

**ROUTE 23 SUSSEX BOROUGH  
REALIGNMENT AND  
PAPAKATING CREEK BRIDGE REPLACEMENT  
PROJECT PURPOSE AND NEED STATEMENT**

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*Submitted to:*

**New Jersey Department of Transportation**

*Submitted by:*

**PB AMERICAS, INC.**

## **1.2 PURPOSE AND NEED FOR THE PROPOSED PROJECT**

### **1.2.1 Project Purpose**

PB has reviewed the Project Purpose & Need for the Proposed Project as set forth in the Environmental Assessment for the original Route 23 Realignment Project in light of the NJDOT's proposed Smart Solutions alternative which provides for a one-way couple utilizing the existing section of Route 23 for northbound traffic and a portion of existing Walling Avenue for the new southbound alignment. This couple drastically reduces the amount of ROW required and reduces traffic flow on existing Route 23 which is currently a two-lane state highway with no shoulders as compared to the Smart Solutions Alternative which proposes one-way travel paths consisting of Route 23 northbound and southbound roadway. The proposed Route 23 northbound roadway will consist of a 12 foot wide single travel lane with proposed bicycle compatible 10 foot wide right shoulder and 8 foot wide left shoulder. The proposed Route 23 southbound roadway will consist of a 12 foot wide single travel lane with a bicycle compatible 10 foot wide right shoulder and a 5 foot wide left shoulder.

We believe this smart-sized alternative does meet the four criteria as defined by the original Project Purpose as follows:

- **Provide a safe roadway system that allows the movement of people and goods along Route 23 through the Borough of Sussex.**

By separating traffic flows using a one-way couple, the number of traffic conflicts along the corridor are reduced by a third. In addition, the daily traffic volume on present Route 23 is reduced by one-half while opposing traffic confronted by left-turning vehicles is eliminated thus reducing the potential for rear-end and angle crashes which according to the Purpose and Need finding accounted for a majority of crashes along Route 23; such crashes were also higher than the statewide average by type. Moreover, the introduction of a wide shoulder will further enhance safety not only for turning traffic but also for traffic entering the travel-way.

The elimination of the opposing left-turn conflicts will prove particularly beneficial in the "dogleg"/S-curve section of Route 23 between Route 284 and Walling Avenue where more than one-half of all crashes occurred in the study area for the years that were examined (2005-07). Conversion of the S-curve to one-way operations will provide a larger cartway for vehicles to negotiate the curve and eliminate opposing traffic to help reduce the incidence of crashes.

- **Provide a more efficient and continuous flow of traffic along Route 23 through the Borough of Sussex.**

The separation of traffic flow to two separate alignments with improved, wider cross-sections and shoulders will - as noted previously - reduce the volume of traffic and also will eliminate traffic movements and conflicts at the three signalized intersections along Route 23. The reduction in movements at these intersections will eliminate at least one traffic signal phase, thereby providing added signal timing for both pedestrians and the remaining traffic movements. Thus the overall anticipated level of service on each movement should improve over and above that postulated under the original IPA alignment.

One potential negative aspect of the proposed alignment is that truck traffic destined to Route 284 (Main Street) from Route 23 SB under the one-way couple would have to travel one additional mile from Loomis Avenue south to where the one-way couple converges at the proposed signalized intersection at Lower Unionville Road and then turn left to travel north along Route 23 to the signalized intersection at Route 284.

However, based on the newly obtained Origin-Destination (O-D) data for heavy trucks, the proposed Smart Solutions build alternative can be expected to have minimal impact on truck traffic through the study area because the majority of heavy trucks were observed to be traveling fully through the study area along both northbound and southbound Route 23. Heavy truck movements between Route 23 SB and Route 284 NB were minimal—between 6:00 AM and 6:00 PM on a typical weekday, only five (5) trucks completed this move. With the diversion in place, the small number of heavy trucks wishing to travel between Route 23 SB and Route 284 NB would likely experience somewhat longer travel times due to the longer, less direct route along the diversion. However, two difficult left turns (first onto the problematic Loomis Avenue segment, and second from Route 23 to Route 284) would be eliminated from the movement. Furthermore, roadway geometry, intersection configurations, and turns along the new route would be drastically improved compared to the existing one, thereby reducing travel times for the vast majority of traffic in the area and increasing safety.

