$ 0.50	$ 3,675.00
T20.2412	80	LF	12 INCH WHITE FINAL EPOXY RESIN PAVEMENT MARKINGS	$ 3.00	$ 240.00
T20.2504	7,350	LF	4 INCH WHITE INTERIM EPOXY RESIN PAVEMENT MARKINGS	$ 0.50	$ 3,675.00
T20.2512	80	LF	12 INCH WHITE INTERIM EPOXY RESIN PAVEMENT MARKINGS	$ 3.00	$ 240.00
T20.2804	7,070	LF	4 INCH YELLOW FINAL EPOXY RESIN PAVEMENT MARKINGS	$ 0.50	$ 3,535.00
T20.2904	7,070	LF	4 INCH YELLOW INTERIM EPOXY RESIN PAVEMENT MARKINGS	$ 0.50	$ 3,535.00
T20.3401	8	EACH	FINAL EPOXY RESIN PAVEMENT MARKING SYMBOL - ARROW (STRAIGHT, LEFT, RIGHT OR COMBINED) STANDARD 20.1.0	$ 65.00	$ 520.00
T20.3405	0	EACH	FINAL EPOXY RESIN PAVEMENT MARKING SYMBOL - YIELD LINE TRIANGLE (ALL SIZES)	$ 100.00	$ -
T20.4506	0	LF	REMOVE PAVEMENT MARKING LINE - LESS THAN OR EQUAL TO 6 INCHES WIDE	$ 0.55	$ -
T20.4508	0	LF	REMOVE PAVEMENT MARKING LINE - GREATER THAN 6 INCHES WIDE	$ 1.50	$ -

ROUTE 146 INTERCHANGE AT POUND HILL ROAD
NORTH SMITHFIELD, RHODE ISLAND
ALTERNATIVE 1 - COST ESTIMATE

Item No.	Qty.	Unit	Item Description	Unit Price	Amount
			SUBTOTAL CONTRACT PAY ITEMS		**$2,505,045.00**
			PLUS 20% CONTINGENCY		$501,000.00
			CONSTRUCTION COST		**$3,006,045.00**
			TOTAL ESTIMATED COST		**$3,006,045.00**
				SAY	**$3,100,000.00**

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Alternative 2

ROUTE 146 INTERCHANGE AT POUND HILL ROAD
NORTH SMITHFIELD, RHODE ISLAND
COST ESTIMATE

Item No.	Qty.	Unit	Item Description	Unit Price	Amount
201.0302	0	EACH	CUTTING AND DISPOSING ISOLATED TREES AND STUMPS (24" OR PLUS)	$ 2,000.00	$ -
201.0321	26,000	SY	CLEARING AND GRUBBING	$ 10.00	$ 260,000.00
201.0409	3,200	SY	REMOVE AND DISPOSE FLEXIBLE PAVEMENT	$ 10.00	$ 32,000.00
201.0450	1,300	LF	REMOVE AND STOCKPILE ON SITE GRANITE CURB	$ 9.00	$ 11,700.00
202.0100	7,000	CY	EARTH EXCAVATION	$ 15.00	$ 105,000.00
202.0700	9,400	CY	COMMON BORROW	$ 25.00	$ 235,000.00
204.0100	25,600	SY	TRIMMING AND FINE GRADING	$ 4.00	$ 102,400.00
205.0240	0	CY	TRENCH ROCK EXCAVATION (0-7')	$ 100.00	$ -
206.0301	0	LF	COMPOST FILTER SOCK	$ 6.00	$ -
209.0200	0	EACH	SACK INSERT CATCH BASIN INLET PROTECTION	$ 200.00	$ -
212.2100	0	LS	MAINTENANCE AND CLEANING OF EROSION AND POLLUTION CONTROLS	$ 9,000.00	$ -
302.0100	4,200	CY	GRAVEL BORROW SUBBASE COURSE	$ 25.00	$ 105,000.00
401.1000	2,600	TON	CLASS 19.0 HMA	$ 90.00	$ 234,000.00
401.2000	1,650	TON	CLASS 12.5 HMA	$ 100.00	$ 165,000.00
403.0300	32,400	SY	ASPHALT EMULSION TACK COAT	$ 0.50	$ 16,200.00
601.0300	30	CY	CLASS A PORTLAND CEMENT CONCRETE	$ 160.00	$ 4,800.00
701.0412	1,308	LF	REINFORCED CONCRETE PIPE M 170 CLASS III 12 INCH	$ 75.00	$ 98,100.00
701.0415	436	LF	REINFORCED CONCRETE PIPE M 170 CLASS III 15 INCH	$ 75.00	$ 32,700.00
702.0605	9	EACH	PRECAST CATCH BASIN 4' DIAMETER STANDARD 4.4.0	$ 2,300.00	$ 20,700.00
702.0630	10	EACH	PRECAST MANHOLE 4' DIAMETER STANDARD 4.2.0	$ 3,000.00	$ 30,000.00
702.9901	1	LS	WATER TREATMENT BMP	$ 30,000.00	$ 30,000.00
808.0800	540	CY	CONCRETE RETAINING WALL CLASS HP 3/4" STANDARD 10.3.0	$ 875.00	$ 472,500.00
901.0191	1	EACH	GUARDRAIL STEEL BEAM ANCHORAGE TRAILING END SECTION STANDARD 34.3.4	$ 2,600.00	$ 2,600.00
902.0100	860	LF	STEEL BACKED TIMBER GUARDRAIL STANDARD 34.4.0	$ 250.00	$ 215,000.00
902.0200	1	EACH	STEEL BACKED TIMBER GUARDRAIL TERMINAL SECTION TYPE 1 STANDARD 34.4.1	$ 3,900.00	$ 3,900.00
905.9901	40	CY	STAMPED AND COLORED CEMENT CONCRETE	$ 600.00	$ 24,000.00
906.0110	480	LF	GRANITE CURB, QUARRY SPLIT STRAIGHT, STANDARD 7.3.0	$ 45.00	$ 21,600.00

