Traffic Study for the Intersection of S. 51st Street and W. Drexel Avenue

City of Franklin Common Council

March 21, 2017

#235822

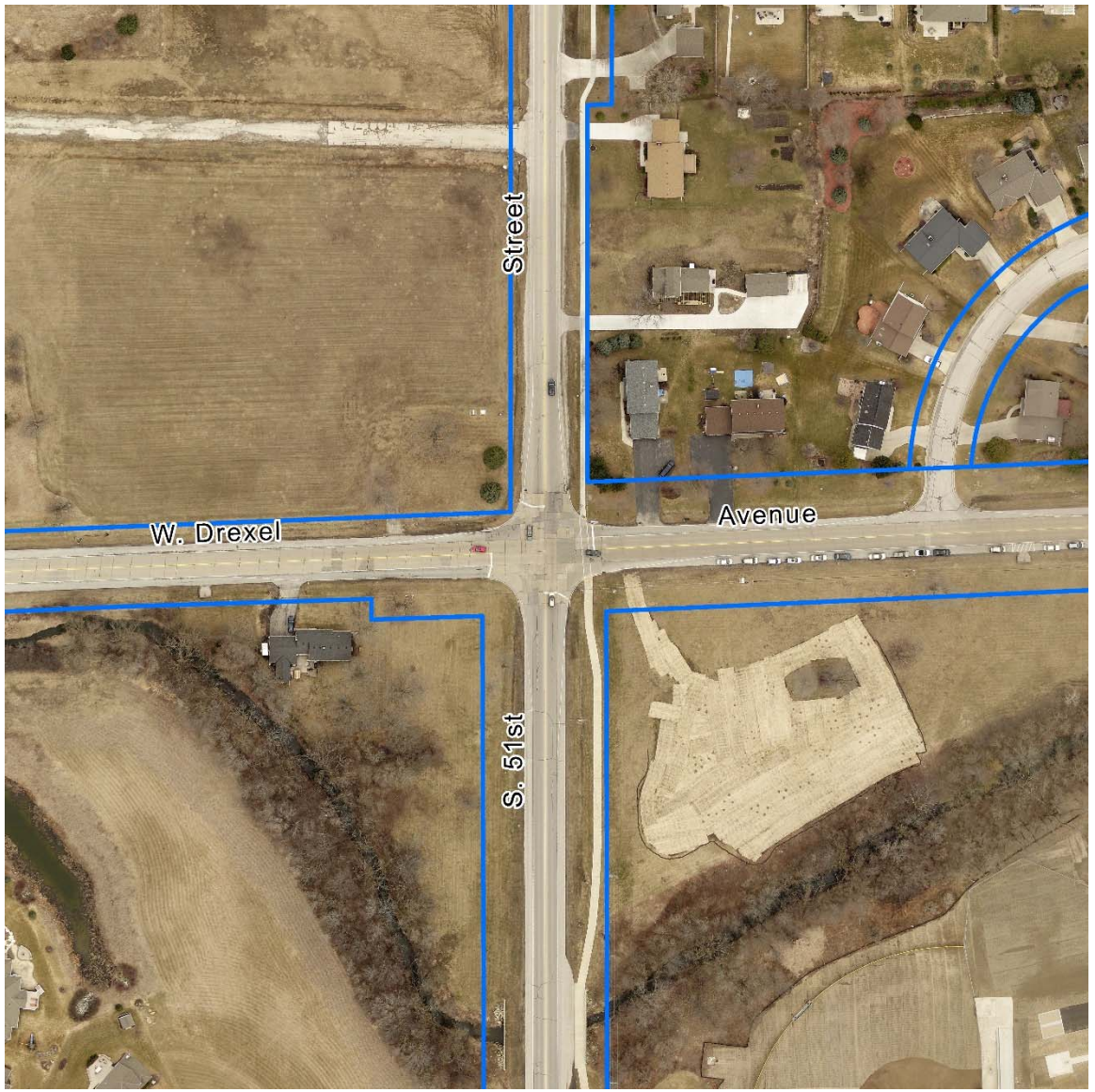
51st Street and Drexel Avenue Traffic Study

