



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

October 14, 2014

SHAILEN P. BHATT  
SECRETARY

Mr. Dev Sitaram  
Karins and Associates, Inc.  
17 Polly Drummond Center  
Newark, Delaware 19711

Dear Mr. Sitaram:

The enclosed Traffic Impact Study (TIS) review letter for the **Colony at Summit Bridge – East and West** (Tax Parcel 11-037.00-002) 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 Standards and Regulations for Subdivision Streets and State Highway Access 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:km

Enclosures

cc with enclosures: Mr. Gary Bolis, Bolis Properties, LLC  
Ms. Constance C. Holland, Office of State Planning Coordination  
Ms. Eileen Fogarty, New Castle County Department of Land Use  
Mr. George Haggerty, New Castle County Department of Land Use  
Mr. Owen Robatino, New Castle County Department of Land Use  
Mr. Antoni Sekowski, New Castle County Department of Land Use  
Mr. Mir Wahed, Johnson, Mirmiran & Thompson, Inc.  
DelDOT Distribution

## DeIDOT Distribution

Frederick H. Schranck, Deputy Attorney General  
Robert McCleary, Director, Transportation Solutions (DOTS)  
Drew Boyce, Director, Planning  
Mark Luszczyk, Chief Traffic Engineer, Traffic, DOTS  
Mark Tudor, Assistant Director, Project Development North, DOTS  
J. Marc Coté, Assistant Director, Development Coordination  
T. William Brockenbrough, Jr., County Coordinator, Development Coordination  
Thomas E. Meyer, Traffic Studies Manager, Traffic, DOTS  
Donald Weber, North District Engineer, North District  
Kevin Canning, Canal District Public Works Engineer, Canal District  
Wayne Henderson, Service Development Planner, Delaware Transit Corporation  
John Garcia, New Castle Subdivision Coordinator, Development Coordination  
Pao Lin, Subdivision Manager, Development Coordination  
Ahmed Abdelmoteleb, New Castle Traffic Engineer, Traffic, DOTS  
Marco Boyce, Planning Supervisor, Statewide & Regional Planning  
Claudy Joinville, Project Engineer, Development Coordination



October 9, 2014

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 2A-The Colony at Summit Bridge East & West**

Dear Mr. Brestel:

Johnson, Mirmiran and Thompson (JMT) has completed the review of the Final Traffic Impact Study (TIS) for The Colony at Summit Bridge East & West, prepared by Karins and Associates. This review was assigned Task Number 2A. Karins and Associates prepared the report in a manner generally consistent with DeIDOT's *Standards and Regulations for Subdivision Streets and State Highway Access*.

The TIS evaluates the impacts of The Colony at Summit Bridge East & West, a residential development proposed along Summit Bridge Road (US Route 301/Delaware Route 896/New Castle Road 387), south of the intersection of Summit Bridge Road with Porter Road (New Castle Road 400) and Glasgow Avenue (New Castle Road 387A). The development will consist of 87 single-family detached houses and 213 townhouses. The development will be split into two sites on either side of Summit Bridge Road: the east site (The Colony at Summit Bridge East) will consist of 39 single-family detached houses and 111 townhouses, while the west site (The Colony at Summit Bridge West) will consist of 48 single-family detached houses and 102 townhouses.

The east site is approximately 60.33 acres of land and the west site is approximately 116.81 acres of land, combining for a total of approximately 177.14 acres of land. The land located on the east side of Summit Bridge Road is currently zoned S (Suburban) and the developer proposes to rezone it to ST (Suburban Transition). The land located on the west side of Summit Bridge Road will remain zoned as S.

Two access points are proposed for the site. One full access, to serve both The Colony at Summit Bridge East (Colony-East) and The Colony at Summit Bridge West (Colony-West), is proposed approximately 1,900 feet south of Porter Road, at the existing intersection of Summit Bridge Road with Mansion House Road (New Castle Road 416). The eastern leg (Mansion House Road) is proposed to be realigned to provide access to Colony-East and a western leg is proposed to be constructed at the intersection to provide access to Colony-West. In addition, a right-in, right-out access serving Colony-East is proposed along northbound Summit Bridge Road approximately 3,600 feet south of Porter Road. Interconnection between Colony-East and Mansion Farm, a



housing development located to the east of the proposed development, is also proposed. Construction of both sites is anticipated to be completed by 2017.

DelDOT currently has two relevant projects within the study area: the SR 896 and Porter Road Intersection Improvements project (Contract # T201200107) and the Howell School Road, SR 896 to SR 71 Improvements project (Contract # T200504110). The SR 896 and Porter Road Intersection was identified in the 2010 Hazard Elimination Program (HEP) as Site V and included a Task I and Task II Report. The project is designed to improve safety and operations at the intersection by modifying the current lane configuration on westbound Porter Road to provide one dedicated left-turn lane, one dedicated through lane, and one dedicated right turn lane. In addition, the westbound Porter Road left-turn lane will be extended, the acceleration lane along southbound Summit Bridge Road between Glasgow Avenue and the Grace Presbyterian Church entrance will be widened and lengthened, the northbound Summit Bridge Road left-turn lane will be lengthened, and the acceleration lane along eastbound Porter Road between Summit Bridge Road and Jayson Drive will be eliminated. The eastbound lane configuration will also be modified to provide one dedicated left turn lane, one dedicated through lane, and one dedicated right turn lane. The existing signal phasing will also be modified. Bike lanes are proposed along eastbound and westbound Porter Road at the intersection. Construction is scheduled for the Spring/Summer of 2014. Additional information can be found on the DelDOT project website at [http://www.deldot.gov/information/projects/sr896\\_PorterRd/](http://www.deldot.gov/information/projects/sr896_PorterRd/).

The Howell School Road, SR 896 to SR 71 Improvements project is designed to improve safety and operations along Howell School Road and at the intersections of Howell School Road and Denny Road with Summit Bridge Road. Improvements are proposed from just west of the intersection of Denny Road and Summit Bridge Road to the intersection of Howell School Road and Robert C. Peoples Boulevard. The project includes eliminating the existing “dog-leg” intersection formed by the intersections of Howell School Road and Denny Road with Summit Bridge Road. Howell School Road will be realigned opposite Denny Road, creating a single signalized intersection with Summit Bridge Road. A traffic camera will also be installed along Summit Bridge Road. The Meadow Glen Subdivision access via Sweet Hollow Drive at Summit Bridge Road will be eliminated and the subdivision will instead gain access from Howell School Road via Meadow Glen Drive. The existing stop-controlled intersection at Howell School Road and Robert C. People’s Boulevard will be reconstructed as a roundabout. A multi-use path along the south side of Howell School Road is proposed to provide improved bicycle and pedestrian access from the Meadow Glen and Caravel Woods Subdivisions to Lums Pond State Park. Construction is scheduled to be complete in 2016. Additional information can be found on the DelDOT project website at [http://www.deldot.gov/information/projects/howell\\_school\\_rd/](http://www.deldot.gov/information/projects/howell_school_rd/).

The TIS provides a crash summary that indicates a total of 142 crashes along Summit Bridge Road, from Howell School Road to Porter Road, within a 0.5-mile radius, from January 2010 to December 2012. A majority of the crashes occurred at the signalized intersections of Summit Bridge Road with Glasgow Avenue and Porter Road, Summit Bridge Road with Denny Road, and Summit Bridge Road with Howell School Road. A total of four crashes were reported in the vicinity of the existing unsignalized intersection of Summit Bridge Road with Mansion House



Road, which is proposed to serve as the full-movement site access for both Colony-East and Colony-West.

Based on our review of the traffic impact study, we have the following comments and recommendations:

The proposed development will meet the New Castle County Level of Service (LOS) Standards as stated in Section 40.11.210 of the Unified Development Code (UDC) for all signalized intersections analyzed in this study, once the DelDOT improvement projects at the intersection of Summit Bridge Road with Glasgow Avenue and Porter Road and at the intersection of Summit Bridge Road with Denny Road and Howell School Road are completed. Each of these projects are scheduled to be complete before the construction of the proposed development is complete.

However, based on the LOS evaluation criteria as stated in DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access*, movements at the following stop-controlled intersections exhibit LOS deficiencies without the implementation of physical roadway and/or traffic control improvements:

<i>Intersection</i>	<i>Situations for which deficiencies occur</i>
Summit Bridge Road/Mansion House Road/North Entrance (Full Access)	2017 AM without The Colony at Summit Bridge East & West (Case 2) 2017 AM and PM with The Colony at Summit Bridge East, with or without connection to Mansion Farm Drive (Cases 3a and 3b) 2017 AM and PM with The Colony at Summit Bridge West (Case 3c) 2017 AM and PM with The Colony at Summit Bridge East & West, with or without connection to Mansion Farm Drive (Cases 4a and 4b)
Summit Bridge Road/Mansion Farm Drive/South Entrance (Right-in, Right-out)	2017 AM with The Colony at Summit Bridge East, with or without connection to Mansion Farm Drive (Cases 3a and 3b) 2017 AM with The Colony at Summit Bridge East & West, with or without connection to Mansion Farm Drive (Cases 4a and 4b)
Glasgow Avenue/Old County Road (New Castle Road 395)	2017 AM and PM without The Colony at Summit Bridge East & West (Case 2) 2017 AM and PM with The Colony at Summit Bridge East, with or without connection to Mansion Farm Drive (Cases 3a and 3b) 2017 AM and PM with The Colony at Summit Bridge West (Case 3c) 2017 AM and PM with The Colony at Summit Bridge East & West, with or without connection to Mansion Farm Drive (Cases 4a and 4b)
Porter Road/Jayson Drive	2017 AM with The Colony at Summit Bridge East, with or without connection to Mansion Farm Drive (Cases 3a and 3b) 2017 AM with The Colony at Summit Bridge West (Case 3c) 2017 AM with The Colony at Summit Bridge East & West, with or without connection to Mansion Farm Drive (Cases 4a and 4b)

At the Summit Bridge Road and Mansion House Road/North Entrance intersection, LOS deficiencies are expected under future conditions without the construction of The Colony at Summit Bridge development as well as with the phased construction of either the Colony-East, Colony-West, or both, with or without the connection to Mansion Farm Drive.



These deficiencies are considerable along the eastbound and westbound approaches serving as site accesses during the full development of The Colony at Summit Bridge with the connection to Mansion Farm Drive (Case 4b) PM peak hour (LOS F with average delay greater than or equal to 1,000 seconds). The deficiencies are relatively moderate for the northbound and southbound left turn movements. Southbound left turn movements would experience an average delay of 36.4 seconds in the AM peak hour and northbound left turn movements would experience an average delay of 48.8 seconds in the PM peak hour. Both of these delays correspond to LOS E, which is unacceptable per DelDOT Standards.

Installation of a traffic signal at this location would mitigate the LOS deficiencies. However, DelDOT's Traffic Section has initially recommended against the installation of a traffic signal due to anticipated operational concerns. To further examine whether installation of a signal would be acceptable, the developer should perform a signal justification study for this location. The details of this study should be discussed with the Traffic Section.

Absent a signal, the site entrances for both Colony-East and Colony-West should be limited to right-in, right-out entrances only to address the LOS deficiencies. With this configuration, vehicles that would normally perform the eastbound and southbound left-turn movements at the site access would instead drive south and make a u-turn at the Summit Bridge Road/Denny Road/Howell School Road signalized intersection, improved per the DelDOT project described above. Given this scenario, this intersection would continue to operate at acceptable levels of service in Case 4b during the weekday AM and PM peak hours.

Similarly, vehicles that would normally perform the westbound and northbound left-turn movements at the site access would instead drive north and make a u-turn at the Summit Bridge Road/Glasgow Avenue/Porter Road signalized intersection, improved per the DelDOT project described above. Given this scenario, this intersection would continue to operate at acceptable levels of service in Case 4b during the weekday AM and PM peak hours. However, given this scenario, it is recommended that the Summit Bridge northbound left turn lane be lengthened further than what is proposed by the DelDOT improvement project to provide a storage length of 750 feet in order to accommodate 95<sup>th</sup> percentile queue lengths.

At the Summit Bridge Road and Mansion Farm Drive/South Entrance intersection, LOS deficiencies are expected under future conditions with the construction of Colony-East, with or without the connection to Mansion Farm Drive. These deficiencies, specifically for the westbound right turn movements, are relatively moderate with the full development of The Colony at Summit Bridge without the connection to Mansion Farm Drive i.e. Case 4a (LOS E with an average delay of 35.6 seconds of delay during the AM peak hour), but grow to considerable levels in Case 4b (LOS F with an average delay of 131.0 seconds of delay during the AM peak hour). The calculated 95<sup>th</sup> percentile queue length along the westbound movement is expected to be 27 feet in the Case 4a AM peak hour and 242 feet in the Case 4b AM peak hour. However, as these deficiencies are limited to the site access, we recommend that the connection to Mansion Farm Drive be provided, as in the Case 4b scenario. This connection would support accepted land use planning goals of the community and DelDOT's neighborhood interconnectivity policies. Furthermore, it is expected



that vehicles will redistribute to alternate points of available egress if the delay is perceived to be too high by road users.

