

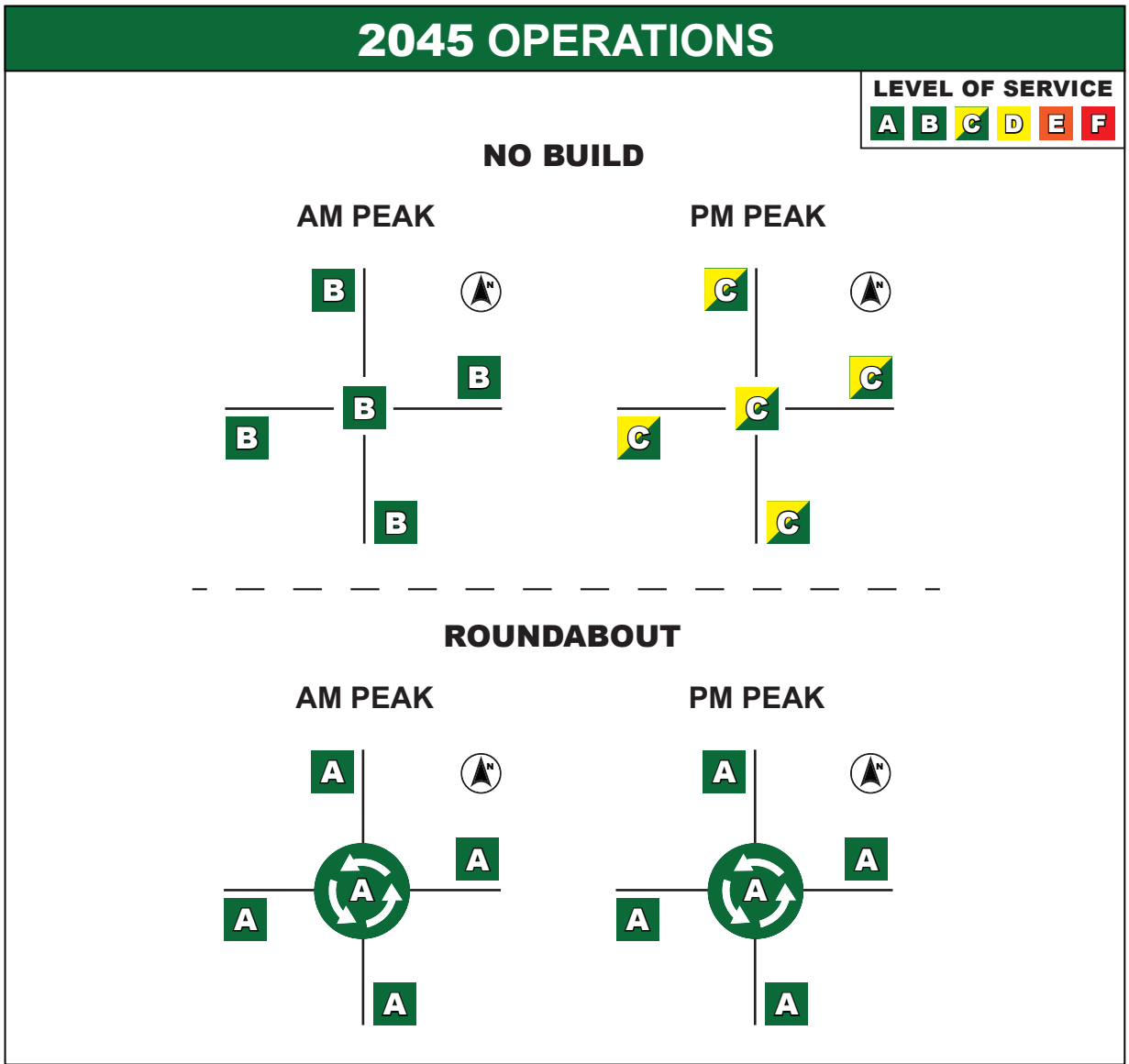
B.

BELSAY ROAD & EAST BRISTOL ROAD

2015-2019 CRASH DATA

CRASHES	INJURIES			
	FATALITIES	TYPE A	TYPE B	TYPE C
20 ANGLE	0	2	3	11
1 HEAD-ON				

2045 OPERATIONS



Opinion of probable cost for single-lane roundabout

\$1.41 MILLION

B. Belsay Road and East Bristol Road

The intersection of Belsay Road and East Bristol Road was included in the early preliminary engineering phase with support from the City of Burton due to poor operational conditions and safety concerns. This intersection is included in the 153 intersections that passed the skim analysis for experiencing crashes correctable by a roundabout and is a secondary analysis Tier Two intersection.

During the skim analysis, it was observed that there were 20 angle crashes and 1 head on left turn crash over the 5-year period. These crashes resulted in zero fatalities, two type A injuries, three type B injuries, and eleven type C injuries at the intersection.

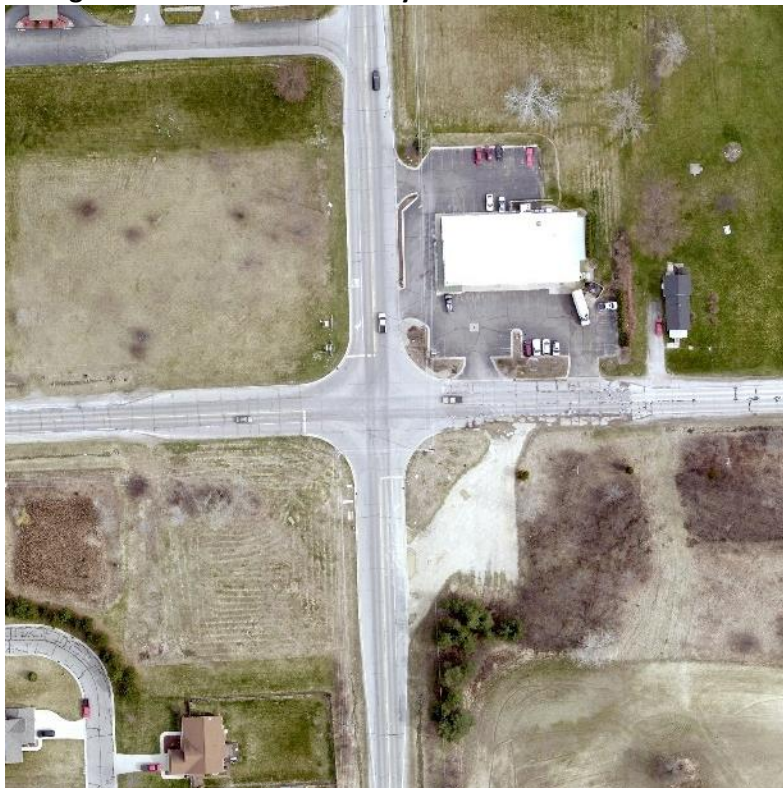
No-Build Conditions

The intersection of Belsay Road and East Bristol Road is four-way stop controlled intersection. East Bristol Road is an east/west road with two-lanes in each direction. Belsay Road is a north/south road also with two-lanes in each direction. All approaches of the intersection widen out from a single-lane to have a right-turn only lane and a shared through/left-turn lane.

