Final Technical Memo	
Date:	8/23/23
To:	Jim Benekos and Nick Loukas
From:	Daniel Jozity
RE:	Fulton Road Intersection Technical Memo

STUDY AREA AND EXISTING CONDITIONS

The study area will be limited to the intersection of Fulton Road, 25th Street and Harrison Avenue in the City of Canton, Stark County, Ohio. The study limits beyond the intersection will be limited to approximately 500' on all approaches. See below for the study area map.

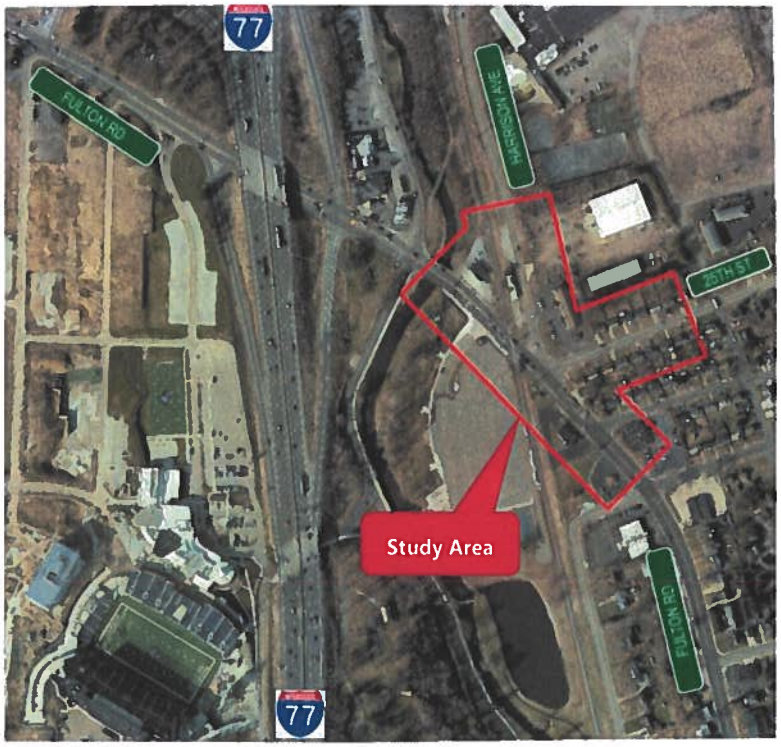

Figure 1 – Study Area Map

Fulton Road is functionally classified as an Urban Minor Arterial with a posted speed of 35 mph. The Right of Way (ROW) at the west end of the study area is 70' wide on either side of the intersection. The existing pavement width is 54' with curb on each side. The roadway has 4 lanes with sporadic sidewalks on both sides with no pedestrian crossing across Fulton Road. The southeast approach has a thru and a left turn lane and the northwest approach has 2 thru lanes with the outside lane being thru/right lane. The approaches to the intersection are on a horizontal tangent alignment that has curves on either end of the intersection. The vertical alignment is generally flat.

25th Street is functionally classified as an urban major collector with a posted speed limit of 35 mph. The ROW width is 50' and widens at the intersection with Fulton Road. The existing pavement width is approximately 29' wide with curb and sidewalk on each side. The two-lane roadway widens at the intersection to 36' wide to accommodate an additional right turn only lane. The approach to the intersection is on a horizontal tangent alignment and the vertical alignment is generally flat.

Harrison Avenue is functionally classified as an urban major collector with a posted speed limit of 35 mph. The ROW width is 45'. The horizontal alignment approaching the intersection is on a tangent with a flat vertical alignment. There is one lane in each direction. The existing pavement width is 24' wide with curb and gutter on the east side and curb on the west side of the roadway. The pavement widens to 36' to add a right turn only lane approaching the intersection. There is no sidewalk on this roadway.

CRASH ANALYSIS

Crash data from 2018 to 2022 was obtained from ODOT Transportation Information Mapping System (TIMS). A total of 63 crashes occurred within the study corridor limits. There was one fatality within the study period and there were 9 injury crashes. The crash data and OH-1 Reports were reviewed for each crash to identify the location of each crash and potential contributing factors. Crash Diagrams and Data are enclosed.

Crash Data Analysis

Crash data for the study area were compared to the statewide averages and were analyzed using ODOT's Crash Analysis Module (CAM) Tool. Statewide averages were obtained from ODOT's historical data. The crash types and statewide averages are shown in Table 1. The frequency of crash types in the study area compared to statewide averages for non-freeways in the state system.

Table 2 – Crash Data

Type of Crash	2018-2022 Number	2018-2022 Percentage	Statewide Average
Rear End	33	52.38%	10.26%
Sideswipe - Passing	11	17.46%	3.66%
Angle	7	11.11%	2.36%
Fixed Object	4	6.35%	34.58%
Right Turn	3	4.76%	0.52%
Head On	2	3.17%	2.86%
Backing	2	3.17%	1.12%
Left Turn	1	1.59%	2.66%
Total	**63**		
Injury Crash	9	14.29%	26.21%
Fatality Crash	1	1.59%	0.93%
Property Damage Only	53	84.13%	72.86%

As per Table 1, Rear End, Sideswipe, Angle, and Right Turn crashes significantly exceed the statewide average for similar type roadways. In reviewing all the crash data, only 11 crashes occurred in snow or rain, with the remaining on dry and clear/cloudy days. Seventy percent of the crashes occurred during daylight hours.

GANNETT FLEMING

Probable Causes of Crashes

The probable causes of the crashes are as follows:

- Rear-end crashes accounted for approximately 52 percent of all crashes and 56 percent of all injuries. Following too closely was the contributing factor in more than half of these crashes, indicating that traffic congestion is likely a contributing factor.
- Sideswipe-passing crashes accounted for approximately 17 percent of all crashes and 11 percent of all injuries. Improper lane changes were the most common contributing factors in these crashes. These crashes are common when drivers must quickly change lanes to get in the proper lane.
- Left-turn, Right-turn and angle crashes accounted for 17 percent of all crashes, 11 percent of all injuries and the fatal crash. It does not appear that sight distance was a contributing factor in these crashes. Therefore, these crashes were likely caused by drivers choosing to make risky maneuvers and accepting smaller gaps in traffic when making a turn or maneuvers due to the wide intersection.

Given that the majority of crashes in the study area were found to be related to congestion, lane utilization or wide intersection, potential mitigation efforts could include improving traffic operations, reducing the number of legs at the intersection, additional channelizing devices, and improved traffic control devices.

ALTERNATIVES CONSIDERED AND DEVELOPMENT

Gannett Fleming reviewed the study area for potential improvements. No improvements were identified to improve the intersection with the exception of a roundabout due to other improvements would require a new at grade crossing to minimize the number of approaches to the intersection which is not allowed per the Ohio Revised Code. Benefits of a roundabout include eliminating conflict points, reducing the number and severity of crashes due to lower speeds and improving operational efficiencies. Roundabouts also offer lower long-term operation and maintenance costs than the current traditional intersection. Varying options of the roundabout layout were reviewed from a standard circular roundabout, an oval roundabout, dual roundabouts, and a peanut roundabout. After discussion with the City of Canton Engineering, it was decided to advance the peanut roundabout alternative as it improves operational benefits, mobility, while minimizing right of way and utility impacts.

TRAFFIC OPERATIONS

All the traffic analyses were conducted for the design year and design hour volume utilizing Highway Capacity Manual (HCM) methodologies.

Traffic Volumes

Traffic counts were obtained from ODOT and Stark County Area Transportation Study (SCATS) for the study area. Historical tube counts from 2011 to 2017 and 2015 turn movement counts at the study intersection were utilized for traffic forecasting for this project and are enclosed.

Analysis Years

For purposes of this study, only the design year of 2048 was utilized for the analyses.

Traffic Forecasting

ODOT modified NCHRP 255 spreadsheet was utilized to obtain the traffic growth rate for the study area. The calculated growth rate was 1.17% based on the historical traffic counts from 2011 to 2017. The turn movement traffic volumes for this intersection were forecasted utilizing the growth factor stated above to determine the

future 2048 design hour volume (DHV) that was utilized for the analyses. See enclosed for the traffic projections and traffic plates utilized for the study.

CAPACITY ANALYSIS

A capacity analysis is the primary method for evaluating the efficiency of a roadway or intersection as it relates to vehicular traffic. The HCM, published by Transportation Research Board (TRB), outlines capacity analysis procedures and criteria for evaluating the operations of unsignalized and signalized intersections. The criteria for evaluating the operation of an intersection are measured in terms of level of service (LOS), a qualitive measure, and control delay per vehicle. There are six levels of service, designated by the letters A through F. LOS A represents the best operating conditions, and LOS F represents the worst operating conditions. LOS criteria are listed in Table 2.

Table 3 – Level of Service Criteria for Signalized and Unsignalized Intersections

Level of Service	Signalized Intersection Delay (Seconds)	Unsignalized Intersection and Roundabout Delay (Seconds)
A	≤ 10	≤ 10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-60
F	> 80 or Volume-Capacity Ratio > 1.0	> 60 or Volume-Capacity Ratio > 1.0

Capacity analyses were conducted for the No Build with signal timing adjustments and a roundabout alternative for the 2048 DHV. Capacity results for each alternative are shown below and detailed capacity analyses are enclosed.

Table 4 – 2048 Design Year Level of Service

Fulton Road, 25th Street and Harrison Avenue	2048 DHV								
	Fulton				Harrison		25th		INT
	SE TH	SE LT	NW TH	NW RT	NE LT	NE RT	NE LT	NE RT	
No Build									
Level of Service	B	E	F	F	E	B	D	F	E
Delay (Sec)	12.9	76.8*	83.1*	83.1*	73.6	13.1	40.5	86.2*	59.7
Peanut Roundabout									
Level of Service	A	A	A	A	C	C	B	B	B
Delay (Sec)	9.2	9.2	9.1	9.1	16.4	16.4	14.1	14.1	10.5

*Volume to Capacity ratio > 1.0

As per Table 3, the peanut roundabout performs significantly better for the design year with no approaches operating over capacity as with the existing intersection.

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PREFERRED ALTERNATIVE

As discussed above, the peanut roundabout alternative was selected to be the preferred alternative for the improvements of the study location. The peanut roundabout improves traffic operations, will mitigate crashes and adds pedestrian access across Fulton Road. Due to the 2048 projected traffic volumes the peanut roundabout requires two thru lanes in each direction with a single lane for turning vehicles as shown below in Figure 2. The peanut roundabout maintains access to all approaches for Fulton Road, 25th Street, Harrison Avenue, and creates a new leg to the Public Parking Lot. The roundabout design elements follow the design criteria for the stated functional classifications above, design speeds and is per the 2023 NCHRP 1043 Guide for Roundabouts and ODOT Location and Design Manual Volume One. A larger scale figure is enclosed.

Figure 2 – Peanut Roundabout Layout

CONSTRUCTION COST

A conceptual estimate of construction cost for the peanut roundabout alternative was prepared. Estimated construction costs were developed using estimated quantities for items that would be needed or impacted to implement the required improvement.

The following assumptions were utilized in estimating construction costs:

- Unit prices were estimated based on ODOT's Summary of Contracts Awarded for 2022, Procedures for Budget Estimating, and prior ODOT bid tabs.
- A 30 percent contingency was selected based on the Procedures for Budget Estimating.

