

Traffic



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BY CHET SKWARCAN



Traffic Engineering Analysis

**Stafford Road at Airtech Parkway
HSA PrimeCare - Warehouse Development
Plainfield, Indiana**

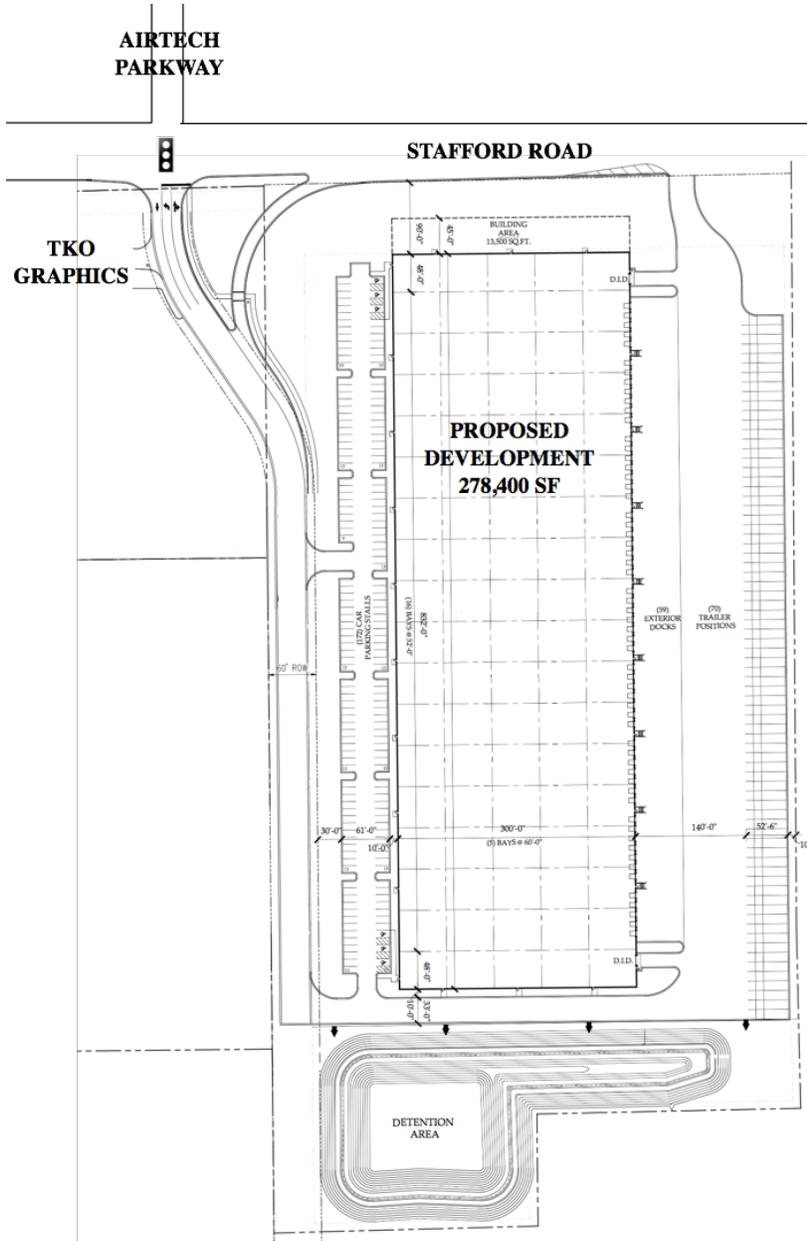
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SEPTEMBER 19, 2017