In the northeast quadrant is Nehring's Market. The remaining quadrants of the intersection are vacant areas. There are overhead electrical cables on the south and east legs of the intersection. There are also overhead utility lines (other than electrical) on the north and west legs. On the ground, there are utility controllers/boxes in the northwest and southeast quadrants located near the right-of-way edges.

An aerial of the existing intersection can be seen in Figure 3.

Figure 3: Aerial view of Belsay Road and East Bristol Road



An operational analysis of the no-build condition was completed for the intersection using the 2045 forecast traffic volumes. The results of the analysis for the future no-build condition reveals all approaches and movements of the intersection operate at LOS C or better during the AM and PM peak hours.

The 95th percentile queue lengths were reviewed at the intersection and the results showed all approaches experienced a maximum queue length of 66 feet (4 vehicles) during the AM peak hour and 151 feet (9 vehicles) during the PM peak hour.

The operational analysis results for the future no-build conditions are presented in Table 8.

Table 8: Operational Analysis for 2045 No-Build Condition

Intersection	Approach	AM Peak		PM Peak	
		Delay/LOS	Queue (veh)*	Delay/LOS	Queue (veh)*
Belsay Road and East Bristol Road	Eastbound	11.4/B	4 (58 ft)	21.8/C	7 (112 ft)
	Westbound	11.6/B	4 (66 ft)	16.9/C	4 (63 ft)
	Northbound	12.7/B	4 (65 ft)	21.7/C	9 (151 ft)
	Southbound	10.7/B	3 (54 ft)	19.7/C	6 (99 ft)
	Overall	11.7/B		20.3/C	

* 95th percentile queue length.

Roundabout Conditions

The proposed roundabout configuration for the intersection of Belsay Road and East Bristol Road is a single lane circulating. The proposed single-lane roundabout configuration will fit inside the existing right-of-way; however, grading easements may be necessary. The proposed inscribed diameter for the concept roundabout is 120 feet. The driveway configuration for Nehring’s Market should be investigated due to the existing driveways closeness to the proposed roundabout entry/exit radius. A concept plan for the single-lane roundabout is to follow the recommendations.

An operational analysis for the single-lane roundabout (build) condition was completed for the intersection using 2045 forecast traffic volumes. The results of the analysis for the roundabout (build) condition reveals all approaches and movements of the intersection operate at LOS A during the AM and PM peak hours.

The 95th percentile queue lengths were reviewed at the intersection and the results showed all approaches experienced a maximum queue length of one (1) vehicle during the AM peak hour and one (1) vehicle during the PM peak hour.

The operation analysis for the future roundabout (build) conditions are presented in Table 9.

Table 9: Operational Analysis for 2045 Roundabout (Build) Condition

Intersection	Approach	AM Peak		PM Peak	
		Delay/LOS	Queue (veh)*	Delay/LOS	Queue (veh)*
Belsay Road and East Bristol Road	Eastbound	5.0/A	0.5	6.7/A	1.1
	Westbound	5.1/A	0.5	5.9/A	0.7
	Northbound	5.8/A	0.8	6.8/A	1.2
	Southbound	5.4/A	0.6	6.6/A	1.2
	Overall	5.4/A		6.5/A	

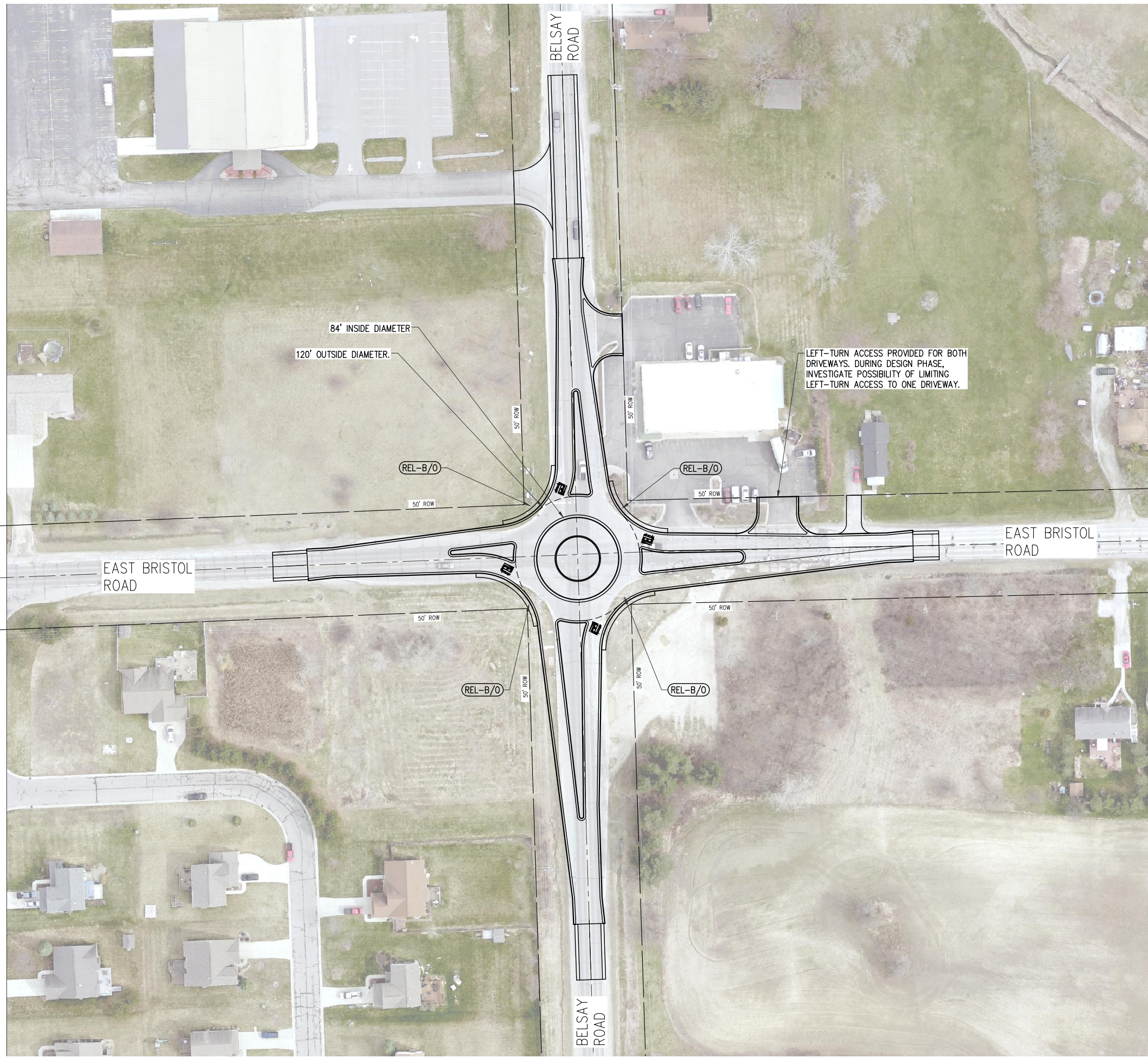
* 95th percentile queue length.

Opinion of probable cost was developed for a single-lane roundabout. The total probable cost is \$1.41 million in year 2025 dollars. The probable cost includes a 20 percent contingency and 3 percent inflation. Not included in this fee are the potential costs to relocate any utilities to accommodate the proposed layout. A full breakdown along with all the assumptions can be found in Appendix 3.