ROUTE 146 INTERCHANGE AT POUND HILL ROAD
NORTH SMITHFIELD, RHODE ISLAND
COST ESTIMATE

Item No.	Qty.	Unit	Item Description	Unit Price	Amount
906.0111	320	LF	GRANITE CURB, QUARRY SPLIT CIRCULAR, STANDARD 7.3.0	$ 55.00	$ 17,600.00
906.0602	2,295	LF	BITUMINOUS BERM STANDARD 7.5.1	$ 2.50	$ 5,737.50
932.0100	200	LF	CUTTING AND MATCHING ASPHALT	$ 4.00	$ 800.00
932.0200	0	LF	FULL-DEPTH SAWCUT OF BITUMINOUS PAVEMENT	$ 2.00	$ -
935.0400	3,000	SY	REMOVING BITUMINOUS PAVEMENT BY MICRO MILLING	$ 3.00	$ 9,000.00
L01.0102	15,600	SY	LOAM BORROW 4 INCHES DEEP	$ 5.00	$ 78,000.00
L02.0102	15,550	SY	RESIDENTIAL SEEDING (TYPE 2)	$ 2.00	$ 31,100.00
L11.0102	0	EACH	TREE PLANT PROTECTION DEVICE STANDARD 51.1.0	$ 220.00	$ -
L11.0103	0	LF	SHRUB PLANT PROTECTION DEVICE STANDARD 51.2.0	$ 6.00	$ -
T01.9901	0	LS	TRAFFIC SIGNAL	$ 200,000.00	$ -
T15.0100	280	SF	DIRECTIONAL REGULATORY AND WARNING SIGNS	$ 35.00	$ 9,800.00
T15.1000	6	EACH	STREET SIGN ASSEMBLY STD. 24.6.1	$ 225.00	$ 1,350.00
T20.2404	7,290	LF	4 INCH WHITE FINAL EPOXY RESIN PAVEMENT MARKINGS	$ 0.50	$ 3,645.00
T20.2412	90	LF	12 INCH WHITE FINAL EPOXY RESIN PAVEMENT MARKINGS	$ 3.00	$ 270.00
T20.2504	7,290	LF	4 INCH WHITE INTERIM EPOXY RESIN PAVEMENT MARKINGS	$ 0.50	$ 3,645.00
T20.2512	90	LF	12 INCH WHITE INTERIM EPOXY RESIN PAVEMENT MARKINGS	$ 3.00	$ 270.00
T20.2804	6,560	LF	4 INCH YELLOW FINAL EPOXY RESIN PAVEMENT MARKINGS	$ 0.50	$ 3,280.00
T20.2904	6,560	LF	4 INCH YELLOW INTERIM EPOXY RESIN PAVEMENT MARKINGS	$ 0.50	$ 3,280.00
T20.3401	8	EACH	FINAL EPOXY RESIN PAVEMENT MARKING SYMBOL - ARROW (STRAIGHT, LEFT, RIGHT OR COMBINED) STANDARD 20.1.0	$ 65.00	$ 520.00
T20.3405	0	EACH	FINAL EPOXY RESIN PAVEMENT MARKING SYMBOL - YIELD LINE TRIANGLE (ALL SIZES)	$ 100.00	$ -
T20.4506	0	LF	REMOVE PAVEMENT MARKING LINE - LESS THAN OR EQUAL TO 6 INCHES WIDE	$ 0.55	$ -
T20.4508	0	LF	REMOVE PAVEMENT MARKING LINE - GREATER THAN 6 INCHES WIDE	$ 1.50	$ -