At the Glasgow Avenue and Old County Road intersection, LOS deficiencies are expected under all future conditions along the eastbound Old County Road left turn movement with or without the construction of The Colony at Summit Bridge development. These deficiencies reach LOS F with an average delay of 166.2 seconds during the Case 4b PM peak hour. The calculated 95<sup>th</sup> percentile queue length along this movement is expected to be less than 170 feet, which could be accommodated along Old County Road without obstructing any adjacent roadways or driveways. Furthermore, the traffic generated by the subject development is expected to account for less than five percent of the overall intersection volume. As such, we do not recommend any improvements be implemented by the developer at this intersection. This intersection would not be affected by the right-in, right-out entrance configuration described above.

At the Porter Road and Jayson Drive intersection, LOS deficiencies are expected under all future conditions along the southbound Jayson Drive left turn movement with the construction of either Colony-East, Colony-West, or both, with or without the connection to Mansion Farm Drive. These deficiencies reach LOS E with an average delay of 37.1 seconds of delay during the Case 4b AM peak hour. The calculated 95<sup>th</sup> percentile queue length along this movement is expected to be less than 33 feet, which could be accommodated along Jayson Drive without obstructing any adjacent roadways or driveways. Furthermore, the traffic generated by the subject development is expected to account for less than five percent of the overall intersection volume. As such, we do not recommend any improvements be implemented by the developer at this intersection. This intersection would not be affected by the right-in, right-out entrance configuration described above.

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 construct the realignment of Mansion House Road to local road standards from its intersection with Summit Bridge Road to a point necessary to complete the tie-in to the existing Mansion House Road. These standards include, but are not limited to, two eleven-foot travel lanes and two five-foot shoulders. The developer should provide a bituminous concrete overlay to the existing travel lanes, at DeIDOT's direction. DeIDOT should analyze the existing lanes' pavement section and recommend an overlay thickness to the developer's engineer if necessary.
2. The developer should construct right-in, right-out entrances for both Colony-East and Colony-West at the existing Summit Bridge Road and Mansion House Road intersection to be consistent with the proposed lane configurations as shown in the table below:



Approach	Current Configuration	Proposed Configuration
Eastbound Mansion House Road (Colony-West Access)	Approach does not exist	One right turn lane
Westbound Mansion House Road (Colony-East Access)	One shared left turn/right turn lane	One right turn lane
Northbound Summit Bridge Road	One left turn lane, one through lane, and one shared through/right turn lane	Two through lanes and one right turn lane
Southbound Summit Bridge Road	One left turn lane and two through lanes	Two through lanes and one right turn lane

As part of the entrance design, the existing northbound and southbound left turn lanes should be re-striped as shoulders and the median crossover between northbound and southbound Summit Bridge Road should be eliminated.

Based on DeIDOT's *Standards and Regulations for Subdivision Streets and State Highway Access*, the recommended minimum storage length (excluding taper) is 410 feet for the southbound Summit Bridge Road right turn lane. Based on the site traffic distribution at this intersection, a northbound right turn lane is not warranted per DeIDOT's *Standards and Regulations for Subdivision Streets and State Highway Access*. However, given that Summit Bridge Road is a high speed roadway, we recommend that a right turn lane be installed at the northbound approach because of the potential safety and operational concerns with even a minor number of vehicles slowing to make right turns from a high speed shared lane. This turn lane should have a minimum storage length of 240 feet (excluding taper).

Upon review of a Signal Justification Study prepared by the developer, provision of a full movement site access and installation of a traffic signal could be revisited by DeIDOT during the site plan review process.

3. The developer should construct a right-in, right-out entrance along northbound Summit Bridge Road approximately 3,600 feet south of the intersection of Summit Bridge Road and Glasgow Avenue/Porter Road to be consistent with the proposed lane configurations as shown in the table below:



<b>Approach</b>	<b>Current Configuration</b>	<b>Proposed Configuration</b>
Eastbound Site Entrance	Approach does not exist	One right turn lane
Northbound Summit Bridge Road	Two through lanes	Two through lanes and one right turn lane

Based on DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access*, the recommended minimum storage length (excluding taper) is 410 feet for the northbound Summit Bridge Road right turn lane. The storage length based on the HCS analysis provides shorter queue lengths than what is reported here.

4. The proposed right-in, right-out site access along northbound Summit Bridge Road, located approximately 3,600 feet south of the intersection of Summit Bridge Road with Glasgow Avenue and Porter Road should provide a connection to the Mansion Farms Subdivision located directly to the east via connection to the existing Mansion Farm Drive stub street and removal of the existing barricade. This site access and connection should be constructed in the early stages of site construction, as agreed upon by the developer and DelDOT, for the purpose of providing alternate access during construction of the Howell School Road, SR 896 to SR 71 Improvements project (Contract # T200504110). The site access and connection should remain open to traffic following the completion of the Howell School Road project.
  
5. The developer should enter into an agreement with DelDOT to fund an equitable portion of the improvements planned as part of the SR 896 and Porter Road Intersection Improvements project (Contract # T201200107). The proposed configuration is shown in the table below. The developer should coordinate with DelDOT on the implementation and equitable cost sharing of these improvements.

<b>Approach</b>	<b>Current Configuration</b>	<b>Proposed Configuration</b>
Eastbound Glasgow Avenue	One left turn lane, one shared through/left turn lane, and one right turn lane	One left turn lane, one through lane, and one right turn lane
Westbound Porter Road	One left turn lane, one shared through/left turn lane, and one right turn lane	One left turn lane, one through lane, and one right turn lane
Northbound Summit Bridge Road	One left turn lane, two through lanes, and one right turn lane	No change
Southbound Summit Bridge Road	One left turn lane, two through lanes, and one right turn lane	No change



Given the right-in, right-out entrance configurations at the Summit Bridge Road and Mansion House Road intersection location described above, the northbound left turn lane should be lengthened further than what is proposed in the latest DelDOT design plans, to provide a minimum storage length of 750 feet in order to accommodate 95<sup>th</sup> percentile queue lengths per HCS analysis. The storage lengths of the remaining separate left turn and right turn lanes along Summit Bridge Road and Glasgow Avenue and Porter Road meet or exceed the recommended lengths per DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access* and/or HCS analysis, per the most recent design plans. However, these lengths should be confirmed as design plans for this intersection progress.

6. The developer should enter into an agreement with DelDOT to fund an equitable portion of the improvements planned as part of the Howell School Road, SR 896 to SR 71 Improvements project (Contract # T200504110). The proposed configuration at the realigned Howell School Road and Denny Road intersection with Summit Bridge Road is shown in the table below. The developer should coordinate with DelDOT on the implementation and equitable cost sharing of these improvements.

<b>Approach</b>	<b>Current Configuration</b>	<b>Proposed Configuration</b>
Eastbound Denny Road	One left turn lane and one right turn lane	One left turn lane, one shared through/left turn lane, and one right turn lane
Westbound Howell School Road	One left turn lane and one right turn lane	One shared through/left turn lane and one right turn lane
Northbound Summit Bridge Road	One left turn lane and two through lanes at the existing intersection with Denny Road and two through lanes and one right turn lane at the existing intersection with Howell School Road	One left turn lane, two through lanes, and one right turn lane
Southbound Summit Bridge Road	Two through lanes and one right turn lane at the existing intersection with Denny Road and one left turn lane and two through lanes at the existing intersection with Howell School Road	Two left turn lanes, two through lanes, and one right turn lane

Given realignment of Howell School Road with Denny Road, the recommended storage lengths (excluding taper) of the separate left turn and right turn lanes along Summit Bridge Road and Denny Road and Howell School Road are listed below. It should be noted that the storage lengths listed for the eastbound left turn lane, northbound right turn lane, and



southbound right turn lane are longer than what is proposed in the latest DelDOT design plans for this project.

<b>Approach</b>	<b>Left Turn Lane</b>	<b>Right Turn Lane</b>
Eastbound Denny Road	415 feet	300 feet
Westbound Howell School Road	-	500 feet
Northbound Summit Bridge Road	360 feet	365 feet
Southbound Summit Bridge Road	760 feet	365 feet

The storage length for the eastbound left turn lane is based on HCS analysis. The storage lengths for the northbound and southbound right turn lanes are based on DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access*. The storage lengths based on HCS analysis provide shorter queue lengths than what is reported here.

7. The following bicycle, pedestrian, and transit improvements should be included:
  - a. The developer should construct a ten-foot wide multi-use path that meets current AASHTO and ADA standards along the easterly side of Summit Bridge Road from the intersection of Summit Bridge Road and Mansion House Road to the southern frontage limits of Colony-East, parallel to Summit Bridge Road. The path should also provide connection to the internal subdivision street network of Colony-West through a crossing at the intersection of Summit Bridge Road and Mansion House Road and connect to the internal subdivision street network of Colony-East. Given the high traffic volumes and vehicle speeds along Summit Bridge Road, it is recommended that the path along the easterly side be constructed behind the existing tree line, at an approximate distance of 50 feet to 60 feet from the traveled way. All paths should be contained within a dedicated permanent easement to DelDOT and/or State right-of-way. The developer should coordinate with DelDOT's Subdivision Section during the plan review process to identify the exact location of proposed pathways and future connection points.
  - b. All internal streets to be built with this development should include five-foot wide ADA compliant sidewalks on both sides of the roadway set back five feet from the roadway. These sidewalks should be constructed to connect to the multi-use path located along the property frontage.



- c. The developer should coordinate with the local school district to provide a covered bus stop, installed on a concrete pad. Internal sidewalks should be connected to this stop and bicycle parking facilities should be included as part of this installation.
- d. ADA compliant curb ramps and marked crosswalks should be provided at the site entrances. The use of Type 3 curb ramps is discouraged.
- e. Utility covers should be moved outside of any designated bicycle lanes or should be flush with the pavement.
- f. The developer should coordinate with DART to determine suitable locations for bus stop amenities (bus pad, shelter, etc.) along northbound and southbound Summit Bridge Road at the intersection of Mansion House Road as well as along northbound Summit Bridge Road at the southern right-in, right-out access to Colony-East. If planned bus routes have been finalized at the time of Entrance Plan Review, the developer should be required to construct these facilities within a dedicated easement to DeIDOT or State right-of-way with ADA compliant connections to the multi-use pathway network. If planned bus routes have not been finalized at the time of the entrance plan review, the developer should enter into an agreement to contribute to the future construction of these amenities.

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

Improvements in this TIS may be considered "significant" under DeIDOT's *Work Zone Safety and Mobility Procedures and Guidelines*. These guidelines are available on DeIDOT's website at [http://www.deldot.gov/information/pubs\\_forms/manuals/de\\_mutcd/index.shtml](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 DeIDOT's Traffic Section. Mr. Weiser can be reached at (302) 659-4073 or by email at [Adam.Weiser@state.de.us](mailto: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, P.E., PTOE  
Enclosure

## **General Information**

**Report date:** February 2014

**Prepared by:** Karins and Associates

**Prepared for:** Bolis Properties, LP

**Tax Parcels:** 11-037.00-002

**Generally consistent with DelDOT's Standards and Regulations for Subdivision Streets and State Highway Access:** Yes.

## **Project Description and Background**

**Description:** Development of 87 single-family detached houses and 213 townhouses. The development will be split into two sites on either side of Summit Bridge Road (US Route 301 / Delaware Route 896). The east site (The Colony at Summit Bridge East) will consist of 39 single-family detached houses and 111 townhouses, while the west site (The Colony at Summit Bridge West) will consist of 48 single-family detached houses and 102 townhouses.

**Location:** The subject site is along both sides of Summit Bridge Road, south of the intersection of Summit Bridge Road / Porter Road (New Castle Road 400).

**Amount of Land to be developed:** The east site is approximately 60.33 acres of land and the west site is approximately 116.81 acres of land, combining for a total of approximately 177.14 acres of land.

**Land Use approval(s) needed:** Rezoning (Colony-East) and Subdivision approval (Colony-East and Colony-West).

**Proposed completion date:** 2017.

**Proposed access locations:** Two access points are proposed. One full access to serve both Colony-East and Colony-West is proposed approximately 1,900 feet south of Porter Road, at the existing intersection of northbound Summit Bridge Road with Mansion House Road (New Castle Road 416). The eastern leg (Mansion House Road) is proposed to be realigned to provide access to Colony-East and a western leg is proposed to be constructed at the intersection to provide access to Colony-West. In addition, a right-in, right-out access serving Colony-East is proposed approximately 3,600 feet south of Porter Road. Interconnection between Colony-East and Mansion Farm, a housing development located to the east of the proposed development, is also proposed.

### **Daily Traffic Volumes:**

- 2012 Average Annual Daily Traffic on Summit Bridge Road: 29,987 vehicles per day.

