



STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. Box 778
DOVER, DELAWARE 19903

JENNIFER COHAN
SECRETARY

July 27, 2016

Mr. Christopher Duke
Becker Morgan Group
250 South Main Street
Suite 109
Newark, DE 19711

Dear Mr. Duke,

The enclosed Traffic Impact Study (TIS) review letter for the **Royal Farms – DE 54** commercial development (Tax Parcel 533-12.00-76.06) has been completed under the responsible charge of a registered professional engineer whose firm is authorized to work in the State of Delaware. They have found the TIS to conform to DelDOT's Development Coordination Manual and other accepted practices and procedures for such studies. DelDOT accepts this review letter and concurs with the recommendations. If you have any questions concerning this letter or the enclosed review letter, please contact me at (302) 760-2167.

Sincerely,

Troy Brestel
Project Engineer

TEB:ct

Enclosures

cc with enclosures: Mr. Randall Bendler, Bendler Realty, Inc.
Ms. Constance C. Holland, Office of State Planning Coordination
Mr. Lawrence Lank, Sussex County Planning and Zoning
Ms. Janelle Cornwell, Sussex County Planning and Zoning
Mr. Richard Mishura, Johnson, Mirmiran & Thompson, Inc.
DelDOT Distribution

DelDOT Distribution

Annie Cordo, Deputy Attorney General
Robert McCleary, Director, Transportation Solutions (DOTS)
Drew Boyce, Director, Planning
Mark Luszcz, Chief Traffic Engineer, Traffic, DOTS
Michael Simmons, Assistant Director, Project Development South, DOTS
J. Marc Coté, Assistant Director, Development Coordination
T. William Brockenbrough, Jr., County Coordinator, Development Coordination
Peter Haag, Traffic Studies Manager, Traffic, DOTS
Alastair Probert, South District Engineer, South District
Gemez Norwood, South District Public Works Manager, South District
Jay Sammons, South District Permit Supervisor, South District
Steve Sisson, Sussex Subdivision Coordinator, Development Coordination
David Dooley, Service Development Planner, Delaware Transit Corporation
Mark Galipo, Traffic Engineer, Traffic, DOTS
Anthony Aglio, Planning Supervisor, Statewide & Regional Planning
Claudy Joinville, Project Engineer, Development Coordination
Scott Johnson, Subdivision Manager, Development Coordination



July 27, 2016

Mr. Troy Brestel
Project Engineer
Development Coordination
DeIDOT Division of Planning
P O Box 778
Dover, DE 19903

RE: Agreement No. 1654
Project Number T201469011
Traffic Impact Study Services
Task 12A-Royal Farms – DE 54 & West Bluewater Run

Dear Mr. Brestel:

Johnson, Mirmiran and Thompson (JMT) has completed the review of the Final Traffic Impact Study (TIS) for Royal Farms No. 263 (a.k.a Royal Farms - DE 54 & West Bluewater Run), prepared by Becker Morgan Group. This review was assigned Task Number 12A. Becker Morgan Group prepared the report in a manner generally consistent with DeIDOT’s *Development Coordination Manual*.

The TIS evaluates the impacts of a proposed 4,946 square foot Royal Farms convenience store with gas pumps, on the northeast corner of the Delaware Route 54 (Lighthouse Road/Sussex Road 58) and West Bluewater Run intersection in Sussex County. The development is proposed on a 2.70-acre parcel of land that is zoned CR-1 (Commercial Regional) and the developer does not propose to rezone the land. The developer is proposing one full access on Delaware Route 54 via connection with Prophet Place, across from West Bluewater Run, and one rights-in/rights-out access along Delaware Route 54. Construction is expected to be completed in 2019.

DeIDOT does not currently have any relevant projects within the study area.

Based on our review of the Traffic Impact Study, we have the following comments and recommendations:

The following intersection exhibits level of service (LOS) deficiencies without the implementation of physical roadway and/or traffic control improvements:

<i>Intersection</i>	<i>Situations for which LOS deficiencies occur</i>
Delaware Route 54/West Bluewater Run/Prophet Place	2019 AM, PM, and Saturday Midday with Royal Farms development (Case 3)



The unsignalized intersection of Delaware Route 54 and West Bluewater Run/Prophet Place exhibits LOS deficiencies under future conditions with the construction of the Royal Farms development (Case 3) during the weekday AM, PM, and Summer Saturday midday peak hours. The deficiencies occur along the northbound West Bluewater Run approach during the PM and Saturday peak hours and along the southbound Prophet Place approach during the AM, PM and Saturday peak hours. The deficiencies are due to the high traffic volumes along Delaware Route 54 and the operation of left turn lanes along the Delaware Route 54 approaches to the intersection. Under Saturday Midday Case 3 conditions, the projected 95th percentile queue length is approximately 80 feet along the northbound West Bluewater Run approach and 355 feet along the southbound Prophet Place approach.

