APPENDIX A

my SOUTHWEST FREEWAY

US 59/IH-69 Rider 42 Corridor Congestion Mitigation Study

Existing Conditions Report

October 2014

Prepared for:

Houston-Galveston Area Council

In Partnership with:

Texas Department of Transportation, Houston District
City of Houston
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Harris County Infrastructure Department

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On the cover:

Picture 1: Accident slowing traffic at IH-45 and US 59 interchange. Image courtesy of the Houston Chronicle Archives

Picture 2: Looking east from Edloe overpass. Image courtesy of the Houston Chronicle Archives

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1.0 Introduction

1.1 Project Purpose

Congestion plagues most U.S. cities, and Houston is no exception. In fact, Houston's US 59 / IH-69 (Southwest Freeway) corridor ranks high in congestion severity among peer cities in both Texas and the U.S. According to TxDOT's 2014 list of 100 Congested Roadways in Texas[1], US 59 (between IH-610 and SH 288) is the third most congested corridor in the state. The complete list of the 100 Most Congested Roadways in Texas is provided in **Appendix A.**

Figure 1: Congestion along US 59 at HOV/HOT Merge

Source: Houston Chronicle

This study focuses on the section of US 59/IH-69 between Beltway 8 and IH-45 in downtown Houston. The impact of congestion along the facility and the problem this study is addressing is summarized by the following:

- The total annual cost of congestion is more than $215 million;
- A 20-minute trip during off-peak hours can take over 40 minutes during peak hours;
- Due to unreliability of travel conditions along the corridor, travelers must plan for the same 20-minute trip to take between 2-3 hours if they want to reach their destination on time;
- The population in the Houston region is expected to grow by 1.2 million over the next decade.[2]
- The Southwest Freeway cannot expand any further without acquiring significant right-of-way, which would be cost prohibitive.

Traffic congestion is often associated with economic prosperity. However, long-term sustained traffic congestion of the type seen on the US 59 corridor in Houston will eventually dampen and even eliminate the region's future growth potential. Maintaining the economic viability of this corridor will require improvements of every type found in the transportation profession's tool box. A major focus is developing short- and long-term strategies that are realistic and effective.

1.2 Rider 42 Project Background

In May 2011, the 82nd Texas Legislature, recognizing the significant economic impact of congestion in major metropolitan areas, set aside $300 million of Proposition 12 bond proceeds to acquire right-of-way, conduct feasibility studies and project planning and outsource engineering work for the most congested roads in the four most congested regions in the state including Houston, Austin, Dallas-Fort Worth, and San Antonio.

[1] *Texas Department of Transportation-2014 Top 100 Congested Roadways in Texas, August 2014.*

[2] *Houston-Galveston Area Council 2040 Regional Growth Forecast, 2014 Q2.*

Rider 42 also required that the Texas A&M Transportation Institute (TTI) serve as a facilitator and coordinator to help the Texas Department of Transportation (TxDOT) and local agencies do two things:

- Advance those projects that can do the most to improve mobility and strengthen local economies in the most congested regions – Houston, Dallas-Fort Worth, Austin, and San Antonio – not only through new construction, but also through better traffic and demand management.
- Identify the most publicly acceptable options to pay for the state's most urgent congestion-relief projects.

In November 2013, the Houston-Galveston Area Council (H-GAC), in partnership with TxDOT, approved the use of state bond funds (Rider 42) to study the causes of congestion along the US 59/IH-69 corridor between the Sam Houston Tollway and IH-45 downtown and identify alternatives for mitigating deficiencies.

1.3 Project Stakeholders

A Steering Committee comprised of key stakeholders is providing project oversight and direction during the course of the study and includes:

- Texas Department of Transportation (TxDOT)
- Houston TranStar
- City of Houston Public Works and Engineering
- City of Houston Police Department (HPD)
- Harris County Public Infrastructure Department (HCIPD)
- Harris County Toll Road Authority (HCTRA)
- Metropolitan Transit Authority of Harris County (METRO)
- Harris County Sheriff's Office (HCSO)
- Texas A&M Transportation Institute (TTI)
- Houston-Galveston Area Council (H-GAC)
- Fast Tow Wrecker Service

The list of project stakeholders may be amended as necessary during the study process.

1.4 Project Study Area

The entire study area for this project extends between IH-45 in downtown Houston to Beltway 8 (Sam Houston Tollway), a distance of approximately 14 miles. The limits of this project are illustrated in **Figure 2**

Figure 2: US 59/IH-69 Corridor Study Limits

Locally, the facility is referred to as the Southwest Freeway. US 59/IH-69 extends border-to-border from Mexico to Canada and is recognized as a major trade route (NAFTA Corridor Highway System) with local, regional, and national significance.

Major interchanges along the corridor include the Sam Houston Tollway, Westpark Toll Road, IH-610, SH 288, and IH-45. Travel demand on the facility is significant due in large part to the several major employment center/trip generators adjacent to the corridor including downtown Houston, the Houston Medical Center, Museum District, Rice University, Greenway Plaza, the Uptown Houston/Galleria area, and Sharpstown.

1.5 Goals and Objectives

The goal is to develop a plan for mitigating congestion on the Southwest Freeway. The plan will include strategies that will:

- Improve mobility, reliability, and safety
- Improve existing capacity
- Improve travel information capabilities
- Better coordinate and manage incident response
- Identify costs and benefits
- Identify measures and techniques to evaluate performance

1.6 Methodology

The base conditions study methodology includes the following:

1) Collect data
2) Inventory transportation system
3) Develop model analysis tool
4) Assess existing conditions
5) Identify issues
6) Develop measures of effectiveness
7) Identify potential strategies to address issues

2.0 Base Conditions

2.1 Data Collection

Agency Stakeholders have conducted a number of studies in recent years to address congestion throughout the region, including the Southwest Freeway corridor. They also have available a significant amount of data that will be used by the study. The Regional Incident Management System is just one example of an agency database containing historical information. TTI through the Rider 42 Mobility Investment Priorities Study has developed a complete tool box of information for agencies to utilize. The data collection effort focused on utilizing as much existing information related to the corridor as possible to build a foundation as we move into the evaluation of mitigation strategies. The study builds on the ideas and efforts that have been previously developed and carries them forward as part of the overall plan development. This approach not only supports agency consensus but also improves cost effectiveness.

The following data were collected from local agencies:

- Previously prepared technical reports and memorandums along the corridor
- Planned capital improvements along the corridor and funding sources
- Existing and planned operational treatments, management strategies, goals, and objectives
- The Houston Freeway Incident Management Program MOU including Houston-region toll roads
- Historical and existing congested areas/segments along the corridor
- Institutional agreements including roles, responsibilities, processes, goals and objectives
- Crash Records Information System (CRIS) data
- Houston Regional ITS Architecture updates
- Successful congestion relief programs in regions with similar characteristics and their key attributes
- Bridge Inventory Data
- Historical Houston TranStar data
- Inventory of available 2011 roadway data

The specific data collected for this study is listed in **Appendix B**. This information is used to develop a complete understanding of the corridor, including deficiencies. Agencies throughout the region provided a wealth of information and this is provided in **Appendix C**.

2.2 Planned Projects in the Area

Planned projects (near and long-term) have been identified. These projects will be included in the analysis model that will be used to evaluate, assess, and compare various mitigation strategies. The model analysis tool used for this project is DynusT and is described in more detail in Section 2.5.

TxDOT has identified nine near (planned implementation by 2018) and long-term programmed projects within the corridor in the Transportation Improvement Plan (TIP).

Near-term programmed projects (funded by Federal, State, and Local dollars):

- Metro Solutions Uptown Corridor (estimated completion in 2013)
- IH-610 to Richmond Avenue design and reconstruction of Post Oak Boulevard (estimated completion in 2018)
- IH-610 Southbound to US 59 northbound direct connector, right of way, and utilities (estimated completion in 2014)
- Reconstruction of US 59 northbound to southbound IH-610 connector (estimated completion date in 2018)
- Uptown multimodal transit center/park and ride terminal (estimated completion in 2018)
- IH-45 South interchange reconfiguration including the construction of entrance and exit ramps as well as the replacement of the existing US 59 Northbound and Southbound direct connectors from US 59 (estimated completion in 2017)

Long-term planned projects:

- IH-610 Southbound to US 59 northbound direct connector (estimated completion date of 2019, funded by Congestion Mitigation and Air Quality (CMAQ) Program)
- IH-610 Northbound to US 59 southbound direct connector (estimated completion date of 2024, not funded)
- Richmond Avenue at IH 610 widening to 8 lanes with utility improvements sponsored by Uptown Houston (estimated completed in 2022, not funded)

These projects will be included in the analysis model prior to the evaluation of mitigation strategies.

2.3 Roadway Characteristics

2.3.1 Overview

Roadway characteristics include the physical aspects of the roadway including ramp location, spacing, and configuration; roadway geometry including horizontal and vertical curves; managed lanes including high-occupancy vehicles (HOV) and high-occupancy toll (HOT) lanes; interchanges; and direct connectors. This information in combination with traffic operations data is useful in assessing how the physical aspects of the roadway are impacting congestion along the corridor.

The US 59/IH-69 corridor is under the jurisdiction of multiple agencies including TxDOT, METRO and the City of Houston. The primary operation and maintenance responsibilities are summarized in **Table 1**.

Table 1: Operations & Maintenance Responsibilities

Agency	Operation & Maintenance Responsibilities
TxDOT	Frontage Roads, Ramps, Main Lanes
METRO	HOV/HOT Lanes, Park-and-Ride Facilities, Transit Centers
City of Houston	Arterial Street Intersections and Frontage Road Traffic Signals

2.3.2 Beltway 8 to IH-610

US-59/IH-69 consists of 11-13 lanes between Beltway 8 and IH-610 including a single reversible high occupancy toll lane. Frontage roads are 2-3 lanes and end west of the IH-610 interchange. In 2011, average daily traffic volumes were in excess of 230,000 vehicles and the annual cost of delay was more than $51 million.

Table 2 lists the critical merge/weave segments in this segment of the corridor and the approximate distance between the ramps.

Table 2: Critical Merge/Weave Locations – BW 8 to IH-610

Between		Travel Direction (NB/SB)	Gore to Gore Length (ft)	Has Auxiliary lane?
On Ramp	Off Ramp			
Beltway 8 Frontage Road	Bissonnet St.	NB	1,850	Yes
Hillcroft St.	Westpark Dr.	NB	1,190	Yes
Chimney Rock Rd.	Westpark Dr.	SB	1,220	Yes

2.3.3 IH-610 to SH 288

Between IH-610 and SH 288 there are 8-10 lanes with a single reversible high occupancy toll lane extending from IH-610 to Spur 527. Frontage roads are 2-3 lanes and begin east of IH-610 but do not extend east of Hazard Street. In 2011 average daily traffic volumes were in excess of 238,000 vehicles and the annual cost of delay was more than $87 million.

Table 3 lists the critical merge/weave segments in this segment of the corridor and the approximate distance between the ramps.

Table 3: Critical Merge/Weave Locations – IH-610 to SH 288

Between		Travel Direction (NB/SB)	Gore to Gore Length (ft)	Has Auxiliary lane?
On Ramp	Off Ramp			
Weslayan St.	Newcastle Dr.	SB	1,010	Yes
Edloe St.	Kirby Dr.	NB	830	Yes
Kirby Dr.	Edloe St.	SB	750	Yes
Buffalo Speedway	Greenbriar Dr.	NB	990	Yes
Greenbriar Dr.	Buffalo Speedway	SB	990	Yes
San Jacinto	SH 288	NB	1,400	Yes

2.3.4 SH 288 to IH-45

Between SH 288 and IH-45 there are 8-11 lanes but no HOT lane. Frontage roads are 2-3 lanes and terminate at SH 288.

Table 4 lists the critical merge/weave segments in this segment of the corridor and the approximate distance between the ramps.

Table 4: Critical Merge/Weave Locations – SH 288 to IH-45

Between		Travel Direction (NB/SB)	Gore to Gore Length (ft)	Has Auxiliary lane?
On Ramp	Off Ramp			
McGowen St.	Polk St.	NB	1,700	No

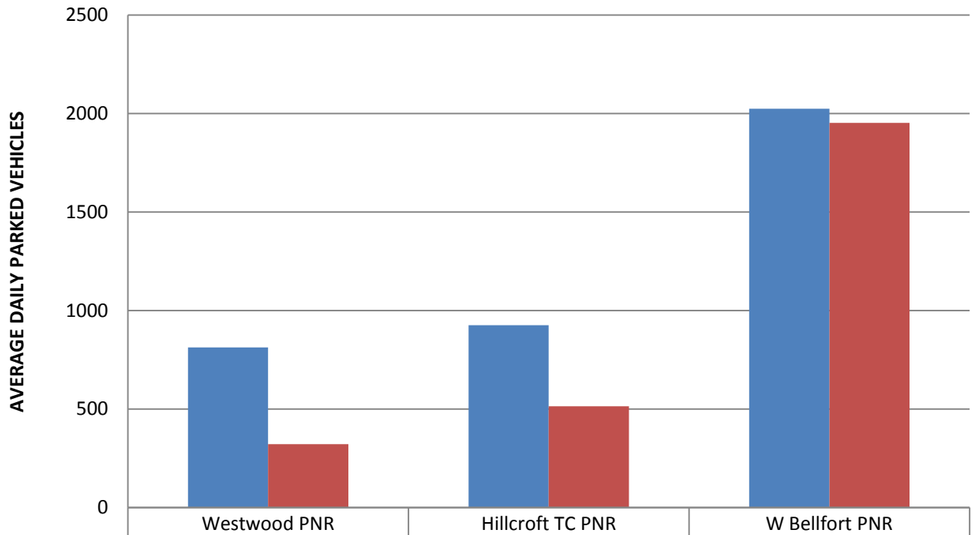
2.4 HOT/HOV Lane

The HOT/HOV lane along US 59/IH-69 runs from south of Beltway 8 to Spur 527 where it follows Spur 527. This lane is open to transit, HOV, and single-occupancy vehicles (SOV). It is a single reversible lane that varies in width from about 14 feet to 33 feet. Access to the HOV/HOT lane is shown below in **Figure 3**. Access to the HOV/HOT lane is via slip ramps or T-ramps from the Park-and-Ride facilities located along the corridor. **Figure 4** shows the Park-and-Ride lot utilization for those locations along the corridor.

Figure 3: HOT/HOV Access and Park-and-Ride Locations[3]

[3] Metropolitan Transit Authority of Harris County 2014 http://www.ridemetro.org/

Figure 4: Park-and-Ride Lot Utilization-March 2014



	Westwood PNR	Hillcroft TC PNR	W Bellfort PNR
Capacity	813	926	2024
Usage	322	514	1953

Source: Texas A&M Transportation Institute

The West Bellfort Park and Ride is consistently filled almost to capacity and would require parking garages be built to expand the capacity. The other two Park and Rides have excess capacity available.

Operation of managed lane facilities is performed by various agencies. METRO is responsible for the reversible HOT lane located within the METRO jurisdiction (Airport to Dunlevy). Sugarland and Fort Bend County operate the HOV diamond lanes that are outside the purview of this study. TxDOT has recently transitioned operational and capital/maintenance responsibilities for the HOT lane to METRO, including signing, barrier realignment and debris removal. The only exception is structural maintenance.

METRO sets operation rules with TxDOT concurrence. METRO has changed hours when SOVs can use the region's lanes and has updated toll rates. HOVs carrying two plus people are not charged a toll, however SOVs are charged a fee based on the time of day to use the facility. The toll charged per vehicle ranges from $1.00 to $6.50.

There is a high dependence on the existing managed lane investment in moving transit. This dependence continues to grow, with Ft Bend County and eventually Uptown Houston counting on the managed lane to deliver more person movement along the corridor in express bus transit. Tolled customers are not considered as high a priority, and METRO envisions that when degradation occurs, tolled users will not be allowed on the lane during peak demand periods, as is happening on other regional corridors now with operational black-out periods being readjusted. Toll revenues do not cover the cost to operate their tolling system, so there is no expectation that tolling will support additional improvements or infrastructure changes in the current operational format (reversible single lane with free HOV use). There is also recognition that the existing operation is not perfect, and various locations present problems in maintaining reliable service.

2.5 ITS Infrastructure

2.5.1 Overview

One of the key mitigation strategies to be evaluated is traffic management and one of the key components of a traffic management system is the field devices (i.e. communications, closed-circuit television, dynamic message signs, and advanced traffic signal controllers) used to communicate with and control traffic. Traffic management is one part of a broader Intelligent Transportation System (ITS). The existence of this infrastructure is a significant asset and supports the implementation of an integrated traffic management system. **Figure 5** shows the inside of the ITS Control Center.

Figure 5: Houston TranStar Control Center

The Houston region (including the US 59/IH-69 corridor) has an extensive deployment of ITS infrastructure. The hub for the monitoring and control of the infrastructure is Houston TranStar, the multi-agency regional transportation and emergency response center. Freeway, tollway and managed lane operations are all monitored from Houston TranStar using the ITS infrastructure.

The arterial street system is continuously being upgraded, as funding permits, to allow increased communications and traffic management capabilities. Several intersections along the corridor have wireless communications capabilities and advanced traffic signal controllers. The transit systems has extensive ITS capabilities. ITS infrastructure deployed along the corridor includes:

- Communications (Fiber, Wireless and Hardwire)
- Closed-Circuit Television (CCTV – 22 locations)
- Automatic Vehicle Identification (AVI)
- Dynamic Message Signs (DMS – 7 locations)
- Highway Advisory Radio (HAR)
- Freeway Ramp Meters (12 locations)
- Regional Computerized Traffic Signal System (RCTSS)
- Roadway Weather Information System (RWIS)
- Automated Traveler Information System (ATIS)
- Regional Incident Management System (RIMS)
- Regional Integrated Traffic Management System (RITMS)

Locations of CCTV, DMS and freeway ramp meters along the corridor are shown on maps in **Appendix D**.

Daily operations along the corridor are monitored and managed by multiple agencies. Most operations occur within Houston TranStar. Agency responsibilities are reflected in **Table 5.**

Table 5: Houston TranStar Agency Responsibilities

Agency / Entity	Responsibility
TxDOT	Monitor Freeways and Frontage Roads
	Monitor and maintain CCTV
	Monitor and maintain AVI/AVI Incident Alarms
	Operate and maintain DMS/HAR
	Enter incidents into RIMS database
	Dispatch Motorist Assistance Program (MAP)
	Operate and maintain ramp meters
	Use of Personnel On Call Electronic Transfer (POCET) for signal maintenance calls
METRO	Monitor HOV/HOT
	Monitor HOV/HOT via CCTV
	Monitor HOV/HOT via AVI Incident Alarms
	Monitor Integrated Vehicle Operations Management System (IVOMS) Outputs (AVL & Schedule Adherence)
	Enter incidents into RIMS database
	Dispatch METRORail, Bus, and Paratransit Services
	Dispatch METRO PD
Harris County – HCPID	Monitor Harris County arterials (signals) via I2 System & Speed/Travel Time Monitoring
	Enter incidents into RIMS database
Harris County – HCTRA	Monitor Toll System via CCTV
	Monitor AVI/AVI Incident Alarms
	Dispatch Patron Emergency Assist Team (PEAT)
Harris County – OEM Office of Emergency Mgmt.	Regular Operations
City of Houston (COH)	Monitor City arterials (signals) via I2 System & Speed/Travel

Agency / Entity	Responsibility
HCSO / HPD / HFD	Regular Operations; Interface with HEC (Houston Emergency Center – 911); Interface with Harris County 911
	Dispatch Heavy Duty Wrecker
Private Traffic Services	Monitor Agency Operations from Houston TranStar Control Floor
Uptown Houston	Monitors Galleria-area for Incidents via Internal CCTV, Freeway/Tollway AVI, and manned assistance patrol
System Users (Public)	Access Houston TranStar website for standard and/or personalized pre-trip or en-route ICM-based travel data; may receive additional route/mode options via web pages.
	Receipt of personalized travel information by mode, facility, time of day; typically travel times, but could be travel cost, etc. via cell phone, email, PDA, satellite radio, the Weather Channel, local media stations, etc.

Source: Houston, Integrated Corridor Management Concept of Operations, March 2010

2.5.2 Assessment

Most ITS devices are operated independently by the controlling agency and not in a fully integrated manner. For example, traffic signal operations along arterial streets including freeway frontage roads are prioritized independent of traffic conditions along the freeway corridor. Another example is freeway incident data (available through RIMS) is primarily used by TxDOT, but not by other agencies affected by freeway operations.

Much of the ITS infrastructure needed to implement and operate an integrated system is already in place. This existing infrastructure provides a significant platform for improving traffic management along the corridor.

2.6 DynusT Modeling

DynusT is a dynamic traffic simulation and assignment (DTA) software designed to address emerging issues in transportation planning and traffic operations. With DynusT, an estimate of system-wide traffic flow dynamics patterns can be evaluated. This model is able to replicate vehicular traffic flows resulting from individual drivers seeking the best routes to their destinations as traffic responds to changing network demand/supply conditions.

DTA is of a similar objective to static traffic assignment used in micro-simulation models, but with a representation of time variations in traffic flows and conditions. Traffic assignment algorithms in the software determine route and link volumes and travel times that satisfy this equilibrium condition through iterative procedures. At equilibrium, no traveler can find an origin-destination route that would lead to a reduction in travel time. If an equilibrium state is reached, it will persist as long as the network and travel demand do not change, because no travelers have incentive to choose different routes. The DynusT Dynamic Traffic Assignment analysis model will be used to evaluate, assess, and compare various mitigation strategies.

2.7 Traffic Data

As previously mentioned, roadway characteristics and historical traffic data are used to identify problem areas along the corridor. For example, the magnitude and location of crash and incident data may suggest a specific problem related to traffic entering and exiting the mainlanes. In analyzing this information we can determine the cause of the problem and evaluate the potential solution including system modifications like ramp closures or ramp modifications. Traffic Data for the corridor has been separated into six segments. These segments are shown in **Figure 6**. Data collected includes travel time, speed, incidents, and crashes.

Figure 6: Corridor Segmentation

2.7.1 Travel Time/Speeds

Travel times for the different segments along the US 59 corridor were found by using the speed charts from the Houston TranStar website (www.houstontranstar.org) between 2009 and 2013. The majority of these travel times are increasing from 2009-2013. This indicates congestion is increasing along US 59. However, there are certain segments along US 59 that have seen a slight decrease in travel times since 2009. **Tables 6-9** show travel times northbound and southbound within the corridor. These tables reflect the average speed and travel time across all lanes within each segment.

Table 6: Southbound AM Peak Speed and Travel Time

US 59 Southwest Southbound AM Peak Hour			
Roadway Segment	**Distance (mi)**	**Speed (mph)**	**Travel Time (min)**
IH-45 Gulf to Fannin	1.8	15	7.20
Fannin to Hazard	1.8	51	2.12
Hazard to Newcastle	2.5	59	2.54
Newcastle to IH-610 West Loop	1.35	65	1.25
IH-610 West Loop to Hillcroft	1.6	65	1.48
Hillcroft to Bissonnet	5.1	55	5.56
Bissonnet to Wilcrest	1.61	70	1.38

Table 7: Northbound AM Peak Speed and Travel Time

US 59 Southwest Northbound AM Peak Hour			
Roadway Segment	**Distance (mi)**	**Speed (mph)**	**Travel Time (min)**
Wilcrest to Bissonnet	1.61	35	2.76
Bissonnet to Hillcroft	5.1	27	11.33
Hillcroft to IH-610 West Loop	1.6	20	4.80
IH-610 West Loop to Newcastle	1.35	39	2.08
Newcastle to Hazard	2.5	38	3.95
Hazard to Fannin	1.8	41	2.63
Fannin to IH-45 Gulf	1.8	50	2.16

Table 8: Southbound PM Peak Speed and Travel Time

US 59 Southwest Southbound PM Peak Hour			
Roadway Segment	**Distance (mi)**	**Speed (mph)**	**Travel Time (min)**
IH-45 Gulf to Fannin	1.8	15	7.20
Fannin to Hazard	1.8	30	3.60
Hazard to Newcastle	2.5	21	7.14
Newcastle to IH-610 West Loop	1.35	25	3.24
IH-610 West Loop to Hillcroft	1.6	30	3.20
Hillcroft to Bissonnet	5.1	25	12.24
Bissonnet to Wilcrest	1.61	45	2.15

Table 9: Northbound PM Peak Speed and Travel Time

US 59 Southwest Northbound PM Peak Hour			
Roadway Segment	**Distance (mi)**	**Speed (mph)**	**Travel Time (min)**
Wilcrest to Bissonnet	1.61	50	1.93
Bissonnet to Hillcroft	5.1	68	4.50
Hillcroft to IH-610 West Loop	1.6	48	2.00
IH-610 West Loop to Newcastle	1.35	49	1.65
Newcastle to Hazard	2.5	15	10.00
Hazard to Fannin	1.8	10	10.80
Fannin to IH-45 Gulf	1.8	16	6.75

Speed graphs were generated using Houston TranStar data based on the 2011 base year. **Figures 7-12** show the average speed changes during the times of the day along the corridor.

Figure 7: Bissonet to Hillcroft Speeds

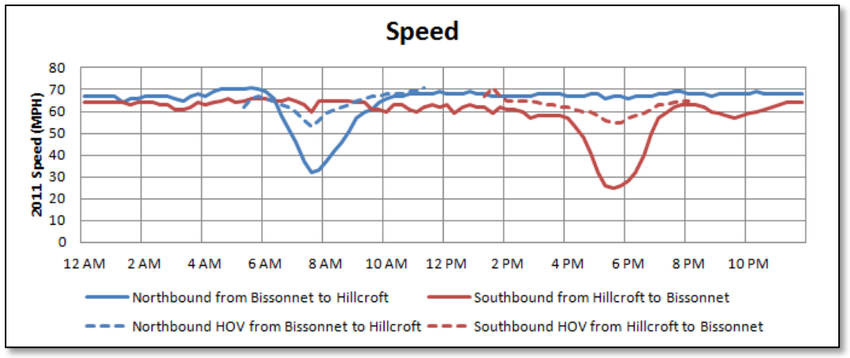


Figure 8: Hillcroft to IH-610 Speeds

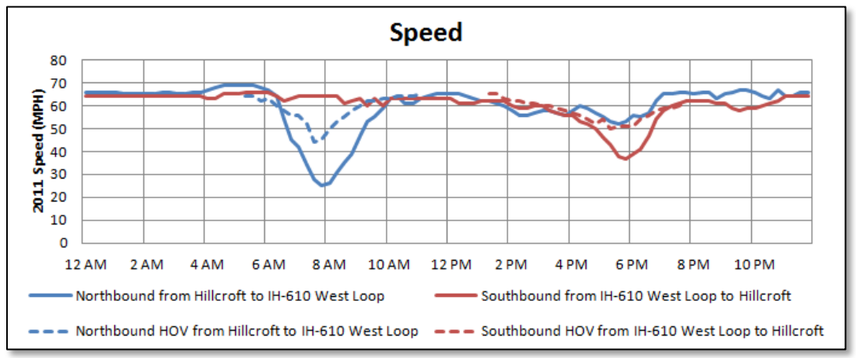


Figure 9: IH-610 to Newcastle Speeds

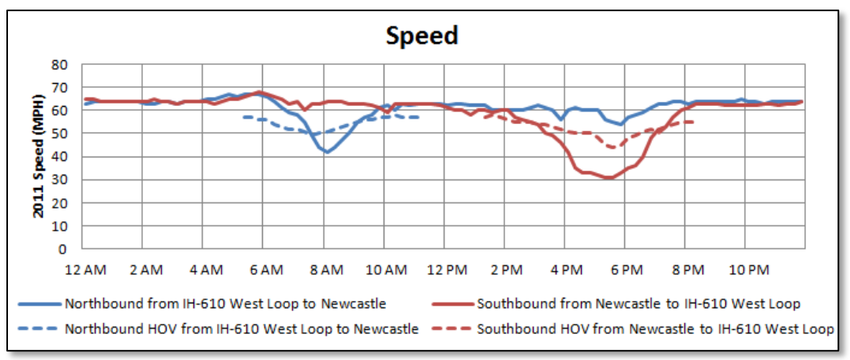


Figure 10: Newcastle to Hazard Speeds

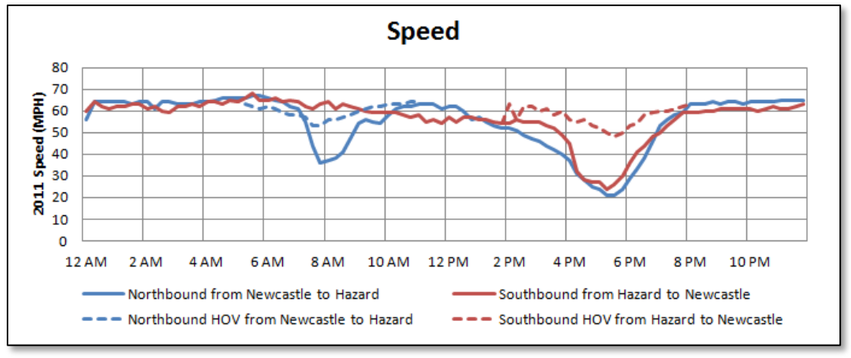


Figure 11: Hazard to Fannin Speeds

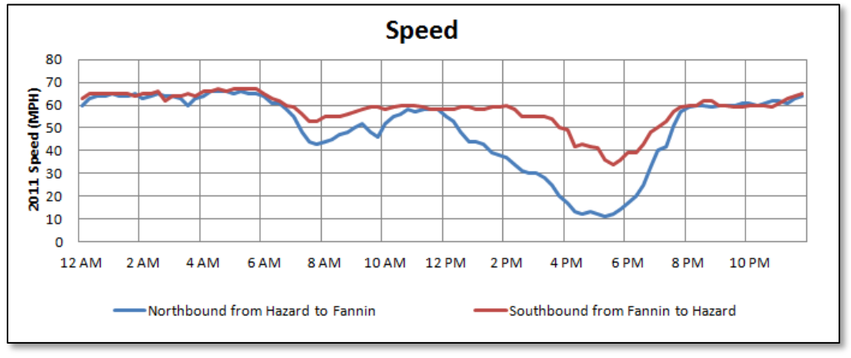
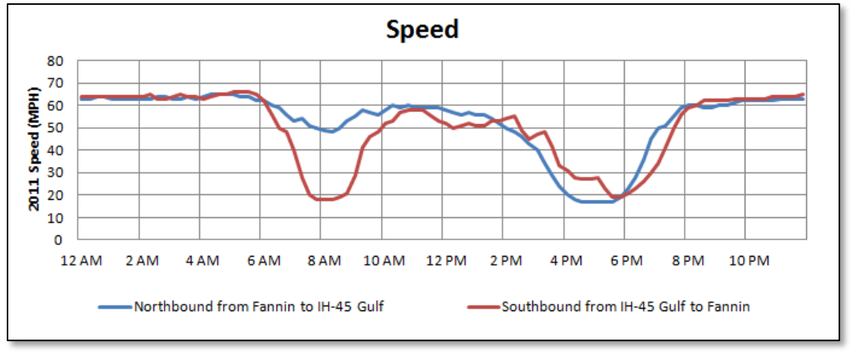


Figure 12: Fannin to IH-45 Speeds



2.7.2 Reliability

Planning Time Index (PTI) is a reliability measure that compares the 95th percentile peak period travel time to the free flow travel time expressed as a ratio. [4] For example, a PTI value of 9.54 (actual from US 59 from IH-610 to SH 288) means that for a 20 minute trip in light traffic, more than 3 hours should be planned in order to arrive on time during a worst case commute. The most significant impact on PTI is non-recurring congestion and those events (incidents) that do not occur on a regular time-of-day basis. A summary of PTI along the corridor is reflected in **Table 10**

Table 10: US 59 Corridor Planning Time Index

Segment	Planning Time Index (PTI)
Beltway 8 to IH-610	6.69
IH-610 to SH 288	9.54
SH 288 to IH-10	10.73

The ability to identify, verify, dispatch, and clear incidents quickly is important to the reliability of a corridor. On average over 1,200 incidents were reported annually along the corridor between 2010 and 2013. The average time to clear an incident is about 30 minutes. **Figure 13** and **Figure 14** show a sample of speed variation[5] on different days of the week that occurs in downtown and west of IH-610. The first graph shows that in the downtown area, there is variation throughout the day with reduction of speed in both of the peak hours. The second graph shows the directionality of the outbound traffic in the PM peak hour, as well as some variation on different days of the week.

Figure 13: Sample Daily Variation – Downtown Area

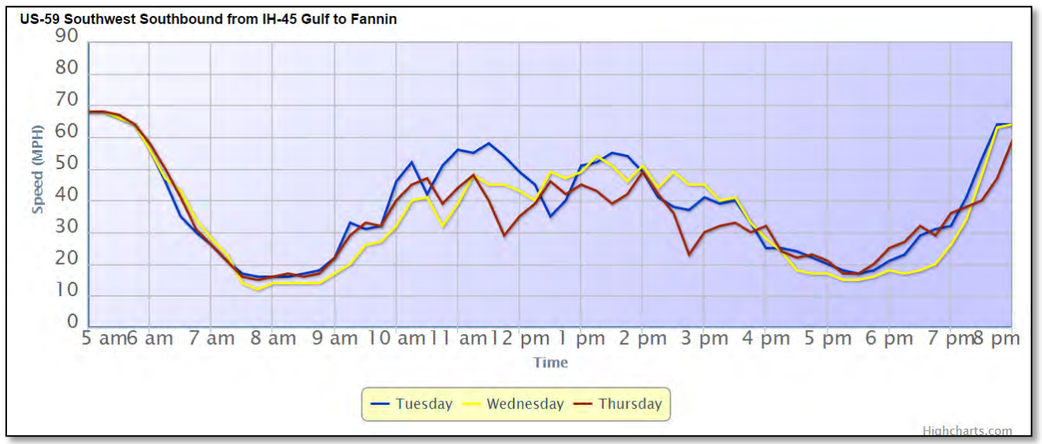
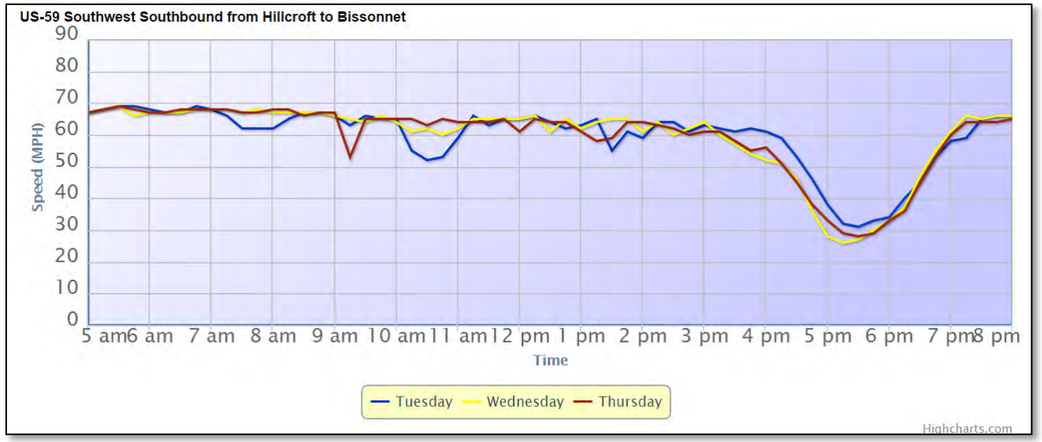


Figure 14: Sample Daily Variation –West of IH-610



[4] *TxDOT 2014 Most Congested Roadways in Texas*
[5] *Houston Transtar 2014 http://www.houstontranstar.org/about_transtar/*

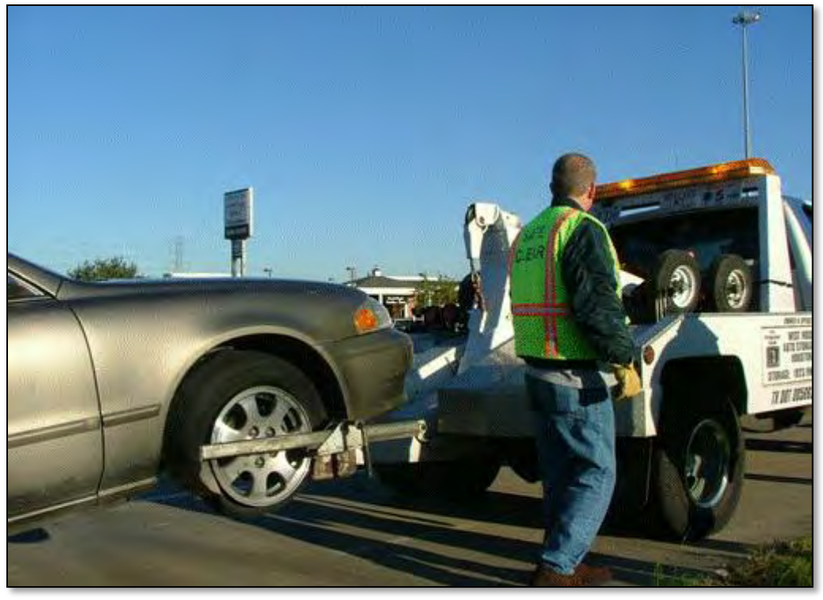
The following services and incident clearance programs are operated by different agencies within or adjacent to the corridor.

- The SafeClear Program is operated and funded by the City of Houston. Motorists stranded (e.g. out of gas, mechanical problems, flat tire) on the shoulder or on the HOV/HOT lane will be towed to a safe location for $50. **Figure 15** shows a vehicle being towed by SafeClear.
- If a vehicle is abandoned, blocking a moving lane, or in an accident or law enforcement incident, it will be towed up to 20 miles for $160. Any tow over 20 miles will be an additional charge of $3.20 per mile.
- Roadside assistance like changing a flat tire, if safe, is provided for $30.
- Motorists may call their own tow trucks, however, the tow truck must arrive before law enforcement to get the tow authorized.
- Metro is the lead sponsor for the Motorist Assistance Program (MAP) which helps stranded motorists on Houston-area freeways. Minor emergencies like overheating, flat tires, and jump starts are cleared. If major services are required MAP will coordinate with the City of Houston SafeClear program. TxDOT, HCSD, Houston TranStar, Verizon Wireless, and the Houston Automobile Dealer Association also sponsor MAP. This service is free of charge.
- The Texas Department of Public Safety offers a Stranded Motorist Hotline to provide help to motorists whose vehicles are disabled on state and federal roadways. If a motorist is inside a city limit, the call is relayed to the local police department. The MAP telephone number is provided to motorists along the Southwest Freeway.

According to the FHWA, about half of congestion is caused by temporary disruptions that take away part of the roadway from use – or nonrecurring congestion[6]. Non-recurring congestion is a major issue along the US 59/IH-69 corridor. Local agencies provide services to clear incidents led by the SafeClear and MAP programs. H-GAC is leading efforts to implement a regional incident clearance program that will be sustainable and annually funded using regional resources. These programs help improve safety, and restore mobility when incidents occur.

The Houston TranStar partnership has developed an incident response manual that provides guidance on response to incidents in the region. This relationship of police, fire, Emergency Medical Services (EMS), tow companies, traffic management and emergency management staff is critical during major incidents, special events, and evacuation.

Figure 15: SafeClear Vehicle Tow



The impact of additional traffic management strategies that can be implemented along the corridor with a goal of reducing clearance times below the current average and that will provide traveler information including travel times, alternative routes, and pre-trip information will be explored.

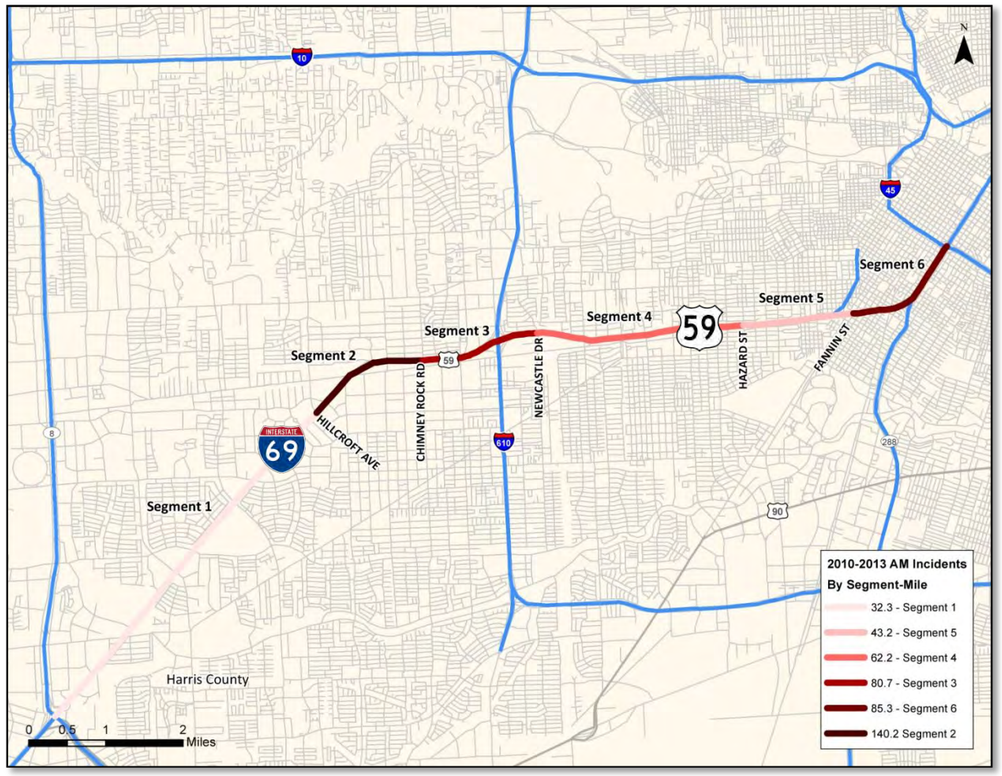
[6] *FHWA 2014 http://ops.fhwa.dot.gov/program_areas/reduce-non-cong.htm*

2.8 Incident/Crash Data

The historical RIMS data[7] was obtained for 2010 to 2013 that details number of incidents, average clearance time, type of incident, Incident conditions, and top incident locations. Also available is an incident clearance report card for 2014 as well as data statistics from the SafeClear program. **Figure 16** shows the average yearly incidents per mile for the six segments of the corridor. Segments 2 and 3 in the Westpark Tollway/IH-610 area show the highest average incidents. **Figure 17** and **Figure 18** show the AM and PM peak incidents per mile. Segment 2 in the vicinity of the Westpark Tollway has the highest number of incidents per mile in the AM Peak while Segment 5 near Spur 527 has the highest number in the PM Peak.

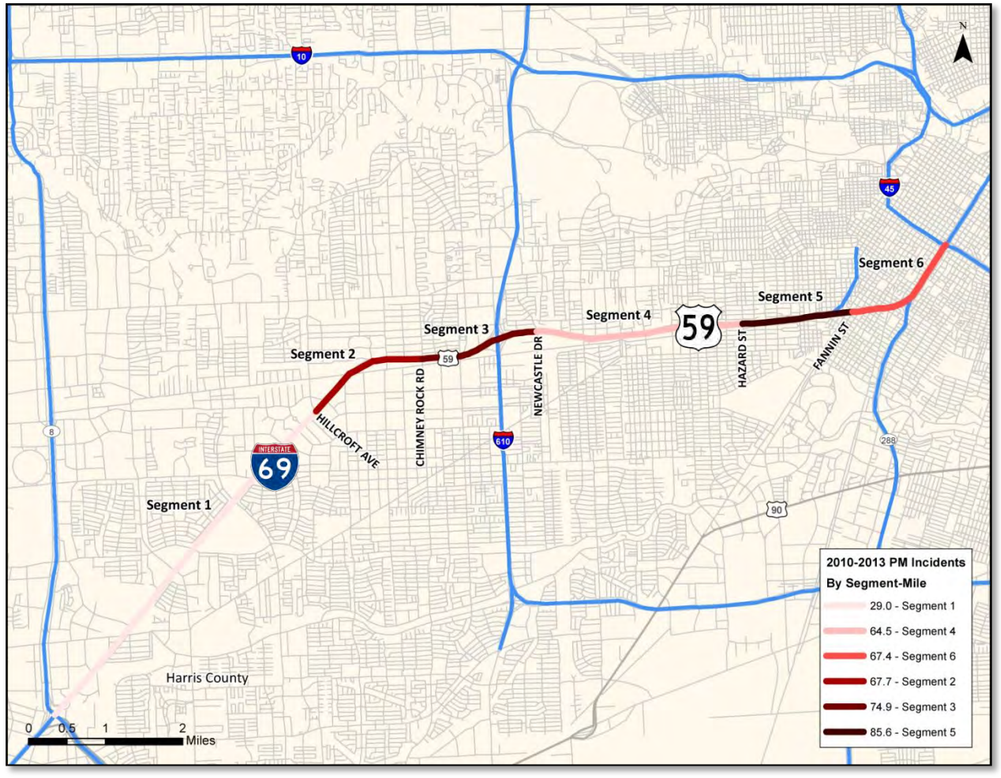
Figure 17: Average Yearly Incidents per Mile

Figure 16: AM Peak Incidents per Mile



[7] *Houston Transtar "Rimstats"-2014 http://www.houstontranstar.org/about_transtar/*

Figure 18: PM Peak Incidents per Mile



Crashes[8] have been further classified by type of crash and by type of injury associated with the crash. **Figure 19** shows the crashes by type with 49% being rear ends and 24% being sideswipes, which can be attributed to traffic congestion. **Figure 20** shows the injury by type, with 73% of crashes having no one injured.

Figure 19: Crashes by Type

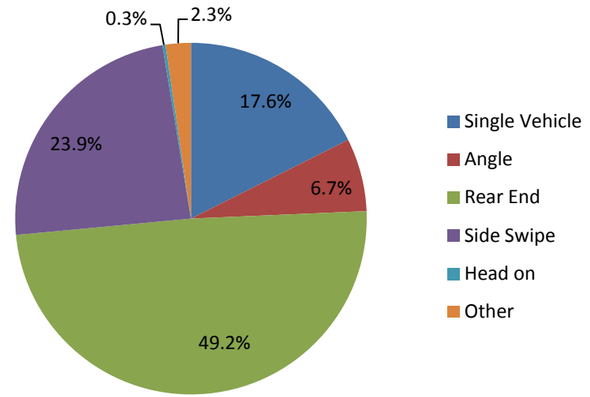
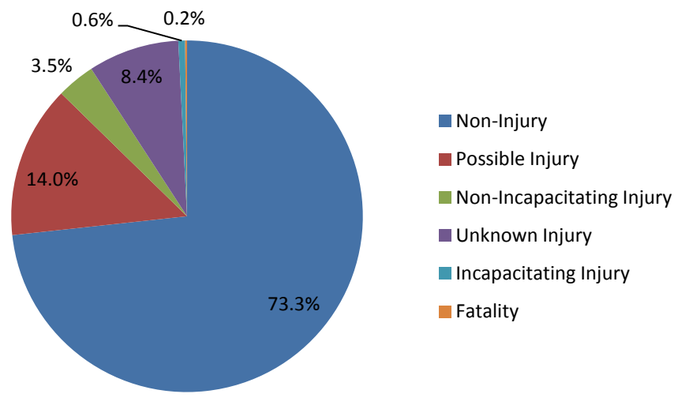


Figure 20: Injury by Type



[8] *TxDOT Crash Records Information System (CRIS) 2010-2013*

2.8.1 High Crash Rate

RIMS data was used to determine the top incident locations along the corridor. **Figure 21** shows the high incident locations along the corridor based on data from 2010 to 2013. IH-610 is the location with the most incidents and is one of nine locations with more than 200 incidents between 2010 and 2013. **Figure 22** shows the highest major and fatal collision locations. IH-610 was the location of the most major collisions and also has the highest rate for fatal collisions in the corridor.

Figure 21: High Incident Locations

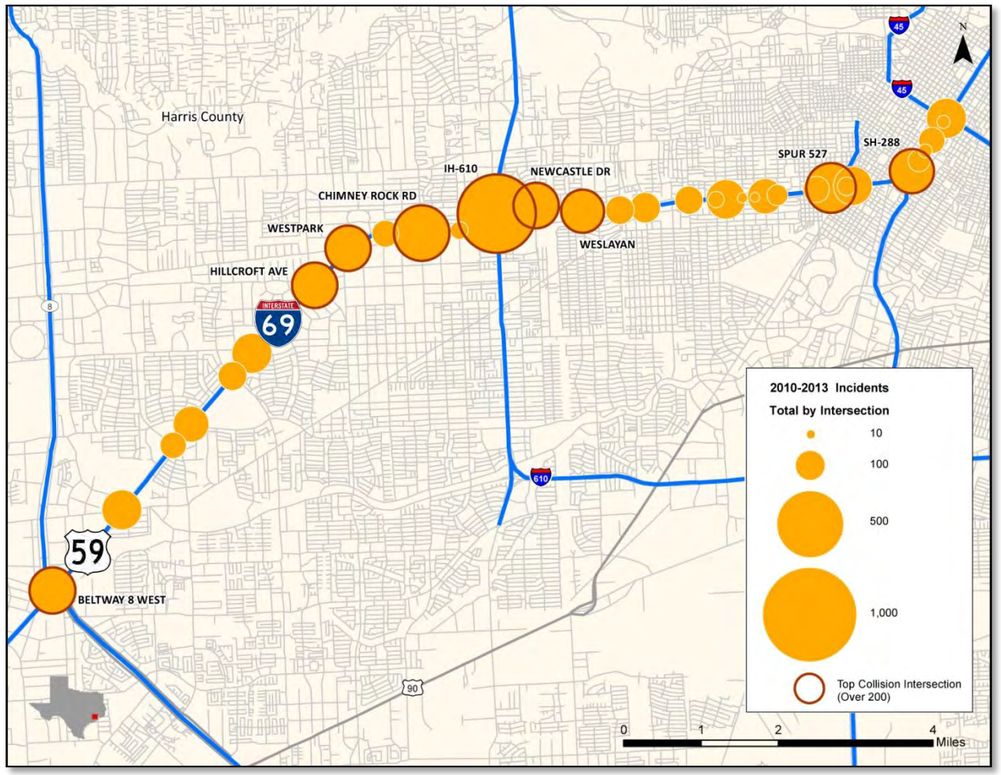
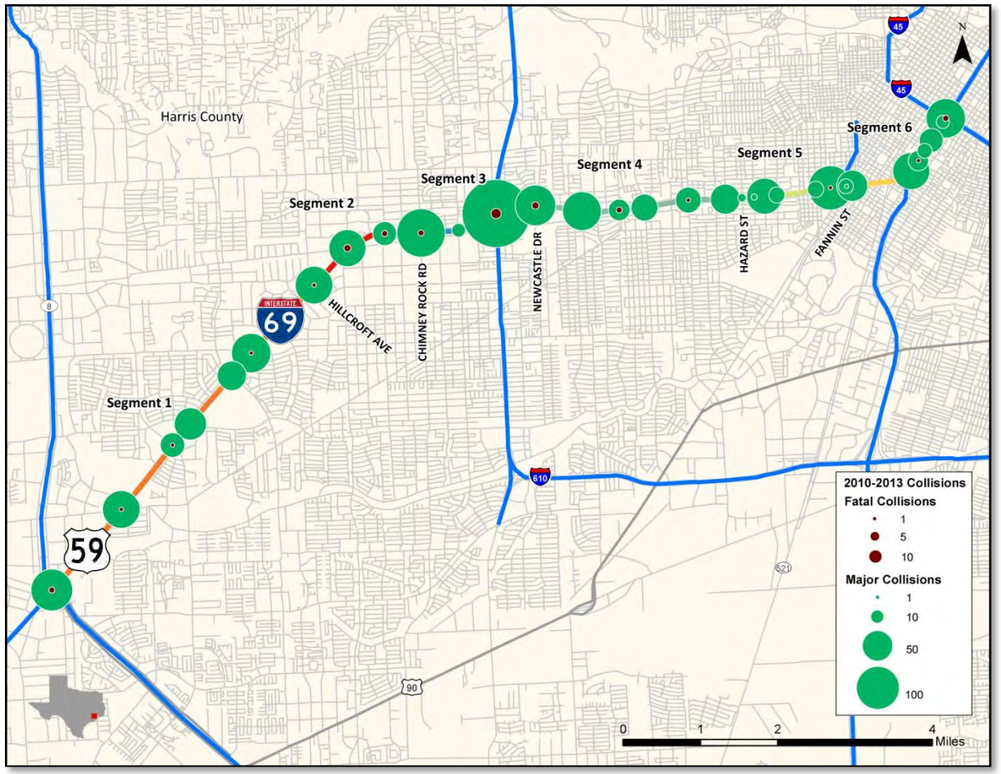


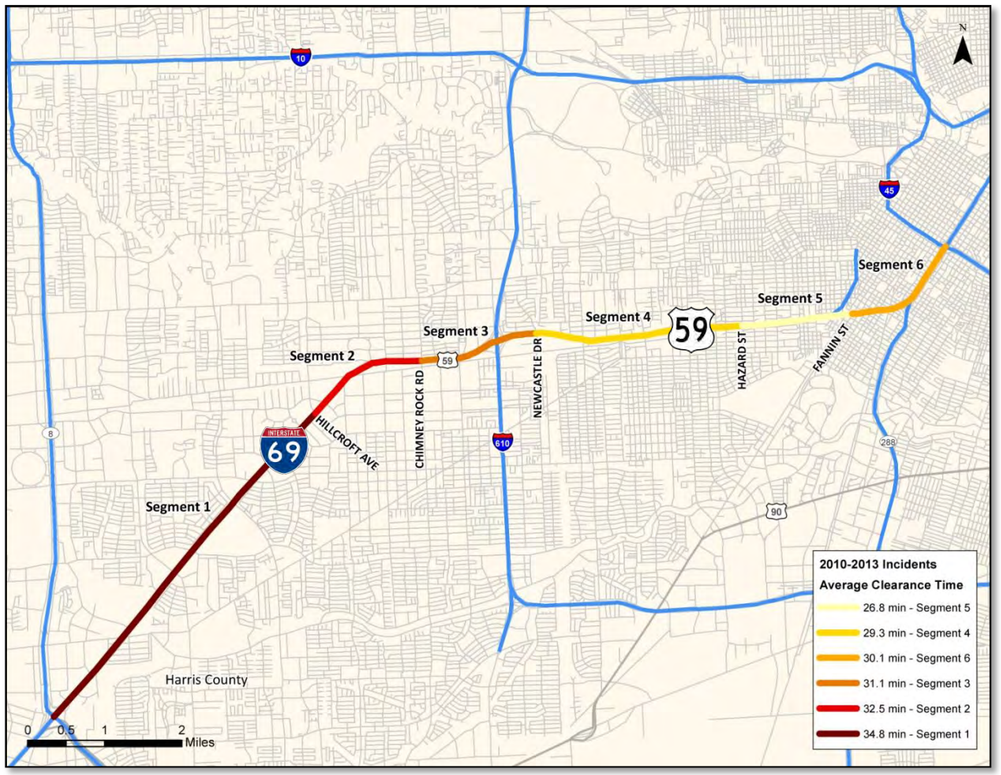
Figure 22: Major and Fatal Collision Locations



2.8.2 Incident Management and Response

Figure 23 shows the average incident clearance time along the corridor. Segment 1, located the furthest from the city center, has the highest response time (34.8 minutes), while Segment 5 has the lowest (26.8 minutes.) Incident clearance and management programs provided by the local agencies are described in Section 2.7.2.

Figure 23: Incident Average Clearance Time



2.9 Memorandums of Understanding and Institutional Agreements

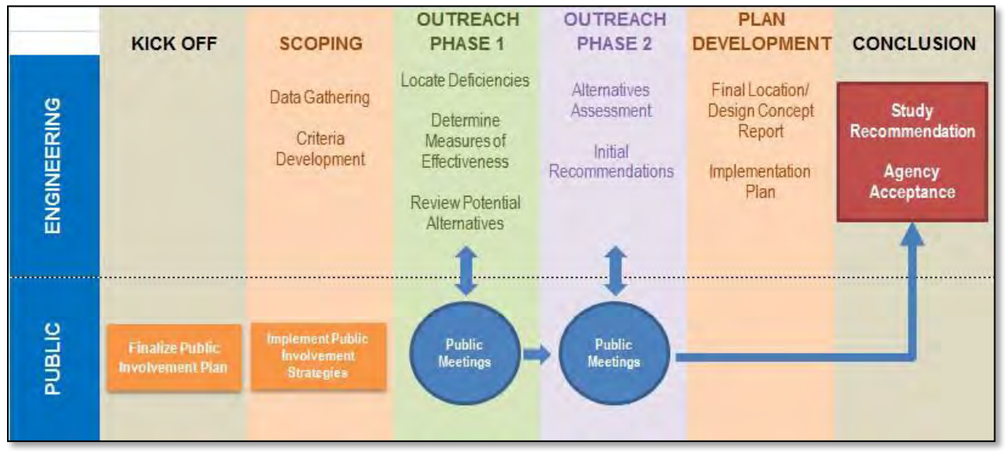
Several institutional agreements are in place between or among the stakeholder agencies responsible for operations and maintenance along the Southwest Freeway corridor. In addition to demonstrating inter-agency coordination and cooperation, these agreements will enable the mitigation strategies envisioned for the corridor to be implemented in an expedited timeframe. The following existing agreements have direct application to potential corridor solutions.

- Interlocal Agreement for a Regional Transportation Management Program (the Houston TranStar master operating agreement)
- Fifteenth Supplemental Agreement for a Houston Area Freeway Incident Management Program
- Multiple Use Agreement for Shared Fiber Optic Communications Cable In Support of the Regional Computerized Traffic Signal System and METRO MAN (TxDOT & METRO)
- Fiber Network Interconnection Agreement between Harris County and TxDOT
- The Houston ITS Priority Corridor Program Agreement No. 126XXF4003 & Amendment No. 7
- The Houston ITS Priority Corridor Program, Condition Responsive Uptown Traveler Information System Work Order Number 24
- Houston Metro HOT Plan and Operations Manual
- Transmittal of High-Occupancy Toll Lane Agreement

2.10 Public Engagement

Public participation and engagement is an important part of the project study and development process. The public can provide insight on issues within the corridor. It's critical to understand the public opinion and to inform and educate them on the various aspects of the project. Oftentimes public opinion will either help build support for or opposition to the project. Therefore, a detailed public involvement plan[9] was developed specifically for this study. The plan is depicted in **Figure 24**.

Figure 24: Public Involvement Plan



The initial Public Engagement Meetings were held on September 10, 2014 from noon to 2 p.m. and from 6-8 p.m. at H-GAC. The meetings were conducted in an open-house format which allowed participants to talk with the study team, view maps of the study area with information on the existing corridor including speed profiles, crashes, and agency identified issues. Participants were encouraged to provide their input on corridor issues. Potential strategies were presented using fact sheets to help the public understand the types of solutions that are being considered as the strategies begin to be analyzed and evaluated.

A virtual layout of the public meeting is available on the project website (www.mysouthwestfreeway.com) for those who were unable to attend the meeting. All materials presented during the actual meeting are available on-line. The period for public input on the initial phase of the project will continue through the end of September 2014. A second public engagement meeting is planned for April 2015. Public comments received thus far are included in **Appendix E.**

[9] *HGAC, Public Involvement Plan, May 2014*

3.0 Corridor Issues

Based on data collected, information reviewed, stakeholder agency input, and public engagement, issues along the corridor have been summarized. This list is not meant to represent every issue identified, but instead provides a summary of the primary issues affecting congestion along the corridor. By addressing these issues during the evaluation of mitigation strategies, a significant impact can be made on developing solutions.

Possible reasons for congestion along this corridor include:

- High volume of commuter traffic from suburbs and during peak periods
- High volume of entering and exiting (merging) traffic from major interchanges
- High volume of ramp exits causing backup onto main lanes at Beltway 8, Gessner Road, Beechnut Street and Bellaire Boulevard (primarily in southbound direction)
- Horizontal and vertical geometrics cause slowdown on the Westpark Tollway curve
- Vertical and horizontal curves and limited sight distances (Spur 527 and US 59)
- Sun glare in morning causes slowing beginning west of Fountain View Drive
- Close spacing of arterial intersections with US 59 frontage roads and Westpark Drive
- Left hand exit onto Spur 527
- Exit ramp spacing close to arterial intersections causing backup onto main lanes
- Ramp spacing causes conflicts between entering/exiting traffic
- Bottleneck caused by parallel freeway section (SH 288 and IH-45)
- HOV/HOT merge with US 59 mainlanes
- HOT/HOV access, illegal access, and enforcement
- HOT/HOV geometrics
- Lack of frontage roads between SH 288 and IH-45
- Lack of frontage roads across IH-610
- Current traffic management approach (including frontage road/arterial street traffic signal operations) is isolated based on agency objectives and priorities
- Non-recurring congestion and incident clearance
- Lack of detailed, coordinated, and automated traffic management plans as part of an incident management program.

4.0 Measures of Effectiveness

Several performance measures or measures of effectiveness (MOE) can be considered for evaluating mitigation strategies including:

- Travel time
- Throughput
- Delay
- Reliability
- Congestion cost
- Operation and Transit savings
- Wasted fuel
- Mobility
- Truck Delay and Congestion Cost
- Capital Costs
- Planning time Index
- Operating and Maintenance Costs
- Commuter Stress Index
- Benefit-cost ratio or cost effectiveness
- Travel time Index
- Social effects
- Evacuation resources
- Economic effects
- Environmental effects
- Implementation timeframe

Each of these measures has value and many of the measures such as travel time and delay are directly related to each other. Based on the study goals, corridor issues and agency input, **Travel Time** and **Throughput** (measured in vehicle miles traveled) are the two primary MOEs that will be used in evaluating mitigation strategies.

5.0 Strategies

The factors contributing to congestion along the corridor are not uncommon to large metropolitan areas experiencing significant growth. They can be addressed and evaluated using various strategies that fall in these distinct categories:

- Traffic Management
- System Modification & Added Capacity
- Travel Options

The potential strategies[10], including a description, benefits, examples, and implementation issues, associated with each of the categories are presented in **Appendix F** and will be the basis for the evaluation phase of this project.

There are a number of system modifications or small added capacity improvement projects that could improve safety and mobility including ramp modifications, managed lanes (including HOV/HOT access), and intersection improvements. **Table 11** lists strategies that are available for implementation within the study corridor. These strategies will be evaluated using the Dynamic Traffic Assignment Software called DynusT and the MOE's identified previously.

[10] *Texas A&M Transportation Institute, Mobility Investment Priorities, 2014 http://mobility.tamu.edu/mip/strategies.php*

Table 11: Congestion Mitigation Strategies

Strategy
Traffic Management
Active Traffic Management
Aggressive Incident Clearance
Dynamic Merge Control
Dynamic Rerouting
Dynamic Truck Restrictions
Queue Warning
Ramp Flow Control
Signal Operations & Management
Traveler Information Systems
Truck Incentives & Use Restrictions
Truck Lane Restrictions
Variable Pricing
Variable Speed Limits
System Modification & Added Capacity
Access Management
Managed (HOT-HOV) Lanes
Auxiliary / Acceleration / Deceleration Lanes
Intersections Improvements
Multimodal Transportation
Ramp Configurations
Travel Options
Bicycle & Pedestrian Facilities
Carpooling
Express Bus Service
Flexible Work Hours
Park-and-Ride Lots
Telecommuting
Transportation Management Associations (TMA)
Vanpooling

Appendix A | TxDOT 2014 Most Congested Roadways in Texas

2014 Most Congested Roadways in Texas

2014 Rank	2014 Rank Truck	Roadway	From	To	County	Annual Hrs of Delay per Mile	Annual Hrs of Truck Delay per Mile	TCI	PTI	CSI	Annual Congestion Cost (M)	Annual Truck Congestion Cost (M)
1	4	IH 610	IH 10/ US 90	IH 69/ US 59	Harris	1,184,702	70,579	2.43	8.70	3.20	$81.35	$17.12
2	1	IH 35	US 290 N	SH 71	Travis	950,795	116,251	2.54	10.00	3.33	$196	$72.12
3	2	US 59	IH 610	SH 288	Harris	777,146	72,937	2.01	9.54	2.12	$105.22	$32.15
4	11	US 75	IH 635	Woodall Rodgers Freeway	Dallas	719,128	47,205	1.72	7.29	2.02	$145.12	$33.74
5	5	IH 35E/ US 77	SH 183	IH 30	Dallas	708,365	70,187	1.96	7.63	2.46	$79.65	$25.25
6	8	US 59	IH 10/ US 90	SH 288	Harris	666,494	55,325	2.34	10.73	3.48	$50.26	$13.90
7	7	IH 635	IH 35E/ US 77	US 75	Dallas	615,132	61,099	1.68	9.83	2.03	$129.08	$41.86
8	6	IH 35W/ US 287	28th St/ SH 183	IH 30	Tarrant	606,750	65,782	2.17	11.68	2.59	$67.06	$22.84
9	14	IH 45	IH 610	IH 10/ US 90	Harris	535,229	35,570	1.63	7.50	1.95	$47.04	$11.08
10	10	IH 35E/ US 77	IH 635	SL 12 N	Dallas	535,025	48,827	1.89	10.16	2.18	$37.33	$11.33
11	18	IH 45	SL 8	IH 610	Harris	497,805	32,377	1.61	6.87	1.97	$105.18	$24.40
12	17	IH 610	IH 45	IH 10/ US90	Harris	471,163	32,471	1.94	8.39	2.38	$70.47	$16.89
13	37	IH 10/ US 90	IH 610	IH 45	Harris	456,205	22,057	1.70	6.82	1.94	$49.06	$8.82
14	9	IH 35W/ US 287	US 81/ US 287	SH 183	Tarrant	431,860	54,289	2.14	10.37	2.40	$64.53	$24.59
15	3	IH 10/ US 90	N Eldridge Pkwy	SL 8	Harris	426,653	72,181	1.78	7.11	1.91	$43.38	$20.09
16	21	IH 45	IH 10/ US 90	IH 610	Harris	413,804	29,264	1.67	6.97	1.96	$66.59	$16.39
17	19	US 290	SL 8	IH 610	Harris	394,503	29,727	1.75	9.03	2.13	$77.42	$20.22
18	34	US 75	PGBT/ SH 190	IH 635	Dallas	377,889	22,290	1.54	6.63	1.80	$53.90	$11.51
19	24	IH 30/ US 67	Jefferson Viaduct	SL 12 E	Dallas	371,242	28,796	1.58	6.28	1.87	$71.65	$18.89
20	16	IH 35E/ US 77/ US 67	IH 30	US 67	Dallas	364,656	33,894	1.51	6.06	1.84	$46.25	$14.05
21	32	Woodall Rodgers Fwy	US 75	N Beckley Ave	Dallas	363,286	22,937	1.92	13.97	2.13	$19.55	$4.25
22	40	IH 69/ US 59	IH 610	SL 8	Harris	358,870	21,520	1.47	6.69	1.72	$59.72	$12.93
23	27	SH 288	IH 45	IH 610	Harris	355,605	24,284	1.76	9.32	1.97	$39.02	$9.25
24	81	IH 820	IH 35 W	Baker Blvd / SH 183	Tarrant	353,266	11,568	1.76	11.76	1.96	$52.06	$6.56
25	-	Mopac Expwy/ SL1	US 183	SL 360	Travis	343,996	7,553	2.04	8.81	2.55	$74.73	$6.41
26	12	IH 345/ US 75/ IH 45	Woodall Rodgers Freeway	US 175	Dallas	340,314	44,606	1.59	6.45	1.99	$20.83	$8.15
27	35	IH 10/ US 90	IH 45	US 59	Harris	328,252	22,279	1.79	8.29	2.22	$21.59	$5.13

TCI: Texas Congestion Index - ratio of the peak period average travel time to the freeflow travel time. A value of 1.20 means that a 30 minute trip during light traffic would take 36 minutes during peak periods.

PTI: Planning Time Index - (a reliability measure) ratio of the 95th percent peak period travel time to the freeflow travel time. A value of 2.50 means that for a 30 minute trip in light traffic, 75 minutes should be planned.

CSI: Commuter Stress Index - the same as the TCI except it is for the peak direction of travel only.

2014 Rank	2014 Rank Truck	Roadway	From	To	County	Annual Hrs of Delay per Mile	Annual Hrs of Truck Delay per Mile	TCI	PTI	CSI	Annual Congestion Cost (M)	Annual Truck Congestion Cost (M)
28	13	IH 10/ US 90	SL 8	IH610	Harris	323,387	38,032	1.44	4.87	1.59	$52.21	$18.96
29	29	IH 45	IH 610	SL 8	Harris	322,920	23,268	1.54	6.13	1.83	$57.09	$14.24
30	82	Westheimer Rd/ FM 1093	SL 8	IH 610	Harris	317,581	11,188	1.55	23.98	1.59	$46.22	$5.89
31	20	US 290	SH 6	SL 8	Harris	303,152	29,271	1.76	6.02	2.30	$35.15	$10.94
32	42	IH 45	SL 8	Nasa Pkwy / FM 528	Harris	295,898	20,563	1.52	5.66	1.75	$51.32	$12.34
33	38	IH 10	Hawkins Blvd	Lee Trevino Dr	El Paso	287,815	21,638	1.48	4.06	1.67	$25.22	$6.52
34	75	SH 121	SH 26	IH 820	Tarrant	274,886	12,199	1.45	6.94	1.58	$69.05	$11.55
35	22	IH 35	SH 71	Slaughter Ln	Travis	273,889	29,107	1.58	4.90	2.00	$35.62	$11.98
36	33	IH 10/ US 90	SH 99	N Eldridge Pkwy	Harris	259,946	22,324	1.55	5.66	1.91	$58.00	$16.53
37	99	Bellaire Blvd	SL 8	IH 610	Harris	254,455	9,643	1.59	25.09	1.71	$31.99	$4.33
38	44	IH 35E/ US 77	BS 121 H	IH 635	Denton	254,169	20,200	1.52	6.35	1.81	$62.98	$17.17
39	51	SH 183	SL 12 W	IH 35E/ US 77	Dallas	250,096	16,571	1.71	7.83	1.79	$17.02	$3.96
40	25	IH 35	IH 410	IH 410	Bexar	246,824	28,138	1.45	5.33	1.65	$22.21	$7.94
41	78	IH 610	IH 60/ US 59	SH 288	Harris	241,627	11,920	1.47	6.04	1.70	$40.20	$7.33
42	70	S Staples St	SH 358	Yorktown Blvd	Nueces	237,514	12,525	1.50	20.64	1.55	$16.95	$3.08
43	-	Dallas North Tollway	PGBT	IH 635	Dallas	235,067	9,309	1.74	8.32	2.25	$29.56	$4.41
44	26	IH 35/ IH10	IH 37/ US 281	US 90	Bexar	229,202	26,527	1.42	5.62	1.56	$23.00	$8.23
45	59	IH 45	Lake Front Cir	Spring Cypress Rd/ FM 2920	Montgomery	227,943	13,994	1.35	5.28	1.43	$32.38	$7.06
46	89	SH 360	IH 30	IH 20	Tarrant	221,696	10,456	1.40	5.50	1.66	$26.01	$4.60
47	-	S Lamar Blvd/ SL 343	W Cesar Chavez St	US 290/ SH 71	Travis	218,930	3,027	1.54	22.82	1.71	$16.89	$0.90
48	-	Westheimer Rd/ FM 1093	SH 6	SL 8	Harris	213,653	7,270	1.48	23.71	1.53	$33.24	$4.15
49	87	SH 6	IH 10/ US 90	Westpark Tollway	Harris	212,459	10,535	1.65	28.98	1.78	$22.95	$4.08
50	-	N Lamar Blvd	W 45th St	W Cesar Chavez St/ SL 343	Travis	207,873	9,197	1.68	23.30	1.87	$16.92	$2.64
51	-	IH 10/ US 87	SL 1604 N	IH 410	Bexar	206,392	8,937	1.37	5.34	1.74	$27.84	$4.53
52	-	FM 1960	SH 249	IH 45	Harris	204,078	6,768	1.52	24.14	1.66	$36.00	$4.43
53	-	Congress Ave	11th St	SH 71 / US 290	Travis	200,869	8,156	1.53	22.46	1.54	$15.97	$2.30
54	36	IH 35	SL 1604 NE	IH 410	Bexar	198,679	22,177	1.37	5.06	1.58	$24.54	$8.62

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PTI: Planning Time Index - (a reliability measure) ratio of the 95th percent peak period travel time to the freeflow travel time. A value of 2.50 means that for a 30 minute trip in light traffic, 75 minutes should be planned.

CSI: Commuter Stress Index - the same as the TCI except it is for the peak direction of travel only.

