PARALLEL ROUTE DIVERSION ANALYSIS

Traffic analysis was conducted to estimate traffic impacts from potential diversions from Washington Avenue to parallel streets based on implementation of the selected street reconfiguration option. While Philadelphia's grid of streets provides multiple route options for motorists, based on proximity and connectivity, Christian Street (to the north) and Ellsworth Street (to the south) were determined to be the most likely parallel routes to experience potential diversion and were analyzed accordingly.

Additional traffic data was needed to perform this analysis. New traffic data was collected in January/February 2020 at the following locations (diagrams showing the turning movement counts are included in Appendix A):

- Weekday 24-hour traffic volume and classification data:
  - Christian Street between 20th and 21st Streets
  - Christian Street between 11th and 12th Streets
  - Washington Avenue between 20th and 21st Streets
  - Washington Avenue between 12th and 13th Streets
  - Ellsworth Street between 20th and 21st Streets

- Weekday intersection turning movement counts (7 - 9 AM, 4 – 6 PM):
  - Christian Street & Grays Ferry Avenue
  - Christian Street & Broad Street
  - Christian Street & 11th Street
  - Ellsworth Street & Broad Street

The first step in modeling potential diversion from Washington Avenue is to determine the alternate routes to be analyzed. Washington Avenue is part of a grid system with cross-streets located approximately 300-500 feet apart. A motorist will not have to travel far out of their way to find an alternate route. While drivers have many options, such as Ellsworth Street, Christian Street, Carpenter Street, and Reed Street, the analysis was focused on two streets – Christian Street and Ellsworth Street – because they are the closest and most continuous street adjacent to Washington Avenue.

- **Christian Street** is a continuous bi-directional road that extends from Grays Ferry Avenue to Christopher Columbus Boulevard.
- **Ellsworth Street** is a continuous one-way (eastbound) road between Grays Ferry Avenue and S. 11th Street. East of S. 11th St, the road switches directionality twice.

Diversion Assumptions

The next step was to determine the overall percentage of motorists that will reasonably choose another route. Results from the O/D analysis, coupled with research on similar road diets implemented in the United States, informed the decision to assume that a maximum of 10% of the total approach volume on Washington Avenue would divert to parallel routes.

Zone-specific diversion rates were developed based on knowledge of the local road system. The percentages below reflect the estimated number of motorists from outside the system that would divert to and from Washington Avenue during a peak period. The PM peak was analyzed as it reflects the highest hourly volume collected. The percentages were applied to volumes derived from the O/D analysis as summarized in previous sections. The 10% diversion volumes and percentage of traffic assigned to parallel routes are as follows:

- **Entering Washington Avenue at Columbus Blvd (WB direction)**:
  - 86 vehicles in the PM peak
  - 63% diverted to westbound street south of Washington Avenue (54 vehicles)
  - 37% diverted to Christian Street (32 vehicles)

- **Exiting Washington Avenue at Columbus Blvd (EB direction)**:
  - 80 vehicles in the PM peak
  - 61% diverted to eastbound street south of Washington Avenue (49 vehicles)
  - 39% diverted to Christian Street (31 vehicles)
- **Entering Washington Avenue Grays Ferry Ave (EB direction)**:
  - 84 vehicles in the PM peak
  - 26% diverted to Ellsworth Street (22 vehicles)
  - 74% diverted to Christian Street (62 vehicles)
- **Exiting Washington Avenue Grays Ferry Ave (WB direction)**:
  - 59 vehicles in the PM peak.
  - 36% diverted to westbound street south of Washington Avenue (21 vehicles)
  - 64% diverted to Christian Street (37 vehicles)

Regional Component of Diverted Traffic

As noted in the O/D section of this memo, most of the regional traffic using the Washington Avenue corridor either originates from a side street, turns onto a side street, or has a destination along the corridor. This leaves only about 10-15% of motorists traveling the entire corridor from end to end (i.e. crosstown traffic). The total volume of crosstown traffic in each direction is listed below, with the number diverted from Washington Avenue in parentheses. These values are a subset of the total diversion volumes shown earlier in this section.