- The rate of inflation was calculated using the ODOT Office of Estimating Fiscal Year Business Plan Inflation Calculator. Based on a construction midpoint of July 2029, a 28.3 percent rate of inflation (midpoint of construction) was assumed.
- The performance bond cost was estimated to be 0.75 percent of the construction cost before adding the contingency.
- The cost for construction layout stakes was estimated to be 1.0 percent of the construction cost before adding the contingency.
- Maintenance of traffic costs were estimated to be 7 percent of the construction cost before adding the contingency.
- The right of way and property lines were established from record plans and Stark County GIS. Land and Structure values were utilized from the Stark County Auditor and converted to a per acre cost for new right of way required.

The conceptual estimate of probable project cost (with inflation) for the peanut roundabout alternative is summarized below in Table 4 and enclosed.

Table 5 – Estimated Cost

Cost Categories	Peanut Roundabout
Roadway	$485,017.00
Erosion Control	$55,000.00
Drainage	$102,180.00
Pavement	$1,122,444.00
Traffic Control	$89,114.30
Lighting	$205,000.00
Railroad Force Account	$1,160,000.00
Utilities	$253,500.00
MOT	$244,000.00
Incidentals	$185,000.00
Contingency (30%)	$1,114,883.00
Inflation (28.3%)	$1,419,573.00
ROW Cost	$877,383.00
Total	**$7,313,115.00**

CRASH ANALYSIS

Fulton Road, 25th Street and Harrison Avenue

GANNETT FLEMING

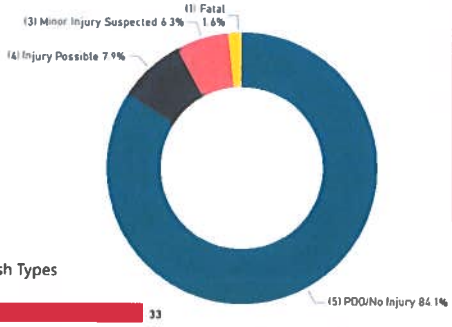
Fulton Ave - Crash Analysis - 2018-2022

Number of Crashes
63

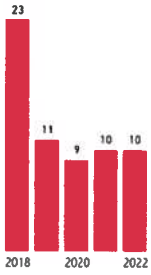
Fatalities
1

Injuries
9

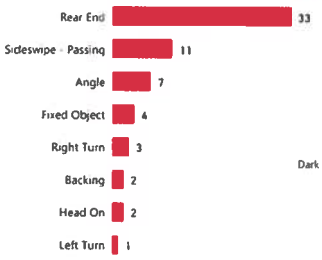
Crash Severity



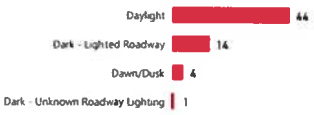
Crash by Year



Crash Types

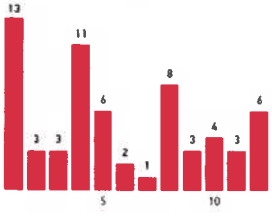


Crash by Lighting

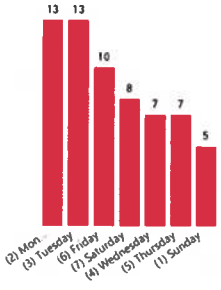


Crash by Road Surface

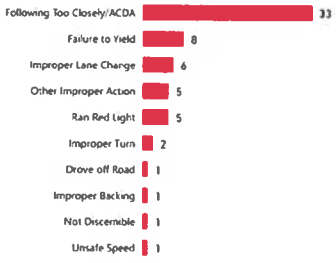
Crash by Month



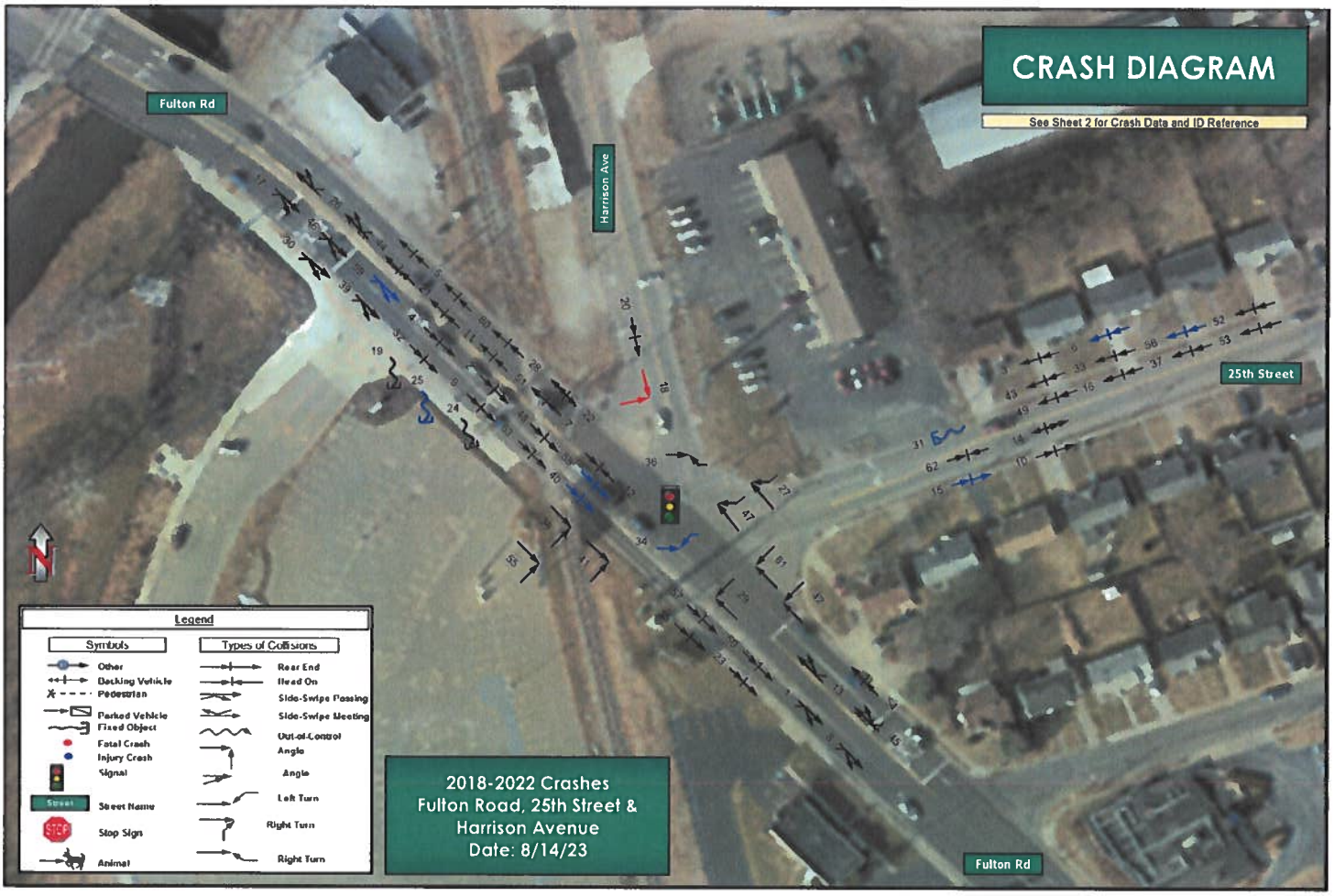
Crash by Day



At-Fault Contributing Factors



Crash Location


CRASH DIAGRAM
See Sheet 2 for Crash Data and ID Reference
Fulton Rd
Harrison Ave
25th Street
Fulton Rd
Legend
Symbols
Other
Backing Vehicle
Pedestrian
Parked Vehicle
Fixed Object
Fatal Crash
Injury Crash
Signal
Street
Street Name
STOP
Stop Sign
Animal
Types of Collisions
Rear End
Head On
Side-Swipe Passing
Side-Swipe Meeting
Out-of-Control
Angle
Angle
Left Turn
Right Turn
Right Turn
2018-2022 Crashes
Fulton Road, 25th Street &
Harrison Avenue
Date: 8/14/23