## Site Map



*\*Graphic is an approximation based on the Site Plan prepared by Karins and Associates.*

## Relevant and On-going Projects

DelDOT currently has two relevant projects within the study area: the SR 896 and Porter Road Intersection Improvements project (Contract # T201200107) and the Howell School Road, SR 896 to SR 71 Improvements project (Contract # T200504110). The SR 896 and Porter Road Intersection was identified in the 2010 Hazard Elimination Program (HEP) as Site V. The project is designed to improve safety and operations at the intersection by modifying the current lane configuration on westbound Porter Road to provide one dedicated left-turn lane, one dedicated through lane, and one dedicated right turn lane. In addition, the westbound Porter Road left-turn lane will be extended, the acceleration lane along southbound Summit Bridge Road between Glasgow Avenue and the Grace Presbyterian Church entrance will be widened and lengthened, the northbound Summit Bridge Road left-turn lane will be lengthened, and the acceleration lane along eastbound Porter Road between Summit Bridge Road and Jayson Drive will be eliminated. The eastbound lane configuration will also be modified to provide one dedicated left turn lane, one dedicated through lane, and one dedicated right turn lane. The existing signal phasing will also be modified to allow the eastbound and westbound through movements to move concurrently. Furthermore, protected-only lead left turn phasing is proposed along the eastbound Glasgow Avenue approach and lag left turn phasing is proposed on the westbound Porter Road approach to

the intersection. Bike lanes are proposed along eastbound and westbound Porter Road at the intersection. Construction is scheduled for the Spring/Summer of 2014. Additional information can be found on the DelDOT project website at [http://www.deldot.gov/information/projects/sr896\\_PorterRd/](http://www.deldot.gov/information/projects/sr896_PorterRd/).

The Howell School Road, SR 896 to SR 71 Improvements project is designed to improve safety and operations along Howell School Road and at the intersections of Howell School Road and Denny Road with Summit Bridge Road. Improvements are proposed from just west of the intersection of Denny Road and Summit Bridge Road to the intersection of Howell School Road and Robert C. Peoples Boulevard. The project includes eliminating the existing “dog-leg” intersection formed by the intersections of Howell School Road and Denny Road with Summit Bridge Road. Howell School Road will be realigned opposite Denny Road, creating a single signalized intersection with Summit Bridge Road. A traffic camera will also be installed along Summit Bridge Road. The Meadow Glen Subdivision access via Sweet Hollow Drive at Summit Bridge Road will be eliminated and the subdivision will instead gain access from Howell School Road via Meadow Glen Drive. The existing stop-controlled intersection at Howell School Road and Robert C. People’s Boulevard will be reconstructed as a roundabout. A multi-use path along the south side of Howell School Road is proposed to provide improved bicycle and pedestrian access from the Meadow Glen and Caravel Woods Subdivisions to Lums Pond State Park. Construction is scheduled to be complete in 2016. Additional information can be found on the DelDOT project website at [http://www.deldot.gov/information/projects/howell\\_school\\_rd/](http://www.deldot.gov/information/projects/howell_school_rd/).

### **Livable Delaware**

*(Source: Delaware Strategies for State Policies and Spending, 2010)*

**Location with respect to the Strategies for State Policies and Spending Map of Delaware:** Colony-West and a majority of Colony-East are located within the Investment Level 3 area. A small portion of Colony-East is located within the Investment Level 2 area.

### **Investment Level 2**

These areas can be composed of less developed areas within municipalities, rapidly growing areas in the counties that have or will have public water and wastewater services and utilities, areas that are generally adjacent to or near Investment Level 1 Areas, smaller towns and rural villages that should grow consistently with their historic character, and suburban areas with public water, wastewater, and utility services. They serve as transition areas between Level 1 and the state’s more open, less populated areas. They generally contain a limited variety of housing types, predominantly detached single-family dwellings.

In Investment Level 2 Areas, like Investment Level 1 Areas, state investments and policies should support and encourage a wide range of uses and densities, promote other transportation options, foster efficient use of existing public and private investments, and enhance community identity and integrity. Investments should encourage departure from the typical single-family-dwelling developments and promote a broader mix of housing types and commercial sites encouraging compact, mixed-use development where applicable. Level 2 Areas share similar priorities as with the Level 1 Areas where the aim remains to: make context sensitive transportation system capacity enhancements, preserve existing facilities, make safety enhancements, make transportation system

capacity improvements, create transit system enhancements, ensure ADA accessibility, and close gaps in the pedestrian system. Other priorities for Level 2 Areas include: Corridor Capacity Preservation, off-alignment multi-use paths, interconnectivity of neighborhoods and public facilities, and signal-system enhancements.

### **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 the Department 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.

### **Proposed Development’s Compatibility with Livable Delaware:**

The proposed development is located immediately adjacent to established residential communities and Investment Level 2 areas. This development would encourage the growth of consistent residential developments in the area and represents logical extension of existing systems, which, according to Livable Delaware, is supported within Investment Level 2 and 3 areas. Therefore, this development appears to be generally consistent with the 2010 update of the Livable Delaware “Strategies for State Policies and Spending.”

### **Comprehensive Plans**

*(Source: New Castle County, 2012 Comprehensive Plan)*

### **New Castle County Comprehensive Plan:**

The lands of the subject property are situated within New Castle County and zoned as S (Suburban). The developer proposes to rezone the land located on the east side of Summit Bridge Road to ST (Suburban Transition) while leaving the land located on the west side of Summit Bridge Road zoned as S. According to the New Castle County Comprehensive Plan, the future land use of the property would be within the Low Density Residential (1-3 units per acre) areas.

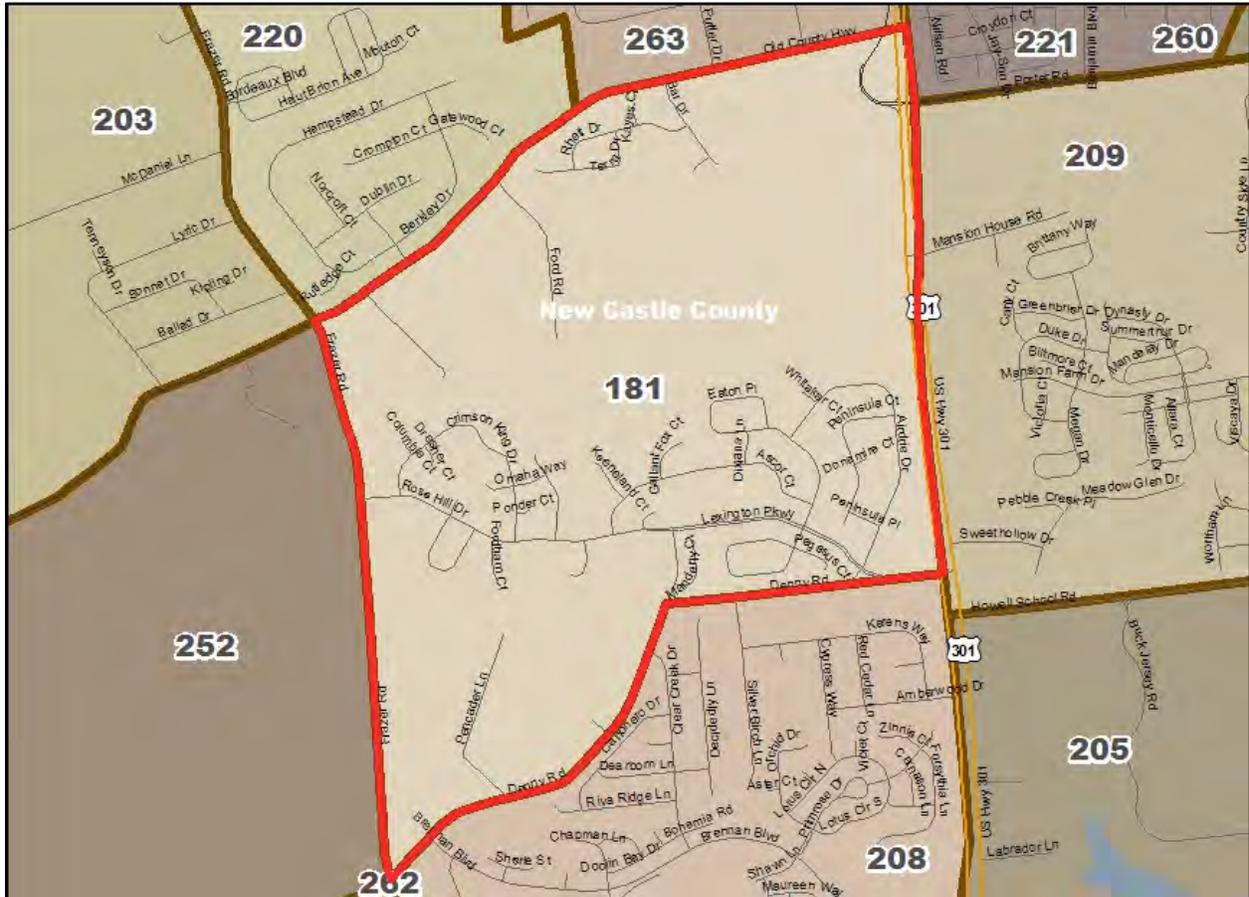
**Proposed Development's Compatibility with the New Castle County Comprehensive Plan:**

The proposed improvements are generally compatible with the County Comprehensive Plan in that both the Suburban (S) and the Suburban Transition (ST) zones provide for residential uses. However, these districts allow for moderate to high density residential development, where the New Castle County Comprehensive Plan Future Land Use Plan seeks to limit these parcels to low density residential development. As such, this development warrants additional discussion.

**Transportation Analysis Zones (TAZ)**

**Transportation Analysis Zones (TAZ) where development would be located: 181 & 209**

**TAZ Boundaries (181):**



**Current employment estimate for TAZ: 54 in 2010**

**Future employment estimate for TAZ: 65 in 2040**

**Current Population estimate for TAZ: 1,934 in 2010**

**Future Population estimate for TAZ: 2,518 in 2040**

**Current household estimate for TAZ: 530 in 2010**

**Future household estimate for TAZ: 781 in 2040**

**Relevant committed developments in the TAZ: Cook Farm.**

**Would the addition of committed developments to current estimates exceed future projections: No.**

**Would the addition of committed developments and the proposed development to current estimates exceed future projections: Yes.**

**TAZ Boundaries (209):**



**Current employment estimate for TAZ: 88 in 2010**

**Future employment estimate for TAZ: 84 in 2040**

**Current Population estimate for TAZ: 2,264 in 2010**

**Future Population estimate for TAZ: 2,779 in 2040**

**Current household estimate for TAZ: 662 in 2010**

**Future household estimate for TAZ: 1,037 in 2040**

**Relevant committed developments in the TAZ: Woods at Mansion Farm**

**Would the addition of committed developments to current estimates exceed future projections: No.**

**Would the addition of committed developments and the proposed development to current estimates exceed future projections: Yes.**

## **Trip Generation**

As per the TIS, the trip generation for the proposed site modifications was determined by using the comparable land use and rates/equations contained in the *Trip Generation, 9<sup>th</sup> Edition: An ITE Informational Report*, published by the Institute of Transportation Engineers (ITE) for ITE Land Use Code 210 (Single-Family Detached Housing) and ITE Land Use Code 230 (Residential Condominium/Townhouse).

The peak period trip generation for the The Colony at Summit Bridge East and West is included in Table 1.

**Table 1**  
THE COLONY AT SUMMIT BRIDGE EAST AND WEST

Land Use	ADT	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
The Colony at Summit Bridge East: 39 Single-Family Detached Houses (Based on ITE Land Use Code 210)	442	10	28	38	29	17	46
The Colony at Summit Bridge East: 111 Townhouses/Twin Houses (Based on ITE Land Use Code 230)	705	10	47	57	44	22	66
The Colony at Summit Bridge West: 48 Single-Family Detached Houses (Based on ITE Land Use Code 210)	535	11	33	44	35	20	55
The Colony at Summit Bridge West: 102 Townhouses/Twin Houses (Based on ITE Land Use Code 230)	655	9	44	53	42	20	62
<b>Total New Trips</b>	<b>2,337</b>	<b>40</b>	<b>152</b>	<b>192</b>	<b>150</b>	<b>79</b>	<b>229</b>

## **Overview of TIS**

### **Intersections examined:**

1. Summit Bridge Road / Mansion House Road / North Entrance (Full Access)
2. Summit Bridge Road / South Entrance (Rights-in, Rights-out)
3. Summit Bridge Road / Entrance to Glasgow Presbyterian Church
4. Summit Bridge Road / Porter Road / Glasgow Avenue
5. Glasgow Avenue / Old County Road (New Castle Road 395)
6. Porter Road / Jayson Drive
7. Summit Bridge Road / Sweet Hollow Drive
8. Summit Bridge Road / Denny Road (New Castle Road 396)
9. Summit Bridge Road / Howell School Road (New Castle Road 54)
10. Howell School Road / Robert C. Peoples Boulevard
11. Denny Road / Lexington Parkway / Airdrie Drive

**Conditions examined:**

1. Case 1 - 2013 Existing conditions.
2. Case 2 – 2017 No Build conditions without The Colony at Summit Bridge East & West.
3. Case 3a – 2017 Build conditions with The Colony at Summit Bridge East only without connection to Mansion Farm Drive.
4. Case 3b – 2017 Build conditions with The Colony at Summit Bridge East only with connection to Mansion Farm Drive.
5. Case 3c – 2017 Build conditions with The Colony at Summit Bridge West only.
6. Case 4a – 2017 Build conditions with The Colony at Summit Bridge East & West without connection to Mansion Farm Drive.
7. Case 4b – 2017 Build conditions with The Colony at Summit Bridge East & West with connection to Mansion Farm Drive.