- City of Franklin requested Commission staff to conduct a traffic engineering study for the intersection of S. 51st Street and W. Drexel Avenue

- The study was requested to address excessive vehicle delay and queue length experienced at the intersection (particularly during student arrival and departure times at the nearby Franklin High School)

- The study analyzed the current operation of the existing all-way stop control at the intersection and identified and evaluated potential improvements to the operation of the intersection

Study Area - Intersection of S. 51st Street/W. Drexel Avenue



Right-of-way line

Study Steps

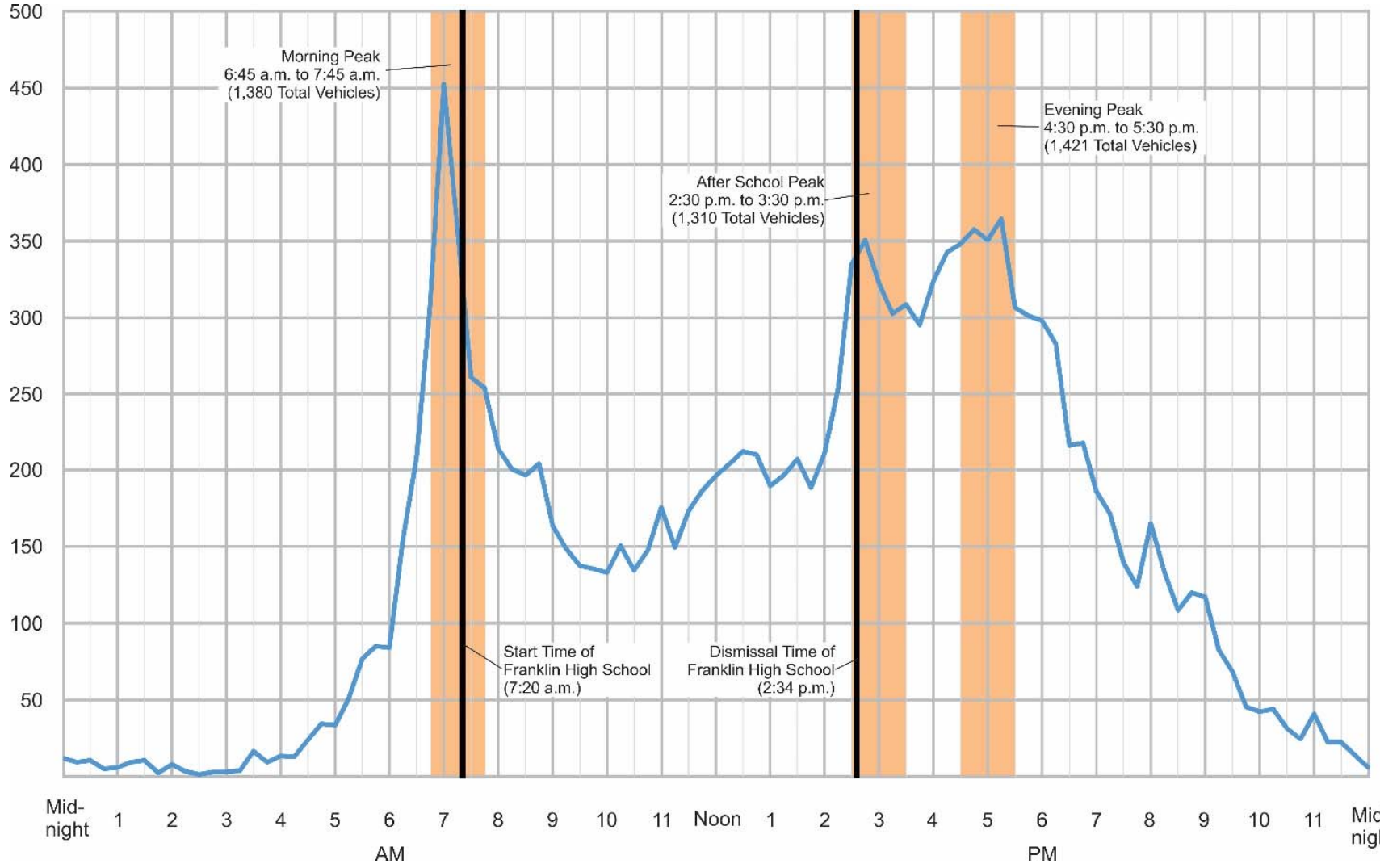
- Inventory and Problem Identification
- Identification of Alternative Intersection Improvements
- Evaluation of Alternative Intersection Improvements