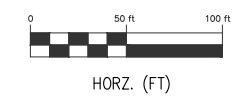
Potential funding for this improvement could be made possible by regular road improvement funding, safety funds, CMAQ, or an earmark. A TOR was computed with a result of 7.06.

Recommendation

A roundabout appears to be feasible at this location but will require coordination to relocate the utilities and change Nehring's Market driveway configuration.



BELSAY ROAD AND EAST BRISTOL ROAD
 ROUNDABOUT CONCEPT
 SCALE: 1" = 100'



CONCEPT PLAN – FOR DISCUSSION PURPOSES ONLY

PLAN DATE: MAY 27, 2021

ROWE PROFESSIONAL SERVICES COMPANY



The Rowe Building
 540 S. Saginaw St., Suite 200
 Flint, MI 48502

O: (810) 341-7500
 F: (810) 341-7573
 www.rowepsc.com

PREPARED FOR
GENESEE COUNTY ROAD COMMISSION
ROUNDABOUT CONCEPTS
 BELSAY ROAD AND EAST BRISTOL ROAD
 ROUNDABOUT CONCEPT

FIGURE NO.
17

JOB No: 19C0262

PLotted: 6/3/2021 3:03 PM R:\Projects\19C0262\01mg\Meiers\Jmg_Concepts\Belsay_Bristol_Concept.dwg

Belsay Road & East Bristol Road - TMC

Tue Mar 9, 2021

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 817408, Location: 42.975637, -83.59378



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	E Bristol Rd Eastbound					E Bristol Rd Westbound					Belsay Rd Northbound					Belsay Rd Southbound									
Time	L	T	R	U	App Ped*	L	T	R	U	App Ped*	L	T	R	U	App Ped*	L	T	R	U	App Ped*	Int				
2021-03-09 7:00AM	6	10	3	0	19	0	5	24	8	0	37	0	3	28	2	0	33	0	4	18	5	0	27	0	116
7:15AM	5	13	1	0	19	0	2	27	7	0	36	0	1	30	5	0	36	0	4	21	8	0	33	0	124
7:30AM	9	14	2	0	25	0	6	25	4	0	35	0	2	29	3	0	34	0	7	27	8	0	42	0	136
7:45AM	13	10	2	0	25	0	4	26	4	0	34	0	8	45	5	0	58	0	4	26	8	0	38	0	155
Hourly Total	33	47	8	0	88	0	17	102	23	0	142	0	14	132	15	0	161	0	19	92	29	0	140	0	531
8:00AM	7	16	3	0	26	0	3	18	2	0	23	0	1	30	6	0	37	0	2	28	10	0	40	0	126
8:15AM	6	18	4	0	28	0	4	15	7	0	26	0	1	31	6	0	38	0	3	22	6	0	31	0	123
8:30AM	3	26	3	0	32	0	8	27	5	0	40	0	3	38	8	0	49	0	2	22	11	0	35	0	156
8:45AM	6	15	3	0	24	0	8	16	5	0	29	0	4	26	5	0	35	0	5	23	6	0	34	0	122
Hourly Total	22	75	13	0	110	0	23	76	19	0	118	0	9	125	25	0	159	0	12	95	33	0	140	0	527
4:00PM	9	30	1	0	40	0	12	23	9	0	44	0	1	44	9	0	54	0	6	38	9	0	53	0	191
4:15PM	14	26	7	0	47	0	9	25	7	0	41	0	4	44	13	0	61	0	10	44	5	0	59	0	208
4:30PM	11	34	6	0	51	0	10	22	1	0	33	0	4	57	12	0	73	0	7	47	11	0	65	0	222
4:45PM	10	30	4	0	44	0	10	18	7	0	35	0	0	46	8	0	54	0	3	42	9	0	54	0	187
Hourly Total	44	120	18	0	182	0	41	88	24	0	153	0	9	191	42	0	242	0	26	171	34	0	231	0	808
5:00PM	15	40	8	0	63	0	12	22	6	0	40	0	3	46	6	0	55	0	8	33	13	0	54	0	212
5:15PM	17	31	4	0	52	0	17	24	4	0	45	0	2	38	11	0	51	0	6	52	11	0	69	0	217
5:30PM	20	22	4	0	46	0	12	19	5	0	36	0	2	60	17	0	79	0	7	40	8	0	55	0	216
5:45PM	11	19	3	0	33	0	6	23	1	0	30	0	1	34	10	0	45	0	6	36	6	0	48	0	156
Hourly Total	63	112	19	0	194	0	47	88	16	0	151	0	8	178	44	0	230	0	27	161	38	0	226	0	801
Total	162	354	58	0	574	0	128	354	82	0	564	0	40	626	126	0	792	0	84	519	134	0	737	0	2667
% Approach	28.2%	61.7%	10.1%	0%	-	-	22.7%	62.8%	14.5%	0%	-	-	5.1%	79.0%	15.9%	0%	-	-	11.4%	70.4%	18.2%	0%	-	-	-
% Total	6.1%	13.3%	2.2%	0%	21.5%	-	4.8%	13.3%	3.1%	0%	21.1%	-	1.5%	23.5%	4.7%	0%	29.7%	-	3.1%	19.5%	5.0%	0%	27.6%	-	-
Lights	161	348	56	0	565	-	126	345	81	0	552	-	40	624	125	0	789	-	83	516	132	0	731	-	2637
% Lights	99.4%	98.3%	96.6%	0%	98.4%	-	98.4%	97.5%	98.8%	0%	97.9%	-	100%	99.7%	99.2%	0%	99.6%	-	98.8%	99.4%	98.5%	0%	99.2%	-	98.9%
Single-Unit Trucks	0	4	0	0	4	-	2	5	0	0	7	-	0	1	0	0	1	-	0	3	1	0	4	-	16
% Single-Unit Trucks	0%	1.1%	0%	0%	0.7%	-	1.6%	1.4%	0%	0%	1.2%	-	0%	0.2%	0%	0%	0.1%	-	0%	0.6%	0.7%	0%	0.5%	-	0.6%
Articulated Trucks	0	0	0	0	0	-	0	3	0	0	3	-	0	0	0	0	0	-	0	0	0	0	0	-	3
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0.8%	0%	0%	0.5%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.1%
Buses	1	2	2	0	5	-	0	1	1	0	2	-	0	1	1	0	2	-	1	0	1	0	2	-	11
% Buses	0.6%	0.6%	3.4%	0%	0.9%	-	0%	0.3%	1.2%	0%	0.4%	-	0%	0.2%	0.8%	0%	0.3%	-	1.2%	0%	0.7%	0%	0.3%	-	0.4%
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Bicycles on Road	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Belsay Road & East Bristol Road - TMC

Tue Mar 9, 2021

Full Length (7 AM-9 AM, 4 PM-6 PM)