ROW ID	CRASH SEVERITY	TYPE OF CRASH	CRASH DT	HOUR	DAY	LIGHT CONDITION	ROAD CONDITION	CONTRIBUTING FACTOR
1	PDO Crash	Sideswipe - Passing	20180107	23	(1) Sunday	Dark - Lighted Roadway	Dry	Improper Lane Change
2	PDO Crash	Rear End	20180109	6	(3) Tuesday	Dark - Lighted Roadway	Ice	Following Too Closely/ACDA
3	PDO Crash	Rear End	20180110	8	(4) Wednesday	Daylight	Wet	Following Too Closely/ACDA
4	PDO Crash	Rear End	20180113	15	(7) Saturday	Daylight	Slush	Other Improper Action
5	PDO Crash	Rear End	20180126	9	(6) Friday	Daylight	Dry	Following Too Closely/ACDA
6	Injury Crash	Rear End	20180125	14	(5) Thursday	Daylight	Dry	Following Too Closely/ACDA
7	PDO Crash	Rear End	20180122	19	(2) Monday	Dark - Lighted Roadway	Wet	Following Too Closely/ACDA
8	PDO Crash	Sideswipe - Passing	20180227	17	(3) Tuesday	Daylight	Dry	Improper Lane Change
9	PDO Crash	Rear End	20180406	19	(6) Friday	Dawn/Dusk	Wet	Following Too Closely/ACDA
10	PDO Crash	Rear End	20180411	18	(4) Wednesday	Daylight	Dry	Following Too Closely/ACDA
11	PDO Crash	Rear End	20180414	15	(7) Saturday	Daylight	Dry	Other Improper Action
12	PDO Crash	Head On	20180417	7	(3) Tuesday	Daylight	Wet	Other Improper Action
13	PDO Crash	Sideswipe - Passing	20180420	14	(6) Friday	Daylight	Dry	Following Too Closely/ACDA
14	PDO Crash	Backing	20180420	22	(6) Friday	Dark - Lighted Roadway	Dry	Failure to Yield
15	Injury Crash	Rear End	20180523	20	(4) Wednesday	Dawn/Dusk	Dry	Following Too Closely/ACDA
16	PDO Crash	Rear End	20180526	1	(7) Saturday	Dark - Lighted Roadway	Dry	Following Too Closely/ACDA
17	PDO Crash	Sideswipe - Passing	20180626	13	(3) Tuesday	Daylight	Dry	Improper Lane Change
18	Fatal Crash	Angle	20180807	14	(3) Tuesday	Daylight	Dry	Failure to Yield
19	PDO Crash	Fixed Object	20180806	14	(2) Monday	Daylight	Dry	Other Improper Action
20	PDO Crash	Rear End	20181022	8	(2) Monday	Daylight	Dry	Following Too Closely/ACDA
21	PDO Crash	Rear End	20181204	7	(3) Tuesday	Daylight	Wet	Following Too Closely/ACDA
22	PDO Crash	Backing	20181211	7	(3) Tuesday	Daylight	Dry	Improper Backing
23	PDO Crash	Rear End	20181230	15	(1) Sunday	Daylight	Dry	Following Too Closely/ACDA
24	PDO Crash	Fixed Object	20190107	22	(2) Monday	Dark - Lighted Roadway	Dry	Drove off Road
25	Injury Crash	Fixed Object	20190317	1	(1) Sunday	Dark - Unknown Roadway Lighting	Dry	Unsafe Speed
26	PDO Crash	Sideswipe - Passing	20190321	7	(5) Thursday	Dawn/Dusk	Wet	Ran Red Light
27	PDO Crash	Right Turn	20190403	9	(4) Wednesday	Daylight	Dry	Failure to Yield
28	PDO Crash	Rear End	20190521	14	(3) Tuesday	Daylight	Dry	Following Too Closely/ACDA
29	PDO Crash	Angle	20190916	11	(2) Monday	Daylight	Dry	Improper Turn
30	PDO Crash	Sideswipe - Passing	20191102	13	(7) Saturday	Daylight	Dry	Failure to Yield
31	Injury Crash	Fixed Object	20191103	14	(1) Sunday	Daylight	Dry	Other Improper Action
32	PDO Crash	Rear End	20191130	19	(7) Saturday	Dark - Lighted Roadway	Dry	Following Too Closely/ACDA
33	PDO Crash	Rear End	20191217	19	(3) Tuesday	Dark - Lighted Roadway	Dry	Following Too Closely/ACDA
34	Injury Crash	Left Turn	20191227	17	(6) Friday	Dark - Lighted Roadway	Dry	Improper Turn
35	PDO Crash	Rear End	20200120	15	(2) Monday	Daylight	Snow	Following Too Closely/ACDA
36	PDO Crash	Right Turn	20200214	12	(6) Friday	Daylight	Dry	Ran Red Light
37	PDO Crash	Rear End	20200131	7	(6) Friday	Dark - Lighted Roadway	Dry	Following Too Closely/ACDA
38	PDO Crash	Angle	20200409	13	(5) Thursday	Daylight	Dry	Ran Red Light
39	PDO Crash	Sideswipe - Passing	20200505	15	(3) Tuesday	Daylight	Dry	Ran Red Light
40	Injury Crash	Rear End	20200801	16	(7) Saturday	Daylight	Wet	Following Too Closely/ACDA
41	PDO Crash	Angle	20200813	9	(5) Thursday	Daylight	Dry	Failure to Yield
42	PDO Crash	Angle	20200818	14	(3) Tuesday	Daylight	Dry	Failure to Yield
43	PDO Crash	Rear End	20200916	12	(4) Wednesday	Daylight	Dry	Following Too Closely/ACDA
44	PDO Crash	Sideswipe - Passing	20210107	9	(5) Thursday	Daylight	Wet	Following Too Closely/ACDA
45	PDO Crash	Sideswipe - Passing	20210118	7	(2) Monday	Dawn/Dusk	Ice	Improper Lane Change
46	PDO Crash	Sideswipe - Passing	20210426	14	(2) Monday	Daylight	Dry	Improper Lane Change
47	PDO Crash	Right Turn	20210510	15	(2) Monday	Daylight	Dry	Not Discernible
48	PDO Crash	Rear End	20210810	16	(3) Tuesday	Daylight	Dry	Following Too Closely/ACDA
49	PDO Crash	Rear End	20210825	8	(4) Wednesday	Daylight	Dry	Following Too Closely/ACDA
50	PDO Crash	Rear End	20210922	11	(4) Wednesday	Daylight	Dry	Following Too Closely/ACDA
51	PDO Crash	Rear End	20211015	0	(6) Friday	Dark - Lighted Roadway	Dry	Following Too Closely/ACDA
52	PDO Crash	Rear End	20211018	17	(2) Monday	Daylight	Dry	Following Too Closely/ACDA
53	PDO Crash	Rear End	20211223	16	(5) Thursday	Daylight	Dry	Following Too Closely/ACDA
54	PDO Crash	Rear End	20220127	9	(5) Thursday	Daylight	Dry	Following Too Closely/ACDA
55	PDO Crash	Angle	20220215	11	(3) Tuesday	Daylight	Dry	Ran Red Light
56	Injury Crash	Rear End	20220327	8	(1) Sunday	Daylight	Ice	Following Too Closely/ACDA
57	PDO Crash	Rear End	20220411	14	(2) Monday	Daylight	Dry	Following Too Closely/ACDA
58	Injury Crash	Rear End	20220418	17	(2) Monday	Daylight	Wet	Following Too Closely/ACDA
59	Injury Crash	Sideswipe - Passing	20220521	22	(7) Saturday	Dark - Lighted Roadway	Dry	Improper Lane Change
60	PDO Crash	Rear End	20220613	10	(2) Monday	Daylight	Dry	Following Too Closely/ACDA
61	PDO Crash	Angle	20220729	16	(6) Friday	Daylight	Dry	Failure to Yield
62	PDO Crash	Head On	20220806	23	(7) Saturday	Dark - Lighted Roadway	Dry	Failure to Yield
63	PDO Crash	Rear End	20221007	19	(6) Friday	Dark - Lighted Roadway	Dry	Following Too Closely/ACDA

CRASH DIAGRAM

See Sheet 1 for Crash Diagram

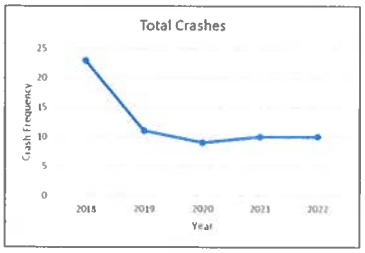
2018-2022 Crashes
Fulton Road, 25th Street &
Harrison Avenue
Date: 8/14/23

Fulton Ave at 25th St

Crash Summary Sheet

Crashes Per Year	12.60	Percent Injury	15.9%	EPDO	2.34

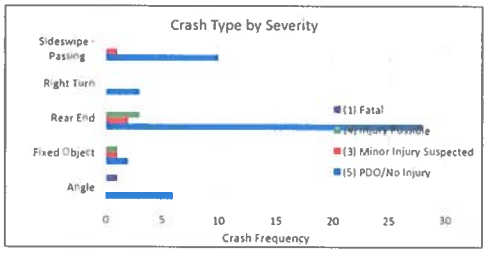
Year	Total Crashes	Fatalities	Serious Injuries
2018	23	1	0
2019	11	0	0
2020	9	0	0
2021	10	0	0
2022	10	0	0
Grand Total	63	1	0



Road Condition	Total Crashes	Fatalities	Serious Injuries
Dry	49	1	0
Ice	3	0	0
Slush	1	0	0
Snow	1	0	0
Wet	9	0	0
Grand Total	63	1	0

Weather	Total Crashes	Fatalities	Serious Injuries
Clear	30	1	0
Cloudy	25	0	0
Rain	5	0	0
Snow	2	0	0
Sleet, Hail	1	0	0
Grand Total	63	1	0

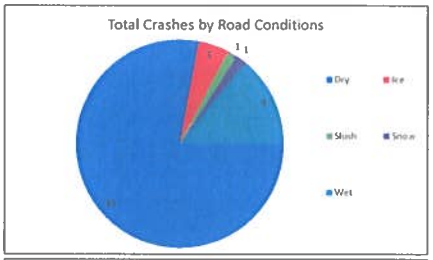
Roadway Contour	Total Crashes	Fatalities	Serious Injuries
Straight Level	31	1	0
Straight Grade	28	0	0
Curve Grade	2	0	0
Curve Level	2	0	0
Grand Total	63	1	0

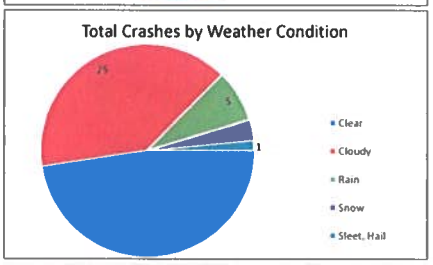


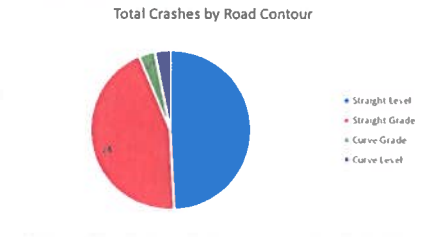
Total Crashes / Crash Type	Injury Level (1) Fatal	(3) Minor Injury	(4) Injury Possi	(5) PDO/No Inj	Grand Total
Rear End	0	2	3	28	33
Sideswipe - Passing	0	1	0	10	11
Angle	1	0	0	6	7
Fixed Object	0	1	1	2	4
Right Turn	0	0	0	3	3
Backing	0	0	0	2	2
Head On	0	0	0	2	2
Left Turn	0	0	0	1	1
Grand Total	1	4	5	53	63

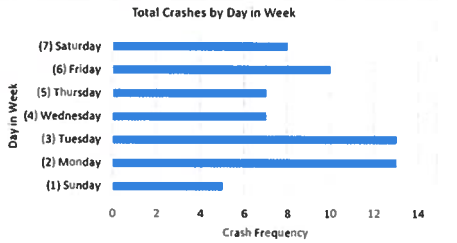
Fulton Ave at 25th St
Crash Summary Sheet

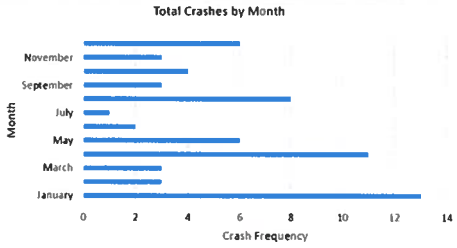
Crashes Per Year	12.60	Percent Injury	15.9%	EPDO	2.34

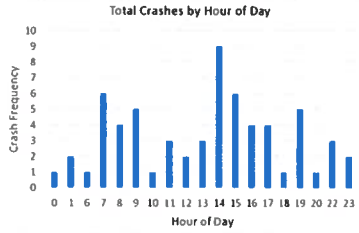












Hour of Day	Total Crashes
0	1
1	2
6	1
7	6
8	4
9	5
10	1
11	3
12	2
13	3
14	9
15	6
16	4
17	4
18	1
19	5
20	1
22	3
23	2
Grand Total	63

Month	Total Crashes
January	13
February	3
March	3
April	11
May	6
June	2
July	1
August	8
September	3
October	4
November	3
December	6
Grand Total	63

Day in Week	Total Crashes
(1) Sunday	5
(2) Monday	13
(3) Tuesday	13
(4) Wednesday	7
(5) Thursday	7
(6) Friday	10
(7) Saturday	8
Grand Total	63

TRAFFIC PROJECTIONS

2048 Design Hour Volume

FULTON RD, HARRISON AVE AND 25TH ST INTERSECTION IMPROVEMENT

MODEL: Design PAPERSIZE: 8.5x11 (in.) DATE: 8/7/2023 TIME: 5:08:41 PM USER: djozity
C:\CONNECT\CustomConfig\Workspaces\OHDOT\WorkSets\Traffic\dgn\Fulton Ave Traffic.dgn

2048 DESIGN HOUR VOLUME

NOTES:

1) TURN MOVEMENT COUNTS WERE OBTAINED FROM ODOT IN 2015.