In coordination with DelDOT's Development Coordination section, JMT performed an additional access scenario with the Site Entrance along Delaware Route 54 as an unsignalized rights-in/lefts-out entrance east of the Delaware Route 54 and West Bluewater Run/Prophet Place intersection. Additionally, an acceleration lane would be provided for the left-out vehicles and would be separated from the eastbound Delaware Route 54 through traffic by a concrete median, which promotes a two-stage left turn onto Delaware Route 54. With this design, the intersection would operate at acceptable LOS D or better during the AM, PM, and Saturday Midday peak hours. Furthermore, the provision of an acceleration lane separated by a concrete median would help to minimize the occurrence of angle crashes due to left-turning traffic onto Delaware Route 54.

With the provision of an unsignalized rights-in/lefts-out access, the unsignalized intersection of Delaware Route 54 and West Bluewater Run/Prophet Place would continue to exhibit LOS deficiencies under future conditions with the construction of the Royal Farms development (Case 3) during the Summer Saturday midday peak hour. The deficiencies occur along the northbound West Bluewater Run approach where the calculated 95th percentile queue length would be approximately 30 feet. The installation of a traffic signal would mitigate the LOS deficiencies. However, as these queue lengths would have minimal impact on the roadway, it is recommended that a signal not be installed at the intersection. Furthermore, the installation of a signal would have an adverse impact on the traffic progression along the Delaware Route 54 corridor.

Should the County approve the proposed development, the following items should be incorporated into the site design and reflected on the record plan. All applicable agreements (i.e. letter agreements for off-site improvements and traffic signal agreements) should be executed prior to entrance plan approval for the proposed development.

1. The developer should provide a bituminous concrete overlay to the existing travel lanes along the Delaware Route 54 site frontage. DelDOT should analyze the existing lanes' pavement section and recommend an overlay thickness to the developer's engineer, if necessary.
2. The developer should construct a rights-in/lefts-out only entrance for the proposed Royal Farms development on Delaware Route 54, east of the Delaware Route 54 intersection with



West Bluewater Run/Prophet Place, to be consistent with the proposed lane configurations as shown in the table below:

Approach	Current Configuration	Proposed Configuration
Eastbound Delaware Route 54	One two-way left turn lane and one through lane	One through lane
Westbound Delaware Route 54	One two-way left turn lane, one through lane, and one right turn lane for Prophet Place	One through lane and one right turn lane
Southbound Site Entrance	Approach does not exist	One left turn lane

Based on DeIDOT's *Development Coordination Manual*, the recommended minimum storage length (excluding taper) is 240 feet for the westbound Delaware Route 54 right turn lane. The storage lengths based on the HCS analysis provide shorter queue lengths than what is reported here.

- The developer should submit a plan and coordinate with DeIDOT's Development Coordination section regarding the rights-in/lefts-out only entrance along Delaware Route 54 to identify the acceleration lane and median design with appropriate signage and pavement markings.
- The developer should construct a full movement ingress and right turn only egress entrance for the proposed Royal Farms development on Delaware Route 54 to form the fourth leg (Prophet Place) at the intersection with West Bluewater Run, to be consistent with the lane configurations as shown in the table below:

Approach	Current Configuration	Proposed Configuration
Eastbound Delaware Route 54	One two-way left turn lane, one through lane, and one right turn lane	No Change
Westbound Delaware Route 54	One two-way left turn lane, one through lane, and one right turn lane	No Change
Northbound West Bluewater Run	One shared through/left turn/right turn lane	No Change
Southbound Prophet Place	One right turn lane	No Change

Based on DeIDOT's *Development Coordination Manual*, the recommended minimum storage length (excluding taper) is 190 feet for the westbound Delaware Route 54 right turn lane. The storage lengths based on the HCS analysis provide shorter queue lengths than what is reported here.



5. The following bicycle and pedestrian improvements should be included:
- a. A five-foot wide ADA compliant sidewalk with a five-foot setback from the roadway should be constructed (and maintained) along the site frontage. The sidewalk should be within a fifteen-foot wide dedicated permanent easement to DelDOT and/or State right of way. If feasible, the sidewalk should be placed behind utility poles and street trees should be provided within the buffer area.
 - b. When right turn lanes are added on Delaware Route 54, a five-foot wide bike lane should also be provided through the right turn lane in order to facilitate safe and unimpeded bicycle travel. A RIGHT TURN YIELD TO BIKES sign (*DE MUTCD R4-4*) should be added before the start of each right turn lane.
 - c. ADA compliant curb ramps and marked crosswalks should be provided at the rights-in/lefts-out only site entrance location on Delaware Route 54 east of the Delaware Route 54 intersection with West Bluewater Run/Prophet Place. The use of diagonal curb ramps is discouraged.
 - d. Utility covers should be moved outside of any bike lanes and paved shoulders or should be flush with the pavement.
 - e. Bike parking racks should be provided near the building entrance within the development. Where the building architecture provides for an awning or other overhang, the bike parking should be covered.
 - f. Sidewalk connections from Delaware Route 54 and Prophet Place to the internal on-site sidewalks should be provided.
 - g. Sidewalk on both sides of Prophet Place and Ark Avenue should be provided to connect the Royal Farms development to the DRC Properties development to the north. ADA compliant curb ramps and marked crosswalks should be provided at each site entrance along those roadways. The use of diagonal curb ramps is discouraged.
 - h. Where internal sidewalks are located alongside of parking spaces, a buffer, physical barrier or signage should be added to eliminate vehicular overhang onto the sidewalk.

