

**Sakonnet River Bridge
Rehabilitation or Replacement Project**

**DRAFT ENVIRONMENTAL
IMPACT STATEMENT
& SECTION 4(f) STATEMENT**

Volume IIa

Transportation Facilities

TRANSPORTATION FACILITIES

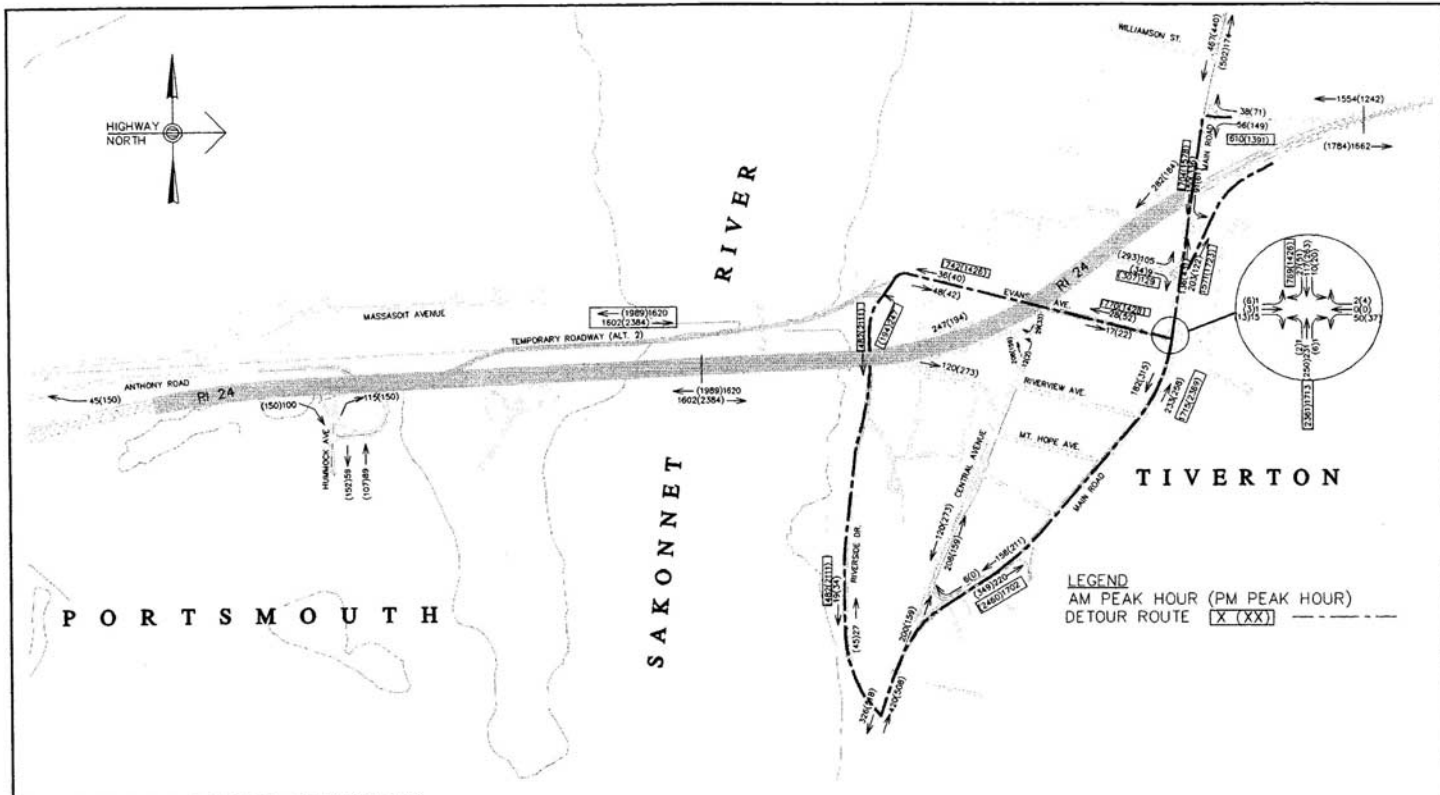
1.1 Traffic Patterns and Volumes

Existing traffic volumes were quantified by performing manual and automatic traffic counts over several periods in 1998 and 1999. The morning peak hour occurred between 7:00 a.m. and 8:00 a.m. and the evening peak hour occurred between 4:00 p.m. and 5:00 p.m. Automatic counting station, weigh-in-motion (WIM) also provided truck classification counts for RI 24.

