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Maryland Park Industrial Development

Maryland Heights, Missouri

Prepared for:

Altus Properties

231 S Bemiston Avenue, Suite 650

St. Louis, MO 63105

Prepared by:

Lochmueller Group

411 N. 10th Street, Suite 200

St. Louis, MO 63101

#522-0142

LOCHMUELLER GROUP

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Executive Summary

Lochmueller Group has prepared a traffic study for the Maryland Park Industrial Development proposed by Altus Properties, to be located in Maryland Heights, Missouri. This study focuses on the development of 30 acres along Creve Coeur Airport Road with the intention to construct up to three buildings of various size for a total of 361,100 SF that would be utilized for warehousing/distribution. Access to the site is proposed via two driveways along Creve Coeur Airport Road, which ultimately connects to Missouri Route 141 (MO 141) via a signalized intersection.

In November 2022, a comprehensive traffic analysis was done of the corridor on the behalf of the proposed (and since approved) 364 Logistics Center (NorthPoint Development) which considered a significant amount of committed and planned developments within the immediate area, all of which rely upon MO 141 as a means of access. This study contemplated the development of 345,500 SF on the subject tract under consideration by Altus Properties as well as the Maryland Heights Commerce Center (as well as its potential expansion), the Golf Port Apartments and Retail, the Westport Commerce Center, the 141 Logistics Center, River Valley Commerce Center and the 364 Logistics Center; all of which have been approved at some level by the City of Maryland Heights over the past several years. However, to date, most of these developments have not yet been constructed and occupied.

Hence, these committed and planned developments were folded into the November 2022 study's scenarios to properly account for their impact on future conditions along MO 141. Based on the study's analysis, several improvements to the study area were determined, as follows:

- Traffic volumes along MO 141 due to continued growth in the area could potentially exceed the capacity provided by two through lanes in the northbound and southbound directions. Three through lanes may ultimately be required in both directions to accommodate the heavy vehicular demand as well as better serve the demands on the side street approaches at the signalized intersections. Per the study, the need for third through lane in each direction on MO 141 would occur at some time beyond the year 2027 but likely prior to the year 2047. In order for the additional lanes on MO 141 to be effective, they would extend, at a minimum, from Casino Drive to River Valley Drive; a distance of approximately 2.5 miles.
- Lengthen the existing 100-foot eastbound left turn lane on Sport Port Road approaching MO 141 to provide 250 feet of storage capacity, exclusive of taper. This is required prior to the development of 740,000 SF within 364 Logistics Center (assumed to be in place by the year 2025). It should be noted that this improvement would eventually be replaced by dual eastbound left turn lanes.
- Dual eastbound left turn lanes should be provided on Sport Port Road's approach to MO 141 would be required by the year 2027 to accommodate the traffic associated with the Maryland Heights Commerce Center (expanded) and/or 364 Logistics Center.
- Dual northbound left turn lanes should be provided on MO 141's approach to the signalized intersection with Sport Port Road by the year 2027 and prior to build out of the 364 Logistics Center. These lanes should each provide 200 feet of storage capacity, exclusive of tapers.
- Sport Port Road would be widened to provide an additional receiving lane for the dual northbound left turn lanes on MO 141. Two westbound lanes would continue on Sport Port Road terminating at the future intersection with River Valley Parkway (to be built by Maryland Heights Commerce Center) as a dedicated right turn lane and a through lane. Should River Valley Parkway not be constructed by this time, the two westbound lanes on Sport Port Road should be carried approximately 650 feet before tapering back to one lane.

- The City of Maryland Heights should continue to pursue the construction and expansion of River Valley Parkway as a means of providing a meaningful parallel route to MO 141.

Given the extensive effort put forth in the November 2022 study, it was agreed upon by the City of Maryland Heights and the Missouri Department of Transportation (MoDOT) that this current study undertaking on the behalf of Altus Properties proposed development could essentially be an *update* of the November 2022 study. The study parameters in terms of time periods and study intersections remained the same. However, three modifications were accounted for in the updated TIS:

- Square footage for the subject tract would be updated to 361,100 SF as proposed by Altus Properties.
- The timing of the development tract by Altus Properties would be pushed forward to the year 2025 (previously was factored in for the year 2027 in the original TIS).
- The baseline traffic volumes along MO 141 would be adjusted to reflect the data collected by MoDOT in September 2022.

The analysis at the study intersections was updated for the following scenarios (as agreed upon by MODOT and the City). Note, the year 2047 was retained as the 20-year horizon to be consistent with the November 2022 study:

- 2022/23 Existing Conditions;
- 2025 Baseline Conditions (inclusive of approved developments anticipated to be online by 2025)
- 2025 Forecasted Conditions (with development of 361,100 SF on subject tract)
- 2047 Baseline Conditions; and
- 2047 Forecasted Conditions (with development of 361,100 SF on subject tract).

Following the updated analysis to reflect the current development proposal by Altus Properties, the following was concluded:

- As proposed, 361,100 SF of warehousing/distribution uses would generate a total of 67 trips in the AM peak hour and 70 trips in the PM peak hour. Included in those total trips would be approximately 7 truck trips in the AM peak hour and 11 truck trips in the PM peak hour.
- The current proposed square footage on the subject tract represents an increase of 15,600 SF over that accounted for in the November 2022 study. This increase in square footage amounts to an increase in two trips in either peak hour, which is negligible.
- Access to the site is proposed via two driveways along Creve Coeur Airport Road, which ultimately connects to Missouri Route 141 (MO 141) via a signalized intersection. Based on the operational analysis at the intersection of Creve Coeur Airport Road and MO 141, the eastbound queue is not expected to extend past the access drive. Therefore, no additional recommendations are necessary for the access drive or eastbound operations.

In addition, historical crash data (2018-2022) from MoDOT was utilized to weight predicted crashes based on actual accident data for the study area. Over the 5-year period, 25 crashes occurred at the intersection of Creve Coeur Airport Road and MO 141. There was six minor injury-related crash and sixteen Property Damage Only (PDO) crashes and three suspected serious injury-related crashes were reported. A safety

analysis was performed in accordance with methodologies outlined in the Highway Safety Manual (HSM) and demonstrated that the proposed mitigation measures in place at this intersection would not significantly impact crash frequency.

The following report outlines in detail the methodology and analysis that supports the above conclusions.

Introduction

Lochmueller Group has prepared a traffic study for the Maryland Park Industrial Development proposed by Altus Properties, to be located in Maryland Heights, Missouri. This study focuses on the development of 30 acres along Creve Coeur Airport Road with the intention to construct up to three buildings of various size for a total of 361,100 SF that would be utilized for warehousing/distribution. Access to the site is proposed via two driveways along Creve Coeur Airport Road, which ultimately connects to Missouri Route 141 (MO 141) via a signalized intersection. Figure 1 illustrates the proposed location of the Maryland Park Industrial Development with the proposed site plan shown in **Figure 2**.

Figure 1: Location of Proposed Maryland Park Industrial Development

In November 2022, a comprehensive traffic analysis was done of the corridor on the behalf of the proposed (and since approved) 364 Logistics Center (NorthPoint Development) which considered a significant amount of committed and planned developments within the immediate area, all of which rely upon MO 141 as a means of access. This study contemplated the development of 345,500 SF on the subject tract under consideration by Altus Properties as well as the Maryland Heights Commerce Center (as well as its potential expansion), the Golf Port Apartments and Retail, the Westport Commerce Center, the 141 Logistics Center, River Valley Commerce Center and the 364 Logistics Center have all been approved by the City of Maryland Heights over the past several years. However, to date, most of these developments have not yet been constructed and occupied.

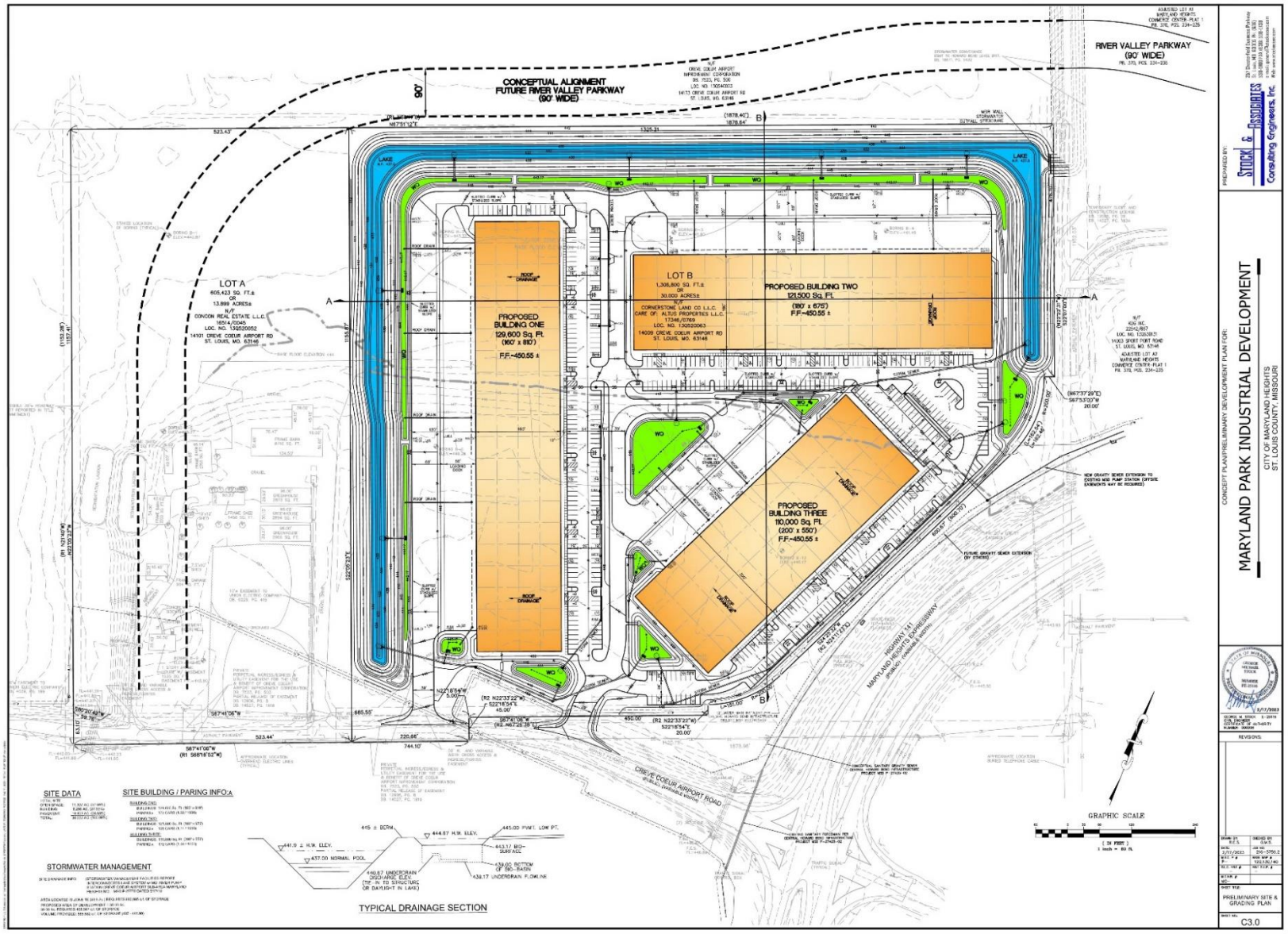

Figure 2: Proposed Maryland Park Industrial Development (Provided by Others)

Given the extensive effort put forth in the November 2022 study, it was agreed upon by the City of Maryland Heights and the Missouri Department of Transportation (MoDOT) that this current study for Altus Properties proposed development could essentially be an *update* of the November 2022 study. The study parameters in terms of time periods and study intersections are to remain the same and are as follows:

- Time Periods:
  - Weekday morning commuter peak period (7 AM to 9 AM)
  - Weekday afternoon commuter peak period (4 PM to 6 PM)

- Study Intersections:
  - Sport Port Road & Missouri Route 141 (signalized)
  - Creve Coeur Mill/Airport Road & Missouri Route 141 (signalized)
  - River Valley Road & Missouri Route 141 (signalized)
  - Site Access Drives at Creve Coeur Airport Road (unsignalized)

However, three modifications will be accounted for in the updated TIS:

- Square footage for the subject tract would be updated to 361,100 SF as proposed by Altus Properties.
- The timing of the development tract by Altus Properties would be pushed forward to the year 2025 (previously was factored in for the year 2027 in the original TIS).
- The baseline traffic volumes along MO 141 would be adjusted to reflect the data collected by MoDOT in September 2022.

The analysis at the study intersections was updated for the following scenarios (as agreed upon by MODOT and the City). Note, the year 2047 was retained as the 20-year horizon to be consistent with the November 2022 study:

- 2022/23 Existing Conditions
- 2025 Baseline Conditions (inclusive of approved developments anticipated to be online by 2025 and background growth)
- 2025 Forecasted Conditions (with development of 361,100 SF on subject tract)
- 2047 Baseline Conditions
- 2047 Forecasted Conditions (with development of 361,100 SF on subject tract)

This following report presents the updated study's methodology and findings.

Existing Roadway Network

Study Area Roadways

Missouri Route 141 (Maryland Heights Expressway) is controlled by MoDOT and is classified as an expressway by East West Gateway. MO 141 is a four-lane freeway with two lanes in each direction and a speed limit of 55 miles per hour (mph) through the study area. MO 141 runs north to MO Route 370 and south all the way through St. Louis County and into Jefferson County.

Golf Port Drive/Sport Port Road is classified as a local road with a speed limit of 30 mph. The intersection of MO 141 and Golf Port Drive/Sport Port Road is signalized. The eastbound approach along Sport Port Road consists of one left-turn lane and one shared through/right-turn lane. The westbound approach along Golf Port Drive consists of one left-turn lane and one shared through/right-turn lane. The northbound and southbound approaches along MO 141 consist of a dedicated left-turn lane, two through lanes, and a dedicated right-turn lane.

Creve Coeur Mill Road is classified as a minor collector with a speed limit of 45 mph, whereas **Creve Coeur Airport Road** is classified as a local road. The intersection of MO 141 and Creve Coeur Mill Road/Creve Coeur Airport Road is signalized. The eastbound approach along Creve Coeur Airport Road consists of one left-turn lane and one shared through/right-turn lane. The westbound approach along Creve Coeur Mill Road consists of one left-turn lane, one through, and one right-turn lane. The northbound and southbound approaches along MO 141 consist of a dedicated left-turn lane, two through lanes, and a dedicated right-turn lane.

River Valley Drive is classified as a local road. River Valley Drive is comprised of two lanes; one in each direction and the speed limit along River Valley Drive varies between 35 mph on the northern end to 40 mph on the southern end. The intersection of River Valley Drive with MO 141 is in the process of being improved due to obligations associated with the development of Westport Commerce Center, 141 Logistics Center and River Valley Commerce Center. Once in place, the intersection would provide for dual northbound left turn lanes on MO 141, a third southbound through lane on MO 141, and widening of the west leg to provide for a dedicated eastbound left-turn lane, a shared eastbound left/through lane and a dedicated eastbound right turn lane. **Figure 3** represents the lane configuration at the improved intersection.

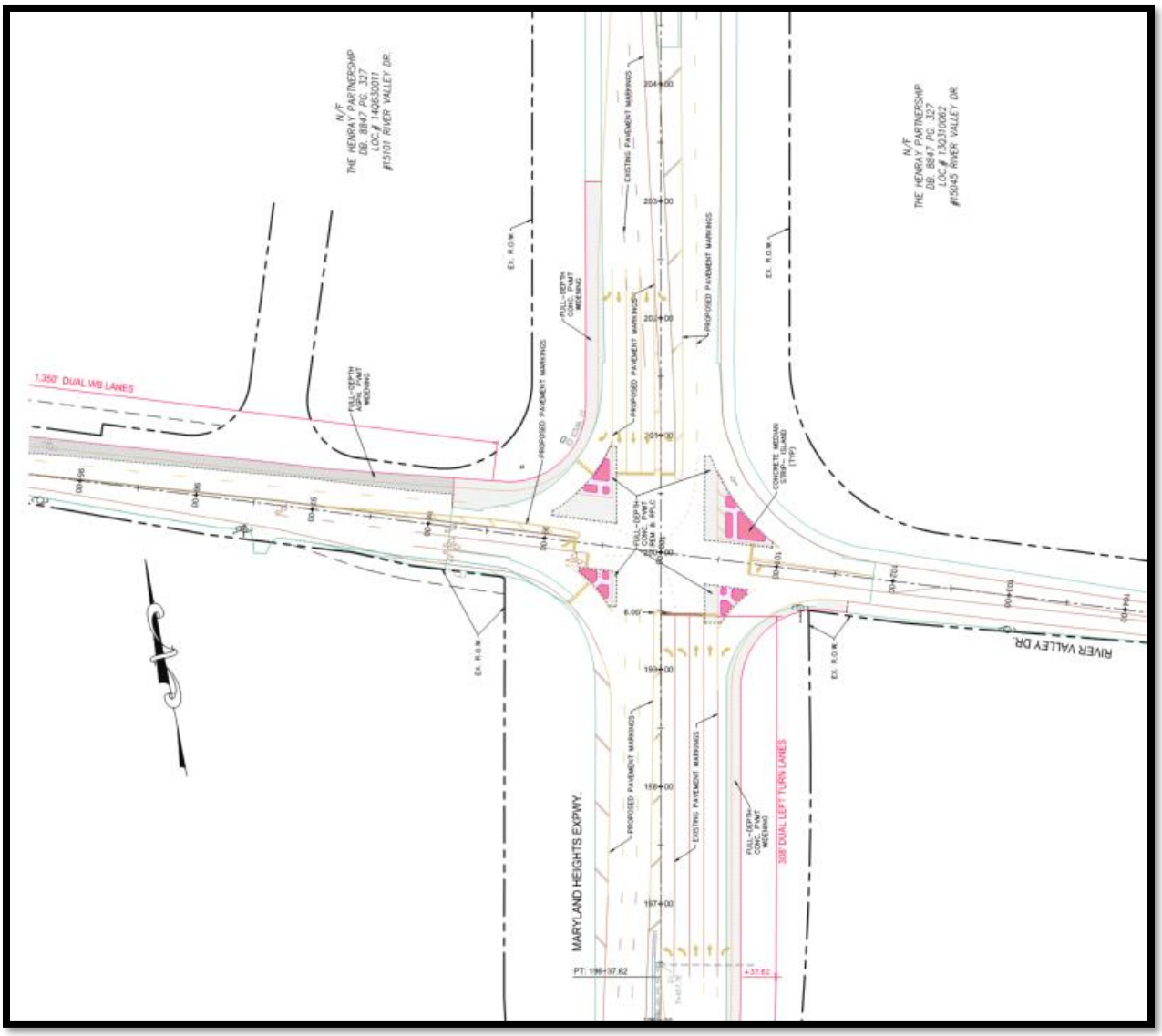

Figure 3: Improved Intersection of MO 141 & River Valley Road

The existing lane configuration and traffic control at the study intersections included in the study area are depicted in **Figure 4.**

Pedestrian/Bicycle Accommodations

MO 141 currently lacks sidewalks, crosswalks and dedicated bicycle facilities. Pedestrian accommodations are not provided at the signalized intersections along MO 141 at Sport Port Road or at Creve Coeur Mill Road/Airport Road. However, Creve Coeur Lake and Creve Coeur Park are located directly south and east of the development area. There are several trails within Creve Coeur Park which accommodate both pedestrians and bicyclists. The Creve Coeur Park Connector, a bike and pedestrian trail, runs through the southern portion of the study area. While the Connector does not run directly along any of the study roads, River Valley Drive experiences high bicycle volumes as riders travel between the Connector and nearby parks. A shoulder approximately 9 feet (ft) in width runs along River Valley Drive which serves as a defacto bicycle lane.

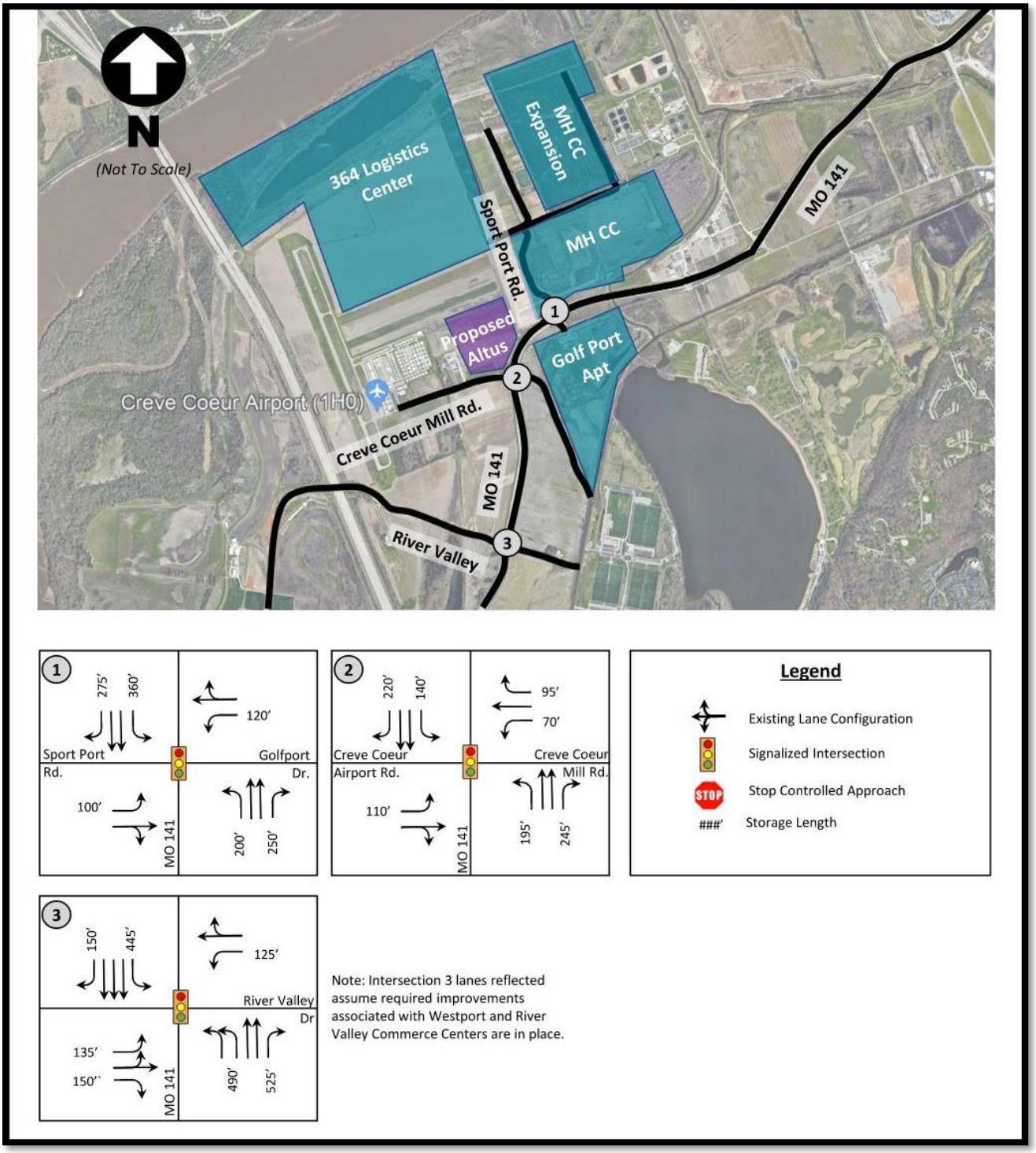

Figure 4: Year 2023 Baseline Lane Configurations

Development Along the MO 141 Corridor

To properly quantify the impact of the proposed Maryland Park Industrial Development, it is necessary to evaluate the amount of traffic generated by the development and its impact to the surrounding road network. However, this effort is complicated by the significant amount of committed and planned developments in the immediate area, all of which rely upon MO 141 as a means of access. The Maryland Heights Commerce Center (as well as its potential expansion), the Golf Port Apartments and Retail, the Westport Commerce Center, the 141 Logistics Center, the River Valley Commerce Center and the 364 Logistics Center have all been approved in some capacity by the City of Maryland Heights over the past several years. However, to date, the vast majority of these developments have not yet been constructed and occupied. **Figure 5** depicts the locations of the various developments along the MO 141 corridor.

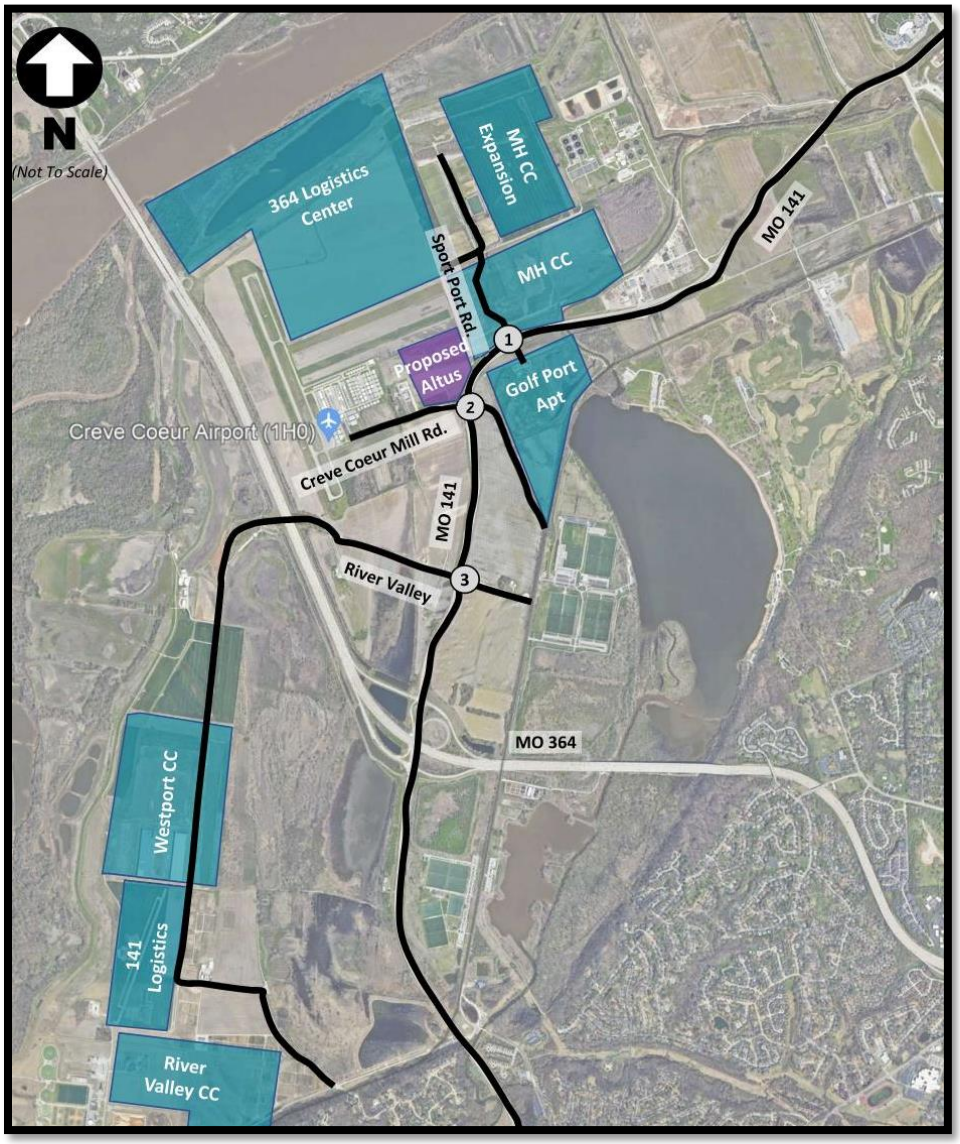

Figure 5: Development along the MO 141 Corridor

An overview of the surrounding developments, including the proposed Maryland Park Industrial Development, is shown below in **Table 1**, which details square footage by phase, development status, and relevant assumptions.

Table 1: Summary of Developments Along MO 141 and Assumptions

Development	Build Out Size	Build Out Use	Status	Assumptions
Maryland Heights Commerce Center	239,145	Office Flex	Committed	Lots 1 and 4; Lot 4 (63,645 SF) constructed in 2023; Lot 1 (175,500 SF) constructed in 2025
	773,900	Office Dist.	Committed - Lot 3 / Planned Lot 2	Lots 2 and 3; Lot 2 (404,700) constructed by 2027; Lot 3 (369,200 SF) constructed in 2024
	340,500	Office Flex	Planned	Lots 9, 10 and 11 of Ortmann Tract Expansion; constructed by 2027
	748,000	Office Dist.	Planned	Lots 12 and 13 of Ortmann Tract Expansion; no defined timeframe (assumed in place by 2047)
Golf Port Apartments	276	Apartments	Under Construction	Phase 1; constructed by 2023
	168	Apartments	Committed	Phase 2; constructed by 2026
	156	Apartments	Committed	Phase 3; constructed by 2029
	175	Apartments	Committed	Phase 4; constructed by 2032
	22	Villas	Committed	Phase 4; constructed by 2032
	20,000	Medical Office	Committed	Constructed in 2024
	20,000	Retail	Committed	Constructed in 2025
	3,500	QSR	Committed	Constructed in 2026
Westport Commerce Center	606,585	Office Flex	Under Construction	Phase 1 in place by 2023
	222,768	Office Flex	Under Construction	Phase 2 in place by 2023
	505,440	Office Flex	Committed	Phase 3 in place by 2025
141 Logistics Center	540,800	Office Flex	Committed	Phase 1 in place by 2024
	540,800	Office Flex	Committed	Phase 2 in place by 2027
River Valley Commerce Center	256,880	Office Dist.	Under Construction	In place by 2023
	354,000	Office Dist.	Committed	In place by 2024
	495,000	Office Dist.	Committed	In place by 2025
Proposed 364 Logistics Center	740,000	Office Dist.	Committed	Phase 1 in place by 2025
	1,157,000	Office Dist.	Committed	Phase 2 in place by 2027
Altus Properties	**361,100**	**Office Dist.**	**Planned (Current TIS)**	**Assumed in place by 2025**

The trip generation for all the various developments in the area, not just the Maryland Park Industrial Development, were included in the scenarios in an effort to align the probable timelines of the various developments into a realistic depiction of the future conditions within the study area. A technical memorandum detailing the concept plans, trip generation, directional distribution, annual background growth percentage, and heavy vehicle percentage for the developments by scenario year was completed and approved by MoDOT and the City of Maryland Heights prior to the documentation of the November 2022 report.

A summary of each of the developments is presented in the subsequent subsections. Please see Appendix for detailed information pertaining to each development.

Maryland Heights Commerce Center

The Maryland Heights Commerce Center is in development by KBG, Inc. Access to the site is provided via Sport Port Road and the future River Valley Parkway, which would be constructed in conjunction with the development of the Maryland Heights Commerce Center. River Valley Parkway's alignment is fixed to where the Metropolitan Sewer District (MSD) has provided an easement and will be built in phases from Sport Port Road to the property line as access is needed. It is envisioned that this roadway would initially be comprised of two travel lanes with turn lanes as needed. Additionally, the Maryland Heights Commerce Center has the potential for expansion onto the Ortmann Tract. The trip generation for the various phases on the MH Commerce Center are reflected in **Table 2.**

Table 2: Maryland Heights Commerce Center Trip Generation

Scenario Year	Size (SF)	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2023	63,645	Office Flex	130	18 (1)	4 (2)	22 (3)	5 (1)	17 (2)	22 (3)
2025	175,500	Office Flex	130	48 (3)	12 (4)	60 (7)	13 (3)	47 (4)	60 (7)
2025	369,200	Office Dist.	150	52 (3)	16 (4)	68 (7)	20 (6)	51 (5)	71 (11)
2027	404,700	Office Dist.	150	55 (4)	17 (4)	72 (8)	21 (6)	54 (6)	75 (12)
2027	340,500	Office Flex	130	94 (6)	22 (8)	116 (14)	25 (5)	91 (9)	116 (14)
2047	748,000	Office Dist.	150	87 (8)	26 (7)	113 (15)	32 (11)	84 (11)	116 (22)
Total Development				354 (25)	97 (29)	451 (54)	116 (32)	344 (37)	460 (69)

The traffic study for the proposed Maryland Heights Commerce Center (not including the expansion to the Ortmann Tract), completed in 2018, determined an extension of the eastbound left turn bay to provide for 200 feet of storage and signal timings adjustments were necessary on Sport Port Road by the year 2025. It was also determined that three northbound and three southbound lanes would be needed on MO 141 with the 20-year horizon.

It should be noted that the expansion of the Maryland Heights Commerce Center onto the Ortmann Tract (in year 2027 and beyond) was not evaluated as part of the 2018 TIS. The City of Maryland Heights is requiring a TIS to be completed that would consider development on the Ortmann Tract prior to construction on those parcels.

Golf Port Apartment

The Golf Port Apartments is also in development by KBG, Inc. and is located in the northeast quadrant of MO 141 and Golf Port Drive. The development includes several phases of apartments, villas, medical office space, retail space, and a quick service restaurant. Currently, the first phase of the development of 276

apartments is under construction. The remaining phases are anticipated for construction between 2024 and 2032. The Golf Port Apartments development will have site access to MO 141 via Golf Port Drive and Creve Coeur Mill Road. The trip generation volumes for the Golf Port Apartments development are shown below in **Table 3.**

Table 3: Golf Port Apartments Trip Generation

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2023	276	Apartments	221	25	85	110	66	42	108
2025	20,000	Med Office	720	49	13	62	24	55	79
2025	20,000	Retail	822	28	19	47	66	66	132
2027	168	Apartments	221	14	48	62	37	24	61
2027	3,500	QSR	934	79	77	156	60	56	116
2047	156	Apartments	221	13	44	57	40	26	66
2047	175	Apartments	221	15	50	65	42	27	69
2047	22	Villas	220	7	23	30	19	11	30
Total Development				230	359	589	354	307	661

The traffic study for the proposed Golf Port Apartments, completed December 2021, determined that permitted-protected phasing for the side streets of Golf Port Drive/Sport Port Road at MO 141 should be implemented (FYA), that a 120 second cycle length should be used along the MO 141 corridor during the PM peak period, that the westbound left turn from Creve Coeur Mill Road onto MO 141 should be lengthened to provide 150 feet of storage, and that the westbound left turn lane from Golf Port Road should be lengthened to 200 feet. It was also determined that three northbound and three southbound lanes would be needed on MO 141 within the 20-year horizon.

Westport Commerce Center

The Westport Commerce Center, as proposed by TriStar Companies, is to be located southwest of Route 364 and MO 141 along River Valley Drive. Phases 1 and 2 of the development will be complete by 2023 with the third phase completed by 2025. The development will encompass a total of 1.33 million SF of office distribution and light industrial uses. Access to the site is provided via three driveways along the west side only of River Valley Drive. The trip generation volumes for the Westport Commerce Center development are shown below in **Table 4.**

Table 4: Westport Commerce Center Trip Generation

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2023	829,353	Office Flex	130	228 (15)	54 (18)	282 (33)	62 (12)	220 (21)	282 (33)
2025	505,440	Office Flex	130	139 (9)	33 (11)	172 (20)	38 (7)	134 (13)	172 (20)
Total Development				367 (24)	87 (29)	454 (53)	100 (19)	354 (34)	454 (53)

The traffic study for the Westport Commerce Center, completed in 2020, determined the following improvements were necessary by the time the center provided for 175,000 SF:

- Widen west leg of River Valley Drive to provide an additional lane approaching MO 141
- Stripe the widened eastbound approach to provide a dedicated left turn lane, a shared left/through lane, and a dedicated right turn lane
- Widen southbound MO 141 to provide a dedicated right turn lane and a third southbound through lane
- Modify the traffic signal's phasing to provide split phasing for River Valley Drive approaches

These improvements are currently under construction.

141 Logistics Center

The 141 Logistics Center is currently under development by Clearpath Development Partners and is located southwest of Route 364 and MO 141 along River Valley Drive. The development will encompass a total of 1.08 million SF of office distribution and light industrial uses, similar to the adjacent Westport Commerce Center. Access to the site is provided via four drives; two onto River Valley Drive and two onto Hog Hollow Road. The trip generation volumes for the 141 Logistics Center development are shown below in **Table 5**.

Table 5: 141 Logistics Center Trip Generation

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2025	540,800	Office Flex	130	149 (10)	35 (12)	184 (22)	40 (8)	144 (14)	184 (22)
2027	540,800	Office Flex	130	149 (10)	35 (12)	184 (22)	40 (8)	144 (14)	184 (22)
Total Development				298 (20)	70 (24)	368 (44)	80 (16)	288 (28)	368 (44)

The 141 Logistics Center's traffic impact was evaluated with the obligated improvements for the Westport Commerce Center, presented above, in place. With the addition of the 141 Logistics Center, the analysis determined the need for additional improvements to accommodate the increase in traffic. Improvements triggered for the intersection of MO 141 at River Valley Drive by the 141 Logistics Center included:

- Dual northbound left-turn lanes on MO 141 with appropriate signal modifications
- Widening of River Valley Drive, west of MO 141, to accommodate an additional receiving lane
- Signal timing changes to adjust for increase demand at various approaches

River Valley Commerce Center

The River Valley Commerce Center is currently under construction by North Point Development and will be located southwest of Route 364 and MO 141 along River Valley Drive and Hog Hollow Road. The site will accommodate a total of 1.1 million SF of office distribution space. Access to the site is provided via two drives: one as an extension of River Valley Drive and one onto Hog Hollow Road. An additional third site access point for emergency vehicles will be provided on the western edge of the site, along Hog Hollow Road. The trip generation volumes for the River Valley Commerce Center development are shown below in **Table 6.**

Table 6: River Valley Commerce Center Trip Generation

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2023	256,800	Office Dist.	150	41 (3)	13 (2)	54 (5)	16 (4)	41 (4)	57 (8)
2025	354,000	Office Dist.	150	51 (4)	15 (3)	66 (7)	19 (6)	50 (5)	69 (11)
2025	495,000	Office Dist.	150	64 (5)	19 (5)	83 (10)	24 (8)	62 (7)	86 (15)
Total Development				156 (12)	47 (10)	203 (22)	59 (18)	153 (16)	212 (34)

The River Valley Commerce Center's impact was evaluated with the obligated improvements for the Westport Commerce Center, presented previously, in place. With the addition of the River Valley Commerce Center, the analysis determined the need for additional improvements at the intersection of MO 141 at River Valley Drive to accommodate the increase in traffic, which included:

- Dual northbound left-turn lanes on MO 141 with appropriate signal modifications
- Widening of River Valley Drive, west of MO 141, to accommodate an additional receiving lane
- Signal timing changes to adjust for increase demand at various approaches

Note the improvements are the same as required by 141 Logistics Center. If both developments move forward concurrently, there is the potential for a cost sharing opportunity. Otherwise, whichever development is in place first would be responsible for constructing the additional improvements.

364 Logistics Center

NorthPoint's 364 Logistics Center was the development under review for the November 2022 study of the traffic along MO 141 and was subsequently approved by the City of Maryland Heights. The development is comprised of up to five buildings of various size for a total of 1,897,000 SF. Access to the site is proposed via one drive at the western termination of Hooks River Road, which ultimately connects to Missouri Route 141 via Sport Port Road. The trip generation for the 364 Logistics Center are summarized in **Table 7**.

Table 7: 364 Logistics Center Trip Generation

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2025	740,000	Office Dist.	150	86 (8)	26 (7)	112 (15)	32 (11)	83 (11)	115 (22)
2027	1,157,000	Office Dist.	150	125 (12)	37 (11)	162 (23)	46 (18)	119 (17)	165 (35)
Total Development				211 (20)	63 (18)	274 (38)	78 (29)	202 (28)	280 (57)

Proposed Maryland Park Industrial Development

Altus Properties' Maryland Park Industrial Development is the proposed development under review for this current iteration of the study of the traffic along MO 141. The proposed development is comprised of up to three buildings of various size for a total of 361,100 SF. Access to the site is proposed via two drives along Creve Coeur Airport Road, which ultimately connects to Missouri Route 141 via Sport Port Road. The eastern drive is currently proposed approximately 415 feet back from the eastbound stop bar at MO 141 and the western drive is an additional 285 feet further to the west. The proposed site development plan was presented in Figure 2 previously.

Trip Generation

The site-generated traffic volumes for the Maryland Park Industrial Development were estimated using data provided in the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition utilizing gross floor area (GFA) as the determining variable. Land Use 150: Warehousing was utilized for the calculations, as discussed during the scoping meeting with the respective agencies. The fitted curve equation was provided and used as there were more than 20 data points available.

The forecasted trips that would be generated by the proposed development are summarized in **Table 8**. As shown, the proposed development would generate a total of approximately 67 trips during the weekday morning peak hour and 70 trips during the weekday evening peak hour upon completion. Truck trip generation volumes are shown alongside the total vehicle trip generation in Table 8. Please note that the truck generation volumes shown in the tables are accounted for in the total vehicle trip generation and are not in addition to the vehicle trip generation volumes.

Table 8: Proposed Maryland Park Industrial Development Trip Generation

Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2025	361,100	Office Dist.	150	52 (4)	15 (3)	67 (7)	20 (6)	50 (5)	70 (11)

As previously mentioned, the subject tract was considered in the November 2022 approved TIS. However, at that time, a total of 345,500 SF of warehouse use was considered. **Table 9** compares the original trip generation estimate for the subject tract, as presented in November 2022, to the current proposal for 361,100 SF of warehouse use. As can be seen, the increase in trips associated with the latest development proposal is negligible.

Table 9: Trip Generation Comparison for Subject Tract

Scenario	Size (SF)	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
Approved November 2022 TIS	345,500	Office Dist.	150	50 (4)	15 (3)	65 (7)	19 (5)	49 (5)	68 (10)
Current Proposal	361,100	Office Dist.	150	52 (4)	15 (3)	67 (7)	20 (6)	50 (5)	70 (11)
Difference	+15.600	NA	NA	+2 (0)	0 (0)	+2 (0)	+1(+1)	+1 (0)	+2 (+1)

Directional Distribution

Given the proposed development's location adjacent to the Maryland Heights Commerce Center and the 364 Logistics Center, the travel patterns were assumed to be the similar to the distribution pattern applied to those uses (as presented in the November 2022 study). The patterns are summarized below in Table 10.

Table 10: Proposed Maryland Park Industrial Development Directional Distribution

Route	Directional Distribution	
	Passenger Vehicles	Heavy Trucks
To/From the North on MO 141	**53%**	**65%**
• To/From the West on I-70	20%	30%
• To/From the East on I-70	20%	35%
• To/From the North on MO 141, North of I-70	5%	0%
• To/From the East on Marine Avenue	5%	0%
• To/From the East on Creve Coeur Mill Road	3%	0%
To/From the South on MO 141	**47%**	**35%**
• To/From the East on MO 364 (Page Avenue)	15%	19%
• To/From the West on MO 364 (Page Avenue)	15%	10%
• To/From the South on MO 141	15%	6%
• To/From the South on Creve Coeur Mill Road	2%	0%

The site generated traffic for the Maryland Park Industrial Development was assigned to the area roadways using the directional distribution presented in Table 10. **Figure 6** illustrates the assignment of the site generated traffic.

Background Growth Along MO 141

An annual background growth rate for application to MO 141 was determined based upon input from East West Gateway and their regional travel demand model. Based upon their understandings of the various developments along the corridor as well as the potential for development beyond those already identified, it was their opinion that 0.5% annual growth rate would be considered conservative. Consequently, this annual growth rate was agreed to by both the City of Maryland Heights and MoDOT.

However, the projected background growth shall be applied in a non-conventional way for this study so as to not "double count" for development along the corridor. Typically, the background growth is applied every year between scenarios as a way of capturing the increase of traffic through the study area unrelated to a particular proposed development. In this case, the background growth is entirely accounted for between 2023 and 2025 as all surrounding developments are documented, and the number of trips for each development is calculated for each respective scenario year. Therefore, the background growth shall only be applied to adjust between the years 2025 to 2047 to account for additional development that is not yet identified.

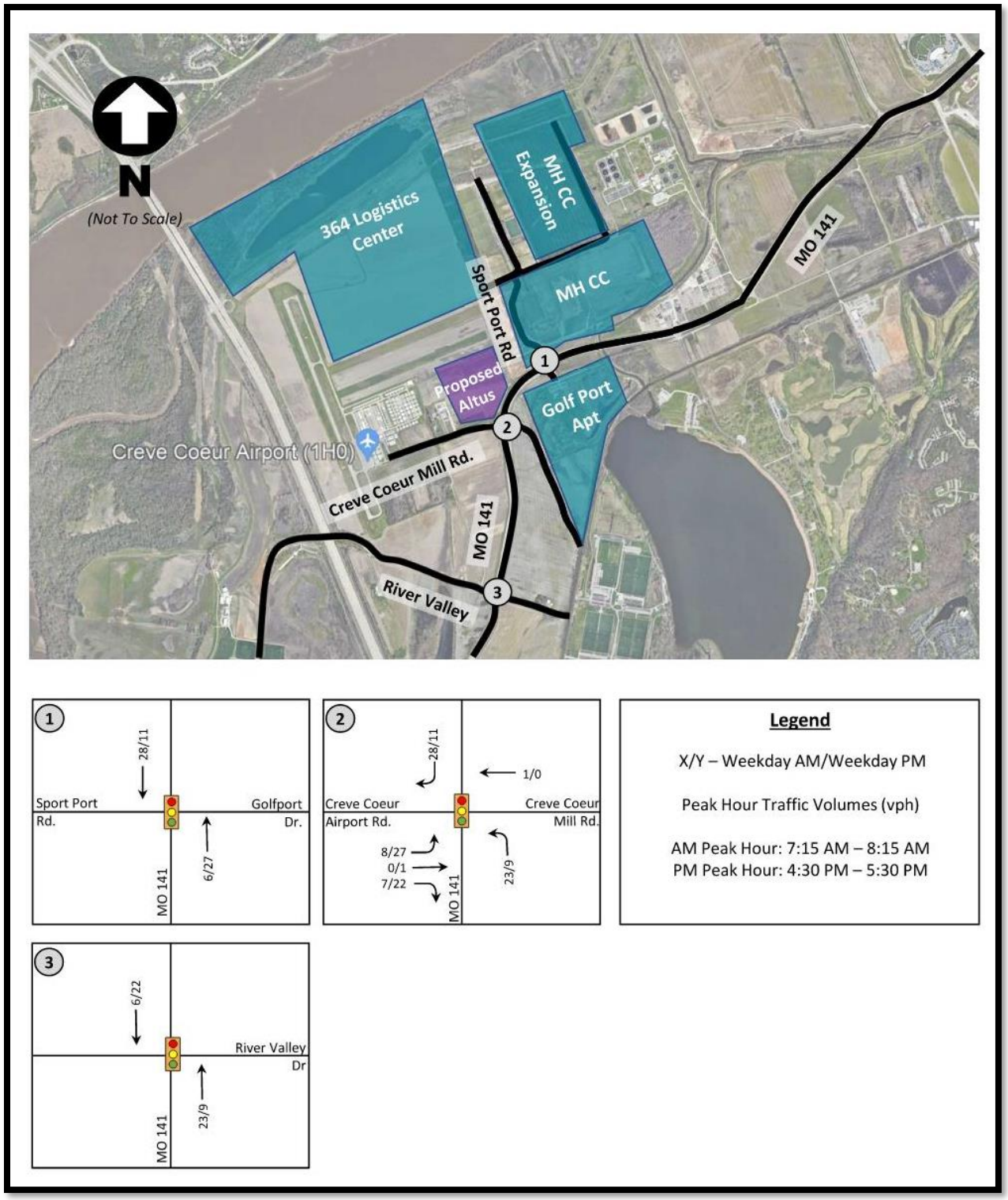

Figure 6: Maryland Park Industrial Development Site Generated Trips

Analysis Methodology

It was agreed upon with the reviewing agencies during the Scoping Meeting for the original study (November 2022) and again in the scoping meeting for this subject tract that conditions along MO 141 would be evaluated during the morning and evening peak periods for a typical weekday since these periods represent the busiest times for the adjacent roadways as well as the proposed use. If the proposed development's traffic can be accommodated during these peak periods, it stands to reason that adequate capacity would be available throughout the remainder of the day.

The intersections included in this analysis include the following:

- Sport Port Road & Missouri Route 141 (signalized)
- Creve Coeur Mill/Airport Road & Missouri Route 141 (signalized)
- River Valley Road & Missouri Route 141 (signalized)
- Site Access Drives at Creve Coeur Airport Road (unsignalized)

Given the level of ongoing development in the area, it was agreed that peak hour traffic data provided by MoDOT for September 2022 would be used as the basis for developing the traffic volumes along MO 141. Thereafter, the various developments, according to their anticipated phasing, would be aggregated with the 2022/23 volumes to develop traffic volumes for the following analysis baseline scenarios that do not reflect the addition of traffic from the proposed Maryland Park Industrial Center:

- **2022/23 Baseline Conditions**
  - September 2022 traffic data collected by MoDOT
  - Assumes intersection with River Valley with MO 141 is improved to provide dual NBLT lanes, third SB through lane, and a dedicated EBLT plus a shared LT/TH lane as obligated by Westport Commerce Center, 141 Logistics Center and River Valley Commerce Center (Figure 3).
- **2025 Base Conditions -** *Includes Existing Traffic plus the following*:
  - 608,345 SF within Maryland Heights Commerce Center (Lots 1, 3 and 4)
  - 276 apartments within Golf Port
  - 20,000 SF medical office & 20,000 SF retail within Golf Port
  - 1,334,793 SF within Westport Commerce Center (representing build out)
  - 540,800 SF within 141 Logistics Center
  - 1,105,880 SF within River Valley Commerce Center (representing build out)
  - 740,000 SF within the proposed 364 Logistics Center (Phase I)

- **2047 Base Conditions** – *includes all represented in 2025 Base Conditions plus*:
  - 0.5% annual growth rate from 2027 to 2047
  - 404,700 within Maryland Heights Commerce Center (Lot 2 – representing build out of the original commerce center)
  - 1,088,500 SF within Maryland Heights Commerce Center Expanded to the Ortmann Tract (representing build out)
  - 168 apartments (Phase 2), 156 apartments (Phase 3), 175 apartments & 22 villas (Phase 4 & 3,500 SF QSR within Golf Port
  - 540,800 SF within 141 Logistics Center (representing build out)
  - 1,157,000 SF within 364 Logistics Center (representing build out)

To identify the impacts of the proposed Maryland Park Industrial Development, the site generated traffic associated the proposed development would be aggregated with the baseline volumes for the following analysis forecasted scenarios:

- **2025 Forecasted Conditions** – *includes all represented in 2025 Base Conditions plus:*
  - 361,100 SF of warehouse/distribution as proposed by Altus Properties
- **2047 Forecasted Conditions** – *includes all represented in 2047 Base Conditions plus*:
  - 361,100 SF of warehouse/distribution as proposed by Altus Properties

Intersection performance or traffic operations are quantified by six Levels of Service (LOS), which range from LOS A ("Free Flow") to LOS F ("Fully Saturated"). LOS C is normally used for design purposes and represents a roadway with volumes ranging from 70% to 80% of its capacity. LOS E is generally considered acceptable for peak period conditions in urban and suburban areas and would be an appropriate benchmark of acceptable traffic for the study area road system.

