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ACCESS JUSTIFICATION REPORT

Interstate-49 and 211th Street
Peculiar, Missouri

Prepared for:

MoDOT

MoDOT PROJECT NO. J4P2247

June 18, 2013

Prepared by:

GBA

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1.0 EXECUTIVE SUMMARY

The Missouri Department of Transportation (MoDOT), in cooperation with the City of Peculiar, is requesting approval from the Federal Highway Administration (FHWA) to construct an additional access onto Interstate-49 (I-49) in the vicinity of 211th Street. This Access Justification Report (AJR) was developed in accordance with the requirements defined in the Federal Register that are dated August 27, 2009 for new or modified access to the Interstate System and as explained in the FHWA publication "*Interstate System Access Information Guide*," dated August 2010.

The Access Justification study process included the following general components:

- Assessment of existing conditions and identification of existing deficiencies;
- Development of future traffic projections for Design Year 2035;
- Evaluation of potential improvement alternatives to address the existing deficiencies and accommodate future traffic demands, both without and with the 211th Street interchange;
- Evaluation and selection of a 211th Street interchange improvement alternative that best addresses the project and regional needs;
- Preparation of documentation seeking concept approval from the FHWA for the proposed new interchange at I-49 and 211th Street.

1.1. Project Summary

The proposed interchange would be located about 3.5 miles south of the recently opened North Cass Parkway interchange, and about 1.5 miles north of the existing interchange at Missouri Highways J/C that currently serves the City of Peculiar, as shown on the accompanying *Exhibit 1-1*.

Exhibit 1-1 Existing & Proposed Interchange Locations

The results of this Access Justification study have indicated that the existing Missouri Highway J/C interchange currently experiences crashes at a rate two to five times higher than the comparable statewide rates. Further, the existing interchange currently experiences recurring congestion and vehicle queuing failures adjacent to the interchange at times during the critical weekday peak periods due to the close proximity of the interchange ramps and the adjacent outer road / local street intersections. Finally, the completed analyses have determined that the existing interchange and local roads will not be able to adequately accommodate the anticipated future traffic demands without significant improvements.

1.2. Preferred Build Alternative

The addition of the proposed 211th Street interchange would be expected to better serve the anticipated traffic within the northern portions of the City of Peculiar, as well as the surrounding county lands, associated with the continued growth and development along the entire length of

the I-49 corridor within Cass County. In particular, this new 211th Street interchange would offer the following benefits:

1. Mitigate Existing Congestion and Safety Deficiencies
   The proposed 211th Street interchange would provide significant relief to the existing Highway J/C interchange currently serving the City of Peculiar, and would be expected to both reduce the traffic congestion and improve the overall safety around this existing interchange area by diverting some of the traffic volume currently served at Highway J/C.

2. Prevent Future Congestion and Safety Issues
   The proposed improvements at the 211th Street interchange will be able to accommodate the expected future traffic growth, with much of the expected economic development within the City of Peculiar anticipated to occur within close proximity to the new interchange. The addition of this interchange provides a good balance for the City of Peculiar between mobility across town and access onto I-49.

3. Minimize Overall Construction Costs
   Although significant improvements will still be required at many of the adjacent intersections and on the nearby roadways located within the study area to handle future traffic, these improvement needs would likely be reduced on a network-wide basis with access onto I-49 at both Highway J/C and 211th Street. Also, the provision of a second interchange to serve the City of Peculiar would ensure that any future improvements required within the Highway J/C interchange area could be minimized. Therefore, the proposed 211th Street interchange was determined to represent the most feasible improvement to serve the study area from a regional traffic operations standpoint.

For the new interchange onto I-49 located at 211th Street, several alternative interchange configurations were initially considered. These "build" alternatives included: a standard diamond interchange, a single-point urban interchange (SPUI), a diverging diamond interchange (DDI), and a 'dog bone' interchange with 3-lane roundabouts. Based upon the completed analyses, a 6-lane wide diverging diamond configuration has been identified as the preferred alternative.

The proposed diverging diamond interchange will include roadway connections between Peculiar Drive on the west end of the 211th Street corridor and the relocated East Outer Road intersection. A local road connection will also be provided on the east end of the corridor between the East Outer Road intersection and School Road, as shown in red on *Exhibit 1-2* on the following page. Additional design details for the preferred DDI configuration are provided on *Exhibit 1-3*, as well as in the attached Appendix F.

Exhibit 1-2 Preferred 211th Street Interchange Configuration

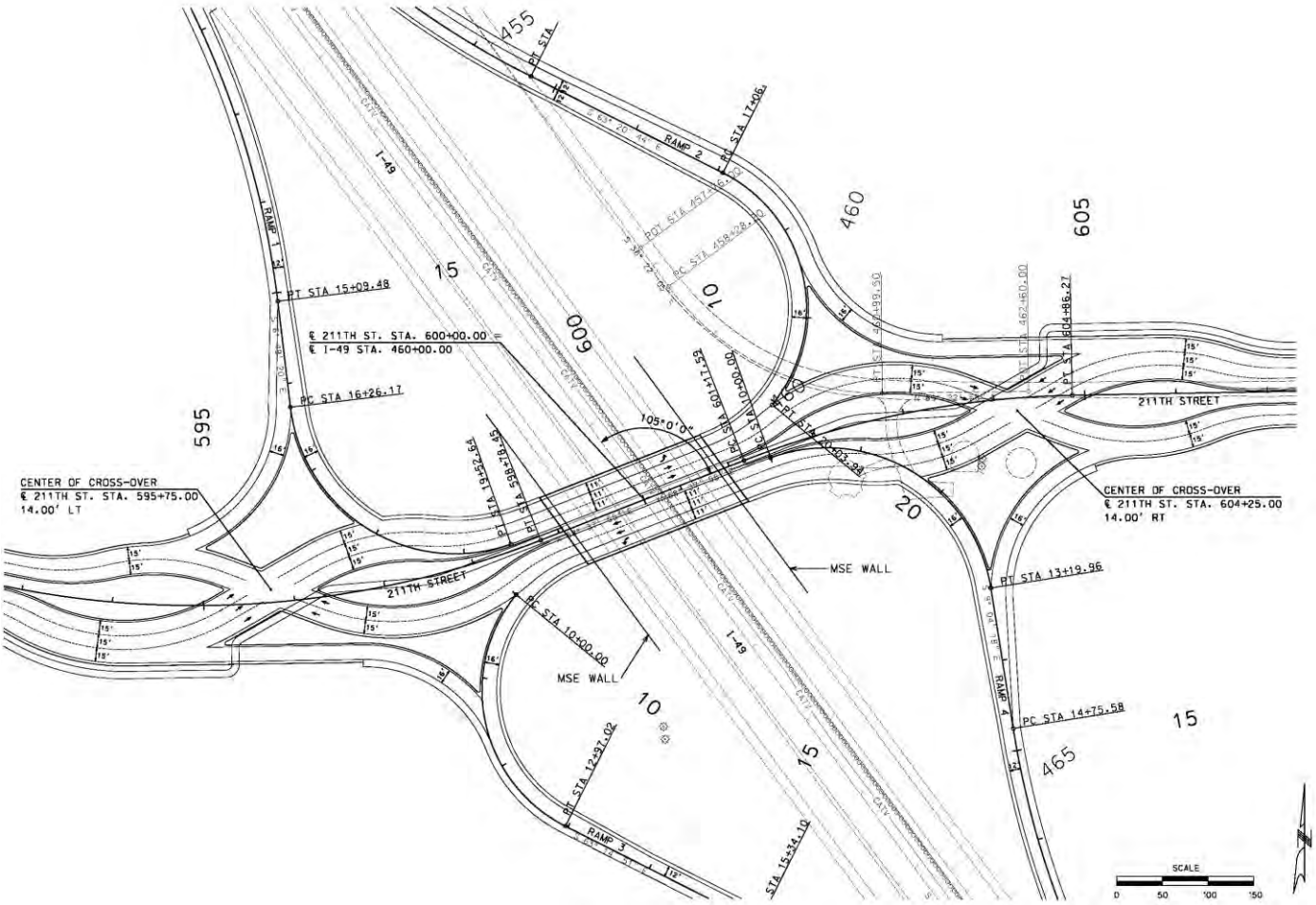


Exhibit 1-3 Preferred 211th Street Interchange Details

2.0 INTRODUCTION

The Missouri Department of Transportation (MoDOT), in cooperation with the City of Peculiar, has retained George Butler Associates, Inc. (GBA) to prepare this Access Justification Report (AJR). MoDOT is requesting permission to add an interchange onto Interstate-49 (I-49 / US-71) in the vicinity of 211th Street in order to better serve the anticipated traffic within the northern portions of the City of Peculiar, as well as surrounding Cass County. GBA previously prepared a preliminary draft AJR document for this same proposal in 2009 at the request of the City of Peculiar and the Cass County Commission.

2.1. Project Area

The City of Peculiar is located within the next outer ring of suburban communities that are rapidly developing along the I-49 corridor southeast of the Kansas City metropolitan area. Traveling along the I-49 corridor from Kansas City, Peculiar is located to the south of several adjacent cities like Grandview, Belton, and Raymore. As shown on the accompanying *Exhibit 2-1*, the City of Peculiar is located approximately 16 miles to the southeast of the Three Trails Crossing interchange with I-435 / I-470, which is the northern terminus of I-49 within the state of Missouri.

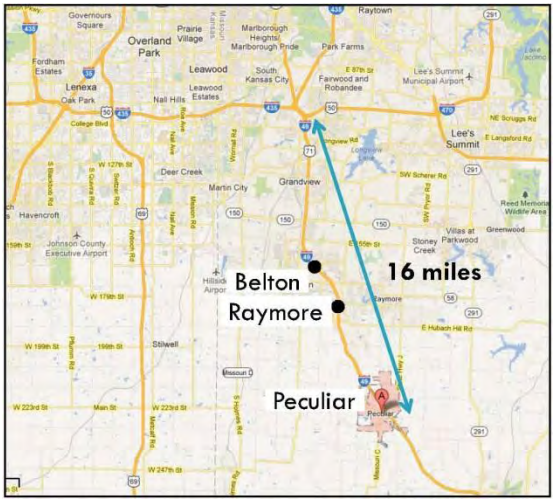


Exhibit 2-1 Location Map

2.2. Current Access

Currently, I-49 has only one interchange within the city limits of Peculiar, located at the existing crossing of Missouri Highways J/C. The proposed 211th Street interchange would be located approximately 7,500 feet to the northwest of the existing I-49 interchange with Missouri Highway J/C, as shown on *Exhibit 2-2*. The recently opened North Cass Parkway interchange, which is located approximately 3.5 miles to the north of the proposed 211th Street location, is another grade-separated access location that has been included along the I-49 study corridor for this AJR project. The study area included for the purposes of this Access Justification study is also depicted on the location map attached as *Exhibit B-1* in Appendix B.

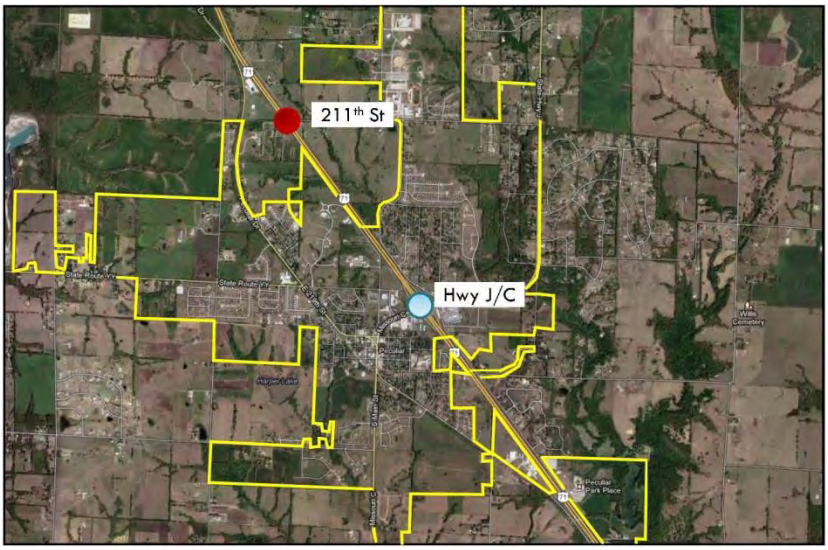


Exhibit 2-2 Existing & Proposed Access

2.3. Regional Growth

A significant amount of development and regional growth has occurred within the communities located in northern Cass County over the past 20 years, and this growth is expected to continue and expand in the future, especially within the open areas along the I-49 corridor. It is this current and anticipated future growth in communities like Belton and Raymore that contributed to the need for constructing the additional interchange access onto I-49 at the North Cass Parkway location. This North Cass Parkway interchange is located about five miles to the north of the existing interchange at Highways J/C that currently serves the City of Peculiar. The North Cass Parkway interchange is accessible to the city only by traveling along several north-south routes that parallel I-49, such as Peculiar Drive and School Road.

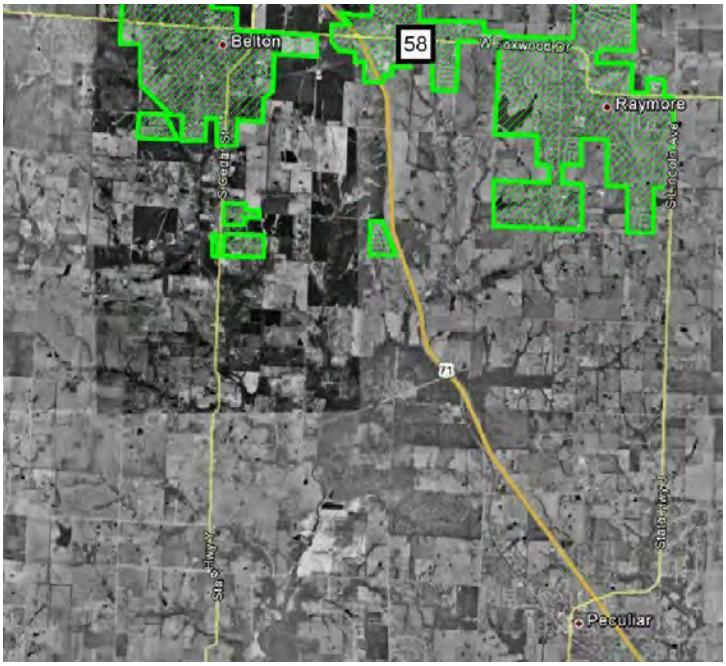


Exhibit 2-3 Regional Growth (1997)

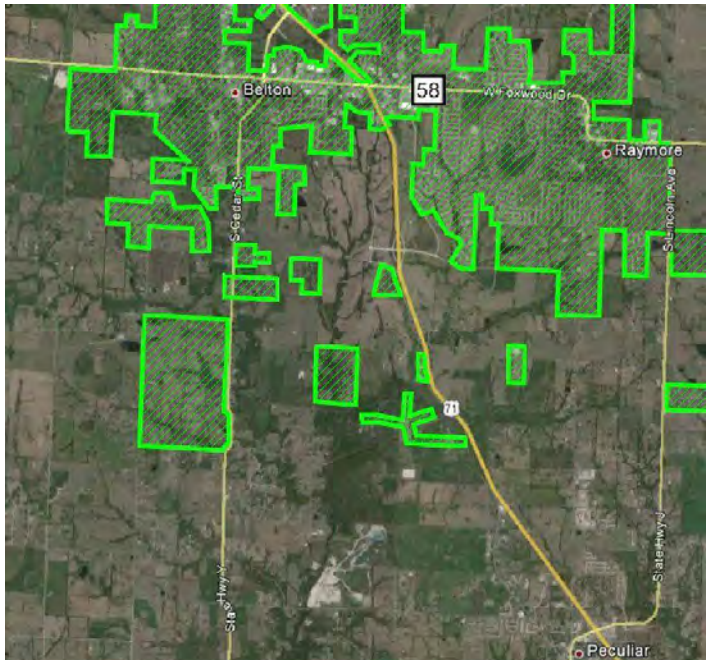


Exhibit 2-4 Regional Growth (2013)

Exhibit 2-3 and *Exhibit 2-4* above serve to illustrate the amount of growth that has occurred within these portions of northern Cass County over a prolonged period of time. Notable development areas shown on these exhibits is the new density along the Missouri Highway 58 corridor in both Belton and Raymore, as well as the amount of residential subdivision growth within Raymore, especially in the two-mile distance between Highway 58 and the new North Cass Parkway connection. The changes over the 16-year time span between these aerial photographs could be similar to the growth that might be expected over the 20-year project design life analyzed for the purposes of this study.

Cass County is one of the fastest growing counties in the region, and the City of Peculiar is one of the fastest growing communities within Cass County. Between the 2000 and 2010 census dates, population within the State of Missouri exhibited a 7% growth rate, while Cass County had a 21% population growth. During this decade, the City of Peculiar had a 77% increase in population, to its current level of 4,608 residents.

Currently, the City of Peculiar could be generally classified as a "bedroom" community, like most of the other cities in the county. That is likely to change drastically over the design horizon of this Access Justification study, with the levels of anticipated growth and development. For comparison purposes, the nearby City of Raymore grew from a population of 5,592 in 1990 to a 2010 population of 19,206 residents in 2010. Similar future growth could be expected for the City of Peculiar.

Another issue that creates additional need for access onto I-49 from communities in Cass County, like Peculiar, is the commuting patterns that currently exist. About 74% of the residents of Cass County currently travel to work outside of the county into the Kansas City, Missouri metropolitan area. Likewise, about 50% of the Cass County workforce is currently from non-county residents. While these commuting patterns may change over time with the addition of more major developments and employment centers within Cass County, the need for adequate access along the I-49 corridor will likely remain constant.

3.0 PURPOSE AND NEED

The purpose of this project is to provide an additional access point onto I-49, which will encourage regional development and alleviate safety and congestion concerns at the existing Highway J/C interchange. The proposed interchange will establish another critically needed east-west connection that will also disperse traffic and reduce volumes within the existing interchange.

The proposed interchange at 211th Street has been planned by the City of Peculiar for several years, and is indicated to be the city's highest transportation improvement priority in the latest adopted *Peculiar Comprehensive Plan (2008)*, prepared by JEO Consulting Group. This priority is primarily a response to the continued intense growth and development along the entire length of the I-49 corridor within Cass County. In 2010, city and county officials worked with MoDOT's Kansas City district planning staff to have the proposed 211th Street interchange included on both the Long-Range Transportation Plan (LRTP) and the Transportation Improvement Program (TIP) administered by the Mid-American Regional Council (MARC), which is the metropolitan planning agency for the bi-state Kansas City metropolitan region. City and county officials believe that the 211th Street interchange is an essential first step in the establishment of an east-west arterial corridor through the northern portions of Cass County, with possible future connectivity into the suburban areas located within Kansas.

The proposed 211th Street interchange and associated corridor improvements would provide a vital connection within the existing and planned street and highway network serving the City of Peculiar. The improvement of 211th Street between School Road and Peculiar Drive would provide important, and logical, local connections to serve developing areas and encourage sensible expansion within the City of Peculiar, as well as provide direct access to the nearby Ray-Pec school district complex which is currently the county's largest employer. In addition, regional connectivity and system linkages would be improved with another connection across I-49, which currently bisects the city into east-west sections and makes direct travel between sections difficult.

Ultimately, city and county officials believe that additional westward connectivity by means of another corridor such as 211th Street must be provided in order to improve the viability of the planned future developments. An improved 211th Street corridor will also allow the more efficient transport of people, goods, and services from Peculiar to the remainder of the Kansas City metropolitan area located to the northwest of the city. Therefore, in addition to providing significant roadway system linkage / road user benefits and improving the overall safety and capacity conditions on the city's other existing roadways, the 211th Street corridor is also expected to support the anticipated land use changes and economic development within the northern portions of the city. While the construction of the 211th Street corridor and I-49 interchange may not be the only catalyst for land use development on the surrounding properties, certainly there is interdependency between such developments and the additional access that will be provided by an improved roadway network that will increase their viability.

4.0 FHWA'S EIGHT POLICY REQUIREMENTS

The purpose of this Access Justification study is essentially two-fold. First, this study must demonstrate that the construction of the proposed interchange onto I-49 at 211th Street is justified, and that any improvements made to only the existing transportation facilities will ultimately be inadequate to serve the expected future traffic demands. Then, it must be demonstrated that the recommended design from this Access Justification study is the preferred interchange configuration for design and construction. The information provided within this report was developed in accordance with the requirements defined in the Federal Register that is dated August 27, 2009 for new or modified access onto the Interstate System, and as explained in the Federal Highway Administration (FHWA) publication "*Interstate System Access Informational Guide*," dated August 2010.

This Access Justification study has been prepared in order to gain Concept Approval from the FHWA for the proposed 211th Street interchange to serve the City of Peculiar and northern Cass County. The FHWA policy has identified eight key issues which must be addressed prior to obtaining Concept Approval of the new break-in-access permit for the proposed new interchange. Each of these eight specific issues is discussed in further detail in the following sections of this report.

5.0 EXISTING FACILITIES

FHWA AJR Policy Point 1: Existing Facilities

"The need being addressed by the request cannot be adequately satisfied by the existing interchanges to the interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily accommodate the design-year traffic demands (23 CFR 652.2(a))."

5.1. Existing Street Network

I-49 is the primary north-south route providing access from the City of Peculiar to the Kansas City metropolitan area to the north, as well as to Harrisonville and the remainder of Cass County to the south. I-49 currently bisects the City of Peculiar, with the downtown business district located on the west side of the highway. The detailed study area for this interchange project is depicted by the yellow hatched area shown below on *Exhibit 5-1*. In addition, the limits of the completed operational analyses for this project are depicted in red on this exhibit.

Exhibit 5-1 Existing Street Network & Study Area

As shown on *Exhibit 5-2* below, Missouri Highway J/C intersects I-49 running in an east-west orientation. Missouri Highway J turns northward on the east side of I-49, while Missouri Highway C turns southward on the west side of I-49. Missouri Highways J and C provide direct connections to many of the major streets that serve the City of Peculiar, with secondary access provided to many local businesses.

Exhibit 5-2 Existing Highway J/C Interchange

There are currently other routes that run parallel to I-49 on both sides of the highway corridor that do currently provide access to these portions of the City of Peculiar. On the west side of corridor, Peculiar Drive (Old U.S. Highway 71) serves as a frontage roadway and provides connectivity through the city's downtown area to Missouri Highway C. On the east side of the corridor, School Road serves as a frontage roadway, and Missouri Route J also runs in a north-south orientation through the eastern portions of the City of Peculiar. In addition to providing direct access to the existing I-49 interchange with Missouri Highway J/C, these roadways also provide access northward to the existing interchanges (i.e., North Cass Parkway, Missouri Highway 58) onto I-49 that are located near the communities of Belton and Raymore.

As shown on the accompanying *Exhibit 5-3* on the following page, travel distances and times would be greatly reduced by utilizing the 211th Street corridor instead of the current route through the existing Highway J/C interchange area. For example, the route shown in red using 211th Street measures 1.3 miles in length and could be travelled by car in less than five minutes, while the route shown in blue through the existing Highway J/C interchange is about four miles long and could take about 12 minutes to traverse.

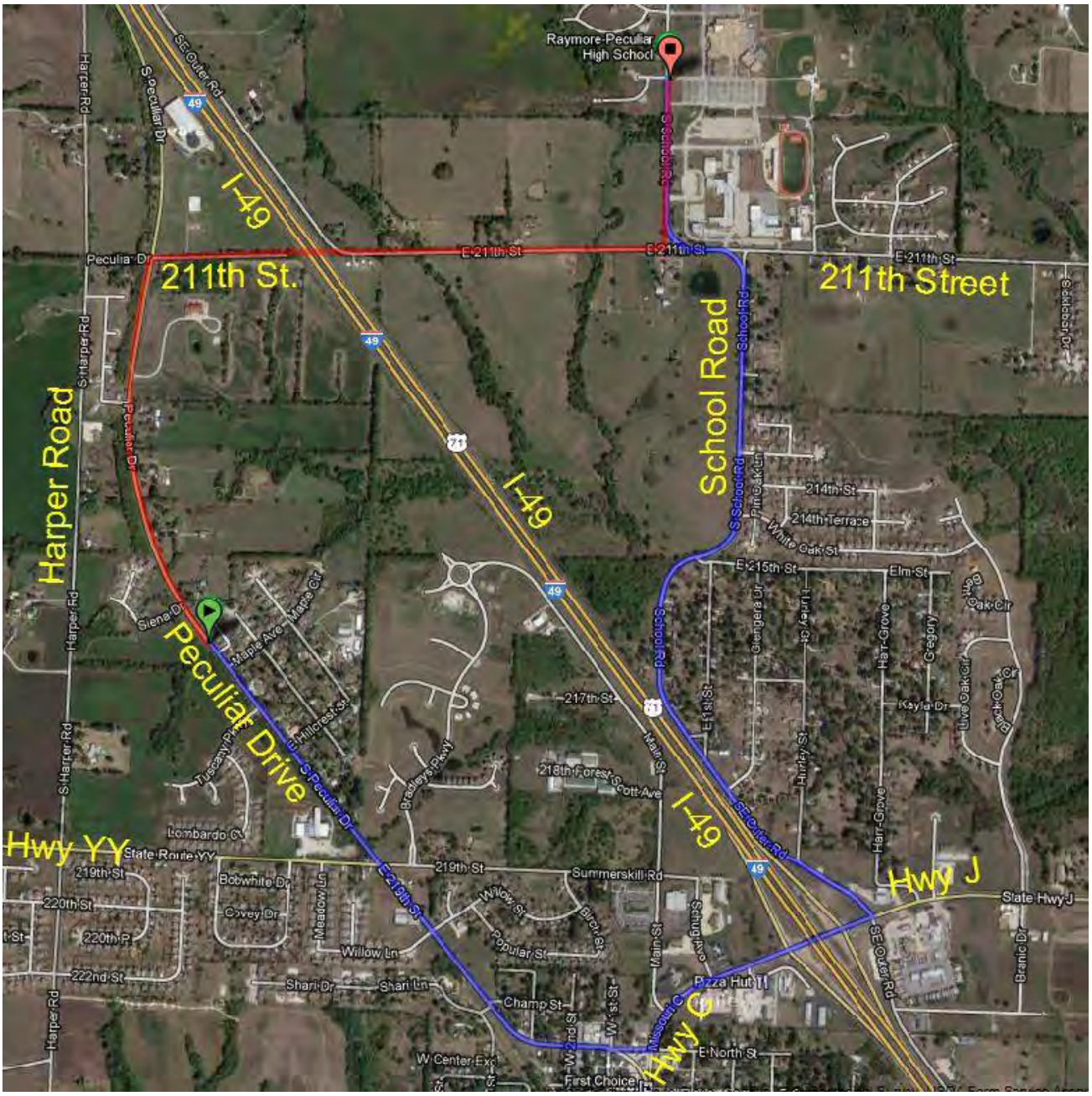


Exhibit 5-3 Parallel Travel Routes

These parallel routes are all currently two-lane facilities that would need significant widening improvements in order to handle the future traffic demands that will be associated with the predicted growth and development within the City of Peculiar. Even with such improvements, the northward travel distances to the nearest adjacent interchanges onto I-49 would be three to five miles without the proposed 211th Street interchange. As a result, there would still be a need to serve the majority of the expected city-wide traffic growth with the existing Missouri Highway J/C interchange onto I-49.

Other challenges presented by the existing local road network include the narrow roadway cross-sections currently provided. Many of these roads have low speed limits and run through older portions of the city, where roadway widening may not be particularly practical. Also, access management is either poor or completely lacking along many of these local streets.

5.2. Lane Configurations

The existing lane configurations, as well as the existing auxiliary lane storage lengths, along the Missouri Highway J/C corridor are shown on *Exhibit B-2* in the attached Appendix B. 211th Street currently intersects Missouri Highway J approximately 1.5 miles to the northeast of the U.S. I-49 interchange with Missouri Highway J/C. Missouri Highway J runs in a north-south orientation at this intersection, with 211th Street serving as the west leg of this "T"-type intersection. 211th Street runs westward from the Missouri Highway J intersection to near I-49, located approximately 1.6 miles west of Missouri Highway J. At that point, 211th Street turns northward and parallels I-49 as the Northeast Outer Road frontage roadway, until it terminates approximately 0.6 miles to the north at a private residence. It should be noted that to the west of the intersection with School Road, 211th Street is currently a gravel roadway.

The existing lane configurations along the I-49 highway corridor, as well as the existing merge and diverge ramp configurations, are shown on the attached *Exhibit B-3* in Appendix B. I-49 currently provides two travel lanes in both the northbound and southbound directions, with only single lane on-ramps and off-ramps at the existing Missouri Highway J/C interchange. Similarly, single lane ramp configurations are currently provided at the North Cass Parkway interchange.

5.3. Operational Deficiencies

The current intersection operations through the existing I-49 interchange with Highways J/C are depicted below on *Table 5-1*. This table depicts the overall signalized intersection levels of service that are currently provided during the morning and evening peak hour conditions, as predicted by the Synchro / SimTraffic computer analysis programs. Further discussion of the detailed operational analyses completed during this Access Justification study is provided in Chapter 7.0 of this report.

Table 5-1
Existing Levels of Service

	Lanes on Bridge	Synchro		SimTraffic	
		A.M.	P.M.	A.M.	P.M.
Southbound I-49/Hwy. C	3	B	B	A	B
Northbound I-49/Hwy. J		A	B	A	A
School Road/Hwy. J		U[1]	U[1]	U[1]	U[1]

[1] *Unsignalized Intersection*

When the existing interchange bridge was re-decked by MoDOT during the summer of 2012, some other improvements were made within the Highway J/C interchange area. A westbound right-turn lane was added between the adjacent School Road intersection and the northbound I-49 ramp terminal, and the interchange's coordinated traffic signal timings were optimized. Therefore, overall intersection performances have recently been improved, as illustrated in *Table 5-1*. Still, some short-term, sporadic congestion and vehicle queuing continues to occur at times during the critical weekday peak periods. In addition, this interchange area also has demonstrated safety concerns that will be further detailed in Section 5.4 below.

During the intersection traffic counts completed for this study, GBA personnel repeatedly observed vehicle queuing conditions during the weekday peak periods that backed through the outer road and local street intersections adjacent to this existing interchange. Although beneficial driver cooperation was sometimes exhibited by mainline vehicles that typically allowed side street vehicles to have better access onto Highway J/C, this behavior also contributes to some driver confusion regarding the assignment of right-of-way to complete desired maneuvers. Finally, the significant number of school buses and semi-trucks can adversely impact the traffic operations within the existing Highway J/C interchange area, particularly at the adjacent School Road intersection and at the nearby access drives serving the adjacent "Flying J" truck stop.

More importantly, as will be discussed in-depth in the "Safety and Operational Analyses" chapter of this report (i.e., Chapter 7), it is not expected that a single interchange onto I-49 will be able to serve all of the future traffic demands for the City of Peculiar. A "No Build" scenario for the existing Highway J/C interchange would be grossly infeasible under the projected Design Year 2035 scenario conditions without the proposed interchange at 211th Street, and even extensive widening and reconfigurations at this interchange would not be expected to address all of the future operational and safety concerns.

5.4. Crash History

Although this Access Justification request is for a new interchange onto I-49, an evaluation of the existing traffic crash rates and patterns was also completed along the interstate segment that would be affected by this proposed improvement. For the purposes of this analysis, a nearly six-mile segment of I-49 (located from about 0.4 miles south of the Missouri Highway J/C interchange to 0.4 miles north of the North Cass Parkway interchange) was evaluated. The I-49 corridor crashes occurring on this six-mile segment over the five-year analysis period from 2007 to 2011 are illustrated in the accompanying *Table 5-2*.

Table 5-2
I-49 Corridor - Crash Severity (2007-2011)

	FATAL	INJURY	PDO	TOTAL
Northbound I-49	2	22	77	101
Southbound I-49	1	20	71	92

Note: Crash statistics and safety data summarized or presented in this table are protected under Federal law. See Appendix G for details.

As shown in the table, there has not been an extensive crash history exhibited along this six-mile segment of I-49. Less than one-quarter of the reported crashes involved occupant injuries, including 12 disabling injury incidents (i.e., 6 northbound and 6 southbound). Three fatal crashes were reported along the study segment of I-49, About 24 percent of the reported crashes along the study segment of I-49 were in the rear-end category.

Although specific crash location was not possible with the recent record data provided, GBA's previous evaluations of the 2003 to 2007 historical crash report data included spot maps that indicated some of these rear-end types of crashes might be attributed to the existing congestion and capacity deficiencies associated with off-ramp movements to the existing Missouri Highway J/C interchange, especially in the southbound direction. An engineering review of the crash reports for the fatality and disabling injury incidents reported between 2007 and 2011 revealed a number of median cross-over crashes. The frequency of this type of incident should be significantly reduced with the addition of median guard cable along the I-49 corridor in 2011.

For the most severe crashes in the study area, the review revealed that primarily driver-related factors were listed as probable contributing circumstances, including driver inattention; improper lane use, lane changes, or passing; speed too fast for conditions; or other physical impairments.

With the construction of the proposed 211th Street interchange, the capacity to serve traffic from the City of Peculiar and the surrounding vicinity would be increased significantly. Also, with the provision of a second access point onto I-49, the existing congestion surrounding the Missouri Highway J/C interchange should be reduced as some traffic diverts to utilize the 211th Street access point, and a corresponding reduction in interchange-related crashes would be expected.

Based upon historical crash rate information supplied to GBA by MoDOT, the project crash rates shown in *Table 5-3* along the study segment of I-49 have consistently been lower than the comparable state-wide crash rates for either the "Interstate" route designation or the "Freeway" roadway classification during the five-year period evaluated for this Access Justification study. The addition of the proposed 211th Street interchange will add new conflict points along the freeway. However, crash rates along this particular segment of I-49 may not be expected to increase since the interchange will be properly designed to modern, safer standards with adequate horizontal and vertical configurations. An additional interchange onto I-49 at 211th Street should help to disperse traffic throughout the area and reduce any congestion currently occurring near the existing Highway J/C interchange. With the possible exception of one disabling injury crash at the existing interchange resulting from wrong-way travel on the northbound off-ramp, none of the most severe crashes along I-49 reviewed for the purposes of this study involved contributing factors that could be directly attributed to inadequate roadway or interchange design.

Table 5-3
I-49 Corridor - Annual Crash Rates

	2007	2008	2009	2010	2011
Northbound I-49	43.86	90.38	61.42	76.82	39.17
Southbound I-49	35.03	45.23	53.30	50.13	64.60
Statewide Interstate	107.86	103.40	100.77	103.84	98.33
Statewide Freeway	110.14	104.78	101.53	104.51	99.05

Note: Crash statistics and safety data summarized or presented in this table are protected under Federal law. See Appendix G for details.

Similarly, the crash history along the Missouri Highway J/C corridor was also evaluated during this study. The study corridor began on Missouri Highway C about 0.34 miles to the west of the I-49 interchange (near the North Street intersection), and ran along Missouri Highway J to the intersection with Twin Oaks Parkway (i.e., about 0.41 miles east of the interchange). The reported corridor crashes along this 0.75-mile long segment of Missouri Highway J/C are summarized in *Table 5-4*.

Table 5-4
Hwy. J/C Corridor - Crash Severity (2007-2011)

	FATAL	INJURY	PDO	TOTAL
Highway J East of I-49	0	7	46	53
Highway C West of I-49	0	6	53	59

Note: Crash statistics and safety data summarized or presented in this table are protected under Federal law. See Appendix G for details.

Previous crash evaluations completed by GBA indicated that crashes along the Missouri Highway J/C corridor occurred mainly at the ramp terminal intersections, as well as at the adjacent 3rd Street intersection located to the west of the interchange leading into the City of Peculiar's downtown area. Now, the vast majority of the crashes that occurred along this corridor during

the study period were still determined to be rear-end, left-turn, and right-angle type crashes, which can likely be attributed to the congested traffic conditions along the Highway J/C corridor, particularly during the peak traffic periods.

Also, the project crash rates along this segment of the Highway J/C corridor were still determined to be significantly higher than the comparable state-wide crash rates for similar two-lane, "lettered route" facilities. This is especially true since all of the reported crashes during the five-year study period occurred within the 0.75-mile highway study segment located within the immediate vicinity of the I-49 interchange. As shown on *Table 5-5*, the annual crash rates along the study segment of Highways J/C were generally determined to be between two times and five times higher than the statewide rates for similar roadway facilities. *Exhibit 5-4* below provides a graphical depiction of the crash locations along the Highway J/C corridor and in the vicinity of the existing interchange area during the year 2010, as an example of where crashes are most frequently occurring.

Table 5-5
Hwy. J/C Corridor - Annual Crash Rates

	2007	2008	2009	2010	2011
Hwy. J East of I-49	909.00	545.40	181.80	1,030.20	545.40
Hwy. C West of I-49	1,111.90	741.27	815.39	889.52	815.39
Statewide Route	240.31	231.40	231.60	227.32	223.01
Statewide 2-Lane	200.35	194.79	192.75	188.21	186.54

Note: Crash statistics and safety data summarized or presented in this table are protected under Federal law. See Appendix G for details.

Exhibit 5-4 Existing Highway J/C Corridor Crashes

6.0 REASONABLE ALTERNATIVES TO NEW ACCESS

FHWA AJR Policy Point 2: Alternatives Analysis

"The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management (such as ramp metering, mass transit, and HOV facilities), geometric design, and alternative improvements to the Interstate without the proposed change(s) in access (23 CFR 625.2(1))."

6.1. Without 211th Street Interchange

Based upon the operational analyses completed in conjunction with this Access Justification study, the existing I-49 interchange with Missouri Highway J/C cannot be expected to adequately serve the expected future traffic demands with its current lane geometrics. In fact, the existing interchange configuration with three lanes provided on the overpass structure would be woefully inadequate to serve the future design traffic volumes. In addition, the existing street system surrounding the current interchange cannot be easily widened in order to provide the roadway cross-section needed to accommodate the future traffic volumes. It is likely that a median-divided, multi-lane arterial street configuration that provides extra width for dual left-turn and right-turn lanes would ultimately be required to serve these projected traffic conditions. This wide arterial roadway configuration would be especially difficult to provide along the Missouri Highway C corridor and through the adjacent intersection with Peculiar Drive, where many commercial properties and buildings are located close to the highway and numerous, closely-spaced access drives are currently provided.

Therefore, in lieu of a true "No Build" alternative, four conceptual improvement alternates were used to evaluate the future sufficiency of the existing Missouri Highway J/C interchange for the purposes of this Access Justification study, as shown on the attached *Exhibits 6-1 through 6-4*.

The first improvement concept would maintain the existing, standard diamond interchange configuration, with the addition of all lanes that could be reasonably constructed. These improvements included the provision of three through lanes in each direction along the Missouri Highway J/C corridor, in addition to advanced left-turn lanes as recommended by MoDOT. These additional lanes would be required through the ramp terminal intersections, resulting in a twelve-lane interchange bridge over I-49. In addition, triple left-turn lanes and dual right-turn lanes would be needed for several movements at the interchange ramp terminals.

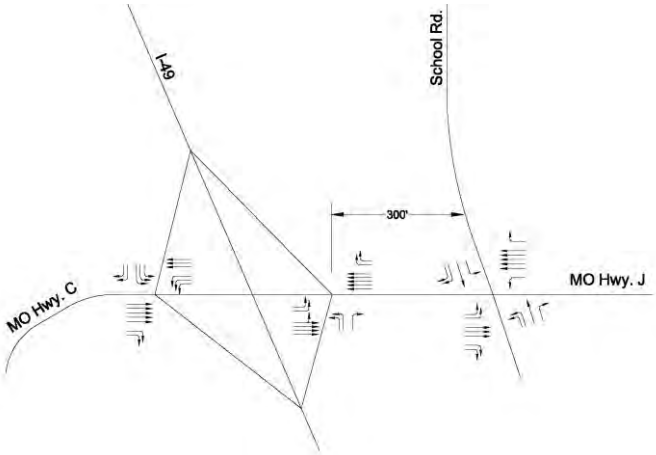


Exhibit 6-1 Hwy. J/C Diamond Option (w/o 211th)

The second concept would convert the existing interchange to a Single Point Urban Interchange (SPUI) configuration, but with full access movements and traffic signalization at the intersection of Missouri Highway J with a relocated School Road. Again, triple left-turn lanes and dual right-turn lanes would be needed at the

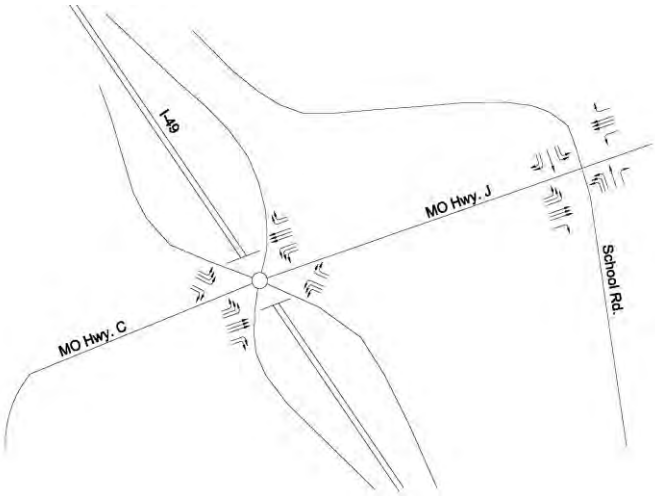


Exhibit 6-2 Hwy. J/C SPUI Option (w/o 211th)

SPUI traffic signal location. The School Road intersection would require triple left-turn lanes for several approaches, and the southbound right-turn lane would require a dual free-flowing movement. In order to accommodate all of these required turn lanes, an eleven- or twelve-lane section would be required on Missouri Highway J between the I-49 interchange and School Road, with nine lanes required on the SPUI bridge.

The third improvement concept would again convert the existing interchange to a SPUI configuration, with an underpass loop roadway to convert side street traffic operations at the adjacent School Road intersection to right-in, right-out maneuvers. School Road would need to be both relocated and widened, and the installation of traffic signals would be required at both of the resulting loop ramp intersections with School Road. The lane configurations needed at the SPUI interchange would largely remain the same as for the previous improvement concept, with nine lanes required on the bridge over I-49.

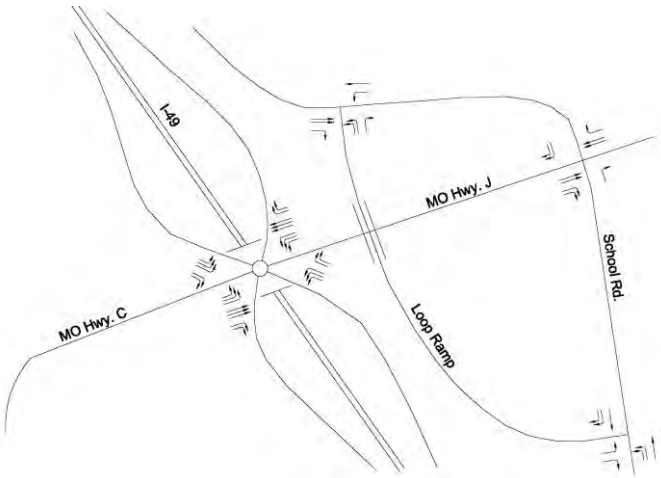


Exhibit 6-3 Hwy. J/C SPUI
with Loop Option (w/o 211th)

Finally, a fourth improvement concept was also evaluated that utilized a Diverging Diamond Interchange (DDI) configuration at this location, with School Road remaining in its existing location. Up to 11 lanes could be needed between the School Road intersection and the adjacent DDI ramp terminal intersection in order to manage the expected future vehicle queuing conditions. Within the DDI cross-over intersections, four entry lanes would be required on each end of the interchange to provide adequate future operations. Likewise, three through lanes would be required on the bridge in each travel direction, in addition to a free-flowing left-turn lane onto each respective I-49 on-ramp, meaning that an eight-lane wide overpass bridge would be required for this configuration.

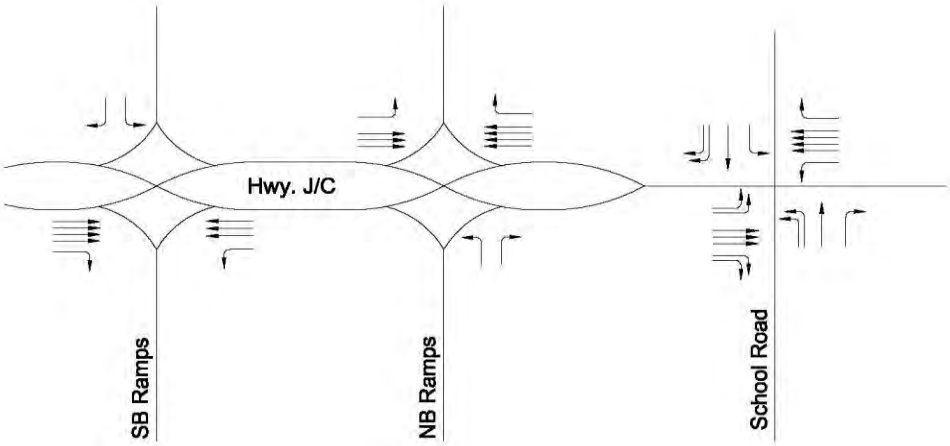


Exhibit 6-4 Hwy. J/C DDI (w/o 211th)

The results of the completed capacity analyses for these conceptual improvement alternatives further illustrated that a single interchange location onto I-49 cannot be expected to handle the future traffic demands for the entire City of Peculiar. This determination essentially justifies the need for an additional access point onto the I-49 corridor, such as the proposed 211th Street interchange.

6.2. With 211th Street Interchange

With the addition of the proposed interchange at 211th Street, significantly fewer improvements would be required at the existing Missouri Highway J/C interchange. Dual left-turn and dual right-turn lanes would still be required at the intersections along both the Missouri Highway J/C and 211th Street corridors. Additionally, MoDOT recommends that advance left-turn lanes be provided at these interchange locations in order to improve the traffic operations and lane utilizations. Still, both the existing Missouri Highway J/C and proposed 211th Street interchanges onto I-49 would adequately serve the expected traffic demands with eight-lane interchange bridge widths in a standard diamond configuration.

As will be further discussed in the "Operational Analysis" sections of this report, additional studies have also been completed during this Access Justification study to evaluate alternative interchange configurations at the proposed 211th Street location. Based upon the results of these supplemental analyses, a six-lane wide DDI configuration has emerged as the preferred alternative. Preliminary analyses have indicated that a similar six-lane diverging diamond configuration could also be utilized at the existing Highway J/C interchange. However, additional studies will be needed to further detail the future configuration needs at that location.

6.3. Other TSM Techniques

Other transportation system management (TSM) improvements, such as ramp metering, mass transit, or High Occupancy Vehicle (HOV) facilities, are not currently provided along the I-49 corridor. These types of TSM improvements would not be expected to be feasible to mitigate the expected congestion along the corridor, especially if another interchange onto I-49 is not constructed to serve the City of Peculiar and the surrounding regions of Cass County. Currently, there are no long-range plans to provide for HOV facilities along the I-49 corridor, nor are there many mass transit alternatives available within this region.

The Kansas City metropolitan area continues to grow southeasterly into Cass County, so improvements have recently been made along the I-49 corridor to expand the KC Scout intelligent transportation systems (ITS) to serve this developing area. Utilizing the existing LightCore fiber-optic connectivity along I-49, KC Scout has added pan-tilt-zoom (PTZ) cameras at all of the existing interchange locations and has installed a dynamic message board near Harrisonville. These ITS improvements are expected to become operational during the Spring 2013. Also, as ramp metering is a congestion countermeasure envisioned to be part of the KC Scout system, where applicable, the proposed 211th Street interchange will be designed to accommodate possible retro-fitted ramp metering devices at the ramp locations.

7.0 OPERATIONAL AND SAFETY ANALYSIS

FHWA AJR Policy Point 3: Operational and Safety Analysis

"An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroads) or on the local street network based on both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (23 CFR 625.2(1), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, shall be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)). Requests for a proposed change in access must include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network (23 CFR 625.2(a) and 655.603(d)). Each request must also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d))."

7.1. Future Safety Considerations

The addition of the proposed 211th Street interchange would also be expected to have an immediate impact on the overall safety within the existing interchange area. Since the high crash rates along the Missouri Highway J/C corridor and within the existing interchange may be related to recurring short-term traffic congestion during the weekday peak periods, the anticipated dispersion of traffic with the construction of the proposed 211th Street interchange would therefore also be expected to result in a reduction of crashes at the adjacent existing interchange. As the projected development occurs and traffic volumes increase within the study area, proper design of required geometric and traffic control improvements will be needed to manage the future traffic congestion and crash experience.

The preferred alternative for the 211th Street interchange as a diverging diamond configuration should also provide future safety benefits at this proposed access location. As conceptually designed, 211th Street will provide a four-lane, median-divided roadway that will function as a higher type of facility and be more capable of handling large volumes of traffic more safely than the existing Highway J/C corridor. Through its design, the diverging diamond configuration will also provide additional safety benefits by using a median through the cross-over intersections and interchange to separate the head-to-head traffic and protect pedestrians. Most importantly, this preferred interchange configuration significantly reduces the number of conflict points within the cross-over terminal intersections, and eliminates typically problematic left-turning conflicts altogether.

7.2. Analysis Scenarios and Softwares

Projected traffic volumes for the 20-year horizon (i.e., Design Year 2035) for each conceptual alternative have been developed, based upon the projected growth and development within the

City of Peculiar, and each traffic volume scenario was subsequently analyzed. Similarly, a future traffic volume scenario was also developed with the addition of the proposed 211th Street interchange and the associated improvements along the 211th Street corridor. These analyses included the preparation of future design traffic volumes for the surrounding roadway network associated with each conceptual alternative.