- **Replace the bridge carrying Route 23 over Papakating Creek due to its structural and geometric deficiencies.**

The Smart Solutions alternative retains the replacement of the Route 23 over Papakating Creek Bridge and thus satisfies this project purpose.

- **Minimize social and environmental impacts and meet the Project Need in a cost-effective manner.**

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By separating the flow of traffic and thereby reducing the volume of traffic traveling along present Route 23, the quality of life for the residents and businesses along this route will be improved with the one-way couple. Although access to some homes and businesses may involve a more circuitous path, the improvements to traffic flow and wider one-way cross-section will reduce congestion and make such access easier. Given the existing cross-streets along the corridor, such movement will involve no more than going around the block (According to NJDOT, the local municipality has embraced this one-way concept.). The elimination of opposing traffic and opposing left-turns will ease access to many businesses and residences. The introduction of a wide shoulder will also enhance safety for both turning traffic and for vehicles entering the travelway from adjacent driveways and side streets. Trucks traveling south along Route 23 (the current Walling Avenue) will be prohibited from turning left from Route 23 onto the local cross streets (including Brookside Avenue and Weibel Plaze/4th Street) by signage. These streets are residential in nature and considered too narrow to accommodate heavy trucks. This design feature will serve to minimize the social and environmental impacts of the proposed alignment to local residences and businesses.

The environmental consequences will be substantially reduced compared to the proposed IPA alternative. There will be a reduction in the area of freshwater wetlands disturbance, particularly in the existing wetland complex associated with the Papakating Creek. The one-way couple will significantly reduce the area of new impervious surface to be constructed due to the reduction in the width of proposed realignment and this will result in a corresponding decrease in the size and area required for proposed wet basins needed to comply with the Stormwater Management Regulations. Due to the reduction in the roadway width and the land requirements for the basins, the one-way couple will substantially reduce required ROW taking, thus decreasing the impact such takings have on the character and function of the community, reduced economic impact in terms of lost revenue from tax ratables and the reduction in the overall project cost.

## **1.2.2 Project Need**

### **Master Plan Consistency**

The proposed Smart Solutions Alternative involves the realignment of the southbound lane of Route 23 through Sussex Borough and the replacement of the Route 23 Bridge over Papakating Creek. The project can be viewed as consistent with the State Development and Redevelopment Plan (SDRP) as follows:

- Statewide Public Investment Priorities Policy 1 advocates that the highest priority be given to infrastructure projects that mitigate life-threatening situations and emergent threats to public health and safety. This applies to the Smart Solutions Alternative. The realignment of southbound Route 23 and the reduction of traffic volume, coupled with elimination of opposing traffic movements, traveling through the S-curve will result in reduction of the high crash rate at this location.
- Route 23 provides access to recreational areas in northwest New Jersey such as the Delaware Water Gap National Recreation Area. The Smart Solutions Alternative therefore supports Statewide Transportation Policy 19, which calls for the promotion of travel and tourism by making appropriate transportation investments that consider seasonal demands.
- The Smart Solutions Alternative is consistent with Statewide Transportation Policy 12, which advocates efficient utilization of capacity and management of the existing transportation system.
- Since the Smart Solutions Alternative contains a reconstruction component, it relates to Statewide Transportation Policy 7, which states that preservation and maintenance of the existing transportation network is the highest transportation priority.
- Since the Smart Solutions Alternative includes the installation of sidewalk on the new bridge, and the provision of new bicycle compatible shoulders along the existing (NB) and realigned (SB) portions of Route 23, the project addresses Statewide Transportation Policy 11, which emphasizes the movement of people through such alternative travel modes as bicycles.

### **System Linkage**

A portion of the project is located in the downtown area of Sussex Borough where there is a high development density and numerous side streets. This produces a great deal of turning movements along the corridor, which disrupts traffic flow. There are no shoulders along this section of roadway and the lack of shoulders

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prevents traffic from circumnavigating around cars waiting to turn onto side streets and driveways, which further deteriorates traffic flow. The proposed Smart Solutions Alternative will provide the missing full width shoulder, which will allow traffic to maneuver around turning vehicles. In addition, the one-way pair feature of this alternative will eliminate turning-movement conflicts from opposing traffic and thus facilitate improved traffic operation and improved safety.