2014 Rank	2014 Rank Truck	Roadway	From	To	County	Annual Hrs of Delay per Mile	Annual Hrs of Truck Delay per Mile	TCI	PTI	CSI	Annual Congestion Cost (M)	Annual Truck Congestion Cost (M)
55	-	FM 1960	SH 249	US 290	Harris	197,438	6,264	1.55	27.02	1.67	$19.38	$2.31
56	48	IH 35E/ US 77	SL 288	N Denton Dr	Denton	196,297	18,034	1.53	6.62	1.53	$26.05	$7.89
57	39	IH 35	Parmer Ln/ FM 734	US 290N/ SS69	Travis	196,190	21,609	1.54	5.45	1.90	$32.02	$11.04
58	-	US 281	Stone Oak Pkwy	SL 1604	Bexar	194,384	7,359	1.52	7.92	1.62	$11.72	$1.65
59	-	IH 410	US 281	IH 10/ US 87	Bexar	193,947	6,001	1.25	3.94	1.32	$18.75	$2.26
60	-	UA 90	SH 288	IH 610	Harris	192,613	6,791	1.49	23.76	1.63	$19.14	$2.42
61	65	IH 45	FM 2920	SL 8	Harris	190,664	13,136	1.36	5.15	1.53	$34.19	$8.23
62	-	S Hulen St	IH 20	W Risinger Rd	Tarrant	190,448	6,443	1.51	25.41	1.61	$19.72	$2.42
63	-	SH 6	US 290	IH 10/ US90	Harris	188,663	9,482	1.60	26.78	1.66	$38.60	$6.95
64	-	SL 12 N	Dallas North Tollway	SL 12 E	Dallas	188,198	2,978	1.42	18.68	1.52	$25.03	$1.55
65	88	IH 10	US 54	Hawkins Blvd	El Paso	187,893	10,519	1.27	4.31	1.32	$15.85	$3.22
66	-	W Slaughter Ln	Brodie Ln	IH 35	Travis	187,657	5,544	1.45	28.21	1.47	$15.54	$1.72
67	30	IH 35	FM 3009	SL 1604 NE	Guadalupe	186,997	22,977	1.38	5.76	1.54	$22.66	$8.52
68	69	US 75/ SH 121	US 380	SH 121 / SH 399	Collin	186,300	12,636	1.52	5.22	1.73	$15.46	$3.69
69	41	IH 635	US 75	Garland Ave/ SH 78	Dallas	186,013	20,710	1.34	6.21	1.55	$39.13	$13.89
70	-	Voss Rd & Hillcroft Ave	IH 10/ US 90	IH 69/ US 59	Harris	184,480	7,948	1.52	24.37	1.64	$18.86	$2.86
71	71	IH 30	SL 12 W	Jefferson Viaduct	Dallas	183,953	12,501	1.36	6.87	1.37	$26.20	$6.31
72	43	IH 35 W	SH 170	US 81/ US 287	Tarrant	182,836	20,524	1.59	8.86	1.83	$24.80	$8.76
73	62	IH 10/ US 180	SH 20	US 54	El Paso	181,943	13,287	1.33	5.71	1.39	$14.63	$3.73
74	28	IH 35	US 59	Hildago St	Webb	181,525	23,334	1.55	17.21	1.70	$8.46	$3.25
75	63	IH 35E/ US 77	SL 12 N	SH 183	Dallas	172,730	13,230	1.36	5.14	1.41	$17.56	$4.68
76	-	Boca Chica Blvd/ SH 48	IH 69E/ US 83/ US 77	E 14th St	Cameron	172,594	3,033	1.33	20.46	1.36	$7.46	$0.50
77	-	SH 16	FM 1560	IH 410	Bexar	172,521	5,251	1.52	25.92	1.59	$26.15	$3.01
78	-	SH 360	SH 183	IH 30	Tarrant	172,497	7,268	1.36	4.98	1.56	$22.30	$3.58
79	-	SL 8	W Little York Road	IH 10/ US90	Harris	171,949	6,709	1.51	6.66	1.55	$20.02	$2.96
80	-	Guadalupe St	N Lamar Blvd	W Cesar Chavez St/ SL 343	Travis	171,093	6,604	1.56	19.95	1.55	$13.96	$1.91
81	-	Hulen St	Camp Bowie Blvd	IH 20	Tarrant	168,794	6,285	1.39	18.85	1.42	$15.29	$2.06

TCI: Texas Congestion Index - ratio of the peak period average travel time to the freeflow travel time. A value of 1.20 means that a 30 minute trip during light traffic would take 36 minutes during peak periods.

PTI: Planning Time Index - (a reliability measure) ratio of the 95th percent peak period travel time to the freeflow travel time. A value of 2.50 means that for a 30 minute trip in light traffic, 75 minutes should be planned.

CSI: Commuter Stress Index - the same as the TCI except it is for the peak direction of travel only.

2014 Rank	2014 Rank Truck	Roadway	From	To	County	Annual Hrs of Delay per Mile	Annual Hrs of Truck Delay per Mile	TCI	PTI	CSI	Annual Congestion Cost (M)	Annual Truck Congestion Cost (M)
82	-	N Lamar Blvd	US 183	W 45th St	Travis	165,522	6,773	1.57	23.38	1.63	$10.11	$1.48
83	-	SL 8	SH 249	Hardy Toll Rd	Harris	165,010	6,694	1.45	6.52	1.51	$27.03	$4.13
84	-	SH 183	SH 121	SH 360	Tarrant	164,944	7,531	1.29	6.09	1.42	$16.45	$2.85
85	-	Matlock Rd	FM 157	W Sublett Rd	Tarrant	164,710	6,352	1.42	19.21	1.53	$15.64	$2.19
86	50	IH 635	SH 78	US 80	Dallas	164,648	17,871	1.29	5.48	1.46	$25.63	$8.92
87	-	Richmond Ave	SL 8	IH 610	Harris	164,158	6,660	1.40	24.24	1.34	$20.89	$3.02
88	-	Oaklawn Ave	Wycliff Ave	Irving Blvd	Dallas	163,212	7,709	1.51	20.02	1.50	$8.23	$1.35
89	-	Bissonnet St	IH 69/ US 59	IH 610	Harris	162,069	5,572	1.47	23.72	1.50	$22.91	$2.84
90	-	Bellaire Blvd	Addicks-Clodine	SL 8	Harris	161,923	5,549	1.59	28.41	1.65	$23.47	$2.93
91	74	SH 288	IH 610	SL8	Harris	160,944	12,292	1.60	5.05	2.05	$19.97	$5.18
92	67	US 59	IH 610	IH 10/ US 90	Harris	160,849	12,930	1.37	10.12	1.46	$9.96	$2.69
93	52	IH 10/ US 90	US 59	IH 610	Harris	160,760	15,226	1.34	5.14	1.49	$15.74	$4.92
94	-	SL 8	IH 10/ US90	IH 69/ US 59	Harris	159,755	5,947	1.50	6.17	1.64	$27.80	$3.93
95	-	IH 820	Baker Blvd/ SH 183	IH 30	Tarrant	159,158	7,108	1.46	6.87	1.50	$17.63	$2.97
96	-	Bryant Irvin Rd	US 183	Altamesa Blvd	Tarrant	159,020	6,314	1.37	20.38	1.39	$11.27	$1.61
97	-	George Dieter Dr	Montwood Dr	N Zaragosa Rd/ FM 659	El Paso	156,469	4,464	1.44	24.67	1.49	$9.97	$1.06
98	-	SL 360	RM 2244	US 290/ SH 71	Travis	155,854	4,197	1.63	17.94	1.98	$15.63	$1.62
99	-	S 1st St	Cesar Chavez St/ SL 343	US 290/ SH 71	Travis	155,792	5,447	1.57	22.92	1.62	$9.62	$1.21
100	-	Coit Rd	Frankford Rd	Forest Lane	Dallas	155,417	6,699	1.38	15.87	1.41	$20.35	$3.18

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Appendix B | Data Collection Summary

Turning Movement Counts (City of Houston)

Turning movement counts were obtained at 48 intersections for 2012 or 2013. No turning movement counts were available for the 2011 base year.

Traffic Signal Timings (City of Houston)

Traffic Signal timings were obtained from HGAC were used in the DynusT Modeling effort. Additional timings were requested and received from the City of Houston. A total of 36 timing plans were obtained. Signal timings along the major intersections of West Park Drive, Hamilton, and Chartres were collected from the City of Houston.

2012 Urban Congestion Trends (FHWA)

The 2012 Urban Congestion Trends dated April 2013 was obtained.

Freeway Management and Operations Handbook – Managed Lanes (FHWA)

Section 8 titled Managed Lane was obtained from the Freeway Management and Operations Handbook dated January 2011.

Houston Area Freeway Incident Management Program Agreement (H-GAC)

The original Houston Area Freeway Incident Management Program agreement from 1990 was obtained from H-GAC.

Draft Houston-Galveston Regional Incident Management Strategic Plan (H-GAC)

The Draft Houston-Galveston Regional Incident Management Strategic Plan dated November 2013 was obtained.

Congestion Management Process Plan (H-GAC)

The Congestion Management Process Plan dated January 2013 was obtained.

Houston Regional ITS Architecture (H-GAC)

The Houston Regional ITS Architecture dated February 2006 was obtained.

Roadway Emergency Evacuation Traffic Management Plan (H-GAC)

The Roadway Emergency Evacuation Traffic Management Plan dated April 2010 was obtained.

METRO Reimagining Presentation (METRO)

A presentation was given by METRO to the H-GAC Technical Advisory Committee on May 14, 2014. This presentation outlined a Draft 5-year Transit Service Plan.

METRO Meeting (METRO)

A meeting with Nader Mirjamali and Hameed Merchant at METRO was conducted by the project team. Meeting minutes were collected that describe the organization, operations, issues, as well as current and planned improvements. There are no METRO non-freeway express routes that use the HOT Lane. All METRO buses are express and travel from various park and ride lots to the Hillcroft Transit Center, and to other employment destinations along the corridor including Greenway Plaza and downtown.

Managed Lane Design Information (METRO/TxDOT)

Information was compiled from METRO, Don Garrison (retired from TxDOT) and archived discussions with Don Stankovsky who was the designer of record in 1985. This includes information on cross section, design flexibility, design exceptions, and location of original design drawings.

US 59 S Pricing Project Profile (METRO)

A survey from April 2014 regarding the US 59 South (Southwest Freeway) Pricing Project Profile was obtained from METRO. This included information about the operations, stakeholders, implementation costs, utilization, financial information, operation policies, technology and enforcement, as well as transit services.

METRO/TxDOT Agreement for HOV/HOT Lanes (METRO)

The METRO/TxDOT Agreement for the HOV/HOT Lanes dated April 2004 was obtained from Nader Mirjamali at METRO.

Managed Lane Information (METRO)

Information was obtained from METRO that outlines access to and from the HOV/HOT lanes, the hours of operation, and tolls collected.

TranStar Interlocal Agreement (TranStar)

The TranStar Interlocal Agreement dated August 1994 was obtained. This is a 12-month auto renewing agreement that can be canceled with 30 days notice.

Historical Data (TranStar)

Historical TranStar data was used to determine the existing areas of congestion along the corridor. The Transtar website was used to generate graphs showing travel speeds for 2011 to 2013. This data was put onto two different maps that show the different levels of congestion along the corridor during the peak AM hour and during the peak PM hour. The congestion areas were identified the average speeds of the vehicles traveling on each segment along the corridor during the peak hour. Average Speeds of less than 20 mph were considered most congested and average speeds over 50 mph were considered not congested. TranStar travel time data was also obtained for segments of US 59.

RIMS Data (TranStar)

Historical Regional Incident Management System data was obtained for 2009 to 2013 that details number of incidents, average clearance time, type of incident, incident conditions, and top incident locations. Also available is an incident clearance report card for 2014 as well as data statistics from the SafeClear program.

Mobility Investment Priorities Project – Houston - US 59 (TTI)

Previous reports conducted by TTI were obtained from 2013. These reports consisted of three segments within the US 59/IH-69 study corridor that outlined current conditions, projects in progress or completed planning efforts to date, as well as next steps to take in planning for the segment. Accompanying two of the three segments was a Mobility Investment Priorities Corridor Project Checklist that evaluated strategies that could be or were already implemented in the segments.

24-hour Counts(TxDOT)

A shape file containing the movement counts was obtained for the 2011 base year.

ATR/Vehicle Classification Counts (TxDOT)

Hourly traffic counts were collected from TXDOT for each month in 2011. Non-Continuous Vehicle Classification Data by Hour from January 1, 2011 to December 31, 2011, were also collected from TxDOT.

2013 Most Congested Roadways in Texas (TxDOT)

The segment of US 59 from SH 288 to IH-610 is ranked 3rd, the segment from IH-10 to SH 288 is ranked 2nd, and the segment from IH-610 to Beltway 8 is ranked 24th in the state.

Planned Projects (TxDOT)

Nine items are listed in the near and long term programmed projects received from TxDOT. The three long-term programmed projects include the IH-610 Southbound to US 59 Northbound Direct Connector with an estimated completion date of 2019, the IH-610 Northbound to US 59 Southbound Direct Connector with an estimated completion date of 2024, and the Richmond Avenue at IH 610 widening to 8 lanes with utility improvements sponsored by Uptown Houston to be completed in 2022.

The six near-term programmed projects include the Metro Solutions Uptown Corridor with an estimated completion date of 2013, the IH-610 to Richmond Avenue design and reconstruction of Post Oak Boulevard to be completed in 2018, the IH-610 Southbound to US 59 Northbound Direct Connector right of way and utilities with an estimated completion date of 2014, the reconstruction of US 59 Northbound to Southbound IH-610 connector with an estimated completion date of 2018, the Uptown Multimodal Transit Center/Park and Ride Terminal to be completed in 2018, and the IH-45 S interchange reconfiguration including the construction of entrance and exit ramps as well as the replacement of the existing US 59 Northbound and Southbound Direct Connectors from US 59 with an estimated completion date of 2017.

North Houston Highway Improvement Project (TxDOT)

The North Houston Highway Improvement Project involves evaluation of the IH 45 North corridor from near downtown Houston to Beltway 8 North, Beltway 8 North from IH 45 North to the Hardy Toll Road, the Hardy Toll Road from IH 610 North Loop to Beltway 8 North, IH 610 North Loop from IH 45 North to the Hardy Toll Road, and portions of IH 10 and US 59 near downtown Houston. There are currently three alternatives for the segment contained in the project area. These alternatives involve widening or realigning I-45 north of the study area.

BRINSAP Bridge Data (TxDOT)

Information regarding the bridges along the corridor was obtained from TxDOT. There are 122 bridges on the US-59 corridor from IH45 and 288. Sixty-six bridges are mainlane bridges, while 46 are ramp or connector bridges. Minimum vertical clearance ranges from 14 feet to 25 feet. The bridges along the corridor were built between 1961 and 2005. Fifteen bridges were reconstructed between 1992 and 2005. The US 59 HOV lane has one bridge that has a superstructure in poor condition at Edloe Street. One substructure is in rated to be in poor condition at US 59 NB and Alabama Street. Of the 15 bridges reconstructed between 1992 and 2005, 6 were widened on both sides in a single widening job.

Houston Region Freight Study (TxDOT)

The Houston Region Freight Study developed by HNTB was obtained that identifies improvements for the eight-county Houston region to address deficiencies in the freight network.

CRIS Crash Data (TxDOT)

Crash data for the corridor was obtained using TxDOT's Crash Record Information System (CRIS) on US 59 between BW 8 in Southwest Houston and IH-10E between January 1, 2009 and December 31, 2013. This data will be used to determine high crash locations along the corridor.

Existing infrastructure (TxDOT)

Information regarding the locations of metered ramps, detectors, and Digital Message Signs was requested from TXDOT. This included twelve ramp meter locations and seven Digital Message sign locations. Funding information associated with the ITS system was also received.

Uptown Houston Association Meeting

A meeting with Robert Taube and Rod Smith at Uptown Houston was conducted by the project team. Meeting minutes were collected that describe the association, dedicated bus lanes, traffic operation strategies, key operational issues, wish list for Improvements and projects, as well as information about the US 59/IH 610 Ramp Project.

Texas Medical Center Information

Information regarding the Texas Medical Center site was obtained from the Texas Medical Center website. This site is located south of US 59/IH-69 off Main Street. Information includes the map of the site, as well as information on daily visitors to the site.

Houston Baptist University Campus/Memorial Hermann Southwest Hospital

Information regarding the Houston Baptist University Campus as well as the Memorial Hermann Southwest Hospital was obtained. This campus and hospital are located near the intersections of US 59/IH-69 and Beechnut Street and Fondren Road. Information includes the map of the campus as well as information on number of beds in the hospital.

Successful Congestion Relief Programs

Data and key attributes from successful congestion relief programs were collected. These programs are in regions with similar characteristics as the US 59/IH 69 South Corridor in Houston. These programs are as follows:

- Aggressive Incident Clearance in places like Florida and Washington
- Applying Decision Support Systems to Integrated Corridor Management (ICM) in San Diego and Dallas
- Georgia's Incident Management Program named Task Force and the Towing and Recovery Incentive Program (TRIP)
- Using ITS for Traffic Incident Management Programs in Ft. Lauderdale, Los Angeles, Detroit, Denver and San Antonio
- Ramp Metering in the California Bay Area

Houston, Integrated Corridor Management Concept of Operations I-10

Dated March 2010, this report details how an Integrated Corridor Management System can be deployed along the I-10 corridor in west Houston, Harris County, Texas.

Origin-Destination Pairs at IH610 Interchange

Information regarding Origin-Destination pairs in the vicinity of the US 59/IH-610 interchange was requested by the Steering Committee. This information has not been received to date.

Appendix C | Agency Comments

US 59/IH 69 Rider 42 Corridor Congestion Mitigation Study
Steering Committee Meeting 1 – Summary of Comments
Date: May 14, 2014
Location: H-GAC 3555 Timmons Lane, Conference Room A

Segment 1

- South of Beltway 8
  - Weave issues northbound
  - Extra pavement?
  - HOV/HOT merge? Kirkland
  - Lane drop outbound (southbound) from Beltway 8 DC- shock wave
  - Eastbound 8 to southbound US 59 backup
- North of Beltway 8
  - Slow down northbound from 8
  - Past Bissonet - traffic hopping on and off frontage to queue jump
  - Slow down at Gessner/Beechnut
    - Memorial Hermann Southwest Hospital
    - Houston Baptist University
- City provides progression on Cross streets, no way to provide progression on frontage road
  - In the past they have tried changing phasing resulted in increase in crashes due to driver inattention
- Any locations that support 3-level grade separation?
- Lot of employment along corridor, high amount of reverse commute traffic.
- Hill Croft/Murphy all approaches high demands
- Backup in evening- Gessner/Beechnut - close spacing- no room to braid ramps
- Beechnut at Gessner - had plans to eliminate lefts to improve LOS
- Flooding issues South of Gessner
- Bellair exit backs up Southbound due to queue at Bellaire signal
  - Bellaire at southbound frontage – turning movement count available?

Segment 2

- Bad weave northbound and southbound from Hillcroft ramp through Westpark DC and braided ramps.
  - Rework area
  - Too many ramps (weaves)
  - High Crash area
    - Fountain view/Chimney rock on ramp
    - Westpark vertical curve
- Northbound AM Sun- rear end collisions
  - Site issues due to braided ramps
- Signal to ramp distance
  - Surface road at Chimney rock and Sage
- Motor assistance program - Safe Clear
  - Work on time to clear- Inter-local DPS

Segment 3

- At 610
  - BRT Tie in
  - Proposed Park and Ride - New T-Ramp - rebuild Houston bridge
  - Uptown BRT at 610 - new TIP (2017-2018) before SuperBowl
  - ROW issue for 59 N to 610 E
  - Proposed LRT along Westpark
  - DC Merge northbound at 610 from 59/69
  - Stack SB to 610 due to people cutting in
    - Extend storage length?
- Chimney Rock Ramp SB moved through 610 Interchange
  - New ramp gore north of 610 moved from south of 610

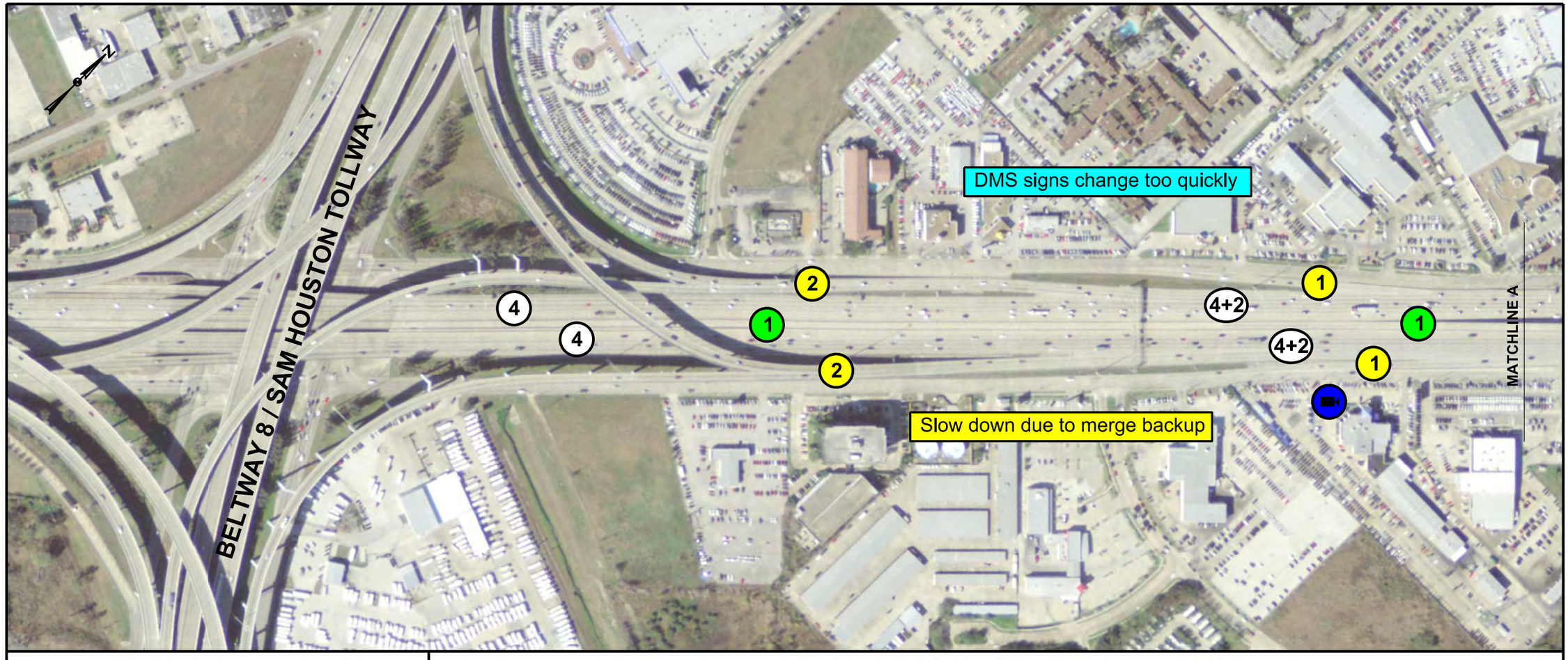
US 59/IH 69 Rider 42 Corridor Congestion Mitigation Study
Steering Committee Meeting 1 – Summary of Comments
Date: May 14, 2014
Location: H-GAC 3555 Timmons Lane, Conference Room A

Segment 4

- Newcastle - Remove ramp of time of day closures
- Proximity of Westpark to frontage road intersections
- Northbound queues from Weslayan St
- Weaving and ramp spacing
- Narrow shoulder near Edloe St
- High crash rate (rear ends) Edloe to Downtown
- Backup at Kirby/Shepard Ramps onto freeway

Segment 5-6

- Lane drop north of Shepard
  - People wait until the last possible minute to merge
- 5 lane to 3 lane drop at Spur 527
- Sight distance eastbound 527 to southbound 59/69
- Managed lane options 288 to 45 (3 options)
  - Overlaps other TxDOT project (w/HNTB)
  - 2 Projects
    - EIS- 288 to N Loop 8
    - EA- Spur 527 to 288
- Plan from TTI- Spur 527
- Lighting at 288 and 45 to improve visibility
- Shoulder for breakdown Lane at 45



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US 59 / IH-69 RIDER 42 CORRIDOR CONGESTION MITIGATION STUDY

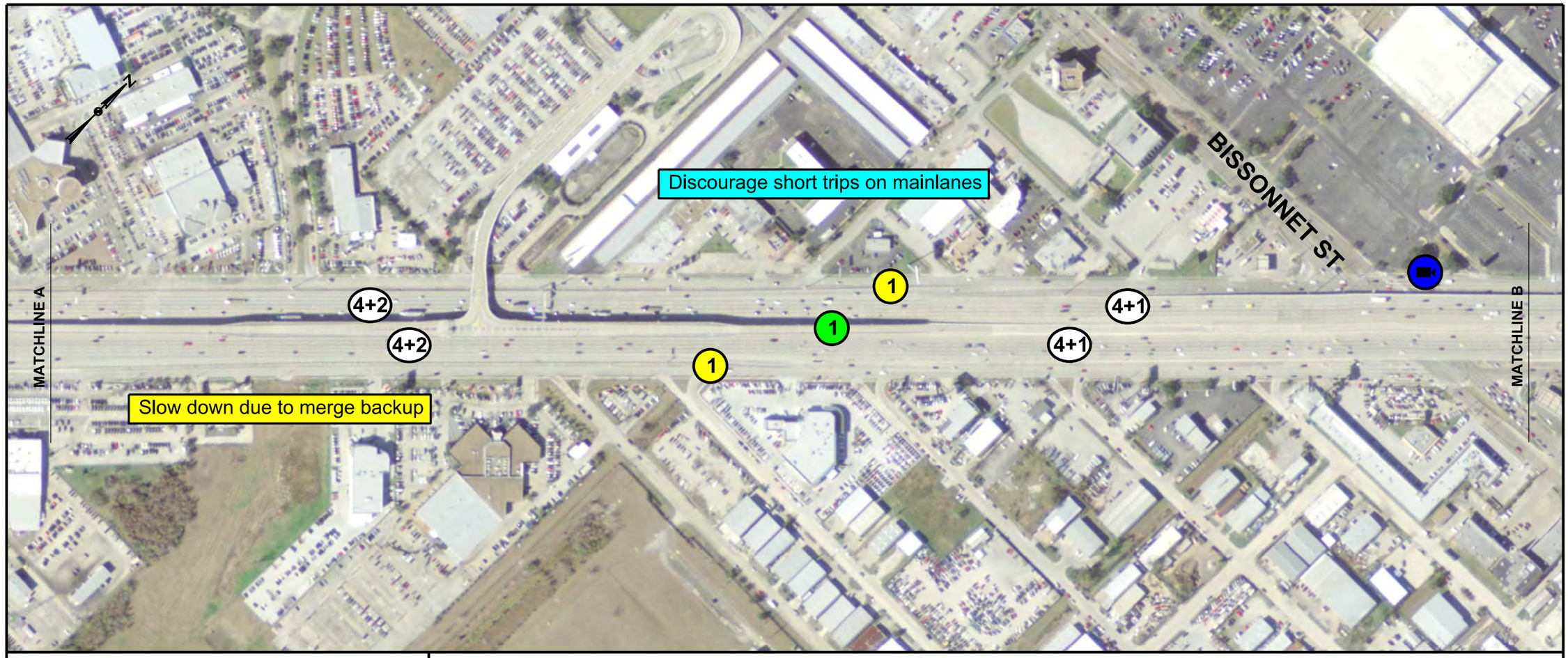
EXHIBIT 1 OF 18

LEGEND

- 5+1 — NUMBER OF MAINLANES + AUXILIARY LANES
- 1 — NUMBER OF HOT LANES
- 1 — NUMBER OF RAMP LANES - UNMETERED
- 1 — NUMBER OF RAMP LANES - METERED
- DIGITAL MESSAGE SIGNS (ITS SIGNS)
- CLOSED CIRCUIT TV (CCTV)

Agency Comments

Public Comments



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US 59 / IH-69 RIDER 42 CORRIDOR CONGESTION MITIGATION STUDY

EXHIBIT 2 OF 18

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Agency Comments

Public Comments

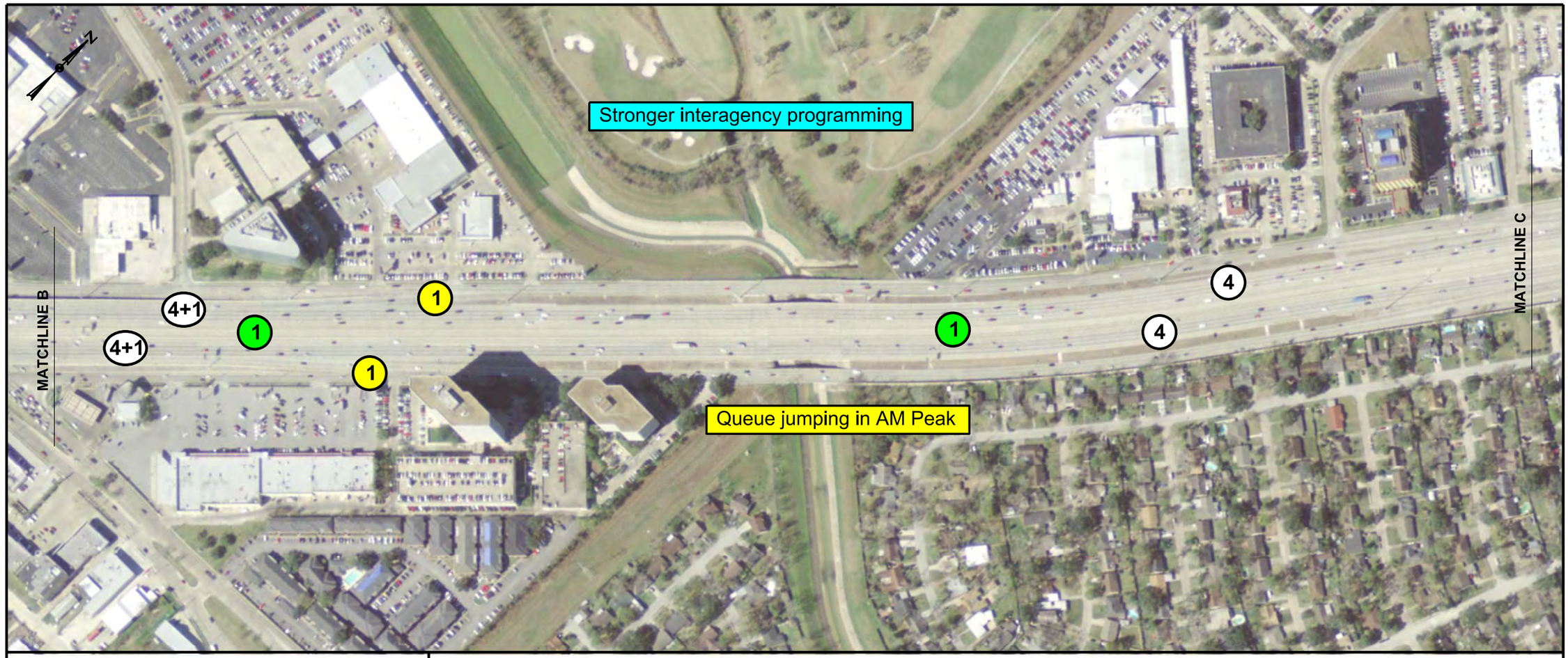

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EXHIBIT 3 OF 18

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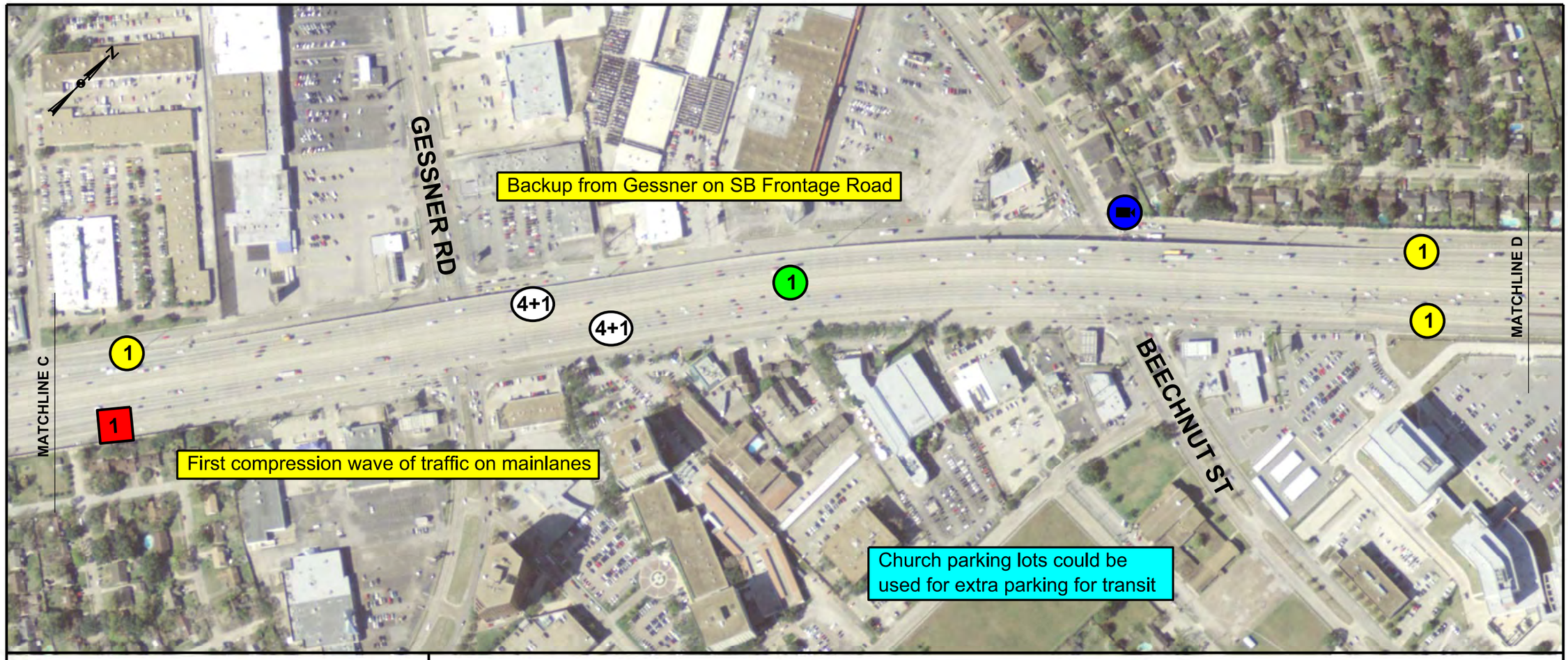
Agency Comments

Public Comments



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US 59 / IH-69 RIDER 42 CORRIDOR CONGESTION MITIGATION STUDY

EXHIBIT 4 OF 18

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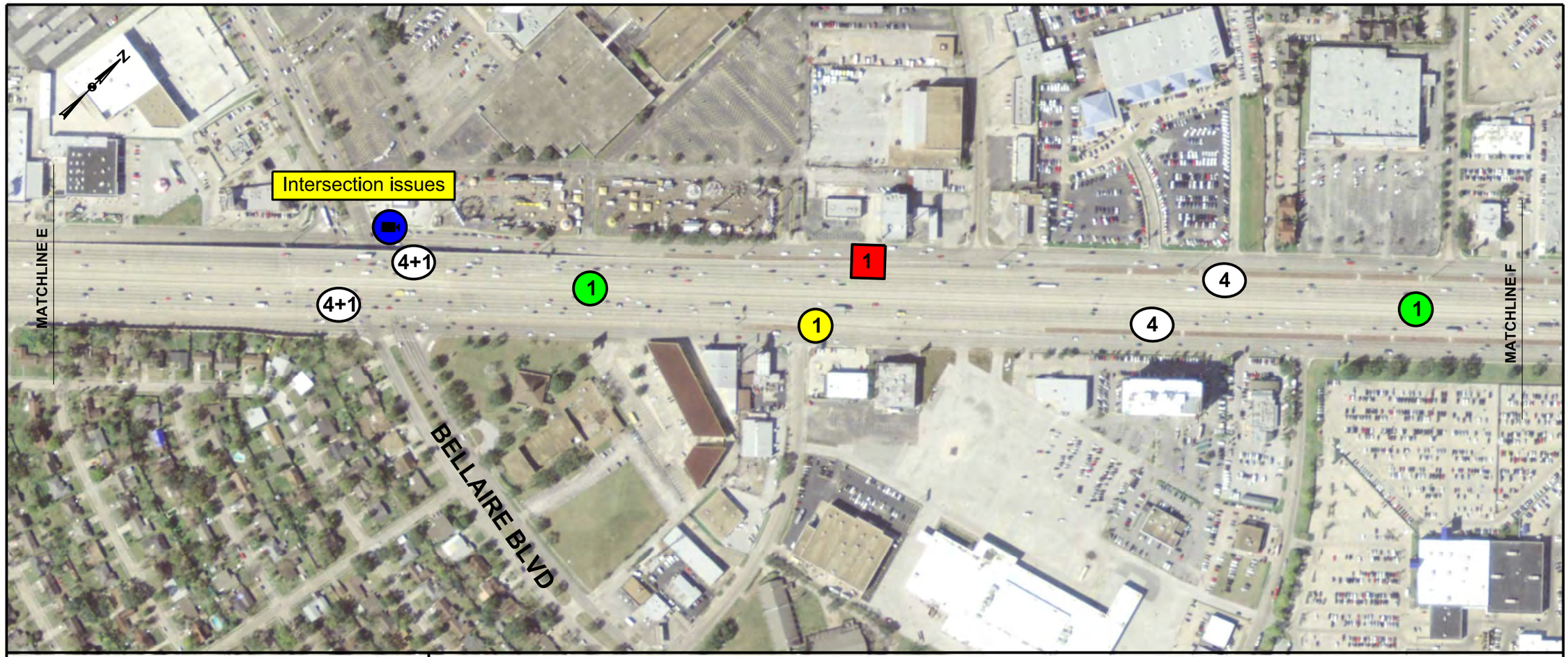
EXHIBIT 5 OF 18



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US 59 / IH-69 RIDER 42 CORRIDOR CONGESTION MITIGATION STUDY

EXHIBIT 6 OF 18

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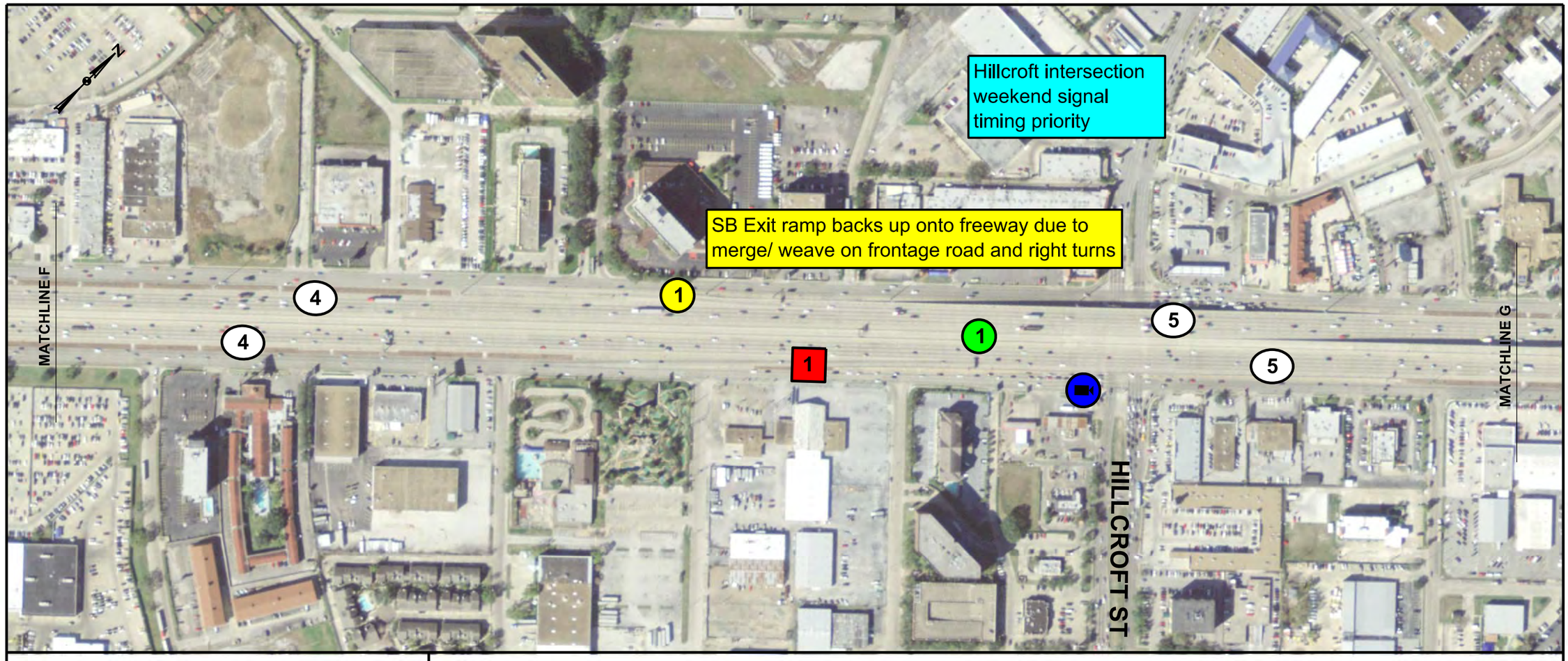

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EXHIBIT 7 OF 18

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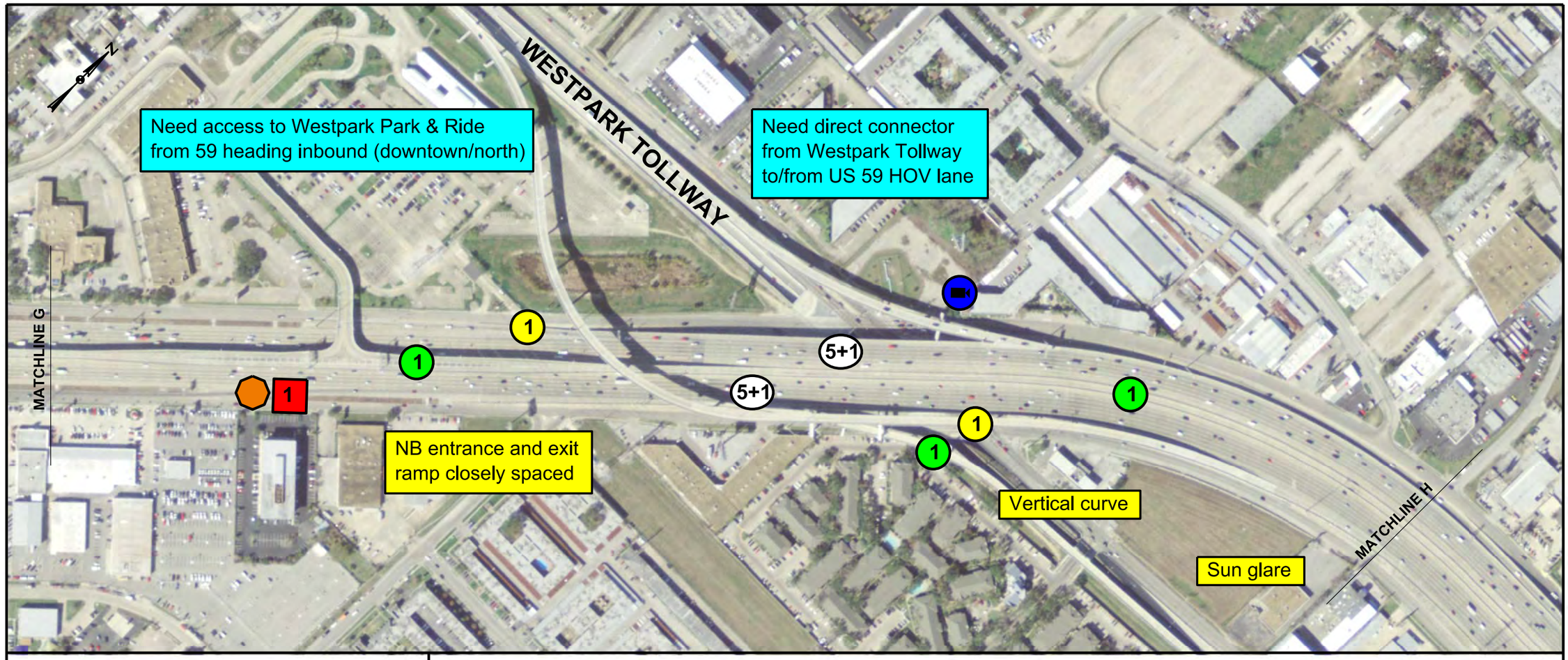

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11500 METRIC BLVD, BLDG M-1, STE 150 PHONE 512-821-2081
AUSTIN, TEXAS 78758 FAX 512-821-2085
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US 59 / IH-69 RIDER 42 CORRIDOR CONGESTION MITIGATION STUDY

EXHIBIT 8 OF 18

LEGEND

- 5+1 — NUMBER OF MAINLANES + AUXILIARY LANES
- 1 — NUMBER OF HOT LANES
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- DIGITAL MESSAGE SIGNS (ITS SIGNS)
- CLOSED CIRCUIT TV (CCTV)

Agency Comments

Public Comments

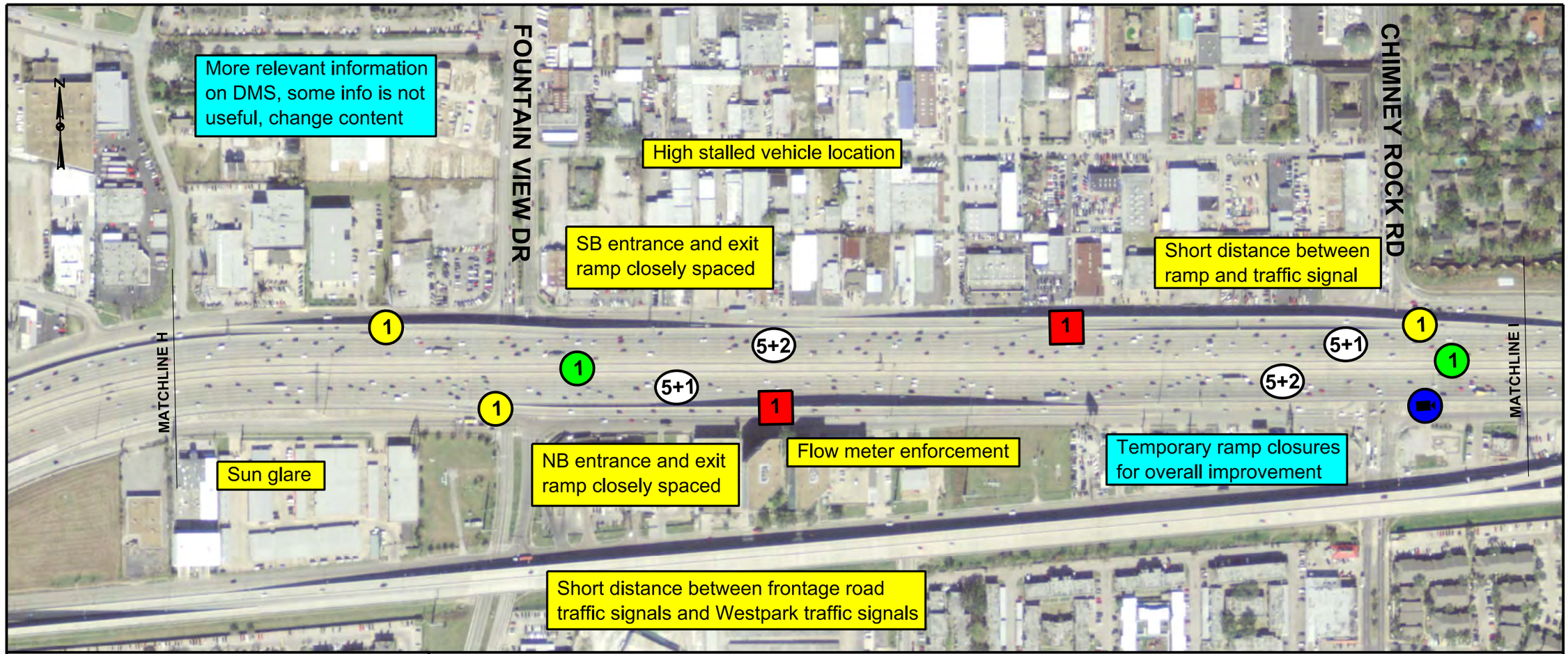

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EXHIBIT 9 OF 18

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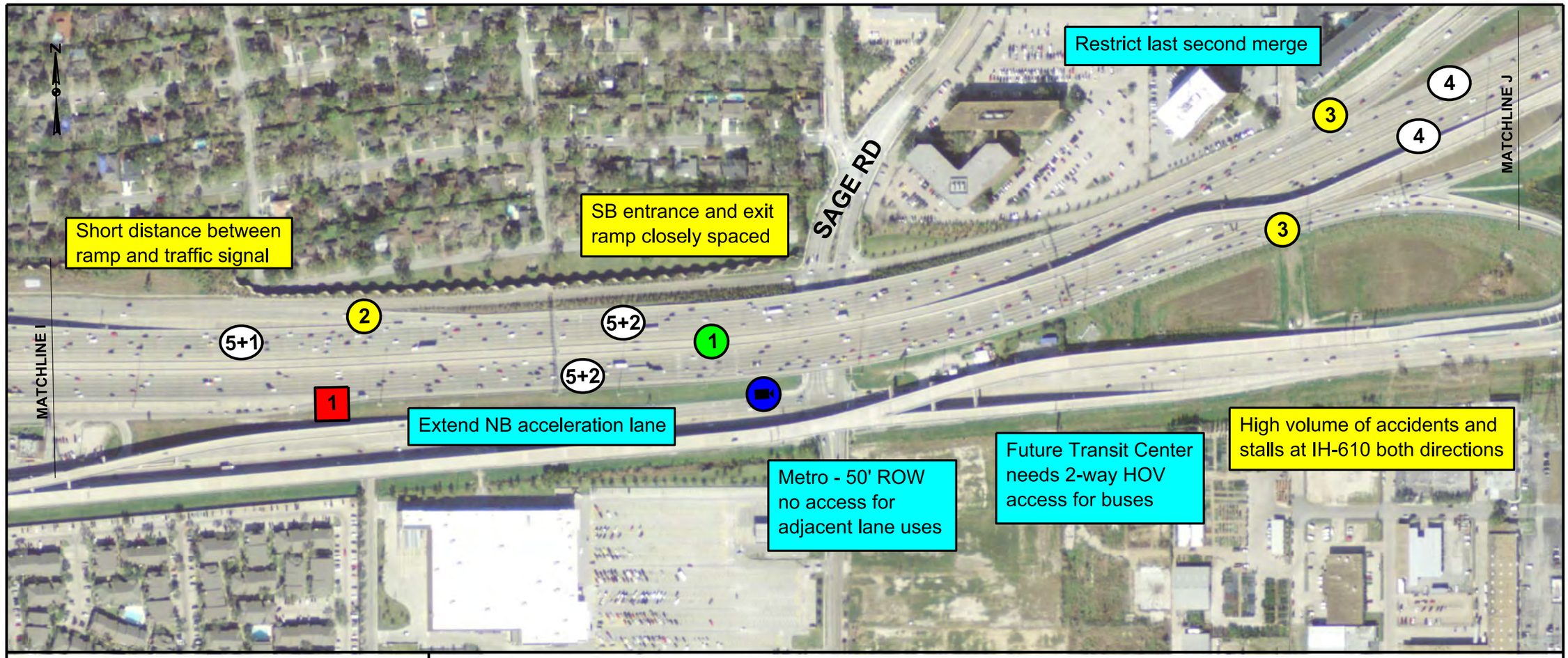

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EXHIBIT 10 OF 18

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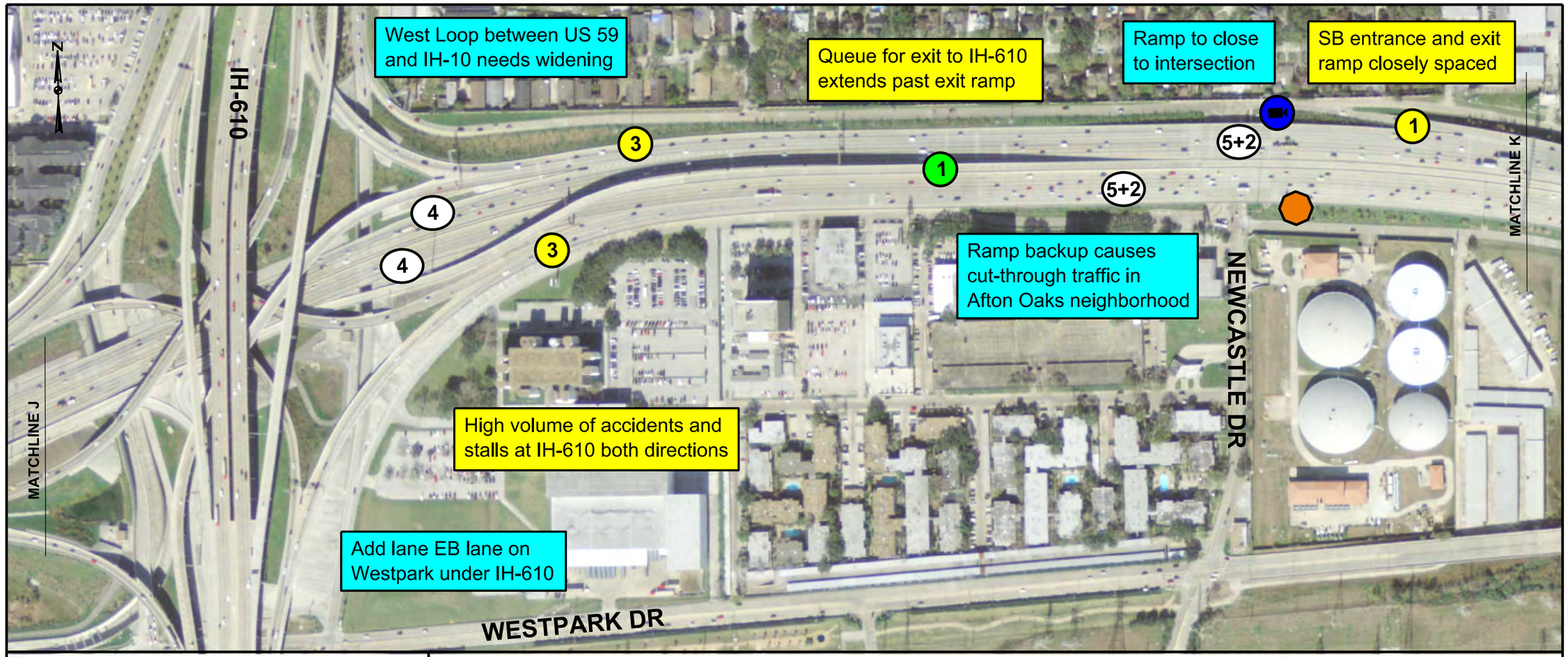

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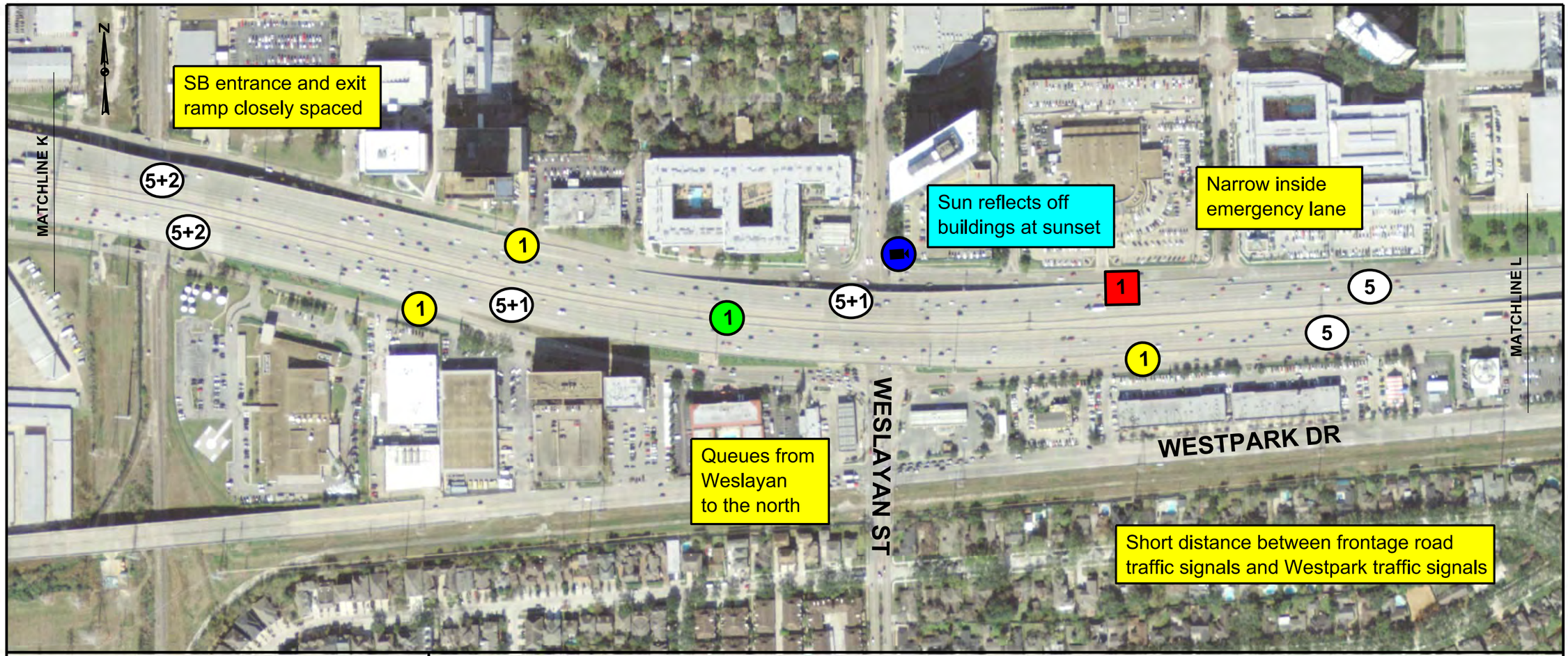

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EXHIBIT 12 OF 18

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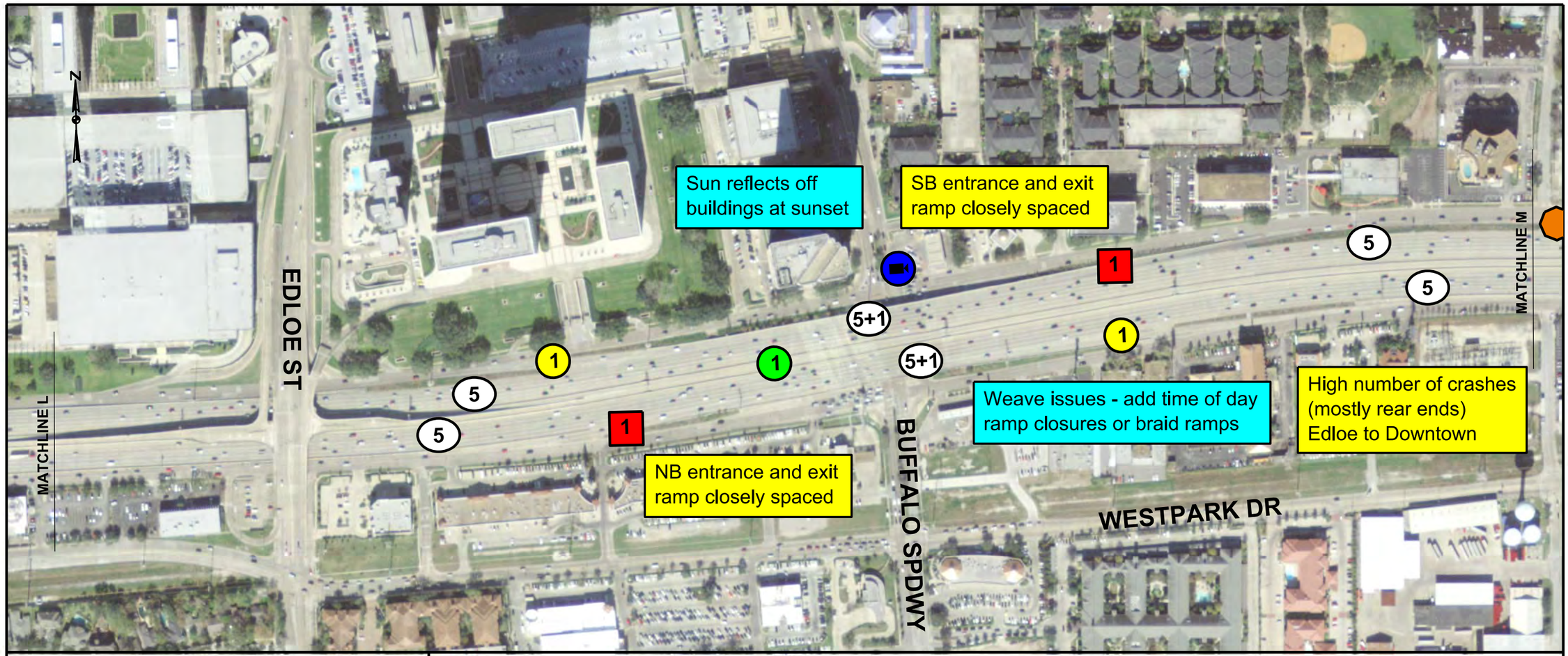

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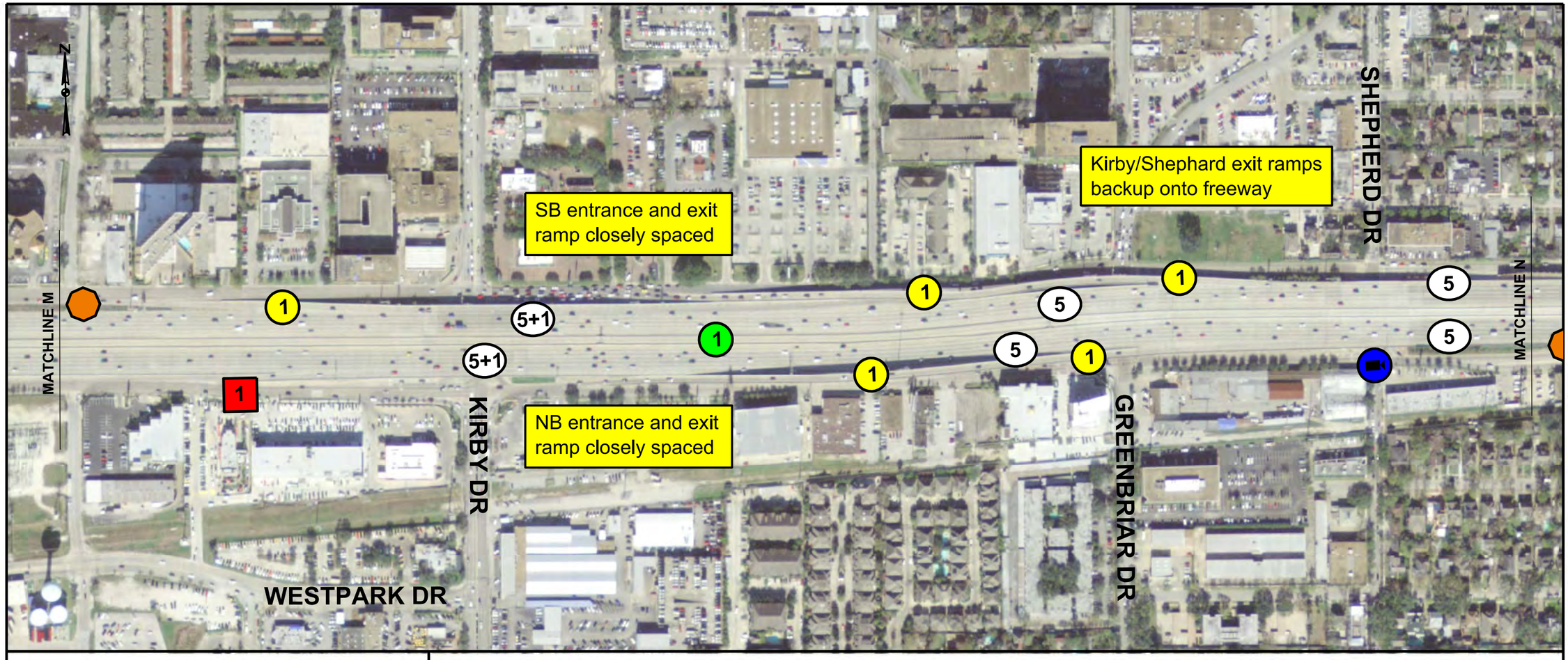

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EXHIBIT 14 OF 18

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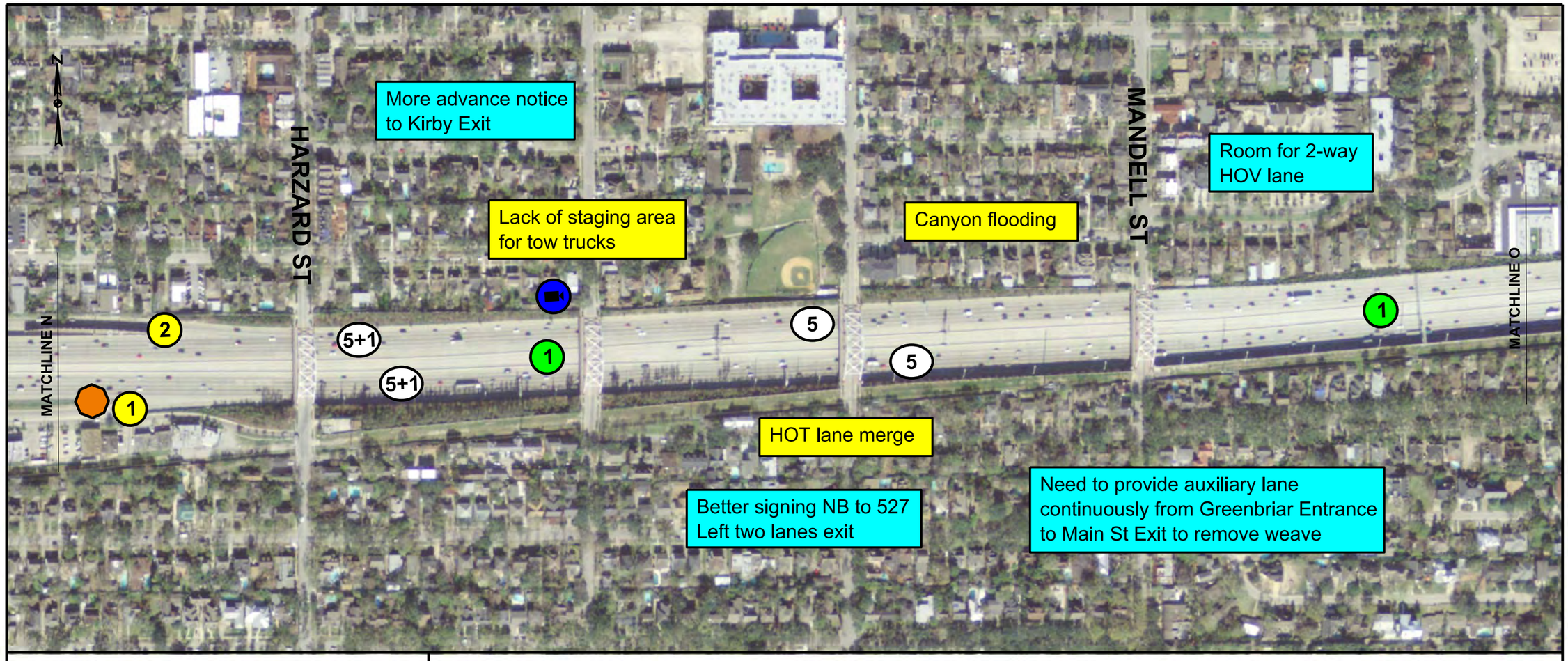

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EXHIBIT 15 OF 18

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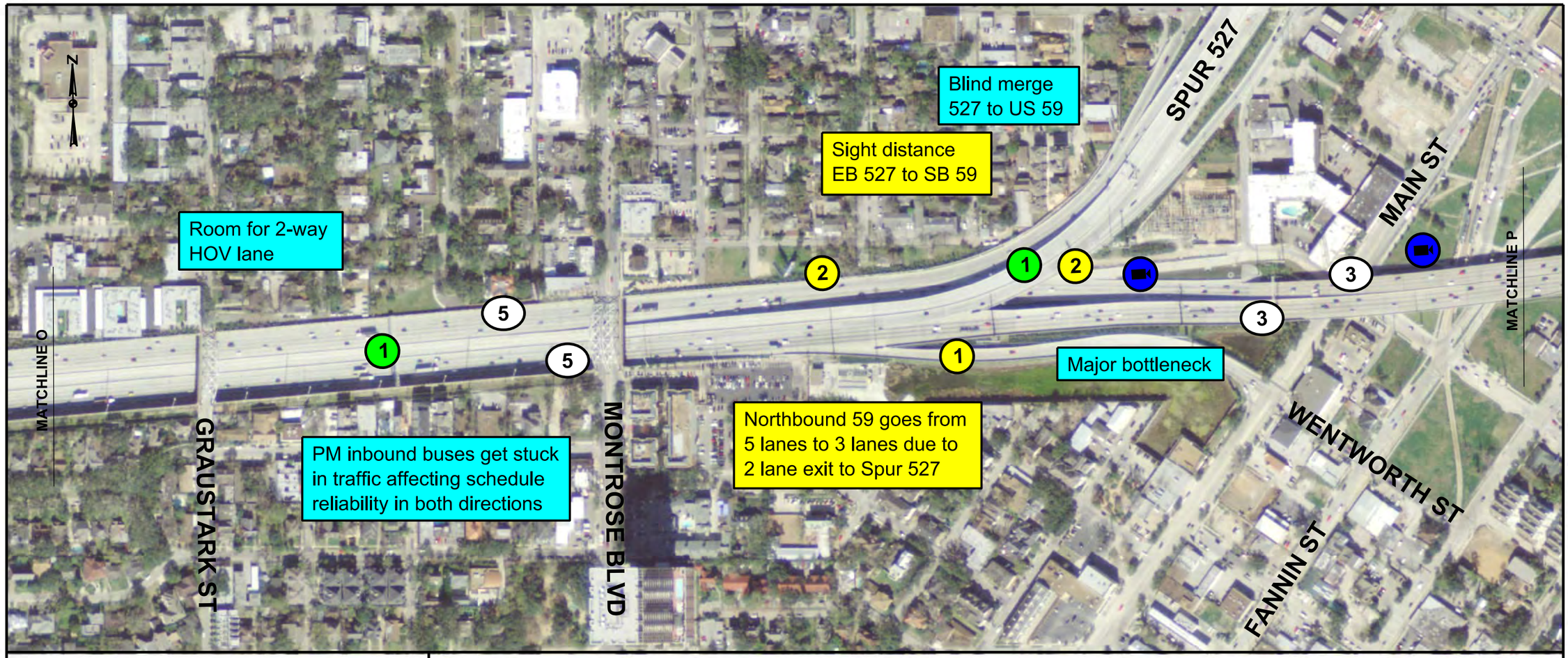

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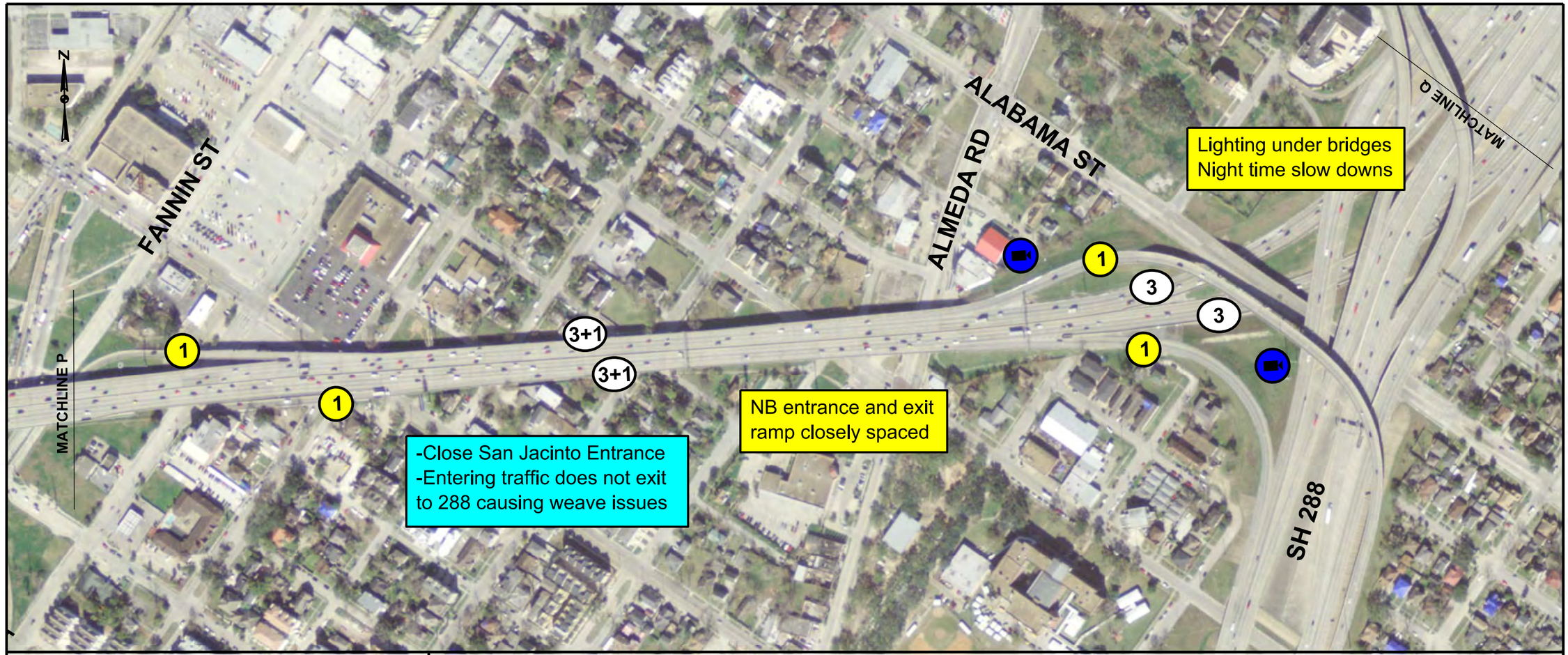

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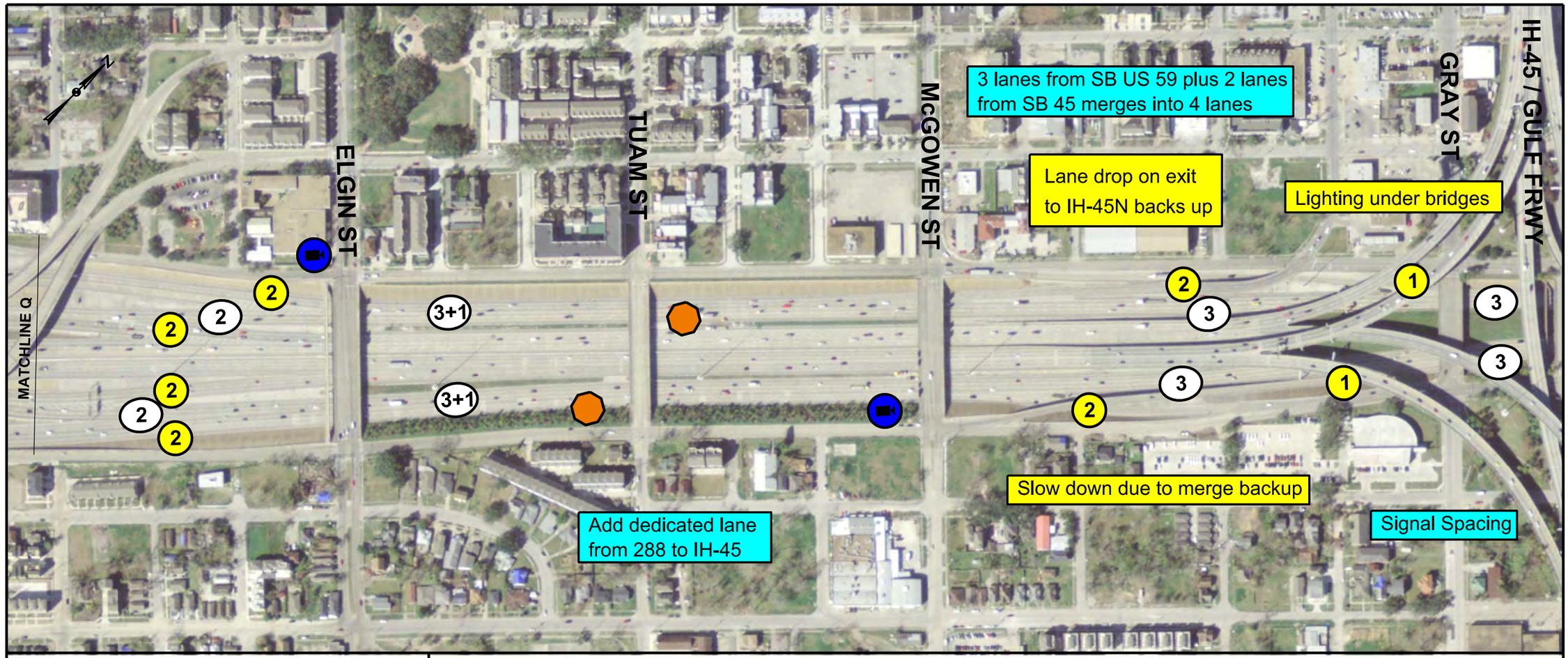

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Agency Comments

Public Comments

Appendix E | Public Engagement Comments

US 59/IH 69 Rider 42 Corridor Congestion Mitigation Study
Public Engagement Meeting 1 – Summary of Comments
Date: September 10, 2014
Location: H-GAC 3555 Timmons Lane, Conference Room A

General Comments (Corridor Wide)

- Church Parking lots could be used for extra parking for transit
- Discourage short trips on mainlanes
- DMS messages on signs change too quickly
- Stronger inter agency programming
- Add "Slower Traffic Keep Right" signs or post onto DMS
- Temporary ramp closures for overall improvement
- More relevant information on DMS, some info is not useful, change content
- Add more main lanes
- HOV/HOT lane too wide – waste of space
- Redesign interchanges
- Double decking the freeway is needed
- Convert shoulders to main or auxiliary lanes – former shoulder lanes can be used as such with public education
- Entrance/exit ramps too close together
- Bite the bullet and build elevated trains
- Need to improve public transit facilities and services
- Need a balanced use of bus and light rail transit
- Higher concrete barrier needed for HOV lane
- Remove concrete barrier for HOV lane
- Two way HOV lane needed
- Truck lane restrictions needed
- More merge restrictions needed (ramp metering and barriers)
- Carpool lane needs to go from 2+ to 3+
- Eliminate toll-paying cars from HOT lane
- Increase the speed limit
- Need minimum speed limits posted
- Implement road user pricing strategies
- Open up HOV/HOT lane to everybody during peak travel times
- Block access to freeway during severe main lane incidents
- Add more traffic enforcement for speeders, driving too slow, and reckless drivers
- Better enforcement the HOV lane is needed
- Changeable message signs don't advertise accidents long enough
- Entrance and exit ramps should not share the same lane (auxiliary lane)
- Lanes should be better marked with direction arrows
- Add a through lane where possible using pylons or barrier, encourage trucks and through traffic to use it.