Please note that this review generally focuses on capacity and level of service issues; additional safety and operational issues will be further addressed through DelDOT's subdivision review process.

Improvements in this TIS may be considered "significant" under DelDOT's *Work Zone Safety and Mobility Procedures and Guidelines*. These guidelines are available on DelDOT's website at http://www.deldot.gov/information/pubs_forms/manuals/de_mutcd/index.shtml. For any additional information regarding the work zone impact and mitigation procedures during construction please contact Mr. Adam Weiser of DelDOT's Traffic Section. Mr. Weiser can be reached at (302) 659-4073 or by email at Adam.Weiser@state.de.us.



Additional details on our review of the TIS are attached. Please contact me at (302) 266-9600 if you have any questions concerning this review.

Sincerely,
Johnson, Mirmiran, and Thompson, Inc.

Mir Wahed

Mir Wahed, P.E., PTOE

cc: Richard Mishura
Joanne Arellano, P.E., PTOE

Enclosure

General Information

Report date: April 2016

Prepared by: Becker Morgan Group, Inc.

Prepared for: Royal Farms No. 263

Tax Parcel: 533-12.00-76.06

Generally consistent with DelDOT's *Development Coordination Manual*: Yes.

Project Description and Background

Description: The proposed development will consist of a 4,946 square foot Royal Farms convenience store with gas pumps.

Location: The subject site is located on the northeast corner of the Delaware Route 54 (Lighthouse Road/Sussex Road 58) intersection with West Bluewater Run in Sussex County.

Amount of Land to be developed: The proposed development is on a 2.70-acre parcel.

Land Use approval(s) needed: Entrance Plan approval.

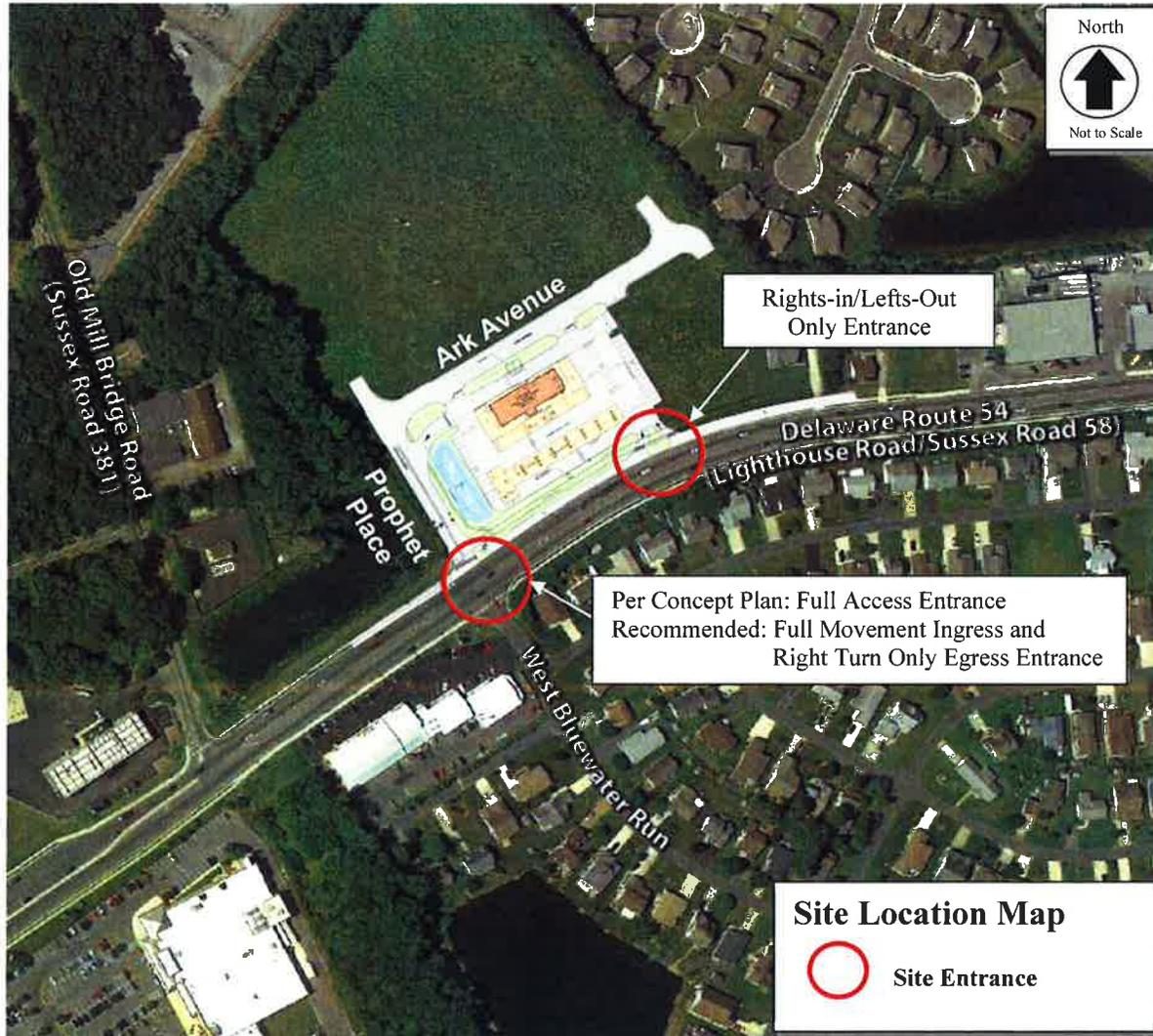
Proposed completion date: Per the November 18, 2015 DelDOT Scoping Meeting Minutes, construction is expected to be completed in 2018. However, per the TIS, the construction is expected to be completed in 2019.