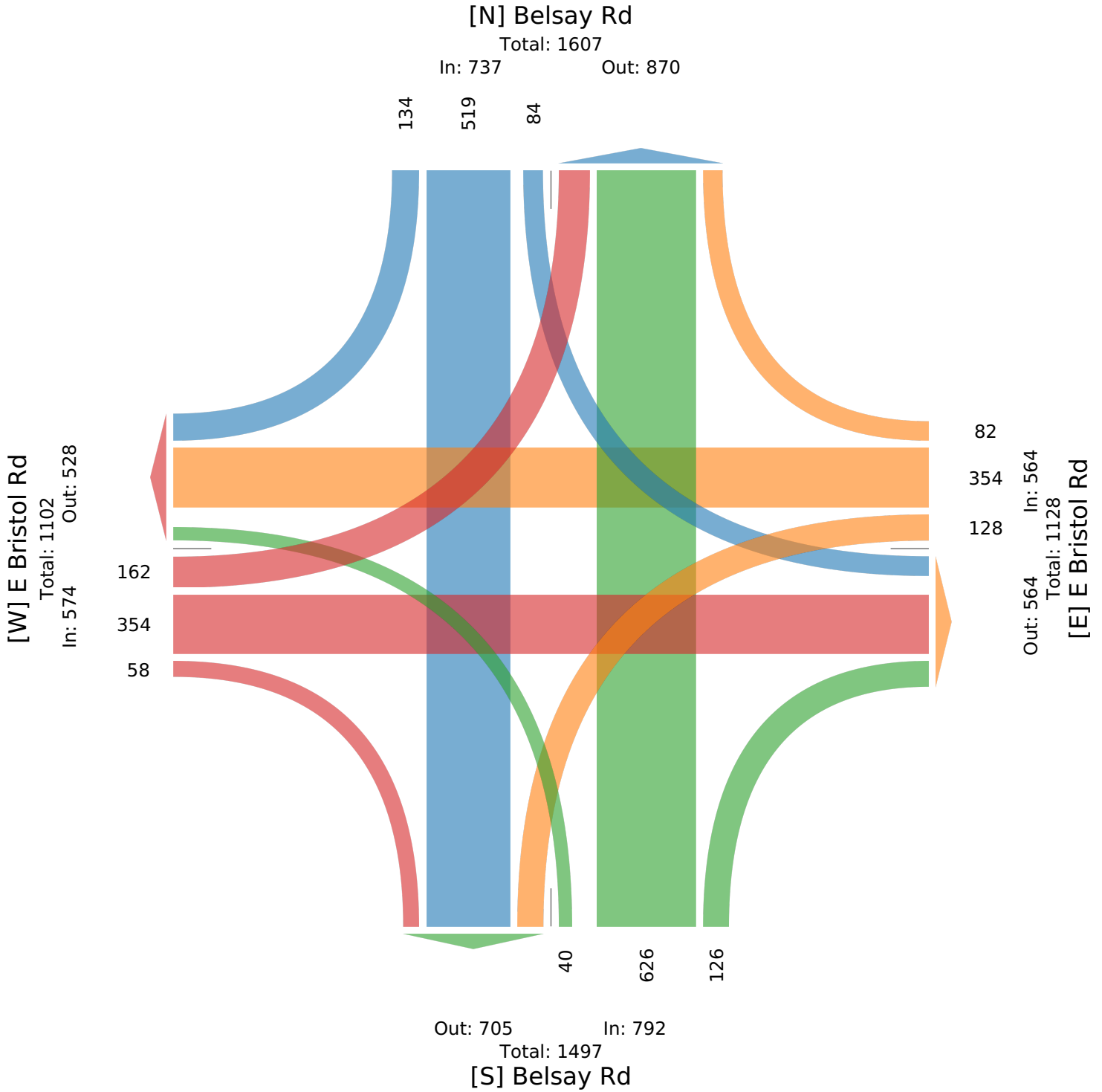
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 817408, Location: 42.975637, -83.59378



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Belsay Road & East Bristol Road - TMC

Tue Mar 9, 2021

AM Peak (7:45 AM - 8:45 AM)

All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 817408, Location: 42.975637, -83.59378



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	E Bristol Rd Eastbound						E Bristol Rd Westbound						Belsay Rd Northbound						Belsay Rd Southbound						Int
	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	
2021-03-09 7:45AM	13	10	2	0	25	0	4	26	4	0	34	0	8	45	5	0	58	0	4	26	8	0	38	0	155
8:00AM	7	16	3	0	26	0	3	18	2	0	23	0	1	30	6	0	37	0	2	28	10	0	40	0	126
8:15AM	6	18	4	0	28	0	4	15	7	0	26	0	1	31	6	0	38	0	3	22	6	0	31	0	123
8:30AM	3	26	3	0	32	0	8	27	5	0	40	0	3	38	8	0	49	0	2	22	11	0	35	0	156
Total	29	70	12	0	111	0	19	86	18	0	123	0	13	144	25	0	182	0	11	98	35	0	144	0	560
% Approach	26.1%	63.1%	10.8%	0%	-	-	15.4%	69.9%	14.6%	0%	-	-	7.1%	79.1%	13.7%	0%	-	-	7.6%	68.1%	24.3%	0%	-	-	-
% Total	5.2%	12.5%	2.1%	0%	19.8%	-	3.4%	15.4%	3.2%	0%	22.0%	-	2.3%	25.7%	4.5%	0%	32.5%	-	2.0%	17.5%	6.3%	0%	25.7%	-	-
PHF	0.558	0.673	0.750	-	0.867	-	0.594	0.796	0.643	-	0.769	-	0.406	0.800	0.781	-	0.784	-	0.688	0.875	0.795	-	0.900	-	0.897
Lights	29	66	12	0	107	-	18	84	18	0	120	-	13	144	25	0	182	-	11	95	34	0	140	-	549
% Lights	100%	94.3%	100%	0%	96.4%	-	94.7%	97.7%	100%	0%	97.6%	-	100%	100%	100%	0%	100%	-	100%	96.9%	97.1%	0%	97.2%	-	98.0%
Single-Unit Trucks	0	2	0	0	2	-	1	1	0	0	2	-	0	0	0	0	0	-	0	3	1	0	4	-	8
% Single-Unit Trucks	0%	2.9%	0%	0%	1.8%	-	5.3%	1.2%	0%	0%	1.6%	-	0%	0%	0%	0%	0%	-	0%	3.1%	2.9%	0%	2.8%	-	1.4%
Articulated Trucks	0	0	0	0	0	-	0	1	0	0	1	-	0	0	0	0	0	-	0	0	0	0	0	-	1
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	1.2%	0%	0%	0.8%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.2%
Buses	0	2	0	0	2	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	2
% Buses	0%	2.9%	0%	0%	1.8%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.4%
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Bicycles on Road	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Belsay Road & East Bristol Road - TMC

Tue Mar 9, 2021

AM Peak (7:45 AM - 8:45 AM)