Segment 1 (Beltway 8 to Hillcroft)

- Hillcroft Intersection – weekends – signal timing – priority
- Reduction to 3 lanes causes bottleneck and backs up US 59 in the afternoon for commuters traveling south

Segment 2 (Hillcroft to Chimney Rock)

- Need direct connector Westpark Tollway to/from US 59 HOV lane
- Deleting left lane (near Westpark Tollway to US 59 Ramp)
- Busway in Westpark ROW?
- Need access to Westpark Park and Ride from 59 headed inbound (downtown/north)
- Convert Westpark tollway to reversible lanes
- Close Fountain View exit during PM peak travel time
- Remove Fountainview exit and the entrance right before Westpark

Segment 3 (Chimney Rock to Newcastle)

- Weaving on IH-610 between 59 and 10, needs widening, causes backup
- Add lane EB under 610 on Westpark
- High accident area NB IH-610 near exit to US 59
- Future transit center in southwest IH-610 quadrant needs two way HOV access for buses
- Metro – 50' ROW no access for adjacent land uses
- Restrict last second merge SB IH-610 to EB US 59
- Extend acceleration lane for EB entrance from Chimney Rock
- Eliminate entrance and exit ramps at critical locations near 610 interchange
- Close Chimney Rock onramp
- Weave - 610 entrance to Chimney Rock exit
- Add barrier to prevent traffic entering at Westheimer from changing over two lanes to get to 59 North.
- Implement 1 to 2 "through" lanes from 610 wet loop near the galleria that should begin near San Felipe and end over 59. Use pylons or barrier to enforce traffic separation.

US 59/IH 69 Rider 42 Corridor Congestion Mitigation Study
Public Engagement Meeting 1 – Summary of Comments
Date: September 10, 2014
Location: H-GAC 3555 Timmons Lane, Conference Room A

Segment 4 (Newcastle to Hazard)

- Improve signing to Kirby exit, provide more advance notice of what lane people need to be in
- TOD ramp closures or braiding for ramps between Buffalo Speedway and Kirby Eastbound
- Buildings along north side of highway reflect sun at sunset near Edloe
- Future light rail transfer station? (University line)
- Intersection to ramp spacing WB at Newcastle
- When 595 at Newcastle backs up, people are exiting at Newcastle and when the feeder backs up they cut through Afton Oaks and speed through.

Segment 5 (Hazard to Fannin)

- Better signing (Left two lanes exit)
- Need to provide auxiliary lane continuously from Greenbriar to Main St Exit (removes weave)
- Why is HOV lane so wide, wasted space
- Room for 2-way HOV lane
- PM inbound buses get stuck in traffic, affecting schedule reliability in both directions
- Major Bottlenecks at 527
- Blind Merge from 527 SB entrance ramp – lanes reduce from 2 to 1
- Redesign Spur 527 interchange and add capacity
- Reduce weaving between Greenbrier and Main Street
- Get rid of the shoulder between Greenbriar and Main Street making it an exit only lane for Museum District and TMC.
- Ticket people who use Spur 527 lanes to the last second then shift to US 59 to cut in front of other drivers

Segment 6 (Fannin to IH-45)

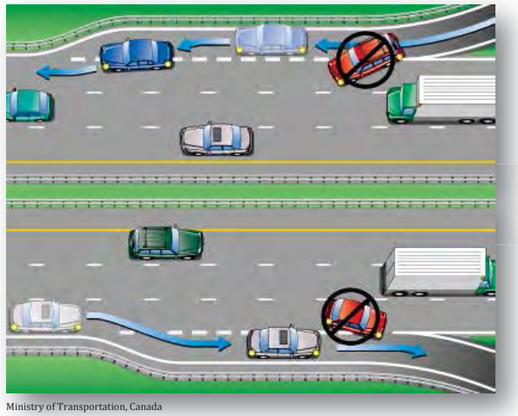
- San Jacinto traffic entering US 59 is heading to IH-45 or Eastex not to 288.
- Keep 4 lanes on US 59 at 527 and close San Jacinto entrance ramp to remove weaving
- Sight distance to unknown drivers tap brakes and cause traffic day and night
- Rumble strip along solid white to prevent early merging
- Corridor implementation of dedicated lane from 288 to IH-45
- Open HOT lane during peak hour
- Merge from IH45 3+2 → 4 inside lane merge/drop
- Signal spacing near IH-45
- IH-45 – Ramp tolling on eixt to US 59 EB,metering on IH-45
- Left side merge from IH-45 NB to US 59 EB creates issues
- Encourage/discourage trips/route choices off from US 59 EB @ east of 45 Downtown
- Coordinate with TxDOT on schematic design for IH-45 (including ramps south)
- Fix IH 45 – benefit may be realized on US 59
- Add 1 to 1.5 miles of barrier to prevent weaving from U of H to 59 South. Traffic should stay on surface streets and enter 59 South under the IH-45 interchange near downtown.
- Eliminate one lane of US 59 North to IH-45 North and South exit ramps, the merge in the turn causes traffic to slow down.

Appendix F | Congestion Mitigation Strategies

ACCELERATION / DECELERATION LANES

Description

Acceleration/deceleration lanes (also known as speed change lanes) provide drivers with an opportunity to speed up or slow down in a space not used by high-speed through traffic. On freeways and some major streets, the speed change between the mainlanes and the adjacent streets can be substantial and cause stop-and-go traffic and more collisions for the main vehicle flow. Dedicated acceleration lanes allow cars that have turned onto the main road to speed up to match the flow of traffic.



Ministry of Transportation, Canada

Target Market

- Freeway ramp areas between entrances and exits.
- Major streets with fast speeds and high turning volumes.
- Freeway interchange ramps.

Speed change lanes reduce congestion in areas where drivers are required to make dramatic speed changes because of turns or merges.

Cost:	●●●○○
Time:	**Moderate**
Impact:	**Spot**
Who:	**City/State**
Hurdles:	**Right-of-way, Institutional**

How Will This Help?

- Increases traffic flow and speed on freeways and major streets.
- Increases intersection capacity and efficiency by adding lanes for turning at intersections
- Improves safety.

Success Stories

- **US 290 Northwest Freeway, Houston**
  Auxiliary lanes were added to several locations along US 290 resulting in the removal of several traffic bottlenecks.
- **IH 394 Freeway, Minneapolis**
  Among several low-cost improvements, a westbound auxiliary lane at Louisiana Ave. almost eliminated evening peak congestion and increased traffic volume handled by 10 percent.

Implementation Issues

Lane space and right-of-way are the primary design issues. Converting the current shoulders to useable lanes may require adding width (possibly requiring acquisition of right-of-way and higher costs) and pavement structural strength.

The most significant implementation barrier is often the assignment of institutional responsibility. There are few DOTs with any staff assigned to look for locations where low-cost treatments can be installed. The contributions that acceleration/ deceleration lanes might make are overlooked in favor of larger or more sophisticated programs.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

ACCESS MANAGEMENT

Description

Access management is a term for a set of techniques that control several elements of a street, such as the spacing, design, and operation of driveways, turns, medians, and intersections. It serves as an effective congestion reduction technique because it controls where vehicles may enter and leave the road. Adequate access management improves safety on roads by limiting the number of locations where cars can slow down or speed up to exit or enter the road. In retrofit situations, public agencies must work with developers in a cooperative process to create the best solution.

Cost:	●●○○○
Time:	**Short**
Impact:	**Corridor**
Who:	**City/State**
Hurdles:	**Retrofit/Business Perceptions**

Target Market

Access management can be applied at any scale, but typically focuses on driveways to development (spacing, removing, and sharing), turning movements on streets (restricting left turns, installing raised medians, and regulating frequency), and intersections (spacing). TxDOT's *Access Management Manual* provides spacing standards for state facilities.

How Will This Help?

- Maximize efficiency by increasing traffic flow and reducing stop-and-go traffic.
- Increase safety by limiting drivers' decision points and removing potential conflicts.
- Preserve public investment because managed roads will operate as designed.
- Improve aesthetics by providing landscaping opportunities and adding visual appeal.

Success Stories

- Arlington, Texas: FM 157 (Cooper Street)—Raised median installation resulted in crash rate approaching a 50 percent decrease.
- Houston, Texas: Westheimer Road—Raised median openings that allowed full access were altered, limiting left-turn movements to improve traffic safety and traffic flow.

Implementation Issues

Good access management begins at the early stages of development when techniques can more easily be integrated into the design. Retrofitting is difficult and costly, but possible. Subdivision regulations and development standards/ordinances should be carefully crafted to facilitate access management implementation.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

ACTIVE TRAFFIC MANAGEMENT

Description

Active traffic management (ATM) uses a combination of congestion management techniques to dynamically manage traffic based on current and near-term expected conditions. Its goal is to maximize the efficiency of a road and the effectiveness of several strategies to delay the onset and intensity of traffic congestion. ATM strategies include:

- Variable Speed Limits.
- Temporary Shoulder Use.
- Queue Warning.
- Dynamic Merge Control.
- Adaptive Ramp Flow Control.
- Dynamic Truck Restrictions.
- Dynamic Rerouting & Traveler Information.

Used widely and successfully in Europe, ATM relies on technology to detect current conditions and automatically deploy these strategies. These strategies have proven to be very effective at delivering the lowest congestion level for the system and can be combined with managed lanes to better optimize performance.

Cost:	●●○○○
Time:	**Moderate**
Impact:	**Corridor**
Who:	**State**
Hurdles:	**Public Support, Right-of-Way, Operations**

Target Market

- Freeways or roads experiencing frequent daily congestion.
- Areas susceptible to adverse weather conditions, bottlenecks, or crashes.

How Will This Help?

- Improve safety through a reduction in crashes during congestion and adverse weather conditions by adjusting traffic speed and flow and providing drivers with real-time information.
- Delay onset of congestion by increasing capacity allowing traffic to flow smoothly and efficiently and improving travel time reliability.
- Provide environmental benefits through decreased emissions, noise, and fuel consumption.
- Relatively low cost to install and maintain.

Success Story

Several countries in Europe have used ATM for years and reaped the benefits. ATM strategies have been shown to increase overall capacity by up to 22 percent, throughput by up to 7 percent, and reduce crashes and secondary incidents by up to 30 percent and 50 percent, respectively. Onset of traffic congestion is delayed and trip times are more reliable.

Implementation Issues

Since most all ATM techniques are new to the United States, public acceptance and understanding is critical to their success. In some, additional right-of-way may be required for overhead gantries, additional lanes and shoulders, or on-ramps. Acquiring this extra space may be difficult. Many of these strategies must seamlessly work in unison with one another, often requiring automated deployment and vigilance from operators to manually adjust the system when necessary to maximize the benefit for drivers.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

AGGRESSIVE INCIDENT CLEARANCE

Description

Several techniques and policies can be used to aggressively reduce the duration and effect that stalled vehicles or crashes have on traffic while increasing safety for everyone. Successful programs encompass:

- *Detection*—quickly finding and verifying incidents as they occur (via cameras, sensors, phone tips, media, and information sharing);
- *Response*—quickly dispatching resources and tow trucks; and
- *Clearance*—aggressively removing vehicles from lanes and managing congested traffic until free flow is restored.

Quickly clearing stalls and crashes also reduces secondary collisions—typically rear-end crashes during unexpected stop-and-go traffic.

Cost:	●●○○○
Time:	**Short**
Impact:	**Region**
Who:	**City/State**
Hurdles:	**Policy**

Target Market

- Freeways sensitive to traffic incidents
- Local streets and freeways with high levels of congestion

Incident clearance works best in corridors that have a high risk of congestion due to crashes or mechanical problems and that are monitored by roving patrols of tow trucks or by sensors providing instant data to operators.

How Will This Help?

- Improve travel-time reliability and decrease delay that accounts for 1/4th of all traffic congestion.
- Increase response time through better coordination and information management.
- Increase safety for emergency management personnel, those involved in the incident, and other drivers.

Success Story

SafeClear, Houston, Texas

With an approximately $5 million program cost for 250 freeway miles, the program offers a 10:1 benefit/cost ratio for crash and congestion reduction. Private tow trucks must respond within six minutes. In order to meet response targets, 60 to 90 tow trucks patrol the freeways during rush hours.

Implementation Issues

Public and private agencies must willingly share information and invest resources, especially across jurisdictional boundaries. This requires considerable planning, organization, and a favorable policy environment that encourages interaction and constant communication between all possible stakeholders. When incidents do occur, sharing information rapidly to all users (including drivers via dynamic message signs or other electronic means) and aggressively clearing traffic lanes will maximize this strategy's effectiveness.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

CARPOOLING

Description

Carpooling programs are designed to promote ridesharing by identifying riders with similar origins and destinations. Using a database of interested riders, employers, or regional agencies can promote this for an entire region.

University of Texas Parking and Transportation Services

Employers can encourage participation through incentives like discounted/favorable parking, use of managed lanes, flexible work schedules, and guaranteed ride home programs. Guaranteed ride home programs offer members a free and reliable ride home during an emergency or unexpected schedule change, incentivizing them to participate in other commute options.

Transportation agencies can develop infrastructure to support carpooling with high-occupancy vehicle lanes, managed lanes, discounted tolls for registered carpools, and support for area-wide ridesharing programs.

Cost:	●○○○○
Time:	**Short**
Impact:	**Regional**
Who:	**City/Private**
Hurdles:	**Personal Habits**

Target Market

- Congested corridors during peak hours.
- Downtown or other activity centers with limited parking or paid parking.

Ridesharing works well for travel patterns without transit service or adequate parking. This service is best paired with managed lanes that offer a price savings for carpools and in areas with park-and-ride lots.

How Will This Help?

- Reduce congestion by eliminating cars from the road.
- Lower costs for user (fuel and maintenance), employers (parking), and transportation agencies (roadway capacity).
- Decrease auto emissions by removing cars from the road and allowing more efficient speeds.

Success Stories

- Carpooling increased in the **Dallas** area following introduction of a system of five high-occupancy vehicle lanes. Average automobile occupancy soon increased by 8 to 12 percent, reducing single-occupancy trips.
- **Bellevue City Hall** in Washington State decreased its vehicle trip rate by 30 percent across 650 employees with a ridesharing program supported by discounted carpool parking and subsidized vanpooling.

Implementation Issues

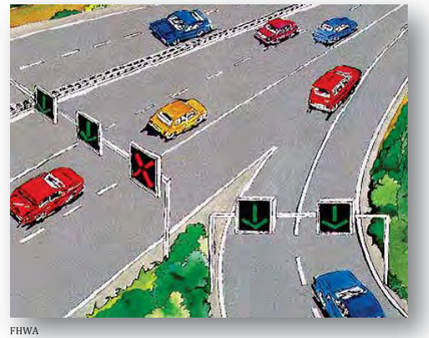
Ridesharing programs are easily implemented by both employers and the city or region but require changes in personal driving habits. Public agencies can encourage and facilitate these programs by providing incentives, including a guaranteed ride home program, marketing, and parking incentives.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

DYNAMIC MERGE CONTROL

Description

Dynamic merge control, or junction control, regulates or closes specific lanes upstream of an interchange. Agencies can change the amount of access based on traffic demand from two entering roadways. Control strategies improve the operation of roads that have more lanes entering the merge area than leaving. A potential U.S. application of this technique would be at a two-lane entrance ramp where the left lane of the entrance ramp merges with the outside lane of the freeway. Under dynamic merge control, either the outside freeway lane or the left lane of the entrance ramp would be closed upstream of the merge (depending on the traffic volume). The intent is to provide higher speeds and more reliable travel times to the higher traffic volume. Dynamic merge control can be a permanent application at known bottlenecks, or it can be used temporarily for special events or until a downstream roadway is widened. It is a practical approach to handling varying traffic demand on the main lanes and the merging lanes to effectively utilize existing capacity.


FHWA

Cost:	●●●○○
Time:	**Moderate**
Impact:	**Corridor**
Who:	**State**
Hurdles:	**Right-of-Way, Operations, Public Support, Design**

Target Market

- Freeways or roads experiencing frequent congestion and significant merging volumes
- Facilities with available capacity on main lanes upstream of an interchange that can be "borrowed"
- Roads where traffic volumes on two connecting roads peak at different times

How Will This Help?

- Delay the onset of congestion by increasing capacity and improving trip reliability.
- Improve safety by reducing primary incidents.
- Increase throughput by temporarily increasing capacity.

Success Stories

- Germany, The Netherlands—Provides priority to the facility with the higher volume and gives a lane drop to the lesser one. http://ops.fhwa.dot.gov/publications/fhwahop10031
- Dynamic Late Merge Control for Work Zones—Encourages drivers to remain in their lane until the lane closure. http://ops.fhwa.dot.gov/wz/workshops/accessible/McCoy.htm

Implementation Issues

Ideally, an expert system will deploy the dynamic merge control strategy based on prevailing roadway conditions without requiring operator intervention. This strategy can be implemented in conjunction with temporary shoulder use as long as overhead gantries with appropriate signing and lane control signals are part of the implementation.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

DYNAMIC REROUTING

Description

Dynamic rerouting is an active traffic management strategy that presents drivers with viable alternate highway routes when their normal route is severely congested due to incidents, special events, or other abnormal traffic conditions. The alternate route is determined based on prevailing traffic conditions along nearby highway routes between a given origin and destination. Alternate route information is typically disseminated using hybrid guide signs, dynamic message signs, or via broadcast media. This not only benefits drivers by shortening their travel time but also keeps the congested corridor from becoming more so.

FHWA

Cost:	●●●○○
Time:	**Short**
Impact:	**Regional**
Who:	**State & Local**
Hurdles:	**Speed/Flow Monitoring System (ITS) Deployment**

Target Market

Dynamic rerouting works well on busy highway and major street networks with viable alternate routes. It can be implemented quickly in regions with traffic management centers and existing intelligent transportation systems (ITS). The strategy pairs well with speed harmonization and temporary shoulder use.

How Will This Help?

- Reduce congestion by shifting traffic to alternate routes.
- Maximize efficiency and capacity of the network by spreading traffic across the network.
- Increase safety by decreasing the likelihood of secondary car crashes.

Success Stories

- TxDOT provided dynamic re-routing messages using portable solar-powered monitors, signs, and cameras in a smart rural work zone system deployed on I-35 in Hillsboro.
- Several nations in Europe, including the Netherlands and Germany, use rotational prism guide signs that change as traffic conditions change to indicate alternate routes to motorists on urban and rural highways.

Implementation Issues

An effective implementation of dynamic rerouting along a freeway/highway route requires a viable parallel corridor that has adequate capacity to serve as an alternate route with minimum negative impacts. The concept requires operational knowledge of the status of the road network, typically through intelligent transportation systems and a regional traffic management center (TMC) that manages the system. The availability of adequate sensor and sign infrastructure to ensure that reliable alternate route information can be generated and provided is required.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

DYNAMIC TRUCK RESTRICTIONS

Description

Dynamic truck restrictions constrain trucks to certain lanes or routes that give at least one lane exclusively to passenger traffic and may be adjusted based on traffic flow or time of day considerations. Other forms of the concept may limit trucks from entering specified entry ramps during certain times of the day or during certain traffic conditions. This enables passenger cars and light trucks to flow more freely without having to frequently brake or maneuver around slower, less agile truck traffic. Unlike static lane restrictions, dynamic lane restrictions do not apply all the time. The goal of using dynamic rather than static restrictions is to achieve greater speed uniformity and better use of capacity during periods of congestion or near-congestion.

AARoads

Cost:	●●●●○
Time:	**Short**
Impact:	**Corridor**
Who:	**State & Local**
Hurdles:	**Legislative & Regulatory**

Restrictions can be triggered using real-time speeds and traffic volume data or by using historical traffic operations data. Real-time operational data allow the corridor operators to be more flexible with implementing the strategy.

Target Market

- Highways with high truck volumes.
- Major streets serving industrial and passenger traffic.

Dynamic truck restrictions should only be used on highways and streets that have significant volumes of truck traffic that interfere with passenger traffic. This strategy works well with speed harmonization.

How Will This Help?

- Improve safety by separating less agile trucks from general passenger car and light truck traffic.
- Better traffic flow and travel time reliability over facilities with only static truck restrictions.
- More uniform speed and driver behavior.

Success Story

The Netherlands began testing dynamic truck restrictions after successful implementations of restrictions based on time-of-day. Positive results have been seen with an increase in left-lane speeds, more stable and homogeneous traffic flow, and slightly higher capacity (about 3 percent) realized.

Implementation Issues

Agencies must seek enabling legislation to allow and enforce dynamic truck restrictions. Accurate and reliable expert systems are needed to deploy the strategy based on prevailing roadway conditions. The installation of sign gantries needs to be sufficient to ensure that at least one sign displaying the restrictions is visible at all times.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

System Modification > Alternative Modes > Express Bus Service

EXPRESS BUS SERVICE

Description

Express bus service is fixed route service that typically picks up passengers from park and ride lots in suburban areas. These commuter routes have limited stops, and typically travel non-stop on highways to reach the destination, usually downtown. Express routes tend to be used for longer distance commuter trips, and many services utilize high occupancy vehicle (HOV) lanes. Express routes usually offer service during peak operating (commuter) periods with limited or no service during the mid-day. Fares for the service may be comparable to park and ride fares—slightly higher than typical local fixed route service.

Target Market

This service focuses on commuters from suburban areas, including state employees, students, and employees working in the central city: typically commuters who would otherwise utilize freeways to travel to and from work during the week.

Cost:	●●●○○
Time:	**Moderate**
Impact:	**Corridor**
Who:	**Transit Provider**
Hurdles:	**Competitiveness, Funding & Sustainability**

How Will This Help?

- Reduces the number of single occupancy vehicles on major freeways and highways.
- Alternative to personal automobile.
- Helpful with time management: passengers can work on the vehicle, typically equipped with WiFi services.

Success Stories

- Dallas State Fair—partnership with DART and the implementation of the Green Line allows customers to directly access the State Fair.
- Austin—The University of Texas partners with Capital Metro in order to mitigate congestion for home football games by offering fixed route service from park and rides.

Implementation Issues

Express routes must be well-planned prior to implementation. Planners should survey the potential users to determine schedules and routing, and should typically offer service in conjunction with one or more park and rides. In areas with limited ridership, sustainability can be an issue, so it is critical to market and promote the service accordingly. Additionally, it is important for these types of routes to have access to HOV/HOTor managed lanes. In order to be a viable solution to congestion mitigation, express routes must be competitive with driving a personal vehicle.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

Travel Options > Work Schedule Changes > Flexible Work Hours

FLEXIBLE WORK HOURS

Description

Flexible work hour programs (or Flextime) allow employees to work within a specific time range during the day, often avoiding peak traffic periods, though all employees work a core period of the day. For example, employees may work anytime during the hours of 6:00 AM and 6:00 PM, so long as they work an eight-hour shift. Ultimately, employees are allowed to set their own schedule with approval.

Staggered work hour programs are a variation of flextime that varies the arrival and departure of groups of employees, but the employees may have no ability to choose their shift. These programs work well in manufacturing or plant operations to alleviate crowding at entrances/exits, elevators, and parking areas. Both of these programs distribute peak hour traffic to less congested hours reducing commute times.

Creative Class

Target Market

- Local, state, and federal government agencies
- Business in all sectors and industries

Unlike telecommuting, flextime can be more easily implemented by manufacturing and industrial businesses that rely on employee shift work.

Cost:	●○○○○
Time:	**Short**
Impact:	**Region**
Who:	**City/Private**
Hurdles:	**None**

How Will This Help?

- Reduce traffic volume and congestion during peak times by shifting drivers to less congested times
- Increase productivity and reduce costs of overtime and sick leave for businesses that participate

Success Stories

- Texas Instruments began their workplace flexibility program in 1993. The company encourages its employees to use different flexible schedule options to fit their individual needs.
- The City of Houston's mayor initiated Flex in City program in 2006. The program works with businesses to support employees shifting their work schedule.

Implementation Issues

Flextime programs are easily created, but may be less appropriate for some employers. The private and public sectors must partner to educate and encourage organizations to take advantage of this strategy. Businesses must assess the costs and operational changes that must be made to accommodate flextime schedules. Ridesharing programs and employee volunteering should be coordinated for maximum benefit.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

INTERSECTION IMPROVEMENTS

Description

Intersections are crucial to a street's performance; they control a road's speed, safety, cost, and efficiency. Accommodation of turning movements directly affects safety and efficiency, making left turns the key design factor in intersection improvement and operation. As such, intersection turn lanes are discussed as a separate strategy.

However, other improvements can also be made to increase safety and capacity, thus reducing congestion on the road. The most common strategies include improving signal timing, removing elements that hinder sight distance, making drivers aware that they are approaching an intersection, and improving bicycle or pedestrian facilities at the intersection.

There are potential applications for intersections of many types: urban or rural, signalized or unsignalized, and major or minor streets. Raised medians, bicycle lanes, improved skew angles, reconfigured signal timing, and advance warning devices are all possible treatments to improve intersection safety and/or capacity.

Cost:	●●●○○
Time:	**Short / Moderate**
Impact:	**Spot**
Who:	**City / State**
Hurdles:	**Right-of-Way**

How Will This Help?

- Maximize capacity and decrease delay by allowing a smoother flow of traffic.
- Increase safety through fewer collisions, including those involving pedestrians and bicyclists.
- Relatively low cost (as compared to intersection widening or reconstruction).

Success Stories

- Advance Warning of End of Green System (AWEGS) resulted in red-light-running reductions of 45 to 50 percent in College Station.
- Coordinated signal systems can improve capacity while reducing crashes. The Institute of Transportation Engineers (ITE) cites two studies that showed crash reductions of 25 to 38 percent.

Implementation Issues

Intersection improvements can be costly if additional right-of-way is needed for the project. Space restrictions must be considered when choosing appropriate treatments that will meet future traffic needs.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

MANAGED (HOV/HOT) LANES

Description

Managed lanes refer to any lane or corridor that controls usage by vehicle eligibility, price, or access control.

- Variably priced (High Occupancy Toll [HOT] or Express)
- High occupancy Vehicle (HOV)
- Exclusive lane use (bus or truck lanes)

Managed lanes provide travel alternatives, giving flexibility to users by allowing them to choose the best method of travel for the trip. This choice reduces congestion by maximizing existing capacity while encouraging transit and carpool/vanpool usage.

Target Market

The kind of managed lane, its design, and operating rules depend upon what the goals for the lane will be: maximizing person-moving capacity, revenue needs, freight-moving capacity, etc. Managed lanes lend themselves to boosting efficiency of both the current transportation network and any new or alternative network (such as transit or freight traffic).

Cost:	●●●●●
Time:	**Moderate-Long**
Impact:	**Corridor**
Who:	**State with Local Partners**
Hurdles:	**Public Support, Operations & Revenue Needs**

How Will This Help?

- Improve Travel Time Reliability for transit or other eligible vehicles.
- Increase Speed and Efficiency on main traffic lanes as cumbersome vehicles are removed.
- Increase Safety by removing large trucks and transit vehicles from main traffic flow.

Success Stories

- Katy Freeway Managed Lanes (Houston) https://www.hctra.org/katymanagedlanes/
- 91 Express Lanes (CA) http://www.91expresslanes.com/
- I-394 MnPass http://www.mnpass.org/index%20394.html
- 95 Express Miami http://www.95express.com/

Implementation Issues

Public acceptance is crucial to successfully integrating managed lanes into a city's transportation network. Planners must carefully craft the goals and objectives for the lanes and engage public opinion throughout the entire process in order to improve understanding and acceptance. Operating rules for newer projects increasingly reflect a balance between traffic performance and revenue needs. There are a number of operational issues—barrier type, integration with the existing freeway, signing, and enforcement—that require non-traditional approaches.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

MULTIMODAL TRANSPORTATION

Description

Multimodal transportation corridors provide the best solution for all person or freight movement in a congested corridor. This requires designers to incorporate strategies such as managed lanes, toll facilities, rail transit, and commute options into a corridor, allowing capacity for moving people and freight to be more easily expanded in the future.

Similarly, multimodal transportation centers take the corridor concept and condense it into a single facility that combines multiple modes including bus, rail, bicycles, rental cars, taxis, and other transportation services. These facilities provide high connectivity and convenience for all users.

Koorosh Oylai, DART

Cost:	●●●●○
Time:	Moderate
Impact:	Urban Corridor
Who:	City/Region
Hurdles:	Right-of-Way

Target Market

- Heavily congested corridors requiring complete redesign
- Locations near major activity centers

Planning and designing multimodal corridors or centers relies on knowing the specific needs and resources of the surrounding community.

How Will This Help?

- Reduce the frequency of constructing new facilities by planning for more capacity to meet demand.
- Improve congestion, travel time, and reliability for all users by offering multiple commute options.
- Increase economic development along the corridor or around multimodal centers.

Success Stories

- The Houston Northwest/US 290 Corridor managed lane is highlighted in a recent national research publication as an exemplary case study of multimodal (in this case HOV/transit) applications to address highway congestion.
- Many former highway-only corridors throughout the U.S. have been converted to include other modal approaches. Examples include several corridors in Los Angeles, San Francisco, and Chicago; the T-REX/IH 25 Corridor in Denver; and the Portland MAX Airport/IH 84 Corridor.

Implementation Issues

Implementing multimodal corridors and facilities requires collaboration among numerous local and state agencies, private organizations, and other groups throughout the entire planning and design process. In both multimodal corridors and centers, acquiring adequate right-of-way or land can be difficult and expensive. Multimodal solutions most often occur when a single mode improvement is needed, but planners consider other modal options, the public suggests it, or funding for alternative modes is available.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

PARK-AND-RIDE LOTS

Description

Park-and-ride lots are typically located on the suburban fringe of urbanized areas. Usually, park-and-rides are strategically placed outside of the "ring of congestion" on major commuter corridors. Services offered at park-and-rides may include local fixed routes, express bus, bus rapid transit, and rail, and are designed for commuters transferring from low-occupancy mode of travel (usually private automobiles) to high-occupancy modes (rail, bus, van- and car-pools). Services from park-and-rides are designed to concentrate transit demand, offering transit services that could not otherwise be cost-effectively provided. Typical park-and-ride amenities include covered or enclosed waiting areas, benches, and sometimes vending machines and restrooms. Lots may vary in size from 200 to over 1,000 spaces, and can be used exclusively for transit or offer shared uses, such as vanpool staging. Transit fares from park-and-rides are typically higher than basic local fares, and parking may be free or for a small fee.

Cost:	●●●○○
Time:	Moderate
Impact:	Corridor
Who:	Transit Provider
Hurdles:	Ease of Access

Target Market

These lots target commuters from suburban areas, including state employees, students, and employees working in the central city—typically commuters who would otherwise utilize freeways to travel to and from work during the week.

How Will This Help?

- Reduces the number of single occupancy vehicles on major freeways and highways.
- Alternative to personal automobile.
- Time management: passengers can work in the vehicle, typically equipped with WiFi services.

Success Story

Fuqua Park & Ride Lot, Houston—Metro offers over 28 park-and- ride lots with direct access to HOV lanes in major corridors, giving buses priority. The number of parking spaces ranges from 3,000 to 7,500.

Implementation Issues

Park-and-ride lots must be strategically located in order to draw customers. Ease of access plays a big role in whether customers will take advantage of the services offered at the lot. Customers may access park-and-rides in different ways, so planners must be mindful of creating safe and meaningful access for pedestricans, bicycles, the automobile, and those passengers transferring in from neighborhood feeder services.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

QUEUE WARNING

Description

Queue warning's basic principle is to inform travelers of the presence of downstream stop-and-go traffic (based on real-time traffic detection) using warning signs and flashing lights. Drivers can anticipate an upcoming situation of emergency braking and slow down, avoid erratic behavior, and reduce queuing-related collisions. Dynamic message signs show a symbol or word when stop-and-go traffic is near. Speed harmonization and lane control signals that provide incident management capabilities can be combined with queue warning. The system can be automated or controlled by a traffic management center operator. Work zones also benefit from queue warning with portable dynamic message signs units placed upstream of expected queue points.

Missouri Department of Transportation

Cost:	●●○○○
Time:	Moderate
Impact:	Corridor
Who:	State
Hurdles:	Public Support, Operations

Target Market

- Freeways or roads experiencing frequent congestion
- Facilities with frequent queues in predictable locations
- Facilities with sight distance restricted by vertical grades, horizontal curves, or poor illumination

How Will This Help?

- Reduce primary and secondary crashes by alerting drivers to congested conditions.
- Delay the onset of congestion, improving smooth and efficient traffic flow and trip reliability.
- Provide environmental benefits through decreased emissions, noise, and fuel consumption.

Success Stories

- IH 610, Houston—A queue warning test system increased average speeds and significantly reduced crash-causing speed variances among lanes.
- Oslo, Norway—Variable signing on main routes improves motorist behavior and improved safety.

Implementation Issues

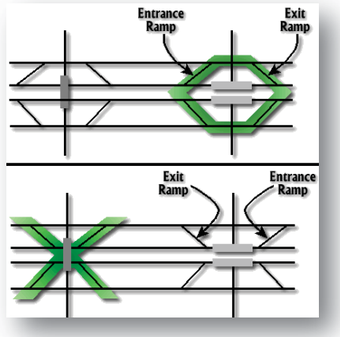
When queue warning is included in a larger traffic management project that has lane control signals and variable speed limits, it is possible to reduce the speed incrementally between gantries and evacuate traffic from one lane to provide access and shelter for emergency vehicles. Work zones also take advantage of queue warnings. Many agencies use mobile message signs to warn approaching traffic of queues. Queue warning can be more effective when deployed in conjunction with speed harmonization. When implemented with speed harmonization, the queue warning pictograms and/or flashing lights need to be visible to all vehicles. An expert system that deploys the strategy based on prevailing roadway conditions without requiring operator intervention is optimal.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

RAMP CONFIGURATION

Description

Access ramp design is one key way to manage a freeway network. Changes to ramp configuration can help manage traffic flows at key junctions in order to maximize operational performance. Some transportation departments effectively implemented new ramps, braiding pairs of ramps by physical grade separation or even closing ramps at problem locations.



Some agencies approached the issue by modifying configurations via ramp relocations and ramp reversals (a ramp reversal is a replacement of an entrance ramp with an exit ramp or vice versa), often for the purpose of reducing vehicle queues at critical locations. The "X" ramp design has become popular in Texas as the alternative to the traditional diamond because of the potential for economic development, operational, and safety benefits. Each of these improvements seeks to maximize vehicular movement while minimizing cost.

Cost:	●●●○○
Time:	Moderate
Impact:	Spot
Who:	City/State
Hurdles:	New Access

Target Market

Reconfiguring entrance and exit ramps works well on freeways with significant development along the frontage roads.

How Will This Help?

- Increase direct access along the frontage road.
- Improve safety because of optimized traffic flows at key junctions.
- Reduce congestion caused by ramp queue spillback onto main freeway lanes.

Implementation Issues

Changes to ramp configuration require careful traffic analysis to determine if the changes will result in positive outcomes without unintended consequences. For Interstate facilities, this analysis means completion of a formal Interstate Access Justification (IAJ) study.

Success Stories

- Single Ramp: IH 30 "Canyon" ramp reversal in Dallas—The eastbound Harwood exit ramp was converted to an entrance ramp in a problem weaving area. The project significantly reduced delay and had a 9:1 benefit-cost ratio and injury crashed dropped 31 percent.
- Ramp Pair: IH 20 at Cooper Street in Arlington—A reversal of the entrance and exit ramps enabled a 400,000 square foot expansion at the Parks Mall directly adjacent to the improved access. Crashes on the frontage road decreased by 41 percent, and queue spillback on the freeway was eliminated.
- "X" Ramp Corridor: South Padre Island/SH 358 in Corpus Christi— Most ramps along the busy retail corridor were reversed, alleviating common queue spillbacks and frequent main lane congestion.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

RAMP FLOW CONTROL

Cost: ●●●○○
Time: Short
Impact: Corridor
Who: State
Hurdles: Acceptance

Description

Ramp flow control (also known as ramp metering) uses specialized traffic signals that release vehicles onto a freeway in a smooth and even manner. The goal is to keep entering vehicles from crowding out freeway traffic and creating stop-and-go traffic that ripples upstream and slows the entire freeway. By releasing one or two vehicles at a time, flow signals keep the freeway moving efficiently for a longer period of time. Less stop-and-go traffic means fewer crashes that cause additional congestion. In return, vehicles will wait on the ramp. This strategy may not completely eliminate traffic congestion, but can delay its onset and shorten its duration.

Target Market

Flow control signals are best implemented in locations and at times where a large group of vehicles enter a freeway at one time, including freeway entrance ramps (on freeway sections near where stop-and-go traffic occurs). High Occupancy Vehicle (HOV) by-pass lanes can be added to ramps to give priority to those users.

How Will This Help?

- Decreased crash rates in signal-controlled areas supported in several studies.
- Increased volume throughput and speed, which reduces travel time for all users.
- Relatively low cost to install and maintain.

Success Stories

- Houston and Atlanta report significant travel-time savings.
- Milwaukee, Portland, Detroit, and Los Angeles report significant increases in travel speeds.
- Portland, Sacramento, and Los Angeles report significant reduction in crash frequency.
- Minneapolis reports significant reduction in emissions.

Implementation Issues

How quickly (if at all) the public accepts ramp flow control remains the pivotal issue in implementation. The public must be convinced of the benefits that can be achieved from ramp flow control. The operators must also stay vigilant in adjusting operation strategies to take maximum advantage of the system.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

SIGNAL OPERATION & MANAGEMENT

City of Carlsbad, CA

Cost: ●●○○○
Time: Short
Impact: Spot / Corridor
Who: City / County / DOT
Hurdles: Manpower

Description

Signal improvements are among the most common, readily available, and cost effective strategies to alleviate congestion. Two primary categories of improvements increase travel speed, reduce stop-and-go traffic, and increase intersection capacity.

- Updating signal equipment—improving hardware and software that allow for efficient coordination and timing strategies.
- Improving signal timing and coordination—give main commuting streets the green time when they need it most.

Signal timing and equipment upgrades can improve congested freeways by increasing traffic flow on access roads or parallel street corridors. Technological advances now allow signals to learn from historical and real-time patterns using artificial intelligence. Using real-time information, signals can automatically retime and coordinate themselves to the most efficient plan, reducing delay up to 40 percent and increasing throughput up to 60 percent.

Target Market

- Local and major streets
- Major activity centers and downtown areas

How Will This Help?

- Reduce congestion directly through increasing intersection capacity and smoothing traffic flow.
- Relatively low cost and high benefit return for the investment.
- Improves safety of the intersection, reducing congestion due to crashes.

Success Story

The City of San Antonio, Texas, has been conducting a city-wide signal system upgrade since 2008, including signal retiming for most major roadway corridors. Benefits include an average travel time reduction (per each 0f 60 corridors) of 54 seconds, total annual delay savings (793 intersections) of 8.6 million motorist hours in traffic, and an annual delay savings of over $159 million.

Implementation Issues

Upgrading and maintaining proper signal timing can be labor intensive and time consuming. Many cities do not allocate the resources or manpower to constantly assess traffic signal timing plans. Signal retiming is recommended every three to five years, depending on regional growth. Resources required for signal retiming typically include 20 to 30 staff hours per intersection and a usual cost of $3,500 to $4,000 per intersection. Jurisdictional issues can arise when major streets cross agency boundaries; best practices for addressing these issues involve joint policies and procedures for maintaining coordination.

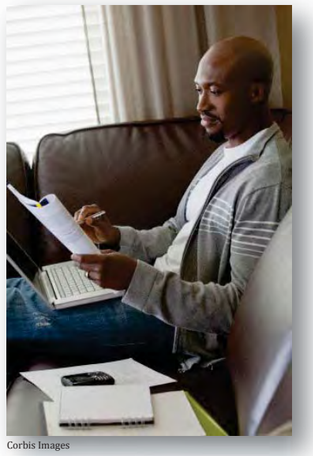
For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

TELECOMMUTING

Description

Telecommuting offers flexibility to employees who can perform work tasks remotely. Advancement in technology has allowed most office functions to occur remotely, eliminating the requirement to be physically present in an office. Telework programs allow employees to work from home or a satellite office either all or part of the day, changing the time of their travel or eliminating their commute entirely.

Telework programs offer enticingly low costs to create and maintain, while simultaneously improving productivity and saving money and resources by reducing wasted time, parking and office space needs, employee turnover rates, and recruiting or training costs. These programs are ideal for public-private partnership relationships.



Corbis Images

Target Market

- Professional and managerial staff
- Business service, wholesale, and banking/finance industries

Businesses and organizations that primarily perform office-related work are best suited to telework programs, as opposed to manufacturing and some service industries.

Cost:	●○○○○
Time:	**Short**
Impact:	**Region**
Who:	**City/Private**
Hurdles:	**None**

How Will This Help?

- Reduce traffic volume and congestion during peak times by removing commuters from the road.
- Increase productivity and reduce costs for businesses that participate.
- Improve environmental factors by reducing cold starts, emissions, and miles traveled.

Success Stories

- In 2007, Houston based CompuCom started a telework program with 20 percent of its 600 employees working at alternative locations.
- In Minneapolis, 75 percent of Best Buy's 4,500 corporate employees participate in a Results-Only Work Environment (ROWE) program. The program allows employees to work at alternative locations and times, while agreeing to have their employer evaluate their work.

Implementation Issues

Telework programs are easily created, but may be less appropriate for some. Private and public sectors must partner to educate and encourage organizations to take advantage of this strategy. Businesses should identify what portion of their operation might be best suited for telework programs, while public agencies should provide incentives, marketing, and organizational assistance for starting these programs.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

TRANSPORTATION MANAGEMENT ASSOCIATIONS

Description

Transportation Management Associations (TMAs) provide transportation services and education to businesses and employees in a particular area, combining the efforts of many employers to reduce program costs. Most TMAs are non-profit collaborations of private and public sector employers working together toward common goals, such as congestion mitigation or pollution reduction.

Dallas Area Rapid Transit, West End Station

TMAs typically serve employers in congested urban areas with rideshare matching, marketing travel options, employer traveler surveys, and developing trip reduction plans. TMAs also help with parking management, flexible work hours, vanpools, special events management, and freight transport movements, just to name a few. Over 140 TMAs exist in the United States, with five in Texas.

Cost:	●○○○○
Time:	**Short**
Impact:	**Regional**
Who:	**Public/Private**
Hurdles:	**Support**

Target Market

Most TMAs in the United States focus on commuters in urban areas. Cities with an emphasis on tourism and special events work with TMAs to educate visitors, and to mitigate the congestion effects of the large number of tourists. TMAs can be arranged to address a variety of local or regional needs.

How Will This Help?

TMAs can significantly reduce the number of single-occupant vehicle trips in an area by offering travel demand management services. Positive congestion impacts are most likely when used to support travel behavior changes following major infrastructure changes such as express or managed lane implementation or new transit services.

Implementation Issues

Long-term implementation requires a continuous revenue stream because TMAs are most often funded by a mixture of employer membership fees and public funds. Since travel behavior changes take time, sustainable partnerships are needed.

Success Stories

- **Central Houston, Inc.** strongly encourages employers to provide some level of transit subsidy to their employees. A 2009 survey of downtown workers, found that 52 percent use some mode other than driving alone.
- **Lloyd District TMA** in Portland, Oregon, partners with local employers to encourage commute trips other than driving alone, resulting in a reduction in drive-alone trips from 60 percent in 1997 to 41 percent in 2011.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

TRAVELER INFORMATION SYSTEMS

Description

Traveler information systems update drivers on current roadway conditions—including delays, incidents, weather-related messages, travel times, emergency alerts, and alternate routes. Providing this information to drivers before and during trips allows them to make more effective travel decisions about changing routes, modes, departure times, or even destinations. More informed drivers result in more efficiently utilized roadway capacity. This means less gridlock and better traffic flow.

Travel information is generated by sensors reporting to a traffic management center or through private entities using data from in-vehicle location devices, or from smart phones communicating location and speed. This information is then disseminated via traditional broadcast media, internet, mobile devices, or roadside messaging. Personalized travel messages and alerts enable individuals to get trip-specific information on demand, or have it pushed to them via email or text message subscription services. Once familiar with these services, nearly 80% of drivers use traveler information to make daily decisions about route or departure time.

Cost:	●●○○○
Time:	**Short**
Impact:	**Region**
Who:	**State/Local**
Hurdles:	**None**

Target Market

- Highway networks, including freeways and toll way
- Major city streets

How Will This Help?

- Maximize efficiency and capacity by providing current transportation system information to drivers.
- Reduce the impacts of congestion.
- Increase safety by alerting drivers of upcoming hazards.

Success Stories

Houston TranStar's sensor network collects data and disseminates traveler information to the public, the media, and third-party providers. TranStar reaches more than 500,000 unique users every month via its website. Each year, nearly 2 million incident and travel time messages are sent to more than 200 roadside message signs in the region. **Benefit to cost ratio is estimated to be more than 11 to 1.**

Implementation Issues

Though relatively inexpensive, these critical systems face budgeting and funding challenges. However, the same infrastructure that provides traveler information also enables more effective incident management and performance measurement—which can mean a greater return on the investment. Maintaining and upgrading these systems to reflect the most up-to-date technology requires implementation and maintenance funding. The good news is that technology and communication advances are driving costs downward each year.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

TRUCK INCENTIVES & USE RESTRICTIONS

Description

Truck incentives and/or use restrictions are intended to encourage freight operators with a financial incentive or place regulatory limits on the time, location, and manner in which truck traffic can access certain areas or corridors for deliveries. The goal of these incentives or restrictions is to shift truck traffic off of congested facilities and out of peak periods in order to both improve truck flow and better accommodate passenger travel. Techniques used to do this include:

PierPASS OffPeak, Long Beach, CA

- Delivery restrictions to non-peak daytime or night-time hours.
- Assessing truck tolls during peak periods and/or providing free passage during non-peak or nighttime hours.
- Access improvements (to shift freight to another mode).

Restrictions may also prohibit on-street truck parking (freeing a turn lane) or prohibiting left turns where no turn lane exists.

Cost:	●○○○○
Time:	**Short**
Impact:	**Regional**
Who:	**State & Local**
Hurdles:	**Legislative & Regulatory**

Target Market

- Major streets serving industrial and passenger traffic.
- Dense urban areas with narrow rights-of-way.
- Freeways with high truck volumes.

Truck incentives and use restrictions can be used in downtown or densely developed areas that experience heavy traffic that can be worsened by drayage, delivery, or construction vehicles. These restrictions also work in areas with narrow rights-of-way, neighborhood streets, or areas with high truck turning volumes.

How Will This Help?

- Improve safety by eliminating heavy truck traffic from tight or congested areas.
- Improve traffic flow for passenger trips.

Success Stories

- Both Boston and Cambridge, Massachusetts, instituted limited delivery hours in downtown areas except for designated routes or for emergency response.
- The Ports of Los Angeles and Long Beach used the "PierPASS OffPeak" program to encourage greater use of container terminals from 6 p.m. to 3 a.m. About 30 percent of container cargo traffic shifted to the off peak.

Implementation Issues

Truck restrictions, specifically moving deliveries to after-hour times, can place a heavy burden on local businesses and delivery companies as they must extend employee hours or work around the restriction schedule. Industry, public, and local business cooperation is crucial to successfully implement this strategy. Local and state agencies must be able to provide enforcement to ensure the effectiveness of the strategy.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

TRUCK LANE RESTRICTIONS

Description

Truck lane restrictions in Texas allow for trucks to be restricted to two or more designated lanes of a highway. This ensures that at least one of the highway lanes (normally the left or inside lane) is used only by passenger vehicles. A restricted vehicle, however, is allowed to use any lane, including the restricted lane, to pass another vehicle and to enter and exit the highway. Lane restrictions can be designated on a 24-hour or peak-period only basis. The most common reasons for implementing truck lane restrictions include improving highway operations, reducing crashes, pavement and structural considerations, and construction work zone restrictions.

Cost:	●○○○○
Time:	**Short**
Impact:	**Corridor**
Who:	**City/State**
Hurdles:	**None**

Target Market

- Freeways with high truck volumes
- Freeways with a high percentage of trucks using the left lane

Truck lane restrictions should only be considered where there is a minimum of four percent trucks in the traffic stream over a 24-hour period and when approximately 10 percent of the total truck traffic is using the lane to be restricted. The roadway section to be restricted should be at least six miles long.

How Will This Help?

- Improve safety by reducing freeway crashes.
- Improve traffic flow by providing a lane free of truck-passenger car interaction.

Success Stories

- Truck lane restrictions have been implemented along urban freeways in the Houston, San Antonio, Austin, and the Dallas-Ft. Worth metro areas.
- Truck lane restrictions have operated successfully outside the urban area along IH 35 between Austin and San Antonio.

Implementation Issues

Routine enforcement of either regular traffic patrols and/or specialized dedicated truck enforcement units should be available to assure compliance. A good public information campaign should be undertaken to inform the public of the implementation of the restriction. This campaign must include the trucking community along the corridor to assure success of the project.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

VANPOOL

Houston Metro

Description

Vanpools provide registered users (usually living or working in a similar area) with organized transit service in a van. Vanpools usually consist of five to fifteen riders that pay to commute for long distances into a city or to a transit stop. The driver typically counts as a passenger and has a free or discounted price.

Employers and local governments sponsor vanpools by providing incentives to employees for riding (e.g. vouchers for transit, subsidized costs, discounted parking). Third-party vanpool operators may be used to provide vans and administer the vanpool program.

In addition to relieving congestion, vanpools offer a much cheaper option to driving alone for commuters. Vanpools may use high-occupancy vehicle (HOV) lanes, which reduces trip time for passengers. These benefits reduce costs to employers by improving tardiness and lowering necessary parking.

Cost:	●●○○○
Time:	**Short**
Impact:	**Region**
Who:	**City/Private**
Hurdles:	**None**

Target Market

- Congested corridors where trip lengths are longer than 20 miles.
- Downtown or other activity centers.

Vanpooling works best in neighborhoods with relatively little transit service and job centers with inadequate parking. This service is best paired with managed lanes that allow vanpools, park-and-ride lots, and transit service.

How Will This Help?

- Reduce congestion by eliminating cars from the road.
- Relatively low cost for all involved: user, employer, and the vanpool sponsor.
- Lower auto emissions by removing cars from the road and allowing more efficient speeds.

Success Stories

- Dallas, Texas: Dallas Area Rapid Transit (DART) implemented a vanpool program consisting of 174 vans resulting in a reduction of about 35 million miles traveled.
- Phoenix, Arizona: Valley Metro has a vanpool program consisting of 380 vans. The program results in a reduction of about 55 million miles traveled.

Implementation Issues

Vanpools can be quickly and inexpensively implemented by employers or other sponsors. However, an employee's scheduling changes can limit an employer's motivation to provide vanpool programs. Public agencies should encourage and facilitate these through incentives, subsidies, marketing, and regulation.

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

Travel Options > Pricing Strategies > Variable Pricing

VARIABLE PRICING

Description

Variable pricing programs raise the price during rush hours and lower the price during off-peak periods to better use the road space. The toll can be adjusted according to a set toll schedule or dynamically, based on traffic demand. Adjusting the toll can persuade drivers to choose:

- An alternate, less congested route
- A different departure time
- A different mode like transit, carpool, or vanpool
- To telecommute or eliminate low-priority trips

Studies have shown this strategy to be one of the most effective ways to incentivize travel alternatives.

Target Market

- Toll roads or toll lanes

Variable pricing works best in congested corridors with strong transit alternatives, or parallel routes that provide less expensive options to the priced facility.

Cost:	●●○○○
Time:	**Moderate**
Impact:	**Corridor**
Who:	**Public Agency**
Hurdles:	**Public Acceptance**

How Will This Help?

- Reduce congestion on tolled facilities by moving some traffic demand to alternate times, routes, or modes, or eliminate trips.
- Provides market signals to increase driver awareness of trip costs.
- Low implementation cost that could produce additional facility revenue.
- Accommodate equity concerns through transit alternatives and discounting fees for specified accounts.

Implementation Issues

Variable pricing's most difficult hurdle lies in public resistance to variable tolling and a lack of public knowledge of the benefits and costs of the program. Many may resist the concept, thinking they must pay for something that has always been free. This pressure may inhibit variable pricing program growth.

Success Stories

- Houston, Texas – The Katy Freeway Managed Lanes operate with a toll rate schedule that charges $1 for a 12-mile trip in the off peak, $2 during the hour before and after the peak two hours, and $4 during the peak two hours in both morning and evening. This ensures free flow conditions in the lanes at all times. https://www.hctra.org/katymanagedlanes/media/Proposed_Katy_Toll_Sched.pdf
- The 91 Express Lanes in Orange County, California operate with a toll rate schedule that maintains free-flow speeds and offers a reliable, predictable commute. The toll schedule is periodically re-evaluated to ensure that service level. http://www.91expresslanes.com/policies.asp

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

Traffic Management > Active Traffic Management > Variable Speed Limits

VARIABLE SPEED LIMITS

Description

Variable speed limits use speed limit signs that can be changed to alert drivers when traffic congestion is imminent. Sensors along the roadway detect when congestion or weather conditions exceed specified thresholds and automatically reduce the speed limit in five mile per hour increments to slow traffic uniformly and delay the onset of congestion. Depending upon the objectives set for the system, speed limits can be regulatory or advisory. Dynamic message signs (DMS) can also be deployed in conjunction with this system to give drivers travel-time information or explanations.

Cost:	●●○○○
Time:	**Moderate**
Impact:	**Corridor**
Who:	**State**
Hurdles:	**Public Support, Legal Authority, Operations**

Target Market

- Freeways or roads experiencing frequent congestion
- Areas susceptible to adverse weather conditions

How Will This Help?

- Improve safety through a reduction in crashes during adverse weather conditions and congestion by slowing motorists entering an area of stop-and-go traffic.
- Delay onset of congestion allowing traffic to flow smoothly and efficiently and improving trip reliability.
- Provide environmental benefits through decreased emissions, noise, and fuel consumption.

Implementation Issues

This technology has been successful in Europe, but is new to the United States. Public acceptance and understanding of the system is crucial to its success. Drivers must be able to understand why the speed limit is being reduced and that their travel times and trip reliability will improve. Whether the new speed limit is advisory or mandatory must also be clearly understood by all drivers. Furthermore, the automated implementation of the dynamic speed display without operator intervention ensures that changes are implemented prior to breakdown. Also, the speed limit signs have to be visible to all vehicles.

Success Stories

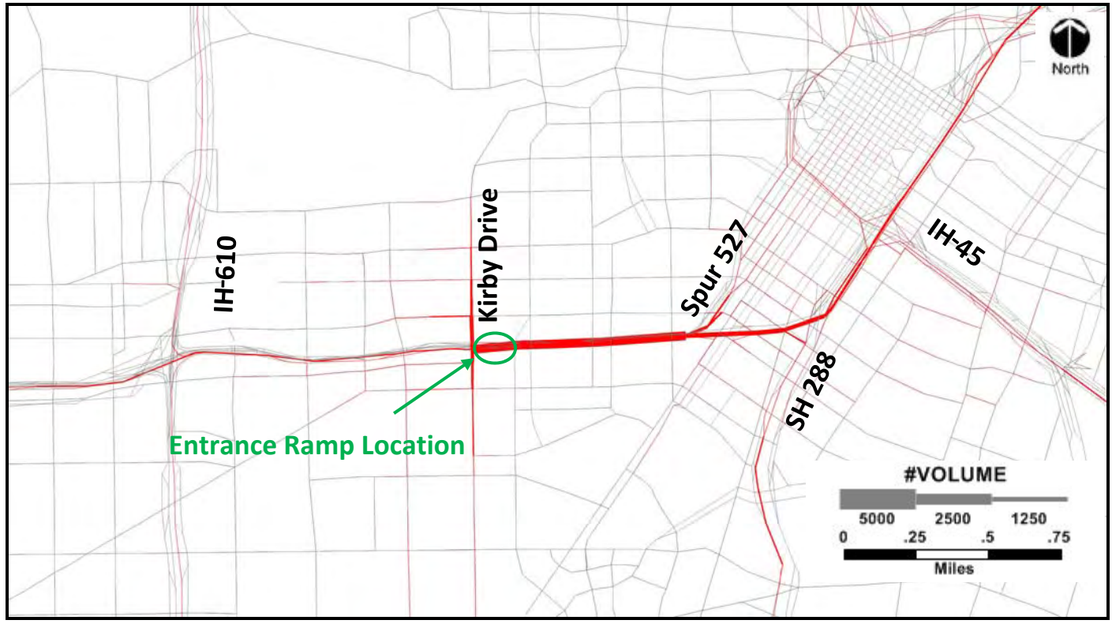
- Smarter Highways, Seattle, WA
  http://www.wsdot.wa.gov/smarterhighways/
- Minneapolis , MN
  https://support.mnpass.net/kayako/index.php?_m=knowledgebase&_a=viewarticle&kbarticleid=123
- England
  http://www.highways.gov.uk/knowledge_compendium/64A9E660C4D342578695740F018E3BDC.asp

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.