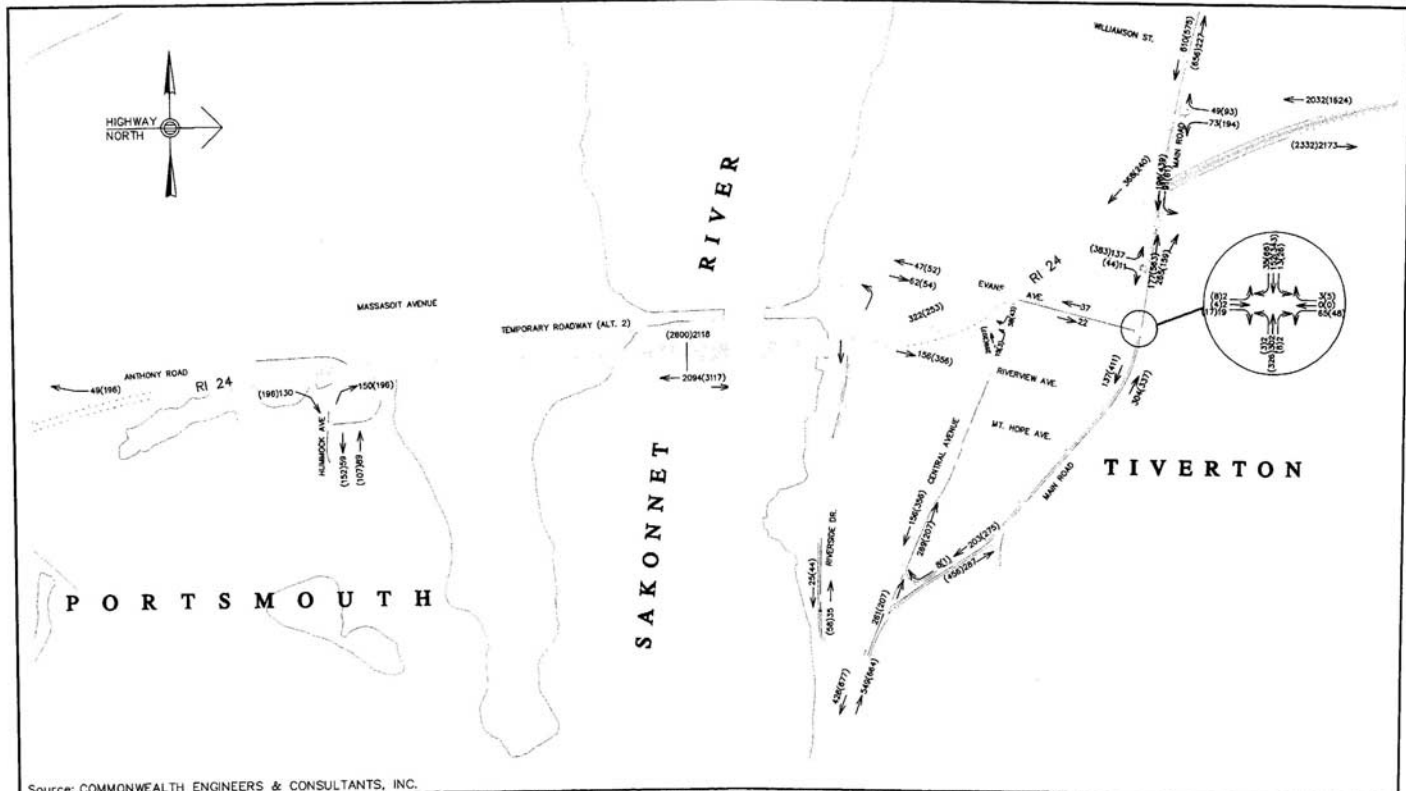
Future traffic volumes on the study area roadway network were projected to the year 2020. Traffic volumes include existing traffic, new traffic due to specific developments in the district, and new traffic due to normal regional traffic growth. In addition to site specific development in the district, an annual growth rate was applied to all existing roadway volumes, which represents traffic increases associated with regional population growth and future development in other areas not specifically addressed in previous sections. The RIDOT Planning and Traffic Management Section provided an annual growth rate of traffic of 1.35% throughout the project area.