**Peak hours evaluated:** Weekday morning and weekday evening peak hours.

**Committed Developments considered:**

1. Woods at Mansion Farm (189 single-family detached houses, 29 single-family attached houses).
2. Farmington (211 single-family detached houses; 60 unbuilt).
3. Estates at Long Branch (f.k.a. Kang Farm) (70 single-family detached houses).
4. Belden (87 single-family detached houses; 46 unbuilt).
5. People’s Plaza Shopping Center (712,530 square feet of commercial space; 156,274 square feet unbuilt).
6. Cook Farm (108 single-family detached houses, 132 single-family attached houses, 151 townhouses).

**Intersection Descriptions**

**1. Summit Bridge Road and Mansion House Road / North Entrance (Full Access)**

**Type of Control:** existing unsignalized intersection

**Eastbound Approach:** (Colony-West Site Access) proposed one shared left turn/right turn lane, stop controlled

**Westbound Approach:** (Mansion House Road) existing one shared left turn/right turn lane, stop controlled

**Northbound Approach:** (Summit Bridge Road) existing two through lanes and one left turn lane

**Southbound Approach:** (Summit Bridge Road) existing two through lanes and one left turn lane

*Note: This intersection includes a grassed median approximately 100 feet in width.*

*Roadway signing and striping within the median accommodate the storage of vehicles to facilitate a two-stage crossing of the northbound and southbound through lanes.*

**2. Summit Bridge Road and South Entrance**

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

**Westbound Approach:** (South Entrance) proposed one right turn lane, stop controlled

**Northbound Approach:** (Summit Bridge Road) proposed two through lanes and one right turn lane

**3. Summit Bridge Road and Entrance to Glasgow Presbyterian Church**

**Type of Control:** existing stop controlled intersection

**Eastbound Approach:** (Entrance to Glasgow Presbyterian Church) existing one right turn lane, stop controlled

**Southbound Approach:** (Summit Bridge Road) existing two through lanes and one right turn lane

**4. Summit Bridge Road and Porter Road / Glasgow Avenue**

**Type of Control:** existing signal controlled intersection

**Eastbound Approach:** (Glasgow Avenue) existing one left turn lane, one shared through/left turn lane, and one channelized right turn lane; proposed one left turn lane, one through lane, and one channelized right turn lane

**Westbound Approach:** (Porter Road) existing one left turn lane, one shared through/left turn lane, and one channelized right turn lane; proposed one left turn lane, one through lane, and one channelized right turn lane

**Northbound Approach:** (Summit Bridge Road) existing one left turn lane, two through lanes, and one channelized right turn lane

**Southbound Approach:** (Summit Bridge Road) existing one left turn lane, two through lanes, and one channelized right turn lane

*Note: This intersection is being improved a part of the DelDOT SR 896 and Porter Road Intersection Improvements project and will be completed prior to the full build out of The Colony at Summit Bridge East and West development.*

**5. Glasgow Avenue and Old County Road**

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

**Eastbound Approach:** (Old County Road) existing one left turn lane and one channelized right turn lane, stop controlled

**Northbound Approach:** (Glasgow Avenue) existing one left turn lane and one through lane

**Southbound Approach:** (Glasgow Avenue) existing one through lane and one right turn lane

**6. Porter Road and Jayson Drive**

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

**Eastbound Approach:** (Porter Road) existing one left turn lane and one through lane

**Westbound Approach:** (Porter Road) existing one through lane and one right turn lane

**Southbound Approach:** (Jayson Drive) existing one left turn lane and one right turn lane, stop controlled

**7. Summit Bridge Road and Sweet Hollow Drive**

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

**Westbound Approach:** (Sweet Hollow Drive) existing one right turn lane

**Northbound Approach:** (Summit Bridge Road) existing two through lanes and one right turn lane

*Note: This intersection will be eliminated as part of the DelDOT Howell School Road, SR 896 to SR 71 Improvements Project and construction will be completed prior to the full build out of The Colony at Summit Bridge East and West.*

**8. Summit Bridge Road and Denny Road**

**Type of Control:** existing signal controlled intersection

**Eastbound Approach:** (Denny Road) existing one left turn lane and one right turn lane

**Northbound Approach:** (Summit Bridge Road) existing one left turn lane and two through lanes

**Southbound Approach:** (Summit Bridge Road) existing two through lanes and one right turn lane

*Note: This intersection includes a grassed median approximately 130 feet in width. Roadway striping and signalization within the median accommodate the storage of vehicles to facilitate a two-stage crossing of the northbound and southbound through lanes. This intersection is being improved as part of the DelDOT Howell School Road, SR 896 to SR 71 Improvements Project and will be completed prior to the full build out of The Colony at Summit Bridge East and West. As part of the DelDOT project, Howell School Road will be realigned to form a four-legged intersection with Denny Road. The eastbound Denny Road approach will be modified to provide one left turn lane, one shared through/left lane, and one channelized right turn lane, the westbound Howell School Road approach will be modified to provide one shared through/left lane and one channelized right turn lane, the northbound approach will be modified to provide one left turn lane, two through lanes, and one channelized right turn lane, and the southbound approach will be modified to provide two left turn lanes, two through lanes, and one channelized right turn lane.*

**9. Summit Bridge Road and Howell School Road**

**Type of Control:** existing signal controlled intersection

**Westbound Approach:** (Howell School Road) existing one left turn lane and one right turn lane

**Northbound Approach:** (Summit Bridge Road) existing two through lanes and one right turn lane

**Southbound Approach:** (Summit Bridge Road) existing one left turn lane and two through lanes

*Note: This intersection includes a grassed median approximately 130 feet in width. Roadway striping and signalization within the median accommodate the storage of vehicles to facilitate a two-stage crossing of the northbound and southbound through lanes. This intersection is being improved as part of the DelDOT Howell School Road, SR 896 to SR 71 Improvements Project and will be completed prior to the full build out of The Colony at Summit Bridge East and West. As part of the DelDOT project, Howell School Road will be realigned to form a four-legged intersection with Denny Road. The eastbound Denny Road approach will be modified to provide one left turn lane, one shared through/left lane, and one channelized right turn lane, the westbound Howell School Road approach will be modified to provide one shared through/left lane and one channelized right turn lane, the northbound approach will be modified to provide one left turn lane, two through lanes, and one channelized right turn lane, and the southbound approach will be modified to provide two left turn lanes, two through lanes, and one channelized right turn lane.*

#### **10. Howell School Road and Robert C. Peoples Boulevard**

**Type of Control:** existing stop controlled intersection (T-Intersection), proposed roundabout

**Eastbound Approach:** (Howell School Road) existing one shared through/left turn lane; proposed one shared through/left turn lane

**Westbound Approach:** (Howell School Road) existing one through lane and one right turn lane; proposed one shared through/right turn lane

**Southbound Approach:** (Robert C. Peoples Boulevard) existing one shared left turn/right turn lane, stop controlled; proposed one shared left turn/right turn lane

*Note: Field observations indicate the southbound approach operates as a separate left turn and right turn lane. This intersection is being improved as part of the DelDOT Howell School Road, SR 896 to SR 71 Improvements Project and will be completed prior to the full build out of The Colony at Summit Bridge East and West. As part of the DelDOT project, this intersection will be converted to a single lane roundabout.*

#### **11. Denny Road and Lexington Parkway / Airdrie Drive**

**Type of Control:** existing stop controlled intersection

**Eastbound Approach:** (Lexington Parkway) existing one left turn lane and one shared through/right turn lane, stop controlled

**Westbound Approach:** (Denny Road) existing one left turn lane and one shared through/right turn lane

**Northbound Approach:** (Denny Road) existing one shared through/left turn/right turn lane, stop controlled

**Southbound Approach:** (Airdrie Drive) existing one shared through/left turn/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. The closest bus routes to the subject property are DTC Routes 40, 41, 42, and 55, accessed at the Peoples Plaza Park and Ride Location near the intersection of Glasgow Avenue and Pulaski Highway (US Route 40). However, none of these routes traverse through any of the subject intersections.

**Planned transit service:** JMT contacted Wayne Henderson, Service Development Planner at the DTC. In an email from Bernard Au from the DTC, it was recommended that bus stops be provided along the northbound and southbound sides of Summit Bridge Road at the intersections with Mansion House Road, the South Entrance (Mansion Farm Drive), the Entrance to Glasgow Presbyterian Church, Porter Road/Glasgow Avenue, and Denny Road/Howell School Road. Bus stops are also recommended to be added to the Howell School Road intersection with Robert C. Peoples Boulevard and the Porter Road intersection with Jayson Drive. It was discussed that these bus stops would serve future bus routes as there are no existing routes that traverse along any of these intersections. Therefore, the DTC has requested that permanent easements be dedicated to DelDOT allowing for the provision of future bus stops at these locations.

**Existing bicycle and pedestrian facilities:** According to DelDOT's *New Castle County Bicycle Map*, Statewide Bicycle Route 1 traverses through the study intersections of Howell School Road with Robert C. Peoples Boulevard as well as Summit Bridge Road with Howell School Road. Connector bicycle routes traverse Summit Bridge Road, Porter Road, and Glasgow Avenue through each of the study intersections. A regional bicycle route traverses along Denny Road through the study intersection of Denny Road/Lexington Parkway/Airdrie Drive and terminates at the Denny Road and southbound Summit Bridge Road intersection.

**Planned bicycle and pedestrian facilities:** JMT contacted Mr. Marco Boyce, DelDOT's Bicycle and Pedestrian Coordinator. In an April 22, 2014 email, Mr. Boyce stated that the Colony at Summit Bridge East and West's pathways should build upon current and future infrastructure investments that will ultimately create a pathway system connecting from Glasgow Park at US 40, south along the SR 896 (Summit Bridge Road) corridor, to Lums Pond State Park and possibly to the C&D Canal Trail, which would provide pathway access west to Chesapeake City, MD and east to Delaware City's waterfront promenade. He stated that The Colony's frontage pathway along Summit Bridge Road should be placed well away from the roadway edge, behind the existing hedge row, trees, and utility poles, within open space, public access easements, and/or State Right-of-Way. Furthermore, within this buffer space between the roadway edge and pathway it is recommended that street trees be installed where feasible. Mr. Boyce provided a graphic illustrating that The Colony's pathway should be placed on the east side of Summit Bridge Road and extend from the proposed full access at Mansion House Road south its proposed realigned intersection with Denny Road and Howell School Road. Pathway access should extend across Summit Bridge Road at its intersection with Mansion House Road to connect The Colony-East with The Colony-West.

**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 frontages, the BLOS with the construction of the proposed development and the provision of no bike lanes are summarized below. The BLOS was determined utilizing the calculators published on the LIB website: <http://www.bikelib.org/roads/blos/blosform.htm>

- Summit Bridge Road – BLOS: C

**Previous Comments**

None.

**General HCS Analysis Comments**

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

1. Karins and Associates performed analyses using HCS+ Version 5.21. JMT used HCS+T7F, Version 5.5. As such, some of the results are different between the two analyses.
2. JMT input upstream signal data in the analysis for unsignalized intersections that were within, 1,500 feet of a signal, whereas the TIS did not. The upstream signal data for the future cases took into account the improvements at Summit Bridge Road/Porter Road/Glasgow Avenue and at Summit Bridge Road/Denny Road/Howell School Road.
3. Although not explicitly stated in the TIS, JMT assumed the analysis results at some locations from the TIS for Cases 3a and 3b as well as 4a and 4b were identical, given that they included the same turning movement volumes, lane configuration, and control of right-of-way.
4. JMT performed additional analyses at the proposed full movement site access, instead allowing only right-in, right-out movements as ingress/egress for both the Colony-East and Colony-West at Mansion House Road. With a right-in, right-out entrance configuration for each site entrance, vehicles that would normally perform the eastbound and southbound left-turn movement at the site access would instead drive south and make a u-turn at the Summit Bridge Road/Denny Road/Howell School Road signalized intersection. Similarly, vehicles that would normally perform the westbound and northbound left-turn movement at the site access would instead drive north and make a u-turn at the Summit Bridge Road/Glasgow Avenue/Porter Road signalized intersection.