2) THE DHV WAS CALCULATED BASED ON THE PEAK HOUR AND THE ROADWAY BEING FUNCTIONALLY CLASSIFIED AS A URBAN MINOR ARTERIAL. THE DESIGN HOUR VOLUMES WERE THEN PROJECTED TO THE DESIGN YEAR OF 2048 BASED ON 1.17% GROWTH RATE FROM THE REGRESSION CALCULATION FROM THE ODOT NCHRP 255 TRAFFIC PROJECTION SPREADSHEET FROM MULTIPLE YEAR ADT VOLUMES.

3) A MINIMUM OF 10 VEHICLES PER MOVEMENT WAS UTILIZED.

DHV = DESIGN HOUR VOLUME

VOLUME MOVEMENT

DESIGN AGENCY
GANNETT FLEMING

DESIGNER	DRJ
REVIEWER	BRO 08-11-23
PROJECT ID	CANTON
SHEET	1
TOTAL	1

TRAFFIC PROJECTIONS

Traffic Forecast

Location	Year	ADT	B&C	T24
Count1				#DIV/0!
Count2				#DIV/0!
Count3				#DIV/0!
Count4				#DIV/0!
Count5	2011	16900		0.00%
Count6	2015	18405		0.00%
Count7	2017	18000		0.00%
Open	2028	20320	0	0.00%
Design	2048	24538	0	0.00%
	gr rate	1.17%	#DIV/0!	

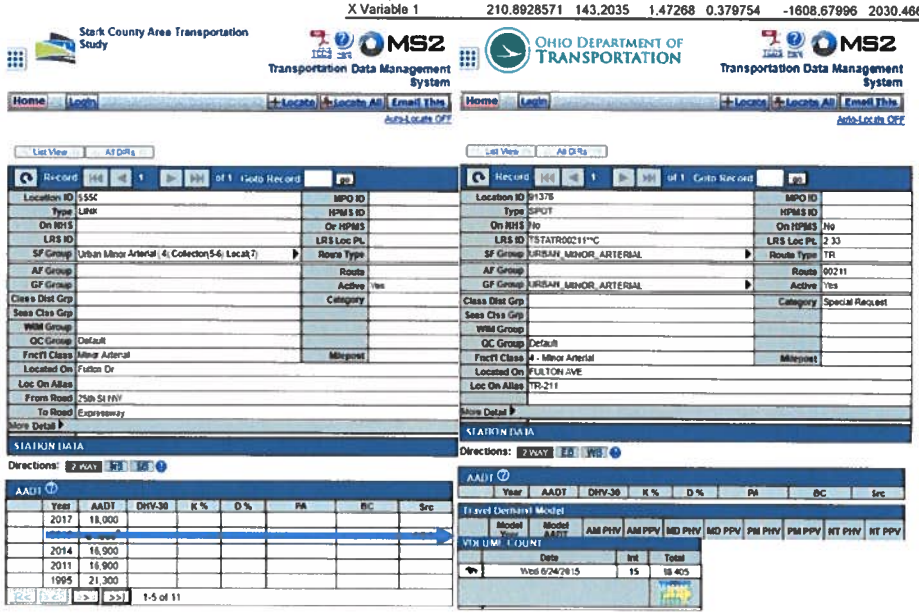
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.827297806
R Square	0.68442166
Adjusted R Square	0.368843321
Standard Error	618.709775
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	830214.9	830214.9	2.168785	0.379753891
Residual	1	382801.8	382801.8		
Total	2	1213017			

	Coefficients	*'andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Upper 95.0%*
Intercept	-407040.1786	288459.8	-1.41108	0.392492	-4072269.167	3258189	-4072269	3258189
X Variable 1	210.8928571	143.2035	1.47268	0.379754	-1608.67996	2030.466	-1608.68	2030.466



8/7/2023
5:42 PM

PEAK HOUR to DESIGN HOUR FACTORS

FUNCTIONAL CLASSIFICATION = 03, 04, 05u

(Urban Principal Arterial, Urban Minor Arterial, & Urban Minor Collector)

Fulton is Minor Arterial
Harrison and 25th Major Collectors

Day / Month	Monthly Average by Day of Week							
	WEEKDAY MON-THUR	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
January	1.25	1.81	1.27	1.25	1.25	1.23	1.18	1.61
February	1.23	1.78	1.26	1.23	1.23	1.19	1.17	1.58
March	1.18	1.63	1.20	1.18	1.17	1.17	1.12	1.47
April	1.13	1.57	1.15	1.14	1.12	1.11	1.08	1.42
May	1.10	1.47	1.12	1.10	1.10	1.07	1.06	1.35
June	1.14	1.51	1.16	1.14	1.14	1.11	1.10	1.40
July	1.14	1.54	1.16	1.14	1.13	1.14	1.11	1.45
August	1.12	1.49	1.14	1.14	1.12	1.10	1.06	1.41
September	1.12	1.53	1.15	1.13	1.13	1.09	1.05	1.42
October	1.12	1.54	1.15	1.12	1.11	1.10	1.05	1.42
November	1.16	1.63	1.17	1.15	1.15	1.15	1.08	1.52
December	1.16	1.61	1.18	1.16	1.16	1.13	1.10	1.50

peak hour volume * factor = design hour volume

2015 Traffic Counts

Overall																	
8:15	22	33	50	105	4	67	2	73	73	7	1	81	1	7	49	57	316
8:30	33	33	71	137	3	61	1	65	121	9	3	133	3	10	57	70	405
8:45	29	53	74	156	4	63	0	67	84	6	5	95	3	9	47	59	377
9:00	22	53	58	133	6	58	0	64	68	8	2	78	3	10	41	54	329
Total	106	172	253	531	17	249	3	269	346	30	11	387	10	36	194	240	1427
4:45	49	56	79	184	5	47	3	55	105	20	5	130	1	10	34	45	414
5:00	51	61	80	192	8	53	0	61	86	10	6	102	0	11	44	55	410
5:15	43	76	112	231	7	55	2	64	107	12	6	125	5	14	30	49	469
5:30	57	73	103	233	3	46	1	50	81	16	9	106	0	6	34	40	429
Total	200	266	374	840	23	201	6	230	379	58	26	463	6	41	142	189	1722

	SR 687 (Fulton Dr) Eastbound				25th St Westbound				SR 687 (Fulton Dr) Northbound				Harrison Ave Southbound				
	LT	TH	RT	Total	LT	TH	RT	Total	LT	TH	RT	Total	LT	TH	RT	Total	Int. Total
Peak	200	266	374	840	23	201	6	230	379	58	26	463	6	41	142	189	1722

For converting partial day turning movements counts to seasonally adjusted 24 hour (AADT) counts
Yellow boxes require user input. Scroll down for 24 hour diagrams. Use the Seasonal AdjustmtFactors_YYYY spreadsheet to lookup seasonal factor
Use Avg TD by FC.xslx to compute P&A B&C FACTORs

Date of Count: 5/7/2015 — 5 Thursday May

DESIGN YEAR 2015
2048
Linear Growth
1.17%
1.46794

PART 1: INPUT PARTIAL DAY P&A VEHICLES — ROUTE: Fulton Road

PARTIAL COUNT * FACTOR * SEASONAL FACTOR = 24 HR P&A

SOUTH LEG — Fulton — FC = 4 — northbound

	LT	THRU	RT	LT	THRU	RT	APROACH TOTAL	DEPART TOTAL		SOUTH LEG THRU	RT	APROACH TOTAL	DEPART TOTAL
DHV FACTOR	1.070	1.070	1.070	379	58	26	463	438	LT 410	60	30	500	460
GROWTH FACTOR	1.468	1.468	1.468	595.293	91.1002	40.838	727.231	687.964	*600*	*90*	*40*	*730*	*690*

WEST LEG — Fulton — FC = — eastbound

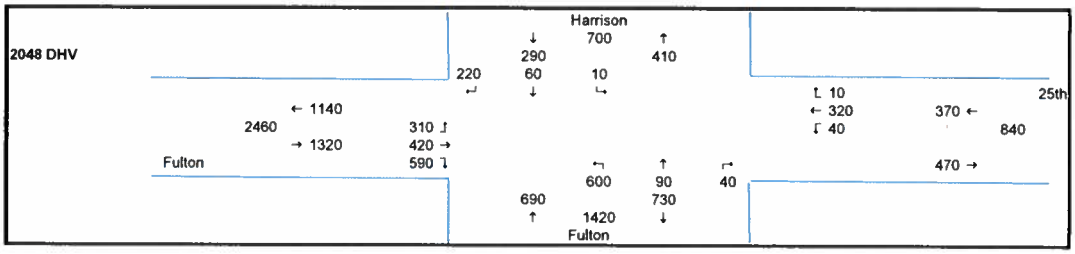
	LT	THRU	RT	LT	THRU	RT	APROACH TOTAL	DEPART TOTAL		WEST LEG THRU	RT	APROACH TOTAL	DEPART TOTAL
DHV FACTOR	1.070	1.070	1.070	200	266	374	840	722	LT 210	280	400	890	780
GROWTH FACTOR	1.468	1.468	1.468	314.139	417.805	587.439	1319.38	1134.04	*310*	*420*	*590*	*1320*	*1140*

NORTH LEG — Harrison — FC = — southbound

	LT	THRU	RT	LT	THRU	RT	APROACH TOTAL	DEPART TOTAL		NORTH LEG THRU	RT	APROACH TOTAL	DEPART TOTAL
DHV FACTOR	1.070	1.070	1.070	6	41	142	189	264	LT 10	40	150	200	280
GROWTH FACTOR	1.468	1.468	1.468	9.42416	64.3984	223.039	296.861	414.663	*10*	*60*	*220*	*290*	*410*

EAST LEG — 25th — FC = — westbound

	LT	THRU	RT	LT	THRU	RT	APROACH TOTAL	DEPART TOTAL		EAST LEG THRU	RT	APROACH TOTAL	DEPART TOTAL
DHV FACTOR	1.070	1.070	1.070	23	201	6	230	298	LT 20	220	10	250	320
GROWTH FACTOR	1.468	1.468	1.468	36.126	315.709	9.42416	361.26	468.067	*40*	*320*	*10*	*370*	*470*



TRAFFIC PROJECTIONS

Existing Turn Movement Counts

OHIO DEPARTMENT OF TRANSPORTATION – DIVISION OF PLANNING -
OFFICE OF TECHNICAL SERVICES

INTERSECTION TRAFFIC COUNT SHOWING TURNING MOVEMENTS

Co.	Station No.	Route	Log	Location	City/Town	FC	Year
STA	89976	0687R	00.00	SR-687 (FULTON DR. N.W.) AND HARRISON AVE. N.W.	IN CANTON	16	2015

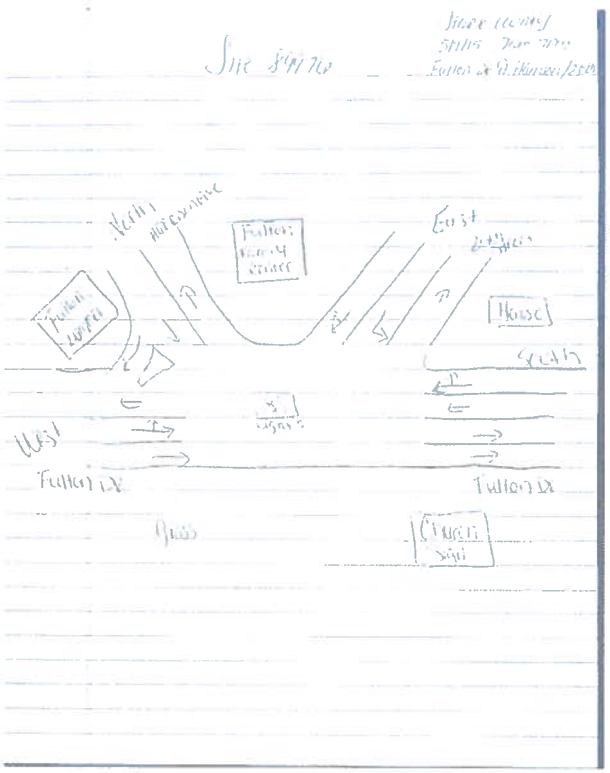
Recorder	Hour	Period	Day	Date	Weather	Road Condition
COUNT ELEC.	07:00 AM	07:00 PM	THU	05/07/2015	UNKNOWN	

Leg Names:
N – HARRISON AVE. N.W.
S – SR-687 (FULTON DR. N.W.)
E – 25TH. STREET
W– SR-687 (FULTON DR. N.W.)