Levels of service for intersections are based on the average delay experienced by motorists, as calculated using the methodology presented in the Highway Capacity Manual (HCM) 6th Edition. The thresholds for each level of service vary based upon the type of control to reflect different driver expectations. Signalized intersections reflect higher delay tolerances as compared to unsignalized locations because motorists are accustomed to and accepting of longer delays at signals. For signalized and all-way stop intersections, the average control delay per vehicle is estimated for each movement and then aggregated for each approach and the intersection as a whole. For intersections with partial (side-street) stop control, the delay is calculated for the minor movements only (side-street approaches and major road left-turns) since through traffic on the major road is not required to stop.

Table 11 summarizes the criterion for both signalized and unsignalized intersections, as defined by the HCM. This methodology was applied to the study intersections using Synchro 11, which is a traffic flow model based on the Highway Capacity Manual (HCM) 6th Edition. The signal timings used for the analysis of the baseline and forecasted conditions are that which were recommended by the previous studies for the Golf Port development. This includes a 90 second cycle length for morning peak hour conditions and a 120 second cycle length for evening peak hour conditions.

Table 11: Intersection Level of Service Thresholds

Level of Service	Control Delay per Vehicle (sec/veh)	
	Signalized	Unsignalized
A	≤ 10	0-10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

A safety analysis was performed in accordance with methodologies outlined in the Highway Safety Manual (HSM). The HSM provides quantitative analysis to support decision making for improving transportation safety. Its methodology relies upon safety performance functions to correlate crash expectancy with location-specific roadway characteristics, such as the number of lanes, presence of shoulders, speeds, and traffic volumes.

Baseline Traffic Operations

To identify the traffic impacts associated with the proposed development of the 364 Logistics Center, it was first necessary to quantify traffic operating conditions for the following baseline years:

- **2022/23 Baseline Conditions** – Accounts existing traffic along MO 141 as of September 2022.

- **2025 Base Conditions –** Includes all represented in 2022/23 existing conditions plus development with Maryland Heights Commerce Center, Golf Port Development, Westport Commerce Center (achieving full buildout), 141 Logistics Center, River Valley Commerce Center (achieving full buildout), and 364 Logistics Center.

- **2047 Base Conditions** – Includes all represented in 2025 Base Conditions plus build out of the Maryland Heights Commerce Center, expansion of the Maryland Heights Commerce Center to the Ortmann Tract, Golf Port Development, 141 Logistics Center, and 364 Logistics Center.

The traffic operations for each of the baseline horizon years are presented below:

2022/23 Baseline Conditions

As noted above, the 2022/23 baseline conditions represent September 2022 traffic counts provide by MoDOT. Figure ***7*** represents the resulting 2022/23 Existing Traffic Volumes.

The roadway geometry for the 2022/23 baseline conditions represents the existing conditions at the study intersections except for the signalized intersection of MO 141 with River Valley Road. By the year 2023, it is anticipated that this intersection would be improved per the obligations associated with Westport and River Valley Commerce Centers and the 141 Logistics Center. Once in place, the intersection would provide for dual northbound left turn lanes, a third southbound through lane, and a dedicated eastbound left turn lane plus shared left-through lane and a dedicated right turn lane (see Figure 3).

The 2023 Baseline Traffic Operations results are summarized in **Table 12**.

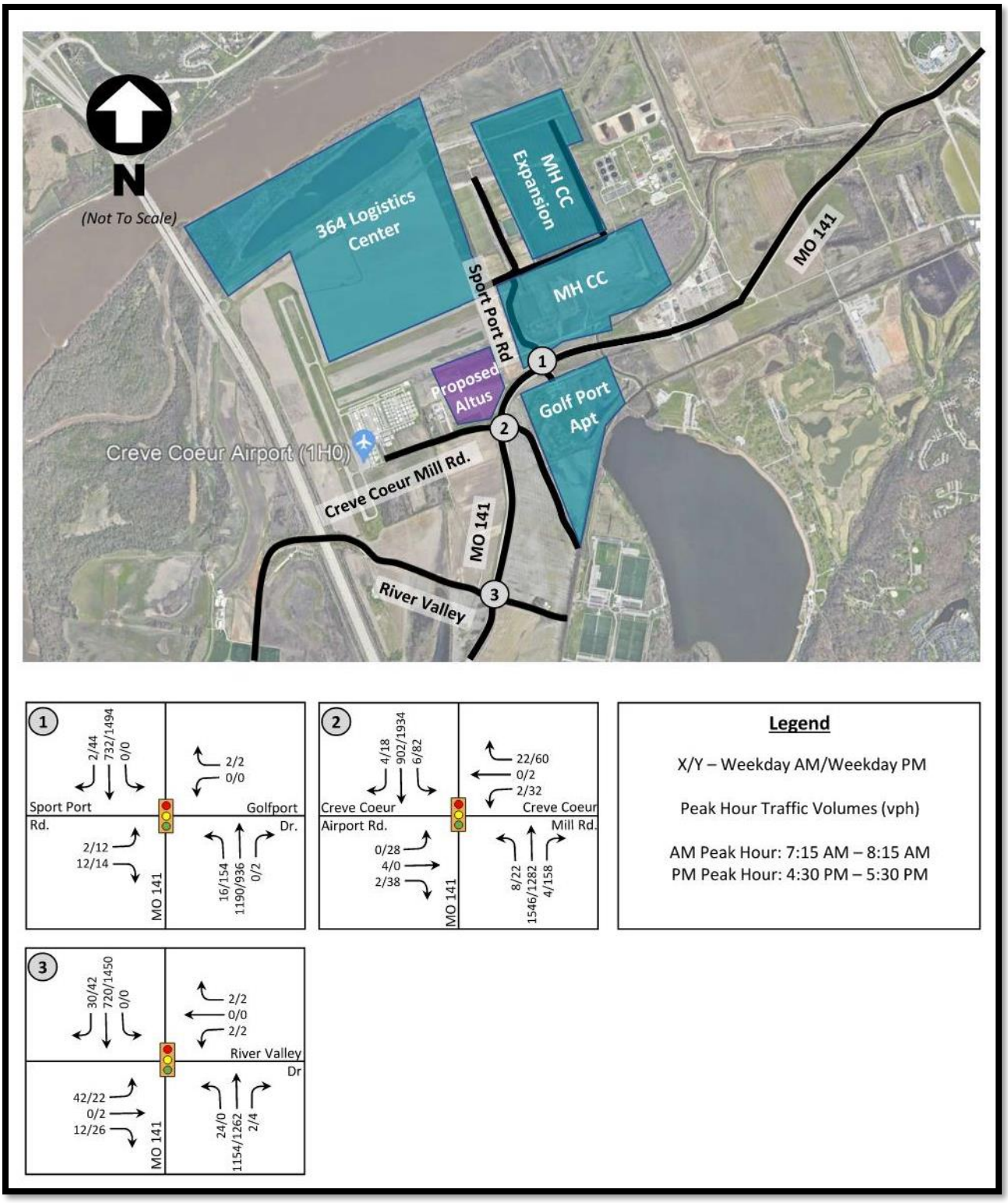

Figure 7: Year 2022/23 Baseline Traffic Volumes

Table 12: Year 2022/23 Baseline Traffic Operating Conditions

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	Weekday AM Peak Hour	Weekday PM Peak Hour
MO 141 and Sport Port Road (Signalized)		
Overall Intersection	**A (6.5)**	**C (20.6)**
Eastbound Approach	A (7.0) [11] <0.04>	C (23.6) [41] <0.18>
Westbound Approach	A (0.5) [0] <0.10>	A (0.3) [0] <0.06>
Northbound Approach	A (5.4) [140] <0.49>	C (23.1) [307] <0.82>
Southbound Approach	A (8.2) [263] <0.38>	B (18.6) [600] <0.74>
MO 141 at Creve Coeur Mill Road/Creve Coeur Airport Road (Signalized)		
Overall Intersection	**A (9.7)**	**C (21.3)**
Eastbound Approach	C (31.7) [14] <0.03>	C (24.1) [56] <0.24>
Westbound Approach	C (24.8) [57] <0.32>	C (31.1) [82] <0.52>
Northbound Approach	A (7.4) [533] <0.67>	C (22.1) [665] <0.75>
Southbound Approach	B (12.0) [393] <0.45>	B (20.0) [#1034] <0.89>
MO 141 at River Valley Drive (Signalized, Improved)		
Overall Intersection	**B (11.0)**	**B (9.7)**
Eastbound Approach	C (33.6) [61] <0.34>	D (44.1) [129] <0.60>
Westbound Approach	B (19.8) [0] <0.05>	C (55.0) [7] <0.06>
Northbound Approach	A (8.9) [255] <0.47>	A (9.2) [381] <0.55>
Southbound Approach	B (11.2) [202] <0.28>	A (4.3) [163] <0.52>

As shown, the intersection approaches all operate at acceptable levels of service for the study intersections. Therefore, improvements are not necessary under 2022/23 Baseline Conditions.

2025 Baseline Conditions

The 2025 baseline conditions build upon the 2023 baseline traffic volumes by adding site generated traffic associated with continued development along the MO 141 corridor. Specifically, the following additional development was considered in place by the year 2025:

- 608,345 SF within Maryland Heights Commerce Center (Lots 1, 3 and 4)
- 276 apartments (Phase I) within Golf Port
- 20,000 SF medical office & 20,000 SF retail within Golf Port
- 1,334,793 SF within Westport Commerce Center (representing build out)
- 540,800 SF within 141 Logistics Center
- 1,105,880 SF within River Valley Commerce Center (representing build out)
- 740,000 SF within 364 Logistics Center (Phase I)

Table 13 summarizes the trip generation of the various developments' phases that are anticipated to come online by the year 2025.

Table 13: Year 2025 Baseline Additional Development Trip Generation

Scenario Year	Development	Vehicles/Hour (Trucks/Hour)					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
2025	MH CC	66 (4)	16 (6)	82 (10)	18 (4)	64 (6)	82 (10)
		52 (3)	16 (4)	68 (7)	20 (6)	51 (5)	71 (11)
	Golf Port	49	13	62	24	55	79
		28	19	47	66	66	132
		25	85	110	66	42	108
	Westport CC	228 (15)	54 (18)	282 (33)	62 (12)	220 (21)	282 (33)
	141 Logistics	149 (10)	35 (12)	184 (22)	40 (8)	144 (14)	184 (22)
	River Valley CC	92 (7)	28 (5)	120 (12)	35 (10)	91 (9)	126 (19)
	364 Logistics	86 (8)	26 (7)	112 (15)	32 (11)	83 (11)	115 (22)
	Total	***775 (47)***	***292 (52)***	***1067 (99)***	***363 (51)***	***816 (66)***	***1179 (117)***

Figure 8 represents the resulting 2025 Baseline Traffic Volumes.

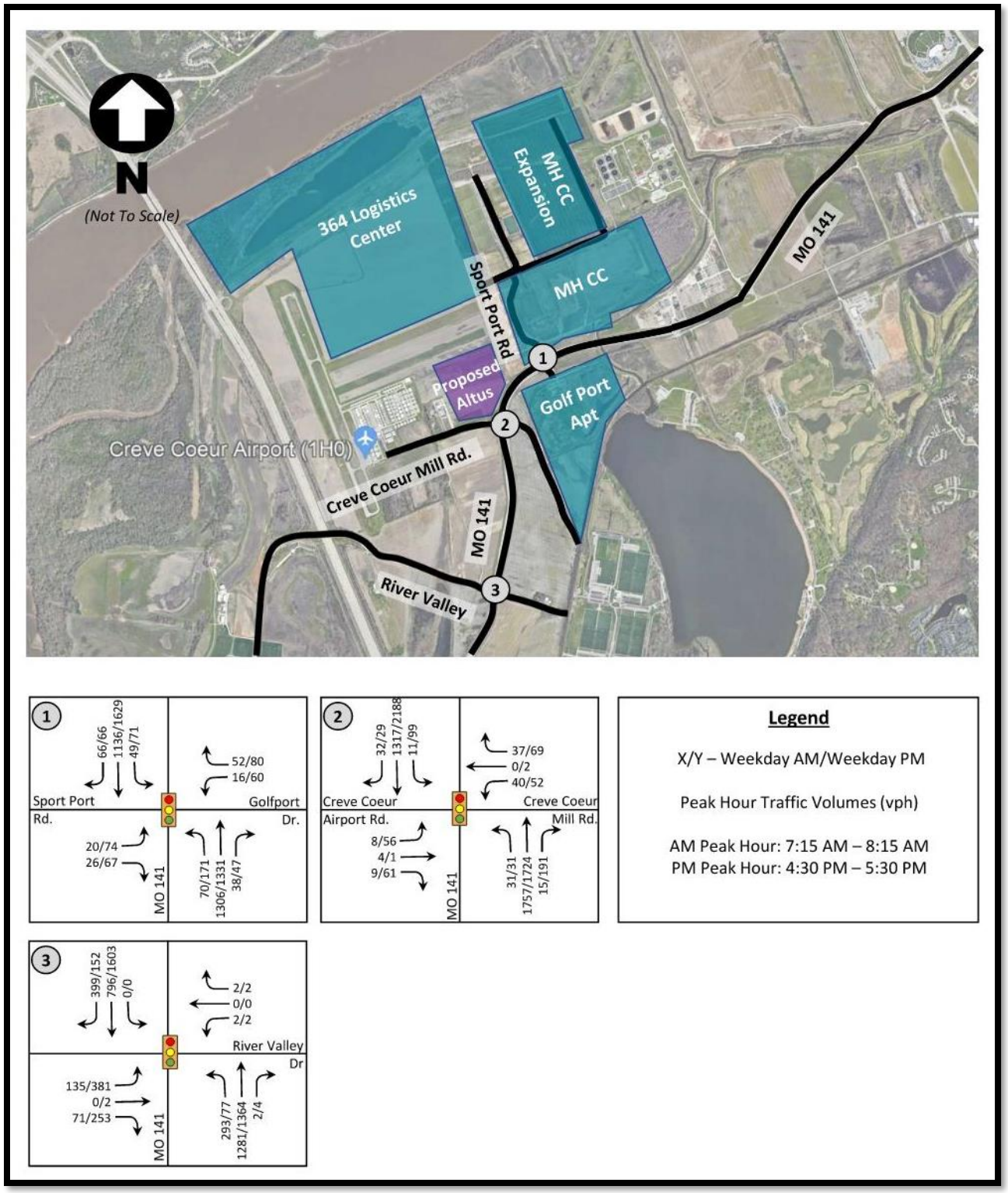

Figure 8: Year 2025 Baseline Traffic Volumes

The roadway geometry for the 2025 baseline conditions represents the existing conditions at the study intersections with the exception of the improved signalized intersection of MO 141 with River Valley Road. The 2025 Baseline Traffic Operations results are summarized in **Table 14.**

Table 14: Year 2025 Baseline Traffic Operating Conditions

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	Weekday AM Peak Hour	Weekday PM Peak Hour
MO 141 and Sport Port Road (Signalized)		
Overall Intersection	**B (13.9)**	**C (28.4)**
Eastbound Approach	B (15.0) [30] <0.17>	C (34.5) [105] <0.58>
Westbound Approach	A (7.9) [25] <0.15>	C (25.9) [86] <0.50>
Northbound Approach	B (11.5) [185] <0.65>	C (31.0) [394] <0.98>
Southbound Approach	B (16.8) [408] <0.60>	C (25.7) [660]<0.85>
MO 141 at Creve Coeur Mill Road/Creve Coeur Airport Road (Signalized)		
Overall Intersection	**B (15.2)**	**C (24.4)**
Eastbound Approach	C (29.8) [20] <0.09>	D (38.5) [91] <0.47>
Westbound Approach	C (24.6) [57] <0.35>	C (31.3) [82] <0.54>
Northbound Approach	A (9.0) [#701] <0.72>	C (20.1) [#678] <0.90>
Southbound Approach	C (22.4) [537] <0.60>	C (27.1) [#1188] <0.97>
MO 141 at River Valley Drive (Signalized, Improved)		
Overall Intersection	**B (13.9)**	**C (25.3)**
Eastbound Approach	C (34.7) [#103] <0.51>	E (56.3) [#301] <0.86>
Westbound Approach	B (19.8) [5] <0.05>	C (27.5) [7] <0.06>
Northbound Approach	B (14.4) [292] <0.77>	B (14.3) [448] <0.62>
Southbound Approach	A (9.7) [268] <0.42>	C (23.0) [m415] <0.58>

As shown in **Table 14**, the intersection approaches all operate at acceptable levels of service for the study intersections. Therefore, improvements are not necessary under 2025 Baseline Conditions. However, it should be acknowledged that in the weekday PM peak hour, the two northbound lanes of MO 141 are approaching capacity at the signalized intersections with Sport Port Road and Creve Coeur Mill Road/Creve Coeur Airport Road.

2047 Baseline Conditions

The 2047 baseline conditions represent the 20-year planning horizon for the corridor assuming the proposed Maryland Park Industrial Development is not in place (year 2047 was chosen to remain consistent with the horizon year in the November 2022 approved traffic study). **Table 15** summarizes the trip generation of the remainder of the developments' phases that are anticipated to come online by 2047 that were not already accounted for in the year 2025 analysis:

- 404,700 within Maryland Heights Commerce Center (Lot 2 – representing build out of the original commerce center)
- 1,088,500 SF within Maryland Heights Commerce Center Expanded to the Ortmann Tract (representing build out)
- 168 apartments (Phase 2), 156 apartments (Phase 3), 175 apartments & 22 villas (Phase 4) & 3,500 SF QSR within Golf Port
- 540,800 SF within 141 Logistics Center (representing build out)
- 1,157,000 SF within 364 Logistics Center (representing build out)

The reader is reminded that the expansion of the Maryland Heights Commerce Center onto the Ortmann Tract (in year 2027 and beyond) will require, per the City of Maryland Heights, the completion of an updated traffic impact study prior to any level of construction on those parcels.

Table 15: Year 2047 Baseline Additional Development Trip Generation

Scenario Year	Development	Vehicles/Hour (Trucks/Hour)					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
2047	MH CC	94 (6)	22 (8)	116 (14)	25 (5)	91 (9)	116 (14)
		142 (12)	43 (11)	185 (23)	53 (17)	138 (17)	191 (34)
	Westport CC	139 (9)	33 (11)	172 (20)	38 (7)	134 (13)	172 (20)
	Golf Port	42	142	184	119	77	196
		79	77	156	60	56	116
		7	23	30	19	11	30
	141 Logistics Center	149 (10)	35 (12)	184 (22)	40 (8)	144 (14)	184 (22)
	364 Logistics Center	125 (12)	37 (11)	162 (23)	46 (18)	119 (17)	165 (35)
	Total	***777 (49)***	***412 (53)***	***1189 (102)***	***400 (55)***	***770 (70)***	***1170 (125)***

In addition, an annual growth rate of 0.5% was applied to MO 141 traffic volumes (year 2025) to account for other developments that are not yet known or speculated upon. **Figure** 9 represents the resulting 2047 Baseline Traffic Volumes.

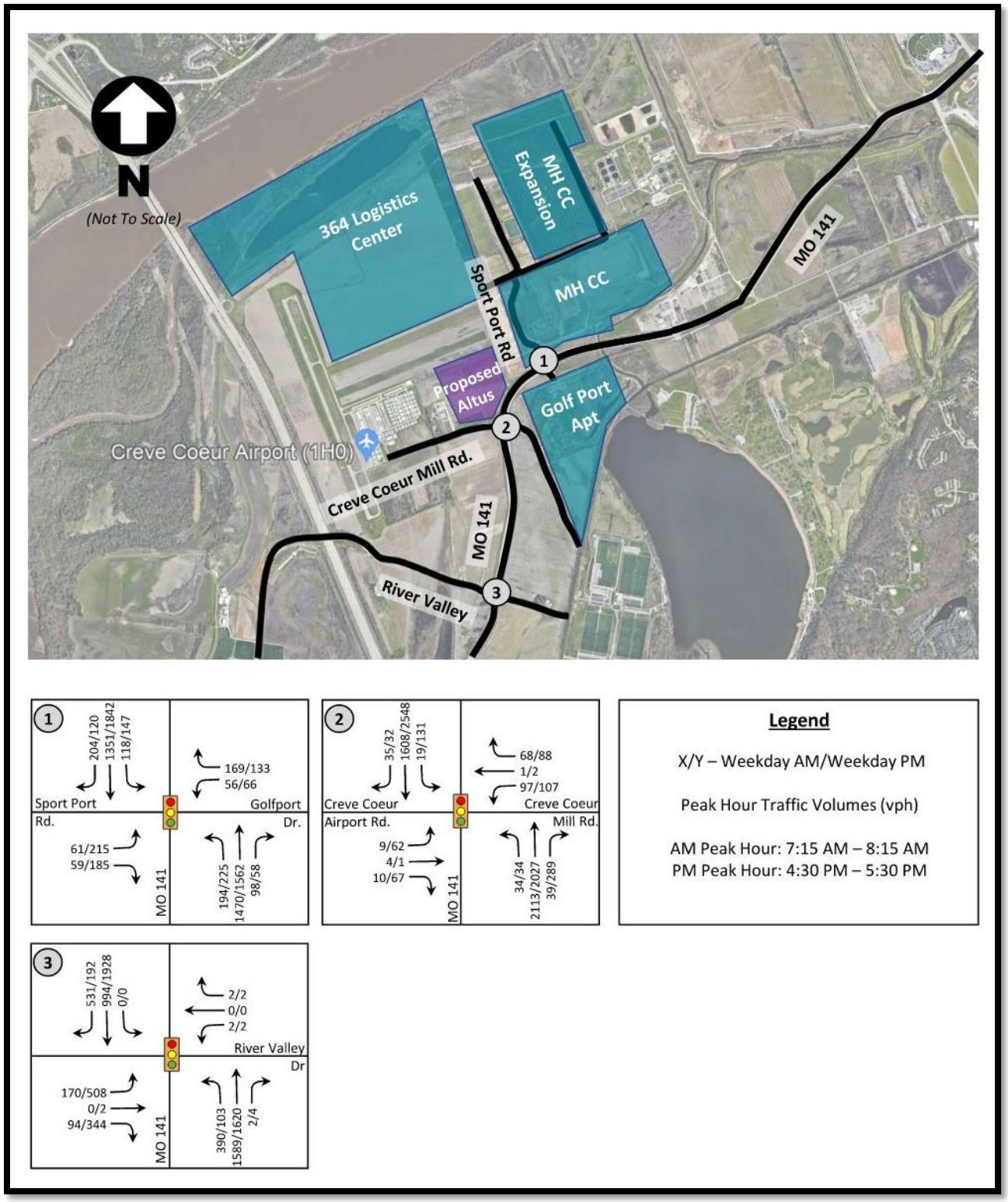

Figure 9: Year 2047 Baseline Traffic Volumes

The 2047 Baseline Traffic Operations results are summarized in **Table 16.** It should be noted the 2047 baseline condition results presented reflect three through lanes in both directions on MO 141, since these additional lanes would be necessary to accommodate the heavy flows along MO 141. No further improvements are warranted for the 2047 Baseline conditions in addition to those previously recommended.

Table 16: Year 2047 Baseline Traffic Operating Conditions

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	Weekday AM Peak Hour	Weekday PM Peak Hour
MO 141 and Sport Port Road (Signalized, Improved)		
Overall Intersection	**B (19.0)**	**D (40.5)**
Eastbound Approach	C (26.6) [40] <0.46>	E (71.8) [#182] <1.02>
Westbound Approach	B (11.6) [62] <0.47>	C (24.5) [89] <0.60>
Northbound Approach	B (15.7) [m#220] <0.91>	D (53.7) [m#431]<1.55>
Southbound Approach	C (22.8) [290] <0.85>	C (23.7) [442] <0.71>
MO 141 at Creve Coeur Mill Road/Creve Coeur Airport Road (Signalized, Improved)		
Overall Intersection	**B (17.7)**	**B (18.5)**
Eastbound Approach	C (28.9) [21] <0.07>	D (37.1) [98] <0.46>
Westbound Approach	D (36.4) [#147] <0.65>	E (73.2) [#188] <0.99>
Northbound Approach	A (9.9) [431] <0.70>	B (17.2) [394] <0.76>
Southbound Approach	C (25.6) [441] <0.57>	B (13.9) [298] <0.80>
MO 141 at River Valley Drive (Signalized, Improved)		
Overall Intersection	**C (20.0)**	**C (24.8)**
Eastbound Approach	D (35.8) [#136] <0.58>	D (48.8) [#435] <.80>
Westbound Approach	B (19.8) [5] <0.05>	C (27.5) [7] <0.06>
Northbound Approach	C (20.8) [#223] <0.99>	B (16.0) [311] <0.56>
Southbound Approach	B (16.3) [327] <0.54>	C (22.2) [m480] <0.85>

Forecasted Traffic Operations

The forecasted operating conditions associated with the proposed Maryland Park Industrial Development were evaluated using the same methodology applied to the base conditions. To identify the traffic impacts associated with the proposed development, the forecasted conditions were evaluated for the following scenarios:

- **2025 Forecasted Conditions** – *includes all represented in 2025 Base Conditions plus:*
  - 361,100 SF of warehouse/distribution as proposed by Altus Properties
- **2047 Forecasted Conditions** – *includes all represented in 2047 Base Conditions plus*:
  - 361,100 SF of warehouse/distribution as proposed by Altus Properties

The traffic operations for each of the forecasted horizon years are presented below:

2025 Forecasted Conditions

The 2025 forecasted conditions are based upon adding the traffic associated with the development of 361,100 SF within the Maryland Park Industrial Development with the 2025 baseline traffic volumes along the MO 141 corridor. Essentially, the site generated traffic represented in Figure 6 was aggregated with the baseline volumes presented in Figure 8, resulting in the 2025 Forecasted Traffic Volumes illustrated in **Figure 10.**

The results of the operational analysis for the 2025 forecasted conditions are summarized in **Table 17**, which also provides the results from the baseline conditions for ease of comparison. As shown, the approaches of all five intersections operate with acceptable conditions under the 2025 forecasted conditions. However, it is recommended that dedicated eastbound left turn lane on Sport Port Road's approach to MO 141 be lengthened to 250 feet to better accommodate the increased peak queue following completion of Phase 1 of the 364 Logistics Center.

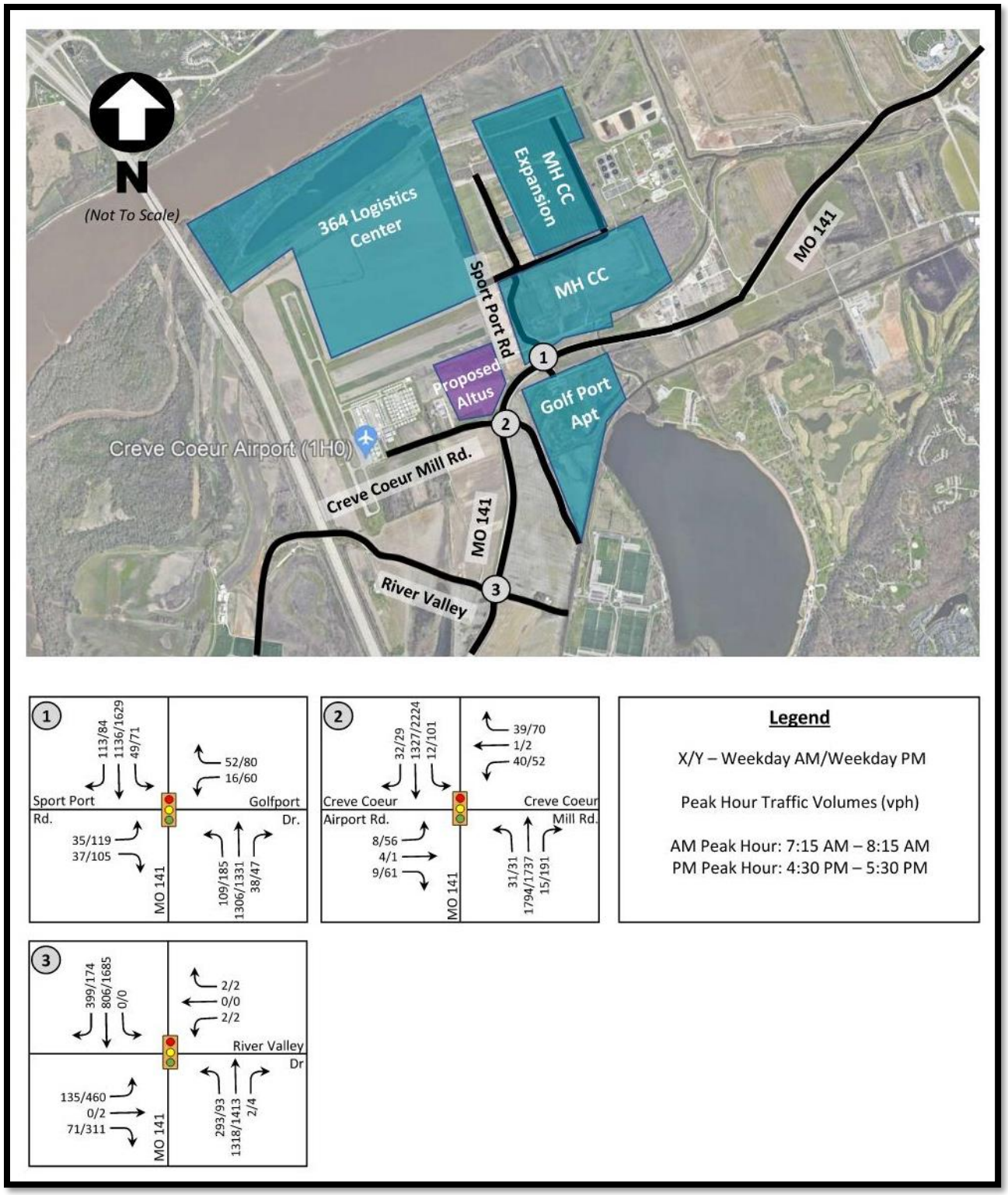

Figure 10: Year 2025 Forecasted Traffic Volumes

Table 17: Year 2025 Forecasted Traffic Operating Conditions

Intersection & Movements	2025 Baseline Conditions		2025 Forecasted Conditions	
	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>		LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	Weekday AM Peak Hour	Weekday PM Peak Hour	Weekday AM Peak Hour	Weekday PM Peak Hour
Highway 141 and Sport Port Road (Signalized, Improved)				
Overall Intersection	**B (13.9)**	**C (28.4)**	**B (16.3)**	**D (35.5)**
Eastbound Approach	B (15.0) [30] <0.17>	C (34.5) [105] <0.58>	B (17.1) [45] <0.26>	D (53.5) [#223] <0.88>
Westbound Approach	A (7.9) [25] <0.15>	C (25.9) [86] <0.50>	A (7.5) [25] <0.15>	C (25.3) [86] <0.48>
Northbound Approach	B (11.5) [185] <0.65>	C (31.0) [394] <0.98>	B (13.9) [182] <0.67>	D (45.7) [393] <1.33>
Southbound Approach	B (16.8) [408] <0.60>	C (25.7) [660]<0.85>	B (19.4) [408] <0.68>	C (24.3) [645] <0.84>
Highway 141 at Creve Coeur Mill Road/Creve Coeur Airport Road (Signalized, Improved)				
Overall Intersection	**B (15.2)**	**C (24.4)**	**B (16.4)**	**C (25.9)**
Eastbound Approach	C (29.8) [20] <0.09>	D (38.5) [91] <0.47>	C (29.8) [20] <0.09>	D (38.5) [91] <0.47>
Westbound Approach	C (24.6) [57] <0.35>	C (31.3) [82] <0.54>	C (24.1) [57] <0.35>	C (31.2) [82] <0.54>
Northbound Approach	A (9.0) [#701] <0.72>	C (20.1) [#678] <0.90>	A (9.4) [#727] <0.73>	C (20.7) [#904] <0.91>
Southbound Approach	C (22.4) [537] <0.60>	C (27.1) [#1188] <0.97>	C (25.0) [539] <0.60>	C (29.5) [#1222] <0.98>
Highway 141 at River Valley Drive (Signalized, Improved)				
Overall Intersection	**B (13.9)**	**C (25.3)**	**B (13.7)**	**C (25.5)**
Eastbound Approach	C (34.7) [#103] <0.51>	E (56.3) [#301] <0.86>	C (34.7) [#103] <0.51>	E (56.3) [#301] <0.86>
Westbound Approach	B (19.8) [5] <0.05>	C (27.5) [7] <0.06>	B (19.8) [5] <0.05>	C (27.5) [7] <0.06>
Northbound Approach	B (14.4) [292] <0.77>	B (14.3) [448] <0.62>	B (14.4) [306] <0.79>	B (14.4) [456] <0.62>
Southbound Approach	A (9.7) [268] <0.42>	C (23.0) [m415] <0.58>	A (9.1) [268] <0.58>	C (23.3) [m418] <0.64>
Creve Coeur Airport Road & East Access Drive (Unsignalized)				
Southbound Approach	NA	NA	A (8.7)[<25]<0.2>	A (8.8)[<25]<0.05>
Creve Coeur Airport Road & West Access Drive (Unsignalized)				
Southbound Approach	NA	NA	A (8.5)[<25]<0.00>	A (8.6)[<25]<0.01>

2047 Forecasted Conditions

The 2047 forecasted conditions represent the 20-year planning horizon for the corridor assuming the proposed Maryland Park Industrial Center is in place. Again, the site generated traffic represented in Figure 6 was aggregated with the baseline volumes presented in Figure 9 resulting in the 2047 Forecasted Traffic Volumes illustrated in **Figure 11.**

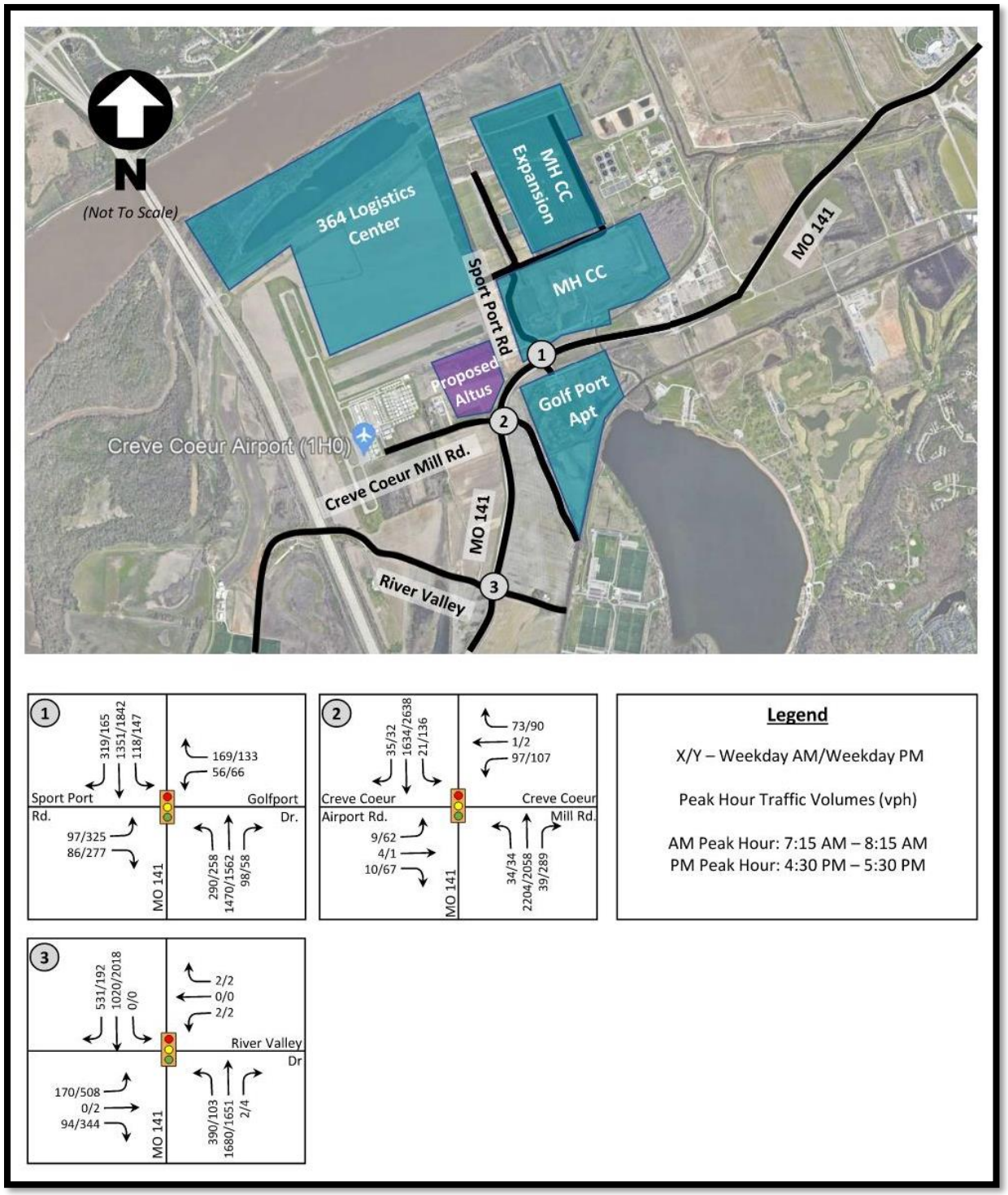

Figure 11: Year 2047 Forecasted Traffic Volumes

The results of the operational analysis for the 2047 forecasted conditions are summarized in **Table 18**, which also provides the results from the 2047 baseline conditions for ease of comparison. As was the case in the 2047 baseline conditions, three through lanes on MO 141 are assumed in place. It is likely that in order for the additional lanes on MO 141 to be effective, they would extend, at a minimum, from Casino Drive to River Valley Drive; a distance of approximately 2.5 miles.

In addition, the dual eastbound left turn lanes on Sport Port Road approaching MO 141 are assumed in place. Given the need for dual northbound left turn lanes on MO 141 at its signalized intersection with Sport Port Road in the forecasted conditions in the year 2027, as determined in the November 2022 study, this improvement was assumed to be in place for the 2047 forecasted conditions. As shown, the approaches at all intersections within the study area operate at acceptable levels of service under 2047 Forecasted Conditions.

Table 18: Year 2047 Forecasted Traffic Operating Conditions

Intersection & Movements	2047 Baseline Conditions		2047 Forecasted Conditions	
	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>		LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	Weekday AM Peak Hour	Weekday PM Peak Hour	Weekday AM Peak Hour	Weekday PM Peak Hour
Highway 141 and Sport Port Road (Signalized, Improved)				
Overall Intersection	**B (19.0)**	**D (40.5)**	**B (19.5)**	**D (37.5)**
Eastbound Approach	C (26.6) [40] <0.46>	E (71.8) [#182] <1.02>	D (37.8) [#73] <0.72>	E (66.3) [#241] <0.99>
Westbound Approach	B (11.6) [62] <0.47>	C (24.5) [89] <0.60>	B (11.5) [62] <0.47>	C (23.4) [84] <0.59>
Northbound Approach	B (15.7) [m#220] <0.91>	D (53.7) [m#431]<1.55>	B (16.0) [m119] <0.73>	D (40.5) [299] <1.22>
Southbound Approach	C (22.8) [290] <0.85>	C (23.7) [442] <0.71>	C (22.2) [290] <0.85>	C (28.0) [461] <0.73>
Highway 141 at Creve Coeur Mill Road/Creve Coeur Airport Road (Signalized, Improved)				
Overall Intersection	**B (17.7)**	**B (18.5)**	**B (17.8)**	**B (18.6)**
Eastbound Approach	C (28.9) [21] <0.07>	D (37.1) [98] <0.46>	C (29.3) [21] <0.08>	D (37.1) [98] <0.46>
Westbound Approach	D (36.4) [#147] <0.65>	E (73.2) [#188] <0.99>	D (38.9) [#147] <0.70>	E (72.9) [#188] <0.99>
Northbound Approach	A (9.9) [431] <0.70>	B (17.2) [394] <0.76>	A (9.9) [464] <0.72>	B (17.9) [405] <0.78>
Southbound Approach	C (25.6) [441] <0.57>	B (13.9) [298] <0.80>	C (25.7) [446] <0.57>	B (13.8) [295] <0.82>
Highway 141 at River Valley Drive (Signalized, Improved)				
Overall Intersection	**C (20.0)**	**C (24.8)**	**B (19.7)**	**C (25.0)**
Eastbound Approach	D (35.8) [#136] <0.58>	D (48.8) [#435] <.80>	D (35.8) [#136] <0.58>	D (48.8) [#440] <0.80>
Westbound Approach	B (19.8) [5] <0.05>	C (27.5) [7] <0.06>	B (19.8) [5] <0.05>	C (27.5) [5] <0.06>
Northbound Approach	C (20.8) [#223] <0.99>	B (16.0) [311] <0.56>	C (20.3) [235] <0.99>	B (16.1) [319] <0.57>
Southbound Approach	B (16.3) [327] <0.54>	C (22.2) [m480] <0.85>	B (16.2) [328] <0.54>	C (22.7) [m495] <0.89>
Creve Coeur Airport Road & East Access Drive (Unsignalized)				
Southbound Approach	NA	NA	A (8.7) [<25]<.02>	A (8.8) [<25]<.06>
Creve Coeur Airport Road & West Access Drive (Unsignalized)				
Southbound Approach	NA	NA	A (8.5) [<25]<.01>	A (8.6) [<25]<.01>

Recommendations

In November 2022, a comprehensive traffic analysis was done of the corridor on the behalf of the proposed (and since approved) 364 Logistics Center (NorthPoint Development) which considered a significant amount of committed and planned developments within the immediate area, all of which rely upon MO 141 as a means of access. This study contemplated the development of 345,500 SF on the subject tract under consideration by Altus Properties as well as the Maryland Heights Commerce Center (as well as its potential expansion), the Golf Port Apartments and Retail, the Westport Commerce Center, the 141 Logistics Center, River Valley Commerce Center and the 364 Logistics Center have all been approved by the City of Maryland Heights over the past several years. However, to date, most of these developments have not yet been constructed and occupied.

Hence, these committed and planned developments were folded into the November 2022 study's scenarios to properly account for their impact on future conditions along MO 141. Based on the study's analysis, several improvements to the study area were determined, as follows:

- Traffic volumes along MO 141 due to continued growth in the area would exceed the capacity provided by two through lanes in the northbound and southbound directions. Three through lanes would be required in both directions to accommodate the heavy vehicular demand as well as better serve the demands on the side street approaches at the signalized intersections. It is likely that in order for the additional lanes on MO 141 to be effective, they would extend, at a minimum, from Casino Drive to River Valley Drive; a distance of approximately 2.5 miles.
- Dual eastbound left turn lanes on Sport Port Road's approach to MO 141 would be required by the year 2027. The additional traffic generated by the expansion of the Maryland Heights Commerce Center into the Ortmann Tract (Lots 9, 10 and 11) exceeds the capacity afforded by a single eastbound left turn lane approaching MO 141.
- The City of Maryland Heights should continue to pursue the construction and expansion of River Valley Parkway as a means of providing a meaningful parallel route to MO 141.

In addition to the improvements necessitated under baseline conditions, the development of the 364 Logistics Center triggers additional infrastructure improvements, as follows:

- Lengthen the existing 100-foot eastbound left turn lane on Sport Port Road approaching MO 141 to provide 250 feet of storage capacity, exclusive of taper. This is required prior to the development of 740,000 SF within 364 Logistics Center (assumed to be in place by the year 2025). It should be noted that this improvement would eventually be replaced by dual eastbound left turn lanes, as required by the year 2027 baseline conditions.
- Provide dual northbound left turn lanes on MO 141's approach to the signalized intersection with Sport Port Road by the year 2027 and prior to build out of the 364 Logistics Center. These lanes should each provide 200 feet of storage capacity, exclusive of tapers.
- Widen Sport Port Road to provide an additional receiving lane for the dual northbound left turn lanes on MO 141. Two westbound lanes would continue on Sport Port Road terminating at the future intersection with River Valley Parkway (to be built by Maryland Heights Commerce Center) as a dedicated right turn lane and a through lane. Should River Valley Parkway not be constructed by this time, the two westbound lanes on Sport Port Road should be carried approximately 650 feet before tapering back to one lane.

Access to the Altus Properties site is proposed via two driveways along Creve Coeur Airport Road, which ultimately connects to Missouri Route 141 (MO 141) via a signalized intersection. Based on the operational analysis at the intersection of Creve Coeur Airport Road and MO 141, the eastbound queue is not expected

to extend past the access drive. Therefore, no additional recommendations are necessary for the access drive or eastbound operations.

River Valley Parkway

The Maryland Height Comprehensive Plan, amended on March 24, 2020, recognizes the potential for expansive development within the Maryland Park Lake District, which is served primarily by MO 141, MO 364, Interstate 70, River Valley Road, Creve Coeur Mill Road, etc. The Comprehensive Plan states "providing a north-south collector roadway running parallel to Missouri Route 141 from I-70 to Waterworks Road is a key improvement towards achieving the access and mobility goals of this plan". This roadway, referred to as River Valley Parkway in the Comprehensive Plan, is shown in **Figure 12** and is ultimately intended to be a four-lane parkway with two lanes in each direction and turn lanes at intersections.

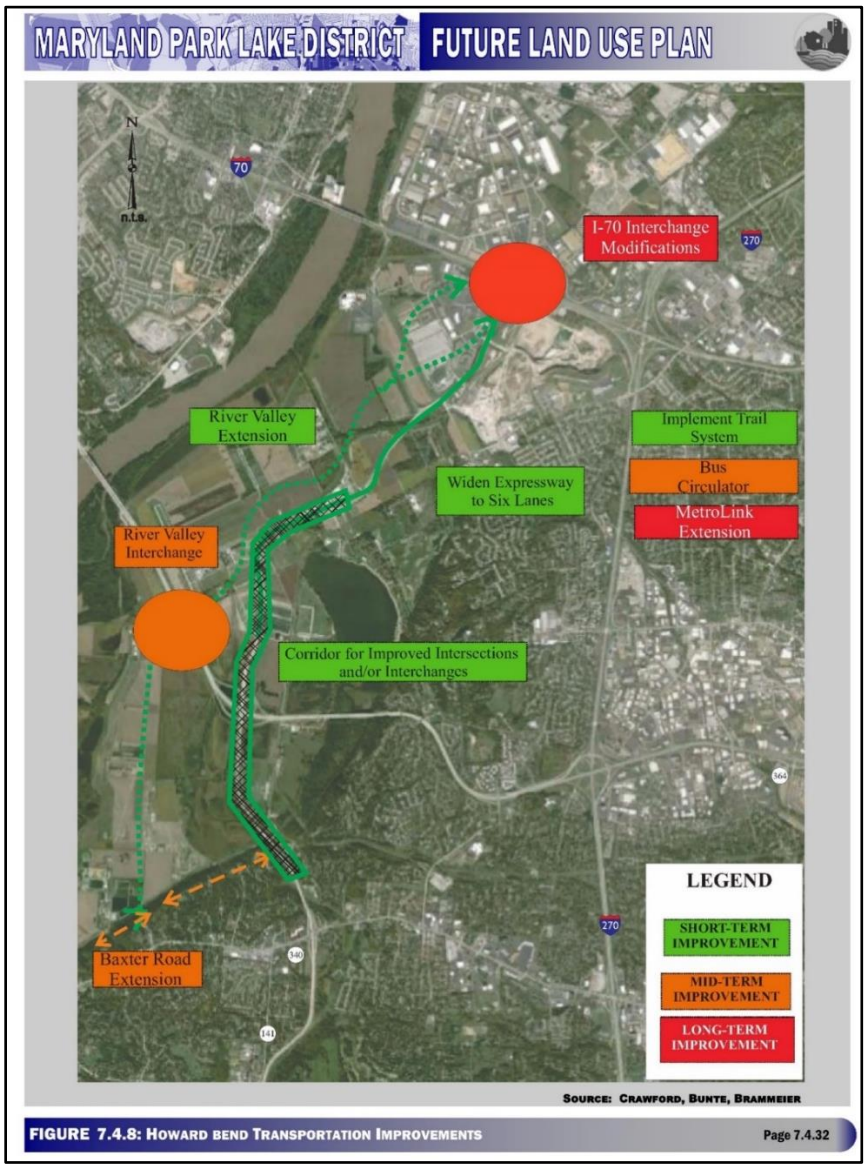

Figure 12: River Valley Parkway per the Maryland Heights Comprehensive Plan (Amended March 2020)

The River Valley Parkway is proposed to extend to both MO 364 (orange circle) and, perhaps, even to I-70 (red circle). These potential connections would directly impact the proposed development as well as the other developments along Sport Port Road and River Valley Drive by providing direct access to MO 364 and I-70 rather than relying upon MO 141 to access these highways. This connection would provide another means of access to the study area, reducing the reliance upon the intersections of MO 141 with Sport Port Road and River Valley Drive and potentially delaying the need for three through lanes in each direction along MO 141.