Table 2  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Mansion House Road/North Entrance (Full Access)<sup>2</sup></b>				
2013 Existing (Case 1)				
Eastbound Mansion House Road Approach	E (38.3) <sup>3</sup>	C (19.0) <sup>3</sup>	-	-
Westbound Mansion House Road Approach	E (45.9) <sup>3</sup> B (11.5) <sup>4</sup>	C (21.3) <sup>3</sup> C (24.7) <sup>4</sup>	D (35.0)	C (21.7)
Northbound Summit Bridge Road Left	A (7.2) <sup>3</sup>	A (7.3) <sup>3</sup>	A (9.5)	C (23.1)
Southbound Summit Bridge Road Left	A (7.2) <sup>4</sup>	A (7.2) <sup>4</sup>	C (24.3)	B (11.8)
2017 without The Colony at Summit Bridge East & West (Case 2) <sup>5</sup>				
Eastbound Mansion House Road Approach	F (52.7) <sup>3</sup>	C (22.8) <sup>3</sup>	-	-
Westbound Mansion House Road Approach	F (66.0) <sup>3</sup> B (12.2) <sup>4</sup>	C (20.3) <sup>3</sup> D (31.4) <sup>4</sup>	E (47.8)	D (28.4)
Northbound Summit Bridge Road Left	A (7.2) <sup>3</sup>	A (7.3) <sup>3,6</sup>	B (10.1)	D (33.0)
Southbound Summit Bridge Road Left	A (7.3) <sup>4</sup>	A (7.3) <sup>4</sup>	D (32.7)	B (13.5)
2017 with The Colony at Summit Bridge East, without Connection to Mansion Farm Drive (Case 3a)				
Eastbound Mansion House Road Approach	F (392.3) <sup>3</sup>	F (67.8) <sup>3</sup>	-	-
Westbound Mansion House Road Approach	F (195.9) <sup>3</sup> B (13.0) <sup>4</sup>	C (24.9) <sup>3</sup> E (42.6) <sup>4</sup>	F (100.9)	D (29.5)
Northbound Summit Bridge Road Left	A (7.3) <sup>3</sup>	A (7.3) <sup>3</sup>	B (10.2)	E (35.2)
Southbound Summit Bridge Road Left	A (7.3) <sup>4</sup>	A (7.3) <sup>4</sup>	E (36.4)	B (14.6)

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

<sup>2</sup> The TIS analyzed the intersections of northbound Summit Bridge Road and Mansion House Road and southbound Summit Bridge Road and Mansion House Road as two separate intersections. JMT analyzed as a single intersection with a raised median and median storage of three vehicles to replicate a two-stage crossing of Summit Bridge Road.

<sup>3</sup> Represents result from TIS analysis of northbound Summit Bridge Road and Mansion House Road.

<sup>4</sup> Represents result from TIS analysis of southbound Summit Bridge Road and Mansion House Road.

<sup>5</sup> For all future cases, JMT used 3% heavy vehicles, by movement, consistent with DelDOT standards, whereas the TIS did not.

<sup>6</sup> The TIS used a volume of 3 vehicles along the westbound right movement whereas JMT used a volume of 1 vehicle, consistent with the 2017 Pre Development Traffic Volumes figure in the TIS Report.

Table 2 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Mansion House Road/North Entrance (Full Access)<sup>2</sup></b>				
2017 with The Colony at Summit Bridge East, without Connection to Mansion Farm Drive (Case 3a) w/ <i>Right-in, Right-out Entrance Configuration</i> <sup>7</sup>				
Westbound Mansion House Road Approach	-	-	E (35.8)	B (14.7)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 3b)				
Eastbound Mansion House Road Approach	F (277.1) <sup>3</sup>	F (66.8) <sup>3</sup>	-	-
Westbound Mansion House Road Approach	E (37.0) <sup>3</sup> B (12.8) <sup>4</sup>	C (16.1) <sup>3</sup> E (41.2) <sup>4</sup>	D (33.5)	C (17.0)
Northbound Summit Bridge Road Left	A (7.3) <sup>3</sup>	A (7.3) <sup>3</sup>	B (10.2)	E (35.7)
Southbound Summit Bridge Road Left	A (7.3) <sup>4</sup>	A (7.3) <sup>4</sup>	E (36.4)	B (14.6)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 3b) w/ <i>Right-in, Right-out Entrance Configuration</i> <sup>7</sup>				
Westbound Mansion House Road Approach	-	-	D (33.1)	B (14.6)
2017 with The Colony at Summit Bridge West (Case 3c) <sup>8</sup>				
Eastbound Mansion House Road Approach	F (90.0) <sup>3</sup> C (20.4) <sup>4</sup>	D (25.2) <sup>3</sup> F (335.6) <sup>4</sup>	F (50.2)	F (*)
Westbound Mansion House Road Approach	F (66.0) <sup>3</sup> C (17.3) <sup>4</sup>	D (28.5) <sup>3</sup> F (*) <sup>4</sup>	F (71.6)	F (*)
Northbound Summit Bridge Road Left	A (7.3) <sup>3</sup>	A (7.3) <sup>3</sup>	B (10.2)	E (43.8)
Southbound Summit Bridge Road Left	A (7.3) <sup>4</sup>	A (7.3) <sup>4</sup>	D (32.7)	B (13.5)

\*HCS did not generate a result due to excessive delay.

<sup>7</sup> Accounts for right-in, right-out access at the entrances to both Colony-East and Colony-West at Mansion House Road and the redistribution of left and through movements at these intersections for the purpose of keeping the access to Colony-East and Colony-West unsignalized.

<sup>8</sup> The analysis of the TIS and JMT include providing a separate right turn lane along Southbound Summit Bridge Road, warranted per DelDOT's Auxiliary Lane Spreadsheet.

Table 2 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Mansion House Road/North Entrance (Full Access)<sup>2</sup></b>				
2017 with The Colony at Summit Bridge West (Case 3c) w/ Right-in, Right-out Entrance Configuration <sup>7</sup>				
Eastbound Mansion House Road Approach	-	-	B (12.5)	D (27.4)
2017 with The Colony at Summit Bridge East & West, without Connection to Mansion Farm Drive (Case 4a)				
Eastbound Mansion House Road Approach	F (782.5) <sup>3</sup> C (21.2) <sup>4</sup>	F (87.0) <sup>3</sup> F (466.9) <sup>4</sup>	F (97.2)	F (*)
Westbound Mansion House Road Approach	E (195.9) <sup>3</sup> C (18.1) <sup>4</sup>	D (26.4) <sup>3</sup> F (*) <sup>4</sup>	F (227.8)	F (*)
Northbound Summit Bridge Road Left	A (7.3) <sup>3</sup>	A (7.3) <sup>3</sup>	B (10.3)	E (47.5)
Southbound Summit Bridge Road Left	A (7.3) <sup>4</sup>	A (7.3) <sup>4</sup>	E (36.4)	B (14.6)
2017 with The Colony at Summit Bridge East & West, without Connection to Mansion Farm Drive (Case 4a) w/ Right-in, Right-out Entrance Configuration <sup>7</sup>				
Eastbound Mansion House Road Approach	-	-	B (12.6)	D (27.9)
Westbound Mansion House Road Approach	-	-	E (37.5)	C (15.1)
2017 with The Colony at Summit Bridge East & West, with Connection to Mansion Farm Drive (Case 4b)				
Eastbound Mansion House Road Approach	F (432.1) <sup>3</sup> C (21.2) <sup>4</sup>	F (87.0) <sup>3</sup> F (466.9) <sup>4</sup>	F (101.1)	F (*)
Westbound Mansion House Road Approach	E (37.6) <sup>3</sup> C (17.9) <sup>4</sup>	C (16.4) <sup>3</sup> F (*) <sup>4</sup>	E (38.5)	F (*)
Northbound Summit Bridge Road Left	A (7.3) <sup>3</sup>	A (7.4) <sup>3</sup>	B (10.3)	E (48.8)
Southbound Summit Bridge Road Left	A (7.3) <sup>4</sup>	A (7.3) <sup>4</sup>	E (36.4)	B (14.6)

\*HCS did not generate a result due to excessive delay.

Table 2 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Mansion House Road/North Entrance (Full Access)<sup>2</sup></b>				
2017 with The Colony at Summit Bridge East & West, with Connection to Mansion Farm Drive (Case 4b) w/ <i>Right-in, Right-out Entrance Configuration</i> <sup>7</sup>				
Eastbound Mansion House Road Approach	-	-	B (12.6)	D (27.9)
Westbound Mansion House Road Approach	-	-	D (33.7)	B (15.0)

Table 2 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Signalized Intersection <sup>9</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Mansion House Road/North Entrance (Full Access)<sup>2,10</sup></b>				
2017 with The Colony at Summit Bridge East, without Connection to Mansion Farm Drive (Case 3a) w/ Improvements <sup>11</sup>	-	-	C (21.1)	B (15.8)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 3b) w/ Improvements <sup>11</sup>	-	-	C (20.8)	B (15.9)
2017 with The Colony at Summit Bridge West (Case 3c) w/ Improvements <sup>11</sup>	-	-	D (36.7)	C (27.5)
2017 with The Colony at Summit Bridge East & West, without Connection to Mansion Farm Drive (Case 4a) w/ Improvements <sup>12</sup>	D (40.9) <sup>3</sup> B (14.0) <sup>4</sup>	B (12.3) <sup>3</sup> D (50.9) <sup>4</sup>	D (41.6)	C (29.5)
2017 with The Colony at Summit Bridge East & West, with Connection to Mansion Farm Drive (Case 4b) w/ Improvements <sup>12</sup>	D (40.5) <sup>3</sup> B (13.7) <sup>4</sup>	B (12.2) <sup>3</sup> D (51.0) <sup>4</sup>	D (41.3)	C (29.6)

<sup>9</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

<sup>10</sup> Improvements scenario incorporates the installation of a traffic signal. The TIS utilized a 120 second cycle length in AM peak hour analysis and a 110 second cycle length in the PM peak hour analysis. JMT utilized a 150 second cycle length in the AM and PM peak hour analyses to be consistent with the nearby signalized intersection of Summit Bridge Road with Porter Road and Glasgow Avenue.

<sup>11</sup> JMT conducted analysis in the improved scenario for Cases 3a, 3b, and 3c whereas the TIS did not.

<sup>12</sup> The TIS proposes the additions of both a northbound and southbound right turn lane, while JMT's analysis includes the addition of a southbound right turn lane only, warranted per DelDOT's Auxiliary Lane Spreadsheet.

Table 3  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>13</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and South Entrance (Rights-in, Rights-out)<sup>14</sup></b>				
2017 with The Colony at Summit Bridge East, without Connection to Mansion Farm Drive (Case 3a)				
Westbound Approach	E (35.6)	B (14.4)	E (35.6)	B (14.4)
2017 with The Colony at Summit Bridge East, without Connection to Mansion Farm Drive (Case 3a) w/ Right-in, Right-out Entrance Configuration <sup>15</sup>				
Westbound Approach	-	-	E (36.6)	B (14.8)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 3b)				
Westbound Approach	F (129.0)	C (17.0)	F (129.0)	C (17.0)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 3b) w/ Right-in, Right-out Entrance Configuration <sup>15</sup>				
Westbound Approach	-	-	F (139.0)	C (17.8)
2017 with The Colony at Summit Bridge East & West, without Connection to Mansion Farm Drive (Case 4a)				
Westbound Approach	E (35.6)	B (14.6)	E (35.6)	B (14.6)

<sup>13</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

<sup>14</sup> TIS and JMT analysis includes the addition of a right turn lane into the site along northbound Summit Bridge Road, warranted per DelDOT's Auxiliary Lane Spreadsheet, and a site entrance lane configuration consisting of one right turn lane.

<sup>15</sup> Accounts for right-in, right-out access at the entrances to both Colony-East and Colony-West at Mansion House Road and the redistribution of left and through movements at these intersections for the purpose of keeping the access to Colony-East and Colony-West unsignalized.

Table 3 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>13</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and South Entrance (Rights-in, Rights-out)<sup>14</sup></b>				
2017 with The Colony at Summit Bridge East & West, without Connection to Mansion Farm Drive (Case 4a) w/ <i>Right-in, Right-out Entrance Configuration</i> <sup>15</sup>				
Westbound Approach	-	-	E (38.3)	C (15.3)
2017 with The Colony at Summit Bridge East & West, with Connection to Mansion Farm Drive (Case 4b)				
Westbound Approach	F (131.0)	C (17.3)	F (131.0)	C (17.3)
2017 with The Colony at Summit Bridge East & West, with Connection to Mansion Farm Drive (Case 4b) w/ <i>Right-in, Right-out Entrance Configuration</i> <sup>15</sup>				
Westbound Approach	-	-	F (156.7)	C (18.5)

Table 4  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>16</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Entrance to Glasgow Presbyterian Church</b>				
2013 Existing (Case 1)				
Eastbound Church Entrance Approach	B (11.7)	C (21.2)	B (10.5)	B (13.9)
2017 without The Colony at Summit Bridge East & West (Case 2)				
Eastbound Church Entrance Approach	B (12.3)	D (25.8)	B (10.7)	B (14.5)
2017 with The Colony at Summit Bridge East, and with or without Connection to Mansion Farm Drive (Cases 3a and 3b)				
Eastbound Church Entrance Approach	B (12.4)	D (26.7)	B (10.8)	B (14.5)
2017 with The Colony at Summit Bridge East, and with or without Connection to Mansion Farm Drive (Cases 3a and 3b) w/ <i>Right-in, Right-out Entrance Configuration</i> <sup>17</sup>				
Eastbound Church Entrance Approach	-	-	B (11.0)	B (15.1)
2017 with The Colony at Summit Bridge West (Case 3c)				
Eastbound Church Entrance Approach	B (12.4)	D (26.7)	B (10.8)	B (14.5)
2017 with The Colony at Summit Bridge West (Case 3c) w/ <i>Right-in, Right-out Entrance Configuration</i> <sup>17</sup>				
Eastbound Church Entrance Approach	-	-	B (10.9)	C (15.3)

<sup>16</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

<sup>17</sup> Accounts for right-in, right-out access at the entrances to both Colony-East and Colony-West at Mansion House Road and the redistribution of left and through movements at these intersections for the purpose of keeping the access to Colony-East and Colony-West unsignalized.