Inventory and Problem Identification

- Adjacent land use and features
- Existing intersection characteristics
- Existing and future traffic volume and turning movements
- Existing and future operating conditions
- Vehicle crashes

Peak Hour Traffic

- Three Peak Hours Identified



Existing Operation of 51st Street/Drexel Avenue Intersection

- When traffic volume exceeds the design capacity of an intersection, it experiences longer delays and queueing of vehicles
- The level-of-service (LOS) for an intersection is determined by the average delay (as shown in the table to the right)

LOS THRESHOLDS FOR AN INTERSECTION

Level-of-service	Control Delay at AWSC and Roundabout (veh/sec)	Control Delay at Traffic Signal (veh/sec)
A	≤ 10	≤ 10
B	> 10 – 15	> 10 – 20
C	> 15 – 25	> 20 – 35
D	>25 – 35	>35 – 55
E	> 35 – 50	> 55 – 80
F	> 50	> 80

AVERAGE INTERSECTION DELAY AND LEVEL-OF-SERVICE

	Morning Peak		After School Peak		Evening Peak	
	Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
Existing	59.4	F	31.3	D	29.9	D
Future Year 2050	160.1	F	122.2	F	121.0	F

Queueing – Existing/Future Forecast Year 2050

- Queueing calculated based on average delay at intersection

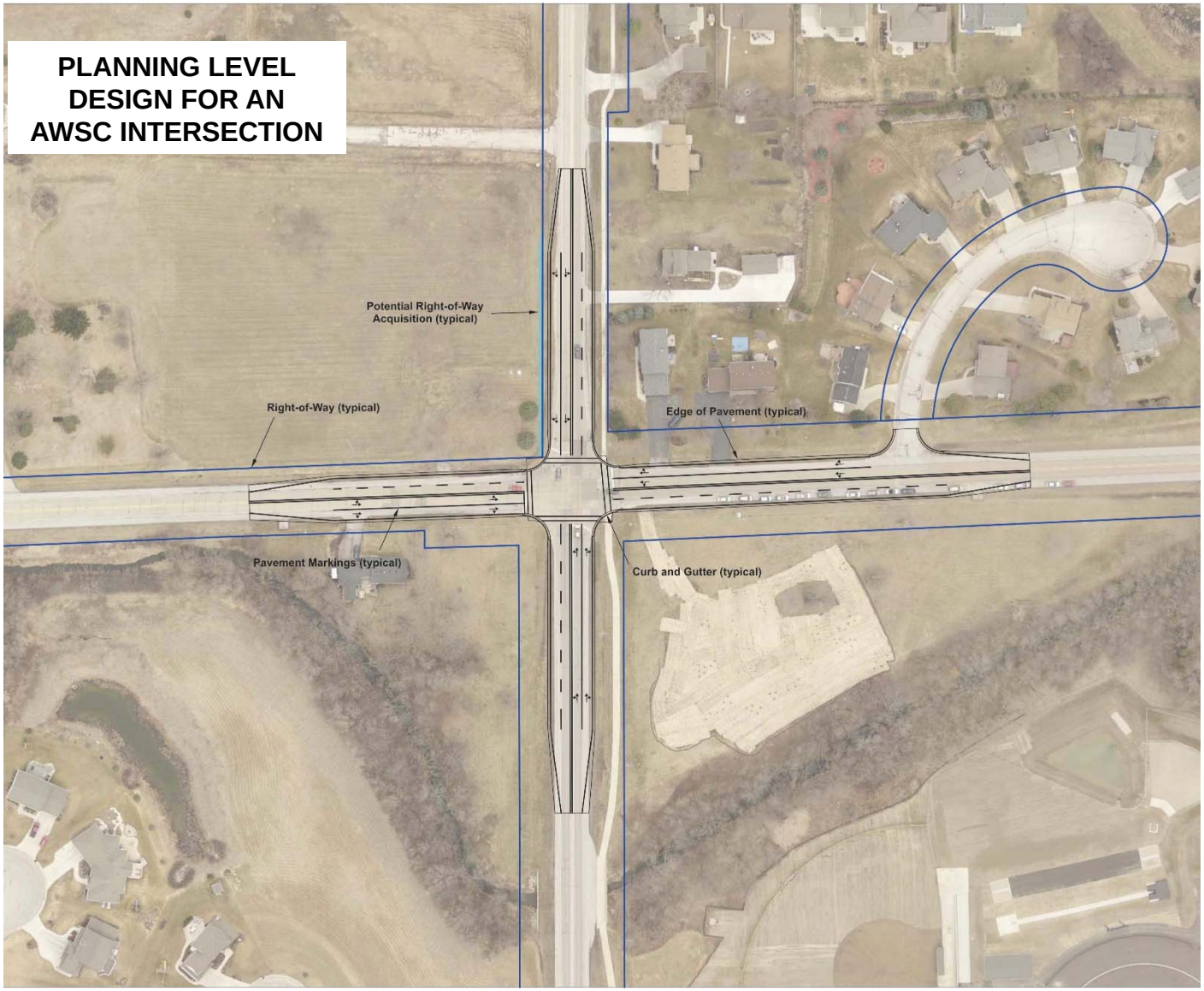
HIGHEST QUEUEING LENGTH (REPRESENTING WORST LANE)