Currently, the Loomis Avenue portion of the S-curve located in the downtown area of Sussex Borough experiences high traffic densities due to its short length (less than 525 feet long) and location between two busy signalized intersections. It is expected that in the future, the obsolescent layout and design of the Loomis Avenue portion of the S-curve will become the primary cause of the deterioration of overall traffic flow and operational conditions in the area, making traffic movements difficult and contributing to further travel flow interruptions and reduced speeds. The Route 23 SB approach to Route 284 is expected to fail by 2028 during the PM peak under the no build scenario. Overall, the existing Route 23/Route 284 intersection will experience near failure (LOS E) by 2028—an unacceptable condition. Heavy truck traffic along Route 23 through the area, which is slowed by the S-curve's poor geometry and sharp left turns, also contributes to the slowing of general traffic, and will continue to do so as volumes in the area increase; The proposed Smart Solutions Alternative will reduce congestion in and around the S-curve by diverting southbound Route 23 traffic to the Route 23 Realignment and substantially reducing both the volume of traffic and the number of turning movement conflicts along existing Route 23. The reduction in the number of turning movements at the intersections will improve highway capacity and reduce congestion. The provision of full-width shoulders will provide adequate space to accommodate truck turning maneuvers which will be unimpeded by opposing traffic.

The existing roadway character and traffic conditions also impact pedestrian circulation and local retail uses. The S-curve, and the problems associated with it, creates a safety issue especially for pedestrians. Congestion along the roadway may discourage downtown trips by local residents, with impacts on the businesses in the retail core of the Borough. The proposed Smart Solutions Alternative will reduce congestion as noted above and will enhance bicycle and pedestrian circulation through the incorporation of a bicycle lane and sidewalks. This alternative will improve safety and promote bicycle and pedestrian use. The Smart Solutions Alternative substantially reduces the right of way taking within the central business district of Sussex Borough and will have a positive impact on businesses by eliminating several business relocations which would have been required under the original alternative. In addition, since the smaller footprint of the Route 23 Realignment in the Smart Solutions Alternative is less land intensive, there will be enhanced opportunities for redevelopment of the abutting properties along the Realignment, which has been a stated goal of Sussex Borough.

## Capacity

Route 23 is currently one-lane with no shoulders in each direction through the Central Business District of Sussex Borough; however, Route 23 is not a continuous roadway. Several turns are required for traffic to remain on Route 23 as it passes through the Borough. Frequent stops at traffic signals and left/right turns are part of the current configuration. Trucks often have difficulty negotiating these turns.

Current traffic conditions were evaluated for the major intersections of this project. Capacity analyses were performed for three signalized intersections using balanced traffic volumes. The volumes were counted by PB in the fall of 2008.

PB utilized SYNCHRO Version 7, which emulates the latest release of the *Highway Capacity Manual (HCM)*, as updated in 2000, to calculate intersection level of service (LOS). The standard performance measure for intersections is the LOS criteria. LOS has been defined in the *HCM* as a “qualitative measure describing conditions within a traffic stream, and their perception by motorists and/or passengers”. LOS is divided into six categories, ranging from LOS ‘A’ (free-flow traffic) to LOS ‘F’ (traffic flows break down over capacity volume conditions).

The capacity of a signalized intersection was determined for individual turning movements at the intersection and for the overall intersection. The *HCM* defines level of service for a signalized intersection based on control delay. Control Delay is a measure of motorist delay due to the presence of the intersection and includes slowing, stopping, and starting time. The level of service criteria for signalized intersections is shown in Table 1 below.