- Entering Washington Avenue at Columbus Blvd (WB direction): 30 vehicles (6 diverted)
- Exiting Washington Avenue at Columbus Blvd (EB direction): 65 vehicles (13 diverted)
- Entering Washington Avenue Grays Ferry Ave (EB direction): 63 vehicles (12 diverted)
- Exiting Washington Avenue Grays Ferry Ave (WB direction): 38 vehicles (8 diverted)

Local Component of Diverted Traffic

While StreetLight Data is a good tool for analyzing regional trip patterns, the determination of route choices for local trips is not fine-grained enough to accurately predict turning movements at each intersection within each individual zone. Therefore, it was assumed that local motorists would divert from Washington Avenue onto the parallel routes at approximately the same percentages as regional motorists disperse to the zones. The diverted volumes derived from this analysis were then modeled in Synchro to determine impacts to selected intersections along Christian Street and Ellsworth Street.

Route Choice

The volumes derived from the diversion analysis were then routed through the system to be analyzed as a proposed condition. It is acknowledged that some local and regional drivers will decide to take an alternate route other than the ones studied. For example, instead of diverting onto Christian Street, a motorist may decide to take Bainbridge Street**. But since Christian Street and Ellsworth Street were identified as the most likely parallel diversion routes, the Synchro analysis assumes that all diverted traffic is shifted to these streets where the routing is practical.** Motorists with an origin or destination north of Washington Avenue were diverted onto Christian St, and those with an origin or destination south of Washington Avenue and traveling eastbound (west of S. 11th Street) were diverted onto Ellsworth Street. Given the limitations of the O/D data as described in the previous paragraph, the local and regional diversion was considered to occur at similar rates and were combined as part of a singular analysis.

Analysis Results

The final step in this analysis was determining the performance of parallel routes based on the assumed diversion volumes and routing. Results comparing existing and proposed traffic performance during the PM peak are shown in Table 6. **It is important to note that only the maximum 10% diversion scenario was analyzed, which is in effect modeling the 3 Lane Option.** While not specifically analyzed, the Mixed Option (5% diversion) would be expected to produce results closer to existing conditions, while the 4-Lane Option (no diversion) would match existing conditions.

INTERSECTION	LOS / DELAY (SEC)		DELAY (SEC)	VOLUME TO CAPACITY (V/C) RATIO (EB / WB)	
	Existing	Proposed	Difference	Existing	Proposed
Grays Ferry Ave at Christian St / S. 25th St	C / 28.8	D / 37.4	8.6	0.76 / 0.50	0.93 / 0.80
Broad St at Christian St	B / 18.1	B / 19.4	1.3	0.60 / 0.48	0.71 / 0.59
Broad St at Ellsworth St	B / 15.5	B / 15.8	0.3	0.44 / N/A	0.54 / N/A
Christian St at S. 11th St	B / 15.3	B / 16.3	1.0	0.58 / 0.35	0.66 / 0.42

Table 6: Intersection LOS and Delay with Diversions (PM Peak / 10% Diversion)

In general, the diversion of motorists from Washington Avenue to adjacent streets is expected to have minimal impacts on traffic operations along those streets. In terms of vehicle delay, the traffic model shows that the intersection of Grays Ferry Avenue at Christian Street / S. 25th Street experiences the greatest increase in delay (8.6 seconds) during the weekday PM peak period. This intersection also has the largest increase in volume to capacity (v/c) ratio, but still operates below capacity in both directions in the proposed condition.

For all other intersections, the model shows that local parallel routes have enough roadway capacity to handle any increases from traffic diversion and still operate well below capacity. For instance, along Christian Street at Broad Street, both the east and west approaches are currently operating at less than 60% capacity during the PM peak. When applying the diverted traffic to Christian Street, even with the v/c ratios increasing by about 10% (from 60% to 71% heading EB and 48% to 59% heading WB), both approaches are still well below capacity.

