

**Alternative Analysis
Bear Island Road Extension
SAC 2014-00855-2IU**

Introduction

The Town of Summerville (the Town) proposes to provide a connection between US 17A and the new Nexton Parkway.¹ The project is located in Summerville, SC, and includes the existing paved roadways, the storm water ditches adjacent to the roadway, maintained residential areas, forested uplands, forested wetlands, and channelized streams. Road locations are indicated on Sheet 1.

Project Purpose and Need

The purpose of the proposed improvements is to improve traffic flow from US 17A to the proposed Nexton Parkway. Providing additional traffic capacity between US 17A and Nexton Parkway would provide improved access to Interstate 26. The proposed improvements are needed to accommodate existing and projected development and population growth in the area and to address existing capacity deficiencies.

Intersection analyses were performed and levels of service (LOS) were defined at intersections located in the project study area based on the Highway Capacity Manual. The capacity analyses for both reports were conducted using Synchro software and based on peak hour traffic data, existing roadway and intersection geometrics, traffic controls, and projected traffic data. Six levels of service (LOS) are defined for each type of facility, from A (the best) to F (the worst). These grades are an indication of the comfort and convenience associated with driving. The AM Peak and PM Peak Hours were used to model potential congestion in the morning and evening rush hours.

Table 1.0 depicts the Levels of Service (LOS) of the No-Build Alternative in 2040 (the project design year). The No-Build Alternative is the continuation of the existing conditions without the construction of the proposed project.

Table 1.0 No-Build Alternative in 2040		
Intersection	Level of Service (Delay in Seconds)	
	AM Peak	PM Peak
Nexton Parkway at Frontage Road B	F (9,145.6)*	F (Error)^
Frontage Road B at Holiday Dr./Sheep Island Road	B (13.1)*	F (194.4)*
Sheep Island Road at Holiday Drive	B (11.2)*	F (140.0)*
Sheep Island Road at Bear Island Road	C (16.2)*	F (8,929.2)*
Bear Island Road at Nexton Parkway	N/A	N/A
* LOS and delay reported for Stop Controlled intersections is that of the approach with the highest delay. ^ Demand exceeds capacity and queue is theoretically infinite, therefore Traffic Model cannot calculate delay. Source: Michael Baker International Inc. (2015)		

¹ Past documents have referred to this Roadway as the Sheep Island Parkway. Since this discussion includes multiple references to Sheep Island Road, in order to distinguish between the two the future Parkway is referred to as the Nexton Parkway in this document.

As shown in Table 1.0, by 2040, without additional traffic improvements in the area, all major intersections would be over capacity with a LOS of F in the PM Peak Hour. Therefore, in order to address traffic flow between US 17A and Nexton Parkway, additional traffic capacity improvements beyond the existing condition are needed.

Alternatives

In addition to the No-Build Alternative, three additional alternatives were studied during project development. These alternatives include the Bear Island Road Extension (Alternative 1), the Widening of Sheep Island Road from Berkeley Circle to Frontage Road B and improvements to Frontage Road B (Alternative 2), and the Widening of Sheep Island Road and Frontage Road B from Berkeley Circle to the new Nexton Parkway (Alternative 3).

No Build Alternative

The No-build Alternative is defined as the continuation of existing conditions for the project area. Under the No-build Alternative, no improvements to existing infrastructure would occur. Since no improvements would occur, the No-Build Alternative would not meet the purpose and need of providing additional capacity between US 17A and the new Nexton Parkway to improve traffic flow. Therefore, since the No-Build Alternative does not meet the purpose and need of the proposed project, the No-Build Alternative was eliminated from further study.

Alternative 1 (Bear Island Road Extension)

Alternative 1 includes extending the existing Bear Island Road to the new Nexton Parkway (1.5 miles), improvements to its intersections with Berkeley Circle and US 17A (Main Street), and drainage improvements. Roadway improvements would consist of a two lane roadway (with curbed median), turn lanes, and pedestrian facilities. New roadway sections would be required between Bear Island Road and Holiday Drive (approximately 0.35-mile), Holiday Drive and Cotton Hope Lane (approximately 0.20-mile), and between Delafield Drive and the proposed Nexton Parkway (approximately 0.20-mile). When taken into account with the future segment of Holiday Drive (Frontage Road B) that would connect to the future Nexton Parkway, four total travel lanes are provided between US 17A and the future Nexton Parkway. This alternative does not require any changes to the lane configuration at the intersection of Nexton Parkway and Frontage Road B or any widening on Frontage Road B that is currently included as part of the permitted interchange project to meet the purpose and need of the proposed project.

