ALTERNATIVES COMPARISON MATRIX

Local Concept Development Study for Columbia Turnpike Bridge over the Black Brook
Borough of Florham Park, Morris County, NJ

COLUMBIA TURNPIKE BRIDGE OVER THE BLACK BROOK
LOCAL CONCEPT DEVELOPMENT STUDY
Borough of Florham Park, Morris County, New Jersey

Alternative Types	Alternative A	Alternative B	Alternative C	Alternative D														
	No Build	Rehabilitation	Replace In-Kind	Alternate D1 New Bridge on Existing Alignment (Single Span)				Alternate D2 New Bridge on Alignment shifted to South (Single Span)				Alternate D3 New Bridge on Alignment shift to North (Single Span)				Alternate D4 New Bridge on Minor Alignment shift to South (Single Span)		
Superstructure Type	Concrete Encased Multi-Stringer w/ Steel Stringer Widening	Steel Multigirder	Steel Multigirder	Prestressed NEXT Beams	Steel Beams	Prestressed Concrete Spread Box Beams	Prestressed Concrete Adjacent Box Beams	Prestressed NEXT Beams	Steel Beams	Prestressed Concrete Spread Box Beams	Prestressed Concrete Adjacent Box Beams	Prestressed NEXT Beams	Steel Beams	Prestressed Concrete Spread Box Beams	Prestressed Concrete Adjacent Box Beams	Steel Beams	Prestressed Concrete Spread Box Beams	Preliminary Preferred Alternative Prestressed Concrete Adjacent Box Beams
				A	B	C	D	A	B	C	D	A	B	C	D	B	C	D
Criteria																		
Meets Project Purpose and Need	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maintenance and Protection of Traffic																		
Number of lanes provided during construction	4	2	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Is Detour Required?	No	Yes (Partial)	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Roadway																		
Controlling Substandard Design Elements Remaining	4	4	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Improves Lane Widths	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Improves Shoulder Widths	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Improves Stopping Sight Distances at MP 15.38	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Profile Raise at the Bridge	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Traffic Operations & Bicycle/Pedestrian																		
Accommodates design year traffic volumes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bicycle/Pedestrian compatibility provided with connectivity to approach roadways	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sidewalks provided	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Construction Duration																		
Duration (Months)	-	9	15	22	22	22	22	22	19	19	19	22	19	19	19	22	22	22
Stages Required	-	2	1	5	5	5	5	4	3	3	3	4	3	3	3	5	5	5
Right of Way Impacts																		
Required ROW (Acres)	-	0	0	0.09	0.09	0.09	0.09	0.31	0.31	0.31	0.31	0.18	0.18	0.18	0.18	0.13	0.13	0.13
Number of Temporary construction easements	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of partial property acquisitions	-	0	0	3	3	3	3	2	2	2	2	2	2	2	2	3	3	3
Number of entire property acquisitions	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Access																		
# of Access Impacts to adjacent properties during construction	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
# of Permanent Access Impacts to adjacent properties	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Structural Design																		
Accelerated Bridge Construction Methodologies	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No
Bridge opening meets design year storm (H&H)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seismic Design addressed	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bridge Approach Safety Upgraded	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
75 yr. Bridge Life Cycle	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wildlife Passage Compatible	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Environmental Impacts																		
Green Acres & Section 4(f)	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Total Wetlands Impacts (acres)	0	0	0.10	0.20	0.20	0.20	0.20	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Threatened and Endangered Species Habitat	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Floodplain (acres)	0	1.1	1.1	1.16	1.16	1.16	1.16	1.81	1.81	1.81	1.81	1.70	1.70	1.70	1.70	1.25	1.25	1.25
Riparian Zone (acres)	0	0	0.1	0.15	0.15	0.15	0.15	0.27	0.27	0.27	0.27	0.14	0.14	0.14	0.14	0.17	0.17	0.17
Historic Resources (# of sites)	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Hazardous Waste/Contaminated Sites	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Seasonal restrictions	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Utilities																		
Anticipated relocations	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Costs																		
Construction Costs	$ -	$ 437,875	$ 875,750	$ 2,342,474	$ 2,422,474	$ 2,342,474	$ 2,502,474	$ 2,827,792	$ 2,907,792	$ 2,827,792	$ 2,987,792	$ 2,584,680	$ 2,664,680	$ 2,584,680	$ 2,744,680	$ 2,408,638	$ 2,328,638	$ 2,488,638
Estimated Utility Relocation Cost	$ -	$ 250,000	$ 250,000	$ 2,775,000	$ 2,775,000	$ 2,775,000	$ 2,775,000	$ 1,250,000	$ 1,250,000	$ 1,250,000	$ 1,250,000	$ 2,775,000	$ 2,775,000	$ 2,775,000	$ 2,775,000	$ 1,275,000	$ 1,275,000	$ 1,275,000
Estimated Right of Way Cost	$ -	$ -	$ -	$ 7,585	$ 7,585	$ 7,585	$ 7,585	$ 11,909	$ 11,909	$ 11,909	$ 11,909	$ 16,697	$ 16,697	$ 16,697	$ 16,697	$ 5,888	$ 5,888	$ 5,888
Life Cycle Cost (Present Value)	$ 1,827,008	$ 658,548	$ 246,138	$ 154,397	$ 246,138	$ 154,397	$ 154,397	$ 154,397	$ 246,138	$ 154,397	$ 154,397	$ 154,397	$ 246,138	$ 154,397	$ 154,397	$ 246,138	$ 154,397	$ 154,397
Total Project Cost	**$1,827,008.00**	**$1,346,423.00**	**$1,371,888.00**	**$5,279,456.00**	**$5,451,197.00**	**$5,279,456.00**	**$5,439,456.00**	**$4,244,098.00**	**$4,415,839.00**	**$4,244,098.00**	**$4,404,098.00**	**$5,530,774.00**	**$5,702,515.00**	**$5,530,774.00**	**$5,690,774.00**	**$3,935,664.00**	**$3,763,923.00**	**$3,923,923.00**