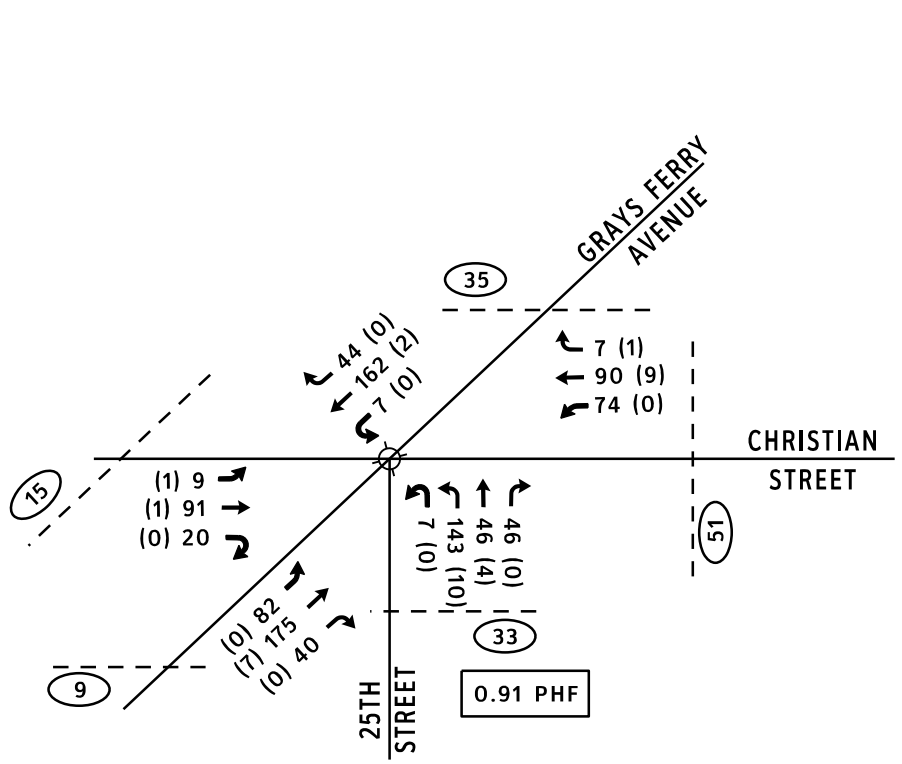
SUMMARY

In the Spring of 2020, the City's Office of Transportation, Infrastructure, and Sustainability (oTIS) engaged WSP to assist in developing and evaluating street reconfiguration options for Washington Avenue between Grays Ferry Avenue and 4th Street that can be implemented by the Streets Department through the repaving project. This memorandum summarizes the methodology and results from the traffic analysis conducted as part of that effort.

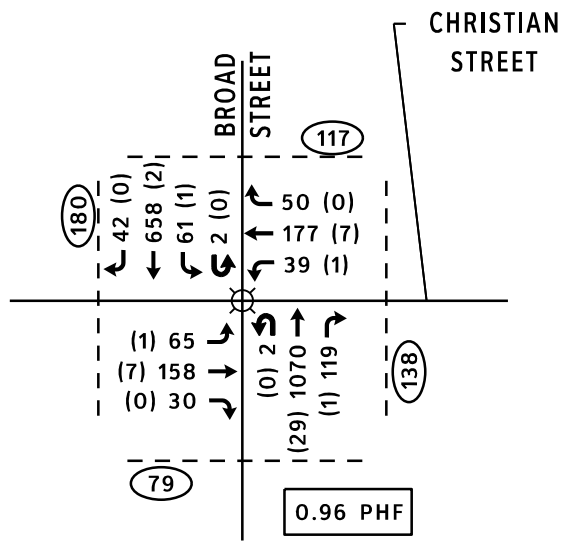
After analyzing a number of options and sub options, three street layout alternatives (3 Lane Cross Section, 4 Lane Cross Section, Mixed Cross Section) were found to be acceptable from a traffic simulation perspective. The City is currently engaging in a public participation process to solicit feedback from stakeholders about the three alternatives, which will guide the City in selecting a preferred alternative for implementation through the repaving project.