The cumulative sum of the above factors is the 2020 Alternative 1: No-build traffic volumes. These future traffic volumes are redistributed to the roadway network in order to determine the traffic volumes for the roadway segments and intersection approaches within the district for Alternatives 2 through 5. The capacity analysis utilizes 2000 existing volumes and 2020 projected volumes for the project alternatives.

Figure No. 1 and 2 shows the a.m and p.m. peak hour volumes for the 2000 and 2020 design year respectively.



2000 AM AND PM PEAK HOUR TRAFFIC VOLUMES
MODEL PREDICTIONS FOR EXISTING ALIGNMENT (ALTERNATIVE 3)
SAKONNET RIVER BRIDGE PROJECT



Rhode Island
Department of Transportation
Federal Highway Administration

2020 AM AND PM PEAKHOUR TRAFFIC VOLUMES

SAKONNET RIVER BRIDGE PROJECT

Figure No.

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2.1 Traffic Operations

The traffic analysis was performed for all major roadway segments, ramp junctions and applicable intersections. The ramp junctions include the ramp interchange on RI 24 at both ends of the Sakonnet River Bridge: Main Road, Tiverton; and Anthony Road/Hummock Avenue, Portsmouth.

For all alternatives the Central Avenue interchange will be eliminated, diverting that traffic to Main Road. Additional local roadways within Tiverton were evaluated due to Alternative 3: Existing Alignment temporary bridge and detour route.

Table 1 indicates the number of lanes for each roadway segment and ramp. Table 2 identifies the number of approaches, parking status and signal indication for intersections within the project area.

TABLE 1 Lane Summary for RI 24 and Ramps

Highway Ramp Segment	Number of Lanes
RI 24 Northbound	
North of Main Road at Sakonnet River Bridge	2 2
South of Anthony Road/Hummock Avenue	2
RI 24 Southbound	
North of Main Road at Sakonnet River Bridge	2 2
South of Anthony Road/Hummock Avenue	2
Ramps	
RI 24 NB off-ramp at Hummock Avenue	1
RI 24 NB on-ramp at Hummock Avenue	1
RI 24 SB off-ramp at Anthony Road	1
RI 24 SB on-ramp at Anthony Road	1
RI 24 NB off-ramp at Central Avenue	1
RI 24 SB on-ramp at Central Avenue	1
RI 24NB off-ramp at Main Road	1
RI24 SB on-ramp at Main Road	1

Source: Commonwealth Engineers & Consultants, Inc.

TABLE 4-2 Intersection Approach Summary

Intersection	Number of Approaches	Parking	Signal
Anthony Road at RI 24 SB ramps	3	No	No
Hummock Avenue at RI NB ramps	3	No	No
Central Avenue at RI 24 SB ramp	3	No	No
Main Road at RI 24 NB ramp	3	No	No
Main Road at RI 24 SB ramp	3	No	No

Source: Commonwealth Engineers & Consultants, Inc.

2.2 Highway Capacity Analysis

A capacity analysis was conducted using the Highway Capacity Software version 3.2, published by the McTrans Center, University of Florida. The capacity of a specific facility, such as a highway segment or intersection, is classified by a level of service (LOS). The concept of LOS uses qualitative measures that characterize operational conditions with a traffic stream, and the perception of conditions by motorists and passengers. The descriptions of individual LOS characterize these conditions in factors including speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. LOS are designated as letters A through F, with Level A representing unimpeded flow which is ideal but only possible when the volume of traffic is small. Level F represents a highly impeded, packed condition. Generally, Level E has the maximum capacity for traffic flow rate.

The desired design condition is LOS-C since it ensures an acceptable operational level of service for the driver. Since LOS can vary considerably during the design hour, capacity and LOS evaluations focus on the peak 15 minute flow. Therefore, under the peak flow condition, a LOS-D is considered acceptable.

The 2000 and 2020 a.m. and p.m. peak hours for the no build, rehabilitation, and new alignment alternatives were evaluated and the resulting LOS for each are shown in Table 3. Alternative 3: Existing Alignment includes a temporary bridge with a detour route during construction, which consequently effects several local roadways within Tiverton. Figure 2 demonstrates the a.m. and p.m. peak hour volumes for the roadway segments and intersection approaches within the study area.