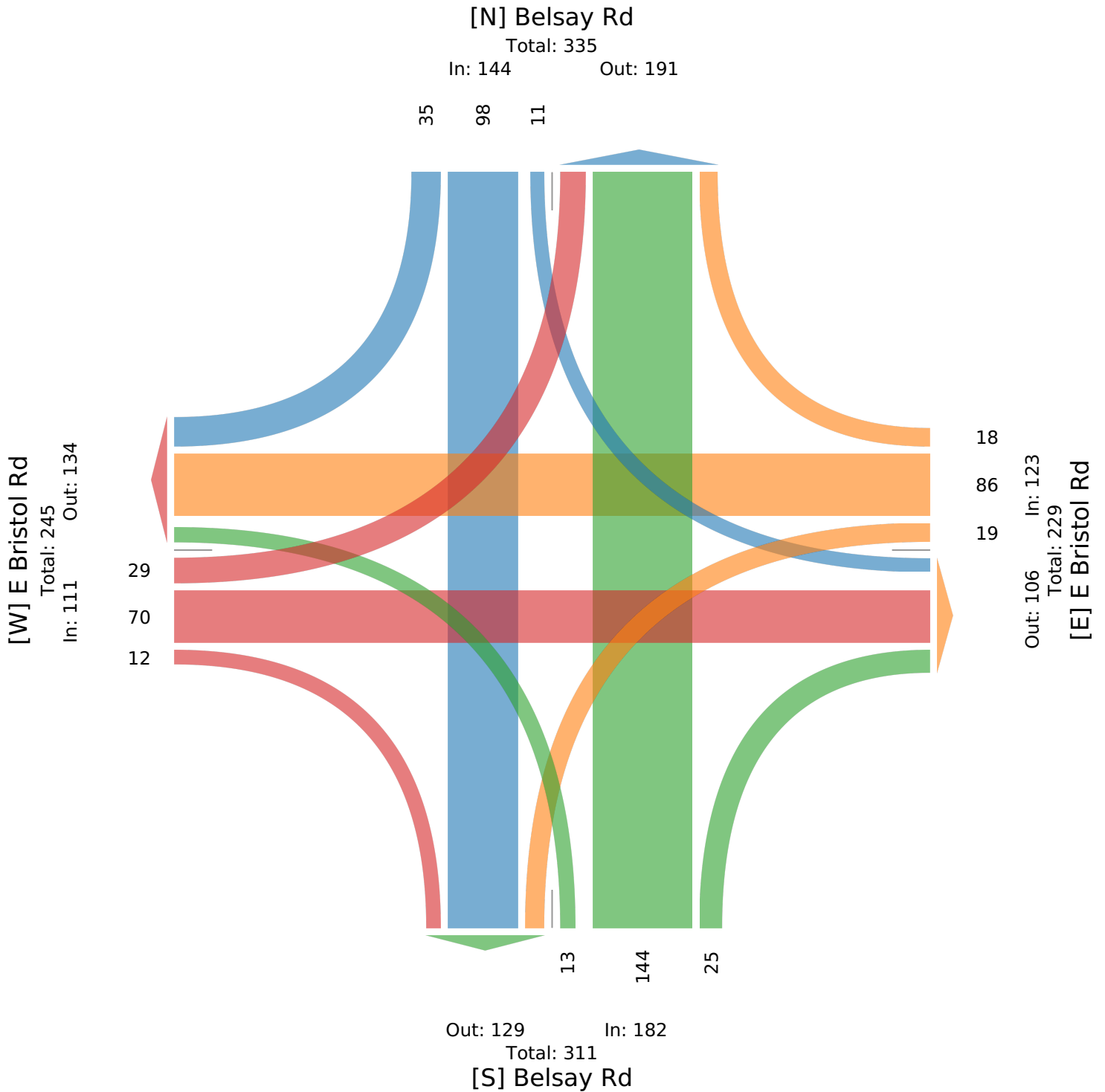
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 817408, Location: 42.975637, -83.59378



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Belsay Road & East Bristol Road - TMC

Tue Mar 9, 2021

PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour

All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 817408, Location: 42.975637, -83.59378



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	E Bristol Rd Eastbound						E Bristol Rd Westbound						Belsay Rd Northbound						Belsay Rd Southbound						Int
	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	
2021-03-09 4:30PM	11	34	6	0	51	0	10	22	1	0	33	0	4	57	12	0	73	0	7	47	11	0	65	0	222
4:45PM	10	30	4	0	44	0	10	18	7	0	35	0	0	46	8	0	54	0	3	42	9	0	54	0	187
5:00PM	15	40	8	0	63	0	12	22	6	0	40	0	3	46	6	0	55	0	8	33	13	0	54	0	212
5:15PM	17	31	4	0	52	0	17	24	4	0	45	0	2	38	11	0	51	0	6	52	11	0	69	0	217
Total	53	135	22	0	210	0	49	86	18	0	153	0	9	187	37	0	233	0	24	174	44	0	242	0	838
% Approach	25.2%	64.3%	10.5%	0%	-	-	32.0%	56.2%	11.8%	0%	-	-	3.9%	80.3%	15.9%	0%	-	-	9.9%	71.9%	18.2%	0%	-	-	-
% Total	6.3%	16.1%	2.6%	0%	25.1%	-	5.8%	10.3%	2.1%	0%	18.3%	-	1.1%	22.3%	4.4%	0%	27.8%	-	2.9%	20.8%	5.3%	0%	28.9%	-	-
PHF	0.779	0.844	0.688	-	0.833	-	0.721	0.896	0.643	-	0.850	-	0.563	0.820	0.771	-	0.798	-	0.750	0.837	0.846	-	0.877	-	0.944
Lights	53	135	22	0	210	-	49	84	18	0	151	-	9	186	37	0	232	-	24	174	44	0	242	-	835
% Lights	100%	100%	100%	0%	100%	-	100%	97.7%	100%	0%	98.7%	-	100%	99.5%	100%	0%	99.6%	-	100%	100%	100%	0%	100%	-	99.6%
Single-Unit Trucks	0	0	0	0	0	-	0	1	0	0	1	-	0	1	0	0	1	-	0	0	0	0	0	-	2
% Single-Unit Trucks	0%	0%	0%	0%	0%	-	0%	1.2%	0%	0%	0.7%	-	0%	0.5%	0%	0%	0.4%	-	0%	0%	0%	0%	0%	-	0.2%
Articulated Trucks	0	0	0	0	0	-	0	1	0	0	1	-	0	0	0	0	0	-	0	0	0	0	0	-	1
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	1.2%	0%	0%	0.7%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.1%
Buses	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Buses	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Bicycles on Road	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Belsay Road & East Bristol Road - TMC