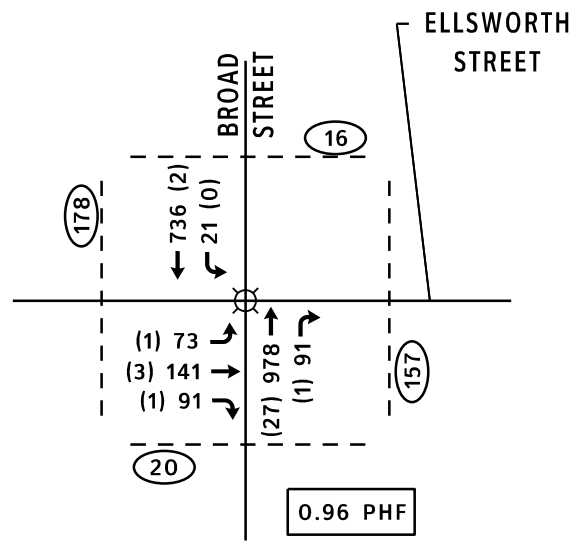
APPENDIX A

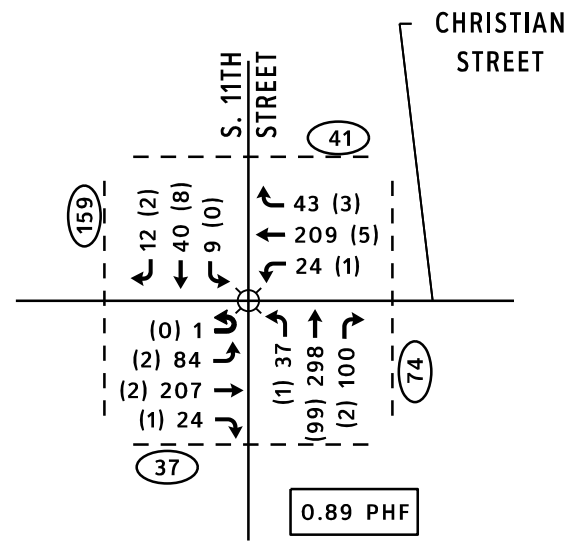
EXISTING 2020 WEEKDAY AM PEAK HOUR TRAFFIC VOLUMES
COUNT DATE - WEDNESDAY, JANUARY 29, 2020