	Morning Peak	After School Peak	Evening Peak
Existing	19	12	8
Future Year 2050	38	34	23

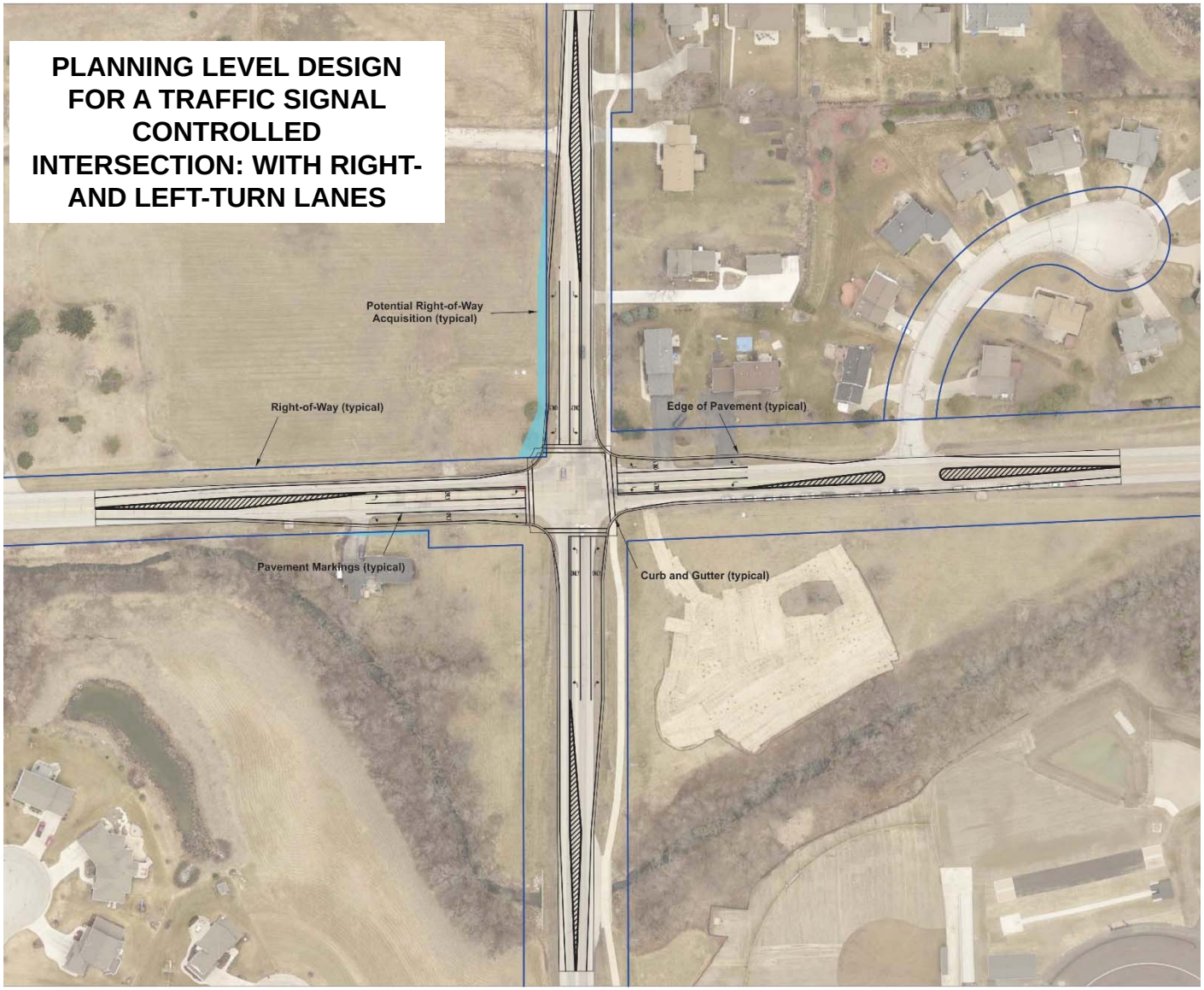
Identification of Alternative Intersection Improvements