SUPPLEMENTAL ALTERNATIVES COMPARISON MATRIX

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LOCAL CONCEPT DEVELOPMENT STUDY
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	Alternative A	Alternative B	Alternative C	Alternative D			
	No Build	**Bridge Rehabilitation**	**Replace In-Kind**	**Alternative D1* New Bridge on Existing Alignment**	**Alternative D2* New Bridge on Alignment shifted to South**	**Alternative D3* New Bridge on Alignment shift to North**	**Alternative D4* New Bridge on Minor Alignment shift to South**
Description of Alternative	No rehabilitative improvements will be performed to address existing structural deficiencies. This alternative involves leaving the existing bridge and approaches as they exist today. Routine maintenance will be performed as needed along its life cycle, based on the conditions and ratings from the biennial inspection reports. The substandard design elements with the roadway will not be addressed.	The existing bridge and approaches will be left as they are configured today with rehabilitating the existing structure with a new concrete deck and steel superstructure. Concrete repairs will be performed throughout the substructure elements along with reconstruction of the bearing seats. The existing superstructure and substructure deficiencies will be addressed. The substandard design elements with the roadway will not be addressed with no shoulder widening to meet current standards. A partial detour is required during construction.	The existing bridge will be replaced entirely, matching the existing single span superstructure configuration along with the same roadway width and lane configurations. The new bridge will address the structural deficiencies of the existing bridge. The substandard design elements with the roadway will not be addressed with no shoulder widening to meet current standards. A full detour is required during construction.	Full replacement of the existing bridge with a new widened structure along the existing roadway alignment. Staged construction methods will maintain 4 lanes of traffic throughout construction to completion of the new bridge. The new single-span bridge will have existing lane widths and add shoulders and one 6' wide sidewalk. Substantial utility relocation will be required of the existing gas main to the north. There will be some minor right-of-way acquisition required for this alignment. Construction duration will be approximately 22 months.	Full replacement of the existing bridge with a new widened structure with the alignment shifted approximately 20.1 feet south. Staged construction methods will maintain 4 lanes of traffic throughout construction to completion of the new bridge. The new single-span bridge will have existing lane widths and add shoulders and one 6' wide sidewalk. Utility impacts with existing gas and water utilities to the north are avoided. Relocation of the force sewer main to the south to outside the existing easement will be required. There will be a larger amount of right-of-way acquisition required compared to the other alignments. Construction duration will be approximately 19 months.	Full replacement of the existing bridge with a new widened structure with the alignment shifted approximately 5.21 feet to the north. Staged construction methods will maintain 4 lanes of traffic throughout construction to completion of the new bridge. The new single-span bridge will have existing lane widths and add shoulders and one 6' wide sidewalk. Substantial utility relocation will be required of the existing gas main to the north similar to Alternative D1. This alternative will have the second largest amount of right-of-way acquisition required compared to the other alignments. Construction duration will be approximately 19 months.	Full replacement of the existing bridge with a new widened structure with the alignment shifted approximately 11.9 feet to the south. Staged construction methods will maintain 4 lanes of traffic throughout construction to completion of the new bridge. The new single-span bridge will have existing lane widths and add shoulders and one 6' wide sidewalk. Utility impacts with existing gas and water utilities to the north are avoided. Relocation of the force sewer main to the south will be required but within its existing easement. There is some minor right-of-way acquisition required for this alignment. Construction duration will be approximately 22 months.