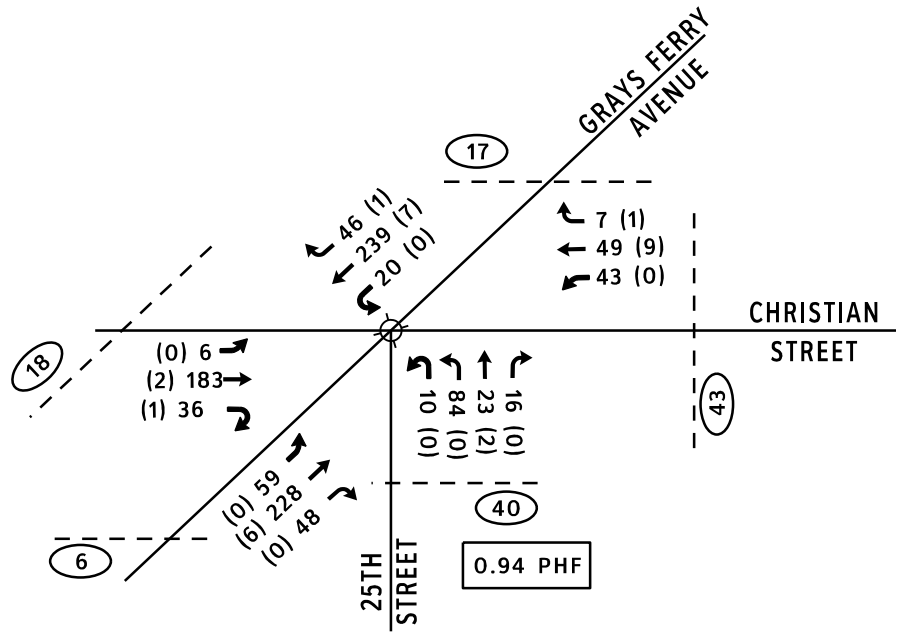
AM PEAK

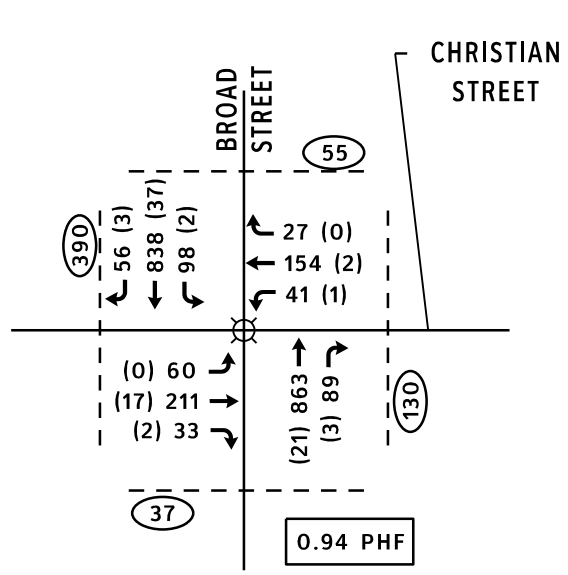


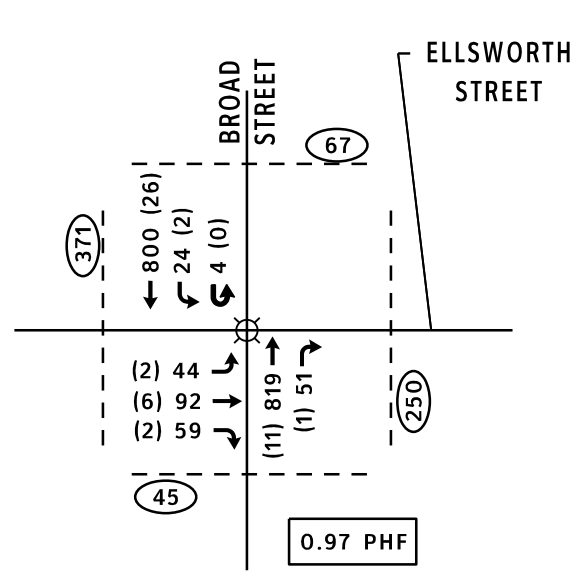


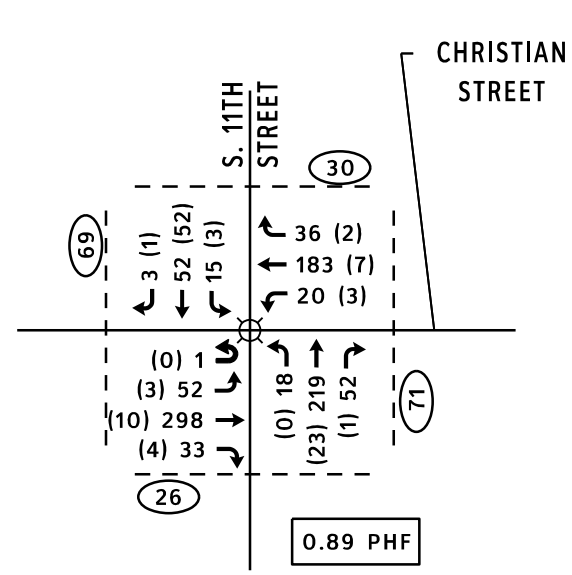


PM PEAK









SYSTEM PEAK HOURS:
7:45 AM - 8:45 AM
5:00 PM - 6:00 PM

LEGEND

———	EXISTING ROADWAY	(XX)	PEDESTRIAN CROSSING VOLUMES
⊗	EXISTING TRAFFIC SIGNAL	X.XX PHF	INTERSECTION PEAK HOUR FACTOR
XX	AM PEAK HOUR TRAFFIC VOLUMES		
(XX)	BICYCLE VOLUMES		