The 2018 traffic impact study for the Maryland Heights Commerce Center also addressed the future River Valley Parkway. The proposed development plan included the planned River Valley Parkway collector road identified by the Comprehensive Plan for the Maryland Park Lake District from Sport Port Road to the northern property line; the alignment being fixed to where MSD has provided an easement. The development of Maryland Heights Commerce Center would be responsible for building River Valley Parkway from Sport Port Road to the property line in phases in order to provide access to Buildings 2 thru Buildings 4. The piece of River Valley Parkway to the south of Sport Port Road that would ultimately connect to the subject tract under consideration by Altus Properties is not proposed as part of the Maryland Heights Commerce Center (Buildings 1 to 4) but is expected as part of future potential phases located along MO 141. A potential alignment of the River Valley Parkway adjacent to the proposed development is shown in Figure 2. Per the 2018 study, initially River Valley Parkway would only need to be constructed as a two-lane road with potential road improvements (turn lanes and/or additional through lanes) needed when future connections are made to the north and/or the south.

Safety Analysis of MO 141 and Creve Coeur Airport Road

Historical crash data (2018-2022) from MoDOT was utilized to weight predicted crashes based on actual accident data for the intersection of Creve Coeur Airport Road and MO 141. **Table 19** summarizes the total number of crashes per year at the study intersections from 2018 to 2022. As shown, the number ranged from a low of 2 crashes in 2020/21 to a high of 10 crashes in 2019. Crashes appear to have dropped off in frequency since 2019.

Table 19: Annual Total Crashes at Creve Coeur Airport Road & MO 141

Year	Total Crashes
2018	7
2019	10
2020	2
2021	2
2022	4
Grand Total	**25**

Table 20 shows the crash severity by type at the study intersections. Crash severity levels have been divided into the following categories: Incapacitating Injury; Injury; Property Damage Only (PDO). There was a single minor injury-related crash and ten Property Damage Only (PDO) crashes during the 5-year period. There were no fatalities or disabling injuries reported during the study period.

Table 20: Crash Severity at Creve Coeur Airport Road & MO 141

Crash Severity	Total Crashes
Fatality	0
Disabling Injury	3
Minor Injury	6
Property Damage Only	16
Grand Total	**25**

The HSM spreadsheet was utilized for the Creve Coeur Airport Road and MO 141 intersection. The HSM predictive methodology forecasts relative changes in crashes between the 2025 Baseline (proposed development not in place) and Build (proposed development in place) scenarios. As summarized in **Table 21**, the build scenario with the previously proposed mitigation measures in place would yield a slight increase in crashes as compared to Baseline scenario.

Table 21: Highway Safety Manual Analysis – Creve Coeur Airport Road & MO 141

Alternative	Expected Crash Frequency (Crashes/Year)		
	Fatal & Injury	Property Damage Only	Total
Baseline (Proposed Altus Development NOT In Place)	11.9	20.9	32.8
Build (Proposed Altus Development In Place)	12.5	22.1	34.6

Conclusions

Lochmueller Group has prepared a traffic study for the Maryland Park Industrial Development proposed by Altus Properties, to be located in Maryland Heights, Missouri. This study focuses on the development of 30 acres along Creve Coeur Airport Road with the intention to construct up to three buildings of various size for a total of 361,100 SF that would be utilized for warehousing/distribution. Access to the site is proposed via two driveways along Creve Coeur Airport Road, which ultimately connects to Missouri Route 141 (MO 141) via a signalized intersection.

In November 2022, a comprehensive traffic analysis was done of the corridor on the behalf of the proposed (and since approved) 364 Logistics Center (NorthPoint Development). This study considered a significant amount of committed and planned developments within the immediate area, all of which rely upon MO 141 as a means of access. This study contemplated the development of 345,500 SF on the subject tract under consideration by Altus Properties as well as the Maryland Heights Commerce Center (as well as its potential expansion), the Golf Port Apartments and Retail, the Westport Commerce Center, the 141 Logistics Center, River Valley Commerce Center and the 364 Logistics Center have all been approved by the City of Maryland Heights over the past several years. However, to date, most of these developments have not yet been constructed and occupied.

Hence, these committed and planned developments were folded into the November 2022 study's scenarios to properly account for their impact on future conditions along MO 141. Based on the study's analysis, several improvements to the study area were determined, as follows:

- Traffic volumes along MO 141 due to continued growth in the area would exceed the capacity provided by two through lanes in the northbound and southbound directions. Three through lanes would be required in both directions to accommodate the heavy vehicular demand as well as better serve the demands on the side street approaches at the signalized intersections.
- Dual eastbound left turn lanes on Sport Port Road's approach to MO 141 would be required by the year 2027. The additional traffic generated by the expansion of the Maryland Heights Commerce Center into the Ortmann Tract (Lots 9, 10 and 11) exceeds the capacity afforded by a single eastbound left turn lane approaching MO 141. However, due to signal timing constraints, dual eastbound left turn lanes should not be put in place without the provision of three through lanes on MO 141.
- The City of Maryland Heights should continue to pursue the construction and expansion of River Valley Parkway as a means of providing a meaningful parallel route to MO 141.

In addition to the improvements necessitated under baseline conditions, the development of the 364 Logistics Center triggers additional infrastructure improvements, as follows:

- Lengthen the existing 100-foot eastbound left turn lane on Sport Port Road approaching MO 141 to provide 250 feet of storage capacity, exclusive of taper. This is required prior to the development of 740,000 SF within 364 Logistics Center (assumed to be in place by the year 2025). It should be noted that this improvement would eventually be replaced by dual eastbound left turn lanes, as required by the year 2027 baseline conditions.
- Provide dual northbound left turn lanes on MO 141's approach to the signalized intersection with Sport Port Road by the year 2027 and prior to build out of the 364 Logistics Center. These lanes should each provide 200 feet of storage capacity, exclusive of tapers
- Widen Sport Port Road to provide an additional receiving lane for the dual northbound left turn lanes on MO 141. Two westbound lanes would continue on Sport Port Road terminating at the future intersection with River Valley Parkway (to be built by Maryland Heights Commerce Center)

as a dedicated right turn lane and a through lane. Should River Valley Parkway not be constructed by this time, the two westbound lanes on Sport Port Road should be carried approximately 650 feet before tapering back to one lane.

Given the proximity of the 364 Logistics Center to the MO 141 and MO 364 (Page Avenue) interchange and the likelihood of additional trips along MO 364 as a result of the development, a sensitivity analysis addressing the potential impacts to the recently improved interchange was completed. It was determined that the improved MO 141 and MO 364 interchange would be able to accommodate the additional traffic generated by the 364 Logistics Center as well as continual growth in the area through the year 2047. Both ramp terminals would be expected to operate at a LOS D or better through the year 2047. Therefore, it can be reasonably concluded that the 364 Logistics Center would not negatively impact the MO 141 and MO 364 interchange.

Access to the site is proposed via two driveways along Creve Coeur Airport Road, which ultimately connects to Missouri Route 141 (MO 141) via a signalized intersection. Based on the operational analysis at the intersection of Creve Coeur Airport Road and MO 141, the eastbound queue is not expected to extend past the access drive. Therefore, no additional recommendations are necessary for the access drive or eastbound operations.

In addition, historical crash data (2018-2022) from MoDOT was utilized to weight predicted crashes based on actual accident data for the study area. Over the 5-year period, 25 crashes occurred at the intersection of Creve Coeur Airport Road and MO 141. There was six minor injury-related crash and sixteen Property Damage Only (PDO) crashes and three suspected serious injury-related crashes were reported. A safety analysis was performed in accordance with methodologies outlined in the Highway Safety Manual (HSM) and demonstrated that the proposed mitigation measures in place at this intersection would not significantly impact crash frequency.

This traffic study adequately describes the forecasted traffic conditions that should be expected as a result of the proposed 364 Logistics Center and the associated infrastructure improvements. Please contact our office at (314) 446-3791 if you have any questions or comments concerning this report.

Completed by Lochmueller Group, Inc.

APPENDIX

Approved November 2022 Traffic Impact Study

OCTOBER 28, 2022

Revised November 18, 2022

364 Logistics Center

Maryland Heights, Missouri

Prepared for:

NorthPoint Development

12977 N. Outer 40 Road

Suite 203

St. Louis, MO 63141

Prepared by:

Lochmueller Group

411 N. 10th Street, Suite 200

St. Louis, MO 63101

LOCHMUELLER GROUP

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Executive Summary

Lochmueller Group has prepared a traffic study for the 364 Logistics Center proposed by NorthPoint Development, to be located in Maryland Heights, Missouri. The study focuses on the development of up to five buildings of various size for a total of 1,897,000 SF that would be utilized for warehousing/distribution. Access to the site is proposed via a drive at the western terminus of Hooks River Road, which ultimately connects to Missouri Route 141 (MO 141) via Sport Port Road.

Evaluating the impact of the proposed 364 Logistics Center is complicated by the significant amount of committed and planned developments in the immediate area, all of which rely upon MO 141 as a means of access. The Maryland Heights Commerce Center (as well as its potential expansion), the Golf Port Apartments and Retail, the Westport Commerce Center, the 141 Logistics Center and the River Valley Commerce Center have all been approved by the City of Maryland Heights over the past several years. However, to date, most of these developments have not yet been constructed and occupied. In addition, the property adjacent to the Thies Farm is being actively marketed for additional warehouse/office flex use and would likely come online in the next several years.

Hence, these committed and planned developments were folded into this study's scenarios to properly account for their impact on future baseline conditions (traffic conditions prior to the introduction of the 364 Logistics Center's site generated traffic). The analysis scenarios for the study are as follows:

- **2023 Base Conditions**
  - 0.5% annual growth from 2019 to 2022 for background growth (representing growth before the specific developments come online)
  - 63,645 SF within Maryland Heights Commerce Center (Lot 4)
  - 276 apartments within Golf Port
  - 829,353 SF within Westport Commerce Center
  - 256,880 SF within River Valley Commerce Center
  - Assumes intersection with River Valley with MO 141 is improved to provide dual NBLT lanes, third SB through lane, and a dedicated EBLT plus a shared LT/TH lane
- **2025 Base Conditions -** *Includes all represented in 2023 Base conditions plus the following*:
  - 544,700 SF within Maryland Heights Commerce Center (Lots 1 and 3)
  - 20,000 SF medical office & 20,000 SF retail within Golf Port
  - 505,440 SF within Westport Commerce Center (representing build out)
  - 540,800 SF within 141 Logistics Center
  - 849,000 SF within River Valley Commerce Center (representing build out)
- **2025 Forecasted Conditions** – *includes all represented in 2025 Base Conditions plus*:
  - 740,000 SF within the proposed 364 Logistics Center (Phase I)
- **2027 Base Conditions** – *includes all represented in 2025 Base Conditions plus*:
  - 404,700 within Maryland Heights Commerce Center (Lot 2 – representing build out of the original commerce center)
  - 340,500 within Maryland Heights Commerce Center Expanded to the Ortmann Tract (Lots 9, 10 & 11)
  - 168 apartments & 3,500 SF QSR within Golf Port
  - 540,800 SF within 141 Logistics Center (representing build out)
  - 345,500 SF within Altus Property (speculative)
- **2027 Forecasted Conditions** – *includes all represented in 2027 Base Conditions plus*:
  - 1,897,000 SF within the proposed 364 Logistics Center (representing build out)

- **2047 Base Conditions** – *includes all represented in 2027 Base Conditions plus*:
  - 0.5% annual growth rate from 2027 to 2047
  - 748,000 SF within Maryland Heights Commerce Center Expanded to the Ortmann Tract (representing build out)
  - 156 apartments (Phase 3), 175 apartments & 22 villas (Phase 4) within Golf Port
- **2047 Forecasted Conditions** – *includes all represented in 2047 Base Conditions plus*:
  - 1,897,000 SF within the proposed 364 Logistics Center (representing build out)

Based on the capacity analysis, several improvements to the study area are warranted under baseline conditions (prior to the introduction of the 364 Logistics Center's site generated traffic and are not the responsibility of NorthPoint's 364 Logistics Center). They are as follows:

- Traffic volumes along MO 141 due to continued growth in the area would exceed the capacity provided by two through lanes in the northbound and southbound directions. Three through lanes would be required in both directions to accommodate the heavy vehicular demand as well as better serve the demands on the side street approaches at the signalized intersections. It is likely that in order for the additional lanes on MO 141 to be effective, they would extend, at a minimum, from Casino Drive to River Valley Drive; a distance of approximately 2.5 miles.
- Dual eastbound left turn lanes on Sport Port Road's approach to MO 141 would be required by the year 2027. The additional traffic generated by the expansion of the Maryland Heights Commerce Center into the Ortmann Tract (Lots 9, 10 and 11) exceeds the capacity afforded by a single eastbound left turn lane approaching MO 141.
- The City of Maryland Heights should continue to pursue the construction and expansion of River Valley Parkway as a means of providing a meaningful parallel route to MO 141.

In addition to the improvements necessitated under baseline conditions, the development of the 364 Logistics Center triggers additional infrastructure improvements, as follows:

- Lengthen the existing 100-foot eastbound left turn lane on Sport Port Road approaching MO 141 to provide 250 feet of storage capacity, exclusive of taper. This is required prior to the development of 740,000 SF within 364 Logistics Center (assumed to be in place by the year 2025). It should be noted that this improvement would eventually be replaced by dual eastbound left turn lanes, as required by the year 2027 baseline conditions.
- Provide dual northbound left turn lanes on MO 141's approach to the signalized intersection with Sport Port Road by the year 2027 and prior to build out of the 364 Logistics Center. These lanes should each provide 200 feet of storage capacity, exclusive of tapers.
- Widen Sport Port Road to provide an additional receiving lane for the dual northbound left turn lanes on MO 141. Two westbound lanes would continue on Sport Port Road terminating at the future intersection with River Valley Parkway (to be built by Maryland Heights Commerce Center) as a dedicated right turn lane and a through lane. Should River Valley Parkway not be constructed by this time, the two westbound lanes on Sport Port Road should be carried approximately 650 feet before tapering back to one lane.

Given the proximity of the 364 Logistics Center to the MO 141 and MO 364 (Page Avenue) interchange and the likelihood of additional trips along MO 364 as a result of the development, a sensitivity analysis addressing the potential impacts to the recently improved interchange was completed. It was determined that the improved MO 141 and MO 364 interchange would be able to accommodate the additional traffic generated by the 364 Logistics Center as well as continual growth in the area through the year 2047. Both

ramp terminals would be expected to operate at a LOS D or better through the year 2047. Therefore, it can be reasonably concluded that the 364 Logistics Center would not negatively impact the MO 141 and MO 364 interchange.

In addition, historical crash data (2017-2021) from MoDOT was utilized to weight predicted crashes based on actual accident data for the study area. Over the 5-year period, 11 crashes occurred at Sport Port Road and MO 141. There was one minor injury-related crash and ten Property Damage Only (PDO) crashes; no fatalities or disabling injury-related crashes were reported. A safety analysis was performed in accordance with methodologies outlined in the Highway Safety Manual (HSM) and demonstrated that the proposed mitigation measures in place at this intersection would not significantly impact crash frequency.

The following report outlines in detail the methodology and analysis that supports the above conclusions.

POSTSCRIPT:

Following submittal of this TIS to MoDOT and the City of Maryland Heights, in October 2022, MoDOT provided traffic counts along MO 141 at the intersections with Sport Port Road and River Valley Road collected in September 2022. The data provided after completion of the study demonstrated that the need for three through lanes on MO 141 at Sport Port Road and Creve Coeur Mill Road would likely be pushed beyond the study horizon of 2027 and not required in 2027 as presented in this report. A preliminary analysis of the reduced through volumes on MO 141 indicate approximately a 20% reduction in the volume to capacity ratios for the through movements, thereby allowing for some flexibility in serving the side street demands without sacrificing the mainline operations. However, the operating conditions were not updated in this report since the analysis was not revised to reflect the MoDOT data received after submittal.

Introduction

Lochmueller Group has prepared a traffic study for the proposed 364 Logistics Center to be located in Maryland Heights, Missouri. The study focuses on the development of up to five buildings of various size for a total of 1,897,000 SF that would be utilized for warehousing/distribution. Access to the site is proposed via a drive at the western terminus of Hooks River Road, which ultimately connects to MO 141 via Sport Port Road. **Figure 1** illustrates the proposed location of the 364 Logistics Center with the proposed site plan shown in **Figure 2**.

Figure 1: Location of Proposed 364 Logistics Center

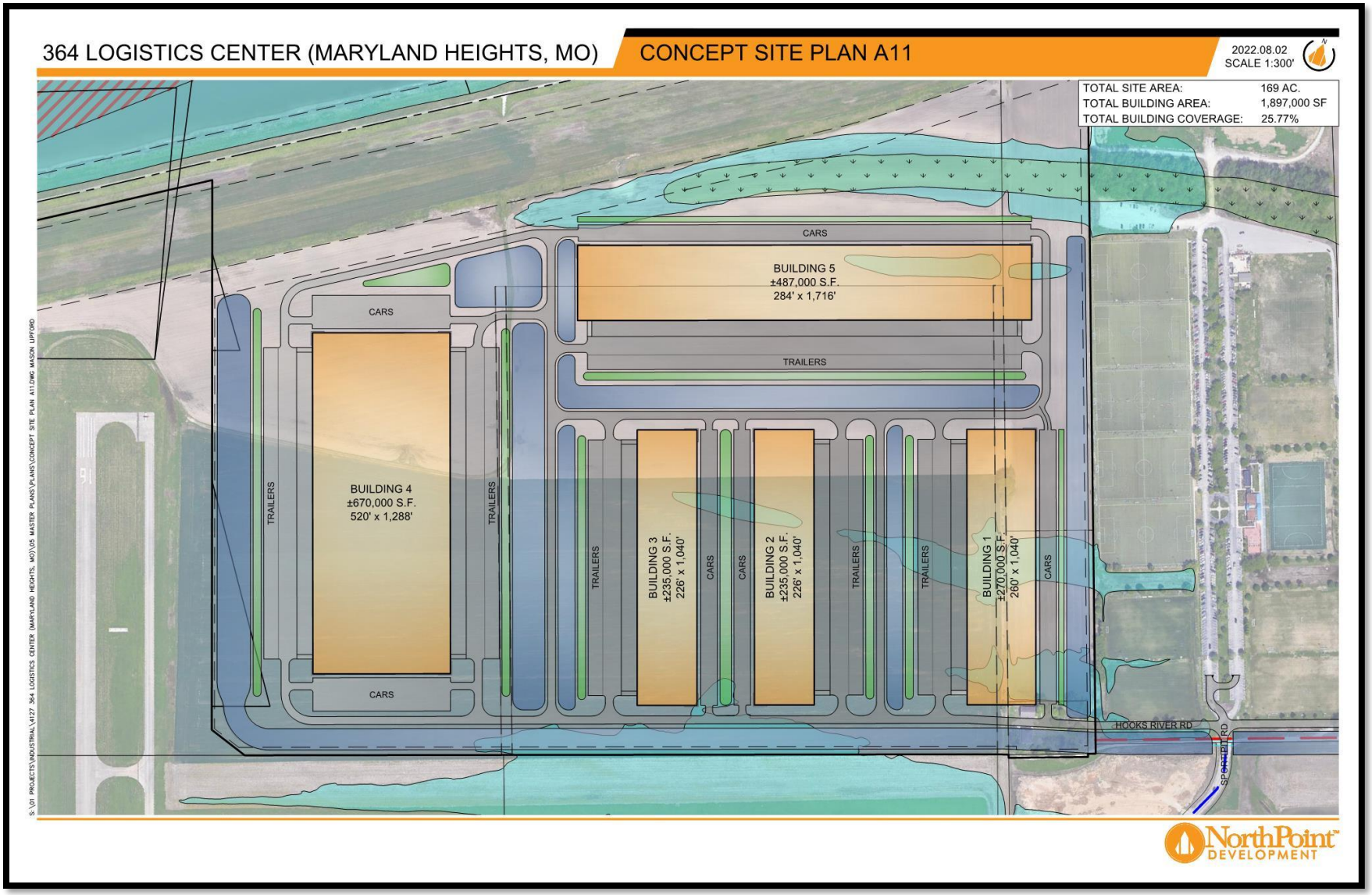


Figure 2: Proposed 364 Logistics Center Site Plan (Provided by Others)

The intent of this study is to identify the traffic generation associated with the proposed development, analyze the associated traffic impacts, and determine the need for mitigation measures, if necessary, to offset the traffic impacts to Sport Port Road and/or its intersection with MO 141. In addition, this study considers the impacts associated with various potential developments already approved along the MO 141 corridor in the vicinity of the proposed development.

This study was performed in accordance with the requirements of the Missouri Department of Transportation (MoDOT) and the City of Maryland Heights. Based upon extensive discussion, it was agreed that the following scenarios would be evaluated as part of this study:

- **2023 Base Conditions** – Accounts for background growth, partial development of the Maryland Heights Commerce Center, Golf Port development, Westport Commerce Center, and River Valley Commerce Center. In addition, it is assumed that the intersection with River Valley with MO 141 is improved as obligated by Westport and River Valley Commerce Centers.
- **2025 Base Conditions –** Includes all represented in 2023 Base conditions plus the continued development of Maryland Heights Commerce Center, Golf Port Development, Westport Commerce Center (achieving full buildout), 141 Logistics Center and River Valley Commerce Center (achieving full buildout).
- **2025 Forecasted Conditions** – Includes all represented in 2025 Base Conditions plus the introduction of Phase 1 of the proposed 364 Logistics Center (740,000 SF).
- **2027 Base Conditions** – Includes all represented in 2025 Base Conditions plus the continued development of Maryland Heights Commerce Center (achieving full buildout), expansion of the Maryland Heights Commerce Center to the Ortmann Tract, Golf Port Development, 141 Logistics Center and the potential for development on the Altus Property adjacent to Thies Farm.
- **2027 Forecasted Conditions** – includes all represented in 2027 Base Conditions plus full buildout of the proposed 364 Logistics Center (1,897,000 SF)
- **2047 Base Conditions** – includes all represented in 2027 Base Conditions plus background growth along MO 141, buildout of the Ortmann Tract and the Golf Port developments.
- **2047 Forecasted Conditions** – includes all represented in 2047 Base Conditions plus full buildout of the proposed 364 Logistics Center (1,897,000 SF)

Conditions were evaluated during the morning and evening peak periods for a typical weekday since these periods represent the busiest times for the adjacent roadways as well as the proposed use. If the proposed development's traffic can be accommodated during these peak periods, it stands to reason that adequate capacity would be available throughout the remainder of the day. The intersections included in this analysis include the following:

- Sport Port Road & Missouri Route 141 (signalized)
- Creve Coeur Mill Road & Missouri Route 141 (signalized)
- River Valley Road & Missouri Route 141 (signalized)
- Site Access Drive at Hooks River Road & Sport Port Road (unsignalized)

This following report presents the study's methodology and findings.

Existing Roadway Network

Study Area Roadways

Missouri Route 141 (Maryland Heights Expressway) is controlled by MoDOT and is classified as an expressway by East West Gateway. MO 141 is a four-lane freeway with two lanes in each direction and a speed limit of 55 miles per hour (mph) through the study area. MO 141 runs north to MO Route 370 and south all the way through St. Louis County and into Jefferson County.

Golf Port Drive/Sport Port Road is classified as a local road with a speed limit of 30 mph. The intersection of MO 141 and Golf Port Drive/Sport Port Road is signalized. The eastbound approach along Sport Port Road consists of one left-turn lane and one shared through/right-turn lane. The westbound approach along Golf Port Drive consists of one left-turn lane and one shared through/right-turn lane. The northbound and southbound approaches along MO 141 consist of a dedicated left-turn lane, two through lanes, and a dedicated right-turn lane.

Creve Coeur Mill Road is classified as a minor collector with a speed limit of 45 mph, whereas **Creve Coeur Airport Road** is classified as a local road. The intersection of MO 141 and Creve Coeur Mill Road/Creve Coeur Airport Road is signalized. The eastbound approach along Creve Coeur Airport Road consists of one left-turn lane and one shared through/right-turn lane. The westbound approach along Creve Coeur Mill Road consists of one left-turn lane, one through, and one right-turn lane. The northbound and southbound approaches along MO 141 consist of a dedicated left-turn lane, two through lanes, and a dedicated right-turn lane.

River Valley Drive is classified as a local road. River Valley Drive is comprised of two lanes; one in each direction and the speed limit along River Valley Drive varies between 35 mph on the northern end to 40 mph on the southern end. The intersection of River Valley Drive with MO 141 is in the process of being improved due to obligations associated with the development of Westport Commerce Center, 141 Logistics Center and River Valley Commerce Center. Once in place, the intersection would provide for dual northbound left turn lanes on MO 141, a third southbound through lane on MO 141, and widening of the west leg to provide for a dedicated eastbound left-turn lane, a shared eastbound left/through lane and a dedicated eastbound right turn lane. **Figure 3** represents the lane configuration at the improved intersection.

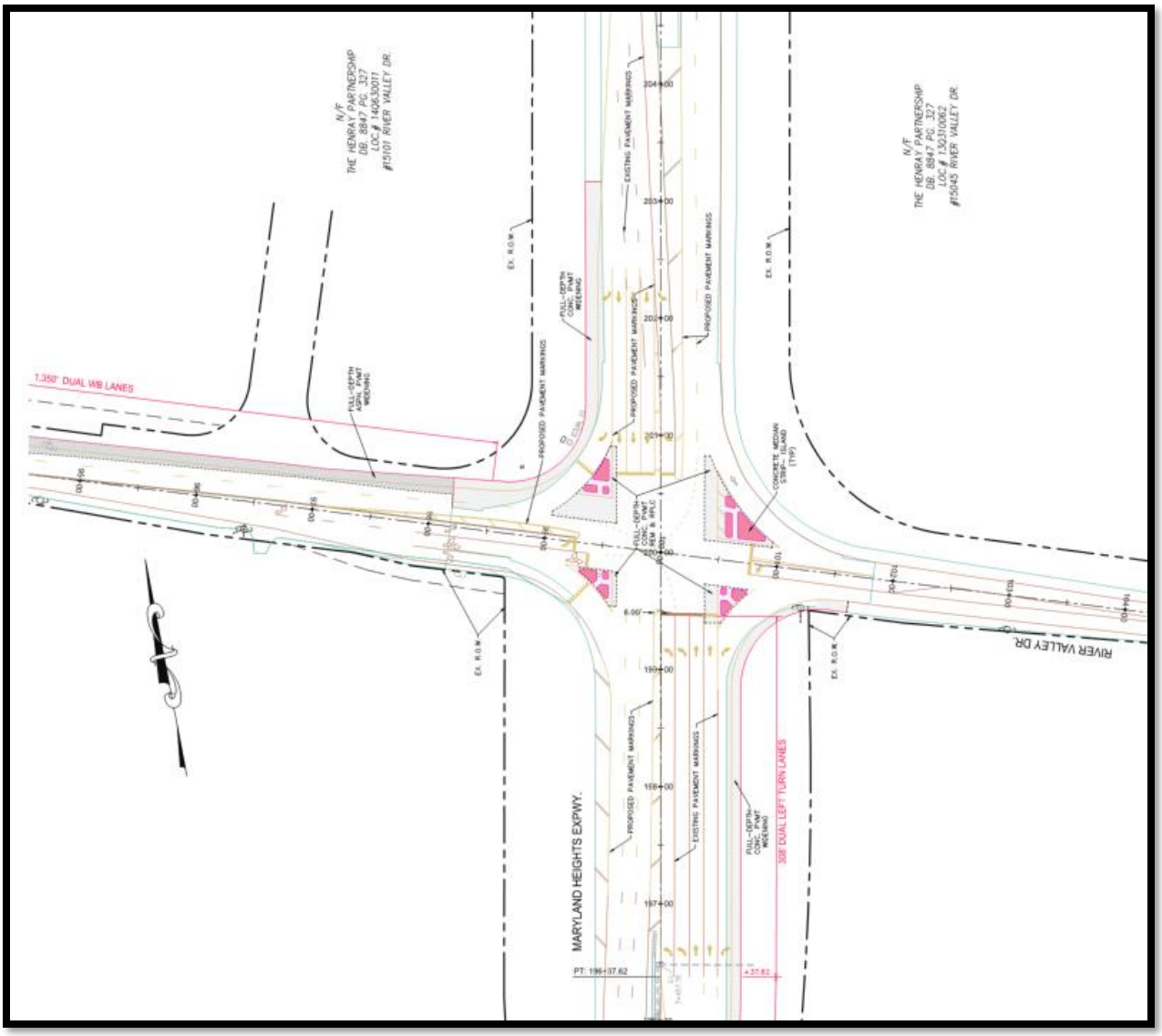


Figure 3: Improved Intersection of MO 141 & River Valley Road

The existing lane configuration and traffic control at the study intersections included in the study area are depicted in **Figure 4.**

Pedestrian/Bicycle Accommodations

MO 141 currently lacks sidewalks, crosswalks and dedicated bicycle facilities. Pedestrian accommodations are not provided at the signalized intersections along MO 141 at Sport Port Road or at Creve Coeur Mill Road/Airport Road. However, Creve Coeur Lake and Creve Coeur Park are located directly south and east of the development area. There are several trails within Creve Coeur Park which accommodate both pedestrians and bicyclists. The Creve Coeur Park Connector, a bike and pedestrian trail, runs through the southern portion of the study area. While the Connector does not run directly along any of the study roads, River Valley Drive experiences high bicycle volumes as riders travel between the Connector and nearby parks. A shoulder approximately 9 feet (ft) in width runs along River Valley Drive which serves as a defacto bicycle lane.

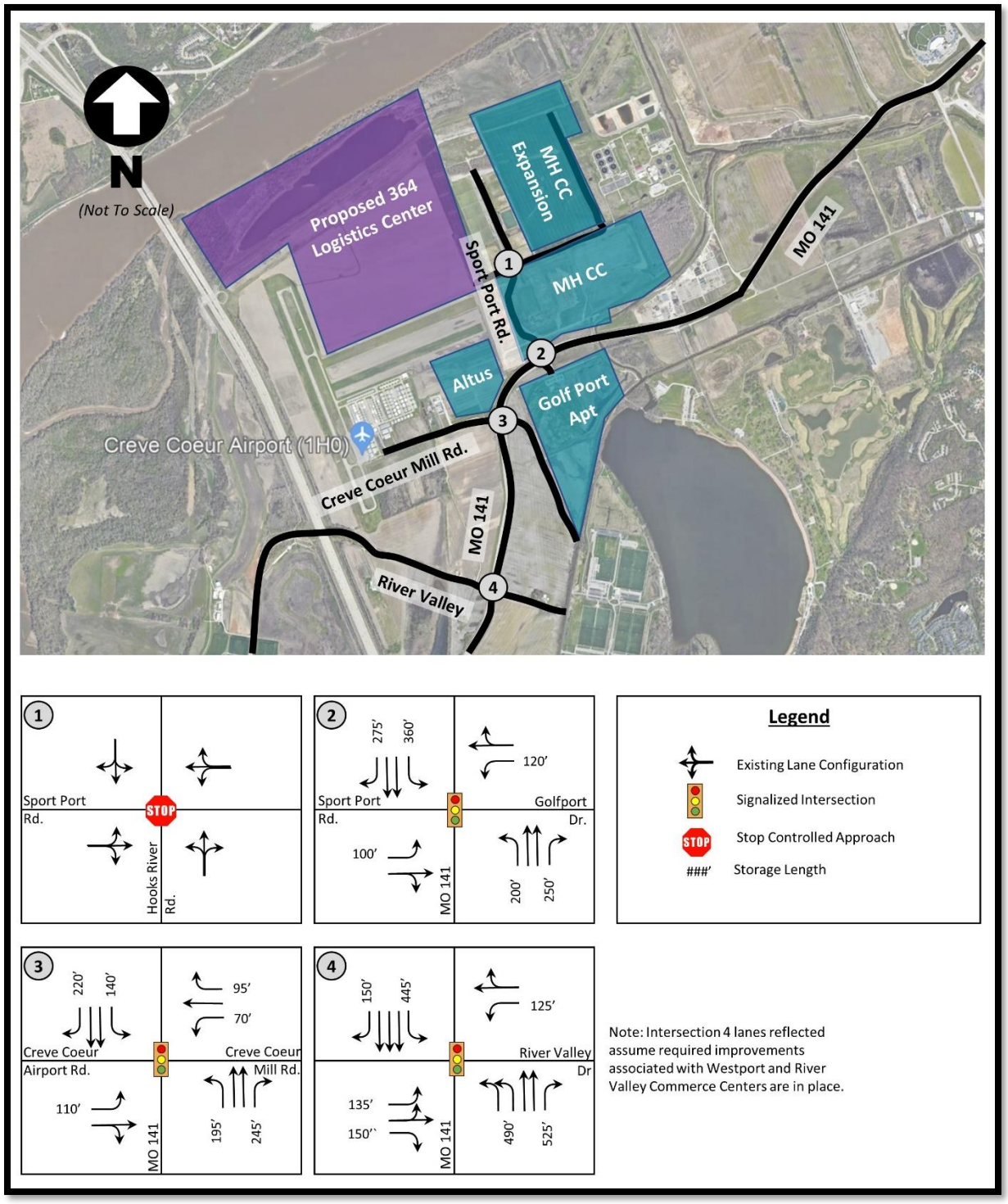


Figure 4: Year 2023 Baseline Lane Configurations

Sport Port International Observations

At the request of MoDOT, field observations were conducted at the intersection of MO 141 and Sport Port Road on September 28th, 2022 between 5 and 7 PM. These evening observations were conducted to understand the traffic conditions generated by the use, SportPort International, a recreational complex for soccer, field hockey, lacrosse and other field related sports. SportPort International is located at the western terminus of Sport Port Road and would be immediately adjacent to the proposed 364 Logistics Center.

Between 5 and 7 PM of a typical weekday, Lochmueller observed several rounds of sporadic and short-lived vehicular queues for the northbound left inbound movement and eastbound left outbound movement that would spill beyond their dedicated bays and often require more than one cycle of the signal to complete their turn. For example, queues of up to 30 vehicles at approximately 5:20 PM; presumably for a 5:30 PM practice/game, were noted. However, these extended queues were short lived and typically lasted less than ten minutes. During these congested periods, northbound left vehicles were observed bypassing the left turn lane and instead making a right onto Golf Port Road, completing a u-turn, and then proceeding through the intersection as a westbound through movement. This, in turn, created brief conflicts with the eastbound vehicles turning left from Sport Port Road as the eastbound left turns were competing with artificially high opposing volumes.

The operating conditions associated with this recreational use and its impacts on the northbound left turn and east and westbound approaches was factored into the weekday pm peak hour analysis.

Development Along the MO 141 Corridor

To properly quantify the impact of the proposed 364 Logistics Center, it is necessary to evaluate the amount of traffic generated by each phase of the development and its impact to the surrounding road network. However, this effort is complicated by the significant amount of committed and planned developments in the immediate area, all of which rely upon MO 141 as a means of access. The Maryland Heights Commerce Center (as well as its potential expansion), the Golf Port Apartments and Retail, the Westport Commerce Center, the 141 Logistics Center and the River Valley Commerce Center have all been approved by the City of Maryland Heights over the past several years. However, to date, the vast majority of these developments have not yet been constructed and occupied. In addition, the property adjacent to the Thies Farm is being actively marketed for additional warehouse/office flex use and will likely come online in the next five years. **Figure 5** depicts the locations of the various developments along the MO 141 corridor.

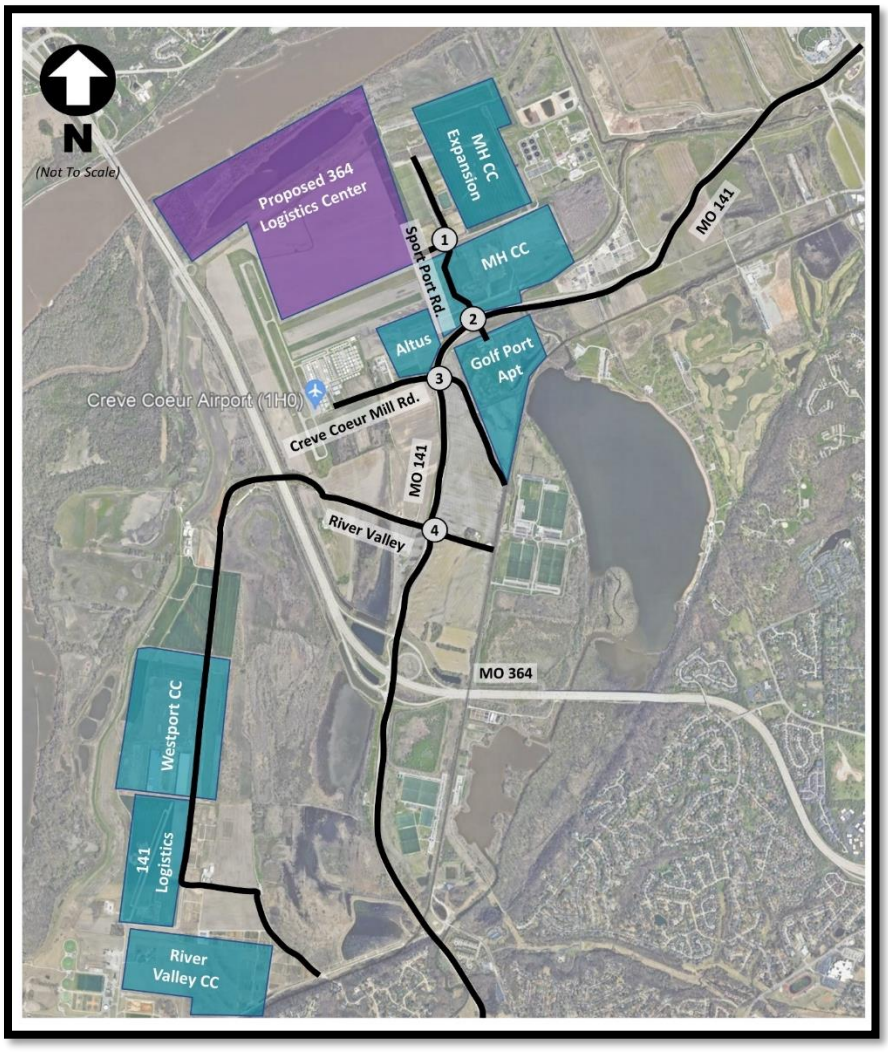


Figure 5: Development along the MO 141 Corridor

An overview of the surrounding developments, including the proposed 364 Logistics Center development, is shown below in **Table 1**, which details square footage by phase, development status, and relevant assumptions.

Table 1: Summary of Developments Along MO 141 and Assumptions

Development	Build Out Size	Build Out Use	Status	Assumptions
Maryland Heights Commerce Center	239,145	Office Flex	Committed	Lots 1 and 4; Lot 4 (63,645 SF) constructed in 2023; Lot 1 (175,500 SF) constructed in 2025
	773,900	Office Dist.	Committed - Lot 3 / Planned Lot 2	Lots 2 and 3; Lot 2 (404,700) constructed by 2027; Lot 3 (369,200 SF) constructed in 2024
	340,500	Office Flex	Planned	Lots 9, 10 and 11 of Ortmann Tract Expansion; constructed by 2027
	748,000	Office Dist.	Planned	Lots 12 and 13 of Ortmann Tract Expansion; no defined timeframe (assumed in place by 2047)
Golf Port Apartments	276	Apartments	Under Construction	Phase 1; constructed by 2023
	168	Apartments	Committed	Phase 2; constructed by 2026
	156	Apartments	Committed	Phase 3; constructed by 2029
	175	Apartments	Committed	Phase 4; constructed by 2032
	22	Villas	Committed	Phase 4; constructed by 2032
	20,000	Medical Office	Committed	Constructed in 2024
	20,000	Retail	Committed	Constructed in 2025
	3,500	QSR	Committed	Constructed in 2026
Westport Commerce Center	606,585	Office Flex	Under Construction	Phase 1 in place by 2023
	222,768	Office Flex	Under Construction	Phase 2 in place by 2023
	505,440	Office Flex	Committed	Phase 3 in place by 2025
141 Logistics Center	540,800	Office Flex	Committed	Phase 1 in place by 2024
	540,800	Office Flex	Committed	Phase 2 in place by 2027
River Valley Commerce Center	256,880	Office Dist.	Under Construction	In place by 2023
	354,000	Office Dist.	Committed	In place by 2024
	495,000	Office Dist.	Committed	In place by 2025
Altus	345,500	Office Dist.	Planned	Assumed in place by 2027
Proposed 364 Logistics Center	**740,000**	**Office Dist.**	**Planned (Current TIS)**	**Phase 1 in place by 2025**
	1,157,000	**Office Dist.**	**Planned (Current TIS)**	**Phase 2 in place by 2027**

The trip generation for all the various developments in the area, not just the proposed 364 Logistics Center, were included in the scenarios in an effort to align the probable timelines of the various developments into a realistic depiction of the future conditions within the study area. A technical memorandum detailing the concept plans, trip generation, directional distribution, annual background growth percentage, and heavy vehicle percentage for the developments by scenario year was completed and approved by MoDOT and the City of Maryland Heights prior to the documentation of this final report and is provided in the Appendix.

A summary of each of the developments is presented in the subsequent subsections. Please see Appendix for detailed information pertaining to each development.

Maryland Heights Commerce Center

The Maryland Heights Commerce Center is in development by KBG, Inc. Access to the site is provided via Sport Port Road and the future River Valley Parkway, which would be constructed in conjunction with the development of the Maryland Heights Commerce Center. River Valley Parkway's alignment is fixed to where the Metropolitan Sewer District (MSD) has provided an easement and will be built in phases from Sport Port Road to the property line as access is needed. It is envisioned that this roadway would initially be comprised of two travel lanes with turn lanes as needed. Additionally, the Maryland Heights Commerce Center has the potential for expansion onto the Ortmann Tract. The trip generation for the various phases on the MH Commerce Center are reflected in **Table 2.**

Table 2: Maryland Heights Commerce Center Trip Generation

Scenario Year	Size (SF)	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2023	63,645	Office Flex	130	18 (1)	4 (2)	22 (3)	5 (1)	17 (2)	22 (3)
2025	175,500	Office Flex	130	48 (3)	12 (4)	60 (7)	13 (3)	47 (4)	60 (7)
2025	369,200	Office Dist.	150	52 (3)	16 (4)	68 (7)	20 (6)	51 (5)	71 (11)
2027	404,700	Office Dist.	150	55 (4)	17 (4)	72 (8)	21 (6)	54 (6)	75 (12)
2027	340,500	Office Flex	130	94 (6)	22 (8)	116 (14)	25 (5)	91 (9)	116 (14)
2047	748,000	Office Dist.	150	87 (8)	26 (7)	113 (15)	32 (11)	84 (11)	116 (22)
Total Development				354 (25)	97 (29)	451 (54)	116 (32)	344 (37)	460 (69)

The traffic study for the proposed Maryland Heights Commerce Center (not including the expansion to the Ortmann Tract), completed in 2018, determined an extension of the eastbound left turn bay to provide for 200 feet of storage and signal timings adjustments were necessary on Sport Port Road by the year 2025. It was also determined that three northbound and three southbound lanes would be needed on MO 141 with the 20-year horizon.

It should be noted that the expansion of the Maryland Heights Commerce Center onto the Ortmann Tract (in year 2027 and beyond) was not evaluated as part of the 2018 TIS. The City of Maryland Heights is requiring a TIS to be completed that would consider development on the Ortmann Tract prior to construction on those parcels.

Golf Port Apartment

The Golf Port Apartments is also in development by KBG, Inc. and is located in the northeast quadrant of MO 141 and Golf Port Drive. The development includes several phases of apartments, villas, medical office

space, retail space, and a quick service restaurant. Currently, the first phase of the development of 276 apartments is under construction. The remaining phases are anticipated for construction between 2024 and 2032. The Golf Port Apartments development will have site access to MO 141 via Golf Port Drive and Creve Coeur Mill Road. The trip generation volumes for the Golf Port Apartments development are shown below in **Table 3.**

Table 3: Golf Port Apartments Trip Generation

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2023	276	Apartments	221	25	85	110	66	42	108
2025	20,000	Med Office	720	49	13	62	24	55	79
2025	20,000	Retail	822	28	19	47	66	66	132
2027	168	Apartments	221	14	48	62	37	24	61
2027	3,500	QSR	934	79	77	156	60	56	116
2047	156	Apartments	221	13	44	57	40	26	66
2047	175	Apartments	221	15	50	65	42	27	69
2047	22	Villas	220	7	23	30	19	11	30
Total Development				230	359	589	354	307	661

The traffic study for the proposed Golf Port Apartments, completed December 2021, determined that permitted-protected phasing for the side streets of Golf Port Drive/Sport Port Road at MO 141 should be implemented (FYA), that a 120 second cycle length should be used along the MO 141 corridor during the PM peak period, that the westbound left turn from Creve Coeur Mill Road onto MO 141 should be lengthened to provide 150 feet of storage, and that the westbound left turn lane from Golf Port Road should be lengthened to 200 feet. It was also determined that three northbound and three southbound lanes would be needed on MO 141 within the 20-year horizon.

Westport Commerce Center

The Westport Commerce Center, as proposed by TriStar Companies, is to be located southwest of Route 364 and MO 141 along River Valley Drive. Phases 1 and 2 of the development will be complete by 2023 with the third phase completed by 2025. The development will encompass a total of 1.33 million SF of office distribution and light industrial uses. Access to the site is provided via three driveways along the west side only of River Valley Drive. The trip generation volumes for the Westport Commerce Center development are shown below in **Table 4.**

Table 4: Westport Commerce Center Trip Generation

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2023	829,353	Office Flex	130	228 (15)	54 (18)	282 (33)	62 (12)	220 (21)	282 (33)
2025	505,440	Office Flex	130	139 (9)	33 (11)	172 (20)	38 (7)	134 (13)	172 (20)
Total Development				367 (24)	87 (29)	454 (53)	100 (19)	354 (34)	454 (53)

The traffic study for the Westport Commerce Center, completed in 2020, determined the following improvements were necessary by the time the center provided for 175,000 SF:

- Widen west leg of River Valley Drive to provide an additional lane approaching MO 141
- Stripe the widened eastbound approach to provide a dedicated left turn lane, a shared left/through lane, and a dedicated right turn lane
- Widen southbound MO 141 to provide a dedicated right turn lane and a third southbound through lane
- Modify the traffic signal's phasing to provide split phasing for River Valley Drive approaches

These improvements are currently under construction.

141 Logistics Center

The 141 Logistics Center is currently under development by Clearpath Development Partners and is located southwest of Route 364 and MO 141 along River Valley Drive. The development will encompass a total of 1.08 million SF of office distribution and light industrial uses, similar to the adjacent Westport Commerce Center. Access to the site is provided via four drives; two onto River Valley Drive and two onto Hog Hollow Road. The trip generation volumes for the 141 Logistics Center development are shown below in **Table 5**.

Table 5: 141 Logistics Center Trip Generation

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2025	540,800	Office Flex	130	149 (10)	35 (12)	184 (22)	40 (8)	144 (14)	184 (22)
2027	540,800	Office Flex	130	149 (10)	35 (12)	184 (22)	40 (8)	144 (14)	184 (22)
Total Development				298 (20)	70 (24)	368 (44)	80 (16)	288 (28)	368 (44)

The 141 Logistics Center's traffic impact was evaluated with the obligated improvements for the Westport Commerce Center, presented above, in place. With the addition of the 141 Logistics Center, the analysis determined the need for additional improvements to accommodate the increase in traffic. Improvements triggered for the intersection of MO 141 at River Valley Drive by the 141 Logistics Center included:

- Dual northbound left-turn lanes on MO 141 with appropriate signal modifications
- Widening of River Valley Drive, west of MO 141, to accommodate an additional receiving lane
- Signal timing changes to adjust for increase demand at various approaches

River Valley Commerce Center

The River Valley Commerce Center is currently under construction by North Point Development and will be located southwest of Route 364 and MO 141 along River Valley Drive and Hog Hollow Road. The site will accommodate a total of 1.1 million SF of office distribution space. Access to the site is provided via two drives: one as an extension of River Valley Drive and one onto Hog Hollow Road. An additional third site access point for emergency vehicles will be provided on the western edge of the site, along Hog Hollow Road. The trip generation volumes for the River Valley Commerce Center development are shown below in **Table 6.**

Table 6: River Valley Commerce Center Trip Generation

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2023	256,800	Office Dist.	150	41 (3)	13 (2)	54 (5)	16 (4)	41 (4)	57 (8)
2025	354,000	Office Dist.	150	51 (4)	15 (3)	66 (7)	19 (6)	50 (5)	69 (11)
2025	495,000	Office Dist.	150	64 (5)	19 (5)	83 (10)	24 (8)	62 (7)	86 (15)
Total Development				156 (12)	47 (10)	203 (22)	59 (18)	153 (16)	212 (34)

The River Valley Commerce Center's impact was evaluated with the obligated improvements for the Westport Commerce Center, presented previously, in place. With the addition of the River Valley Commerce Center, the analysis determined the need for additional improvements at the intersection of MO 141 at River Valley Drive to accommodate the increase in traffic, which included:

- Dual northbound left-turn lanes on MO 141 with appropriate signal modifications
- Widening of River Valley Drive, west of MO 141, to accommodate an additional receiving lane
- Signal timing changes to adjust for increase demand at various approaches

Note the improvements are the same as required by 141 Logistics Center. If both developments move forward concurrently, there is the potential for a cost sharing opportunity. Otherwise, whichever development is in place first would be responsible for constructing the additional improvements.