**Table 1**  
**LOS Criteria for Signalized Intersections\***

Level of Service	Control Delay per Vehicle (sec)
A	$\leq 10.0$
B	$> 10.0$ and $< 20.0$
C	$\geq 20.0$ and $< 35.0$
D	$\geq 35.0$ and $55.0 \leq$
E	$\geq 55.0$ and $\leq 80.0$
F	$> 80.0$

\*Source: *HCM2000*, TRB, 2000

There are three signalized intersections within the project area. The intersection of Route 23 and Loomis Avenue (CR 639) operates at LOS ‘C’ during the AM peak period, LOS ‘B’ during the Midday peak period, and LOS ‘B’ during the PM peak

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period. The intersection of Route 23 and East Main Street (Route 284) operates at LOS 'B', LOS 'B', and LOS 'C' respectively. And the intersection of Route 23 and Lower Unionville Road operates at LOS 'A', LOS 'B', and LOS 'B' respectively. (See Table 2)

**Table 2: Existing Year Peak Hour LOS Summary  
Signalized Intersections (2008)**

Location	Approach	2008 AM Peak Hour		2008 MID Peak Hour		2008 PM Peak Hour		
		Average Delay (sec)	LOS	Average Delay (sec)	LOS	Average Delay (sec)	LOS	
<b>Route23/Walling Ave.</b>								
Route 23/Walling Ave. & Loomis Ave.	Northbound	16.1	B	18.8	B	19.8	B	
	Southbound	39.5	D	36.8	D	36.5	D	
	<b>Loomis Ave.</b>							
	Eastbound	14.7	B	9.9	A	13.5	B	
	Westbound	13.2	B	12.5	B	7.9	A	
	Overall Intersection	23	C	19.4	B	16.4	B	
<b>Route 23</b>								
Route 23 & Route 284	Northbound	15.1	B	15.8	B	18.9	B	
	Southbound	6.8	A	7.9	A	17.7	B	
	<b>Route 284</b>							
	Westbound	32.8	C	31.4	C	31.3	C	
Overall Intersection	16	B	15.8	B	20.4	C		
<b>Route23</b>								
Route 23 & Lower Unionville Rd.	Northbound	6.3	A	11.7	B	14.0	B	
	Southbound	7.6	A	11.5	B	11.4	B	
	<b>Lower Unionville Rd.</b>							
	Eastbound	0.0	A	32.3	C	31.8	C	
	Westbound	35.4	D	33.9	C	33.8	C	
	Overall Intersection	9.3	A	14.5	B	15.4	B	

PB developed a projected growth rate of ½ percent per year for traffic in the study area. Given this rate of growth, these service levels will degrade unless modifications are made to the existing roadway in order to add capacity or divert southbound Route 23 onto a parallel roadway via Wallington Avenue. A conversion of Route 23 into a one-way couple system would divert SB through traffic from existing roadway that improves highway operations and safety.



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Table 3 includes the LOS summary for the future no-build year 2028. Given this scenario, performance at several key locations will degrade to LOS E or F. These are the southbound approach of Route 23 at Route 284 during the 2028 PM peak (LOS F) and the overall performance at this intersection during the same PM peak (LOS E)

**Table 3: No-build Peak Hour LOS Summary  
Signalized Intersections (2028)**

Location	Approach	2028 AM Peak Hour		2028 MID Peak Hour		2028 PM Peak Hour		
		Average Delay (sec)	LOS	Average Delay (sec)	LOS	Average Delay (sec)	LOS	
<i>Route23/Walling Ave.</i>								
<b>Route 23/Walling Ave. &amp; Loomis Ave.</b>	Northbound	15.2	B	17.6	B	19	B	
	Southbound	44	D	37.4	D	38.2	D	
	<i>Loomis Ave.</i>							
	Eastbound	19	B	12.2	B	24.2	C	
	Westbound	14.6	B	14.7	B	21.6	C	
	Overall Intersection	27	C	20.9	C	25.5	C	

<i>Route 23</i>								
<b>Route 23 &amp; Route 284</b>	Northbound	16.5	B	10.4	B	29.4	C	
	Southbound	8	A	17.2	B	145.9	F	
	<i>Route 284</i>							
	Westbound	34.1	C	31.5	C	31.5	C	
	Overall Intersection	17	B	17.1	B	71.2	E	

<i>Route23</i>								
<b>Route 23 &amp; Lower Unionville Rd.</b>	Northbound	6.9	A	10.7	B	20.4	C	
	Southbound	8.2	A	12.6	B	12	B	
	<i>Lower Unionville Rd.</i>							
	Eastbound	0.0	A	32	C	31.6	C	
	Westbound	35.4	D	33.8	C	33.7	C	
	Overall Intersection	10.0	A	14.4	B	19.2	B	

Under the 2028 build scenario, performance at these locations of concern improves significantly. The southbound approach of Route 23 at Route 284 is eliminated under the build condition and the overall performance at this intersection during the same PM peak improves from LOS E to LOS B. (see table 4). Overall performance at each intersection is LOS B for the future build scenario.