Proposed access locations: One full movement access on Delaware Route 54 via a connection with Prophet Place and one rights-in/rights-out access on Delaware Route 54.

Daily Traffic Volumes:

- 2015 Average Annual Daily Traffic on Delaware Route 54: 6,762 vehicles per day.

Site Map



**Graphic is an approximation based on the Concept Plan prepared by Becker Morgan Group dated September 2, 2015.*

Relevant and On-going Projects

DelDOT does not currently have any relevant projects within the study area.

Livable Delaware

(Source: Delaware Strategies for State Policies and Spending, 2015)

Location with respect to the Strategies for State Policies and Spending Map of Delaware:

The proposed development is located within the Investment Level 3 and 4 areas.

Investment Level 3

Investment Level 3 Areas generally fall into two categories. The first category covers lands that are in the long-term growth plans of counties or municipalities where development is not necessary to accommodate expected population growth during a five-year planning period (or longer). The second category includes lands that are adjacent to or intermingled with fast-growing areas within counties or municipalities that are otherwise categorized as Investment Levels 1 or 2. Investment Level 3 is further characterized by areas with new development separated from existing development by a substantial amount of vacant land that is not contiguous with existing infrastructure, areas that are experiencing some development pressure, areas with existing but disconnected development, and possible lack of adequate infrastructure.

The state will consider investing in infrastructure within Investment Level 3 Areas once the Investment Level 1 and 2 Areas are substantially built out, or when the infrastructure or facilities are logical extensions of existing systems and deemed appropriate to serve a particular area. The priorities in the Level 3 Areas are for DelDOT to focus on regional movements between towns and other population centers. Local roadway improvements will be made by developers and property owners as development occurs. Lower priority is given to transportation system–capacity improvements and transit-system enhancements.

Investment Level 4

Delaware's Investment Level 4 Areas are rural in nature, and are where the bulk of the state's open space/natural areas and agricultural industry is located. These areas contain agribusiness activities, farm complexes, and small settlements. They typically include historic crossroads or points of trade, often with rich cultural ties. Delaware's Investment Level 4 Areas are also the location of scattered residential uses, featuring almost entirely single-family detached residential structures. Delaware's Investment Level 4 Areas also include many unincorporated communities, typically with their own distinctive character and identity. Investment Level 4 Areas depend on a transportation system primarily of secondary roads linked to roadways used as regional thoroughfares for commuting and trucking.

It is the state's intent to discourage additional urban and suburban development in Investment Level 4 Areas unrelated to agriculture and to the areas' needs. In Investment Level 4 Areas, the state's investments and policies should retain the rural landscape and preserve open spaces and farmlands, support farmland-related industries, and establish defined edges to more concentrated development. The focus for the Level 4 Areas will be to preserve and maintain existing facilities in safe working order, corridor-capacity preservation, and the enhancement of transportation facilities to support agricultural business.

Proposed Development's Compatibility with Livable Delaware:

The proposed development would be located adjacent to residential developments. According to Livable Delaware, it is important in Level 3 areas to ensure housing is constructed in conjunction with needed services. As a gas station provides a service to all drivers in the area, this development appears to be generally consistent with the 2015 update of the Livable Delaware "Strategies for State Policies and Spending."