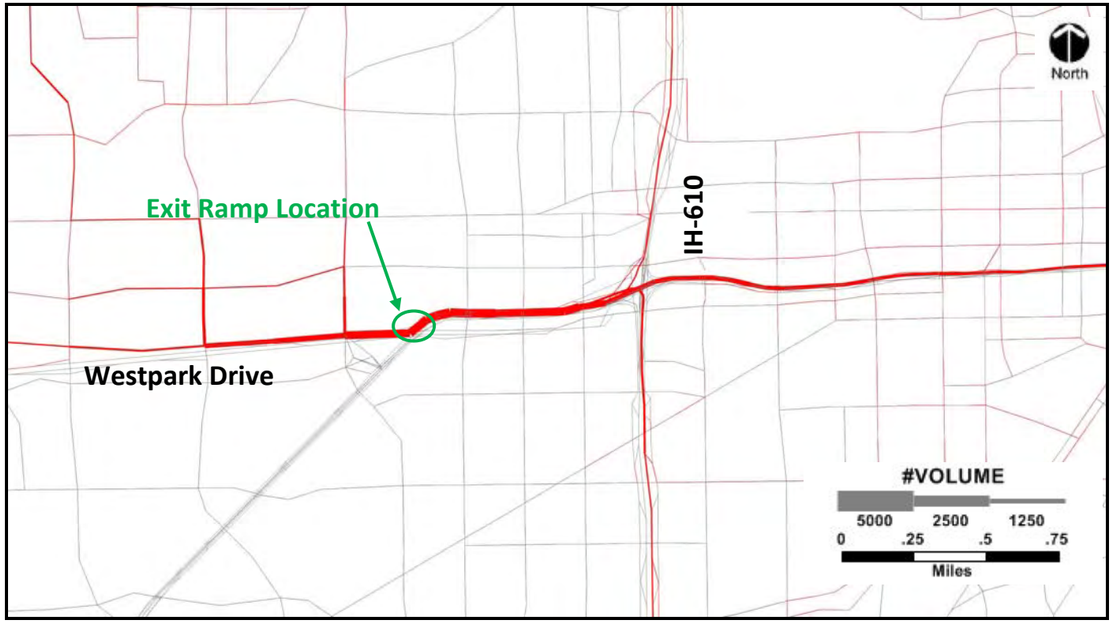
APPENDIX B

DynusT Ramp Origin & Destinations for Affected Ramp Locations

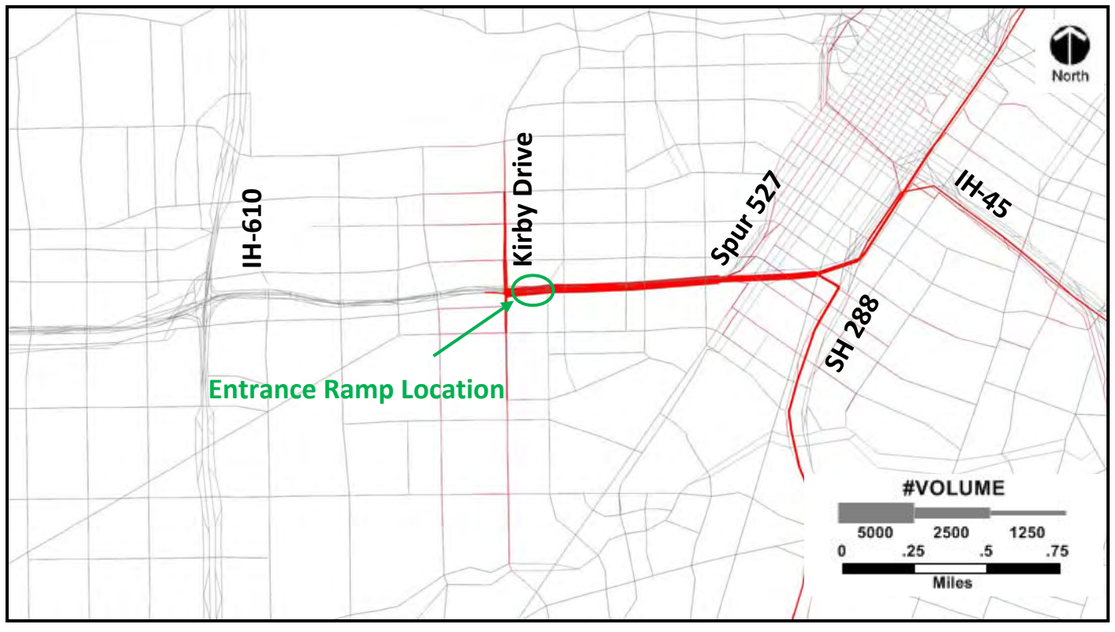
NB Entrance Ramp from Kirby Drive - AM



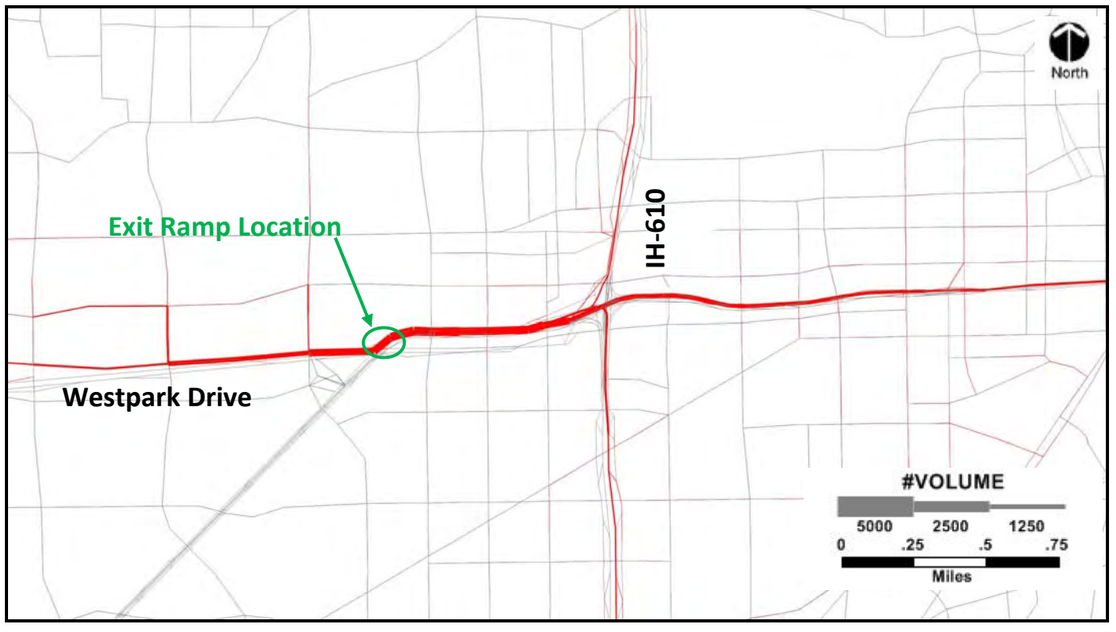
SB Exit Ramp to Westpark Drive - AM



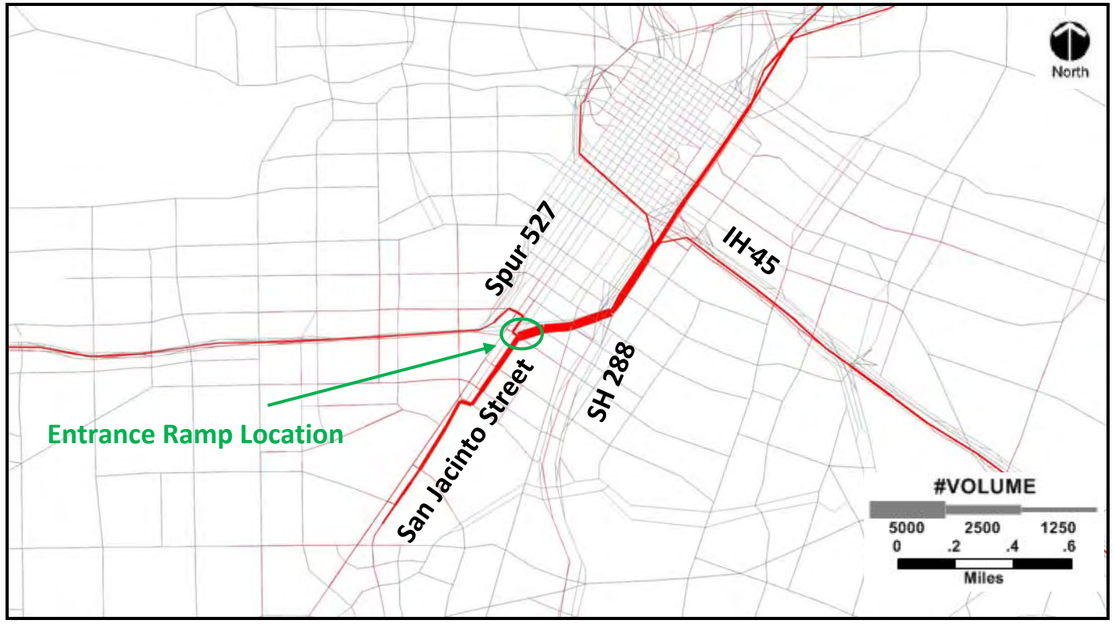
NB Entrance Ramp from Kirby Drive - PM



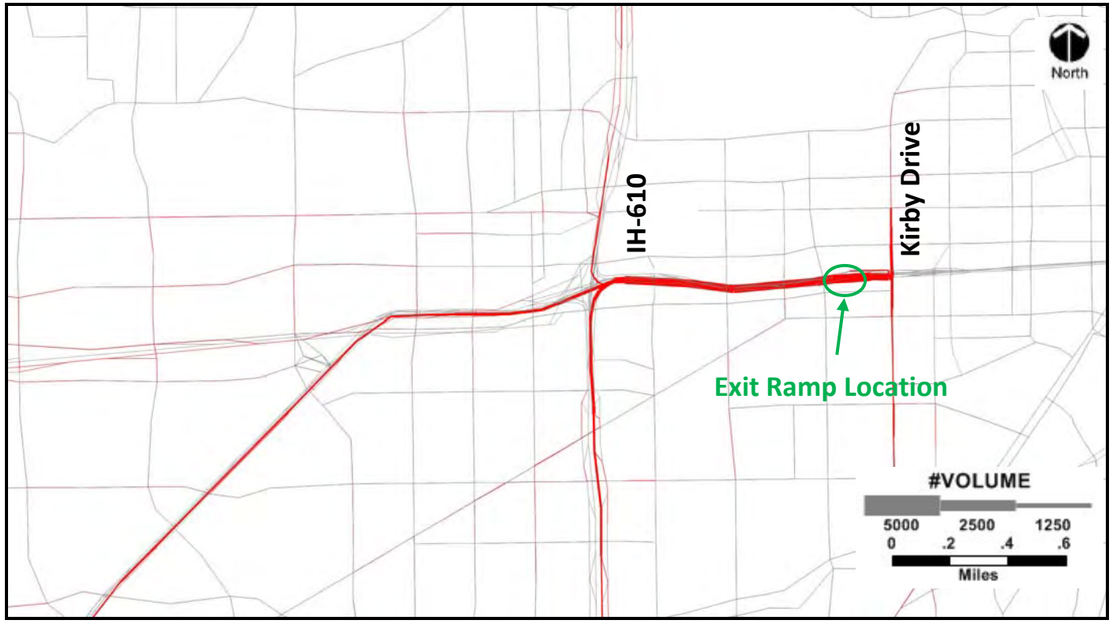
SB Exit Ramp to Westpark Drive – PM



NB Entrance Ramp from San Jacinto Street – AM



NB Exit Ramp to Kirby Drive – AM



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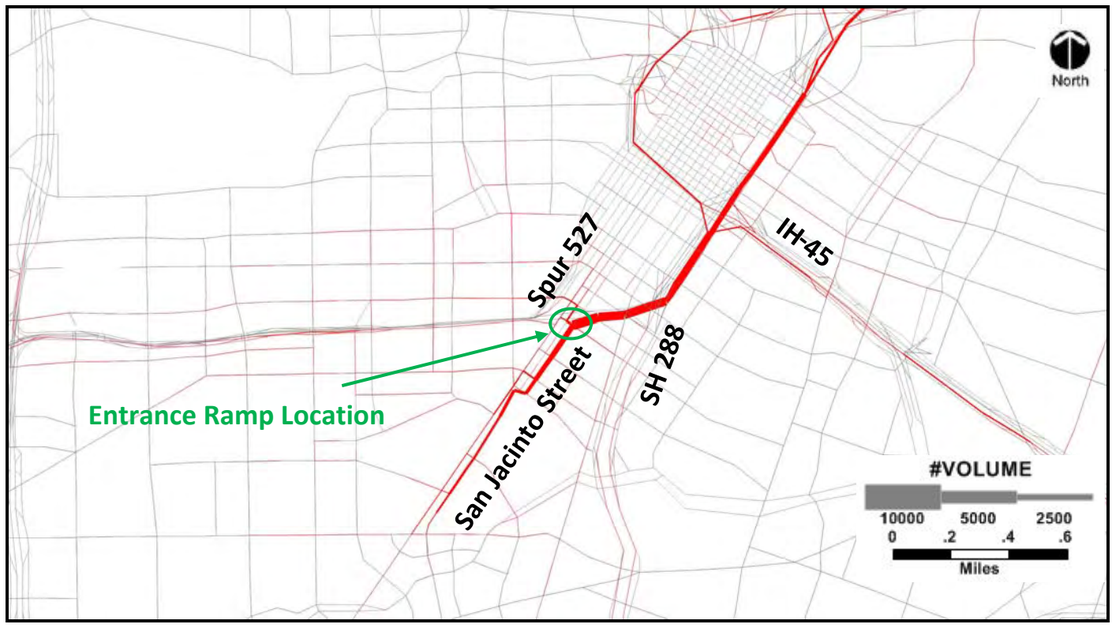

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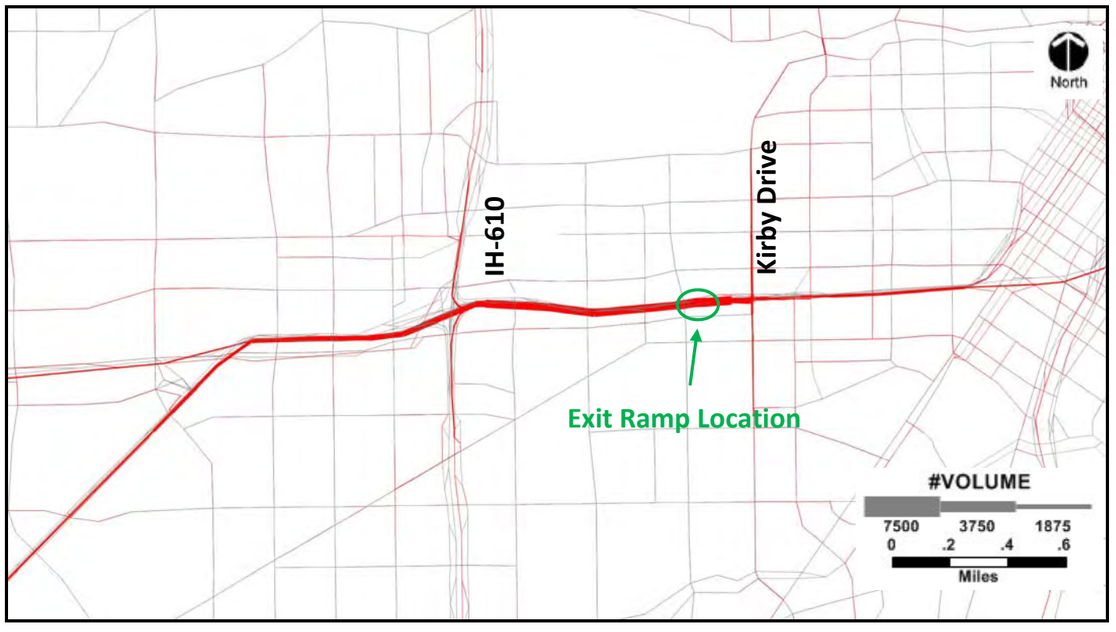
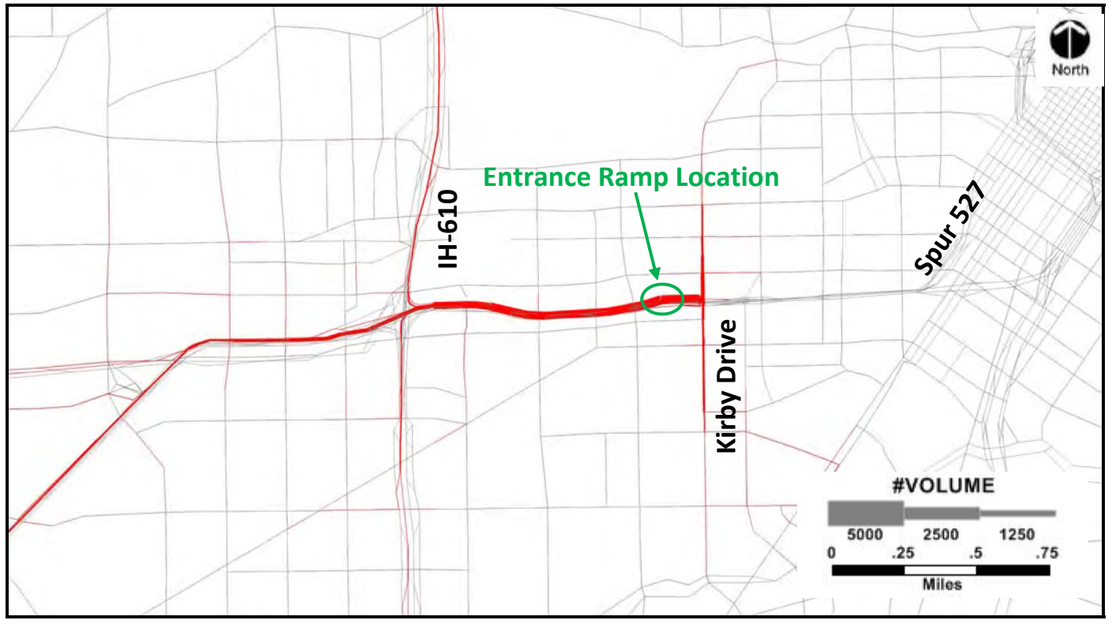
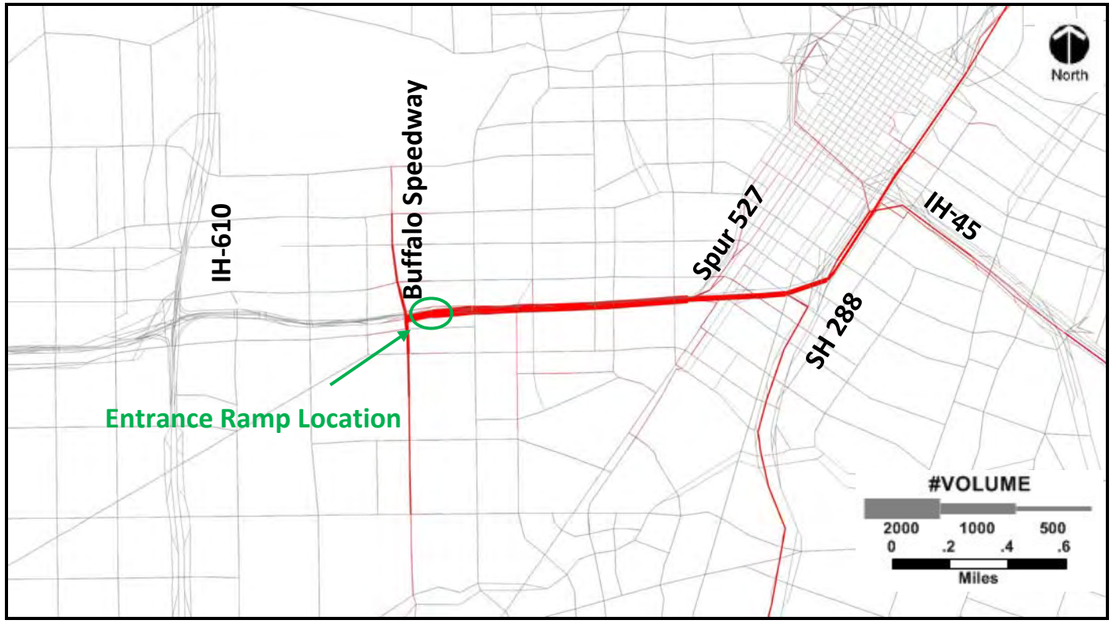


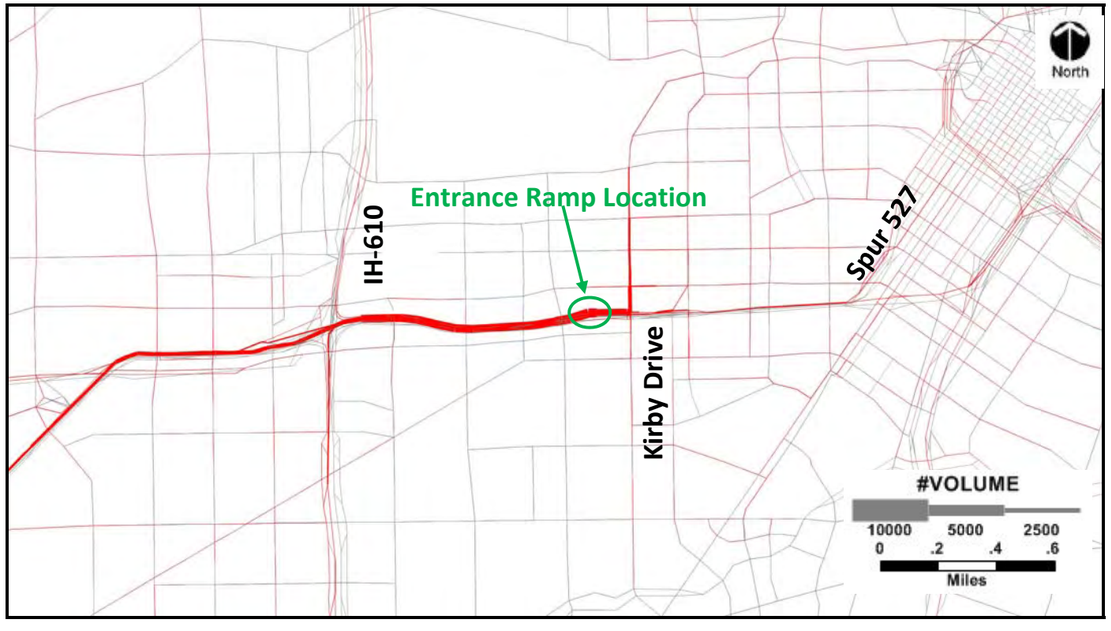
SB Entrance Ramp from Kirby Drive – AM



NB Entrance Ramp from Buffalo Speedway – AM



SB Entrance Ramp from Kirby Drive – PM



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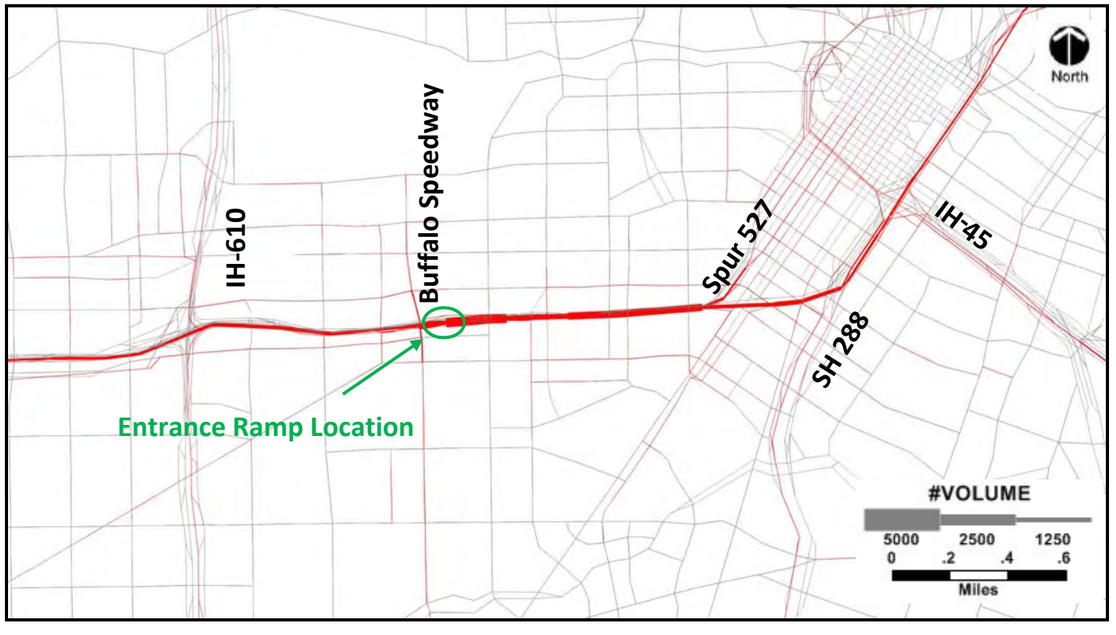
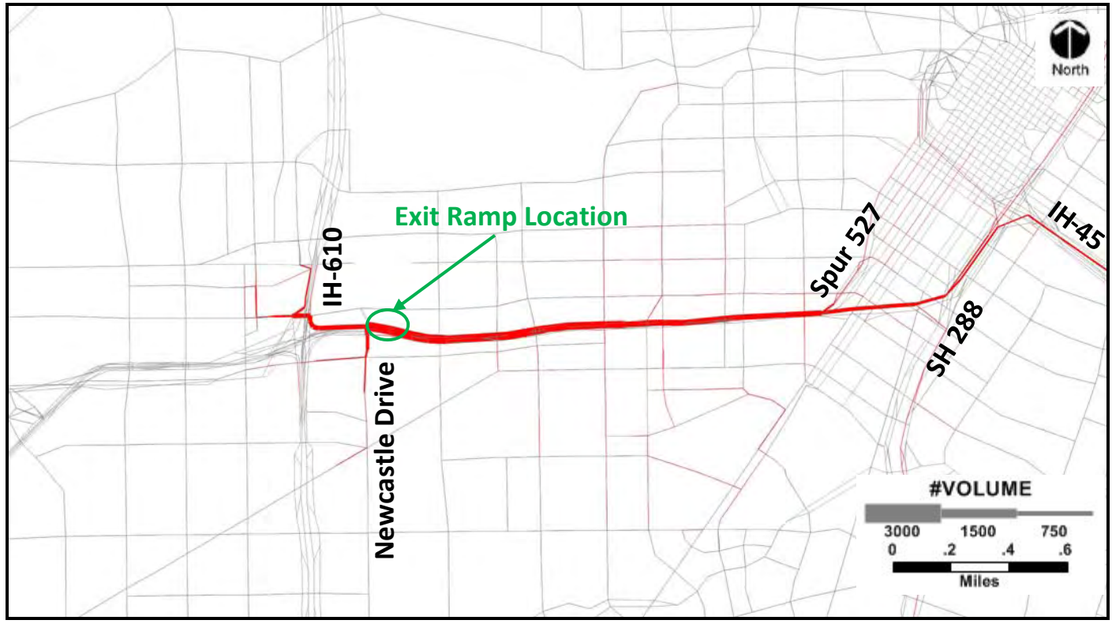


SB Exit Ramp to Newcastle Drive – AM



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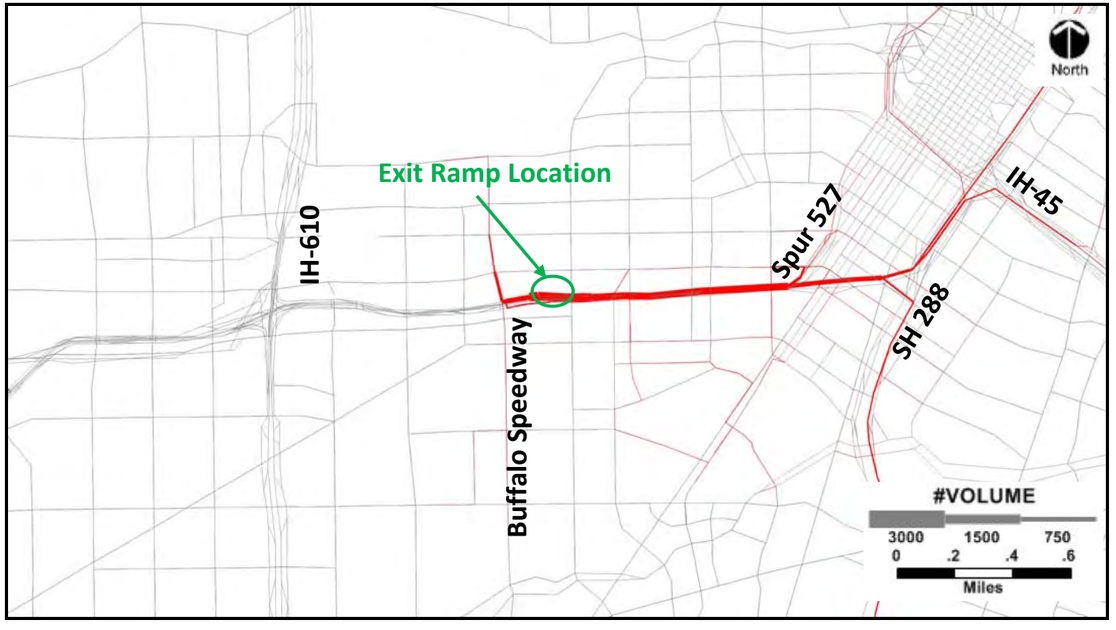

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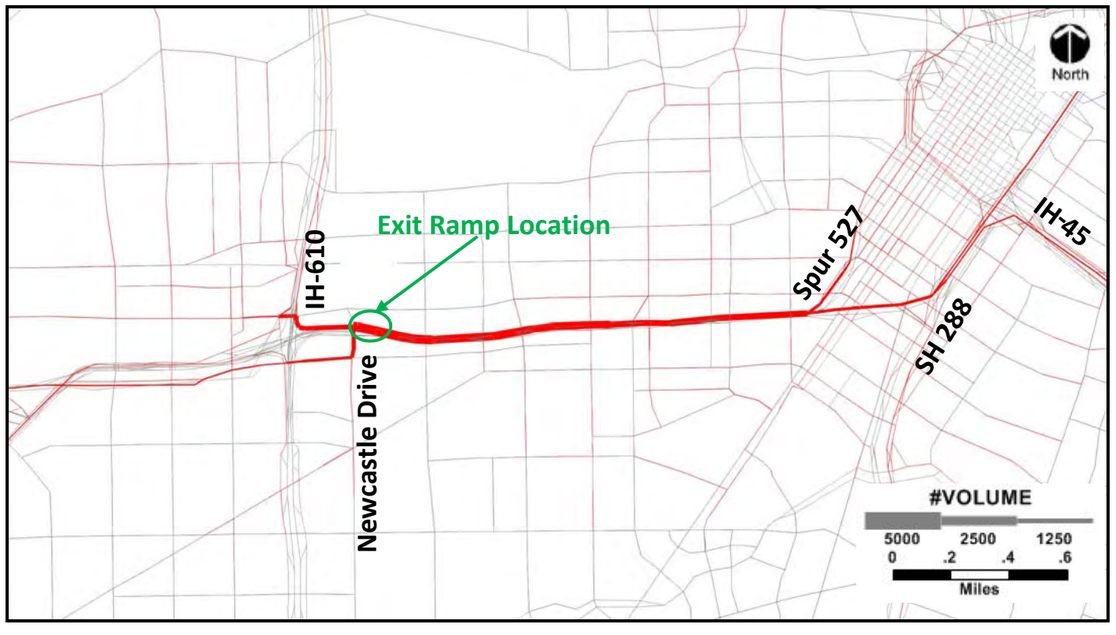
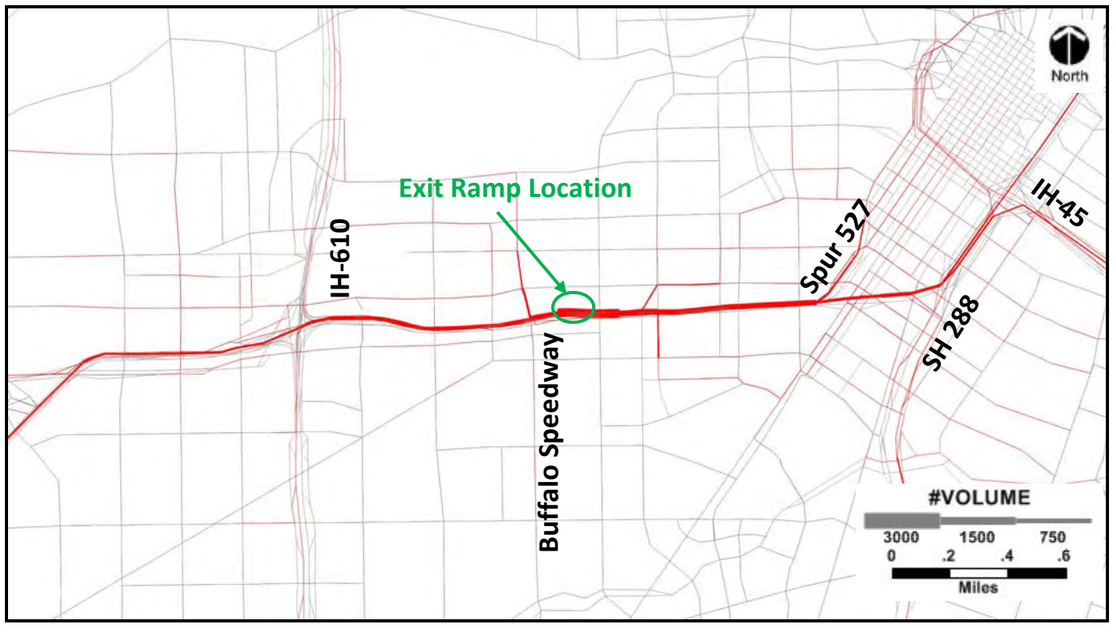
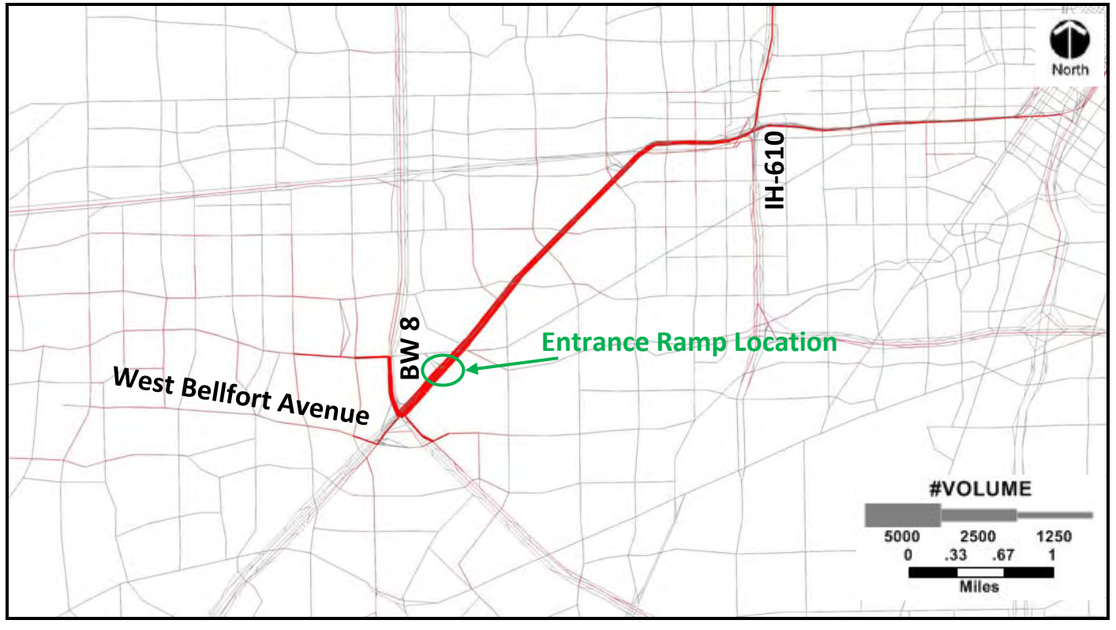


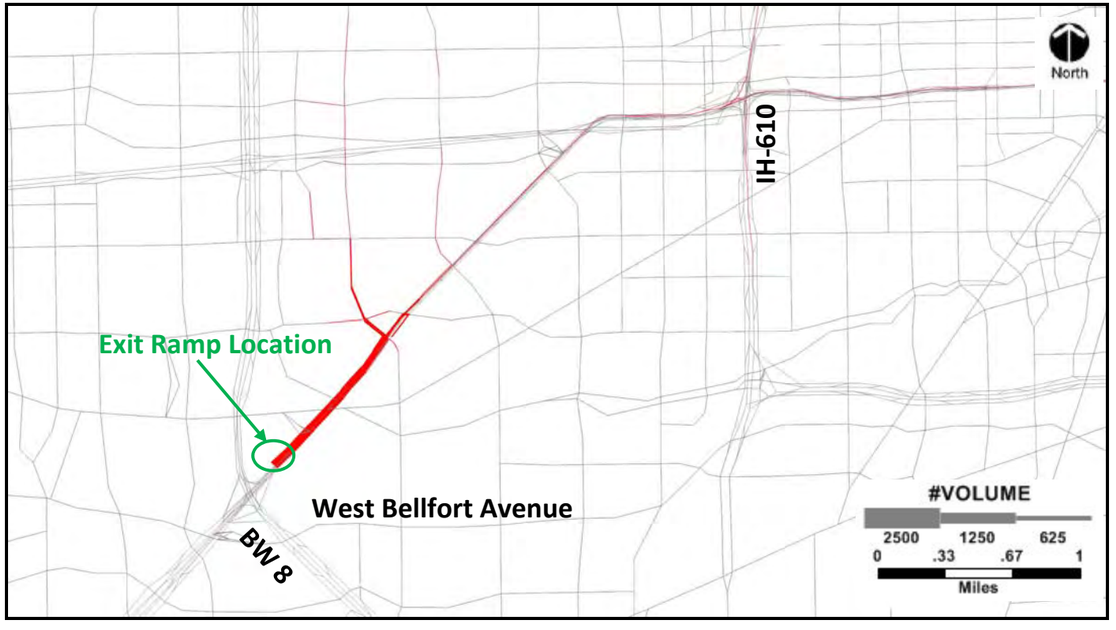
SB Exit Ramp to Buffalo Speedway – PM



NB Entrance Ramp from West Bellfort Avenue – AM



SB Exit Ramp to West Bellfort Avenue – AM



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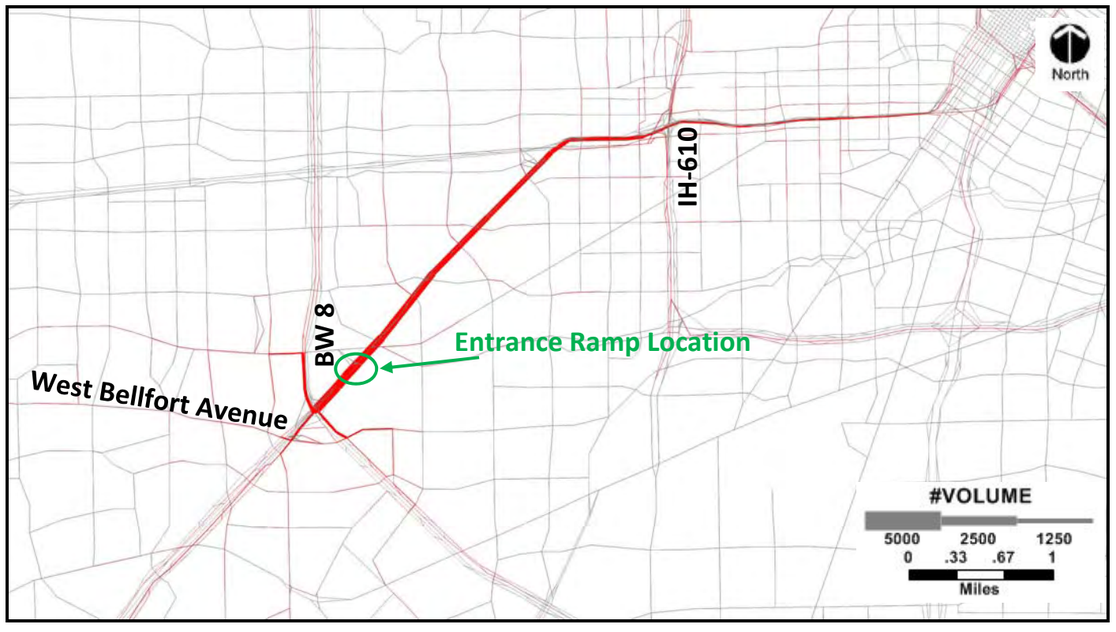
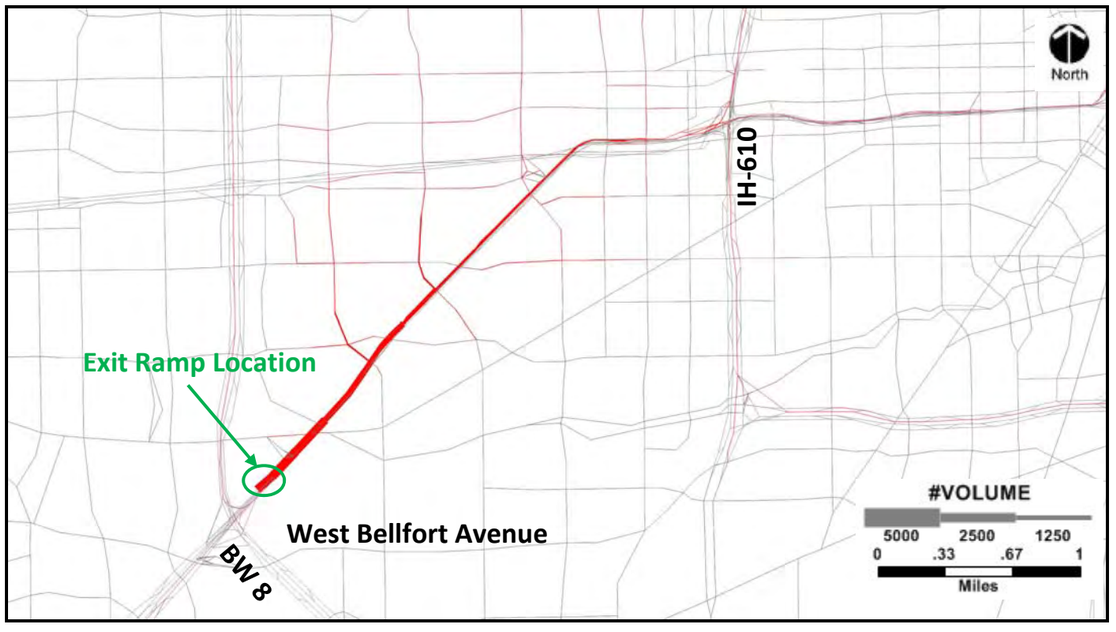
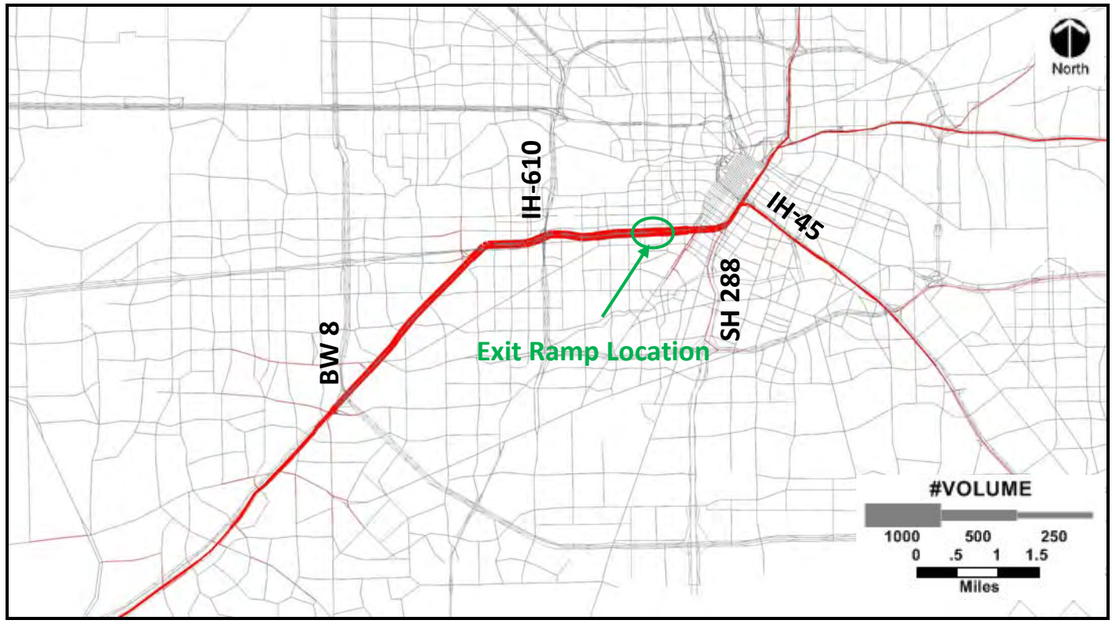


SB Exit Ramp to West Bellfort Avenue – PM

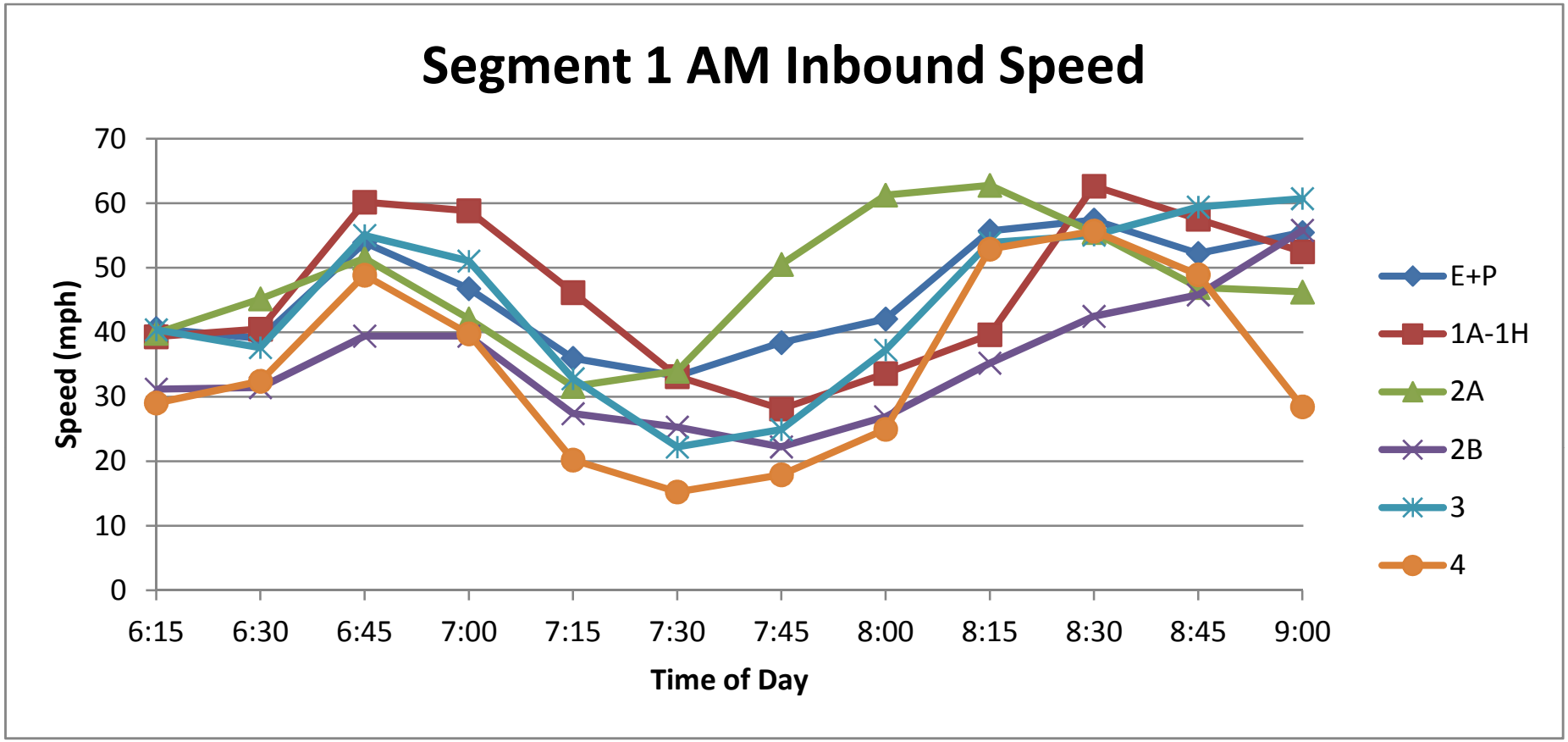


NB HOV/HOT Exit Ramp to General Purpose Lanes near Hazard Street – AM

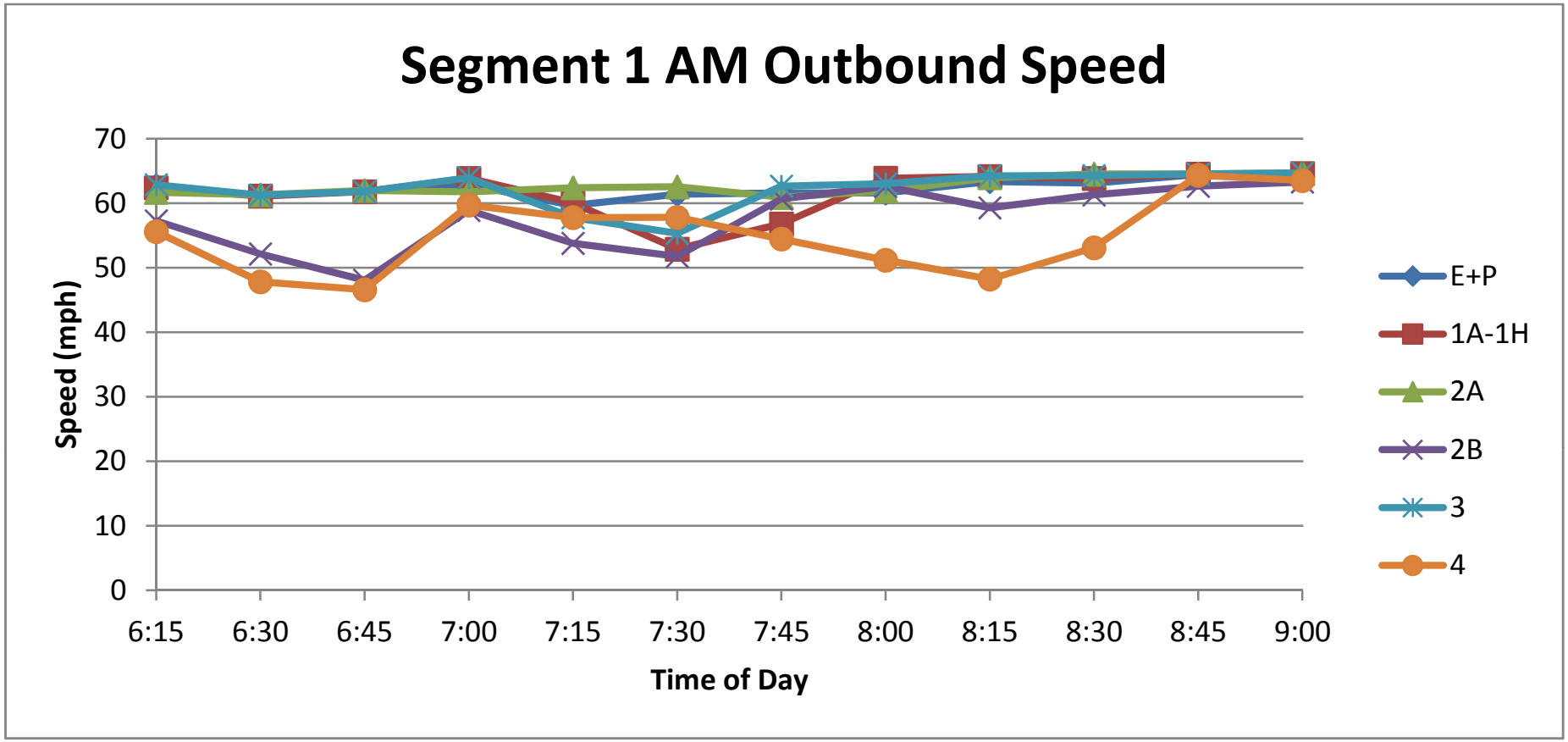


APPENDIX C

2011 DynusT Results - H-GAC Models



2011 DynusT Results - H-GAC Models



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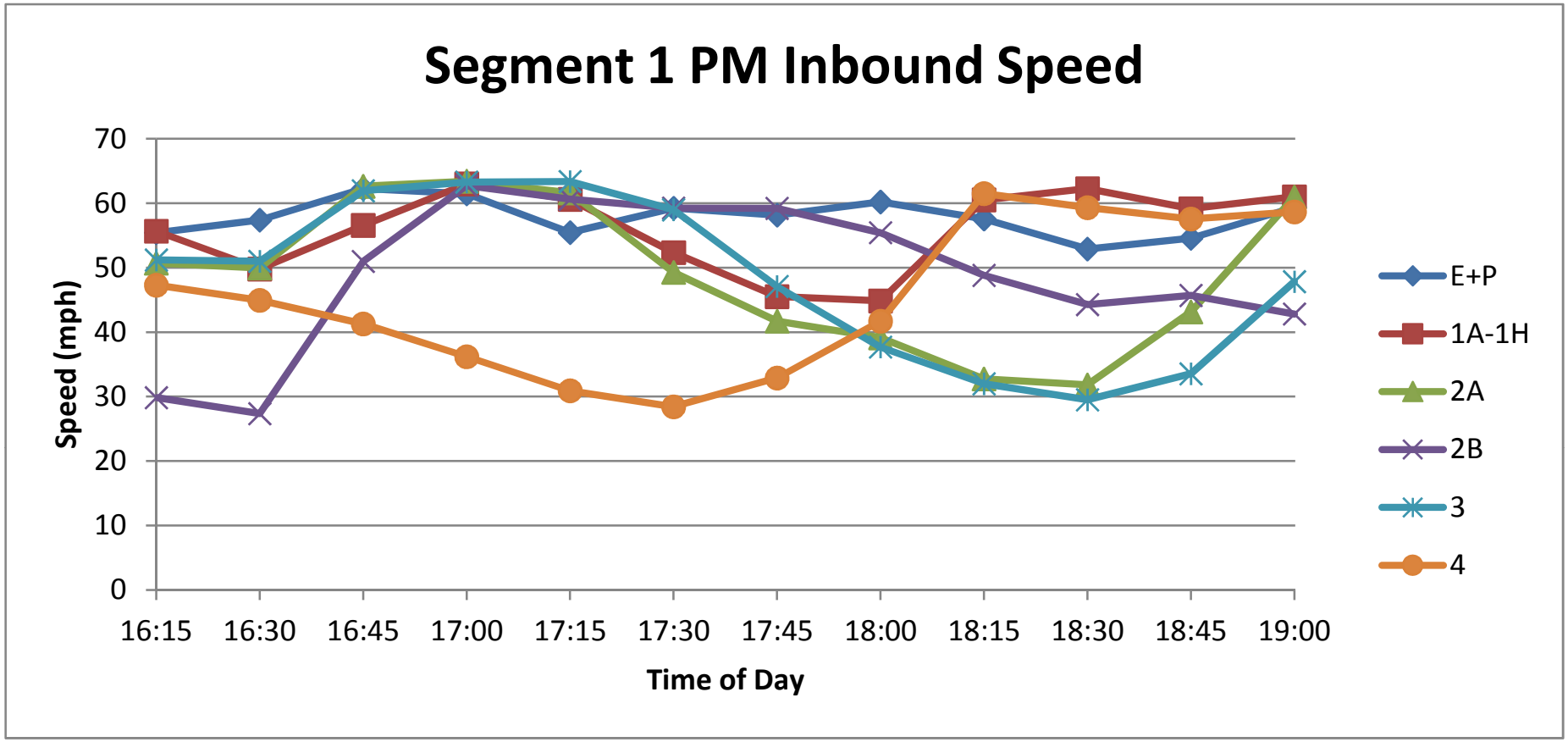

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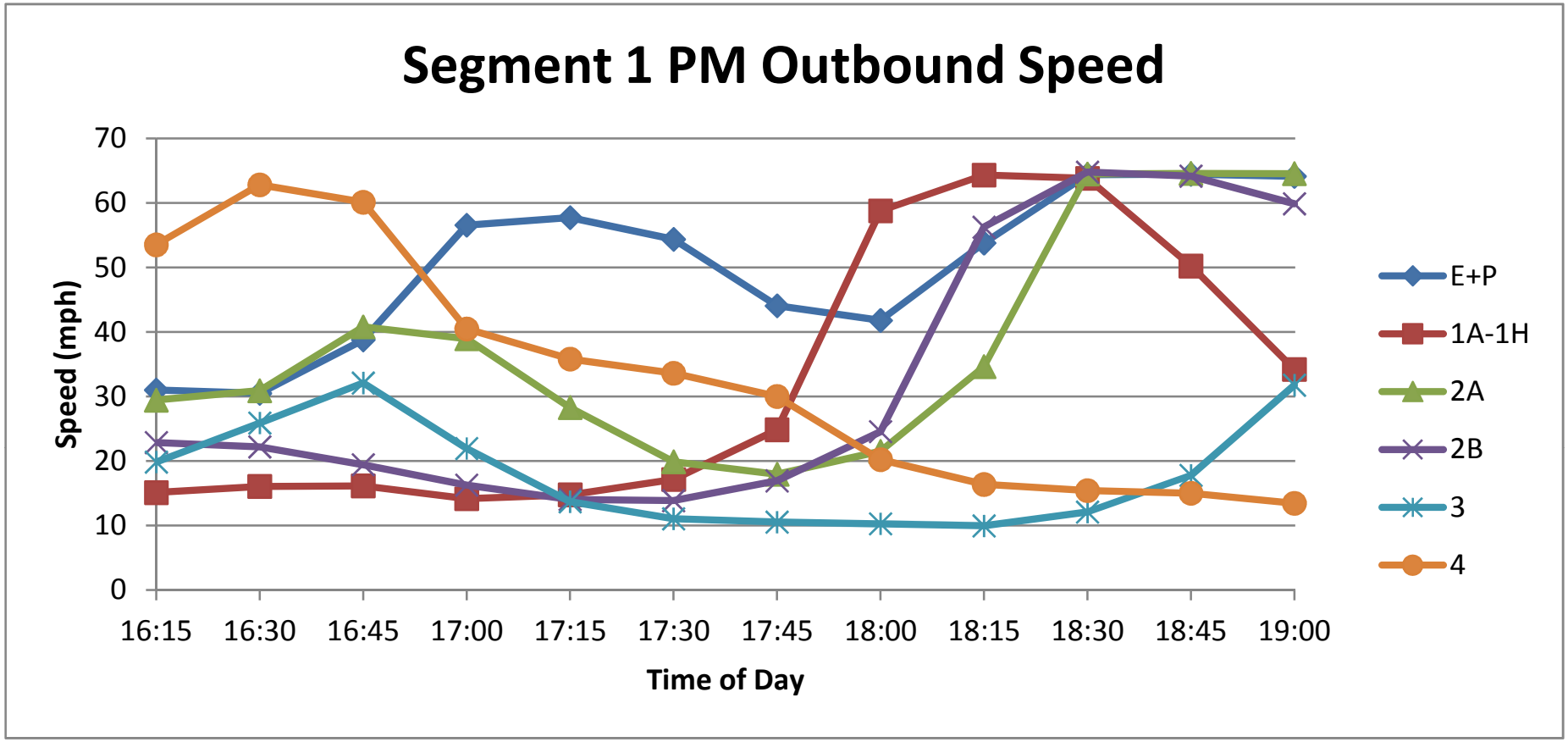

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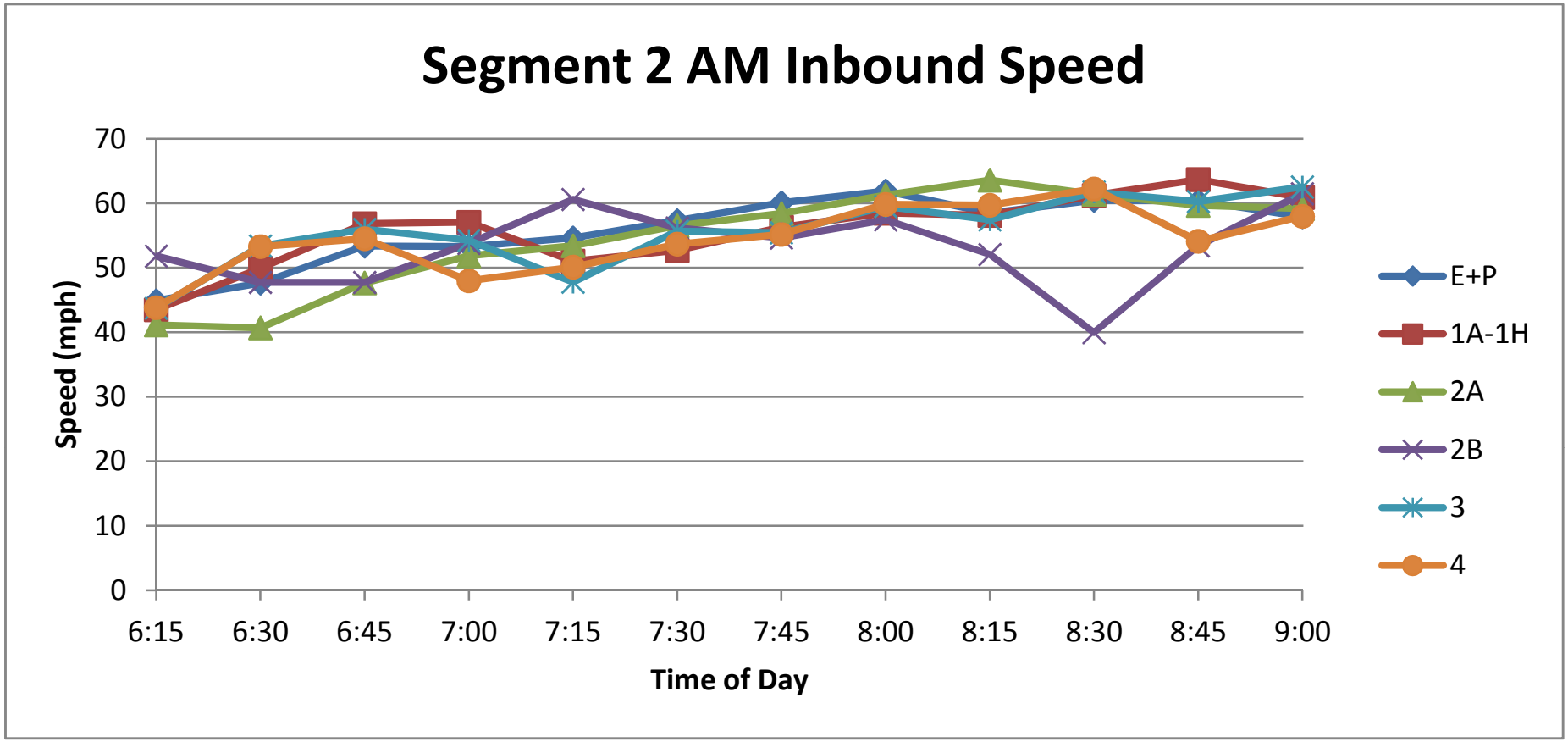
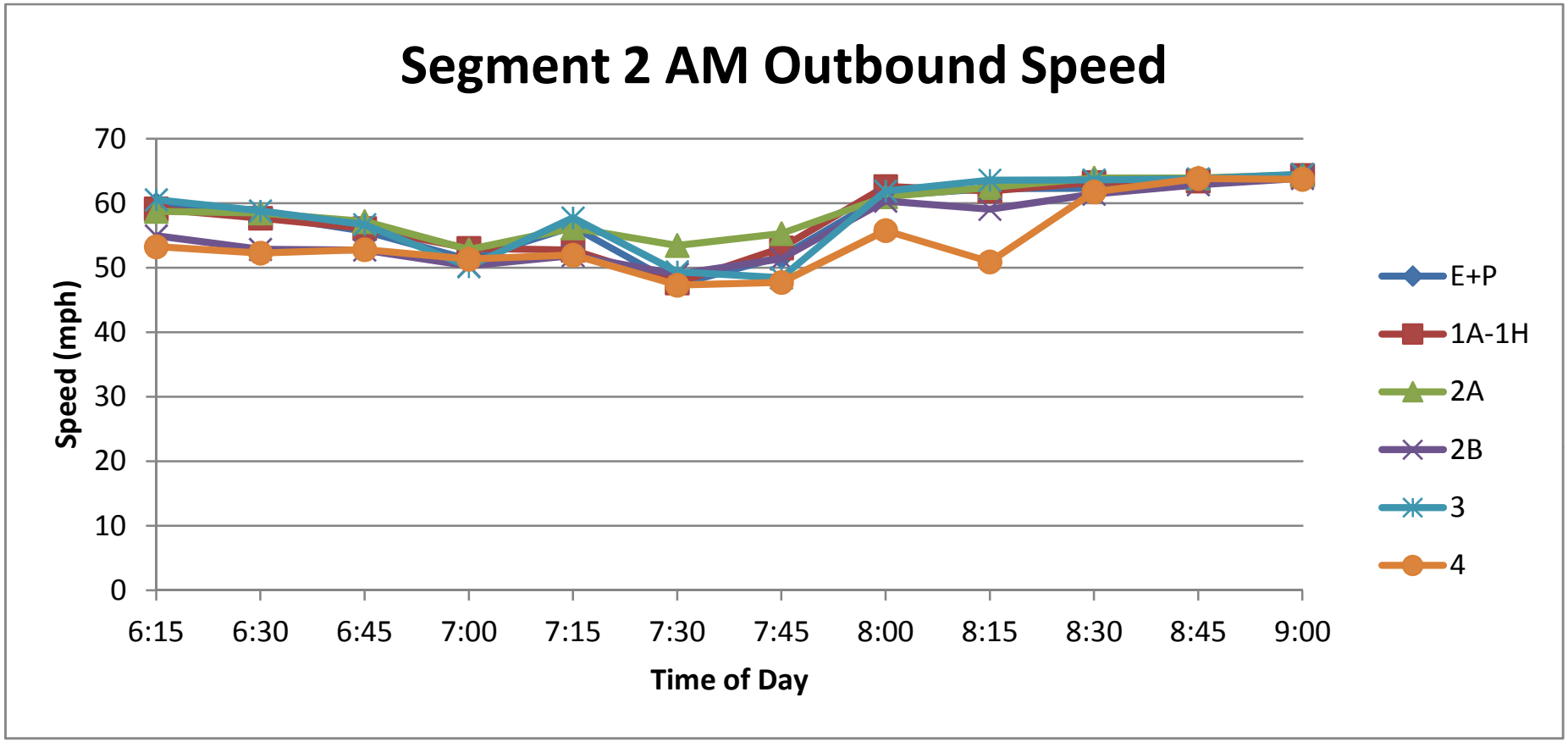


2011 DynusT Results - H-GAC Models



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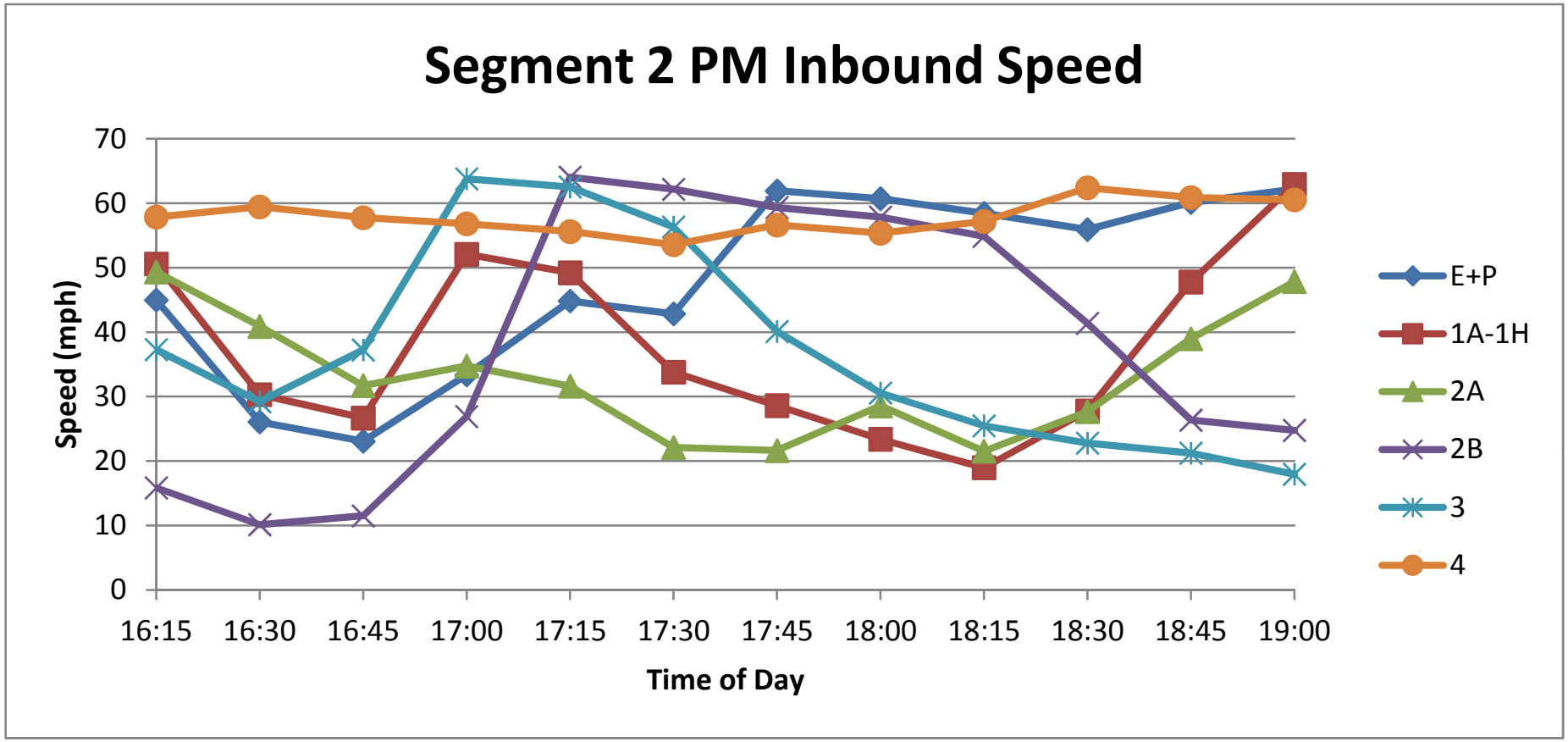
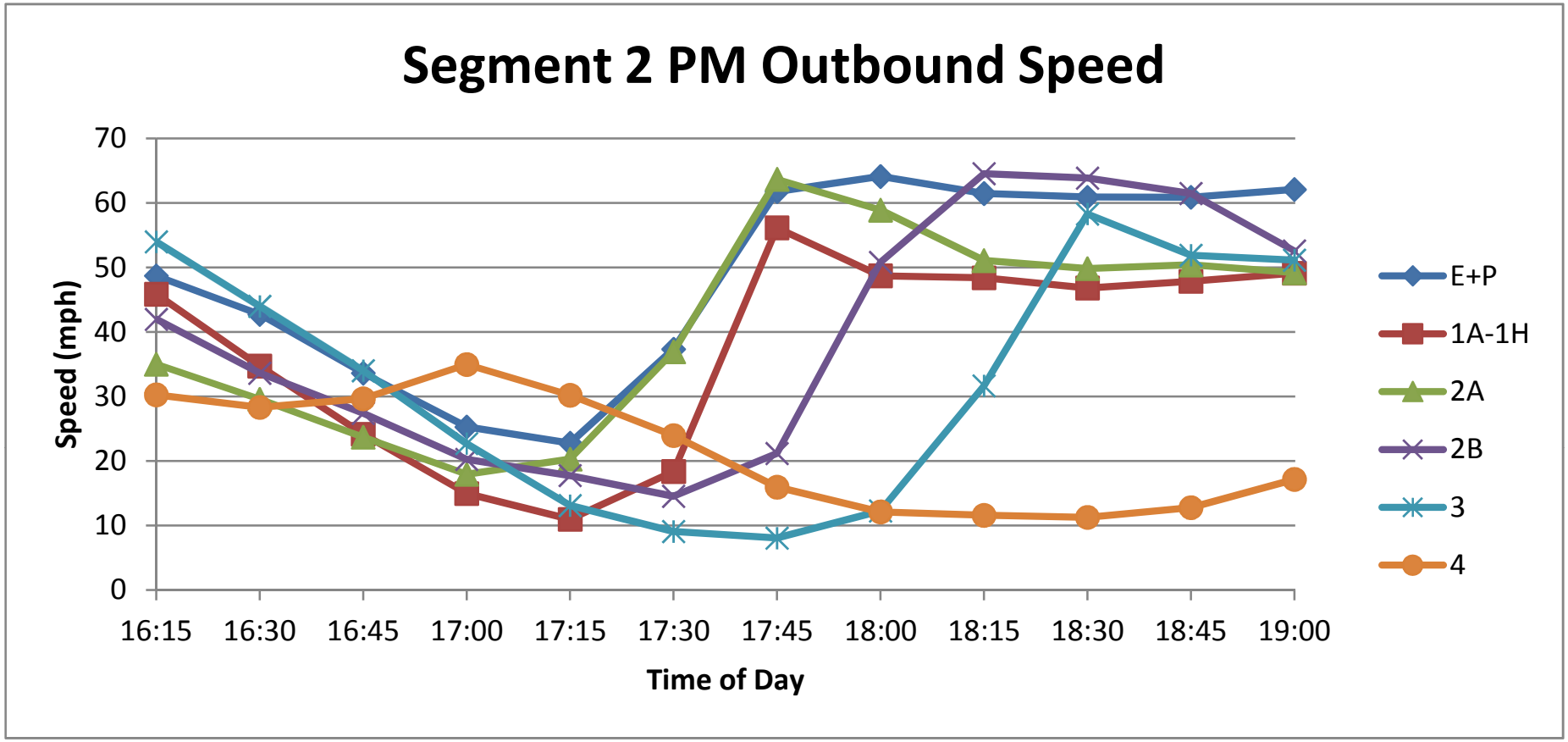
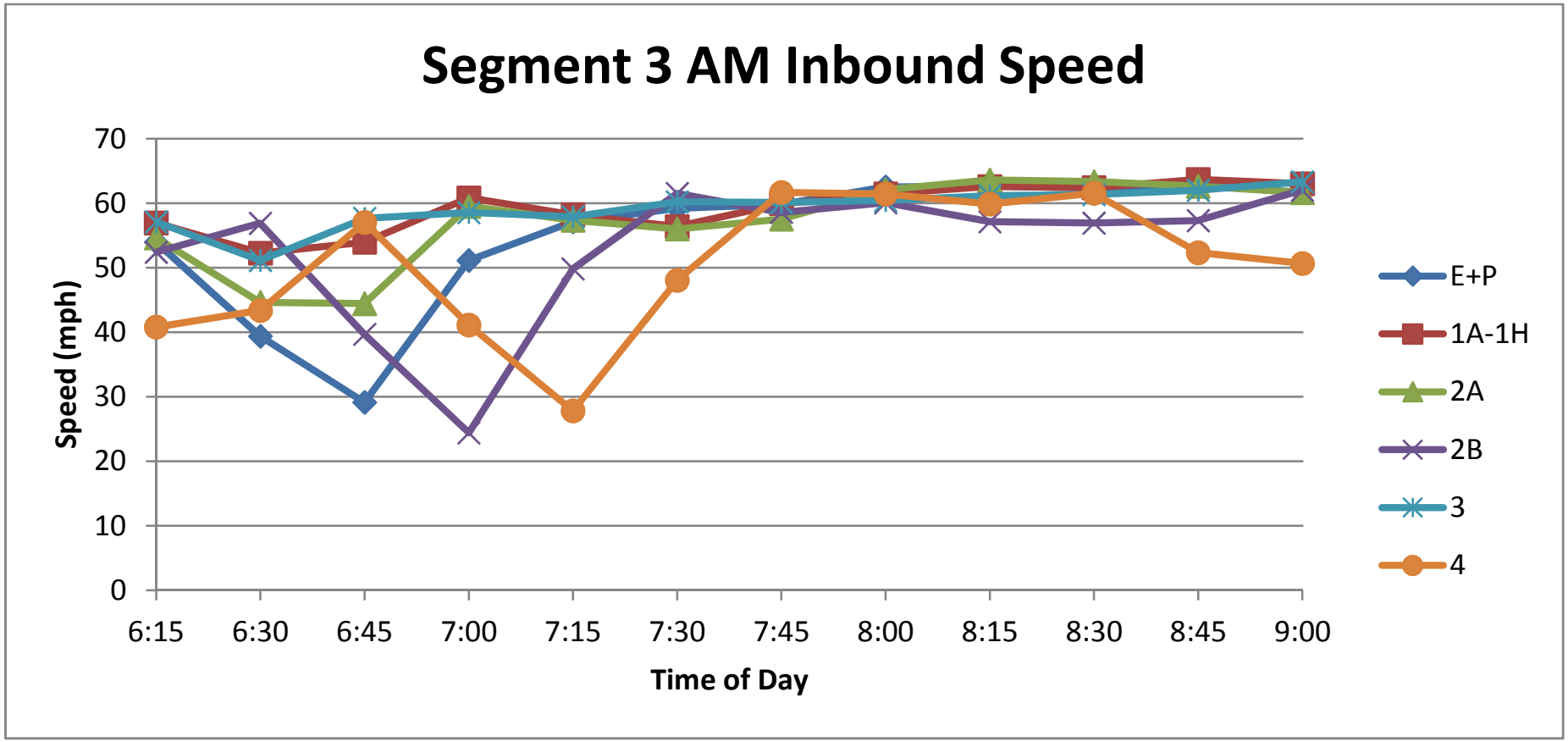


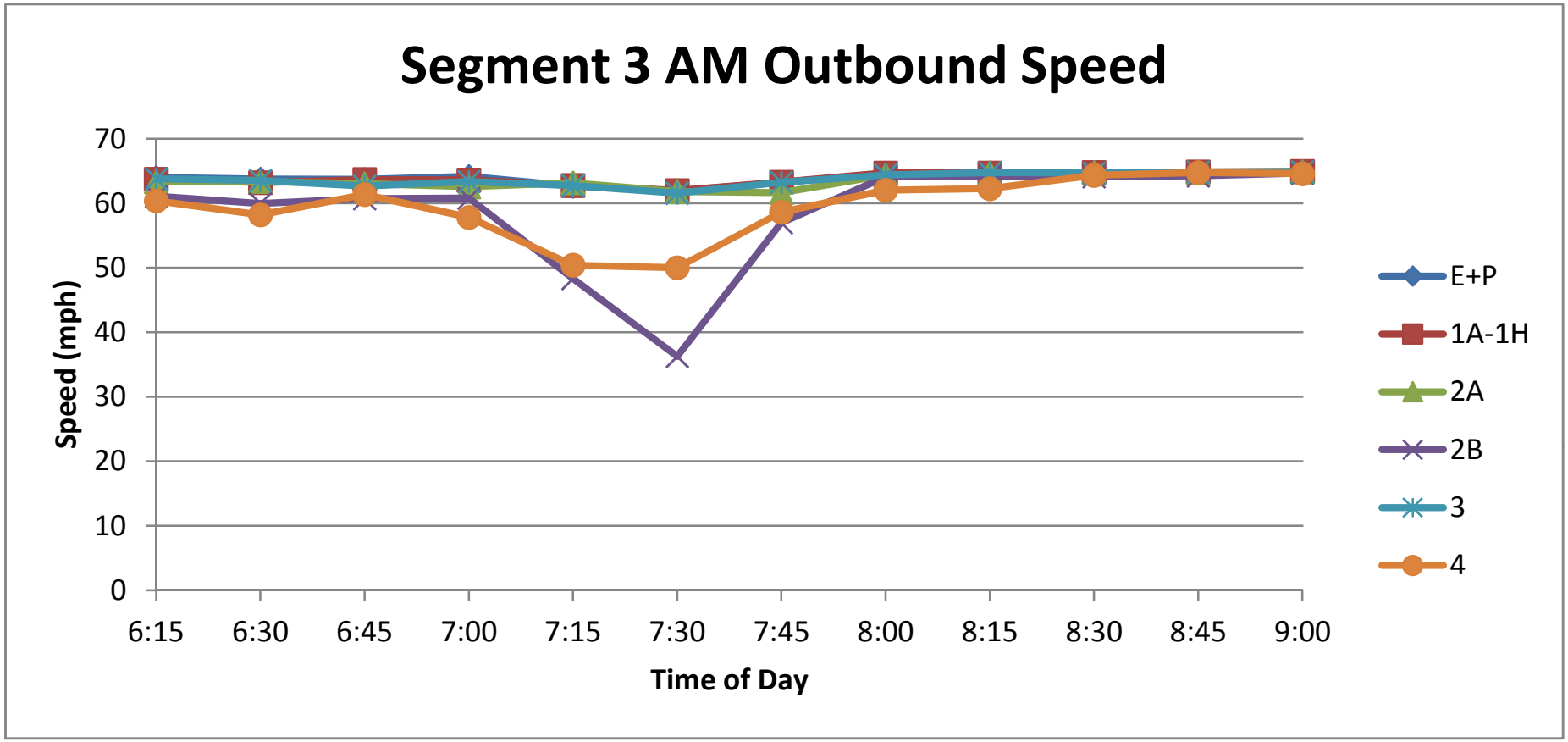
2011 DynusT Results - H-GAC Models



2011 DynusT Results - H-GAC Models



2011 DynusT Results - H-GAC Models



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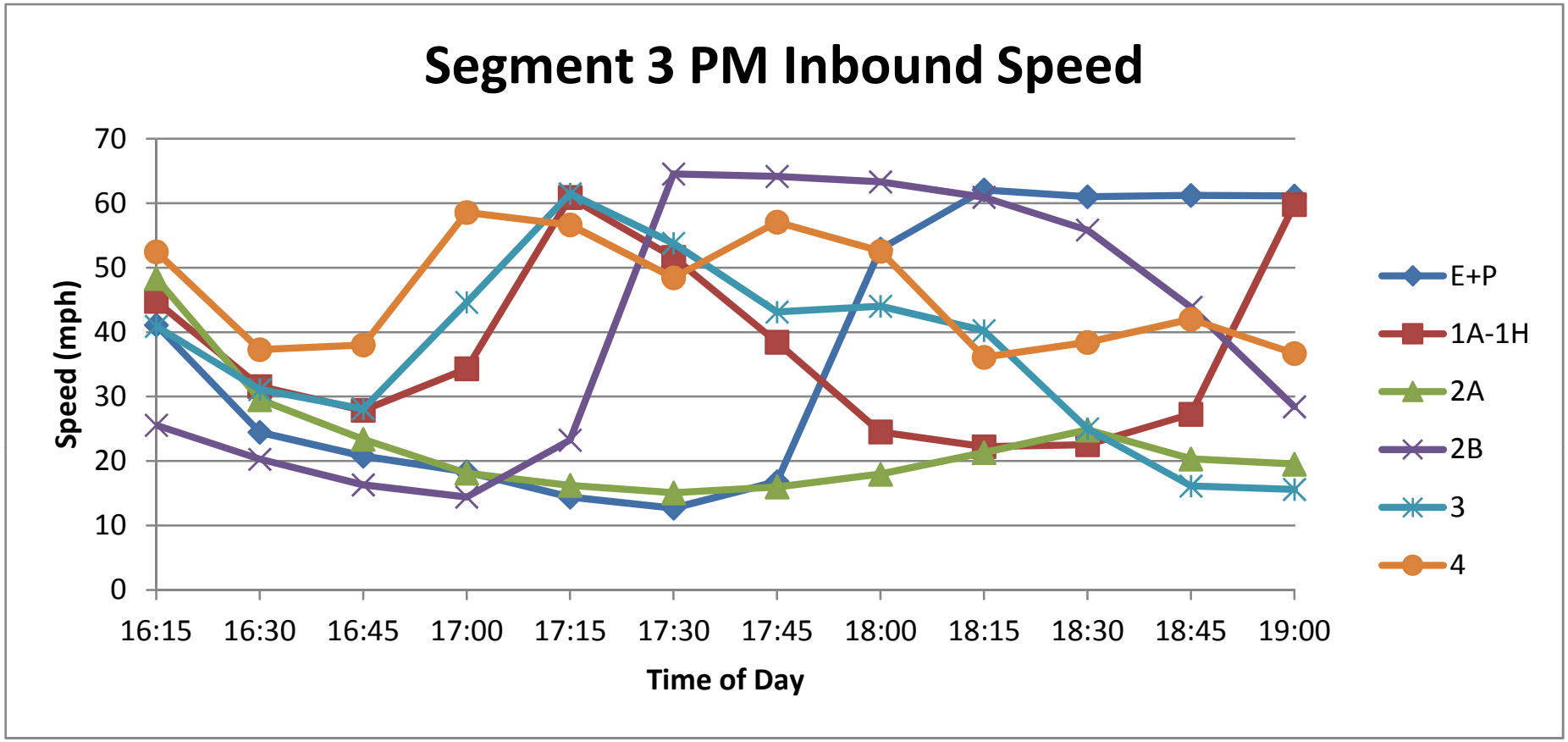