ROUTE 146 INTERCHANGE AT POUND HILL ROAD
NORTH SMITHFIELD, RHODE ISLAND
COST ESTIMATE

Item No.	Qty.	Unit	Item Description	Unit Price	Amount
			SUBTOTAL CONTRACT PAY ITEMS		**$2,390,497.50**
			PLUS 20% CONTINGENCY		$478,000.00
			CONSTRUCTION COST		**$2,868,497.50**
			TOTAL ESTIMATED COST		**$2,868,497.50**
				SAY	**$2,900,000.00**

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Alternative 2A

ROUTE 146 INTERCHANGE AT POUND HILL ROAD
NORTH SMITHFIELD, RHODE ISLAND
COST ESTIMATE

Item No.	Qty.	Unit	Item Description	Unit Price	Amount
201.0302	0	EACH	CUTTING AND DISPOSING ISOLATED TREES AND STUMPS (24" OR PLUS)	$ 2,000.00	$ -
201.0321	26,000	SY	CLEARING AND GRUBBING	$ 10.00	$ 260,000.00
201.0409	3,200	SY	REMOVE AND DISPOSE FLEXIBLE PAVEMENT	$ 10.00	$ 32,000.00
201.0450	1,300	LF	REMOVE AND STOCKPILE ON SITE GRANITE CURB	$ 9.00	$ 11,700.00
202.0100	7,000	CY	EARTH EXCAVATION	$ 15.00	$ 105,000.00
202.0700	9,400	CY	COMMON BORROW	$ 25.00	$ 235,000.00
204.0100	25,600	SY	TRIMMING AND FINE GRADING	$ 4.00	$ 102,400.00
205.0240	0	CY	TRENCH ROCK EXCAVATION (0-7')	$ 100.00	$ -
206.0301	0	LF	COMPOST FILTER SOCK	$ 6.00	$ -
209.0200	0	EACH	SACK INSERT CATCH BASIN INLET PROTECTION	$ 200.00	$ -
212.2100	0	LS	MAINTENANCE AND CLEANING OF EROSION AND POLLUTION CONTROLS	$ 9,000.00	$ -
302.0100	4,200	CY	GRAVEL BORROW SUBBASE COURSE	$ 25.00	$ 105,000.00
401.1000	2,600	TON	CLASS 19.0 HMA	$ 90.00	$ 234,000.00
401.2000	1,650	TON	CLASS 12.5 HMA	$ 100.00	$ 165,000.00
403.0300	32,400	SY	ASPHALT EMULSION TACK COAT	$ 0.50	$ 16,200.00
601.0300	30	CY	CLASS A PORTLAND CEMENT CONCRETE	$ 160.00	$ 4,800.00
701.0412	1,308	LF	REINFORCED CONCRETE PIPE M 170 CLASS III 12 INCH	$ 75.00	$ 98,100.00
701.0415	436	LF	REINFORCED CONCRETE PIPE M 170 CLASS III 15 INCH	$ 75.00	$ 32,700.00
702.0605	9	EACH	PRECAST CATCH BASIN 4' DIAMETER STANDARD 4.4.0	$ 2,300.00	$ 20,700.00
702.0630	10	EACH	PRECAST MANHOLE 4' DIAMETER STANDARD 4.2.0	$ 3,000.00	$ 30,000.00
702.9901	1	LS	WATER TREATMENT BMP	$ 30,000.00	$ 30,000.00
808.0800	540	CY	CONCRETE RETAINING WALL CLASS HP 3/4" STANDARD 10.3.0	$ 875.00	$ 472,500.00
901.0191	1	EACH	GUARDRAIL STEEL BEAM ANCHORAGE TRAILING END SECTION STANDARD 34.3.4	$ 2,600.00	$ 2,600.00
902.0100	860	LF	STEEL BACKED TIMBER GUARDRAIL STANDARD 34.4.0	$ 250.00	$ 215,000.00
902.0200	1	EACH	STEEL BACKED TIMBER GUARDRAIL TERMINAL SECTION TYPE 1 STANDARD 34.4.1	$ 3,900.00	$ 3,900.00
905.9901	40	CY	STAMPED AND COLORED CEMENT CONCRETE	$ 600.00	$ 24,000.00
906.0110	480	LF	GRANITE CURB, QUARRY SPLIT STRAIGHT, STANDARD 7.3.0	$ 45.00	$ 21,600.00