Table 4 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>16</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Entrance to Glasgow Presbyterian Church</b>				
2017 with The Colony at Summit Bridge East & West, and with or without Connection to Mansion Farm Drive (Cases 4a and 4b)				
Eastbound Church Entrance Approach	B (12.5)	D (27.6)	B (10.8)	B (14.4)
2017 with The Colony at Summit Bridge East & West, and with or without Connection to Mansion Farm Drive (Cases 4a and 4b) w/ <i>Right-in, Right-out Entrance Configuration</i> <sup>17</sup>				
Eastbound Church Entrance Approach	-	-	B (11.0)	C (15.4)

Table 5  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Signalized Intersection <sup>18</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Porter Road/Glasgow Avenue<sup>19,20,21,22,23</sup></b>				
2013 Existing (Case 1) <sup>24</sup>	D (39.5)	D (46.5)	D (36.9)	D (49.4)
2017 without The Colony at Summit Bridge East & West (Case 2)	D (54.3)	E (62.0)	C (35.7)	D (48.6)
2017 with The Colony at Summit Bridge East, and with or without Connection to Mansion Farm Drive (Cases 3a and 3b)	E (56.3)	E (62.9)	C (36.1)	D (49.8)
2017 with The Colony at Summit Bridge East, and without Connection to Mansion Farm Drive (Case 3a) w/ Right-in, Right-out Entrance Configuration <sup>25</sup>	-	-	D (37.1)	D (51.1)

<sup>18</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

<sup>19</sup> JMT assumed percentages of left turns that would utilize the shared through/left lane, when applicable, based on observed lane utilization. The TIS did not provide this information.

<sup>20</sup> The TIS used a cycle length of 120 and 145 seconds during the AM and PM peak hours, respectively, while JMT used a cycle length of 150 seconds in the AM peak hour and 140 seconds in the PM peak hour based on field observations.

<sup>21</sup> The TIS input right-turn-on-red volumes for each approach to obtain intersection level-of-service. However, when right turn movements were observed to be free flowing based on field observations, or assumed to be free flowing based on lane configuration and type of control, JMT removed these right turn volumes from the analysis based on HCM guidelines.

<sup>22</sup> JMT accounted for heavy vehicle percentages by lane group, where the TIS accounted for heavy vehicle percentages by movement.

<sup>23</sup> All future cases incorporate the DelDOT improvement project which includes providing one left turn lane, one through lane, and one channelized right turn lane on the westbound approach, and providing one left turn lane, one through lane, and one channelized right turn lane on the eastbound approach. Consistent with the DelDOT project, JMT modeled the westbound left turn movement as a protected only lag phase, whereas the TIS did not.

<sup>24</sup> The TIS accounts for an eastbound lane configuration consisting of one left turn lane, one through lane, and one right turn lane, which is inconsistent with the existing lane configuration. JMT accounted for an existing eastbound lane configuration consisting of one left turn lane, one shared left/through lane, and one channelized right turn lane, confirmed via field observation.

<sup>25</sup> Accounts for right-in, right-out access at the entrances to both Colony-East and Colony-West at Mansion House Road and the redistribution of left and through movements at these intersections for the purpose of keeping the access to Colony-East and Colony-West unsignalized.

Table 5 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Signalized Intersection <sup>18</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Porter Road/Glasgow Avenue<sup>19,20,21,22,23</sup></b>				
2017 with The Colony at Summit Bridge East, and with Connection to Mansion Farm Drive (Case 3b) w/ <i>Right-in, Right-out Entrance Configuration</i> <sup>25</sup>	-	-	D (36.9)	D (51.0)
2017 with The Colony at Summit Bridge West (Case 3c)	E (56.3)	E (62.9)	D (36.1)	D (49.9)
2017 with The Colony at Summit Bridge West (Case 3c) w/ <i>Right-in, Right-out Entrance Configuration</i> <sup>25</sup>	-	-	D (36.6)	D (51.8)
2017 with The Colony at Summit Bridge East & West, and with or without Connection to Mansion Farm Drive (Cases 4a and 4b)	E (59.3)	E (64.0)	D (36.5)	D (51.8)
2017 with The Colony at Summit Bridge East & West, and with or without Connection to Mansion Farm Drive (Cases 4a and 4b) w/ <i>Additional Improvements</i> <sup>26</sup>	D (49.5)	D (53.8)	-	-
2017 with The Colony at Summit Bridge East & West, without Connection to Mansion Farm Drive (Case 4a) w/ <i>Right-in, Right-out Entrance Configuration</i> <sup>25</sup>	-	-	D (37.9)	D (54.6)
2017 with The Colony at Summit Bridge East & West, with Connection to Mansion Farm Drive (Case 4b) w/ <i>Right-in, Right-out Entrance Configuration</i> <sup>25</sup>	-	-	D (37.6)	D (54.3)

<sup>26</sup> The TIS included an additional improvement scenario which included a northbound lane configuration consisting of two left turn lanes, two through lanes, and one channelized right turn lane. JMT did not analyze this improvement scenario since levels-of-service for Case 4a and 4b were found to be acceptable, given the lane configuration proposed in the DelDOT improvement project.

Table 6  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>27</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Glasgow Avenue and Old County Road</b>				
2013 Existing (Case 1)				
Eastbound Old County Road Left	C (21.4)	D (27.0)	C (21.7)	D (29.0)
Eastbound Old County Road Right	B (10.0)	B (12.9)	A (10.0)	B (12.9)
Eastbound Old County Road Approach	B (14.2)	C (17.8)	B (14.2)	C (18.5)
Northbound Glasgow Avenue Left	A (7.9)	A (9.5)	A (7.9)	A (9.5)
2017 without The Colony at Summit Bridge East & West (Case 2)				
Eastbound Old County Road Left	E (41.5)	F (100.8)	E (43.3)	F (166.2)
Eastbound Old County Road Right	B (10.6)	C (15.1)	B (10.6)	C (15.1)
Eastbound Old County Road Approach	C (24.6)	F (54.7)	D (25.4)	F (84.9)
Northbound Glasgow Avenue Left	A (8.2)	B (10.8)	A (8.2)	B (10.8)
2017 with The Colony at Summit Bridge East, and with or without Connection to Mansion Farm Drive (Cases 3a and 3b)				
Eastbound Old County Road Left	E (42.5)	F (104.5)	E (44.8)	F (177.6)
Eastbound Old County Road Right	B (10.6)	C (15.2)	B (10.6)	C (15.2)
Eastbound Old County Road Approach	D (25.1)	F (56.5)	D (26.1)	F (90.3)
Northbound Glasgow Avenue Left	A (8.2)	B (10.8)	A (8.2)	B (10.8)
2017 with The Colony at Summit Bridge West (Case 3c)				
Eastbound Old County Road Left	E (42.5)	F (106.4)	E (44.8)	F (177.6)
Eastbound Old County Road Right	B (10.6)	C (15.2)	B (10.6)	C (15.2)
Eastbound Old County Road Approach	C (25.1)	F (57.4)	D (26.1)	F (90.3)
Northbound Glasgow Avenue Left	A (8.2)	B (10.9)	A (8.2)	B (10.9)

<sup>27</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 6 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>27</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Glasgow Avenue and Old County Road</b>				
2017 with The Colony at Summit Bridge East & West, without Connection to Mansion Farm Drive (Case 4a)				
Eastbound Old County Road Left	E (44.0)	F (108.4)	E (45.6)	F (185.7)
Eastbound Old County Road Right	B (10.6)	C (15.4)	B (10.6)	C (15.4)
Eastbound Old County Road Approach	D (25.8)	F (58.4)	D (26.5)	F (94.1)
Northbound Glasgow Avenue Left	A (8.2)	B (10.9)	A (8.2)	B (10.9)
2017 with The Colony at Summit Bridge East & West, with Connection to Mansion Farm Drive (Case 4b)				
Eastbound Old County Road Left	E (44.0)	F (108.4)	E (45.6)	F (181.6)
Eastbound Old County Road Right	B (10.6)	C (15.4)	B (10.6)	C (15.4)
Eastbound Old County Road Approach	D (25.8)	F (58.4)	D (26.5)	F (92.2)
Northbound Glasgow Avenue Left	A (8.2)	B (10.9)	A (8.2)	B (10.9)

Table 6 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Signalized Intersection <sup>28</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Glasgow Avenue and Old County Road</b>				
2017 without The Colony at Summit Bridge East & West (Case 2) w/ <i>Improvement Option 1</i> <sup>29</sup>	-	-	B (12.5)	C (20.6)
2017 with The Colony at Summit Bridge East, and with or without Connection to Mansion Farm Drive (Cases 3a and 3b) w/ <i>Improvement Option 1</i> <sup>29</sup>	-	-	B (12.5)	C (21.4)
2017 with The Colony at Summit Bridge West (Case 3c) w/ <i>Improvement Option 1</i> <sup>29</sup>	-	-	B (12.5)	C (21.5)
2017 with The Colony at Summit Bridge East & West, and with or without Connection to Mansion Farm Drive (Cases 4a and 4b) w/ <i>Improvement Option 1</i> <sup>29</sup>	-	-	B (12.5)	C (22.3)

<sup>28</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

<sup>29</sup> Improvement Option 1 accounts for the addition of a three phase traffic signal with a 60 second cycle length.

Table 6 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Roundabout <sup>30</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Glasgow Avenue and Old County Road</b>				
2017 without The Colony at Summit Bridge East & West (Case 2) w/ <i>Improvement Option 2</i> <sup>31</sup>				
Eastbound Old County Road	-	-	A (8.3)	B (12.8)
Northbound Glasgow Avenue	-	-	B (14.7)	B (11.1)
Southbound Glasgow Avenue	-	-	A (6.8)	E (35.6)
2017 with The Colony at Summit Bridge East, and with or without Connection to Mansion Farm Drive (Cases 3a and 3b) w/ <i>Improvement Option 2</i> <sup>31</sup>				
Eastbound Old County Road	-	-	A (8.4)	B (12.8)
Northbound Glasgow Avenue	-	-	C (15.0)	B (11.2)
Southbound Glasgow Avenue	-	-	A (6.8)	E (35.6)
2017 with The Colony at Summit Bridge West (Case 3c) w/ <i>Improvement Option 2</i> <sup>31</sup>				
Eastbound Old County Road	-	-	A (8.4)	B (12.8)
Northbound Glasgow Avenue	-	-	C (15.0)	B (11.2)
Southbound Glasgow Avenue	-	-	A (6.8)	E (35.8)
2017 with The Colony at Summit Bridge East & West, and with or without Connection to Mansion Farm Drive (Cases 4a and 4b) w/ <i>Improvement Option 2</i> <sup>31</sup>				
Eastbound Old County Road	-	-	A (8.4)	B (13.0)
Northbound Glasgow Avenue	-	-	C (15.4)	B (11.3)
Southbound Glasgow Avenue	-	-	A (6.8)	E (37.2)

<sup>30</sup> JMT analyzed the roundabout using Sidra Intersection 6.0. The numbers following level of service are average delay per vehicle, measured in seconds, calculated with the Sidra Intersection US HCM Model. The analysis assumed an environment factor of 1.0.

<sup>31</sup> Improvement Option 2 accounts for the modification of the T-intersection of Old County Road and Glasgow Avenue to a one lane roundabout.