Expansion Factor P&A:	1.30
Expansion Factor B&C:	1.21
Seasonal Factor P&A:	0.90
Seasonal Factor B&C:	0.71
Combined Factor P&A:	1.17
Combined Factor B&C:	0.86

***Note:** Expansion Factor used – 2014 Hourly Percent by Vehicle Type (FC16 = URBAN 4)

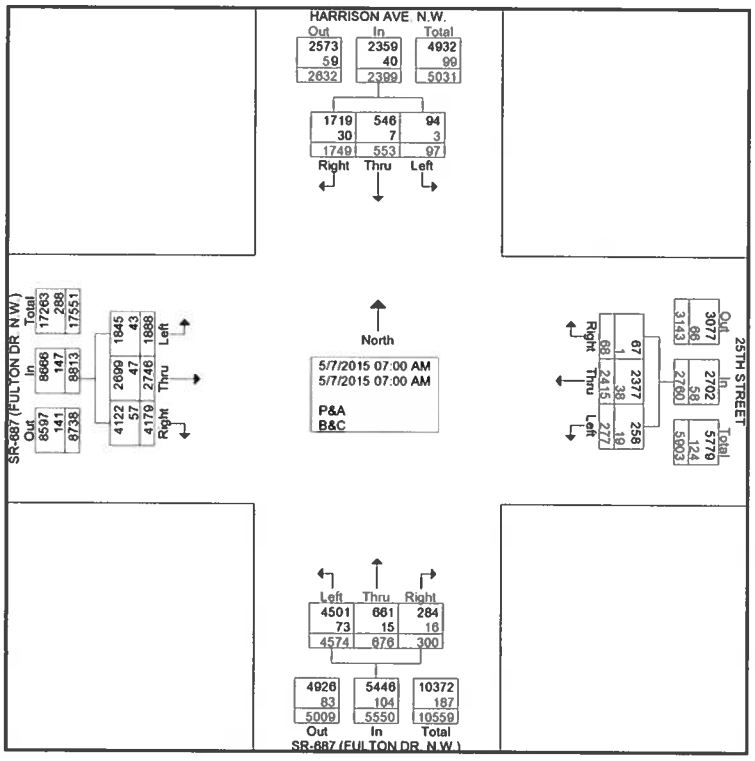
SITE 89976 STARK COUNTY
5/7/15 7AM – 7PM
FULTON @ HARRISON/25TH STREET



Ohio Department of Transportation

1980 West Broad Street
Columbus, OH 43223
(614) 466-3728

File Name : FULTON DR. & HARRISON AVE.
Site Code : 89976
Start Date : 5/7/2015
Page No : 1



Ohio Department of Transportation

1980 West Broad Street
Columbus, OH 43223
(614) 466-3728

LOCATION: FULTON DR. & HARRISON AVE.
COUNTED BY: COUNT ELECTRONICS
WEATHER: DRY
NOTES: RAW DATA

File Name : FULTON DR. & HARRISON AVE.
Site Code : 89976
Start Date : 5/7/2015
Page No : 1

Groups Printed- P&A

	SR-687 (FULTON DR. N.W.) Eastbound				25TH STREET West Bound				SR-687 (FULTON DR. N.W.) Northbound				HARRISON AVE. N.W. South Bound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	18	32	40	90	0	27	0	27	58	2	3	63	0	3	29	32	212
07:15 AM	30	27	54	111	1	31	1	33	77	6	1	84	1	8	28	37	265
07:30 AM	19	39	78	136	2	35	0	37	103	6	3	112	0	10	57	67	352
07:45 AM	20	58	85	163	6	33	0	39	96	7	2	105	2	13	33	48	355
Total	87	156	257	500	9	126	1	136	334	21	9	364	3	34	147	184	1184
08:00 AM	18	31	69	118	2	45	0	47	61	2	2	65	2	10	36	48	278
08:15 AM	20	33	47	100	2	62	2	66	73	7	1	81	1	7	48	56	303
08:30 AM	30	32	71	133	3	57	0	60	116	9	3	128	3	10	55	68	389
08:45 AM	29	51	74	154	4	61	0	65	81	5	3	89	3	9	45	57	365
Total	97	147	261	505	11	225	2	238	331	23	9	363	9	36	184	229	1335
09:00 AM	22	51	56	129	5	56	0	61	63	8	2	73	3	9	40	52	315
09:15 AM	21	33	54	108	5	47	0	52	71	6	3	80	1	7	26	34	274
09:30 AM	27	47	62	136	2	33	1	36	73	6	3	82	4	7	15	26	280
09:45 AM	28	64	56	148	4	35	1	40	64	5	3	72	2	4	29	35	295
Total	98	195	228	521	16	171	2	189	271	25	11	307	10	27	110	147	1164
10:00 AM	34	35	67	136	3	34	1	38	64	7	4	75	3	6	23	32	281
10:15 AM	23	52	67	142	4	23	4	31	63	11	5	79	2	4	32	38	290
10:30 AM	27	34	64	125	2	38	1	41	76	5	5	86	2	3	16	21	273
10:45 AM	19	39	68	126	4	47	3	54	70	11	5	86	1	8	22	31	297
Total	103	160	266	529	13	142	9	164	273	34	19	326	8	21	93	122	1141
11:00 AM	25	40	65	130	3	31	2	36	82	11	5	98	0	10	30	40	304
11:15 AM	35	44	57	136	2	38	1	41	82	13	4	99	2	13	29	44	320
11:30 AM	25	56	78	159	6	52	2	60	84	16	12	112	4	14	26	44	375
11:45 AM	36	35	62	133	4	37	1	42	85	15	5	105	0	10	25	35	315
Total	121	175	262	558	15	158	6	179	333	55	26	414	6	47	110	163	1314
12:00 PM	32	44	84	160	13	34	3	50	88	14	9	111	1	7	21	29	350
12:15 PM	27	48	66	141	7	48	6	61	74	12	5	91	1	11	33	45	338
12:30 PM	25	41	65	131	4	42	0	46	73	6	7	86	3	8	29	40	303
12:45 PM	28	47	74	149	4	39	1	44	78	17	6	101	2	10	38	50	344
Total	112	180	289	581	28	163	10	201	313	49	27	389	7	36	121	164	1335
01:00 PM	30	42	74	146	5	40	1	46	74	10	6	90	3	11	28	42	324
01:15 PM	33	33	69	135	5	35	3	43	80	8	10	98	4	10	27	41	317
01:30 PM	29	37	67	133	7	43	1	51	82	15	4	101	2	17	31	50	335
01:45 PM	26	58	71	155	4	31	1	36	74	18	4	96	0	13	17	30	317
Total	118	170	281	569	21	149	6	176	310	51	24	385	9	51	103	163	1293

Ohio Department of Transportation

1980 West Broad Street
Columbus, OH 43223
(614) 466-3728

LOCATION: FULTON DR. & HARRISON AVE.
COUNTED BY: COUNT ELECTRONICS
WEATHER: DRY
NOTES: RAW DATA

File Name : FULTON DR. & HARRISON AVE.
Site Code : 89976
Start Date : 5/7/2015
Page No : 2

Groups Printed- P&A

	SR-687 (FULTON DR. N.W.) Eastbound				25TH STREET West Bound				SR-687 (FULTON DR. N.W.) Northbound				HARRISON AVE. N.W. South Bound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
02:00 PM	34	52	69	155	6	36	0	42	84	22	6	112	3	12	33	48	357
02:15 PM	31	50	75	156	3	39	1	43	68	15	7	90	0	14	28	42	331
02:30 PM	34	63	80	177	3	33	1	37	80	14	7	101	3	9	22	34	349
02:45 PM	52	53	85	190	1	42	0	43	79	16	7	102	4	9	23	36	371
Total	151	218	309	678	13	150	2	165	311	67	27	405	10	44	106	160	1408
03:00 PM	36	54	83	173	9	44	4	57	106	16	1	123	1	9	39	49	402
03:15 PM	43	53	97	193	7	39	0	46	80	27	7	114	3	9	25	37	390
03:30 PM	49	57	83	189	7	47	0	54	95	21	9	125	3	6	32	41	409
03:45 PM	52	51	81	184	5	44	4	53	101	15	7	123	0	13	27	40	400
Total	180	215	344	739	28	174	8	210	382	79	24	485	7	37	123	167	1601
04:00 PM	54	44	96	194	6	59	1	66	101	18	7	126	0	17	29	46	432
04:15 PM	39	49	70	158	8	47	1	56	123	16	7	146	0	15	32	47	407
04:30 PM	33	62	78	173	7	66	0	73	85	11	4	100	2	10	19	31	377
04:45 PM	49	56	77	182	5	46	3	54	105	20	4	129	1	10	34	45	410
Total	175	211	321	707	26	218	5	249	414	65	22	501	3	52	114	169	1626
05:00 PM	49	61	79	189	8	52	0	60	86	10	6	102	0	11	44	55	406
05:15 PM	42	75	112	229	6	55	2	63	106	12	6	124	5	14	30	49	465
05:30 PM	56	72	103	231	3	46	1	50	81	15	9	105	0	6	33	39	425
05:45 PM	50	68	96	214	5	50	1	56	73	12	5	90	1	8	29	38	398
Total	197	276	390	863	22	203	4	229	346	49	26	421	6	39	136	181	1694
06:00 PM	44	44	74	162	6	48	2	56	69	13	4	86	1	6	42	49	353
06:15 PM	38	53	100	191	2	32	0	34	59	14	2	75	0	11	30	41	341
06:30 PM	28	57	80	165	7	47	1	55	64	13	2	79	0	12	30	42	341
06:45 PM	29	48	60	137	2	26	1	29	36	5	7	48	0	10	19	29	243
Total	139	202	314	655	17	153	4	174	228	45	15	288	1	39	121	161	1278
Grand Total	1578	2305	3522	7405	219	2032	59	2310	3846	563	239	4648	79	463	1468	2010	16373
Apprch %	21.3	31.1	47.6		9.5	88	2.6		82.7	12.1	5.1		3.9	23	73		
Total %	9.6	14.1	21.5	45.2	1.3	12.4	0.4	14.1	23.5	3.4	1.5	28.4	0.5	2.8	9	12.3	