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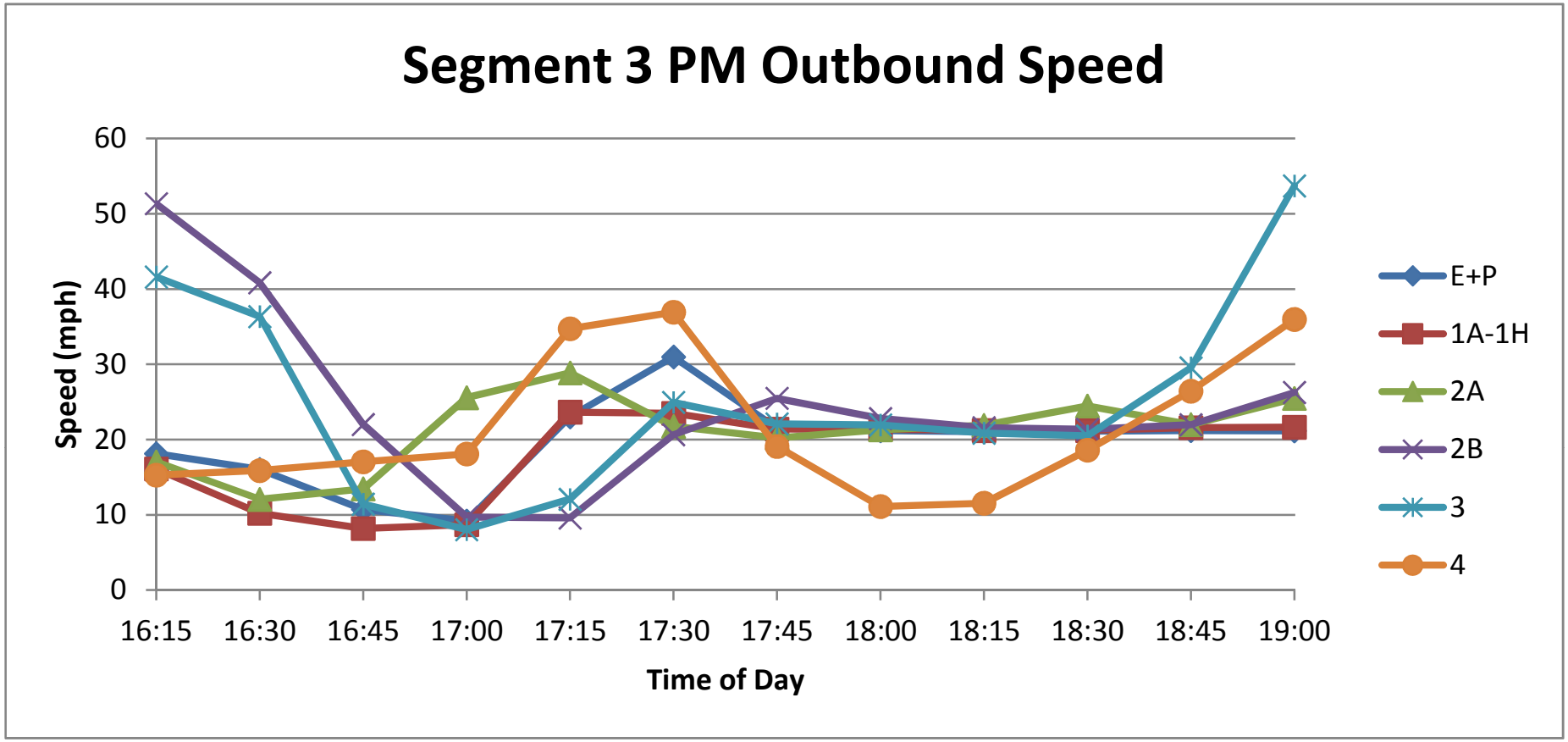

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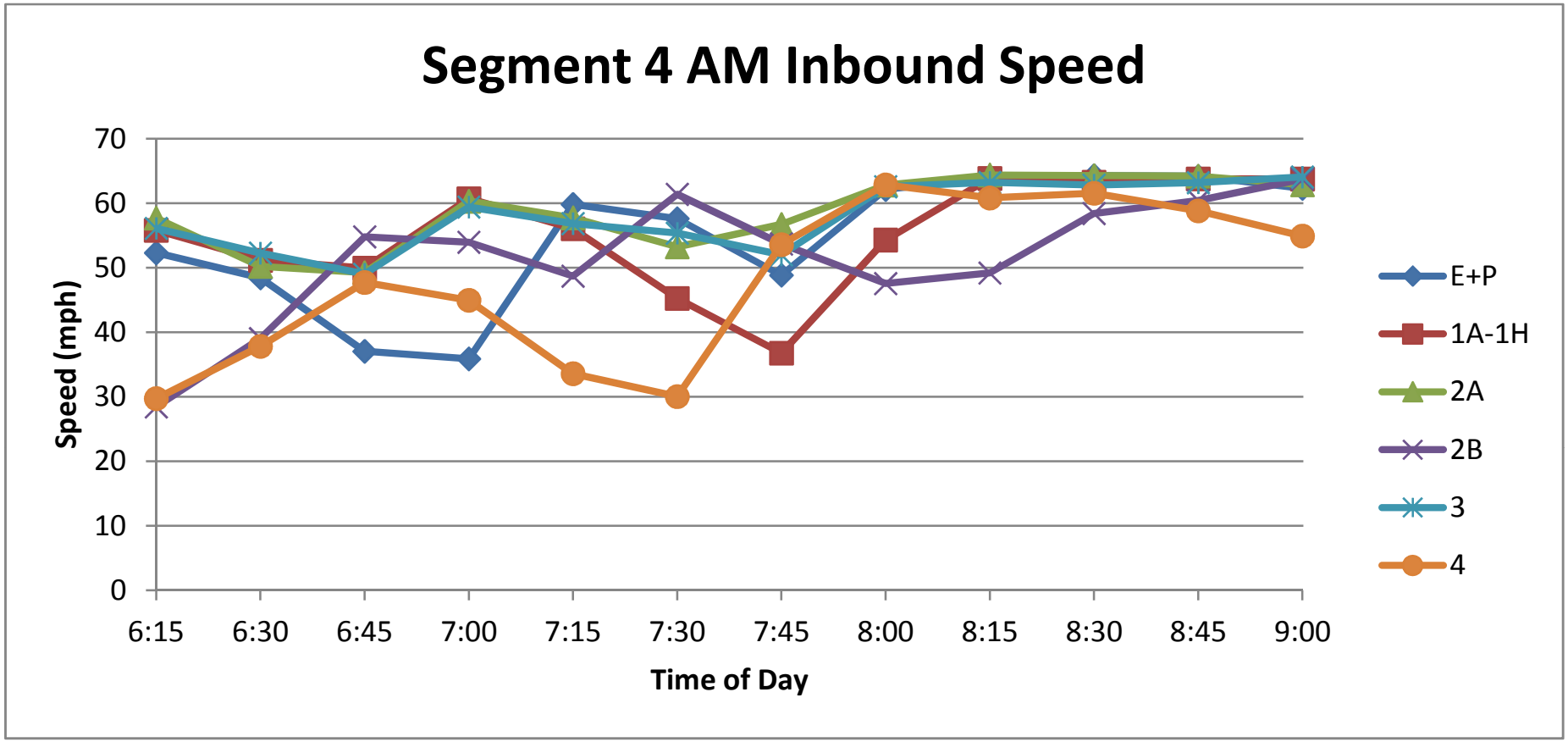

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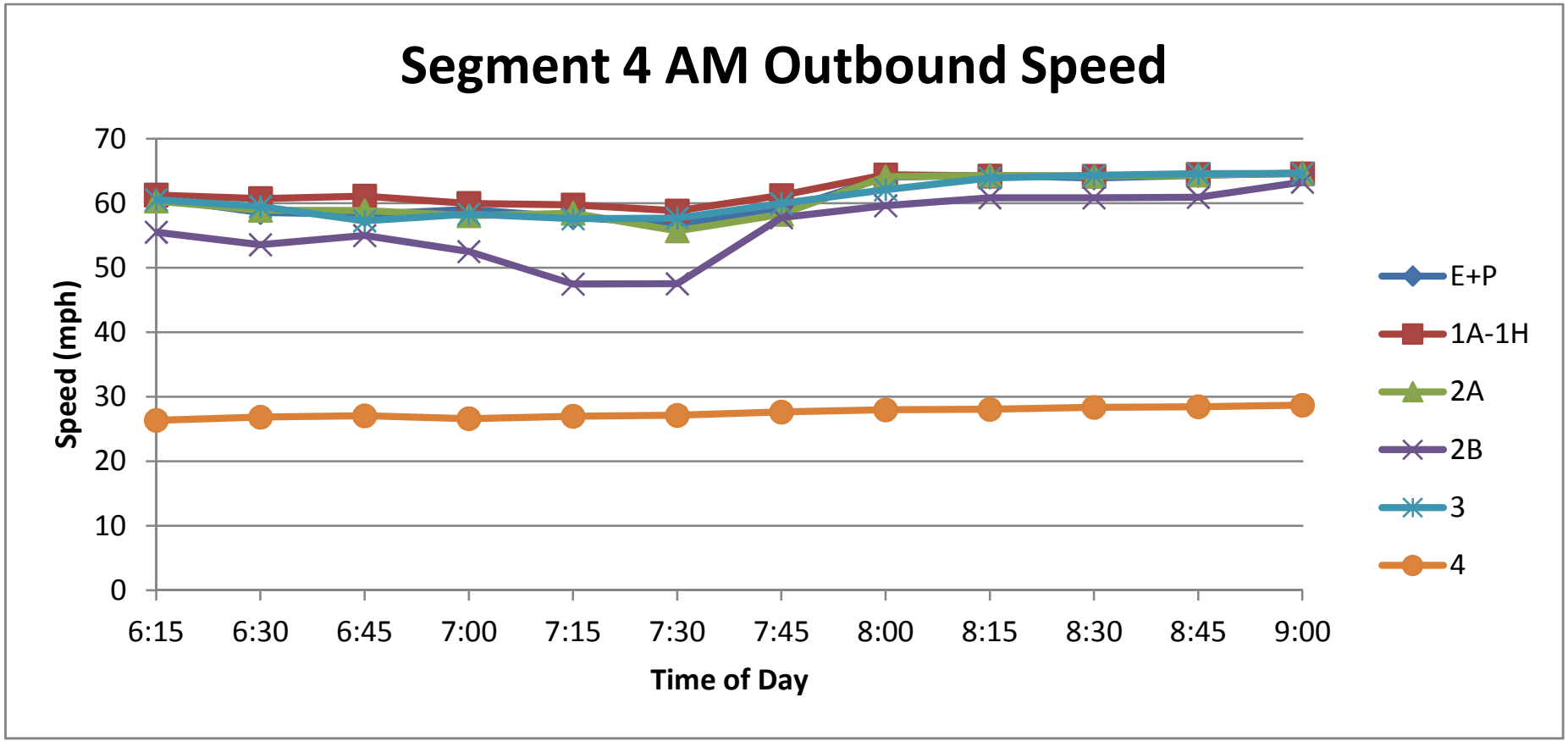

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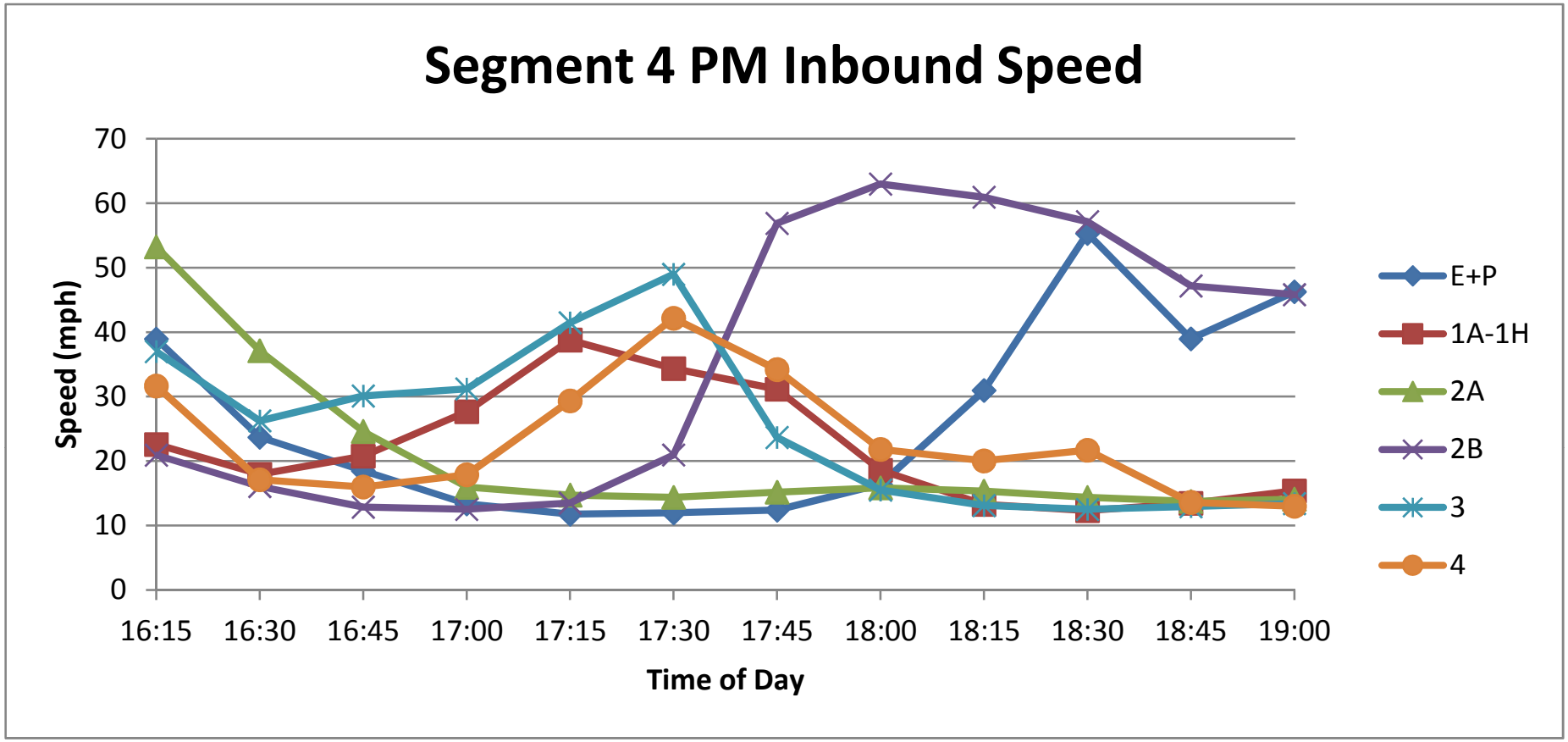

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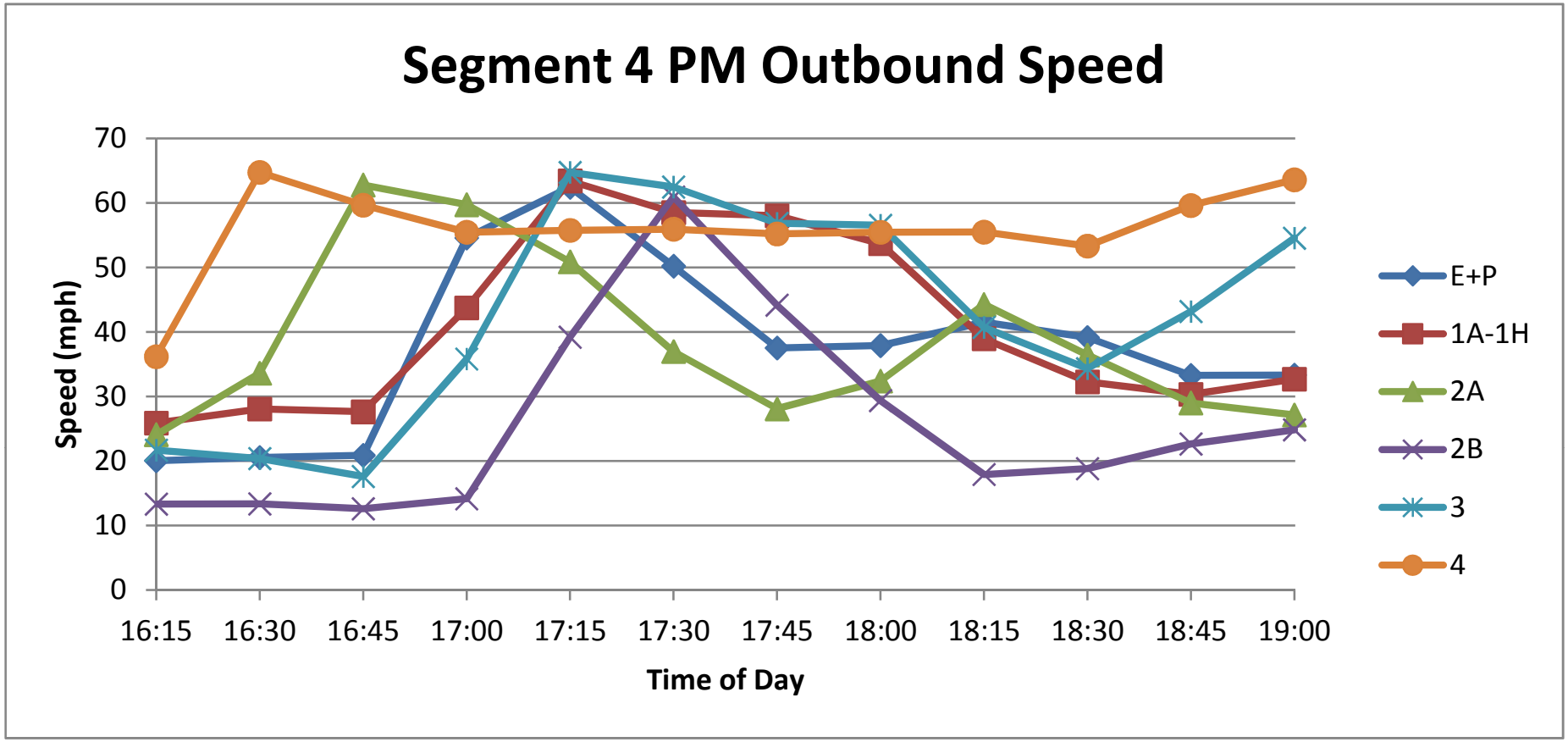

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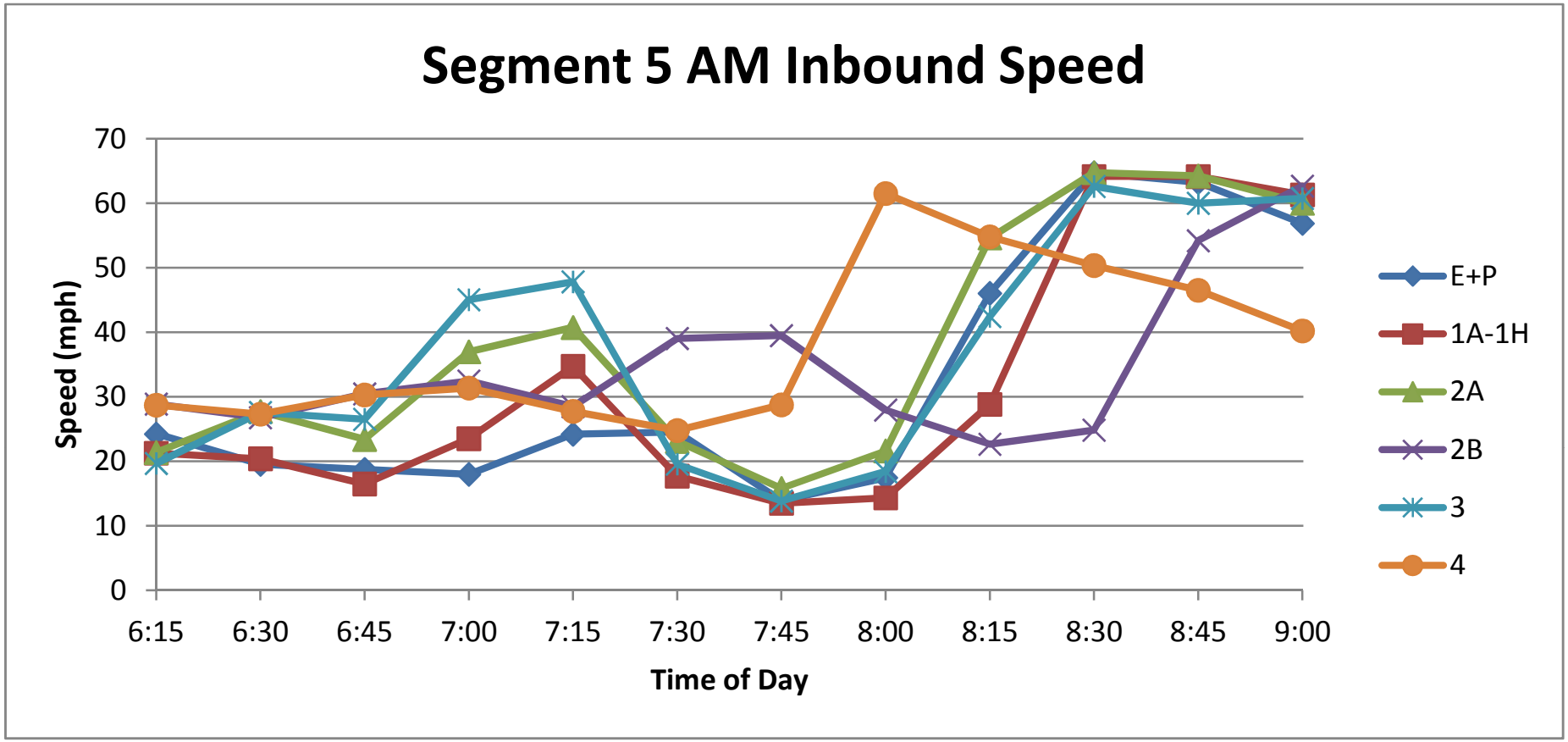

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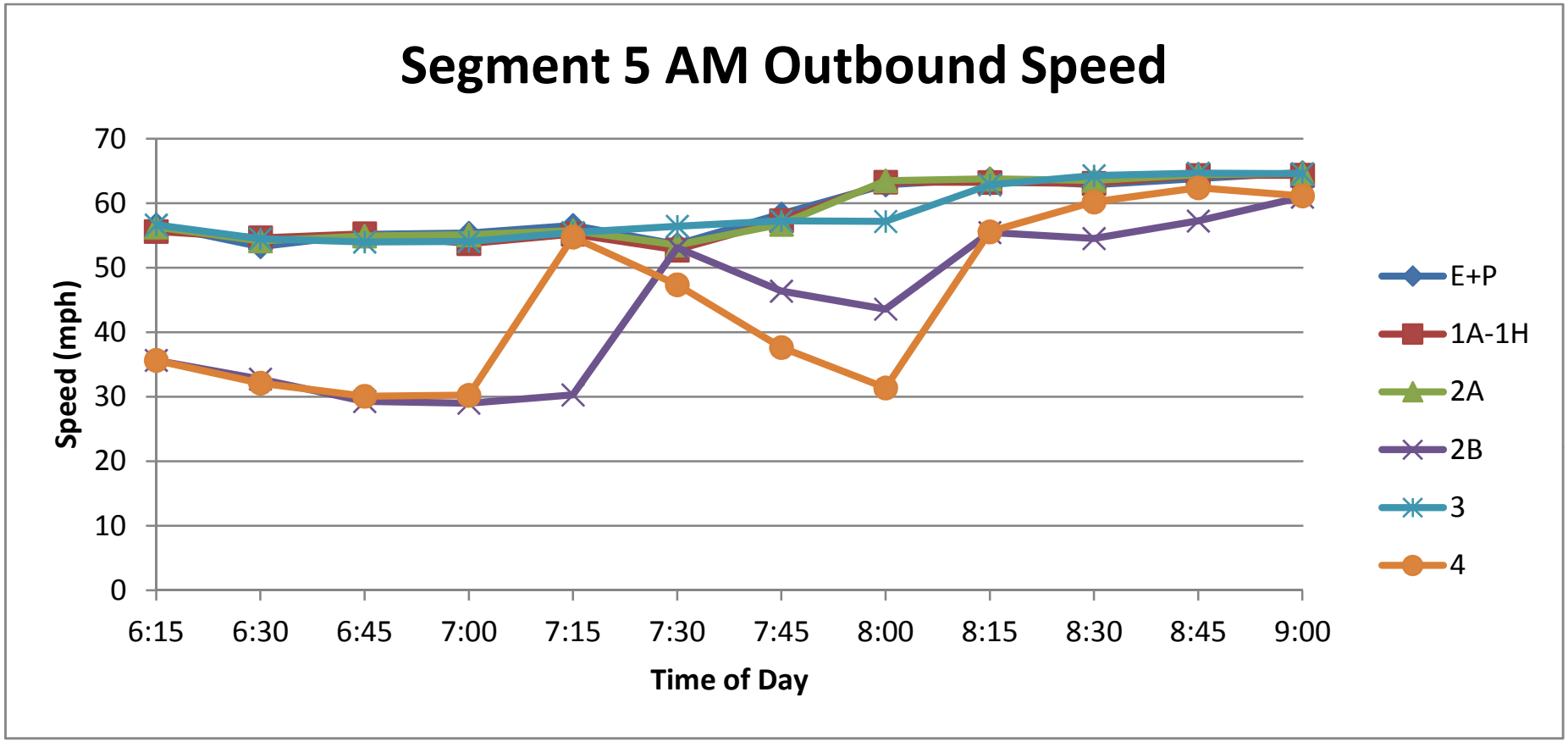

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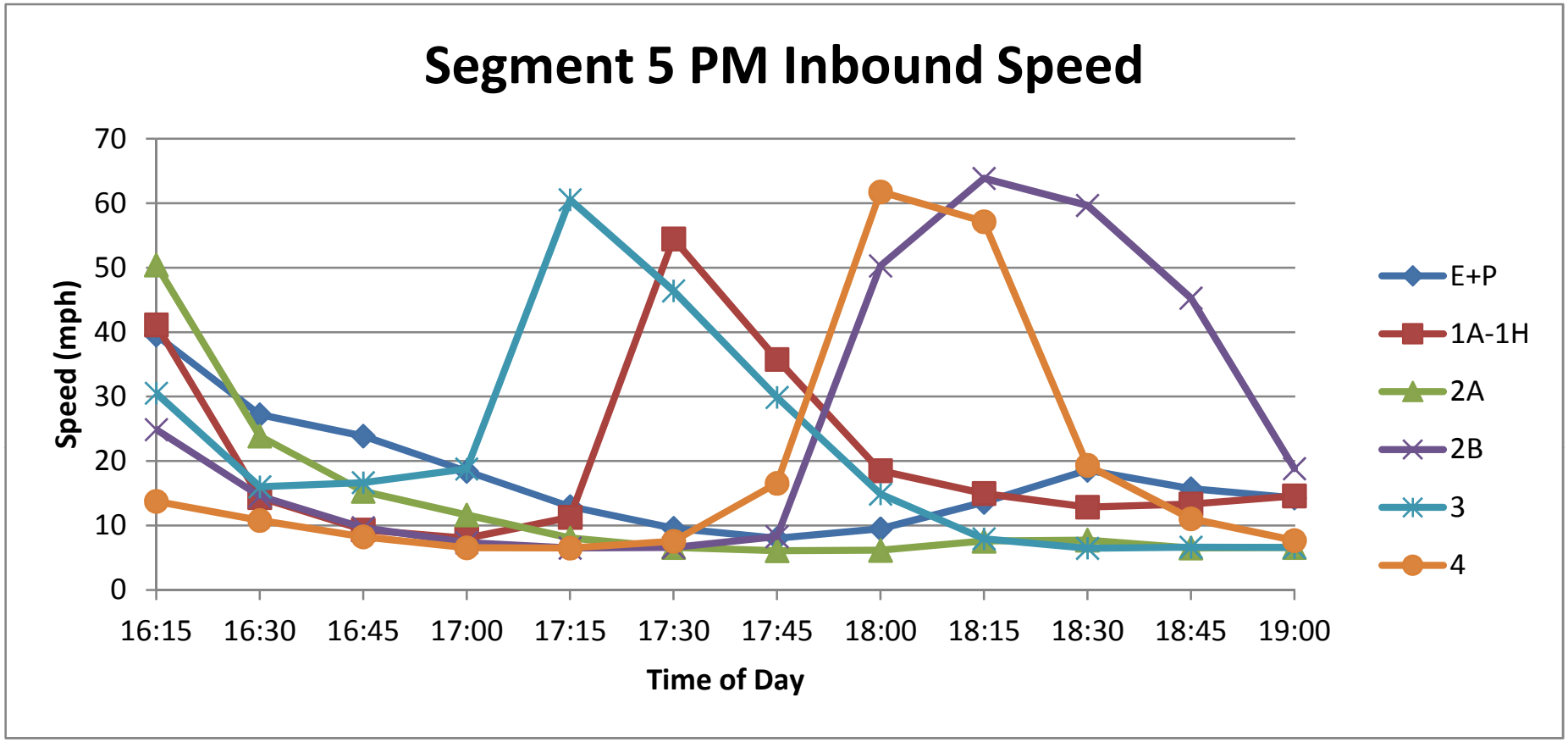

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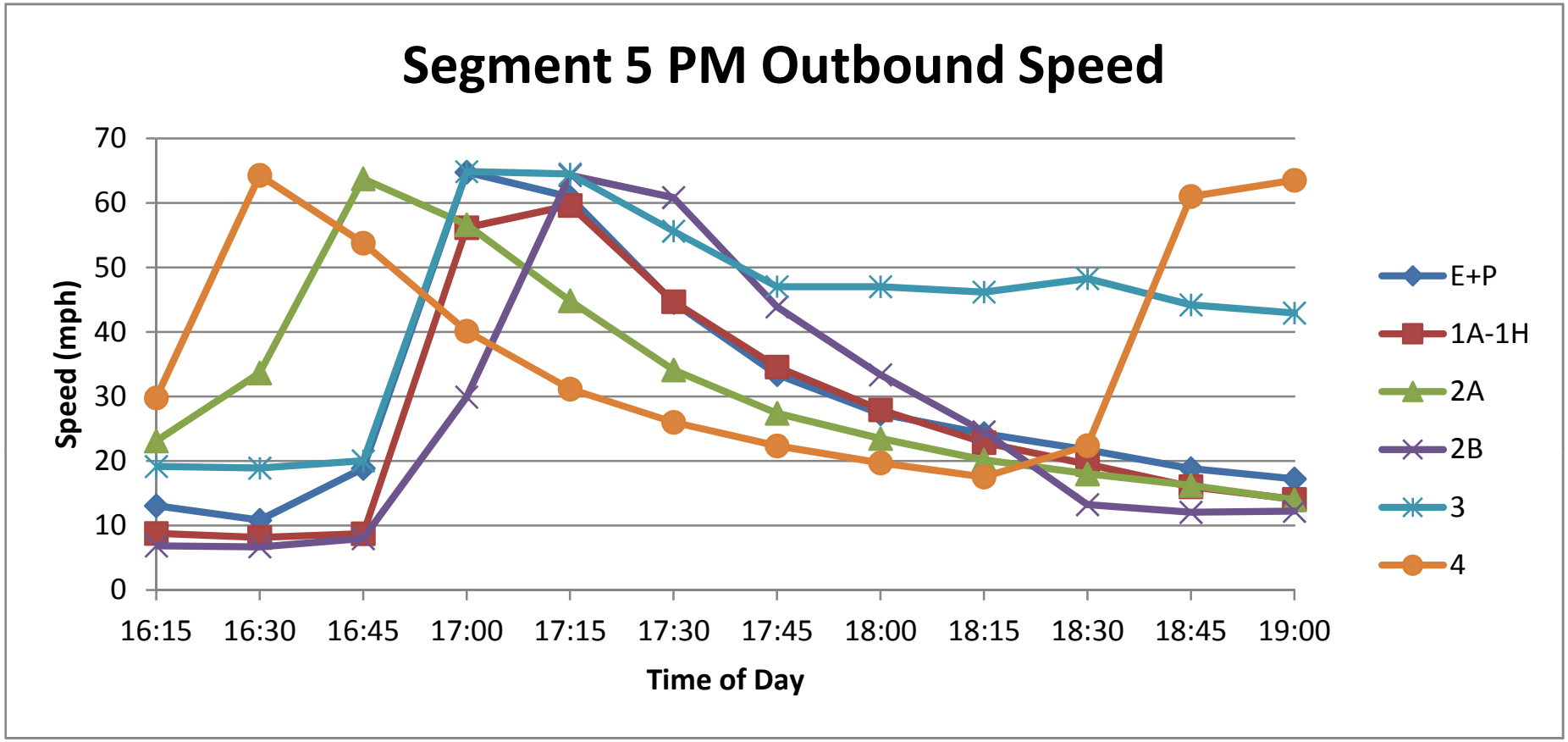

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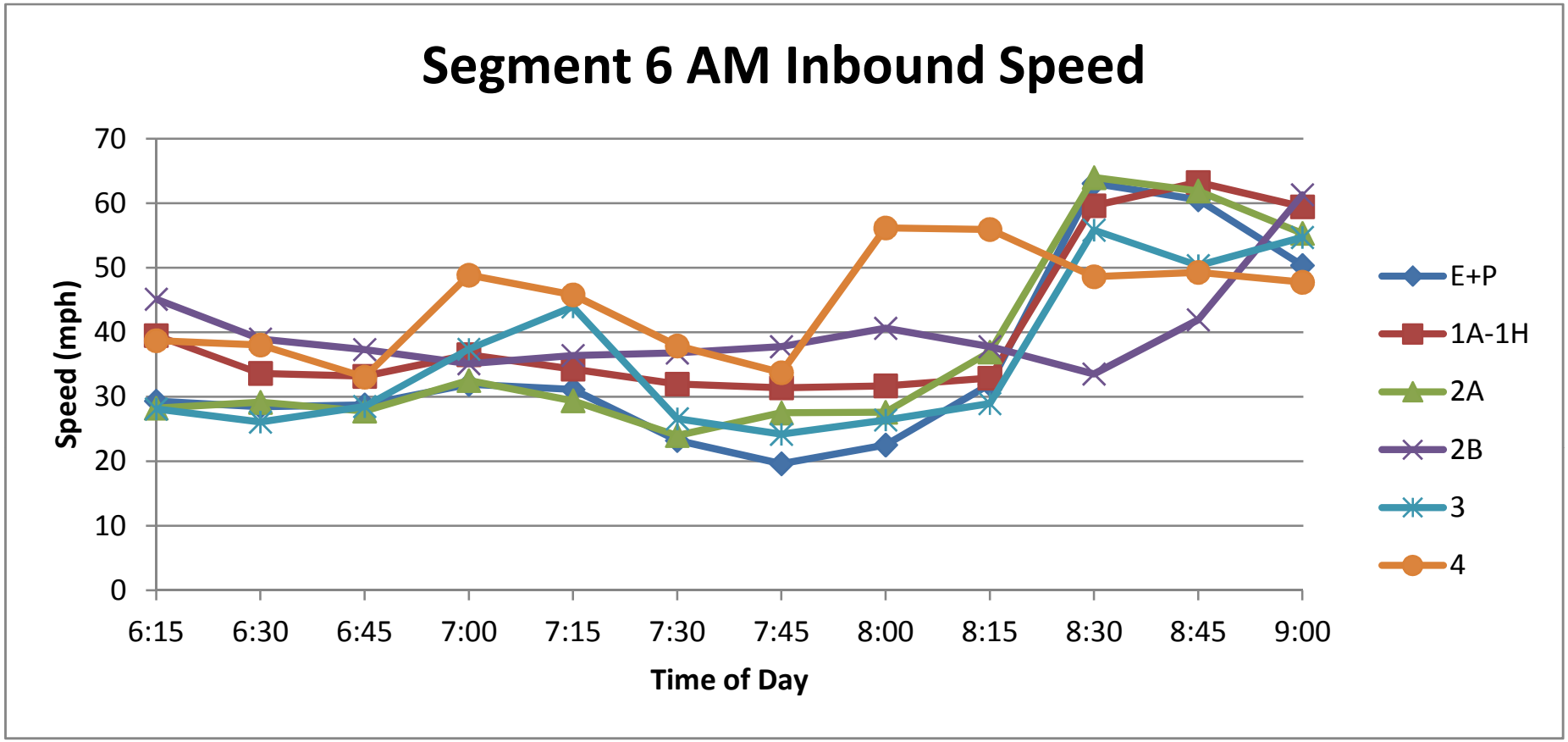

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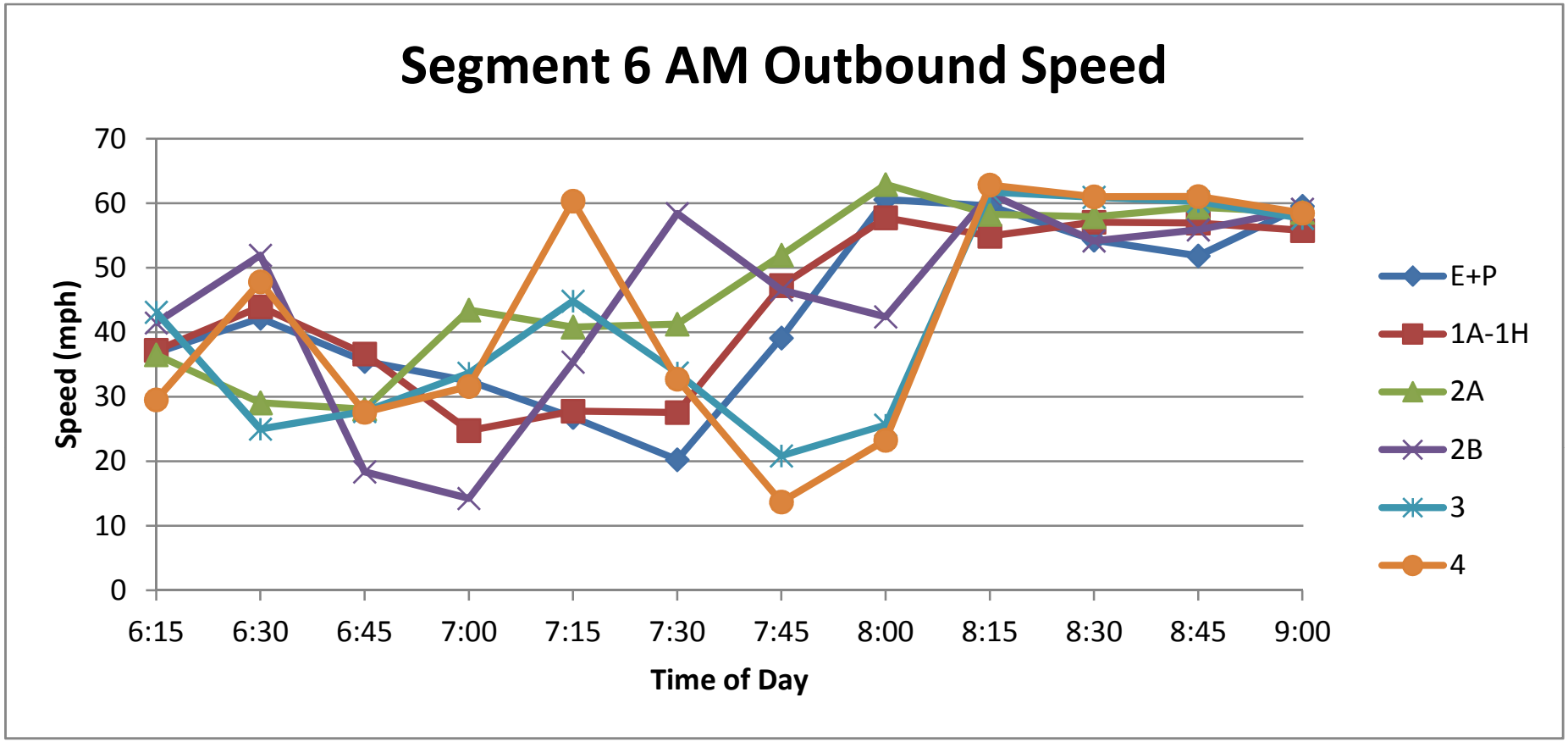

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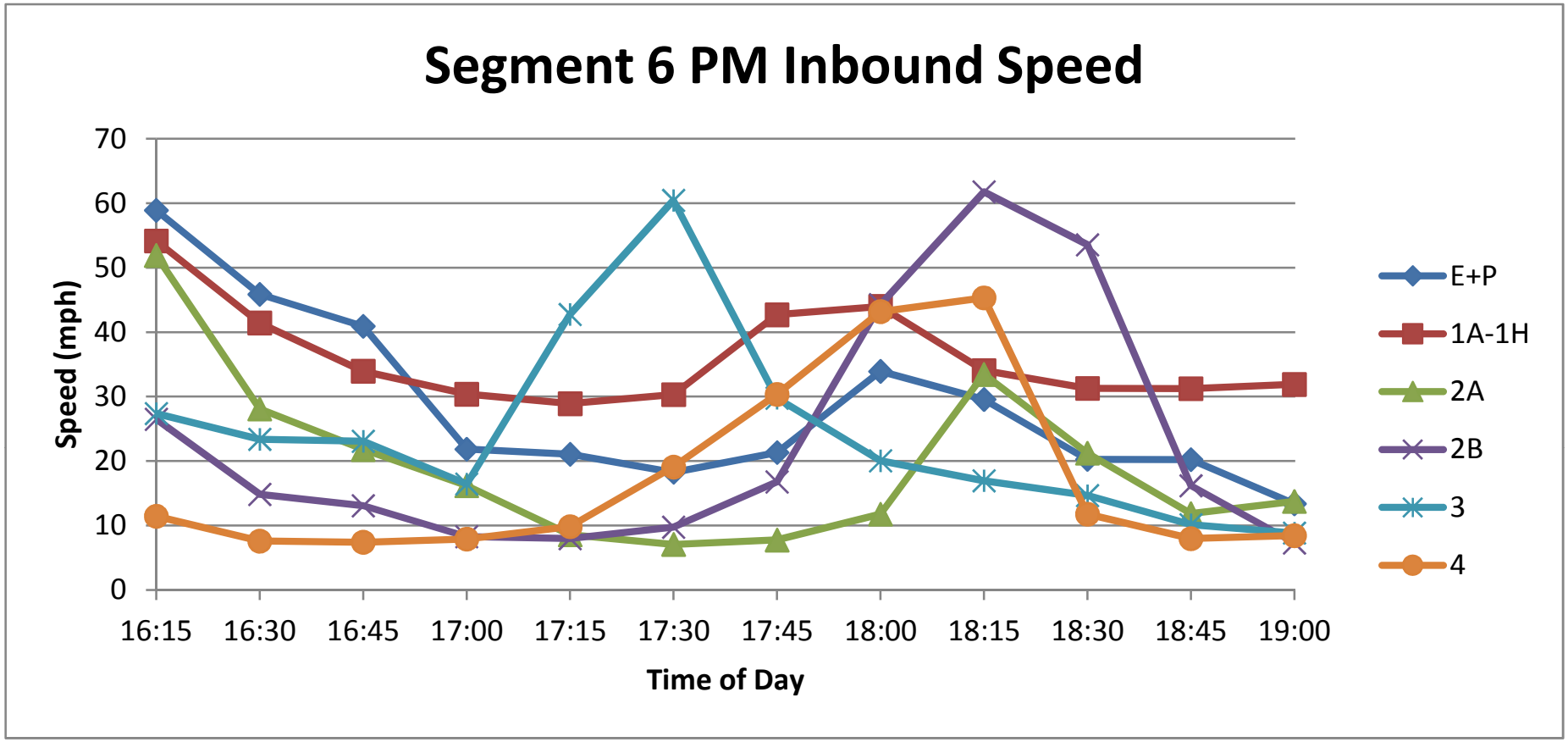

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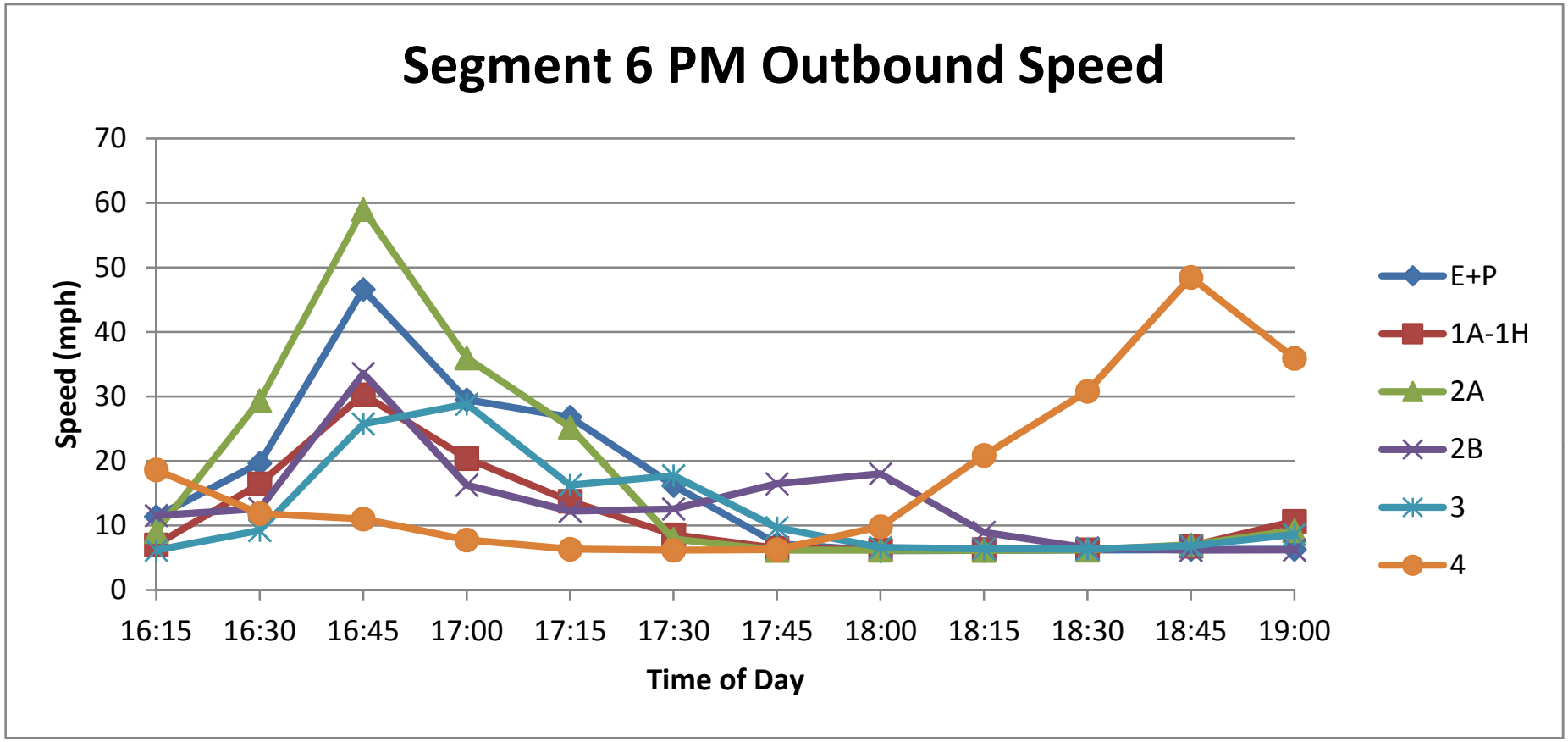

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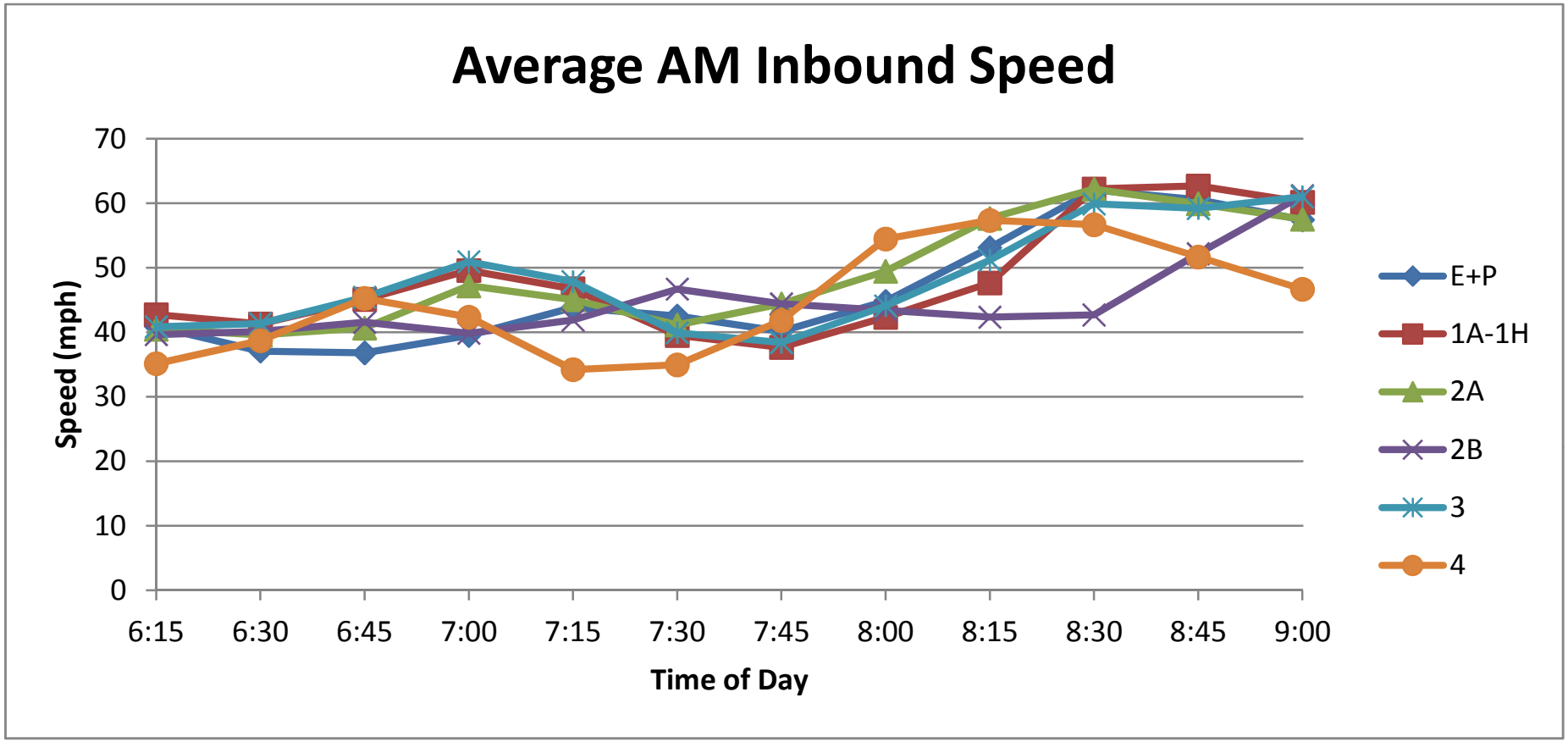

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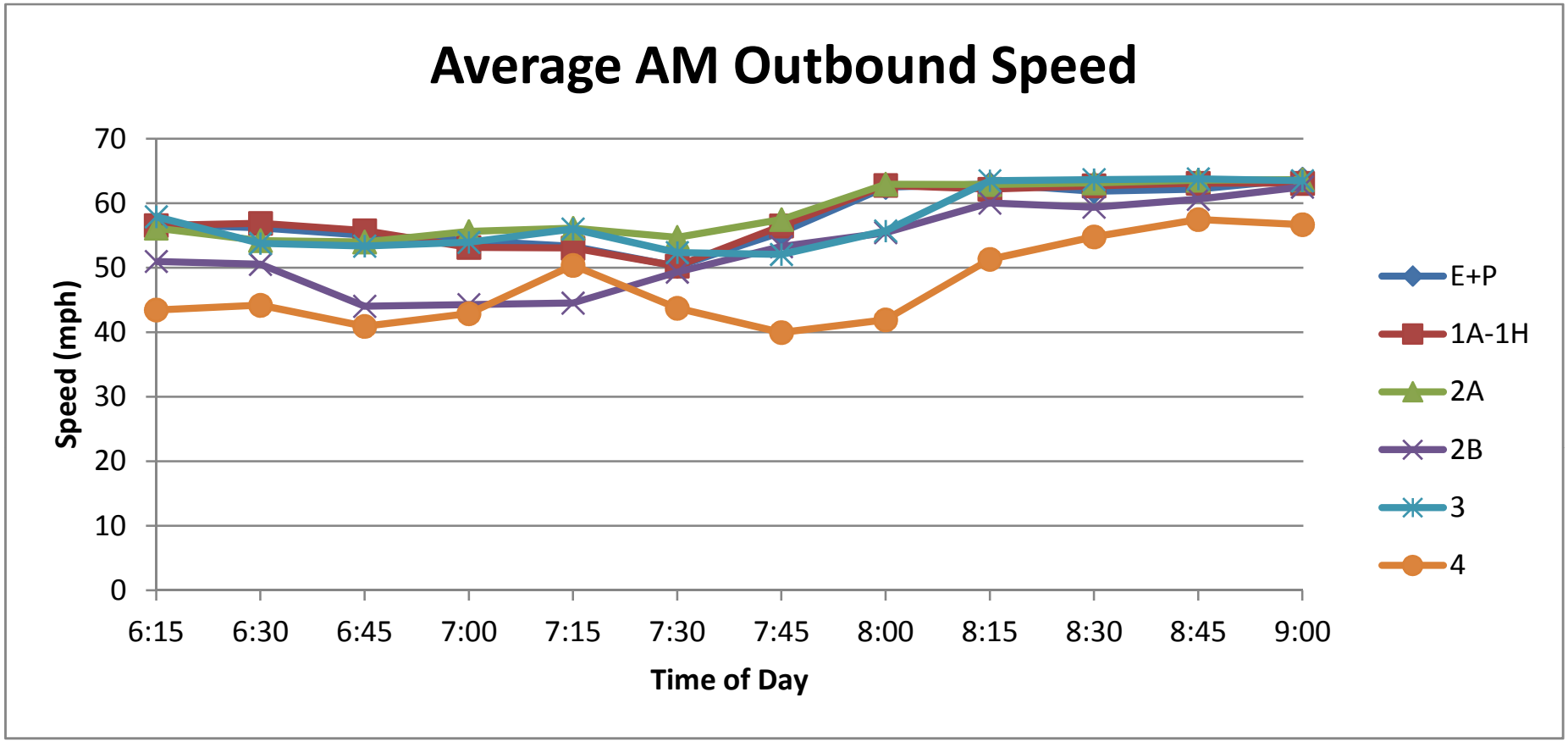

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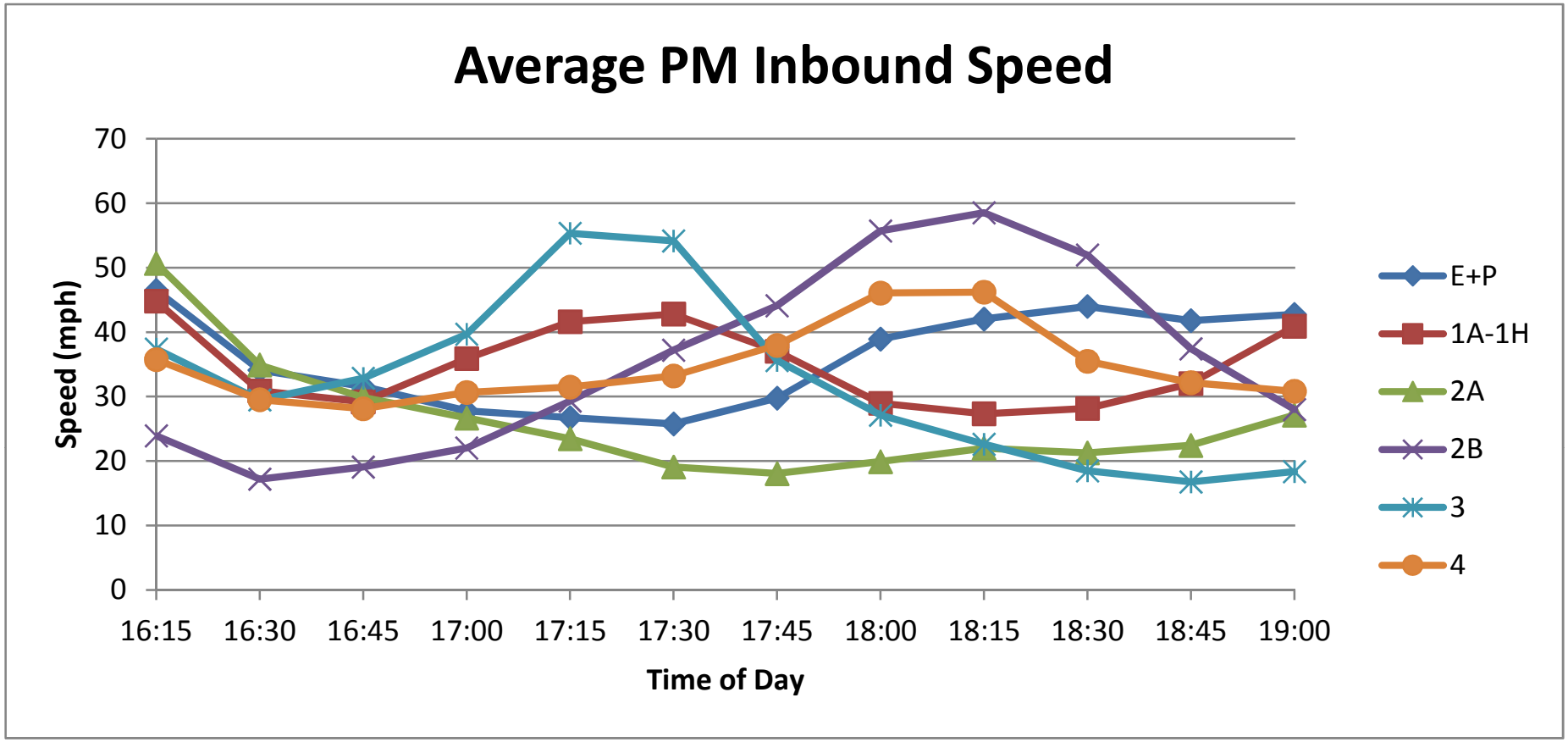

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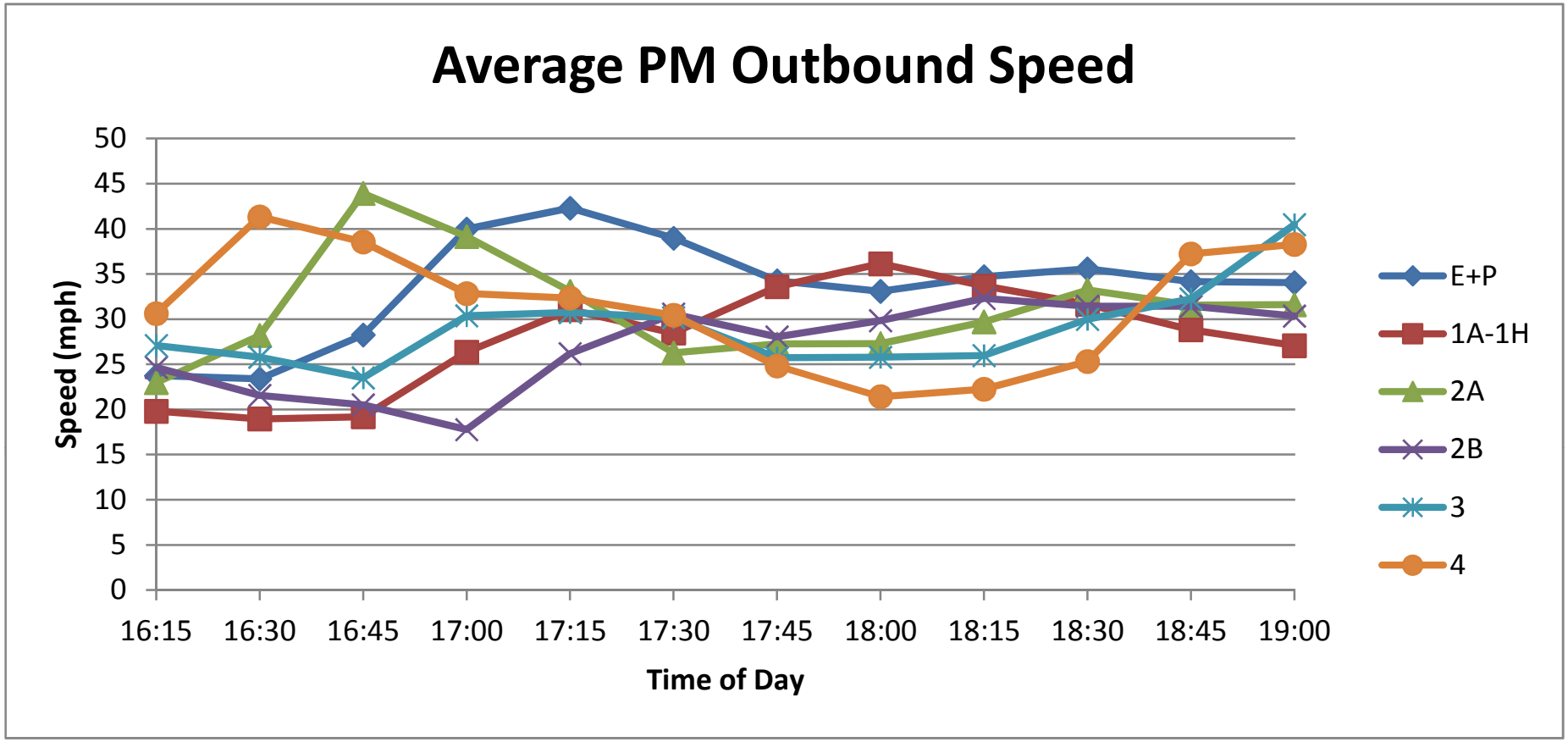

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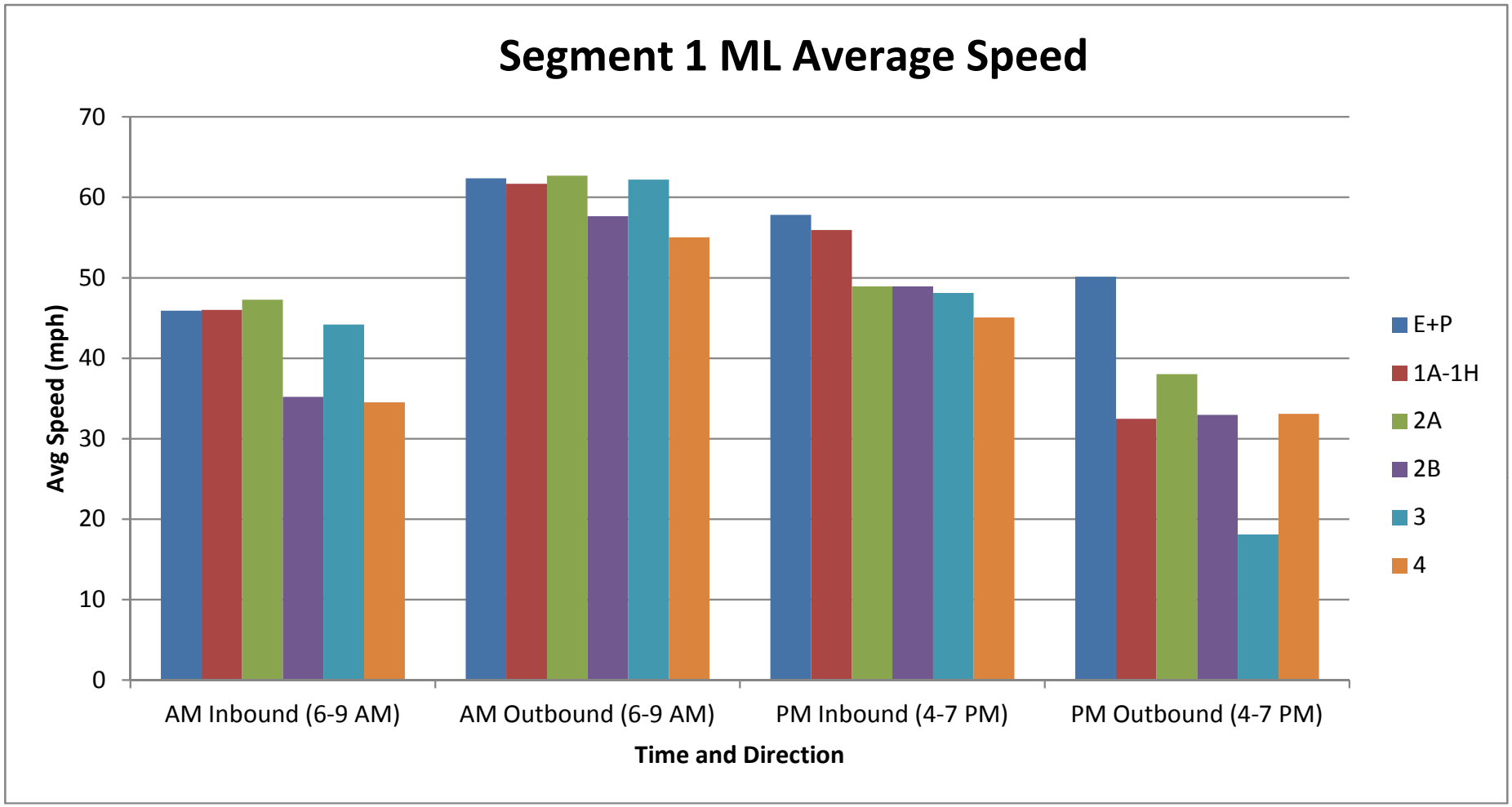

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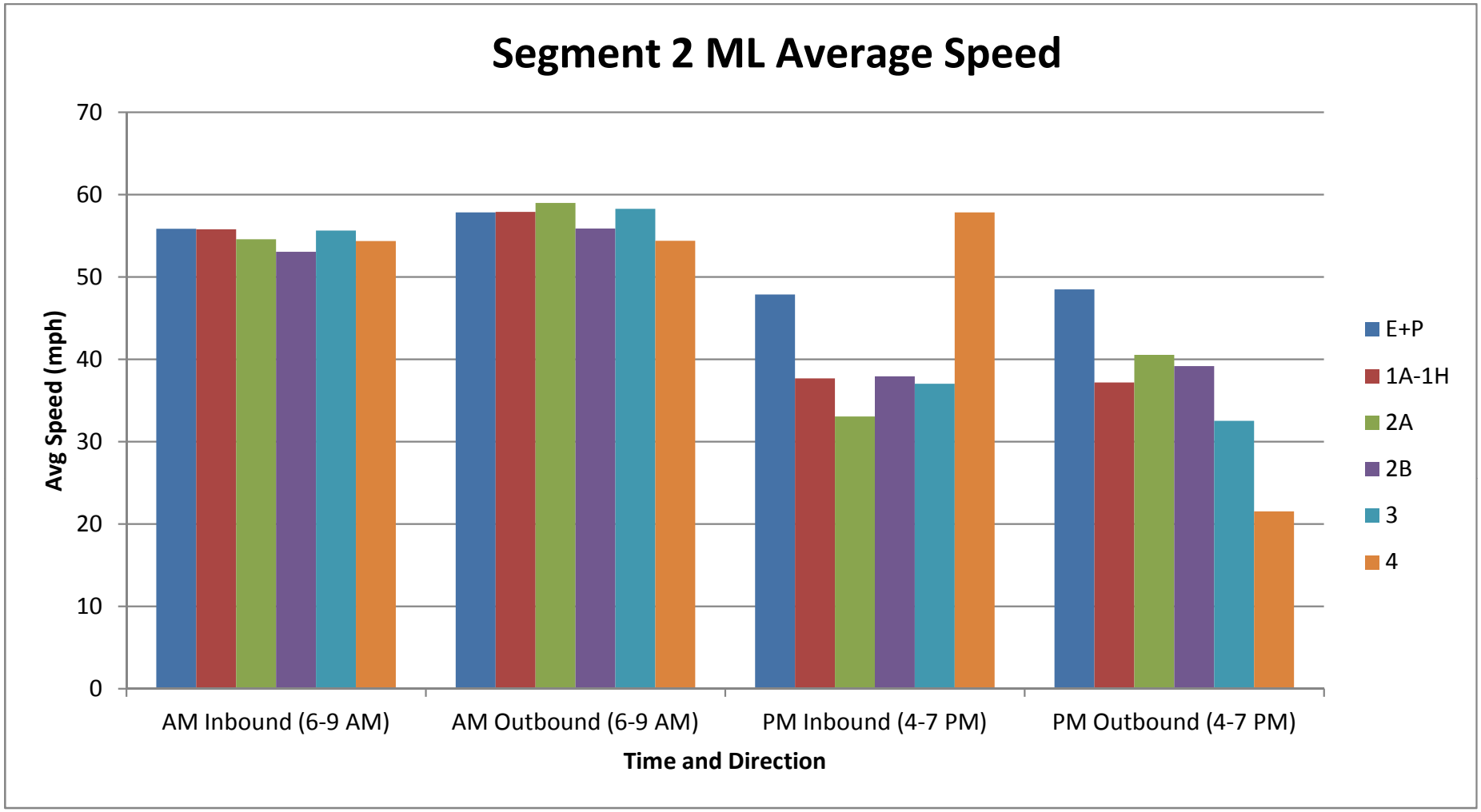