Table 7  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>32</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Porter Road and Jayson Drive</b>				
2013 Existing (Case 1)				
Eastbound Porter Road Left	A (9.3)	A (8.7)	A (9.3)	A (8.7)
Southbound Jayson Drive Left	D (30.9)	C (23.2)	D (30.9)	C (24.4)
Southbound Jayson Drive Right	C (16.0)	B (11.1)	C (16.0)	B (11.1)
Southbound Jayson Drive Approach	C (20.5)	C (15.3)	C (20.5)	C (15.8)
2017 without The Colony at Summit Bridge East & West (Case 2)				
Eastbound Porter Road Left	A (9.5)	A (9.1)	A (9.3)	A (9.1)
Southbound Jayson Drive Left	E (38.8)	D (28.3)	D (33.8)	D (30.5)
Southbound Jayson Drive Right	C (17.3)	B (11.8)	C (16.2)	B (11.8)
Southbound Jayson Drive Approach	C (23.8)	C (17.6)	C (21.5)	C (18.3)
2017 with The Colony at Summit Bridge East, and with or without Connection to Mansion Farm Drive (Cases 3a and 3b)				
Eastbound Porter Road Left	A (9.5)	A (9.1)	A (9.3)	A (9.1)
Southbound Jayson Drive Left	E (40.8)	D (29.4)	E (35.5)	D (32.0)
Southbound Jayson Drive Right	C (17.5)	B (12.0)	C (16.3)	B (12.0)
Southbound Jayson Drive Approach	C (24.5)	C (18.1)	C (22.1)	C (19.0)
2017 with The Colony at Summit Bridge West (Case 3c)				
Eastbound Porter Road Left	A (9.5)	A (9.1)	A (9.3)	A (9.1)
Southbound Jayson Drive Left	E (40.8)	D (29.4)	E (35.5)	C (16.3)
Southbound Jayson Drive Right	C (17.5)	B (12.0)	C (16.3)	B (12.0)
Southbound Jayson Drive Approach	C (24.5)	C (18.1)	C (22.1)	B (13.5)

<sup>32</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 7 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>32</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Porter Road and Jayson Drive</b>				
2017 with The Colony at Summit Bridge East & West, without Connection to Mansion Farm Drive (Cases 4a)				
Eastbound Porter Road Left	A (9.5)	A (9.2)	A (9.4)	A (9.2)
Southbound Jayson Drive Left	E (43.0)	D (30.8)	E (37.1)	D (34.0)
Southbound Jayson Drive Right	C (17.6)	B (12.2)	C (16.4)	B (12.2)
Southbound Jayson Drive Approach	D (25.3)	C (18.7)	C (22.7)	C (19.8)
2017 with The Colony at Summit Bridge East & West, and with Connection to Mansion Farm Drive (Cases 4b)				
Eastbound Porter Road Left	A (9.5)	A (9.2)	A (9.4)	A (9.2)
Southbound Jayson Drive Left	E (43.0)	D (30.8)	E (37.1)	D (33.7)
Southbound Jayson Drive Right	C (17.6)	B (12.2)	C (16.4)	B (12.2)
Southbound Jayson Drive Approach	D (25.3)	C (18.7)	C (22.7)	C (19.7)

Table 7 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Signalized Intersection <sup>33</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Porter Road and Jayson Drive</b>				
2017 without The Colony at Summit Bridge East & West (Case 2) w/ <i>Improvement Option 1</i> <sup>34</sup>	-	-	A (8.2)	A (6.7)
2017 with The Colony at Summit Bridge East, and with or without Connection to Mansion Farm Drive (Cases 3a and 3b) w/ <i>Improvement Option 1</i> <sup>34</sup>	-	-	A (8.2)	A (6.8)
2017 with The Colony at Summit Bridge West (Case 3c) w/ <i>Improvement Option 1</i> <sup>34</sup>	-	-	A (5.4)	A (6.8)
2017 with The Colony at Summit Bridge East & West, and with or without Connection to Mansion Farm Drive (Cases 4a and 4b) w/ <i>Improvement Option 1</i> <sup>34</sup>	-	-	A (8.2)	A (6.9)

<sup>33</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

<sup>34</sup> Improvement Option 1 accounts for the addition of a three phase traffic signal with a 60 second cycle length.

Table 7 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Roundabout <sup>35</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Porter Road and Jayson Drive</b>				
2017 without The Colony at Summit Bridge East & West (Case 2) w/ <i>Improvement Option 2</i> <sup>36</sup>				
Eastbound Porter Road	-	-	A (9.8)	B (10.3)
Westbound Porter Road	-	-	B (13.3)	B (11.5)
Southbound Jayson Drive	-	-	B (11.5)	A (6.8)
2017 with The Colony at Summit Bridge East, without Connection to Mansion Farm Drive (Case 3a) w/ <i>Improvement Option 2</i> <sup>36</sup>				
Eastbound Porter Road	-	-	B (10.2)	B (10.5)
Westbound Porter Road	-	-	B (13.5)	B (12.0)
Southbound Jayson Drive	-	-	B (11.6)	A (6.9)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 3b) w/ <i>Improvement Option 2</i> <sup>36</sup>				
Eastbound Porter Road	-	-	B (10.2)	B (10.4)
Westbound Porter Road	--	-	B (13.5)	B (12.1)
Southbound Jayson Drive	-	-	B (11.6)	A (7.0)
2017 with The Colony at Summit Bridge West (Case 3c) w/ <i>Improvement Option 2</i> <sup>36</sup>				
Eastbound Porter Road	-	-	B (10.2)	B (10.5)
Westbound Porter Road	-	-	B (13.5)	B (12.1)
Southbound Jayson Drive	-	-	B (11.6)	A (7.0)

<sup>35</sup> JMT analyzed the roundabout using Sidra Intersection 6.0. The numbers following level of service are average delay per vehicle, measured in seconds, calculated with the Sidra Intersection US HCM Model. The analysis assumed an environment factor of 1.0.

<sup>36</sup> Improvement Option 2 includes the modification of the T-intersection of Porter Road and Jayson Drive to a one lane roundabout.

Table 7 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Roundabout <sup>35</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Porter Road and Jayson Drive</b>				
2017 with The Colony at Summit Bridge East & West, and with or without Connection to Mansion Farm Drive (Cases 4a and 4b) w/ <i>Improvement Option 2</i> <sup>36</sup>				
Eastbound Porter Road	-	-	B (10.7)	B (10.7)
Westbound Porter Road	-	-	B (13.7)	B (12.6)
Southbound Jayson Drive	-	-	B (11.7)	A (7.1)

Table 8  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>37</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Sweet Hollow Drive<sup>38,39,40</sup></b>				
2013 Existing (Case 1)				
Westbound Sweet Hollow Drive Right	D (26.5)	B (12.4)	B (11.3)	B (10.5)
2017 without The Colony at Summit Bridge East & West (Case 2)				
Westbound Sweet Hollow Drive Right	D (32.6)	B (13.6)	B (12.4)	B (10.2)
2017 with The Colony at Summit Bridge East, without Connection to Mansion Farm Drive (Case 3a)				
Westbound Sweet Hollow Drive Right	D (32.8)	B (13.7)	B (12.5)	B (10.3)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 3b)				
Westbound Sweet Hollow Drive Right	D (30.3)	B (14.2)	B (12.5)	B (10.6)
2017 with The Colony at Summit Bridge West (Case 3c)				
Westbound Sweet Hollow Drive Right	D (32.8)	B (13.7)	B (12.5)	B (10.3)
2017 with The Colony at Summit Bridge East & West, without Connection to Mansion Farm Drive (Case 4a)				
Westbound Sweet Hollow Drive Right	D (33.1)	B (13.9)	B (12.5)	B (10.4)

<sup>37</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

<sup>38</sup> Consistent with the guidelines provided in the *DelDOT Standards and Regulations for Subdivision Streets and State Highway Access*, JMT increased the PHF for the future AM cases to be 0.92 for a total intersection volume over 1,000 vph, whereas the TIS did not.

<sup>39</sup> Consistent with the guidelines provided in the *DelDOT Standards and Regulations for Subdivision Streets and State Highway Access*, JMT increased the heavy vehicle percentage along the westbound right turn for the future PM cases to be 3%, whereas the TIS increased this percentage to be 4%.

<sup>40</sup> The intersection of Summit Bridge Road and Sweet Hollow Drive will be eliminated as part of the Howell School Road DelDOT realignment project.

Table 8 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>37</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Sweet Hollow Drive<sup>38,39,40</sup></b>				
2017 with The Colony at Summit Bridge East & West, with Connection to Mansion Farm Drive (Case 4b)				
Westbound Sweet Hollow Drive Right	D (30.5)	B (14.4)	B (12.5)	B (10.7)

Table 9  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Signalized Intersection <sup>41</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Denny Road (New Castle Road 396)<sup>42,43,44,45</sup></b>				
2013 Existing (Case 1)	C (22.1) <sup>46</sup> C (22.5) <sup>47</sup>	A (9.7) <sup>46</sup> C (22.3) <sup>47</sup>	C (23.6)	C (20.2)
2017 without The Colony at Summit Bridge East & West (Case 2)	D (40.0) <sup>46</sup> C (29.3) <sup>47</sup>	B (10.7) <sup>46</sup> D (40.8) <sup>47</sup>	C (34.6)	C (32.0)
2017 with The Colony at Summit Bridge East, without Connection to Mansion Farm Drive (Case 3a)	D (40.7) <sup>46</sup> C (29.1) <sup>47</sup>	D (10.7) <sup>46</sup> D (42.8) <sup>47</sup>	C (34.6)	C (33.1)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 3b)	C (33.0) <sup>46</sup> C (29.2) <sup>47</sup>	B (10.8) <sup>46</sup> D (42.3) <sup>47</sup>	C (33.6)	C (32.4)
2017 with The Colony at Summit Bridge West (Case 3c)	D (40.6) <sup>46</sup> C (29.1) <sup>47</sup>	B (10.7) <sup>46</sup> D (42.2) <sup>47</sup>	C (34.6)	C (32.8)
2017 with The Colony at Summit Bridge East & West, without Connection to Mansion Farm Drive (Case 4a)	D (41.3) <sup>46</sup> C (29.0) <sup>47</sup>	B (10.8) <sup>46</sup> D (44.4) <sup>47</sup>	C (34.6)	C (34.0)
2017 with The Colony at Summit Bridge East & West, with Connection to Mansion Farm Drive (Case 4b)	C (33.4) <sup>26</sup> C (29.0) <sup>27</sup>	B (10.9) <sup>46</sup> D (44.0) <sup>47</sup>	C (33.6)	C (33.3)

<sup>41</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

<sup>42</sup> The TIS analyzed the intersections of northbound Summit Bridge Road and Denny Road and southbound Summit Bridge Road and Denny Road as two separate intersections whereas JMT analyzed as a single intersection.

<sup>43</sup> Heavy vehicle percentages during the AM and PM peak hours were not included in the provided traffic counts. As such, JMT utilized the heavy vehicle percentages presented in the Percent of Heavy Vehicles figure on page 20 of the TIS report.

<sup>44</sup> Right turn on red data during the AM and PM peak hours were not included in the provided traffic counts. As such, JMT utilized the right turn on red volumes presented in the Existing Right Turn on Red Traffic figure on page 21 of the TIS report. Furthermore, JMT utilized the right turn on red volume percentages proportionally in the future cases whereas the TIS utilized the existing percentages for the future cases.

<sup>45</sup> JMT utilized a 150 second cycle length during the AM and PM peak hours consistent with field observations whereas the TIS utilized a 108 second cycle length during the AM peak hour and a 113 second cycle length during the PM peak hour.

<sup>46</sup> Represents result from TIS analysis of northbound Summit Bridge Road and Denny Road.

<sup>47</sup> Represents result from TIS analysis of southbound Summit Bridge Road and Denny Road.

Table 10  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Signalized Intersection <sup>48</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Howell School Road (New Castle Road 54)<sup>49, 50, 51</sup></b>				
2013 Existing (Case 1)	C (31.0) <sup>52</sup> A (8.7) <sup>53</sup>	B (18.6) <sup>52</sup> A (9.7) <sup>53</sup>	C (23.6)	C (25.3)
2017 without The Colony at Summit Bridge East & West (Case 2)	D (49.1) <sup>52</sup> A (10.0) <sup>53</sup>	C (22.0) <sup>52</sup> B (11.4) <sup>53</sup>	C (31.0)	D (41.7)
2017 with The Colony at Summit Bridge East, without Connection to Mansion Farm Drive (Case 3a)	D (49.7) <sup>52</sup> A (10.0) <sup>53</sup>	C (24.9) <sup>52</sup> B (11.5) <sup>53</sup>	C (32.5)	D (43.9)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 3b)	D (49.8) <sup>52</sup> A (10.0) <sup>53</sup>	D (44.6) <sup>52</sup> B (11.5) <sup>53</sup>	C (30.9)	D (42.7)
2017 with The Colony at Summit Bridge West (Case 3c)	D (49.7) <sup>52</sup> A (10.0) <sup>53</sup>	C (22.3) <sup>52</sup> B (11.5) <sup>53</sup>	C (32.3)	D (42.5)
2017 with The Colony at Summit Bridge East & West, without Connection to Mansion Farm Drive (Case 4a)	D (50.3) <sup>52</sup> A (10.0) <sup>53</sup>	C (25.5) <sup>52</sup> B (11.6) <sup>53</sup>	C (33.9)	D (44.8)
2017 with The Colony at Summit Bridge East & West, with Connection to Mansion Farm Drive (Case 4b)	D (50.4) <sup>52</sup> A (10.0) <sup>53</sup>	D (45.3) <sup>52</sup> B (11.6) <sup>53</sup>	C (32.1)	D (43.6)

<sup>48</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

<sup>49</sup> The TIS analyzed the intersections of northbound Summit Bridge Road and Howell School Road and southbound Summit Bridge Road and Howell School Road as two separate intersections whereas JMT analyzed as a single intersection.