In addition to the bridge alternatives, a toll plaza maybe considered for project financing. A RI 24 one-way toll plaza on the northbound side would require elimination of the Hummock Avenue interchange and redirect traffic to the Boyd Lane interchange to the south. The Boyd Lane and Anthony Road intersection capacity analysis was developed to analyze potential toll plaza traffic impacts.

TABLE 3 Highway Capacity Analysis, Level of Service Summary

Location	2000 Existing Volume		2020 No Build Rehab. (Alt 1-2)		2020 Existing Align. (Alt. 3)		2020 New Alignment (Alt 4-5)	
	AM	PM	AM	PM	AM	PM	AM	PM
RI 24 NB North of Main Road	B	C	C	C	C	C	C	C
RI 24 NB at Sakonnet River Bridge	B	C	C	D	C	D	C	D
RI 24 NB South of Hummock Ave.	B	C	C	D	C	D	C	D
RI 24 SB North of Main Road	B	B	C	B	C	B	C	B
RI 24 SB at Sakonnet River Bridge	C	B	D	C	D	C	D	C
RI 24 SB South of Hummock Ave.	C	B	D	C	D	C	D	C
Main Road at RI 24	A	A	A	A	A	A	A	A
Main Road south of Evans Ave.	C	C	C	D	C	D	C	D
Riverside Drive	A	B	B	B	B	B	B	B
Evans Avenue	B	B	B	B	B	B	B	B

Source: HCS: Basic Freeway Sections Release 3.2, Multilane Rural and Suburban Highways Release 3.2, 1985 Two Lane Highway

RI 24 Northbound North of Main Road

Currently, this freeway section operates at LOS-B for the morning peak hour and LOS-C during the evening peak hour. In the design year 2020, Alternatives 1, 2 and 3-5 are expected to operate at LOS-C for both peak hours.

RI 24 Northbound at Sakonnet River Bridge

Currently, this section of RI 24 operates at LOS-B for the morning peak hour and LOS-C for the evening peak hour. In the design year 2020, alternative 1, 2, and 3-5 are expected to operate at LOS-C for the morning peak hour and LOS-D for the evening peak hour.

RI 24 Northbound South at Hummock Avenue

Currently, this section of RI 24 operates at LOS-B for the morning peak hour and LOS-C for the evening peak hours. In the design year 2020, all alternatives are expected to operate at LOS-C for the morning peak hour and LOS-D for the evening peak hour.

RI 24 Southbound North of Main Road

Currently this section of RI 24 operates at LOS-B for the morning and evening peak hours. In the design year 2020, all alternatives are expected to operate at LOS-C in the morning peak hour and LOS-B in the evening peak hour.

RI 24 Southbound at Sakonnet River Bridge

Currently, this section of RI 24 operates at LOS-C for the morning peak hour and LOS-B for the evening peak hour. In the design year 2020, all alternatives are expected to operate at LOS-C in the morning peak hour and LOS-D in the evening peak hour.

RI 24 Southbound South of Hummock Avenue

Currently, this section of RI 24 operates at LOS-C for the morning peak hour and LOS-B for the evening peak hour. In the design year 2020 all alternatives are expected to operate at LOS-D for the morning peak hour and LOS-C for the evening peak hour.

Main Road at RI 24

Currently, this section of Main Road operates at LOS-A through its four lane section. There are no improvements proposed for Main Road with the exception of the detour route under Alternative 3. During the construction period for Alternative 3, Main Road in this 4-lane section is expected to operate at LOS-B.

Main Road South of Evans Avenue

Currently, this section of Main Road operates at LOS-C and is expected to continue operating at LOS-C in the design year 2020 for the morning peak hour, and will operate at LOS-D for the evening peak hour. A decrease to LOS-E is expected for the Alternative 3 detour route during the construction period.

Riverside Drive

Currently, Riverside Drive operates at LOS-A in the morning peak hour and LOS-B in the evening peak hour. Riverside Drive is expected to operate a LOS-B for design year 2020 for both peak hour periods, with the exception of the detour route under Alternative 3 proposed detour route. Riverside Drive is expected to operate at LOS-E, the maximum flow rate for a two-lane roadway during the construction period under alternative 3.