Executive Summary

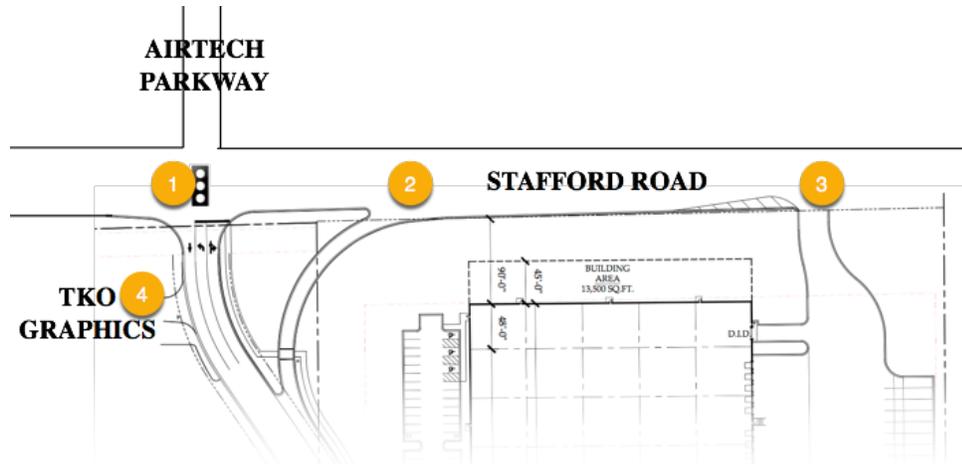
The purpose of this traffic analysis is to evaluate traffic impacts associated with a warehouse development proposed on the southeast quadrant of Stafford Road at Airtech Parkway in Plainfield, Indiana. The conceptual site plan used for this analysis is depicted below:



The proposed land use is *warehousing*. Primary access is provided via the existing traffic signal at Stafford Road and Airtech Parkway. Note that a dedicated "bypass" lane is provided for traffic exiting the site and turning right onto Stafford Road. Secondary access is provided approximately 650 feet to the east along Stafford Road. Note the secondary access is not full access (i.e., left turning traffic exiting the site is prohibited).

Executive Summary (continued)

Recommended geometry and/or mitigation for each intersection/driveway location is summarized below.

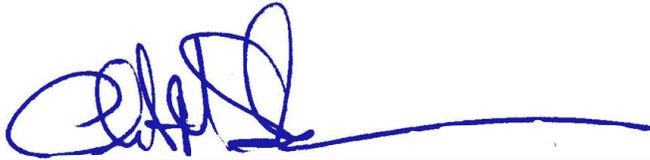


- 1). Stafford Road at Airtech Parkway - This intersection currently operates at a Level of Service (LOS) B. The additional site traffic does not cause significant impact to the traffic signal with peak hour LOS results dropping slightly to an overall LOS C. These delays are within the acceptable range of signal operation - no mitigation is recommended. Note there is discussion of potentially extending Airtech Parkway southward in the future and connecting to Whitaker Road. If/when this happens traffic volumes along Airtech Parkway may increase, which in turn increases delay at the site access, however little overall impact is expected.
- 2). Dedicated Bypass Lane for Exiting Traffic Turning Right – The proposed bypass lane works well with relatively minor delay. Queuing at this intersection remains below one vehicle. No mitigation required.
- 3). Secondary Access at Stafford Road – Secondary access is currently proposed as a “three-quarter intersection” with the exiting left turning movement prohibited. This intersection operates with acceptable delay during the AM and PM full buildout scenarios with the intersection operating at LOS C. Even though delay is acceptable, the resulting queues impact westbound through traffic on Stafford Road. Due to the high volume of vehicles on Stafford Road, without a designated left turn lane, a westbound vehicle stopping to make a left turn into the development results in queue build up. The addition of a left turn lane or restricting this driveway to a right-in/right-out access is recommended.
- 4). Existing Access for TKO Graphics – The existing TKO access operates at a LOS A. These delays are expected to remain similar under the full buildout scenario. If Airtech Parkway is extended southward to Whitaker Road, through volumes are expected to increase along Airtech Parkway which slightly increases delay for TKO exiting vehicles. However, as the delay is currently very low, there are no concerns at this intersection due to the addition of development and site traffic.

Overall there were no concerns with the projected LOS due to the addition of the proposed development with the exception of westbound queueing at the secondary access along Stafford Road for vehicles turning left into the site as addressed above.

Certification

I certify this Traffic Analysis has been prepared by me or under my immediate supervision and that I have experience and training in the field of traffic and transportation engineering.