Comprehensive Plans

(Source: Sussex County, June 2008 Comprehensive Plan Update)

Sussex County Comprehensive Plan:

The subject property is zoned CR-1 (Commercial Regional) and will not be rezoned as part of the proposed development. According to the Sussex County Comprehensive Plan, the future land use of the property would be within the Low Density and Environmentally Sensitive Developing areas.

Proposed Development's Compatibility with the Sussex County Comprehensive Plan:

Per the Sussex County Comprehensive Plan, homes with light commercial uses nearby can be appropriate to provide for convenient services in Environmentally Sensitive Developing Areas. Furthermore, the focus of retail uses in Low Density Areas should be providing convenience goods and services to nearby residents. As such, the development is generally compatible with the Sussex County Comprehensive Plan.

Trip Generation

As per the TIS, the trip generation for the proposed development was determined by using the comparable land use and rates/equations contained in the *Trip Generation, 9th Edition: An ITE Informational Report*, published by the Institute of Transportation Engineers (ITE) for ITE Land Use Code 853 (Convenience Market with Gasoline Pumps).

The peak period trip generation utilized in the TIS for the proposed development is included in Table 1.

Table 1
Royal Farms

Land Use	ADT	AM Peak Hour			PM Peak Hour			SAT Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
4,946 SF Convenience Market with Gasoline Pumps (ITE Code 853)	4,182	101	101	202	126	126	252	114	113	227
Pass-By Trips		64	63	127	83	83	166	72	71	143
Net New Trips		37	38	75	43	43	86	42	42	84

Overview of TIS

Intersections examined:

1. Site Access / Delaware Route 54 (Lighthouse Road/Sussex Road 58)
2. Delaware Route 54 / West Bluewater Run / Prophet Place
3. Delaware Route 54 / Old Mill Bridge Road (Sussex Road 381)

Conditions examined:

1. Case 1 – 2016 Existing conditions
2. Case 2 – 2019 No Build conditions without Royal Farms development
3. Case 3 – 2019 Build conditions with Royal Farms development

Note: The November 18, 2015 DelDOT Scoping Meeting Minutes states the existing case to be evaluated under 2015 conditions and the future cases to be evaluated under 2018 conditions. However, the TIS has performed the existing analysis under 2016 conditions and the future analyses under 2019 conditions.

Peak hours evaluated: Weekday morning, weekday evening, and summer Saturday midday peak hours.

Committed Developments considered:

1. DRC Residential Development (100 condominium/townhome dwelling units)

Intersection Descriptions

1. Site Access / Delaware Route 54 (Lighthouse Road/Sussex Road 58)

Type of Control: proposed stop controlled intersection (T-intersection)

Eastbound Approach: (Delaware Route 54) existing one two-way left turn lane and one through lane

Westbound Approach: (Delaware Route 54) existing one two-way left turn lane, one through lane, and one right turn for Prophet Place, and one through lane for Delaware Route 54; proposed one two-way left turn lane, one through lane, and one right turn lane

Southbound Approach: (Site Access) proposed one right turn lane, stop controlled

2. Delaware Route 54 / West Bluewater Run / Prophet Place

Type of Control: existing stop controlled intersection

Eastbound Approach: (Delaware Route 54) existing one two-way left turn lane, one through lane, and one right turn lane

Westbound Approach: (Delaware Route 54) existing one two-way left turn lane, one through lane, and one right turn lane

Northbound Approach: (West Bluewater Run) existing one shared through/left turn/right turn lane, stop controlled

Southbound Approach: (Prophet Place) existing one right turn lane, stop controlled; proposed one shared through/left turn/right turn lane, stop controlled

3. Delaware Route 54 / Old Mill Bridge Road (Sussex Road 381)

Type of Control: existing stop controlled intersection (T-intersection)

Eastbound Approach: (Delaware Route 54) existing one left turn lane and one through lane

Westbound Approach: (Delaware Route 54) existing one through lane and one right turn lane

Southbound Approach: (Old Mill Bridge Road) existing one right turn lane, stop controlled

Transit, Pedestrian, and Bicycle Facilities

Existing transit service: Delaware Transit Corporation (DTC) currently does not provide any service in the study area.

Planned transit service: JMT contacted Tremica Cherry, Fixed Route Scheduler at the DTC. No recommendations have been provided.

Existing bicycle and pedestrian facilities: According to DelDOT's *Delaware Bicycle Facility Master Plan* (October 2005) and the *Sussex County Bicycle Map*, Regional Bicycle Route S-9 exists within the study area. Regional Bicycle Route S-9 runs along Delaware Route 54 and traverses through all of the project's study intersections.

Within the project area, sidewalks and bike lanes are present along both sides of Delaware Route 54. Pedestrian curb ramps and crosswalks are present at the unsignalized intersections of Delaware Route 54 with Old Mill Bridge Road and West Bluewater Run.