- Improving the current all-way stop control
  - Adding two lanes at each leg of the intersection to increase capacity
- Traffic control signal
- Roundabout

Alternative 1 – Enhance Existing AWSC Intersection

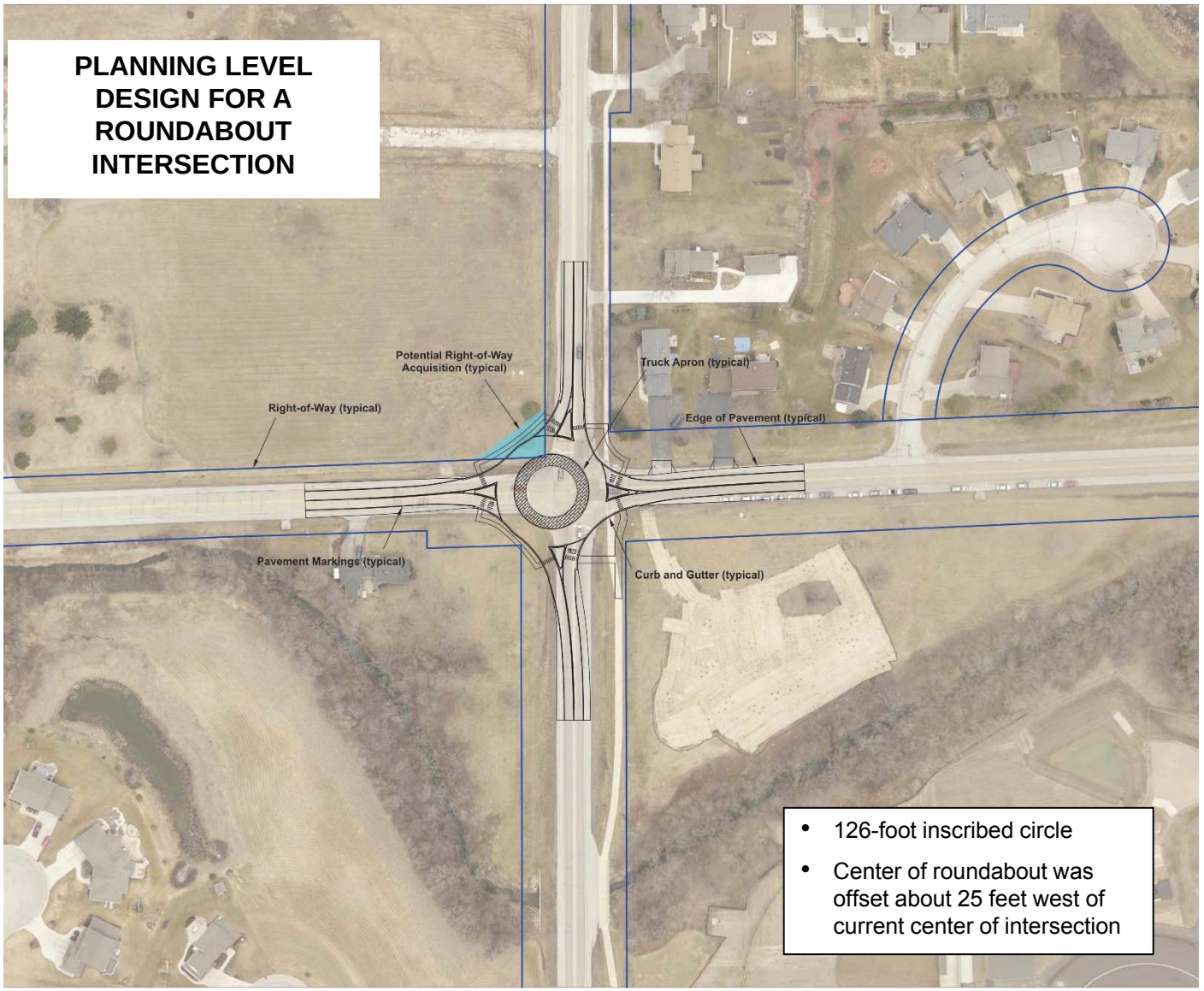


Alternative 2 – Traffic Signals With Right- And Left-Turn Lanes



Alternative 3 – Traffic Signals With Only Left-Turn Lanes

Alternative 4: Roundabout



Evaluation of Alternatives

- Ability to reduce delay and queueing
- Impacts to adjacent land
  - Right-of-way
  - Effect on residences
  - Effect on utilities
- Minimize construction costs

Ability to Reduce Delay (LOS) – Existing Conditions

AVERAGE INTERSECTION DELAY AND LEVEL-OF-SERVICE

	Morning Peak		After School Peak		Evening Peak	
	Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
AWSC – No Improvement	59.4	F	31.3	D	29.9	D
Alternative 1: AWSC – Additional Lanes	19.4	C	14.0	B	14.4	B
Alternative 2: Traffic Signals With Right- and Left- Turn Lanes	8.5	A	8.4	A	8.4	A
Alternative 3: Traffic Signals With Only Left-Turn Lane	10.3	B	9.2	A	9.0	A
Alternative 4: Roundabout	10.8	B	8.1	A	8.1	A

Ability to Reduce Delay (LOS) – Forecast Year 2050

AVERAGE INTERSECTION DELAY AND LEVEL-OF-SERVICE

	Morning Peak		After School Peak		Evening Peak	
	Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
AWSC – No Improvement	160.1	F	122.2	F	121.0	F
Alternative 1: AWSC – Additional Lanes	49.3	E	21.2	C	22.7	C
Alternative 2: Traffic Signals With Right- and Left- Turn Lanes	9.3	A	8.8	A	8.9	A
Alternative 3: Traffic Signals With Only Left-Turn Lane	18.7	B	10.0	B	10.1	B
Alternative 4: Roundabout	24.5	C	12.1	B	12.3	B

Ability to Reduce Queueing

- Highest Queueing Length (representing worst lane)