Altus Potential Development

A potential industrial use development, currently being marketed by Altus, is planned for the tract of land adjacent to Thies Farms in the northwest corner of the intersection of Route 141 and Creve Coeur Airport/Mill Road. While the full details of the development are not realized, for the purposes of this study it is assumed it will be in place by 2027 with an estimated 345,500 SF of office distribution space. **Table 7** below displays the potential trip generation volumes for this development.

Table 7: Altus Development Trip Generation

Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2027	345,500	Office Dist.	150	50 (4)	15 (3)	65 (7)	19 (5)	49 (5)	68 (10)

Proposed 364 Logistics Center

NorthPoint's 364 Logistics Center is the proposed development under review for this current study of the traffic along MO 141. The proposed development is comprised of up to five buildings of various size for a total of 1,897,000 SF. Access to the site is proposed via one drive at the western termination of Hooks River Road, which ultimately connects to Missouri Route 141 via Sport Port Road. The proposed site development plan was presented in Figure 2 previously.

Trip Generation

The site-generated traffic volumes for the 364 Logistics Center development were estimated using data provided in the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition utilizing

gross floor area (GFA) as the determining variable. Land Use 150: Warehousing was utilized for the calculations, as discussed during the scoping meeting with the respective agencies. The fitted curve equation was provided and used as there were more than 20 data points available.

The forecasted trips that would be generated by the proposed development are summarized in **Table 8**. As shown, the proposed HBLD River Valley development would generate a total of approximately 274 trips during the weekday morning peak hour and 280 trips during the weekday evening peak hour upon completion. Truck trip generation volumes are shown alongside the total vehicle trip generation in Table 8. Please note that the truck generation volumes shown in the tables are accounted for in the total vehicle trip generation and are not in addition to the vehicle trip generation volumes.

Table 8: Proposed 364 Logistics Center Trip Generation

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2025	740,000	Office Dist.	150	86 (8)	26 (7)	112 (15)	32 (11)	83 (11)	115 (22)
2027	1,157,000	Office Dist.	150	125 (12)	37 (11)	162 (23)	46 (18)	119 (17)	165 (35)
Total Development				211 (20)	63 (18)	274 (38)	78 (29)	202 (28)	280 (57)

Directional Distribution

Given the proposed development's location adjacent to the Maryland Heights Commerce Center, the travel patterns were assumed to be the similar to the distribution pattern applied to the Maryland Heights Commerce Center in the traffic impact study prepared in 2018. The patterns are summarized below in **Table 9** and reflect the request from MoDOT to shift a portion of the heavy vehicle distribution from the south on MO 141 to the east on MO 364 (as compared to the directional distribution presented for the Maryland Heights Commerce Center study in 2018).

Table 9: Proposed 364 Logistics Center Directional Distribution

Route	Directional Distribution	
	Passenger Vehicles	Heavy Trucks
To/From the North on MO 141	**53%**	**65%**
• To/From the West on I-70	20%	30%
• To/From the East on I-70	20%	35%
• To/From the North on MO 141, North of I-70	5%	0%
• To/From the East on Marine Avenue	5%	0%
• To/From the East on Creve Coeur Mill Road	3%	0%
To/From the South on MO 141	**47%**	**35%**
• To/From the East on MO 364 (Page Avenue)	15%	19%
• To/From the West on MO 364 (Page Avenue)	15%	10%
• To/From the South on MO 141	15%	6%
• To/From the South on Creve Coeur Mill Road	2%	0%

The site generated traffic for each phase of the proposed 364 Logistics Center was assigned to the area roadways using the directional distribution presented in Table 9. **Figure 6** illustrates the assignment of the traffic generated by Phase I of the 364 Logistics Center while **Figure 7** shows the assignment of the traffic generated by the full buildout of the proposed 364 Logistics Center.

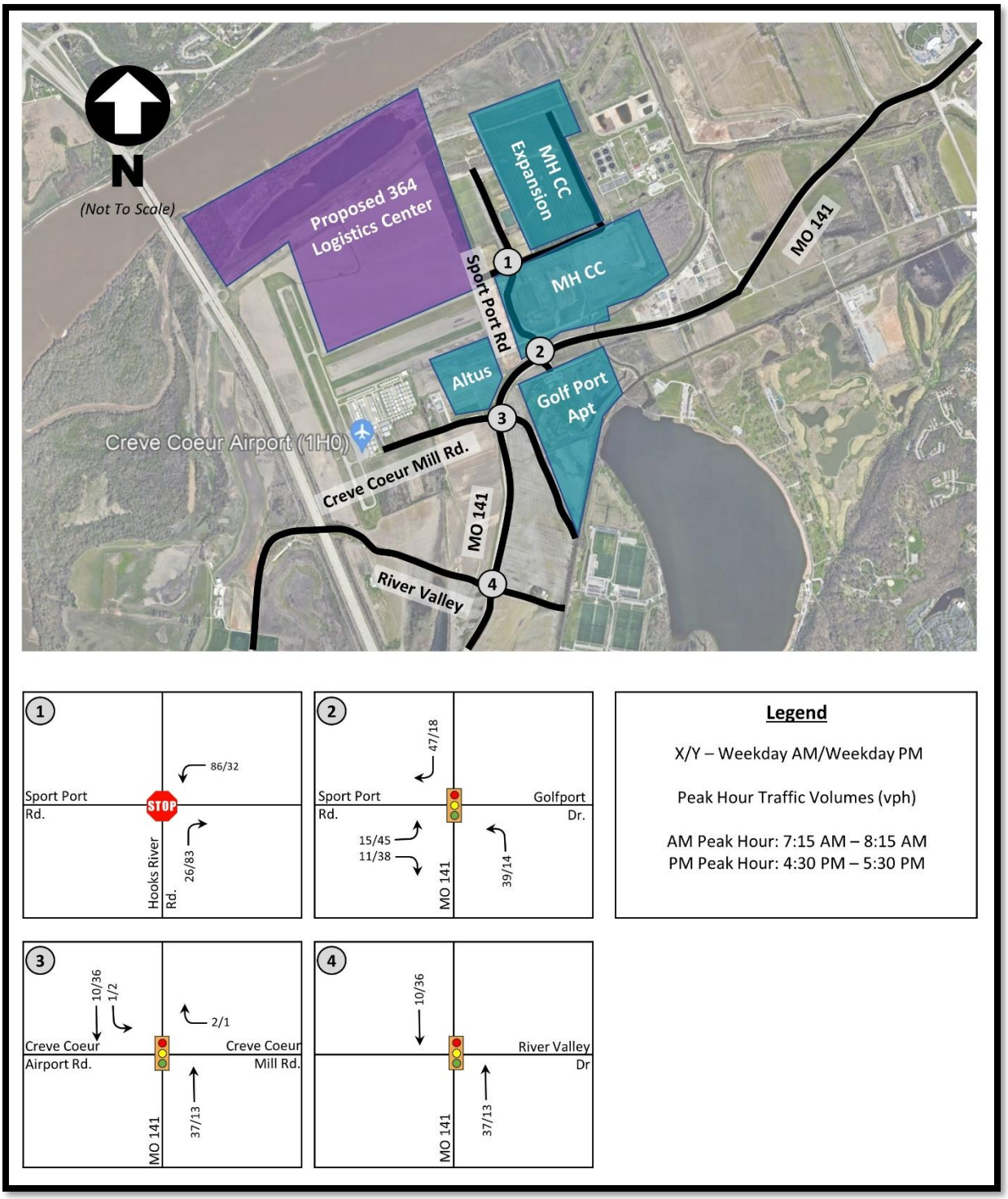


Figure 6: 364 Logistics Center - Phase I Site Generated Trips

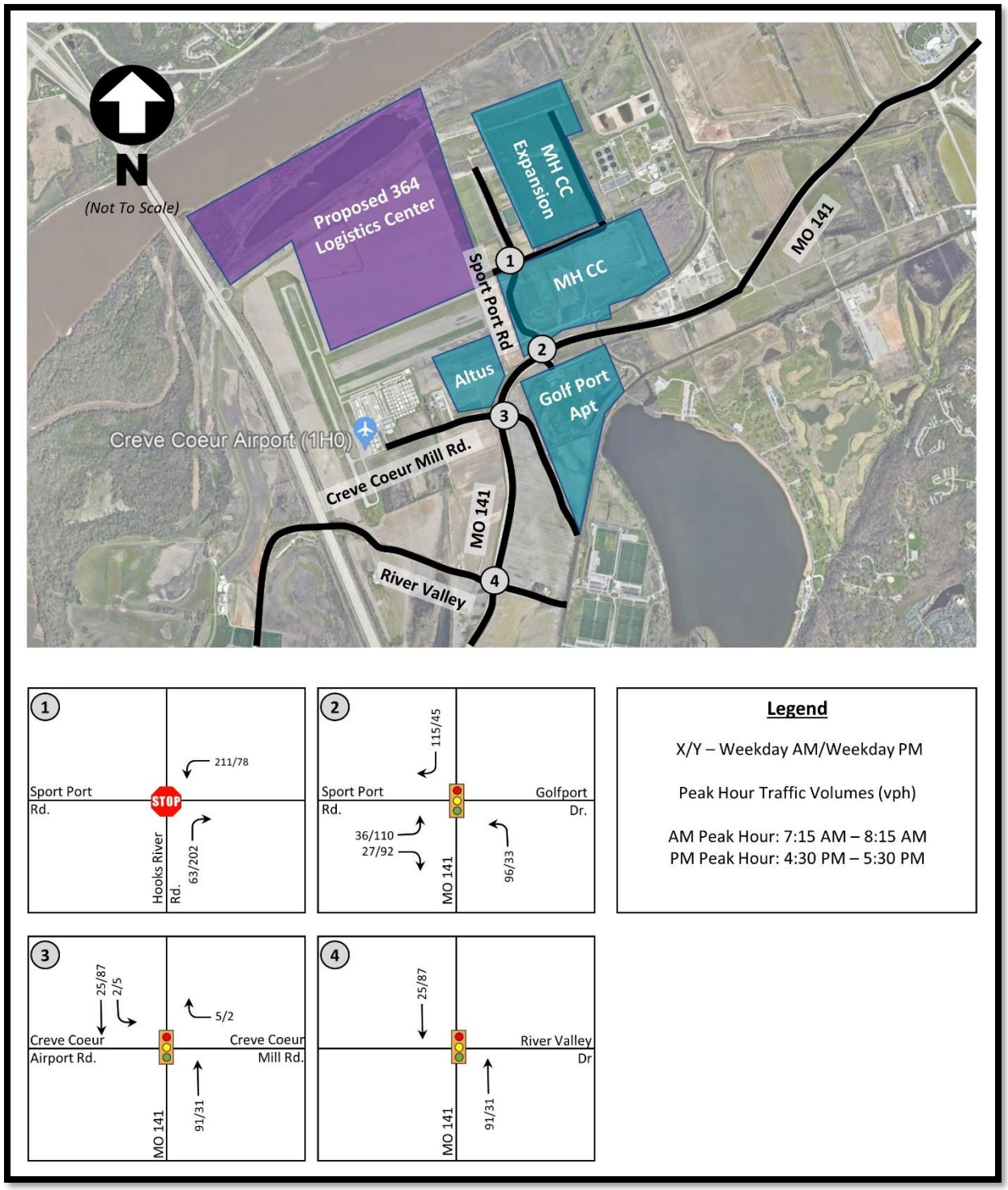


Figure 7: 364 Logistics Center - Full Buildout Site Generated Trips

Background Growth Along MO 141

An annual background growth rate for application to MO 141 was determined based upon input from East West Gateway and their regional travel demand model. Based upon their understandings of the various developments along the corridor as well as the potential for development beyond those already identified, it was their opinion that 0.5% annual growth rate would be considered conservative. Consequently, this annual growth rate was agreed to by both the City of Maryland Heights and MoDOT.

However, the projected background growth shall be applied in a non-conventional way for this study so as to not "double count" for development along the corridor. Typically, the background growth is applied every year between scenarios as a way of capturing the increase of traffic through the study area unrelated to a particular proposed development. In this case, the background growth is entirely accounted for between 2023 and 2027 as all surrounding developments are documented, and the number of trips for each development is calculated for each respective scenario year. Therefore, the background growth shall only be applied to adjust 2019 counts to the 2023 baseline, and again between the years 2027 to 2047 to account for additional development that is not yet identified.

Analysis Methodology

It was agreed upon during the Scoping Meeting with the reviewing agencies that conditions along MO 141 would be evaluated during the morning and evening peak periods for a typical weekday since these periods represent the busiest times for the adjacent roadways as well as the proposed use. If the proposed development's traffic can be accommodated during these peak periods, it stands to reason that adequate capacity would be available throughout the remainder of the day.

The intersections included in this analysis include the following:

- Sport Port Road & Missouri Route 141 (signalized)
- Creve Coeur Mill Road & Missouri Route 141 (signalized)
- River Valley Road & Missouri Route 141 (signalized)
- Site Access Drive at Hooks River Road & Sport Port Road (unsignalized)

Given the level of ongoing development in the area, it was agreed that peak hour traffic data provided by MoDOT for October 2019 would be used as the basis for developing the traffic volumes rather than counting along MO 141. The 2019 data would be adjusted upwards to the base year of 2023 using the agreed upon annual growth rate of 0.5%. Thereafter, the various developments, according to their anticipated phasing, would be aggregated with the 2023 volumes to develop traffic volumes for the following analysis baseline scenarios that do not reflect the addition of traffic from the proposed 364 Logistics Center:

- **2023 Base Conditions**
  - 0.5% annual growth from 2019 to 2022 for background growth (representing growth before the specific developments come online)
  - 63,645 SF within Maryland Heights Commerce Center (Lot 4)
  - 276 apartments within Golf Port
  - 829,353 SF within Westport Commerce Center
  - 256,880 SF within River Valley Commerce Center
  - Assumes intersection with River Valley with MO 141 is improved to provide dual NBLT lanes, third SB through lane, and a dedicated EBLT plus a shared LT/TH lane

- **2025 Base Conditions -** *Includes all represented in 2023 Base conditions plus the following*:
  - 544,700 SF within Maryland Heights Commerce Center (Lots 1 and 3)
  - 20,000 SF medical office & 20,000 SF retail within Golf Port
  - 505,440 SF within Westport Commerce Center (representing build out)
  - 540,800 SF within 141 Logistics Center
  - 849,000 SF within River Valley Commerce Center (representing build out)

- **2027 Base Conditions** – *includes all represented in 2025 Base Conditions plus*:
  - 404,700 within Maryland Heights Commerce Center (Lot 2 – representing build out of the original commerce center)
  - 340,500 within Maryland Heights Commerce Center Expanded to the Ortmann Tract (Lots 9, 10 & 11)
  - 168 apartments & 3,500 SF QSR within Golf Port
  - 540,800 SF within 141 Logistics Center (representing build out)
  - 345,500 SF within Altus Property (speculative)

- **2047 Base Conditions** – *includes all represented in 2027 Base Conditions plus*:
    - 0.5% annual growth rate from 2027 to 2047
    - 748,000 SF within Maryland Heights Commerce Center Expanded to the Ortmann Tract (representing build out)
    - 156 apartments (Phase 3), 175 apartments & 22 villas (Phase 4) within Golf Port

To identify the impacts of the proposed 364 Logistics Center, the site generated traffic associated with each phase of its development would be aggregated with the baseline volumes for the following analysis forecasted scenarios:

- **2025 Forecasted Conditions** – *includes all represented in 2025 Base Conditions plus*:
    - 740,000 SF within the proposed 364 Logistics Center (Phase I)
- **2027 Forecasted Conditions** – *includes all represented in 2027 Base Conditions plus*:
    - 1,897,000 SF within the proposed 364 Logistics Center (representing build out)

- **2047 Forecasted Conditions** – *includes all represented in 2047 Base Conditions plus*:
    - 1,897,000 SF within the proposed 364 Logistics Center (representing build out)

Intersection performance or traffic operations are quantified by six Levels of Service (LOS), which range from LOS A ("Free Flow") to LOS F ("Fully Saturated"). LOS C is normally used for design purposes and represents a roadway with volumes ranging from 70% to 80% of its capacity. LOS D or E are generally considered acceptable for peak period conditions in urban and suburban areas and would be an appropriate benchmark of acceptable traffic for the study area road system.

Levels of service for intersections are based on the average delay experienced by motorists, as calculated using the methodology presented in the Highway Capacity Manual (HCM) 6th Edition. The thresholds for each level of service vary based upon the type of control to reflect different driver expectations. Signalized intersections reflect higher delay tolerances as compared to unsignalized locations because motorists are accustomed to and accepting of longer delays at signals. For signalized and all-way stop intersections, the average control delay per vehicle is estimated for each movement and then aggregated for each approach and the intersection as a whole. For intersections with partial (side-street) stop control, the delay is calculated for the minor movements only (side-street approaches and major road left-turns) since through traffic on the major road is not required to stop.

Table 10 summarizes the criterion for both signalized and unsignalized intersections, as defined by the HCM. This methodology was applied to the study intersections using Synchro 11, which is a traffic flow model based on the Highway Capacity Manual (HCM) 6th Edition. The signal timings used for the analysis of the baseline and forecasted conditions are that which were recommended by the previous studies for the Golf Port development. This includes a 90 second cycle length for morning peak hour conditions and a 120 second cycle length for evening peak hour conditions.

Table 10: Intersection Level of Service Thresholds

Level of Service	Control Delay per Vehicle (sec/veh)	
	Signalized	Unsignalized
A	≤ 10	0-10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

In addition, this methodology was also utilized to conduct a sensitivity analysis of the MO 141 and MO 364 interchange for the 20-year forecasted horizon as well as to evaluate conditions at the future intersection of River Valley Parkway and Sport Port Road.

A safety analysis was performed in accordance with methodologies outlined in the Highway Safety Manual (HSM). The HSM provides quantitative analysis to support decision making for improving transportation safety. Its methodology relies upon safety performance functions to correlate crash expectancy with location-specific roadway characteristics, such as the number of lanes, presence of shoulders, speeds, and traffic volumes.

Baseline Traffic Operations

To identify the traffic impacts associated with the proposed development of the 364 Logistics Center, it was first necessary to quantify traffic operating conditions for the following baseline years:

- **2023 Base Conditions** – Accounts for background growth, partial development of the Maryland Heights Commerce Center, Golf Port development, Westport Commerce Center, and River Valley Commerce Center. In addition, it is assumed that the intersection with River Valley with MO 141 is improved as obligated by Westport and River Valley Commerce Centers.

- **2025 Base Conditions –** Includes all represented in 2023 Base conditions plus the continued development of Maryland Heights Commerce Center, Golf Port Development, Westport Commerce Center (achieving full buildout), 141 Logistics Center and River Valley Commerce Center (achieving full buildout).

- **2027 Base Conditions** – Includes all represented in 2025 Base Conditions plus the continued development of Maryland Heights Commerce Center (achieving full buildout), expansion of the Maryland Heights Commerce Center to the Ortmann Tract, Golf Port Development, 141 Logistics Center and the potential for development on the Altus Property adjacent to Thies Farm.

- **2047 Base Conditions** – includes all represented in 2027 Base Conditions plus background growth along MO 141, buildout of the Ortmann Tract and the Golf Port developments.

The traffic operations for each of the baseline horizon years are presented below:

2023 Baseline Conditions

As noted above, the 2023 baseline conditions represent October 2019 traffic counts increased to 2023 levels assuming 0.5% annual growth. In addition, the traffic generated by a portion of the Maryland Heights Commerce Center, Golf Port Apartments, Westport Commerce Center, and River Valley Commerce Centers were included. Table 11 summarizes the trip generation of the various developments' phases that are anticipated to come online by 2023. **Figure 8** represents the resulting 2023 Baseline Traffic Volumes.

Table 11: Year 2023 Baseline Development Trip Generation

Scenario Year	Development	Vehicles/Hour (Trucks/Hour)					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
2023	MH CC	18 (1)	4 (2)	22 (3)	5 (1)	17 (2)	22 (3)
	Golf Port Apartments	25 (0)	85 (0)	110 (0)	66 (0)	42 (0)	108 (0)
	Westport CC	228 (15)	54 (18)	282 (33)	62 (12)	220 (21)	282 (33)
	River Valley CC	41 (3)	13 (2)	54 (5)	16 (4)	41 (4)	57 (8)
	Total	***312 (19)***	***156 (22)***	***468 (41)***	***149 (17)***	***320 (27)***	***469 (44)***

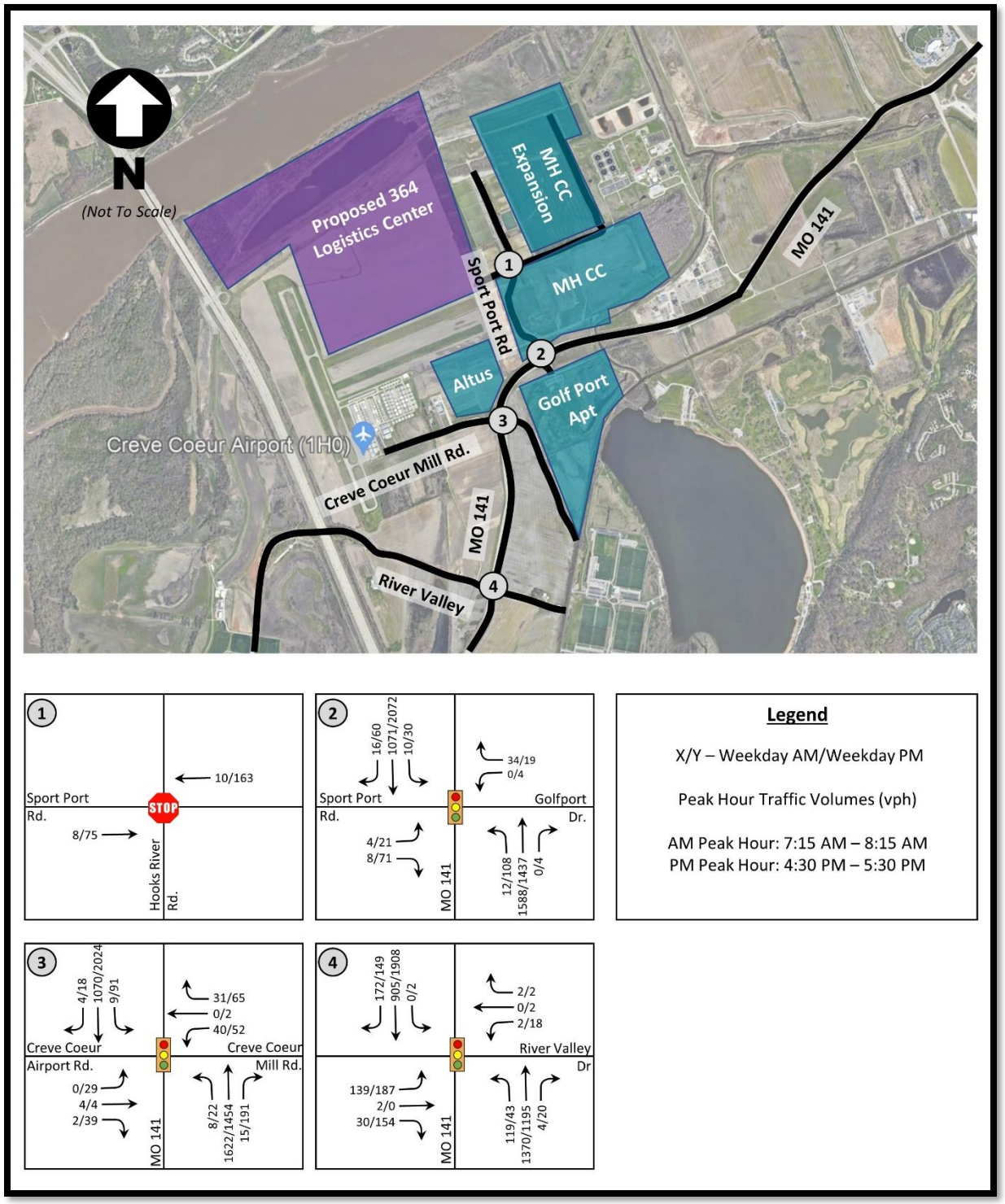


Figure 8: Year 2023 Baseline Traffic Volumes

The roadway geometry for the 2023 baseline conditions represents the existing conditions at the study intersections except for the signalized intersection of MO 141 with River Valley Road. By the year 2023, it is anticipated that this intersection would be improved per the obligations associated with Westport and River Valley Commerce Centers. Once in place, the intersection would provide for dual northbound left turn lanes, a third southbound through lane, and a dedicated eastbound left turn lane plus shared left-through lane and a dedicated right turn lane (see Figure 3).

The 2023 Baseline Traffic Operations results are summarized in **Table 12**.

Table 12: Year 2023 Baseline Traffic Operating Conditions

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	Weekday AM Peak Hour	Weekday PM Peak Hour
Sport Port Road and Hooks River Rd (Unsignalized, Two-Way Stop)		
Note: No appreciable traffic turning onto or off Hooks River Road due to lack of development along the roadway.		
MO 141 and Sport Port Road (Signalized)		
Overall Intersection	**A (7.6)**	**C (29.4)**
Eastbound Approach	B (10.2) [11[<0.04>	B (11.9) [40] <0.22>
Westbound Approach	A (0.5) [0] <0.0>	A (7.6) [13] <0.07>
Northbound Approach	A (8.0) [#672] <0.63>	C (21.8) [398] <0.73>
Southbound Approach	A (7.2) [331] <0.43>	D (36.5) [#1131] <0.98>
MO 141 at Creve Coeur Mill Road/Creve Coeur Airport Road (Signalized)		
Overall Intersection	**A (8.8)**	**C (22.5)**
Eastbound Approach	C (31.7) [14] <0.03>	C (34.0) [56] <0.25>
Westbound Approach	C (24.8) [57] <0.32>	C (31.2) [82] <0.30>
Northbound Approach	A (6.5) [520] <0.67>	C (25.9) [658] <0.75>
Southbound Approach	B (11.0) [402] <0.45>	B (18.8) [m434] <0.89>
MO 141 at River Valley Drive (Signalized, Improved)		
Overall Intersection	**B (12.3)**	**B (14.4)**
Eastbound Approach	D (43.0) [#105] <0.53>	D (42.7) [137] <0.63>
Westbound Approach	B (19.8) [0] <0.05>	E (69.5) [30] <0.55>
Northbound Approach	A (9.3) [327] <0.55>	B (15.0) [521] <0.56>
Southbound Approach	B (11.3) [232] <0.34>	A (7.8) [345] <0.73>

As shown, the intersection approaches all operate at acceptable levels of service for the study intersections. Therefore, improvements are not necessary under 2023 Baseline Conditions. However, it should be acknowledged that in the weekday PM peak hour, the two southbound lanes of MO 141 are approaching capacity at the signalized intersection with Sport Port Road; with 2,000 vehicles per hour traveling southbound the volume to capacity ratio reaches 0.98 despite receiving 78 seconds of the 120 second cycle length.

2025 Baseline Conditions

The 2025 baseline conditions build upon the 2023 baseline traffic volumes by adding site generated traffic associated with continued development along the MO 141 corridor. **Table 13** summarizes the trip generation of the various developments' phases that are anticipated to come online by 2025. **Figure 9** represents the resulting 2025 Baseline Traffic Volumes.

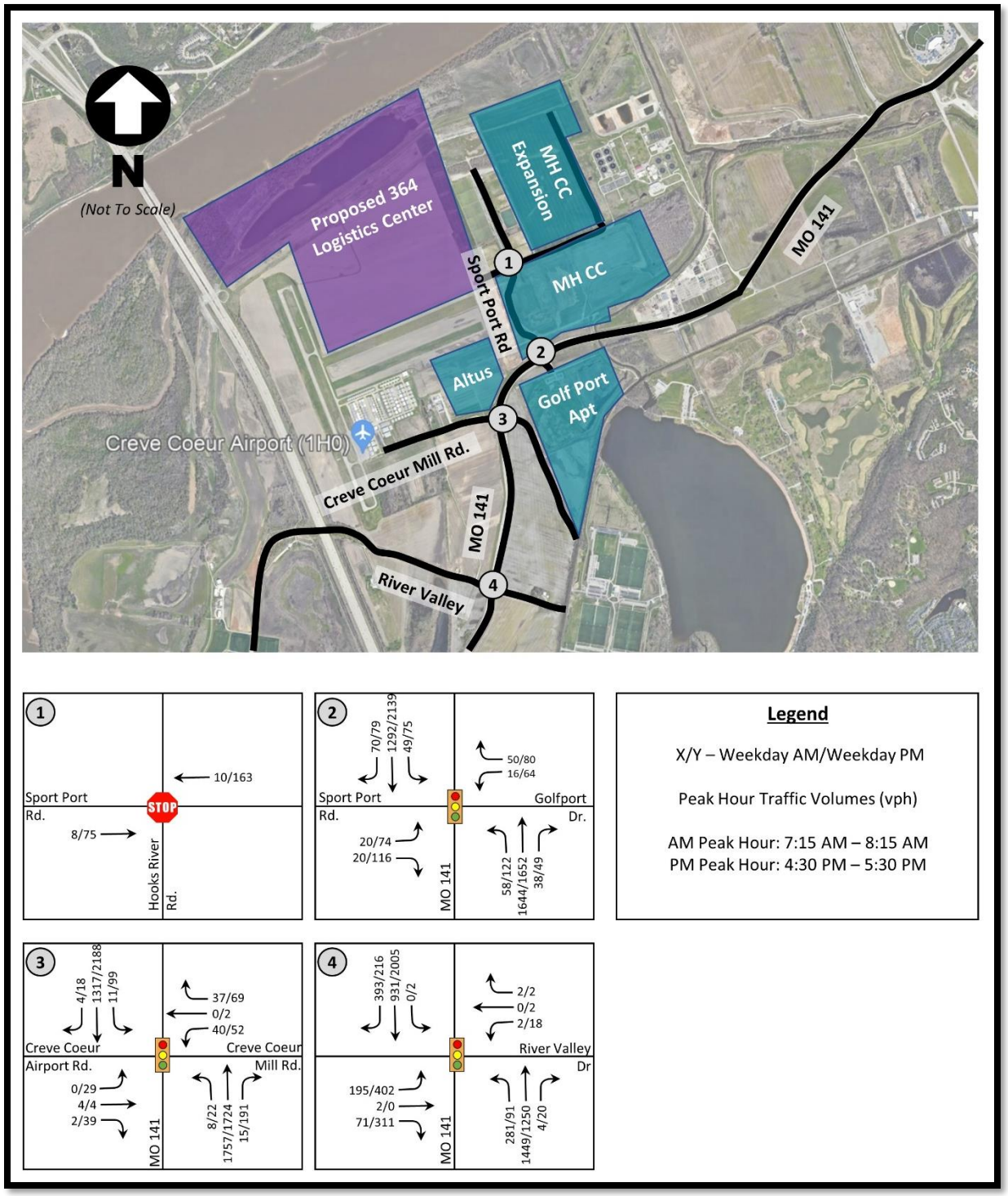


Figure 9: Year 2025 Baseline Traffic Volumes

Table 13: Year 2025 Baseline Additional Development Trip Generation

Scenario Year	Development	Vehicles/Hour (Trucks/Hour)					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
2025	MH CC	48 (3)	12 (4)	60 (7)	13 (3)	47 (4)	60 (7)
		52 (3)	16 (4)	68 (7)	20 (6)	51 (5)	71 (11)
	Golf Port Apartments	49 (0)	13 (0)	62 (0)	24 (0)	55 (0)	79 (0)
		28 (0)	19 (0)	47 (0)	66 (0)	66 (0)	132 (0)
	141 Logistics	149 (10)	35 (12)	184 (22)	40 (8)	144 (14)	184 (22)
	River Valley CC	*51 (4)*	*15 (3)*	66 (7)	*19 (6)*	*50 (5)*	69 (11)
	Total	***377 (20)***	***110 (23)***	***487 (43)***	***182 (23)***	***413 (28)***	***595 (51)***

The roadway geometry for the 2025 baseline conditions represents the existing conditions at the study intersections with the exception of the improved signalized intersection of MO 141 with River Valley Road. The 2025 Baseline Traffic Operations results are summarized in **Table 14.**

Table 14: Year 2025 Baseline Traffic Operating Conditions

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	Weekday AM Peak Hour	Weekday PM Peak Hour
Sport Port Road and Hooks River Rd (Unsignalized, Two-Way Stop)		
Note: No appreciable traffic turning onto or off Hooks River Road due to lack of development along the roadway.		
MO 141 and Sport Port Road (Signalized)		
Overall Intersection	**B (17.1)**	**D (49.9)**
Eastbound Approach	B (17.0) [30] <0.17>	C (27.7) [105] <0.58>
Westbound Approach	A (8.1) [25] <0.14>	C (30.2) [90] <0.61>
Northbound Approach	B (16.4) [#715] <0.82>	C (33.6) [#910] <0.94>
Southbound Approach	B (18.3) [#546] <0.67>	E (67.6) [#1190] <1.08>
MO 141 at Creve Coeur Mill Road/Creve Coeur Airport Road (Signalized)		
Overall Intersection	**B (12.6)**	**B (19.4)**
Eastbound Approach	C (32.5) [14] <0.04>	C (34.0) [56] <0.25>
Westbound Approach	C (24.2) [57] <0.35>	C (30.9) [82] <0.52>
Northbound Approach	A (7.2) [#702] <0.72>	B (17.3) [#395] <0.90>
Southbound Approach	B (18.9) [550] <0.55>	C (20.1) [m424] <0.96>
MO 141 at River Valley Drive (Signalized, Improved)		
Overall Intersection	**B (17.7)**	**C (33.1)**
Eastbound Approach	D (40.0) [#164] <0.61>	E (60.9) [#321] <0.90>
Westbound Approach	B (19.8) [5] <0.05>	E (69.5) [30] <0.55>
Northbound Approach	B (15.2) [363] <0.75>	C (20.3) [580] <0.63>
Southbound Approach	B (16.4) [265] <0.43>	C (30.9) [m519] <0.86>

As shown in **Table 14**, the intersection approaches all operate at acceptable levels of service for the study intersections. Therefore, improvements are not necessary under 2025 Baseline Conditions. However, it should be acknowledged that in the weekday PM peak hour, the two southbound lanes of MO 141 are approaching or exceeding capacity at the signalized intersections with Sport Port Road and Creve Coeur Mill Road/Creve Coeur Airport Road.

2027 Baseline Conditions

The 2027 baseline conditions build further upon the 2025 baseline traffic volumes by adding site generated traffic associated with continued development along the MO 141 corridor; including continued development with the MH Commerce Center (inclusive of expansion onto the Ortmann Tract), Golf Port Apartments, 141 Logistics Center, and the Altus property. **Table 15** summarizes the trip generation of the various developments' phases that are anticipated to come online by 2027. **Figure 10** represents the resulting 2027 Baseline Traffic Volumes.

Table 15: Year 2027 Baseline Additional Development Trip Generation

Scenario Year	Development	Vehicles/Hour (Trucks/Hour)					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
2027	MH CC	55 (4)	17 (4)	72 (8)	21 (6)	54 (6)	75 (12)
		94 (6)	22 (8)	116 (14)	25 (5)	91 (9)	116 (14)
	Golf Port Apartments	14 (0)	48 (0)	62 (0)	37 (0)	24 (0)	61 (0)
		79 (0)	77 (0)	156 (0)	60 (0)	56 (0)	116 (0)
	Westport CC	139 (9)	33 (11)	172 (20)	38 (7)	134 (13)	172 (20)
	141 Logistics	149 (10)	35 (12)	184 (22)	40 (8)	144 (14)	184 (22)
	Altus	50 (4)	15 (3)	65 (7)	19 (5)	49 (5)	68 (10)
	Total	***580 (33)***	***247 (38)***	***827 (71)***	***240 (31)***	***552 (47)***	***792 (78)***

The reader is reminded that the expansion of the Maryland Heights Commerce Center onto the Ortmann Tract (in year 2027 and beyond) will require, per the City of Maryland Heights, the completion of an updated traffic impact study prior to any level of construction on those parcels.

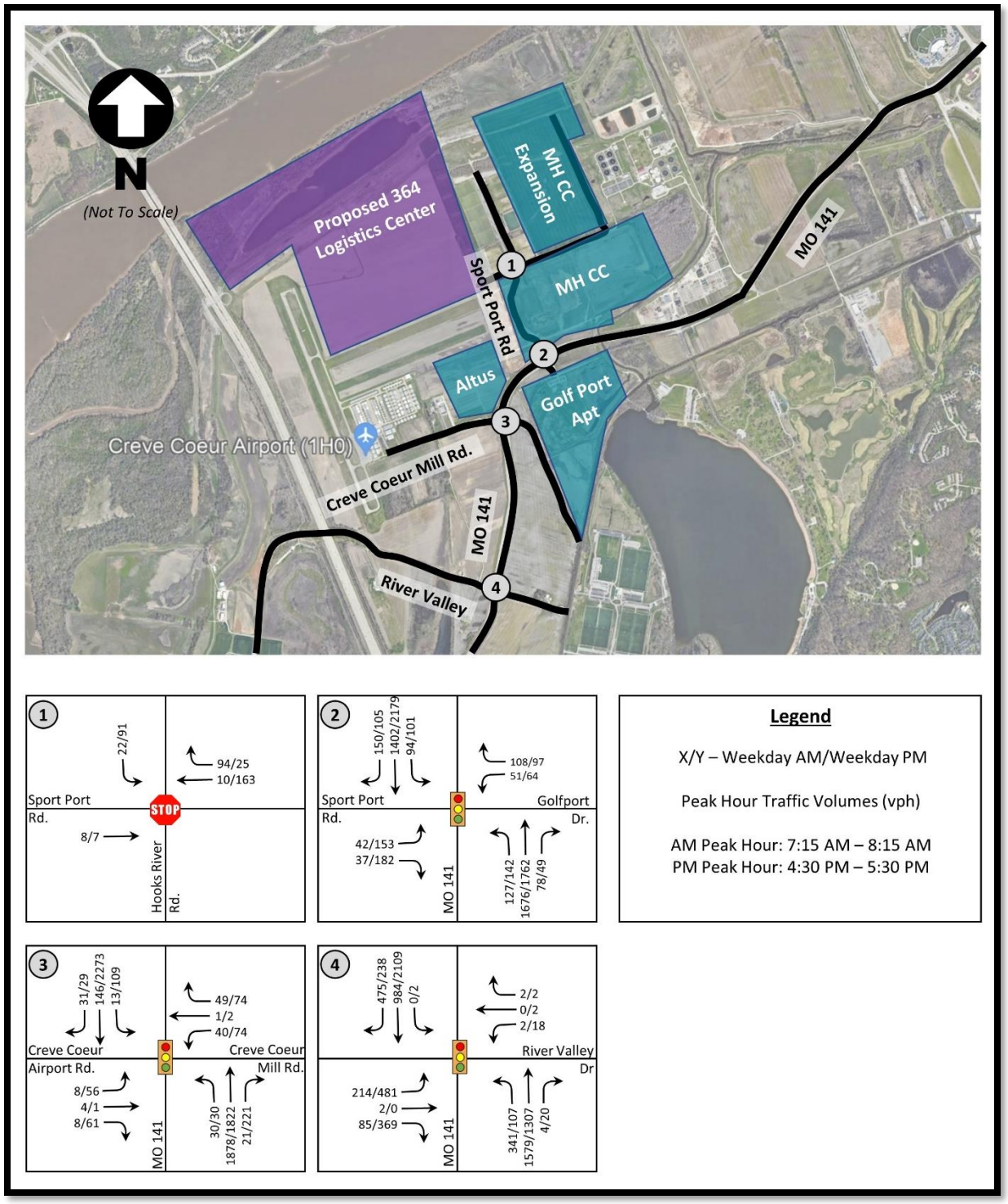


Figure 10: Year 2027 Baseline Traffic Volumes

The 2027 Baseline Traffic Operations results are summarized in **Table 16.**

Table 16: Year 2027 Baseline Traffic Operating Conditions

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	Weekday AM Peak Hour	Weekday PM Peak Hour
Sport Port Road and Hooks River Rd (Two-Way Stop)		
Southbound Left	A (9.0) [<25] <0.03>	C (15.4) [38] <0.35>
MO 141 and Sport Port Road (Signalized, Improved)		
Overall Intersection	**B (16.6)**	**C (26.8)**
Eastbound Approach	C (25.4) [30] <0.32>	E (57.0) [#136] <0.93>
Westbound Approach	B (12.1) [58] <0.30>	C (24.5) [88] <0.51>
Northbound Approach	B (13.9) [#124] <0.69>	C (25.3) [285] <0.97>
Southbound Approach	B (19.7) [305] <0.68>	C (24.0) [565] <0.81>
MO 141 at Creve Coeur Mill Road/Creve Coeur Airport Road (Signalized, Improved)		
Overall Intersection	**B (12.0)**	**B (17.9)**
Eastbound Approach	C (29.8) [20] <0.07>	D (37.3) [91] <0.44>
Westbound Approach	C (20.8) [57] <0.32>	D (40.5) [107] <0.69>
Northbound Approach	A (5.3) [249] <0.54>	C (23.3) [m176] <0.67>
Southbound Approach	B (19.6) [413] <0.46>	B (10.4) [283] <0.70>
MO 141 at River Valley Drive (Signalized, Improved)		
Overall Intersection	**B (19.2)**	**C (28.1)**
Eastbound Approach	D (38.4) [#181] <0.61>	E (68.3) [#407] <0.96>
Westbound Approach	B (19.8) [5] <0.05>	E (69.5) [30] <0.55>
Northbound Approach	B (16.1) [214] <0.87>	B (17.8) [343] <0.48>
Southbound Approach	B (19.2) [314] <0.51>	B (18.7) [#743] <0.94>

However, unlike the years 2023 and 2025, improvements would be necessary in the 2027 baseline year to achieve the represented traffic operations. The eastbound approach of Sport Port Road to the intersection with MO 141 is expected to deteriorate beyond what could be accommodated with the single left turn lane. Consequently, dual left turn lanes on the eastbound approach would be necessary to mitigate the increase of traffic turning onto MO 141 from Sport Port Road.

Furthermore, the northbound and southbound approaches of MO 141 would struggle under 2027 baseline conditions to accommodate the nearly 4,000 vph traveling along MO 141 in the weekday pm peak hour. As traffic on the side streets increases due to continued development, the signal operations cannot effectively serve MO 141 without resulting in failing conditions for one or more approaches. Therefore, it is evident that by the year 2027, consideration would need to be given to the provision of three lanes in each direction on MO 141 to accommodate the increasing demand due to continued development. It is likely that in order for the additional lanes on MO 141 to be effective, they would extend, at a minimum, from Casino Drive to River Valley Drive; a distance of approximately 2.5 miles.

Recall that the above improvements are needed regardless of whether or not the proposed 364 Logistics Center is approved and constructed. Rather, the need for the third lane in both directions on MO 141 is a result of the already approved developments, as well as the potential development of the Altus tract.

2047 Baseline Conditions

The 2047 baseline conditions represent the 20-year planning horizon for the corridor assuming the proposed 364 Logistics Center is not in place. **Table 17** summarizes the trip generation of the remainder of the developments' phases that are anticipated to come online by 2047 that were not already accounted for in the years 2023, 2025 or 2027. In addition, an annual growth rate of 0.5% was applied to MO 141 to account for other developments that are not yet known are speculated upon. **Figure 11** represents the resulting 2047 Baseline Traffic Volumes.

Table 17: Year 2047 Baseline Additional Development Trip Generation

Scenario Year	Development	Vehicles/Hour (Trucks/Hour)					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
2047	MH CC	87 (8)	26 (7)	113 (15)	32 (11)	84 (11)	116 (22)
	Golf Port Apartments	13 (0)	44 (0)	57 (0)	40 (0)	26 (0)	66 (0)
		15 (0)	50 (0)	65 (0)	42 (0)	27 (0)	69 (0)
		7 (0)	23 (0)	30 (0)	19 (0)	11 (0)	30 (0)
	Total	*122 (8)*	*143 (7)*	*265 (15)*	*133 (11)*	*148 (11)*	*281 (22)*

The 2047 Baseline Traffic Operations results are summarized in **Table 18.** It should be noted the 2047 baseline condition results presented have the previous recommended improvements incorporated into the models, including three through lanes in both directions on MO 141. No further improvements are warranted for the 2047 Baseline conditions in addition to those previously recommended.

Table 18: Year 2047 Baseline Traffic Operating Conditions

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	Weekday AM Peak Hour	Weekday PM Peak Hour
Sport Port Road and Hooks River Rd (Unsignalized, Two-Way Stop)		
Southbound Left	B (12.4) [<25] <0.11>	B (13.5) [33] <0.31>
MO 141 and Sport Port Road (Signalized, Improved)		
Overall Intersection	**B (19.5)**	**D (37.8)**
Eastbound Approach	C (28.0) [40] <0.46>	E (78.1) [#186] <1.02>
Westbound Approach	B (11.4) [62] <0.46>	C (25.3) [94] <0.60>
Northbound Approach	B (15.8) [m#194] <0.87>	D (36.7) [352]
Southbound Approach	C (24.1) [354] <0.85>	C (33.0) [721] <0.93>
MO 141 at Creve Coeur Mill Road/Creve Coeur Airport Road (Signalized, Improved)		
Overall Intersection	**B (17.5)**	**B (18.1)**
Eastbound Approach	C (29.3) [21] <0.07>	D (37.1) [98] <0.46>
Westbound Approach	D (36.4) [#147] <0.36>	E (73.2) [#188] <0.99>
Northbound Approach	A (8.8) [426] <0.66>	B (16.8) [m372] <0.76>
Southbound Approach	C (26.6) [455] <0.57>	B (13.6) [341] <0.80>
MO 141 at River Valley Drive (Signalized, Improved)		
Overall Intersection	**C (21.0)**	**D (51.8)**
Eastbound Approach	D (36.5) [#202] <0.59>	E (75.2) [#463] <1.00>
Westbound Approach	B (19.8) [5] <0.05>	E (74.1) [33] <0.61>
Northbound Approach	B (19.3) [263] <0.96>	B (19.5) [417] <0.56>
Southbound Approach	C (20.0) [326] <0.56>	E (62.3) [m#906] <1.08>

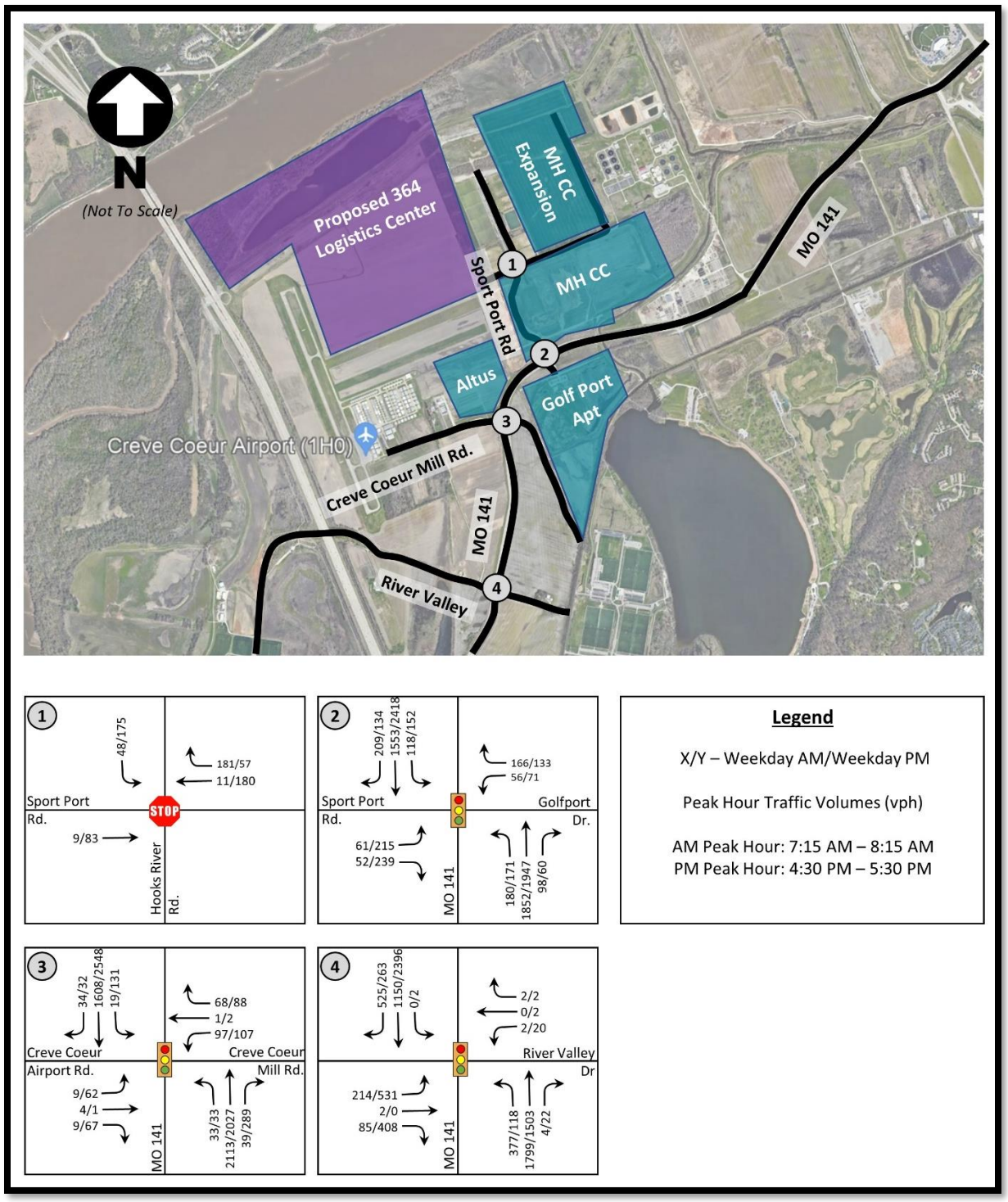


Figure 11: Year 2047 Baseline Traffic Volumes

Forecasted Traffic Operations

The forecasted operating conditions associated with the proposed 364 Logistics Center were evaluated using the same methodology applied to the base conditions. To identify the traffic impacts associated with the proposed development of the 364 Logistics Center, the forecasted conditions were evaluated for the following scenarios:

- **2025 Forecasted Conditions** – Includes all developments represented in 2025 Base Conditions plus the introduction of Phase 1 of the proposed 364 Logistics Center (740,000 SF).
- **2027 Forecasted Conditions** – includes all development represented in 2027 Base Conditions plus full buildout of the proposed 364 Logistics Center (1,897,000 SF)
- **2047 Forecasted Conditions** – includes all developments represented in 2047 Base Conditions plus full buildout of the proposed 364 Logistics Center (1,897,000 SF)

The traffic operations for each of the forecasted horizon years are presented below:

2025 Forecasted Conditions

The 2025 forecasted conditions are based upon adding the traffic associated with Phase 1 of the 364 Logistics Center with the 2025 baseline traffic volumes along the MO 141 corridor. Essentially, the site generated traffic represented in Figure 6 was aggregated with the baseline volumes presented in Figure 9, resulting in the 2025 Forecasted Traffic Volumes illustrated in **Figure 12.**

The results of the operational analysis for the 2025 forecasted conditions are summarized in **Table 19**, which also provides the results from the baseline conditions for ease of comparison. As shown, the approaches of all four intersections operate with acceptable conditions under the 2025 forecasted conditions. However, it is recommended that dedicated eastbound left turn lane on Sport Port Road's approach to MO 141 be lengthened to 250 feet to better accommodate the increased peak queue following completion of Phase 1 of the 364 Logistics Center.