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September 19, 2017

Date



Proposed Development

The proposed development consists of a warehouse situated on the southeast quadrant of Stafford Road at Airtech Parkway in Plainfield, Indiana. The site plan proposes a 278,400 square foot warehouse. Primary access is proposed via Airtech Parkway at the existing traffic signal. Secondary access is proposed approximately 650 feet to the east onto Stafford Road.

Trip Generation

Based on the proposed development, projected site trips are tabulated below. In order to ensure recommendations address the potential range of land uses, two scenarios were evaluated: 1) typical high-cube warehouse and 2) E-commerce type facility:

Daily Volumes

| LAND USE | ITE CODE # | DEVELOPMENT UNITS | QUANTITY | DAILY RATE | ENTER PERCENT | EXIT PERCENT | NEW TRIPS | |
|---|------------|-------------------|----------|------------|---------------|--------------|-----------|------|
| | | | | | | | ENTER | EXIT |
| High Cube Warehouse/Distribution Center | 152 | KSF | 278.4 | 1.68 | 50% | 50% | 234 | 234 |
| Industrial Park (E-Commerce) | 130 | KSF | 278.4 | 6.83 | 50% | 50% | 951 | 951 |

AM Peak Hour

| LAND USE | ITE CODE # | DEVELOPMENT UNITS | QUANTITY | AM RATE | ENTER PERCENT | EXIT PERCENT | NEW TRIPS | |
|---|------------|-------------------|----------|---------|---------------|--------------|-----------|------|
| | | | | | | | ENTER | EXIT |
| High Cube Warehouse/Distribution Center | 152 | KSF | 278.4 | 0.11 | 69% | 31% | 21 | 9 |
| Industrial Park (E-Commerce) | 130 | KSF | 278.4 | 0.82 | 82% | 18% | 187 | 41 |

PM Peak Hour

| LAND USE | ITE CODE # | DEVELOPMENT UNITS | QUANTITY | PM RATE | ENTER PERCENT | EXIT PERCENT | NEW TRIPS | |
|---|------------|-------------------|----------|---------|---------------|--------------|-----------|------|
| | | | | | | | ENTER | EXIT |
| High Cube Warehouse/Distribution Center | 152 | KSF | 278.4 | 0.12 | 31% | 69% | 10 | 23 |
| Industrial Park (E-Commerce) | 130 | KSF | 278.4 | 0.85 | 21% | 79% | 50 | 187 |

NOTES:

1. All trip generation rates based on "Trip Generation", Institute of Transportation Engineers, 9th Edition unless otherwise noted.
2. AM Trips calculated using Peak Hour of Adjacent Street Traffic One Hour Between 7 and 9 a.m.
3. PM Trips calculated using Peak Hour of Adjacent Street Traffic One Hour Between 4 and 6 p.m.

Trip Distribution

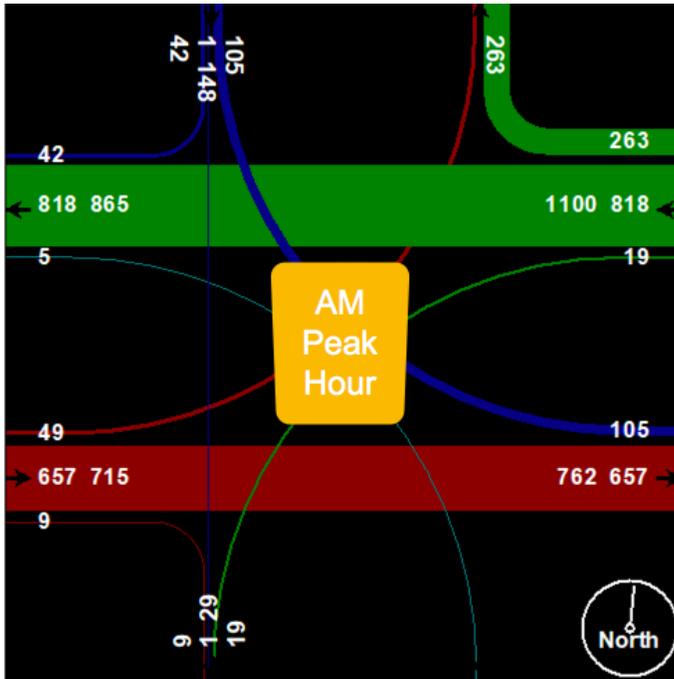
The graphic below depicts the projected distribution of trips associated with this development:



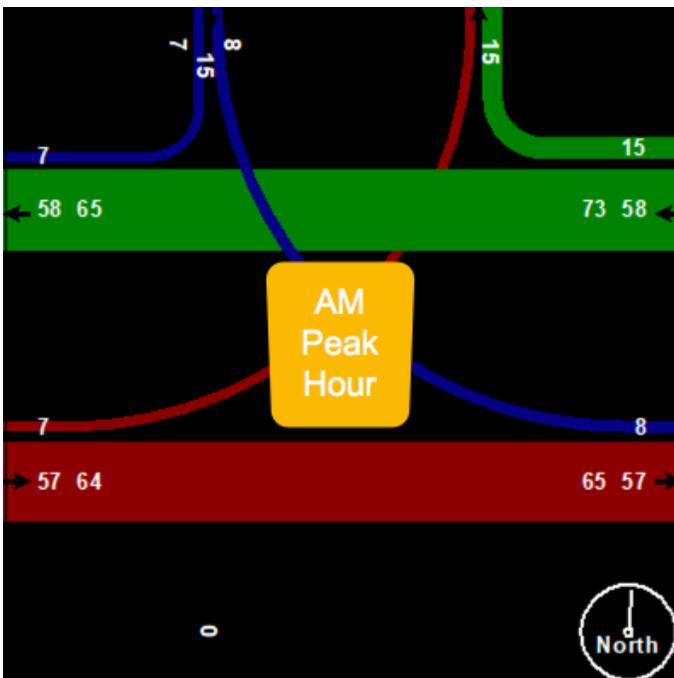
Existing Traffic Conditions

As part of this analysis, traffic data was collected in the vicinity of the proposed development. The following graphics depict existing traffic conditions:

AM Peak Hour - All Traffic

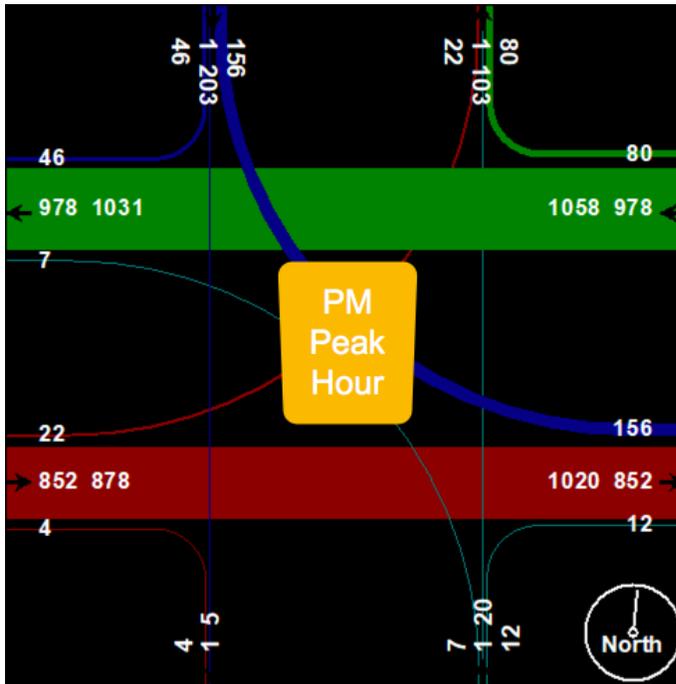


AM Peak Hour - Trucks Only

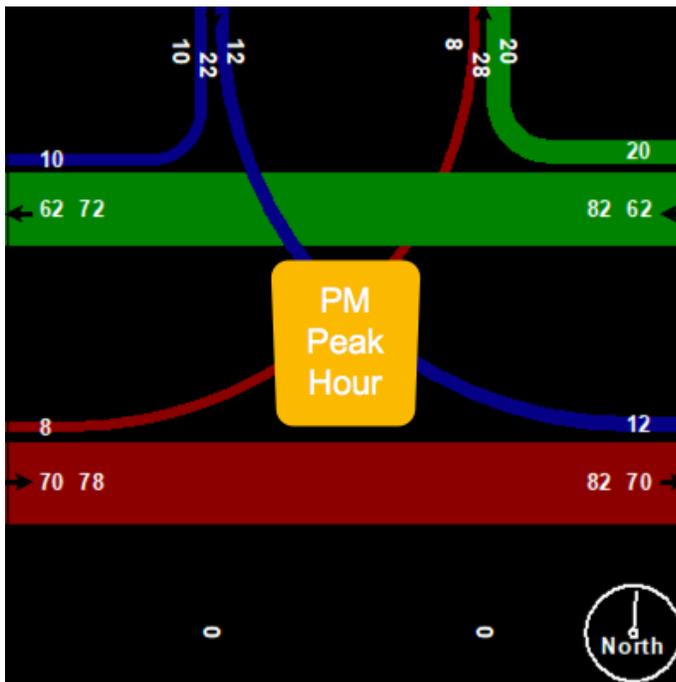


Existing Traffic Conditions (continued)

PM Peak Hour - All Traffic



PM Peak Hour - Trucks Only

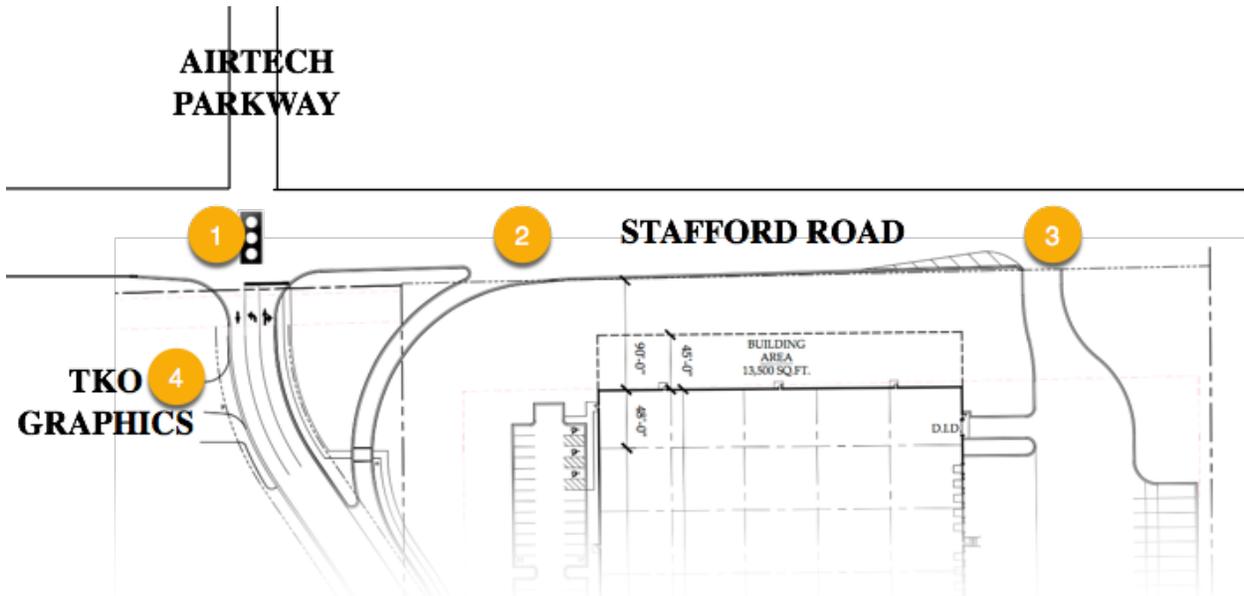


Level of Service Analysis

Level of Service (LOS) analysis was performed to evaluate existing and full buildout conditions (see appendix). The charts below are a summary of the results. Overall there were no concerns with the projected LOS due to the addition of the new development with the exception of queuing at the secondary access along Stafford Road for westbound vehicles turning left into the site (see next page).