Meets Project Purpose and Need	No	No	No	Yes	Yes	Yes	Yes
Advantages	• Least amount of immediate cost • No additional environmental impacts caused due to construction • No required ROW	• Only temporary environmental impacts caused due to construction • Structural deficiencies are addressed • Lower cost alternative • No required ROW	• Only temporary environmental impacts caused due to construction • Structural deficiencies are addressed • Lower cost alternative • No required ROW	• Structural deficiencies are addressed • Improves existing Stopping Sight Distance on Columbia Turnpike • Staged construction will maintain 4 lanes of traffic • Minimized environmental impacts from construction • Meets Project Purpose and Need • Corrects existing substandard geometry with added shoulders • Shortest project limits	• Structural deficiencies are addressed • Improves existing Stopping Sight Distance on Columbia Turnpike • Staged construction will maintain 4 lanes of traffic • Minimized environmental impacts from construction • Avoids significant utility impacts to the north • Meets Project Purpose and Need • Corrects existing substandard geometry with added shoulders	• Structural deficiencies are addressed • Improves existing Stopping Sight Distance on Columbia Turnpike • Staged construction will maintain 4 lanes of traffic • Minimized environmental impacts from construction • Avoids relocation of the southern force sewer main • Meets Project Purpose and Need • Corrects existing substandard geometry with added shoulders • Avoids stream realignment at the inlet	• Structural deficiencies are addressed • Improves existing Stopping Sight Distance on Columbia Turnpike • Staged construction will maintain 4 lanes of traffic • Minimized environmental impacts from construction • Facilitates relocation of the southern force sewer within its existing ROW • Meets Project Purpose and Need • Corrects existing substandard geometry with added shoulders • Avoids stream realignment at the inlet
Disadvantages	• Continued deterioration of structure elements at their current rate • High maintenance efforts and costs • Potential for future weight restrictions, traffic disruptions, and eventual closure of the bridge • Does not meet Project Purpose and Need • Maintains existing substandard deck geometry	• Limited remaining life of rehabilitated elements • Moderate future maintenance efforts and costs • Does not meet Project Purpose and Need • Maintains existing substandard deck geometry • Partial detour required	• Detour required • Does not meet Project Purpose and Need • Maintains existing substandard deck geometry.	• Significant utility relocation will be required for the gas main to the north. • Requires some stream realignment at the inlet	• Requires relocation of the southern force sewer main sewer beyond its existing ROW • Longest project limits • Requires moderate stream realignment at the inlet	• Significant utility relocation will be required for the gas main to the north.	• Requires relocation of the southern force sewer main
Controlling Substandard Design Elements Remaining	2 - Stopping Sight Distance at Vertical Curves (Sag) 1 - Stopping Sight Distance at Vertical Curves (Crest) 1 - Outside Shoulder Width	2 - Stopping Sight Distance at Vertical Curves (Sag) 1 - Stopping Sight Distance at Vertical Curves (Crest) 1 - Outside Shoulder Width	2 - Stopping Sight Distance at Vertical Curves (Sag) 1 - Stopping Sight Distance at Vertical Curves (Crest) 1 - Outside Shoulder Width	1 - Stopping Sight Distance at Vertical Curves (Sag)	1 - Stopping Sight Distance at Vertical Curves (Sag)	1 - Stopping Sight Distance at Vertical Curves (Sag)	1 - Stopping Sight Distance at Vertical Curves (Sag)
Required ROW (Acres)	0	0	0	0.09	0.31	0.18	0.13
Anticipated Utility Relocations	No	Yes	Yes	Yes	Yes	Yes	Yes
Cost				**	**	**	**
Construction Cost	$0	$437,875	$875,750	$2,502,474	$2,987,792	$2,744,680	$2,488,638
Estimated Utility Relocation Cost	$0	$250,000	$250,000	$2,775,000	$1,250,000	$2,775,000	$1,275,000
Estimated Right of Way Cost	$0	$0	$0	$7,585	$11,909	$16,697	$5,888
Life Cycle Cost (Present Value)	$1,827,008	$658,548	$246,138	$154,397	$154,397	$154,397	$154,397
Total Project Cost	**$1,827,008**	**$1,346,423**	**$1,371,888**	**$5,439,456**	**$4,404,098**	**$5,690,774**	**$3,923,923**