Alternative 2 (Widen Sheep Island Road between Berkeley Circle and Frontage Road B)

Under Alternative 2, the existing Sheep Island Road would be widened from two to three lanes from the intersection of Sheep Island Road and Azalea Square Drive (two through lanes and a center turn lane), to the intersection of Sheep Island Road and Frontage Road B (a distance of approximately 0.55-mile). The center turn lane on Sheep Island Road would allow for left turning traffic to move out of the travel way, thereby improving traffic flow. Future driveways and entrances in the undeveloped areas adjacent to Sheep Island Road would likely require a left turn lane in the future to move turning traffic out of the travel way. The 3-lane section accommodates this now, instead of the roadway needing to be redesigned/reconstructed in the future as development occurs. A five lane section would also be required between Holiday Drive and Frontage Road B. This Alternative would also include intersection improvements (additional turning lanes) at Sheep Island Road/Holiday Drive/Frontage Road B intersection, as well as the

intersection with Nexton Parkway. The following intersection improvements would be required to meet traffic demand:

- Additional left turn lane on Nexton Parkway to Frontage Road B resulting in dual left turn lanes;
- Dual left turn lanes on Sheep Island Road to Frontage Road B;
- Appropriate receiving lanes and lane taper on Frontage Road B to accept dual left turns from both intersections (this results essentially in the widening of Frontage Road B for most of its length); and,
- A right turn lane on Frontage Road B to Nexton Parkway.

This alternative would not provide additional travel lanes from US 17A to Nexton Parkway.

Alternative 3 (Widen Sheep Island Road and Frontage Road B from Berkeley Circle to Nexton Parkway)

Alternative 3 would consist of widening Sheep Island Road from two to four lanes from the intersection of Sheep Island Road and Berkeley Circle, to the intersection of Sheep Island Road and Holiday Drive. In addition, Alternative 3 would add two additional lanes on the proposed Frontage Road B that connects to the future Nexton Parkway. The total distance of this alternative is approximately 1.4 miles from Berkeley Circle to the future Nexton Parkway. This alternative would also continue approximately 0.3-mile east on Holiday Drive (towards US 17A) to accommodate the transition from two to four lanes. The widening of the future segment of Holiday Drive provides four lanes from US 17A (via Berkeley Circle) to the future Nexton Parkway. It was determined through the traffic analysis that since a three lane section (Alternative 2) on Sheep Island Road would meet the purpose and need by accommodating traffic demands, a four lane section would not be required. A four lane section would consist of an ‘overbuilt’ alternative and would not present a balanced comparison to the other alternatives (due to higher costs and wetland impacts for four travel lanes that are not needed to meet traffic demand). Therefore, Alternative 3 was eliminated from further study.

Alternative Discussion

Table 2.0 below depicts the traffic analysis of Alternatives 1 and 2 in the design year (2040).

Table 2.0				
Alternatives 1 and 2 in 2040				
	Alternative 1		Alternative 2	
	Level of Service (Delay in Seconds)			
Intersection	AM Peak	PM Peak	AM Peak	PM Peak
Nexton Parkway at Frontage Road B	B (17.8)	D (49.3)	B (18.8)	C (26.3)
Frontage Road B at Holiday Dr./Sheep Island Road	B (10.7)	C (18.5)*	A (7.5)	A (9.1)
Sheep Island Road at Holiday Drive	A (9.8)*	B (15.0)*	B (13.7)*	D (33.0)*
Sheep Island Road at Bear Island Road	A (9.2)*	D (25.3)*	A (9.1)*	C (23.2)*
Bear Island Road at Nexton Parkway	C (22.6)	C (19.5)*	N/A	N/A

* LOS and delay reported for Stop Controlled intersections is that of the approach with the highest delay.
Source: Michael Baker International Inc. (2015)

Compared to the No-Build Alternative in 2040 (refer to Table 1.0), both Alternatives provide an improvement in traffic operations, with no intersections at or over capacity. Based on the traffic analysis, both Alternatives can meet the purpose and need of improving traffic flow between US 17A and Nexton Parkway. However, as described in the Alternative Selection section below, Alternative 1 provides for distinct traffic/logistical advantages when compared to Alternative 2.