Series of operational analyses were completed in order to evaluate and refine each of the conceptual improvement alternatives discussed previously in Chapter 6 of this report. Again, four improvement alternatives were used to evaluate the sufficiency of the existing Missouri Highway J/C interchange without the 211th Street interchange for the purposes of this Access Justification study. These alternatives, used in lieu of a true "No Build" alternative that was demonstrated to be grossly insufficient, included various configurations at the Missouri Highway J/C interchange, without the construction of the proposed 211th Street interchange. Then, additional analyses were completed to evaluate the operational conditions at both the existing and proposed interchanges with the provision of the 211th Street access interchange.

All of these volume / capacity analyses were completed in order to determine the expected delays and levels of service (LOS) at each of the study intersections, including all ramp terminal intersections at the existing and/or proposed interchanges. Analysis was also completed for each freeway segment, merge area, and diverge area along the I-49 corridor under each of the respective future traffic volume scenarios.

For most of the intersection capacity calculations completed for the purposes of this Access Justification study, Trafficware's Synchro / SimTraffic software package was utilized. Within the Synchro program, the Highway Capacity Manual (HCM) Level of Service (LOS) results have been reported in this study. The SimTraffic program, a traffic simulation modeling software, was also used to complete a more detailed review of the detrimental effects of vehicle queuing expected between the closely-spaced intersections in and around each respective interchange location.

When more specific evaluations of alternative interchange configurations at the proposed 211th Street interchange location were needed, other analysis softwares were also utilized. The SIDRA program was utilized to evaluate any proposed roundabout locations, and more detailed VISSIM simulation models were also prepared to analyze the preferred DDI interchange configuration. In general, the Synchro and SIDRA analysis results were utilized only for screening purposes to identify potentially viable interchange configurations. Then, more detailed results were obtained using either the SimTraffic or VISSIM simulation modeling tools to refine the lane configuration needs within these viable configurations and to make selection recommendations.

Finally, it should be noted that the latest version of McTrans' Highway Capacity Software (i.e., HCS 2010), which utilizes only HCM-based procedures, was used for the LOS calculations for each freeway segment, merge area, and diverge area along the I-49 corridor. A description of the HCM LOS criteria used in these intersection analyses is provided on the attached *Exhibit A-1* in the attached Appendix A. Likewise, descriptions of the freeway segment and merge / diverge segment LOS criteria are provided on *Exhibit A-2* and *Exhibit A-3*, respectively.

7.3. Existing Traffic Volumes

GBA personnel originally performed manual turning movement counts in April 2008 during the preparation of the preliminary draft Access Justification study report. Traffic counts were performed during both the A.M. and P.M. peak periods at the following study intersections:

- I-49 (formerly US-71) Southbound Ramps with Missouri Highway J/C
- I-49 (formerly US-71) Northbound Ramps with Missouri Highway J/C
- Missouri Highway J/C with School Road
- Missouri Highway J with 211th Street
- 211th Street with School Road

Additionally, on-road machine counters were placed on School Road, both north and south of the 211th Street intersection, as well as on 211th Street, both east and west of the offset School Road intersections. Daily roadway traffic volumes were recorded for the 24-hour period concurrent with the turning movement counts completed in April 2008.

During this updated Access Justification study process, new traffic counts were obtained in November 2012 at the critical existing intersections within the Highway J/C interchange area, per direction from MoDOT staff. In addition, historical traffic counts were provided to GBA by MoDOT for many of the state-maintained routes within the project area, including I-49. Comparisons of the available data sources indicated that traffic volumes within the study area were generally steady in the interim between studies. In fact, the November 2012 counts at the existing Highway J/C interchange were found to be slightly lower than the April 2008 counts previously obtained.

Based upon preliminary direction received from both MoDOT and FHWA-MO division staffs, the new November 2012 traffic counts have been utilized for the analysis of the existing conditions during this Access Justification study. The resulting balanced traffic volumes during the A.M. and P.M. peak hours are shown on *Figures D-1 and D-2*, respectively, in the attached Appendix D. On these figures, the total hourly traffic volume is listed first, with the number of heavy vehicles recorded during each respective peak hour included in parenthesis.

These vehicular counts at the interchange ramp terminals, in conjunction with the existing traffic volume information provided by MoDOT, were used to determine the mainline traffic volumes on I-49 during the critical A.M. and P.M. peak hours. The existing Average Daily Traffic (ADT) volume on I-49 is currently about 37,000 vehicles per day (vpd) south of the existing Highway J/C interchange, and approximately 39,000 vpd to the north of this interchange. Currently, the design hourly volume percentage is approximately 9% and a 17% heavy vehicle composition uses I-49. The predominant directions of travel along the interstate corridor were determined to be northbound in the morning and southbound in the evening. The resulting I-49 mainline and interchange ramp traffic volumes at the Highway J/C and North Cass Parkway locations are shown in detail on the attached *Figure D-3*.

7.4. Construction Year Traffic Volumes

A reassignment process was performed in order to determine the traffic volume patterns that might be expected for the Construction Year 2015 design horizon, following construction of the proposed 211th Street interchange. The existing traffic counts at the Missouri Highway J/C interchange and at other city intersections within the study area were logically reassigned to allow vehicles to follow more direct routes and have additional access onto and from I-49 via the new 211th Street interchange location. In general, this reassignment process resulted in a traffic diversion of 30 to 35 percent of the traffic volume at the existing Missouri Highway J/C interchange during the critical weekday peak periods.

The resulting Construction Year traffic volumes during both the A.M. and P.M. peak hours are shown on ***Figures D-4 and D-5***, respectively, in the attached Appendix D. Likewise, the resulting I-49 mainline and interchange ramp traffic volumes at the Highway J/C, 211th Street, and North Cass Parkway locations are shown in detail on the attached ***Figure D-6***.

7.5. Trip Generation and Assignment Process

A copy of the approved *Peculiar Comprehensive Plan (2008)*, prepared by JEO Consulting Group, Inc., was obtained from the city. The future land use information and map provided in this report, and shown on ***Exhibit 7-1***, was utilized to divide the City of Peculiar into 76 individual development tracts. Typical land use assumptions and trip generation data available from the Institute of Transportation Engineers (ITE) was then used in order to determine the expected traffic production and attraction for each land tract at the Design Year 2035 horizon.

The development-generated trips were then distributed throughout the study area using specifically developed distribution patterns for the A.M. and P.M. peak periods, both with and without the 211th Street interchange. In this manner, turning movement volumes were calculated for the study intersections for each of the previously described conceptual improvement alternates.

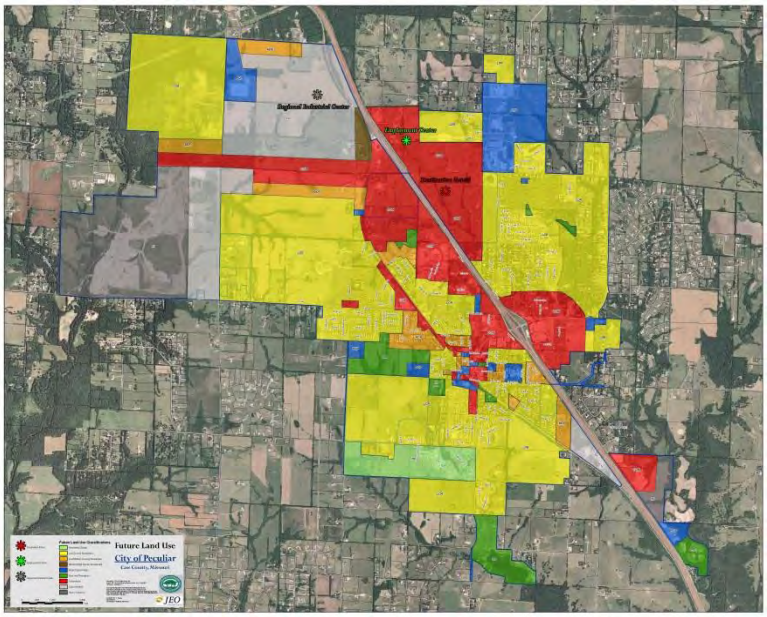


Exhibit 7-1 City of Peculiar Future Land Use Map

It should be noted that this traffic assignment process considered the impacts of all known and/or planned roadway improvements in the area. The assigned traffic volumes were then added onto the existing traffic count volumes in order to develop the future Design Year 2035 traffic volumes utilized in the analyses of each respective interchange configuration.

For further reference, a more detailed description of the trip generation, trip distribution, and traffic assignment process utilized for the purposes of this Access Justification study is provided on *Exhibit C-1* in the attached Appendix C.

7.6. Future Traffic Volumes

For each of these previously described interchange alternates, specific Design Year 2035 traffic volume figures have been prepared for the purposes of this Access Justification study and are depicted on the various figures included in the attached Appendix D. The following table lists each conceptual improvement alternative, and the corresponding figures on which its respective design volumes are shown.

	A.M. Volumes	P.M. Volumes
Standard Diamond (w/o 211th St.)(2035)	*Figure D-7*	*Figure D-8*
Diverging Diamond (w/o 211th St.)(2035)	*Figure D-7*	*Figure D-8*
SPUI (w/o 211th St.)(2035)	*Figure D-7*	*Figure D-8*
SPUI w/ Loop (w/o 211th St.)(2035)	*Figure D-9*	*Figure D-9*
Standard Diamond / DDI (w/ 211th St.)(2035)	*Figure D-11*	*Figure D-12*

Similarly, the projected I-49 mainline and interchange ramp traffic volumes for the peak hours under the Design Year 2035 conditions are shown in detail on the attached *Figure D-10*. The traffic volumes on this figure would be applicable with any of the first four conceptual improvement alternates without the proposed 211th Street interchange, when all development-generated traffic would be expected to utilize the existing Missouri Highway J/C interchange. When the proposed 211th Street interchange is added, the I-49 mainline and interchange ramp traffic volumes would be modified as reflected on the attached *Figure D-13*.

In order to determine the expected increase in the mainline I-49 traffic volumes for the Design Year 2035 scenarios, the historical traffic counts along the corridor were reviewed. Based on this data, mainline interstate volumes were inflated using an annual growth rate of two percent per year to the Year 2035 design horizon. Without the proposed 211th Street interchange, I-49 would be expected to carry approximately 59,000 vpd south of the existing Highway J/C interchange and about 67,000 vpd to the north of this interchange. When the proposed 211th Street interchange is added, the projected ADT volume on I-49 south of the Highway J/C interchange would be expected to remain at 59,000 vpd. However, the daily traffic volume on I-49 to the north of the new 211th Street access location would be expected to increase to about 75,000 vpd, as more traffic would be attracted onto the interstate corridor to utilize the additional access provided at the proposed 211th Street interchange.

7.7. Operational Analyses

Detailed operational analyses were completed for the existing conditions, as well as for each of the conceptual interchange improvement alternatives under the Design Year 2035 scenario. These completed analyses determined the expected LOS operations and vehicle queue lengths for the individual movements, and overall LOS at the signalized study intersections. For each analysis scenario, the A.M. and P.M. peak hour conditions were analyzed using Synchro and/or

SimTraffic. In addition, HCM-based analyses were completed to evaluate the operations of the I-49 mainline segments, as well as at the respective ramp merge and diverge areas.

In some cases, SimTraffic or VISSIM will report a significantly longer queue with a less favorable movement LOS than Synchro reports. Often, this results because simulation modeling programs like SimTraffic and VISSIM are more capable of modeling the interaction between adjacent intersections, as well as any cases where an auxiliary turn lane fills completely and turning vehicles overflow into the adjacent through lane. HCM-based analysis procedures, such as Synchro, assume an infinite amount of storage when calculating the expected queue length for a particular movement. In these cases, the SimTraffic and/or VISSIM software packages provide a more accurate prediction of the expected operational conditions, and were utilized for these reasons in this Access Justification study.

7.7.1 Existing Conditions

Synchro results for the existing A.M. and P.M. peak hours are shown on *Figure E-1* in the attached Appendix E. Similarly, the results of the completed SimTraffic analyses for the existing peak hour conditions are shown on *Figure E-2*. All study intersections are indicated to currently operate at LOS "B" or better, with most individual movements at LOS "D" or better. Queue lengths indicated by the completed analyses would generally be manageable. However, it should be noted that these completed analyses represent the average vehicle delay results over each respective critical peak hour.

MoDOT's recent addition of the westbound right-turn lane at the northbound I-49 ramps with Missouri Highway J/C seems to have mitigated some of the occasional backups through the adjacent School Road intersection that were previously observed by GBA personnel during the 2008 data collection process, particularly during the A.M. peak hour. However, while completing the 2012 intersection turning movement counts, GBA personnel continued to observe at least short-term periods of vehicle congestion and queuing within the interchange area when traffic still spilled back into the adjacent outer road and local street intersections.

Finally, the results of the HCS analyses for the existing I-49 corridor are depicted on *Figure E-3*. All of the existing I-49 freeway segments, merges, and diverge areas are currently indicated to be operating at LOS "D" or better, as shown on this figure and in the "Existing" column on the following *Table 7-1*.

Table 7-1 Interstate-49 Corridor - HCS Levels of Service							
Traffic Volume Scenario		Existing	Const. Year	Future Without 211th Street Interchange		Future With 211th Street Interchange	
Geometric Configuration		Existing	Const. Year	Existing	Improved	Existing	Improved
Report Figure		Fig. E-3	Fig. E-7	Fig. E-16	Fig. E-16	Fig. E-27	Fig. E-27
Peak Hour Condition		A.M./P.M.	A.M./P.M.	A.M./P.M.	A.M./P.M.	A.M./P.M.	A.M./P.M.
Southbound I-49							
	Segment north of N. Cass Parkway	A/C	A/C	D/F	B/C	D/F	C/D
	Diverge to N. Cass Parkway	B/C	B/C	D/F	X/X	D/F	X/X
	Segment at N. Cass Parkway	A/C	A/C	C/C	-/-	C/C	-/-
	Merge from N. Cass Parkway	B/C	B/C	C/D	-/-	D/E	D/D
	Segment between N. Cass Pkwy. & 211th St.	B/C	A/C	C/D	-/-	D/E	-/-
	Diverge to 211th Street	-/-	B/C	-/-	-/-	D/E	C/D
	Segment at 211th Street	-/-	A/C	-/-	-/-	B/D	-/-
	Merge from 211th Street	-/-	B/C	-/-	-/-	C/D	-/-
	Segment between 211th Street & Hwy. J/C	A/C	A/C	C/D	-/-	C/E	-/-
	Diverge to Hwy. J/C	B/D	B/C	D/E	C/D	C/E	B/D
	Segment at Hwy. J/C	A/B	A/B	B/B	-/-	B/C	-/-
	Merge from Hwy. J/C	B/C	B/B	B/D	-/-	B/D	-/-
	Segment south of Hwy. J/C	A/B	A/B	B/D	-/-	B/D	-/-
Northbound I-49							
	Segment south of Hwy. J/C	B/B	B/A	C/B	-/-	C/B	-/-
	Diverge to Hwy. J/C	B/B	B/B	D/C	-/-	D/C	-/-
	Segment at Hwy. J/C	B/A	B/A	B/A	-/-	C/B	-/-
	Merge from Hwy. J/C	C/B	C/B	D/C	-/-	D/C	-/-
	Segment between Hwy. J/C & 211th Street	C/B	C/A	D/C	-/-	D/C	-/-
	Diverge to 211th Street	-/-	C/B	-/-	-/-	D/C	-/-
	Segment at 211th Street	-/-	B/A	-/-	-/-	D/B	-/-
	Merge from 211th Street	-/-	C/B	-/-	-/-	D/D	-/-
	Segment between 211th St. & N. Cass Pkwy.	C/B	C/B	D/C	-/-	E/D	-/-
	Diverge to N. Cass Parkway	C/B	C/B	D/C	-/-	E/D	D/D
	Segment at N. Cass Parkway	C/A	C/B	B/B	-/-	C/C	-/-
	Merge from N. Cass Parkway	C/B	C/B	E/D	X/X	E/D	X/X
	Segment north of N. Cass Parkway	C/B	C/B	E/D	C/B	F/E	C/C
					X = 3rd Highway Lane Provided		

7.7.2 Construction Year Conditions

Synchro results for the A.M. and P.M. peak hours under the Construction Year scenario are shown on *Figures E-4 and E-5* in the attached Appendix E, respectively. The results of the completed VISSIM simulation analyses for these projected peak hour conditions are shown on the attached *Figure E-6*. These analyses included the addition of the 211th Street intersection, with the preferred diverging diamond configuration. As shown on these figures, and in *Table 7-2* provided below, all study intersections would be expected to operate at LOS "C" or better, with all individual movements at LOS "D" or better.

Table 7-2 Construction Year Levels of Service					
	Lanes on Bridge	Synchro		VISSIM	
		A.M.	P.M.	A.M.	P.M.
Southbound I-49/Hwy. C	3	B	B	n/a	n/a
Northbound I-49/Hwy. J		A	A	n/a	n/a
School Road/Hwy. J		U[1]	U[1]	n/a	n/a
Peculiar Dr.		U[1]	U[1]	U[1]	U[1]
Southbound I-49/211th St.	6	C	C	A	B
Northbound I-49/211th St.		A	A	A	A
Frontage Rd.		U[1]	U[1]	U[1]	U[1]
		[1] Unsignalized Intersection			
		n/a = Not Analyzed			

Likewise, the results of the HCS analyses for the I-49 corridor under the Construction Year scenario are depicted on *Figure E-7*. All of the existing I-49 freeway segments, merges, and diverge areas were indicated to operate at LOS "C" or better, as shown on this figure and in the "Construction Year" column on *Table 7-1*.

7.7.3 Design Year 2035 Conditions

The LOS operations and expected vehicle queue lengths were analyzed under the Design Year 2035 traffic volume conditions for all potential interchange configurations, both with and without the proposed 211th Street interchange, for the purposes of this Access Justification study. More detailed discussions about the results of these completed operational analyses are provided in the following section of this report (i.e., Section 7.8 – Comparison of Alternatives).

Operational analyses were completed for each of the four conceptual improvement alternatives at the existing I-49 interchange with Missouri Highway J/C, without the addition of the proposed interchange at 211th Street. These analyses utilized the Synchro software program, as well as the SimTraffic simulation program when required. The results of these Synchro / SimTraffic analyses are depicted on *Figure E-8* through *Figure E-15* in the attached Appendix E.

Likewise, several alternative configurations were also analyzed when the proposed 211th Street interchange was included. Again, the Synchro and SimTraffic software programs were used to obtain the analysis results for these scenarios, as depicted on *Figure E-17* through *Figure E-24* in the attached Appendix E.

For the preferred diverging diamond interchange configuration proposed at the 211th Street location onto I-49, more detailed VISSIM simulation models were also prepared. The summary results from these VISSIM models for the future A.M. and P.M. peak hour conditions are depicted on *Figure E-25*. Finally, *Figure E-26* depicts the detailed results for the SIDRA analysis completed to analyze a roundabout interchange alternative at the 211th Street location.

7.8. Comparison of Alternatives

The existing I-49 interchange with Missouri Highway J/C cannot be expected to adequately serve the expected future traffic demands with its current lane geometrics. Therefore, three conceptual improvement alternates without a 211th Street interchange were evaluated in lieu of a true "No Build" alternative, in addition to the proposed 211th Street interchange alternative. All of the improvement alternates have been compared for the purposes of this Access Justification study in order to determine the optimum improvement alternative that would be expected to satisfy the future traffic demands within the study area.

7.8.1 Without 211th Street Interchange

The following paragraphs describe the expected LOS operations and vehicle queue lengths for the various alternative interchange types at the existing Highway J/C location onto I-49.

Standard Diamond – The operational analyses of this alternative during the A.M. and P.M. peak hours under the projected Design Year 2035 traffic conditions are summarized on *Figure E-8* in the attached Appendix E. Even with significant geometric improvements, LOS "F" intersection and movement operations would be expected within the I-49 and Missouri Highway J/C interchange, particularly during the P.M. peak hour conditions. The completed analyses assumed three through lanes in both directions along Missouri Highway J/C, advanced left-turn lane entries, and triple left-turn lanes at some locations. In order to provide acceptable traffic operations with this interchange configuration, improvements beyond those shown on the figures, such as a fourth through lane in each direction along Missouri Highway J/C, would actually be necessary. Therefore, it can be seen that failing traffic operations and unacceptable vehicle queuing conditions ultimately result from this alternative. These operational and queuing conditions would not be expected to improve significantly even if the existing School Road intersection with Missouri Highway J could be relocated eastward farther away from the interchange.

It should be noted that this interchange configuration was analyzed with Synchro only. This configuration was determined to be over-capacity to the point that in the SimTraffic simulations excessive numbers of vehicles were denied entry into the roadway, and queues backed up for the entire length of the input links. The Synchro results shown on *Figure E-8* offer enough evidence to indicate that this interchange alternative will not operate adequately under the future traffic demands. Therefore, further detailed analysis was not completed with either the SimTraffic or VISSIM simulation modeling programs.

Single Point Urban Interchange – Operational analyses for this improvement alternate at the I-49 and Missouri Highway J/C interchange are summarized on *Figures E-9 and E-10*. This alternate would include the construction of a single-point intersection to replace the two standard diamond ramp intersections within the existing interchange. However, the intersection of School Road with Missouri Highway J would require relocation eastward, a traffic signal, and significant geometric widening. In order to serve the southbound right-turn movement at the intersection of Missouri Highway J with School Road, two free-flow turning lanes would be required. This configuration results in a 12-lane section between the School Road interchange and the adjacent interchange along Missouri Highway J, which may not be feasible to construct.

As shown on the figures, both the Synchro and SimTraffic analyses indicate various LOS and queuing deficiencies, even with the significant numbers of lanes provided. LOS "F" operations are indicated for various traffic movements, particularly during the P.M. peak hour. Queues in excess of 1,000 feet in length are predicted for several movements.

Single Point Urban Interchange with Loop – Operational analyses for this improvement alternate at the I-49 and Missouri Highway J/C interchange are summarized on *Figures E-11 through E-14* in the attached Appendix E. The single-point intersection would again combine the two standard diamond ramp intersections within the existing interchange, and the underpass loop roadway would limit the adjacent School Road intersection to right-in, right-out maneuvers.

All lanes that could be reasonably constructed were added within this alternative interchange configuration. Even with three though lanes in each direction along the Missouri Highway J/C corridor and triple left-turn lanes entering and exiting I-49, LOS "F" operations would still be expected for various movements within the network. As discussed previously, some of the vehicle queues reported by the Synchro program on *Figure E-12* exceed the available storage lengths. Therefore, the SimTraffic analyses shown on *Figures E-13 and E-14* may offer a more realistic depiction of the expected queues and traffic operations.

Diverging Diamond Interchange – The results of the operational analyses for this alternative configuration at the Highway J/C interchange are summarized on *Figure E-15* in the attached Appendix E. The completed analyses indicated that an eight-lane DDI configuration would be required. Even with reconfiguration of this interchange, some poor operations and vehicle queuing conditions would be expected, particularly during the P.M. peak hour. Vehicle queuing between the northbound I-49 ramps and the School Road intersection would be problematic if it remained near its existing location, and lengthy vehicle queues might also be expected on the I-49 off-ramps as vehicles utilized this single access point to the City of Peculiar.

The following summary in *Table 7-3* provides the results of the Synchro and SimTraffic analyses completed for the four alternative interchange configurations at Highway J/C, without the proposed 211th Street interchange onto I-49:

Table 7-3 Future Levels of Service Without 211th Street Interchange						
Hwy. J/C Interchange Configuration		Lanes on Bridge	Synchro		SimTraffic	
			A.M.	P.M.	A.M.	P.M.
Standard Diamond (Figure E-8)						
	Southbound I-49/Hwy. C	12	B	C	n/a	n/a
	Northbound I-49/Hwy. J		B	D[2,3]	n/a	n/a
	School Road/Hwy. J		C[3]	F[2,3]	n/a	n/a
Single-Point Urban Interchange (Figures E-9 and E-10)						
	Single Point I-49/Hwy. J/C	9	B	C	F[2,3]	E[2,3]
	School Road/Hwy. J		C	E[2,3]	C	D[2,3]
Single-Point Urban Interchange with Loop (Figures E-11 to E-14)						
	Single Point I-49/ Hwy. J/C	9	B	C	C	F[2,3]
	School Road/Hwy. J		U[1]	U[1,2,3]	U[1]	U[1]
	North School/Loop Road		C	C	F[2,3]	E[2,3]
	South School/Loop Road		C	C	D[2,3]	B
Diverging Diamond Interchange (Figure E-15)						
	Southbound I-49/Hwy. C	8	B[2]	C[2,3]	n/a	n/a
	Northbound I-49/Hwy. J		A	C[2,3]	n/a	n/a
	School Road/Hwy. J		C[2]	D[2,3]	n/a	n/a
						[1] Unsignalized Intersection
						[2] One or more movements with LOS "F"
						[3] One or more movements with excessive queues
						n/a = Not Analyzed

<u>I-49 Corridor</u> – For each of the previously discussed improvement alternates, no interchange was included at the 211th Street location, and the existing Missouri Highway J/C interchange served as the sole access point from the City of Peculiar onto I-49. The projected Design Year 2035 traffic volumes during the A.M. and P.M. peak hours are shown on ***Figure D-10*** for this condition. Similarly, the HCS-based operations for each mainline highway section and all ramps areas are shown on the attached ***Figure E-16*** and are also summarized in ***Table 7-1***. On this figure and summary table, the analysis results for the existing four-lane configuration on I-49 are depicted.

With its current four-lane highway configuration, poor LOS "E" or "F" traffic operations would be expected for the two-lane I-49 freeway segments and the merge / diverge areas on the north end of the North Cass Parkway interchange in the predominant directions of travel (i.e., northbound during the A.M. peak hour, and southbound during the P.M. peak hour). As shown on ***Figure E-16***, these conditions can be mitigated through the addition of a third mainline lane in each direction between this interchange and the adjacent Missouri Highway 58 location. The ramp diverge movement at the existing Missouri Highway J/C interchange would also be expected to experience LOS "E" operations during the P.M. peak hour under these conditions,

but would operate at acceptable levels with minor construction to lengthen the auxiliary lane from its existing 400-foot length to at least 700 feet.

The North Cass Parkway interchange has been previously identified by MoDOT as being the expected southern end of a future six-lane cross-section along the I-49 corridor, so these identified widening improvements would remain consistent with those future plans for this facility. In fact, a project to widen I-49 from 155th Street southward to North Cass Parkway is already approved and on the LRTP and TIP project lists maintained by MARC, and the project is also on MoDOT's State-wide TIP listing.

7.8.2 With 211th Street Interchange

The following paragraphs describe the expected LOS operations and vehicle queue lengths for the various alternate interchange types with the addition of the proposed 211th Street interchange onto I-49. *Figures E-17 through E-26* depict the results of these completed operational analyses.

Two Standard Diamonds – The results of the Synchro and SimTraffic operational analyses of the projected conditions throughout the study area, with the addition of a standard diamond interchange onto I-49 at 211th Street, are summarized in the attached Appendix E on *Figures E-17 through E-22*.

Overall, this improvement alternate provides more satisfactory operations than any of the previously discussed options that do not include an interchange at 211th Street. Neither the Synchro nor SimTraffic analyses predict less than LOS "D" overall operations at any study intersection, under either the A.M or the P.M. traffic volume conditions. While the SimTraffic analyses indicates that a few individual movements along the 211th Street corridor would be expected to operate at LOS "F" during the P.M. peak hour conditions, vehicle queues were found to be generally acceptable. Synchro calculations projected LOS "E" or better traffic operations for all overall intersections and individual movements, with reasonable vehicle queuing.

Highway J/C: While several lane additions would still be required to provide an eight- or nine-lane cross-section through the existing Missouri Highway J/C interchange in order to serve the significant growth projected in the city and study area, the scope of these geometric improvements is much more reasonable than for any of the previously discussed alternates that did not include the proposed 211th Street interchange. *Figures E-17 through E-20* depict the results of these operational analyses with the School Road intersection in its current location about 300 feet to the east of the existing interchange.

As shown on the attached *Figures E-21 and E-22*, the required improvements east of the Missouri Highway J/C interchange with I-49 could be slightly reduced if the existing School Road intersection could be relocated eastward farther away from the interchange. Because increased vehicle queuing distances would be available between the adjacent intersections with the relocation of School Road eastward, fewer through lanes would be required on Missouri Highway J, as shown on these figures. However, this intersection relocation could be a costly improvement to implement, requiring coordination with and/or acquisition of the several existing

commercial properties located along this segment of the Missouri Highway J corridor, as well as realignments of several adjacent city streets.

The results of the completed analyses for these two diamond interchange alternates at the existing Highway J/C interchange are summarized below in *Table 7-4*:

Table 7-4 Future Levels of Service With 211th Street Interchange						
Hwy. J/C Interchange Configuration		Lanes on Bridge	Synchro		SimTraffic	
			A.M.	P.M.	A.M.	P.M.
Standard Diamond w/ Existing School Road (300') (Figures E-17 to E-20)						
	Southbound I-49/Hwy. C	9	B	C	B	C
	Northbound I-49/Hwy. J		B	B	B	B
	School Road/Hwy. J		C	B	C	B
Standard Diamond w/ Relocated School Road (950') (Figures E-21 and E-22)						
	Southbound I-49/Hwy. C	8	n/a	n/a	B	C
	Northbound I-49/Hwy. J		n/a	n/a	B	C
	School Road/Hwy. J		n/a	n/a	C	B
Diverging Diamond (Figures E-23 and E-24)						
	Southbound I-49/Hwy. C	6	B	B	n/a	n/a
	Northbound I-49/Hwy. J		A	B	n/a	n/a
	School Road/Hwy. J		B	B	n/a	n/a
			n/a = Not Analyzed			

211th Street: The completed capacity analyses indicated that the ultimate configuration of the 211th Street corridor may need to include three through lanes at several of the study intersections, as well as dual left turn lanes at most locations. Again, the completed SimTraffic analyses indicate that a few individual movements along the 211th Street corridor would still operate at LOS "F" during the P.M. peak hour conditions, but vehicle queues were found to be acceptable. Synchro calculations projected LOS "D" or better traffic operations for all overall intersections and LOS "E" or better for all individual movements, with reasonable vehicle queuing. The results of these analyses are summarized in *Table 7-5* on the following page.

Two Diverging Diamonds – Supplemental analyses were also completed to evaluate diverging diamond interchange alternatives at both the existing Highway J/C interchange and the proposed location of the 211th Street interchange onto I-49. Preliminary Synchro analyses were first completed for both interchange locations, as depicted on *Figures E-23 and E-24*.

Highway J/C: As shown on these figures and in *Table 7-4* above, a six-lane diverging diamond configuration would be expected to adequately handle the future traffic demand when an interchange is also provided onto I-49 at 211th Street. This option likely represents the most feasible interchange configuration, given the existing right-of-way constraints and adjacent commercial properties at this location. However, it should be noted that no immediate improvements are planned by MoDOT at the Highway J/C interchange, nor is there an interchange improvement project on the currently approved LRTP listing. While it may be

possible to add signalization at the intersection of Missouri Highway J with School Road as a MoDOT maintenance activity, the city and/or future developers would be expected to fund the remaining geometric improvements indicated at this intersection.

211th Street: With a six-lane diverging diamond interchange at 211th Street, the completed Synchro analyses indicated that all overall intersections would be expected to operate at LOS "D" or better. A few individual movements at the adjacent outer road intersections would be expected to operate at LOS "E" under these conditions, particularly during the P.M. peak hour. Within the 211th Street DDI interchange, the westbound movements at the southbound ramp terminal would operate at LOS "E" during the A.M. peak hour, as would the southbound off-ramp left-turn movement during the P.M. peak hour. The results of these Synchro analyses are summarized in *Table 7-5* below.

In addition, more detailed simulation modeling was also completed for the proposed 211th Street diverging diamond interchange utilizing the VISSIM software, and the results depicted on *Figure E-25* likely offer better predictions of the expected levels of service and vehicle queuing under these future conditions. As shown on these figures, the completed VISSIM simulations indicate that all overall intersections would be expected to perform at LOS "D" or better under the projected future conditions, with a few isolated LOS "E" and "F" movements at the adjacent local road intersections, particularly during the critical P.M. peak hour. The results of these operational analyses using VISSIM are also included in *Table 7-5*.

Table 7-5
Future Levels of Service With 211th Street Interchange

211th Street Interchange Configuration	Lanes on Bridge	Synchro		SimTraffic		VISSIM		SIDRA	
		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
Standard Diamond (Figures E-17 to E-22)									
211th Street and Peculiar Road		C	D	C	D[2]	n/a	n/a	n/a	n/a
211th Street and Southbound I-49	8	B	B	B	B	n/a	n/a	n/a	n/a
211th Street and Northbound I-49		B	B	B	C	n/a	n/a	n/a	n/a
211th Street and Frontage Road		B	C	B	D[2,3]	n/a	n/a	n/a	n/a
211th Street and School Road		C	C	C	C	n/a	n/a	n/a	n/a
Diverging Diamond Interchange (Figures E-23 through E-25)									
211th Street and Peculiar Road		C	D	n/a	n/a	C	D	n/a	n/a
211th Street and Southbound I-49	6	D	C	n/a	n/a	C	C	n/a	n/a
211th Street and Northbound I-49		B	B	n/a	n/a	B	C	n/a	n/a
211th Street and Frontage Road		C	D	n/a	n/a	B	C[2]	n/a	n/a
Roundabouts (3-Lane) (Figure E-26)									
211th Street and Southbound I-49	6	n/a	n/a	n/a	n/a	n/a	n/a	A	D[2]
211th Street and Northbound I-49		n/a	n/a	n/a	n/a	n/a	n/a	A	E[2]

[2] *One or more movements with LOS "F"*

n/a = Not Analyzed

Roundabout Interchange at 211th Street – Supplemental analyses were also completed at the proposed interchange location at 211th Street onto I-49, as shown on the attached *Figure E-26*. These analyses were completed using the SIDRA analysis software, as stated previously. The completed SIDRA analyses determined that at least three-lane roundabouts would be required at these interchange terminals, as indicated on the figure and in *Table 7-5*. Even with three circulating lanes in these large roundabouts, the future traffic volumes during the critical peak hours would be expected to exceed the available roundabout capacity. Despite predicted roundabout operations of LOS "E" or better under the projected future traffic conditions, the completed SIDRA analyses indicated these roundabouts would be operating in saturated conditions, with volume / capacity ratios at or above 1.00. Typically, traffic operations become unstable at volume / capacity ratios higher than 0.80 or 0.85. As roundabouts are also especially susceptible to gridlock, their use at the proposed 211th Street interchange location would not be recommended.

I-49 Corridor – The attached *Figure E-27* in Appendix E depicts the expected traffic operations along the I-49 corridor for the mainline segments and ramp areas with the existing four-lane configuration, respectively. With the construction of the proposed interchange at 211th Street, a significant amount of development-generated traffic would be diverted away from the Missouri Highway J/C interchange location. With a more even distribution of the traffic from within the City of Peculiar, most segments and merge / diverge areas along the I-49 study corridor would be expected to experience LOS "D" or better operations with a four-lane highway, as shown on the figure and also summarized in *Table 7-1*.

With the existing four-lane interstate configuration, there would still be a few mainline freeway segments with LOS "E" operations in the predominant travel directions during the peak hours. The addition of a third mainline lane in each direction on I-49 between the North Cass Parkway interchange and the adjacent Missouri Highway 58 interchange to the north would be expected to mitigate any operational concerns along I-49 at the northern end of the study corridor. Additionally, there are a few more ramp auxiliary lanes at the existing North Cass Parkway and Highway J/C interchanges that may need to be extended from their current lengths in order to provide improved traffic operations under this future traffic volume scenario. To the south of the North Cass Parkway interchange, the throughput capacity issues identified cannot be addressed without the widening of I-49 to provide six mainline lanes. Such a significant improvement is beyond the scope of the current interchange project.

8.0 ACCESS CONNECTIONS AND PROPOSED DESIGN

FHWA AJR Policy Point 4: Access Connections and Design

"The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2), and 655.603(d)."

8.1. Access Connections and Ownership

The conceptual study that has been developed for the recommended 211th Street interchange configuration would provide full access of movements between 211th Street and I-49. In turn, full access would be provided to other arterial and collector roads that would serve the expected developments within the vicinity of the proposed interchange, including Missouri Highway J, School Road, Peculiar Drive, and Harper Road. On a more regional scale, the 211th Street interchange is also envisioned to help create an east-west arterial corridor through the northern portions of Cass County into Kansas.

Of these nearby roadways, MoDOT currently owns and maintains Peculiar Drive (Old Highway 71) and Missouri Highway J, in addition to I-49. The 211th Street corridor is currently a public roadway between School Road and Harper Road, with various sections owned by either the city or county. The entire 211th Street study corridor is expected to come under ownership of the city, pending the outcome of an ongoing annexation process for several of the properties adjacent to this project. MoDOT would retain full control of access along 211th Street through the proposed interchange between the intersections with Peculiar Drive and the Northeast Outer Road.

8.2. Proposed Interchange Designs

The proposed ramp improvements along the I-49 study corridor are shown on the attached *Exhibit B-5*. Initially, standard ramps will be constructed in association with the 211th Street interchange, with ramps between 650 and 1,050 feet in length based on the completed HCS analyses. These proposed lengths for the interchange ramps meet or exceed both MoDOT and AASHTO design standards. These initial proposed interchange improvements are shaded on the exhibit. As traffic volumes continue to increase on I-49, the operational analyses completed for this Access Justification study indicate that lengthening of several existing ramps at the adjacent Missouri Highway J/C and North Cass Parkway interchanges may be necessary. These potential future ramp improvements are shown with a diagonal hatch on the exhibit.

It is likely that I-49 will need to be widened to a six-lane freeway facility north of the North Cass Parkway interchange in order to handle the future traffic demands. Again, a widening project is currently on the approved LRTP list for scoping by MoDOT to provide these freeway improvements. Eventually, it may be necessary to extend this six-lane freeway configuration farther southward along the I-49 study corridor. As shown on *Figure E-27* in the attached Appendix E, LOS "E" operations are expected for several of the two-lane mainline freeway segments along the I-49 corridor at the Design Year 2035 horizon and could indicate that freeway widening may be justified shortly thereafter. Therefore, as a practical design consideration, the proposed 211th Street bridges over I-49 will be constructed in such a manner to allow for possible six-lane widening within the existing median area, should the need arise for this improvement in the future.

An alignment study also completed by GBA has evaluated the potential impacts and benefits of several different horizontal and vertical alignments for the proposed 211th Street corridor. As shown on *Exhibit 8-1* on the following page, various horizontal alignments were considered to minimize the cost of bridge structures related to the skew between roadways and to reduce the detrimental environmental impacts due to adverse stream crossings. Horizontal alignment "F" emerged from this study as the preferred design option for the 211th Street corridor.

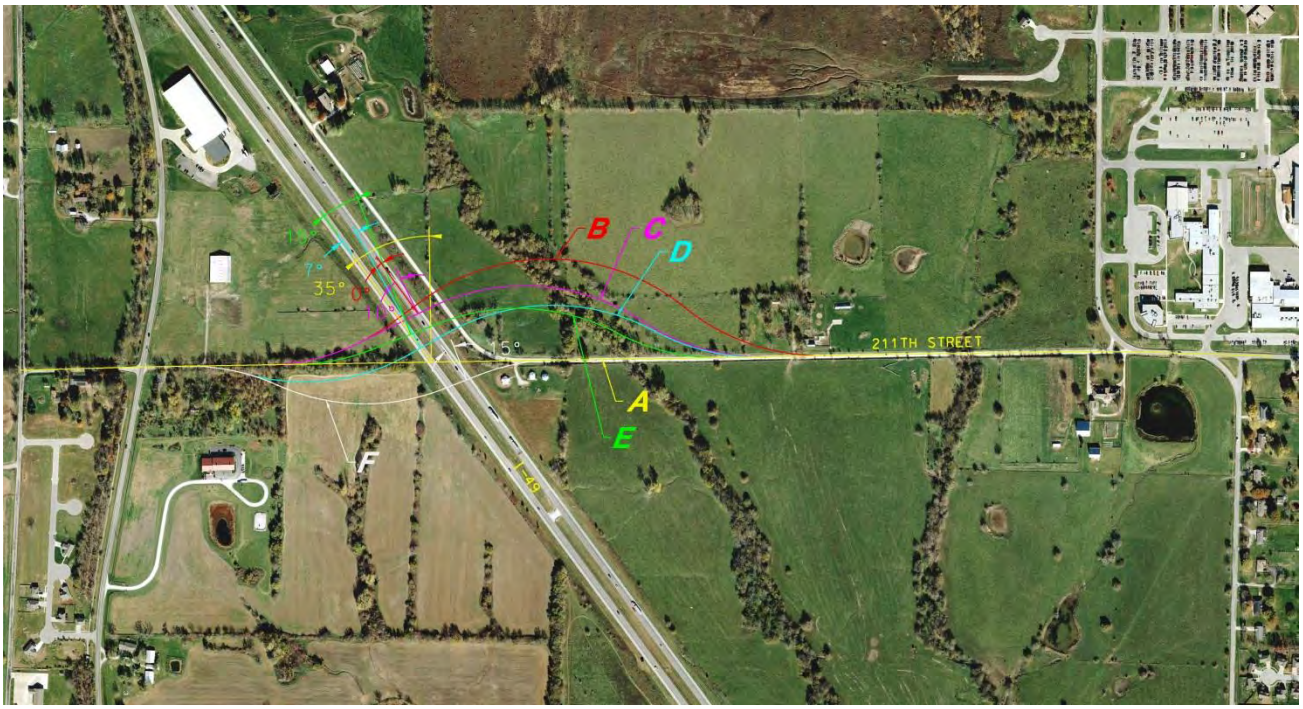


Exhibit 8-1 211th Street Horizontal Alignment Alternatives

The recommended roadway network configuration, along with center to center distances between adjacent intersections, is shown on *Exhibit B-4*. In conjunction with a locally-funded city/county project, the existing intersection of 211th Street with School Road will be converted into a pair of split "T"-type intersections, as shown on *Exhibit F-1*. This improvement will establish 211th Street as the priority through route over School Road between the Peculiar Drive and Missouri Highway J intersections. With these proposed modifications, existing access would be maintained to the Ray-Pec school district complex and the adjacent residential neighborhoods.

All ramps and roadways associated with the proposed 211th Street interchange will be designed and built to meet both MoDOT and AASHTO geometric criteria. A design speed of 50 miles per hour (mph) was used for the layouts of all interchange ramps, with a maximum of six degrees of curvature. A design speed of 35 mph was used for the layout of 211th Street through the interchange. The maximum vertical grades on the proposed ramps would be 6.0% either upward or downward. The projected heavy vehicle percentages used for the design of the proposed interchange were 17% on I-49 and 5% along the 211th Street corridor. In summary, no design exceptions are anticipated in order to accommodate the proposed interchange configuration.

The attached *Exhibits F-2 and F-3* show the proposed roadway typical sections along 211th Street, for the interchange ramps, and on the East Outer Road. *Exhibit F-4* provides additional design details within the proposed interchange area, while *Exhibit F-5* depicts the proposed profile grade along 211th Street through the interchange. Similarly, *Exhibit F-6* depicts the proposed profile grades for the northbound and southbound ramps, with the preferred overpass alignment. As shown on these exhibits, the recommended profile would create an overpass of 211th Street over the current I-49 profile alignment. Based on the surrounding terrain, completed geotechnical

investigations, and other drainage / environmental concerns, constructing 211th Street over I-49 would be preferred. Although more borrow material may be required in order to construct an overpass interchange with allowable clearances over I-49, this option avoids the need to excavate a significant amount of hard shale on the western side of the interstate corridor. Another primary advantage of this overpass design is that I-49 mainline traffic will be minimally impacted during construction of the proposed interchange and the 211th Street bridges. In addition, overpass interchange configurations typically require shorter on-ramps to allow entering traffic to accelerate and achieve the speeds necessary to merge with the adjacent mainline traffic. The recommended DDI overpass interchange alternative is depicted on *Exhibit 8-2* below.

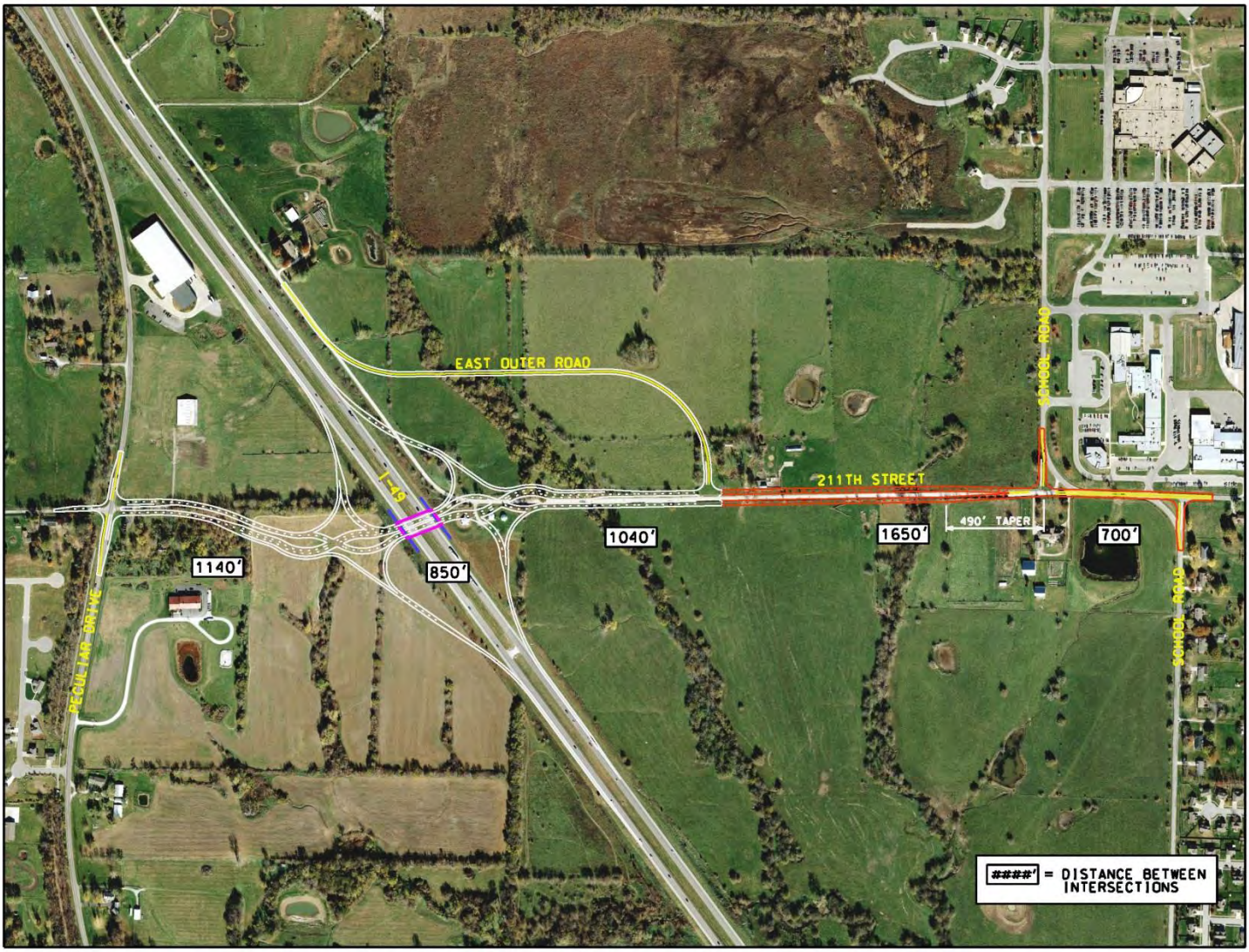


Exhibit 8-2 Preferred 211th Street DDI Configuration on I-49

From an overall project perspective, the interchange improvements required to handle the future traffic projections at this location will generally be provided during the initial construction project. Only minor turn lane extensions or ramp widening should be needed to provide the ultimate geometry within the interchange area. The 211th Street overpass bridges will also be designed and constructed to accommodate any future I-49 mainline widening that might eventually be

required. Along the 211th Street corridor, it is recommended that the right-of-way amounts needed to accommodate the ultimate roadway configuration be acquired in association with the initial interchange / road construction project to minimize the overall project costs.

However, it is expected that a slightly reduced roadway cross-section will initially be constructed on 211th Street between Peculiar Drive and School Road. In general, a six-lane roadway cross-section will first be provided along 211th Street, with an expected capacity of between 30,000 and 35,000 vpd (i.e., about 75% to 80% of the projected Design Year 2035 volumes). The initial 211th Street roadway configuration will be designed and located in a manner that ensures its compatibility with the ultimate lane needs along the corridor. As shown on *Exhibit 8-2* above and on *Exhibit F-7* in the attached Appendix F, reasonable and safe tapered transitions will also be utilized to make connections to the planned/reconfigured School Road intersections, while also minimizing construction of temporary pavements. If allowed by the available project budgets, 211th Street will be constructed as a four-lane road for the entire length of project to School Road.

Future widening and intersection improvements will then be needed whenever adjacent land use development occurs to expand the corridor to the ultimate configurations that have been determined by the operational analyses completed within this report. It is expected that other funding mechanisms, such as Tax Increment Financing (TIF) or Transportation Development Districts (TDD), will be utilized by the city and developers to add these future required lanes, when needed. In addition, the five-mile long 211th Street corridor segment between Missouri Highway J and Missouri Highway Y has already been identified on the MARC LRTP listing as a regionally significant transportation improvement and will be eligible for future state or federal funding assistance.

With the existing and proposed spacing of interchanges along the I-49 corridor, and the available widths of the existing right-of-way along the corridor, there appear to be adequate opportunities for the proper design and placement of guide signing for the proposed 211th Street interchange. It is anticipated that all of the sign installations will be of the ground-mounted variety. There will be some guide sign interaction expected between the existing Highway J/C and proposed 211th Street interchanges, given the approximate 1.5-mile spacing distance, as shown on the conceptual signing plans provided on *Exhibits F-8A and F-8B* in the attached Appendix F.