Ohio Department of Transportation

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1980 West Broad Street
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Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	1	1	1	3	0	1	0	1	2	0	0	2	0	0	0	0	6
07:15 AM	0	1	1	2	1	1	0	2	0	0	0	0	0	0	3	3	7
07:30 AM	4	1	1	6	0	3	0	3	3	1	0	4	1	1	1	3	16
07:45 AM	2	1	1	4	0	1	0	1	1	0	1	2	0	0	1	1	8
Total	7	4	4	15	1	6	0	7	6	1	1	8	1	1	5	7	37
08:00 AM	3	2	2	7	0	0	0	0	2	0	0	2	0	1	1	2	11
08:15 AM	2	0	3	5	2	5	0	7	0	0	0	0	0	0	1	1	13
08:30 AM	3	1	0	4	0	4	1	5	5	0	0	5	0	0	2	2	16
08:45 AM	0	2	0	2	0	2	0	2	3	1	2	6	0	0	2	2	12
Total	8	5	5	18	2	11	1	14	10	1	2	13	0	1	6	7	52
09:00 AM	0	2	2	4	1	2	0	3	5	0	0	5	0	1	1	2	14
09:15 AM	1	2	1	4	1	6	0	7	5	2	0	7	0	0	1	1	19
09:30 AM	1	2	0	3	0	2	0	2	1	1	0	2	0	0	1	1	8
09:45 AM	0	1	0	1	0	0	0	0	4	0	1	5	0	0	0	0	6
Total	2	7	3	12	2	10	0	12	15	3	1	19	0	1	3	4	47
10:00 AM	0	0	1	1	0	2	0	2	3	1	0	4	1	0	1	2	9
10:15 AM	1	0	0	1	2	0	0	2	1	0	0	1	0	0	0	0	4
10:30 AM	1	1	1	3	0	1	0	1	1	0	0	1	1	0	0	1	6
10:45 AM	0	4	1	5	0	0	0	0	3	1	1	5	0	0	0	0	10
Total	2	5	3	10	2	3	0	5	8	2	1	11	2	0	1	3	29
11:00 AM	0	0	1	1	0	0	0	0	2	2	0	4	0	0	0	0	5
11:15 AM	1	1	4	6	1	0	0	1	0	0	0	0	0	0	0	0	7
11:30 AM	1	0	1	2	1	1	0	2	5	1	0	6	0	0	0	0	10
11:45 AM	0	1	1	2	0	0	0	0	2	0	1	3	0	0	0	0	5
Total	2	2	7	11	2	1	0	3	9	3	1	13	0	0	0	0	27
12:00 PM	0	0	0	0	0	0	0	0	2	0	0	2	0	0	1	1	3
12:15 PM	1	0	2	3	1	0	0	1	2	0	0	2	0	0	0	0	6
12:30 PM	2	2	0	4	0	1	0	1	1	0	0	1	0	0	0	0	6
12:45 PM	1	0	2	3	0	0	0	0	1	1	0	2	0	0	0	0	5
Total	4	2	4	10	1	1	0	2	6	1	0	7	0	0	1	1	20
01:00 PM	2	1	2	5	0	1	0	1	2	1	1	4	0	1	3	4	14
01:15 PM	1	1	1	3	1	0	0	1	1	0	0	1	0	1	1	2	7
01:30 PM	1	2	2	5	0	0	0	0	1	0	1	2	0	0	1	1	8
01:45 PM	3	1	3	7	0	0	0	0	1	0	0	1	0	0	1	1	9
Total	7	5	8	20	1	1	0	2	5	1	2	8	0	2	6	8	38

Ohio Department of Transportation

LOCATION: FULTON DR. & HARRISON AVE.
COUNTED BY: COUNT ELECTRONICS
WEATHER: DRY
NOTES: RAW DATA

1980 West Broad Street
Columbus, OH 43223
(614) 466-3728

File Name : FULTON DR. & HARRISON AVE.
Site Code : 89976
Start Date : 5/7/2015
Page No : 2

Groups Printed- B&C

	SR-687 (FULTON DR. N.W.) Eastbound				25TH STREET West Bound				SR-687 (FULTON DR. N.W.) Northbound				HARRISON AVE. N.W. South Bound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
02:00 PM	1	1	6	8	0	1	0	1	0	0	1	1	0	0	1	1	11
02:15 PM	0	1	2	3	1	1	0	2	0	0	0	0	0	0	1	1	6
02:30 PM	1	1	4	6	0	1	0	1	3	1	0	4	0	0	0	0	11
02:45 PM	0	1	3	4	0	1	0	1	2	0	1	3	0	0	0	0	8
Total	2	4	15	21	1	4	0	5	5	1	2	8	0	0	2	2	36
03:00 PM	1	2	0	3	0	0	0	0	3	0	0	3	0	0	3	3	9
03:15 PM	1	1	5	7	2	0	0	2	2	0	0	2	0	0	0	0	11
03:30 PM	0	1	1	2	1	0	0	1	1	0	1	2	0	0	0	0	5
03:45 PM	1	2	1	4	0	0	0	0	3	1	1	5	0	2	1	3	12
Total	3	6	7	16	3	0	0	3	9	1	2	12	0	2	4	6	37
04:00 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	2
04:15 PM	1	2	1	4	2	1	0	3	1	0	1	2	0	0	0	0	9
04:30 PM	1	1	1	3	0	1	0	1	1	0	0	1	0	0	0	0	5
04:45 PM	0	0	2	2	0	1	0	1	0	0	1	1	0	0	0	0	4
Total	2	4	4	10	2	3	0	5	2	0	2	4	0	0	1	1	20
05:00 PM	2	0	1	3	0	1	0	1	0	0	0	0	0	0	0	0	4
05:15 PM	1	1	0	2	1	0	0	1	1	0	0	1	0	0	0	0	4
05:30 PM	1	1	0	2	0	0	0	0	0	1	0	1	0	0	0	0	3
05:45 PM	0	0	0	0	0	0	0	0	2	0	1	3	0	0	1	1	4
Total	4	2	1	7	1	1	0	2	3	1	1	5	0	0	1	1	15
06:00 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
06:15 PM	1	1	0	2	1	0	0	1	0	0	0	0	0	0	0	0	3
"BREAK"																	
06:45 PM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1
Total	1	2	0	3	1	0	0	1	0	0	1	1	0	0	0	0	5
Grand Total	44	48	61	153	19	41	1	61	78	15	16	109	3	7	30	40	363
Apprch %	28.8	31.4	39.9		31.1	67.2	1.6		71.6	13.8	14.7		7.5	17.5	75		
Total %	12.1	13.2	16.8	42.1	5.2	11.3	0.3	16.8	21.5	4.1	4.4	30	0.8	1.9	8.3	11	

TRAFFIC ANALYSIS

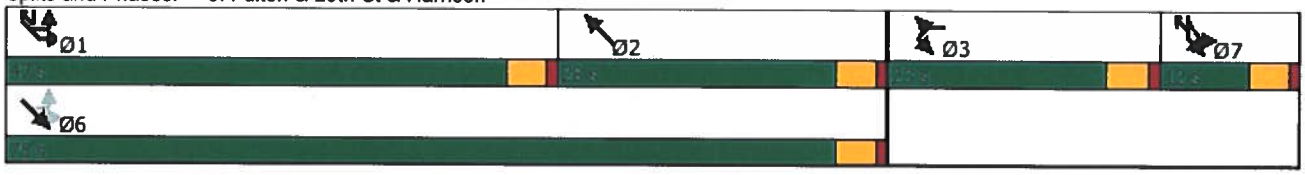
2048 No Build

Lane Group	WBL	WBR	WBR2	SBL2	SBL	SBR	SEL2	SEL	SET	NWT	NWR	NWR2
Lane Configurations												
Traffic Volume (vph)	40	320	10	10	60	220	310	420	590	600	90	10
Future Volume (vph)	40	320	10	10	60	220	310	420	590	600	90	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80	0			0	50		0			0	
Storage Lanes	1	1			1	1		1			0	
Taper Length (ft)	25				25			25				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.850				0.850				0.979		
Flt Protected	0.950				0.950			0.950				
Satd. Flow (prot)	1770	1583	0	0	1770	1583	0	1770	1863	3465	0	0
Flt Permitted	0.950				0.950			0.143				
Satd. Flow (perm)	1770	1583	0	0	1770	1583	0	266	1863	3465	0	0
Right Turn on Red			Yes			Yes						Yes
Satd. Flow (RTOR)		104				60				1		
Link Speed (mph)	35				35				35	35		
Link Distance (ft)	627				545				447	441		
Travel Time (s)	12.2				10.6				8.7	8.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	348	11	11	65	239	337	457	641	652	98	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	43	359	0	0	76	239	0	794	641	761	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Right	Left	Left	Right	Left	Left	Left	Left	Right	Right
Median Width(ft)	12				12				12	12		
Link Offset(ft)	0				0				0	0		
Crosswalk Width(ft)	16				16				16	16		
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	9	15	15	9	15	15			9	9
Number of Detectors	1	1		1	1	1	1	1	2	2		
Detector Template	Left	Right		Left	Left	Right	Left	Left	Thru	Thru		
Leading Detector (ft)	20	20		20	20	20	20	20	100	100		
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0		
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0		
Detector 1 Size(ft)	20	20		20	20	20	20	20	6	6		
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)									94	94		
Detector 2 Size(ft)									6	6		
Detector 2 Type									Cl+Ex	Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)									0.0	0.0		
Turn Type	Prot	Prot		Prot	Prot	pt+ov	pm+pt	pm+pt	NA	NA		
Protected Phases	3	3		7	7	7 1	1	1	6	2		
Permitted Phases							6	6				

Lane Group	WBL	WBR	WBR2	SBL2	SBL	SBR	SEL2	SEL	SET	NWT	NWR	NWR2
Detector Phase	3	3		7	7	7 1	1	1	6	2		
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0		
Minimum Split (s)	22.5	22.5		9.5	9.5		22.5	22.5	22.5	22.5		
Total Split (s)	23.0	23.0		12.0	12.0		47.0	47.0	75.0	28.0		
Total Split (%)	20.9%	20.9%		10.9%	10.9%		42.7%	42.7%	68.2%	25.5%		
Maximum Green (s)	18.5	18.5		7.5	7.5		42.5	42.5	70.5	23.5		
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5		
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0		
Lost Time Adjust (s)	0.0	0.0			0.0			0.0	0.0	0.0		
Total Lost Time (s)	4.5	4.5			4.5			4.5	4.5	4.5		
Lead/Lag							Lead	Lead		Lag		
Lead-Lag Optimize?							Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0		
Recall Mode	None	None		None	None		Min	Min	Min	Min		
Walk Time (s)	7.0	7.0					7.0	7.0	7.0	7.0		
Flash Dont Walk (s)	11.0	11.0					11.0	11.0	11.0	11.0		
Pedestrian Calls (#/hr)	0	0					0	0	0	0		
Act Effct Green (s)	18.5	18.5			7.5	54.5		70.5	70.5	23.5		
Actuated g/C Ratio	0.17	0.17			0.07	0.50		0.64	0.64	0.21		
v/c Ratio	0.14	1.02			0.63	0.29		1.06	0.54	1.03		
Control Delay	40.5	86.2			73.6	13.1		76.8	12.9	83.1		
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0	0.0		
Total Delay	40.5	86.2			73.6	13.1		76.8	12.9	83.1		
LOS	D	F			E	B		E	B	F		
Approach Delay	81.3				27.7				48.3	83.1		
Approach LOS	F				C				D	F		