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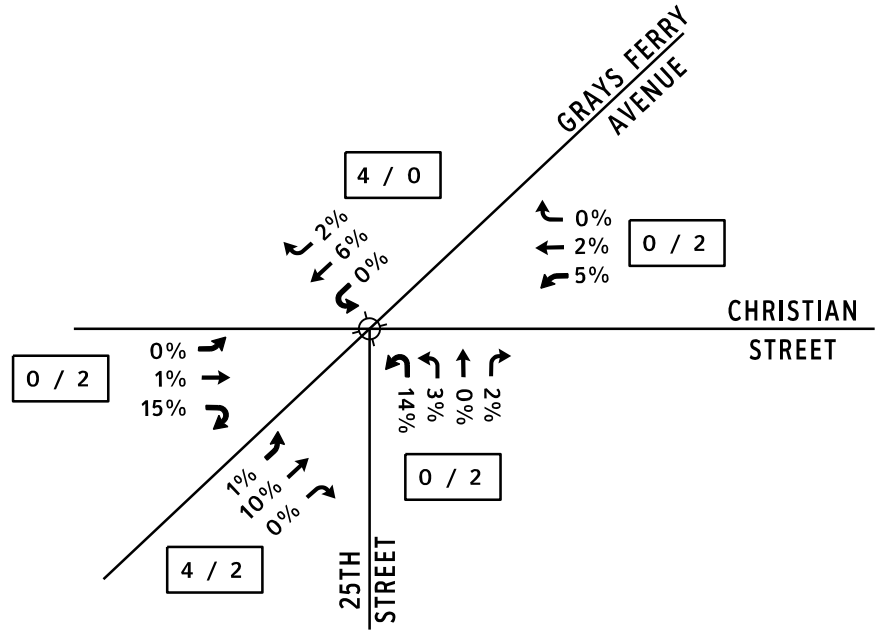
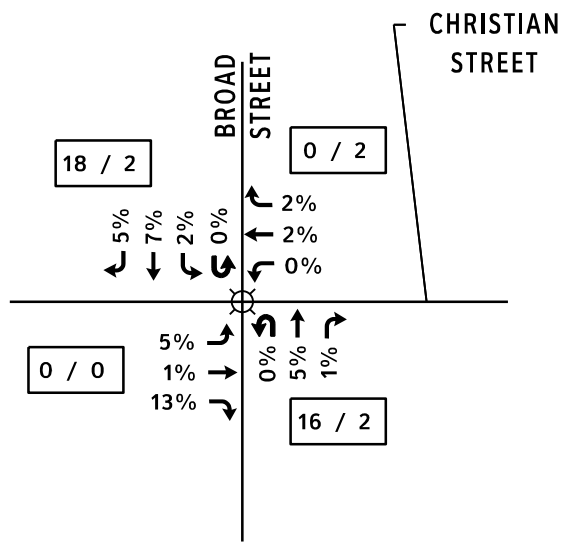
WASHINGTON AVENUE TRAFFIC STUDY
PHILADELPHIA, PA