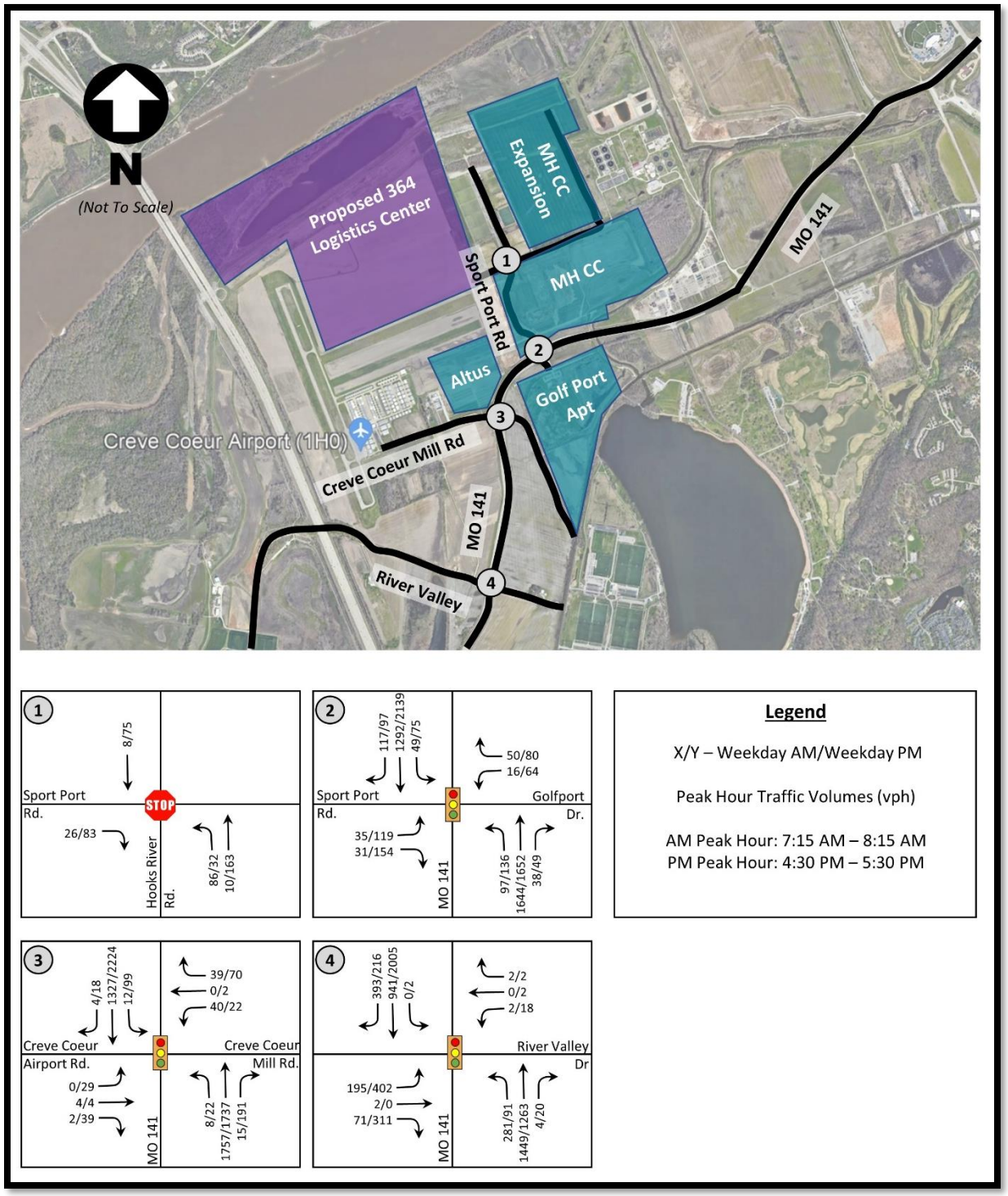


Figure 12: Year 2025 Forecasted Traffic Volumes

Table 19: Year 2025 Forecasted Traffic Operating Conditions

Intersection & Movements	2025 Baseline Conditions		2025 Forecasted Conditions	
	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>		LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	Weekday AM Peak Hour	Weekday PM Peak Hour	Weekday AM Peak Hour	Weekday PM Peak Hour
Sport Port Road and Hooks River Rd (Two-Way Stop)				
Westbound Left	N/A	N/A	A (7.5) [<25] <0.06>	A (7.6) [<25] <0.03>
Northbound Right	N/A	N/A	A (8.7) [<25] <0.03>	A (9.2) [<25] <0.10>
Highway 141 and Sport Port Road (Signalized, Improved)				
Overall Intersection	**B (17.1)**	**D (49.9)**	**B (19.8)**	**E (56.2)**
Eastbound Approach	B (17.0) [30] <0.17>	C (27.7) [105] <0.58>	B (18.5) [45] <0.26>	D (47.8) [#222] <0.88>
Westbound Approach	A (8.1) [25] <0.14>	C (30.2) [90] <0.61>	A (7.7) [25] <0.14>	C (30.3) [89] <0.61>
Northbound Approach	B (16.4) [#715] <0.82>	C (33.6) [#910] <0.94>	B (19.6) [#715] <0.84>	D (38.6) [#910] <0.98>
Southbound Approach	B (18.3) [#546] <0.67>	E (67.6) [#1190]	C (20.6) [#549] <0.71>	E (74.5) [#1178] <1.10>
Highway 141 at Creve Coeur Mill Road/Creve Coeur Airport Road (Signalized, Improved)				
Overall Intersection	**B (12.6)**	**B (19.4)**	**B (13.6)**	**C (20.1)**
Eastbound Approach	C (32.5) [14] <0.04>	C (34.0) [56] <0.25>	C (32.5) [14] <0.04>	C (34.0) [56] <0.25>
Westbound Approach	C (24.2) [57] <0.35>	C (30.9) [82] <0.52>	C (23.8) [57] <0.35>	C (30.8) [82] <0.52>
Northbound Approach	A (7.2) [#702] <0.72>	B (17.3) [#395] <0.90>	A (7.2) [#703] <0.72>	B (17.7) [#475] <0.91>
Southbound Approach	B (18.9) [550] <0.55>	C (20.1) [m424] <0.96>	C (21.3) [552] <0.55>	C (21.1) [m415] <0.98>
Highway 141 at River Valley Drive (Signalized, Improved)				
Overall Intersection	**B (17.7)**	**C (33.1)**	**B (18.2)**	**C (32.4)**
Eastbound Approach	D (40.0) [#164] <0.61>	E (60.9) [#321] <0.90>	D (40.0) [#164] <0.61>	E (60.9) [#321] <0.90>
Westbound Approach	B (19.8) [5] <0.05>	E (69.5) [30] <0.55>	B (19.8) [5] <0.05>	E (69.5) [30] <0.55>
Northbound Approach	B (15.2) [363] <0.75>	C (20.3) [580] <0.63>	B (15.2) [363] <0.75>	C (20.4) [591] <0.64>
Southbound Approach	B (16.4) [265] <0.43>	C (30.9) [m519] <0.86>	C (20.0) [326] <0.56>	C (29.6) [m510] <0.86>

2027 Forecasted Conditions

The 2027 forecasted conditions are based upon adding the traffic associated with the buildout of the 364 Logistics Center with the 2027 baseline traffic volumes along the MO 141 corridor. Essentially, the site generated traffic represented in Figure 7 was aggregated with the baseline volumes presented in Figure 10**,** resulting in the 2027 Forecasted Traffic Volumes illustrated in **Figure 13.**

The results of the operational analysis for the 2027 forecasted conditions are summarized in **Table 20**, which also provides the results from the 2027 baseline conditions for ease of comparison. As was the case in the 2027 baseline conditions, three through lanes on MO 141 are necessary in order to have flexibility with the timing at the signalized intersections to serve the increased demands on the side streets. In addition, the dual eastbound left turn lanes on Sport Port Road approaching MO 141 would still be necessary to accommodate the traffic associated with the expansion of the Maryland Heights Commerce Center as well as build out of the 364 Logistics Center.

However, the additional traffic from the buildout of the 364 Logistics Center would also require the provision of dual northbound left turn lanes on MO 141 at its signalized intersection with Sport Port Road. These lanes should each provide 200 feet of storage capacity, exclusive of tapers. The provision of dual northbound lanes from MO 141 would require that Sport Port Road be widened to accommodate an additional receiving lane headed west towards the developments. The two westbound lanes could terminate at the future intersection with River Valley Parkway (to be built by Maryland Heights Commerce Center) as a dedicated right turn lane and a through lane. However, should River Valley Parkway not be constructed prior to build out of the 364 Logistics Center, the two westbound lanes on Sport Port Road should be carried approximately 650 feet west of MO 141 before tapering down to one lane.

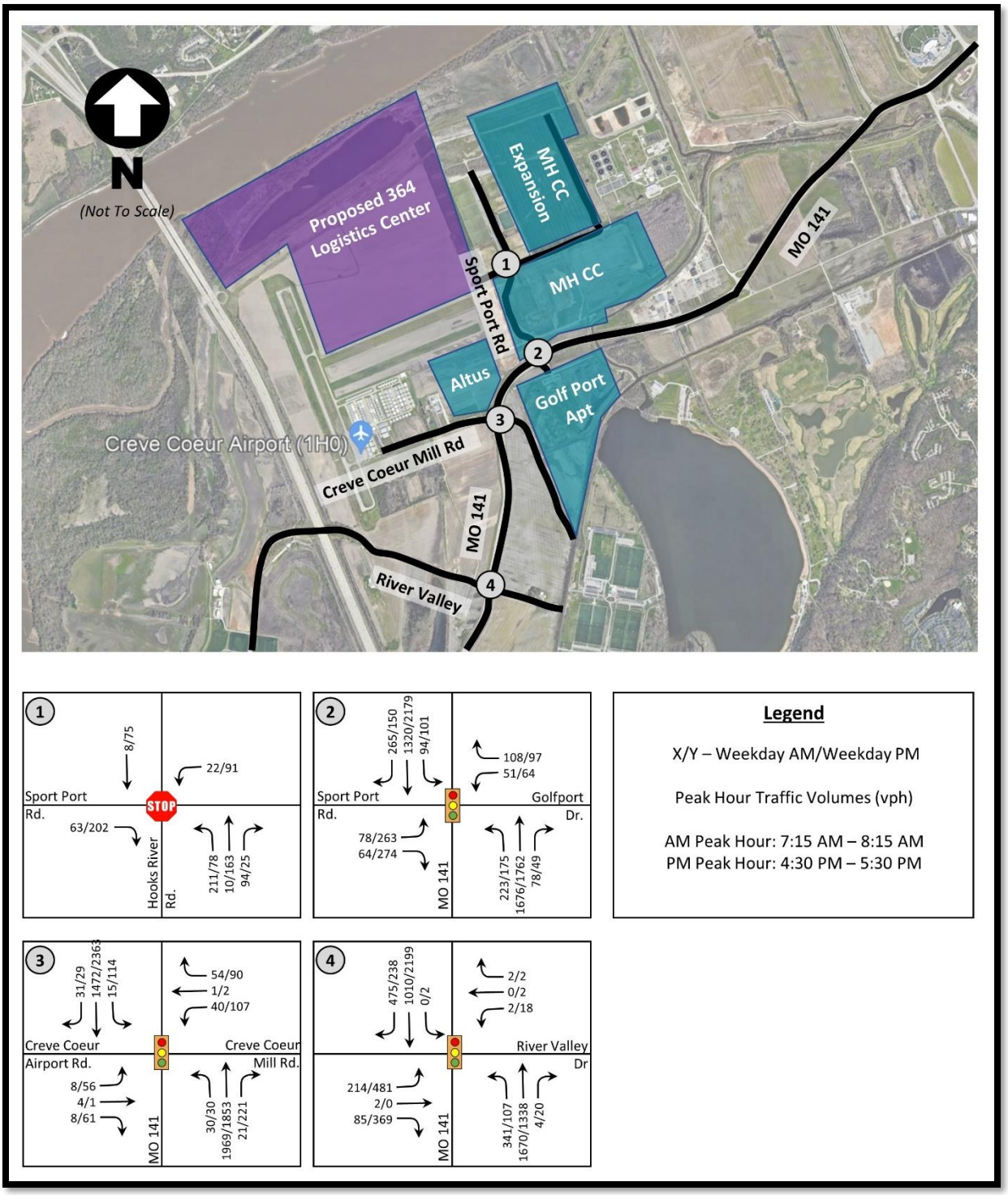


Figure 13: Year 2027 Forecasted Traffic Volumes

Table 20: Year 2027 Forecasted Traffic Operating Conditions

Intersection & Movements	2027 Baseline Conditions		2027 Forecasted Conditions	
	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>		LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	Weekday AM Peak Hour	Weekday PM Peak Hour	Weekday AM Peak Hour	Weekday PM Peak Hour
Sport Port Road and Hooks River Rd (Two-Way Stop)				
Westbound Left	N/A	N/A	A (7.7) [<25] <0.15>	A (7.9) [<25] <0.07>
Northbound Right	N/A	N/A	A (8.9) [<25] <0.07>	B (10.0) [<25] <0.23>
Southbound Left	A (9.0) [<25] <0.03>	C (15.4) [38] <0.35>	C (15.7) [<25] <0.07	C (21.7) [33] <0.32>
Highway 141 and Sport Port Road (Signalized, Improved)				
Overall Intersection	**B (16.6)**	**C (26.8)**	**B (17.1)**	**D (36.1)**
Eastbound Approach	C (25.4) [30] <0.32>	E (57.0) [#136] <0.93>	C (32.8) [#56] <0.59>	E (66.5) [#289] <0.95>
Westbound Approach	B (12.1) [58] <0.30>	C (24.5) [88] <0.51>	B (11.7) [58] <0.30>	B (18.2) [80] <0.37>
Northbound Approach	B (13.9) [#124] <0.69>	C (25.3) [285] <0.97>	B (14.5) [94] <0.72>	C (33.2) [405] <0.95>
Southbound Approach	B (19.7) [305] <0.68>	C (24.0) [565] <0.81>	B (19.2) [281] <0.68>	C (33.2) [639] <0.90>
Highway 141 at Creve Coeur Mill Road/Creve Coeur Airport Road (Signalized, Improved)				
Overall Intersection	**B (12.0)**	**B (17.9)**	**B (13.3)**	**B (18.2)**
Eastbound Approach	C (29.8) [20] <0.07>	D (37.3) [91] <0.44>	C (30.5) [20] <0.08>	D (36.5) [45] <0.41>
Westbound Approach	C (20.8) [57] <0.32>	D (40.5) [107] <0.69>	C (21.3) [57] <0.34>	E (72.9) [#188] <0.99>
Northbound Approach	A (5.3) [249] <0.54>	C (23.3) [m176] <0.67>	A (7.0) [321] <0.59>	C (24.1) [m488] <0.69>
Southbound Approach	B (19.6) [413] <0.46>	B (10.4) [283] <0.70>	C (20.7) [412] <0.47>	A (7.0) [128] <0.74>
Highway 141 at River Valley Drive (Signalized, Improved)				
Overall Intersection	**B (19.2)**	**C (28.1)**	**B (18.5)**	**C (29.6)**
Eastbound Approach	D (38.4) [#181] <0.61>	E (68.3) [#407] <0.96>	D (38.4) [#181] <0.61>	E (68.3) [#407] <0.96>
Westbound Approach	B (19.8) [5] <0.05>	E (69.5) [30] <0.55>	B (19.8) [5] <0.05>	E (69.5) [30] <0.55>
Northbound Approach	B (16.1) [214] <0.87>	B (17.8) [343] <0.48>	B (15.9) [233] <0.87>	B (17.9) [354] <0.49>
Southbound Approach	B (19.2) [314] <0.51>	B (18.7) [#743] <0.94>	B (17.8) [314] <0.51>	C (22.2) [m#802] <0.98>

2047 Forecasted Conditions

The 2047 forecasted conditions represent the 20-year planning horizon for the corridor assuming the proposed 364 Logistics Center is in place and built out. Again, the site generated traffic represented in Figure 7 was aggregated with the baseline volumes presented in Figure 11, resulting in the 2047 Forecasted Traffic Volumes illustrated in **Figure 14.**

The results of the operational analysis for the 2047 forecasted conditions are summarized in **Table 21**, which also provides the results from the 2047 baseline conditions for ease of comparison. As was the case in the 2047 baseline conditions, three through lanes on MO 141 are assumed in place. It is likely that in order for the additional lanes on MO 141 to be effective, they would extend, at a minimum, from Casino Drive to River Valley Drive; a distance of approximately 2.5 miles.

In addition, the dual eastbound left turn lanes on Sport Port Road approaching MO 141 are assumed in place. Given the need for dual northbound left turn lanes on MO 141 at its signalized intersection with Sport Port Road in the forecasted 2027 conditions, this improvement was also assumed to be in place for the 2047 forecasted conditions. As shown, the approaches at all intersections within the study area operate at acceptable levels of service under 2047 Forecasted Conditions.

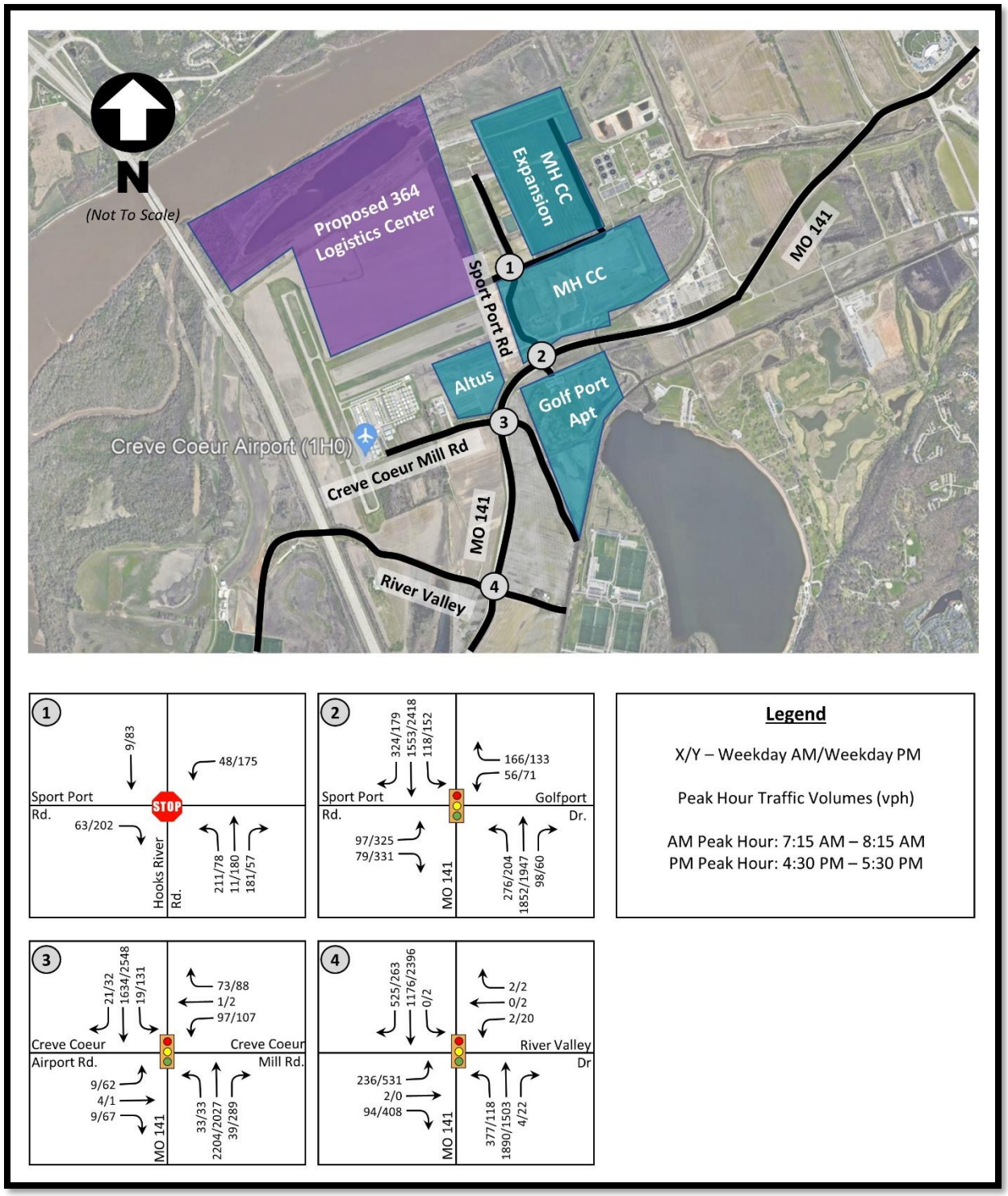


Figure 14: Year 2047 Forecasted Traffic Volumes

Table 21: Year 2047 Forecasted Traffic Operating Conditions

Intersection & Movements	2047 Baseline Conditions		2047 Forecasted Conditions	
	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>		LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	Weekday AM Peak Hour	Weekday PM Peak Hour	Weekday AM Peak Hour	Weekday PM Peak Hour
Sport Port Road and Hooks River Rd (Two-Way Stop)				
Westbound Left	N/A	N/A	A (7.7) [<25] <0.15>	A (8.0) [<25] <0.07>
Northbound Right	N/A	N/A	A (8.9) [0.2] <0.07>	B (10.0) [<25] <0.24>
Southbound Left	B (12.4) [<25] <0.11>	B (13.5) [33] <0.31>	C (19.2) [<25] <0.17>	E (38.3) [108] <0.66>
Highway 141 and Sport Port Road (Signalized, Improved)				
Overall Intersection	**B (19.5)**	**D (37.8)**	**C (20.7)**	**D (40.5)**
Eastbound Approach	C (28.0) [40] <0.46>	E (78.1) [#186] <1.02>	D (39.1) [#73] <0.72>	E (74.1) [#304] <0.99>
Westbound Approach	B (11.4) [62] <0.46>	C (25.3) [94] <0.60>	B (11.4) [62] <0.46>	C (25.4) [89] <0.64>
Northbound Approach	B (15.8) [m#194] <0.87>	D (36.7) [352]	B (17.2) [m112] <0.83>	C (33.4) [365] <0.98>
Southbound Approach	C (24.1) [354] <0.85>	C (33.0) [721] <0.93>	C (24.0) [354] <0.85>	D (39.8) [#811] <0.99>
Highway 141 at Creve Coeur Mill Road/Creve Coeur Airport Road (Signalized, Improved)				
Overall Intersection	**B (17.5)**	**B (18.1)**	**B (17.5)**	**B (17.3)**
Eastbound Approach	C (29.3) [21] <0.07>	D (37.1) [98] <0.46>	C (29.8) [21] <0.07>	D (37.1) [98] <0.46>
Westbound Approach	D (36.4) [#147] <0.36>	E (73.2) [#188] <0.99>	D (38.9) [#147] <0.70>	E (73.2) [#188] <0.99>
Northbound Approach	A (8.8) [426] <0.66>	B (16.8) [m372] <0.76>	A (8.6) [443] <0.72>	B (16.8) [m372] <0.76>
Southbound Approach	C (26.6) [455] <0.57>	B (13.6) [341] <0.80>	C (26.8) [460] <0.57>	B (12.0) [m300] <0.80>
Highway 141 at River Valley Drive (Signalized, Improved)				
Overall Intersection	**C (21.0)**	**D (51.8)**	**C (20.8)**	**D (51.4)**
Eastbound Approach	D (36.5) [#202] <0.59>	E (75.2) [#463] <1.00>	D (36.5) [#202] <0.59>	E (75.2) [#463] <1.00>
Westbound Approach	B (19.8) [5] <0.05>	E (74.1) [33] <0.61>	B (19.8) [5] <0.05>	E (74.1) [33] <0.61>
Northbound Approach	B (19.3) [263] <0.96>	B (19.5) [417] <0.56>	B (19.1) [285] <0.96>	B (19.5) [417] <0.56>
Southbound Approach	C (20.0) [326] <0.56>	E (62.3) [m#906] <1.08>	B (20.0) [326] <0.54>	E (61.6) [m#906] <1.08>

Recommendations

Based on the preceding capacity analysis of the baseline and forecasted operation conditions, several improvements to the study area are warranted.

Under baseline conditions (prior to the introduction of the 364 Logistics Center's site generated traffic and are not the responsibility of NorthPoint's 364 Logistics Center). They are as follows:

- Traffic volumes along MO 141 due to continued growth in the area would exceed the capacity provided by two through lanes in the northbound and southbound directions. Three through lanes would be required in both directions to accommodate the heavy vehicular demand as well as better serve the demands on the side street approaches at the signalized intersections. It is likely that in order for the additional lanes on MO 141 to be effective, they would extend, at a minimum, from Casino Drive to River Valley Drive; a distance of approximately 2.5 miles.
- Dual eastbound left turn lanes on Sport Port Road's approach to MO 141 would be required by the year 2027. The additional traffic generated by the expansion of the Maryland Heights Commerce Center into the Ortmann Tract (Lots 9, 10 and 11) exceeds the capacity afforded by a single eastbound left turn lane approaching MO 141.
- The City of Maryland Heights should continue to pursue the construction and expansion of River Valley Parkway as a means of providing a meaningful parallel route to MO 141.

In addition to the improvements necessitated under baseline conditions, the development of the 364 Logistics Center triggers additional infrastructure improvements, as follows:

- Lengthen the existing 100-foot eastbound left turn lane on Sport Port Road approaching MO 141 to provide 250 feet of storage capacity, exclusive of taper. This is required prior to the development of 740,000 SF within 364 Logistics Center (assumed to be in place by the year 2025). It should be noted that this improvement would eventually be replaced by dual eastbound left turn lanes, as required by the year 2027 baseline conditions.
- Provide dual northbound left turn lanes on MO 141's approach to the signalized intersection with Sport Port Road by the year 2027 and prior to build out of the 364 Logistics Center. These lanes should each provide 200 feet of storage capacity, exclusive of tapers.
- Widen Sport Port Road to provide an additional receiving lane for the dual northbound left turn lanes on MO 141. Two westbound lanes would continue on Sport Port Road terminating at the future intersection with River Valley Parkway (to be built by Maryland Heights Commerce Center) as a dedicated right turn lane and a through lane. Should River Valley Parkway not be constructed by this time, the two westbound lanes on Sport Port Road should be carried approximately 650 feet before tapering back to one lane.

POSTSCRIPT:

Following submittal of this TIS to MoDOT and the City of Maryland Heights, in October 2022, MoDOT provided traffic counts along MO 141 at the intersections with Sport Port Road and River Valley Road collected in September 2022. The data provided after completion of the study demonstrated that the need for three through lanes on MO 141 at Sport Port Road and Creve Coeur Mill Road would likely be pushed beyond the study horizon of 2027 and not required in 2027 as presented in this report. A preliminary analysis of the reduced through volumes on MO 141 indicate approximately a 20% reduction in the volume to capacity ratios for the through movements, thereby allowing for some flexibility in serving the side street demands without sacrificing the mainline operations. However, the operating conditions were not updated in this report since the analysis was not revised to reflect the MoDOT data received after submittal.

River Valley Parkway

The Maryland Height Comprehensive Plan, amended on March 24, 2020, recognizes the potential for expansive development within the Maryland Park Lake District, which is served primarily by MO 141, MO 364, Interstate 70, River Valley Road, Creve Coeur Mill Road, etc. The Comprehensive Plan states "providing a north-south collector roadway running parallel to Missouri Route 141 from I-70 to Waterworks Road is a key improvement towards achieving the access and mobility goals of this plan". This roadway, referred to as River Valley Parkway in the Comprehensive Plan, is shown in **Figure 15** and is ultimately intended to be a four-lane parkway with two lanes in each direction and turn lanes at intersections.

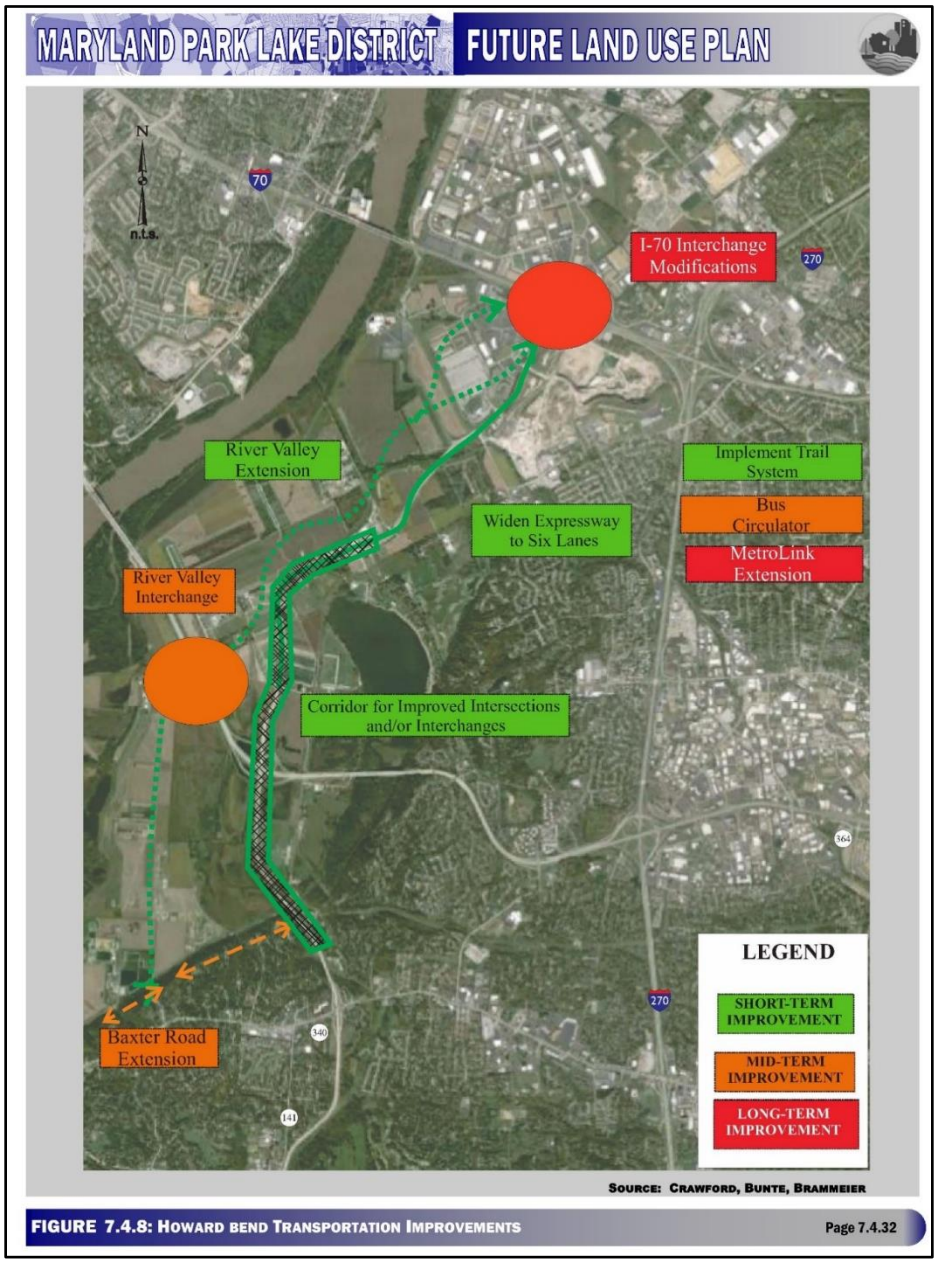


Figure 15: River Valley Parkway per the Maryland Heights Comprehensive Plan (Amended March 2020)

The River Valley Parkway is proposed to extend to both MO 364 (orange circle) and, perhaps, even to I-70 (red circle). These potential connections would directly impact the proposed development as well as the other developments along Sport Port Road and River Valley Drive by providing direct access to MO 364 and I-70 rather than relying upon MO 141 to access these highways. This connection would provide another means of access to the study area, reducing the reliance upon the intersections of MO 141 with Sport Port Road and River Valley Drive and potentially delaying the need for three through lanes in each direction along MO 141.

The 2018 traffic impact study for the Maryland Heights Commerce Center also addressed the future River Valley Parkway. The proposed development plan included the planned River Valley Parkway collector road identified by the Comprehensive Plan for the Maryland Park Lake District from Sport Port Road to the northern property line; the alignment being fixed to where MSD has provided an easement. The development of Maryland Heights Commerce Center would be responsible for building River Valley Parkway from Sport Port Road to the property line in phases in order to provide access to Buildings 2 thru Buildings 4. The piece of River Valley Parkway to the south of Sport Port Road that would ultimately connect to the Altus tract is not proposed as part of the Maryland Heights Commerce Center (Buildings 1 to 4) but is expected as part of future potential phases located along MO 141. Per the 2018 study, initially River Valley Parkway would only need to be constructed as a two-lane road with potential road improvements (turn lanes and/or additional through lanes) needed when future connections are made to the north and/or the south.

Analysis of Sport Port Road and River Valley Parkway

Given the potential for River Valley Parkway to be constructed in conjunction with the development of Maryland Heights Commerce Center, it was determined that it would be beneficial to include the future intersection with Sport Port Road in the analysis to ensure that reasonable operating conditions could be maintained at this location following development of the 364 Logistics Center.

The 2018 traffic impact study for the Maryland Heights Commerce Center concluded that a LOS B or better could be maintained at this intersection assuming side street stop control was implements on River Valley Parkway. The study also concluded that Sport Port Road, west of River Valley Parkway, would have ample capacity as a two-lane roadway, even with the expansion of the Commerce Center to the Ortmann tract. The study also recommended that auxiliary turn lane may be necessary at the intersections with River Valley Parkway and/or Hooks River as future development occurs.

The results of the operational analysis for the intersection of Sport Port Road with River Valley Parkway for the forecasted year 2047 are shown below in **Table 22**. It was assumed the intersection would be built with dedicated left turn lanes for each of the approaches in order to preemptively build the intersection to accommodate the future expansion of River Valley Parkway to the north and south. As dual northbound left turn lanes are recommended at the intersection of MO 141 and Sport Port Road under 2027 forecasted conditions, it is recommended the outside westbound lane on Sport Port Road from MO 141 terminate as a dedicated right turn lane at the intersection of Sport Port Road and River Valley Parkway. **Table 22** presents the operating conditions assuming side-street stop control, as was recommended in the 2018 study. As can be seen, by the year 2047, side street stop control would continue to function although the southbound left from River Valley Parkway would begin to show strain.

It should be noted that this study does not take into consideration the future traffic volumes drawn to River Valley Parkway should it extend north of Maryland Heights Commerce Center or south of the Altus tract. A thorough study of River Valley Parkway and its future extents, attractiveness, etc. should be considered in the future to ensure the appropriate level of traffic control at this intersection.

Table 22: Year 2047 Forecasted Operating Conditions at Sport Port Road & River Valley Parkway

Intersection & Movements	LOS (Delay, sec) [Max Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Sport Port Road and River Valley Parkway (Unsignalized, Two-Way Stop)		
EBLT from Sport Port Road	A (8.9) [<25] <0.01>	A (8.2) [<25] <0.01>
WBLT from Sport Port Road	A (7.5) [<25] <0.01>	A (8.7) [<25] <0.01>
NBT/R Valley Parkway	B (13.3) [<25] <0.05>	C (17.8) [<25] <0.01>
SBL River Valley Parkway	C (18.9) [<25] <0.11>	E (49.5) [83] <0.60>
SBT/R River Valley Parkway	C (15.8) [<25] <0.03>	C (21.4) [<25] <0.05>

Sensitivity Analysis of MO 364 & MO 141 Improved Interchange

MoDOT recently improved the interchange of MO 364 (Page Avenue) and MO 141 to enhance capacity. In particular, the eastbound to northbound movement was diverted to the northern ramp terminal and the eastbound to southbound movement was provided additional lanes at the south ramp terminal. Given the proximity of the 364 Logistics Center, as well as other nearby developments, to this critical interchange and the likelihood of additional trips along MO 364 as a result of continued development in the study area, a sensitivity analysis addressing the impacts to the interchange was requested by MoDOT. Synchro files with the base volumes and improved configuration for the interchange were provided by MoDOT and used as the basis for this analysis.

It was assumed that if the improved interchange could handle the 2047 forecasted traffic volumes, then the MO 141 and MO 364 interchange could handle the proposed 364 Logistics Center and other nearby development volumes through the various phases of development. Therefore, the sensitivity analysis was completed for the 2047 forecasted conditions only. It should be noted that to provide a conservative analysis, an annual growth rate of 0.5% was applied to this interchange through the year 2047. **Table 23** summarizes the 2047 forecasted operating conditions for the MO 141 and MO 364 interchange assuming the 364 Logistics development, as well as the other nearby developments, are fully operational.

Table 23: Year 2047 Forecasted Operating Conditions - MO 364 & MO 141 Interchange

Intersection & Movements	LOS (Delay, sec) [Max Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
MO 364 WB Ramps & Missouri Route 141 (signalized)		
Overall Intersection	**C (30.7)**	**D (50.3)**
Eastbound Approach	E (75.3) [#595] <1.03>	C (31.7) [298] <0.63>
Westbound Approach	C (31.6) [#387] <0.81>	D (37.6) [405] <0.89>
Northbound Approach	C (20.4) [506] <0.88>	B (16.0) [m477] <0.85>
Southbound Approach	C (22.2) [479] <0.75>	E (72.7) [#1046] <1.19>
MO 364 EB Ramps & Missouri Route 141 (signalized)		
Overall Intersection	**A (3.7)**	**C (26.3)**
Eastbound Approach	A (2.1) [<25] <0.77>	A (0.5) [<25] <0.42>
Northbound Approach	A (5.6) [242] <0.61>	B (12.0) [589] <0.90>
Southbound Approach	A (2.9) [m56] <0.55>	D (52.2) [m#220] <1.70>

Delay presented in seconds per vehicle

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles

As shown, the MO 141 and MO 364 interchange is successfully able to accommodate the additional traffic generated by the 2047 build traffic volumes. Each intersection operates at a LOS D or better, which is acceptable for peak period conditions; particularly those in the year 2047. Some movements do show signs that they have reached capacity, however signal timing adjustments would be able to accommodate the forecasted 2047 traffic volumes and mitigate the over-capacity approaches. As previously stated, it was determined that if the interchange could handle the projected 2047 forecasted volumes, then the interchange could handle the projected 364 Logistics Center volumes as well. Therefore, it can be reasonably concluded that the 364 Logistics Center would not negatively impact the MO 141 and MO 364 interchange.

Safety Analysis of MO 141 and Sport Port Road

Historical crash data (2017-2021) from MoDOT was utilized to weight predicted crashes based on actual accident data for the intersection of Sport Port Road and MO 141. **Table 24** summarizes the total number of crashes per year at the study intersections from 2017 to 2021. As shown, the number ranged from a low of 2 crashes in 2017 to a high of 4 crashes in 2019.

Table 24: Annual Total Crashes at Sport Port Road & MO 141

Year	Total Crashes
2017	2
2018	3
2019	4
2020	0
2021	2
Grand Total	**11**

Table 25 shows the crash severity by type at the study intersections. Crash severity levels have been divided into the following categories: Incapacitating Injury; Injury; Property Damage Only (PDO). There was a single minor injury-related crash and ten Property Damage Only (PDO) crashes during the 5-year period. There were no fatalities or disabling injuries reported during the study period.

Table 25: Crash Severity at Sport Port Road & MO 141

Crash Severity	Total Crashes
Fatality	0
Disabling Injury	0
Minor Injury	1
Property Damage Only	10
Grand Total	**11**

The HSM spreadsheet was utilized for the Sport Port/Golfport Drive and MO 141 intersection. The HSM predictive methodology forecasts relative changes in crashes between the 2027 Baseline (no improvements put in place) and Build (improvements implemented) scenarios. As summarized in **Table 26**, the build scenario with the previously proposed mitigation measures in place would yield a slight increase in crashes as compared to Baseline scenario. The additional lanes along MO 141 in the build scenario decreases the overall safety of the intersection.

Table 26: Highway Safety Manual Analysis – Sport Port Road & MO 141

Alternative	Expected Crash Frequency (Crashes/Year)		
	Fatal & Injury	Property Damage Only	Total
Baseline (No Improvements in Place)	6.1	10.4	16.5
Build (Improvements in Place)	6.4	10.8	17.2

Conclusions

Lochmueller Group has prepared the preceding traffic study for the 364 Logistics Center proposed by NorthPoint Development, to be located in Maryland Heights, Missouri. The study focused on the development of up to five buildings of various size for a total of 1,897,000 SF that would be utilized for warehousing/distribution. Access to the site is proposed via a drive at the western terminus of Hooks River Road, which ultimately connects to Missouri Route 141 (MO 141) via Sport Port Road.

Evaluating the impact of the proposed 364 Logistics Center is complicated by the significant amount of committed and planned developments in the immediate area, all of which rely upon MO 141 as a means of access. The Maryland Heights Commerce Center (as well as its potential expansion), the Golf Port Apartments and Retail, the Westport Commerce Center, the 141 Logistics Center and the River Valley Commerce Center have all been approved by the City of Maryland Heights over the past several years. However, to date, most of these developments have not yet been constructed and occupied. In addition, the property adjacent to the Thies Farm is being actively marketed for additional warehouse/office flex use and would likely come online in the next several years. All of these developments were folded into the analysis presented in this report in an effort to accurately portray the future conditions along MO 141 at the study intersections. It should be noted that the future River Valley Parkway extending beyond the extents of the Maryland Heights Commerce Center was not taken into consideration in this study since it would have a profound impact upon traffic forecasts that would be well beyond the responsibility of the proposed 364 Logistics Center.

Based on the capacity analysis, several improvements to the study area are warranted under baseline conditions (prior to the introduction of the 364 Logistics Center's site generated traffic and are not the responsibility of NorthPoint's 364 Logistics Center). They are as follows:

- Traffic volumes along MO 141 due to continued growth in the area would exceed the capacity provided by two through lanes in the northbound and southbound directions. Three through lanes would be required in both directions to accommodate the heavy vehicular demand as well as better serve the demands on the side street approaches at the signalized intersections.
- Dual eastbound left turn lanes on Sport Port Road's approach to MO 141 would be required by the year 2027. The additional traffic generated by the expansion of the Maryland Heights Commerce Center into the Ortmann Tract (Lots 9, 10 and 11) exceeds the capacity afforded by a single eastbound left turn lane approaching MO 141. However, due to signal timing constraints, dual eastbound left turn lanes should not be put in place without the provision of three through lanes on MO 141.
- The City of Maryland Heights should continue to pursue the construction and expansion of River Valley Parkway as a means of providing a meaningful parallel route to MO 141.

In addition to the improvements necessitated under baseline conditions, the development of the 364 Logistics Center triggers additional infrastructure improvements, as follows:

- Lengthen the existing 100-foot eastbound left turn lane on Sport Port Road approaching MO 141 to provide 250 feet of storage capacity, exclusive of taper. This is required prior to the development of 740,000 SF within 364 Logistics Center (assumed to be in place by the year 2025). It should be noted that this improvement would eventually be replaced by dual eastbound left turn lanes, as required by the year 2027 baseline conditions.
- Provide dual northbound left turn lanes on MO 141's approach to the signalized intersection with Sport Port Road by the year 2027 and prior to build out of the 364 Logistics Center. These lanes should each provide 200 feet of storage capacity, exclusive of tapers

- Widen Sport Port Road to provide an additional receiving lane for the dual northbound left turn lanes on MO 141. Two westbound lanes would continue on Sport Port Road terminating at the future intersection with River Valley Parkway (to be built by Maryland Heights Commerce Center) as a dedicated right turn lane and a through lane. Should River Valley Parkway not be constructed by this time, the two westbound lanes on Sport Port Road should be carried approximately 650 feet before tapering back to one lane.

Given the proximity of the 364 Logistics Center to the MO 141 and MO 364 (Page Avenue) interchange and the likelihood of additional trips along MO 364 as a result of the development, a sensitivity analysis addressing the potential impacts to the recently improved interchange was completed. It was determined that the improved MO 141 and MO 364 interchange would be able to accommodate the additional traffic generated by the 364 Logistics Center as well as continual growth in the area through the year 2047. Both ramp terminals would be expected to operate at a LOS D or better through the year 2047. Therefore, it can be reasonably concluded that the 364 Logistics Center would not negatively impact the MO 141 and MO 364 interchange.

In addition, historical crash data (2017-2021) from MoDOT was utilized to weight predicted crashes based on actual accident data for the study area. Over the 5-year period, 11 crashes occurred at Sport Port Road and MO 141. There was one minor injury-related crash and 10 Property Damage Only (PDO) crashes; no fatalities or disabling injury-related crashes were reported. A safety analysis was performed in accordance with methodologies outlined in the Highway Safety Manual (HSM) and demonstrated that the proposed mitigation measures in place at this intersection would not significantly impact crash frequency.

This traffic study adequately describes the forecasted traffic conditions that should be expected as a result of the proposed 364 Logistics Center and the associated infrastructure improvements. Please contact our office at (314) 446-3791 if you have any questions or comments concerning this report.

Completed by Lochmueller Group, Inc.

POSTSCRIPT:

Following submittal of this TIS to MoDOT and the City of Maryland Heights, in October 2022, MoDOT provided traffic counts along MO 141 at the intersections with Sport Port Road and River Valley Road collected in September 2022. The data provided after completion of the study demonstrated that the need for three through lanes on MO 141 at Sport Port Road and Creve Coeur Mill Road would likely be pushed beyond the study horizon of 2027 and not required in 2027 as presented in this report. A preliminary analysis of the reduced through volumes on MO 141 indicate approximately a 20% reduction in the volume to capacity ratios for the through movements, thereby allowing for some flexibility in serving the side street demands without sacrificing the mainline operations. However, the operating conditions were not updated in this report since the analysis was not revised to reflect the MoDOT data received after submittal.

APPENDIX

Technical Memorandum
Dated September 23rd, 2022

MEMO

To:	Mr. Eddie Watkins Mr. Yan Gluzman Ms. Erin LoRusso, AICP
From:	Ms. Julie Nolfo, PE, PTOE Mr. Nick Sokolis, EIT
Date:	September 23, 2022 Revised September 26, 2022
Subject:	Technical Memorandum: 364 Logistics Center (NorthPoint) Lochgroup Project # 522-0077

Lochmueller Group is in the process of preparing a traffic impact study for the 364 Logistics Center to be located in Maryland Heights, Missouri. The study focuses on the development of up to 5 buildings of various size for a total of 1,897,000 SF that would be utilized for warehousing/distribution. Access to the site is proposed via a drive at the western terminus of Hooks River Road, which ultimately connects to Missouri Route 141 via Sport Port Road. **Figure 1** illustrates the proposed location of the 364 Logistics Center.

Figure 1. Proposed Location of 364 Logistics Center

411 North 10th Street, Suite 200
St. Louis, Missouri 63101
PHONE: 314.621.3395

In order to properly quantify the impact of the proposed development, it is necessary to evaluate the amount of traffic generated and apply it to the network over several future scenario years that correspond with the intended phasing of development for the 364 Logistics Center. However, this effort is complicated by the significant amount of committed and planned developments in the immediate area, all of which rely upon MO 141 as a means of access. The Maryland Heights Commerce Center (as well as its potential expansion), the Golf Port Apartments and Retail, the Westport Commerce Center, the 141 Logistics Center and the River Valley Commerce Center have all been approved by the City of Maryland Heights over the past several years. However, to date, the vast majority of these developments have not yet been constructed and occupied. In addition, the property adjacent to the Thies Farm is being actively marketed for additional warehouse/office flex use and will likely come online in the next five years. **Figure 2** depicts the locations of the various developments along the MO 141 corridor.