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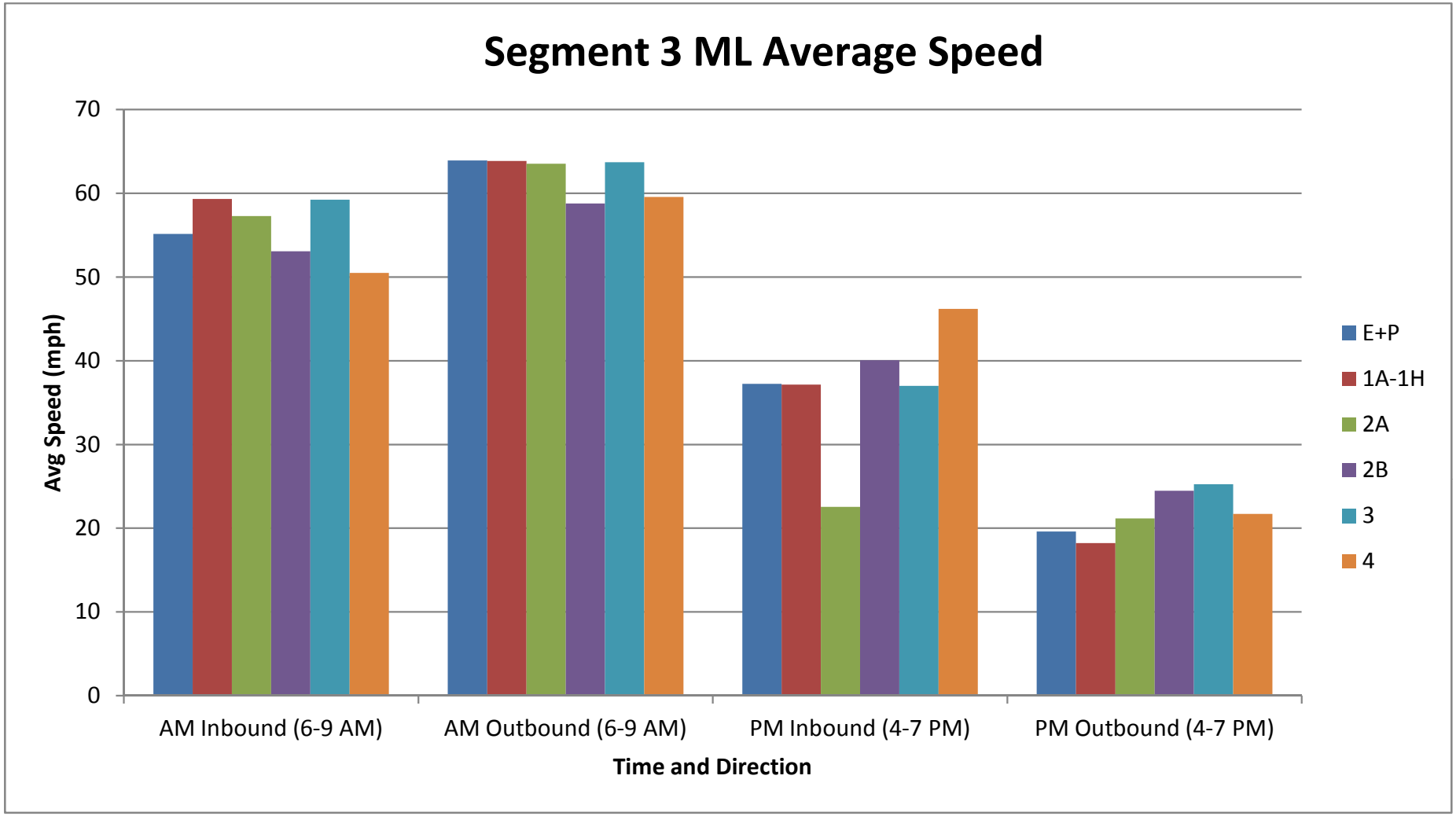

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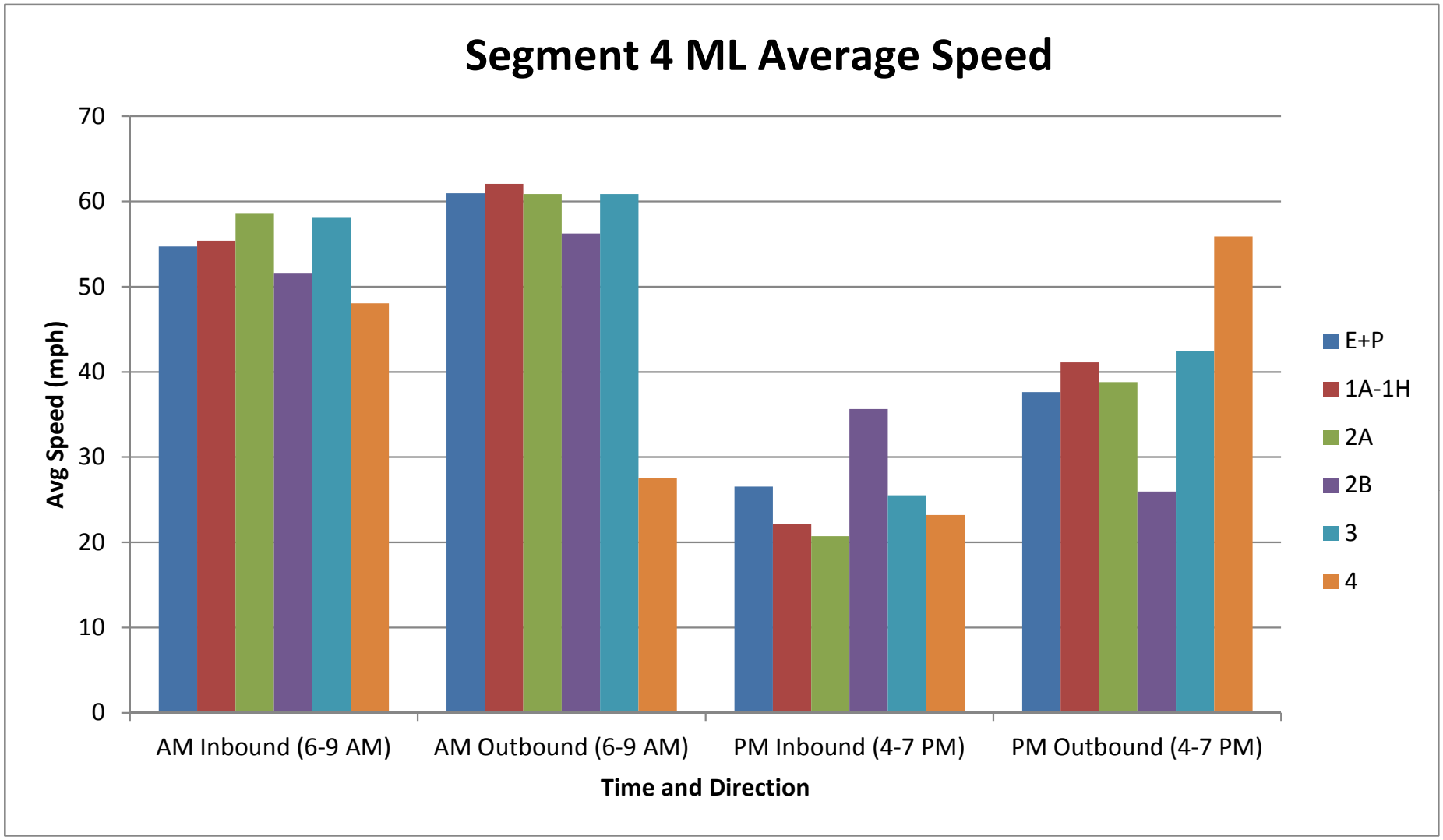

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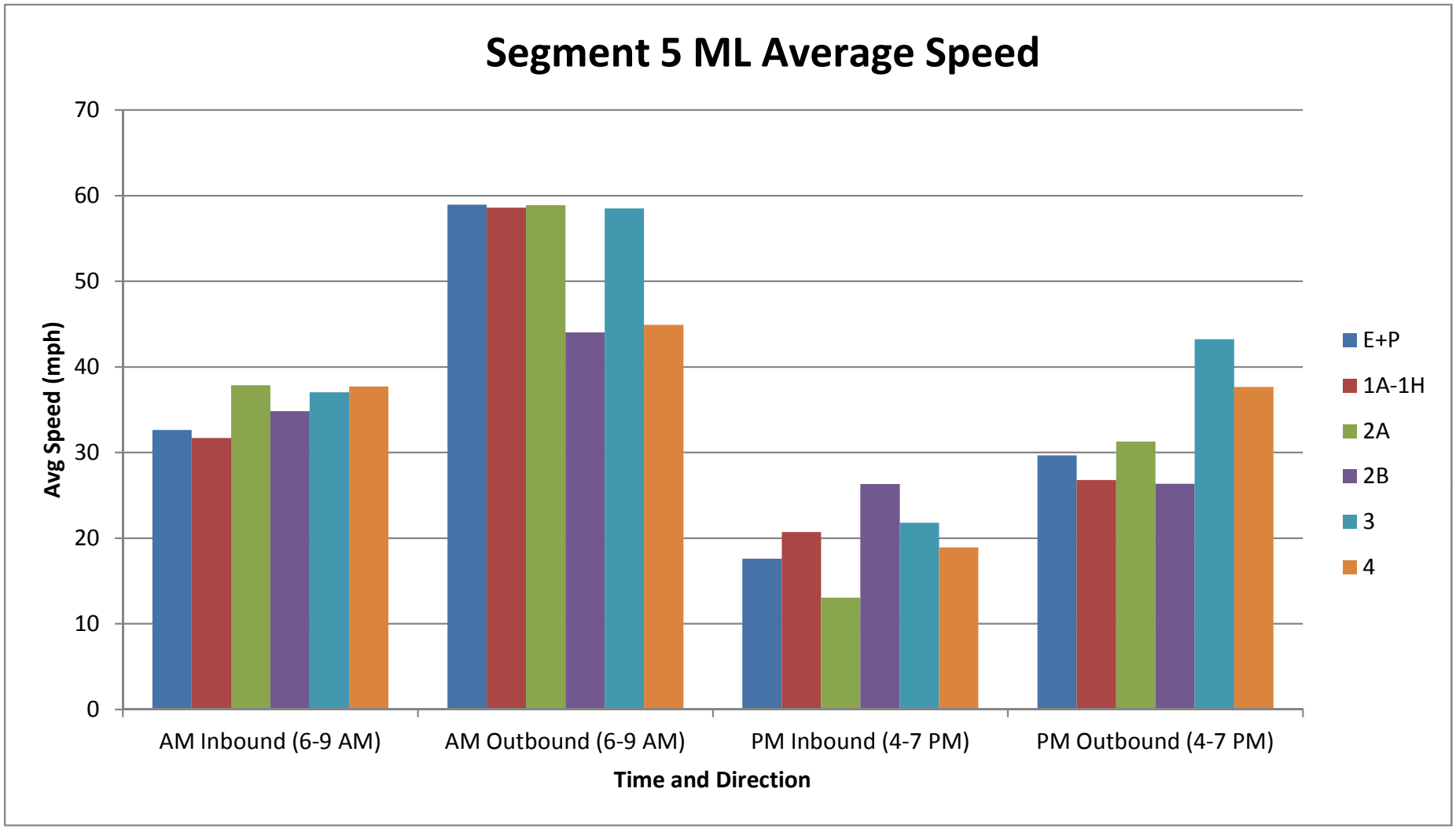

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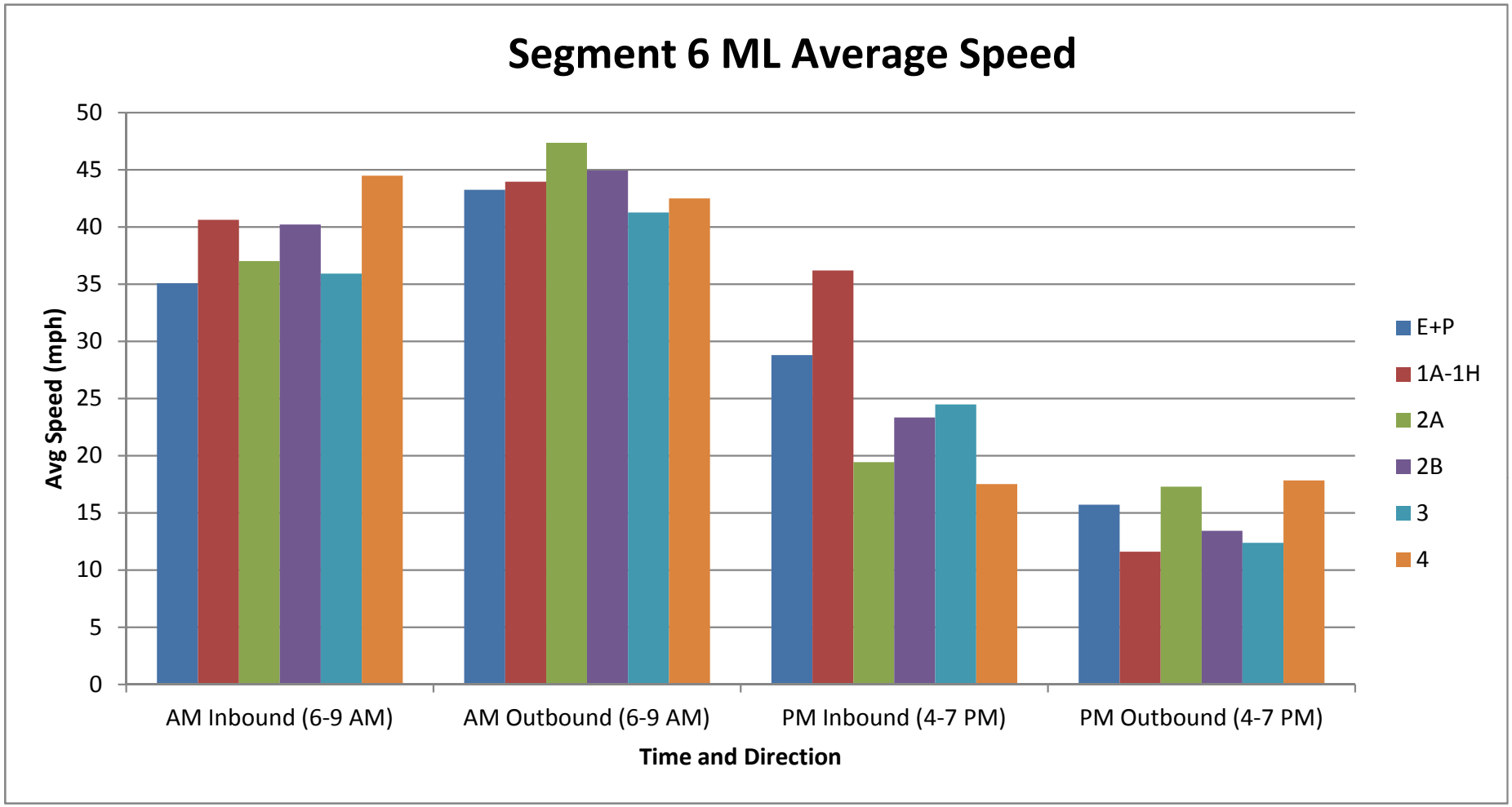

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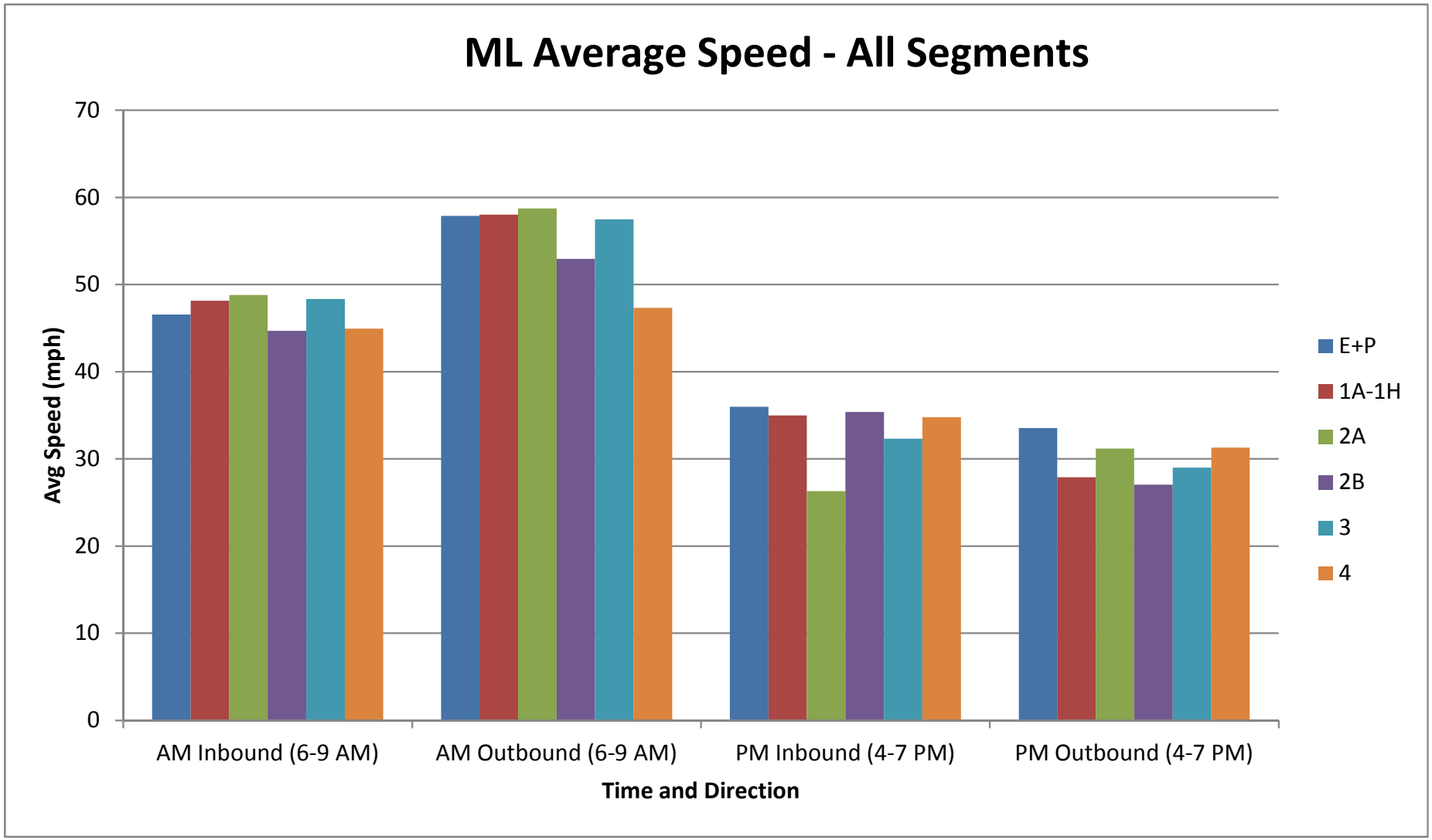

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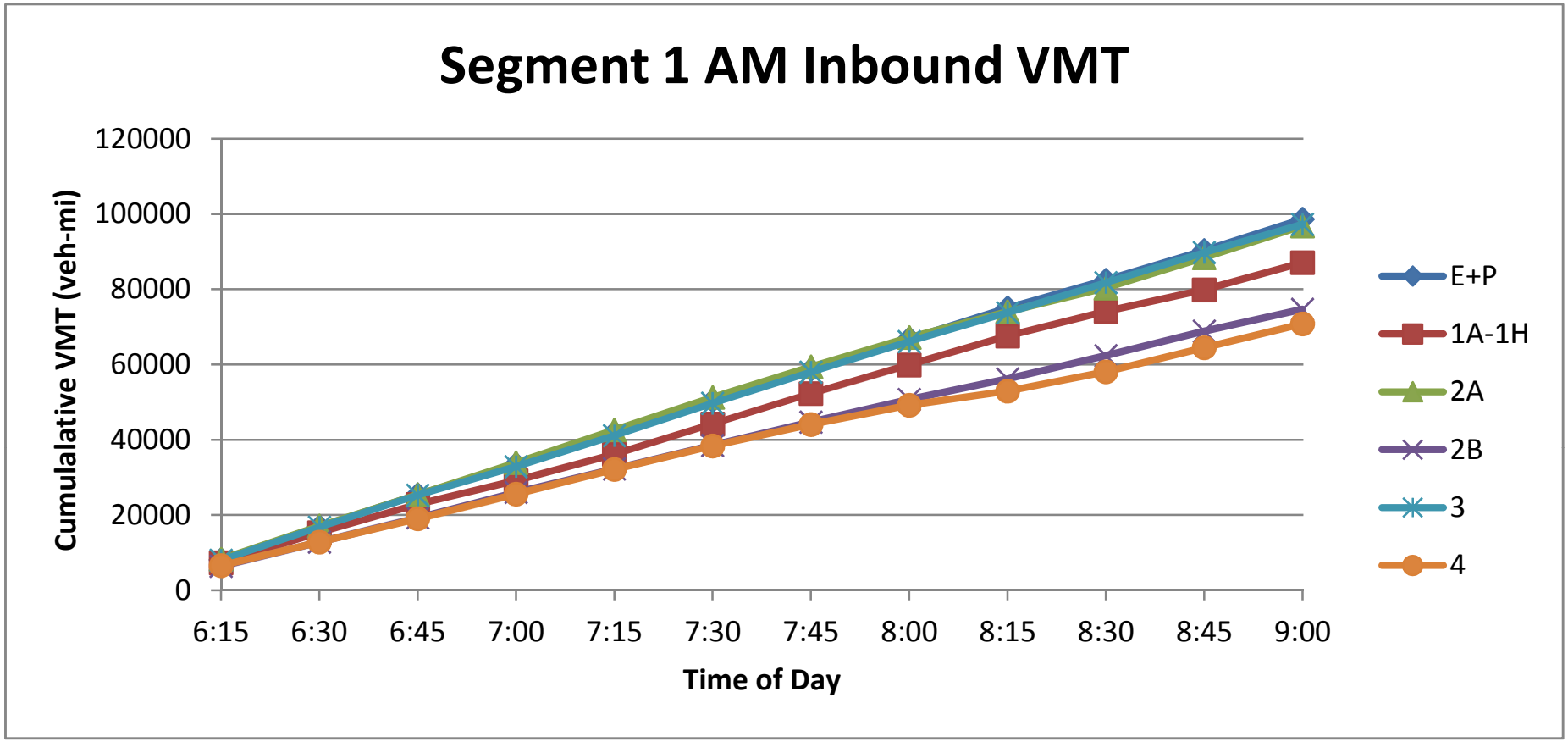

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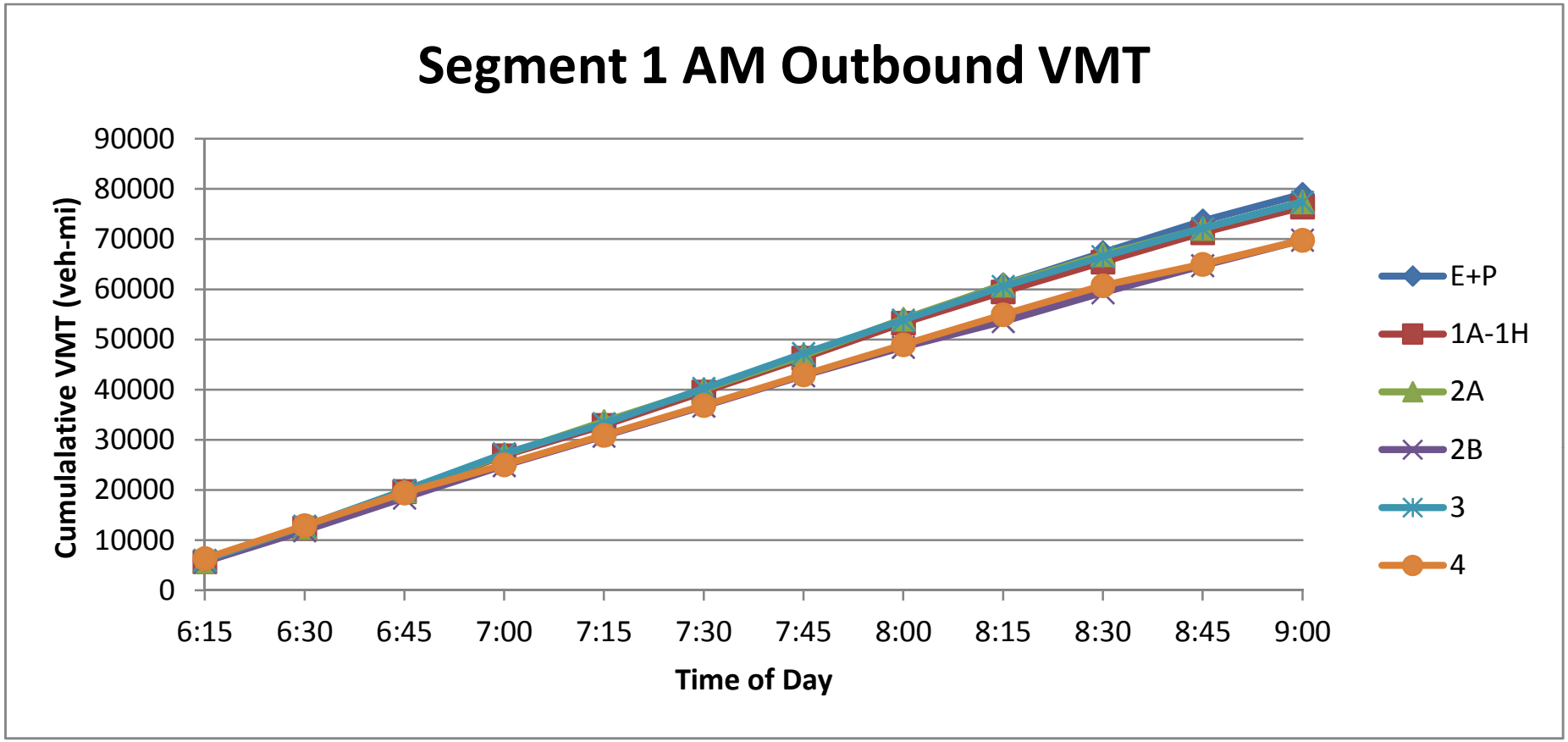

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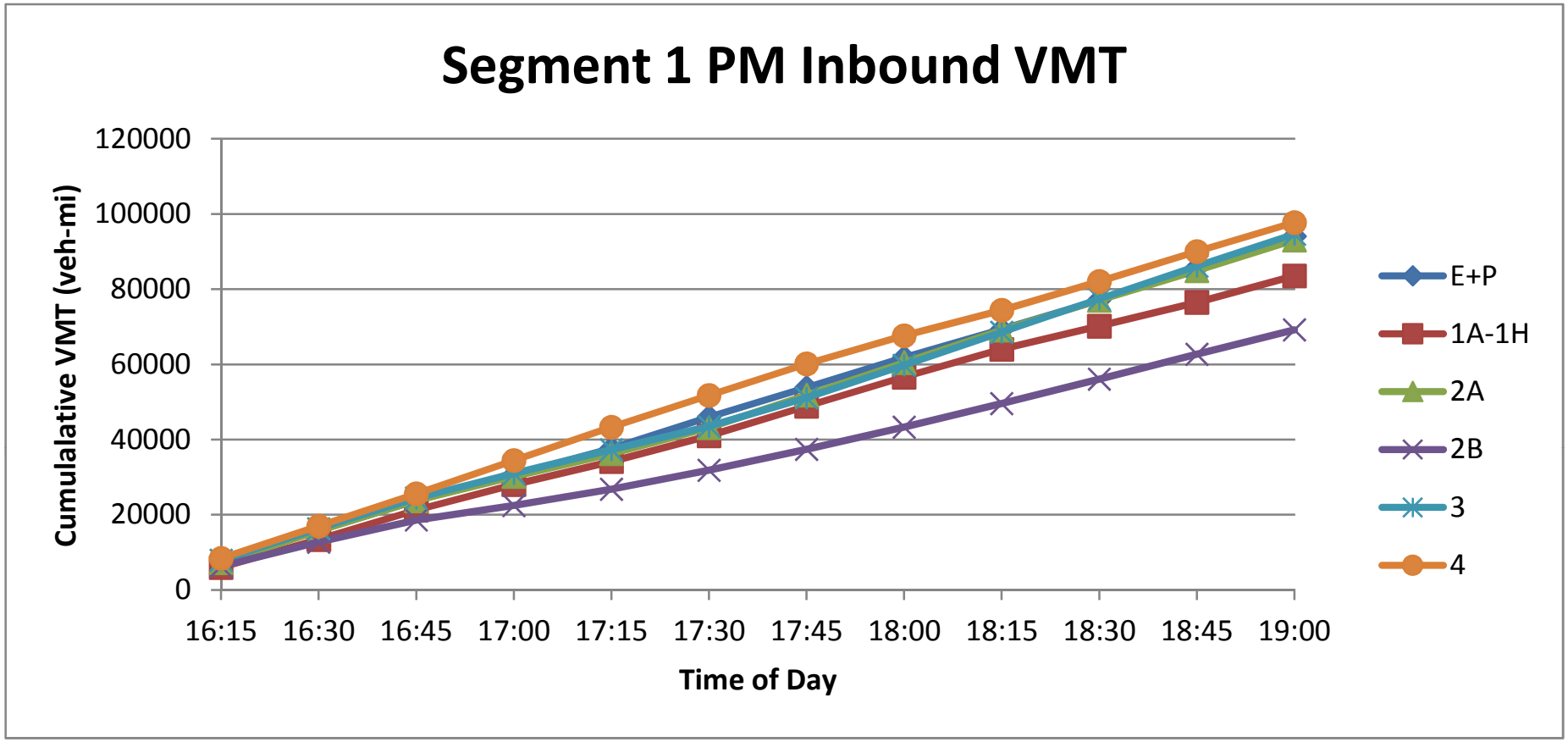

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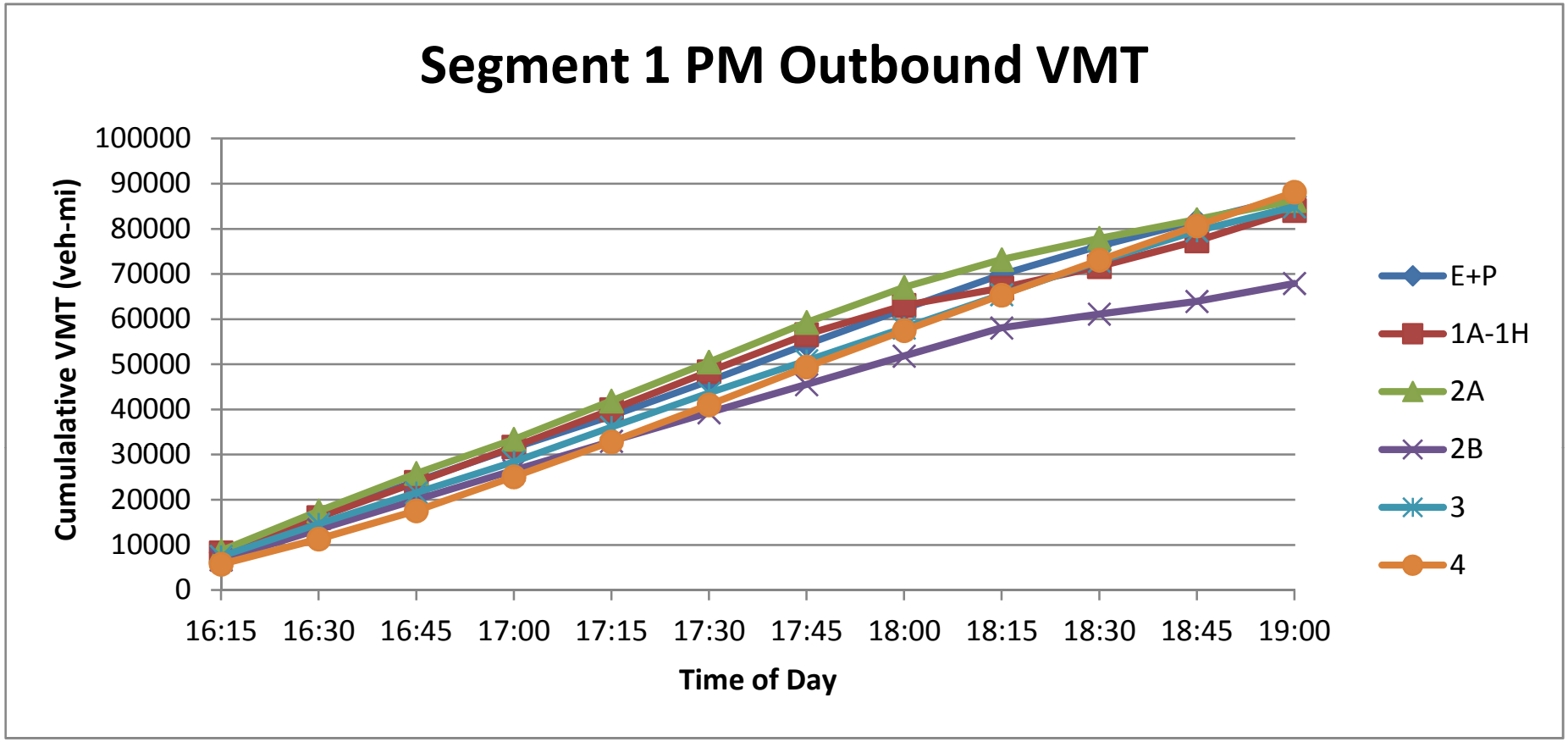

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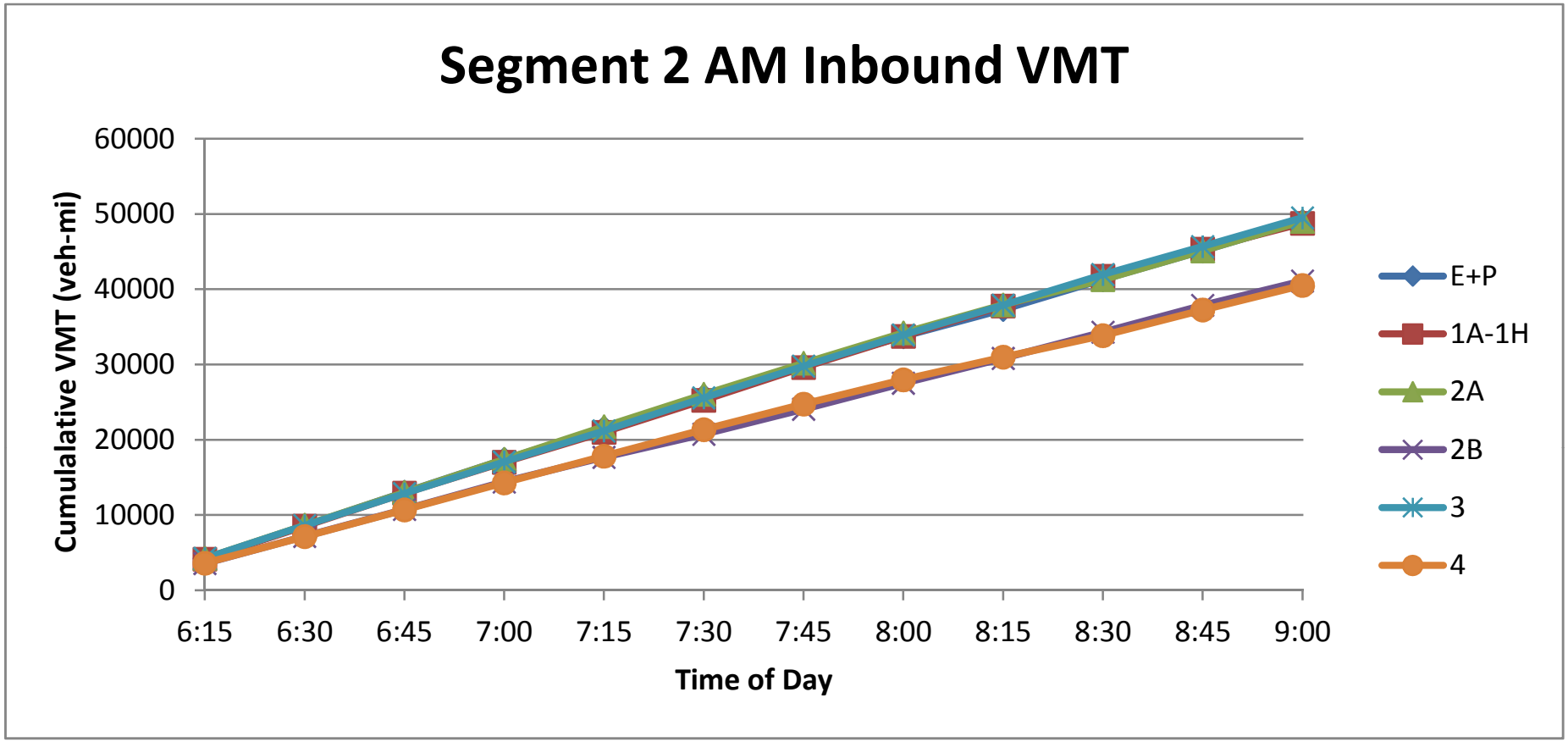

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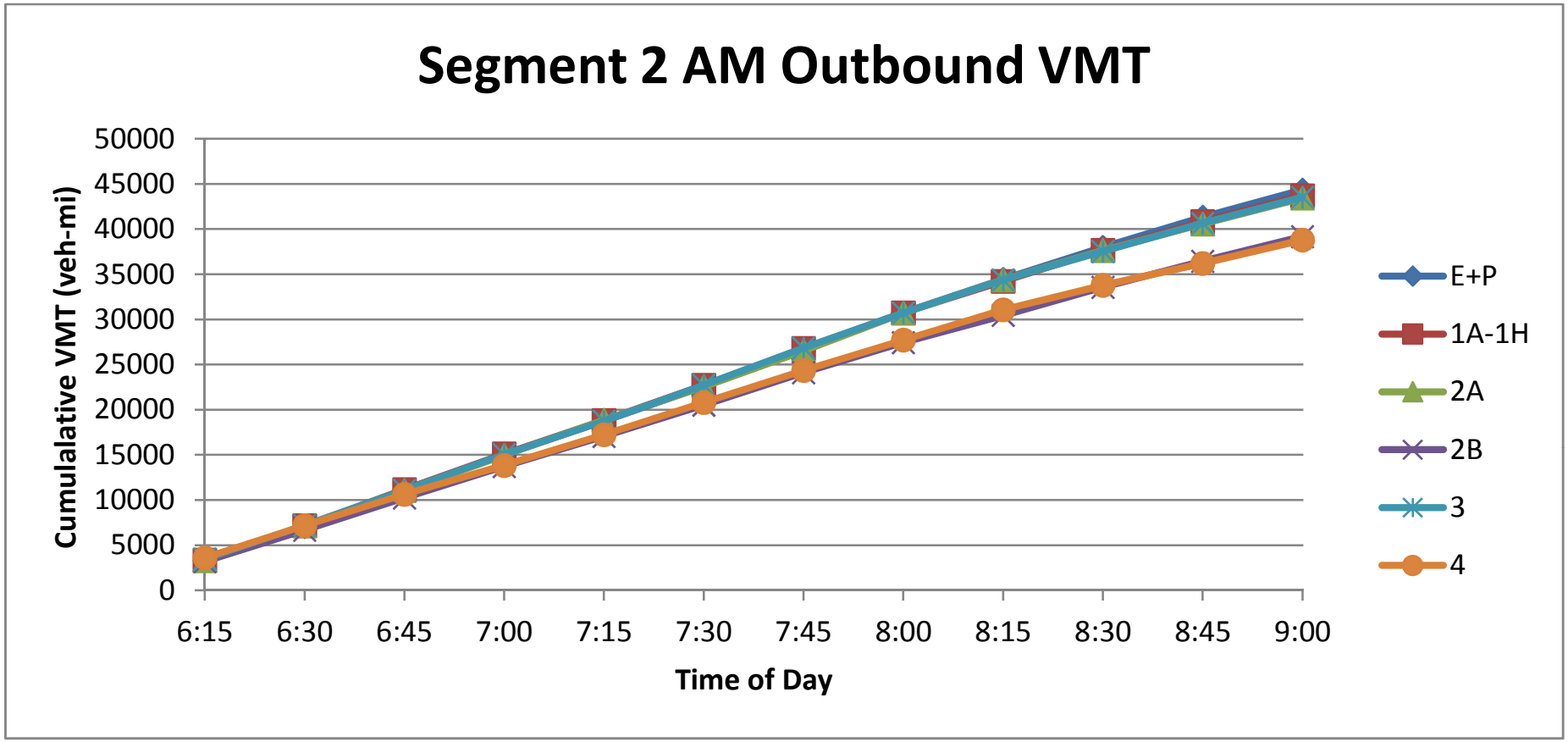

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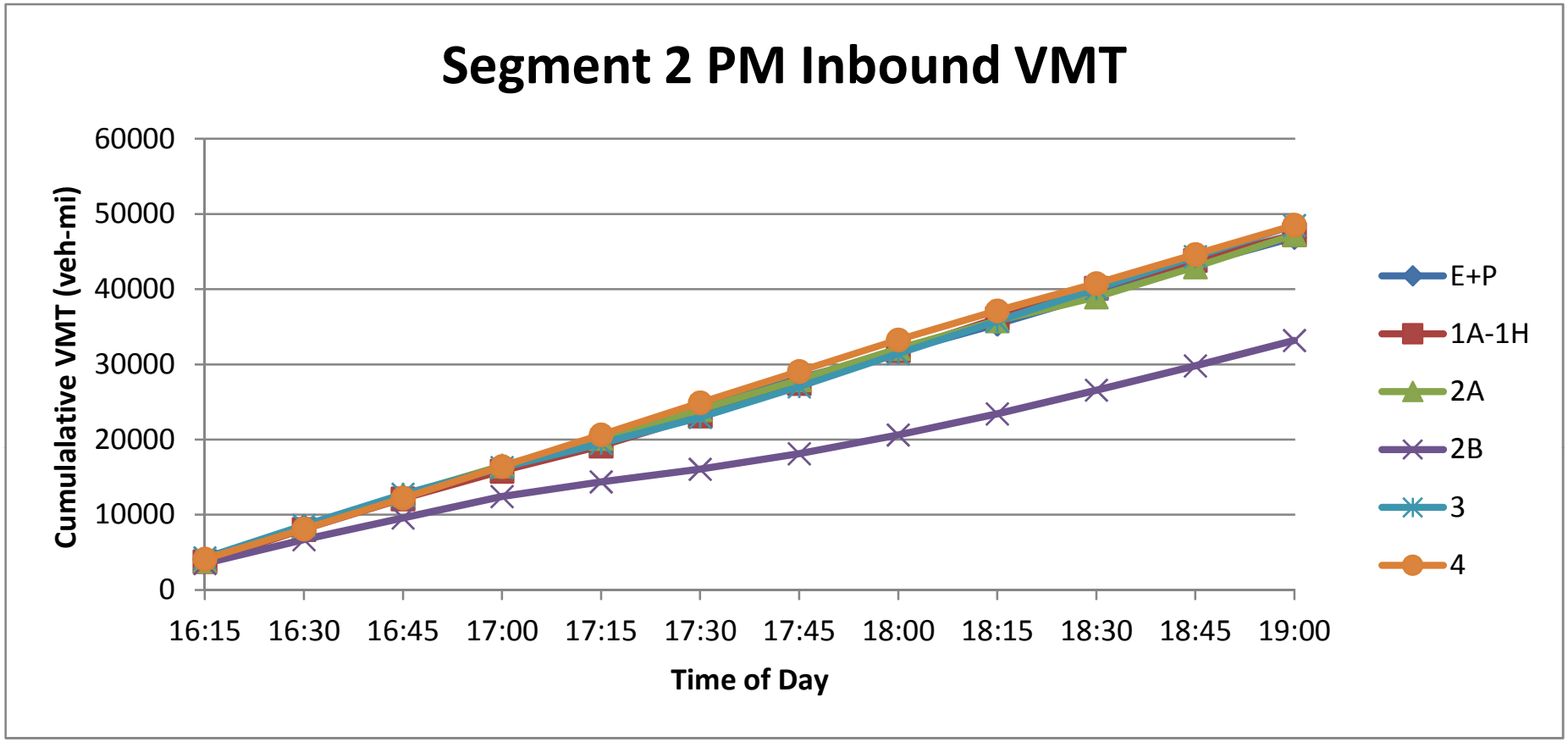

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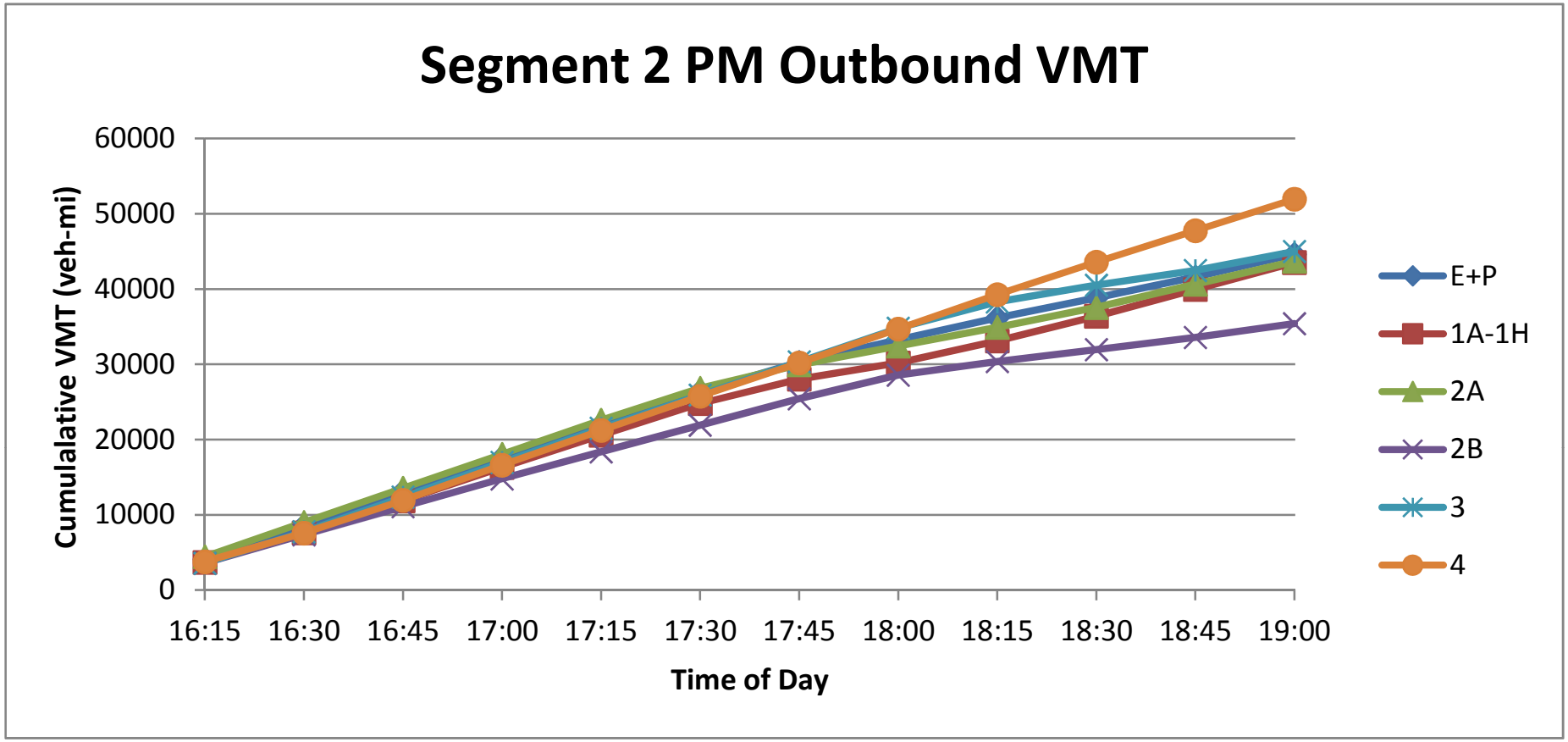
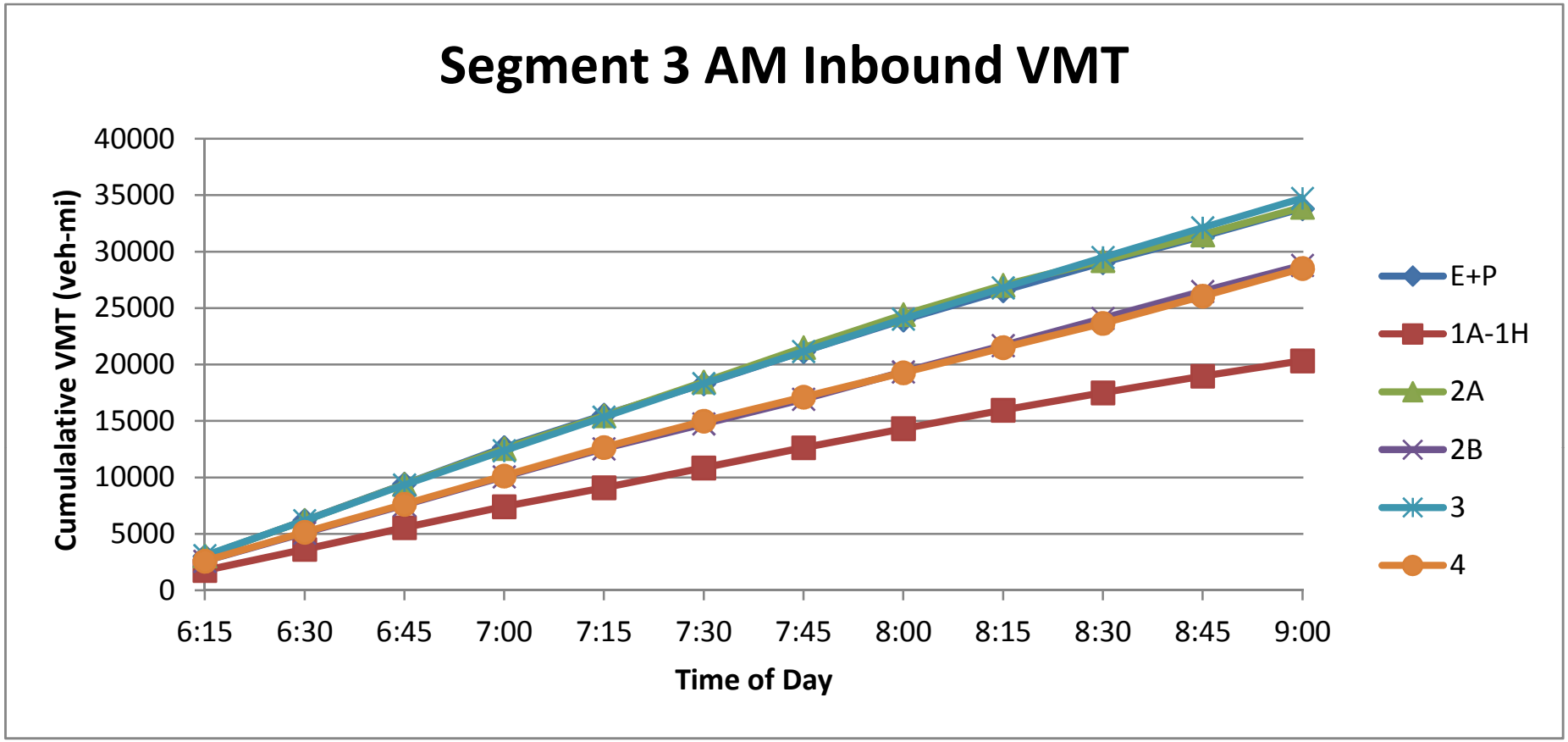


2011 DynusT Results - H-GAC Models



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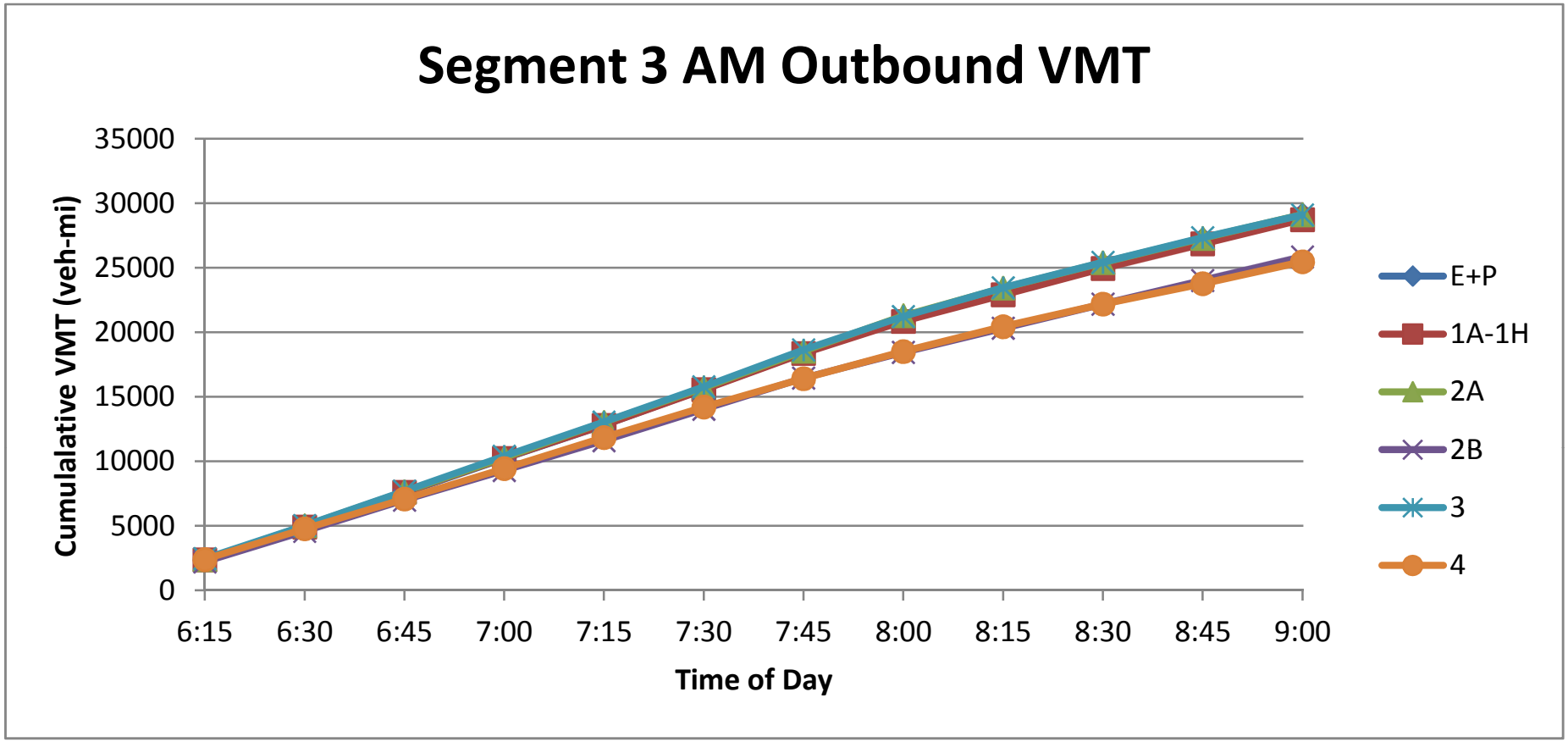

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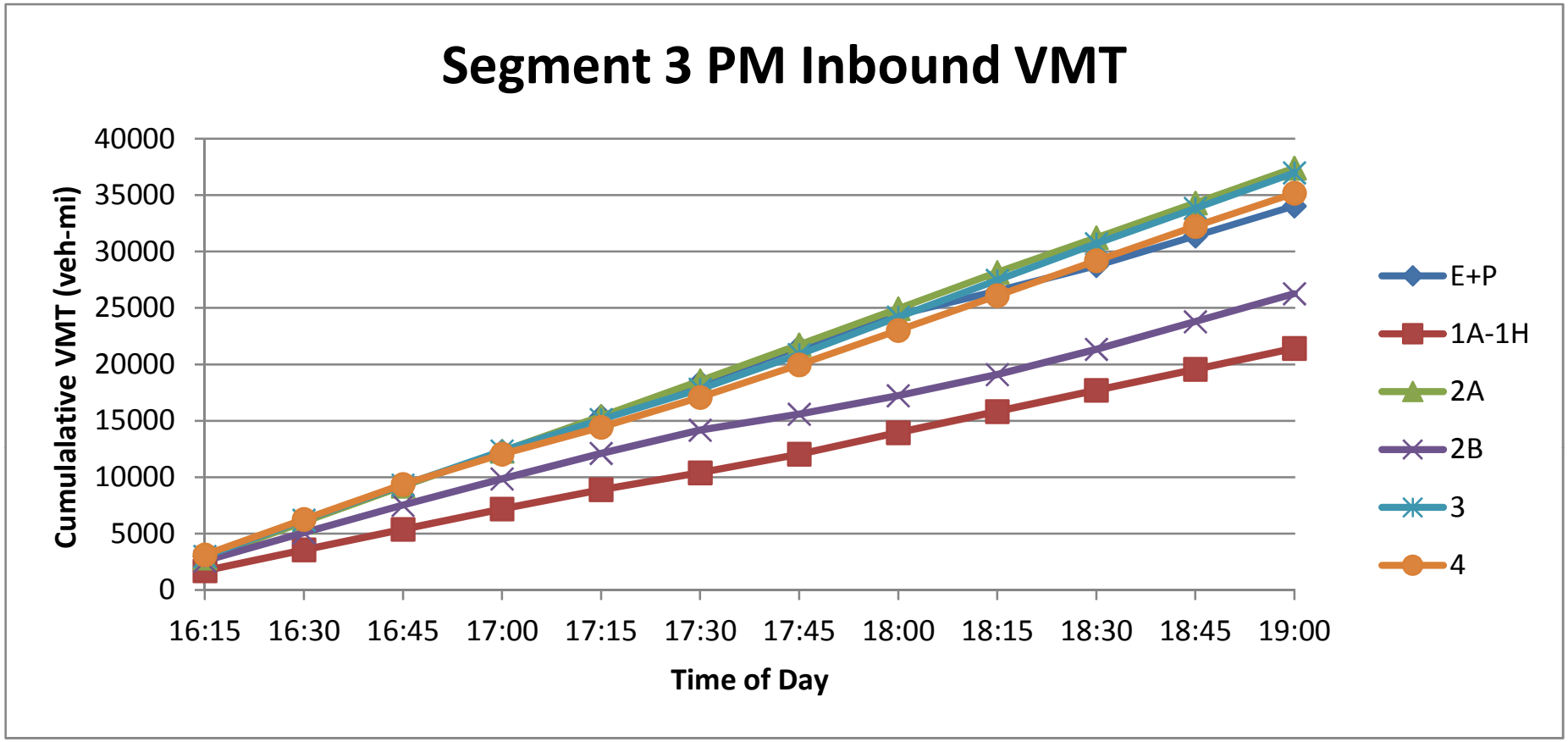

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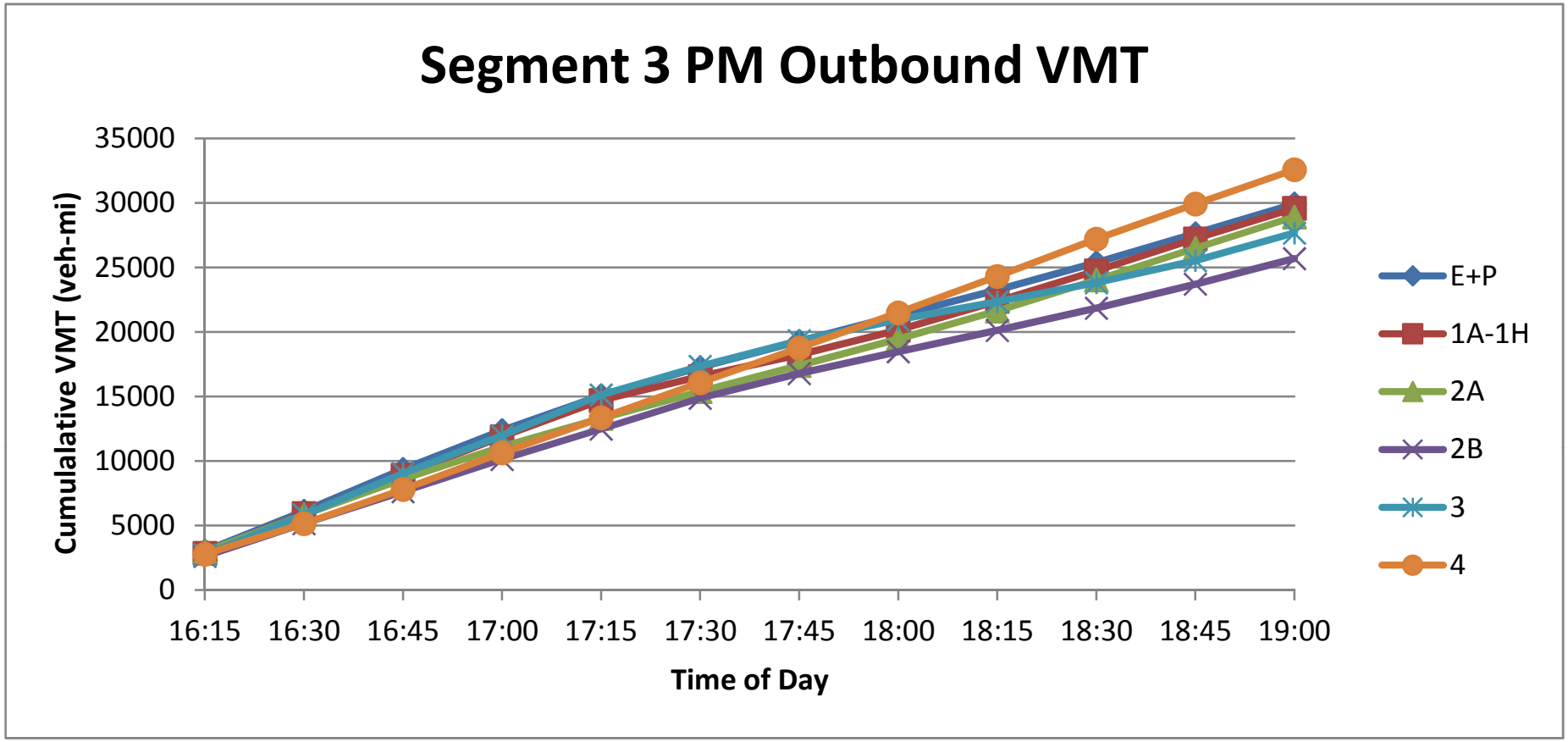

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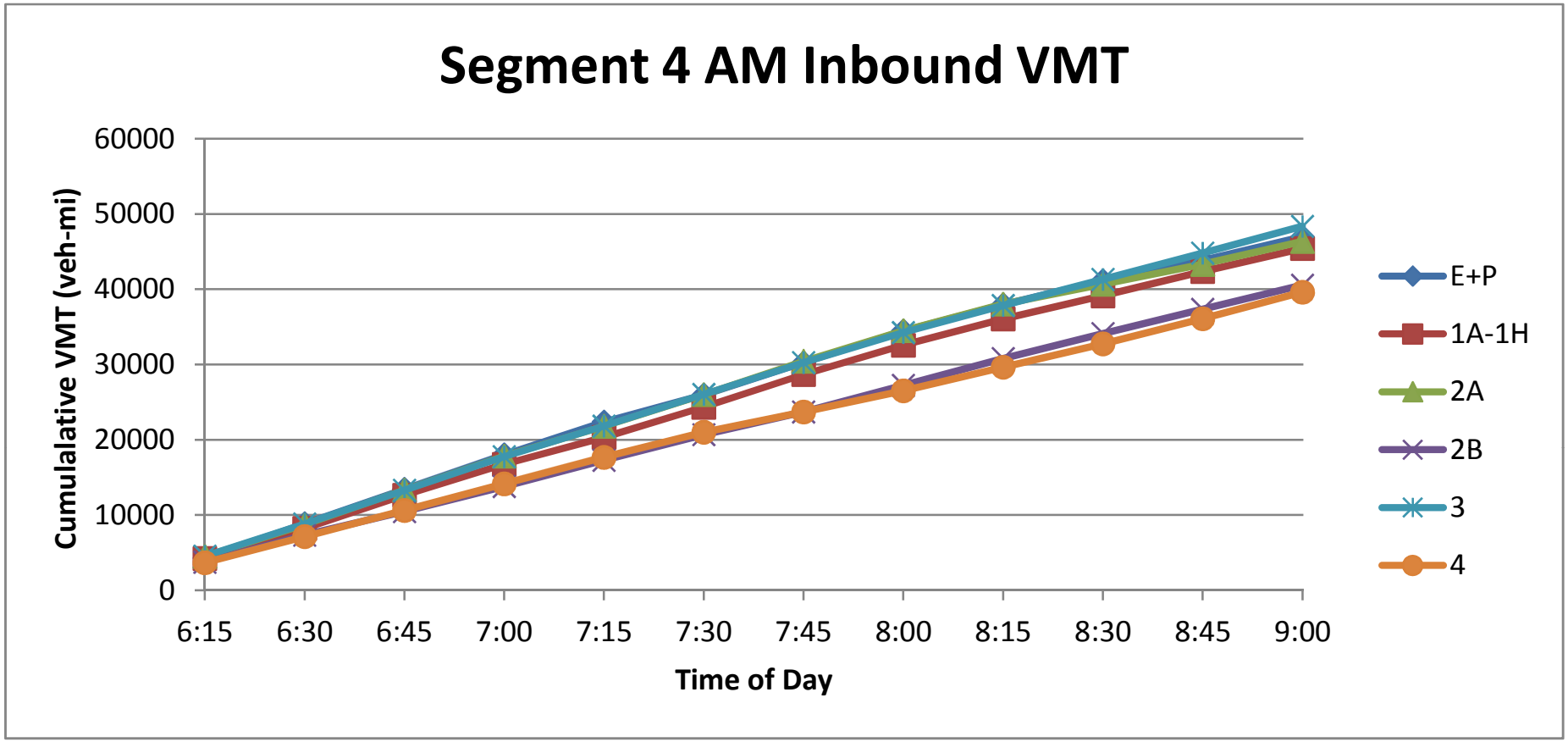

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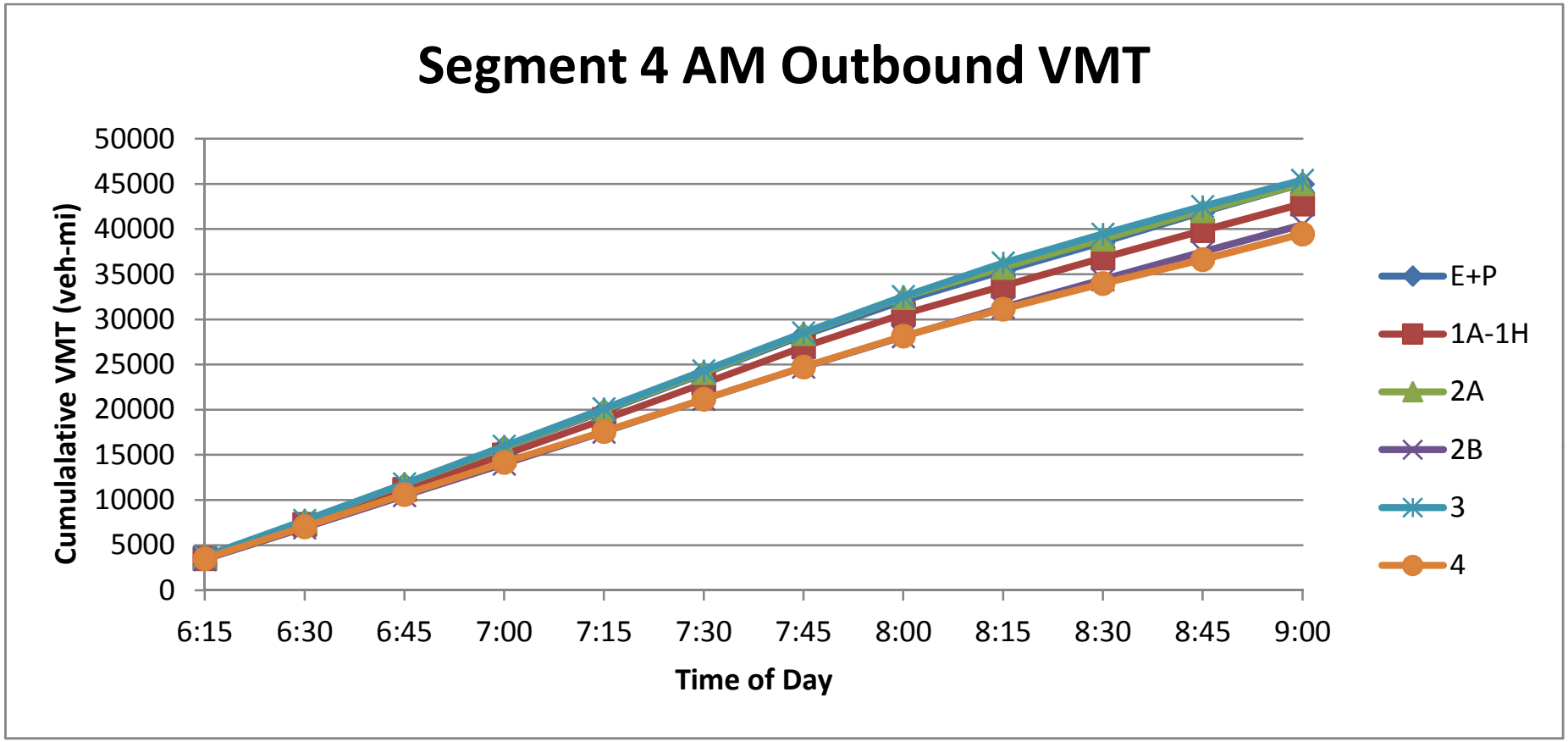

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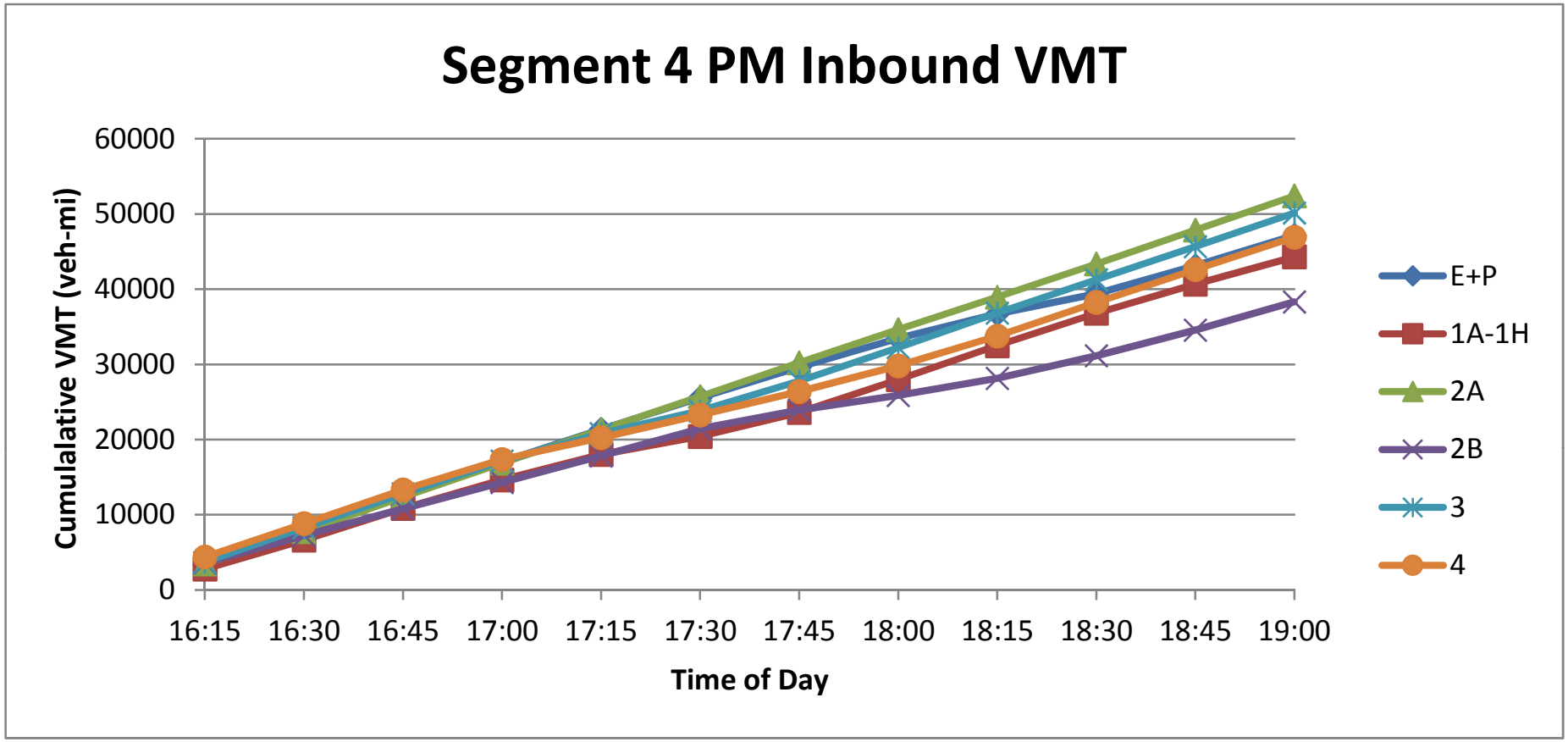