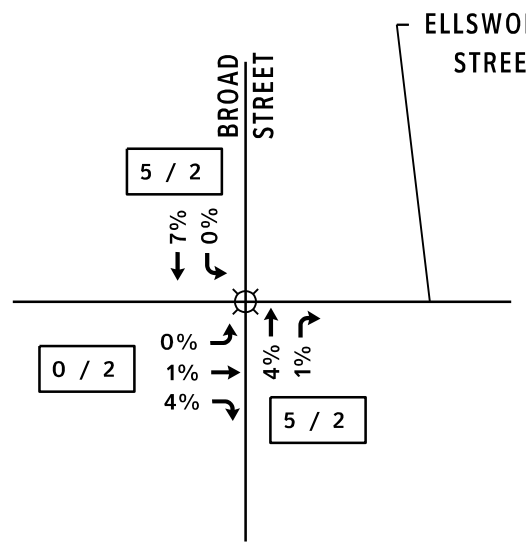
N.T.S	A - 1	JUN 2020

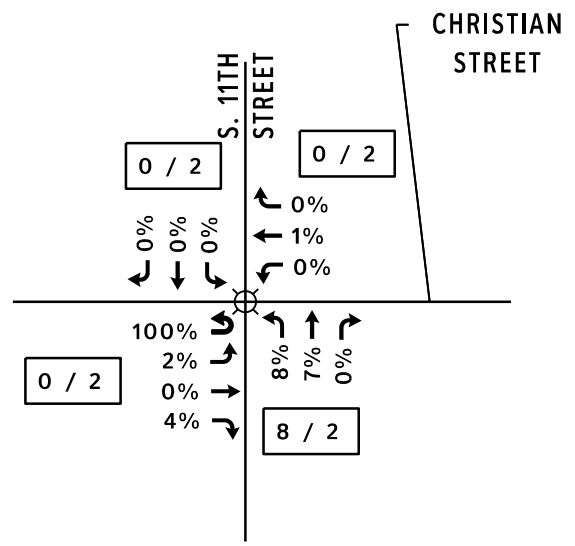
EXISTING 2020 WEEKDAY AM PEAK HOUR TRAFFIC VOLUMES
ADDITIONAL SYNCHRO INPUTS

AM PEAK

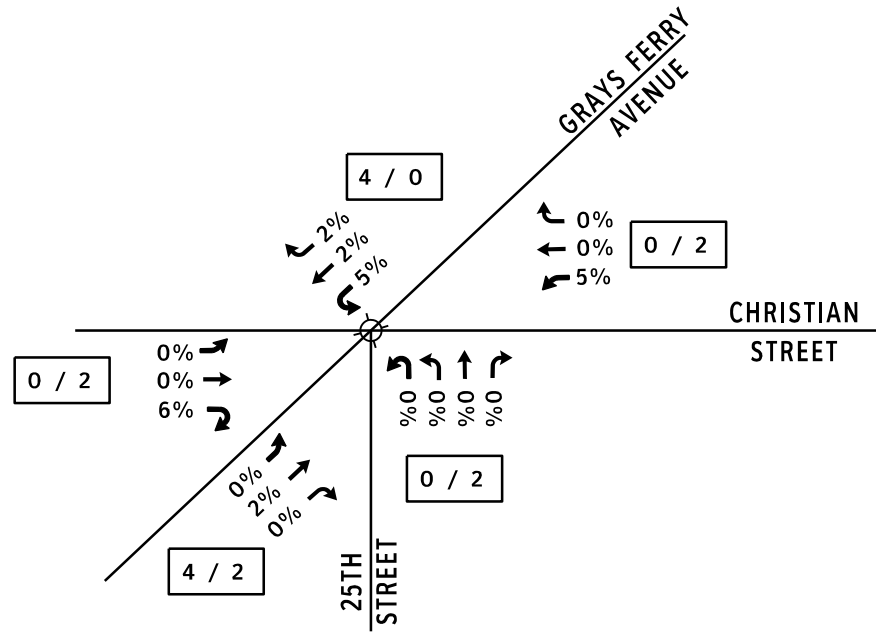


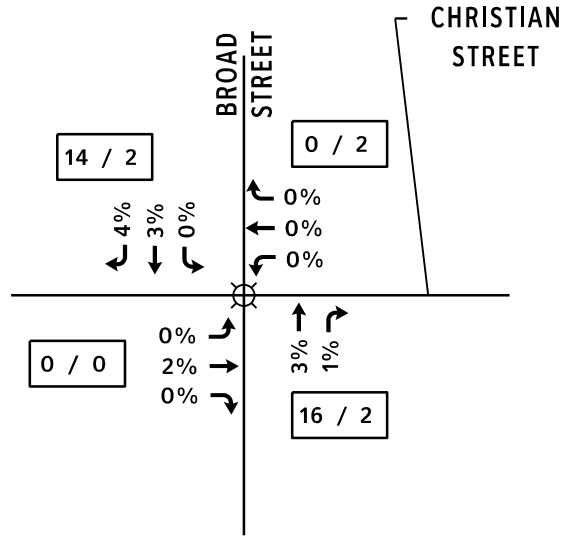


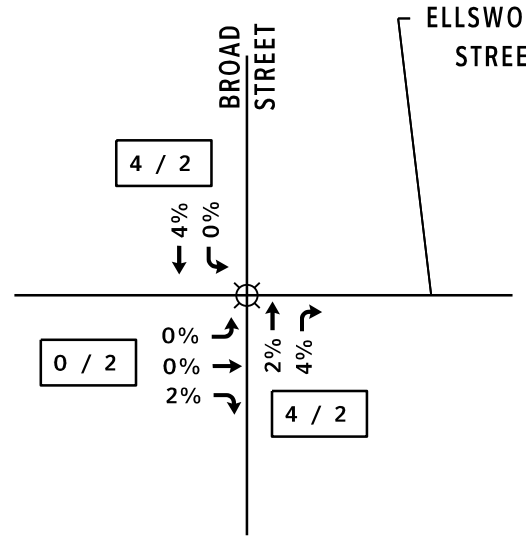


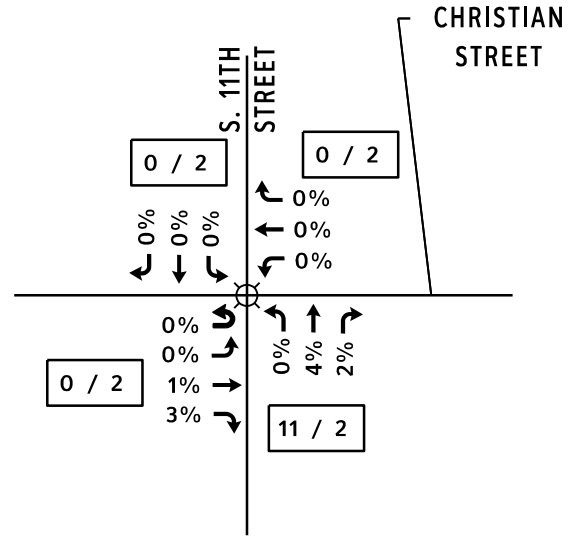


PM PEAK









SYSTEM PEAK HOURS:
7:45 AM - 8:45 AM
5:00 PM - 6:00 PM

LEGEND

- EXISTING ROADWAY
- EXISTING TRAFFIC SIGNAL
- X% Heavy Vehicle Percentage
- XX / XX BUS STOPS / PARKING MANUVERS PER HOUR