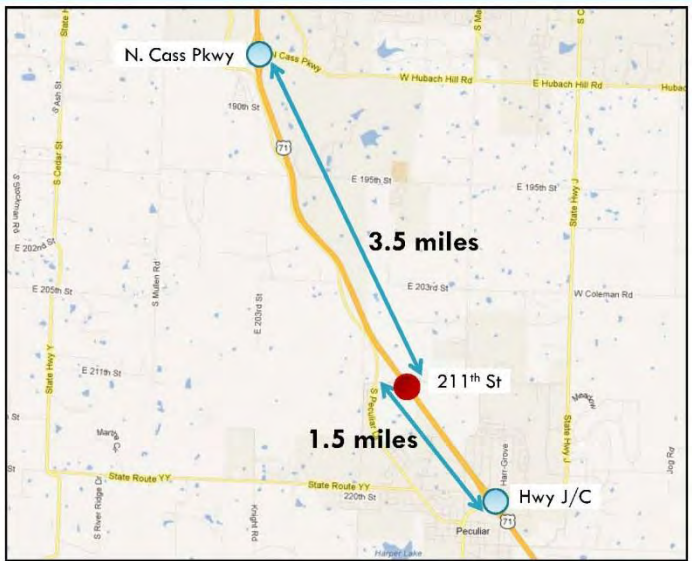


Exhibit 8-3 Adjacent Interchange Spacing

8.3. Access Management

The practice of access control typically utilizes raised medians and islands in order to restrict driveway access near to an intersection and/or prevent some vehicle turning movements within the intersections along a roadway segment. Access control measures are typically employed to improve both the traffic operations at the intersections, as well as improve the roadway safety by prohibiting dangerous turning maneuvers.

Currently, there are no access control restrictions along any of the existing sections of 211th Street within the study area. The existing Highway J/C interchange also currently provides full access for vehicular movements at that location, since no raised medians are provided. Likewise, full access is currently allowed along all of the other arterial and collector streets that will be expected to serve the expected growth and development along the 211th Street corridor.

The preliminary layouts that have been developed for the recommended 211th Street diverging diamond interchange configuration in this AJR will allow full, unrestricted vehicular movements between I-49 and the 211th Street corridor. In addition, separation of the east-west vehicular traffic will be provided along 211th Street through the proposed DDI interchange area, with raised median barriers located between the signalized cross-over intersections.

As shown on *Exhibit 8-2*, it will not be possible to accommodate the 1,320' spacing recommended in MoDOT's "*Access Management Guidelines*" between the proposed southbound ramp terminals and Peculiar Drive. Between the northbound ramp terminals and the East Outer Road, intersection spacing will be maximized with consideration of impacts on the existing farmstead. Due to the close spacing of the planned intersections between School Road and Peculiar Drive, raised medians will be utilized to restrict any intermediate access drives that might be allowed in the future to only right-in, right-out vehicle movements. MoDOT intends to purchase limited access right-of-way in order to prevent any future modifications of the access control that will be provided by the initial interchange designs.

8.4. Bicycle and Pedestrian Accommodations

The 211th Street corridor will be designated as a bike route and will provide bike/trail facilities intended to promote non-vehicular traffic along this corridor. These facilities will enhance connectivity between the existing local neighborhoods and the Ray-Pec school campus, in addition to the anticipated future commercial and office centers in the vicinity of the proposed interchange. I-49 currently represents a major barrier to non-motorized travel, and the proposed interchange project will provide an overpass mitigating the effects of this existing barrier. Through the median of the recommended DDI interchange configuration, pedestrian and bicycles will travel across I-49 from one side of Peculiar to the other. In this manner, the neighborhoods, schools, and future developments will be interconnected with shorter, safer routes for all non-motorized road users.

8.5. Auxiliary Lane Needs

Based upon the completed HCS analyses of the I-49 freeway segments between the adjacent Highway J/C and 211th Street interchanges, it is not anticipated that any full-length auxiliary lanes will need to be included in the initial project designs. The proposed interchange will

include ramps designed with adequate lengths to serve the future design traffic conditions. Any future operational concerns within the merge/diverge areas at the existing Highway J/C and North Cass Parkway interchanges can be addressed with only minor auxiliary lane extensions.

The completed analyses did indicate that the southbound two-lane freeway segment between these adjacent interchanges would be expected to operate at LOS "E" during the future P.M. peak hour traffic condition. This future throughput capacity issue on I-49 cannot likely be addressed without the widening of the freeway to provide six mainline lanes. Such a significant improvement is beyond the scope of this current interchange project, but may need to be programmed and designed by MoDOT in the future, whenever it becomes appropriate to do so.

9.0 TRANSPORTATION AND LAND USE PLANS

FHWA AJR Policy Point 5: Transportation and Land Use Plan Compliance

"The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all requests for new or revised access must be included in an adopted Metropolitan Transportation Plan, in the adopted Statewide or Metropolitan Improvement Program (STIP or TIP), and the Congestion Management Process within transportation management areas, as appropriate, and as specified in 23 CFR part 450, and the transportation conformity requirements of 40 CFR parts 51 and 93."

The proposed interchange onto I-49 at the 211th Street location has been planned by the City of Peculiar for several years, and is indicated to be the city's highest transportation improvement priority in the latest adopted version of the *Peculiar Comprehensive Plan (2008)*, which is available from the city. City and county representatives also coordinated MoDOT District management and MARC officials to have the proposed interchange included on both the LRTP and TIP lists. The construction of the 211th Street interchange will likely be the primary catalyst for the expected development within the northern half of the City of Peculiar, as well as the surrounding parts of Cass County.

The City of Peculiar's adopted Comprehensive Master Plan and Future Land Use Maps (adopted in November 2008) indicate that significant commercial and industrial development is planned within the immediate vicinity of the proposed 211th Street interchange onto I-49, as well as along the entire 211th Street study corridor length within the city. The city's staff and residents desire to create a destination retail center located in the southeast quadrant of the proposed interchange, with large commercial / employment centers located immediately to the north across 211th Street. Another key component of the city's anticipated growth and economic development will be a regional industrial center that is planned for the northwest quadrant of the proposed interchange, where a significant amount of electrical power is already available to support any large-scale industrial users.

10.0 COMPREHENSIVE NETWORK STUDY

FHWA AJR Policy Point 6: Comprehensive Interstate Network Study

"In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan (23 U.S.C. 109(d), 23 CFR 625.2(a), 655.603(d), and 771.111)."

The proposed 211th Street interchange would be located on I-49 about 1.5 miles north of the existing Missouri Highway J/C interchange that currently serves the City of Peculiar. The next interchange to the north along I-49 is at the North Cass Parkway crossing, located approximately 3.5 miles north of the proposed 211th Street location. The recent access provided by the North Cass Parkway interchange will be expected to further accelerate the growth and development within the northern portions of Cass County. However, due to its distance from the projected growth centers in northern Peculiar, the North Cass Parkway interchange cannot be expected to attract and/or serve a significant amount of traffic from within the study area. There are currently no plans for other interchanges to be provided between the 211th Street and North Cass Parkway locations. However, the available segment distance between these locations would likely accommodate one additional interchange at a typical urban spacing interval that could provide benefits to the expected future traffic operations at both the North Cass Parkway and proposed 211th Street interchanges.

The operational analyses completed for the purposes of this Access Justification study have considered the impacts of the proposed 211th Street interchange upon these adjacent interchanges. The proposed interchange should have no adverse impacts upon the operations at either adjacent location. In fact, the addition of the proposed 211th Street interchange should allow for improved operations at the existing Missouri Highway J/C interchange, both now and in the future. Also, by providing an alternate access point onto I-49, less significant geometric improvements would be needed at the Missouri Highway J/C interchange to adequately serve the future traffic demands associated with expected growth within the City of Peculiar.

11.0 TRANSPORTATION SYSTEM IMPROVEMENTS

FHWA AJR Policy Point 7: Coordination with Transportation System Improvements

"When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements (23 CFR 625.2(a) and 655.603(d)). The request must describe the commitments agreed upon to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and Interstate access point (23 CFR 625.2(a) and 655.603(d))."

Based upon the significant growth that the City of Peculiar is expecting in the coming years, as indicated in the latest version of the *Peculiar Comprehensive Plan (2008)*, various improvements to the transportation infrastructure will be required in order to provide acceptable future traffic

operations. At this time, there are no specific improvement projects that have been programmed or planned within the study area by either the city or MoDOT. However, both entities recognize the deficiencies of the existing Missouri Highway J/C interchange and desire to relocate the adjacent School Road intersection eastward to improve the intersection spacing. The operational analyses of the surrounding roadway network, as detailed in Chapter 7 of this report, have indicated that very significant improvements will be required at many of the study intersections and on nearby local roadways without the construction of the proposed 211th Street interchange. Without any improvements to the existing city streets and the current Missouri Highway J/C interchange configuration, significant traffic congestion would be expected within the study area given the projected levels of growth and development, despite the construction of the proposed 211th Street interchange.

However, these improvement needs would be reduced on a network-wide basis if another access point onto I-49 is provided at 211th Street. As development within the City of Peculiar occurs, the widening of many of the existing roadways, as well as the installation of traffic signals at most of the major city intersections, will still be needed in order to provide acceptable routes to the I-49 interchanges serving Peculiar. This will require on-going coordination by the City of Peculiar as development plans are developed in the vicinity of the 211th Street interchange. In addition, it will be necessary to coordinate with MoDOT regarding any future widening or auxiliary lane improvements on I-49 to serve the projected design traffic volumes along the corridor.

12.0 ENVIRONMENTAL CONSIDERATIONS

FHWA AJR Policy Point 8: Planning and NEPA Process

"The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of the environmental processing (23 CFR 771.111)."

The NEPA process is anticipated to start soon after a Concept Approval is obtained from the FHWA for the proposed 211th Street interchange. The proposed interchange has previously been added to the LRTP and TIP lists through MARC. MARC has also recently updated the new LRTP for the Kansas City MPO, "*Transportation Outlook 2040.*" For the City of Peculiar, GBA has also previously completed the environmental reviews that would likely be required to prepare any Categorical Exclusion (CE2) documentation for this project. As discussed previously, the city and Cass County previously retained GBA to perform a detailed Corridor Study for the full five-mile length of the 211th Street corridor from Missouri Highway J on the east end to Missouri Highway Y on the west end. Again, that study report was submitted to MoDOT in June 2011. A brief summary of these preliminary environmental reviews is provided on the attached *Exhibit H-1*.

13.0 FUNDING AND SCHEDULE

The following sections describe the current funding plan for the design and construction of the proposed 211th Street interchange, as well as the anticipated project schedule.

13.1. Project Funding

On the April 7, 2009 ballot, City of Peculiar voters approved the use of General Obligation (GO) bonds to partially finance both the 211th Street improvements and the I-49 interchange. The ballot question described future GO bonds totaling $8,000,000 "for the purpose of extending and improving" the city's streets. The ballot question also indicated that no less than 90% of the bond proceeds would be dedicated to build an I-49 interchange at 211th Street and the connecting roads to the interchange, with the remaining 10% of the GO bond proceeds for improving other existing city streets. The City of Peculiar chose to delay the issuance of the approved GO bonds until cost-sharing funds were also committed from Federal and/or State sources.

Since 2007, the city staff also pursued additional sources of funding for the proposed 211th Street interchange project, including "stimulus" funding through The American Recovery and Reinvestment Act (ARRA) of 2009; funding through Community Development Block Grants (CDBG); and direct Federal Appropriations though their representatives in Washington, D.C. During this time period, the Cass County Commission also continued to show strong support for the proposed project, and committed more than $400,000 toward the production of both the "*211th Street Corridor Study*" (submitted to MoDOT in June 2011) and the previously described preliminary draft AJR to confirm the feasibility of this project.

In 2012, MoDOT and the City of Peculiar entered into a 50/50 cost-share agreement in order to fund the design and construction of the proposed 211th Street interchange and corridor improvements. In addition to the city's previously committed $8,200,000 funds, MoDOT Cost-Share funding totaling approximately $8,100,000 has also been allocated to increase the final project funding support level to more than $16,300,000. It should be noted that the cost-share funding can only be utilized for the proposed interchange improvements and connections along the 211th Street corridor between Peculiar Drive and the relocated Northeast Outer Road intersections. The city and other local agencies will be responsible for the construction of the proposed improvements between the Outer Road and School Road intersections, in addition to any project cost over-runs.

13.2. Project Schedule

In 2012, GBA was retained by MoDOT, in partnership with the City of Peculiar, to prepare the necessary preliminary, right-of-way, and final design documents for the proposed 211th Street interchange and connecting roadways. Separate plan sets will be developed for the interchange and local roads projects. This design work will commence in earnest following the conditional approval of this AJR by the FHWA, and is expected to be completed in order to allow a combined project bid letting date in January 2015. MoDOT plans to obtain the necessary right-of-way during 2014 to accommodate the projects' construction, with utilities to be relocated during fiscal years 2014 and 2015. Following the awarding of the project to a contractor beginning in early 2015, construction on the project is expected to be completed by the Fall of 2016.

14.0 SUMMARY AND RECOMMENDATIONS

Due to the projected growth within the City of Peculiar and northern Cass County, the completed operational analyses have revealed that it would be difficult to route all development-related traffic onto I-49 through the single existing interchange with Missouri Highway J/C. Currently, Missouri Highway J/C crosses I-49 with a three-lane bridge. In order to serve the projected Design Year 2035 conditions, this existing bridge would require a significant amount of widening, or the interchange will need to be reconfigured to either a SPUI or DDI alternative. The number of lanes required on the Missouri Highway J/C interchange bridge would depend entirely on which interchange improvement configuration is ultimately selected (i.e., twelve lanes wide for the improved diamond interchange configuration, nine lanes wide for either reconfigured SPUI alternative, and eight lanes for a reconfigured DDI alternative). Given the existing geometric and right-of-way constraints along the connecting roadways at this location, these interchange alternatives may be too large and impractical to construct. In addition, the interchange would still be expected to operate poorly despite all of these significant improvements.

However, with the construction of the proposed I-49 interchange at 211th Street, significantly less widening improvement (i.e., to only an eight-lane standard diamond interchange bridge, or to a narrower six-lane DDI configuration) will be required at the adjacent I-49 interchange with Missouri Highway J/C, as compared with any of the other conceptual improvement alternatives.

As described throughout this report, without the addition of the proposed interchange at 211th Street, inadequate traffic operations would be expected at all intersections within the study area, even with the addition of mainline and auxiliary lanes at all possible locations. The adjacent North Cass Parkway interchange is located too far from the projected growth areas within the City of Peculiar to significantly benefit the traffic operations within this study area. Therefore, the proposed 211th Street interchange represents the most feasible improvement in order to serve the study area from a regional traffic operations standpoint, and is the best alternative to minimize the overall construction costs and right-of-way impacts associated with the I-49 interchanges to serve the City of Peculiar.

APPENDIX A

Level of Service Definitions

Exhibit A-1 - Intersection Level of Service Definitions
Exhibit A-2 - Freeway Segment Level of Service Definitions
Exhibit A-3 - Freeway Merge and Diverge Segments Level of Service Definitions

EXHIBIT A-1

Intersection Level of Service Definitions

Level of service criteria are outlined in the 2010 edition of the *"Highway Capacity Manual"* (HCM) for both signalized and unsignalized intersections. The HCM defines the level of service as a measure of the quality of traffic flow. There are six different levels of service for each facility type, each representing a range of operating conditions. Each level of service is designated by a letter from "A" to "F", with "A" being the most desirable condition and "F" being the least desirable condition. The level of service criteria, as reported by the 2010 HCM, for both signalized and unsignalized intersections are listed below:

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

EXHIBIT A-2

Freeway Segment Level of Service Definitions

Level of service criteria are outlined in the 2010 edition of the *"Highway Capacity Manual"* (HCM) for basic freeway segments. The HCM defines the level of service as a measure of the quality of traffic flow. There are six different levels of service for basic freeway segments, each representing a range of operating conditions. Each level of service is designated by a letter from "A" to "F", with "A" being the most desirable condition and "F" being the least desirable condition. LOS "A" describes free-flow operations, where vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream. LOS "F" describes breakdown conditions, or unstable flow, that exist within queues forming behind bottlenecks that may be due to traffic incidents, points of recurring congestion, or in other locations where the demand traffic volume flow rate exceeds the basic freeway segment's capacity.

A basic freeway segment can be characterized by three performance measures: density in passenger cars per mile per lane (pc/mi/ln), space mean speed in miles per hour (mph), and the ratio of the demand flow rate to capacity (v/c). Because speed is constant through a broad range of flows and the v/c ratio is not directly discernible to road users (except at capacity), the service measure for basic freeway segments is density. The level of service criteria, as reported by the 2010 HCM, for basic freeway segments are listed below:

Basic Freeway Segments	
Level of Service	Density (pc/mi/ln)
A	≤ 11
B	> 11 and ≤ 18
C	> 18 and ≤ 26
D	> 26 and ≤ 35
E	> 35 and ≤ 45
F	> 45

EXHIBIT A-3

Freeway Merge and Diverge Segments Level of Service Definitions

Level of service criteria are outlined in the 2010 edition of the *"Highway Capacity Manual"* (HCM) for freeway merge and diverge segments. The HCM defines the level of service as a measure of the quality of traffic flow. Freeway merge and diverge segment level of service is defined in terms of density in passenger cars per mile per lane (pc/mi/ln) for all cases with stable operations.

There are six different levels of service for freeway merge and diverge segments, each representing a range of operating conditions. Each level of service is designated by a letter from "A" to "F", with "A" being the most desirable condition and "F" being the least desirable condition. LOS "A" describes when unrestricted operations exist, and the density is low enough to permit smooth merging and diverging with very little turbulence in the traffic stream. LOS "F" exists when the freeway demand exceeds the capacity of the upstream (diverges) or downstream (merges) freeway segment, or where the off-ramp demand exceeds the off-ramp capacity. LOS "F" also defines the operating conditions within queues that form on both the ramp and the freeway mainline when capacity is exceeded by demand.

The level of service criteria, as reported by the 2010 HCM, for freeway merge and diverge segments are listed below:

Freeway Merge and Diverge Segments	
Level of Service	Density (pc/mi/ln)
A	≤ 10
B	> 10 and ≤ 20
C	> 20 and ≤ 28
D	> 28 and ≤ 35
E	> 35
F	Demand exceeds Capacity

APPENDIX B

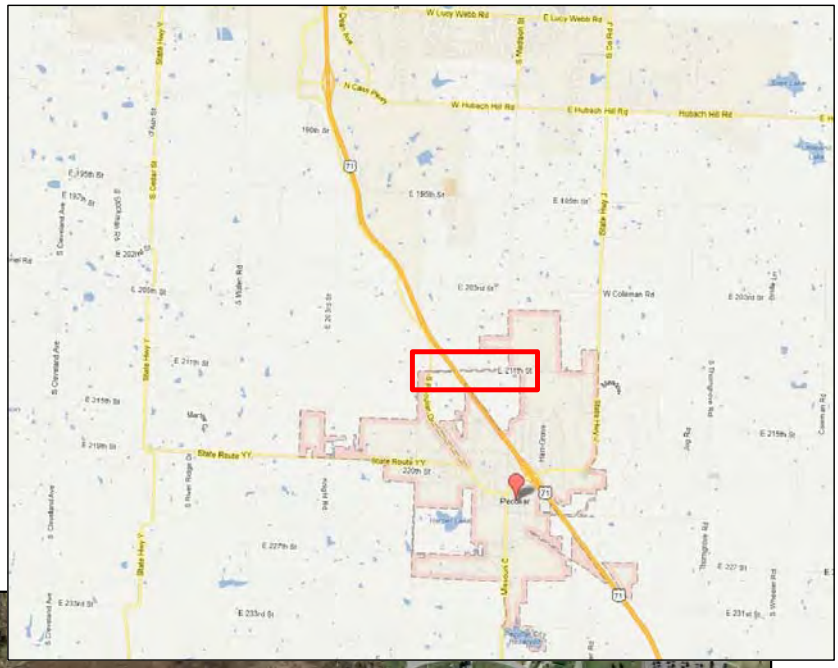
Geometric Configurations

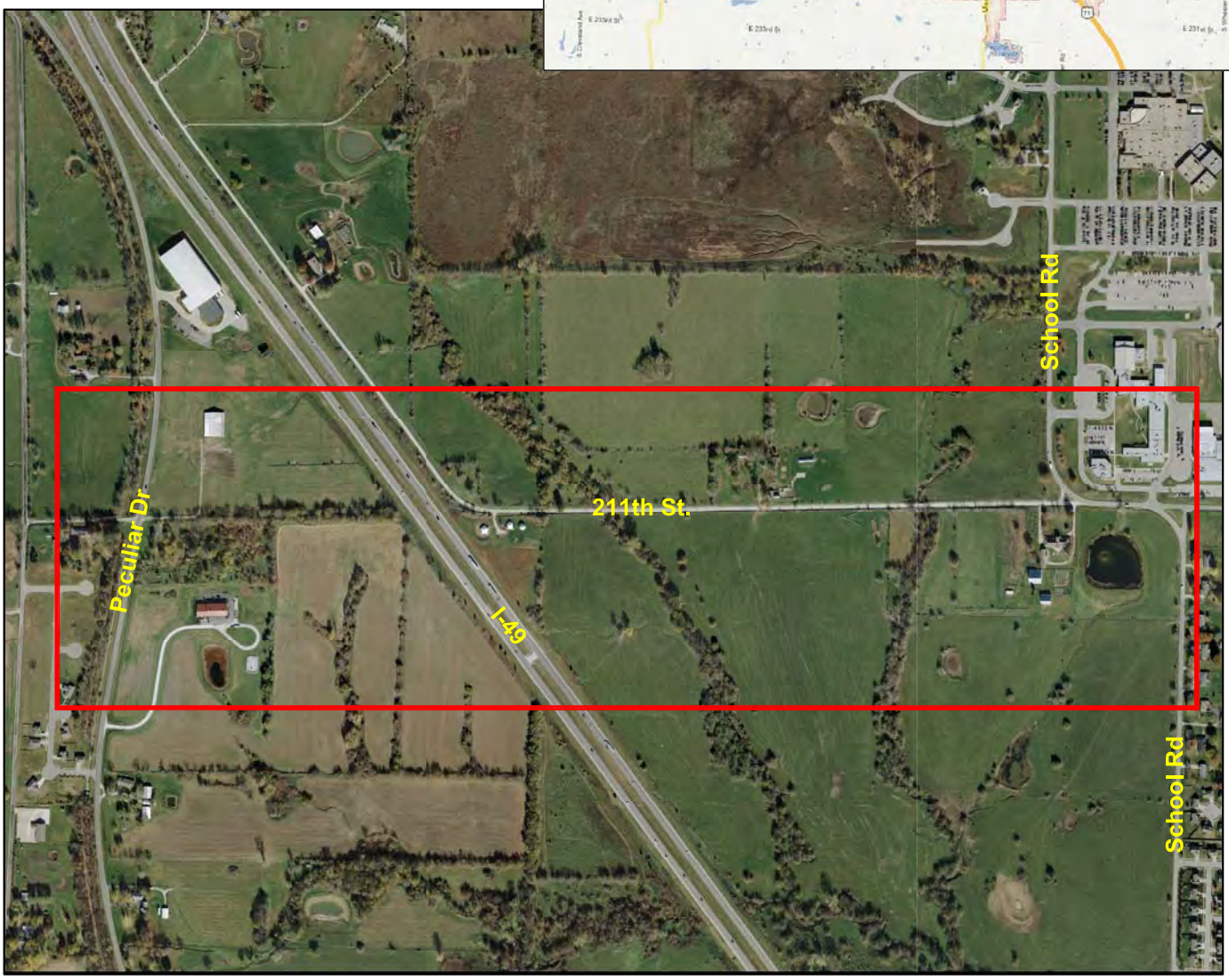
Exhibit B-1 - Location Map & Project Area Boundary
Exhibit B-2 - Existing Lane Configurations
Exhibit B-3 - Existing Lane Configurations – I-49 Highway Corridor
Exhibit B-4 - Future Intersection Spacing
Exhibit B-5 - Future Lane Configurations – I-49 Highway Corridor

N.T.S.

LEGEND

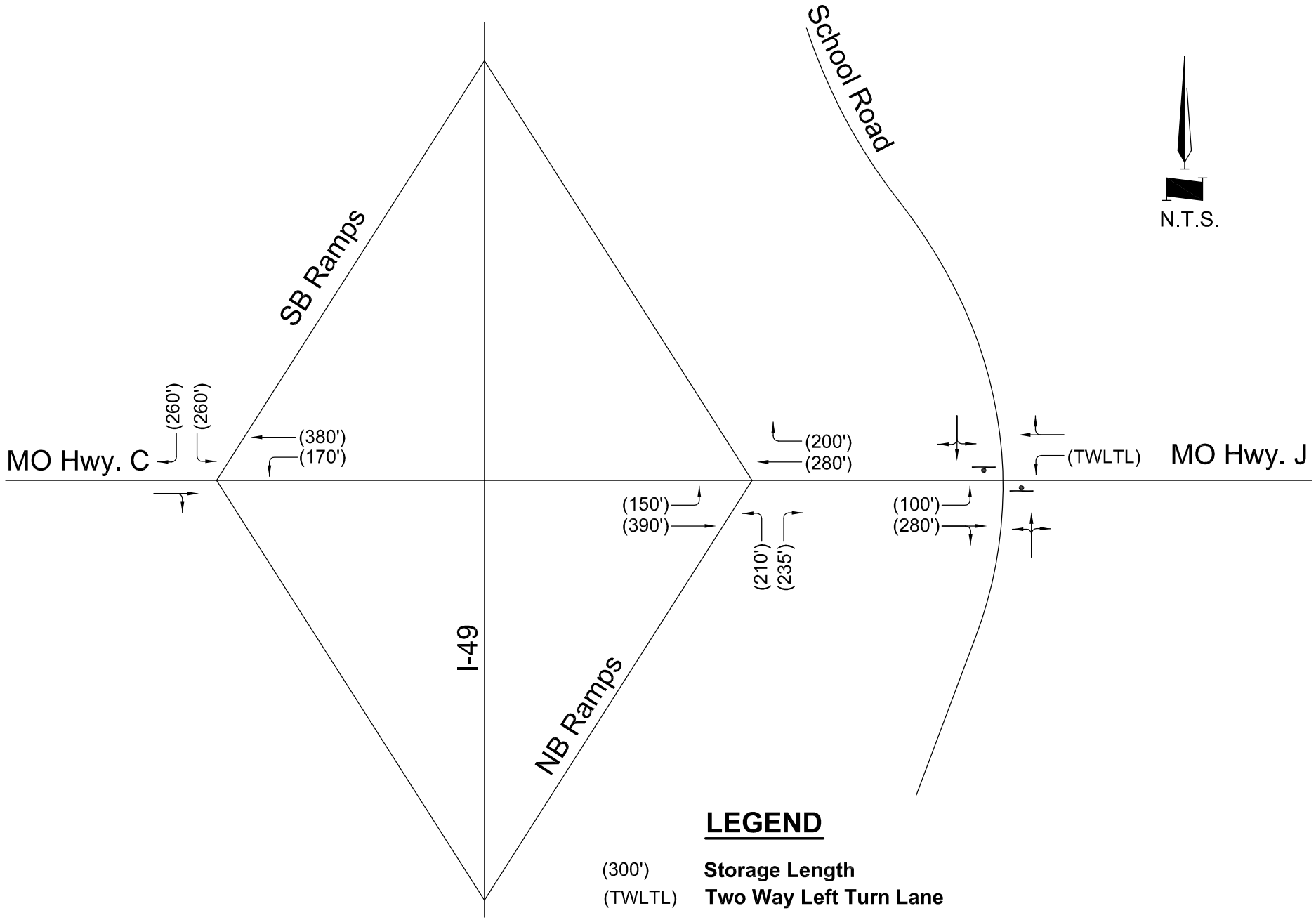
Project Area





GBA architects engineers

PROJECT NUMBER	Location Map & Project Area Boundary	EXHIBIT B-1
J4P2247		
DATE 04/01/2013		



LEGEND

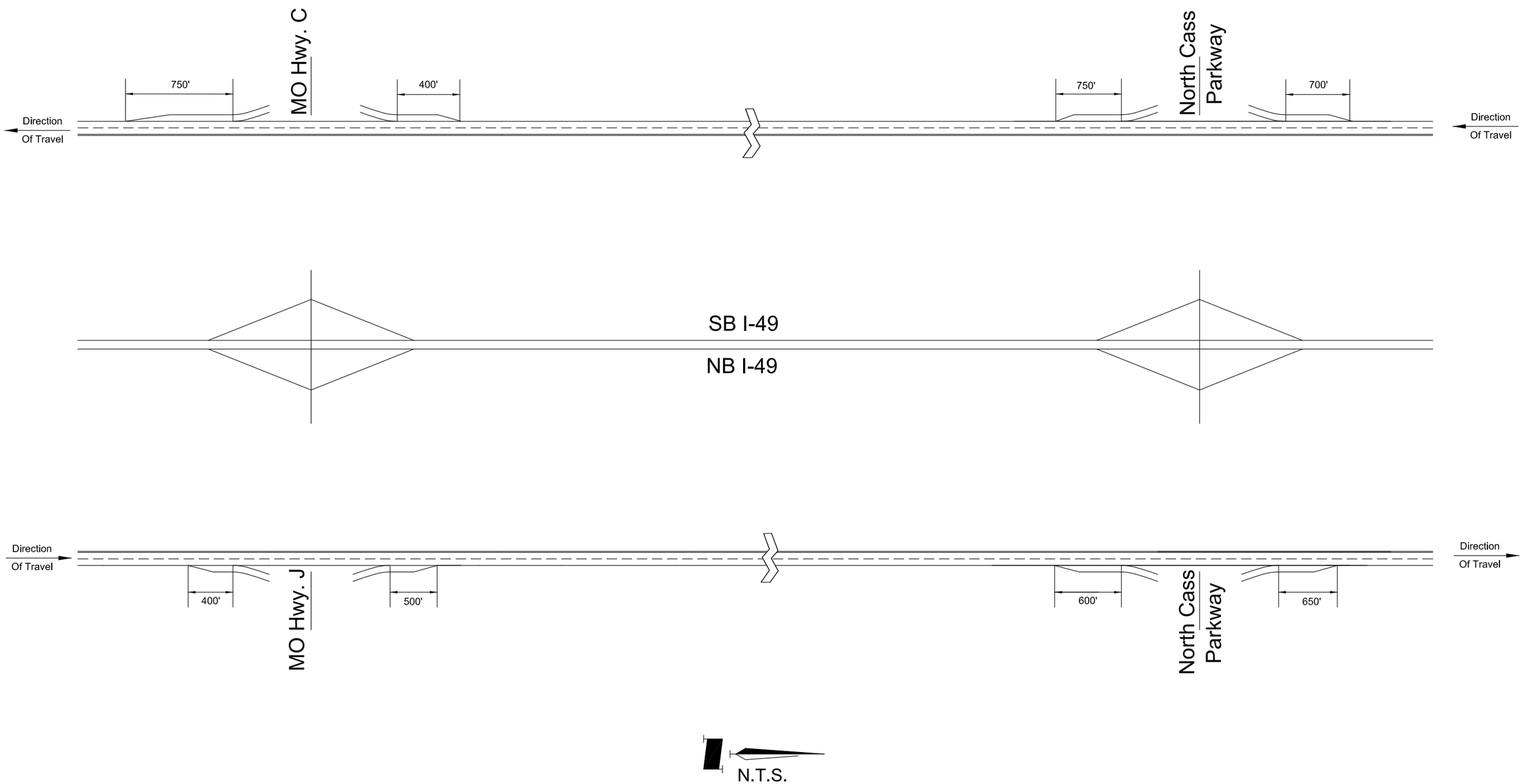
(300') **Storage Length**

(TWLTL) **Two Way Left Turn Lane**

GBA architects engineers

PROJECT NUMBER J4P2247	Existing Lane Configurations	EXHIBIT B-2
DATE 04/01/2013		

G:\12670\Analysis\Traffic\CAD\AJR Figures\Exhibit 2.dwg Layout: AM Existing Volume Interchange -- Wednesday March 13, 2013, 10:09am -- Copyright 2013, George Butler Associates, Inc.



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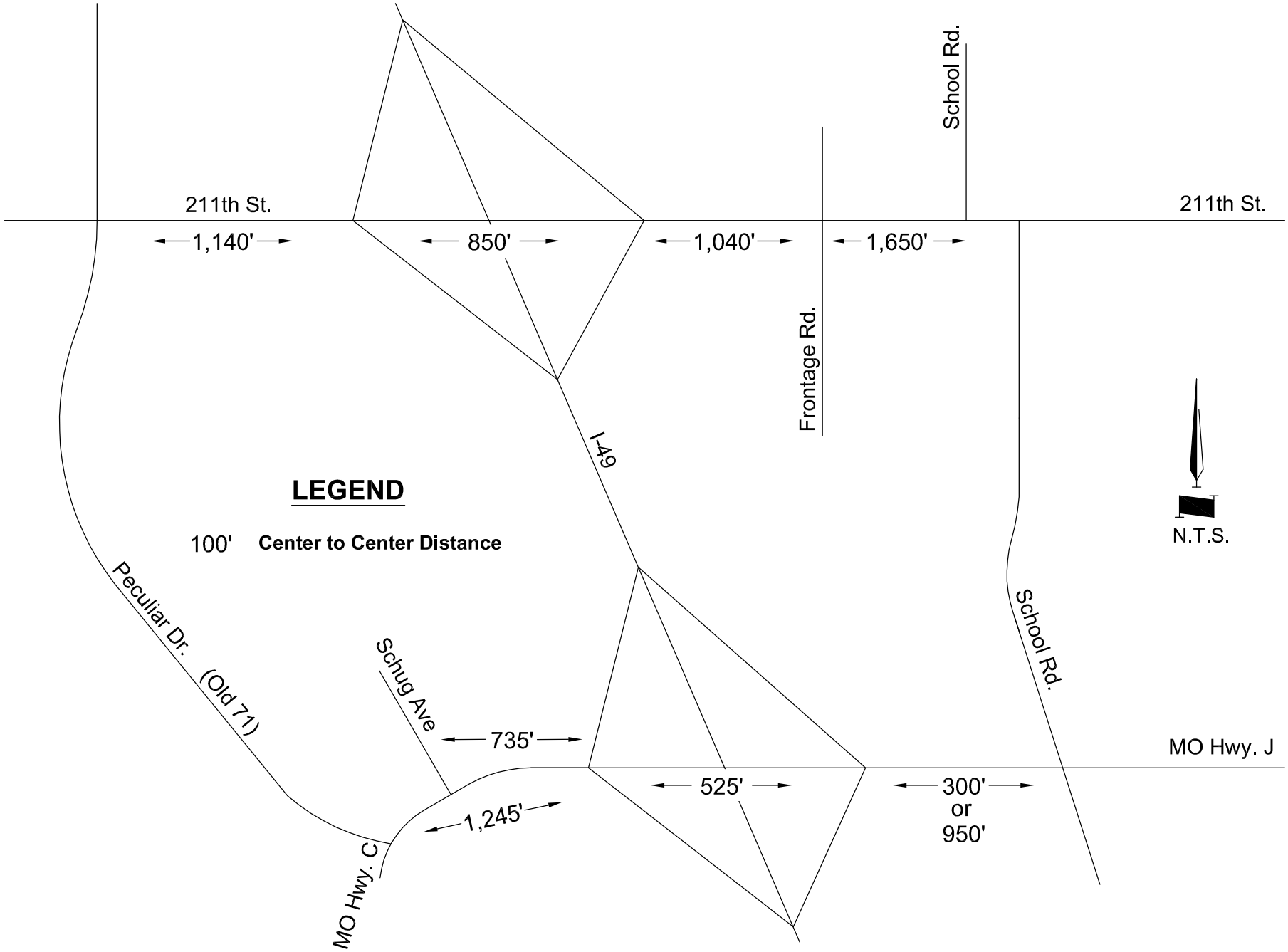
GBA architects engineers

PROJECT NUMBER J4P2247	Existing Lane Configurations I-49 Highway Corridor	EXHIBIT B-3
DATE 04/01/2013		



GBA
architects
engineers

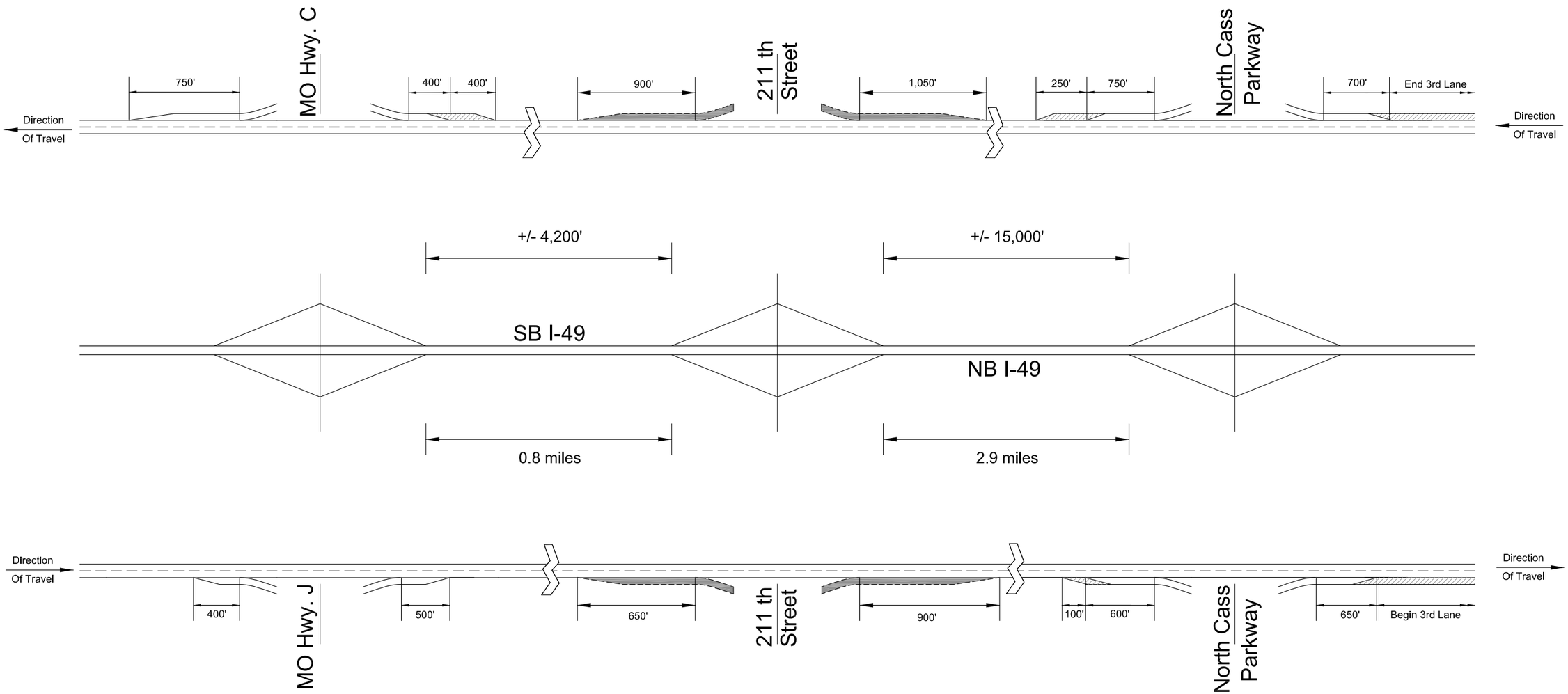
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Future Intersection Spacing

EXHIBIT B-4

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Storage Lengths -- Monday March 25, 2013, 4:34pm -- Copyright 2013, George Butler Associates, Inc.



LEGEND

- Existing / Planned Conditions
- Proposed 211th Ramps
- Possible Future Improvements (By Others)

N.T.S.

GBA architects engineers

PROJECT NUMBER
J4P2247
DATE
04/01/2013

Future Lane Configurations
I-49 Highway Corridor

EXHIBIT B-5

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions With.dwg Layout: Exhibit B-5 Hwy Configurations -- Sunday March 24, 2013, 2:45pm -- Copyright 2013, George Butler Associates, Inc.

APPENDIX C

Land Use / Traffic Projections

Exhibit C-1 - Traffic Assignment Process
Exhibit C-2 - Future Traffic Assignment Land Use / Development Parcel Map
Exhibit C-3 - Traffic Analysis Zone Map
Table C-1 - Trip Generation by Parcel
Table C-2 - Trip Generation Summary by Zone
Table C-3 - Trip Distribution Table (Without 211th Street Interchange)
Table C-4 - Trip Distribution Table (With 211th Street Interchange)

Exhibit C-1

Traffic Assignment Process

Trip Generation:

First, a copy of the approved *Peculiar Comprehensive Plan (2008)*, prepared by JEO Consulting Group, Inc., was obtained from the city. The future land use information provided within this approved report, and shown on ***Figure C-1***, was utilized to divide the City of Peculiar into 76 individual development tracts, in order to determine the expected traffic generation for each tract. The attached ***Exhibit C-2*** included in this appendix shows the expected land uses by tract, as specified in these planning documents. Total acreages for each development tract were determined using a combination of aerial photography and property lot information provided by the Cass County Geographic Information System (GIS) department. Then, a calculation table was created to estimate the expected trip generation for each parcel, as shown in ***Table C-1***.

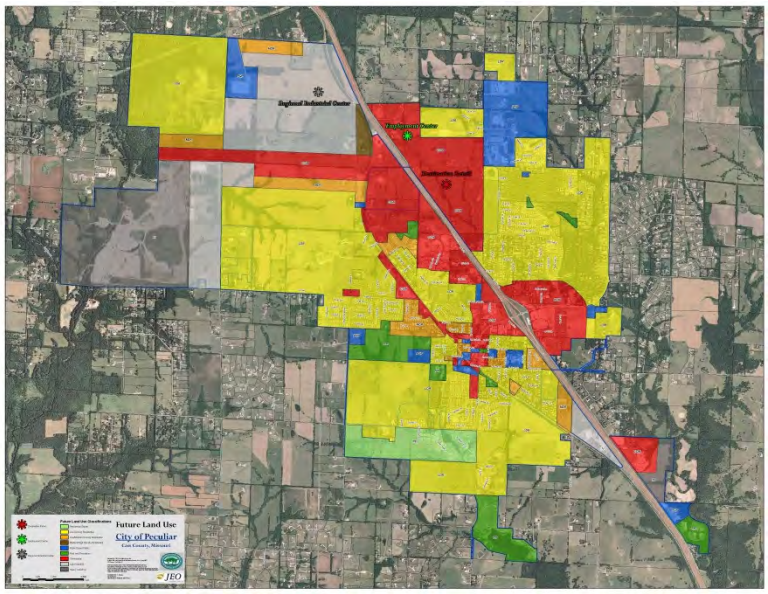


Figure C-1 City of Peculiar Future Land Use Map

Each land tract was examined individually in order to estimate the total developable area as a percentage of the total parcel area, labeled as "Useable Area" in the table. Additionally, each land tract was reviewed to determine the percentage of its total developable area that would be expected to develop by the Design Year 2035 horizon. These estimates were based upon where the individual property was located within the City of Peculiar, as well as its proximity to the proposed 211th Street interchange. This percentage is shown in ***Table C-1*** within the column labeled "Assumed 2035 Development." These two reduction factors were then multiplied together to create a "Resultant Land Use Multiplier." This factor was then applied to the raw tract areas in order to reduce the total area for each parcel down to the estimated area that would be expected to develop and generate traffic by the Design Year 2035 horizon.

For the expected land uses "Low Density Residential" and "Medium Density Residential," the reduced tract area was then converted to a number of dwelling units by the following conversion factors: 2 units per acre for low density residential areas, and 6 units per acre for medium density residential areas. The number of units estimated for each tract is shown in ***Table C-1*** below the "Dwelling Units" sub-heading. For all other land uses (i.e., retail, office, light industrial, and heavy industrial), the reduced tract areas were converted into an available Gross Land Area (GLA). A Floor-to-Area Ratio (FAR) of 0.25 was used for retail, office and light

industrial tracts, while an FAR of 0.05 was used for heavy industrial tracts. The resulting GLA value for each tract is shown in the table below the "Gross Land Area" sub-heading.

The trip generation for each tract was estimated based upon the Institute of Transportation Engineers' (ITE) "*Trip Generation Handbook*." For residential land uses, the number of dwelling units was used to calculate the expected Average Daily Traffic (ADT) volume, as well as the inbound and outbound trips generated during the A.M. and P.M. peak hours. In both the low-density and medium-density residential cases, ITE land use code 210 (Single Family Dwellings) was utilized. For all other land uses, the GLA was used to calculate the total number of trips generated for each parcel. The following ITE Land Use Codes were utilized for the various land use classifications:

- Retail – ITE land use code 820 (Shopping Center)
- Office – ITE land use code 710 (General Office Building)
- Light Industrial – ITE land use code 110 (General Light Industrial)
- Heavy Industrial – ITE land use code 130 (Industrial Park)

It should be noted that the "Public" and "Parks and Recreation" land uses would not be expected to generate significant additional trips that would affect the peak period Design Year 2035 traffic conditions.

The final calculation performed in ***Table C-1*** reduced the expected trips generated by each land tract in order to account for internal trips within the project study area. As shown in the table, the overall trip generation for each land tract was reduced according to the following factors: Low Density Residential (70%); Medium Density Residential (80%); Retail (75%); Office (75%); Light Industrial (75%); and Heavy Industrial (75%).

<u>Traffic Analysis Zones:</u>
As shown in the attached ***Table C-2***, the 76 individual land tracts were then grouped into ten zones in order to assign these generated trips to the existing and/or future road network. The table also includes a summary of the expected traffic generation associated with each land use type. The attached ***Exhibit C-3*** in the appendix provides a detailed traffic analysis zone map. This exhibit also depicts the nine external routes (labeled I through IX) to which the generated trips were distributed around the study area. Finally, ***Exhibit C-3*** also shows each zone's total expected trip generation on a daily basis, as well as on a directional (i.e., inbound vs. outbound) basis during each of the respective peak hours, as calculated in ***Table C-2***.

<u>Trip Distribution:</u>
For each respective trip generation zone, a specific individual distribution pattern was developed for each of the following four traffic volume / roadway network scenarios:

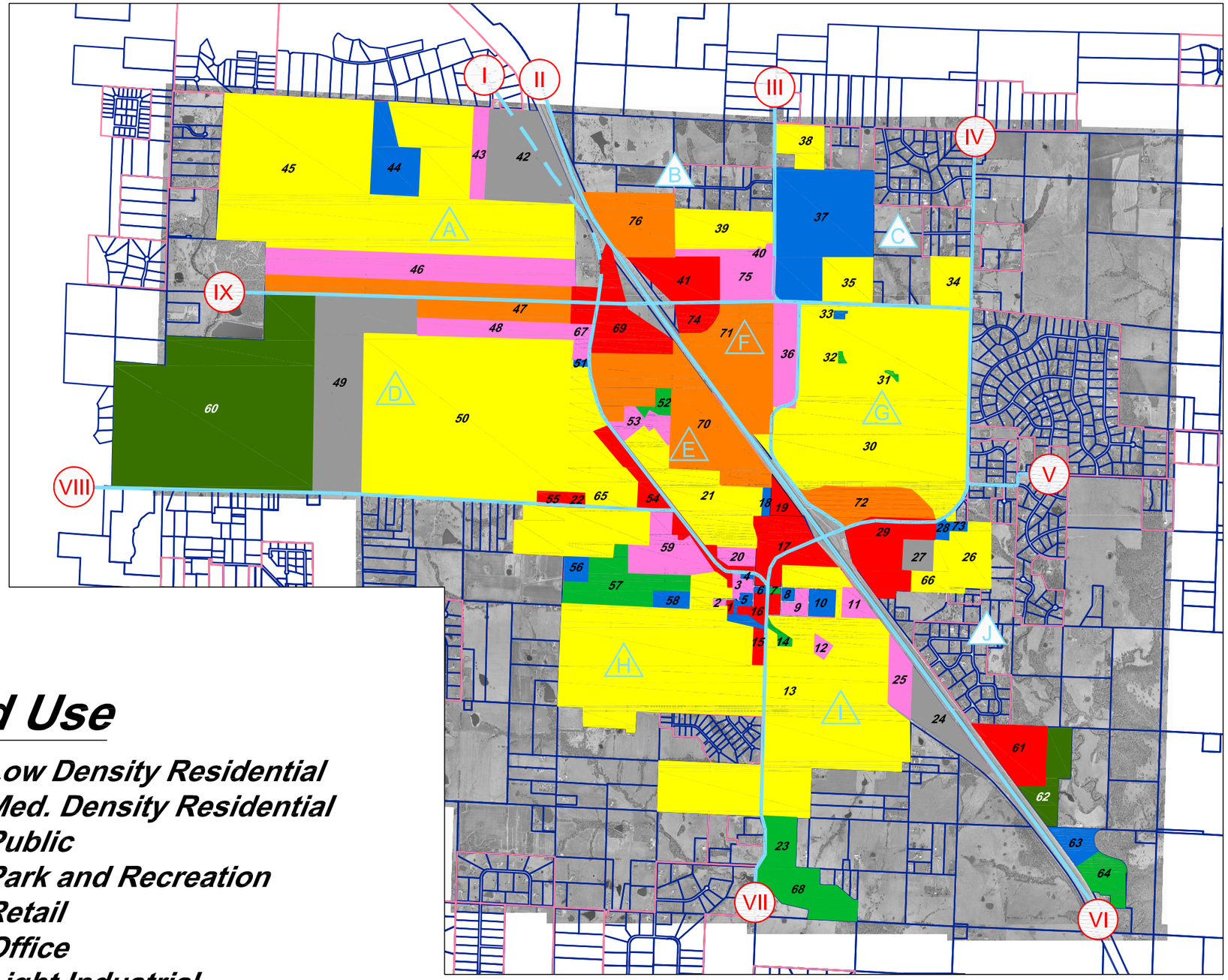
- A.M. peak hour, without the construction of the 211th Street interchange
- P.M. peak hour, without the construction of the 211th Street interchange
- A.M. peak hour, with the construction of the 211th Street interchange
- P.M. peak hour, with the construction of the 211th Street interchange

The development-generated trips were then distributed throughout the study area using the distribution patterns shown in the attached *Tables C-3 and C-4*. The distribution patterns during the A.M. and P.M. peak hours for analysis scenarios without the 211th Street interchange are shown in *Table C-3*. Similarly, the distribution patterns during the A.M. and P.M. peak hours for the analysis scenarios with the 211th Street interchange are shown in *Table C-4*.