Tue Mar 9, 2021

PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour

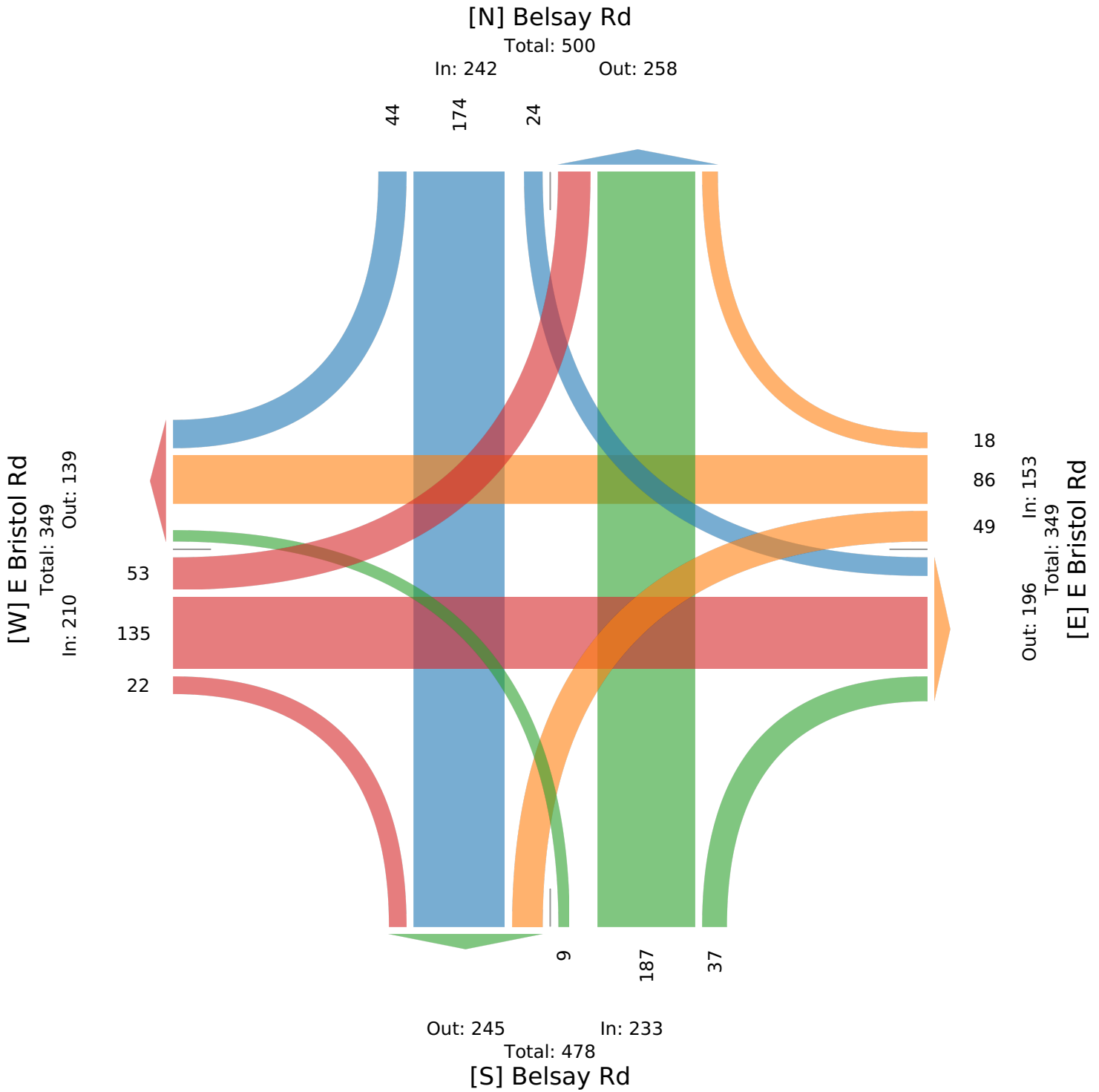
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 817408, Location: 42.975637, -83.59378



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Intersection	
Intersection Delay, s/veh	11.7
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗		↖	↗		↖	↗
Traffic Vol, veh/h	38	91	16	25	112	23	17	187	33	14	127	46
Future Vol, veh/h	38	91	16	25	112	23	17	187	33	14	127	46
Peak Hour Factor	0.87	0.87	0.87	0.77	0.77	0.77	0.78	0.78	0.78	0.90	0.90	0.90
Heavy Vehicles, %	4	4	4	2	2	2	0	0	0	3	3	3
Mvmt Flow	44	105	18	32	145	30	22	240	42	16	141	51
Number of Lanes	0	1	1	0	1	1	0	1	1	0	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	11.4	11.6	12.7	10.7
HCM LOS	B	B	B	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	8%	0%	29%	0%	18%	0%	10%	0%
Vol Thru, %	92%	0%	71%	0%	82%	0%	90%	0%
Vol Right, %	0%	100%	0%	100%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	204	33	129	16	137	23	141	46
LT Vol	17	0	38	0	25	0	14	0
Through Vol	187	0	91	0	112	0	127	0
RT Vol	0	33	0	16	0	23	0	46
Lane Flow Rate	262	42	148	18	178	30	157	51
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.438	0.062	0.27	0.029	0.316	0.046	0.271	0.078
Departure Headway (Hd)	6.026	5.275	6.544	5.684	6.386	5.583	6.232	5.472
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	596	677	549	628	562	640	575	653
Service Time	3.772	3.021	4.297	3.436	4.138	3.334	3.984	3.223
HCM Lane V/C Ratio	0.44	0.062	0.27	0.029	0.317	0.047	0.273	0.078
HCM Control Delay	13.4	8.4	11.7	8.6	12.1	8.6	11.3	8.7
HCM Lane LOS	B	A	B	A	B	A	B	A
HCM 95th-tile Q	2.2	0.2	1.1	0.1	1.3	0.1	1.1	0.3

Intersection: 1: Belsay Road & E. Bristol Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	R	LT	R
Maximum Queue (ft)	74	42	89	30	70	25	66	43
Average Queue (ft)	35	10	36	12	40	13	32	16
95th Queue (ft)	58	30	66	29	65	26	54	31
Link Distance (ft)	484		412		433		494	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		95		150		175		175
Storage Blk Time (%)	0		0					
Queuing Penalty (veh)	0		0					

Network Summary

Network wide Queuing Penalty: 0

Intersection	
Intersection Delay, s/veh	20.3
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕	↕		↕	↕		↕	↕
Traffic Vol, veh/h	69	176	29	64	112	23	12	243	48	31	226	57
Future Vol, veh/h	69	176	29	64	112	23	12	243	48	31	226	57
Peak Hour Factor	0.83	0.83	0.83	0.85	0.85	0.85	0.80	0.80	0.80	0.88	0.88	0.88
Heavy Vehicles, %	0	0	0	1	1	1	0	0	0	0	0	0
Mvmt Flow	83	212	35	75	132	27	15	304	60	35	257	65
Number of Lanes	0	1	1	0	1	1	0	1	1	0	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	21.8	16.9	21.7	19.7
HCM LOS	C	C	C	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	5%	0%	28%	0%	36%	0%	12%	0%
Vol Thru, %	95%	0%	72%	0%	64%	0%	88%	0%
Vol Right, %	0%	100%	0%	100%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	255	48	245	29	176	23	257	57
LT Vol	12	0	69	0	64	0	31	0
Through Vol	243	0	176	0	112	0	226	0
RT Vol	0	48	0	29	0	23	0	57
Lane Flow Rate	319	60	295	35	207	27	292	65
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.661	0.112	0.635	0.067	0.464	0.054	0.613	0.122
Departure Headway (Hd)	7.46	6.717	7.741	6.876	8.063	7.153	7.552	6.77
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	481	530	463	517	445	497	476	526
Service Time	5.247	4.503	5.529	4.663	5.859	4.948	5.341	4.558
HCM Lane V/C Ratio	0.663	0.113	0.637	0.068	0.465	0.054	0.613	0.124
HCM Control Delay	23.8	10.4	23.2	10.2	17.7	10.4	21.7	10.5
HCM Lane LOS	C	B	C	B	C	B	C	B
HCM 95th-tile Q	4.7	0.4	4.3	0.2	2.4	0.2	4	0.4

Intersection: 1: Belsay Road & E. Bristol Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	R	LT	R
Maximum Queue (ft)	136	22	69	22	237	21	155	41
Average Queue (ft)	61	13	40	14	67	17	55	15
95th Queue (ft)	112	29	63	27	151	27	99	29
Link Distance (ft)	484		412		433		489	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		95		150		175		175
Storage Blk Time (%)	4				2		0	
Queuing Penalty (veh)	1				1		0	