Planned bicycle and pedestrian facilities: JMT contacted Mr. John Fiori and Ms. Sarah Coakley, DelDOT's Bicycle and Pedestrian Coordinators. Per email correspondence on April 25, 2016 from Mr. Fiori, the following improvements were recommended:

- Maintain a minimum 5' buffer from the edge of sidewalk to the back of curb whenever it is feasible.
- Maintain a minimum 5' wide bike lane along the right turn lanes.
- Recommend internal bicycle racks.
- Recommend internal sidewalk connections from Delaware Route 54 and Prophet Place.

Bicycle Level of Service and Bicycle Compatibility Index: According to the League of Illinois Bicyclists (LIB), Bicycle Level of Service (BLOS) is an emerging national standard for quantifying the bike-friendliness of a roadway by measuring on-road bicyclist comfort levels for specific roadway geometries and traffic conditions. Utilizing the 10-year projected AADT along the site frontage, the BLOS with the construction of the proposed development and the provision of 5' bike lanes are summarized below. The BLOS was determined utilizing the calculators published on the LIB website: <http://www.rideillinois.org/blos/blosform.htm>

- Delaware Route 54 – BLOS: C

Previous Comments

All comments from the preliminary TIS have been addressed in the final TIS.

General HCS Analysis Comments

(See table footnotes on the following pages for specific comments)

1. The TIS used HCS+ Version 5.6 for unsignalized intersections whereas JMT utilized HCS 2010 Version 6.80.
2. Per DelDOT's *Development Coordination Manual*, JMT used a heavy vehicle percentage of 3% for each movement in the future scenario analysis, unless the existing heavy vehicle percentage was greater than 3%, in which case the existing heavy vehicle percentage was used for analysis of future scenarios. The TIS maintained the heavy vehicle percentages utilized in their existing cases throughout the future cases.
3. The TIS used the HCS+ Version 5.6 default saturation flow rate value of 1700 vehicles per hour for each through and right turn movement at the unsignalized intersections. JMT used the HCS 2010 Version 6.70 default values of 1800 vehicles per hour for through movements and 1500 vehicles per hour for right turns at unsignalized intersections.
4. The Summer Saturday midday volumes used in the TIS is based on a 2007 traffic count and growing this volume to the build out year. However, JMT obtained data from a 2013 traffic count (Bennett Point TIS), and based on the volume comparison, the Royal Farms TIS volume was underrepresented in the build condition. As such, JMT updated the Saturday volume based on the latest traffic count and analyzed accordingly.

Table 2
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Royal Farms #263
Report Dated April 2016
Prepared by Becker Morgan Group, Inc.

Unsignalized Intersection ¹ Two-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Midday	Weekday AM	Weekday PM	Saturday Midday
2019 Build with Royal Farms development (Case 3)						
Southbound Site Entrance Approach	B (10.5)	B (12.9)	B (14.9)	B (10.5)	B (13.0)	C (18.0)
2019 Build with Royal Farms development (Case 3) with <i>Improvements Option 1</i> ³						
Southbound Site Entrance Approach	-	-	-	B (14.4)	C (16.2)	D (28.7)

¹ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

² JMT utilized updated Case 3 AM peak hour volumes as the TIS miscalculated the trip generation during the AM peak hour.

³ Improvements Option 1 involves the provision of one rights-in/lefts-out driveway along Delaware Route 54, east of the Delaware Route 54 and West Bluewater Run/Prophet Place intersection. An acceleration lane for left turns onto Delaware Route 54 will also be provided within a median along Delaware Route 54. As such, the median storage was increased to 2 vehicles in the analysis. Furthermore, the southbound Prophet Place approach to Delaware Route 54 would provide a right-out only movement.

Table 3
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Royal Farms #263
Report Dated April 2016
Prepared by Becker Morgan Group, Inc.

Unsignalized Intersection ⁴ Two-Way Stop Control	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Midday	Weekday AM	Weekday PM	Saturday Midday
Delaware Route 54 / West Bluewater Run / Prophet Place						
2016 Existing (Case 1) ⁵						
Westbound Delaware Route 54 Left	A (8.9)	A (9.2)	A (9.0)	A (8.9)	A (9.2)	B (10.7)
Northbound West Bluewater Run Approach	B (14.4)	C (17.4)	C (16.0)	C (15.5)	C (19.3)	D (27.0)
2019 No Build without Royal Farms development (Case 2) ⁶						
Eastbound Delaware Route 54 Left	A (8.0)	A (8.7)	A (9.3)	A (8.1)	A (8.8)	B (10.2)
Westbound Delaware Route 54 Left	A (8.9)	A (9.3)	A (9.1)	A (9.0)	A (9.4)	B (11.1)
Northbound West Bluewater Run Approach	C (16.0)	C (22.0)	C (20.1)	C (16.3)	C (22.2)	D (33.0)
Southbound Prophet Place Approach	B (14.2)	C (18.2)	C (20.2)	B (10.7)	B (12.3)	C (17.6)

⁴ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

⁵ Since Saturday midday count data was not provided, JMT assumed a PHF of 0.92 at the intersection and 3% heavy vehicles along every movement. The TIS also assumed a PHF of 0.92 but assumed 0% heavy vehicles along every movement.