Traffic Assignment:

It should be noted that this traffic assignment process considered the impacts of all known planned roadway improvements within the project study area. The assigned traffic volumes were then added onto the existing traffic count volumes in order to develop the future Design Year 2035 traffic volumes utilized in the analyses of each respective interchange scenario and/or configuration. It should be noted that the slightly higher existing traffic volumes obtained in April 2008 were utilized for conservative purposes during this assignment process, per the direction of MoDOT staff.

Using the specifically developed trip distribution patterns, in addition to the expected trip generation for each of the traffic analysis zones, turning movement volumes were then calculated at the study intersections for each of the respective traffic volume / roadway network scenarios.



Legend

- I — External Destination
- A — Traffic Analysis Zone (TAZ)
- 65 — Tract Number
- TAZ Boundary
- Major Roadway (non-boundary)

Land Use

- Low Density Residential
- Med. Density Residential
- Public
- Park and Recreation
- Retail
- Office
- Light Industrial
- Heavy Industrial

GBA architects engineers

PROJECT NUMBER	Future Traffic Assignment Land Use / Development Parcel Map	EXHIBIT C-2
J4P2247		
DATE 04/01/2013		

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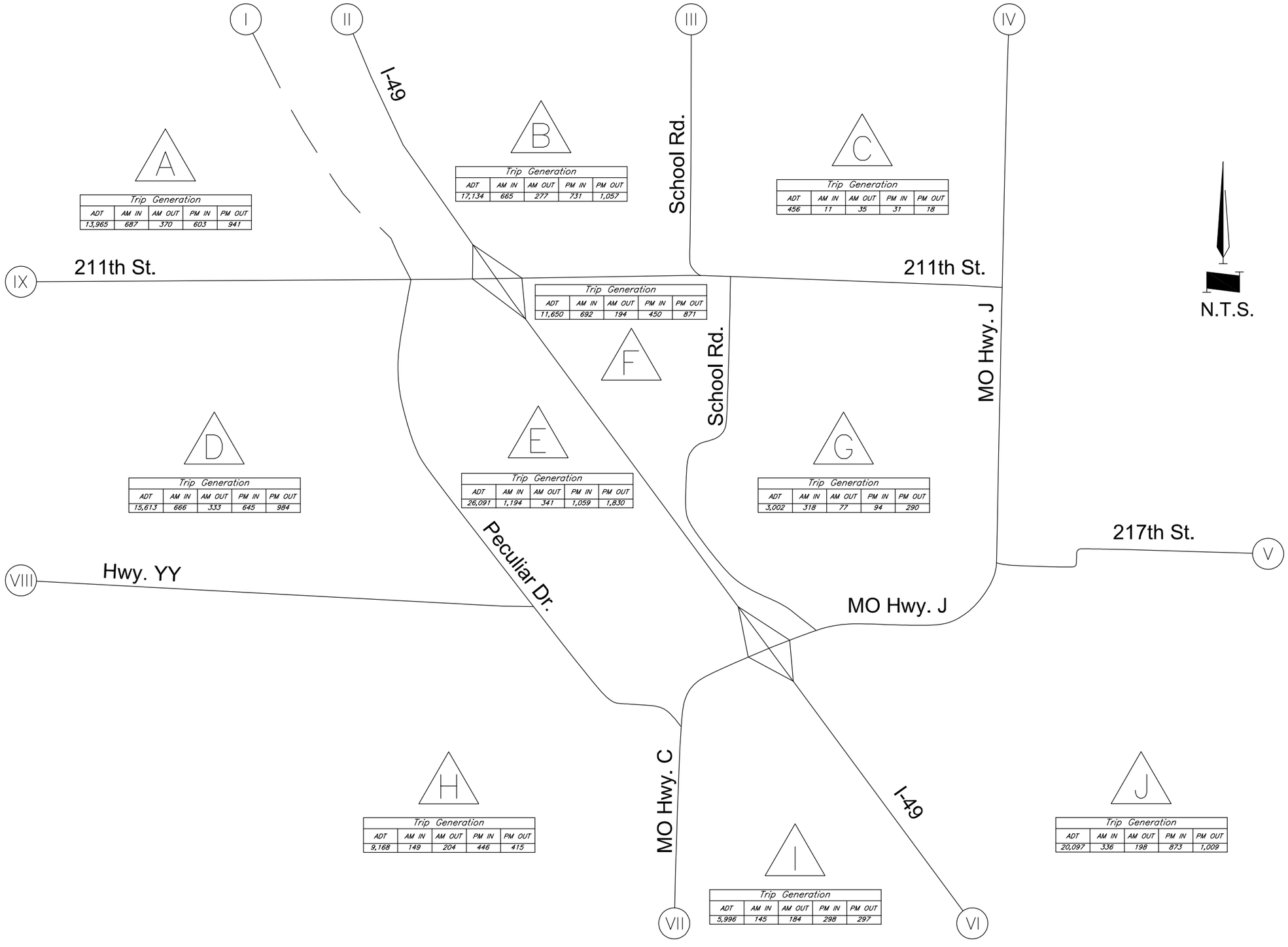

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PROJECT NUMBER	Traffic Analysis Zone Map	EXHIBIT C-3
J4P2247		
DATE 04/01/2013		

I-49 and 211th St.
Peculiar, MO

Table C-1
Trip Generation by Parcel

04/01/2013

	Land Use Classification		Total Zone Area					Dwelling Units		Gross Floor Area (square footage)						Trip Generation					Trip Generation With Internal Trip Reduction				
																ADT	A.M. PEAK HOUR (VPH)		P.M. PEAK HOUR (VPH)		ADT	A.M. PEAK HOUR (VPH)		P.M. PEAK HOUR (VPH)	
Tract Number	Class Number	Land Use Description	(sq. ft.)	(acres)	Useable Area	Assumed 2035 Development	Resultant Land Use Multiplier	Low Density Residential	Medium Density Residential	Public	Park and Recreation	Retail	Office	Light Industrial	Heavy Industrial	(VPD)	IN	OUT	IN	OUT	(VPD)	IN	OUT	IN	OUT
1	5	Retail	50681	1.16	100%	40%	40%					5068				977	16	10	42	45	733	12	8	32	34
2	2	Medium Density Residential	45056	1.03	50%	40%	20%		1							18	3	8	1	1	15	2	6	1	1
3	2	Medium Density Residential	246429	5.66	20%	40%	8%		3							38	3	8	3	2	30	2	6	2	2
4	3	Public	42416	0.97	0%	70%																			
5	3	Public	410984	9.43	0%	40%																			
6	3	Public	42549	0.98	0%	40%																			
7	4	Park and Recreation	41676	0.96	0%	40%																			
8	3	Public	90179	2.07	0%	40%																			
9	2	Medium Density Residential	311142	7.14	20%	40%	8%		3							47	3	9	3	2	37	2	7	2	2
10	3	Public	455622	10.46	0%	40%																			
11	2	Medium Density Residential	527765	12.11	100%	40%	40%		29							334	7	22	22	13	267	6	18	18	10
12	2	Medium Density Residential	175295	4.02	1%	40%	0.4%		0.1							2	2	7			1	2	6		
13	1	Low Density Residential	35243789	808.84	75%	40%	30%	485								4447	87	262	280	164	3113	61	183	196	115
14	4	Park and Recreation	218393	5.01	0%	40%																			
15	5	Retail	341765	7.84	90%	40%	36%					30759				3156	47	30	138	150	2367	35	23	104	113
16	5	Retail	513899	11.79	90%	40%	36%					46251				4114	60	38	181	196	3086	45	29	136	147
17	5	Retail	2579413	59.20	50%	70%	35%					225699				11527	156	99	514	557	8646	117	74	386	418
18	3	Public	179669	4.12	0%	70%																			
19	5	Retail	470918	10.81	90%	70%	63%					74170				5592	80	51	247	267	4194	60	38	185	200
20	2	Medium Density Residential	494212	11.34	20%	70%	14%		10							120	4	12	8	5	96	3	10	6	4
21	1	Low Density Residential	4920804	112.93	50%	70%	35%	79								838	16	49	55	32	586	11	34	39	22
22	5	Retail	181778	4.17	100%	40%	40%					18178				2242	34	22	98	106	1682	26	17	74	80
23	4	Park and Recreation	1083526	24.87	0%	40%																			
24	7	Light Industrial	1652619	37.93	50%	40%	20%							82631		576	67	9	10	71	432	50	7	7	53
25	2	Medium Density Residential	984810	22.60	90%	40%	36%		49							538	11	33	35	21	430	9	26	28	17
26	1	Low Density Residential	1825826	41.90	75%	40%	30%	25								292	7	20	19	11	204	5	14	13	8
27	7	Light Industrial	716281	16.44	70%	70%	49%							87744		612	71	10	10	76	459	53	7	8	57
28	3	Public	204082	4.68	0%	70%																			
29	5	Retail	3037843	69.72	60%	70%	42%					318974				14434	191	122	646	700	10825	143	92	485	525
30	1	Low Density Residential	23451814	538.22	20%	40%	8%	86								906	17	52	59	35	634	12	36	41	25
31	4	Park and Recreation	39860	0.91	0%	40%																			
32	4	Park and Recreation	43113	0.99	0%	40%																			
33	3	Public	59872	1.37	0%	40%																			
34	1	Low Density Residential	1315081	30.18	50%	40%	20%	12								149	4	13	10	6	104	3	9	7	4
35	1	Low Density Residential	1551245	35.60	90%	40%	36%	26								297	7	21	20	12	208	5	15	14	8
36	2	Medium Density Residential	1746219	40.08	75%	70%	53%		126							1288	24	73	83	49	1031	19	58	66	39
37	3	Public	7637560	175.28	0%	40%																			
38	1	Low Density Residential	1242839	28.52	75%	40%	30%	17								205	5	16	14	8	143	4	11	10	6
39	1	Low Density Residential	2665236	61.17	75%	70%	53%	64								692	14	41	45	27	484	10	29	32	19
40	2	Medium Density Residential	543409	12.47	90%	70%	63%		47							521	11	32	34	20	416	9	26	27	16
41	5	Retail	2673447	61.36	75%	70%	53%					350890				15357	203	130	688	745	11518	152	98	516	559
42	7	Light Industrial	4519211	103.72	90%	40%	36%							406729		2936	344	47	50	368	2202	258	35	38	276
43	2	Medium Density Residential	1019117	23.39	80%	40%	32%		45							498	10	31	33	19	398	8	25	26	15
44	3	Public	2388573	54.82	0%	20%																			
45	1	Low Density Residential	25055500	575.02	75%	35%	26%	302								2873	55	166	183	107	2011	39	116	128	75
46	2	Medium Density Residential	6068999	139.28	80%	38%	30%		254							2452	47	140	156	92	1961	38	112	125	74
47	6	Office	5723449	131.35	90%	40%	36%						515110			4713	613	84	111	544	3535	460	63	83	408
48	2	Medium Density Residential	1818581	41.74	80%	40%	32%		80							848	16	49	55	32	678	13	39	44	26
49	7	Light Industrial	8326680	191.10	80%	20%	16%							333067		2386	267	36	38	275	1790	200	27	29	206
50	1	Low Density Residential	24844336	570.18	60%	44%	26%	301								2866	55	165	182	107	2006	39	116	127	75
51	3	Public	86529	1.99	0%	70%																			
52	4	Park and Recreation	382687	8.78	0%	70%																			
53	2	Medium Density Residential	892998	20.49	20%	70%	14%		17							206	5	16	14	8	165	4	13	11	6
54	5	Retail	2096178	48.11	60%	40%	24%					125771				7882	110	70	350	379	5912	83	53	263	284
55	5	Retail	276755	6.35	90%	40%	36%					24908				2751	41	27	120	130	2064	31	20	90	98
56	3	Public	412239	9.46	0%	40%																			
57	4	Park and Recreation	2924778	67.12	0%	40%																			
58	3	Public	444961	10.21	0%	40%																			
59	2	Medium Density Residential	2378210	54.58	30%	40%	12%		39							440	9	28	29	17	352	7	22	23	14
60	8	Heavy Industrial	21705710	498.15	90%	20%	18%								195351	1717	142	31	40	152	1288	107	23	30	114
61	5	Retail	2128106	48.84	90%	40%	36%					191530				10361	141	90	461	500	7771	106	68	346	375
62	8	Heavy Industrial	1665190	38.22	90%	40%	36%								29973	896	33	7	14	51	672	25	5	11	38
63	3	Public	769034	17.65	0%	40%																			
64	4	Park and Recreation	1178383	27.04	0%	40%																			
65	1	Low Density Residential	6489724	148.94	60%	40%	24%	71								764	15	45	50	29	534	11	32	35	20
66	1	Low Density Residential	888844	20.40	70%	70%	49%	20								236	6	18	16	9	166	4	13	11	6
67	2	Medium Density Residential	104201	2.39	90%	70%	63%		9							114	4	12	8	5	91	3	10	6	4
68	3	Public	2322312	53.30	0%	40%																			
69	5	Retail	4110386.5	94.33	60%	70%	42%					431591				17568	230	147	789	855	13176	173	110	592	641
70	6	Office	7875153	180.73	90%	70%	63%						1240337			9273	1237	169	250	1218	6954	928	127	188	914
71	6	Office	5712103	131.09	70%	70%	49%						699733			5967	783	107	147	716	4475	587	80	110	537
72	6	Office	2541717	58.33	70%	70%	49%						311360			3199	409	56	73	355	2399	307	42	55	266
73	3	Public	104201	2.39	0%	40%																			
74	5	Retail	1080782	24.80	70%	70%	49%					132396				8150	113	72	362	392	6112	85	54	272	294
75	2	Medium Density Residential	1707649	39.19	80%	70%	56%		132							1339	25	76	87	51	1071	20	61	70	41
76	6	Office	3402024	78.08	90%	70%	63%						535819			4859	632	86	115	564	3644	474	65	86	423
ALL			**253,504,417**	**5,818**				**1,489**	**845**	**0**	**0**	**1,976,182**	**3,302,359**	**910,172**	**225,325**	**164,612**	**6,492**	**2,974**	**6,998**	**10,296**	**123,171**	**4,864**	**2,215**	**5,230**	**7,711**

I-49 and 211th St.
Peculiar, MO

Table C-2
Trip Generation Summary by Zone

04/01/2013

Assumed 2035 Development by Zone

	ADT (VPD)	A.M. PEAK HOUR (VPH) IN	A.M. PEAK HOUR (VPH) OUT	P.M. PEAK HOUR (VPH) IN	P.M. PEAK HOUR (VPH) OUT
Zone A	13,965	687	370	603	941
Zone B	17,134	665	277	731	1,057
Zone C	456	11	35	31	18
Zone D	15,613	666	333	645	984
Zone E	26,091	1,194	341	1,059	1,830
Zone F	11,650	692	194	450	871
Zone G	3,002	318	77	94	290
Zone H	9,168	149	204	446	415
Zone I	5,996	145	184	298	297
Zone J	20,097	336	198	873	1,009
SUM	**123,171**	**4,864**	**2,215**	**5,230**	**7,711**

Assumed 2035 Development by Land Use

	ADT (VPD)	A.M. PEAK HOUR (VPH) IN	A.M. PEAK HOUR (VPH) OUT	P.M. PEAK HOUR (VPH) IN	P.M. PEAK HOUR (VPH) OUT
Low Density Residential	10,195	202	608	653	383
Med Density Residential	7,041	147	445	457	270
Retail	78,084	1,067	681	3,477	3,767
Office	21,008	2,756	377	522	2,548
Light Industrial	4,882	562	76	81	592
Heavy Industrial	1,960	131	29	41	152
SUM	**123,171**	**4,864**	**2,215**	**5,230**	**7,711**

I-49 and 211th St.
Peculiar, MO

Table C-3
Trip Distribution Table
(Without 211th Street Interchange)

04/01/2013

Legend

I	Peculiar Drive North
II	Interstate-49 North
III	School Road North
IV	Route J North
V	217th Street East
VI	Interstate-49 South
VII	Route C South
VIII	Highway YY West
IX	211th Street West
M	Misc. Surface Streets

The table below shows the percentage distributions from each Trip Analysis Zone to the extents of the study area. Inbound and outbound percentages were assumed to be the same. The scenarios described below are the A.M. and P.M. peak hours without the construction of a 211th Street Interchange.

A.M. Peak Hour - Without 211th Street Interchange

Zone	I	II	III	IV	V	VI	VII	VIII	IX	M
A	5	8	0	0	6	10	8	25	0	38
B	0	8	41	2	6	10	8	25	0	0
C	0	8	21	22	6	10	8	25	0	0
D	21	22	4	4	6	10	8	25	0	0
E	21	22	4	4	6	10	8	25	0	0
F	3	22	18	8	6	10	8	25	0	0
G	3	22	8	18	6	10	8	25	0	0
H	5	30	8	8	6	10	8	25	0	0
I	5	30	8	8	6	5	13	25	0	0
J	5	30	8	8	6	10	8	25	0	0

P.M. Peak Hour - Without 211th Street Interchange

Zone	I	II	III	IV	V	VI	VII	VIII	IX	M
A	5	6	0	0	5	14	10	25	0	35
B	0	6	38	2	5	14	10	25	0	0
C	0	6	20	20	5	14	10	25	0	0
D	19	19	4	4	5	14	10	25	0	0
E	19	19	4	4	5	14	10	25	0	0
F	3	19	16	8	5	14	10	25	0	0
G	3	19	8	16	5	14	10	25	0	0
H	5	25	8	8	5	14	10	25	0	0
I	5	25	8	8	5	7	17	25	0	0
J	5	25	8	8	5	14	10	25	0	0

I-49 and 211th St.
Peculiar, MO

Table C-4
Trip Distribution Table
(With 211th Street Interchange)

04/01/2013

Legend	
I	Peculiar Drive North
II	Interstate-49 North
III	School Road North
IV	Route J North
V	217th Street East
VI	Interstate-49 South
VII	Route C South
VIII	Highway YY West
IX	211th Street West
M	Misc. Surface Streets

The table below shows the percentage distributions from each Trip Analysis Zone to the extents of the study area. Inbound and outbound percentages were assumed to be the same. The scenarios described below are the A.M.and P.M. peak hours with the construction of a 211th Street Interchange.

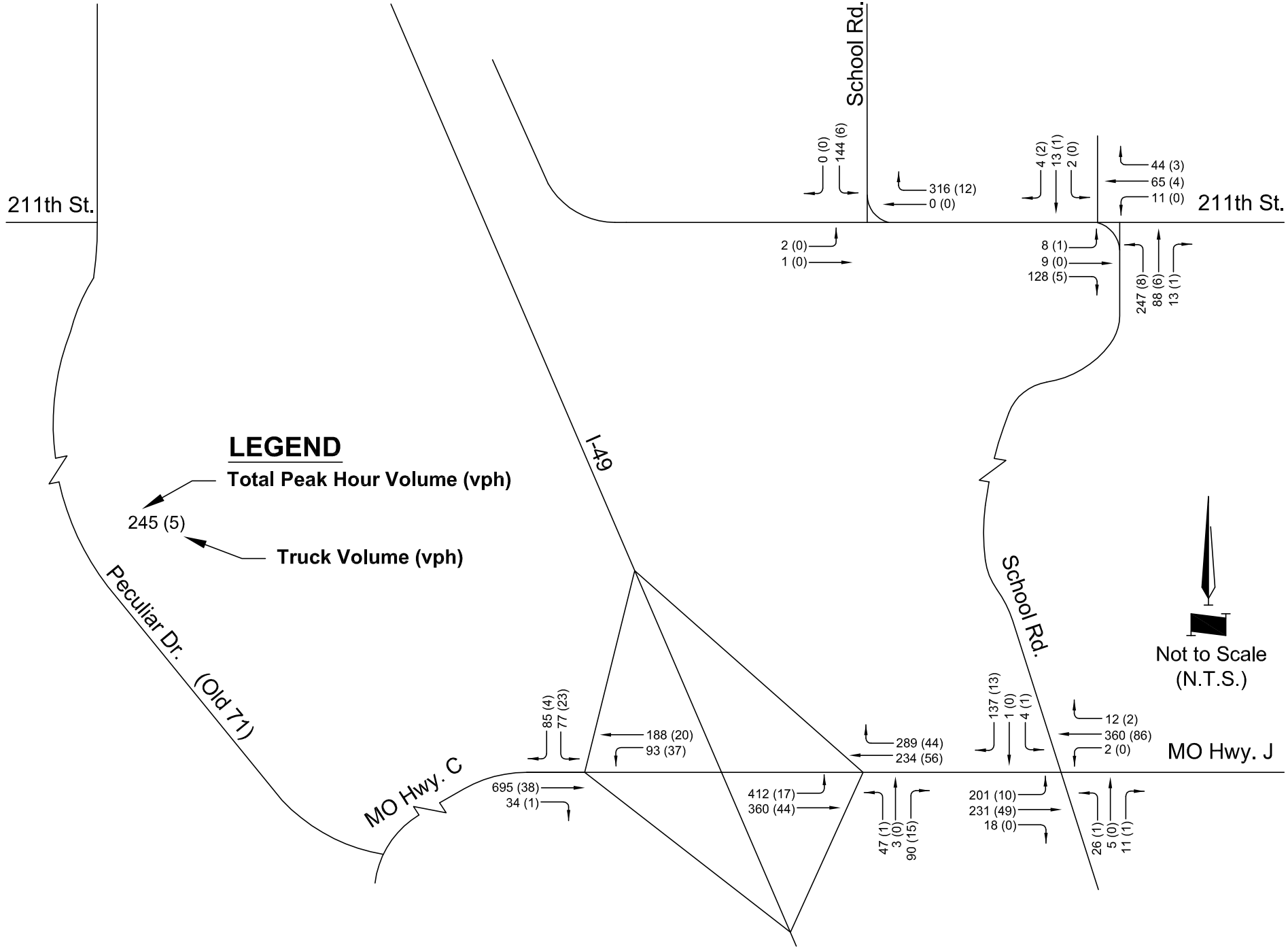
A.M. Peak Hour - With 211th Street Interchange										
Zone	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**M**
A	10	25	8	8	6	10	8	10	15	0
B	5	25	13	8	6	10	8	10	15	0
C	5	25	8	13	6	10	8	10	15	0
D	5	30	8	8	6	10	8	10	15	0
E	5	30	8	8	6	10	8	10	15	0
F	5	30	8	8	6	10	8	10	15	0
G	5	30	8	8	6	10	8	10	15	0
H	5	30	8	8	6	10	8	10	15	0
I	5	30	8	8	6	5	13	10	15	0
J	5	30	8	8	6	10	8	10	15	0

P.M. Peak Hour - With 211th Street Interchange										
Zone	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**M**
A	10	20	8	8	5	14	10	10	15	0
B	5	20	13	8	5	14	10	10	15	0
C	5	20	8	13	5	14	10	10	15	0
D	5	25	8	8	5	14	10	10	15	0
E	5	25	8	8	5	14	10	10	15	0
F	5	25	8	8	5	14	10	10	15	0
G	5	25	8	8	5	14	10	10	15	0
H	5	25	8	8	5	14	10	10	15	0
I	5	25	8	8	5	9	15	10	15	0
J	5	25	8	8	5	14	10	10	15	0

APPENDIX D

Design Traffic Volumes

Exhibit D-1 - Existing Volumes (A.M. Peak Hour)
Exhibit D-2 - Existing Volumes (P.M. Peak Hour)
Exhibit D-3 - Existing Volumes (Interstate-49 Corridor) (A.M. & P.M. Peak Hours)
Exhibit D-4 - Construction Year Volumes (A.M. Peak Hour)
Exhibit D-5 - Construction Year Volumes (P.M. Peak Hour)
Exhibit D-6 - Construction Year Volumes (Interstate-49 Corridor) (A.M. & P.M. Peak Hours)
Exhibit D-7 - Future Volumes Without 211th Street Interchange (A.M. Peak Hour)
Exhibit D-8 - Future Volumes Without 211th Street Interchange (P.M. Peak Hour)
Exhibit D-9 - Future Volumes Without 211th Street Interchange (Hwy. J/C SPUI with Loop) (A.M. & P.M. Peak Hours)
Exhibit D-10 - Future Volumes Without 211th Street Interchange (Interstate-49 Corridor) (A.M. & P.M. Peak Hours)
Exhibit D-11 - Future Volumes With 211th Street Interchange (A.M. Peak Hour)
Exhibit D-12 - Future Volumes With 211th Street Interchange (P.M. Peak Hour)
Exhibit D-13 - Future Volumes With 211th Street Interchange (Interstate-49 Corridor) (A.M. & P.M. Peak Hours)



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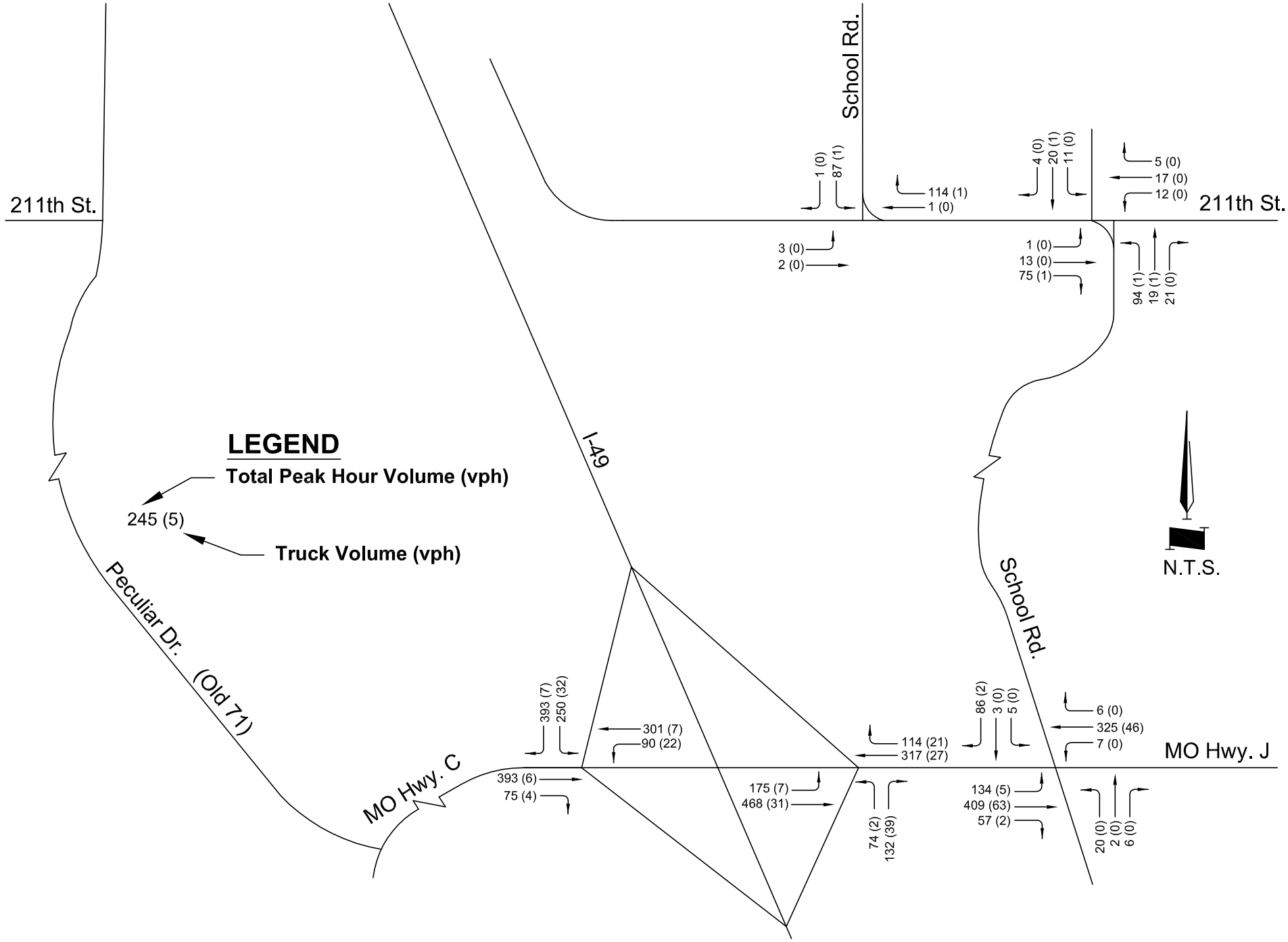
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Existing Volumes
A.M. Peak Hour
(6:45-7:45 A.M.)

FIGURE D-1

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Existing conditions.dwg Layout: EX Vol AM -- Thursday March 14, 2013, 3:14pm -- Copyright 2013, George Butler Associates, Inc.



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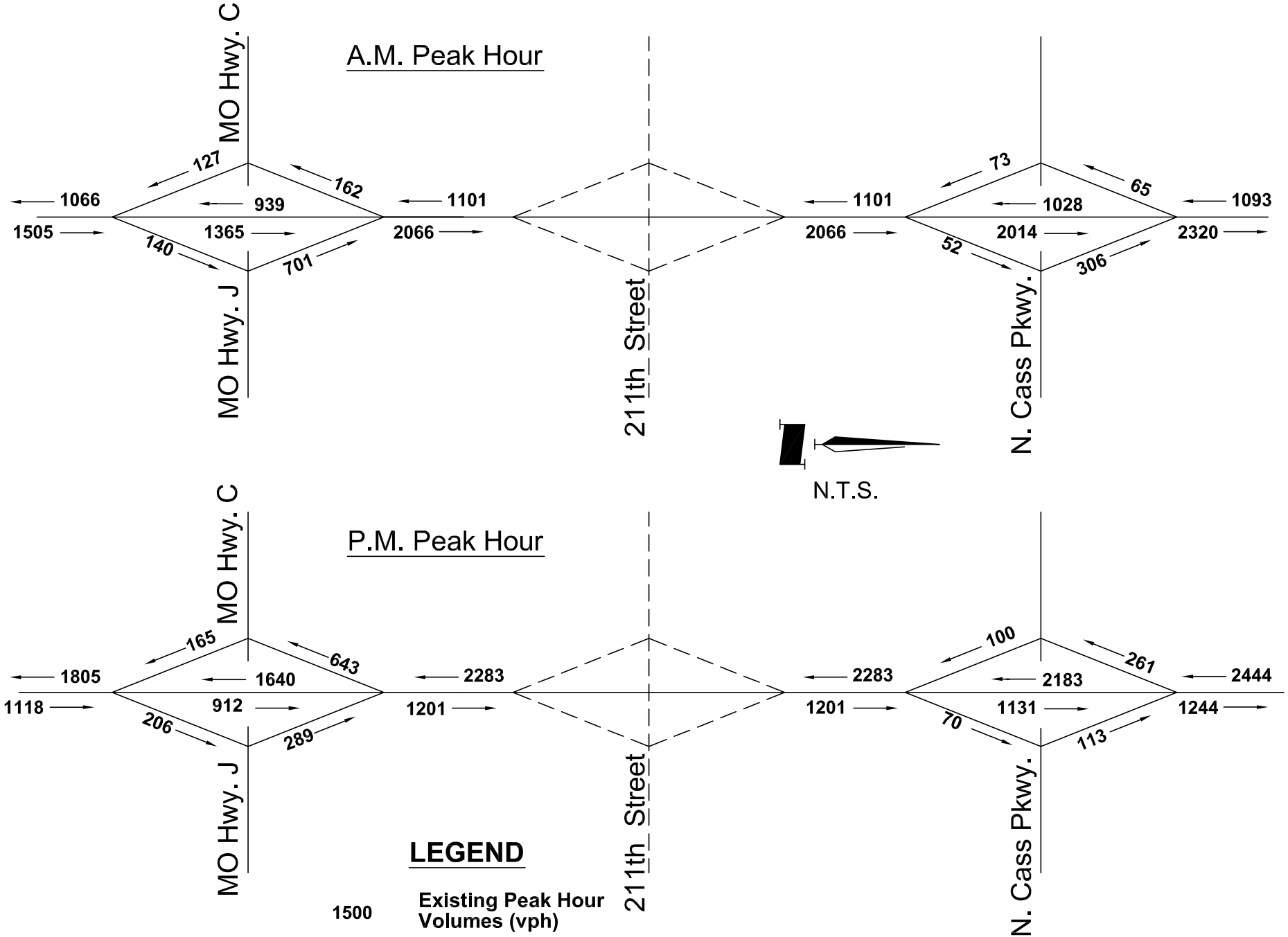
PROJECT NUMBER J4P2247	Existing Volumes P.M. Peak Hour (4:40-5:40 P.M.)	FIGURE D-2
DATE 04/01/2013		

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Existing conditions.dwg Layout: EX Vol PM -- Thursday March 14, 2013, 3:14pm -- Copyright 2013, George Butler Associates, Inc.



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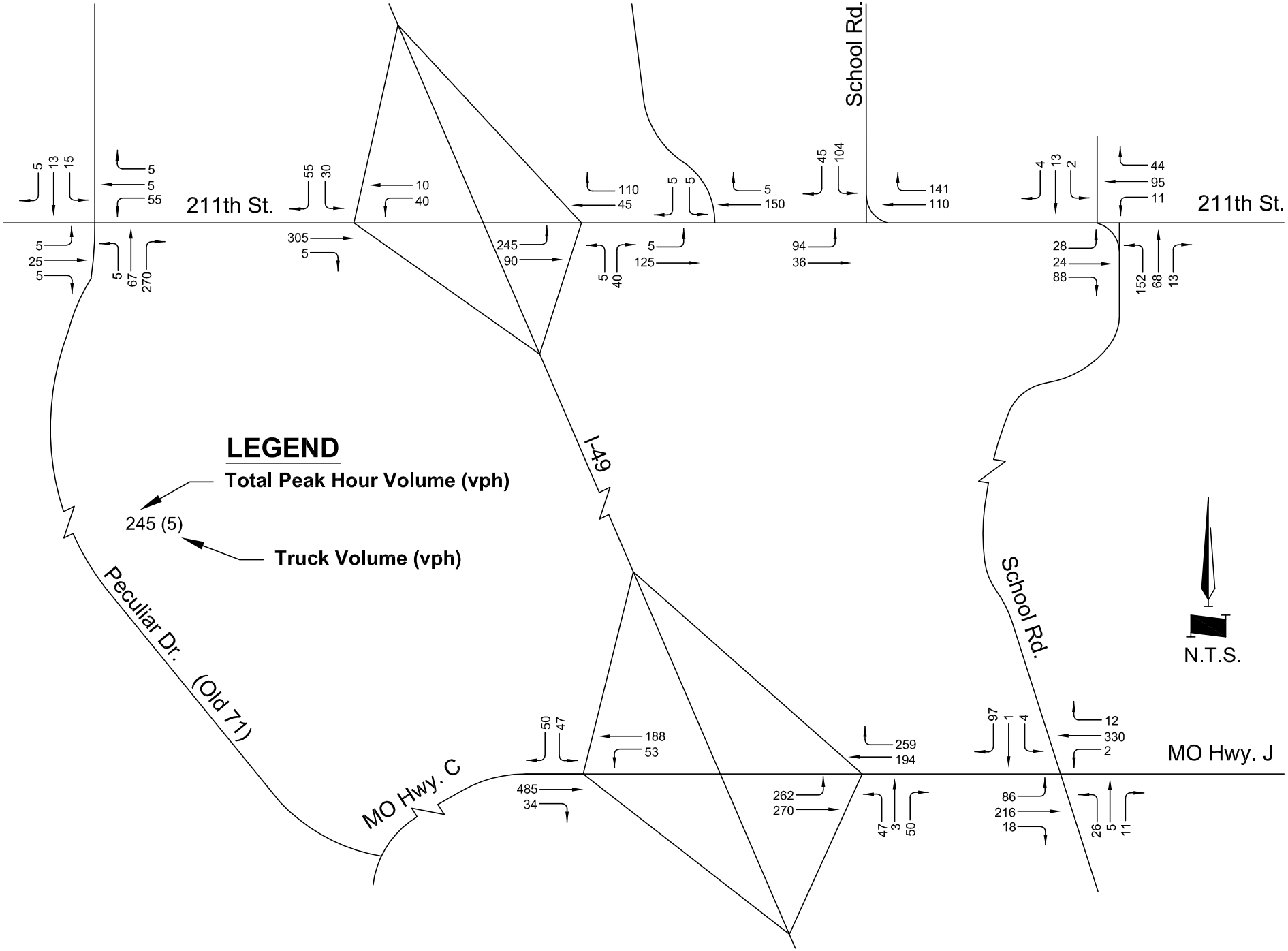
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Existing Volumes
Interstate-49 Corridor
A.M. & P.M. Peak Hours

FIGURE D-3

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Existing conditions.dwg Layout: EX Vol HCS -- Thursday March 14, 2013, 3:15pm -- Copyright 2013, George Butler Associates, Inc.



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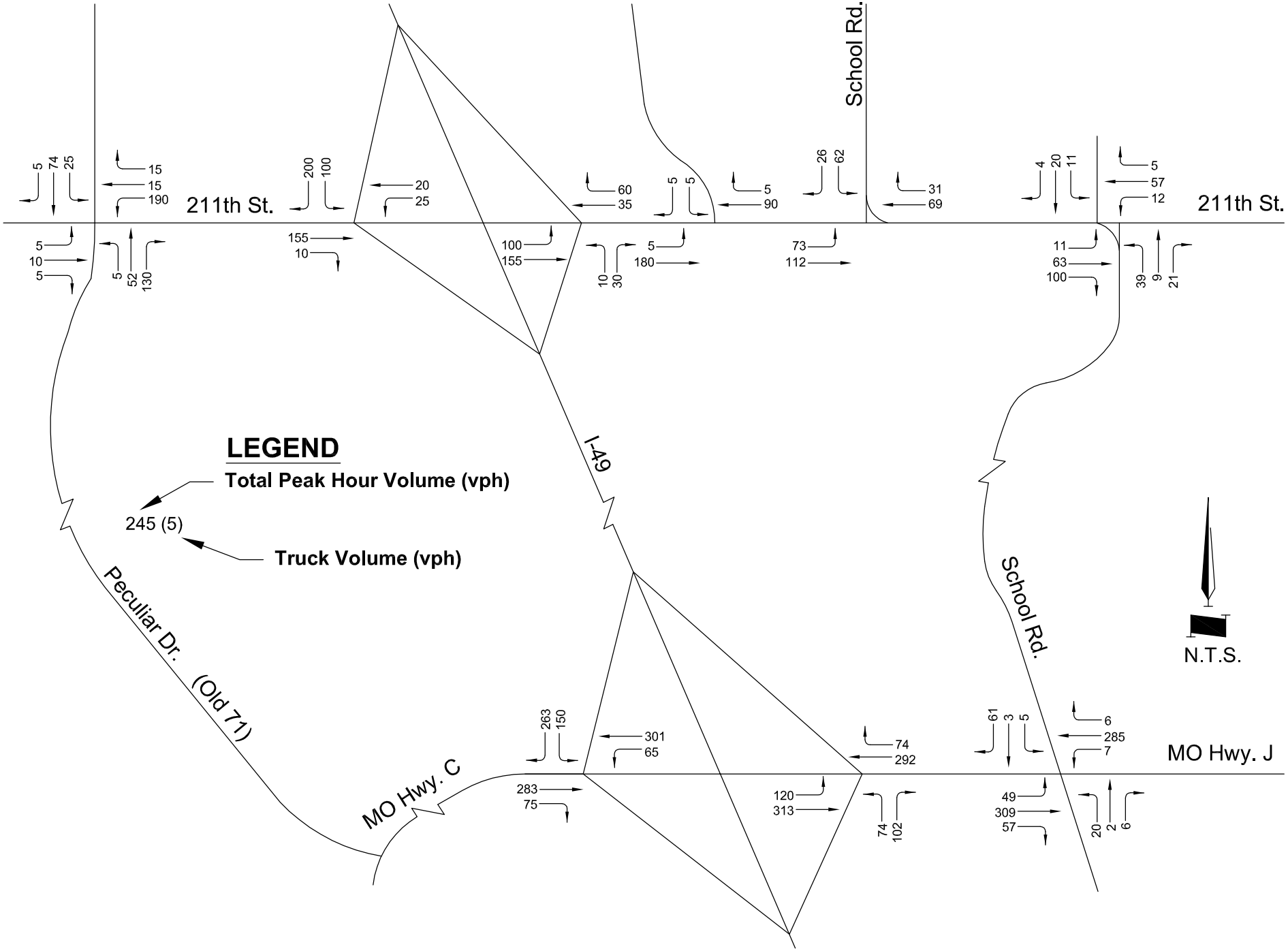
PROJECT NUMBER J4P2247	Construction Year Volumes A.M. Peak Hour	FIGURE D-4
DATE 04/01/2013		

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Existing conditions.dwg Layout: CY Vol AM -- Thursday March 14, 2013, 3:15pm -- Copyright 2013, George Butler Associates, Inc.



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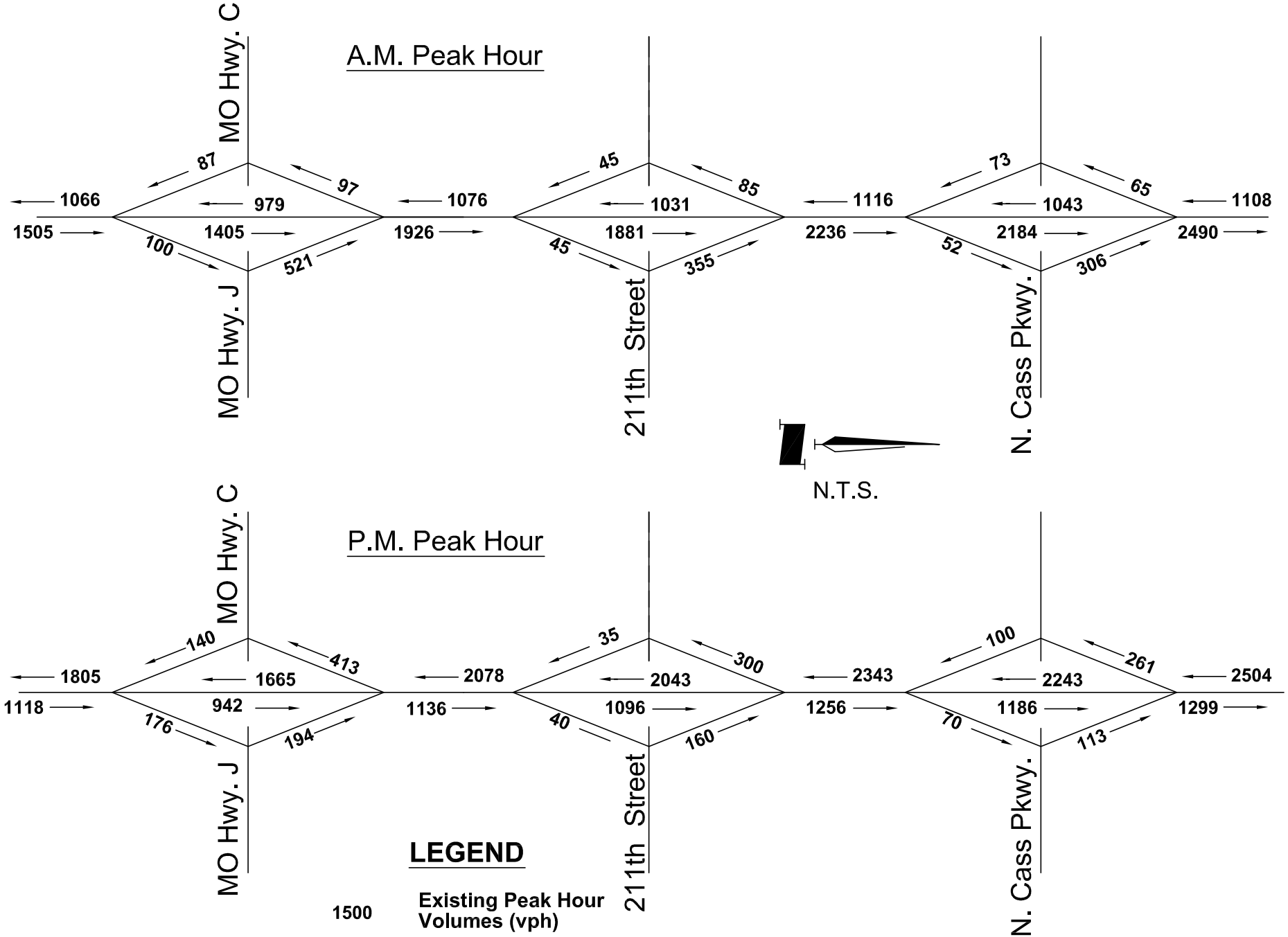
PROJECT NUMBER J4P2247	Construction Year Volumes P.M. Peak Hour	FIGURE D-5
DATE 04/01/2013		

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Existing conditions.dwg Layout: CY Vol PM -- Thursday March 14, 2013, 3:15pm -- Copyright 2013, George Butler Associates, Inc.



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PROJECT NUMBER
J4P2247

DATE
04/01/2013

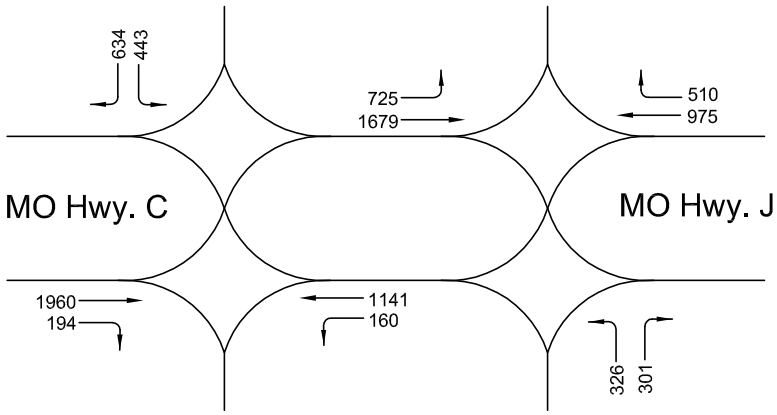
Construction Year Volumes
Interstate-49 Corridor
A.M. & P.M. Peak Hours

FIGURE D-6

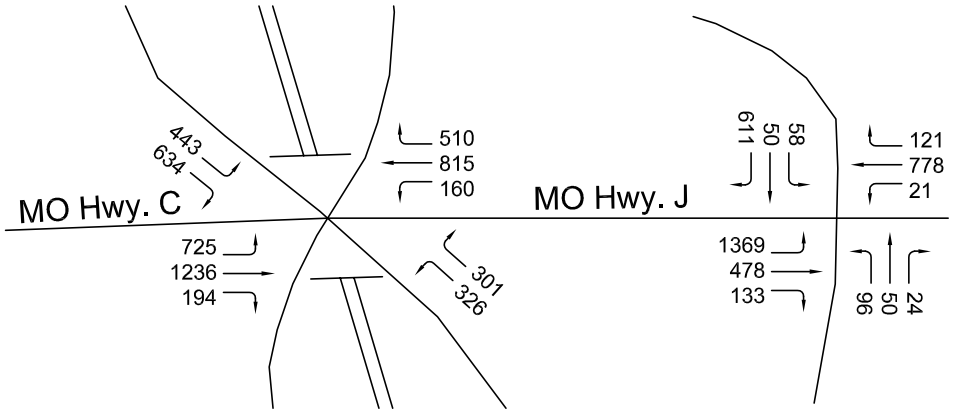
G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Existing conditions.dwg Layout: CY Vol HCS -- Thursday March 14, 2013, 3:22pm -- Copyright 2013, George Butler Associates, Inc.