	Morning Peak		After School Peak		Evening Peak	
	Existing	Year 2050	Existing	Year 2050	Existing	Year 2050
AWSC – No Improvement	19	38	11	34	8	23
Alternative 1: AWSC – Additional Lanes	4	12	3	6	2	5
Alternative 2: Traffic Signal With Right- and Left- Turn Lanes	2	3	3	3	2	4
Alternative 3: Traffic Signal With Only Left-Turn Lane	5	13	3	4	3	5
Alternative 4: Roundabout	4	14	3	5	2	5

Impacts to Adjacent Land

- Little to no right-of-way acquisition necessary for any of the alternatives

Alternative	Right-of-Way Acquisition (acres)
Alternative 1: AWSC – Additional Lanes	0.02
Alternative 2: Traffic Signals With Right- and Left- Turn Lanes	0.07
Alternative 3: Traffic Signals With Only Left-Turn Lane	0.00
Alternative 4: Roundabout	0.05

Impacts to Adjacent Land (continued)

- Effect on residences
  - Alternative 1 - AWSC With Additional Lanes
    - Entering/exiting the driveways of four residences would potentially be affected by two additional lanes within functional area of intersection
  - Alternatives 2/3 - Traffic Signals
    - Entering/exiting the driveways of two residences would potentially be affected by the added left-turn lane
  - Alternative 4 - Roundabout
    - Entering/exiting the driveway of one resident could potentially be affected by being in proximity to a splitter island (Should it be difficult for a vehicle exiting this driveway to travel eastbound on Drexel Avenue, the vehicle can exit the driveway and travel west on Drexel Avenue and complete a U-turn through roundabout to travel east. A vehicle turning into this driveway from the eastbound lane on Drexel Avenue may cause vehicles to stop in the roundabout.)
- Effect on utilities
  - Alternative 1 – AWSC With Additional Lanes
    - None (essentially remaining in existing pavement envelope)
  - Alternative 2 – Traffic Signals With Right- and Left- Turn Lanes
    - 2 utility poles would potentially need to be relocated (one in NE corner and one in SE Corner)
  - Alternative 3 – Traffic Signals With Only Left- Turn Lanes
    - None (essentially remaining in existing pavement envelope)
  - Alternative 4 - Roundabout
    - None (able to move roundabout to avoid impacts to utility poles)

Estimated Planning-Level Construction Cost

Alternative	Estimated Construction Cost[a]	Estimated Right-of-Way Cost	Estimated Total Cost[b]
Alternative 1: AWSC – Additional Lanes	$ 0.92 Million	$ 0.01 Million	$ 0.93 Million
Alternative 2: Traffic Signals With Right- and Left-Turn Lanes	$1.78 Million	$0.02 Million	$1.80 Million
Alternative 3: Traffic Signals With Only Left-Turn Lane	$ 1.61 Million	$ 0.00 Million	$ 1.61 Million
Alternative 4: Roundabout	$0.60 Million	$0.02 Million	$0.62 Million

[a] The estimated construction costs include reconstructing the segments of S. 51st Street and W. Drexel Avenue affected by each of the alternatives, as shown on the planning-level designs. The construction costs for Alternatives 1, 2, and 3 could be reduced if the current pavement structure for all or portions of the affected roadway is in good enough condition that they could be resurfaced or reconditioned, rather than reconstructed. The estimated construction costs include preliminary and final engineering.

[b] Does not include cost for utility relocation.

Note: With respect to operation and maintenance costs, Alternative 1 (upgrade existing AWSC) would have slightly higher annual operation and maintenance costs than the current intersection due to the additional lanes and pavement markings, but would be expected to have the lowest operation and maintenance costs of the four alternatives.

Alternatives 2 and 3 (provide traffic signals) would be expected to have the highest annual operation and maintenance costs of the alternatives, mostly due to the cost to provide electricity to the traffic signals and to regularly service equipment.

Alternative 4 (provide a roundabout) would be expected to have annual operation and maintenance costs less than those for Alternatives 2 and 3, but more than that for Alternative 1. Operation and maintenance costs for a roundabout typically include the costs to regularly re-stripe pavement markings, to maintain the additional pavement (including the colored pavement of the truck apron), and to maintain any landscaping in the center of the roundabout.