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**Table 4: Build Alternative Peak Hour LOS Summary  
Signalized Intersections (2028)**

Location	Approach	2028 AM Peak Hour		2028 MID Peak Hour		2028 PM Peak Hour	
		Average Delay (sec)	LOS	Average Delay (sec)	LOS	Average Delay (sec)	LOS
<b>Route 23/Walling Ave. &amp; Loomis Ave.</b>	<i>Route23/Walling Ave.</i>						
	Northbound						
	Southbound	29.6	C	29.9	C	29.7	C
	<i>Loomis Ave.</i>						
	Eastbound	6.4	A	5.6	A	5.5	A
	Westbound	4.2	A	4.4	A	9.1	A
	Overall Intersection	13	B	12	B	12.1	B
<b>Route 23 &amp; Route 284</b>	<i>Route 23</i>						
	Northbound	6.1	A	5.9	A	6.5	A
	Southbound						
	<i>Route 284</i>						
	Westbound	33.6	C	32.8	C	28.7	C
Overall Intersection	16	B	12.7	B	10.6	B	
<b>Route 23 &amp; Lower Unionville Rd.</b>	<i>Route23</i>						
	Northbound	8.5	A	8.5	A	19.0	B
	Southbound						
	<i>Lower Unionville Rd.</i>						
	Eastbound	24.9	C	17	B	15.7	B
	Westbound	19.8	B	21	C	18.4	B
Overall Intersection	19.2	B	14.2	B	17.5	B	

## **Traffic Safety and Operational Condition**

PB analyzed three years of crash data (January 2005 through December 2007) provided by NJDOT's Bureau of Safety Programs. The analysis includes data for Route 23, from MP 39.10 (near CR 565) to MP 40.13 (Newton Ave), and Route 284 near the intersection with Route 23 (MP 0.0 to 0.10). During this three-year period, a total of 90 crashes were reported within the project study area. PB analyzed crash data at the three major signalized intersections within the corridor (Lower Unionville Rd, Route 284, and CR 639/Walling Ave), as well as midblock sections between intersections throughout the study corridor.

The project area includes two distinct roadway cross sections. Between just north of Lower Unionville Road (MP 39.60) and south of CR 565 (MP 39.10), Route 23's cross-section consists of two lanes with a shoulder. Through this segment, Route 23 experienced a crash rate of 1.92 crashes per million vehicle miles (crashes/mvm), which falls below the 2007 statewide average crash rate of 2.90 crashes/mvm for that cross section type. From north of Lower Unionville Rd (MP 39.60) through Newton Ave (MP 40.13), Route 23's cross-section is two lanes without a shoulder. This portion of the study area experienced a crash rate of 6.28 crashes/mvm, which is greater than the 2007 statewide average of 4.34 crashes/mvm for similar cross-sections.

Most of the crashes (56.7 percent) within the study corridor were same-direction rear-end, which exceeds the statewide average of 45.7 percent for this crash type. Other crash type overrepresentations included angle collisions (15.6 percent actual, 11.1 percent statewide average), encroachment (7.8 percent actual, 0.30 percent statewide average), animal (3.3 percent actual, 3.0 percent statewide average), and backing (3.3 percent actual, 0.8 percent statewide average).

The bulk of all crashes occurred near the S-curve portion of Route 23, between Munson Street and Newton Avenue (MP 39.90 – MP 40.13). This portion of the study area accounted for 57 percent of the total crashes (51 crashes). There was a decreasing trend in same-direction, rear-end crashes through this section over the three year period. There were 11 such crashes in 2005, nine in 2006, and four in 2007. Simultaneously, there was an increasing trend in turning movement crashes (right angle, angle, and encroachment): one in 2005, eight in 2006, and eight in 2007.