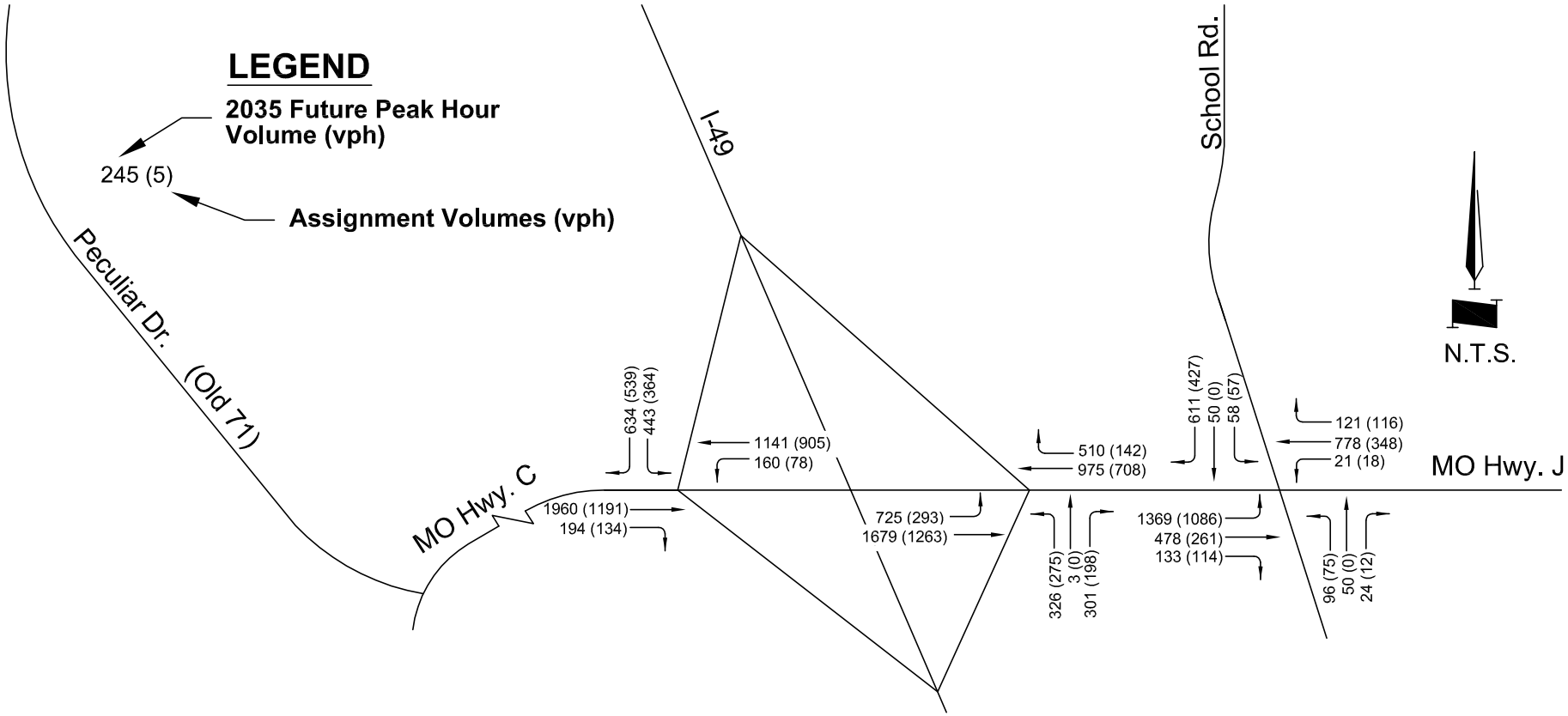
G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future Vol AM Without -- Friday March 15, 2013, 9:55am -- Copyright 2013, George Butler Associates, Inc.

Diverging Diamond (DDI) Option



Single Point Urban Interchange (SPUI) Option





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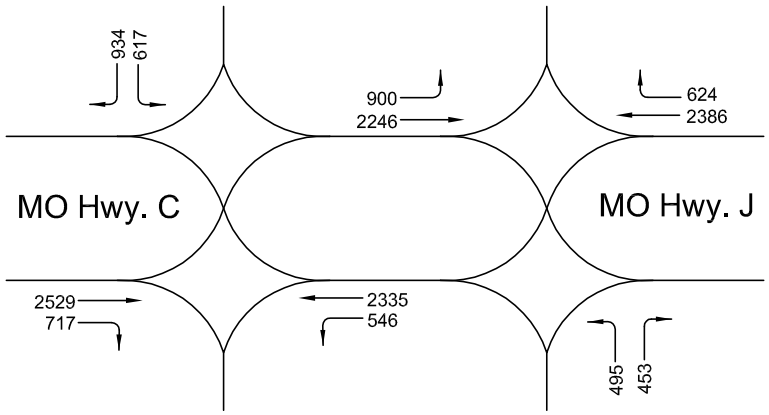
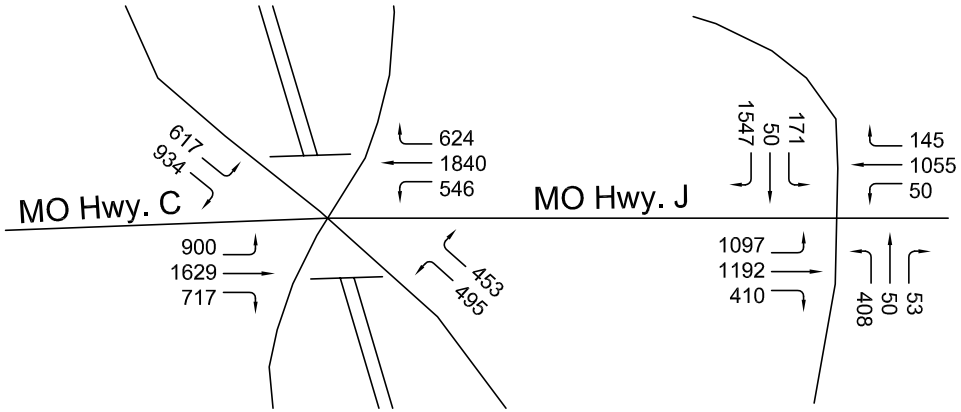
PROJECT NUMBER J4P2247	Future Volumes Without 211th Interchange A.M. Peak Hour	FIGURE D-7
DATE 04/01/2013		

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future Vol PM Without -- Friday March 15, 2013, 9:56am -- Copyright 2013, George Butler Associates, Inc.

Diverging Diamond (DDI) Option



Single Point Urban Interchange (SPUI) Option

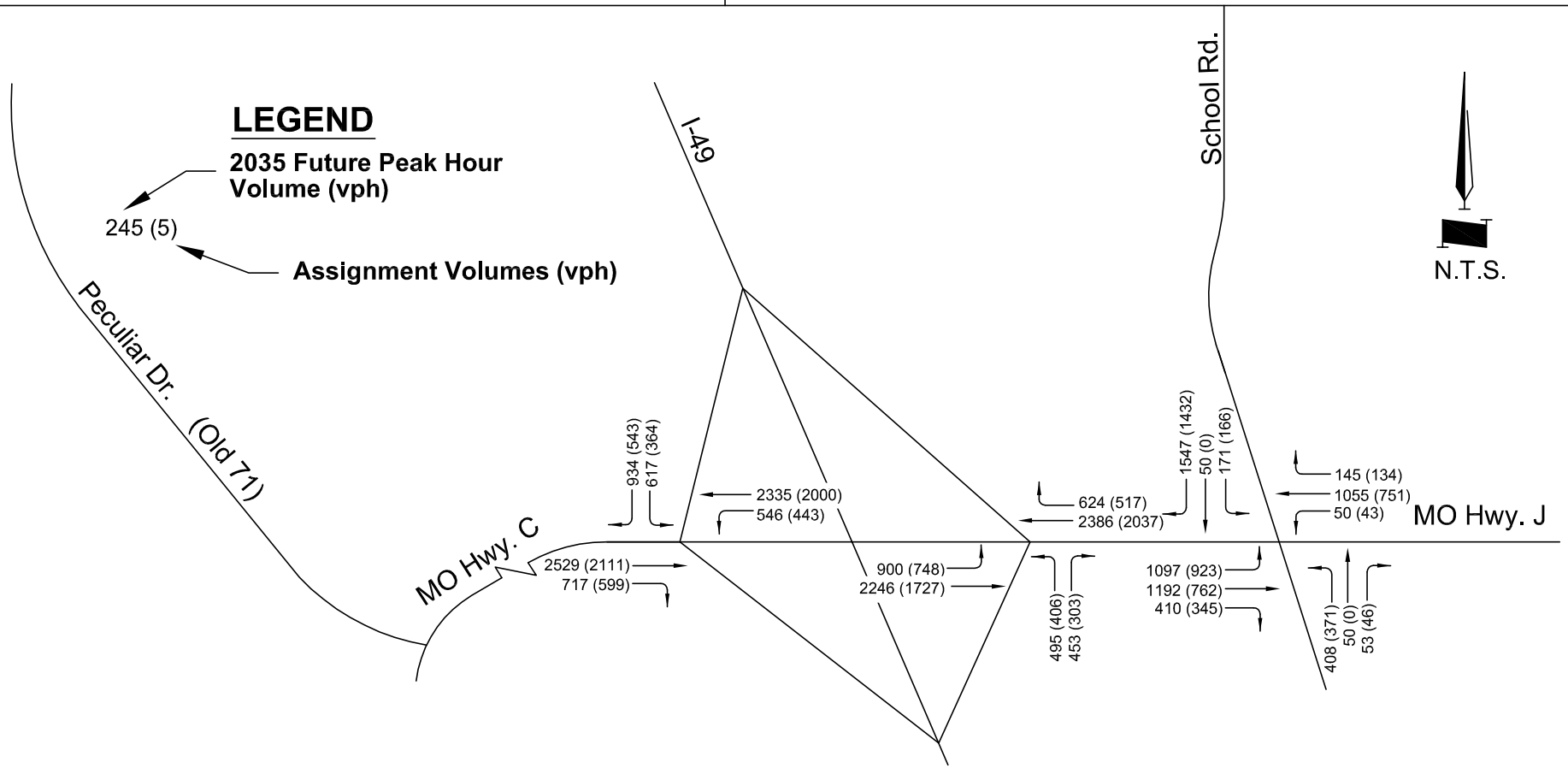


LEGEND

2035 Future Peak Hour Volume (vph)

245 (5)

Assignment Volumes (vph)



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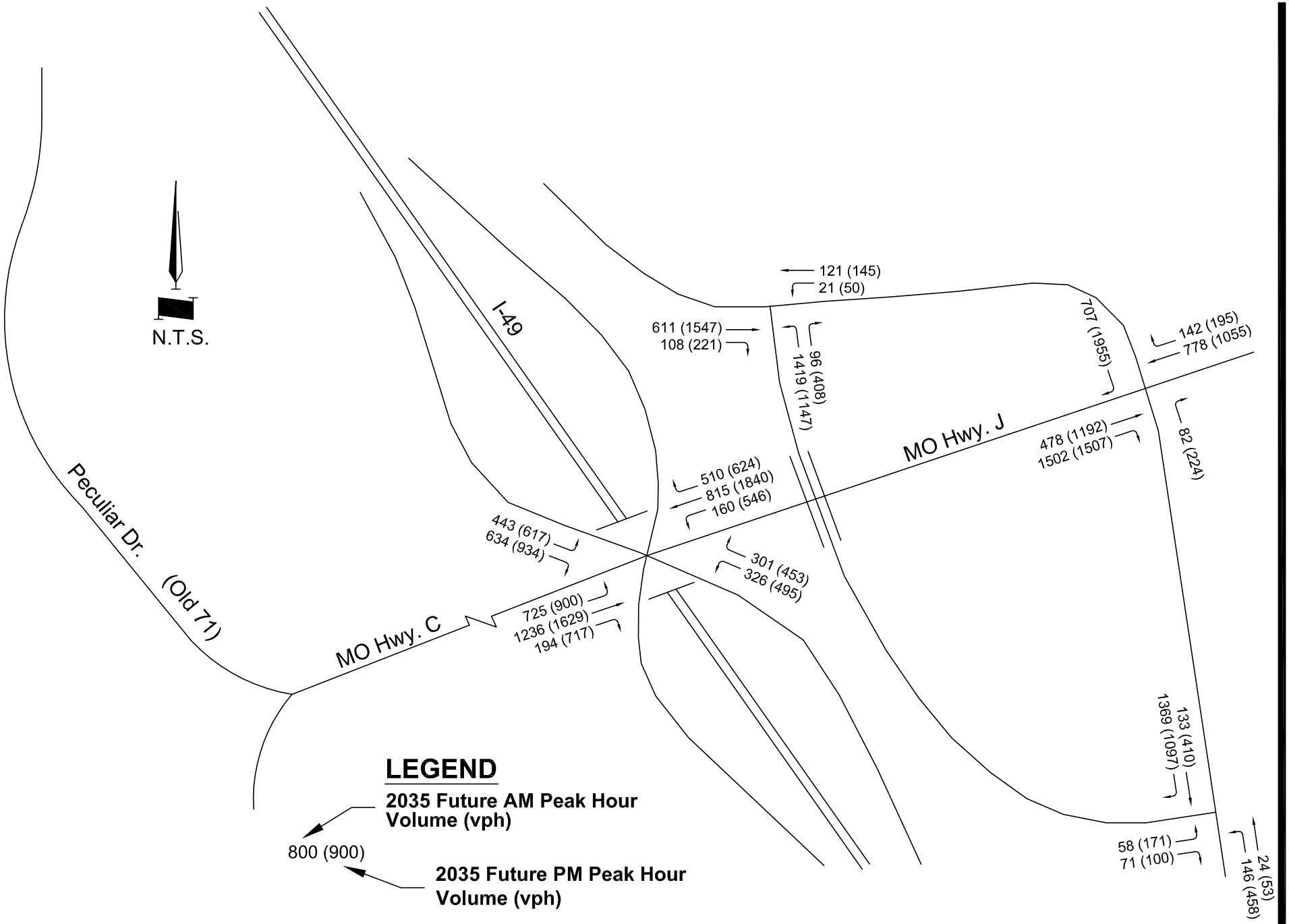
PROJECT NUMBER	Future Volumes Without 211th Interchange P.M. Peak Hour	FIGURE D-8
J4P2247		
DATE 04/01/2013		



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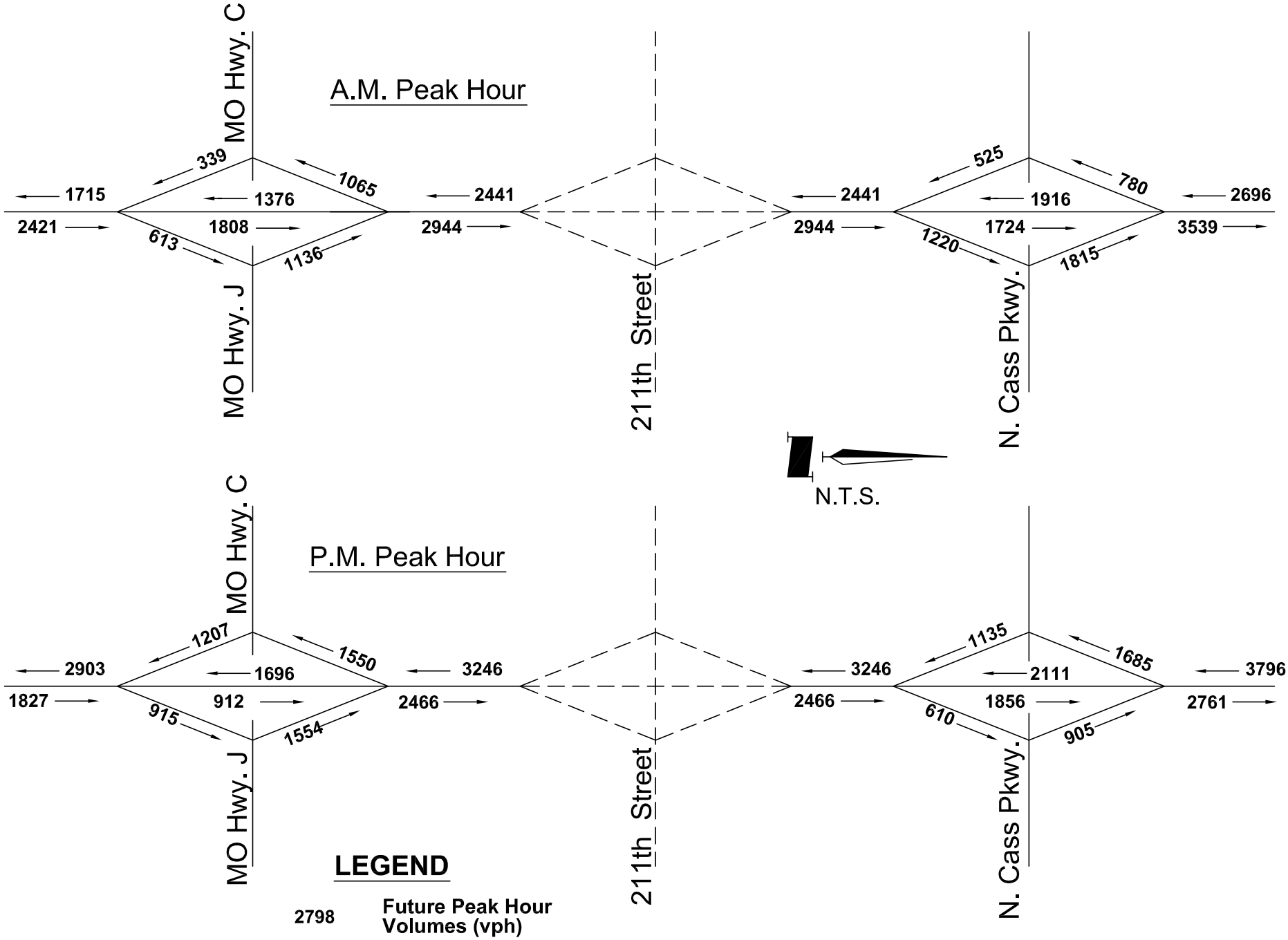
PROJECT NUMBER J4P2247	Future Volumes Without 211th Interchange Hwy. J/C SPUI With Loop A.M. & P.M. Peak Hours	FIGURE D-9
DATE 04/01/2013		

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future Vol SPUI loop -- Friday March 15, 2013, 9:56am -- Copyright 2013, George Butler Associates, Inc.



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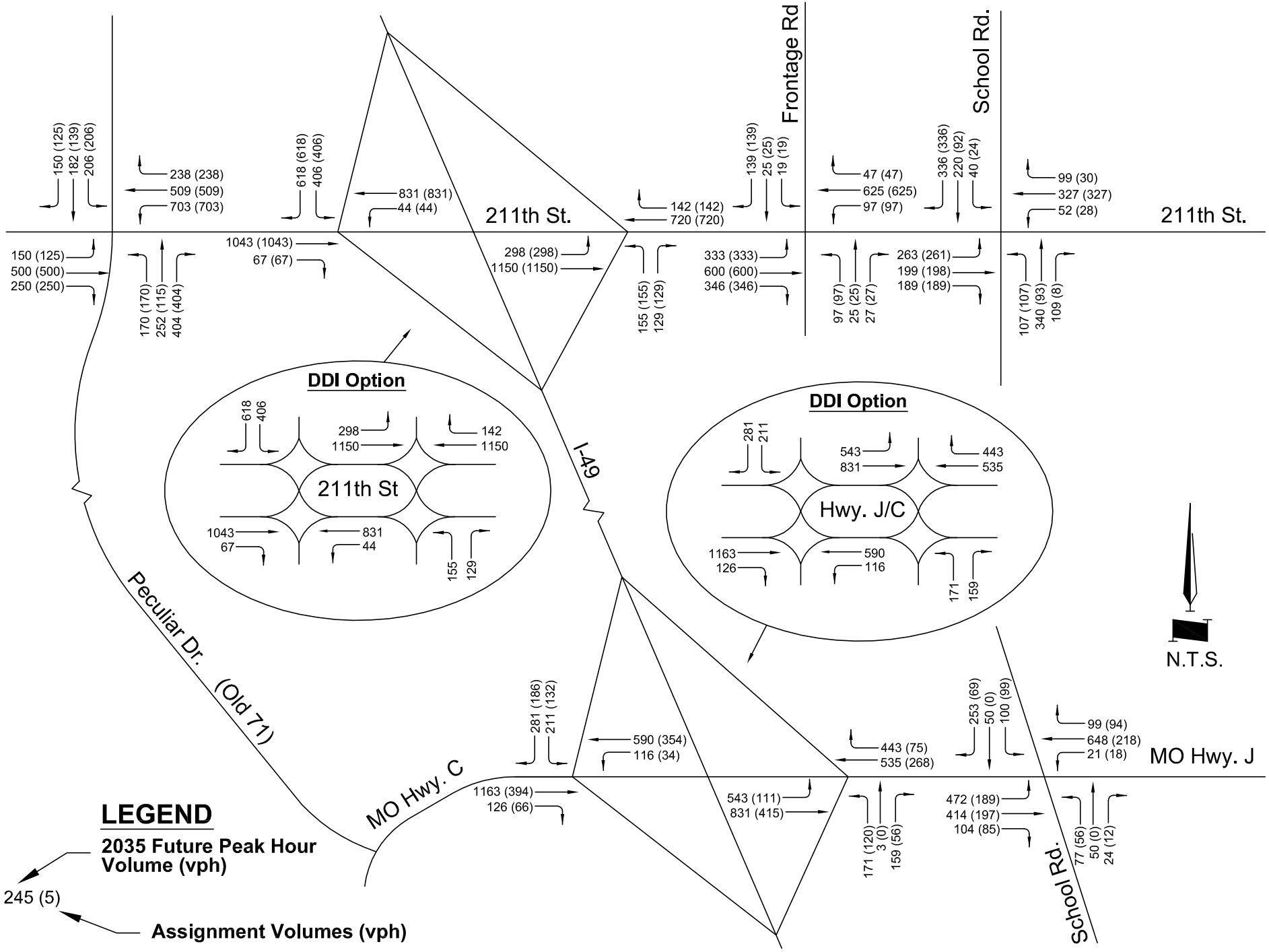
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Future Volumes
Without 211th Interchange
Interstate-49 Corridor
A.M. & P.M. Peak Hours

FIGURE D-10

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions With.dwg Layout: Future Hwy & No Build -- Friday March 15, 2013, 9:42am -- Copyright 2013, George Butler Associates, Inc.



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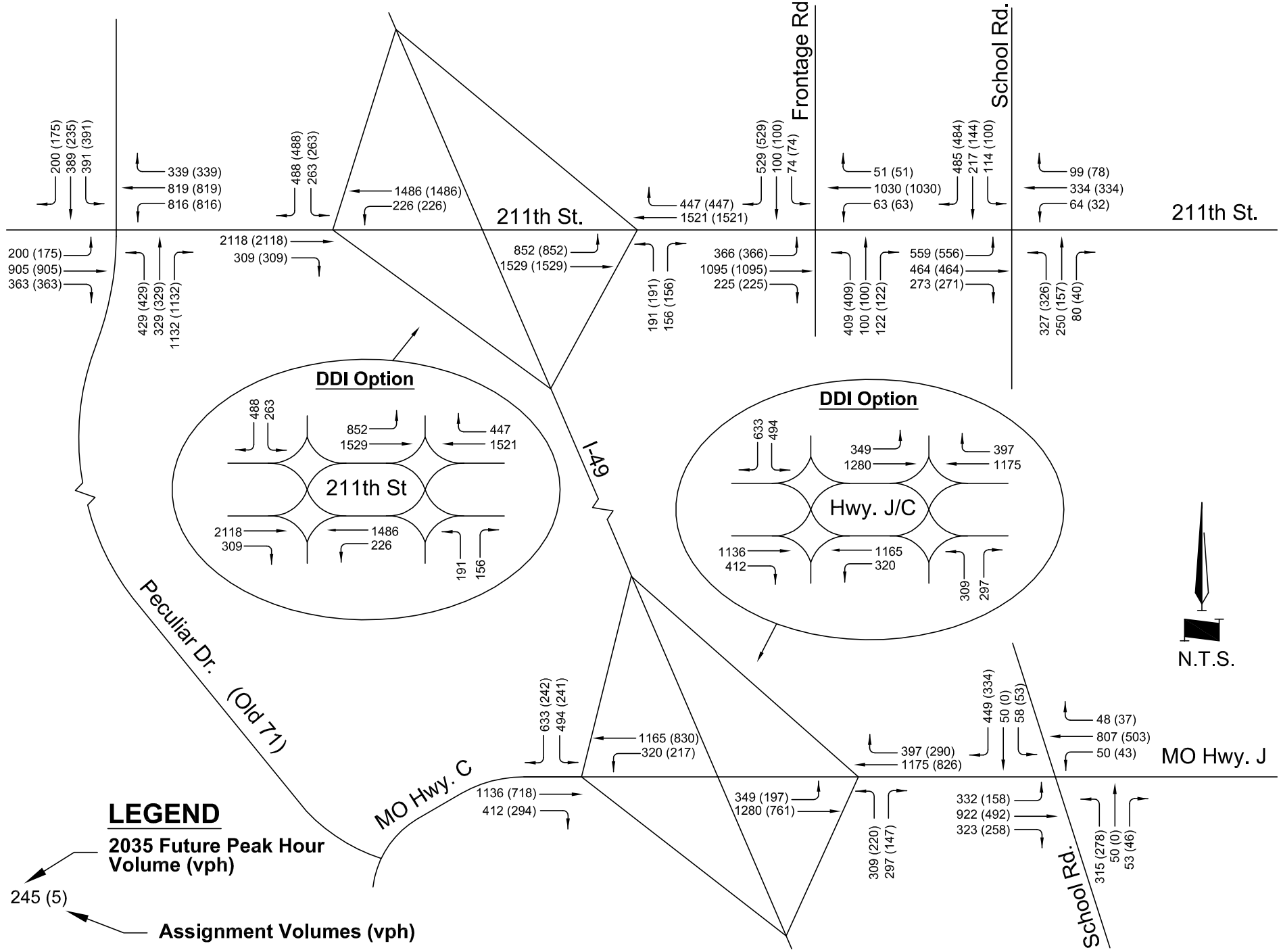
PROJECT NUMBER J4P2247

DATE 04/01/2013

Future Volumes With 211th Interchange A.M. Peak Hour

FIGURE D-11

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future Vol AM With -- Thursday March 21, 2013, 2:37pm -- Copyright 2013, George Butler Associates, Inc.



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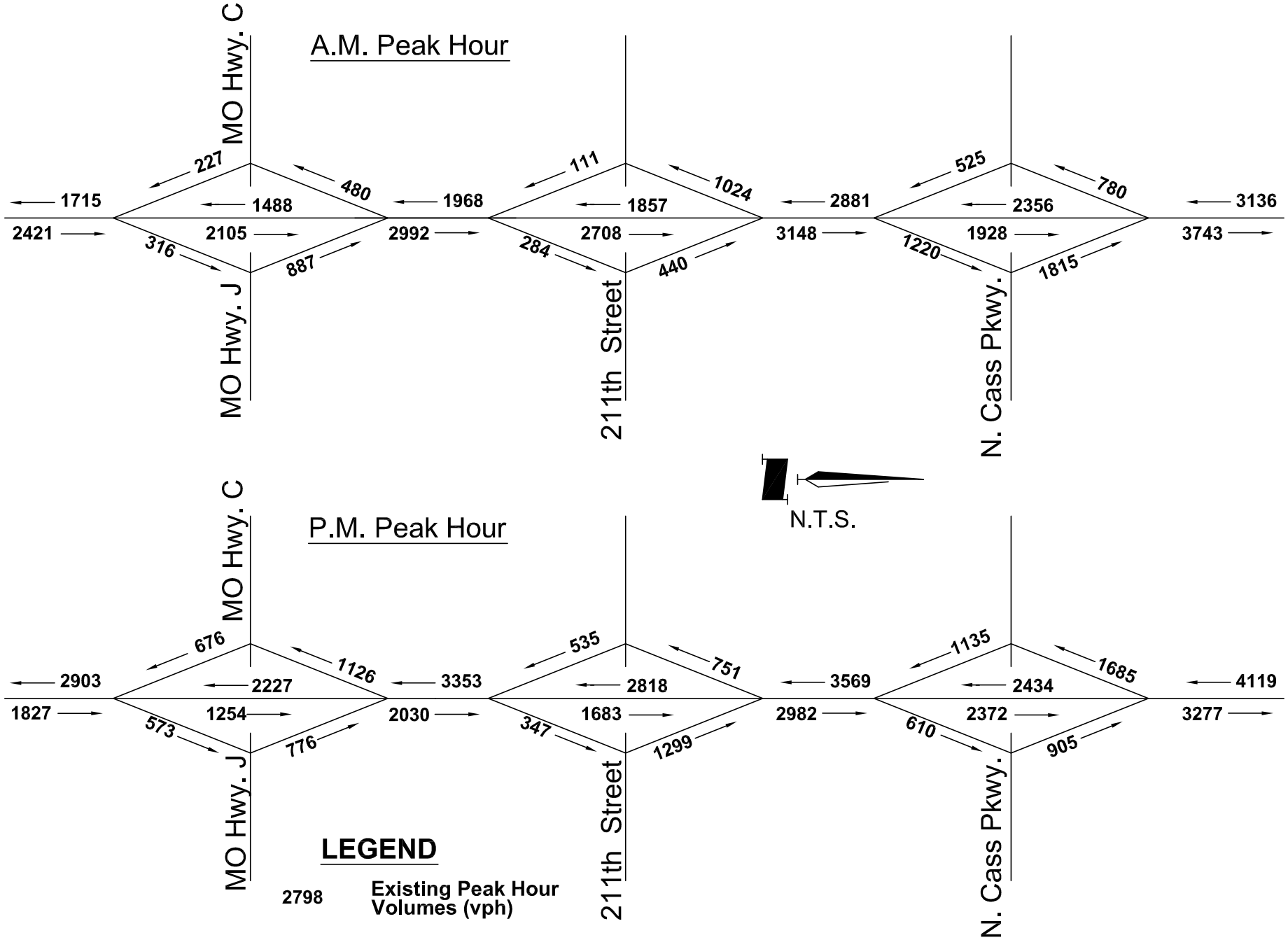
DATE 04/01/2013

Future Volumes With 211th Interchange P.M. Peak Hour

FIGURE D-12

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future Vol PM With -- Thursday March 21, 2013, 2:38pm -- Copyright 2013, George Butler Associates, Inc.



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PROJECT NUMBER
J4P2247

DATE
04/01/2013

Future Volumes
With 211th Interchange
Interstate-49 Corridor
A.M. & P.M. Peak Hours

FIGURE D-13

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions With.dwg Layout: Future Hwy & Ramp Volumes -- Friday March 15, 2013, 9:41am -- Copyright 2013, George Butler Associates, Inc.

APPENDIX E

Traffic Operations

Existing Configurations					
Synchro Analysis		SimTraffic Analysis		HCS Analysis	
A.M. LOS	P.M. LOS	A.M. LOS	P.M. LOS	A.M. LOS	P.M. LOS
Figure E-1	*Figure E-1*	*Figure E-2*	*Figure E-2*	*Figure E-3*	*Figure E-3*

Construction Year Configurations					
Synchro Analysis		VISSIM Analysis		HCS Analysis	
A.M. LOS	P.M. LOS	A.M. LOS	P.M. LOS	A.M. LOS	P.M. LOS
Figure E-4	*Figure E-5*	*Figure E-6*	*Figure E-6*	*Figure E-7*	*Figure E-7*

Future Without 211th Street Interchange	Synchro Analysis		SimTraffic Analysis	
Hwy. J/C Interchange Configuration	A.M. LOS	P.M. LOS	A.M. LOS	P.M. LOS
Standard Diamond	*Figure E-8*	*Figure E-8*	N/A	N/A
SPUI	*Figure E-9*	*Figure E-9*	*Figure E-10*	*Figure E-10*
SPUI with Loop	*Figure E-11*	*Figure E-12*	*Figure E-13*	*Figure E-14*
Diverging Diamond	*Figure E-15*	*Figure E-15*	N/A	N/A

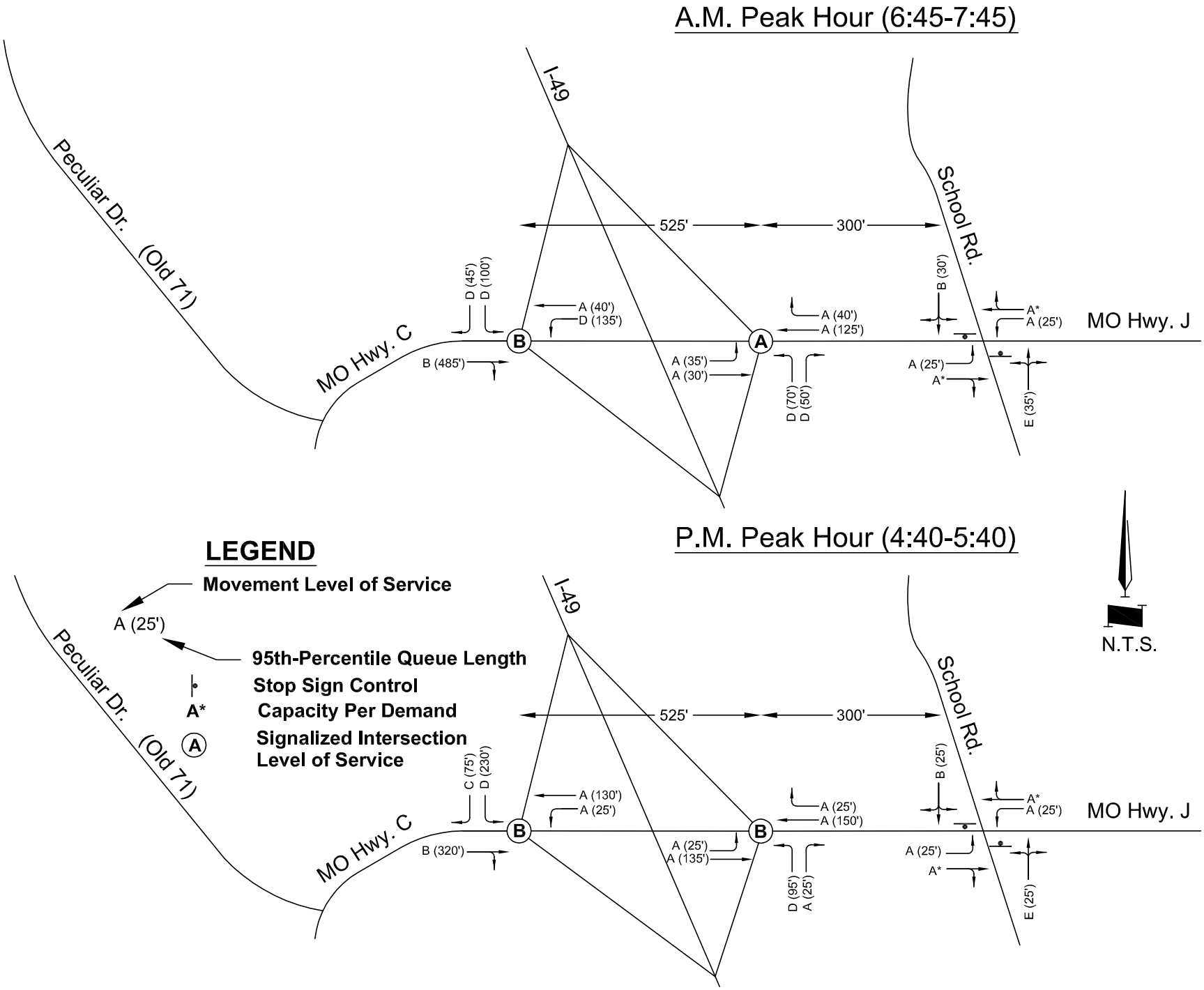
Future Without 211th Street Interchange	HCS Analysis	
Existing / Improved Interchanges	A.M. LOS	P.M. LOS
Interstate-49 Corridor (2 Interchanges)	*Figure E-16*	*Figure E-16*

Future With 211th Street Interchange	Synchro Analysis		SimTraffic Analysis	
Hwy. J/C Interchange Configuration	A.M. LOS	P.M. LOS	A.M. LOS	P.M. LOS
Standard Diamond (Existing School Rd.)	*Figure E-17*	*Figure E-18*	*Figure E-19*	*Figure E-20*
Standard Diamond (Relocated School Rd.)	N/A	N/A	*Figure E-21*	*Figure E-22*
Diverging Diamond	*Figure E-23*	*Figure E-24*	N/A	N/A

Future With 211th Street Interchange	Synchro Analysis		VISSIM Analysis	
211th Street Interchange Configuration	A.M. LOS	P.M. LOS	A.M. LOS	P.M. LOS
Diverging Diamond Interchange	*Figure E-23*	*Figure E-24*	*Figure E-25*	*Figure E-25*

Future With 211th Street Interchange	SIDRA Analysis	
211th Street Interchange Configuration	A.M. LOS	P.M. LOS
Roundabout Interchange	*Figure E-26*	*Figure E-26*

Future With 211th Street Interchange	HCS Analysis	
Proposed / Improved Interchanges	A.M. LOS	P.M. LOS
Interstate-49 Corridor (3 Interchanges)	*Figure E-27*	*Figure E-27*



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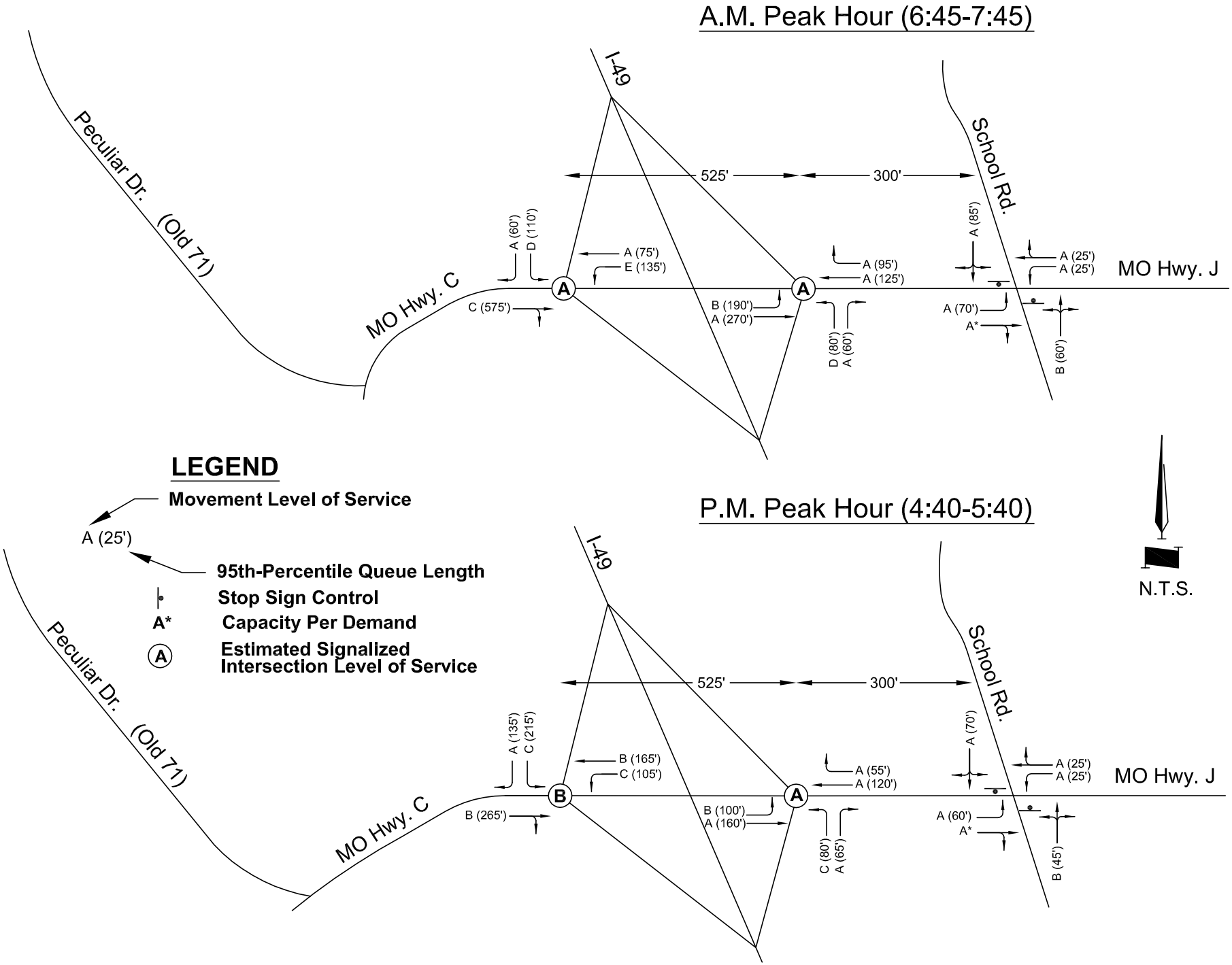
PROJECT NUMBER J4P2247	Existing Synchro LOS A.M. & P.M. Peak Hours	FIGURE E-1
DATE 04/01/2013		

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Existing conditions.dwg Layout: EX LOS Synchro -- Tuesday March 19, 2013, 11:24am -- Copyright 2013, George Butler Associates, Inc.



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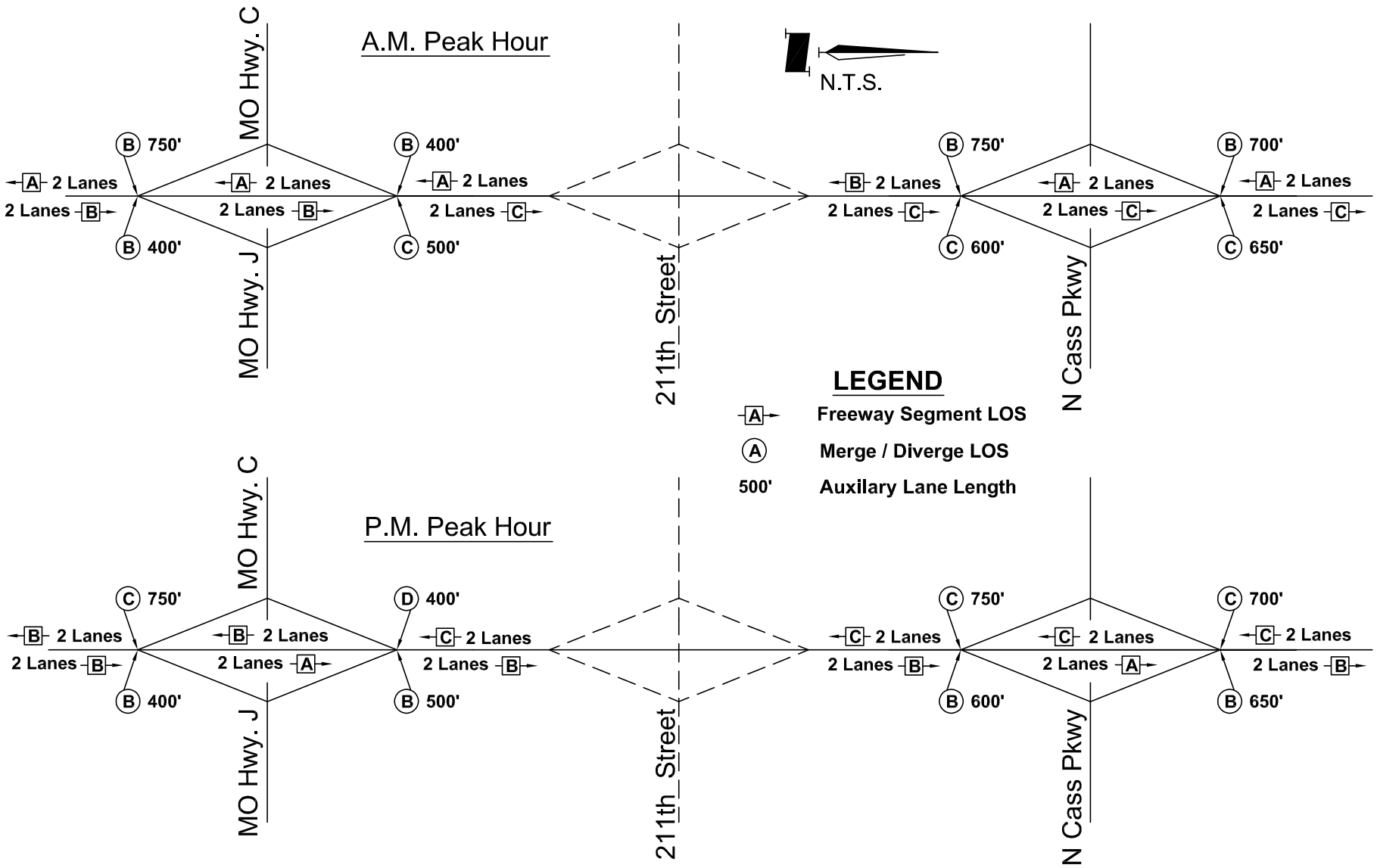
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Existing SimTraffic LOS
A.M. & P.M Peak Hours

FIGURE E-2

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Existing conditions.dwg Layout: EX LOS Sim -- Tuesday March 19, 2013, 11:25am -- Copyright 2013, George Butler Associates, Inc.



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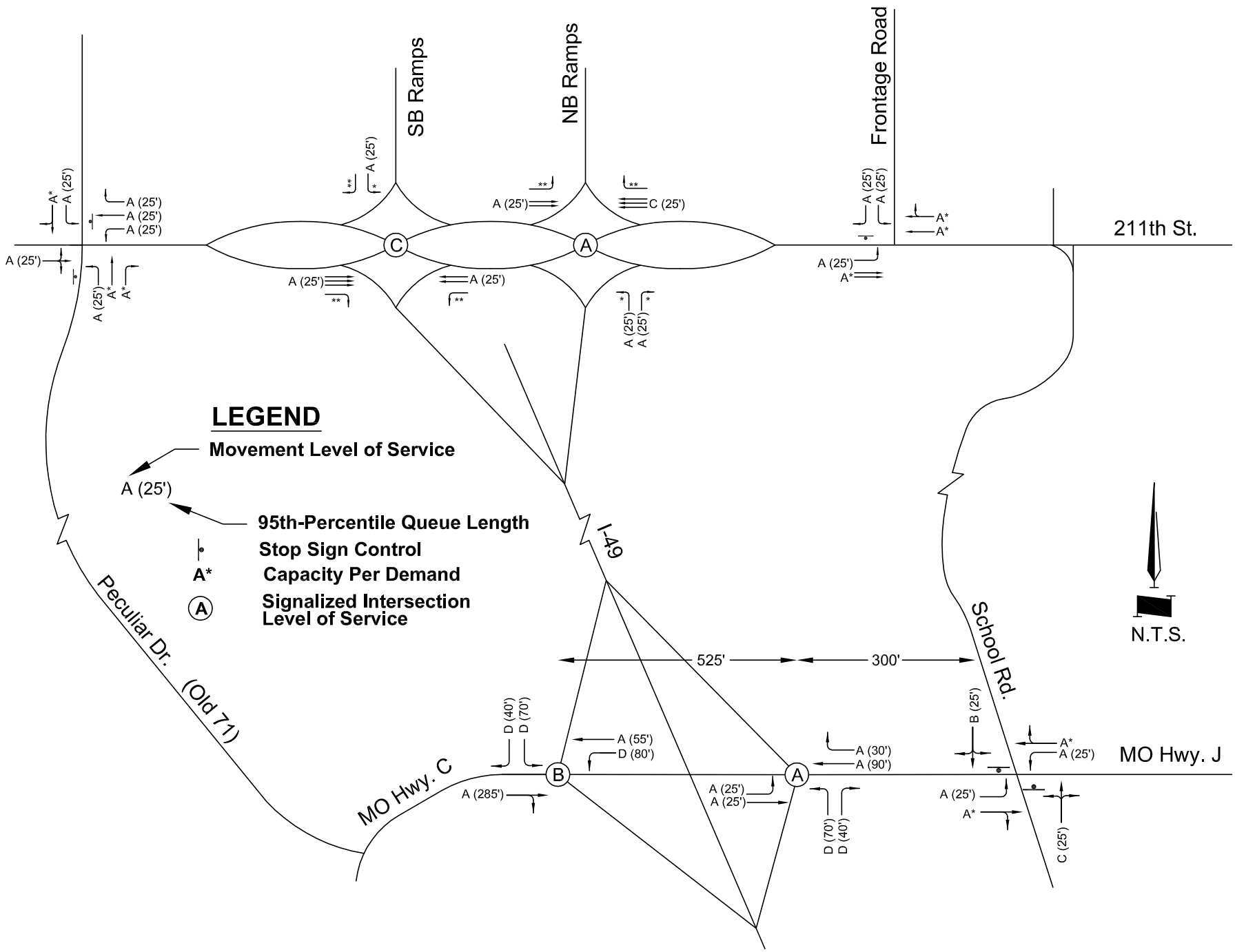
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Existing HCS LOS
Interstate-49 Corridor
A.M. & P.M. Peak Hours

FIGURE E-3

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Existing conditions.dwg Layout: EX Los HCS -- Thursday March 14, 2013, 3:23pm -- Copyright 2013, George Butler Associates, Inc.



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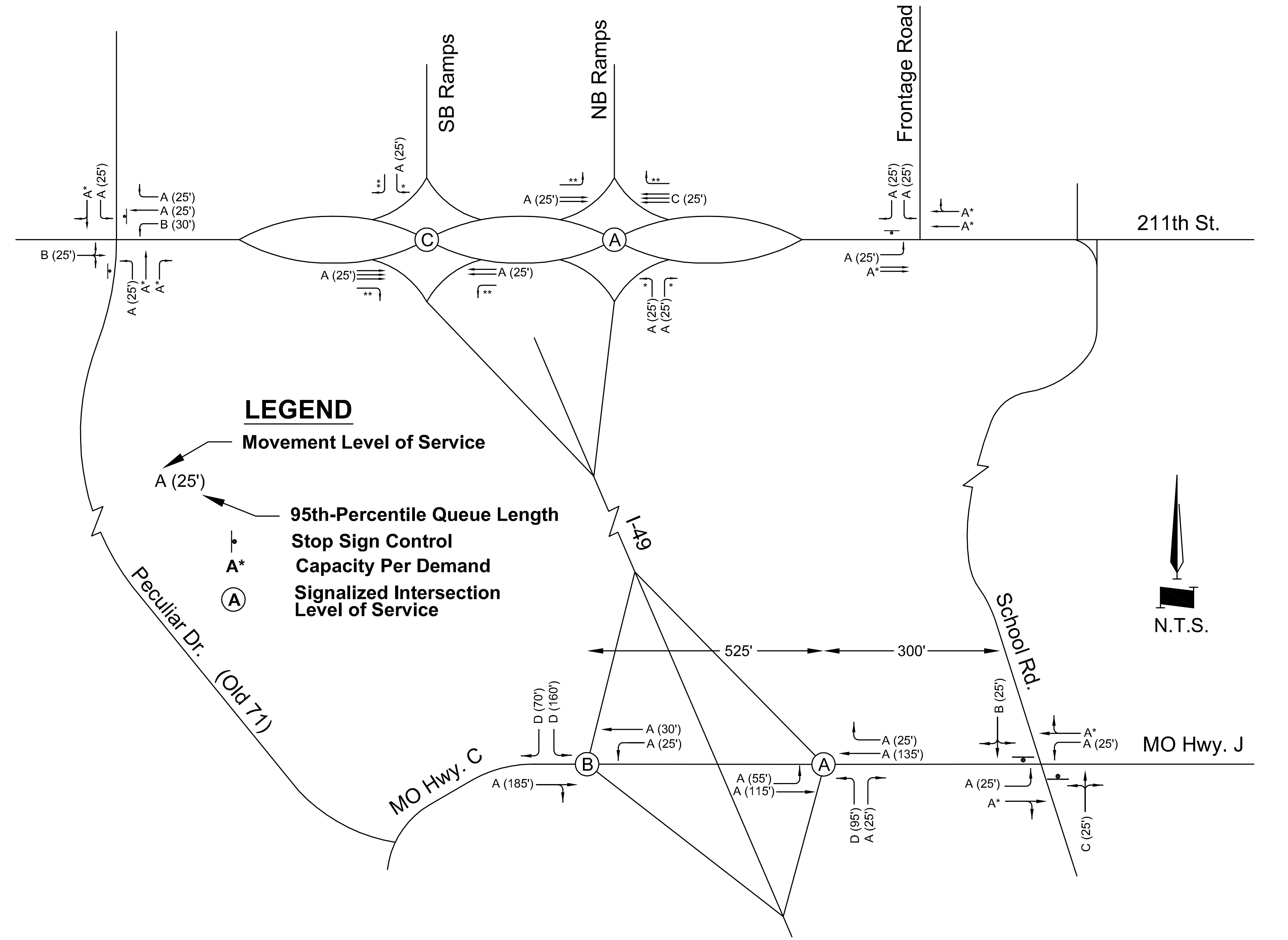
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Construction Year Synchro LOS
A.M Peak Hour

FIGURE E-4

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Existing conditions.dwg Layout: CY LOS AM -- Tuesday March 19, 2013, 11:30am -- Copyright 2013, George Butler Associates, Inc.