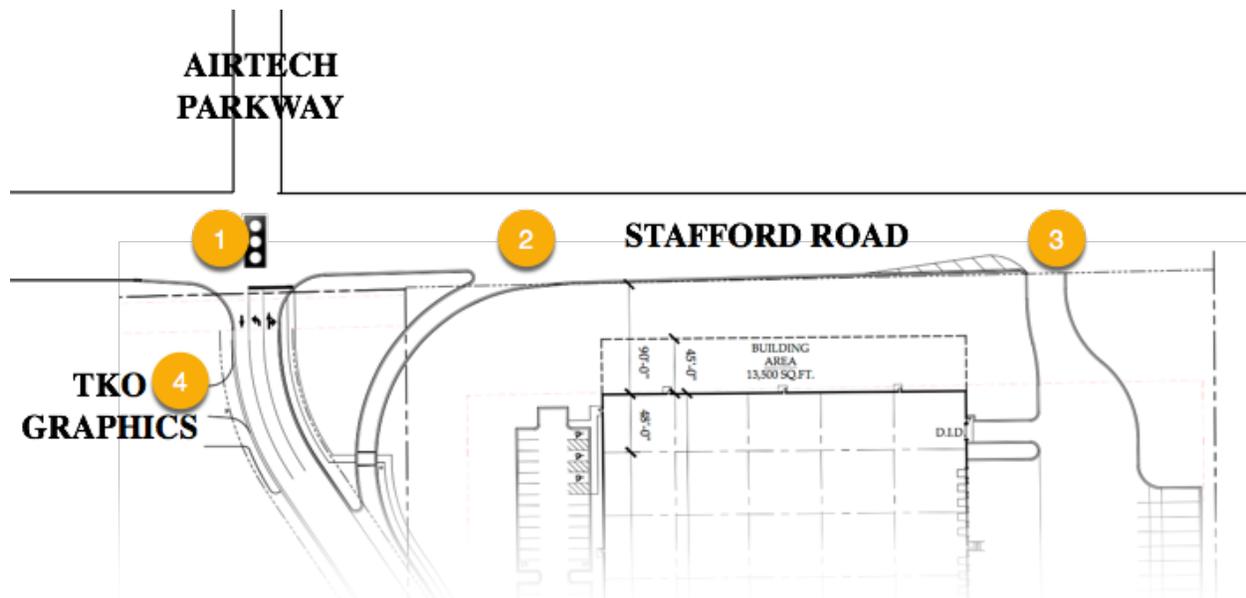
| AM Peak Hour | Existing | Plus Background Growth | Plus Site Traffic - Warehouse | Plus Site Traffic - E-commerce |
|--------------|----------|------------------------|-------------------------------|--------------------------------|
| 1 | B | B | B | B |
| 2 | | | B | B |
| 3 | | | B | B |
| 4 | A | A | A | A |

| PM Peak Hour | Existing | Plus Background Growth | Plus Site Traffic - Warehouse | Plus Site Traffic - E-commerce |
|--------------|----------|------------------------|-------------------------------|--------------------------------|
| 1 | B | B | B | C |
| 2 | | | C | C |
| 3 | | | C | C |
| 4 | A | A | A | A |



Summary and Recommendations

1). Stafford Road at Airtech Parkway - This intersection currently operates at a Level of Service (LOS) B with worst individual movements at LOS D in the AM and PM peak hour. The additional site traffic does not cause significant impact to the traffic signal with AM LOS results staying the same and PM LOS results dropping slightly to an overall LOS C with worst individual movement D in the full buildout scenario. These delays are within the acceptable range of signal operation - no mitigation recommended. There is discussion of potentially extending Airtech Parkway southward in the future and connecting to Whitaker Road. If/when this happens traffic volumes along Airtech Parkway may increase, which increases delay at the site access, however little overall impact is expected. It is also worth noting that should the westbound left turning movement be closed at the secondary access (driveway #3) the westbound left volumes at the signal will increase accordingly. Because the signal is projected to operate well within its capacity, the westbound left turning movement operates at a LOS C during the worst volume case therefore little impact expected from these additional vehicles. In either case, signal retiming is recommended to ensure proper split timing when the development is operational.