Evans Avenue

Currently, Evans Avenue operates at LOS-B during both the morning and evening peak periods and is expected to maintain this LOS-B for design year 2020 under all alternatives, with the exception

of the detour route for Alternative 2. For the Alternative 3 detour route during construction, Evans Avenue is expected to operate at LOS-F impeded flow conditions for both peak periods.

2.3 Intersection Capacity Analysis

The 2000 and 2020 a.m. and p.m. peak hours for all alternatives were evaluated and the resulting LOS for each are shown in Table 4.

TABLE 4-4 Intersection Capacity Analysis, Level of Service Summary

Location	2000 Existing Volume		2020 No Build Rehab. (Alt 1-2)		2020 Existing Align. (Alt 3)		2020 New Alignment (Alt 4-5)	
	AM	PM	AM	PM	AM	PM	AM	PM
RI 24 NB off-ramp to Main Road	B	C	B	D	C	E	C	E
RI 24 NB on-ramp from Main Road	B	B	--	--	--	--	--	--
RI 24 SB on-ramp from Main Road	A	A	A	A	A	A	A	A
RI 24 SB off-ramp to Main Road	B	C		B	C	C	C	C
RI 24 Ramps on/off Anthony Road	A	B	B	B	B	B	B	B
Boyd Lane and Anthony Road.	C	C	C	E	C	E	C	E
Main Road and Evans Avenue	B	B	B	B	B	B	B	B
Riverside Drive and Main Road	A	B	B	B	B	B	B	B

-- Ramp Mitigation proposed under separate RIDOT Project
Source: HCS Two-Way Stop Control Analysis, Release 3.2

Intersection of RI 24 NB Off-ramp to Main Road

Under existing conditions this intersection is not signalized and operates at LOS-B during the morning peak hour and LOS-C during the evening peak hour. Under all alternatives this intersection is expected to generate additional traffic volume as a direct result of eliminating the Central Avenue off-ramp. In the design year 2020, this intersection is expected to operate at LOS-B in the morning peak hour and LOS-D in the evening peak hour. This intersection will decrease in LOS during both morning and evening peak hour under all alternatives, due to the additional traffic generated from Central Avenue.

Intersection of RI 24 NB On-Ramp from Main Road

Under current conditions, this intersection is not signalized and prohibits Main Road northbound traffic access due to the divided median on Main Road. This intersection is being reconfigured under a separate RIDOT project as previously described.

Intersection of RI 24 SB On-Ramp from Main Road

Under existing conditions, this intersection is not signalized and operates at LOS-A for both the morning and evening peak hours. In design year 2020, this intersection is expected to remain a LOS-A with the exception of the detour route option. It should be noted that the RIDOT intends to close either Central Avenue southbound ramp and/or Main Road southbound ramp to RI24 to improve safety. If this is done, this intersection will be signalized.

Intersection of RI 24 SB Off-Ramp to Main Road

This intersection is being reconfigured under a separate RIDOT project as previously described. This intersection operates at acceptable LOS during both the morning peak and evening peak hours.

Intersection RI 24 Ramps on and off Anthony Road

This intersection currently is not signalized and operates at LOS-A for the morning peak hour and LOS-B for the evening peak hour. This intersection is expected to maintain a LOS-B for design year 2020 in both peak hour periods.

Intersection of Boyd Lane and Anthony Road

Currently, this intersection is unsignalized and operates at LOS-C for both morning and evening peak hour periods. Irrespective of the alternative chosen, including No-Build, the Anthony Road approach will exceed capacity for the p.m. peak period in the design year 2020.

Intersection of Main Road and Evans Avenue

Currently, this intersection is not signalized and operates at LOS-B for the morning and evening peak hours. This intersection is expected to maintain LOS-B for all alignments for design year 2020 in both peak hours.

Intersection of Main Road and Riverside Drive

Currently, this intersection operates at an LOS-A for the morning peak hour and LOS-B for the evening peak hour. This intersection is expected to maintain LOS-B for all alignments for design year 2020 in both peak hours.

2.4 Ramps Analysis

The 2000 and 2020 a.m. and p.m. peak hours for all alternatives were evaluated and the resulting LOS for each are shown in Table 5.