⁶ The TIS modeled the southbound Prophet Place approach as one shared through/left turn/right turn lane. However, per DelDOT correspondence, this approach would only permit right turn movements under Case 2 conditions. As such, JMT redistributed the Case 2 volumes accordingly and modeled the southbound approach with one right turn lane.

Table 3 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Royal Farms #263
Report Dated April 2016
Prepared by Becker Morgan Group, Inc.

Unsignalized Intersection ⁷ Two-Way Stop Control	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday MIDDAY	Weekday AM	Weekday PM	Saturday MIDDAY
Delaware Route 54 / West Bluewater Run / Prophet Place						
2019 Build with Royal Farms development (Case 3) ^{8,9}						
Eastbound Delaware Route 54 Left	A (8.3)	A (9.1)	A (9.7)	A (8.2)	A (9.1)	B (10.7)
Westbound Delaware Route 54 Left	A (8.7)	A (9.1)	A (8.9)	A (8.8)	A (9.1)	B (10.7)
Northbound West Bluewater Run Approach	C (17.6)	D (27.0)	C (23.3)	D (25.1)	F (70.7)	F (210.7)
Southbound Prophet Place Approach	C (21.9)	D (34.5)	E (43.9)	E (41.8)	F (143.2)	F (1484.0)
2019 Build with Royal Farms development (Case 3) with Improvements Option 1 ^{8,10}						
Eastbound Delaware Route 54 Left	-	-	-	A (8.1)	A (8.9)	B (10.4)
Westbound Delaware Route 54 Left	-	-	-	A (8.8)	A (9.2)	B (10.7)
Northbound West Bluewater Run Approach	-	-	-	C (17.6)	D (28.6)	E (45.5)
Southbound Prophet Place Approach	-	-	-	B (10.7)	B (12.8)	C (18.4)

⁷ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

⁸ JMT utilized updated Case 3 AM peak hour volumes as the TIS miscalculated the trip generation during the AM peak hour.

⁹ The TIS modeled this intersection with a two-way left turn lane. However, JMT modeled this intersection without a two-way left turn lane median type, as auxiliary turn lanes would be required along the eastbound and westbound approaches of Delaware Route 54 due to the provision of full access along Prophet Place.

¹⁰ Improvements Option 1 involves the provision of one rights-in/lefts-out driveway along Delaware Route 54 east of the Delaware Route 54 and West Bluewater Run/Prophet Place intersection. Additionally, the southbound Prophet Place approach to Delaware Route 54 would provide a right-out only movement.

Table 3 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Royal Farms #263
Report Dated April 2016
Prepared by Becker Morgan Group, Inc.

Unsignalized Intersection ¹¹ Two-Way Stop Control	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Midday	Weekday AM	Weekday PM	Saturday Midday
Delaware Route 54 / West Bluewater Run / Prophet Place						
2019 Build with Royal Farms development (Case 3) with Improvements Option 2 ^{8,12}						
Eastbound Delaware Route 54 Left	-	-	-	A (8.2)	A (9.1)	B (10.7)
Westbound Delaware Route 54 Left	-	-	-	A (8.8)	A (9.1)	B (10.7)
Northbound West Bluewater Run Approach	-	-	-	D (25.1)	F (70.7)	F (210.7)
Southbound Prophet Place Through/Left	-	-	-	E (46.3)	F (151.7)	F (1507.6)
Southbound Prophet Place Right	-	-	-	B (10.7)	B (12.5)	C (17.4)
Southbound Prophet Place Approach	-	-	-	E (36.8)	F (117.8)	F (1164.1)
2019 Build with Royal Farms development (Case 3) with Improvements Option 3 ^{8,13}						
Eastbound Delaware Route 54 Left	-	-	-	A (8.3)	A (9.2)	B (10.8)
Westbound Delaware Route 54 Left	-	-	-	A (9.1)	A (9.5)	B (11.2)
Northbound West Bluewater Run Approach	-	-	-	C (19.0)	D (29.8)	E (47.5)
Southbound Prophet Place Approach	-	-	-	B (10.7)	B (12.5)	C (17.4)

¹¹ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

¹² Improvements Option 2 scenario includes the modification of the southbound Prophet Place approach to provide one shared through/left turn lane and one right turn lane. In addition, the two-way-left turn lanes along the Delaware Route 54 approaches would be restriped as exclusive left turn lanes.