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Natural Cycle: 110			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 1.06			
Intersection Signal Delay: 59.7		Intersection LOS: E	
Intersection Capacity Utilization 91.9%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 3: Fulton & 25th St & Harrison



TRAFFIC ANALYSIS

2048 Peanut Roundabout

LANE LEVEL OF SERVICE

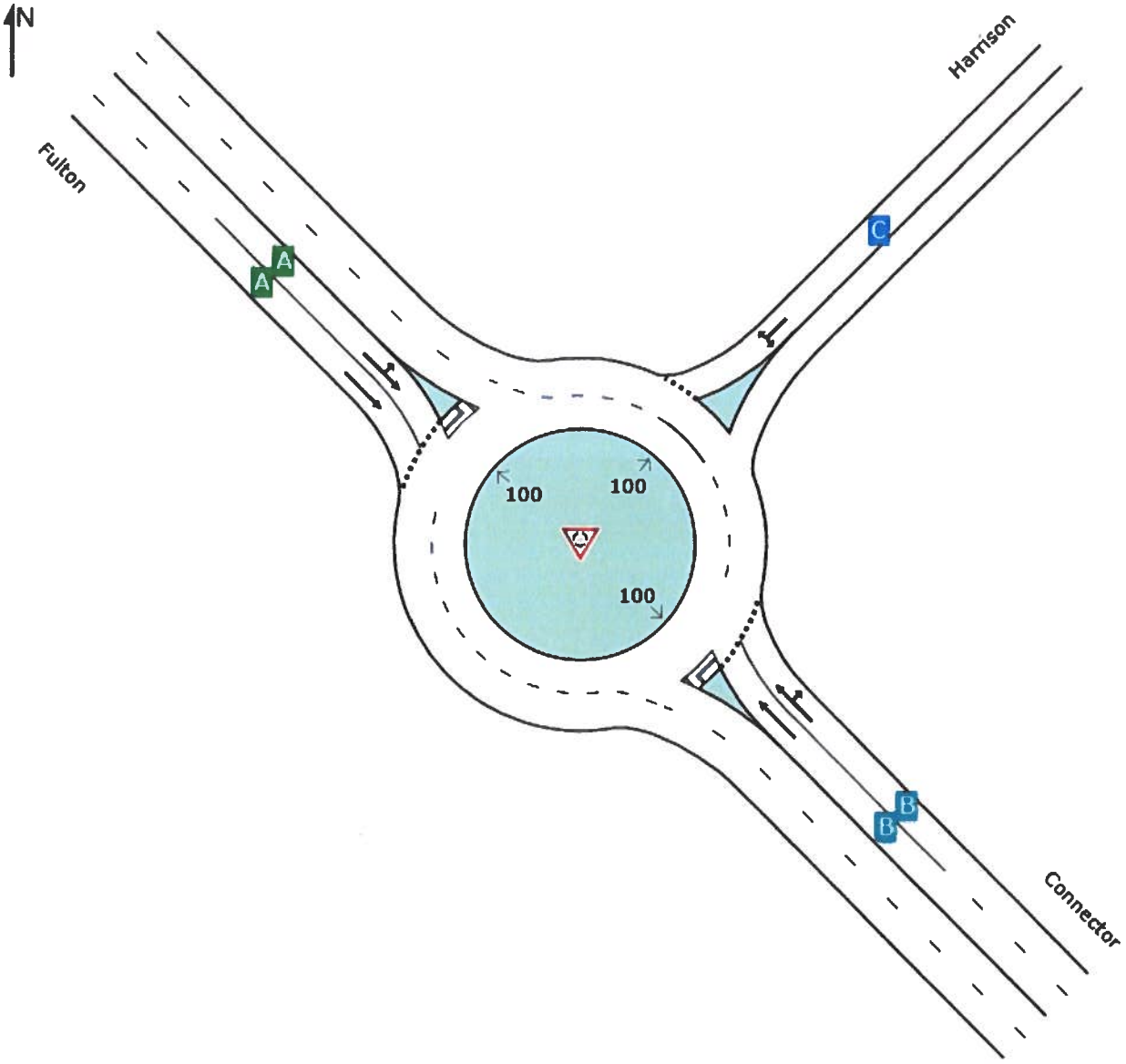
Lane Level of Service

Site: 101 [Harrison (Site Folder: Fulton Rd Dual Roundabouts)]

Network: N102 [Fulton Rd (Network Folder: Fulton Rd Dual Roundabouts)]

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	Southeast	Northeast	Northwest	
LOS	B	C	A	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

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MOVEMENT SUMMARY

Site: 101 [Harrison (Site Folder: Fulton Rd Dual Roundabouts)]

Network: N102 [Fulton Rd (Network Folder: Fulton Rd Dual Roundabouts)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
SouthEast: Connector														
8x	T1	1000	3.0	1000	3.0	0.551	10.6	LOS B	1.8	46.9	0.64	0.65	0.85	29.2
18x	R2	109	3.0	109	3.0	0.551	10.6	LOS B	1.8	46.9	0.64	0.65	0.85	27.8
Approach		1109	3.0	1109	3.0	0.551	10.6	LOS B	1.8	46.9	0.64	0.65	0.85	29.0
NorthEast: Harrison														
1x	L2	76	3.0	76	3.0	0.549	16.4	LOS C	1.2	31.5	0.75	0.91	1.27	22.9
16x	R2	239	3.0	239	3.0	0.549	16.4	LOS C	1.2	31.5	0.75	0.91	1.27	28.6
Approach		315	3.0	315	3.0	0.549	16.4	LOS C	1.2	31.5	0.75	0.91	1.27	27.6
NorthWest: Fulton														
7x	L2	337	3.0	337	3.0	0.559	9.1	LOS A	1.7	43.1	0.35	0.18	0.35	32.0
4x	T1	1098	3.0	1098	3.0	0.559	9.1	LOS A	1.7	43.1	0.35	0.18	0.35	27.3
Approach		1435	3.0	1435	3.0	0.559	9.1	LOS A	1.7	43.1	0.35	0.18	0.35	28.9
All Vehicles		**2859**	**3.0**	**2859**	**3.0**	**0.559**	**10.5**	**LOS B**	**1.8**	**46.9**	**0.51**	**0.44**	**0.64**	**28.7**

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 102 [25th (Site Folder: Fulton Rd Dual Roundabouts)]

Network: N102 [Fulton Rd (Network Folder: Fulton Rd Dual Roundabouts)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
SouthEast: Fulton														
8x	T1	750	3.0	750	3.0	0.428	9.2	LOS A	0.9	24.2	0.62	0.64	0.72	27.8
18x	R2	11	3.0	11	3.0	0.428	9.2	LOS A	0.9	24.2	0.62	0.64	0.72	32.1
Approach		761	3.0	761	3.0	0.428	9.2	LOS A	0.9	24.2	0.62	0.64	0.72	27.9
NorthEast: 25th														
1x	L2	43	3.0	43	3.0	0.563	14.1	LOS B	1.5	38.4	0.74	0.90	1.23	30.5
16x	R2	359	3.0	359	3.0	0.563	14.1	LOS B	1.5	38.4	0.74	0.90	1.23	24.2
Approach		402	3.0	402	3.0	0.563	14.1	LOS B	1.5	38.4	0.74	0.90	1.23	25.2
NorthWest: Connector														
7x	L2	467	3.0	467	3.0	0.443	7.1	LOS A	1.1	29.0	0.21	0.08	0.21	29.0
4x	T1	707	3.0	707	3.0	0.443	7.1	LOS A	1.1	29.0	0.21	0.08	0.21	31.2
Approach		1174	3.0	1174	3.0	0.443	7.1	LOS A	1.1	29.0	0.21	0.08	0.21	30.3
All Vehicles		**2337**	**3.0**	**2337**	**3.0**	**0.563**	**9.0**	**LOS A**	**1.5**	**38.4**	**0.44**	**0.40**	**0.55**	**28.6**

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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LANE LEVEL OF SERVICE

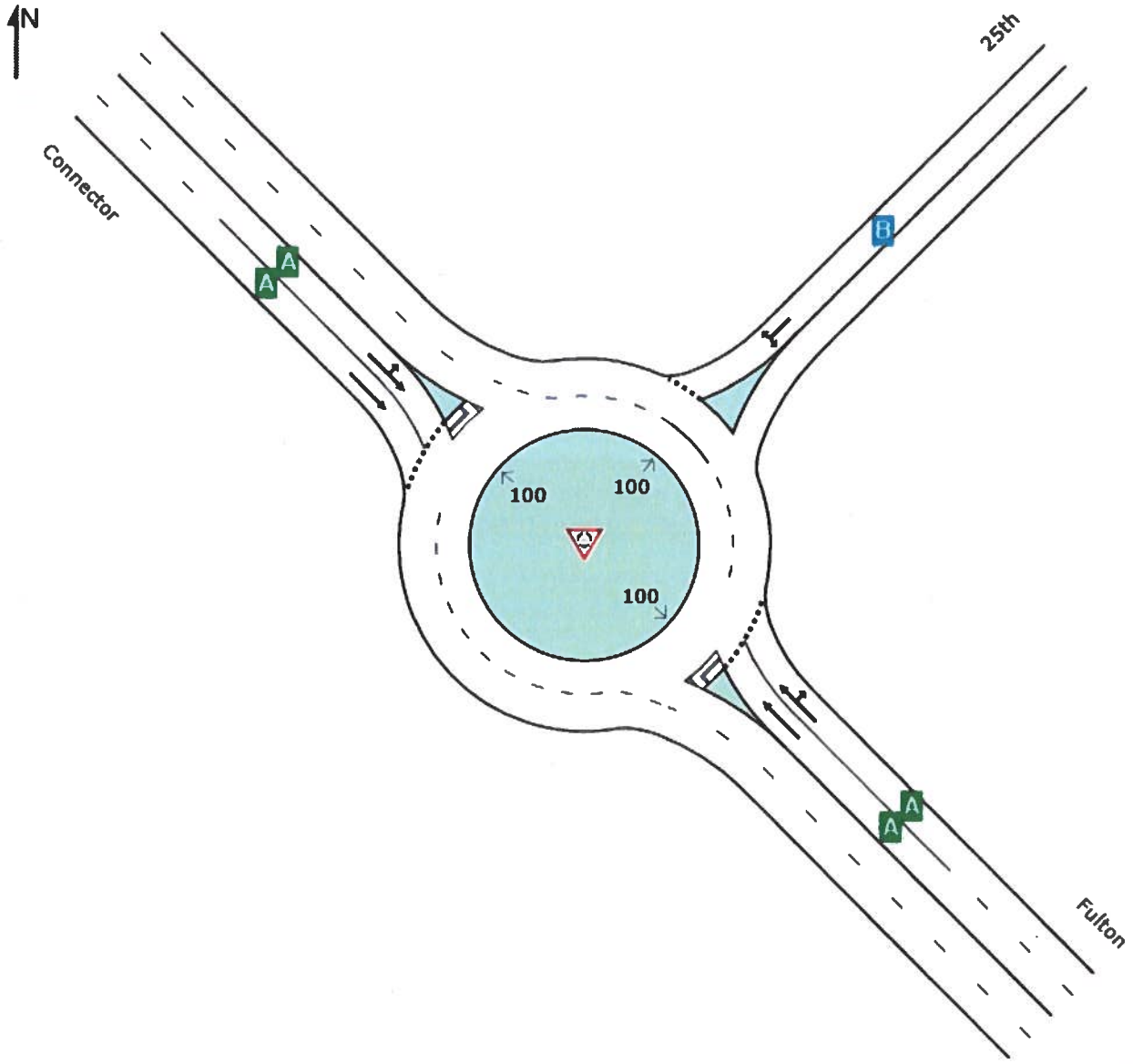
Lane Level of Service

Site: 102 [25th (Site Folder: Fulton Rd Dual Roundabouts)]