Potential Impacts

Since both Alternatives can meet the purpose and need of the proposed project, in order to determine a Preferred Alternative, the potential impacts of each Alternative need to be weighed to determine the most practicable alternative. A breakdown of the impacts of each of the alternatives is included at the end of this document in Table 3.0.

Both Alternatives 1 and 2 have a potential for noise and safety issues. Alternative 1 could cause potential noise and safety concerns on the portion of the proposed roadway within the Weatherstone subdivision. Alternative 2 has the potential for noise concerns along portions of Weatherstone that abut Sheep Island Road and Frontage Road B. From a safety standpoint Alternative 2 would not provide the additional access points in and out of Weatherstone when compared to Alternative 1. Alternative 2 would cause greater traffic volumes on internal roadways within the neighborhood, which causes traffic safety concerns. In addition, from a safety standpoint, Alternative 1 provides better access for emergency vehicles, which could lead to shorter response times versus Alternative 2.

For Alternative 1, since the roadway would be designed as a residential street with a 25 mph speed limit similar to the existing residential roadways, safety concerns and noise are anticipated to be similar to the existing residential roadways within the subdivision. Alternative 2 would have less wetland impact than Alternative 1 because Alternative 2 would occur largely on existing alignments (Sheep Island Road/Frontage Road B). When looking at costs of the two projects Alternative 2 would cost approximately \$1.47 million more than Alternative 1. Part of the cost difference is made up by the fact that the Town of Summerville already owns the majority of the right-of-way for Alternative 1 and Alternative 2 would require additional land to be purchased.

Alternative Selection

According to the USACE Guidelines as defined in *Guidelines for Specification of Disposal Sites for Dredged or Fill Material* (40 CFR 230), no discharge of dredged or fill material shall be permitted if there is a practical alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem. Further in the Guidelines it states that an alternative is considered practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

As previously stated, traffic data shows that each of the Alternatives would provide an acceptable level of service when looking at future traffic volumes. However, when comparing the two Alternatives more closely, Alternative 1 provides some distinct advantages from a traffic standpoint. Alternative 1 can provide the following traffic benefits over Alternative 2:

- Provides drivers more options to get between US 17A and Nexton Parkway;
- Would result in less traffic volume at each intersection (since traffic would be more dispersed and Alternative 2 required much larger intersections to handle traffic volumes)

- more turning lanes at intersections under Alternative 2 results in more traffic volume at intersections);
- Provides three additional access points when compared to Alternative 2, which would reduce internal neighborhood traffic and provide for potentially shorter response times for emergency vehicles;
- Alternative 1 provides a T-intersection at Holiday Drive and Sheep Island Road (at Weatherstone entrance);
- Alternative 1 has less turning movements when compared to Alternative 2 (due to additional turning lanes required at intersections under Alternative 2);
- Alternative 2 would require larger and more complex intersection design, which would give the area a more urbanized feel vs. the more suburban intersections in Alternative 1;
- The more complex intersection design is why some of the movements in Table 2.0 have a better LOS in Alternative 2 when compared to Alternative 1; however, looking at the differences in delay where Alternative 2 provides a better LOS the additional delay only ranges between 2.1 and 23 seconds; and,
- If incident would occur at an intersection, Alternative 1 provides additional option to get to I-26. In this scenario, Alternative 2 would push traffic back to US 17A to access I-26.

Alternative 1 was determined to be the most practical alternative due to the difference in cost when compared to Alternative 2 (refer to Table 3.0). In addition, as mentioned above Alternative 1 has a logistical advantage from a traffic standpoint when compared to Alternative 2. Alternative 2 would have less wetland impact; however, the construction costs associated with the intersection improvements, right-of-way, design, and environmental studies make its implementation impracticable given current funding available. Alternative 1 has already gone through the design process and permits have already been submitted on the project. Alternative 2 would also need to be designed, which would require additional survey, environmental, hydrologic, and geotechnical studies in support of the design process. Alternative 2 could also cause a potential issue with the construction of the Nexton Parkway Interchange Project. Alternative 2 would require alterations to the construction of the Nexton Parkway Interchange Project where it ties into Frontage Road B, widening of Frontage Road B to accept turning lanes, alteration of the intersection of Sheep Island Road/Frontage Road B, and alteration of the Sheep Island Road/Holiday Drive intersection. Consideration for close coordination to avoid construction delays and cost escalation should be considered as the Nexton Parkway project is set to start construction in early 2016.