Therefore, this technical memo aims to breakdown the trip generation for all of the various developments in the area, not just the proposed 364 Logistics Center, in an effort to align the probable timelines for the various developments into a realistic depiction of the future conditions within the study area. To that end, this memo will detail each of the developments in the area of the MO 141 corridor. Each development will be broken down into their phases of construction to detail how much traffic will be added during each scenario year. This will illustrate the trip generation by all developments in the study area to give a clear image of the impact by year.

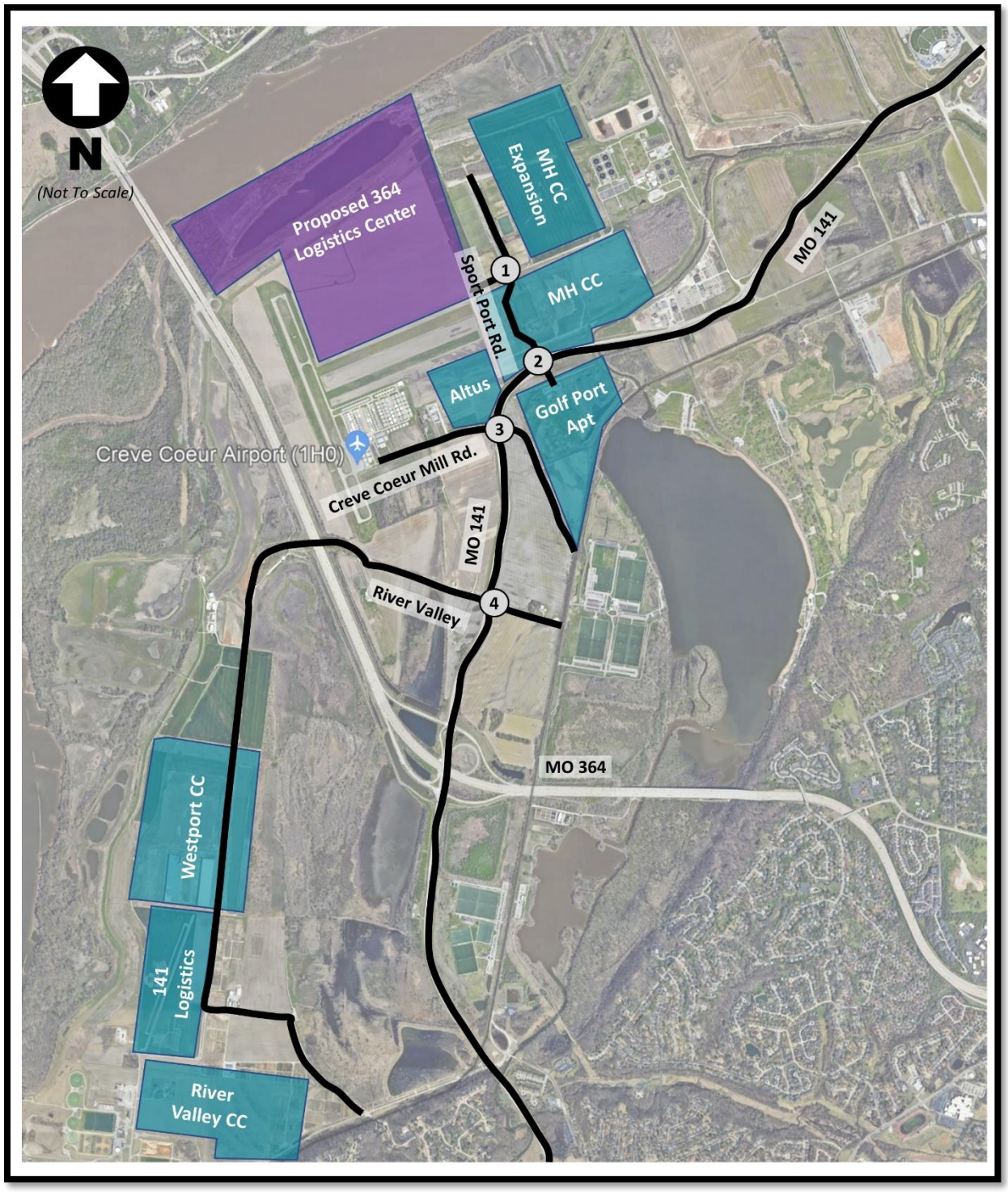


Figure 2. Development along the MO 141 Corridor

Trip Generation of Known Development Along MO 141 Corridor

The trip generation, by phase, for each of the known developments along the MO 141 corridor are presented within this memorandum. The associated trip generation for each development was updated from their previously completed traffic studies to represent the latest square footages and phasing and was completed using data provided in the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition for the appropriate land use codes for each development. It should be noted that the trip generation for each scenario year is *in addition to* the trips generated at each of the preceding scenario years. Truck trip generation volumes are also shown alongside total vehicle trip generation. Please note that the truck generation volumes shown in the tables are accounted for in the total vehicle trip generation and are not in addition to the vehicle trip generation volumes.

An overview of the surrounding developments and the proposed 364 Logistics Center development is shown below in **Table 1**, which details square footage by phase, development status, and relevant assumptions. Each of the developments is presented in the subsequent subsections.

Maryland Heights Commerce Center

The Maryland Heights Commerce Center is in development by KBG, Inc. Access to the site is provided via Sport Port Road and the future River Valley Parkway. Additionally, the Maryland Heights Commerce Center has the potential for expansion onto the Ortmann Tract. The trip generation for the various phases on the MH Commerce Center are reflected below in **Table 2** with approved site plans for the development illustrated in **Figures 3** and **4**.

The directional distribution of the site generated trips for the Maryland Heights Commerce Center is shown below in **Table 3** and is consistent with that presented in the original traffic impact study prepared in 2018. The distribution differentiates between passenger vehicles and heavy trucks to distinguish the routes between vehicle types. Distribution for the later phases assuming development on the Ortmann Tract is expected to follow the same distribution for the earlier phases as presented in the 2018 traffic study.

Table 1. Summary of Developments and Assumptions

Development	Build Out Size	Build Out Use	Status	Assumptions
Maryland Heights Commerce Center	239,145	Office Flex	Committed	Lots 1 and 4; Lot 4 (63,645 SF) constructed in 2023; Lot 1 (175,500 SF) constructed in 2025
	773,900	Office Dist.	Committed - Lot 3 / Planned Lot 2	Lots 2 and 3; Lot 2 (404,700) constructed by 2027; Lot 3 (369,200 SF) constructed in 2024
	340,500	Office Flex	Planned	Lots 9, 10 and 11 of Ortmann Tract Expansion; constructed by 2027
	748,000	Office Dist.	Planned	Lots 12 and 13 of Ortmann Tract Expansion; no defined timeframe (assumed in place by 2047)
Golf Port Apartments	276	Apartments	Under Construction	Phase 1; constructed by 2023
	168	Apartments	Committed	Phase 2; constructed by 2026
	156	Apartments	Committed	Phase 3; constructed by 2029
	175	Apartments	Committed	Phase 4; constructed by 2032
	22	Villas	Committed	Phase 4; constructed by 2032
	20,000	Medical Office	Committed	Constructed in 2024
	20,000	Retail	Committed	Constructed in 2025
	3,500	QSR	Committed	Constructed in 2026
Westport Commerce Center	606,585	Office Flex	Under Construction	Phase 1 in place by 2023
	222,768	Office Flex	Under Construction	Phase 2 in place by 2023
	505,440	Office Flex	Committed	Phase 3 in place by 2025
141 Logistics Center	540,800	Office Flex	Committed	Phase 1 in place by 2024
	540,800	Office Flex	Committed	Phase 2 in place by 2027
River Valley Commerce Center	256,880	Office Dist.	Under Construction	In place by 2023
	354,000	Office Dist.	Committed	In place by 2024
	495,000	Office Dist.	Committed	In place by 2025
Altus	345,500	Office Dist.	Planned	Assumed in place by 2027
Proposed 364 Logistics Center	**740,000**	**Office Dist.**	**Planned (Current TIS)**	**Phase 1 in place by 2025**
	1,157,000	**Office Dist.**	**Planned (Current TIS)**	**Phase 2 in place by 2027**

Table 2. Maryland Heights Commerce Center Trip Generation

Scenario Year	Size (SF)	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2023	63,645	Office Flex	130	18 (1)	4 (2)	22 (3)	5 (1)	17 (2)	22 (3)
2025	175,500	Office Flex	130	48 (3)	12 (4)	60 (7)	13 (3)	47 (4)	60 (7)
2025	369,200	Office Dist.	150	52 (3)	16 (4)	68 (7)	20 (6)	51 (5)	71 (11)
2027	404,700	Office Dist.	150	55 (4)	17 (4)	72 (8)	21 (6)	54 (6)	75 (12)
2027	340,500	Office Flex	130	94 (6)	22 (8)	116 (14)	25 (5)	91 (9)	116 (14)
2047	748,000	Office Dist.	150	87 (8)	26 (7)	113 (15)	32 (11)	84 (11)	116 (22)
Total Development				354 (25)	97 (29)	451 (54)	116 (32)	344 (37)	460 (69)

Table 3. Maryland Heights Commerce Center Directional Distribution

Route	Directional Distribution	
	Passenger Vehicles	Heavy Trucks
To/From the North on MO 141	**53%**	**65%**
• To/From the West on I-70	20%	30%
• To/From the East on I-70	20%	35%
• To/From the North on MO 141, North of I-70	5%	0%
• To/From the East on Marine Avenue	5%	0%
• To/From the East on Creve Coeur Mill Road	3%	0%
To/From the South on MO 141	**47%**	**35%**
• To/From the East on MO 364 (Page Avenue)	15%	15%
• To/From the West on MO 364 (Page Avenue)	15%	10%
• To/From the South on MO 141	15%	10%
• To/From the South on Creve Coeur Mill Road	2%	0%

During a previous study, it was determined an extension of the eastbound left turn bay and signal timings adjustments were necessary on Sport Port Road by the year 2025. It was also determined that three northbound and three southbound lanes would be needed on MO 141 with the 20-year horizon.

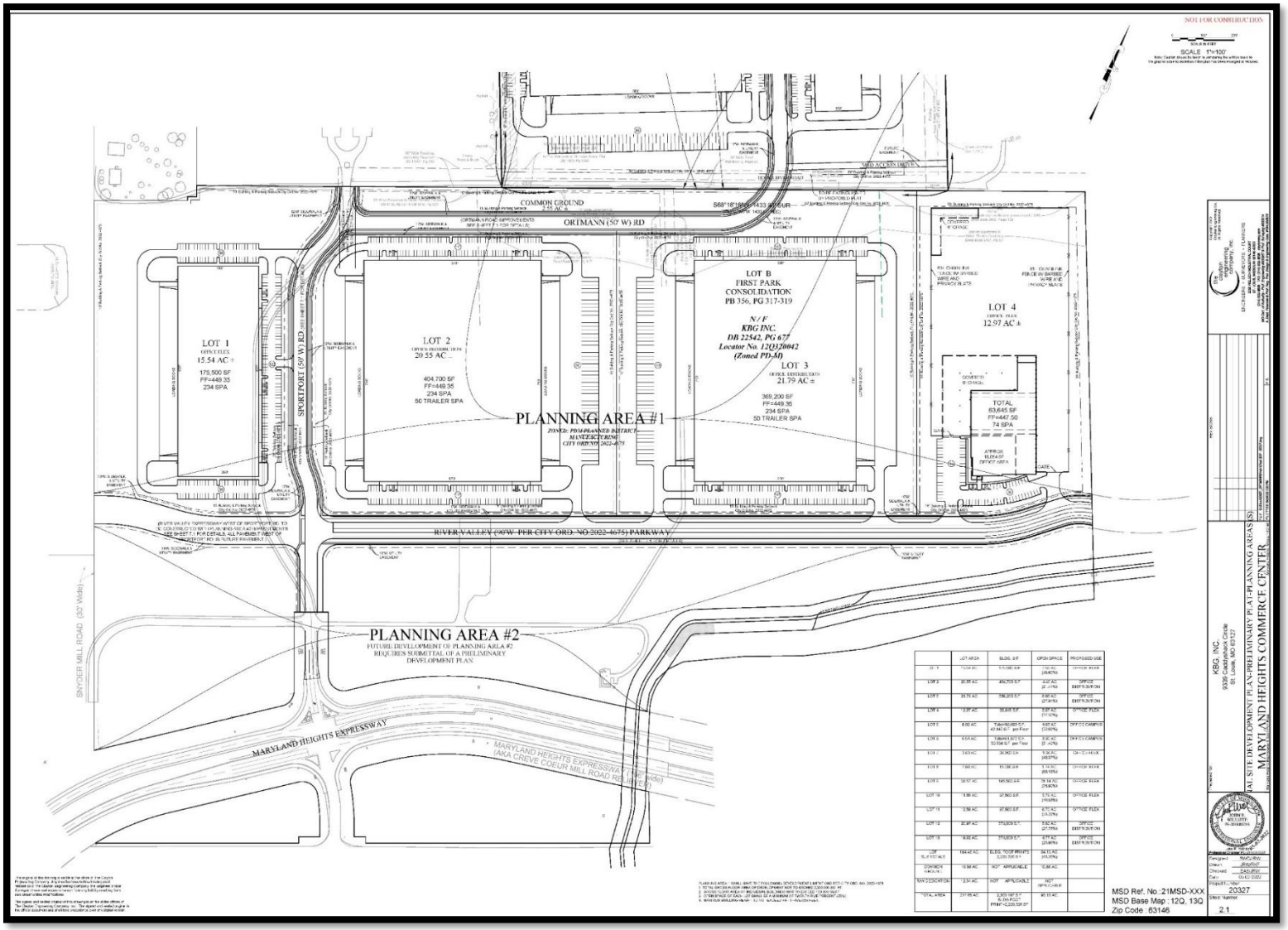


Figure 3. Maryland Heights Commerce Center Site Plan

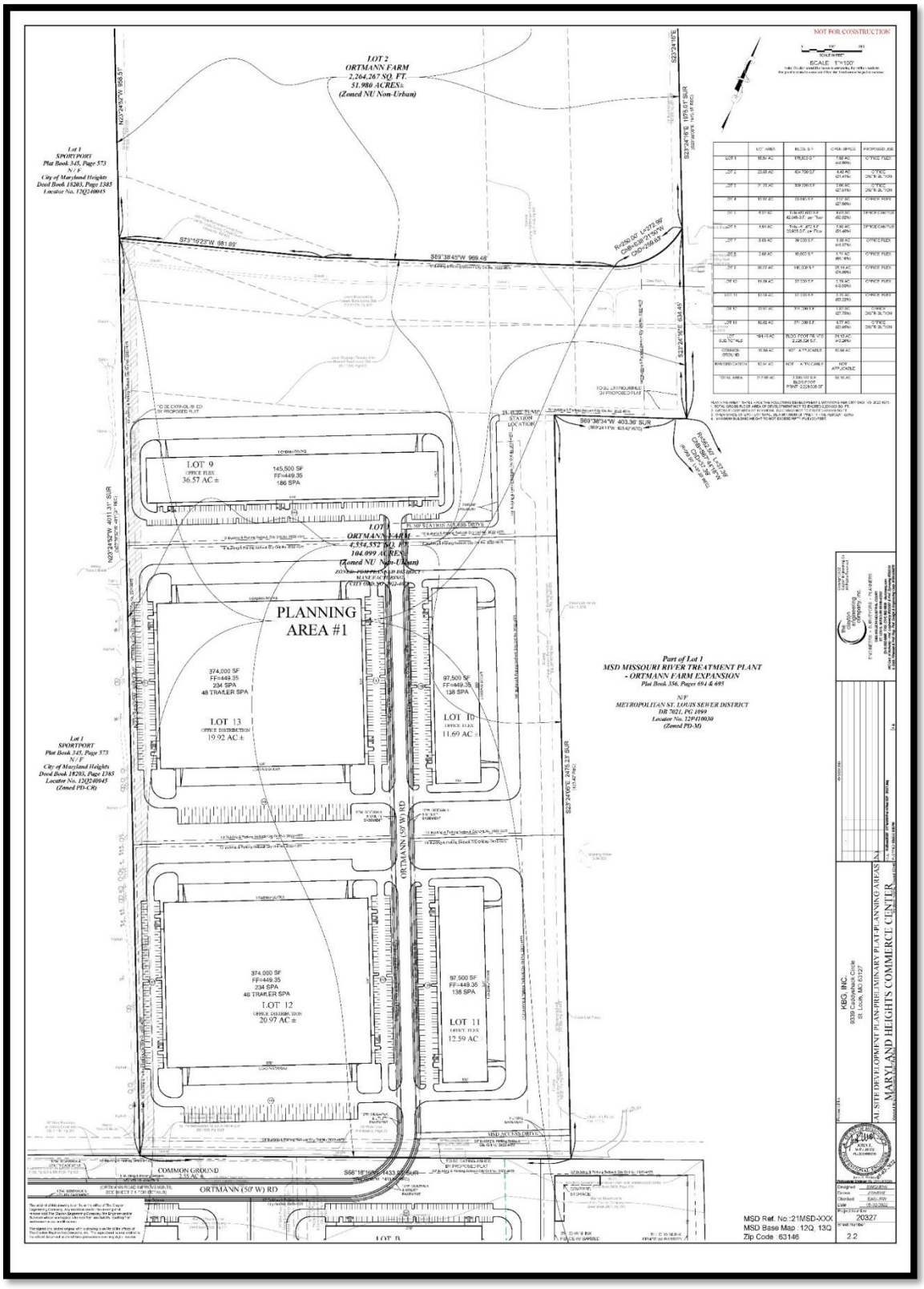


Figure 4. Maryland Heights Commerce Center Expanded Site Plan: Ortmann Tract

Golf Port Apartments

The Golf Port Apartments is in development by KBG, Inc. in the northeast quadrant of MO 141 and Golf Port Drive. The development includes several phases of apartments, villas, medical office space, retail space, and a quick service restaurant. Currently, the first phase of the development of 276 apartments is under construction. The remaining phases are anticipated for construction between 2024 and 2032. The Golf Port Apartments development will have site access to MO 141 via Golf Port Drive and Creve Coeur Mill Road.

The trip generation volumes for the Golf Port Apartments development are shown below in **Table 4** with the approved site plan shown in **Figure 5**:

Table 4. Golf Port Apartments Trip Generation

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2023	276	Apartments	221	25	85	110	66	42	108
2025	20,000	Med Office	720	49	13	62	24	55	79
2025	20,000	Retail	822	28	19	47	66	66	132
2027	168	Apartments	221	14	48	62	37	24	61
2027	3,500	QSR	934	79	77	156	60	56	116
2047	156	Apartments	221	13	44	57	40	26	66
2047	175	Apartments	221	15	50	65	42	27	69
2047	22	Villas	220	7	23	30	19	11	30
Total Development				230	359	589	354	307	661

The directional distribution for the generated trips of the Golf Port Apartments is shown below in **Table 5** and is consistent with that presented in the original traffic impact study prepared in 2021.

Table 5. Golf Port Apartments Directional Distribution

Route	Percentage
To/From the North on MO 141	**50%**
To/From the South on MO 141	**50%**
• To/From the south on MO 141	45%
• To/From the south on Creve Coeur Mill Road	5%

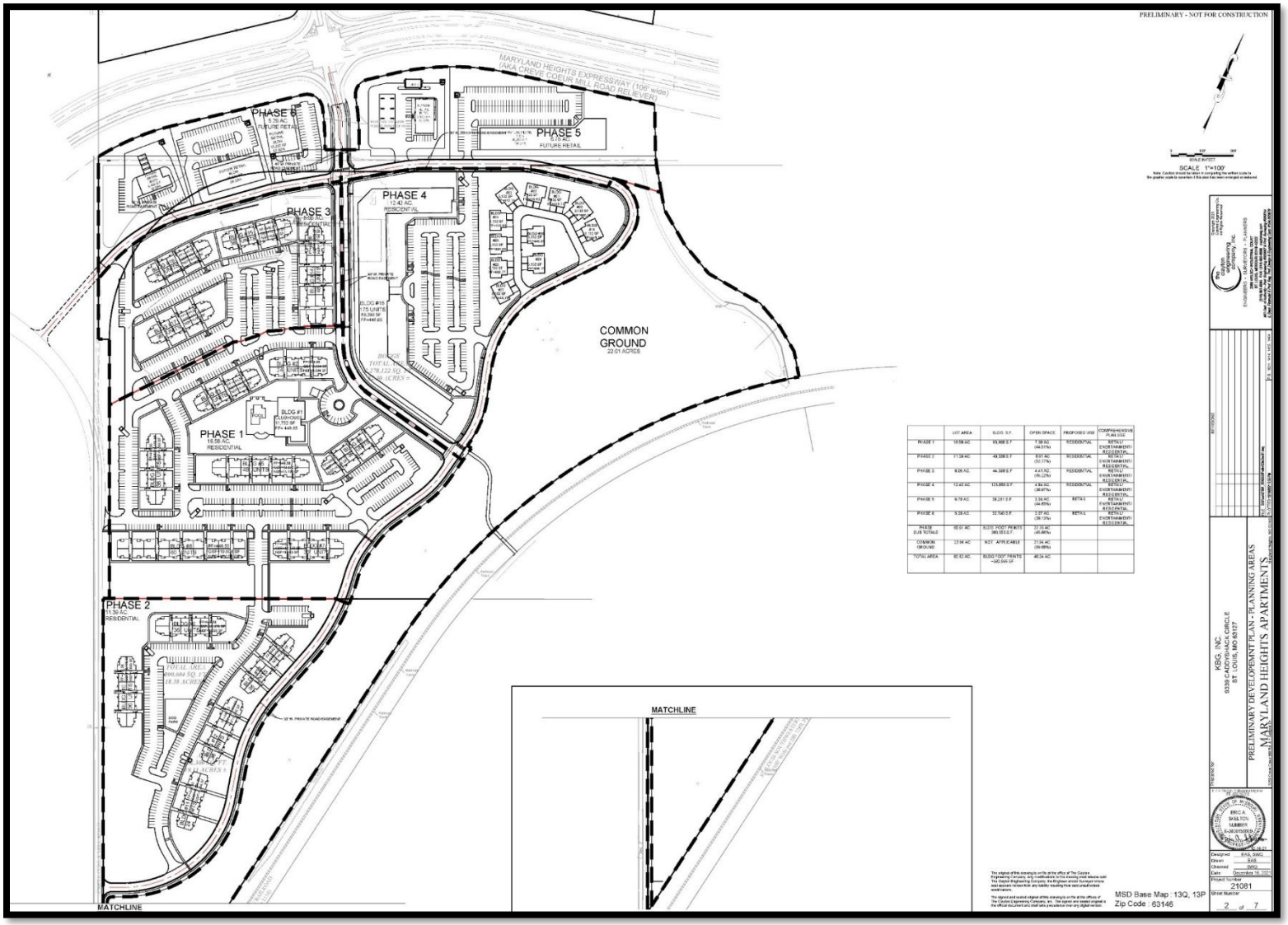


Figure 5. Golf Port Apartments Site Plan

Westport Commerce Center

The Westport Commerce Center is under development by TriStar Companies located southwest of Route 364 and MO 141 along River Valley Drive. Phases 1 and 2 of the development will be complete by 2023 with the third phase completed by 2025. The development will encompass a total of 1.33 million SF of office distribution and light industrial uses. Access to the site is provided via three driveways along the west side only of River Valley Drive.

The trip generation volumes for the Westport Commerce Center development are shown below in **Table 6** with the approved site plan shown in **Figure 6**.

Table 6. Westport Commerce Center Trip Generation

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2023	829,353	Office Flex	130	228 (15)	54 (18)	282 (33)	62 (12)	220 (21)	282 (33)
2025	505,440	Office Flex	130	139 (9)	33 (11)	172 (20)	38 (7)	134 (13)	172 (20)
Total Development				367 (24)	87 (29)	454 (53)	100 (19)	354 (34)	454 (53)

The directional distribution of the generated trips for the Westport Commerce Center is shown below in **Table 7** and is consistent with that presented in the original traffic impact study prepared in 2020.

Table 7. Westport Commerce Center Directional Distribution

Route	Percentage
To/From the North on MO 141	**55%**
To/From the South on MO 141	**40%**
• To/From the East on MO 364 (Page Avenue)	25%
• To/From the West on MO 364 (Page Avenue)	15%
To/From the South on Hog Hollow Road	**3%**
To/From the East on River Valley Drive via Hog Hollow Road	**2%**

The previous study for the Westport Commerce Center found the following improvements were necessary by the time the center was fully operation at the end of 2021:

- Widen west leg of River Valley Drive to provide an additional lane approaching MO 141
- Stripe the widened eastbound approach to provide a dedicated left turn lane, a shared left/through lane, and a dedicated right turn lane
- Widen southbound MO 141 to provide a dedicated right turn lane and a third southbound through lane
- Modify the traffic signal's phasing to provide split phasing for River Valley Drive approaches

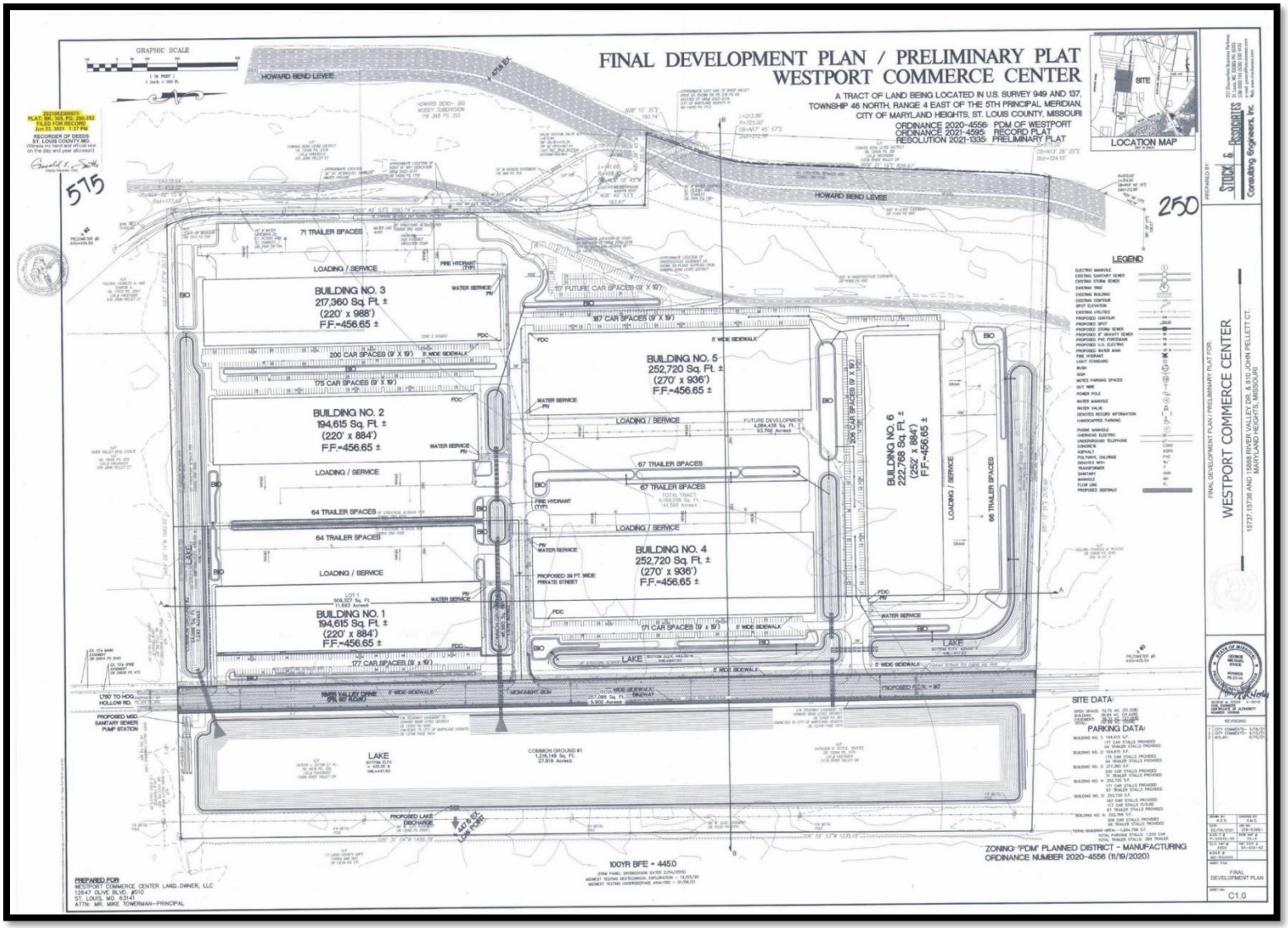


Figure 6. Westport Commerce Center Site Plan

141 Logistics Center

The 141 Logistics Center is currently under development by Clearpath Development Partners and is located southwest of Route 364 and MO 141 along River Valley Drive. The development will encompass a total of 1.08 million SF of office distribution and light industrial uses, similar to the adjacent Westport Commerce Center. Access to the site is provided via four drives; two onto River Valley Drive and two onto Hog Hollow Road.

The trip generation volumes for the 141 Logistics Center development are shown below in **Table 8** with the approved site plan shown in **Figure 7.**

Table 8. 141 Logistics Center Trip Generation

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2025	540,800	Office Flex	130	149 (10)	35 (12)	184 (22)	40 (8)	144 (14)	184 (22)
2027	540,800	Office Flex	130	149 (10)	35 (12)	184 (22)	40 (8)	144 (14)	184 (22)
Total Development				298 (20)	70 (24)	368 (44)	80 (16)	288 (28)	368 (44)

The directional distribution of the trips generated by the 141 Logistics Center is shown below in **Table 9**. This is the same distribution pattern as previously shown for the Westport Commerce Center and is consistent with that presented in the original traffic impact study prepared in 2022.

Table 9. 141 Logistics Center Directional Distribution

Route	Percentage
To/From North on MO 141	**55%**
To/From South on MO 141	**40%**
• To/From the East on 364/Page Avenue	25%
• To/From the West on 364/Page Avenue	15%
To/From the South on Hog Hollow Road	**3%**
To/From the East on River Valley Drive via Hog Hollow Road	**2%**

The 141 Logistics Center impact was evaluated with the obligated improvements for the Westport Commerce Center in place. With the addition of the 141 Logistics Center, the analysis determined the need for additional improvements to accommodate the increase in traffic. Improvements triggered for the intersection of MO 141 at River Valley Drive by the 141 Logistics Center for 2022 conditions included:

- Dual northbound left-turn lanes on MO 141 with appropriate signal modifications
- Widening of River Valley Drive, west of MO 141, to accommodate an additional receiving lane
- Signal timing changes to adjust for increase demand at various approaches

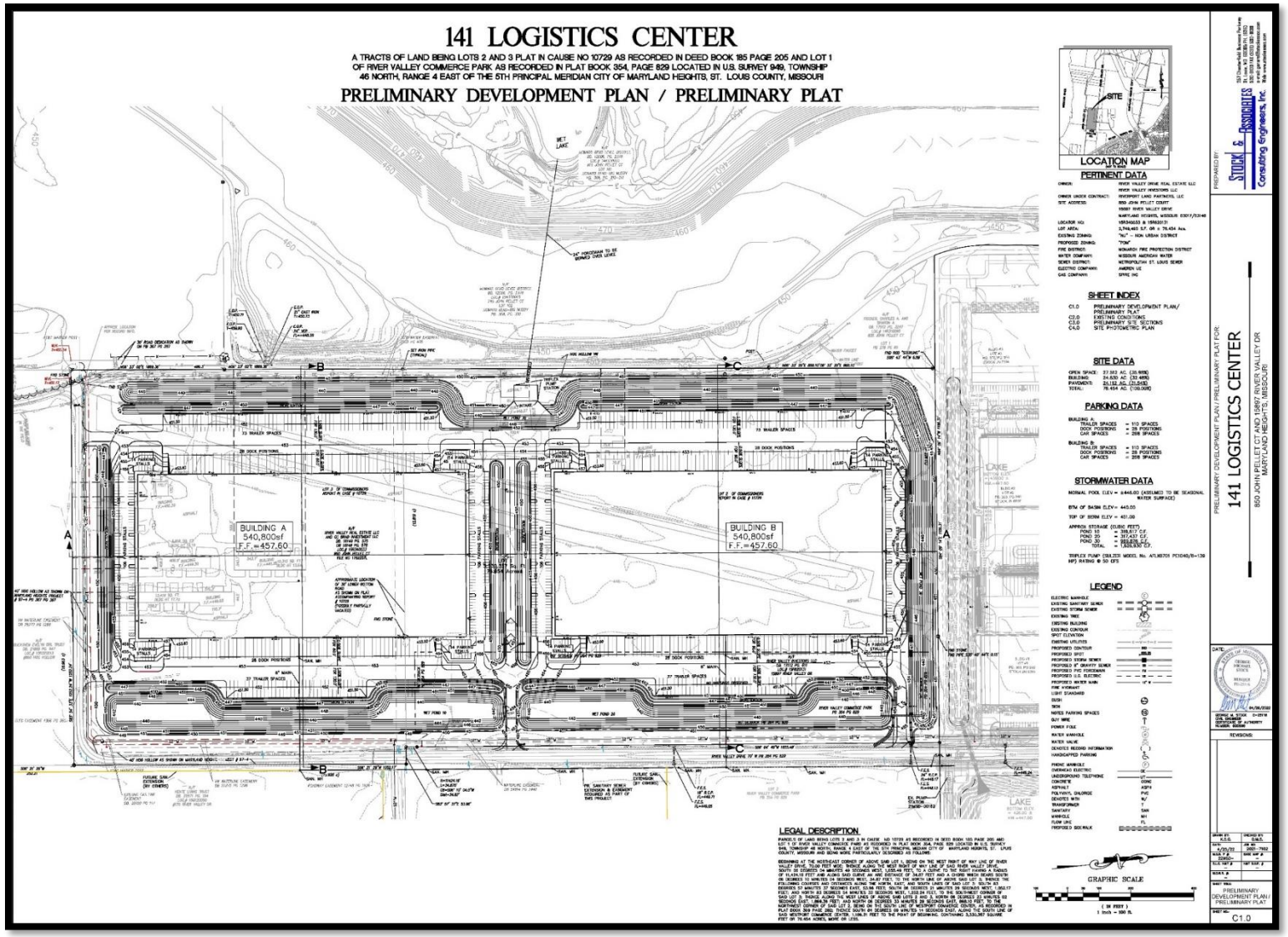


Figure 7. 141 Logistics Center Site Plan

River Valley Commerce Center

The River Valley Commerce Center is under construction by North Point Development and will be located southwest of Route 364 and MO 141 along River Valley Drive and Hog Hollow Road. The site will accommodate a total of 1.1 million SF of office distribution space. Access to the site is provided via two drives: one as an extension of River Valley Drive and one onto Hog Hollow Road. An additional third site access point for emergency vehicles will be provided on the western edge of the site, along Hog Hollow Road.

The trip generation volumes for the River Valley Commerce Center development are shown below in **Table 10** with the approved site plan shown in **Figure 8.**

Table 10. River Valley Commerce Center Trip Generation

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2023	256,800	Office Dist.	150	41 (3)	13 (2)	54 (5)	16 (4)	41 (4)	57 (8)
2025	354,000	Office Dist.	150	51 (4)	15 (3)	66 (7)	19 (6)	50 (5)	69 (11)
2025	495,000	Office Dist.	150	64 (5)	19 (5)	83 (10)	24 (8)	62 (7)	86 (15)
Total Development				156 (12)	47 (10)	203 (22)	59 (18)	153 (16)	212 (34)

The directional distribution of the trips generated by the River Valley Commerce Center is shown below in **Table 11**. This is the same distribution pattern as previously shown for the Westport Commerce Center and 141 Logistics Center and is consistent with that presented in the original traffic impact study prepared in 2022.

Table 11. River Valley Commerce Center Directional Distribution

Route	Percentage
To/From North on MO 141	**55%**
To/From South on MO 141	**40%**
• To/From the East on 364/Page Avenue	25%
• To/From the West on 364/Page Avenue	15%
To/From the South on Hog Hollow Road	**3%**
To/From the East on River Valley Drive via Hog Hollow Road	**2%**

The River Valley Commerce Center's impact was evaluated with the obligated improvements for the Westport Commerce Center in place. With the addition of the River Valley Commerce Center, the analysis determined the need for additional improvements at the intersection of MO 141 at River Valley Drive to accommodate the increase in traffic, which included:

- Dual northbound left-turn lanes on MO 141 with appropriate signal modifications
- Widening of River Valley Drive, west of MO 141, to accommodate an additional receiving lane
- Signal timing changes to adjust for increase demand at various approaches

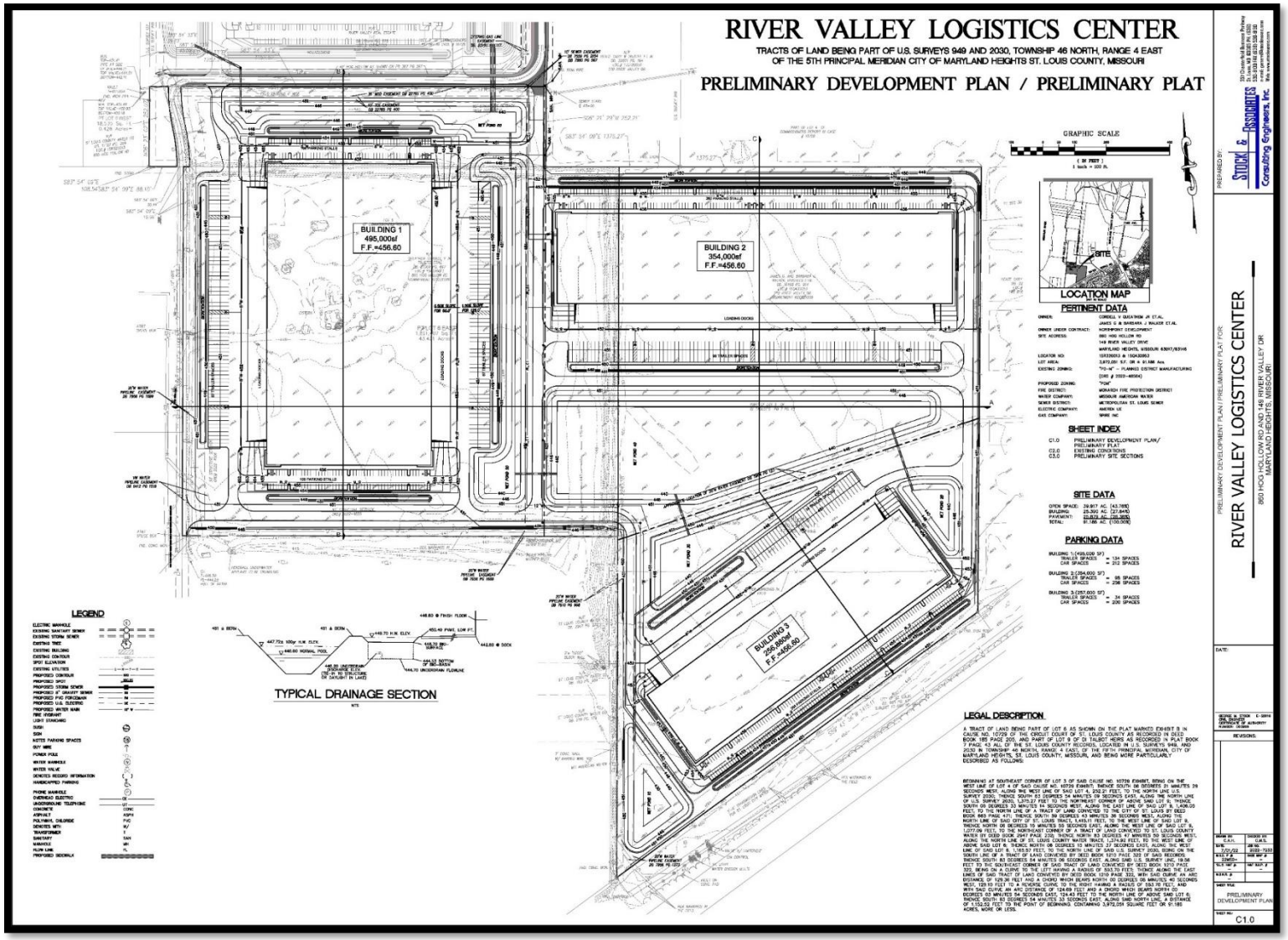


Figure 8. River Valley Commerce Center Site Plan

Altus Development

A potential industrial use development, currently being marketed by Altus, is planned for the tract of land adjacent to Theis Farms in the northwest corner of the intersection of Route 141 and Creve Coeur Airport/Mill Road. While the full details of the development are not yet known, for the purposes of this study it is assumed it will be in place by 2027 with an estimated 345,500 SF of office distribution space. **Table 12** below displays the potential trip generation volumes for this development (site plan is not currently available).

Table 12. Altus Development Trip Generation

Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2027	345,500	Office Dist.	150	50 (4)	15 (3)	65 (7)	19 (5)	49 (5)	68 (10)

The directional distribution of the trips generated by the Altus Development were assumed to be the same as the distribution pattern applied to the Maryland Heights Commerce Center in the traffic impact study prepared in 2018. The patterns are summarized below in **Table 13**.

Table 13. Altus Development Directional Distribution

Route	Directional Distribution	
	Passenger Vehicles	Heavy Trucks
To/From the North on MO 141	**53%**	**65%**
• To/From the West on I-70	20%	30%
• To/From the East on I-70	20%	35%
• To/From the North on MO 141, North of I-70	5%	0%
• To/From the East on Marine Avenue	5%	0%
• To/From the East on Creve Coeur Mill Road	3%	0%
To/From the South on MO 141	**47%**	**35%**
• To/From the East on MO 364 (Page Avenue)	15%	15%
• To/From the West on MO 364 (Page Avenue)	15%	10%
• To/From the South on MO 141	15%	10%
• To/From the South on Creve Coeur Mill Road	2%	0%

Proposed 364 Logistics Center

NorthPoint's 364 Logistics Center is the proposed development under review for this current study iteration of the traffic study along MO 141. The proposed development is comprised of up to five buildings of various size for a total of 1,897,000 SF. Access to the site is proposed via one drive at the western termination of Hooks River Road, which ultimately connects to Missouri Route 141 via Sport Port Road. The proposed site plan is illustrated in **Figure 9.**

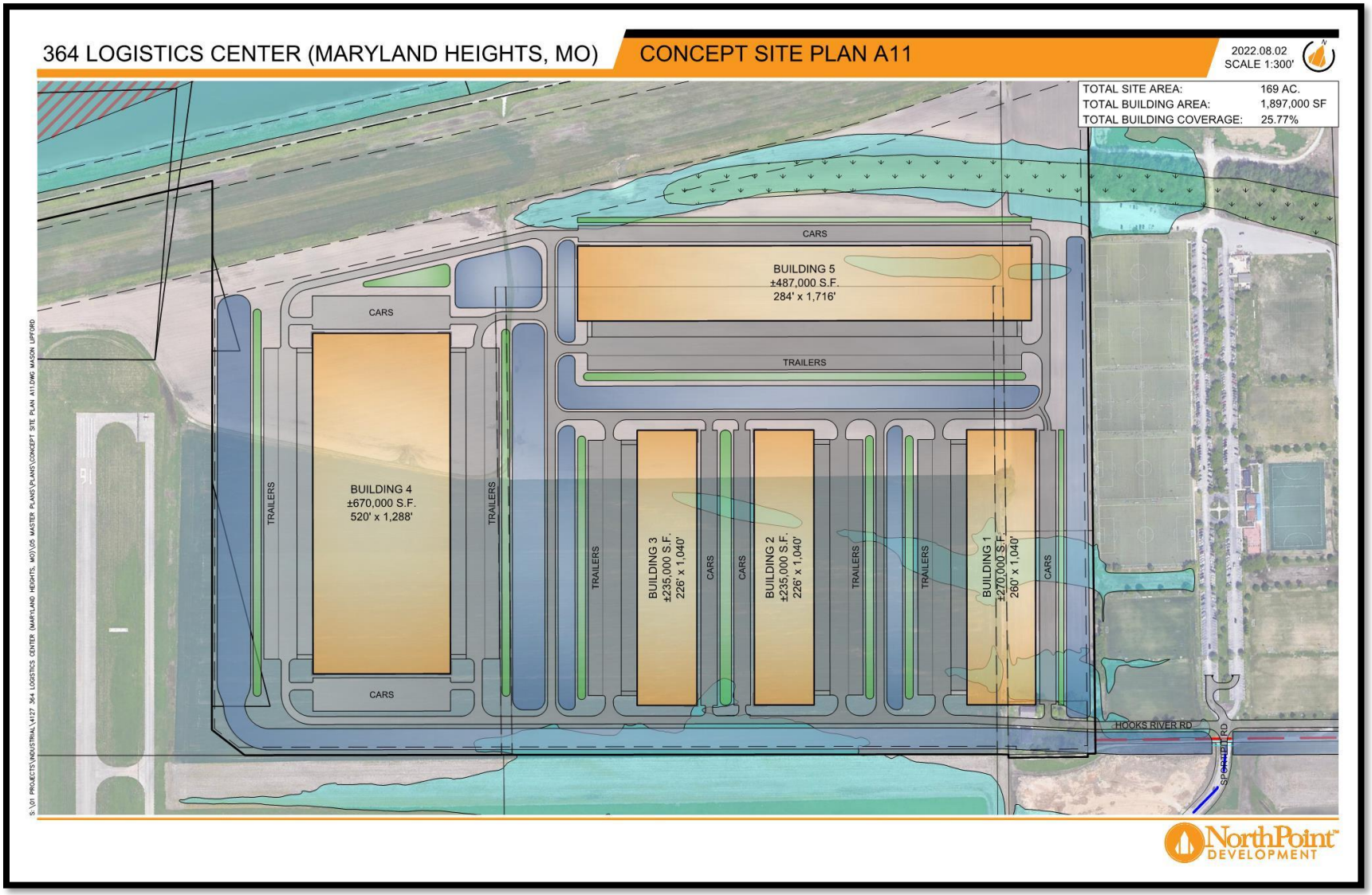


Figure 9. Proposed 364 Logistics Center Site Plan

The trip generation volumes for the proposed 364 Logistics Center development are shown below in **Table 14**.

Table 14. 364 Logistics Center Trip Generation by Year

Scenario Year	Size	Use	ITE LUC	Vehicles/Hour (Trucks/Hour)					
				AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
2025	740,000	Office Dist.	150	86 (8)	26 (7)	112 (15)	32 (11)	83 (11)	115 (22)
2027	1,157,000	Office Dist.	150	125 (12)	37 (11)	162 (23)	46 (18)	119 (17)	165 (35)
Total Development				211 (20)	63 (18)	274 (38)	78 (29)	202 (28)	280 (57)

Given the proposed development's location adjacent to the Maryland Heights Commerce Center, the travel patterns were assumed to be the same as the distribution pattern applied to the Maryland Heights Commerce Center in the traffic impact study prepared in 2018. The patterns are summarized below in **Table 15.**

Table 15. 364 Logistics Center Directional Distribution

Route	Directional Distribution	
	Passenger Vehicles	Heavy Trucks
To/From the North on MO 141	**53%**	**65%**
• To/From the West on I-70	20%	30%
• To/From the East on I-70	20%	35%
• To/From the North on MO 141, North of I-70	5%	0%
• To/From the East on Marine Avenue	5%	0%
• To/From the East on Creve Coeur Mill Road	3%	0%
To/From the South on MO 141	**47%**	**35%**
• To/From the East on MO 364 (Page Avenue)	15%	15%
• To/From the West on MO 364 (Page Avenue)	15%	10%
• To/From the South on MO 141	15%	10%
• To/From the South on Creve Coeur Mill Road	2%	0%

Background Growth

An annual background growth rate to apply to MO 141 was determined based upon input from East West Gateway and their regional travel demand model. Based upon their understandings of the various developments along the corridor as well as the potential for development beyond those already identified, it was their opinion that 0.5% annual growth rate would be considered conservative. Consequently, this annual growth rate was agreed to by both the City of Maryland Heights and MoDOT.

However, the projected background growth shall be applied in a non-conventional way for this study so as to not "double count" for development along the corridor. Typically, the background growth is applied every year between scenarios as a way of capturing the increase of traffic through the study area unrelated to a particular proposed development. In this case,

the background growth is entirely accounted for between 2023 and 2027 as all surrounding developments are documented, and the number of trips for each development is calculated for each respective scenario year. Therefore, the background growth shall only be applied to adjust 2019 counts to the 2023 baseline, and again between the years 2027 to 2047 to account for additional development that is not yet identified.