2). Dedicated Bypass Lane for Exiting Traffic Turning Right – The proposed bypass lane works well with relatively minor delay. During the AM and PM full buildout scenarios for both warehousing and E-Commerce (higher generator case) land uses, the bypass lane operates with an overall LOS B with an individual right-turning LOS C or better. Queuing at this intersection remains below one vehicle. No mitigation required

3). Secondary Access at Stafford Road – Secondary access is currently proposed as a “three-quarter intersection” with the exiting left turning movement prohibited. This intersection operates with acceptable delay during the AM and PM full buildout scenarios with the intersection operating at LOS B with worst individual movement at LOS C or better. Even though the delay is acceptable, the resulting queues cause concern. Due to the high volume of vehicles on Stafford Road, and without a designated left turn lane, when a westbound vehicle stops to make a left turn into the development the queues build up quickly. The addition of a left turn lane or restricting this driveway to a right-in/right-out access is recommended. The addition of a left turn lane removes the small number of turning vehicles from the through lane

Summary and Recommendations (continued)

traffic and therefore mitigates the queueing issue (most westbound vehicles are expected to turn left at the traffic signal). The restriction of the westbound left turn pushes these vehicles to the signalized intersection at Stafford Road and Airtech Parkway. This signal has sufficient capacity to handle these additional vehicles.

4). Existing Access for TKO Graphics – The existing TKO access operates at a LOS A with worst movement at LOS A. These delays are expected to remain similar under the full buildout scenario. If Airtech Parkway is extended southward to Whitaker Road, the through volumes are expected to increase along Airtech Parkway which slightly increases delay for TKO exiting vehicles. However, as the delay is currently very low, there are no concerns at this intersection due to the addition of development and site traffic.

Overall there were no concerns with the projected LOS due to the addition of the proposed development with the exception of queueing concerns at the secondary access along Stafford Road for westbound vehicles turning left into the site as addressed above.

Appendix

Level of Service (LOS) Analysis

- AM Peak Hour - Existing Traffic
- AM Peak Hour - Existing plus normal background growth
- AM Peak Hour - Existing plus normal background growth plus site traffic - Warehouse
- AM Peak Hour - Existing plus normal background growth plus site traffic - E-commerce
- PM Peak Hour - Existing Traffic
- PM Peak Hour - Existing plus normal background growth
- PM Peak Hour - Existing plus normal background growth plus site traffic - Warehouse
- PM Peak Hour - Existing plus normal background growth plus site traffic - E-commerce

Level of Service Descriptions

Level of Service (LOS) is expressed as a letter rating reflective of the weighted average control delay of the overall intersection (or by individual lane movement). A LOS of D is considered acceptable in most cases before mitigation measures are investigated. The following tables summarize the various Levels of Service for both signalized and unsignalized intersections:

Table 1. Level of Service Criteria for Signalized Intersections

| Level of Service | Average Control Delay (seconds/vehicle) | General Description |
|------------------|---|---|
| A | ≤10 | Free Flow |
| B | >10 – 20 | Stable Flow (slight delays) |
| C | >20 – 35 | Stable flow (acceptable delays) |
| D | >35 – 55 | Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding) |
| E | >55 – 80 | Unstable flow (intolerable delay) |
| F ¹ | >80 | Forced flow (congested and queues fail to clear) |

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio for a lane group exceeds 1.0 LOS F is assigned to the individual lane group. LOS for overall approach or intersection is determined solely by the control delay.

Table 2. Level of Service Criteria for Unsignalized Intersections

| Level of Service | Average Control Delay (seconds/vehicle) |
|------------------|---|
| A | 0 – 10 |
| B | >10 – 15 |
| C | >15 – 25 |
| D | >25 – 35 |
| E | >35 – 50 |
| F ¹ | >50 |

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio exceeds 1.0, LOS F is assigned an individual lane group for all unsignalized intersections, or minor street approach at two-way stop-controlled intersections. Overall intersection LOS is determined solely by control delay.