Therefore, since Alternative 1 (extension of Bear Island Road) meets the project purpose, is less expensive than Alternative 2, and provides an advantage from a logistical standpoint, Alternative 1 was determined to be the only Practical Alternative when taking into account costs, existing technology, and logistics.

**Table 3.0
Alternative Impact Matrix**

Impacts	No-build	Alternative 1	Alternative 2
Public Interest Review Factors			
Conservation	No Impact	No Impact	No Impact
Economics	No Impact	Beneficial (serves development)	Beneficial (serves development)
Aesthetics	No Impact	Tree Removal	Tree Removal
General Environment	No Impact	No Impact	No Impact
Wetlands			
Wetland (AC)	No Impact	3.14	1.35*
Cultural Values	No Impact	No Impact	No Impact
Fish & Wildlife Values			
T&E	No Impact	No Impact	No Impact
Essential Fish Habitat	No Impact	No Impact	No Impact
Land Use	No Impact	Access to undeveloped land	Access to undeveloped land
Flood Hazards	No Impact	No Impact	No Impact
Property Ownership	No Impact	Right-of-way acquisition required	Right-of-way acquisition required
Flood Plain Values	No Impact	No Impact	No Impact
Navigation	No Impact	No Impact	No Impact
Recreation	No Impact	Beneficial (Sidewalks)	Beneficial (Sidewalks)
Shore Erosion & Accretion	No Impact	No Impact	No Impact
Water Supply / Water Quality	No Impact	No Impact	No Impact
Energy Needs	No Impact	No Impact	No Impact
Safety	Adverse	Beneficial (improved traffic operations)/Adverse (Roadway in neighborhood)	Beneficial (improved traffic operations)/Adverse (does not decrease internal traffic in neighborhood)
Mineral Needs	No Impact	No Impact	No Impact
Food & Fiber production	No Impact	No Impact	No Impact
Needs & Welfare of People	Adverse (traffic not improved)	Beneficial (improved traffic operations)/Adverse (potential noise)	Beneficial (improved traffic operations)/Adverse (potential noise)
Logistics	Adverse (traffic not improved)	Beneficial (improved traffic operations-provides three additional access points).	Beneficial (improved traffic operations – does not provide additional access points).
Costs	None	Design - \$ - ROW: \$1,036,163 Construction: \$3,579,977 Total: \$4,616,140	Design: \$286,000 ROW: \$1,717,127 Construction: \$4,085,357 Total: \$6,088,483

*Impacts based on previous field delineations supplemented with hydric soil data from the Berkeley County Soil Survey, aerial photographic interpretation, and limited ground truthing. These impacts do not represent field delineated wetlands. This total represents the difference between the previously permitted sections of Frontage Road B and Nexton Parkway and impacts required to implement Alternative 2.

AERIAL PHOTO 2013

Sheep Island Road Widening Impacts 1.35 ac
Previously Permitted Wetland Impacts 2.82 ac
Total Impacts 4.17 ac

Bear Island Road Wetland Impacts 3.14 ac



Project Area

Proposed Nexton Parkway

Frontage Road B

Sheep Island Rd

I-26

Holiday Dr

Holiday Dr

Westvaco Rd

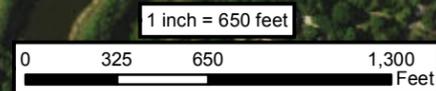
Sheep Island Rd

Bear Island Road

Berkeley Cir

Berlin G Meyers Pky

BEAR ISLAND ROAD
CITY OF SUMMERVILLE
BERKELEY COUNTY, S.C.
DATE: 01/07/2016
SHEET 1 OF 1



Legend

- DITCH/CANAL
- NRPW
- PIPE
- SHORELINE
- SRPW
- STREAM
- STREAM/UNSURVEYED
- Proposed Bear Island ROW
- 3-Lane Alternative
- Nexton Parkway ROW
- S.I. Additional Wetlands
- Previously Permitted Areas
- Bear Island Road Wetlands
- Delineated Wetlands

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, User Community