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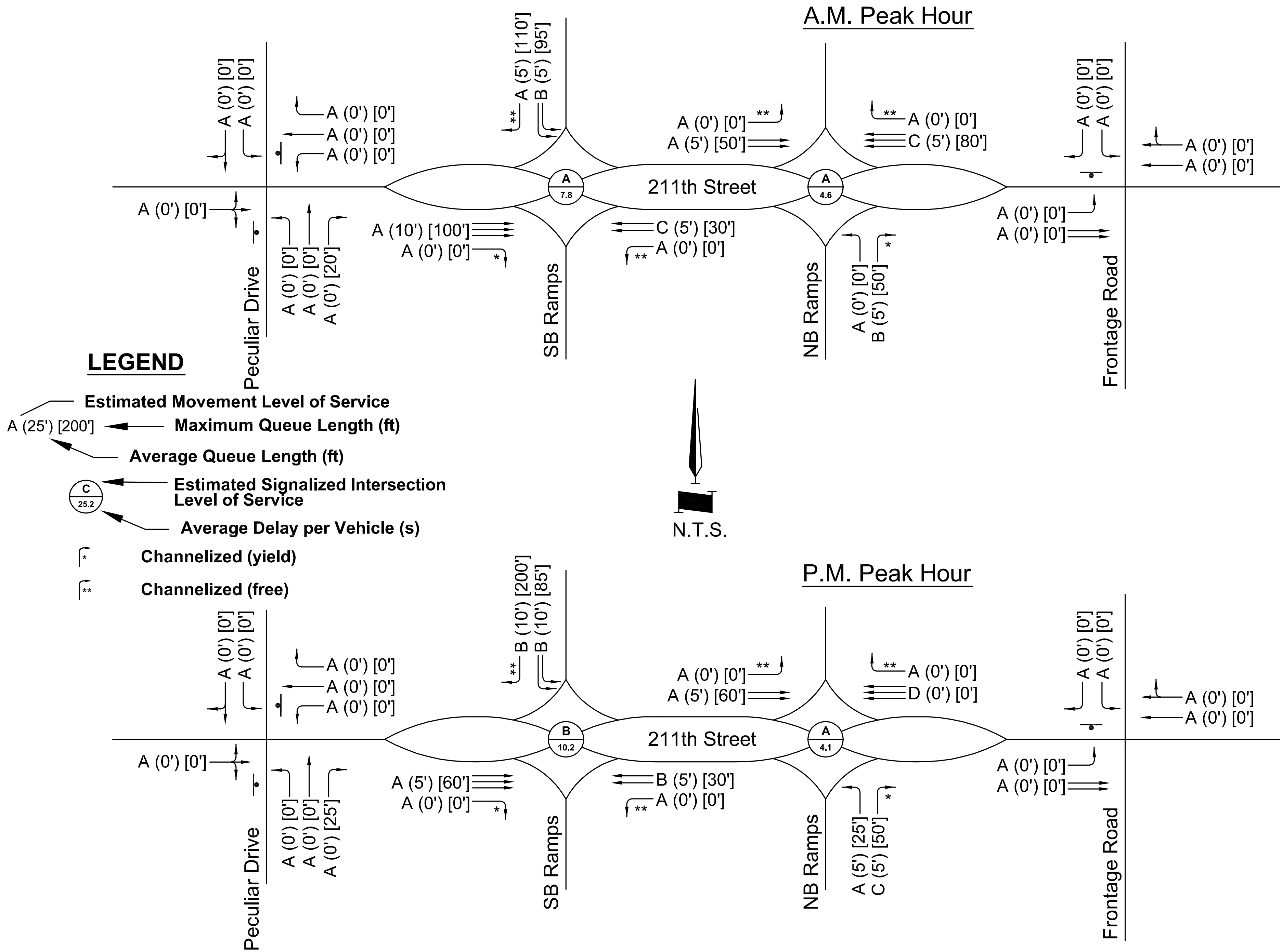
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Construction Year Synchro LOS
P.M Peak Hour

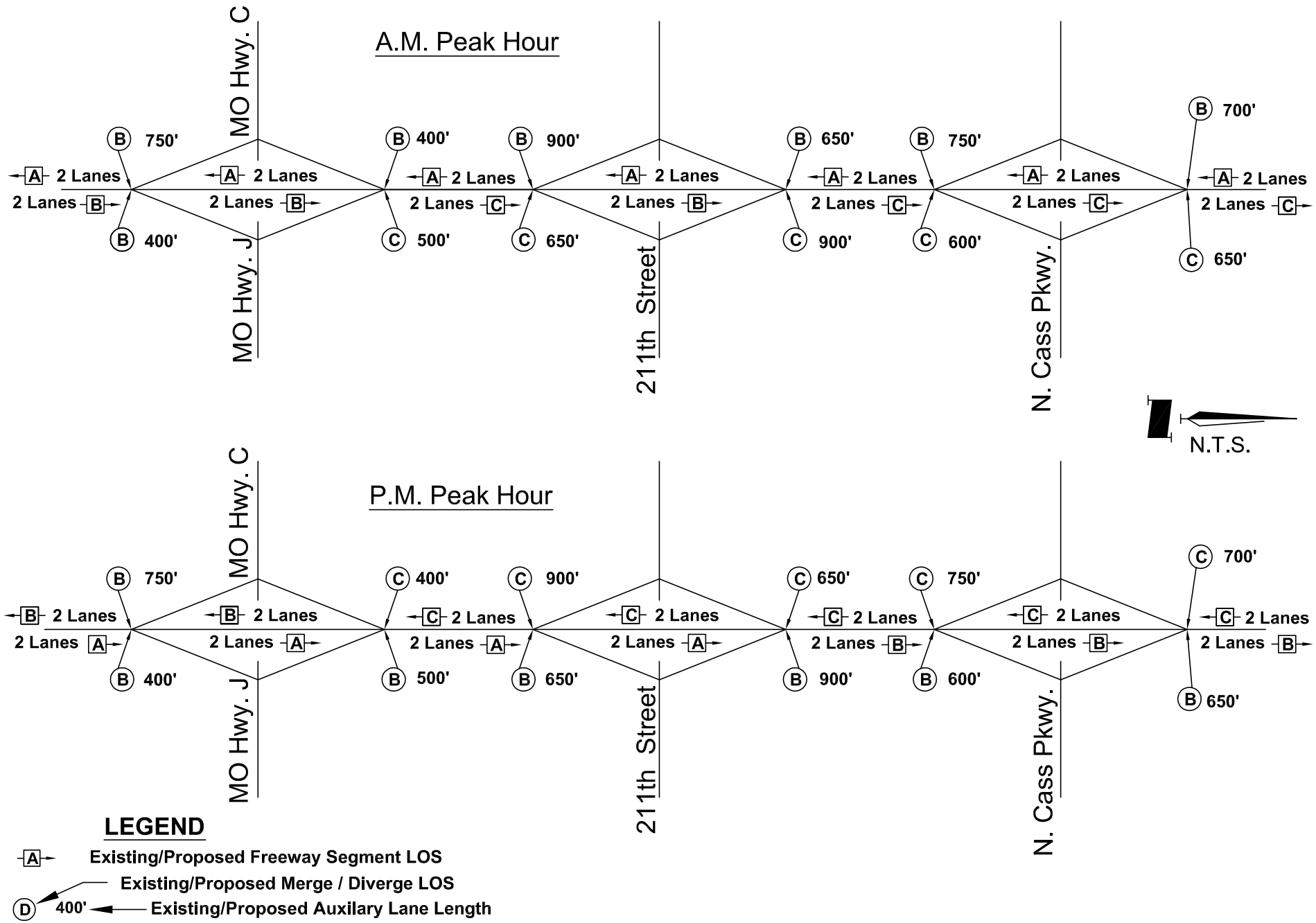
FIGURE E-5

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Existing conditions.dwg Layout: CY LOS PM -- Tuesday March 19, 2013, 12:46pm -- Copyright 2013, George Butler Associates, Inc.



GBA architects engineers	PROJECT NUMBER J4P2247 DATE 04/01/2013	Construction Year VISSIM LOS With 211th DDI Interchange A.M. & P.M. Peak Hours	FIGURE E-6

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: CY LOS With DDI (vis) --- Tuesday March 19, 2013, 11:52am --- Copyright 2013, George Butler Associates, Inc.



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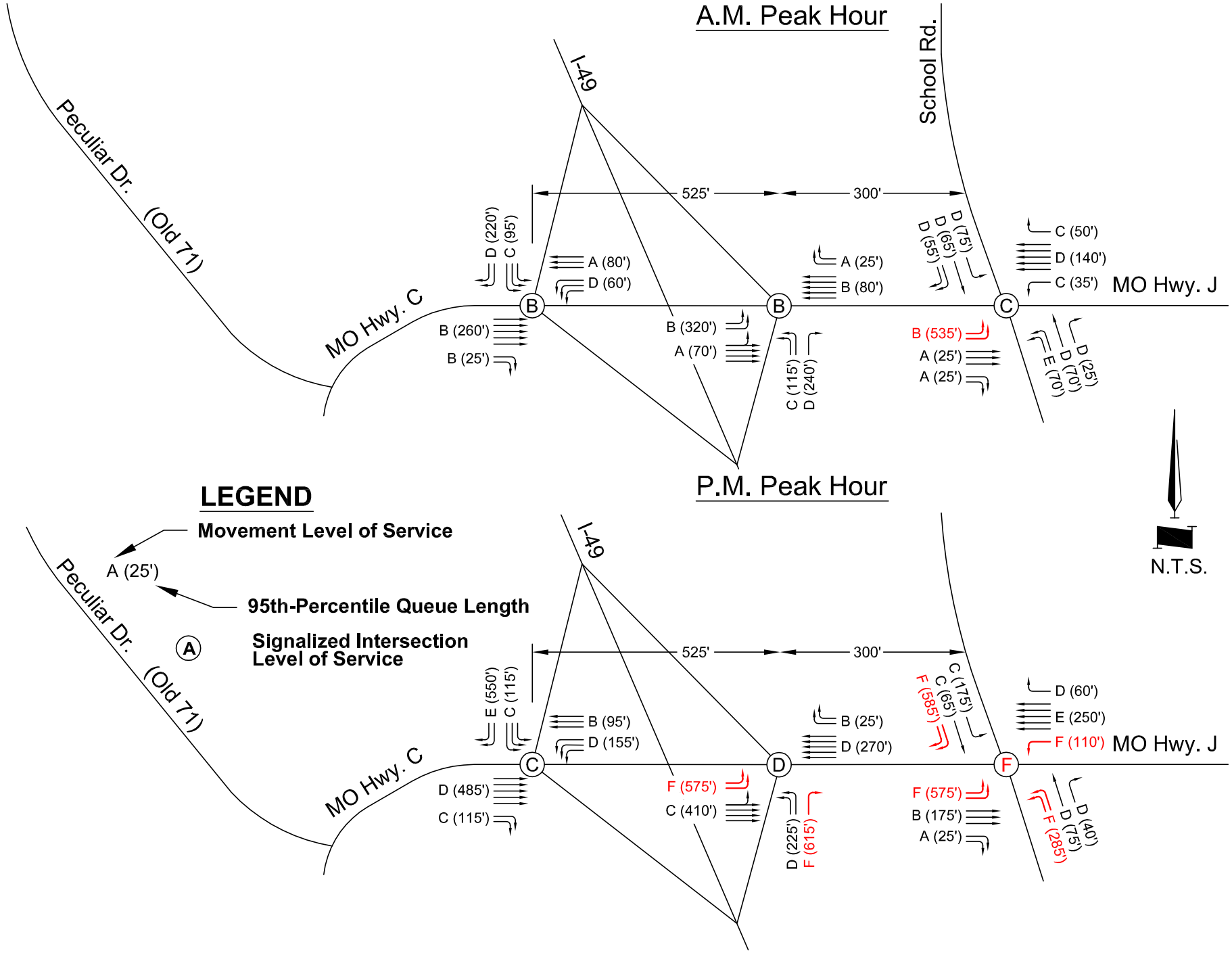
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Construction Year HCS LOS
With 211th Interchange
Interstate-49 Corridor (2 Lane)
A.M. & P.M. Peak Hours

FIGURE E-7

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions With.dwg Layout: CY LOS HCS -- Tuesday March 19, 2013, 11:29am -- Copyright 2013, George Butler Associates, Inc.



G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS Without -- Tuesday March 19, 2013, 1:17pm -- Copyright 2013, George Butler Associates, Inc.

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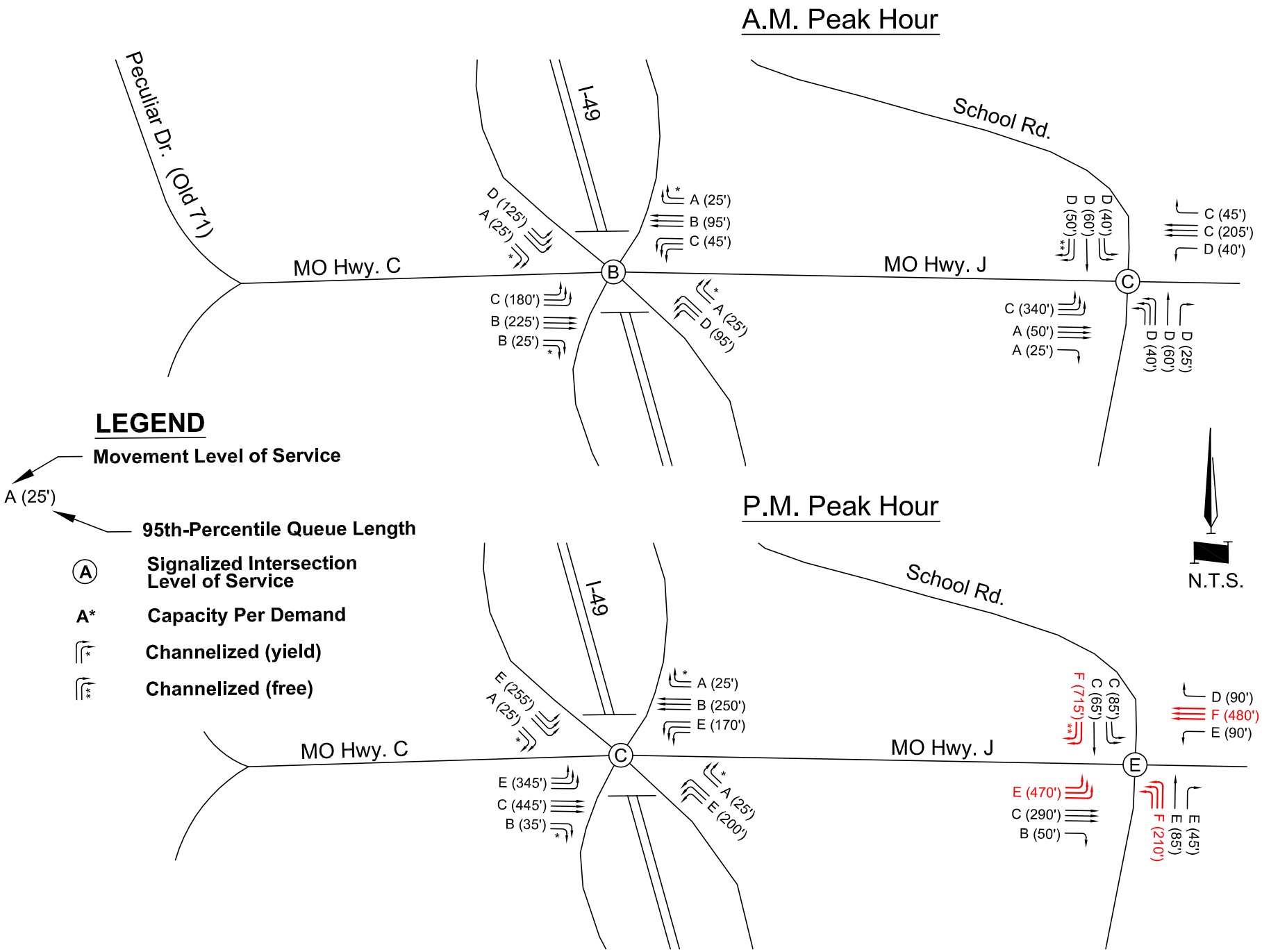
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Future Synchro LOS
Without 211th Interchange
Hwy. J/C Diamond
A.M. & P.M Peak Hours

FIGURE E-8

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS SPUI Signal (Syn) -- Tuesday March 19, 2013, 11:34am -- Copyright 2013, George Butler Associates, Inc.



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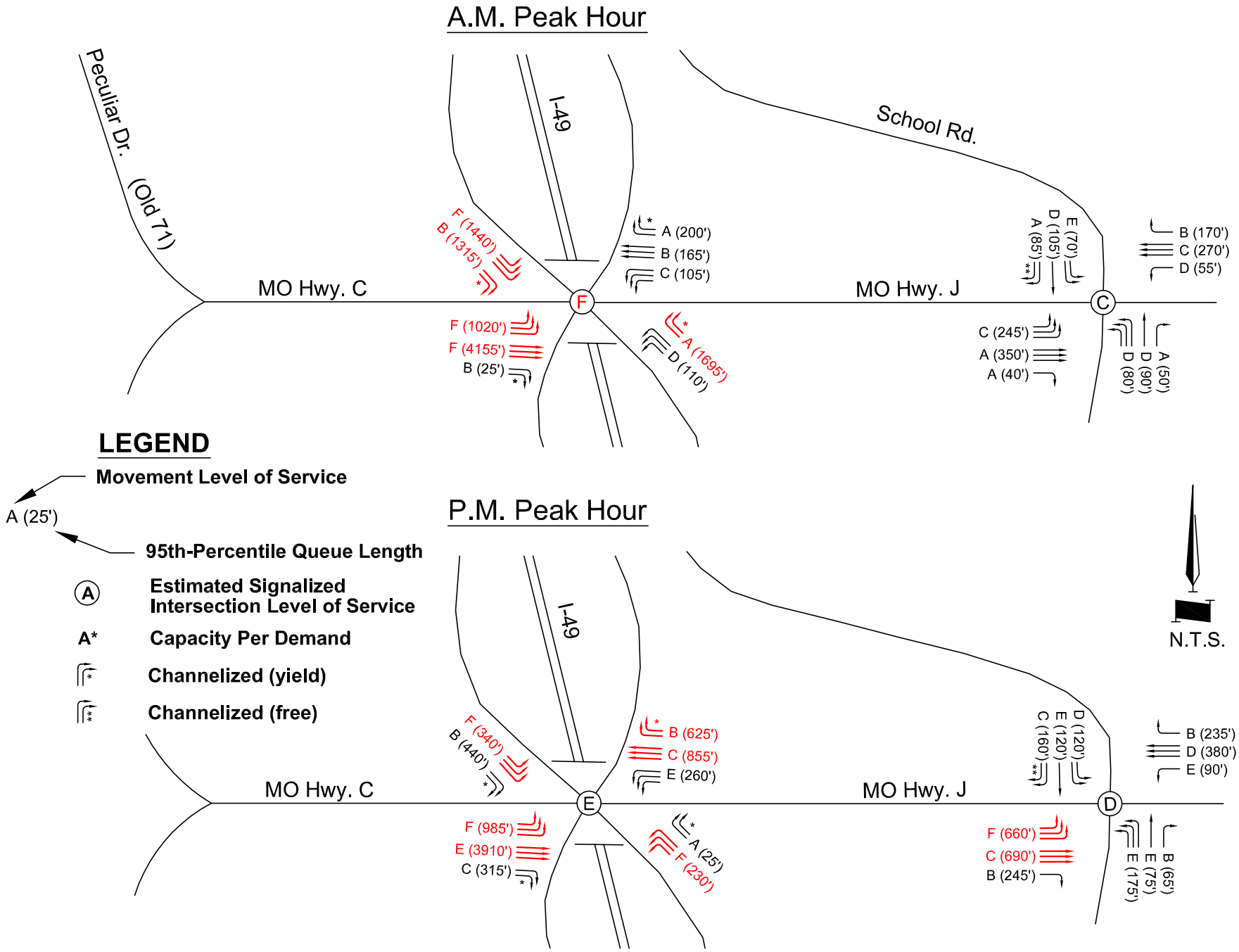
PROJECT NUMBER J4P2247	Future Synchro LOS Without 211th Interchange Hwy. J/C SPUI A.M. & P.M Peak Hours	FIGURE E-9
DATE 04/01/2013		



G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS SPUI Signal (Sim) -- Tuesday March 19, 2013, 9:39am -- Copyright 2013, George Butler Associates, Inc.

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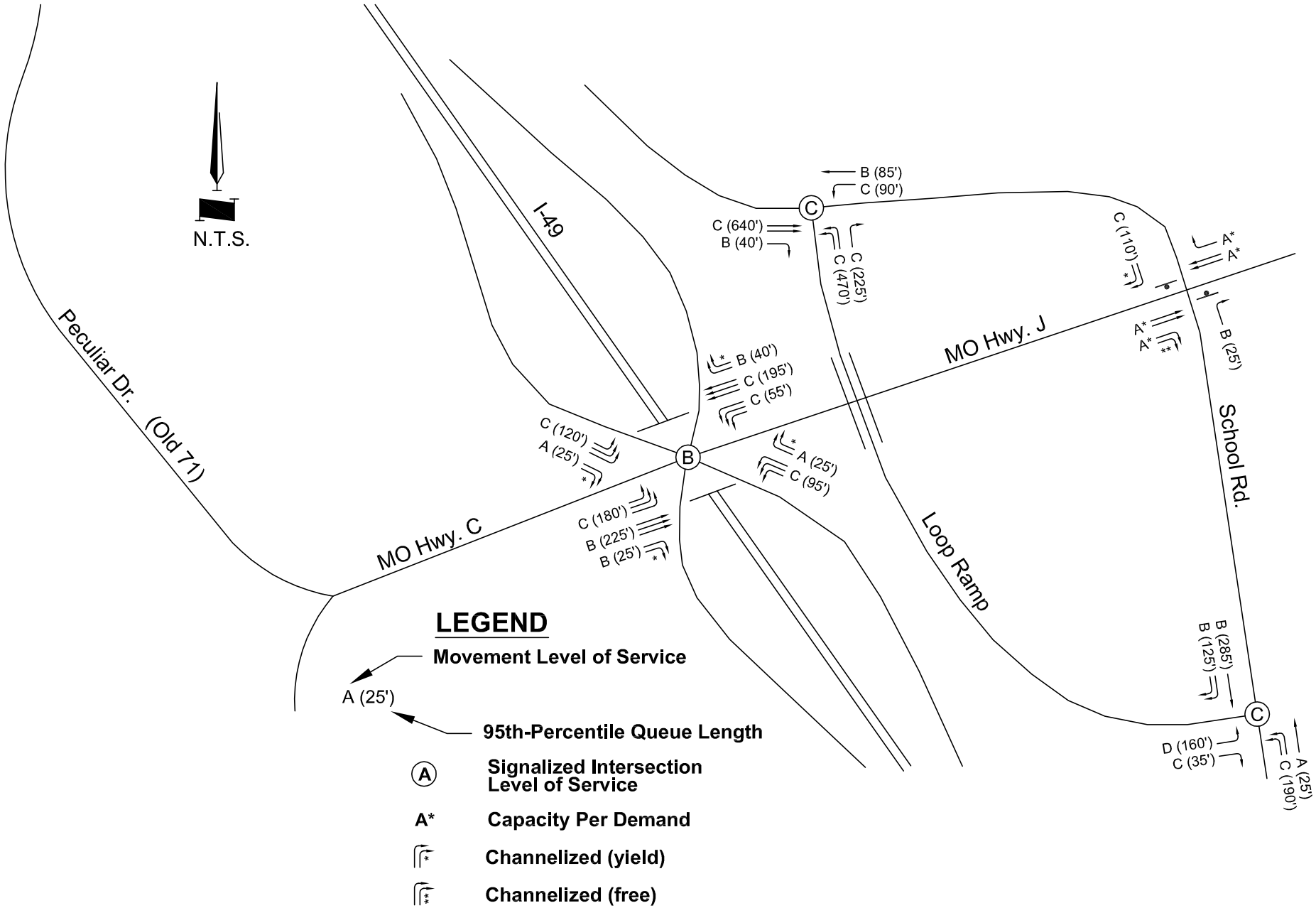
PROJECT NUMBER J4P2247	Future SimTraffic LOS Without 211th Interchange Hwy. J/C SPUI A.M. & P.M. Peak Hours	FIGURE E-10
DATE 04/01/2013		



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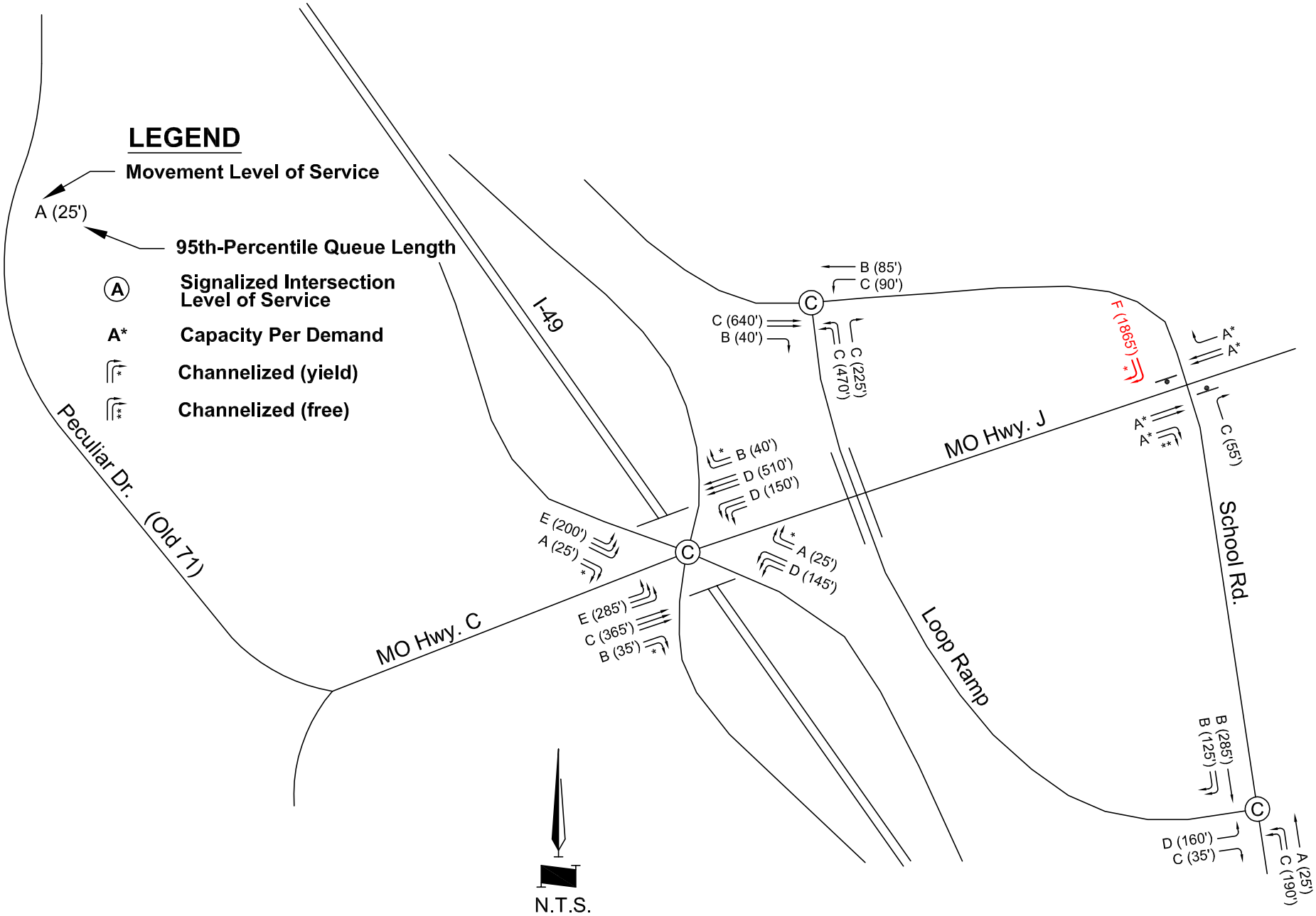
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Future Synchro LOS
Without 211th Interchange
Hwy. J/C SPUI With Loop
A.M. Peak Hour

FIGURE E-11

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS AM SPUI loop (syn) -- Friday March 15, 2013, 9:58am -- Copyright 2013, George Butler Associates, Inc.



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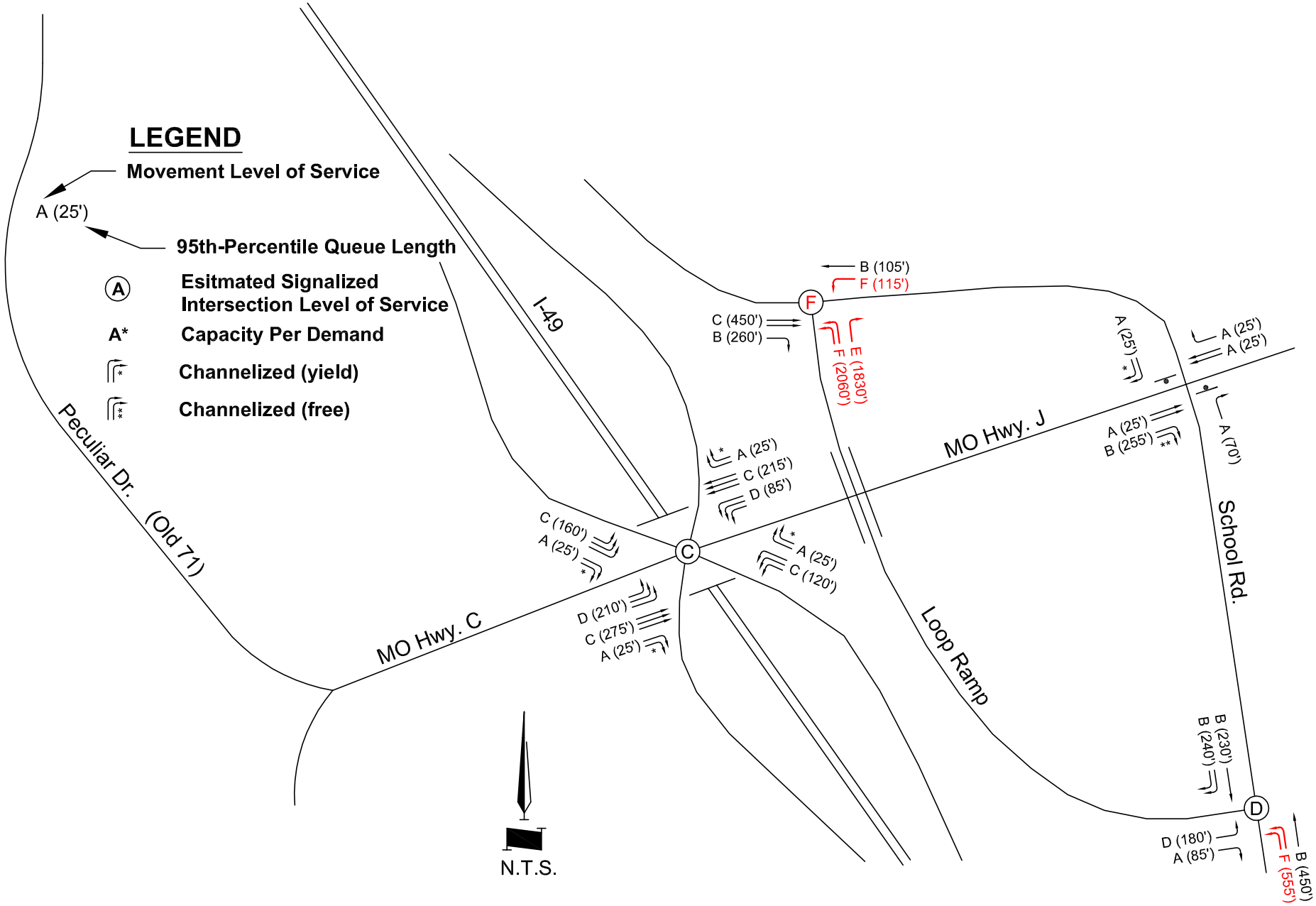
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Future Synchro LOS
Without 211th Interchange
Hwy. J/C SPUI With Loop
P.M. Peak Hour

FIGURE E-12

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS PM SPUI loop (syn) -- Friday March 15, 2013, 9:59am -- Copyright 2013, George Butler Associates, Inc.



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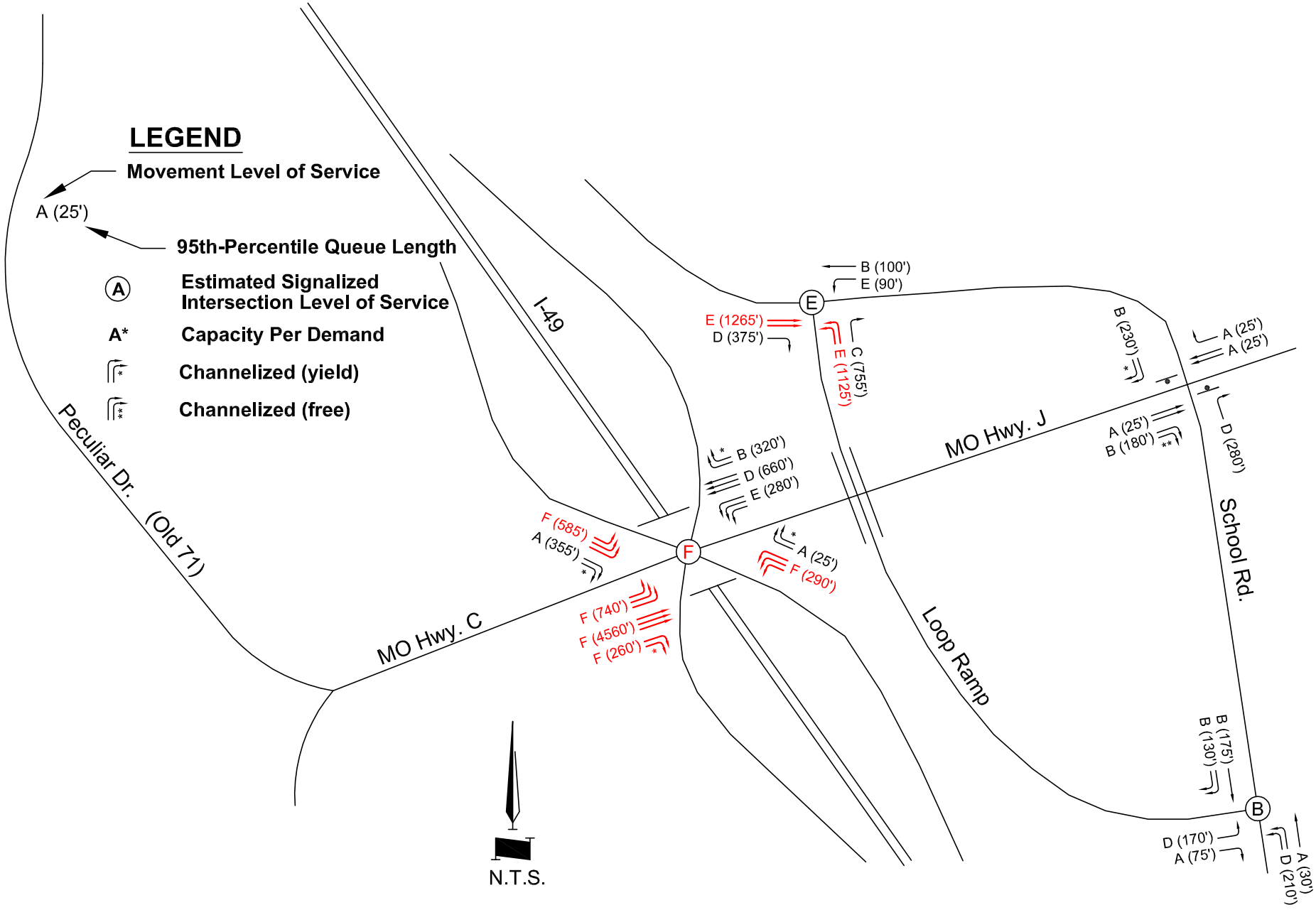
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Future SimTraffic LOS
Without 211th Interchange
Hwy. J/C SPUI With Loop
A.M. Peak Hour

FIGURE E-13

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS AM SPUI loop (sim) -- Friday March 15, 2013, 9:59am -- Copyright 2013, George Butler Associates, Inc.

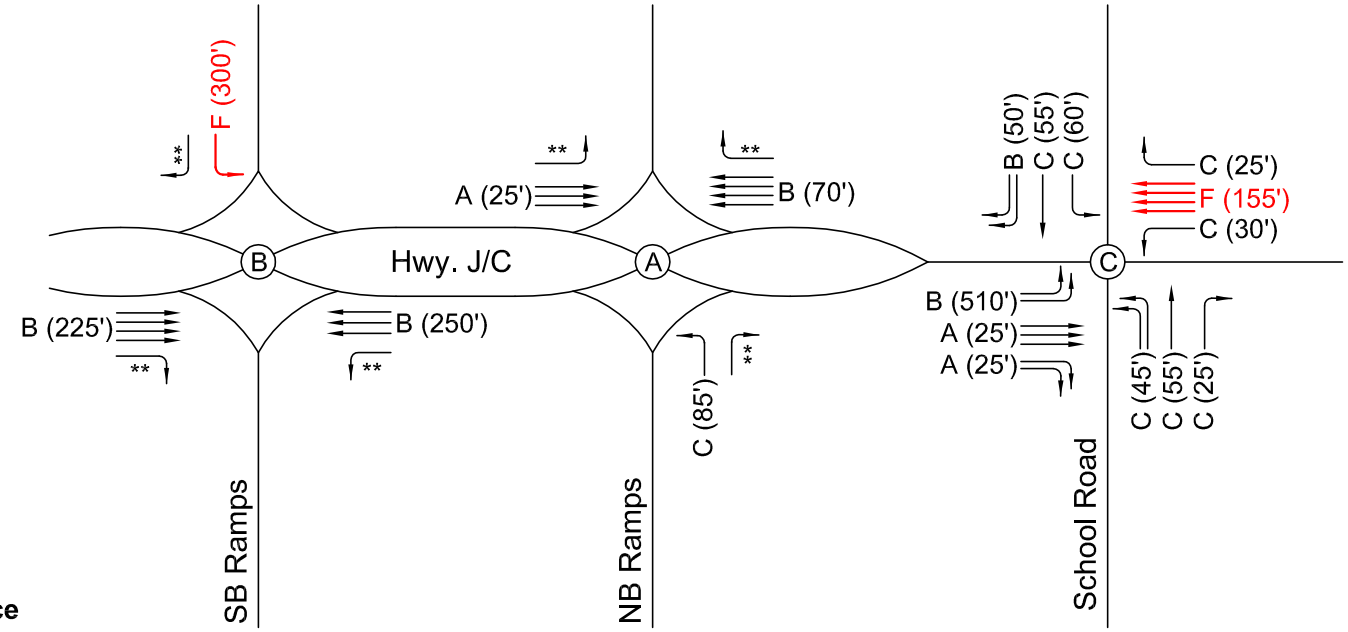


GBA architects engineers	PROJECT NUMBER J4P2247 DATE 04/01/2013	Future SimTraffic LOS Without 211th Interchange Hwy. J/C SPUI With Loop P.M. Peak Hour	FIGURE E-14

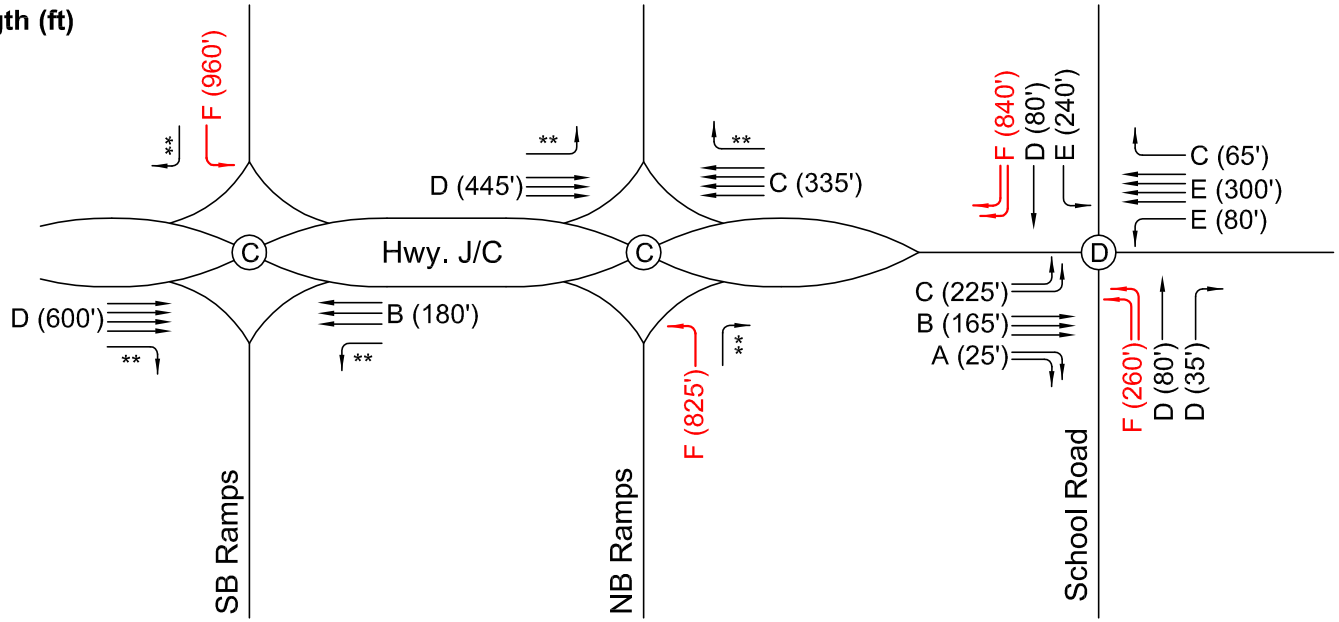
G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS PM SPUI loop (sim) -- Tuesday March 19, 2013, 9:24am -- Copyright 2013, George Butler Associates, Inc.

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS without JC DDI (Syn) -- Friday March 15, 2013, 10:05am -- Copyright 2013, George Butter Associates, Inc.

A.M. Peak Hour



P.M. Peak Hour



LEGEND

Movement Level of Service

A (25')

Average Queue Length (ft)

(B) **Signalized Intersection Level of Service**

* **Channelized (yield)**

** **Channelized (free)**

N.T.S.