Network Summary

Network wide Queuing Penalty: 3

Belsay Road and E. Bristol Road – AM Peak

Rodel - C:\Users\902JAM\OneDrive - ROWE PSC\19C0262_GeneseeCountyRAB\RODEL\Belsay_Bristol.rod

File View Help

Project: Belsay Road and Bristol Road Date: 4-Jun-2021 Model: Rodel 2017 Timeslice: 7.5 Full Geometry Peak: AM Feet RHD

Name: 2045 Flows: 2045 Delay: Control Results: Veh Peak60/15m Synthetic Flow Profile Conf: 50 Light 23

Approach Geometry							Entry Geometry				Circ Geom			Exit Geometry				Entry Capacity Mods	
Leg Name	Bearing	G	V	n	E	n	L'	R	Φ	D	C	n	Ex	n	Vx	n	-+ Cap (v/h)	Xwalk Fact	
1 SB-Belsay Road	0	0	11.00	1	15.00	1	190.00	60.00	24.00	120.00	18.00	1	15.00	1	11.00	1	0	1.000	
2 EB-Bristol Road	90	0	11.00	1	15.00	1	200.00	60.00	24.00	120.00	18.00	1	15.00	1	11.00	1	0	1.000	
3 NB-Belsay Road	180	0	11.00	1	15.00	1	290.00	60.00	24.00	120.00	18.00	1	15.00	1	11.00	1	0	1.000	
4 WB-Bristol Road	270	0	11.00	1	15.00	1	265.00	60.00	24.00	120.00	18.00	1	15.00	1	11.00	1	0	1.000	

Volume Modifiers				Turning Volumes (veh/hr)						Arrival Volume Ratios			Arrival Volume Times (min)			PHF
Leg Name	%Truck	Factor	U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Ratio1	Ratio2	Ratio3	Time1	Time2	Time3			
1 SB-Belsay Road	3.0	1.00	0	14	127	46	0	0.750	1.125	0.750	0	30	60			
2 EB-Bristol Road	4.0	1.00	0	38	91	16	0	0.750	1.125	0.750	0	30	60			
3 NB-Belsay Road	2.0	1.00	0	17	187	33	0	0.750	1.125	0.750	0	30	60			
4 WB-Bristol Road	0.0	1.00	0	25	112	23	0	0.750	1.125	0.750	0	30	60			

Calibration Accidents Economics Bypass Run

	Peak 60min Results	Bypass Type	Flow Rate (veh/hr)		Opp Rate (veh/hr)		Capacity (veh/hr)		Ave VCR		Ave Del (sec/veh)		Max Q (veh)		Max Q95% (veh)		LOS A-F			
			Entry	Bypass	Entry	Bypass	Entry	Bypass	Entry	Bypass	Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Entry	By	Leg
1	SB-Belsay Road	None	187		154		1117		0.1673		5.38		5.38	0.23		0.59		A		A
2	EB-Bristol Road	None	145		166		1088		0.1333		4.95		4.95	0.17		0.45		A		A
3	NB-Belsay Road	None	237		143		1146		0.2068		5.84		5.84	0.30		0.78		A		A
4	WB-Bristol Road	None	160		242		1135		0.1409		5.10		5.10	0.19		0.50		A		A
All	Intersection												5.38							A

Results 60 Results 15 Int / Slope - 60 Int / Slope - 15 Economics Global Results

Belsay Road and E. Bristol Road – PM Peak

Rodel - C:\Users\902JAM\OneDrive - ROWE PSC\19C0262_GeneseeCountyRAB\RODEL\Belsay_Bristol.rod

File View Help



Project: Belsay Road and Bristol Road Date: 4-Jun-2021 Model: Rodel 2017 Timeslice: 7.5 Full Geometry: Full Geometry Peak: PM Feet: Feet RHD: RHD
 Name: 2045 Flows: 2045 Delay: Control Results: Veh Peak60/15m Synthetic Flow Profile: Synthetic Flow Profile Conf: 50 Light: Light 24

Approach Geometry						
Leg Name	Bearing	G	V	n		
1 SB-Belsay Road	0	0	11.00	1		
2 EB-Bristol Road	90	0	11.00	1		
3 NB-Belsay Road	180	0	11.00	1		
4 WB-Bristol Road	270	0	11.00	1		

Entry Geometry						Circ Geom		
E	n	L'	R	Φ	D	C	n	
15.00	1	190.00	60.00	24.00	120.00	18.00	1	
15.00	1	200.00	60.00	24.00	120.00	18.00	1	
15.00	1	290.00	60.00	24.00	120.00	18.00	1	
15.00	1	265.00	60.00	24.00	120.00	18.00	1	

Exit Geometry			
Ex	n	Vx	n
15.00	1	11.00	1
15.00	1	11.00	1
15.00	1	11.00	1
15.00	1	11.00	1

Entry Capacity Mods	
-+ Cap (v/h)	Xwalk Fact
0	1.000
0	1.000
0	1.000
0	1.000

Volume Modifiers		
Leg Name	%Truck	Factor
1 SB-Belsay Road	0.0	1.00
2 EB-Bristol Road	0.0	1.00
3 NB-Belsay Road	0.0	1.00
4 WB-Bristol Road	1.0	1.00

Turning Volumes (veh/hr)					
	U-Turn	Exit-3	Exit-2	Exit-1	Bypass
	0	31	226	57	0
	0	69	176	29	0
	0	12	243	48	0
	0	64	112	23	0

Arrival Volume Ratios			Arrival Volume Times (min)			PHF
Ratio1	Ratio2	Ratio3	Time1	Time2	Time3	
0.750	1.125	0.750	0	30	60	
0.750	1.125	0.750	0	30	60	
0.750	1.125	0.750	0	30	60	
0.750	1.125	0.750	0	30	60	

Calibration
 Accidents
 Economics
 Bypass

	Peak 60min Results	Bypass Type	Flow Rate (veh/hr)		Opp Rate (veh/hr)		Capacity (veh/hr)		Ave VCR		Ave Del (sec/veh)		Max Q (veh)		Max Q95% (veh)		LOS A-F		
			Entry	Bypass	Entry	Bypass	Entry	Bypass	Entry	Bypass	Entry	Bypass	Leg	Entry	Bypass	Entry	By	Leg	
1	SB-Belsay Road	None	314		188		1165		0.2694		6.58		6.58	0.44	1.15		A		A
2	EB-Bristol Road	None	274		321		1091		0.2511		6.67		6.67	0.40	1.06		A		A
3	NB-Belsay Road	None	303		276		1120		0.2706		6.77		6.77	0.45	1.17		A		A
4	WB-Bristol Road	None	199		324		1070		0.1859		5.92		5.92	0.27	0.70		A		A
All	Intersection												6.53						A

Results 60
 Results 15
 Int / Slope - 60
 Int / Slope - 15
 Economics
 Global Results