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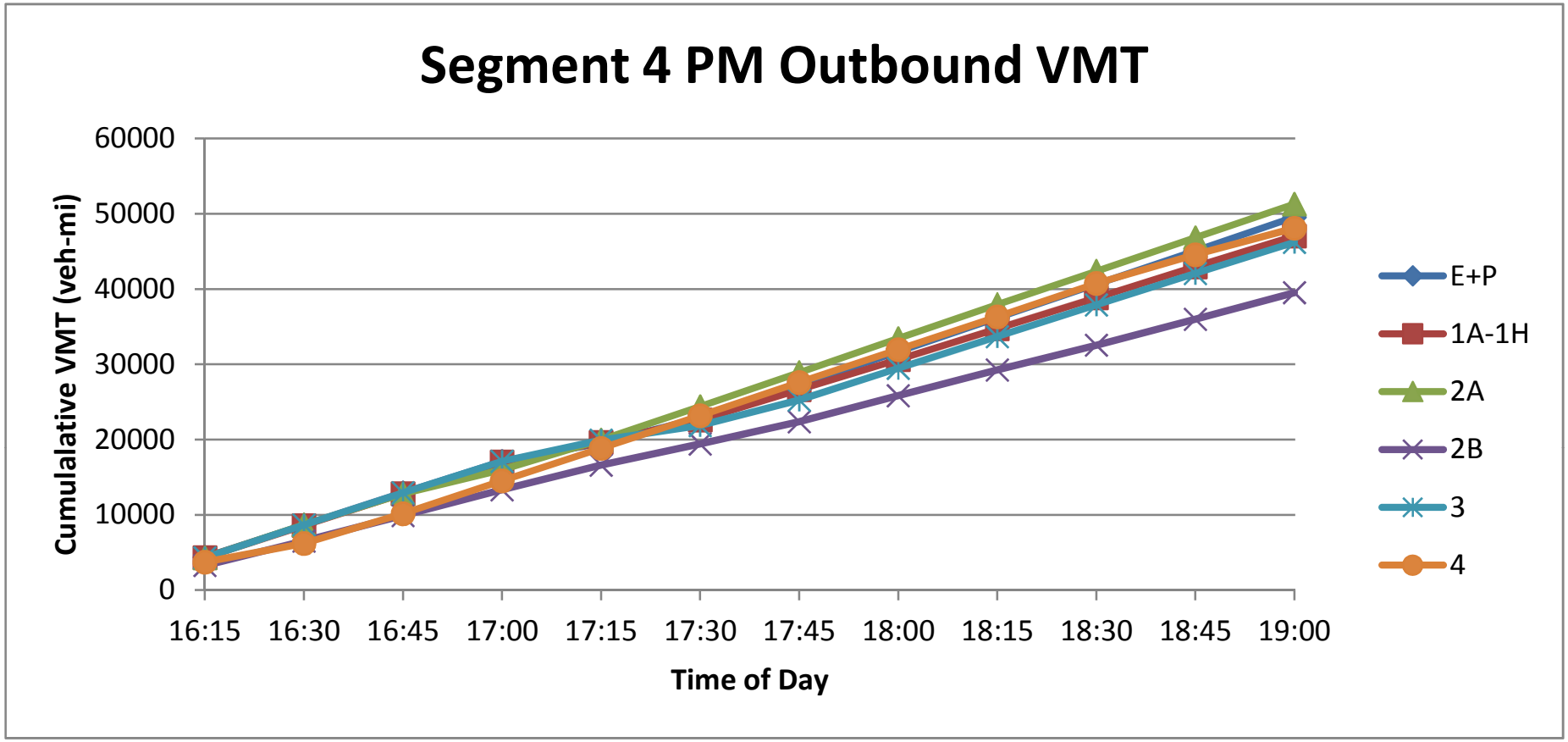

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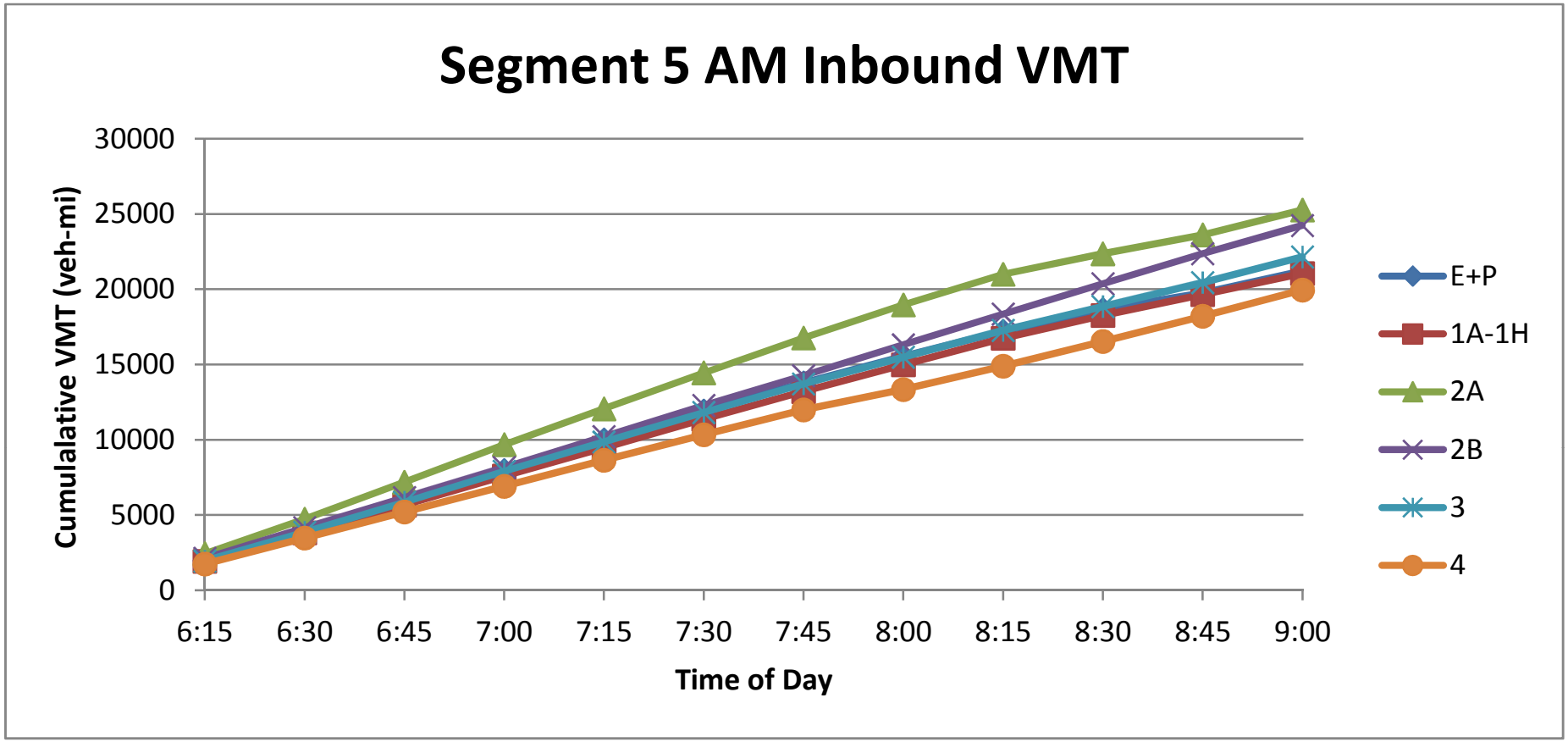

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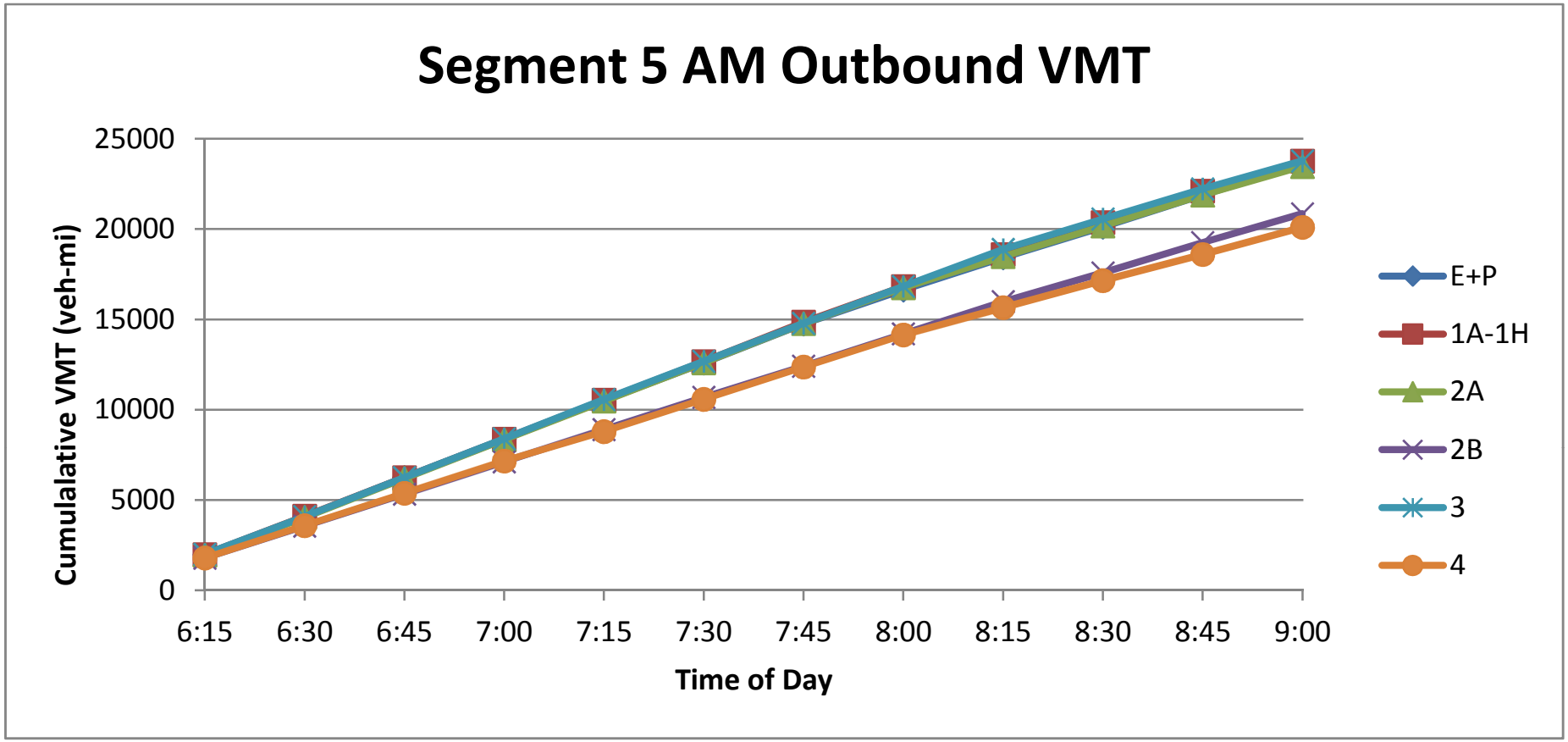

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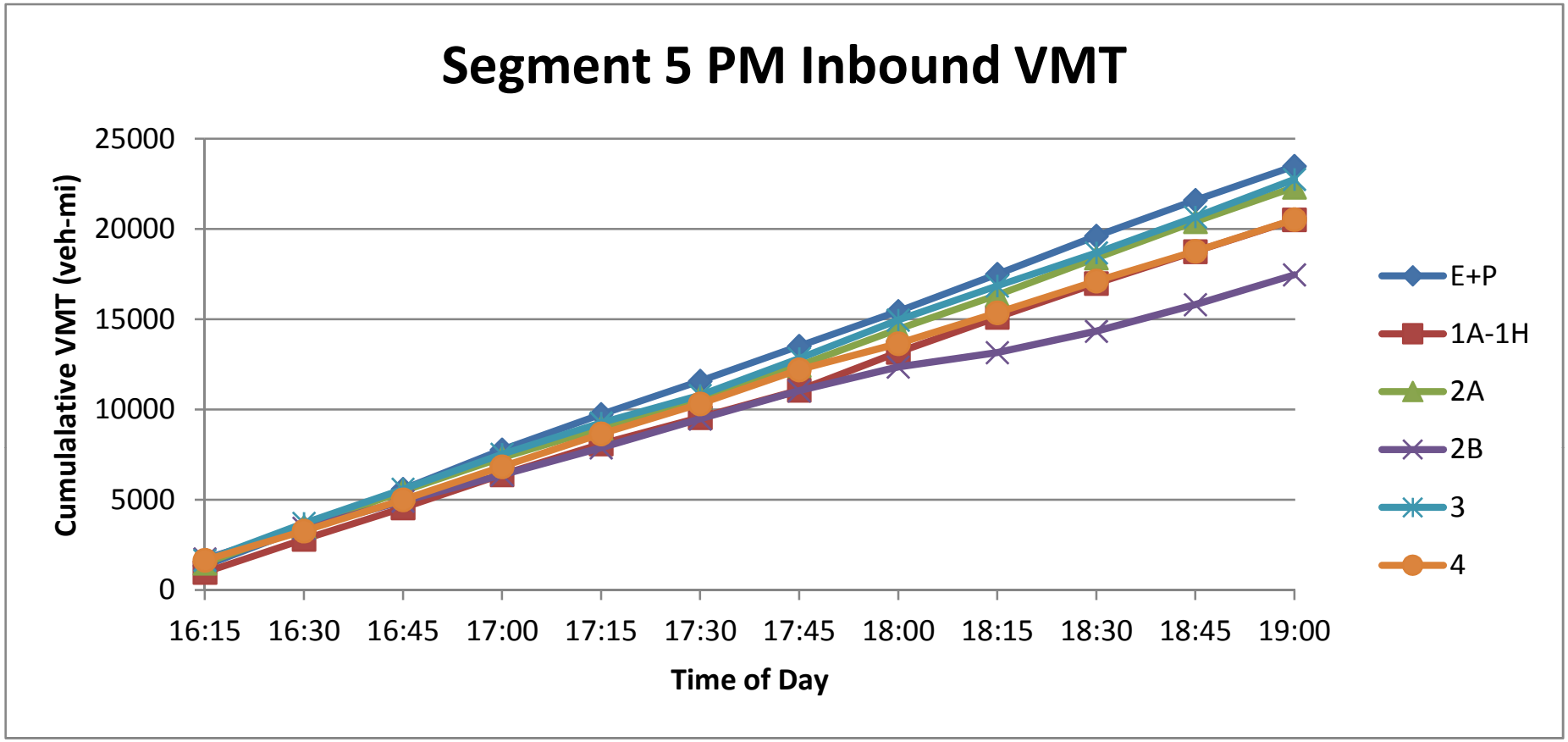

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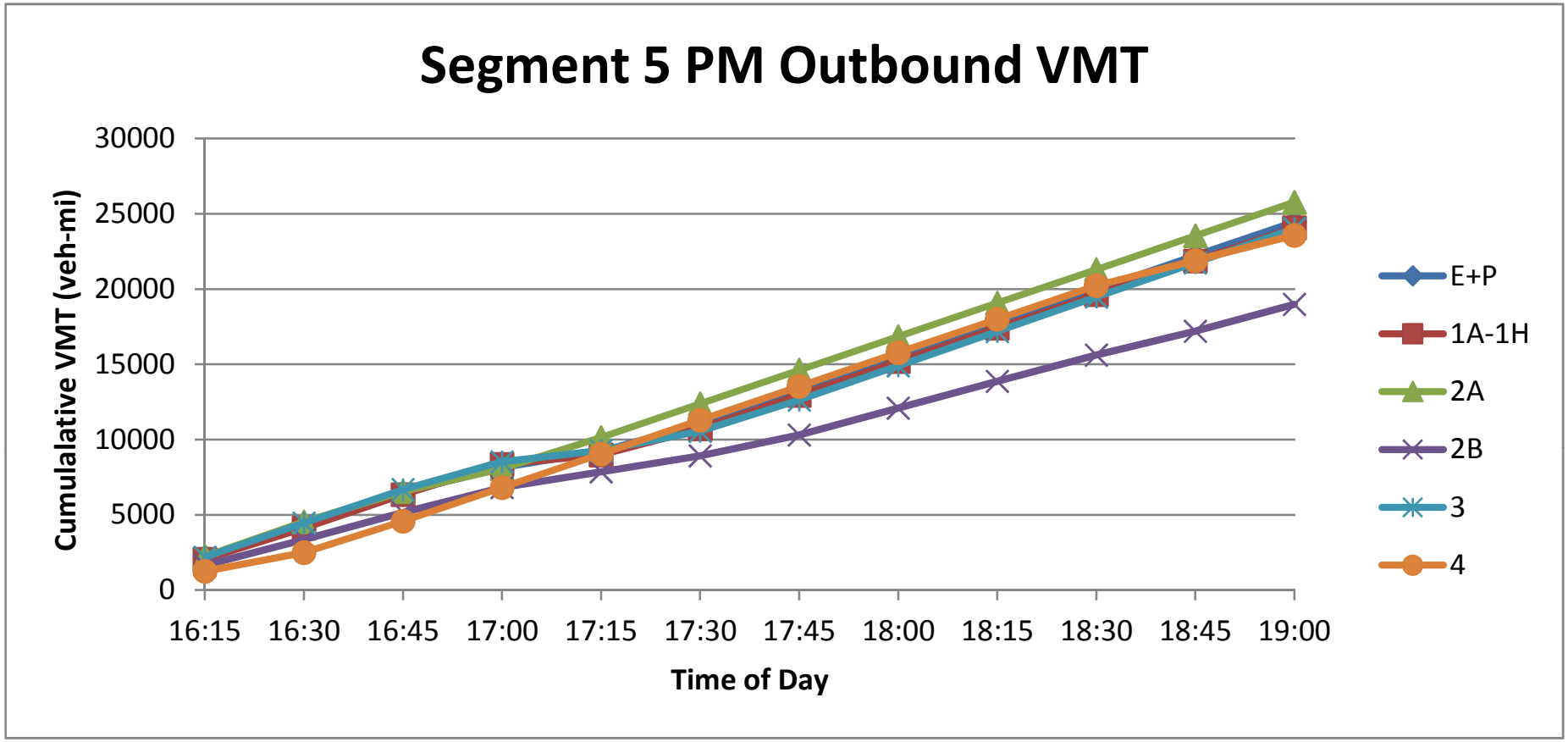

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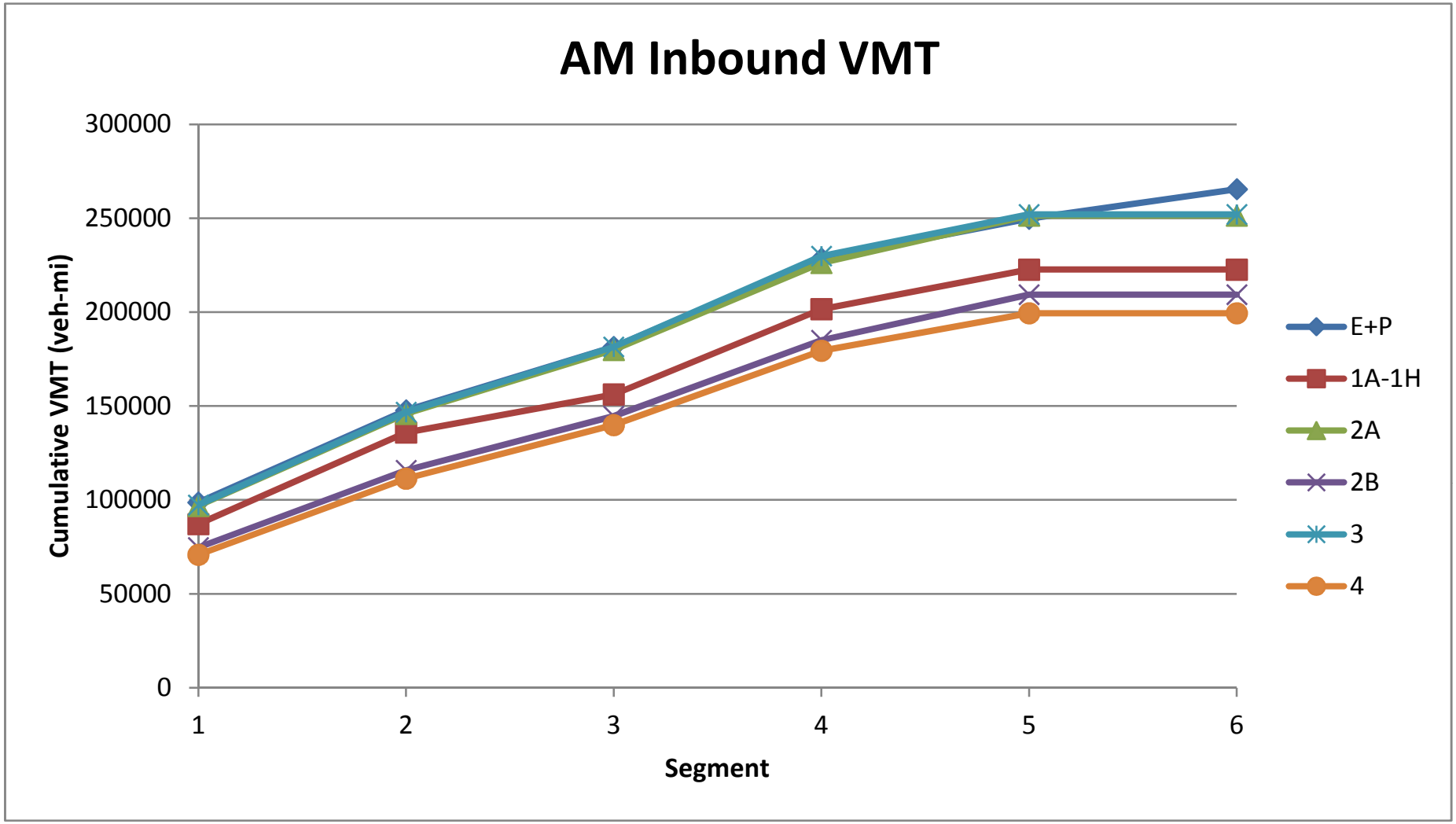

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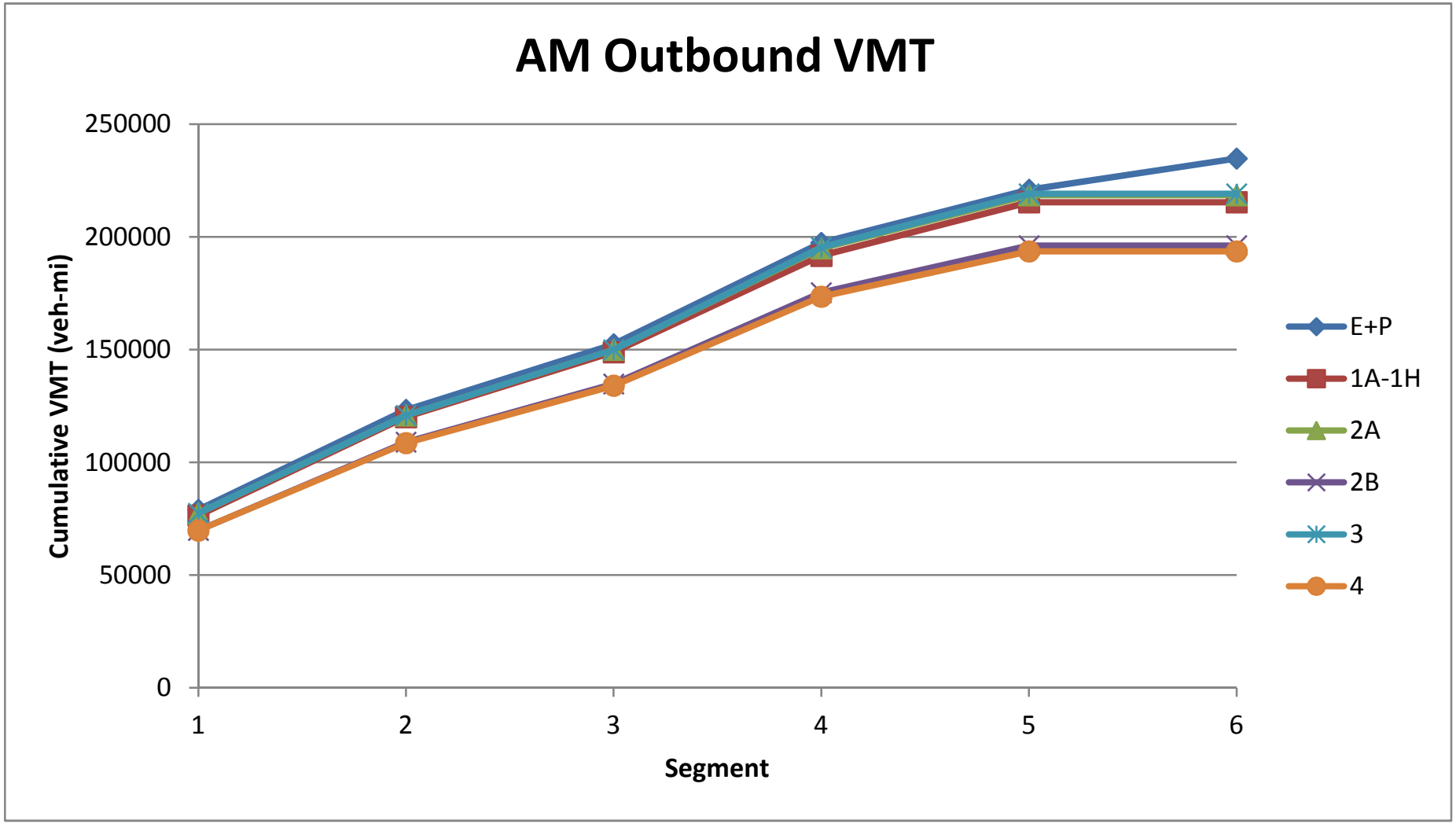

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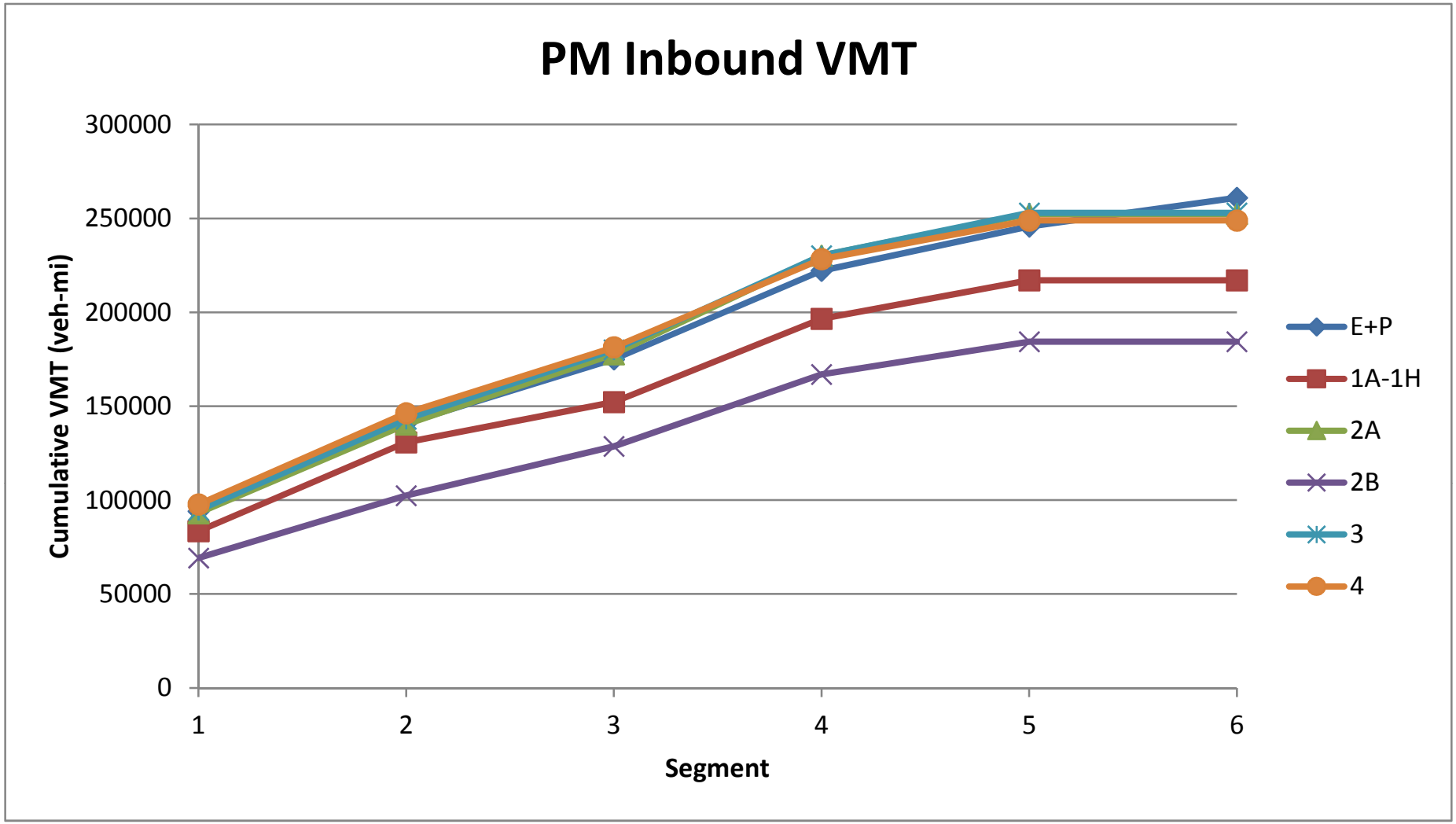

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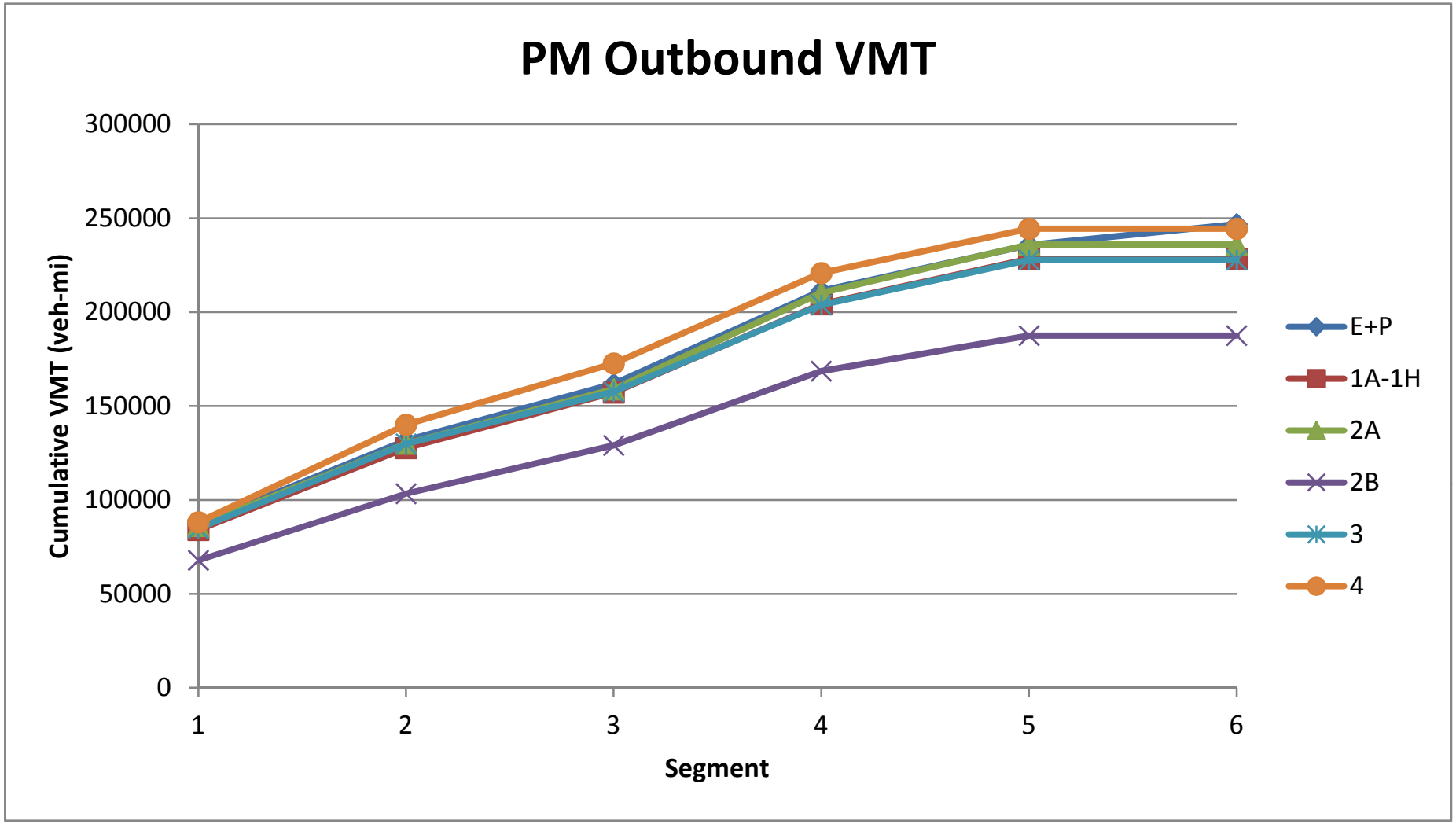

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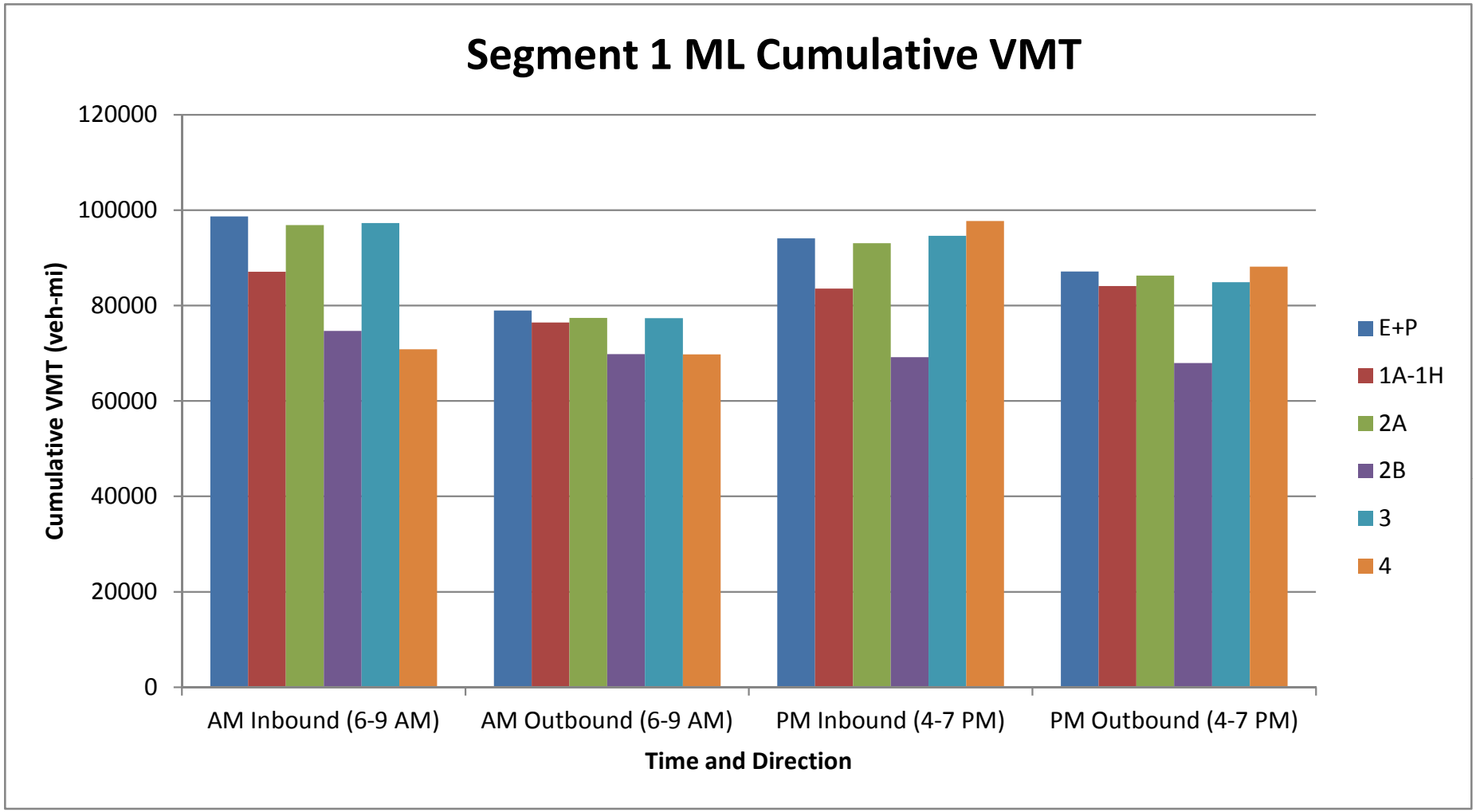

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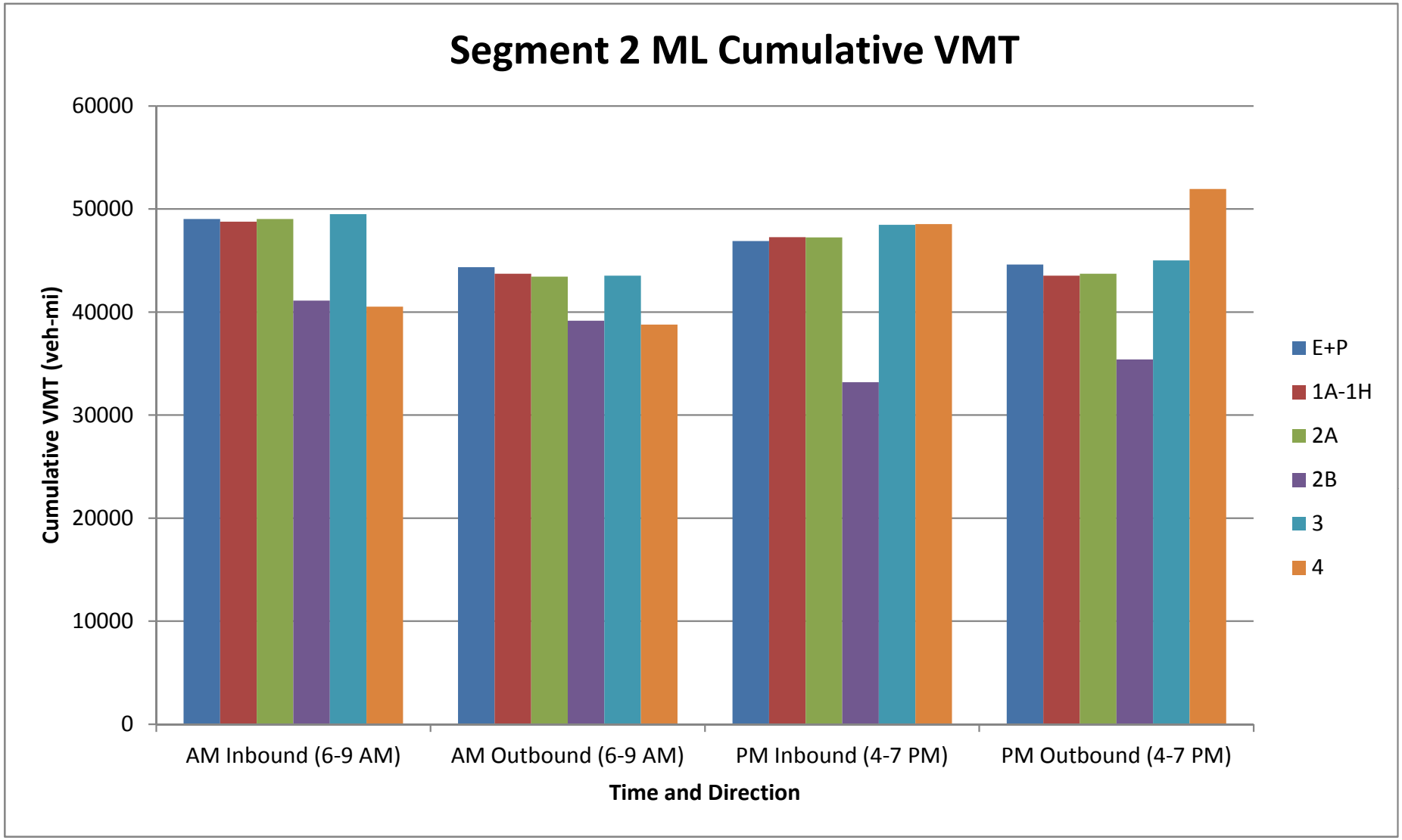

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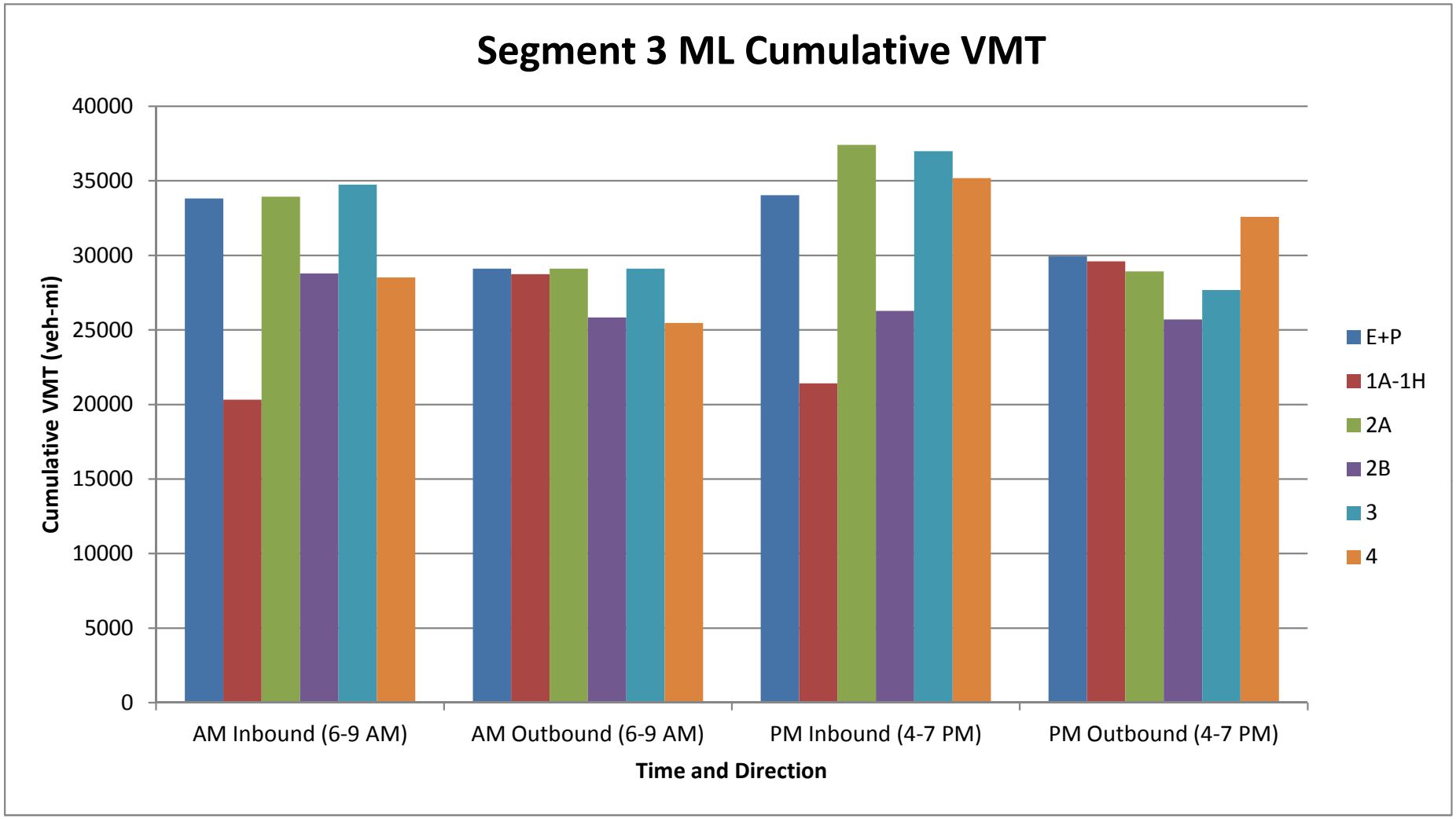

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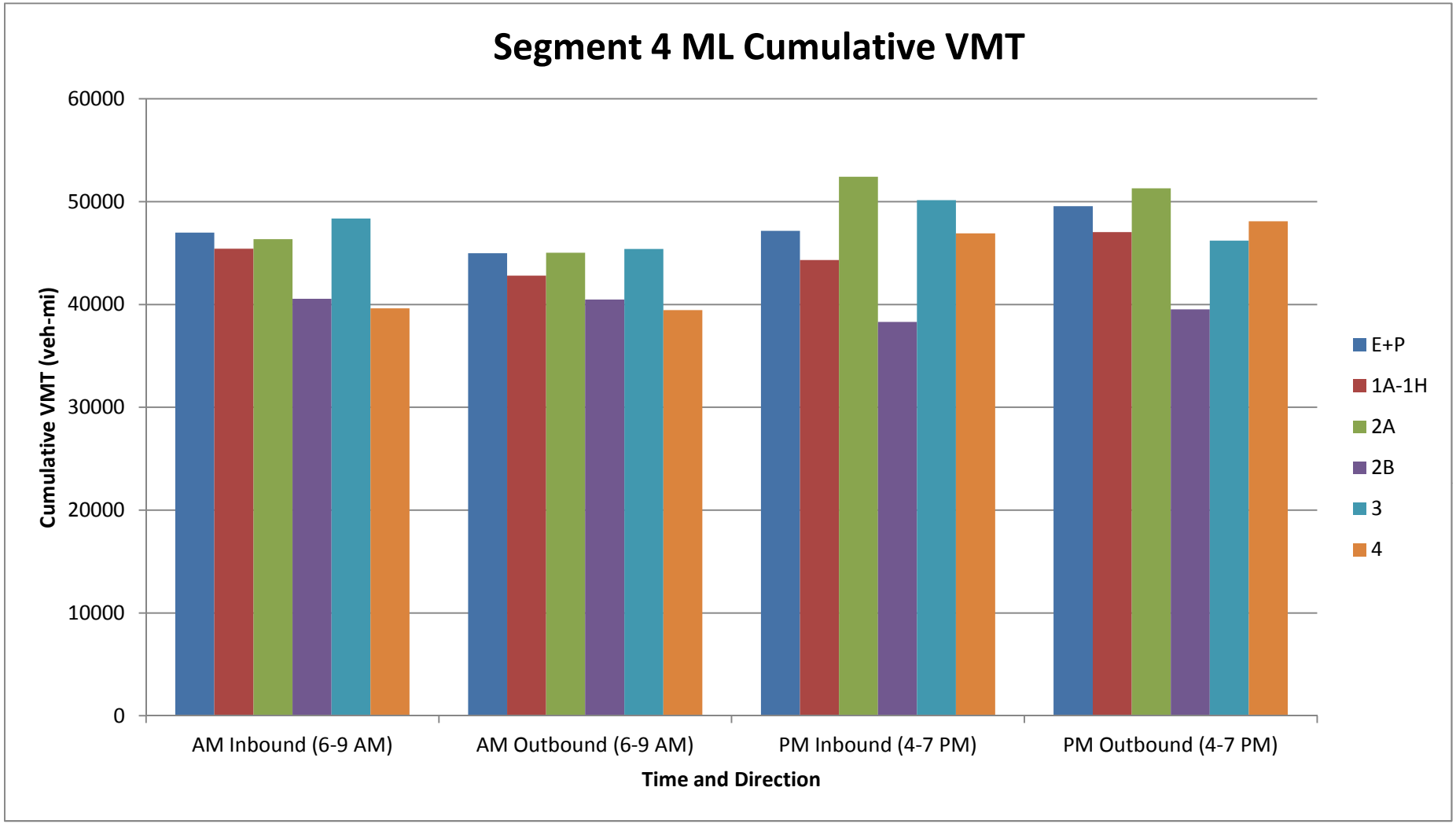
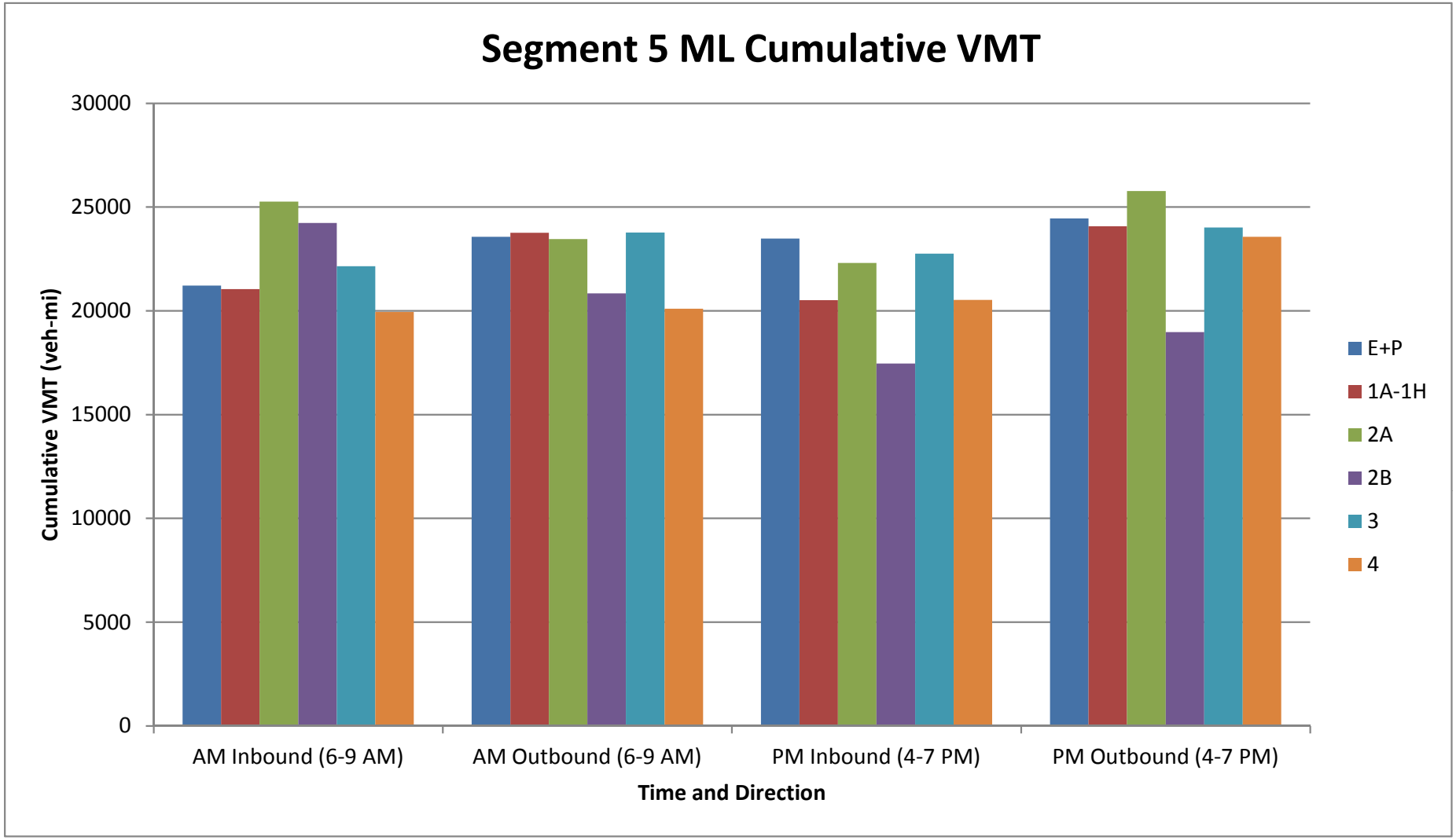
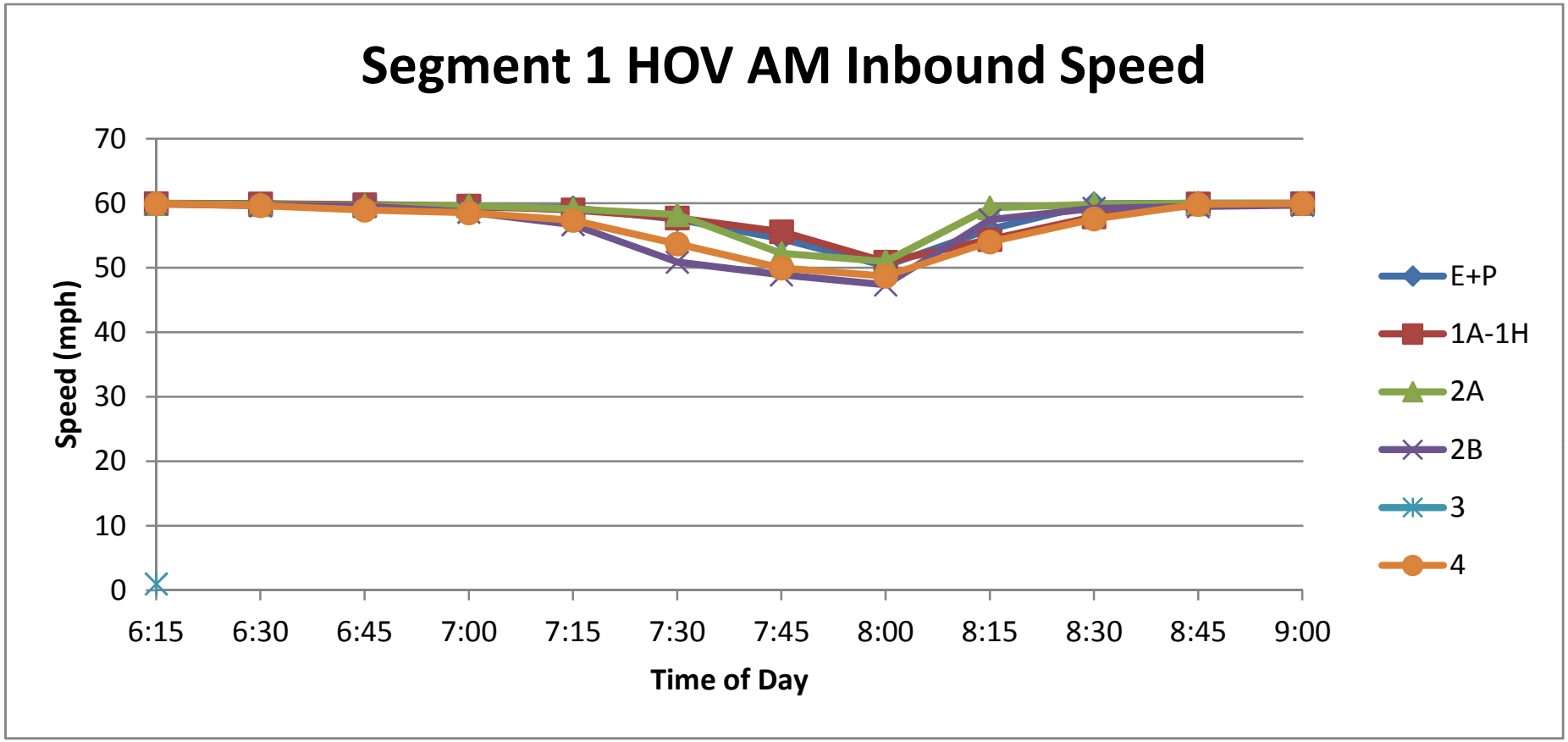


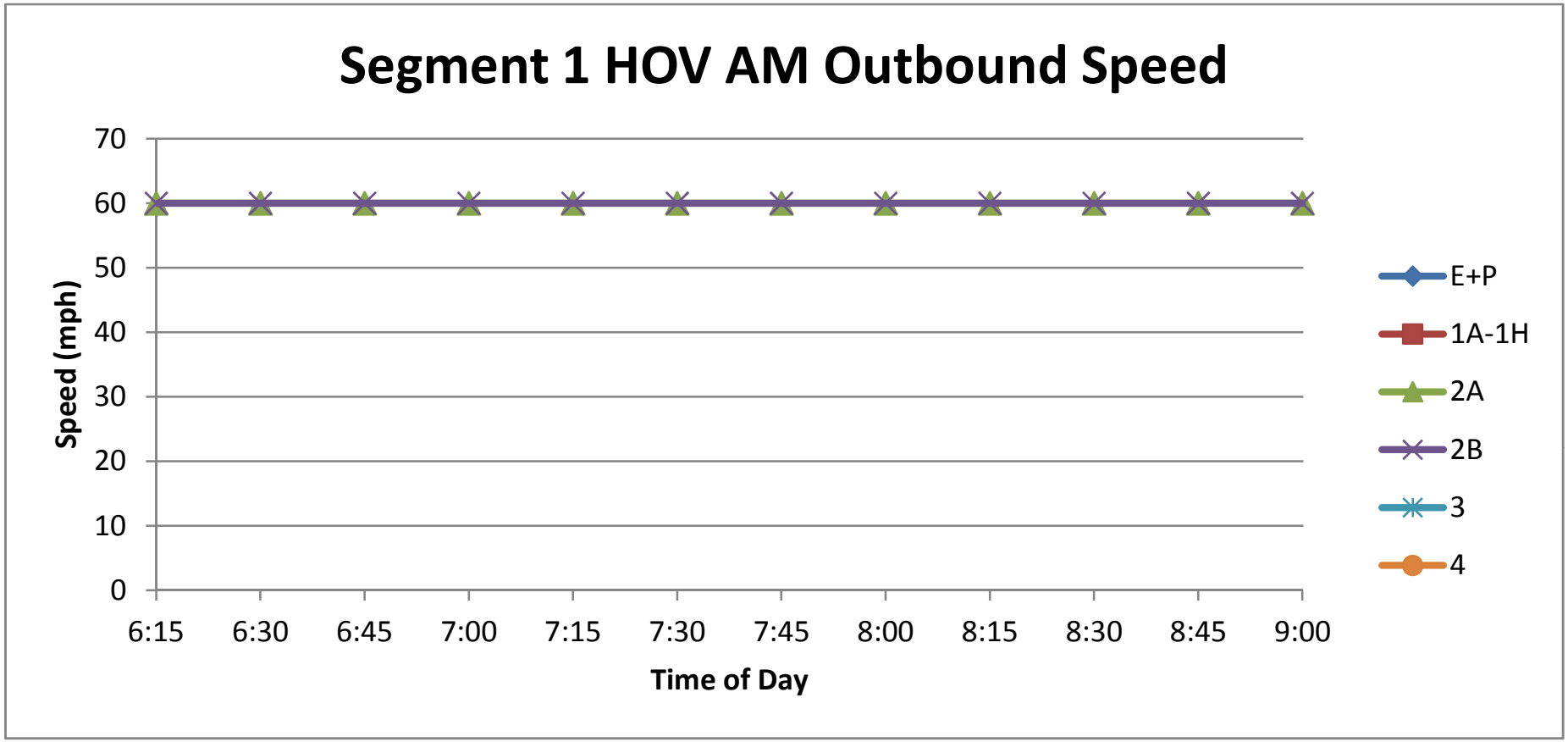
2011 DynusT Results - H-GAC Models



2011 DynusT Results - H-GAC Models



2011 DynusT Results - H-GAC Models



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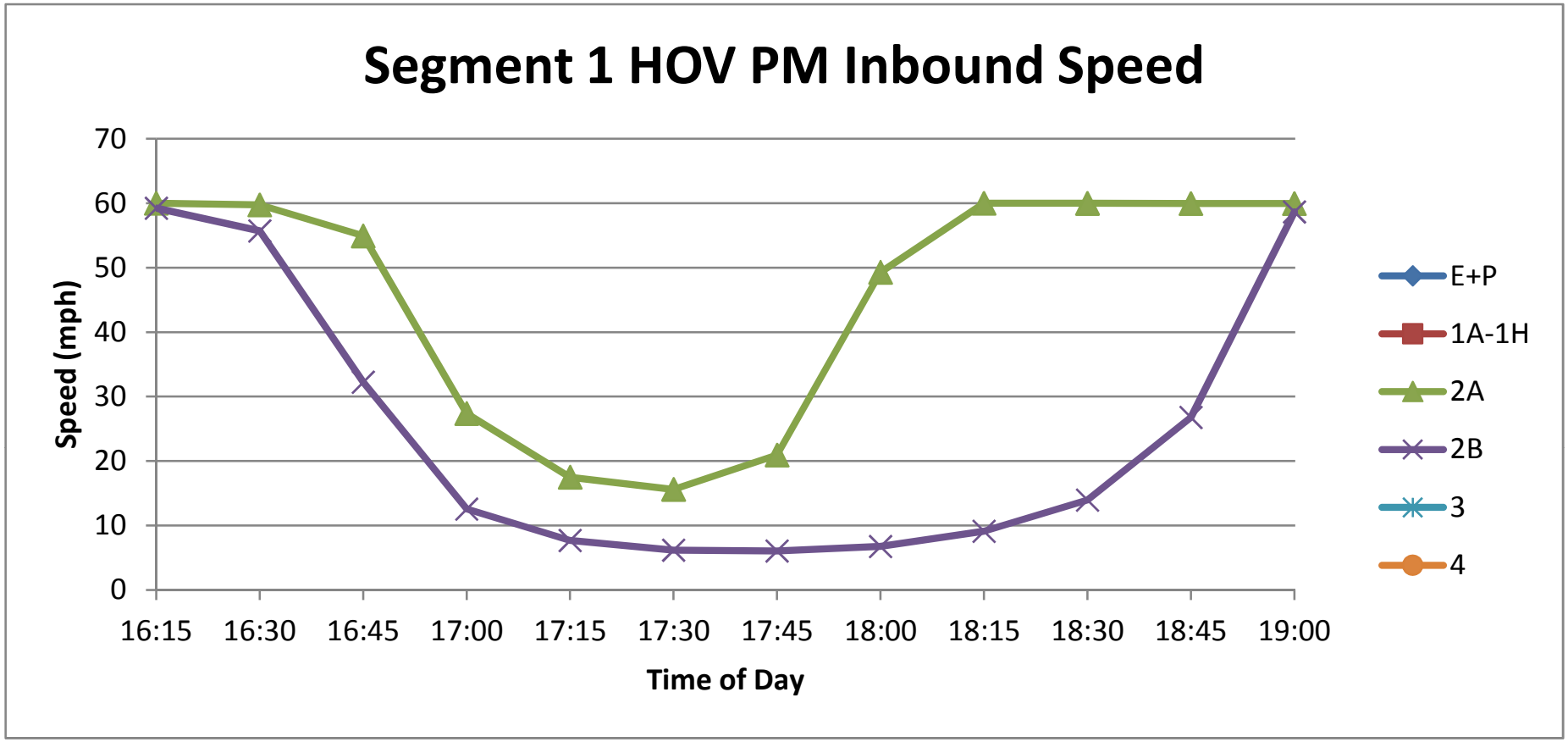
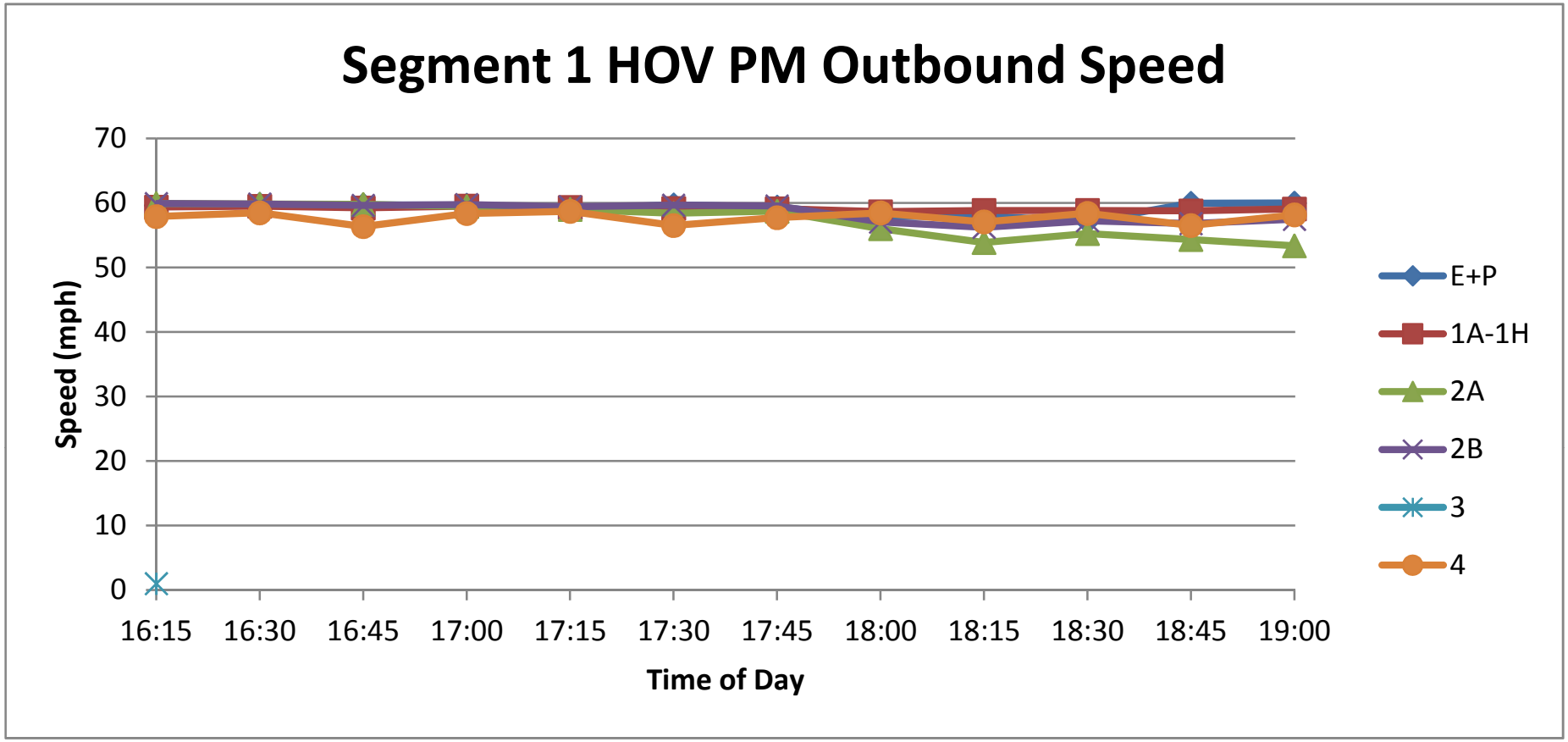


2011 DynusT Results - H-GAC Models



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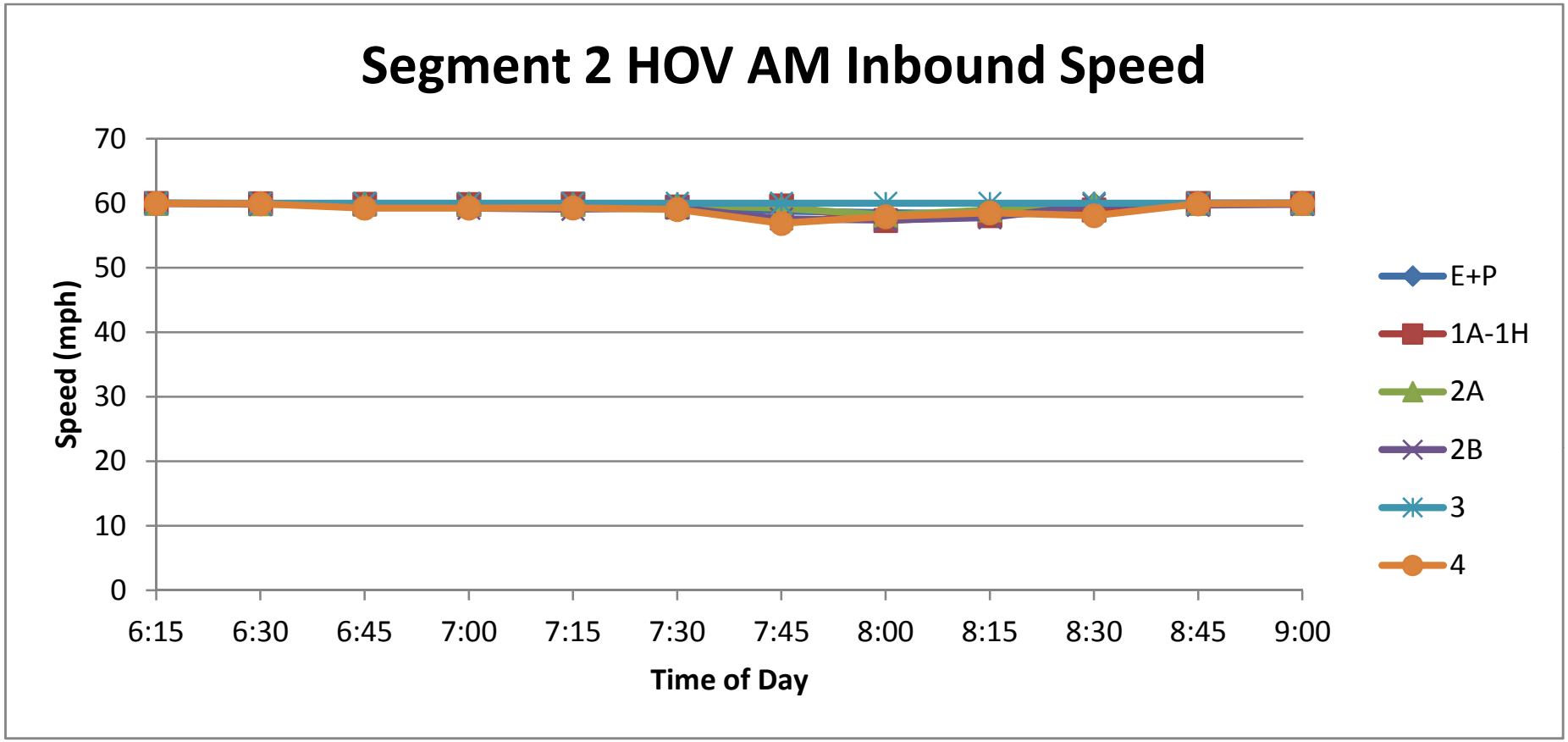
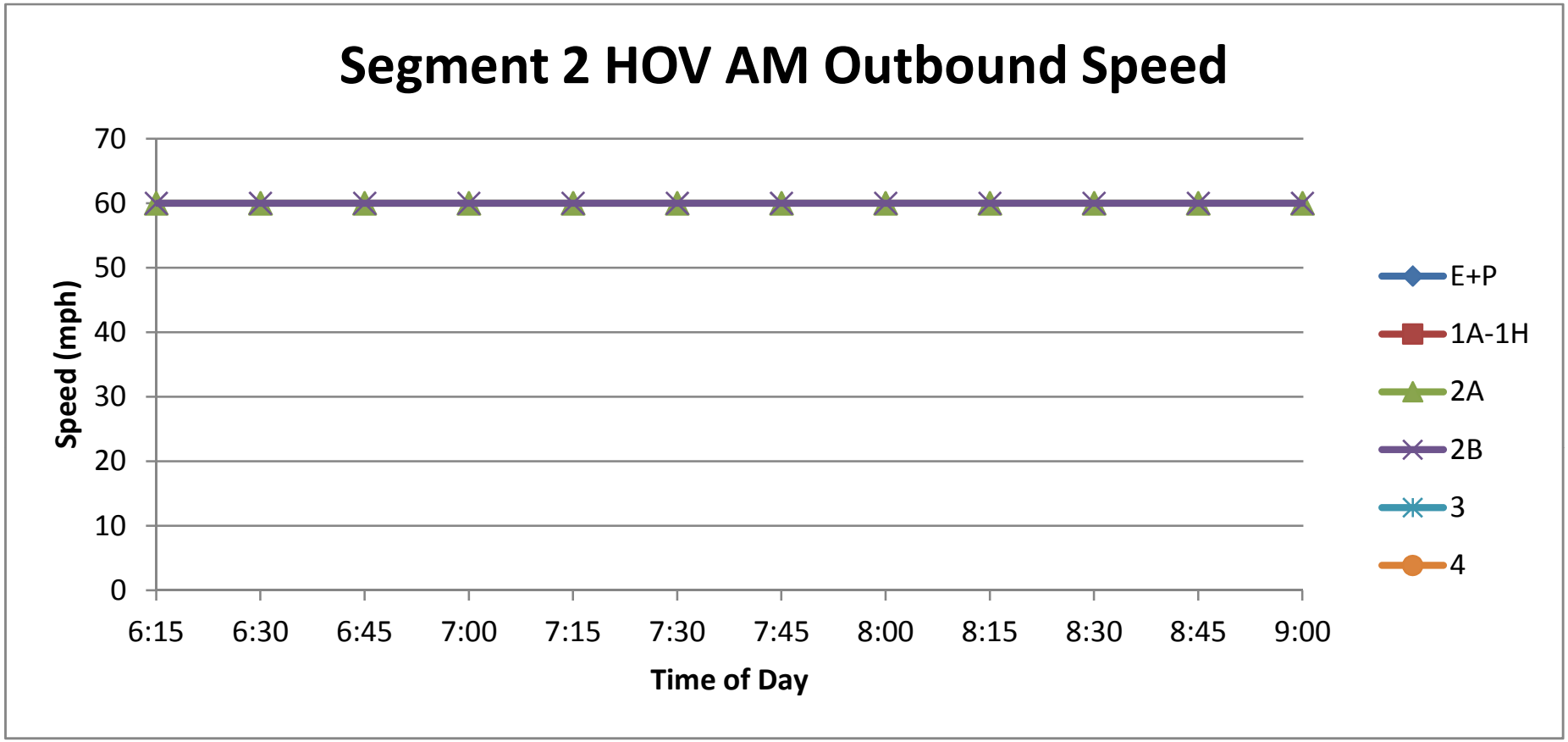