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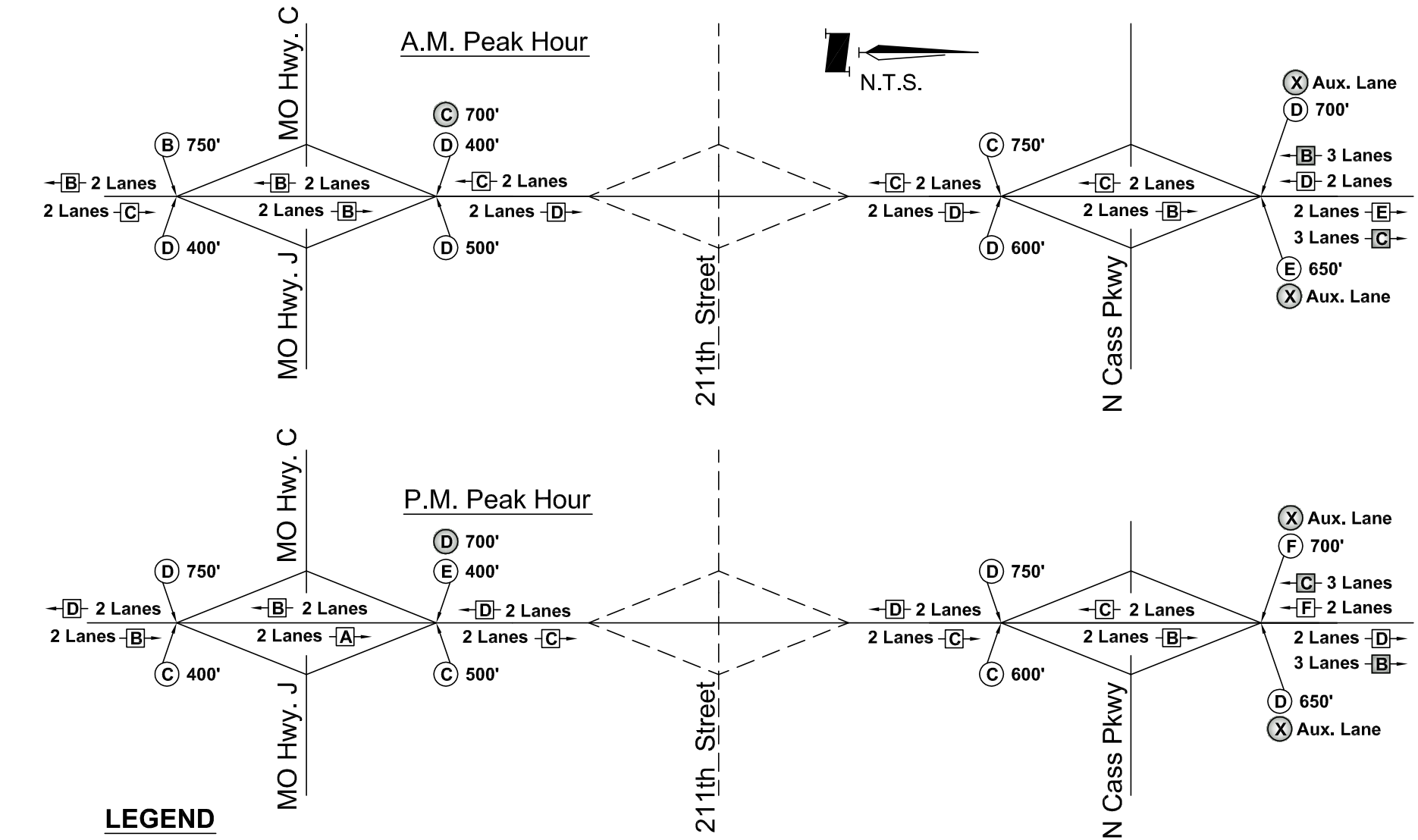
PROJECT NUMBER J4P2247	Future Synchro LOS Without 211th Interchange Hwy. J/C DDI A.M. & P.M Peak Hours	FIGURE E-15
DATE 04/01/2013		



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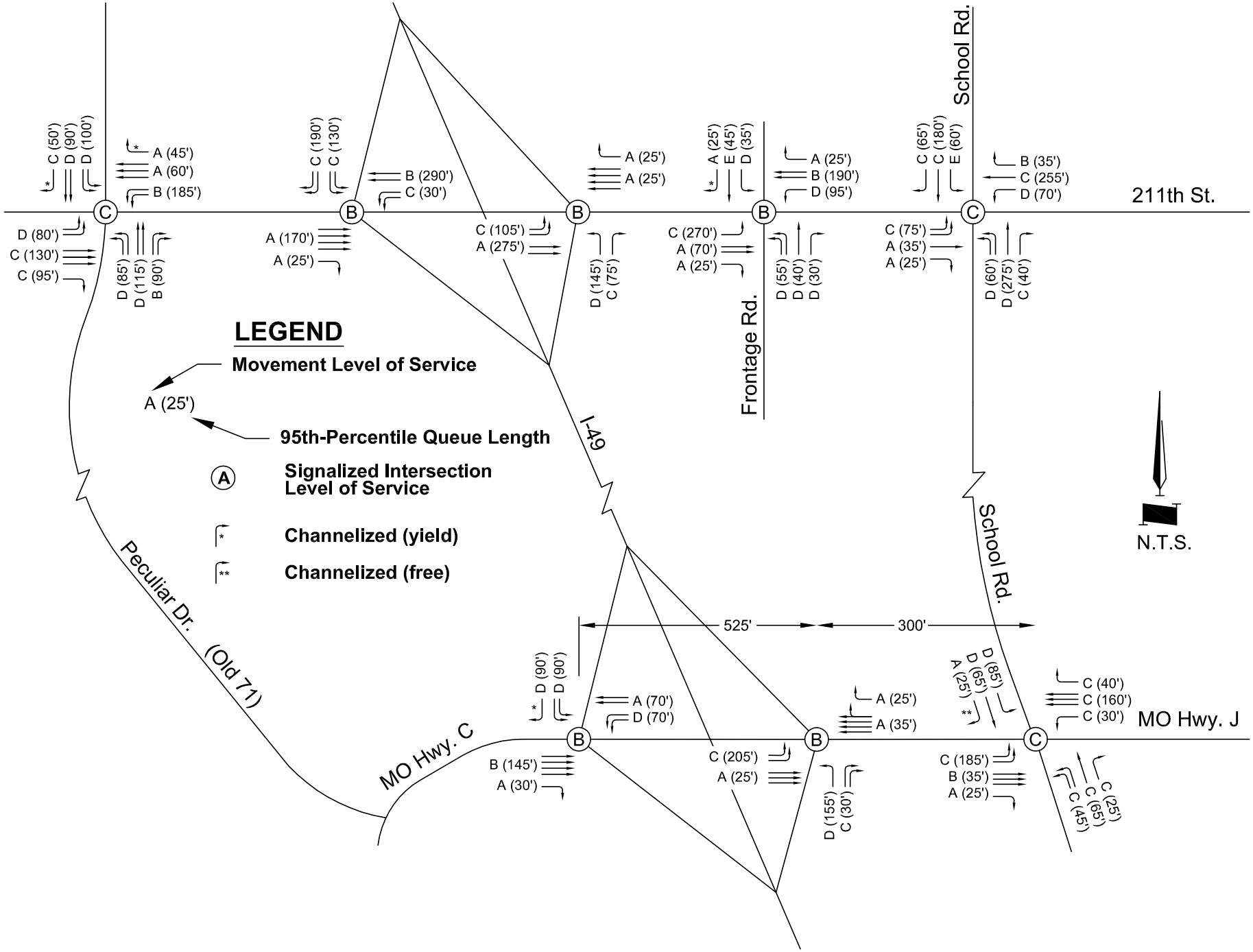
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Future HCS LOS
Without 211th Interchange
Interstate-49 Corridor
A.M. & P.M. Peak Hours

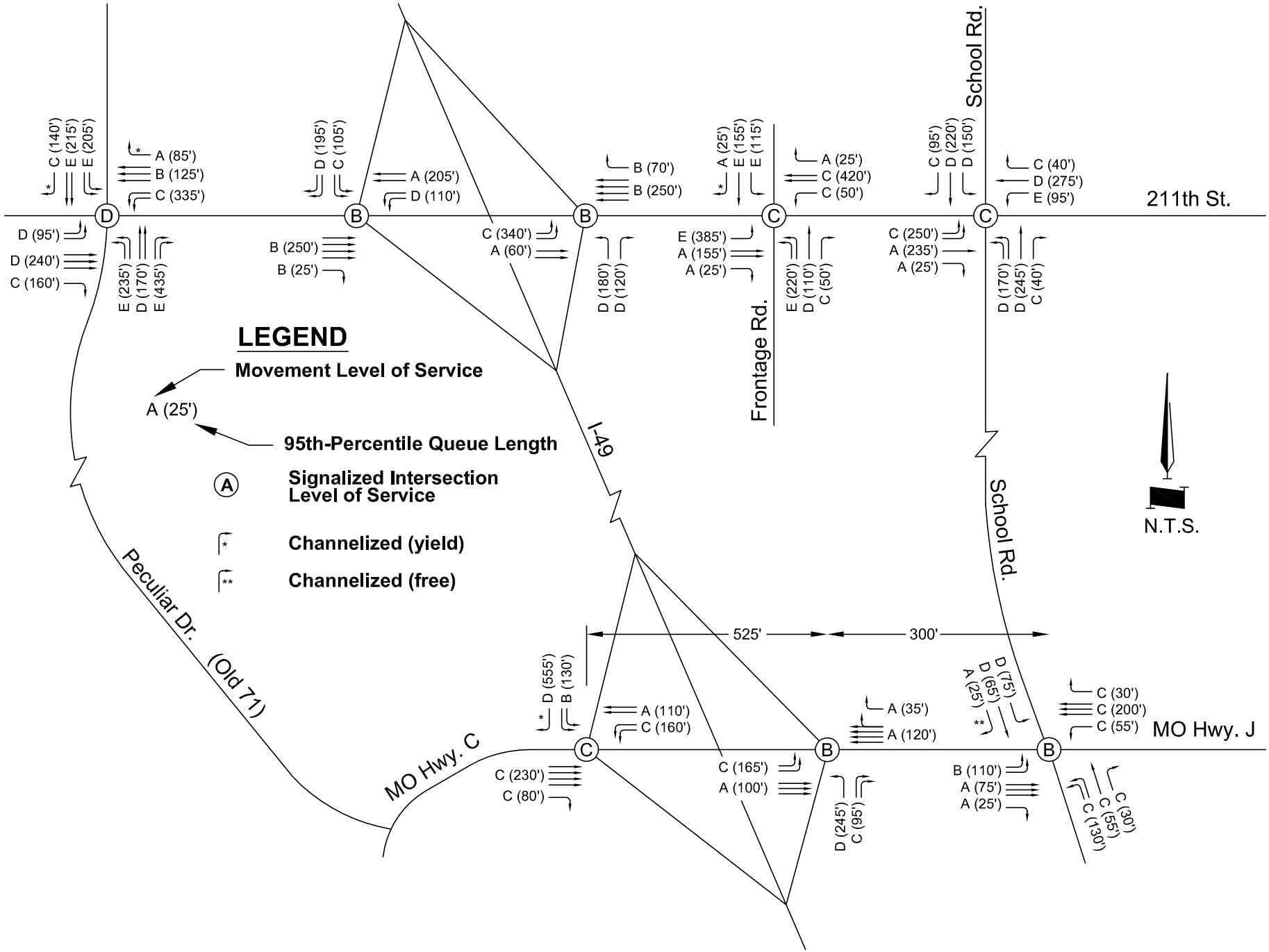
FIGURE E-16

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions With.dwg Layout: No Build Future -- Friday March 15, 2013, 9:42am -- Copyright 2013, George Butler Associates, Inc.



GBA architects engineers	PROJECT NUMBER J4P2247 DATE 04/01/2013	Future Synchro LOS With Diamond Interchanges A.M. Peak Hour	FIGURE E-17

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS AM With (syn) -- Thursday March 21, 2013, 2:21pm -- Copyright 2013, George Butler Associates, Inc.



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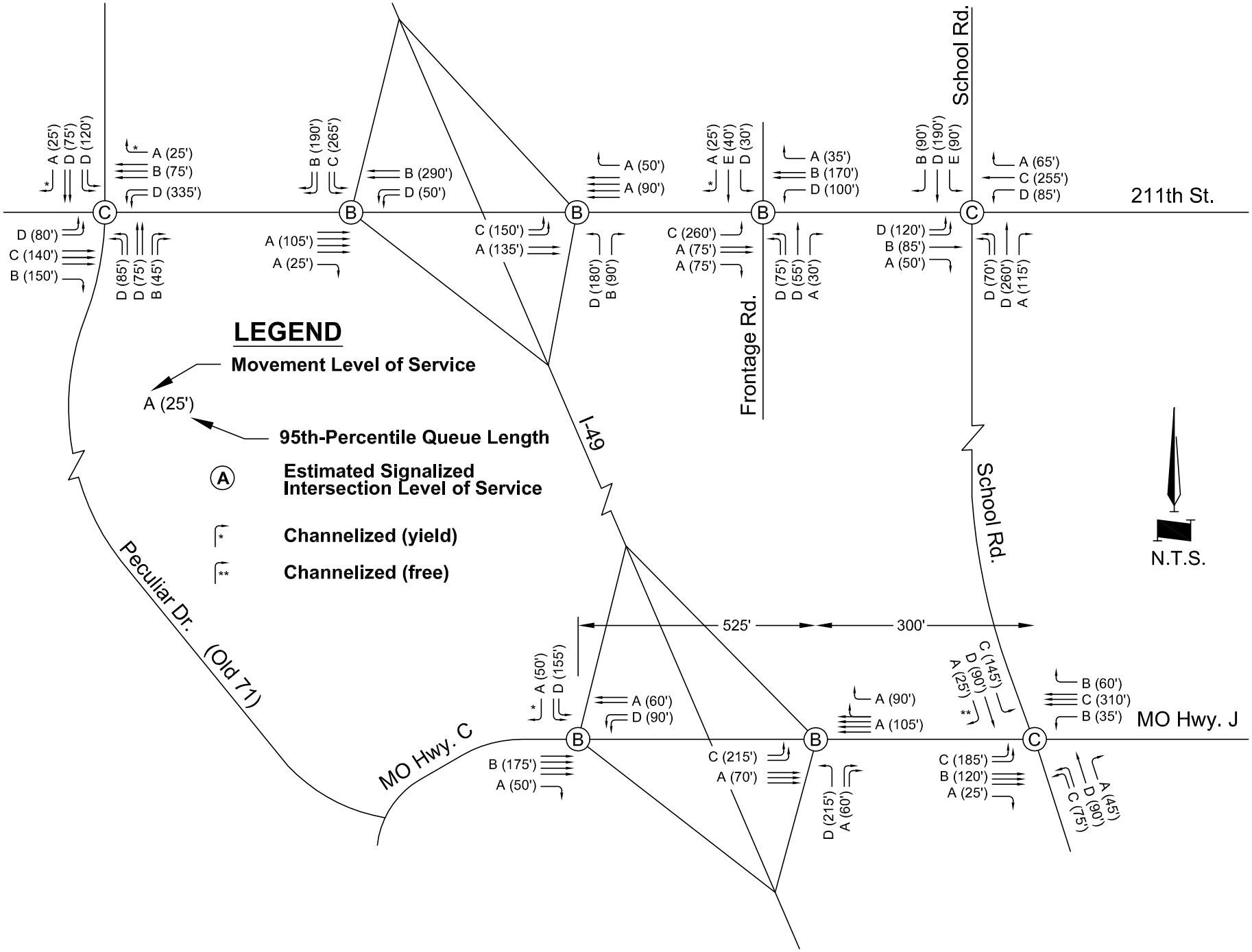
G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS PM With (syn) -- Thursday March 21, 2013, 2:22pm -- Copyright 2013, George Butler Associates, Inc.



G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS AM With (sim) -- Thursday March 21, 2013, 2:22pm -- Copyright 2013, George Butler Associates, Inc.

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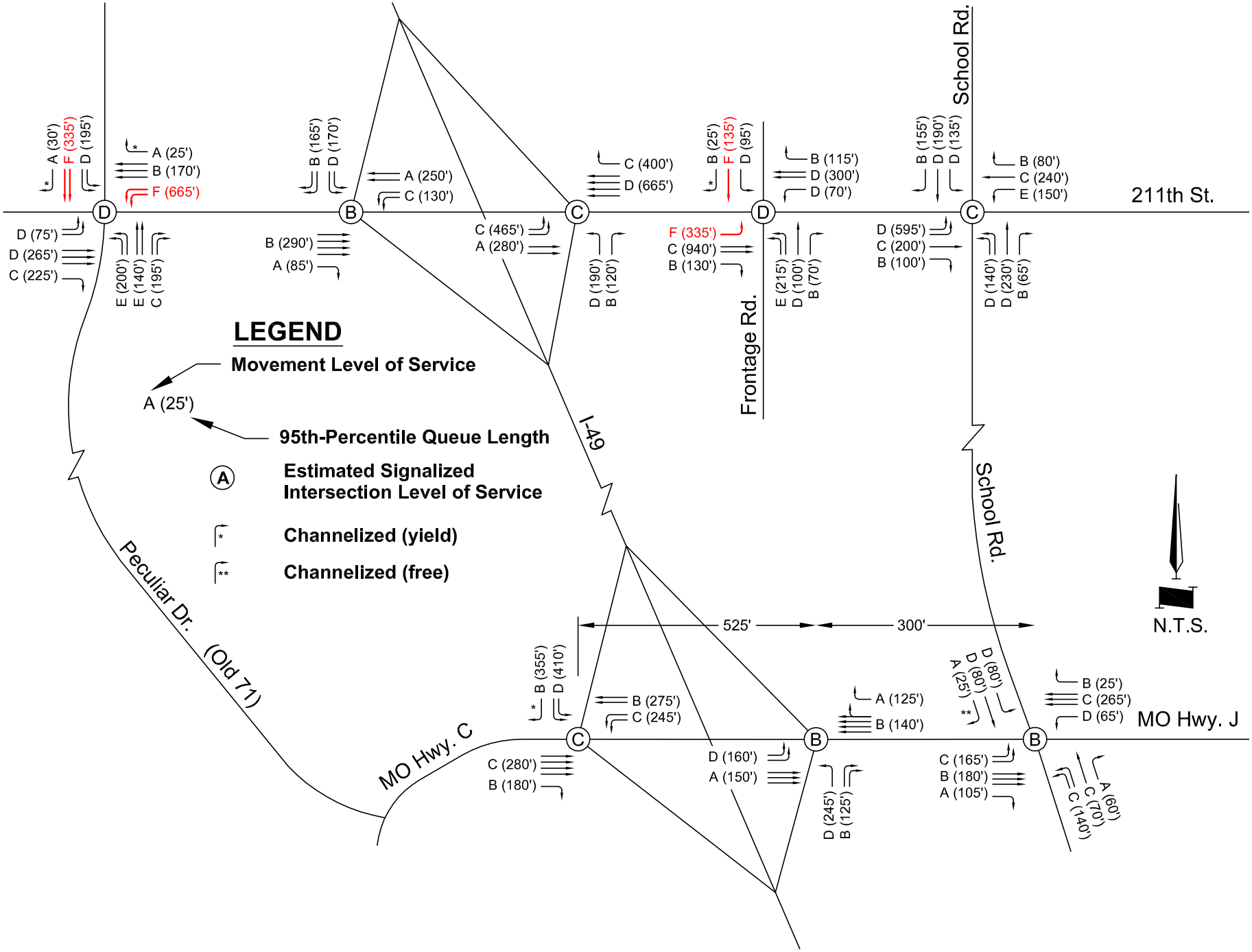
PROJECT NUMBER J4P2247	Future SimTraffic LOS With Diamond Interchanges A.M. Peak Hour	FIGURE E-19
DATE 04/01/2013		



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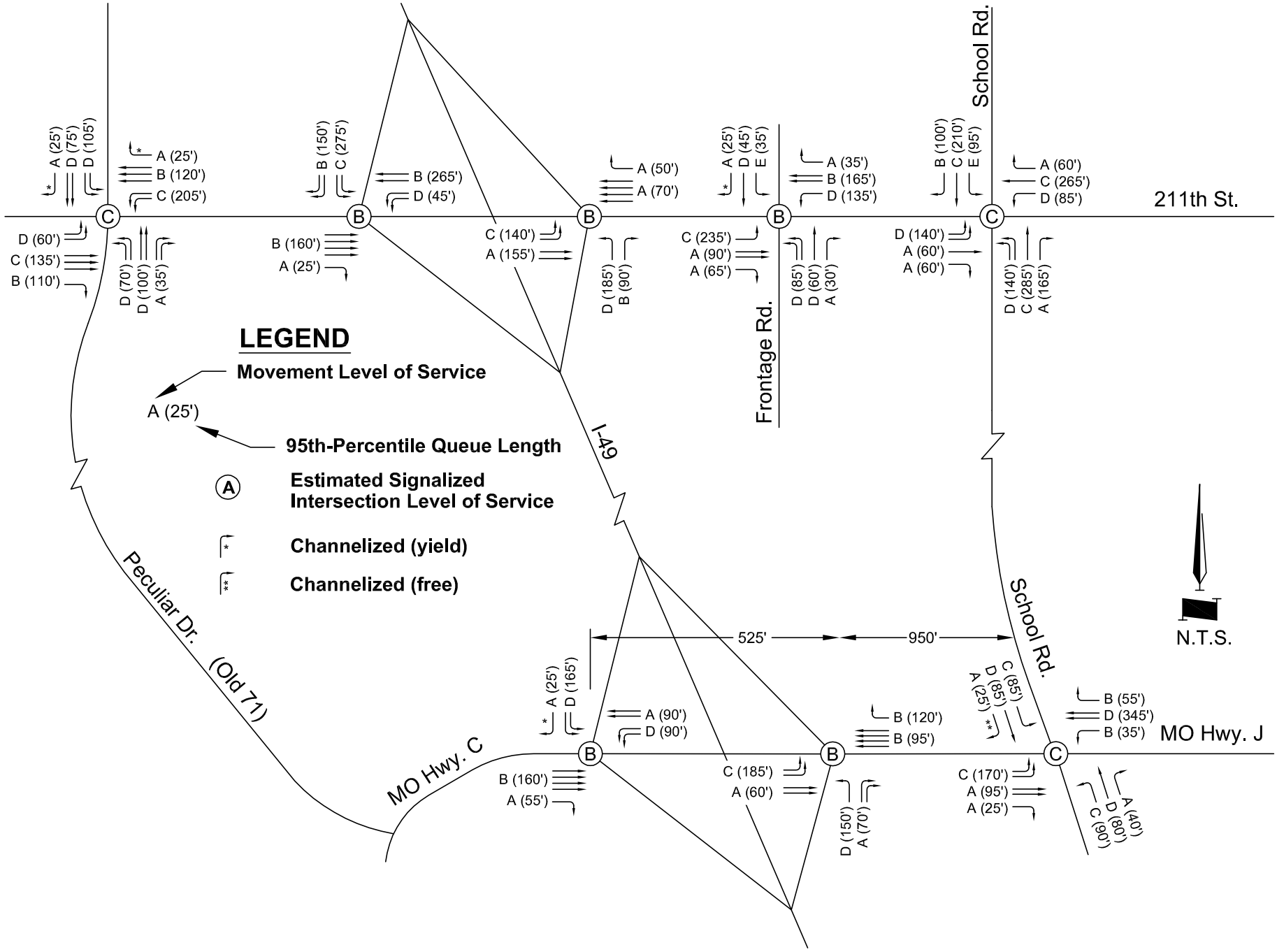
PROJECT NUMBER
J4P2247

DATE
04/01/2013

Future SimTraffic LOS
With Diamond Interchanges
P.M. Peak Hour

FIGURE E-20

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS PM With (sim) -- Thursday March 21, 2013, 2:23pm -- Copyright 2013, George Butler Associates, Inc.



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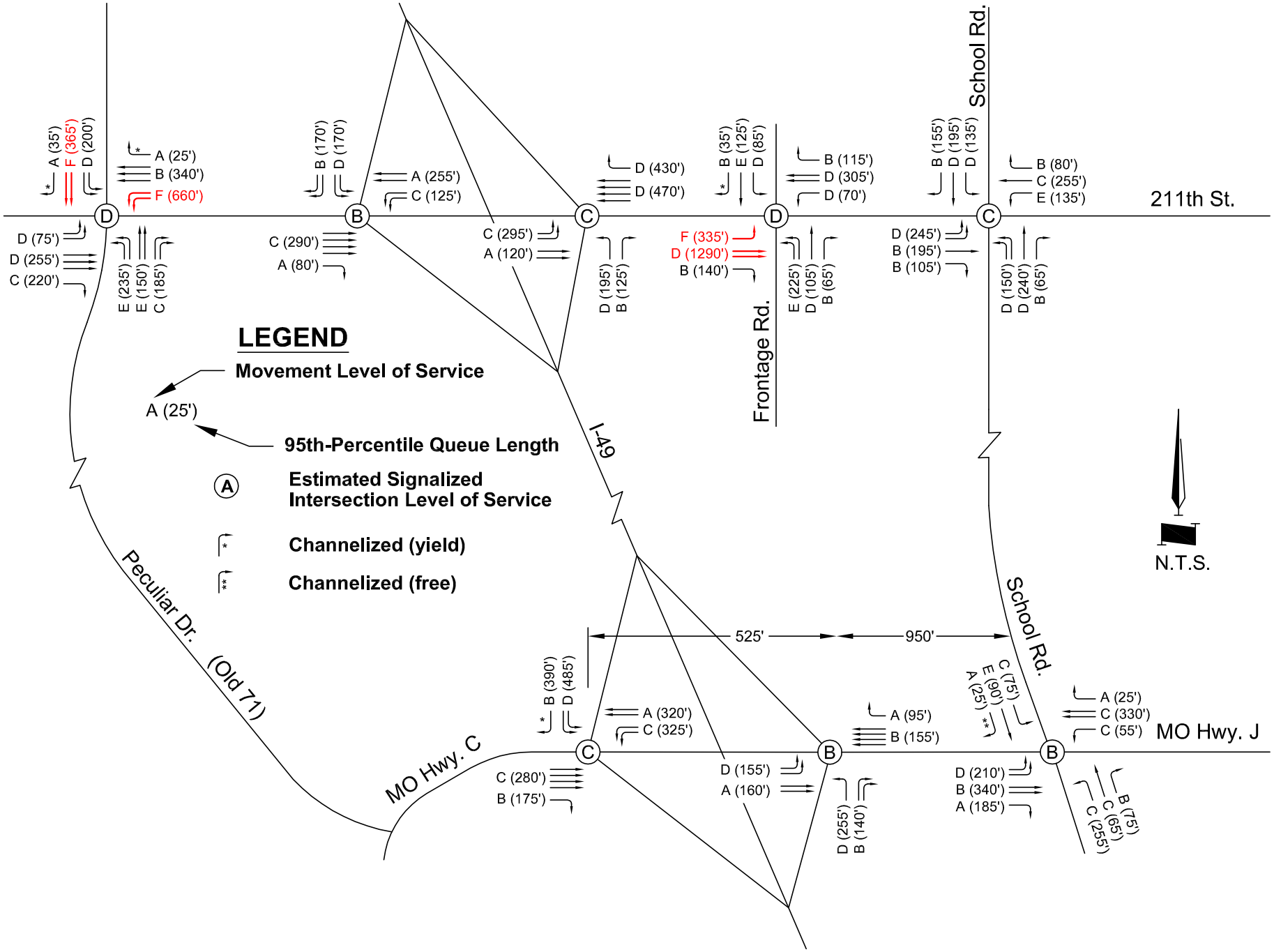
PROJECT NUMBER J4P2247	Future SimTraffic LOS With Diamond Interchanges Relocated School Road A.M. Peak Hour	FIGURE E-21
DATE 04/01/2013		

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS AM With 950' (sim) -- Thursday March 21, 2013, 2:24pm -- Copyright 2013, George Butler Associates, Inc.



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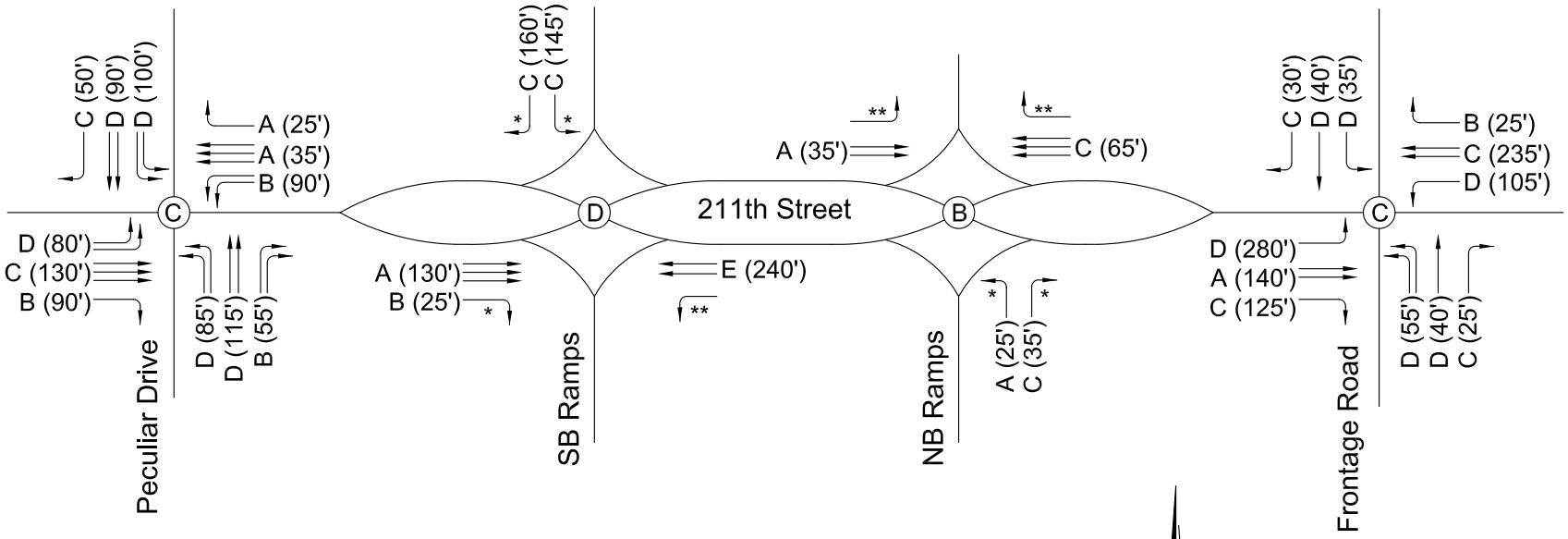
G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS PM With 950' (sim) -- Thursday March 21, 2013, 2:24pm -- Copyright 2013, George Butler Associates, Inc.



N.T.S.

LEGEND

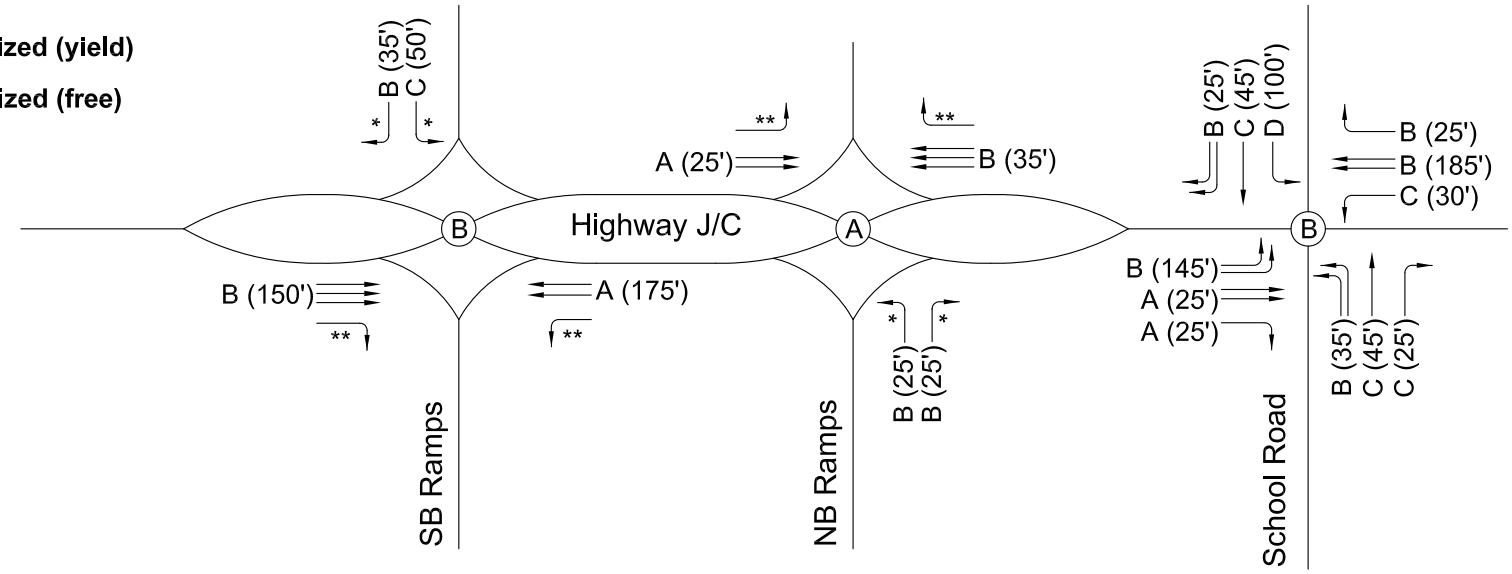
Movement Level of Service

A (25') — 95th-Percintile Queue Length (ft)

(B) Signalized Intersection Level of Service

* Channelized (yield)

** Channelized (free)



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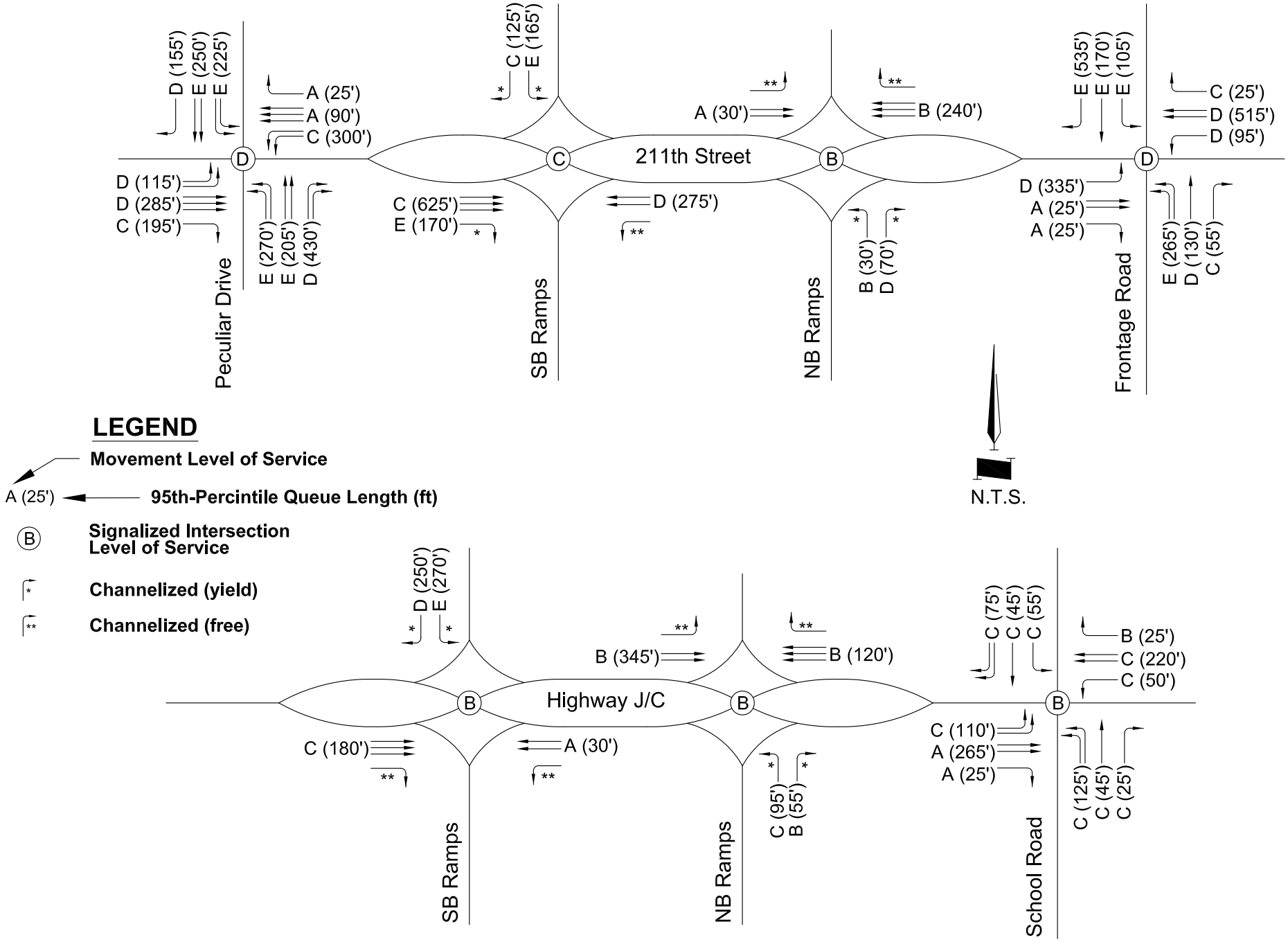
PROJECT NUMBER J4P2247

DATE 04/01/2013

Future Synchro LOS With DDI Interchanges A.M. Peak Hour

FIGURE E-23

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS With DDI AM (Syn) -- Thursday March 28, 2013, 10:15am -- Copyright 2013, George Butler Associates, Inc.



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PROJECT NUMBER J4P2247	Future Synchro LOS With DDI Interchanges P.M Peak Hour	FIGURE E-24
DATE 04/01/2013		

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS With DDI PM (Syn) -- Thursday March 28, 2013, 10:20am -- Copyright 2013, George Butler Associates, Inc.

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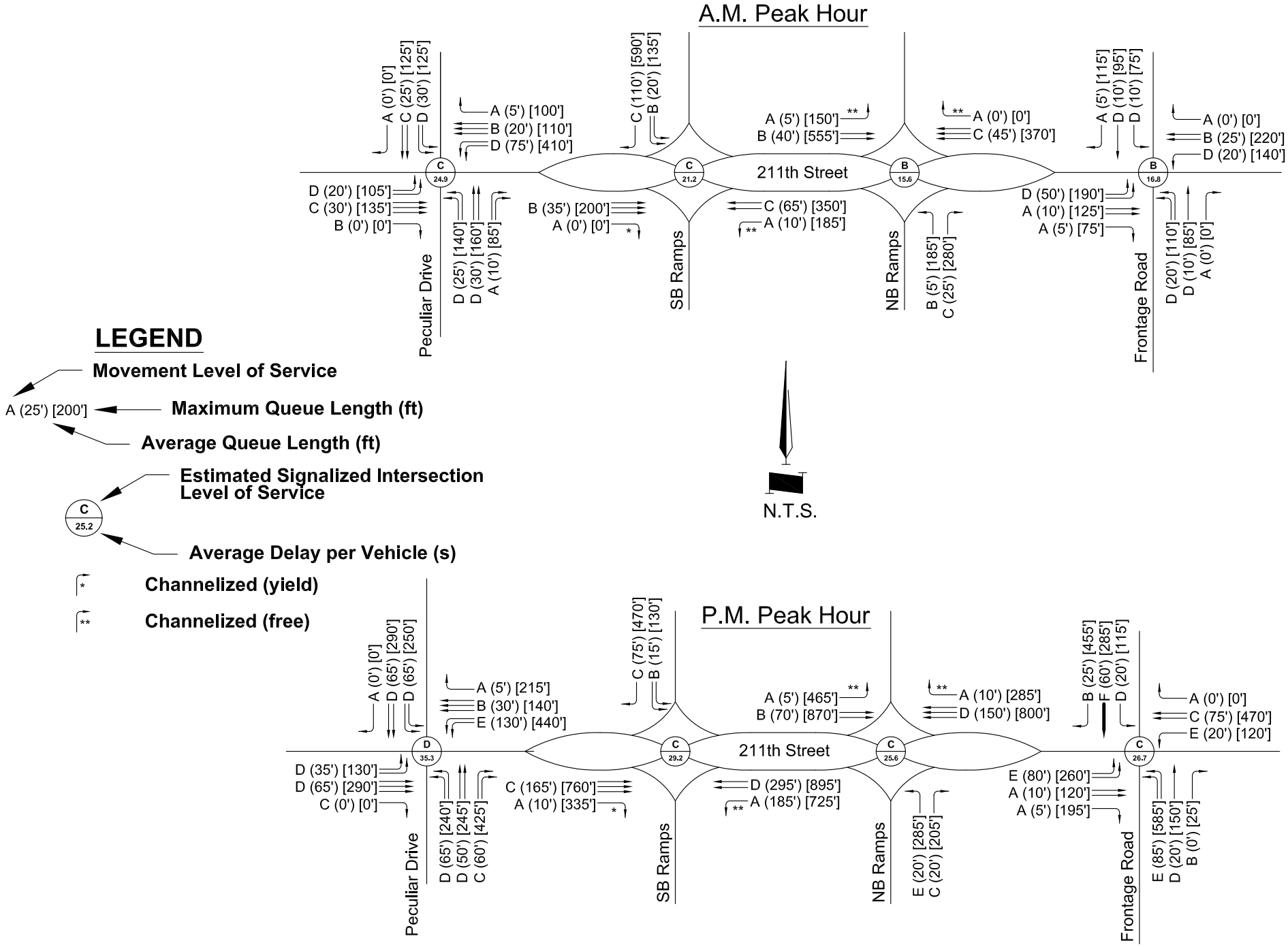

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PROJECT NUMBER J4P2247	Future VISSIM LOS With 211th DDI Interchange A.M. & P.M Peak Hours	FIGURE E-25
DATE 04/01/2013		

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions Without.dwg Layout: Future LOS With RAB -- Thursday March 21, 2013, 2:17pm -- Copyright 2013, George Butler Associates, Inc.

N.T.S.

LEGEND

Vehicle Movement

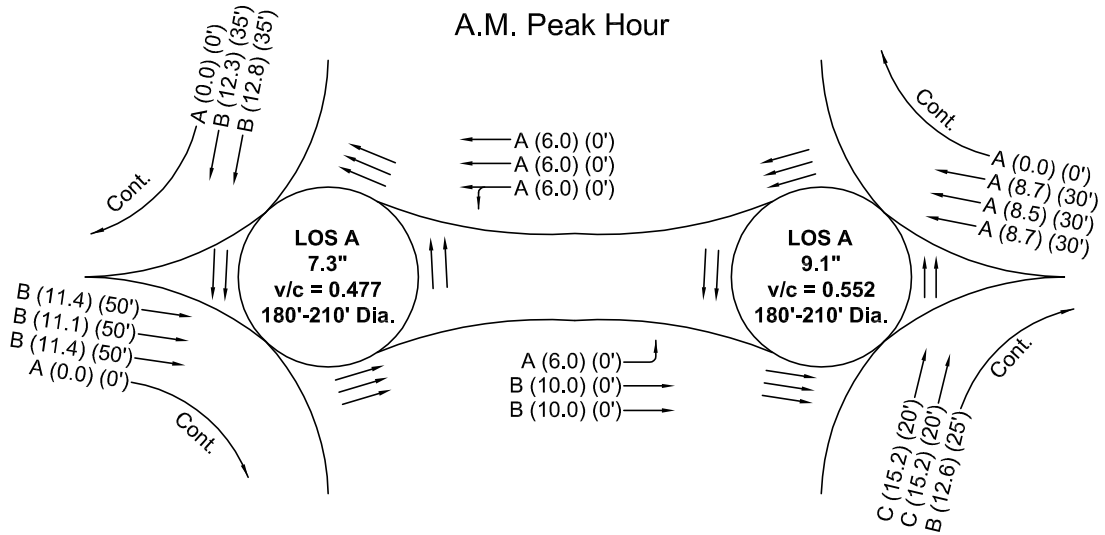
95th-Percentile Queue Length (ft.)

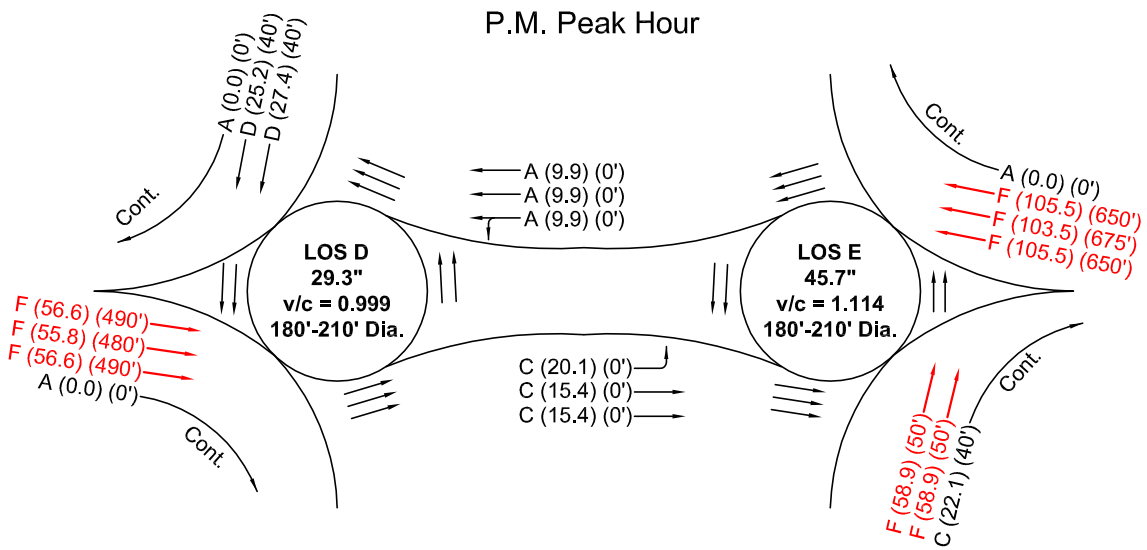
D (25.2) (40')

Movement Delay (sec.)

Movement Level of Service

Cont. Continuous Turn Lane





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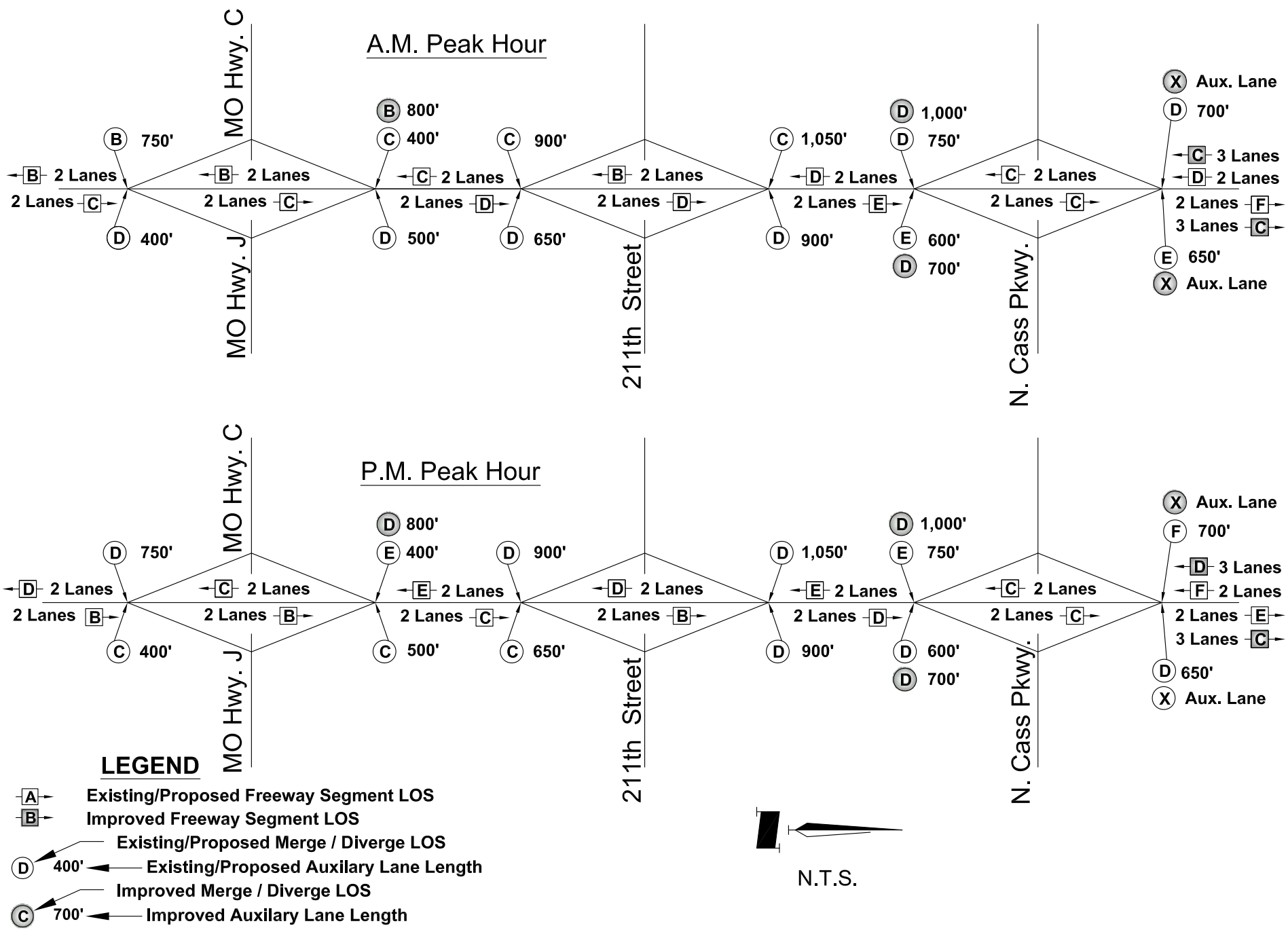
PROJECT NUMBER J4P2247	Future SIDRA LOS With 211th Interchange Roundabout Terminals A.M & P.M. Peak Hours	FIGURE E-26
DATE 04/01/2013		



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PROJECT NUMBER
J4P2247

DATE
04/01/2013

Future HCS LOS
With 211th Interchange
Interstate-49 Corridor (2 Lane)
A.M. & P.M. Peak Hours

FIGURE E-27

G:\12670\Analysis\Traffic\CAD\AJR Figures\211th Future conditions With.dwg Layout: Future LOS HCS 2-lane -- Wednesday March 27, 2013, 1:54pm -- Copyright 2013, George Butler Associates, Inc.