South of Munson Street, outside of the S-curve portion noted above, 26 of the 38 crashes that occurred (68 percent) were same-direction rear-end, which exceeds the 2007 statewide average for this type (45.7 percent). The signalized intersection at Lower Unionville Road, the other major intersection in the study area, experienced relatively few crash incidents. Two crashes occurred at or near this intersection in 2005, four in 2006, and two in 2007. At this intersection, four crashes were same-direction, rear-end, one crash was head-on, and one crash involved an animal in the roadway.

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Overall the data indicate the bulk of the crashes are of the same-direction rear end and angle types and that these rates were higher than the statewide average for each type. These types of crashes are often related to vehicles having stopped and waiting to turn left against opposing traffic.

The proposed Smart Solutions Alternative will decrease the crash rate along the existing Route 23 from milepost 39.5 to milepost 40.1. In the Smart Solutions Alternative, the one-way pair utilizing Route 23 Realignment will significantly reduce the existing high volume of traffic on existing Route 23 within the Borough of Sussex business district; relieve congestion and reduce the number of vehicle turning conflicts thus reducing the crash rate.

### **Replacement of Route 23 Bridge over Papakating Creek**

The existing structure, built in 1941 (Structure No. 1904-154), is a four-span simply supported concrete encased steel girder bridge. The bridge is not eligible for listing on the National Register of Historic Places. Also beneath the existing structure there is an abandoned railroad bed that currently serves as an informal biking trail. The bridge currently carries a 12-foot lane, 8-foot right shoulder and 4-foot left shoulder in each direction, separated by a 6-foot raised concrete median.

Based upon the Tenth Cycle Bridge Re-evaluation Report dated October 1999, the structure is considered structurally deficient primarily due to the poor condition of the substructure elements and bridge deck. The substructure is in poor condition due to the severe cracks and spalls at the base of all the piers. The spalls have resulted in a reduction of approximately 25 percent of the bearing area. The deck is in poor condition due to bumpy patches throughout the deck and spalls over 25 percent of the deck area. The superstructure is in fair condition with large spalls in the concrete encasement and rusted steel at the ends of the bottom flange. All bearing plates show moderate rust.

Rehabilitation of the existing Route 23 Bridge over Papakating Creek does not appear practical, since major elements of the bridge would need to be replaced. The proposed Smart Solutions Alternative succeeds in addressing this need by replacing the existing structure with a new structure at the same location. The new bridge would be constructed with standard lane widths of 3.6 meters (12 feet), shoulders and median. Construction will be staged so that one lane of traffic is open in each direction during the construction.

### **1.2.3 Summary**

In developing and designing the proposed Smart Solutions Alternative, NJDOT has sought to replace the Route 23 structure over Papakating Creek and upgrade the existing roadway to current design standards in a cost-effective manner.

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The existing alignment runs through a historic and residential area. Large traffic volumes and heavy trucks, which must negotiate the S-curve, detract from the quality of the area. As traffic increases over time due to growth within the region, the air and noise impacts on these areas will worsen if no action is taken. The discontinuous roadway alignment also causes reduced traffic speeds and increased traffic turning movements, which result in a further degradation of air quality within the project area. The proposed Smart Solutions Alternative will reduce traffic volume and the number of trucks on existing Route 23 alignment through the historic district; it will enhance capacity and reduce congestion and thus reduce further degradation of air quality.

Environmental and social sensitivity are of great importance to the completion of this project. The proposed Smart Solutions Alternative has been designed to minimize effects to the local community, wetlands, hazardous materials and other environmental concerns and to do so in a cost effective manner. The Smart Solutions Alternative will result in only one displacement of commercial property on the alignment. No residences will be displaced in this Alternative. The displaced commercial establishment will be assisted in relocating to a suitable location.

In summary, both the need to replace the Route 23 Bridge over Papakating Creek and the importance of improving traffic circulation in the region through the construction of the Route 23 Realignment have resulted in the development of a proposed Smart Solutions Alternative that meets the four project needs outlined above. This proposed alternative better fulfills these objectives than other alternatives examined to date.