TABLE 5 Ramp Junctions Capacity Analysis Summary

Location	2000 Existing Volume		2020 No Build Rehab. (Alt 1-2)		2020 Existing Align. (Alt 3)		2020 New Alignment (Alt 4-5)	
	AM	PM	AM	PM	AM	PM	AM	PM
Main Road at RI 24 SB On-Ramp Junction	C	B	D	C	D	C	D	C
Main Road at RI 24 NB Off-Ramp Junction	B	B	B	C	B	C	B	C
Central Avenue at RI 24 SB On-Ramp Junction	B	C	--	--	--	--	--	--
Central Avenue at RI 24 SB Off-Ramp Junction	C	B	--	--	--	--	--	--
Anthony Road at RI 24 SB On-Ramp Junction	C	B	D	C	D	C	D	C
Anthony Road at RI 24 SB Off-Ramp Junction	C	C	D	D	D	D	D	D
Hummock Avenue at RI 24 NB On-Ramp Junction	B	C	C	D	C*	D*	C*	D*
Hummock Avenue at RI 24 NB Off-Ramp Junction	B	C	C	D	C*	D*	C*	D*

-- To be eliminated based on current Design Study Report

*Will be eliminated under toll plaza option

Source: HCS: Ramps and Ramp Junctions Release 3.2

Main Road at RI 24 SB On-Ramp Junction

Currently, this ramp junction operates at LOS-C during the morning peak hour and LOS-B during the evening peak hour. In the design year 2020, this ramp junction is expected to operate at LOS-D for the morning peak hour and LOS-C for the evening peak hour for all alternatives. A Design Study Report for this ramp is currently under design by RIDOT to determine the feasibility of construction a new RI24 southbound ramp to improve merge lengths and sight distances.

Main Road at RI 24 NB Off-Ramp Junction

Currently, this ramp junction operates at LOS-B during the morning and evening peak hours. In the design year 2020, this ramp junction is expected to operate at LOS-B in the morning and LOS-C in the evening peak for all alternatives.

Central Avenue at RI 24 SB On-Ramp Junction

Currently, this ramp junction operates at LOS-B for the morning peak hour and LOS-C for the evening peak hour. In the design year 2020 this ramp will not be functioning, either closed or removed.

Central Avenue at RI 24 NB Off-Ramp Junction

Currently, this ramp junction operates at LOS-C for the morning and LOS-B for the evening peak hour. In the design year 2020 this ramp will not be functioning, either closed or removed.

Anthony Road at RI 24 SB On-Ramp Junction

Currently this ramp junction operates at LOS-C for the morning peak and LOS-B for the evening peak hours. In design year 2020, this ramp is expected to operate at LOS-D in the morning peak and LOS-C in the evening peak for all alternatives.

Anthony Road at RI 24 SB Off-Ramp Junction

Currently this ramp junction operates at LOS-C for both the morning and evening peak hours. In the design year 2020, this ramp is expected to operate at LOS-D in the morning and evening peak hours for all alternatives.

Hummock Avenue at RI 24 NB On-Ramp Junction

Currently, this ramp junction operates at LOS-B in the morning peak and LOS-C in the evening peak hour. In the design year 2020, this ramp is expected to operate at LOS-C in the morning peak and LOS-D in the evening peak for all alternatives.

Hummock Avenue at RI 24 NB Off-Ramp Junction

Currently, this ramp junction operates at LOS-B for the morning peak hour and LOS-C in the evening peak hour. In the design year 2020, this ramp is expected to operate at LOS-C in the morning peak hour and LOS-D in the evening peak hour. Under the toll plaza build option, this ramp will be eliminated.

3.1 Mitigation Measures

Based on the capacity analysis, it is anticipated that RI 24 over the Sakonnet River Bridge will operate at LOS-C and D in the design year 2020, regardless of the alternative implemented. Under peak flow conditions this LOS is acceptable; therefore, a four-lane highway is projected to meet the transportation demand for 2020.

Since traffic volume under all alternatives will increase to the Main Road RI 24 northbound off-ramp due to closure of the Central Avenue ramps, a traffic signal system at the Main Road ramp should be considered.