Network: N102 [Fulton Rd (Network Folder: Fulton Rd Dual Roundabouts)]

New Site
Site Category: (None)
Roundabout

	Approaches			Intersection
	Southeast	Northeast	Northwest	
LOS	A	B	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

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COST ESTIMATE

Construction and Right of Way Estimates

Fulton Road Improvement
Conceptual Estimated Costs

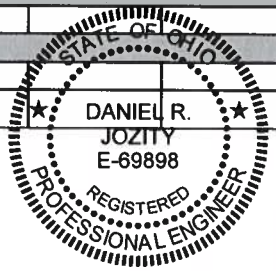
	Peanut Roundabout
Roadway	$485,017.00
Erosion Control	$55,000.00
Drainage	$102,180.00
Pavement	$1,122,444.00
Traffic Control	$89,135.00
Lighting	$205,000.00
Railroad Force Account	$1,160,000.00
Utilities	$253,500.00
MOT	$244,000.00
Incidentals	$185,000.00
Contingency (30%)	$1,114,883.00
Inflation (28.3%) Middle of Project 2029	$1,419,573.00
Sub-Total	**$6,435,732.00**
ROW Cost	**$877,383.00**
Total	**$7,313,115.00**

STATE OF OHIO
DANIEL R. JOZITY
E-69898
REGISTERED PROFESSIONAL ENGINEER

Digitally signed by Daniel Jozity
Date: 2023.08.24 17:30:26-04'00'
Contact Info: djozity@gfnet.com

Peanut Roundabout Alternative

Pavement	Depth (ft)	Unit	Assumed Qty	Unit Cost	Total Cost
1 1/4 " Asphalt Concrete Surface Course, Type 1, (449), PG70-22	0.104	CY	344	$ 210.00	$ 72,240.00
1 3/4" Asphalt Concrete Intermediate Course, Type 2, (449)	0.146	CY	481	$ 160.00	$ 76,960.00
9" Asphalt Concrete Base, PG64-22, (449)	0.750	CY	2405	$ 145.00	$ 348,725.00
6" Aggregate Base	0.500	CY	1603	$ 60.00	$ 96,180.00
6" Traffic Island		SY	621	$ 120.00	$ 74,520.00
Curb and Gutter		FT	2907	$ 35.00	$ 101,745.00
Curb and Gutter, Truck Apron		FT	1022	$ 50.00	$ 51,100.00
Curb, Type 6		FT	906	$ 30.00	$ 27,180.00
Stabilize Subgrade		SY	9617	$ 12.00	$ 115,404.00
Truck Apron		SY	658	$ 150.00	$ 98,700.00
Tack Coat (0.06 gal/yd2)		GAL	1186	$ 5.00	$ 5,930.00
8" Non-reinforced Concrete Pavement		SY	512	$ 105.00	$ 53,760.00
Roadway		**Unit**	**Assumed Qty**	**Unit Cost**	**Total Cost**
Pavement Removed		SY	9009	$ 15.00	$ 135,135.00
Median Removed		SY	40	$ 25.00	$ 1,000.00
Subgrade Compaction		SY	9617	$ 3.00	$ 28,851.00
Geotextile Fabric		SY	9617	$ 3.00	$ 28,851.00
Landscaped Median		SY	2108	$ 60.00	$ 126,480.00
Sidewalk		SF	15470	$ 10.00	$ 154,700.00
Curb Ramps		EA	20	$ 500.00	$ 10,000.00
Erosion Control		**Unit**	**Assumed Qty**	**Unit Cost**	**Total Cost**
Erosion Control		LS	1	$ 55,000.00	$ 55,000.00
Drainage		**Unit**	**Assumed Qty**	**Unit Cost**	**Total Cost**
Project Drainage		FT	1703	$ 60.00	$ 102,180.00
Traffic Control		**Unit**	**Assumed Qty**	**Unit Cost**	**Total Cost**
Signing and Pavement Marking		FT	1703	$ 45.00	$ 76,635.00
Removal of Existing Signal per Intersection		EACH	1	$ 12,500.00	$ 12,500.00
Lighting		**Unit**	**Assumed Qty**	**Unit Cost**	**Total Cost**
Lighting System Removed		EACH	1	$ 15,000.00	$ 15,000.00
Lighting in Parking Lot (3 Luminaires)		EACH	1	$ 45,000.00	$ 45,000.00
Lighting at Roundabout (6 Luminaires plus approach)		EACH	1	$ 145,000.00	$ 145,000.00
Railroad Force Account		**Unit**	**Assumed Qty**	**Unit Cost**	**Total Cost**
Railroad Crossing Removed		EACH	1	$ 35,000.00	$ 35,000.00
Highway/Railroad Grade Crossing and Track		EACH	1	$ 150,000.00	$ 150,000.00
Gates and Flashing Light System		EACH	1	$ 975,000.00	$ 975,000.00
Utilities		**Unit**	**Assumed Qty**	**Unit Cost**	**Total Cost**
Fire Hyrdrant Relocation		EACH	1	$ 3,500.00	$ 3,500.00
Relocation of High Voltage Transmission Pole		EACH	1	$ 250,000.00	$ 250,000.00
MOT					
7% of cost before incend.					$ 244,000.00
Incidentals		**Unit**	**Assumed Qty**	**Unit Cost**	**Total Cost**
Performace Bond		LUMP	1	$ 30,000.00	$ 30,000.00
Field Office, Type B		MONTH	6	$ 2,500.00	$ 15,000.00
Mobilization		LUMP	1	$ 100,000.00	$ 100,000.00
Construction Layout Stakes		LUMP	1	$ 40,000.00	$ 40,000.00
Contingency (30%)					
					$ 1,114,883.00
Inflation (28.3%) Middle of Project 2029					
					$ 1,419,573.00
Total					**$ 6,435,732.00**



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Date: 2023.08.24 11:30:40-04'00'
Contact Info: djozity@gfnet.com

Acquisition	Unit (SF) or (Acreage)	x	Cost/Unit ($$/Acres)	10% Temp. Value 100% Fee Simple	Subtotal Land Value	+	Structure Values (If Taken)	+	Damages (Loss in Value to the Residue)	Subtotal Structures & Damages	Landscaping & Incidental ($800 per take)	=	Total Non Labor Acquisition Costs	Parcel Count	Total Takes	Partial Takes	No. of Structures Impacted
Residential - Fee Simple	0.247324242	x	$151,914.34	100.0%	$37,572.10	+	$114,000.00	+	0	$114,000.00	$2,400.00	=	$267,972.10	5	2	3	3
Residential - Temporary	0	x	$151,914.34	10.0%	$0.00	+	0	+	0	0	$0.00	=	$0.00	0	-	0	-
Commercial - Fee Simple	0.425974288	x	$62,324.49	100.0%	$26,548.63	+	0	+	$21,100.00	$21,100.00	$7,200.00	=	$75,948.63	9	0	9	-
Commercial - Temporary	0	x	$62,324.49	10.0%	$0.00	+	0	+	0	0	$0.00	=	$0.00	0	-	0	-
Industrial - Fee Simple	0	x	-	100.0%	-	+	0	+	0	0		=	$0.00	0	-	-	-
Industrial - Temporary	0	x	-	10.0%	-	+	0	+	0	0		=	$0.00	0	-	-	-
Agricultural - Fee Simple	0	x	-	100.0%	-	+	0	+	0	0		=	$0.00	0	-	-	-
Agricultural - Temporary	0	x	-	10.0%	-	+	0	+	0	0		=	$0.00	0	-	-	-

Relocation	Unit (Displacement)	x	*RHP/RSP			+	Move Cost	+	Reestablishment			=	Total Non Labor RAP Costs	Estimate amount of time necessary to relocate all RAP parcels = (months)
- Residential														
Owner Occupant	2	x			$34,000.00	+	$6,000.00					==	$80,000.00	Estimated number of years until project wide R/W acquisition begins = _____
Tenant	0	x			$10,000.00	+	$1,750.00						$0.00	
- Commercial/Farm/NPO														
Owner	0					x	$15,000.00	++			$10,000.00	==	$0.00	
Tenant	0					x	$15,000.00				$10,000.00		$0.00	
- Personal Property	0					x	$1,000					==	$0.00	

[(total of acquisition cost) x 0.02] x0.025] + [(total of acquisition cost) x 0.15] x1.30] +[(total of acquisition cost) x 0.10] x 1.50] = Contingency	Contingency (Incidentals, Admin, Review & Appropriation)	$121,232.06
	Total Non Labor R/W Costs	$545,152.78

*RHP - Replacement Housing Payment
*RSP - Rent Supplemental Payment
*NPO - Non-Profit Organization

Labor (External)	Unit (Parcels)	X	Unit Price	=	Total Cost
Titles	14	x	$400	=	$5,600
Appraisal					
- Simple	0	x	$750	=	$0
- Detailed	14	x	$4,500	=	$63,000
Appraisal Review					
- Simple	0	x	$500	=	$0
- Detailed	14	x	$2,000	=	$28,000
Negotiations	14	x	$1,100	=	$15,400
Relocations					
- Personal Property	2	x	$1,500	=	$3,000
- Residential	2	x	$5,200	=	$10,400
- Commercial/Farm/*NPO		x	$5,600	=	$0
Closings	14	x	$400	=	$5,600
Project Management	14	x	$550	=	$7,700
Asbestos Testing & Abatement		x		=	$0
				Total Labor Cost	$138,700

R/W Cost Estimator

R/W Cost Estimate Prepared by	Date
Gannett Fleming	8/22/2023

Total Labor Costs	$138,700
Total Non Labor R/W Costs	$545,152.78
Inflation Adjustment (28.3%)	$193,530.34
Total R/W Costs	$877,383

STATE OF OHIO
DANIEL R. JOZITY
E-69898
REGISTERED PROFESSIONAL ENGINEER

Digitally signed by Daniel Jozity
Date: 2023.08.24 14:30:55-04'00'
Contact Info: djozity@gfnet.com

* Non-Profit Organization

ALTERNATE FIGURE

Peanut Roundabout

FULTON RD STUDY

GANNETT FLEMING

W 25TH ST & FULTON RD INTERSECTION RD STUDY
PEANUT ROUNDABOUT OPTION

HORIZONTAL SCALE IN FEET
0 40
20 80