Analysis Scenarios

The breakdown of trip generation by development allows for a more concise addition of traffic during each of the horizon years: 2023, 2025, 2027 and 2047. Given the ongoing construction along the corridor, traffic counts from Fall 2019 were utilized as the starting point. The various scenarios, and the associated level of development considered in each, are as follows:

- **2023 Base Conditions**
  - 0.5% annual growth from 2019 to 2022 for background growth (representing growth before the specific developments come online)
  - 63,645 SF within Maryland Heights Commerce Center (Lot 4)
  - 276 apartments within Golf Port
  - 829,353 SF within Westport Commerce Center
  - 256,880 SF within River Valley Commerce Center
  - Assumes intersection with River Valley with MO 141 is improved to provide dual NBLT lanes, third SB through lane, and a dedicated EBLT plus a shared LT/TH lane

- **2025 Base Conditions**
  - 544,700 SF within Maryland Heights Commerce Center (Lots 1 and 3)
  - 20,000 SF medical office & 20,000 SF retail within Golf Port
  - 505,440 SF within Westport Commerce Center (representing build out)
  - 540,800 SF within 141 Logistics Center
  - 849,000 SF within River Valley Commerce Center (representing build out)

- **2025 Forecasted Conditions** – includes all represented in 2025 Base Conditions plus:
  - 740,000 SF within the proposed 364 Logistics Center

- **2027 Base Conditions** – includes all represented in 2025 Base Conditions plus:
  - 404,700 within Maryland Heights Commerce Center (Lot 2 – representing build out of the original commerce center)
  - 340,500 within Maryland Heights Commerce Center Expanded to the Ortmann Tract (Lots 9, 10 & 11)
  - 168 apartments & 3,500 SF QSR within Golf Port
  - 540,800 SF within 141 Logistics Center (representing build out)
  - 345,500 SF within Altus Property (speculative)

- **2027 Forecasted Conditions** – includes all represented in 2027 Base Conditions plus:

  - 1,897,000 SF within the proposed 364 Logistics Center (representing build out)

- **2047 Base Conditions** – includes all represented in 2027 Base Conditions plus:
  - 0.5% annual growth rate from 2027 to 2047
  - 748,000 SF within Maryland Heights Commerce Center Expanded to the Ortmann Tract (representing build out)
  - 156 apartments (Phase 3), 175 apartments & 22 villas (Phase 4) within Golf Port

- **2047 Forecasted Conditions** – includes all represented in 2047 Base Conditions plus:
  - 1,897,000 SF within the proposed 364 Logistics Center (representing build out)

The summary of the trip generation of the various developments coming online per scenario year is summarized below in **Table 16**.

Heavy Truck Percentages

It is important to accurately estimate the heavy truck percentage along the network roadways as the proposed 364 Logistic Center development, and many of the surrounding area developments, are expected to generate a higher-than-average truck percentage due to their land use. To estimate the heavy truck percentage in future scenarios, a truck trip generation was also completed for the proposed development and applicable surrounding area developments. It is important to note the truck trip generation is not an increase in total number of vehicles but rather the number of trucks generated within the total vehicle generation of a site.

For all developments using the Sport Port Road access onto Route 141, the amount of generated truck trips was directly added into the truck percentage. This includes vehicles exiting sites via the eastbound approach of the intersection as well as the vehicles entering Sport Port Road via the northbound left or southbound right at the intersection. The truck percentage of the mainline northbound and southbound through movements was assumed to be 5%, as was consistently applied to the previous traffic impact studies along the corridors (and was requested by MoDOT). The truck percentages at the intersection of Route 141 and Sport Port Road for each scenario year is shown below in **Table 17.**

Table 16. Development Trip Generation by Scenario Year

Scenario Year	Development	Vehicles/Hour (Trucks/Hour)					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
2023	MH CC	18 (1)	4 (2)	22 (3)	5 (1)	17 (2)	22 (3)
	Golf Port Apartments	25 (0)	85 (0)	110 (0)	66 (0)	42 (0)	108 (0)
	Westport CC	228 (15)	54 (18)	282 (33)	62 (12)	220 (21)	282 (33)
	River Valley CC	41 (3)	13 (2)	54 (5)	16 (4)	41 (4)	57 (8)
	Total	*312 (19)*	*156 (22)*	*468 (41)*	*149 (17)*	*320 (27)*	*469 (44)*
2025	MH CC	48 (3)	12 (4)	60 (7)	13 (3)	47 (4)	60 (7)
		52 (3)	16 (4)	68 (7)	20 (6)	51 (5)	71 (11)
	Golf Port Apartments	49 (0)	13 (0)	62 (0)	24 (0)	55 (0)	79 (0)
		28 (0)	19 (0)	47 (0)	66 (0)	66 (0)	132 (0)
	141 Logistics	149 (10)	35 (12)	184 (22)	40 (8)	144 (14)	184 (22)
	River Valley CC	*51 (4)*	*15 (3)*	66 (7)	*19 (6)*	*50 (5)*	69 (11)
	364 Logistics	**86 (8)**	**26 (7)**	**112 (15)**	**32 (11)**	**83 (11)**	**115 (22)**
	Total	*463 (28)*	*136 (30)*	*599 (58)*	*214 (34)*	*496 (39)*	*710 (73)*
2027	MH CC	55 (4)	17 (4)	72 (8)	21 (6)	54 (6)	75 (12)
		94 (6)	22 (8)	116 (14)	25 (5)	91 (9)	116 (14)
	Golf Port Apartments	14 (0)	48 (0)	62 (0)	37 (0)	24 (0)	61 (0)
		79 (0)	77 (0)	156 (0)	60 (0)	56 (0)	116 (0)
	Westport CC	139 (9)	33 (11)	172 (20)	38 (7)	134 (13)	172 (20)
	141 Logistics	149 (10)	35 (12)	184 (22)	40 (8)	144 (14)	184 (22)
	Altus	50 (4)	15 (3)	65 (7)	19 (5)	49 (5)	68 (10)
	364 Logistics	**125 (12)**	**37 (11)**	**162 (23)**	**46 (18)**	**119 (17)**	**165 (35)**
	Total	*705 (45)*	*284 (49)*	*989 (94)*	*286 (49)*	*671 (64)*	*957 (113)*
2047	MH CC	87 (8)	26 (7)	113 (15)	32 (11)	84 (11)	116 (22)
	Golf Port Apartments	13 (0)	44 (0)	57 (0)	40 (0)	26 (0)	66 (0)
		15 (0)	50 (0)	65 (0)	42 (0)	27 (0)	69 (0)
		7 (0)	23 (0)	30 (0)	19 (0)	11 (0)	30 (0)
	Total	*122 (8)*	*143 (7)*	*265 (15)*	*133 (11)*	*148 (11)*	*281 (22)*

Table 17. Heavy Truck Percentages at Route 141 and Sport Port Road

Year	2023		2025		2027		2047	
Peak Hour	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
NBL	3%	0%	5%	5%	6%	10%	6%	11%
NBT	5%	5%	5%	5%	5%	5%	5%	5%
SBT	5%	5%	5%	5%	5%	5%	5%	5%
SBR	4%	1%	9%	15%	9%	23%	10%	25%
EBL	32%	6%	34%	12%	35%	14%	34%	14%
EBR	9%	1%	18%	5%	20%	7%	20%	7%

Upon approval of the assumptions presented in the preceding Technical Memorandum, the volumes for the scenario years will be tabulated and used as the basis for the traffic impact study of the 364 Logistics Center development. We appreciate your review of the preceding traffic impact study assumptions and offering of concurrence. We look forward to receiving your comments and/or consensus on this information. Please contact Julie Nolfo at jnolfo@lochgroup.com or 314-446-3791 should any questions arise during your review.

HSM Safety Reports

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections

General Information		Location Information	
Analyst	Lochmueller Group	Roadway	MO 141
Agency or Company	Lochmueller Group	Intersection	Golfport/Sportport
Date Performed	10/21/22	Jurisdiction	St. Louis County
		Analysis Year	2027

Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT $_{major}$ (veh/day)	$AADT_{MAX}$ = 67,700 (veh/day)	--	46,390
AADT $_{minor}$ (veh/day)	$AADT_{MAX}$ = 33,400 (veh/day)	--	4,750
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C_i		1.00	5.21
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	2
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	2
Type of left-turn signal phasing for Leg #1		Permissive	Protected
Type of left-turn signal phasing for Leg #2		--	Protected
Type of left-turn signal phasing for Leg #3		--	Protected
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			1
Maximum number of lanes crossed by a pedestrian (n_{lanesx})		--	8
Number of bus stops within 300 m (1,000 ft) of the intersection		0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.66	0.83	0.92	1.00	0.91	1.00	0.46

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bimv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	11.636	1.000	11.636	0.46	5.21	27.893
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	4.061	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ = 0.361	4.203	0.46	5.21	10.075
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	7.182	$(5)_{TOTAL}-(5)_{FI}$ = 0.639	7.433	0.46	5.21	17.818

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type$_{(FI)}$**	**Predicted N $_{bimv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted N $_{bimv\ (PDO)}$ (crashes/year)**	**Predicted N $_{bimv\ (TOTAL)}$ (crashes/year)**
	from Table 12-11	$(9)_{FI}$ from Worksheet 2C	from Table 12-11	$(9)_{PDO}$ from Worksheet 2C	$(9)_{PDO}$ from Worksheet 2C
Total	1.000	10.075	1.000	17.818	27.893
		(2)*$(3)_{FI}$		(4)*$(5)_{PDO}$	(3)+(5)
Rear-end collision	0.450	4.534	0.483	8.606	13.140
Head-on collision	0.049	0.494	0.030	0.535	1.028
Angle collision	0.347	3.496	0.244	4.348	7.844
Sideswipe	0.099	0.997	0.032	0.570	1.568
Other multiple-vehicle collision	0.055	0.554	0.211	3.760	4.314

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bisv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bisv}**
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.539	1.000	0.539	0.46	5.21	1.292
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.114	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ = 0.209	0.113	0.46	5.21	0.270
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.431	$(5)_{TOTAL}-(5)_{FI}$ = 0.791	0.427	0.46	5.21	1.023

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type$_{(FI)}$**	**Predicted N $_{bisv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted N $_{bisv\ (PDO)}$ (crashes/year)**	**Predicted N $_{bisv\ (TOTAL)}$ (crashes/year)**
	from Table 12-13	(9)$_{FI}$ from Worksheet 2E	from Table 12-13	(9)$_{PDO}$ from Worksheet 2E	(9)$_{PDO}$ from Worksheet 2E
Total	1.000	0.270	1.000	1.023	1.292
		(2)*(3)$_{FI}$		(4)*(5)$_{PDO}$	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.001	0.001
Collision with animal	0.002	0.001	0.002	0.002	0.003
Collision with fixed object	0.744	0.201	0.870	0.890	1.090
Collision with other object	0.072	0.019	0.070	0.072	0.091
Other single-vehicle collision	0.040	0.011	0.023	0.024	0.034
Single-vehicle noncollision	0.141	0.038	0.034	0.035	0.073

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(7)*
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{pedi}**	**Predicted N_{pedi}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16	(4)*(5)
Total	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--

* Column 6 has been removed due to redundant application of calibration factors and inconsistency with HSM Equation 12-30

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
1.00	1.00	1.00	1.00

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients**					**Overdispersion Parameter, k**	**$N_{pedbase}$**	**Combined CMF**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	from Table 12-14						from Equation 12-29	(4) from Worksheet 2H		(4)*(5)*(6)
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.004	1.00	5.21	0.022
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	5.21	0.022

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(7)*
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{bikei}**	**Predicted N_{bikei}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17	(4)*(5)
Total	27.893	1.292	29.186	0.015	0.438
Fatal and injury (FI)	--	--	--	--	0.438

* Column 6 has been removed due to redundant application of calibration factors and inconsistency with HSM Equation 12-31

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)
Collision type	**Fatal and injury (FI)**	**Property damage only (PDO)**	**Total**
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
MULTIPLE-VEHICLE			
Rear-end collisions (from Worksheet 2D)	4.534	8.606	13.140
Head-on collisions (from Worksheet 2D)	0.494	0.535	1.028
Angle collisions (from Worksheet 2D)	3.496	4.348	7.844
Sideswipe (from Worksheet 2D)	0.997	0.570	1.568
Other multiple-vehicle collision (from Worksheet 2D)	0.554	3.760	4.314
Subtotal	10.075	17.818	27.893
SINGLE-VEHICLE			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.001	0.001
Collision with animal (from Worksheet 2F)	0.001	0.002	0.003
Collision with fixed object (from Worksheet 2F)	0.201	0.890	1.090
Collision with other object (from Worksheet 2F)	0.019	0.072	0.091
Other single-vehicle collision (from Worksheet 2F)	0.011	0.024	0.034
Single-vehicle noncollision (from Worksheet 2F)	0.038	0.035	0.073
Collision with pedestrian (from Worksheet 2G or 2I)	0.022	0.000	0.022
Collision with bicycle (from Worksheet 2J)	0.438	0.000	0.438
Subtotal	0.730	1.023	1.752
Total	10.805	18.841	29.646

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections

(1)	(2)
Crash severity level	**Predicted average crash frequency, $N_{predicted\ int}$ (crashes/year)**
	(Total) from Worksheet 2K
Total	29.6
Fatal and injury (FI)	10.8
Property damage only (PDO)	18.8

Worksheet 4A -- Predicted Crashes by Collision and Site Type and Observed Crashes Using the Project-Level EB Method for Urban and Suburban Arterials

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Collision type / Site type	**Predicted crashes**			**Observed crashes,** $N_{observed}$ (crashes/year)	**Overdispersion Parameter, k**	$N_{predicted\ w0}$ Equation A-8 $(6)*(2)^2$	$N_{predicted\ w1}$ Equation A-9 sqrt((6)*(2))	W_0 Equation A-10	N_0 Equation A-11	w_1 Equation A-12	N_1 Equation A-13	$N_{expected/comb}$ Equation A-14
	$N_{predicted}$ (TOTAL)	$N_{predicted}$ (FI)	$N_{predicted}$ (PDO)									
ROADWAY SEGMENTS												
Multiple-vehicle nondriveway												
Segment_1	0.000	0.000	0.000	--	0.840	0.000	0.000	--	--	--	--	--
Segment_2	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_3	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_4	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_5	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_6	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_7	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_8	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment Totals:	0.000	0.000	0.000									
Single-vehicle												
Segment_1	0.000	0.000	0.000	--	0.810	0.000	0.000	--	--	--	--	--
Segment_2	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_3	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_4	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_5	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_6	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_7	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_8	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment Totals:	0.000	0.000	0.000									
Multiple-vehicle driveway-related												
Segment_1	0.000	0.000	0.000	--	0.810	0.000	0.000	--	--	--	--	--
Segment_2	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_3	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_4	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_5	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_6	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_7	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_8	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment Totals:	0.000	0.000	0.000									
INTERSECTIONS												
Multiple-vehicle												
Intersection_1	27.893	10.075	17.818	--	0.390	303.435	3.298	--	--	--	--	--
Intersection_2	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_3	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_4	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_5	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_6	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_7	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_8	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection Totals:	27.893	10.075	17.818									
Single-vehicle												
Intersection_1	1.292	0.270	1.023	--	0.360	0.601	0.682	--	--	--	--	--
Intersection_2	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_3	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_4	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_5	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_6	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--

Intersection_7	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_8	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection Totals:	1.292	0.270	1.023									
COMBINED (sum of column)	29.186	10.345	18.841	5	--	304.036	3.980	0.088	7.118	0.880	26.283	16.701

Worksheet 4B -- Predicted Pedestrian and Bicycle Crashes for Urban and Suburban Arterials

(1)	(2)	(3)
Site Type	**N_{ped}**	**N_{bike}**
ROADWAY SEGMENTS		
Segment_1	0.000	0.000
Segment_2	0.000	0.000
Segment_3	0.000	0.000
Segment_4	0.000	0.000
Segment_5	0.000	0.000
Segment_6	0.000	0.000
Segment_7	0.000	0.000
Segment_8	0.000	0.000
INTERSECTIONS		
Intersection_1	0.022	0.438
Intersection_2	0.000	0.000
Intersection_3	0.000	0.000
Intersection_4	0.000	0.000
Intersection_5	0.000	0.000
Intersection_6	0.000	0.000
Intersection_7	0.000	0.000
Intersection_8	0.000	0.000
COMBINED (sum of column)	0.022	0.438

Worksheet 4C -- Project-Specific EB Method Summary Results for Urban and Suburban Arterials

(1)	(2)	(3)	(4)	(5)	(6)
Crash severity level	**$N_{predicted}$**	**N_{ped}**	**N_{bike}**	$N_{expected\ (vehicle)}$	$N_{expected}$
Total	$(2)_{COMB}$ from Worksheet 4A	$(2)_{COMB}$ from Worksheet 4B	$(3)_{COMB}$ from Worksheet 4B	$(13)_{COMB}$ Worksheet 4A	(3)+(4)+(5)
	29.186	0.022	0.438	16.701	17.161
Fatal and injury (FI)	$(3)_{COMB}$ from Worksheet 4A	$(2)_{COMB}$ from Worksheet 4B	$(3)_{COMB}$ from Worksheet 4B	$(5)_{TOTAL} * (2)_{FI} / (2)_{TOTAL}$	(3)+(4)+(5)
	10.345	0.022	0.438	5.920	6.380
Property damage only (PDO)	$(4)_{COMB}$ from Worksheet 4A	--	--	$(5)_{TOTAL} * (2)_{PDO} / (2)_{TOTAL}$	(3)+(4)+(5)
	18.841	0.000	0.000	10.781	10.781

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections

General Information		Location Information	
Analyst	Lochmueller Group	Roadway	MO 141
Agency or Company	Lochmueller Group	Intersection	Golfport/Sportport
Date Performed	10/21/22	Jurisdiction	St. Louis County
		Analysis Year	2027

Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT $_{major}$ (veh/day)	$AADT_{MAX}$ = 67,700 (veh/day)	--	44,370
AADT $_{minor}$ (veh/day)	$AADT_{MAX}$ = 33,400 (veh/day)	--	3,970
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C_i		1.00	5.21
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	2
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Permissive / Protected
Type of left-turn signal phasing for Leg #2		--	Permissive / Protected
Type of left-turn signal phasing for Leg #3		--	Protected
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			1
Maximum number of lanes crossed by a pedestrian (n_{lanesx})		--	6
Number of bus stops within 300 m (1,000 ft) of the intersection		0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.66	0.87	0.92	1.00	0.91	1.00	0.48

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bimv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	10.647	1.000	10.647	0.48	5.21	26.609
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	3.704	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ = 0.360	3.837	0.48	5.21	9.590
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	6.574	$(5)_{TOTAL}-(5)_{FI}$ = 0.640	6.810	0.48	5.21	17.020

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type$_{(FI)}$**	**Predicted N $_{bimv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted N $_{bimv\ (PDO)}$ (crashes/year)**	**Predicted N $_{bimv\ (TOTAL)}$ (crashes/year)**
	from Table 12-11	$(9)_{FI}$ from Worksheet 2C	from Table 12-11	$(9)_{PDO}$ from Worksheet 2C	$(9)_{PDO}$ from Worksheet 2C
Total	1.000	9.590	1.000	17.020	26.609
		(2)*$(3)_{FI}$		(4)*$(5)_{PDO}$	(3)+(5)
Rear-end collision	0.450	4.315	0.483	8.221	12.536
Head-on collision	0.049	0.470	0.030	0.511	0.980
Angle collision	0.347	3.328	0.244	4.153	7.480
Sideswipe	0.099	0.949	0.032	0.545	1.494
Other multiple-vehicle collision	0.055	0.527	0.211	3.591	4.119

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bisv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bisv}**
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.498	1.000	0.498	0.48	5.21	1.246
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.106	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ = 0.210	0.105	0.48	5.21	0.262
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.398	$(5)_{TOTAL}-(5)_{FI}$ = 0.790	0.394	0.48	5.21	0.984

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type$_{(FI)}$**	**Predicted N $_{bisv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted N $_{bisv\ (PDO)}$ (crashes/year)**	**Predicted N $_{bisv\ (TOTAL)}$ (crashes/year)**
	from Table 12-13	(9)$_{FI}$ from Worksheet 2E	from Table 12-13	(9)$_{PDO}$ from Worksheet 2E	(9)$_{PDO}$ from Worksheet 2E
Total	1.000	0.262	1.000	0.984	1.246
		(2)*(3)$_{FI}$		(4)*(5)$_{PDO}$	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.001	0.001
Collision with animal	0.002	0.001	0.002	0.002	0.002
Collision with fixed object	0.744	0.195	0.870	0.856	1.051
Collision with other object	0.072	0.019	0.070	0.069	0.088
Other single-vehicle collision	0.040	0.010	0.023	0.023	0.033
Single-vehicle noncollision	0.141	0.037	0.034	0.033	0.070

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(7)*
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{pedi}**	**Predicted N_{pedi}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16	(4)*(5)
Total	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--

* Column 6 has been removed due to redundant application of calibration factors and inconsistency with HSM Equation 12-30

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
1.00	1.00	1.00	1.00

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients**					**Overdispersion Parameter, k**	**$N_{pedbase}$**	**Combined CMF**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	from Table 12-14						from Equation 12-29	(4) from Worksheet 2H		(4)*(5)*(6)
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.004	1.00	5.21	0.019
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	5.21	0.019

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(7)*
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{bikei}**	**Predicted N_{bikei}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17	(4)*(5)
Total	26.609	1.246	27.855	0.015	0.418
Fatal and injury (FI)	--	--	--	--	0.418

* Column 6 has been removed due to redundant application of calibration factors and inconsistency with HSM Equation 12-31

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)
Collision type	**Fatal and injury (FI)**	**Property damage only (PDO)**	**Total**
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
MULTIPLE-VEHICLE			
Rear-end collisions (from Worksheet 2D)	4.315	8.221	12.536
Head-on collisions (from Worksheet 2D)	0.470	0.511	0.980
Angle collisions (from Worksheet 2D)	3.328	4.153	7.480
Sideswipe (from Worksheet 2D)	0.949	0.545	1.494
Other multiple-vehicle collision (from Worksheet 2D)	0.527	3.591	4.119
Subtotal	9.590	17.020	26.609
SINGLE-VEHICLE			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.001	0.001
Collision with animal (from Worksheet 2F)	0.001	0.002	0.002
Collision with fixed object (from Worksheet 2F)	0.195	0.856	1.051
Collision with other object (from Worksheet 2F)	0.019	0.069	0.088
Other single-vehicle collision (from Worksheet 2F)	0.010	0.023	0.033
Single-vehicle noncollision (from Worksheet 2F)	0.037	0.033	0.070
Collision with pedestrian (from Worksheet 2G or 2I)	0.019	0.000	0.019
Collision with bicycle (from Worksheet 2J)	0.418	0.000	0.418
Subtotal	0.699	0.984	1.683
Total	10.289	18.003	28.292

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections

(1)	(2)
Crash severity level	**Predicted average crash frequency, $N_{predicted\ int}$ (crashes/year)**
	(Total) from Worksheet 2K
Total	28.3
Fatal and injury (FI)	10.3
Property damage only (PDO)	18.0

Worksheet 4A -- Predicted Crashes by Collision and Site Type and Observed Crashes Using the Project-Level EB Method for Urban and Suburban Arterials

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Collision type / Site type	**Predicted crashes**			**Observed crashes,** $N_{observed}$ (crashes/year)	**Overdispersion Parameter, k**	$N_{predicted\ w0}$ Equation A-8 $(6)*(2)^2$	$N_{predicted\ w1}$ Equation A-9 sqrt((6)*(2))	W_0 Equation A-10	N_0 Equation A-11	w_1 Equation A-12	N_1 Equation A-13	$N_{expected/comb}$ Equation A-14
	$N_{predicted}$ (TOTAL)	$N_{predicted}$ (FI)	$N_{predicted}$ (PDO)									
ROADWAY SEGMENTS												
Multiple-vehicle nondriveway												
Segment_1	0.000	0.000	0.000	--	0.840	0.000	0.000	--	--	--	--	--
Segment_2	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_3	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_4	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_5	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_6	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_7	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_8	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment Totals:	0.000	0.000	0.000									
Single-vehicle												
Segment_1	0.000	0.000	0.000	--	0.810	0.000	0.000	--	--	--	--	--
Segment_2	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_3	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_4	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_5	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_6	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_7	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_8	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment Totals:	0.000	0.000	0.000									
Multiple-vehicle driveway-related												
Segment_1	0.000	0.000	0.000	--	0.810	0.000	0.000	--	--	--	--	--
Segment_2	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_3	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_4	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_5	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_6	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_7	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment_8	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Segment Totals:	0.000	0.000	0.000									
INTERSECTIONS												
Multiple-vehicle												
Intersection_1	26.609	9.590	17.020	--	0.390	276.146	3.221	--	--	--	--	--
Intersection_2	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_3	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_4	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_5	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_6	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_7	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_8	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection Totals:	26.609	9.590	17.020									
Single-vehicle												
Intersection_1	1.246	0.262	0.984	--	0.360	0.559	0.670	--	--	--	--	--
Intersection_2	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_3	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_4	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_5	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_6	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--

Intersection_7	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection_8	0.000	0.000	0.000	--	0.000	0.000	0.000	--	--	--	--	--
Intersection Totals:	1.246	0.262	0.984									
COMBINED (sum of column)	27.855	9.852	18.003	5	--	276.704	3.891	0.091	7.090	0.877	25.054	16.072

Worksheet 4B -- Predicted Pedestrian and Bicycle Crashes for Urban and Suburban Arterials

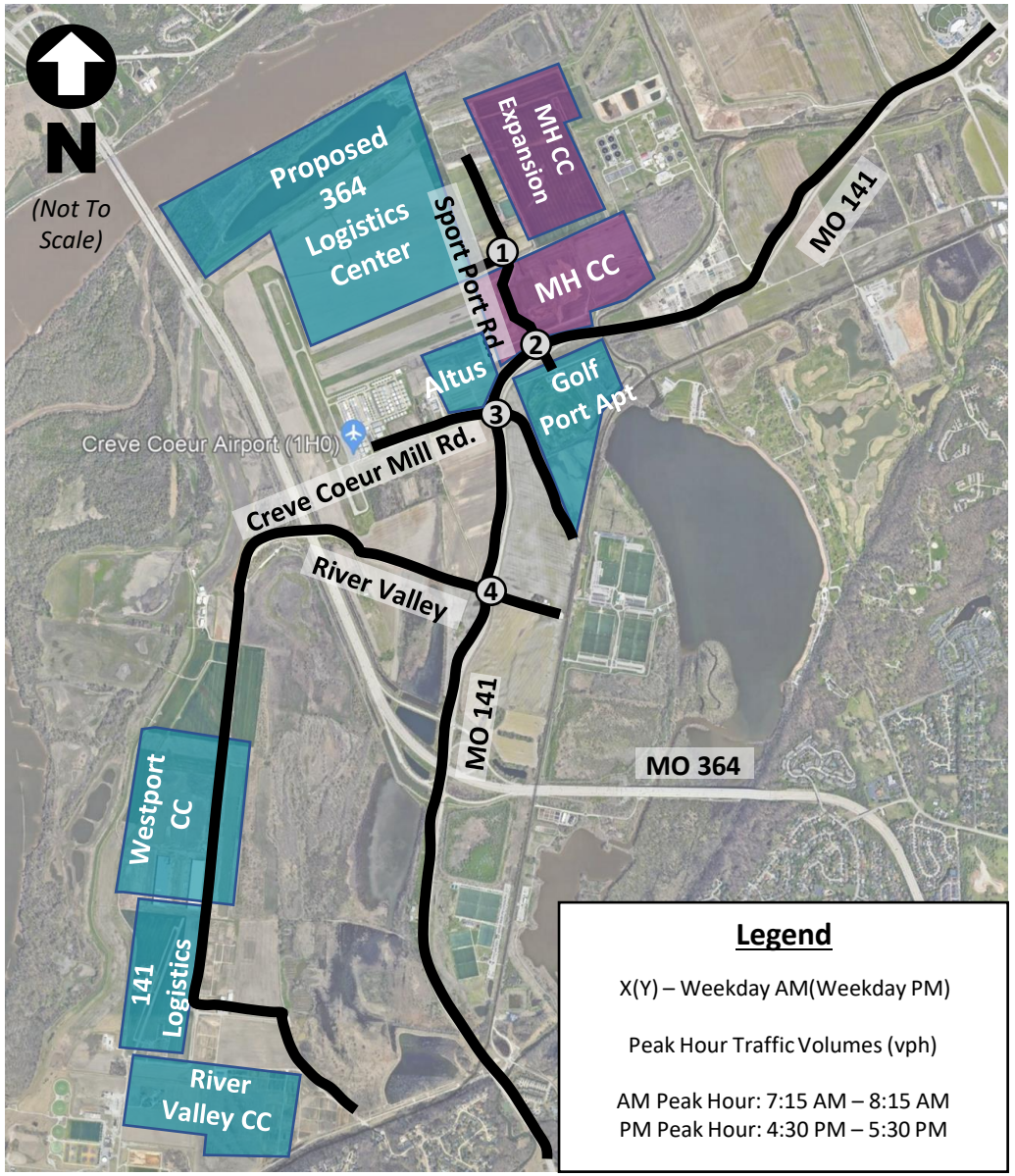
(1)	(2)	(3)
Site Type	**N_{ped}**	**N_{bike}**
ROADWAY SEGMENTS		
Segment_1	0.000	0.000
Segment_2	0.000	0.000
Segment_3	0.000	0.000
Segment_4	0.000	0.000
Segment_5	0.000	0.000
Segment_6	0.000	0.000
Segment_7	0.000	0.000
Segment_8	0.000	0.000
INTERSECTIONS		
Intersection_1	0.019	0.418
Intersection_2	0.000	0.000
Intersection_3	0.000	0.000
Intersection_4	0.000	0.000
Intersection_5	0.000	0.000
Intersection_6	0.000	0.000
Intersection_7	0.000	0.000
Intersection_8	0.000	0.000
COMBINED (sum of column)	0.019	0.418

Worksheet 4C -- Project-Specific EB Method Summary Results for Urban and Suburban Arterials

(1)	(2)	(3)	(4)	(5)	(6)
Crash severity level	**$N_{predicted}$**	**N_{ped}**	**N_{bike}**	$N_{expected\ (vehicle)}$	$N_{expected}$
Total	$(2)_{COMB}$ from Worksheet 4A	$(2)_{COMB}$ from Worksheet 4B	$(3)_{COMB}$ from Worksheet 4B	$(13)_{COMB}$ Worksheet 4A	(3)+(4)+(5)
	27.855	0.019	0.418	16.072	16.509
Fatal and injury (FI)	$(3)_{COMB}$ from Worksheet 4A	$(2)_{COMB}$ from Worksheet 4B	$(3)_{COMB}$ from Worksheet 4B	$(5)_{TOTAL} * (2)_{FI} / (2)_{TOTAL}$	(3)+(4)+(5)
	9.852	0.019	0.418	5.684	6.121
Property damage only (PDO)	$(4)_{COMB}$ from Worksheet 4A	--	--	$(5)_{TOTAL} * (2)_{PDO} / (2)_{TOTAL}$	(3)+(4)+(5)
	18.003	0.000	0.000	10.388	10.388

Site Generated Traffic Exhibits for Development Along MO 141

Maryland Heights Commerce Center



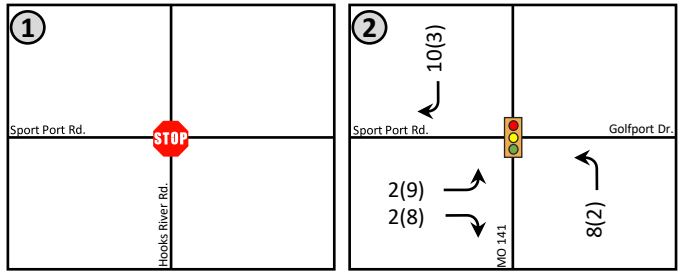
Legend

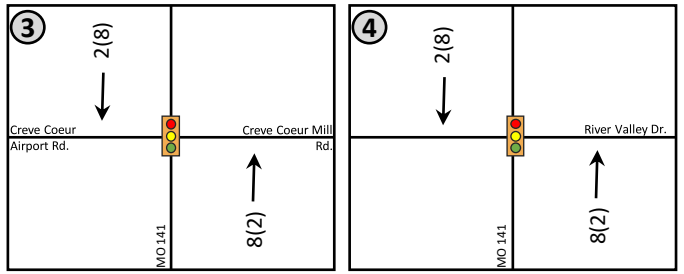
X(Y) – Weekday AM(Weekday PM)

Peak Hour Traffic Volumes (vph)

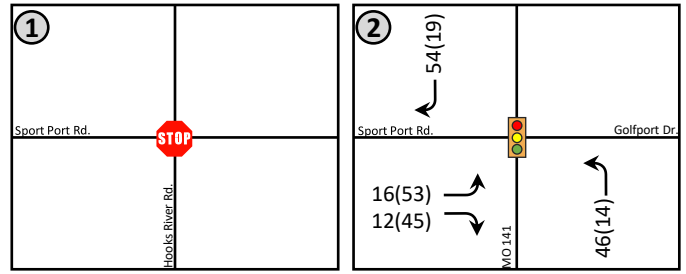
AM Peak Hour: 7:15 AM – 8:15 AM
PM Peak Hour: 4:30 PM – 5:30 PM

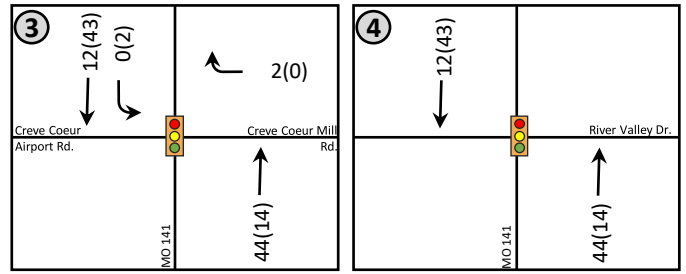
2023 Site Generated Volume



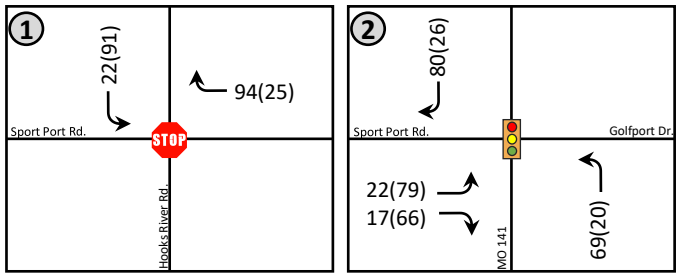


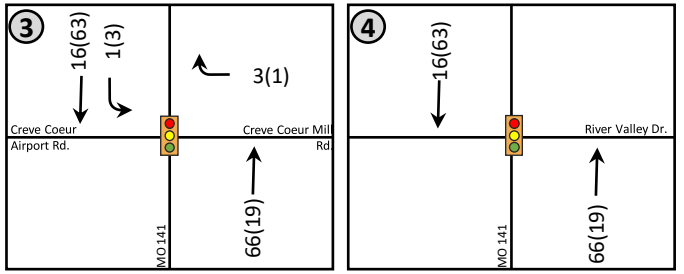
2025 Site Generated Volume



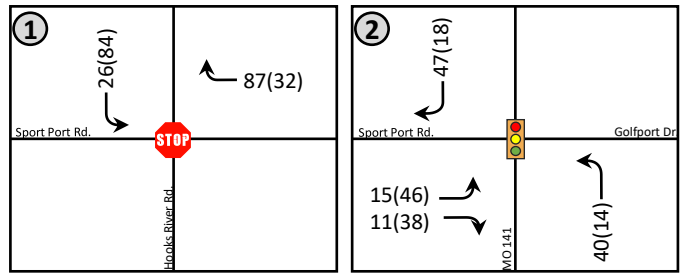


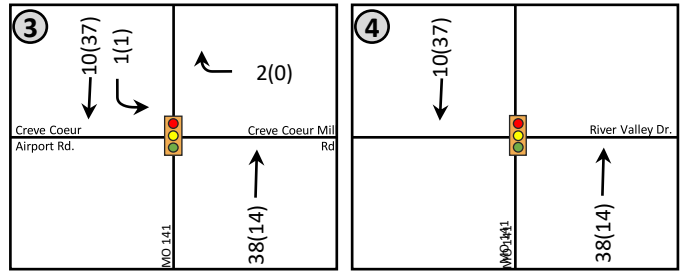
2027 Site Generated Volume





2047 Site Generated Volume





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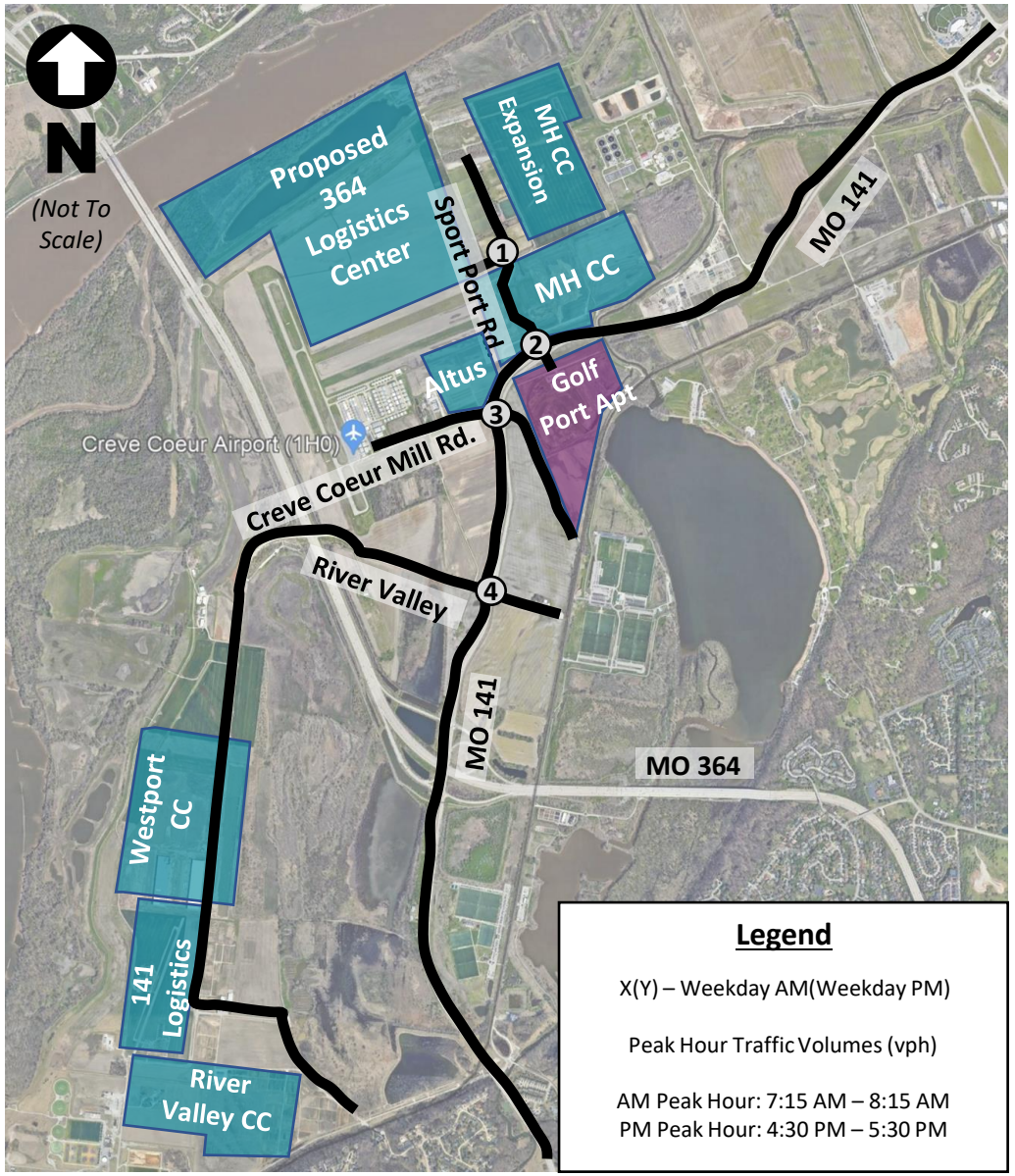

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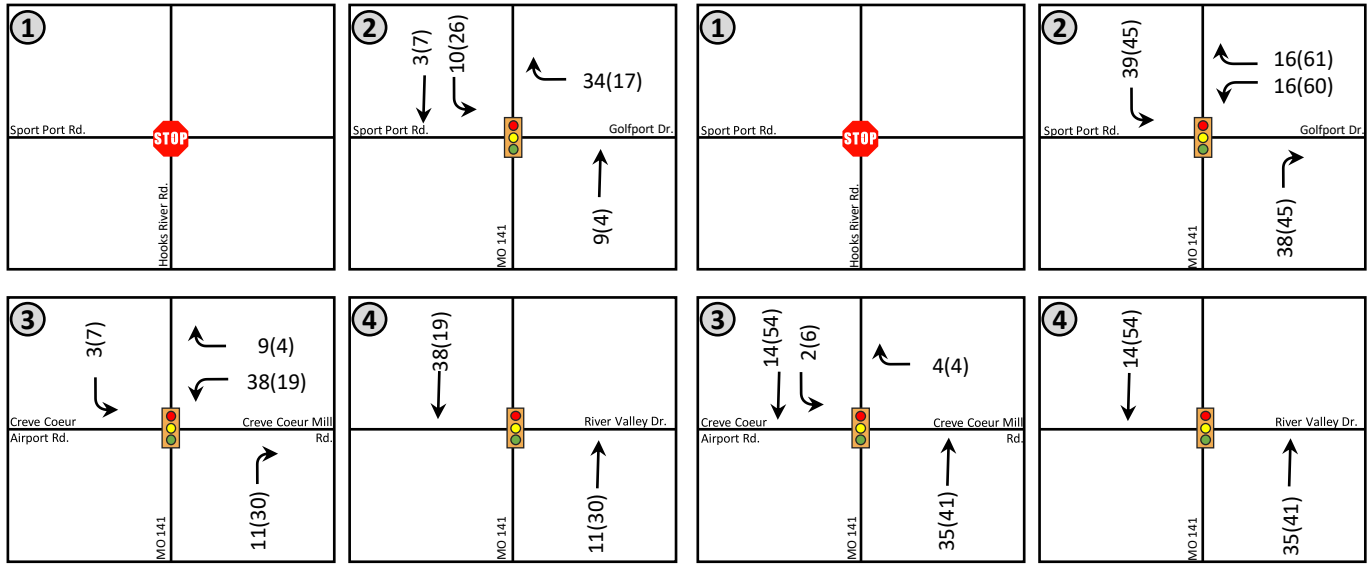

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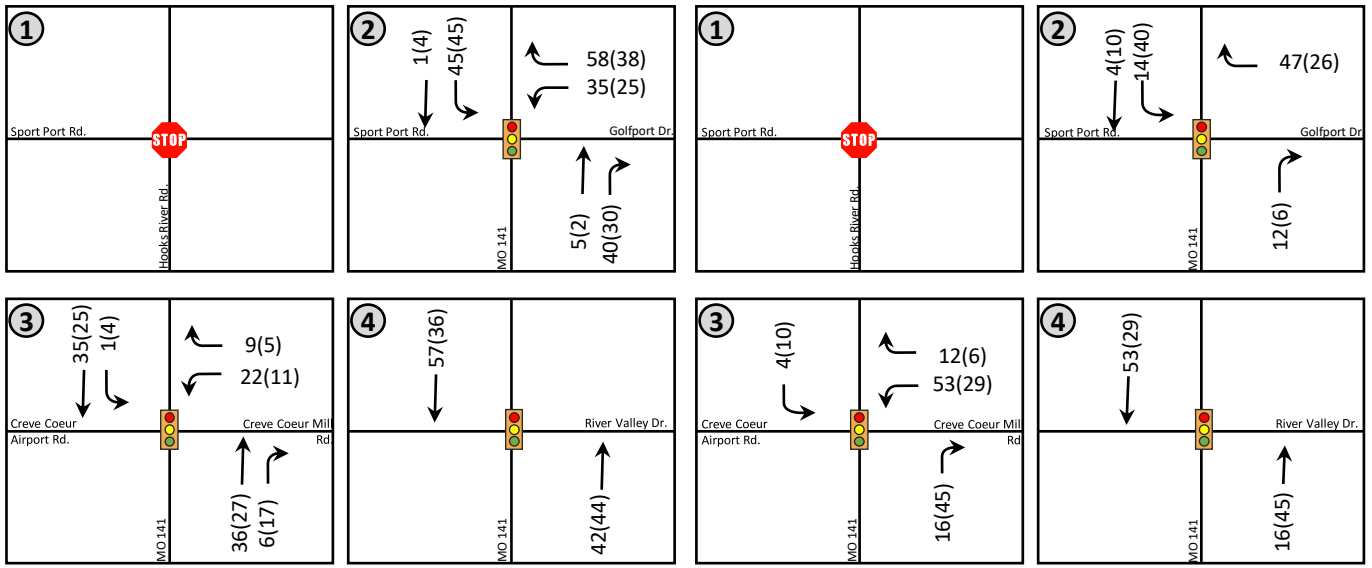

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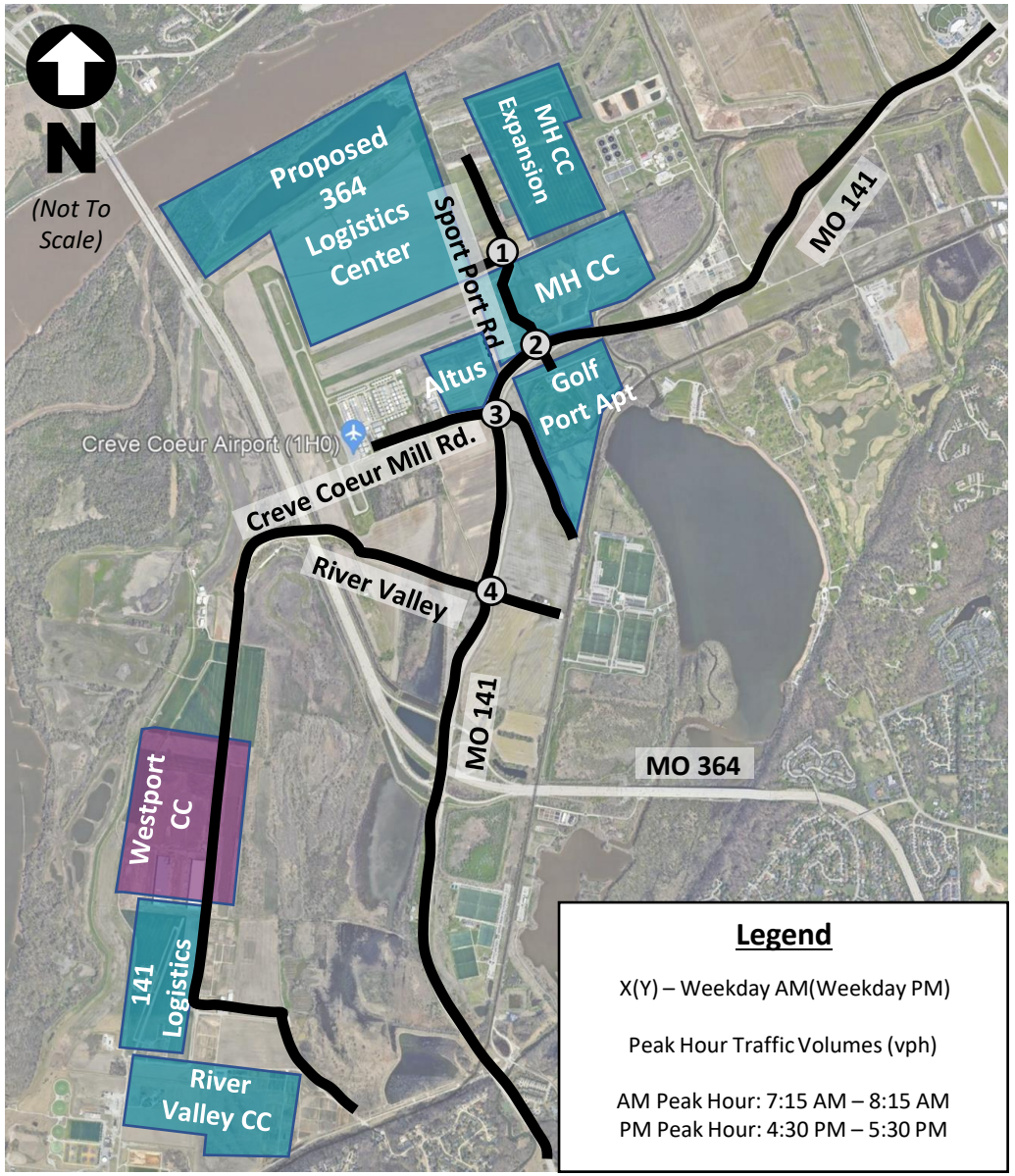

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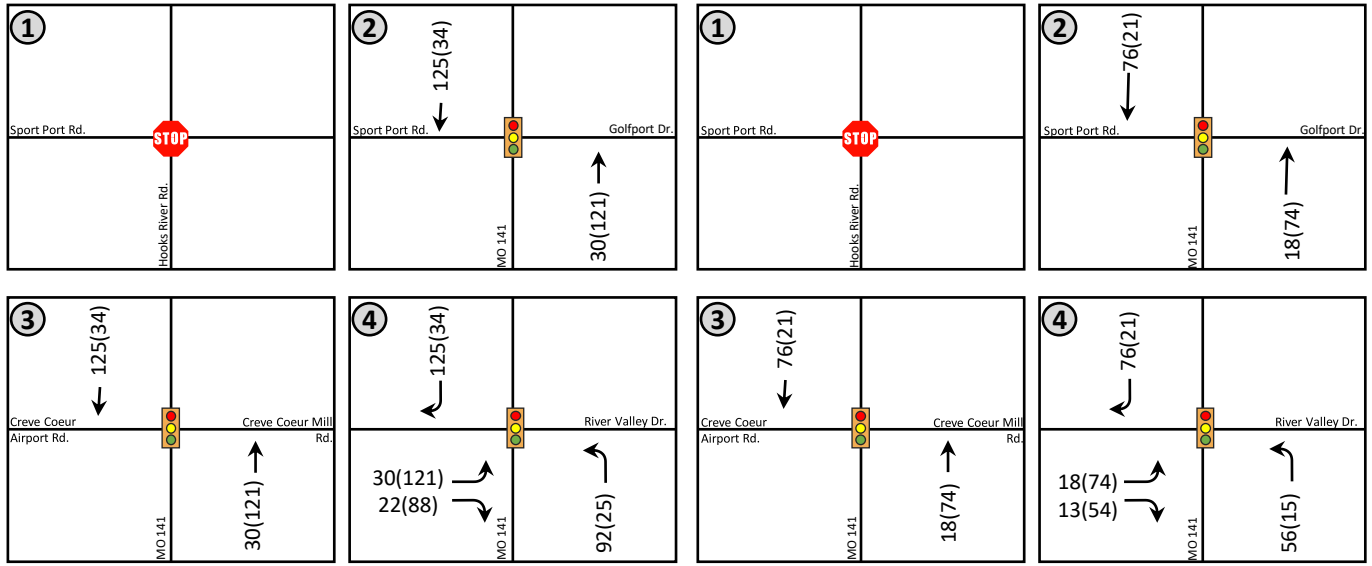