<sup>50</sup> JMT utilized the right turn on red volume percentages proportionally in the future cases whereas the TIS utilized the existing percentages for the future cases.

<sup>51</sup> JMT utilized a 150 second cycle length during the AM and PM peak hours consistent with field observations whereas the TIS utilized a 108 second cycle length during the AM peak hour and a 113 second cycle length during the PM peak hour.

<sup>52</sup> Represents result from TIS analysis of northbound Summit Bridge Road and Howell School Road.

<sup>53</sup> Represents result from TIS analysis of southbound Summit Bridge Road and Howell School Road.

Table 10 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Signalized Intersection <sup>54</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Denny Road (New Castle Road 396)/Howell School Road (New Castle Road 54)</b>				
2017 without The Colony at Summit Bridge East & West (Case 2) with Improvements <sup>55</sup>	-	-	D (50.8)	C (33.0)
2017 with The Colony at Summit Bridge East, without Connection to Mansion Farm Drive (Case 3a) with Improvements <sup>55</sup>	-	-	D (51.0)	C (33.4)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 3a) with Improvements and Right-in, Right-out Entrance Configuration <sup>56</sup>	-	-	D (51.2)	D (36.5)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 3b) with Improvements <sup>55</sup>	-	-	D (49.6)	C (33.0)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 3b) with Improvements and Right-in, Right-out Entrance Configuration <sup>56</sup>	-	-	D (49.8)	D (35.9)
2017 with The Colony at Summit Bridge West (Case 3c) with Improvements <sup>55</sup>	-	-	D (51.0)	C (33.3)

<sup>54</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

<sup>55</sup> The Improvements scenario includes the build out of the DeIDOT intersection improvement project of realigning Denny Road and Howell School Road to a four legged signalized intersection. JMT modeled the intersection to operate with a four phase signal and a 150 second cycle length. Additionally, the PHF was assumed to be 0.92 and right turn movements were modeled as permissive within the signal phasing where separate right turn lanes are provided. Furthermore, the westbound Howell School Road right turn was omitted from the analysis since it would operate as a free flow movement.

<sup>56</sup> Accounts for improvements made as part of the DeIDOT project described above and a right-in, right-out access at the entrances to both Colony-East and Colony-West at Mansion House Road and the redistribution of left and through movements at these intersections for the purpose of keeping the access to Colony-East and Colony-West unsignalized.

Table 10 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Signalized Intersection <sup>54</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Summit Bridge Road and Denny Road (New Castle Road 396)/Howell School Road (New Castle Road 54)</b>				
2017 with The Colony at Summit Bridge West (Case 3c) with Improvements and Right-in, Right-out Entrance Configuration <sup>56</sup>	-	-	D (51.5)	D (35.1)
2017 with The Colony at Summit Bridge East & West, without Connection to Mansion Farm Drive (Case 4a) with Improvements <sup>55</sup>	-	-	D (51.4)	C (33.8)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 4a) with Improvements and Right-in, Right-out Entrance Configuration <sup>56</sup>	-	-	D (52.1)	D (39.2)
2017 with The Colony at Summit Bridge East & West, with Connection to Mansion Farm Drive (Case 4b) with Improvements <sup>55</sup>	-	-	D (50.0)	C (33.3)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 4b) with Improvements and Right-in, Right-out Entrance Configuration <sup>56</sup>	-	-	D (50.6)	D (38.5)

Table 11  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>57</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Howell School Road and Robert C. Peoples Boulevard<sup>58</sup></b>				
2013 Existing (Case 1)				
Eastbound Howell School Road Left	A (7.7)	A (8.2)	A (7.7)	A (8.2)
Southbound Robert C. Peoples Boulevard Approach	B (10.3)	B (11.4)	B (10.3)	B (11.4)
2017 without The Colony at Summit Bridge East & West (Case 2)				
Eastbound Howell School Road Left	A (7.9)	A (8.5)	A (7.9)	A (8.5)
Southbound Robert C. Peoples Boulevard Approach	B (11.0)	B (13.0)	B (11.0)	B (13.0)
2017 with The Colony at Summit Bridge East, without Connection to Mansion Farm Drive (Case 3a)				
Eastbound Howell School Road Left	A (7.9)	A (8.6)	A (7.9)	A (8.6)
Southbound Robert C. Peoples Boulevard Approach	B (11.1)	B (13.1)	B (11.1)	B (13.1)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 3b)				
Eastbound Howell School Road Left	A (7.7)	A (8.1)	A (7.7)	A (8.1)
Southbound Robert C. Peoples Boulevard Approach	B (10.4)	B (10.9)	B (10.4)	B (10.9)
2017 with The Colony at Summit Bridge West (Case 3c)				
Eastbound Howell School Road Left	A (7.9)	A (8.6)	A (7.9)	A (8.6)
Southbound Robert C. Peoples Boulevard Approach	B (11.1)	B (13.2)	B (11.1)	B (13.2)

<sup>57</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

<sup>58</sup> Although striping for two lanes does not exist along the southbound Robert C. Peoples Boulevard approach, the TIS and JMT modeled the southbound approach with a separate left turn and right turn lane per field observations.

Table 11 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>57</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Howell School Road and Robert C. Peoples Boulevard<sup>58</sup></b>				
2017 with The Colony at Summit Bridge East & West, without Connection to Mansion Farm Drive (Case 4a)				
Eastbound Howell School Road Left	A (7.9)	A (8.6)	A (7.9)	A (8.6)
Southbound Robert C. Peoples Boulevard Approach	B (11.2)	B (13.3)	B (11.2)	B (13.3)
2017 with The Colony at Summit Bridge East & West, with Connection to Mansion Farm Drive (Case 4b)				
Eastbound Howell School Road Left	A (7.7)	A (8.1)	A (7.7)	A (8.1)
Southbound Robert C. Peoples Boulevard Approach	B (10.5)	B (11.0)	B (10.5)	B (11.0)

Table 11 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Roundabout <sup>59</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Howell School Road and Robert C. Peoples Boulevard</b>				
2017 without The Colony at Summit Bridge East & West (Case 2) with Improvements <sup>60</sup>				
Eastbound Howell School Road	-	-	A (5.6)	A (7.2)
Westbound Howell School Road	-	-	A (5.0)	A (8.0)
Southbound Robert C. Peoples Boulevard Approach	-	-	A (7.6)	A (5.7)
2017 with The Colony at Summit Bridge East, without Connection to Mansion Farm Drive (Case 3a) with Improvements <sup>60</sup>				
Eastbound Howell School Road	-	-	A (5.7)	A (7.3)
Westbound Howell School Road	-	-	A (5.0)	A (8.5)
Southbound Robert C. Peoples Boulevard Approach	-	-	A (7.7)	A (5.8)
2017 with The Colony at Summit Bridge East, with Connection to Mansion Farm Drive (Case 3b) with Improvements <sup>60</sup>				
Eastbound Howell School Road	-	-	A (5.0)	A (5.2)
Westbound Howell School Road	-	-	A (4.5)	A (6.6)
Southbound Robert C. Peoples Boulevard Approach	-	-	A (5.9)	A (4.9)

<sup>59</sup> JMT analyzed the roundabout using Sidra Intersection 6.0. The numbers following level of service are average delay per vehicle, measured in seconds, calculated with the Sidra Intersection US HCM Model. The analysis assumed an environment factor of 1.0.

<sup>60</sup> The Improvements scenario includes the build out of the DelDOT intersection improvement project of converting the T-intersection of Howell School Road and Robert C. Peoples Boulevard to a one lane roundabout.

Table 11 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Roundabout <sup>59</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Howell School Road and Robert C. Peoples Boulevard</b>				
2017 with The Colony at Summit Bridge West (Case 3c) with Improvements <sup>60</sup>				
Eastbound Howell School Road	-	-	A (5.7)	A (7.3)
Westbound Howell School Road	-	-	A (5.0)	A (8.5)
Southbound Robert C. Peoples Boulevard Approach	-	-	A (7.7)	A (5.8)
2017 with The Colony at Summit Bridge East & West, without Connection to Mansion Farm Drive (Case 4a) with Improvements <sup>60</sup>				
Eastbound Howell School Road	-	-	A (5.7)	A (7.4)
Westbound Howell School Road	-	-	A (5.1)	A (8.6)
Southbound Robert C. Peoples Boulevard Approach	-	-	A (7.7)	A (5.9)
2017 with The Colony at Summit Bridge East & West, with Connection to Mansion Farm Drive (Case 4b) with Improvements <sup>60</sup>				
Eastbound Howell School Road	-	-	A (5.1)	A (5.3)
Westbound Howell School Road	-	-	A (4.6)	A (6.7)
Southbound Robert C. Peoples Boulevard Approach	-	-	A (5.9)	A (4.9)

Table 12  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>61</sup> All-Way Stop Control	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Denny Road and Lexington Parkway and Airdrie Drive<sup>62,63</sup></b>				
2013 Existing (Case 1) <sup>64</sup>				
Eastbound Lexington Parkway Approach	A (9.90)	A (8.08)	A (9.33)	A (8.17)
Westbound Denny Road Approach	A (8.53)	A (8.71)	A (8.56)	A (8.73)
Northbound Denny Road Approach	A (8.14)	A (7.45)	A (8.14)	A (7.48)
Southbound Airdrie Drive Approach	A (8.26)	A (7.86)	A (8.27)	A (7.89)
Overall Intersection	A (8.57)	A (8.38)	A (8.59)	A (8.41)
2017 without The Colony at Summit Bridge East & West (Case 2)				
Eastbound Lexington Parkway Approach	A (9.59)	A (8.39)	A (9.62)	A (8.39)
Westbound Denny Road Approach	A (8.89)	A (9.45)	A (8.91)	A (9.45)
Northbound Denny Road Approach	A (8.80)	A (7.94)	A (8.80)	A (7.94)
Southbound Airdrie Drive Approach	A (8.47)	A (8.15)	A (8.47)	A (8.15)
Overall Intersection	A (8.99)	A (8.97)	A (9.01)	A (8.97)
2017 with The Colony at Summit Bridge East, and with or without Connection to Mansion Farm Drive (Cases 3a and 3b)				
Eastbound Lexington Parkway Approach	A (9.59)	A (8.39)	A (9.62)	A (8.39)
Westbound Denny Road Approach	A (8.89)	A (9.45)	A (8.91)	A (9.45)
Northbound Denny Road Approach	A (8.80)	A (7.94)	A (8.80)	A (7.94)
Southbound Airdrie Drive Approach	A (8.47)	A (8.15)	A (8.47)	A (8.15)
Overall Intersection	A (8.99)	A (8.97)	A (9.01)	A (8.97)

<sup>61</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

<sup>62</sup> JMT utilized the heavy vehicle percentage per lane group along the eastbound and westbound approaches during the AM peak hour whereas the TIS did not.

<sup>63</sup> Although the intersection is under three-way stop control, both the TIS and JMT analyzed the intersection under all-way stop control.

<sup>64</sup> JMT utilized the Case 1 PM peak hour volume of 63 vehicles for the eastbound Lexington Parkway through movement per the 2013 Seasonally Adjusted Traffic Volumes figure on page 19 of the TIS report whereas the TIS did not.

Table 12 (Continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
Based on Final Traffic Impact Study for The Colony at Summit Bridge East and West  
Prepared by Karins and Associates

Unsignalized Intersection <sup>61</sup> All-Way Stop Control	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Denny Road and Lexington Parkway and Airdrie Drive<sup>62,63</sup></b>				
2017 with The Colony at Summit Bridge West (Case 3c)				
Eastbound Lexington Parkway Approach	A (9.59)	A (8.39)	A (9.62)	A (8.39)
Westbound Denny Road Approach	A (8.89)	A (9.45)	A (8.91)	A (9.45)
Northbound Denny Road Approach	A (8.80)	A (7.94)	A (8.80)	A (7.94)
Southbound Airdrie Drive Approach	A (8.47)	A (8.15)	A (8.47)	A (8.15)
Overall Intersection	A (8.99)	A (8.97)	A (9.01)	A (8.97)
2017 with The Colony at Summit Bridge East & West, and with or without Connection to Mansion Farm Drive (Cases 4a and 4b)				
Eastbound Lexington Parkway Approach	A (9.59)	A (8.39)	A (9.62)	A (8.39)
Westbound Denny Road Approach	A (8.89)	A (9.45)	A (8.91)	A (9.45)
Northbound Denny Road Approach	A (8.80)	A (7.94)	A (8.80)	A (7.94)
Southbound Airdrie Drive Approach	A (8.47)	A (8.15)	A (8.47)	A (8.15)
Overall Intersection	A (8.99)	A (8.97)	A (9.01)	A (8.97)