ROUTE 146 INTERCHANGE AT POUND HILL ROAD
NORTH SMITHFIELD, RHODE ISLAND
COST ESTIMATE

Item No.	Qty.	Unit	Item Description	Unit Price	Amount
906.0111	320	LF	GRANITE CURB, QUARRY SPLIT CIRCULAR, STANDARD 7.3.0	$ 55.00	$ 17,600.00
906.0602	2,295	LF	BITUMINOUS BERM STANDARD 7.5.1	$ 2.50	$ 5,737.50
932.0100	200	LF	CUTTING AND MATCHING ASPHALT	$ 4.00	$ 800.00
932.0200	0	LF	FULL-DEPTH SAWCUT OF BITUMINOUS PAVEMENT	$ 2.00	$ -
935.0400	3,000	SY	REMOVING BITUMINOUS PAVEMENT BY MICRO MILLING	$ 3.00	$ 9,000.00
L01.0102	15,600	SY	LOAM BORROW 4 INCHES DEEP	$ 5.00	$ 78,000.00
L02.0102	15,550	SY	RESIDENTIAL SEEDING (TYPE 2)	$ 2.00	$ 31,100.00
L11.0102	0	EACH	TREE PLANT PROTECTION DEVICE STANDARD 51.1.0	$ 220.00	$ -
L11.0103	0	LF	SHRUB PLANT PROTECTION DEVICE STANDARD 51.2.0	$ 6.00	$ -
T01.9901	1	LS	TRAFFIC SIGNAL	$ 200,000.00	$ 200,000.00
T15.0100	280	SF	DIRECTIONAL REGULATORY AND WARNING SIGNS	$ 35.00	$ 9,800.00
T15.1000	6	EACH	STREET SIGN ASSEMBLY STD. 24.6.1	$ 225.00	$ 1,350.00
T20.2404	7,290	LF	4 INCH WHITE FINAL EPOXY RESIN PAVEMENT MARKINGS	$ 0.50	$ 3,645.00
T20.2412	90	LF	12 INCH WHITE FINAL EPOXY RESIN PAVEMENT MARKINGS	$ 3.00	$ 270.00
T20.2504	7,290	LF	4 INCH WHITE INTERIM EPOXY RESIN PAVEMENT MARKINGS	$ 0.50	$ 3,645.00
T20.2512	90	LF	12 INCH WHITE INTERIM EPOXY RESIN PAVEMENT MARKINGS	$ 3.00	$ 270.00
T20.2804	6,560	LF	4 INCH YELLOW FINAL EPOXY RESIN PAVEMENT MARKINGS	$ 0.50	$ 3,280.00
T20.2904	6,560	LF	4 INCH YELLOW INTERIM EPOXY RESIN PAVEMENT MARKINGS	$ 0.50	$ 3,280.00
T20.3401	8	EACH	FINAL EPOXY RESIN PAVEMENT MARKING SYMBOL - ARROW (STRAIGHT, LEFT, RIGHT OR COMBINED) STANDARD 20.1.0	$ 65.00	$ 520.00
T20.3405	0	EACH	FINAL EPOXY RESIN PAVEMENT MARKING SYMBOL - YIELD LINE TRIANGLE (ALL SIZES)	$ 100.00	$ -
T20.4506	0	LF	REMOVE PAVEMENT MARKING LINE - LESS THAN OR EQUAL TO 6 INCHES WIDE	$ 0.55	$ -
T20.4508	0	LF	REMOVE PAVEMENT MARKING LINE - GREATER THAN 6 INCHES WIDE	$ 1.50	$ -

ROUTE 146 INTERCHANGE AT POUND HILL ROAD
NORTH SMITHFIELD, RHODE ISLAND
COST ESTIMATE

Item No.	Qty.	Unit	Item Description	Unit Price	Amount
			SUBTOTAL CONTRACT PAY ITEMS		**$2,590,497.50**
			PLUS 20% CONTINGENCY		$518,000.00
			CONSTRUCTION COST		**$3,108,497.50**
			TOTAL ESTIMATED COST		**$3,108,497.50**
				SAY	**$3,200,000.00**