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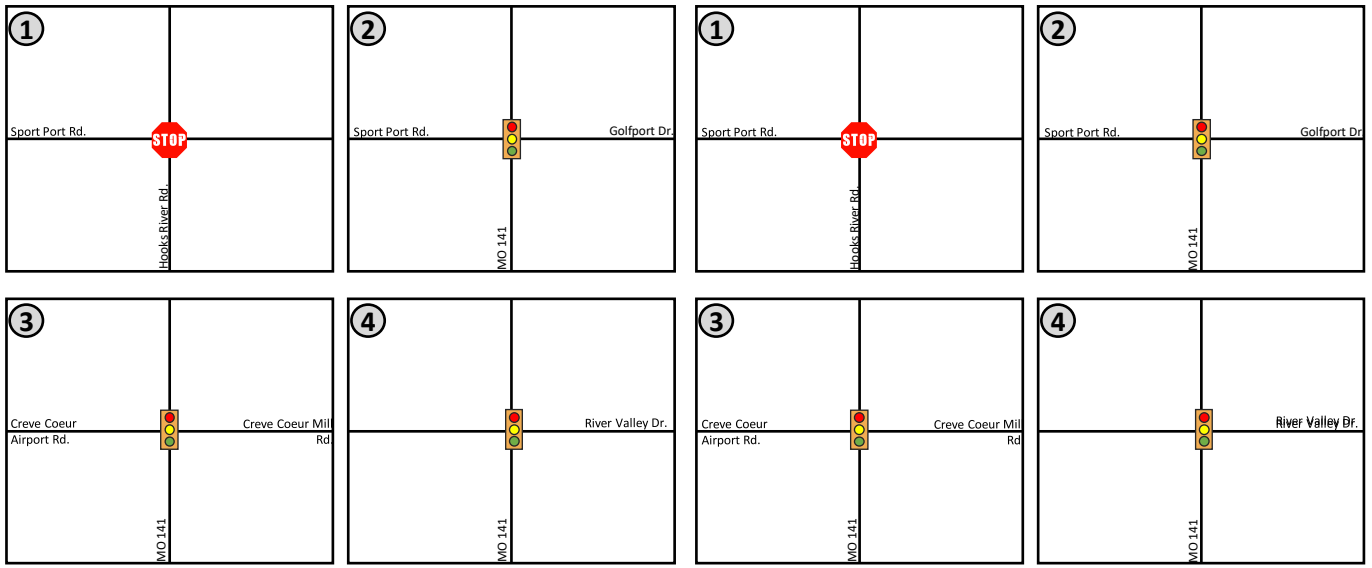

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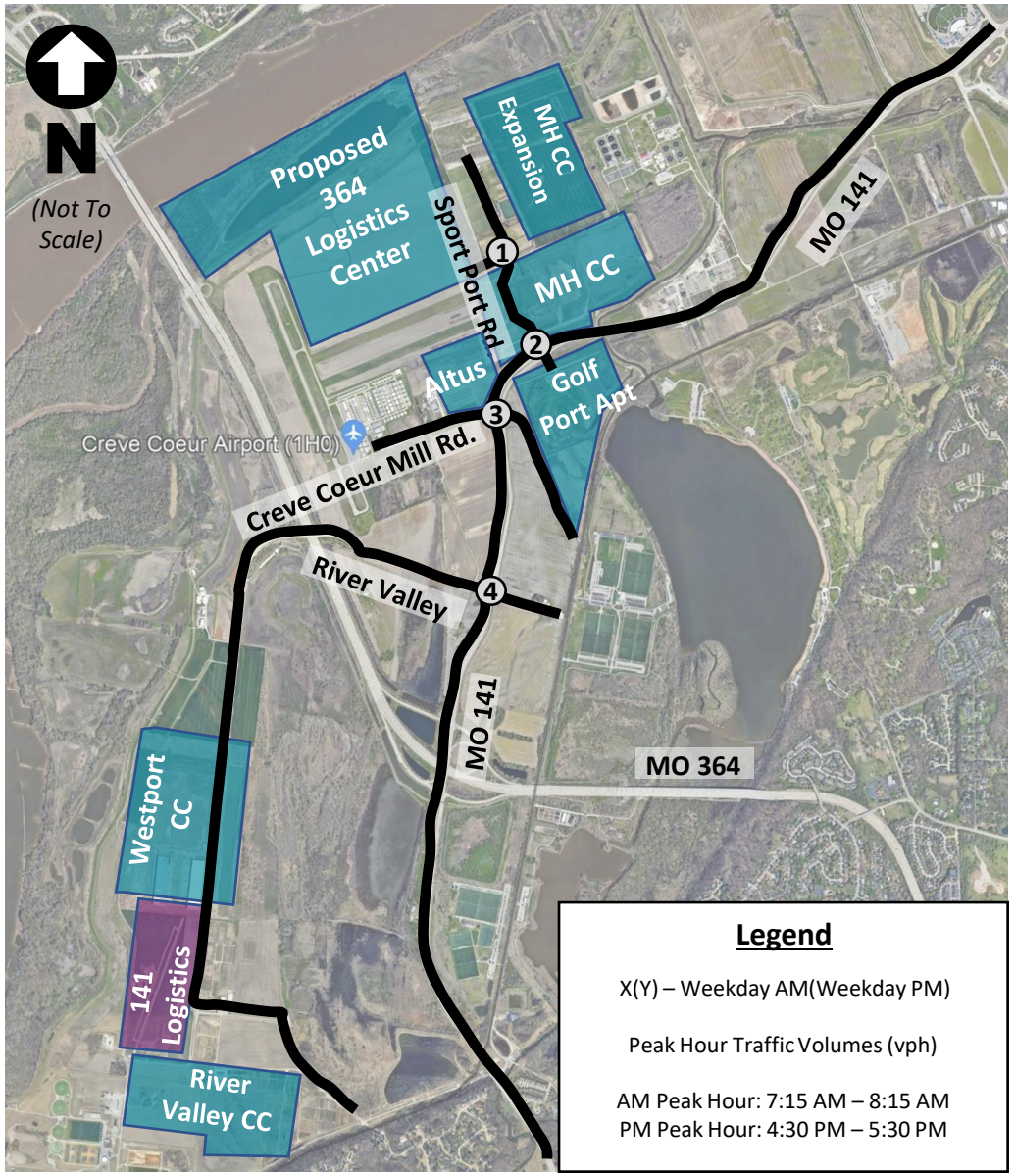
141 Logistics Center



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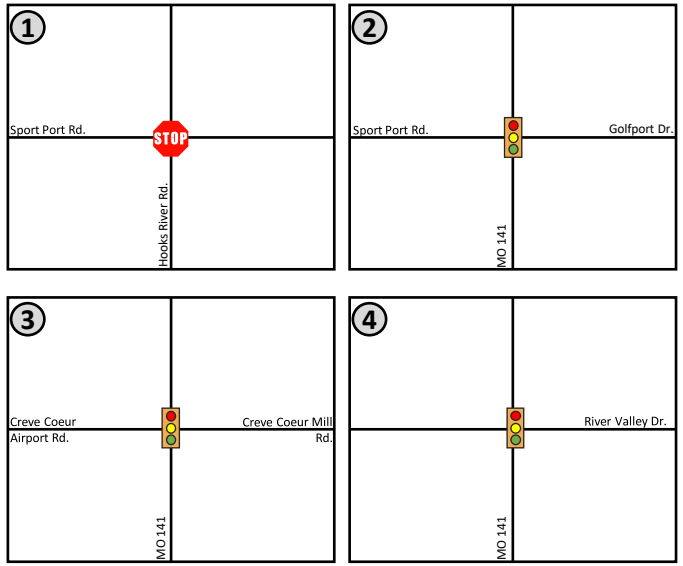

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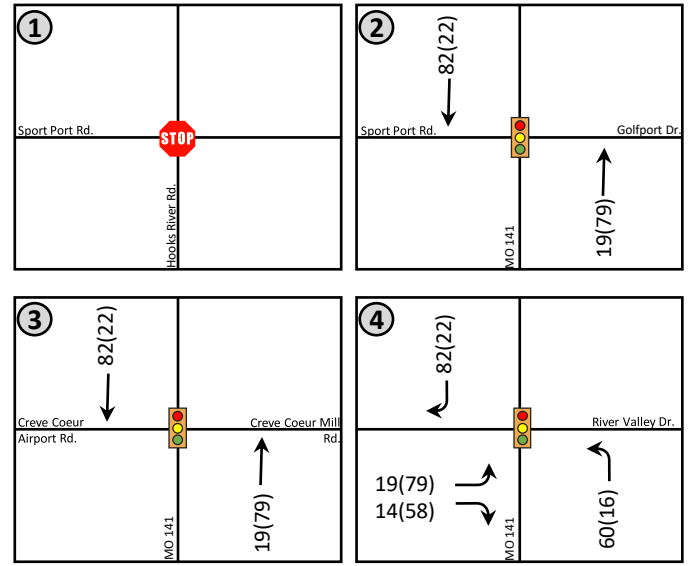

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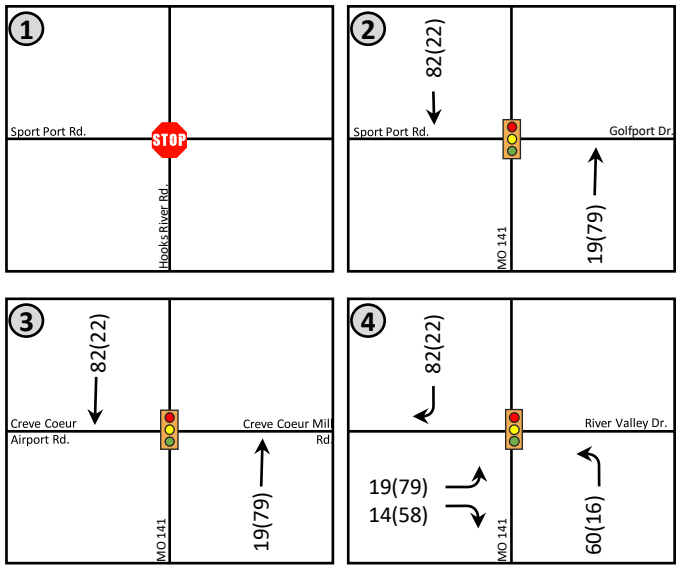

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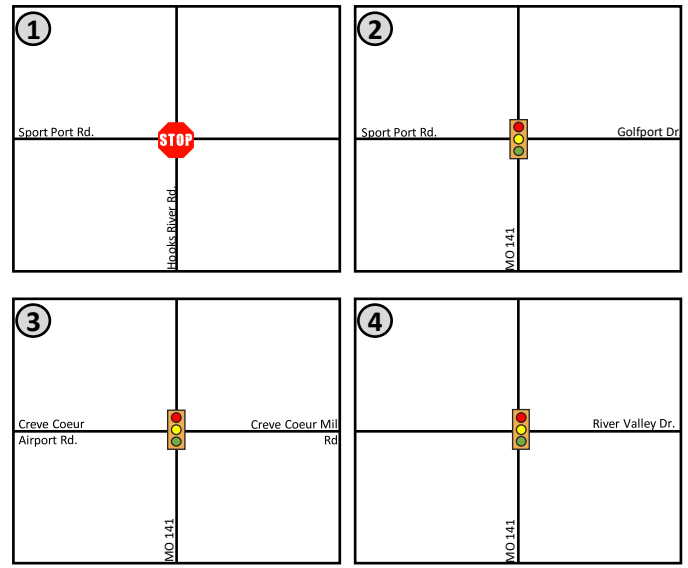

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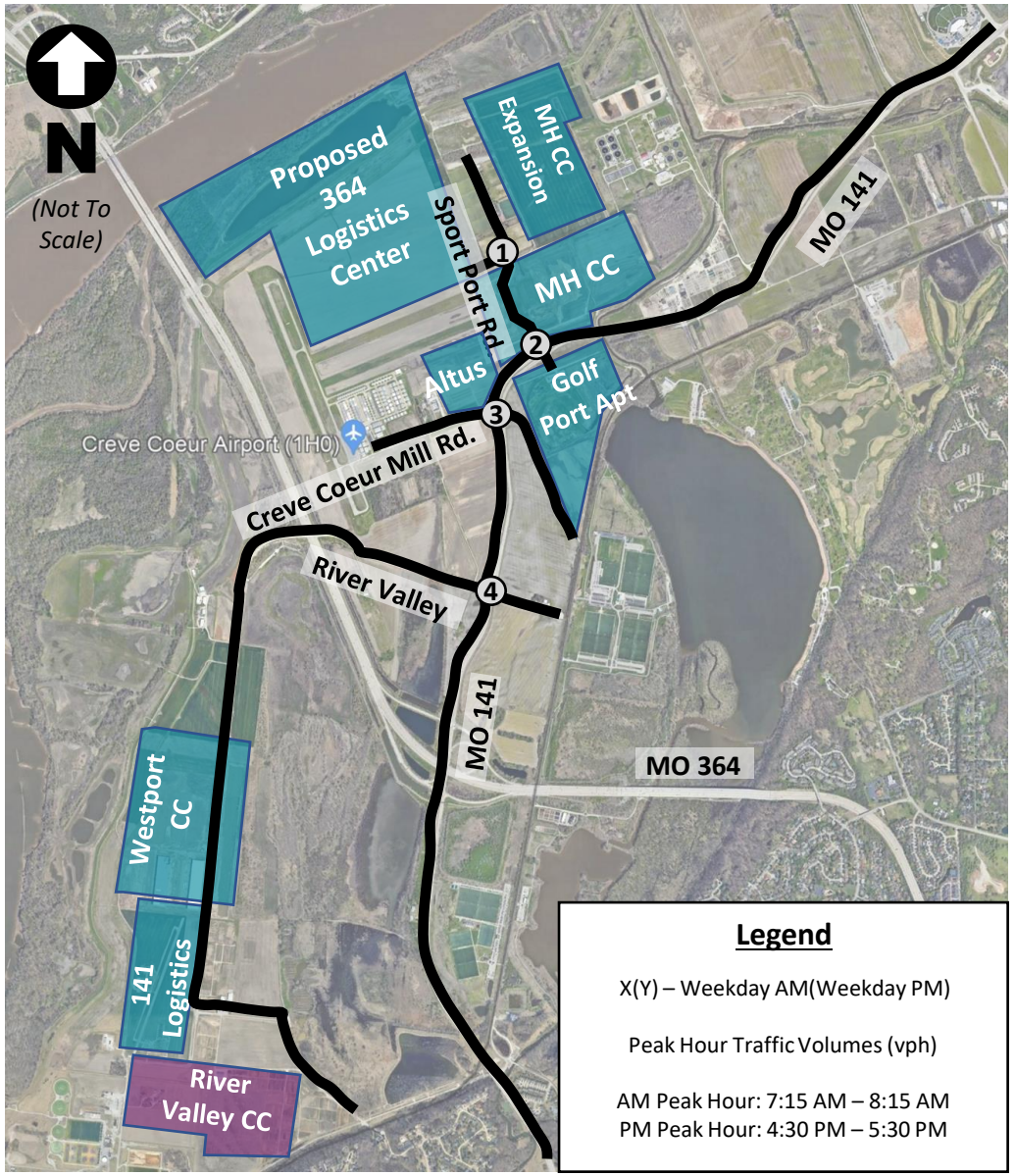

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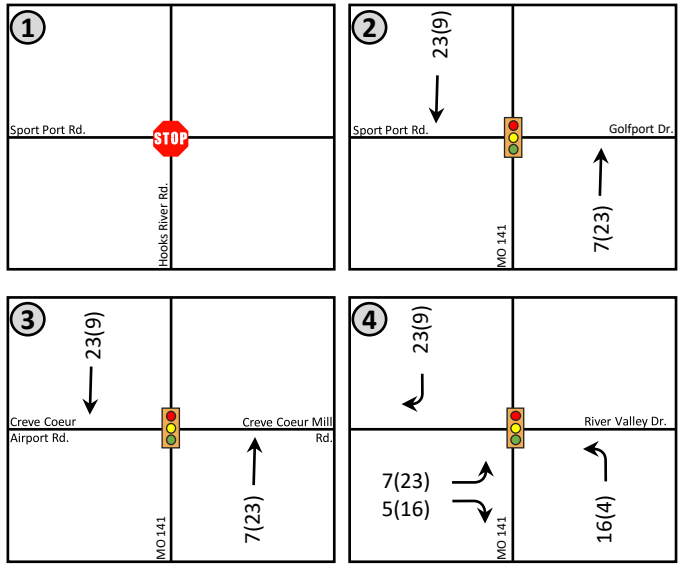

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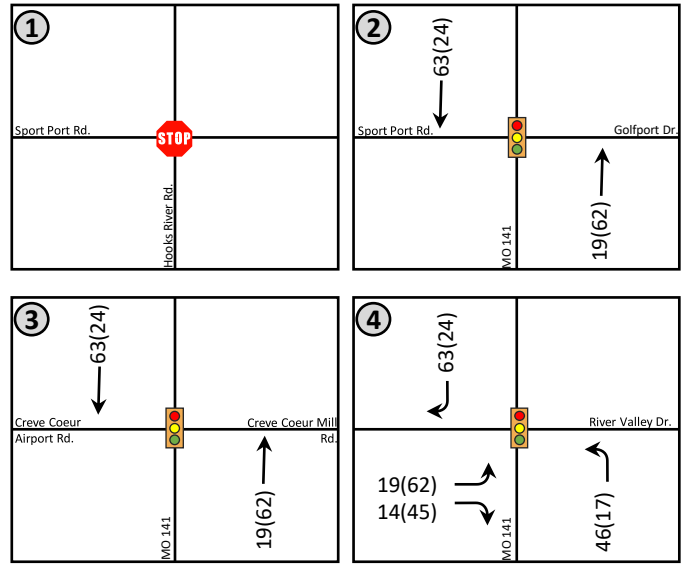

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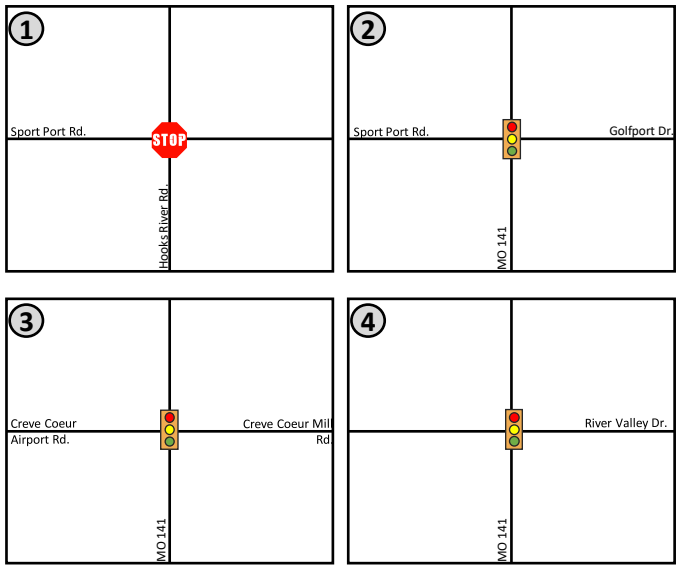

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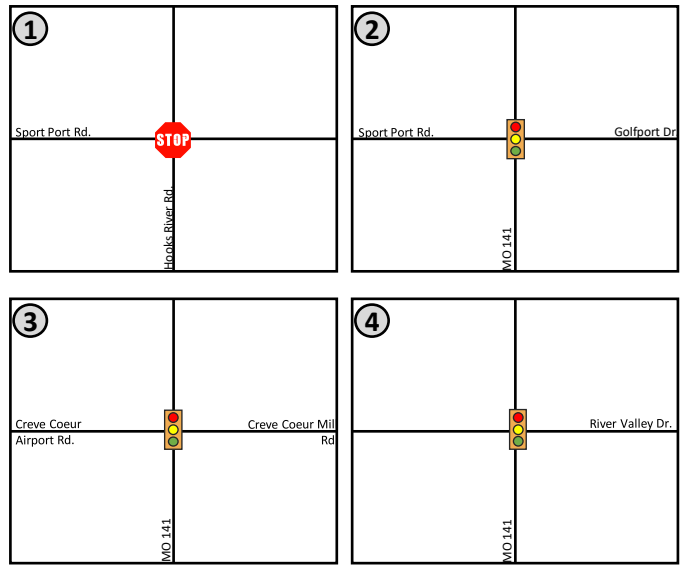
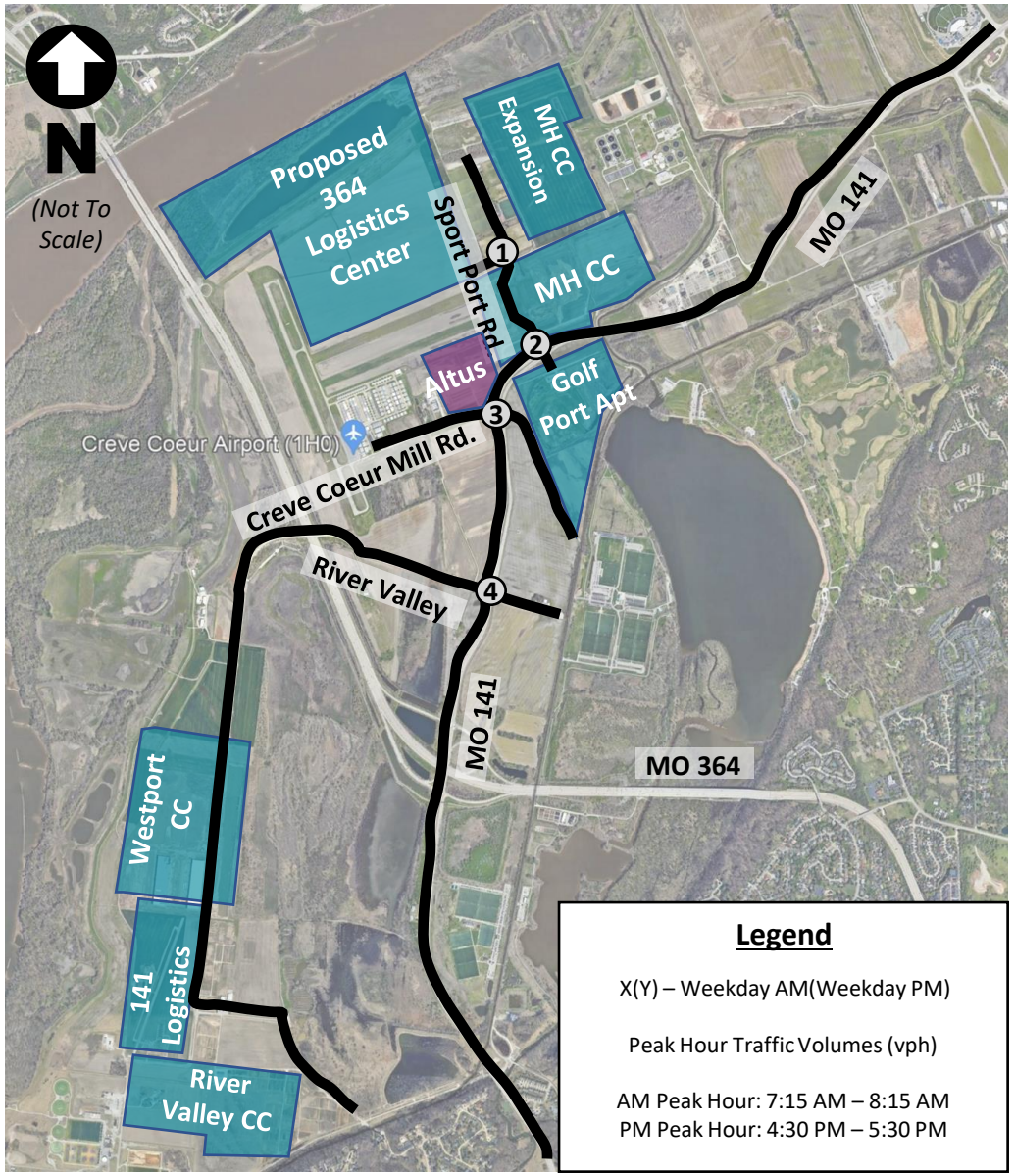


Altus Development



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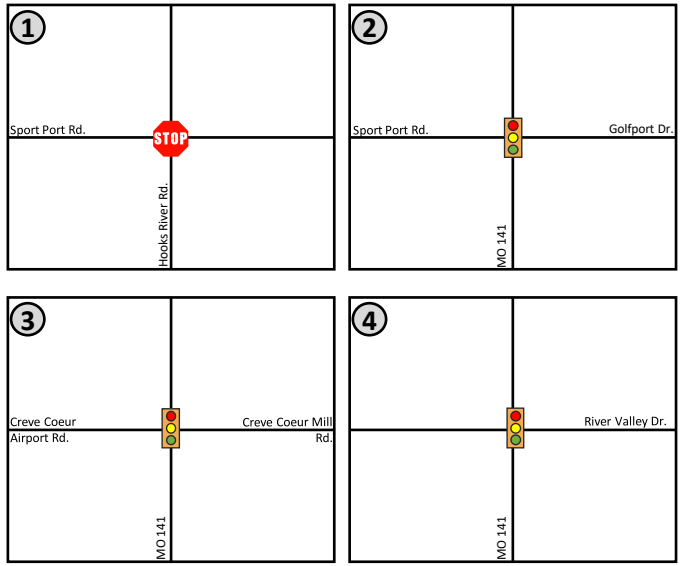

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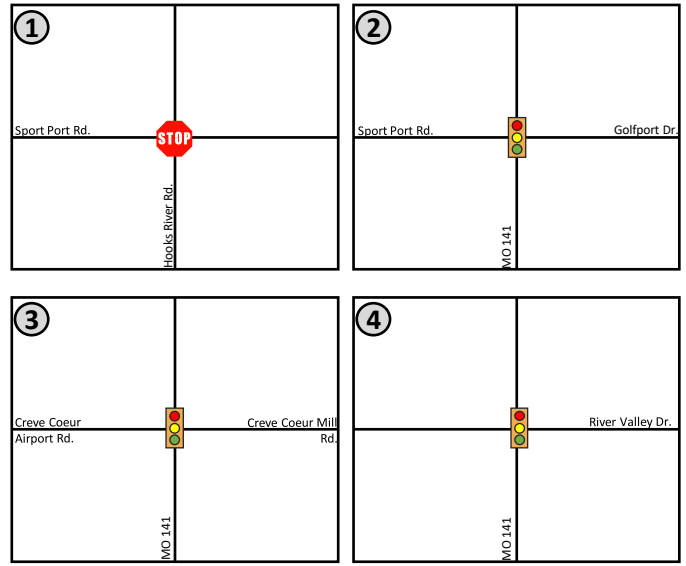

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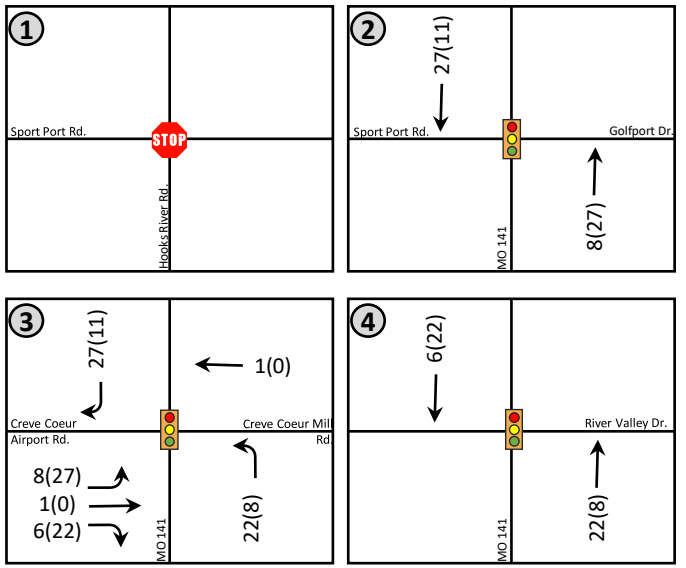

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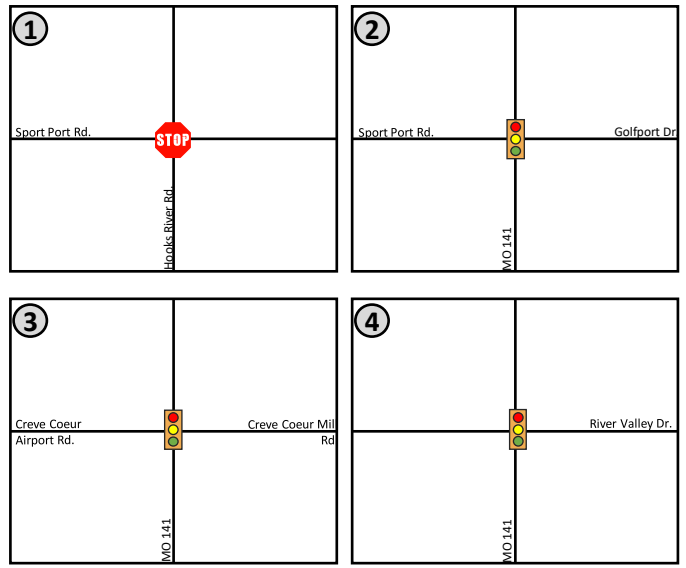

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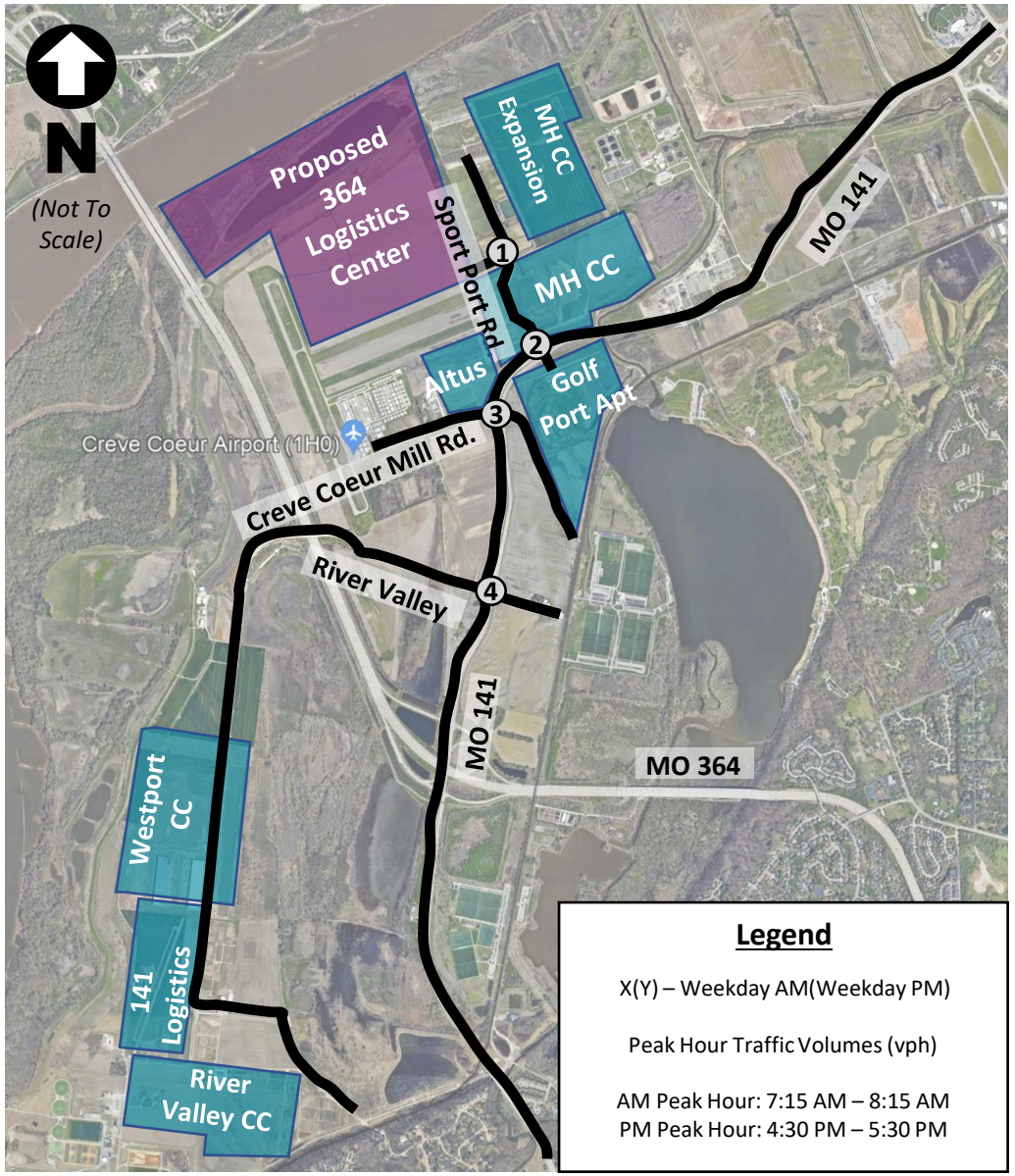

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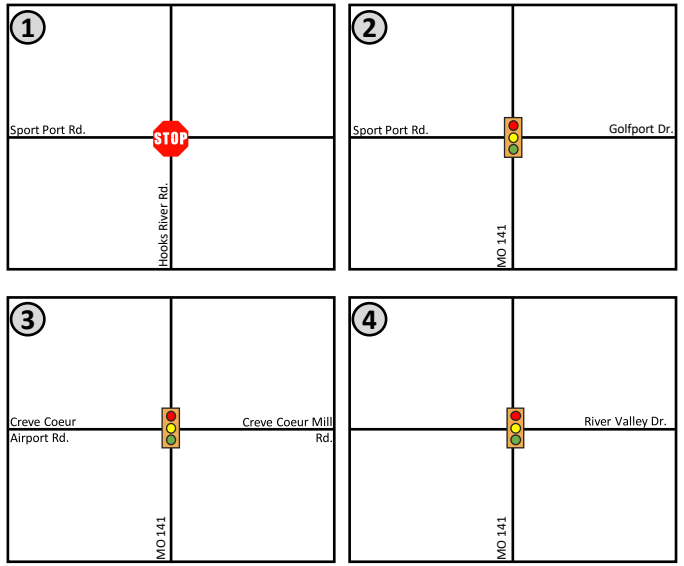

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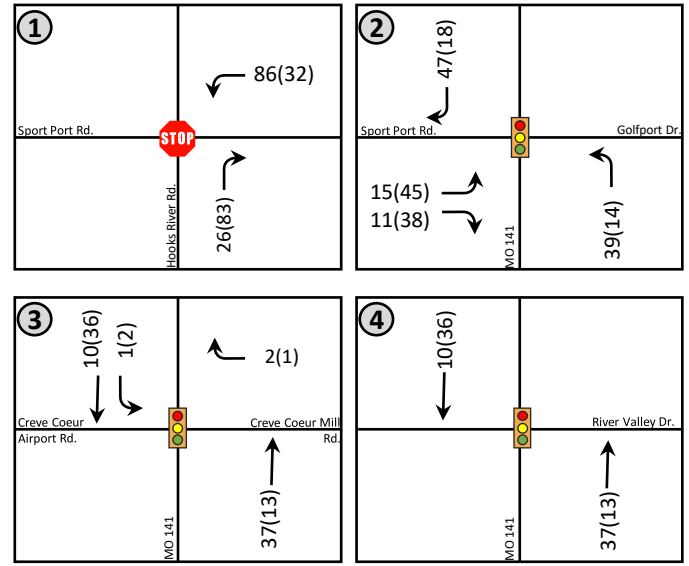

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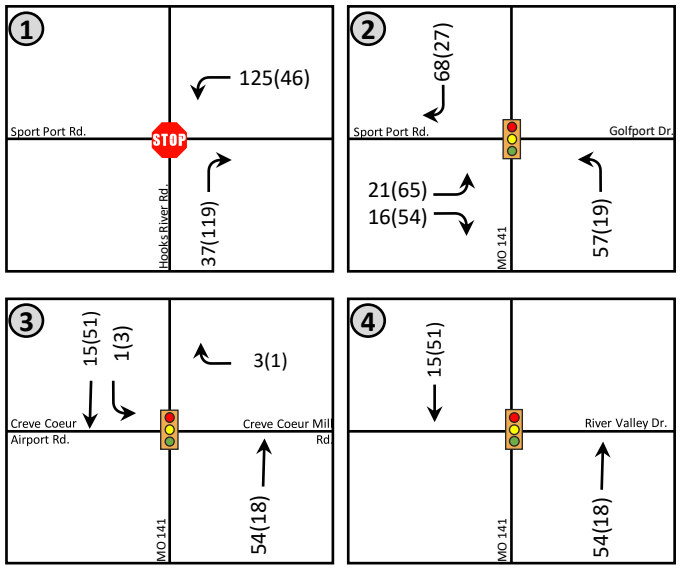

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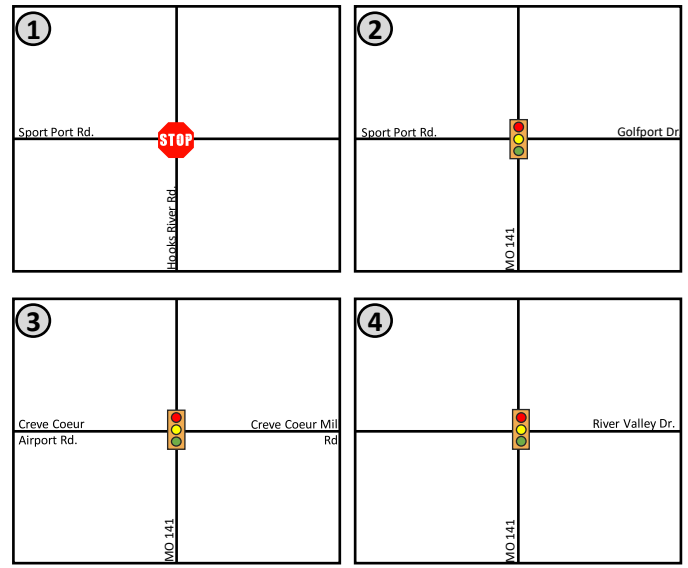

HSM Safety Reports

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections

General Information		Location Information	
Analyst	Lochmueller Group	Roadway	MO 141
Agency or Company	Lochmueller Group	Intersection	Creve Couer Airport
Date Performed	03/14/23	Jurisdiction	St. Louis County
		Analysis Year	2025

Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT $_{major}$ (veh/day)	$AADT_{MAX}$ = 67,700 (veh/day)	--	45,000
AADT $_{minor}$ (veh/day)	$AADT_{MAX}$ = 33,400 (veh/day)	--	5,910
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C_i		1.00	5.21
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	3
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	2
Type of left-turn signal phasing for Leg #1		Permissive	Permissive
Type of left-turn signal phasing for Leg #2		--	Permissive
Type of left-turn signal phasing for Leg #3		--	Protected
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			0
Maximum number of lanes crossed by a pedestrian (n_{lanesx})		--	0
Number of bus stops within 300 m (1,000 ft) of the intersection		0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.66	0.94	0.88	1.00	0.91	1.00	0.50

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bimv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	11.844	1.000	11.844	0.50	5.21	30.846
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	4.111	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ = 0.359	4.253	0.50	5.21	11.076
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	7.337	$(5)_{TOTAL}-(5)_{FI}$ = 0.641	7.591	0.50	5.21	19.770

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type$_{(FI)}$**	**Predicted N $_{bimv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted N $_{bimv\ (PDO)}$ (crashes/year)**	**Predicted N $_{bimv\ (TOTAL)}$ (crashes/year)**
	from Table 12-11	$(9)_{FI}$ from Worksheet 2C	from Table 12-11	$(9)_{PDO}$ from Worksheet 2C	$(9)_{PDO}$ from Worksheet 2C
Total	1.000	11.076	1.000	19.770	30.846
		(2)*$(3)_{FI}$		(4)*$(5)_{PDO}$	(3)+(5)
Rear-end collision	0.450	4.984	0.483	9.549	14.533
Head-on collision	0.049	0.543	0.030	0.593	1.136
Angle collision	0.347	3.843	0.244	4.824	8.667
Sideswipe	0.099	1.097	0.032	0.633	1.729
Other multiple-vehicle collision	0.055	0.609	0.211	4.172	4.781

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bisv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bisv}**
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.560	1.000	0.560	0.50	5.21	1.459
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.120	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ = 0.212	0.119	0.50	5.21	0.309
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.444	$(5)_{TOTAL}-(5)_{FI}$ = 0.788	0.441	0.50	5.21	1.150

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type$_{(FI)}$**	**Predicted N $_{bisv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted N $_{bisv\ (PDO)}$ (crashes/year)**	**Predicted N $_{bisv\ (TOTAL)}$ (crashes/year)**
	from Table 12-13	(9)$_{FI}$ from Worksheet 2E	from Table 12-13	(9)$_{PDO}$ from Worksheet 2E	(9)$_{PDO}$ from Worksheet 2E
Total	1.000	0.309	1.000	1.150	1.459
		(2)*(3)$_{FI}$		(4)*(5)$_{PDO}$	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.001	0.001
Collision with animal	0.002	0.001	0.002	0.002	0.003
Collision with fixed object	0.744	0.230	0.870	1.000	1.230
Collision with other object	0.072	0.022	0.070	0.080	0.103
Other single-vehicle collision	0.040	0.012	0.023	0.026	0.039
Single-vehicle noncollision	0.141	0.044	0.034	0.039	0.083

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(7)*
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{pedi}**	**Predicted N_{pedi}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16	(4)*(5)
Total	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--

* Column 6 has been removed due to redundant application of calibration factors and inconsistency with HSM Equation 12-30

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
1.00	1.00	1.00	1.00

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients**					**Overdispersion Parameter, k**	**$N_{pedbase}$**	**Combined CMF**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	from Table 12-14						from Equation 12-29	(4) from Worksheet 2H		(4)*(5)*(6)
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	#NUM!	1.00	5.21	#NUM!
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	5.21	#NUM!

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(7)*
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{bikei}**	**Predicted N_{bikei}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17	(4)*(5)
Total	30.846	1.459	32.305	0.015	0.485
Fatal and injury (FI)	--	--	--	--	0.485

* Column 6 has been removed due to redundant application of calibration factors and inconsistency with HSM Equation 12-31

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)
Collision type	**Fatal and injury (FI)**	**Property damage only (PDO)**	**Total**
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
MULTIPLE-VEHICLE			
Rear-end collisions (from Worksheet 2D)	4.984	9.549	14.533
Head-on collisions (from Worksheet 2D)	0.543	0.593	1.136
Angle collisions (from Worksheet 2D)	3.843	4.824	8.667
Sideswipe (from Worksheet 2D)	1.097	0.633	1.729
Other multiple-vehicle collision (from Worksheet 2D)	0.609	4.172	4.781
Subtotal	11.076	19.770	30.846
SINGLE-VEHICLE			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.001	0.001
Collision with animal (from Worksheet 2F)	0.001	0.002	0.003
Collision with fixed object (from Worksheet 2F)	0.230	1.000	1.230
Collision with other object (from Worksheet 2F)	0.022	0.080	0.103
Other single-vehicle collision (from Worksheet 2F)	0.012	0.026	0.039
Single-vehicle noncollision (from Worksheet 2F)	0.044	0.039	0.083
Collision with pedestrian (from Worksheet 2G or 2I)	0.000	0.000	0.000
Collision with bicycle (from Worksheet 2J)	0.485	0.000	0.485
Subtotal	0.794	1.150	1.944
Total	11.870	20.920	32.790

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections

(1)	(2)
Crash severity level	**Predicted average crash frequency, $N_{predicted\ int}$ (crashes/year)**
	(Total) from Worksheet 2K
Total	32.8
Fatal and injury (FI)	11.9
Property damage only (PDO)	20.9

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections

General Information		Location Information	
Analyst	Lochmueller Group	Roadway	MO 141
Agency or Company	Lochmueller Group	Intersection	Creve Couer Airport
Date Performed	03/14/23	Jurisdiction	St. Louis County
		Analysis Year	2025

Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT $_{major}$ (veh/day)	$AADT_{MAX}$ = 67,700 (veh/day)	--	45,520
AADT $_{minor}$ (veh/day)	$AADT_{MAX}$ = 33,400 (veh/day)	--	5,920
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C_i		1.00	5.21
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	2
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	2
Type of left-turn signal phasing for Leg #1		Permissive	Permissive
Type of left-turn signal phasing for Leg #2		--	Permissive
Type of left-turn signal phasing for Leg #3		--	Protected
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			0
Maximum number of lanes crossed by a pedestrian (n_{lanesx})		--	0
Number of bus stops within 300 m (1,000 ft) of the intersection		0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.66	0.94	0.92	1.00	0.91	1.00	0.52

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bimv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	11.995	1.000	11.995	0.52	5.21	32.542
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	4.168	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ = 0.359	4.312	0.52	5.21	11.698
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	7.427	$(5)_{TOTAL}-(5)_{FI}$ = 0.641	7.683	0.52	5.21	20.843

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type$_{(FI)}$**	**Predicted N $_{bimv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted N $_{bimv\ (PDO)}$ (crashes/year)**	**Predicted N $_{bimv\ (TOTAL)}$ (crashes/year)**
	from Table 12-11	$(9)_{FI}$ from Worksheet 2C	from Table 12-11	$(9)_{PDO}$ from Worksheet 2C	$(9)_{PDO}$ from Worksheet 2C
Total	1.000	11.698	1.000	20.843	32.542
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	(3)+(5)
Rear-end collision	0.450	5.264	0.483	10.067	15.332
Head-on collision	0.049	0.573	0.030	0.625	1.199
Angle collision	0.347	4.059	0.244	5.086	9.145
Sideswipe	0.099	1.158	0.032	0.667	1.825
Other multiple-vehicle collision	0.055	0.643	0.211	4.398	5.041

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bisv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bisv}**
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.565	1.000	0.565	0.52	5.21	1.532
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.120	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ = 0.211	0.119	0.52	5.21	0.324
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.448	$(5)_{TOTAL}-(5)_{FI}$ = 0.789	0.445	0.52	5.21	1.209

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type$_{(FI)}$**	**Predicted N $_{bisv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted N $_{bisv\ (PDO)}$ (crashes/year)**	**Predicted N $_{bisv\ (TOTAL)}$ (crashes/year)**
	from Table 12-13	(9)$_{FI}$ from Worksheet 2E	from Table 12-13	(9)$_{PDO}$ from Worksheet 2E	(9)$_{PDO}$ from Worksheet 2E
Total	1.000	0.324	1.000	1.209	1.532
		(2)*(3)$_{FI}$		(4)*(5)$_{PDO}$	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.001	0.002
Collision with animal	0.002	0.001	0.002	0.002	0.003
Collision with fixed object	0.744	0.241	0.870	1.051	1.292
Collision with other object	0.072	0.023	0.070	0.085	0.108
Other single-vehicle collision	0.040	0.013	0.023	0.028	0.041
Single-vehicle noncollision	0.141	0.046	0.034	0.041	0.087

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(7)*
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{pedi}**	**Predicted N_{pedi}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16	(4)*(5)
Total	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--

* Column 6 has been removed due to redundant application of calibration factors and inconsistency with HSM Equation 12-30

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
1.00	1.00	1.00	1.00

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients**					**Overdispersion Parameter, k**	**$N_{pedbase}$**	**Combined CMF**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	from Table 12-14						from Equation 12-29	(4) from Worksheet 2H		(4)*(5)*(6)
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	#NUM!	1.00	5.21	#NUM!
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	5.21	#NUM!

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(7)*
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{bikei}**	**Predicted N_{bikei}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17	(4)*(5)
Total	32.542	1.532	34.074	0.015	0.511
Fatal and injury (FI)	--	--	--	--	0.511

* Column 6 has been removed due to redundant application of calibration factors and inconsistency with HSM Equation 12-31

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)
Collision type	**Fatal and injury (FI)**	**Property damage only (PDO)**	**Total**
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
MULTIPLE-VEHICLE			
Rear-end collisions (from Worksheet 2D)	5.264	10.067	15.332
Head-on collisions (from Worksheet 2D)	0.573	0.625	1.199
Angle collisions (from Worksheet 2D)	4.059	5.086	9.145
Sideswipe (from Worksheet 2D)	1.158	0.667	1.825
Other multiple-vehicle collision (from Worksheet 2D)	0.643	4.398	5.041
Subtotal	11.698	20.843	32.542
SINGLE-VEHICLE			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.001	0.002
Collision with animal (from Worksheet 2F)	0.001	0.002	0.003
Collision with fixed object (from Worksheet 2F)	0.241	1.051	1.292
Collision with other object (from Worksheet 2F)	0.023	0.085	0.108
Other single-vehicle collision (from Worksheet 2F)	0.013	0.028	0.041
Single-vehicle noncollision (from Worksheet 2F)	0.046	0.041	0.087
Collision with pedestrian (from Worksheet 2G or 2I)	0.000	0.000	0.000
Collision with bicycle (from Worksheet 2J)	0.511	0.000	0.511
Subtotal	0.835	1.209	2.044
Total	12.534	22.052	34.585

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections

(1)	(2)
Crash severity level	**Predicted average crash frequency, $N_{predicted\ int}$ (crashes/year)**
	(Total) from Worksheet 2K
Total	34.6
Fatal and injury (FI)	12.5
Property damage only (PDO)	22.1