APPENDIX F

Conceptual Designs

Exhibit F-1 - 211th Street Interchange Configuration
Exhibit F-2 - 211th Street Typical Sections
Exhibit F-3 - Ramp & East Outer Road Typical Sections
Exhibit F-4 - Interchange Details
Exhibit F-5 - 211th Street Profile Alignment
Exhibit F-6 - Ramp Profile Alignments
Exhibit F7 - 211th Street Lane Transition
Exhibit F-8A - Conceptual Signing Plans (Sheet 1 of 2)
Exhibit F-8B - Conceptual Signing Plans (Sheet 2 of 2)

DATE	DESCRIPTION
3/19/2013	

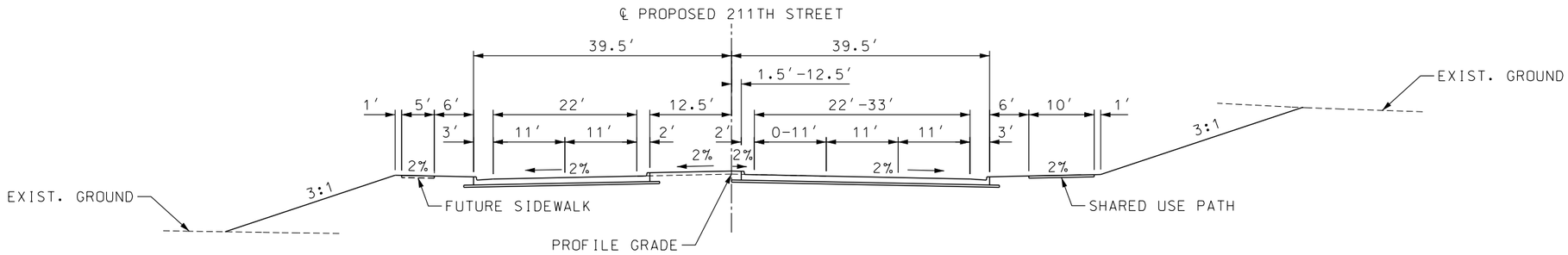
DATE

I-49 & 211th STREET INTERCHANGE

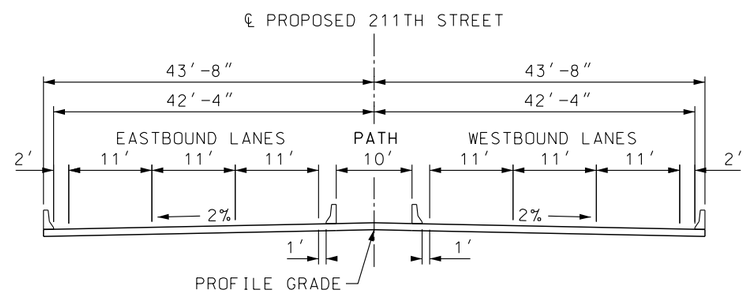
211th ST. INTERCHANGE CONFIGURATION

EXHIBIT

F-1



SECTION
211TH STREET TYPICAL SECTION
WEST OF I-49



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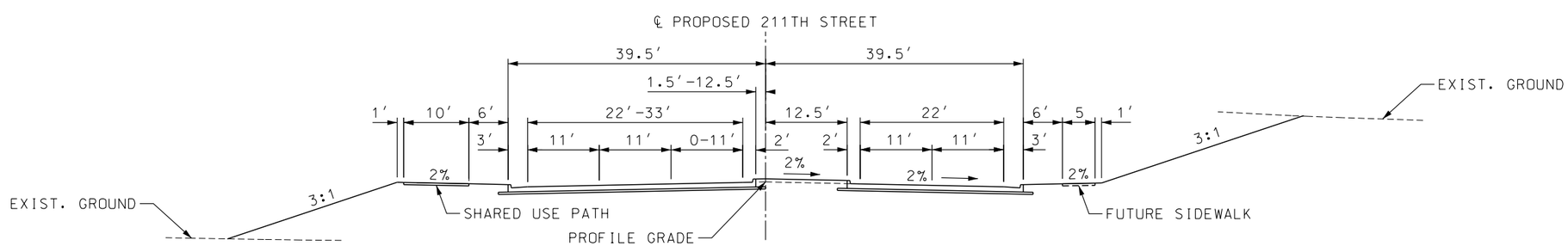
ACROSS BRIDGE



SECTION
211TH STREET TYPICAL SECTION
EAST OF I-49

DATE
6/6/2013

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ENGINEER
E-2002024022

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ARCHITECT 00212
LANDSCAPE ARCHITECT 000025
PRO. LAND SURVEYOR 000059

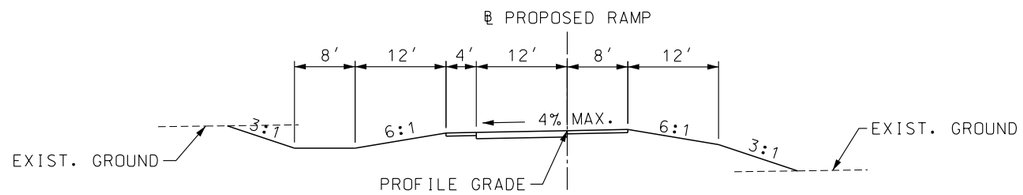
I-49 & 211th STREET
INTERCHANGE

211TH STREET
TYPICAL SECTIONS

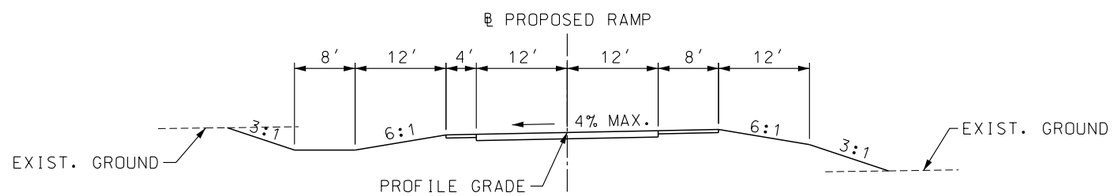
EXHIBIT
F-2

G:\12670\Micro\Highways\AJR_TYPICALS_J4P2247_I1_211th_I49.dgn

4:25:42 PM 6/6/2013



SECTION
RAMP 1 TYPICAL SECTION (SOUTHBOUND OFF-RAMP)
RAMP 3 TYPICAL SECTION (SOUTHBOUND ON-RAMP)
RAMP 4 TYPICAL SECTION (NORTHBOUND OFF-RAMP)



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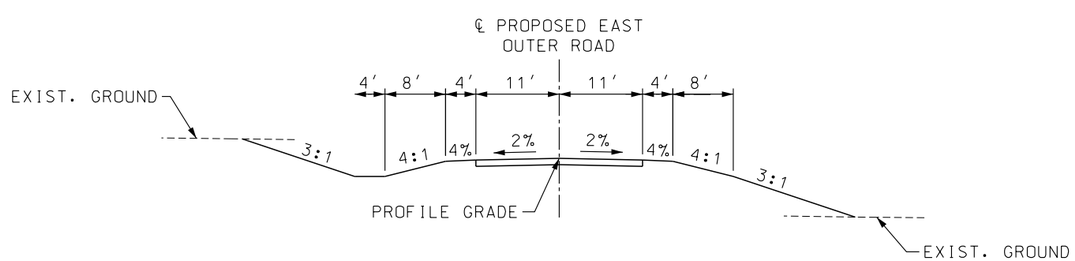
RAMP 2 TYPICAL SECTION (NORTHBOUND ON-RAMP)



SECTION
EAST OUTER ROAD TYPICAL SECTION

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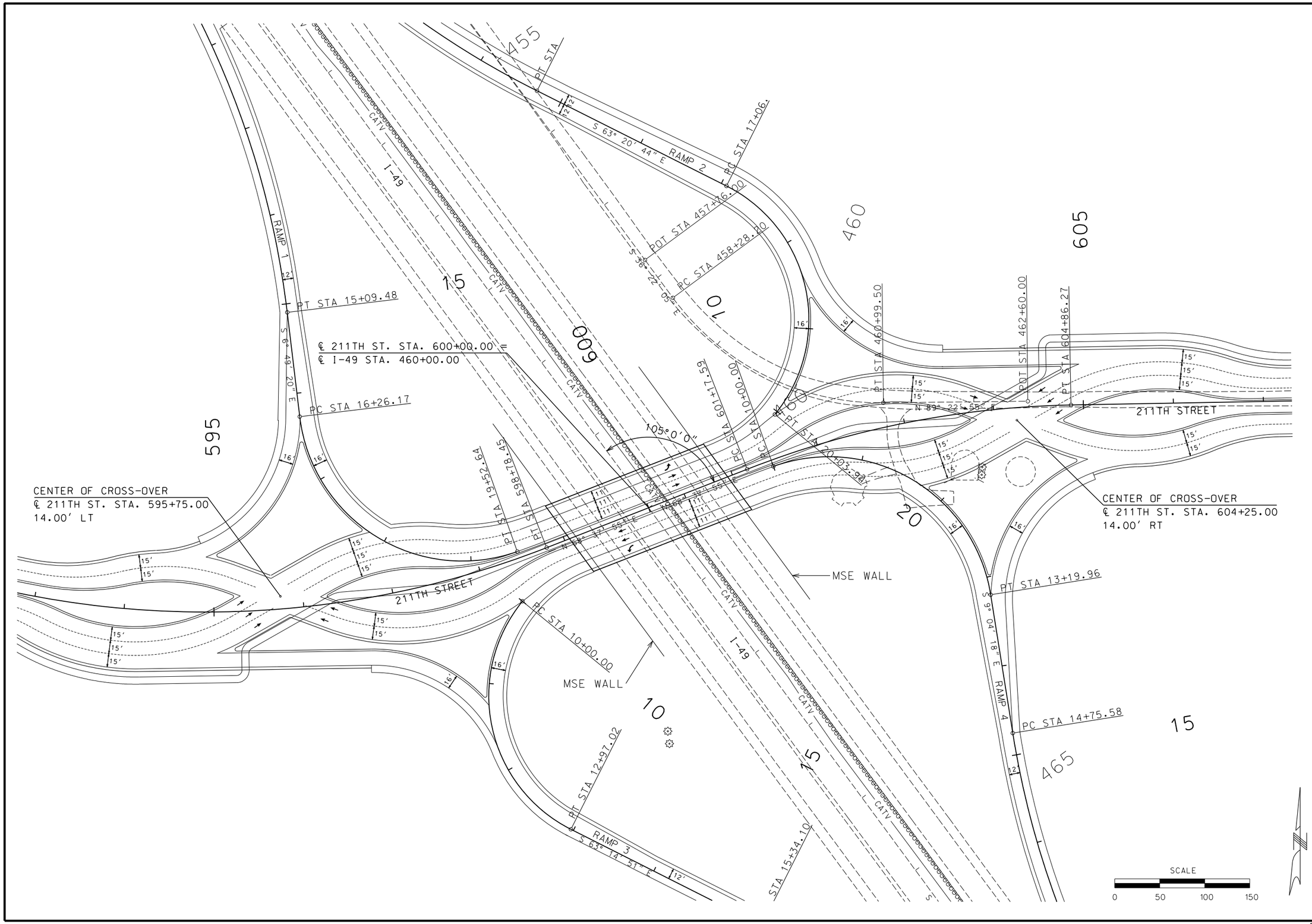
I-49 & 211th STREET
INTERCHANGE

RAMP & EAST OUTER ROAD
TYPICAL SECTIONS

EXHIBIT
F-3

G:\12670\Micro\Highways\AJR_TYPICALS_J4P2247_I1_211th_I49.dgn

4:23:33 PM 6/6/2013



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INTERCHANGE

INTERCHANGE
DETAILS

EXHIBIT
F-4

G:\12670\Micro\Highways\AJR_PLAN_DETAIL_J4P2247_I50_211th_I49.dgn

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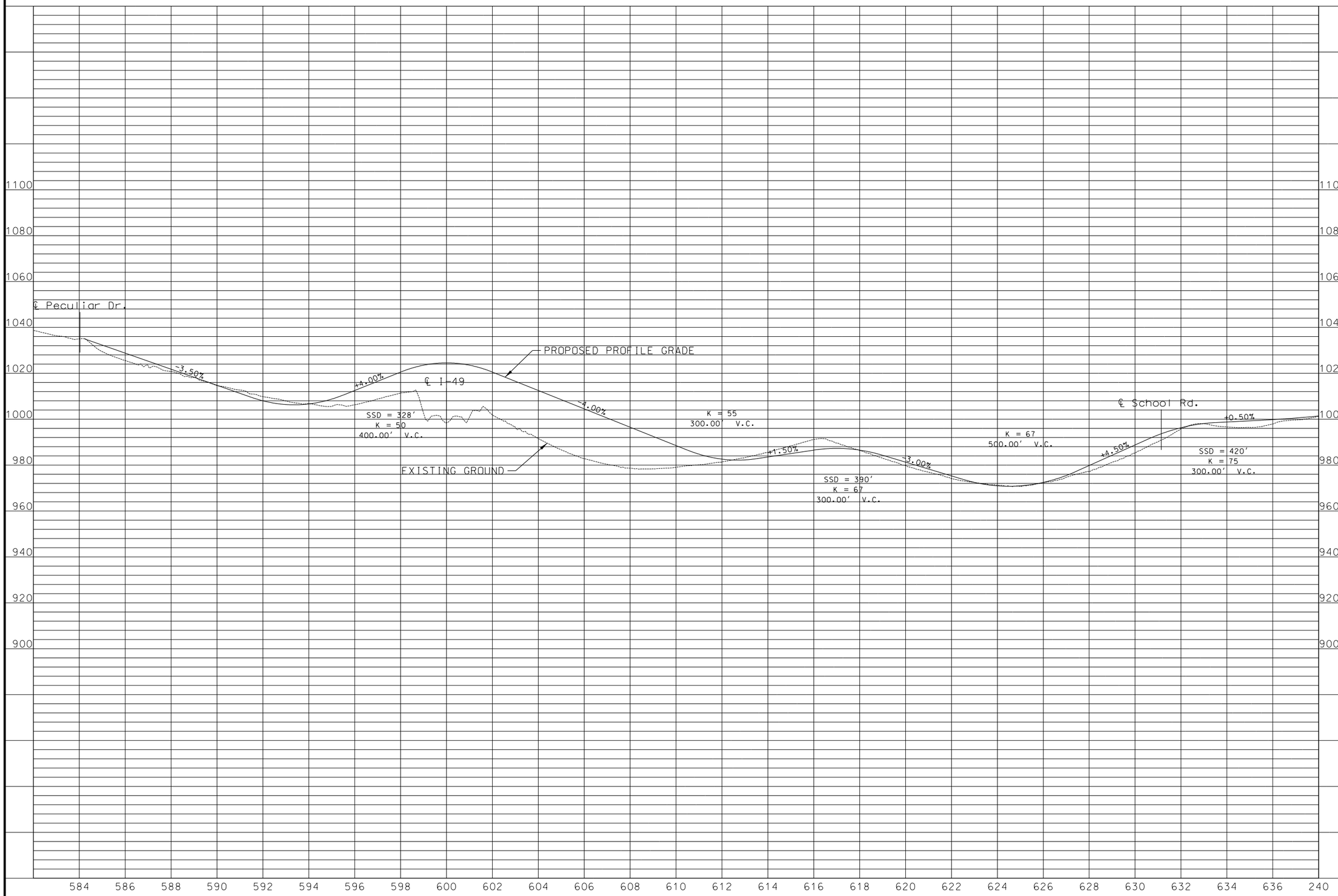

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I-49 & 211th STREET
INTERCHANGE

211th STREET
PROFILE ALIGNMENT

EXHIBIT
F-5

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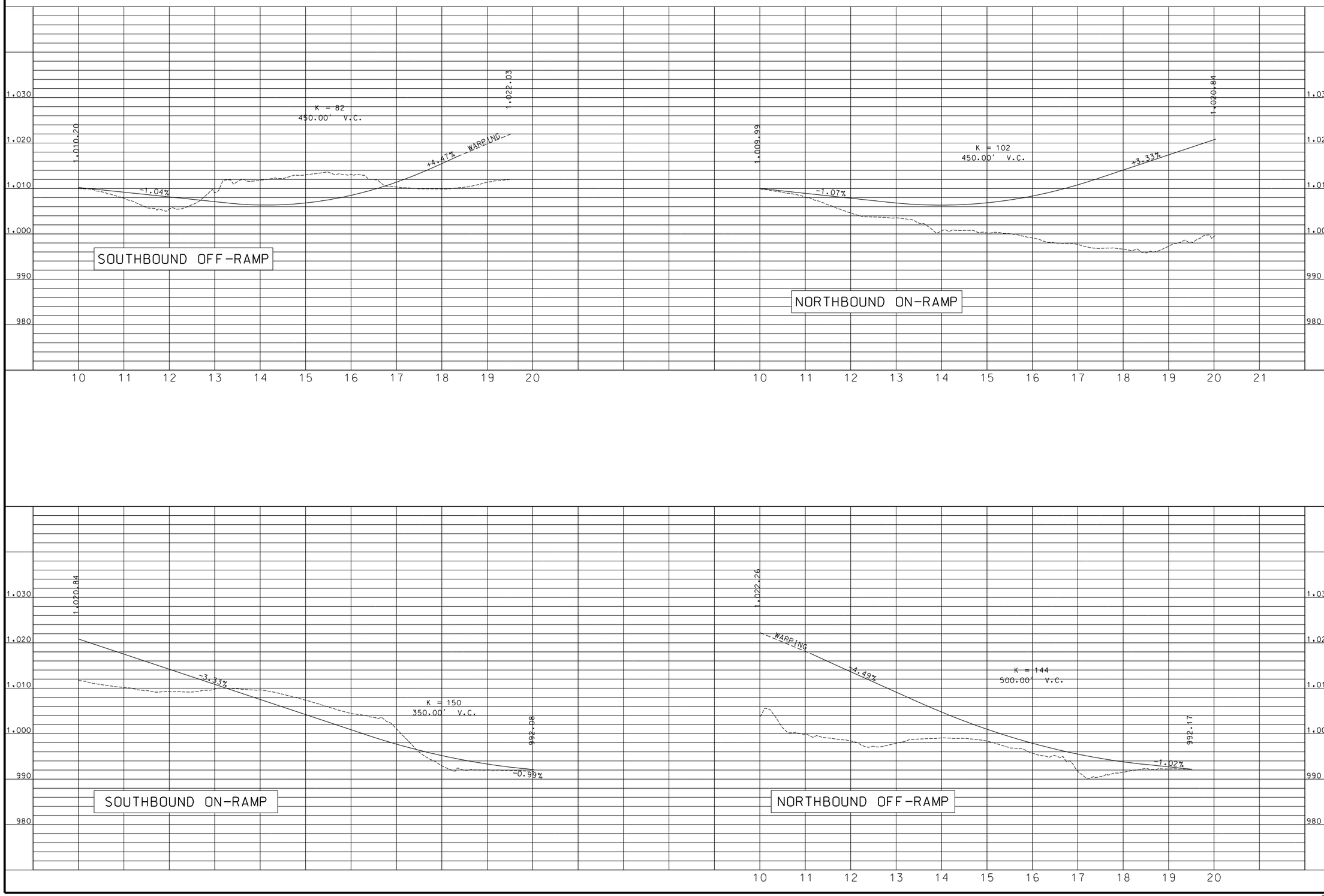

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I-49 & 211th STREET
INTERCHANGE

RAMP
PROFILE ALIGNMENTS

EXHIBIT
F-6

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4:07:11 PM 6/6/2013

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I-49 & 211th STREET
INTERCHANGE

211th STREET LANE
TRANSITION

EXHIBIT
F-7

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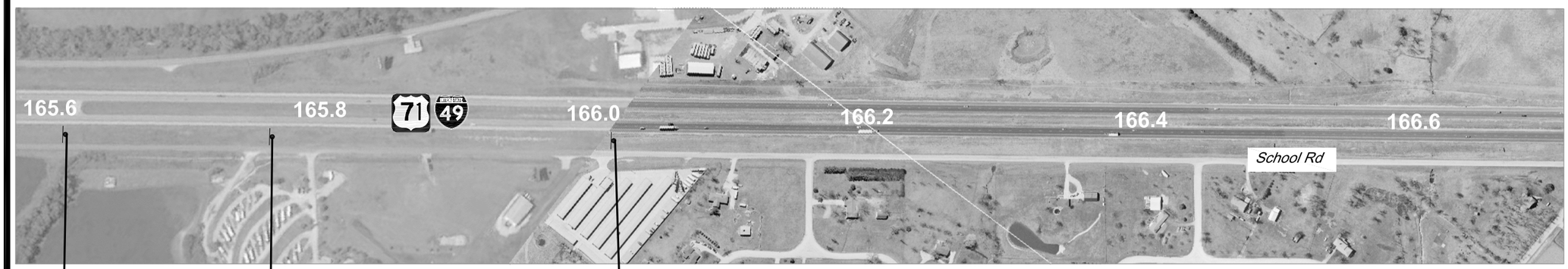
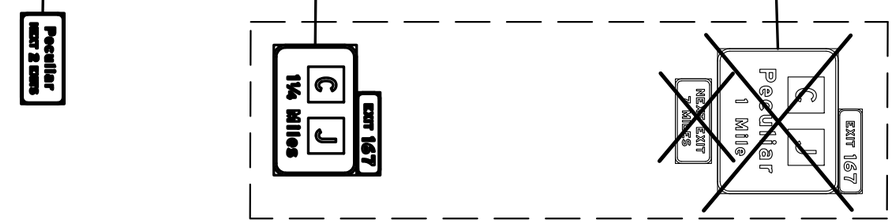
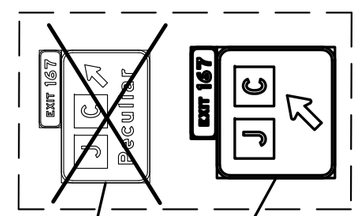
2:49:36 PM 6/13/2013

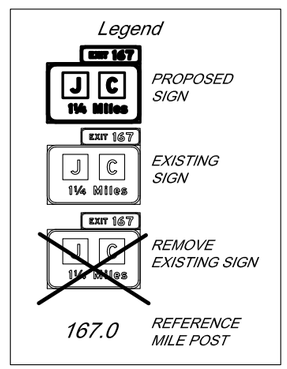


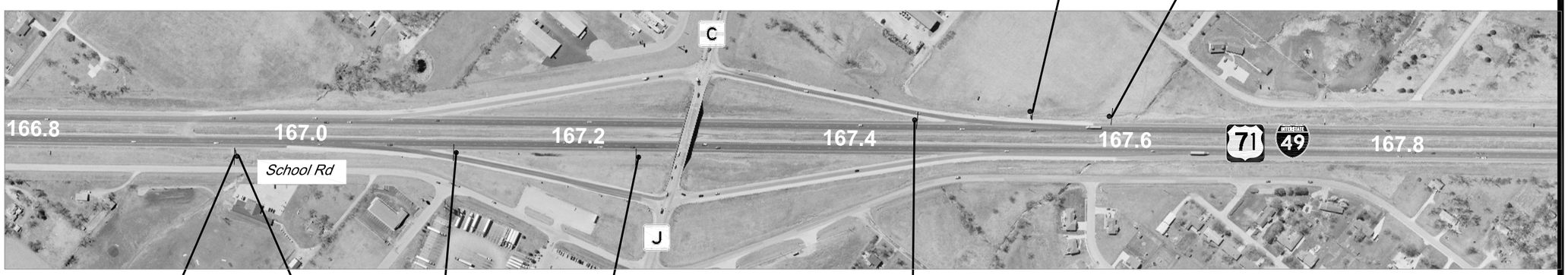


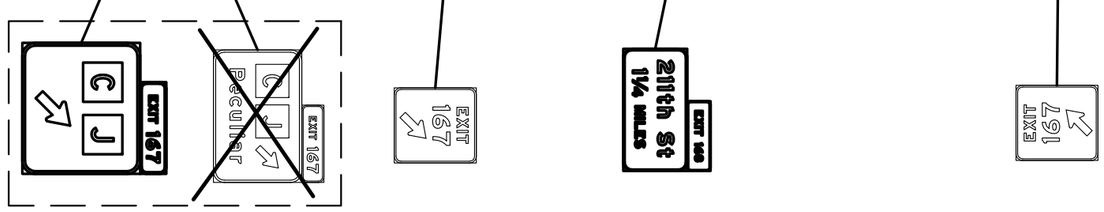
When Existing Sign Condition Requires Replacement

When Existing Sign Condition Requires Replacement









When Existing Sign Condition Requires Replacement

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I-49 & 211th Street
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Sheet 1 of 2

REVISION

PROJECT NUMBER
J4P2247

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6/13/13

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MDS

DRAWN
JFF

REVIEWED
DJM

SHEET TITLE

SHEET NUMBER
Exhibit F-8A

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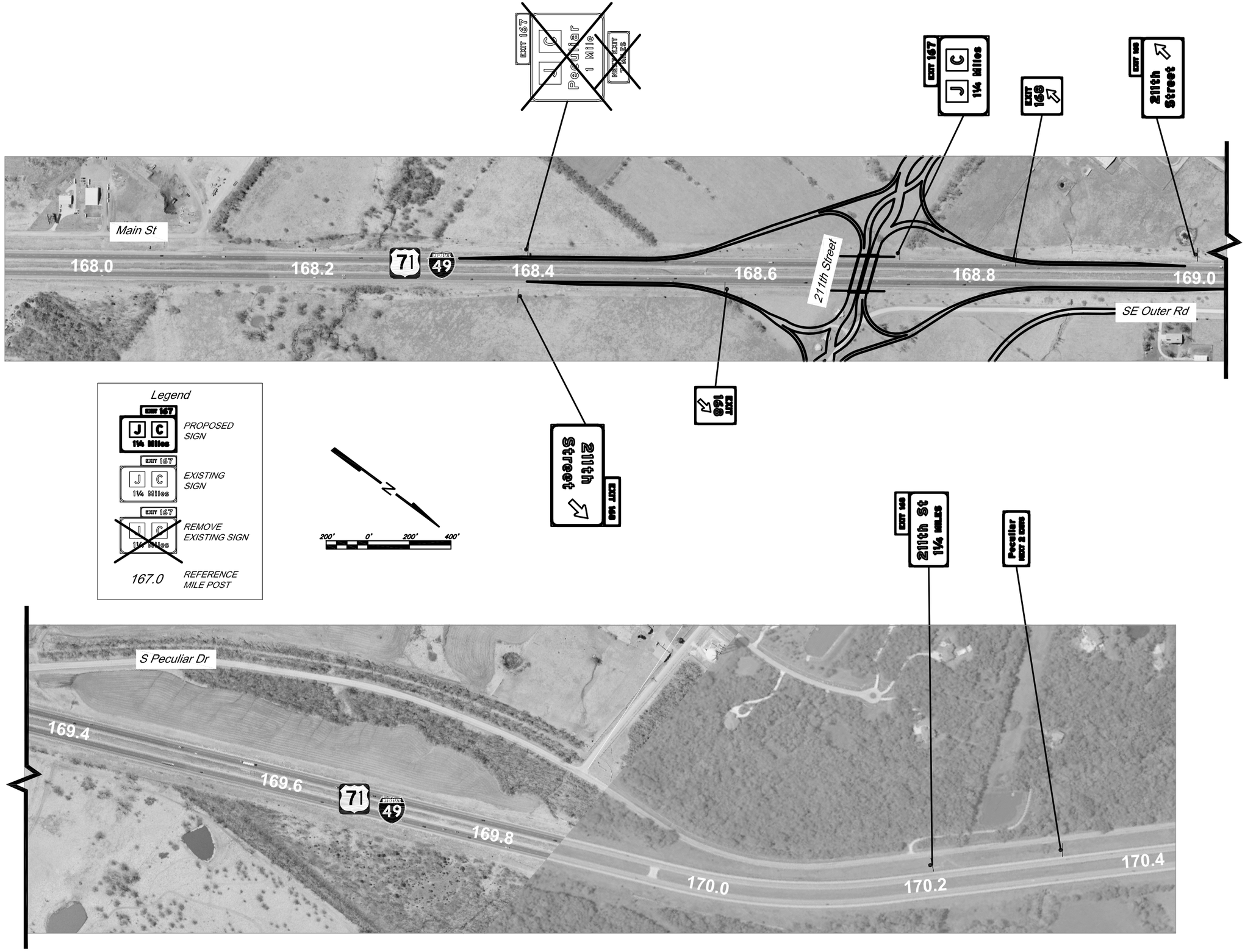

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JFF

REVIEWED
DJM

SHEET TITLE

SHEET NUMBER
Exhibit F-8B

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APPENDIX G

Traffic Crash and Safety Data

Exhibit G-1 - Traffic Crash and Safety Data Policy

Exhibit G-1

Traffic Crash and Safety Data Policy

The National Environmental Policy Act (NEPA), 42 USC Sections 4321-4370f, requires that this analysis of the proposed project must consider and discuss its effects and impacts on mankind, and its effects and impacts on plants, animals, resources, and the natural world in general. One of the key elements to be discussed in any analysis of a proposed highway project is its effects and impacts on the safety of those who use those highways. However, Congress has recognized that even while this document summarizes and presents traffic crash and safety information for the general information and benefit of the public, pursuant to federal law, some people may attempt to use the information to establish federal, state, or local liability in lawsuits arising from highway crashes. Congress has enacted a law, 23 USC Section 409, which prohibits the discovery or use of highway crash and safety data, developed under federal law to make highway safety improvements, in litigation seeking damages for crashes and occurrences on these highways. Congress's rationale is obvious: the safety data was compiled and collected at their request, to help prevent future crashes, injuries and death on our nation's highways. If that information can be used in expensive damage suits, then the millions of dollars that litigation may cost the Missouri Department of Transportation (MoDOT) and local governments will not be available for their use to make Missouri's highways safer.

Traffic crash statistics and safety data are compiled, presented and summarized in portions of this document. Where noted in an introductory footnote to a segment of this document, the discussion, reports, lists, tables, diagrams, and data presented throughout that chapter, unit, section or subsection was compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites or hazardous roadway conditions pursuant tables, diagrams and data are not subject to discovery, and they are prohibited by federal law (USC Section 409) from being admitted into evidence in a federal or state court proceeding, or from being considered for other purposes, in any action for damages arising from an occurrence on the highways, intersections, or interchanges discussed in this document.

APPENDIX H

Environmental Reviews

Exhibit H-1 - Environmental Review Summary

Exhibit H-1

Environmental Review Summary

This project is being pursued under the presumption that the improvements will be environmentally classified as a Categorical Exclusion (CE2). Based upon preliminary investigations and the available evidence, the probability of significant impacts appears to be minimal. The following environmental databases and other sources were reviewed to identify any existing environmental conditions that would present a challenge to the development of the proposed project.

WETLANDS AND WATERS OF THE U.S.

A review of USGS topographic maps and the USFWS National Wetland Inventory GIS database revealed that 211th Street crosses two (2) unnamed tributaries to East Branch between Interstate-49 and School Road. The proposed Northeast Outer Road crosses the western unnamed tributary approximately 400 feet upstream of the western 211th Street crossing. In addition, a formerly identified pond (that has since experienced siltation and now has wetland features) is shown immediately upstream of the western 211th Street crossing. No other potential waters of the U.S. (including wetlands) are shown within the project limits.

The anticipated new stream crossing associated with the proposed Northeast Outer Road will require a U.S. Army Corps of Engineers (Corps) Section 404 permit. In addition, any additional impacts associated with rehabilitation or replacement of the existing stream crossings along 211th Street will also have to be accounted for in the Section 404 permit. If the former pond / current wetland area is determined to be impacted by the project, compensatory mitigation may be required; therefore, Section 404 permit coordination with the Corps should be conducted early in the design process.

FLOODPLAINS

A review of FEMA Flood Insurance Rate Maps (FIRM) showed that portions of the proposed 211th Street lie within Zone A and Zone X floodplains. A portion of the proposed Northeast Outer Road will also lay within a Zone A floodplain. The 211th Street impacts will not be new impacts, as the proposed road generally follows the alignment of existing 211th Street. The Proposed Northeast Outer Road would add a new stream crossing, and perhaps additional complexity, to the project. The floodplains in question belong to two (2) unnamed tributaries to East Branch between Interstate-49 and School Road, and are shown on FIRM 29037C0151E and FIRM 29037C0152E. A floodplain development permit will be necessary.

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) BUYOUT LANDS

The Flood Disaster Protection Act of 1973, as amended by the Disaster Relief and Emergency Assistance Act of 1988 (The Stafford Act), identified the use of disaster relief funds under Section 404 from the Hazard Mitigation Grant Program (HMGP), including the acquisition and relocation of flood damaged property. The Volkmer Bill further expanded the use of HMGP

funds under Section 404 to "buyout" flood damaged property, which had been affected by the Great Flood of 1993.

There are numerous restrictions on these FEMA buyout properties. No structures or improvements may be erected on these properties unless they are open on all sides. The sites shall be used only for open space purposes, and shall stay in public ownership. These conditions and restrictions (among others), along with the right to enforce same, are deemed to be covenants running with the land in perpetuity and are binding on subsequent successors, grantees, or assigns. Any decision involving these properties should take into consideration the 2-3 years is necessary to process an exemption from FEMA, which would likely be a permanent easement rather than a transfer of property.

There are no FEMA buyout properties in the project area.

HISTORIC AND CULTURAL RESOURCES

A review of federal, state, and county listings of historical places was conducted for the immediate project area and surrounding lands. No historic sites were found. A review of Missouri Department of Natural Resources (MDNR) and State Historic Preservation Office (SHPO) databases for previous archeology surveys and known archeological sites in the project area was conducted, and no known archeological sites were found. Coordination with the SHPO would need to be initiated to determine if a historical or archeological survey of the project area is required for the proposed improvements.

ENVIRONMENTAL JUSTICE

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low – Income Populations, directs individual Federal agencies to develop approaches that address environmental justice concerns. The proposed project could potentially require residential displacements on three adjacent properties. The proposed project is located in a U.S. Census Block Group that has a minority level of 3.0% and a poverty level of 7.5%, which are both below the statewide averages. Therefore, no undue or disproportionate impacts would occur to minority or low-income populations.

HAZARDOUS WASTE SITES

In an attempt to identify properties that may possess the potential to negatively impact the environmental integrity of the project, recent copies of Federal and State environmental databases were obtained from Environmental Data Resources, Inc. (EDR) of Southport, Connecticut. Environmental databases reviewed included, but were not limited to: National Priority List (NPL); Hazardous Waste Generators; Brownfields; Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS); Solid and Hazardous Waste Sites; Aboveground and Underground Storage Tanks; Leaking Underground Storage Tanks; Voluntary Cleanup Programs (VCP); Hazardous Waste Treatment, Storage and Disposal Facilities; and Drycleaners.

According to the EDR Report, the only database site listed as occurring near the project is the Raymore-Peculiar School District located at 211th Street and School Road. This site is listed on the RCRA - Conditionally Exempt Small Quantity Generator (RCRA CESQG) and the Underground Storage Tank (UST) databases. The EDR Report indicates that the site has had no reported RCRA violations and that the UST's are reported as being removed. Therefore, this site does not appear to represent a potential environmental concern for the project. No other potential hazardous waste sites were identified within the project area during the environmental database review.

The potential to encounter wastes from unknown sites should always be a consideration. Any unknown sites that are found during project construction will be handled in accordance with Federal and State Laws and Regulations.

THREATENED AND ENDANGERED SPECIES

A search of the Missouri Department of Conservation (MDC) Heritage Database revealed that the federally threatened and state endangered Mead's Milkweed (Asclepias meadii) is known to occur in native grassland prairies of Cass County. Therefore, further agency correspondence with MDC and the U.S. Fish and Wildlife Service (USFWS) should be conducted to determine if impacts to Mead's Milkweed, or other sensitive species or natural communities of conservation concern, might occur as a result of the project.

The project is within the breeding range of the federally endangered Indiana bat. Therefore, if a large number of trees need to be cleared for the project, those trees will first need to be surveyed by a qualified biologist to determine if they are suitable roost trees for this species. If suitable trees are found in the project area, tree-clearing restrictions may be necessary. Concurrence from the U.S. Fish and Wildlife Service will also be required if a large number of trees need to be removed.

PARKLANDS

There are no federal, state, county, or city parks located in the study area. There are no Section 6(f) or potential Section 4(f) properties located in the study area.

AIR QUALITY

This project is located in a non-classified area as defined by the Environmental Protection Agency through the Clean Air Act. Therefore, the conformity requirements of 40 CFR Part 93 do not apply to this project. No further action will be required for Air Quality.

NOISE QUALITY

With the additional improvements proposed, there will be the need to perform a noise impact study in order to determine the increase over the existing noise levels resulting from the increased traffic volumes. MoDOT's Noise Policy will be followed to determine whether any form of noise mitigation will need to be developed as part of the overall project designs.

WATER QUALITY

No impacts to wells, sinkholes, sensitive streams, springs, or caves are anticipated. No significant effect on water quality is anticipated, as long as the necessary erosion control and sediment control measures are properly employed during construction at all areas of soil disturbance.

FARMLAND IMPACTS

Portions of the project may be located outside of the City limits of Peculiar, Missouri. Therefore, in accordance with Section 4 of the MoDOT Local Public Agency Manual, the Farmland Protection Policy Act (FPPA) may apply. Potential farmland impacts should be further evaluated by completing and submitting Form AD-1006 (Farmland Conversion Impact Rating) to the local Natural Resources Conservation Services (NRCS) service center for review.

APPENDIX I

AJR Presentation to FHWA-MO Division

Exhibit I-1 - AJR Presentation to FHWA/MO Division

Exhibit I-1

AJR Presentation to FHWA-MO Division

A presentation was made by MoDOT's Kansas City District staff, assisted by GBA personnel, to management staff of the Federal Highway Administration's Missouri Division (FHWA-MO) on Wednesday, January 30, 2013. The purpose of this introductory presentation was to prepare the FHWA-MO for this proposed project and its intended access request onto Interstate-49, in advance of the final preparations for this Access Justification Report document. Project background information, conceptual interchange alignments, and preliminary traffic analysis results were presented at this meeting, as depicted on the PowerPoint slides contained within this appendix.

J4P2247 I-49/211TH STREET INTERCHANGE - PECULIAR, MO

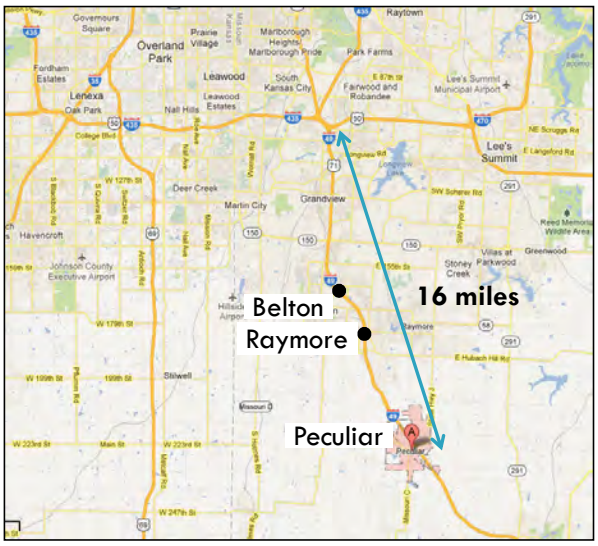
January 30, 2013

AJR Presentation to FHWA-MO Division

Presentation Overview

- Regional growth
- Deficiencies of existing access
- Location of proposed access
- Details of proposed interchange

Project Location



Regional Growth

March 1997

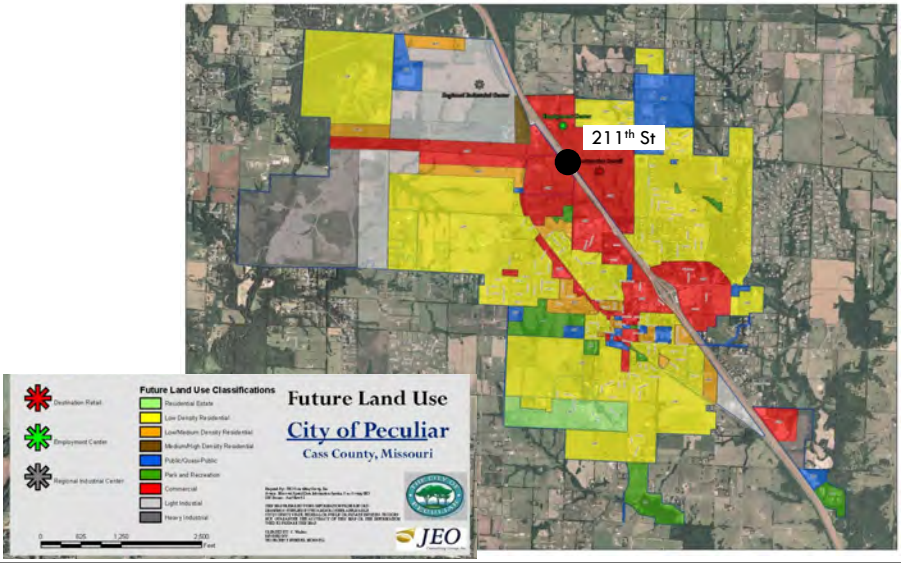
Regional Growth

Regional Growth

- Population growth from 2000 to 2010
  - State of Missouri -- 7% increase
  - Cass County -- 21% increase
  - Peculiar -- 77% increase (2010 Pop. 4,608)
- Commuting patterns
  - 74% of Cass County residents work outside of Cass County
  - 50% of Cass County workforce are non county residents

Raymore Population Growth
(Neighbor to the north)
1990: 5592
2000: 11,146
2010: 19,206

Peculiar Land Use Plan

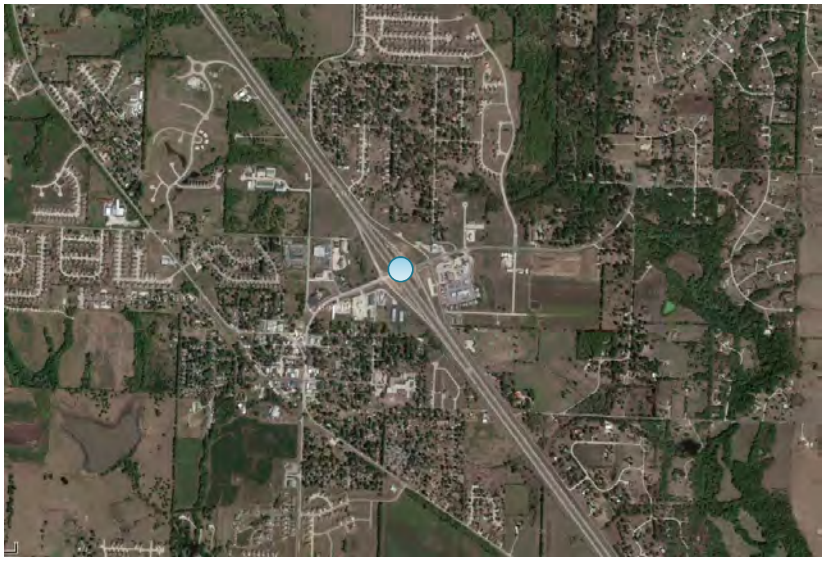


Project Support

- City's highest transportation priority since 2008
  - Tax initiative passed in 2009 specifically for project
- MoDOT and City have entered into a 50/50 Cost Share agreement – the project is funded.
- Cass County committed to project
- Project is on approved MARC LRTP and TIP

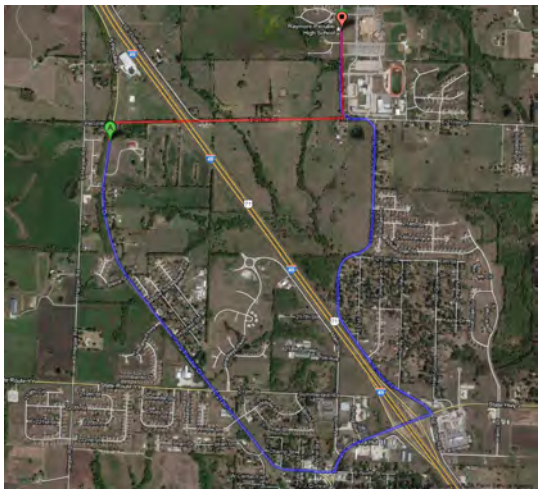
City's Existing Access to I-49

City's Existing Access to I-49



City's Existing Access to I-49

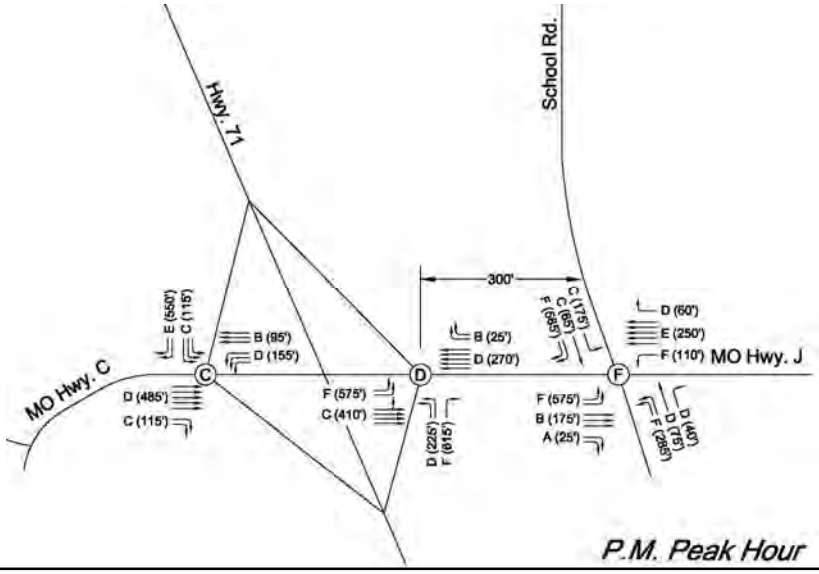
Existing Access Challenges



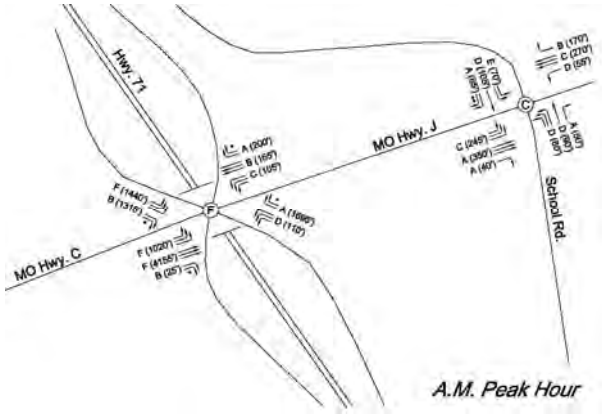
Existing Access Challenges

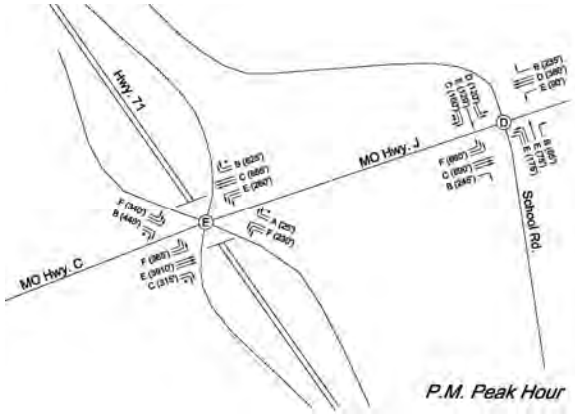
- High crash rate:
  - 4 to 5 x Statewide Rate on Rtes C/J (2007-2011)
  - Half Statewide Rate on I-49 (2007-2011)

Existing Access Challenges



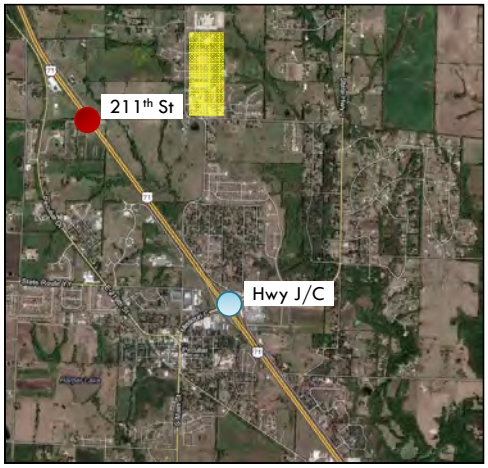
Existing Access Challenges



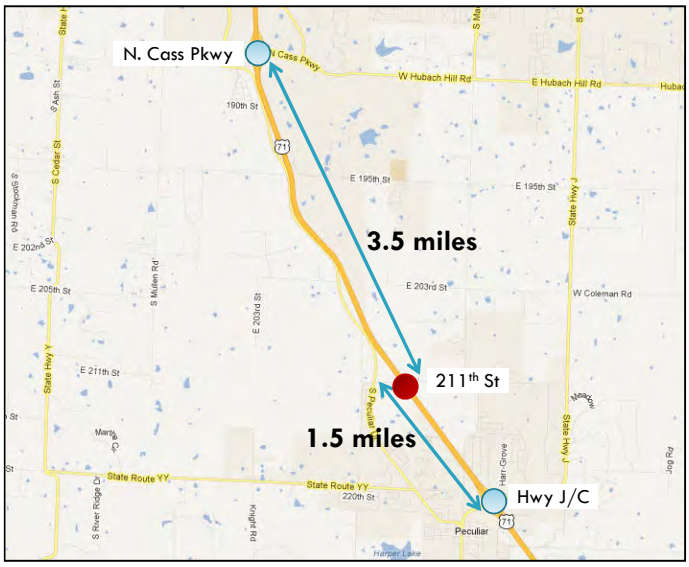


Location of New Access

- Economic development
- Available infrastructure
- School district complex
- County E/W corridor

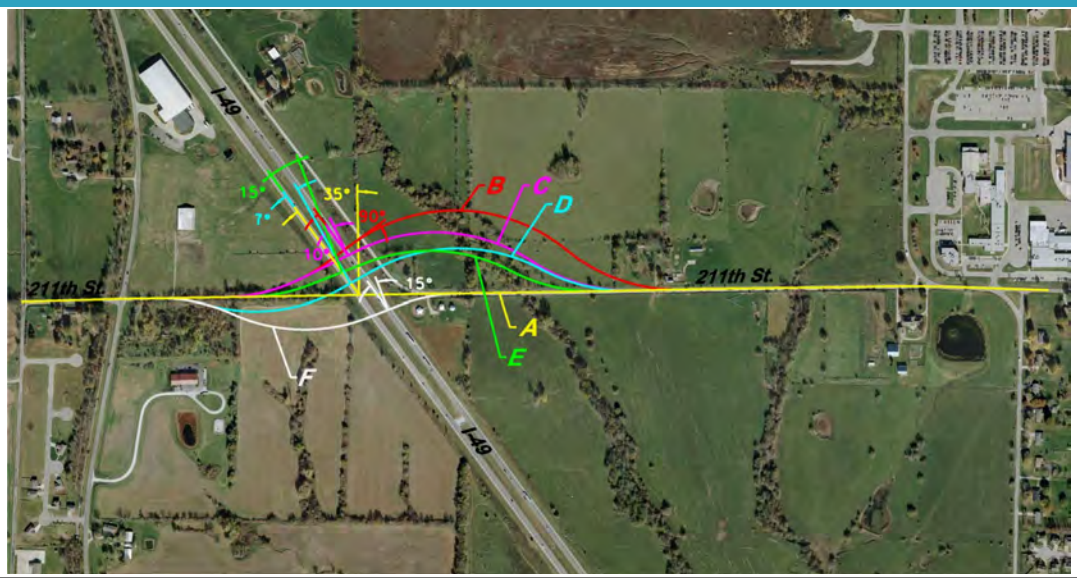


Adjacent Interchanges

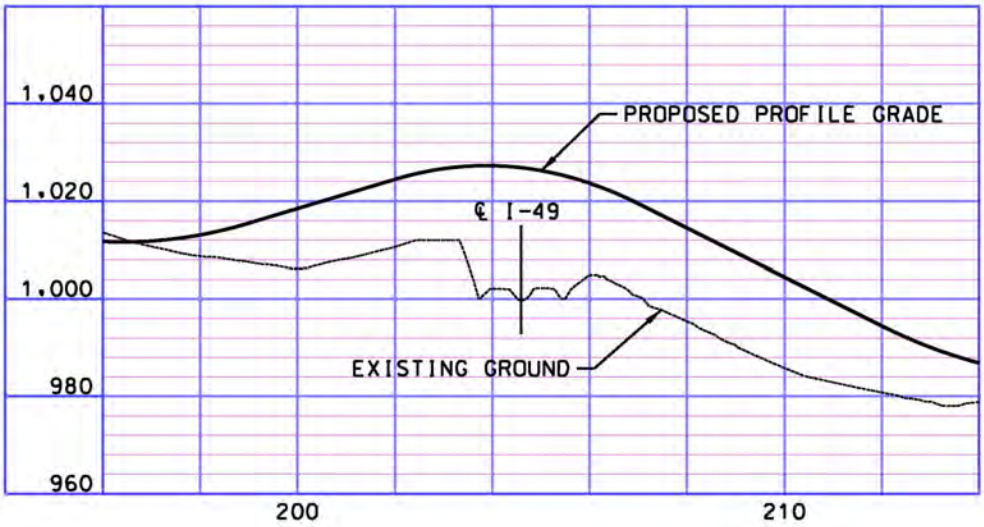


NEPA Considerations

Conceptual Alignment Analysis



Conceptual Profile



Interchange Type Analysis

Interchange Configuration	No. Lanes Required on Bridge	Future PM Peak Hour LOS SB Ramps	Future PM Peak Hour LOS NB Ramps	Relative Construction Cost
Single Point Urban	Not Analyzed	Not Analyzed	Not Analyzed	$$$$
Standard Diamond	8	B	C	$$$
Diamond w/ Roundabouts	6	D	E	$$
Diverging Diamond	6	D	D	$

Proposed Improvements

In Conclusion

- Regional growth demonstrates purpose and need.
- Existing access cannot handle future travel demands.
- Proposed location supports planned economic development.
- Recommended improvements provide long-term practical solution within budget.