Intersection

Belsay Road and East Bristol Road

Opinion of Probable Cost

By: Rowe PSC

Date: 5/20/2021

PAY ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	AMOUNT
Mobilization (10%)	1	LSUM	\$95,000.00	\$95,000.00
Pavt, Rem	7500	Syd	\$10.00	\$75,000.00
Curb and Gutter, Rem	1800	Ft	\$10.00	\$18,000.00
Embankment, CIP	3000	Cyd	\$15.00	\$45,000.00
Excavation, Earth	2000	Cyd	\$10.00	\$20,000.00
Aggregate Base	2800	Ton	\$21.00	\$58,800.00
Shoulder, CI II	80	Ton	\$25.00	\$2,000.00
HMA, 4E10	450	Ton	\$85.00	\$38,250.00
HMA Approach	175	Ton	\$50.00	\$8,750.00
Conc Pavt, Nonreinf, 9 inch	4000	Syd	\$45.00	\$180,000.00
Joint, Contraction, Cp	3400	Ft	\$10.00	\$34,000.00
Joint, Expansion, E2	300	Ft	\$25.00	\$7,500.00
Joint, Expansion, E3	1335	Ft	\$15.00	\$20,025.00
Curb and Gutter, Conc, Det B1	3160	Ft	\$25.00	\$79,000.00
Curb and Gutter, Conc, Det D1	250	Ft	\$25.00	\$6,250.00
Curb, Conc, Det E1	135	Ft	\$25.00	\$3,375.00
Driveway Opening, Conc, Det M	170	Ft	\$22.00	\$3,740.00
Conc Pavt, Decorative Colored, 9 inch	8800	Sft	\$12.50	\$110,000.00
Turf Establishment, Performance	6500	Syd	\$5.00	\$32,500.00
MOT	1	LSUM	\$70,000.00	\$70,000.00
Pavement Markings	1	LSUM	\$15,000.00	\$15,000.00
Signing	1	LSUM	\$20,000.00	\$20,000.00
Drainage	1	LSUM	\$100,000	\$100,000.00
TOTAL				\$1,042,190

CONTINGENCY (20%) \$208,438.0

ESTIMATED TOTAL CONSTRUCTION COST (YEAR 2021) \$1,250,628.0

3% ANNUAL INFLATION 2021 TO 2025 \$156,964.83

ESTIMATED TOTAL CONSTRUCTION COST (YEAR 2025) **\$1,407,592.83**

*** Notes**

6" Agg base used for driveways and shoulders, 8" used for roadway, 12" used for islands (10% of total added)

Pavement and curb removal quantities are estimated with the assumption that the northeast corner parking lot will be partially removed

Assumed 5" HMA thickness for approach and 8" thick for HMA roadway

B1 curb was calculated by adding the splitter islands along with the roadways, minus the radius for the roundabout

E1 curb was calculated for the inner roundabout curb

E2 joint expansion was calculated for the outer radius of the roundabout

D1 curb was calculated for the truck apron

Drainage includes enclosed storm for all curbed areas, spillways, and underdrain

MOT taken as approximately ~8% of total before mobilization; based on previous roundabout projects

ROW acquisition costs not included

Joints assumed for central island/splitter islands

E3 joint expansion was calculated using the radius of curves from the B/C of the roundabout and splitter islands

NUMBER OF CRASHES OR INJURED PERSONS.

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
	2015	2016	2017	2018	2019

Fatal and A-Injury Reduction	%REDUCTION	78%	Roundabout		
Number of Crashes	0	0	0	0	1

A-Injured or Killed Persons	0	0	0	0	2
-----------------------------	---	---	---	---	---

Minor Crash Reduction	%REDUCTION	57%	0		
Number of Crashes	0	0	0	0	27
	0	0	0	0	24
	0	0	0	0	3

	%REDUCTION	0%			
Number of Crashes	0	0	0	0	0
	0	0	0	0	0
A-Injured or Killed Persons	0	0	0	0	0

	%REDUCTION	0%			
Number of Crashes	0	0	0	0	0
	0	0	0	0	0
A-Injured or Killed Persons	0	0	0	0	0

	%REDUCTION	0%			
Number of Crashes	0	0	0	0	0
	0	0	0	0	0
A-Injured or Killed Persons	0	0	0	0	0

of A-injuries: 2 For reference only
 # of Fatalities: 0 For reference only; "Q" accounts

for the risk of a fatality.

PROJECT COST ESTIMATE : \$1,407,593 If unknown, enter "0" (zero).
 ADTb (before-volume) 1.0 You may change these
 ADTa (after-volume) 1.1 default ADT values.
 # OF YEARS OF DATA: 5.00 3 to 5 years should be used.
 RATE OF INFLATION: 2.50%
 AREA TYPE: Urban "Rural", "Urban", or "Between"

REMARKS:

Belsay Road and Bristol Road
 Genesee County Roundabout Study
 1495110, 3251574
 0.9997728, 7.0363164
 Roundabout

COMPUTED BENEFITS DERIVED THROUGH CRASH REDUCTION

TOR 2021

Date **9-Jul-21**

Project: **Belsay Road and Bristol Road**

City/Twp. **City of Burton**

Prepared By: **ROWE Professional Services Company**

County **Genesee County**

PR: **1495110, 3251574**

PR MP Range: **0.9997728, 7.0363164**

The method of evaluating crash costs, used below, is given on page 67 of Roy Jorgensen's report of Highway Safety Improvement Criteria, 1966 edition. This same method is given in the Bureau of Public Roads IM21-3-67. In 1994 we have adapted the Q formula to blend Fatalities and A-injuries only.

In the following analysis the costs provided by the National Safety Council are :

2019 NSC VALUES:

Death	\$1,659,000	=FATCOST
Disabling (A) injury:	\$96,200	=ACOST
B-injury:	\$27,800	=BCOST
PDO and/or Minor Injury Crash:	\$12,200	=PDOCOST

$$BTOTAL = ADTa / ADTb \times [(Q \times R1) + (BCOST \times R2) + (PDOCOST \times R3)]$$

WHERE:

BTOTAL =	Total Benefit in Dollars Over Years Used	\$778,820
ADTa =	Average traffic volume after the improvement	1.1
ADTb =	Average traffic volume before the improvement	1.0
R1 =	Reduction in fatalities and A-Injuries Combined.	1.6
R2 =	Reduction in B-Injury crashes:	1.7
R3 =	Reduction in PDO and C-injury crashes:	13.7
Q =	$[FATCOST + ((I/F) \times INJCOST)] / [1 + (I/F)]$	
=	$[1,659,000 + (6.10 \times 96,200)] / [1 + 6.10]$	\$316,400
	for AREA TYPE "Urban"	
I/F =		6.10

Q-Reference	Q	A-Injuries	Fatalities	I/F
RURAL	\$363,900	6,072	1,255	4.84
URBAN	\$316,400	9,902	1,624	6.10
BETWEEN	\$334,900	15,974	2,879	5.55

Data from Safety Programs Unit
5-Year Statewide Non-Trunkline Crash Figures Used.
(*From 1-1-2015 Through 12-31-2019).

Time of Return (T.O.R.) is based on 5 years of data.

NOINFB = No-Inflation Annual Benefit = BTOTAL / years \$155,764

With an inflation rate of 2.50%

B = Annual Benefit = Present Value (with Inflation) \$199,391

C = Project Cost \$1,407,593

TOR = C / B = COST / ANNUAL BENEFIT = **7.06**

B. Belsay and East Bristol

1. [2045 AM Peak Hour No Build](#)
2. [2045 PM Peak Hour No Build](#)
3. [2045 AM Peak Hour Roundabout](#)
4. [2045 PM Peak Hour Roundabout](#)