Based upon the capacity analysis performed in the project area the following mitigation measures are identified:

Alternative No. 1: No Build and Alternative No. 2: Rehabilitation

The Central Avenue interchange in Tiverton was originally built in 1956 to serve as the end of the highway until RI 24 was completed in 1966. This half-interchange consists of a RI 24 southbound on-ramp to the bridge and a RI 24 northbound off-ramp from the bridge. The Central Avenue on-ramp to RI 24 southbound is 24-feet (7.3 m) wide with a yield sign at the highway approach. There is little acceleration distance for motorists entering the highway. This is unusual and unexpected by motorists since all other entrance ramps to RI 24 in Rhode Island have sufficient acceleration lanes to safely merge with the high speed traffic. For these alternatives the Central Avenue interchange should be closed by a physical barrier. Improvements to the Main Road/RI 24 interchange under a separate RIDOT project will be designed to incorporate this traffic.

Alternative No. 3: Existing Alignment

For this alternative, it is recommended that improvements be considered at the following intersections:

1. Evans Avenue and Riverside Drive: *geometric improvements*
2. Evans Avenue and Main Road: *temporary signalization*
3. Riverside Drive and Main Road: *major geometric improvements, temporary signalization*
4. Main Road and RI 24 southbound off-ramp: *temporary signalization*

Alternative 4: North Alignment and Alternative 5: South Alignment

The intersection improvements recommended for these alternatives include the Anthony Road/Boyd Lane signal with the toll plaza option, and the proposed signal at the RI 24 northbound Main Road off-ramp.

4.1 Toll Plaza Analysis

An analysis of a potential toll plaza on RI 24 was conducted in order to assess the feasibility of this method of project funding. The toll analysis was coordinated with the Rhode Island Turnpike and Bridge Authority (RITBA), which operates and maintains the Claiborn Pell Bridge with toll revenues and until May 1998 operated the Mount Hope Bridge toll plaza. RITBA provided traffic, toll revenue and operations, and bridge operation and maintenance data from the Pell and Mount hope Bridges for use in the RI 24 analysis.

4.2 Tolling Scenarios

The toll scenarios shown in Table 6 were analyzed for their effect on traffic in the study area, and their ability to provide adequate financing for the Sakonnet River Bridge project at a reasonable and acceptable toll level.

TABLE 4-6 Toll Plaza Scenarios

Scenario	Pell Bridge	Mt. Hope Bridge	Sakonnet River Bridge
1	Two-Way Toll	No Toll	Two-Way Toll
2	Two-Way Toll	No Toll	One-Way Toll
3	Two-Way Toll	One-Way Toll	One-Way Toll
4	One-Way Toll	One-Way Toll	One-Way Toll
5	One-Way Toll	½ Fare One-Way Toll	One-Way Toll
6	One-Way Toll	One-Way Toll	One-Way Toll

Source: URS Corporation

The fact that the three bridges connect to Aquidneck Island encourages one-way toll collection, as long as tolls are collected either all inbound or all outbound. The outbound direction was chosen for the toll analysis since the Claiborn Pell Bridge toll plaza administration building is on the outbound side of the existing plaza. The analyses do not differ if inbound tolling were to be preferred.

4.3 Traffic Impacts of Tolling

The Rhode Island Statewide traffic model was updated to 1998 demographic conditions, then utilized to determine the elasticity of traffic in the study area when the different tolling scenarios are modeled.

When the Pell and Sakonnet bridges are tolled, and the Mount Hope Bridge remains untolled, the volume of trips into and out of Aquidneck Island are reduced by approximately 9%. If the Mount Hope Bridge is also tolled, then total trips are reduced by 14%. It is noted that the model did not show the reduced RI 24 traffic being routed to RI 114 (Mount Hope Bridge) when only the Pell and Sakonnet bridges are tolled. This indicates that tolling reduces the number of trips to Aquidneck Island, not the direction that trips are taken.

Regarding the arterials in the project area, traffic increases as much as 3% on RI 136 in Bristol if the Mount Hope Bridge is not tolled but the Pell and Sakonnet are.

4.4 Mitigation Methods

The proposed toll booth plaza would impact the Anthony Road and Boyd Lane intersection. Under the no-build alternative this intersection is expected to operate at capacity; therefore, the additional traffic created from the elimination of the RI 24 Hummock Avenue ramps would result in the Anthony Road/Boyd Lane interchange exceeding capacity. If the toll plaza is implemented it is recommended that signalization of the Anthony Road/Boyd Lane interchange be considered.