Notes:
*** - This Alternative has four different superstructure concepts. See the below Table for Advantages and Disadvantages of each superstructure.**
**** - Costs presented for this Alternative are based on the Prestressed Adjacent Box Beam superstructure type**

Alternative	**A - Single Span**	**B - Single Span**	**C - Single Span**	**D - Single Span**
Superstructure Type	**Prestressed NEXT Beams**	**Steel Beams**	**Prestressed Concrete Spread Box Beams**	**Prestressed Concrete Adjacent Box Beams**
Advantages	• Accelerated Bridge Construction methods • Integral deck with beams • Greater service life with shop castings of beams and deck • Lower superstructure costs	• Greatest flexibility with staging • Least complex constructability • Greatest adaptability to carry utilities • Most adaptable for future deck replacements • Beams can be readily repaired if damaged or deteriorated	• Greater flexibility for staging • Greater service life with shop castings of beams • Lower superstructure costs • Minimal maintenance costs	• Moderate flexibility for staging • Greater service life with shop castings of beams • Greatest ability to prevent flexure cracking in deck contributing to extended deck life and greater durability. • Extended deck life gives advantage in overall life cycle by providing a longer window for an eventual full deck replacement • Morris County preference for Adjacent Box Beams in line with their programmatic approach for replacement bridges and deck cracking prevention
Disadvantages	• Least flexibility for staging • Greater potential for material failures with higher number of precast connections and closure pours • More complex constructability • Deck replacement would require beams to be removed	• Requires periodic bridge beam painting • Highest material cost • Steel beams over waterways is not preferred	• Beams repairs are less practical if damaged or deteriorated • Higher effort to perform future deck replacement • Morris County preference to not use Spread Box Beams due recent experience with premature deck cracking on other replacement bridges in their inventory.	• Increased number of beams and resultant superstructure costs • Higher effort to perform future deck replacement • Beams repairs are less practical if damaged or deteriorated