¹³ Improvements Option 3 scenario includes the provision of an interconnection between Prophet Place and Tidal Road. The intersection of Delaware Route 54 and Prophet Place/West Bluewater Run would be maintained as currently configured under existing conditions (with a left out restriction along Prophet Place).

Table 3 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Royal Farms #263
Report Dated April 2016
Prepared by Becker Morgan Group, Inc.

Signalized Intersection ¹⁴	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Midday	Weekday AM	Weekday PM	Saturday Midday
Delaware Route 54 / West Bluewater Run / Prophet Place						
2019 Build with Royal Farms development (Case 3) with Improvements Option 1 and Mitigation ^{8,10,15}	-	-	-	B (12.1)	B (15.6)	B (17.5)
2019 Build with Royal Farms development (Case 3) with Improvements Option 4 ^{8,16}	-	-	-	B (15.7)	B (16.3)	C (24.0)

¹⁴ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

¹⁵ Mitigation includes the addition of a traffic signal (90 seconds cycle length during the AM and PM peak hours and 120 seconds cycle length during the Saturday peak hour).

¹⁶ Improvements Option 4 scenario includes the addition of a traffic signal (90 seconds cycle length during the AM and PM peak hours and 120 seconds cycle length during the Saturday peak hour) and the modification of the northbound approach to provide one left turn lane and one shared through/right turn lane. The two-way left turn lane along Delaware Route 54 would be restriped as left turn lanes. JMT modeled the southbound approach with one through lane and one right turn lane as side street approaches with only left and/or right movements must be coded with a through movement having a zero volume to be computed properly per McTrans HCS 2010 technical support.

Table 4
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Royal Farms #263
Report Dated April 2016
Prepared by Becker Morgan Group, Inc.

Unsignalized Intersection ¹⁷ Two-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Midday	Weekday AM	Weekday PM	Saturday Midday
Delaware Route 54 / Old Mill Bridge Road (Sussex Road 381)						
2016 Existing (Case 1)						
Eastbound Delaware Route 54 Left	A (8.2)	A (9.1)	A (9.2)	A (8.3)	A (9.1)	A (10.0)
Southbound Old Mill Bridge Road Approach	B (11.2)	B (13.0)	B (13.4)	B (11.2)	B (13.0)	C (15.9)
2019 No Build without Royal Farms development (Case 2) ¹⁸						
Eastbound Delaware Route 54 Left	A (8.3)	A (9.3)	A (9.3)	A (8.4)	A (9.4)	B (10.5)
Southbound Old Mill Bridge Road Approach	B (11.2)	B (13.5)	B (14.0)	B (11.4)	B (13.8)	C (17.5)
2019 Build with Royal Farms development (Case 3)						
Eastbound Delaware Route 54 Left	A (8.3)	A (9.4)	A (9.4)	A (8.4)	A (9.5)	B (10.5)
Southbound Old Mill Bridge Road Approach	B (11.4)	B (13.9)	B (14.3)	B (11.4)	B (14.0)	C (17.6)
2019 Build with Royal Farms development (Case 3) <i>with Improvements Option 1</i> ¹⁹						
Eastbound Delaware Route 54 Left	-	-	-	A (8.4)	A (9.5)	B (10.5)
Southbound Old Mill Bridge Road Approach	-	-	-	B (11.4)	B (14.1)	C (17.6)

¹⁷ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

¹⁸ JMT utilized updated Case 2 volumes at the Old Mill Bridge Road intersection. The updated volumes take into account the volume redistribution due to the provision of right turn only movements at the Prophet Place approach to Delaware Route 54.

¹⁹ Improvements Option 1 involves the provision of one rights-in/lefts-out driveway along Delaware Route 54 east of the Delaware Route 54 and West Bluewater Run/Prophet Place intersection. Additionally, the southbound Prophet Place approach to Delaware Route 54 would provide a right-out only movement.

Table 4
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Royal Farms #263
Report Dated April 2016
Prepared by Becker Morgan Group, Inc.

Unsignalized Intersection ²⁰ Two-Way Stop Control (T-intersection)	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Midday	Weekday AM	Weekday PM	Saturday Midday
Delaware Route 54 / Old Mill Bridge Road (Sussex Road 381)						
2019 Build with Royal Farms development (Case 3) with Improvements Option 3 ²¹						
Eastbound Delaware Route 54 Left	-	-	-	A (8.4)	A (9.5)	B (10.5)
Southbound Old Mill Bridge Road Approach	-	-	-	B (11.4)	B (14.0)	C (17.6)

²⁰ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

²¹ Improvements Option 3 scenario includes the provision of an interconnection between Prophet Place and Tidal Road. The intersection of Delaware Route 54 and Prophet Place/West Bluewater Run would be maintained as currently configured under existing conditions (with a left out restriction along Prophet Place).