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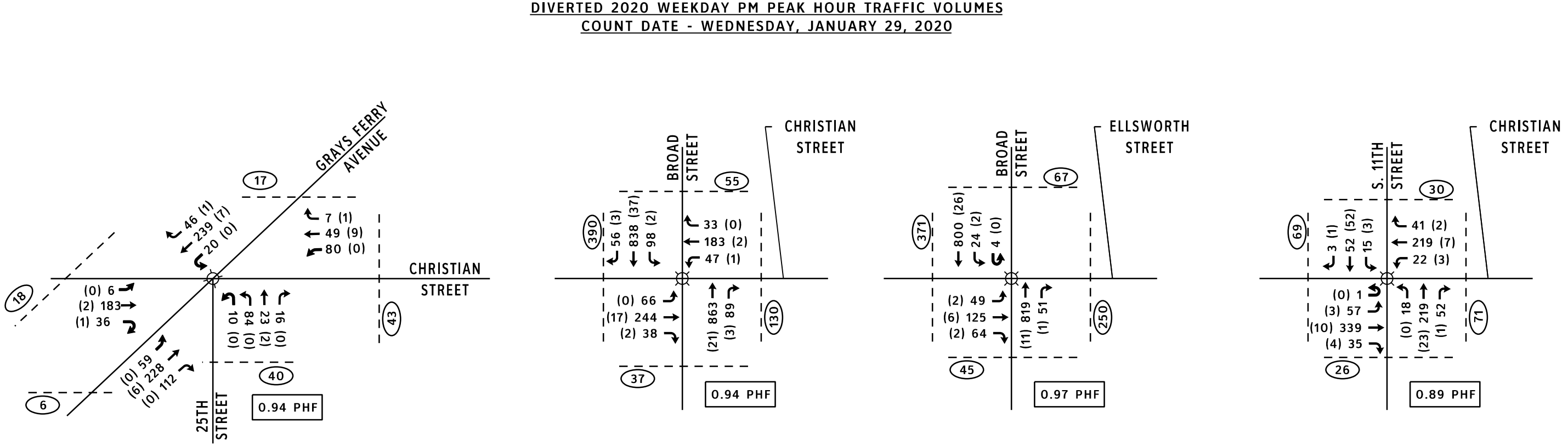
WASHINGTON AVENUE
TRAFFIC STUDY
PHILADELPHIA, PA

N.T.S	A - 2	JUN 2020

DIVERTED 2020 WEEKDAY PM PEAK HOUR TRAFFIC VOLUMES
COUNT DATE - WEDNESDAY, JANUARY 29, 2020



SYSTEM PEAK HOURS:
5:00 PM - 6:00 PM

LEGEND

- EXISTING ROADWAY
- EXISTING TRAFFIC SIGNAL
- XX — AM PEAK HOUR TRAFFIC VOLUMES
- (XX) — BICYCLE VOLUMES
- XX — PEDESTRIAN CROSSING VOLUMES
- X.XX PHF — INTERSECTION PEAK HOUR FACTOR

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WASHINGTON AVENUE
TRAFFIC STUDY
PHILADELPHIA, PA

N.T.S	A - 3	JUN 2020