2011 DynusT Results - H-GAC Models



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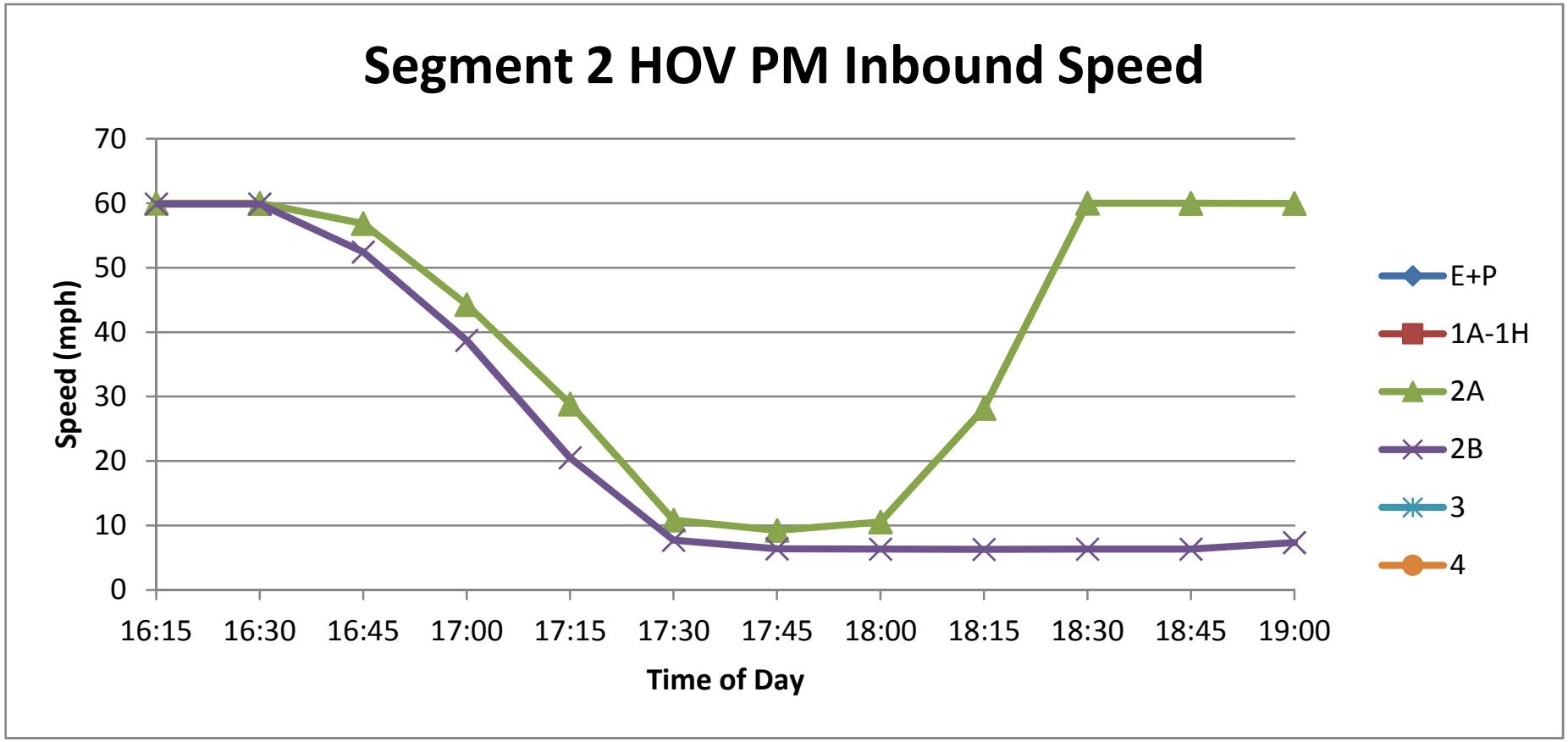

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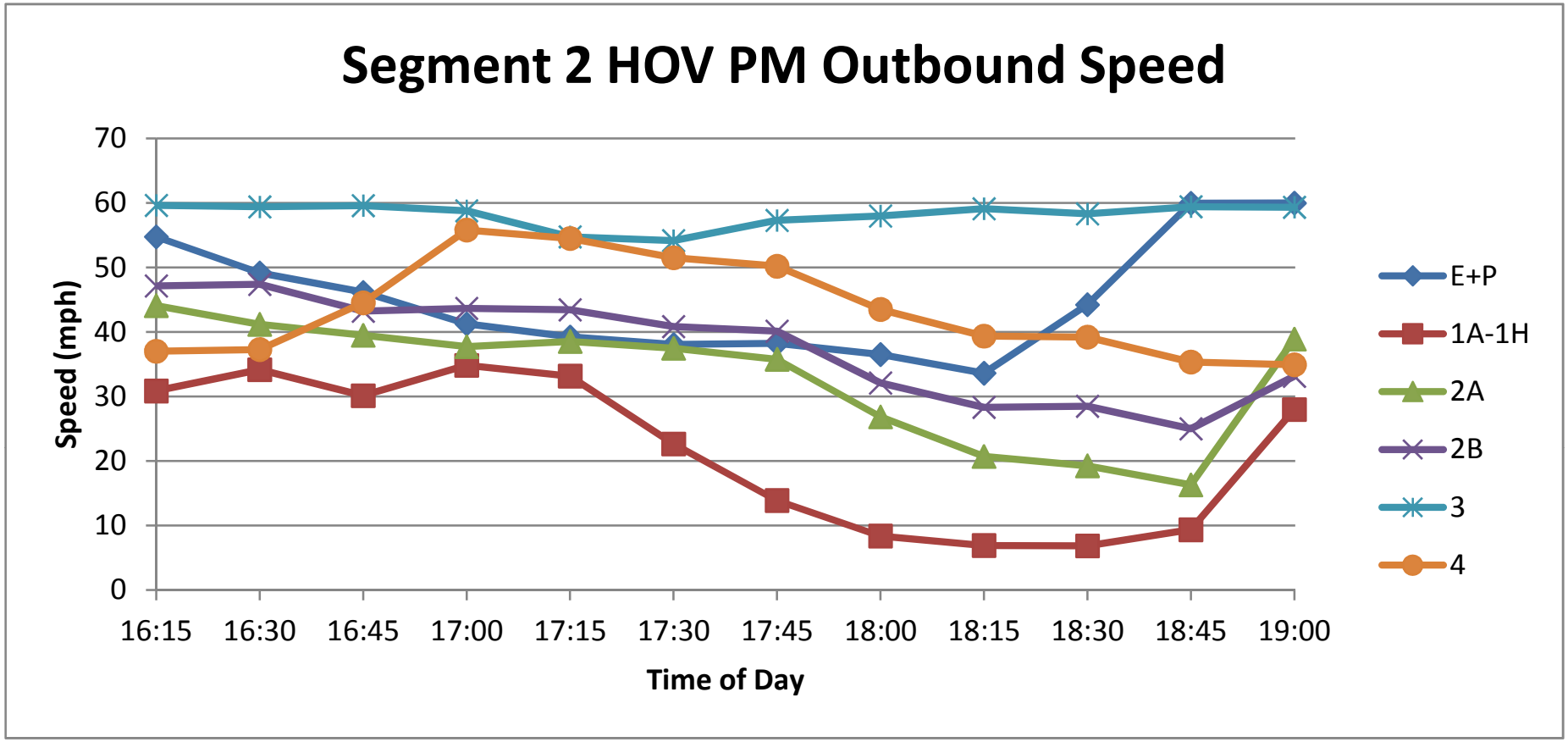

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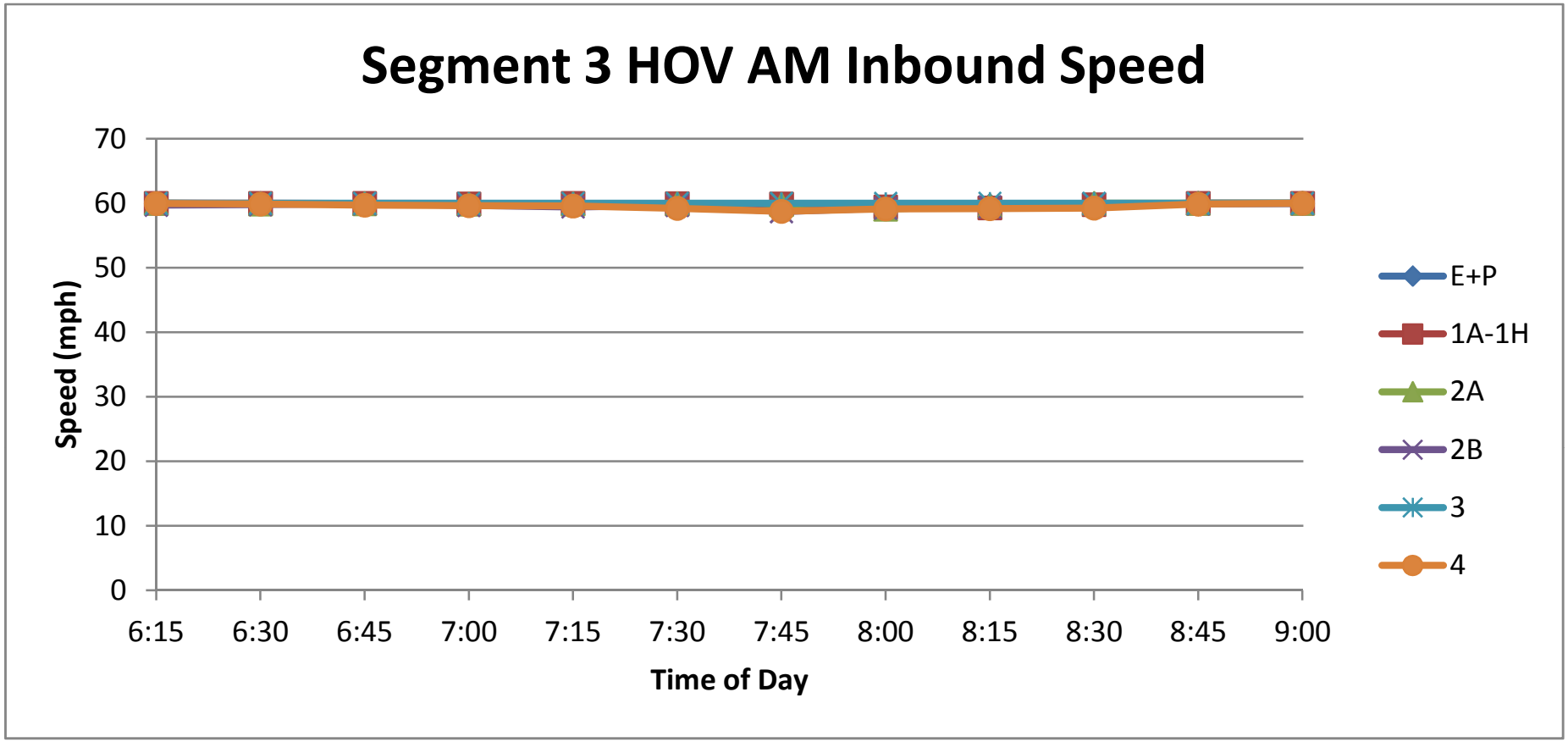

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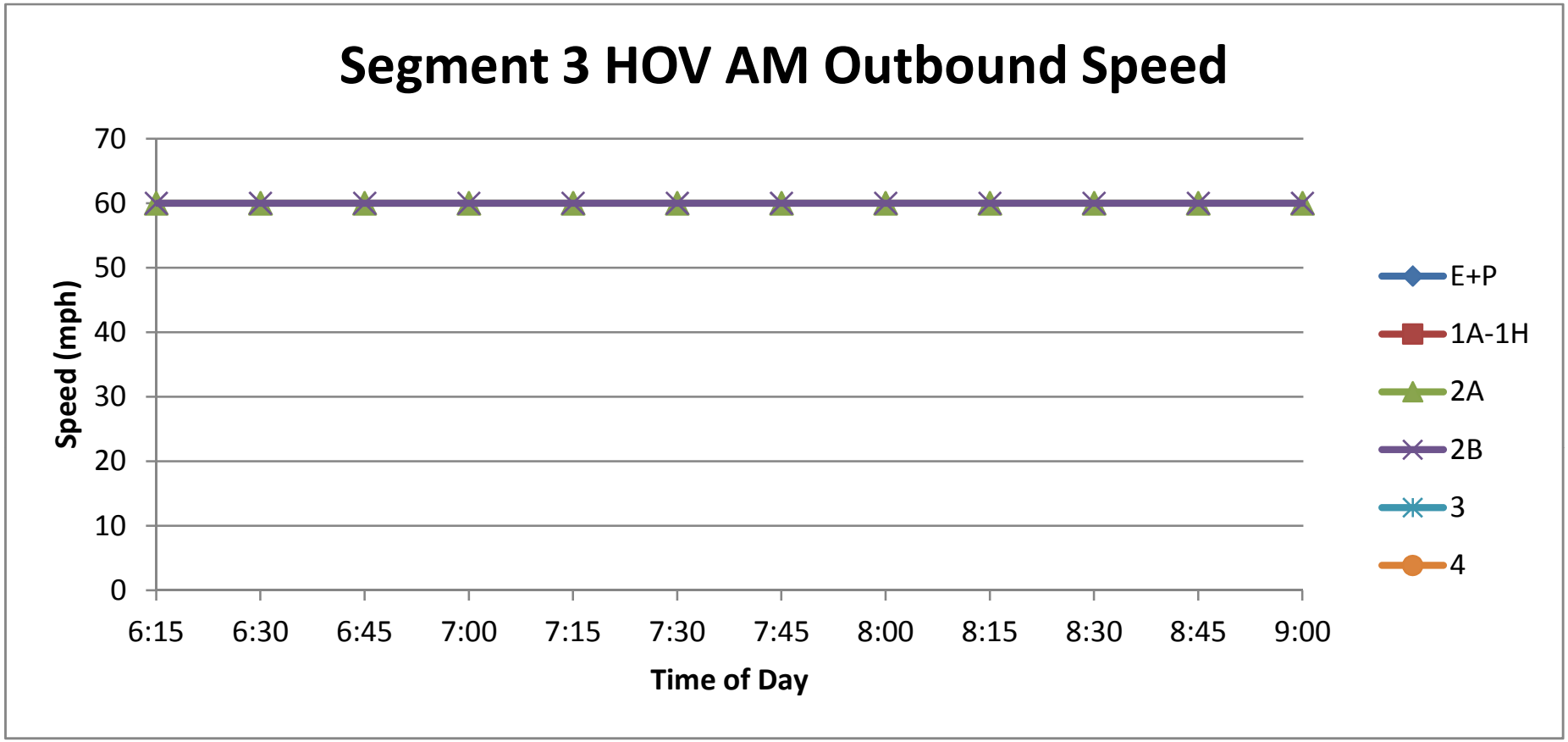

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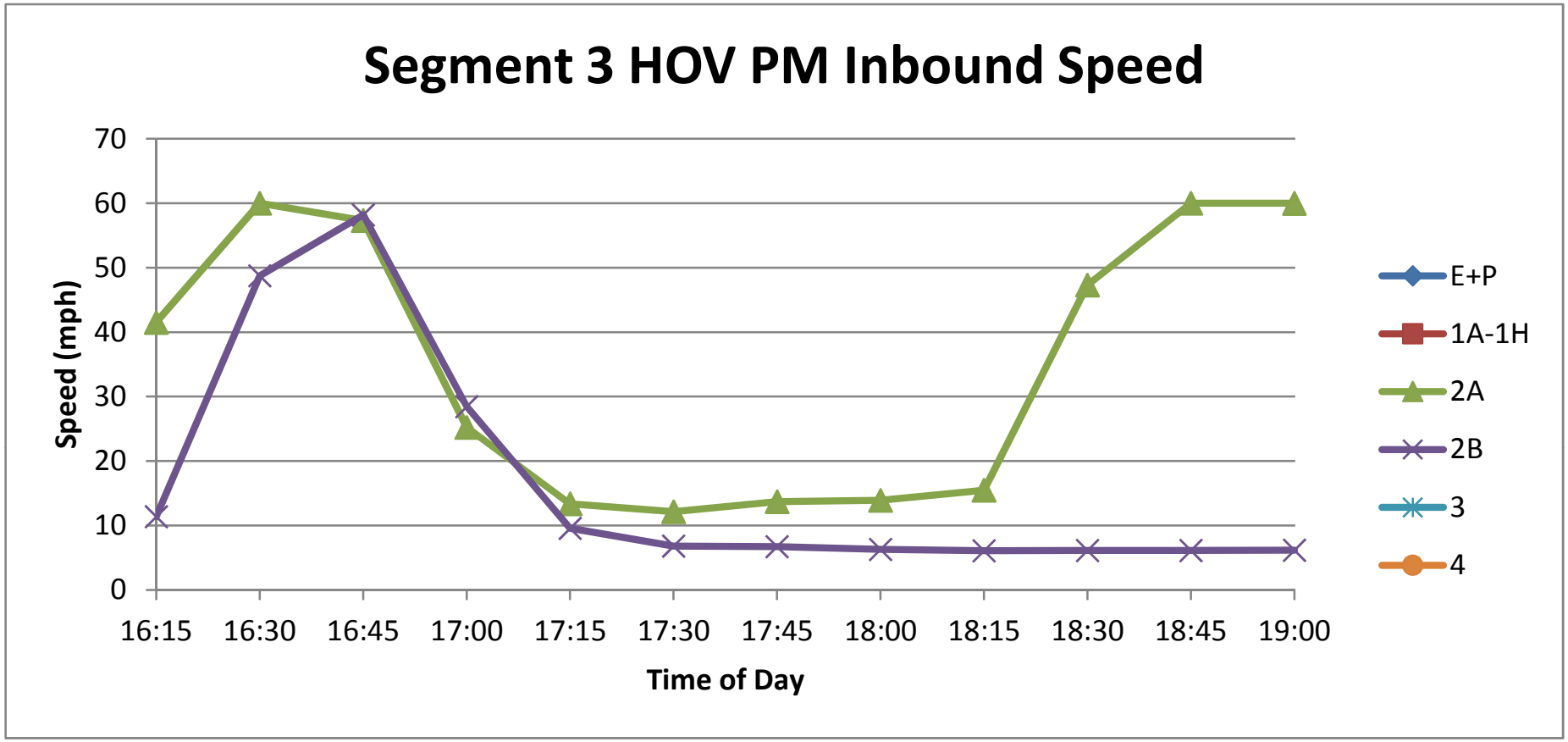

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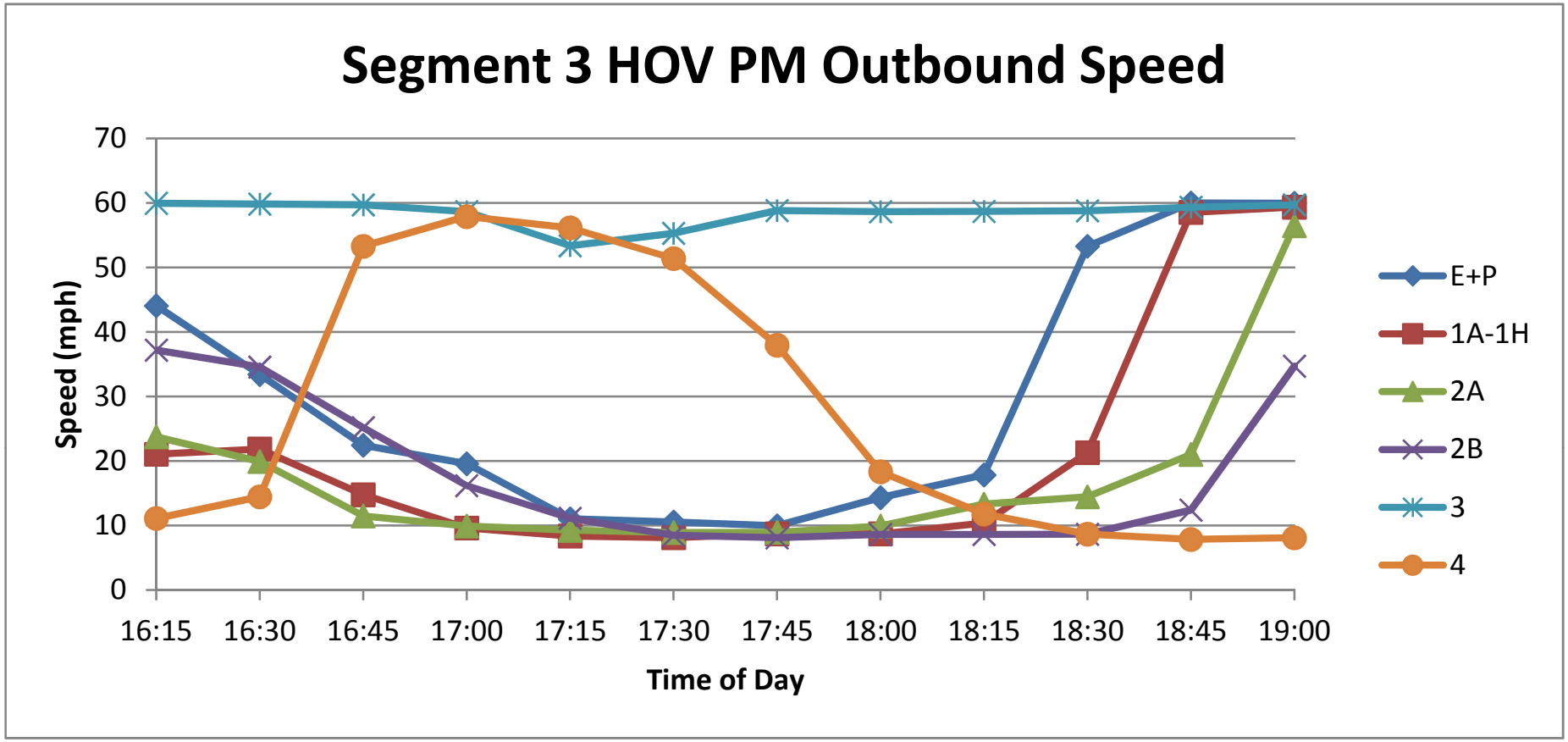

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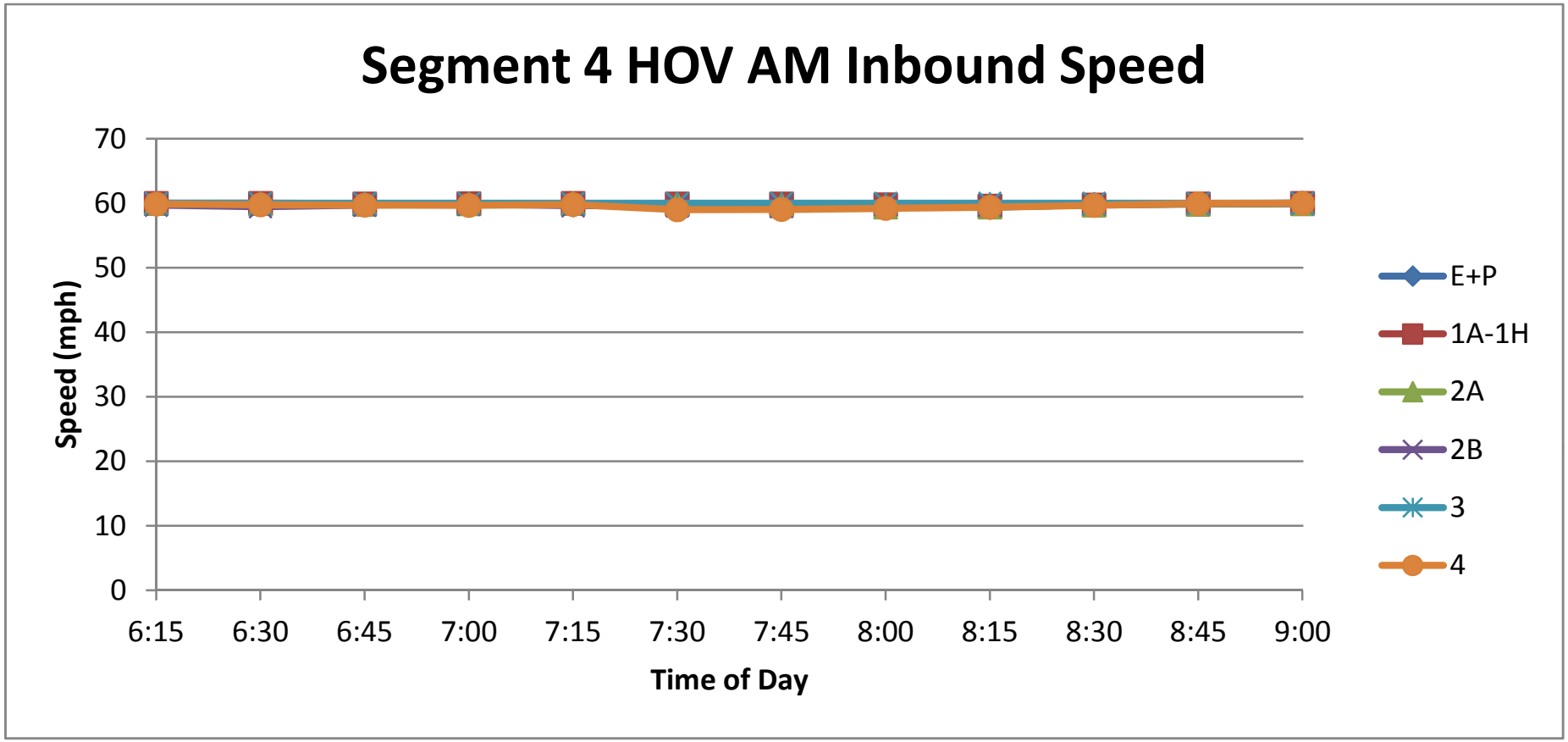

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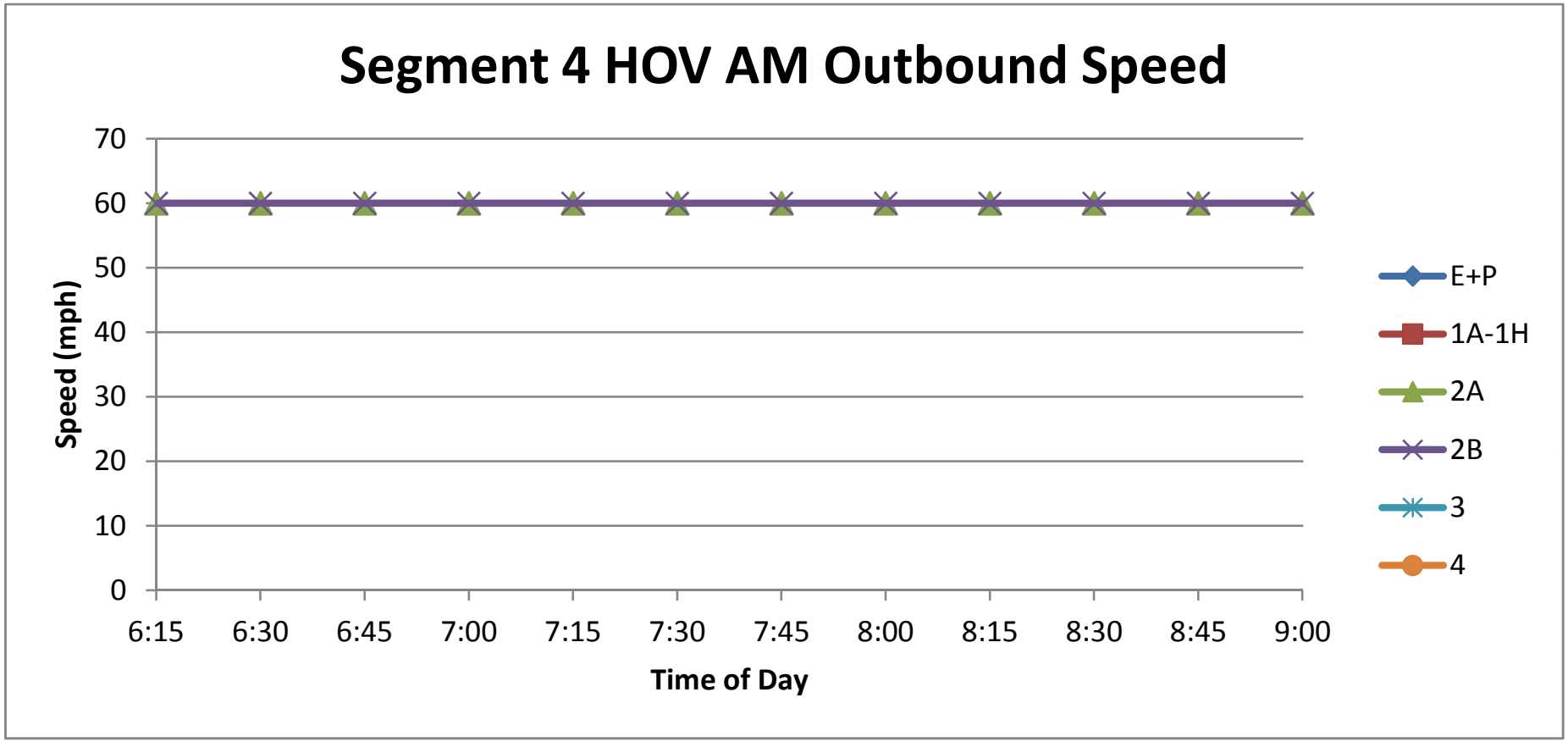

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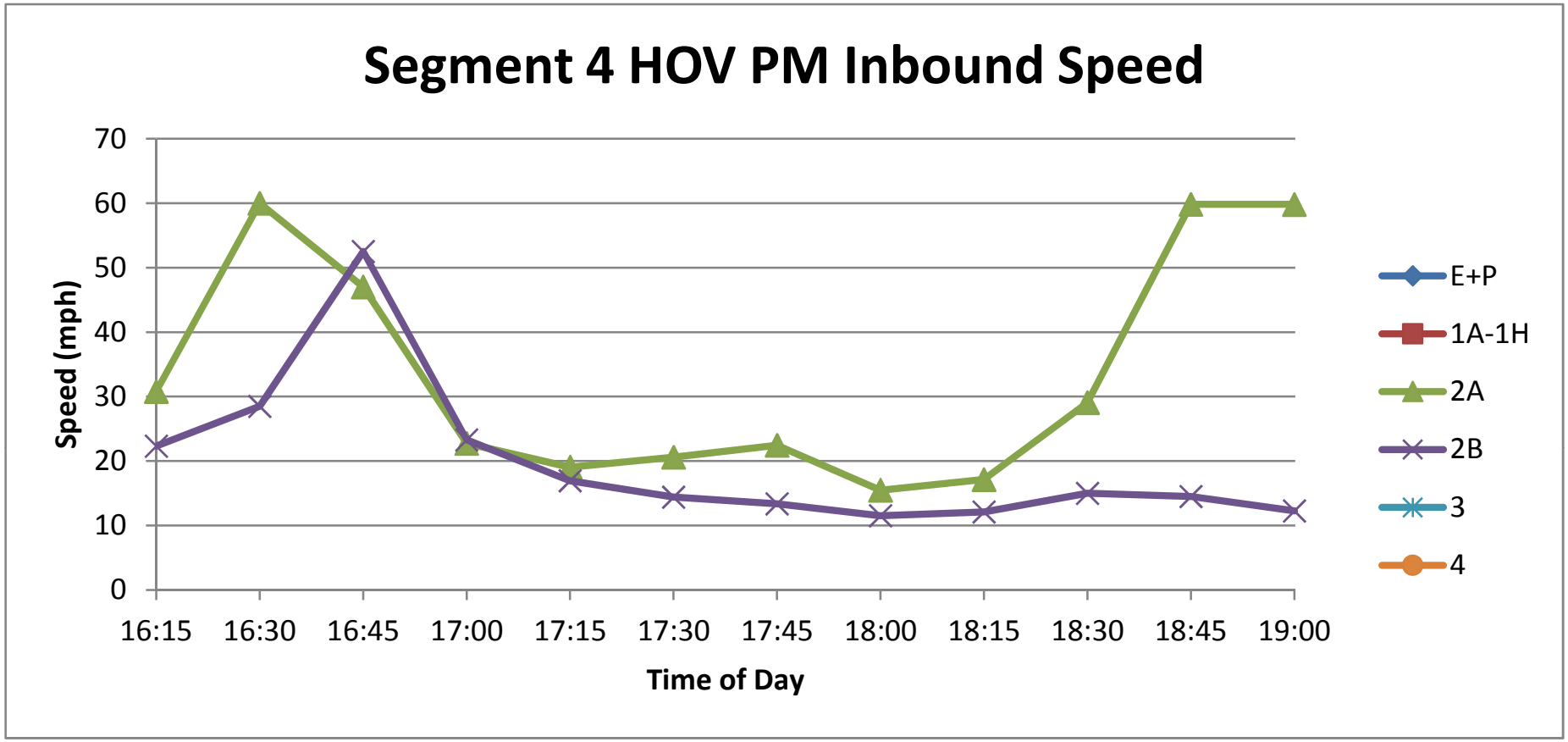

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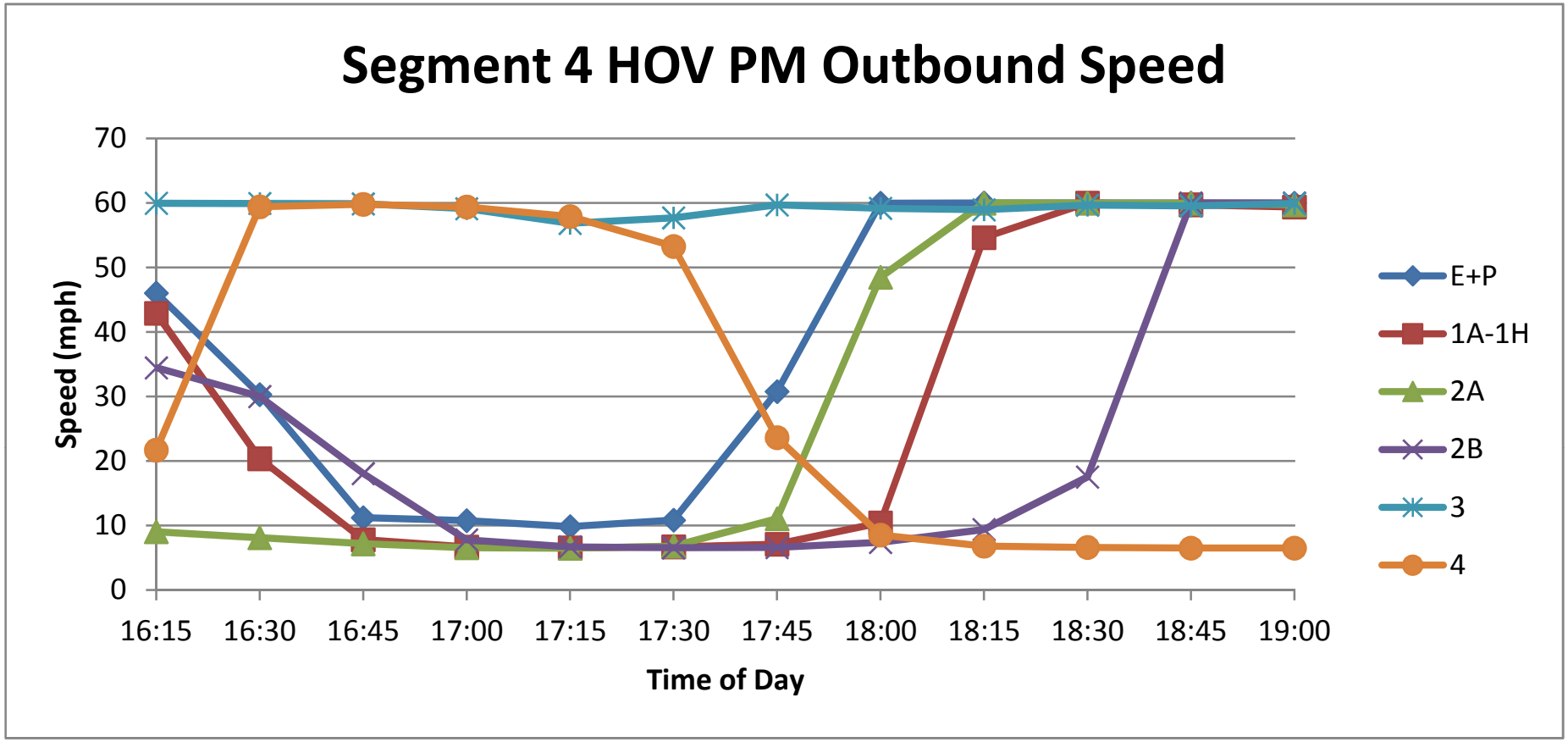

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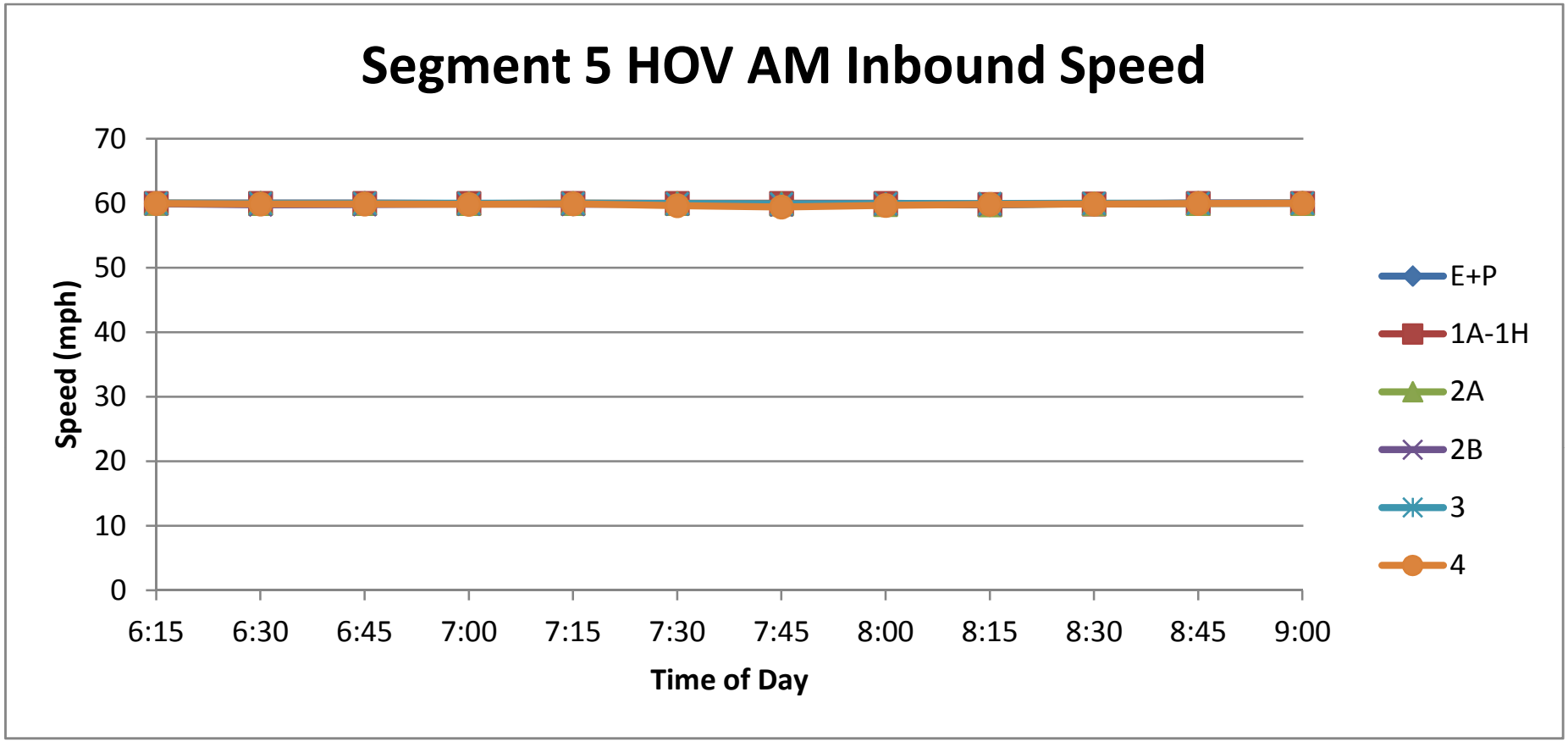

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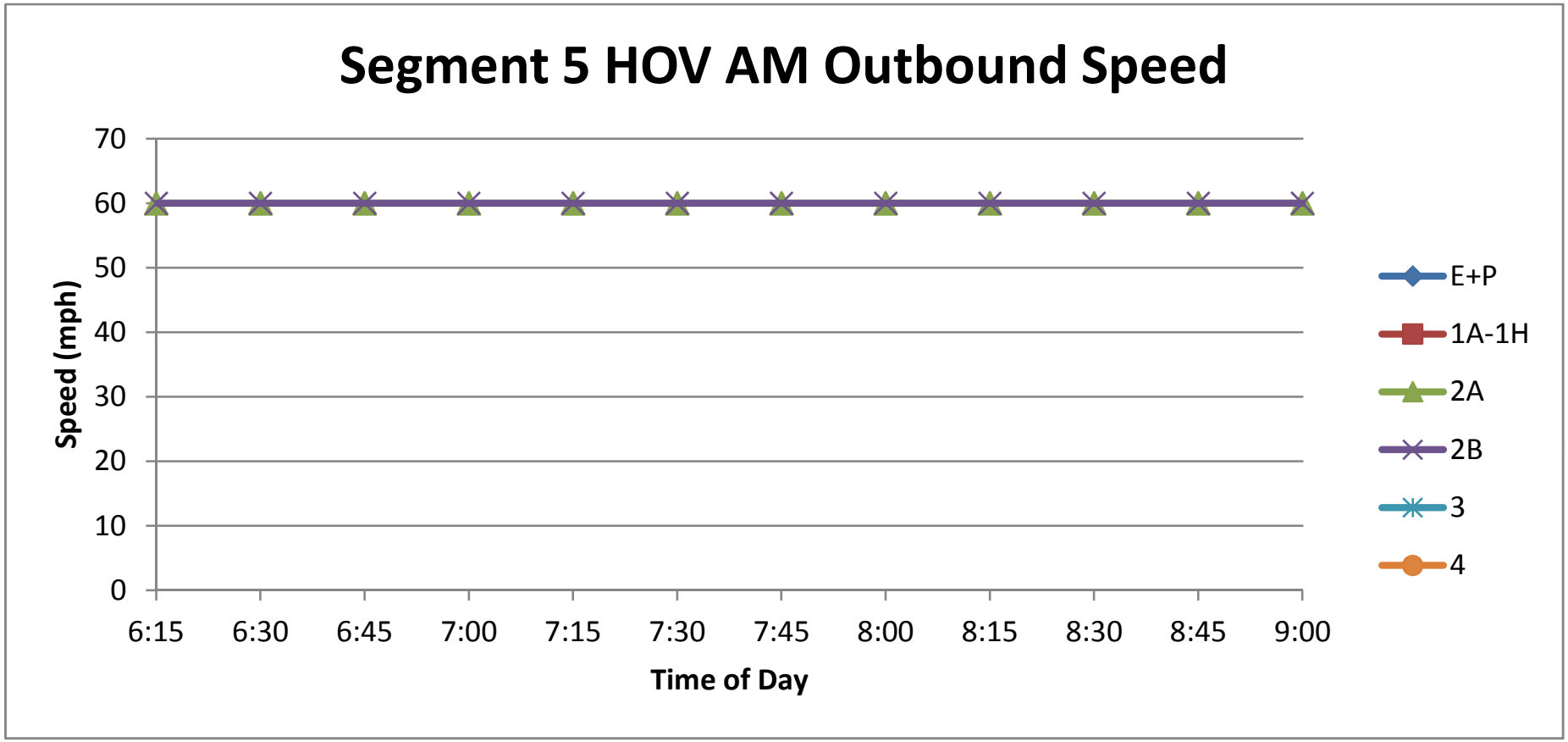

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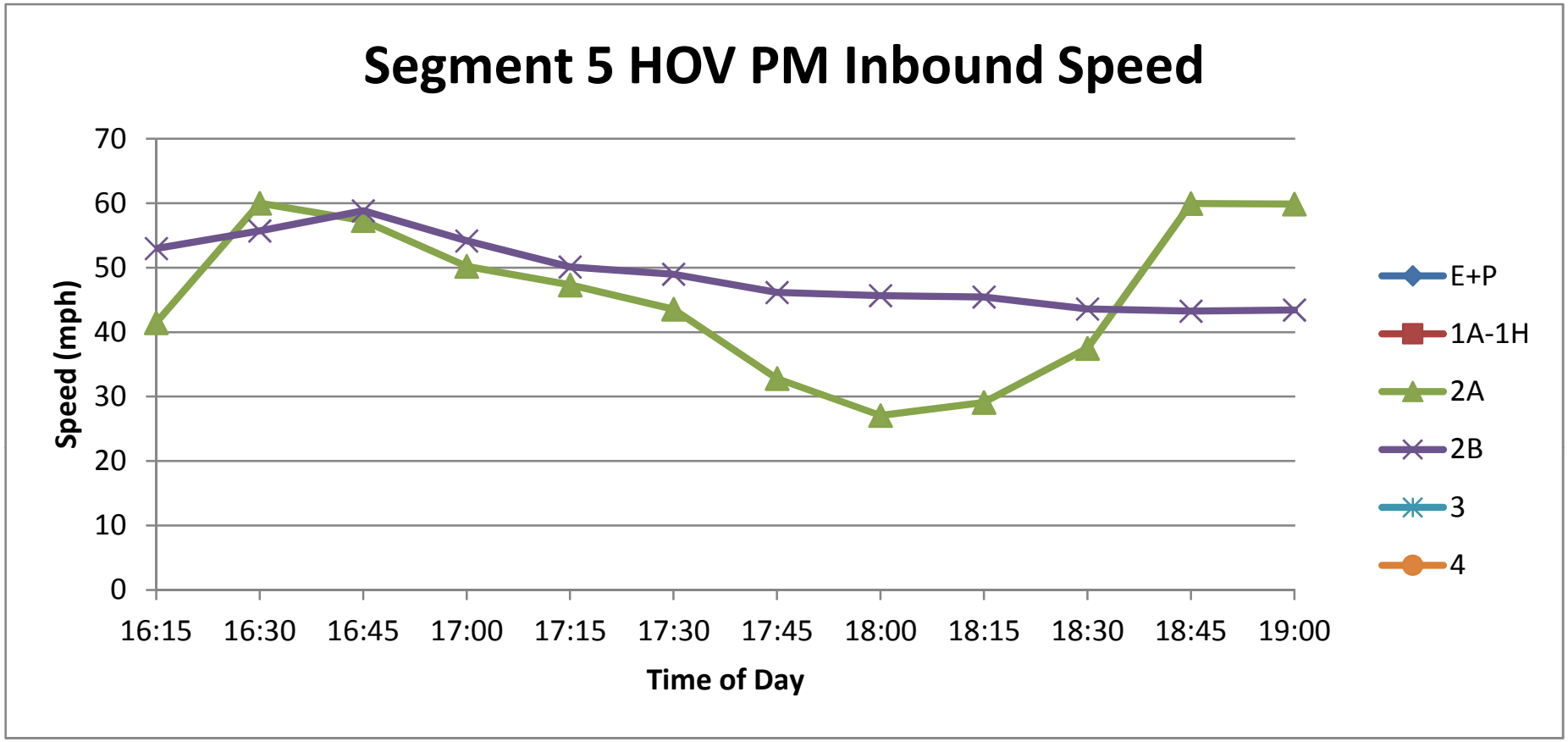

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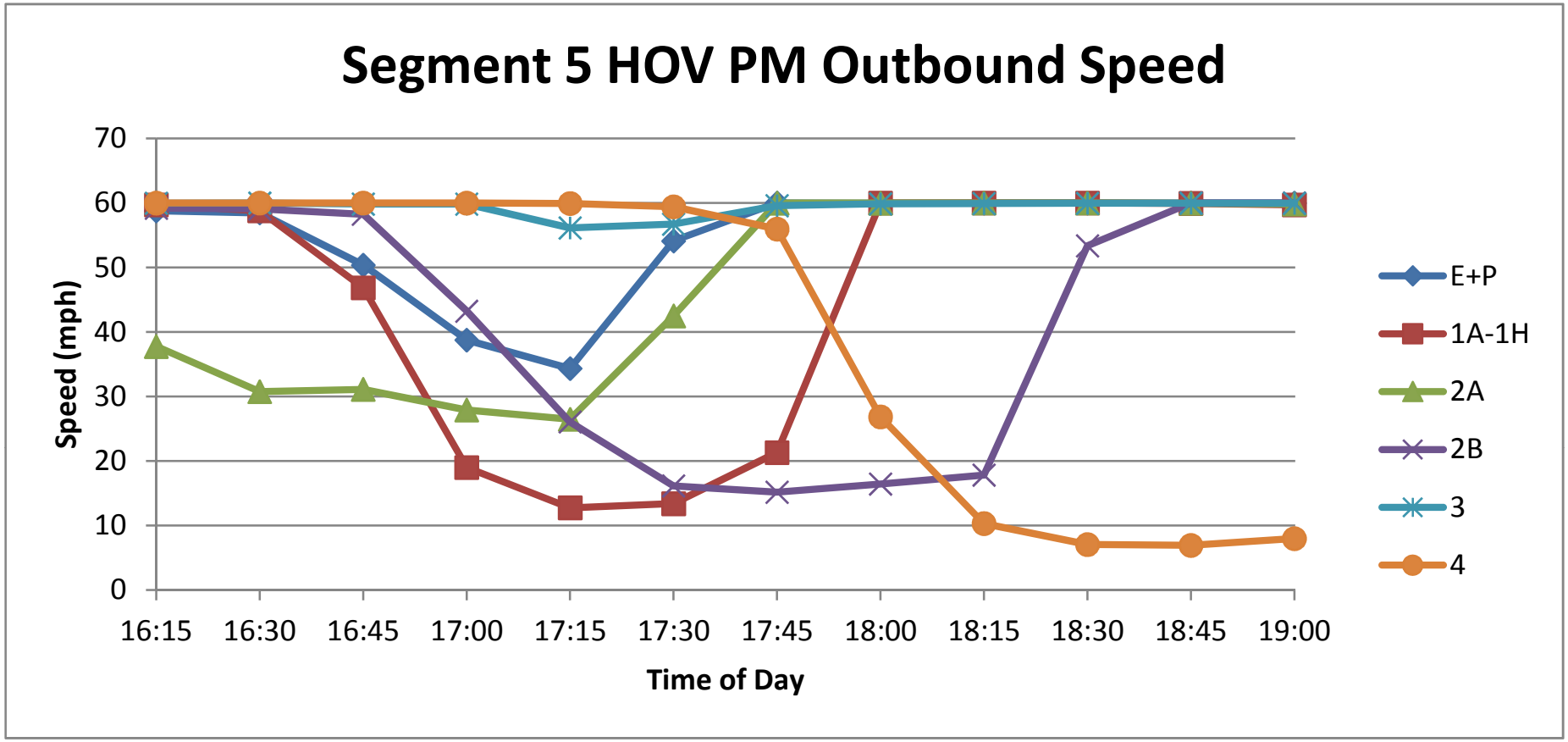

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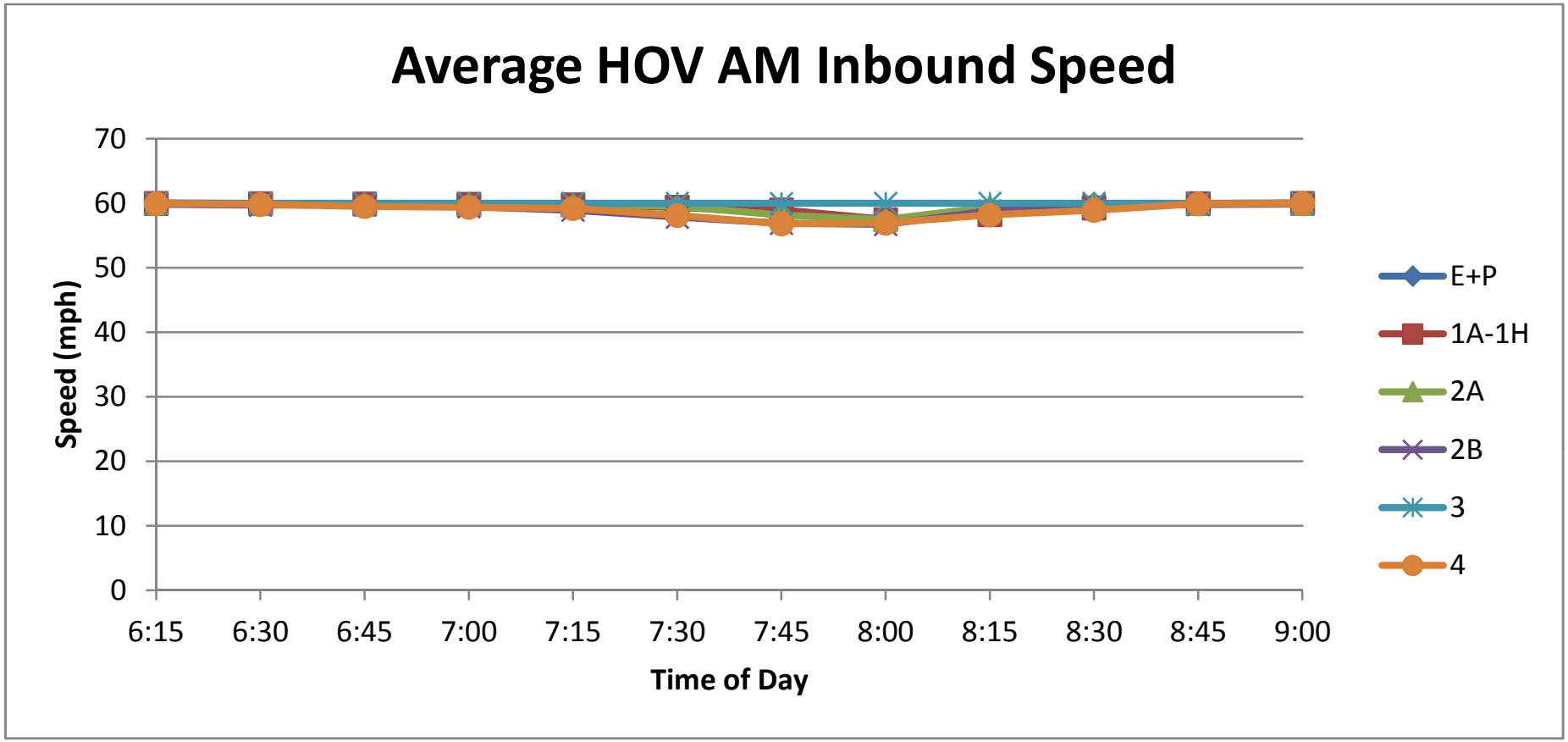

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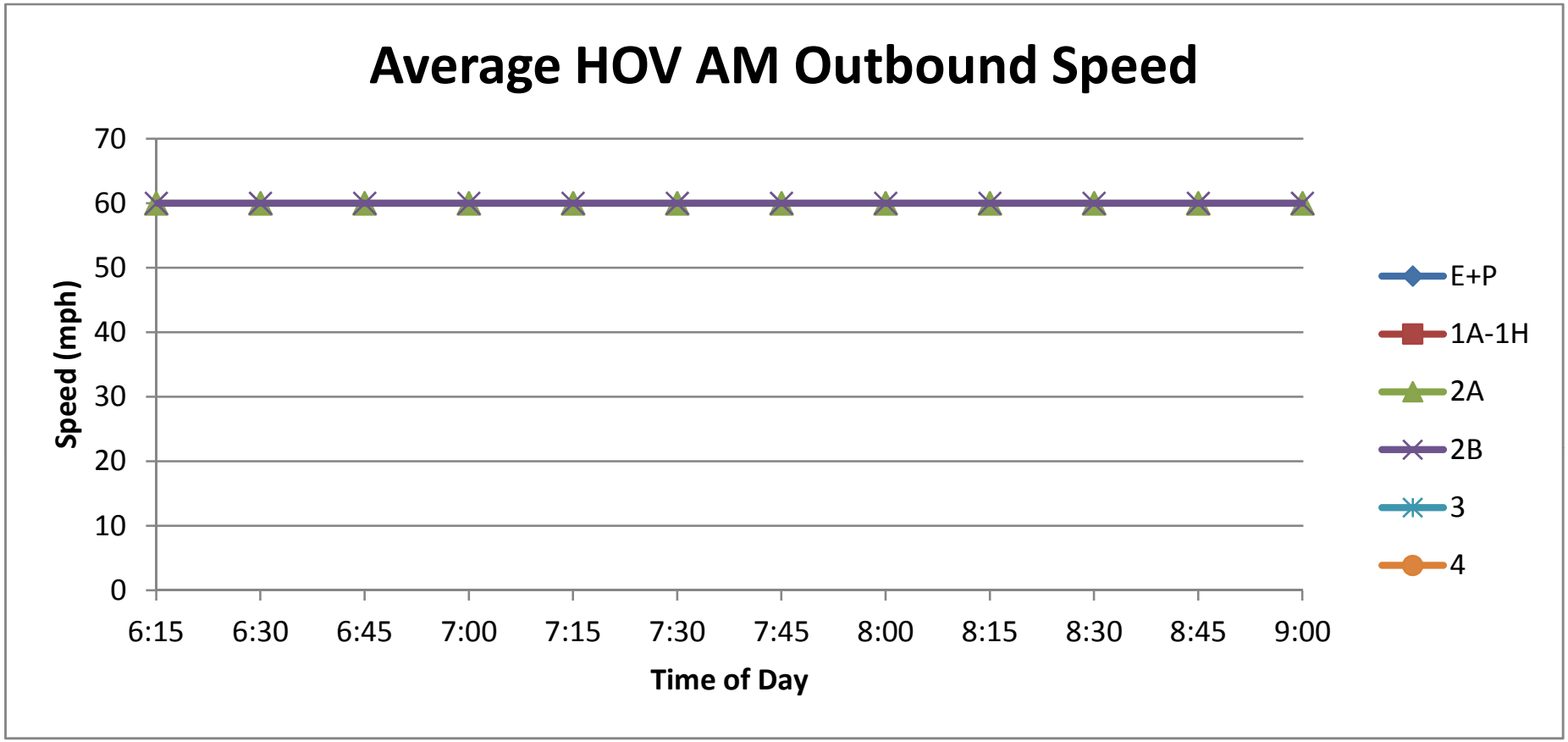

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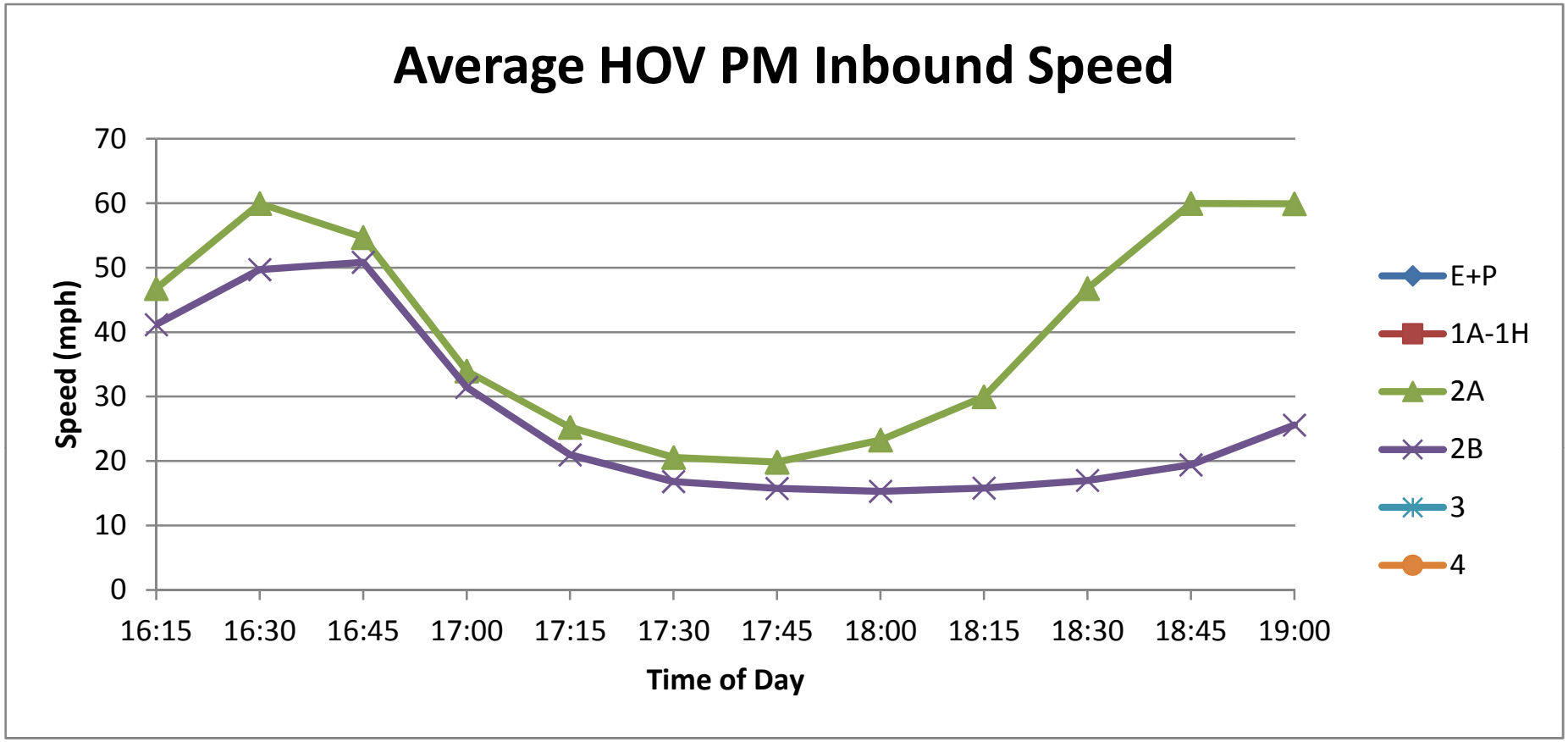

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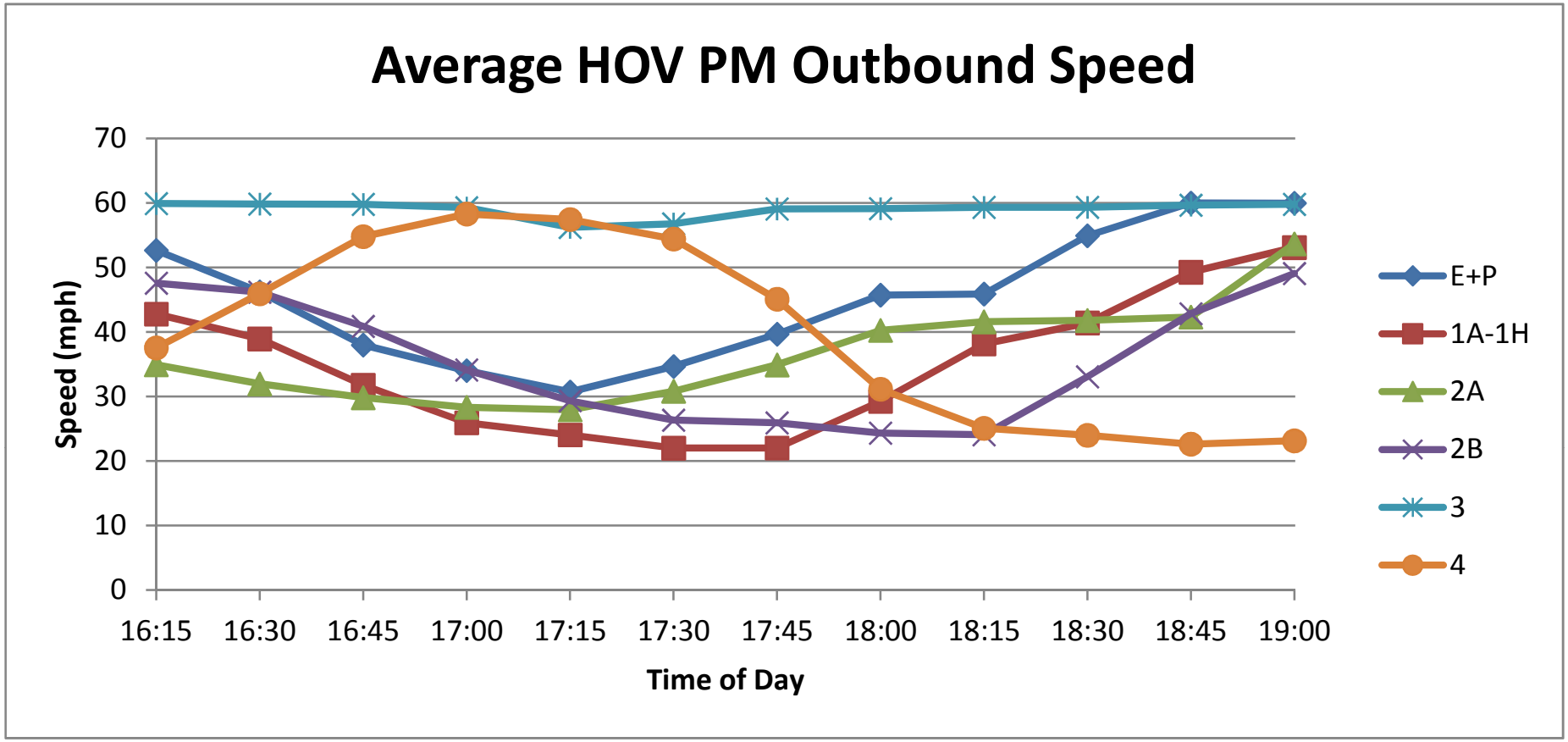

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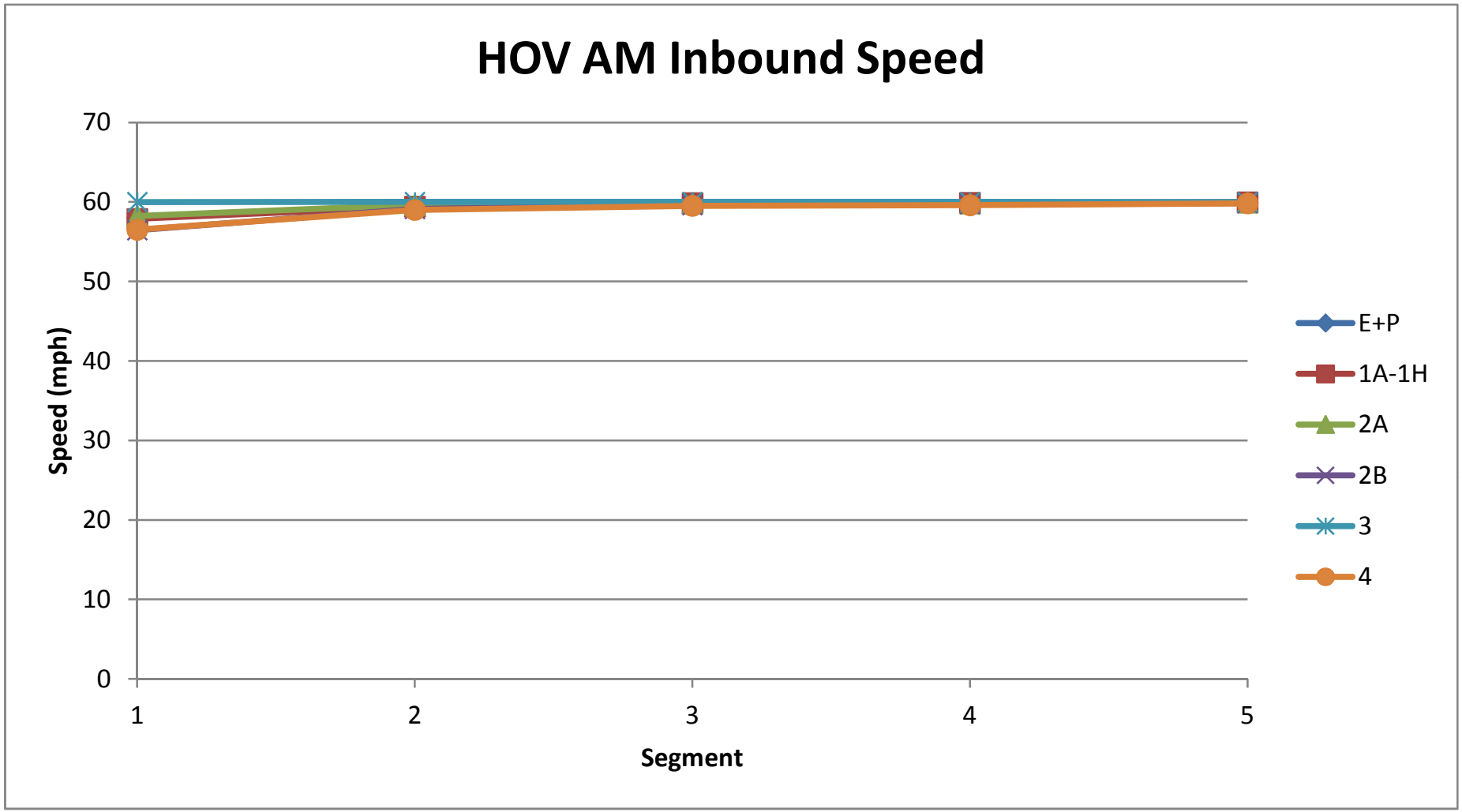

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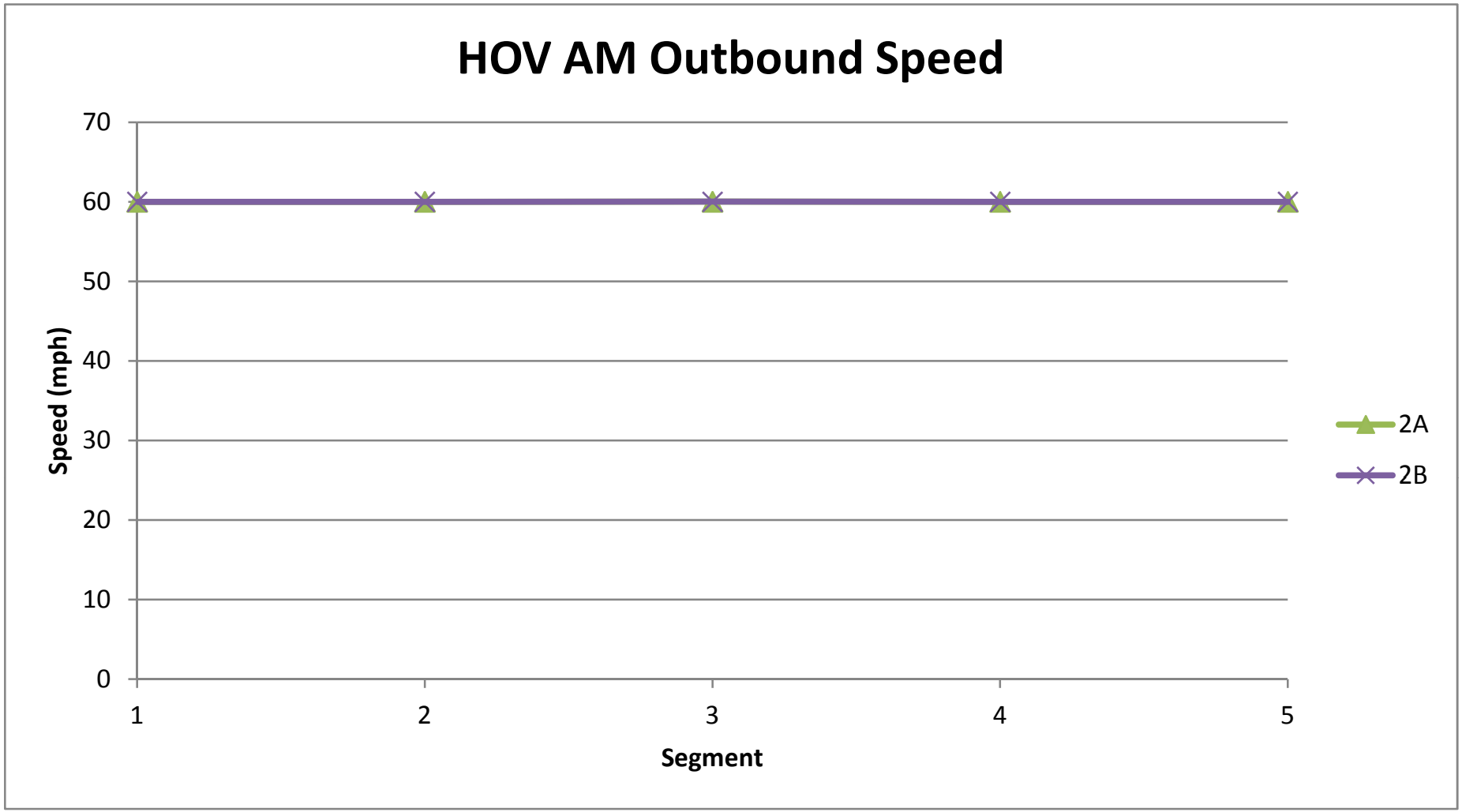

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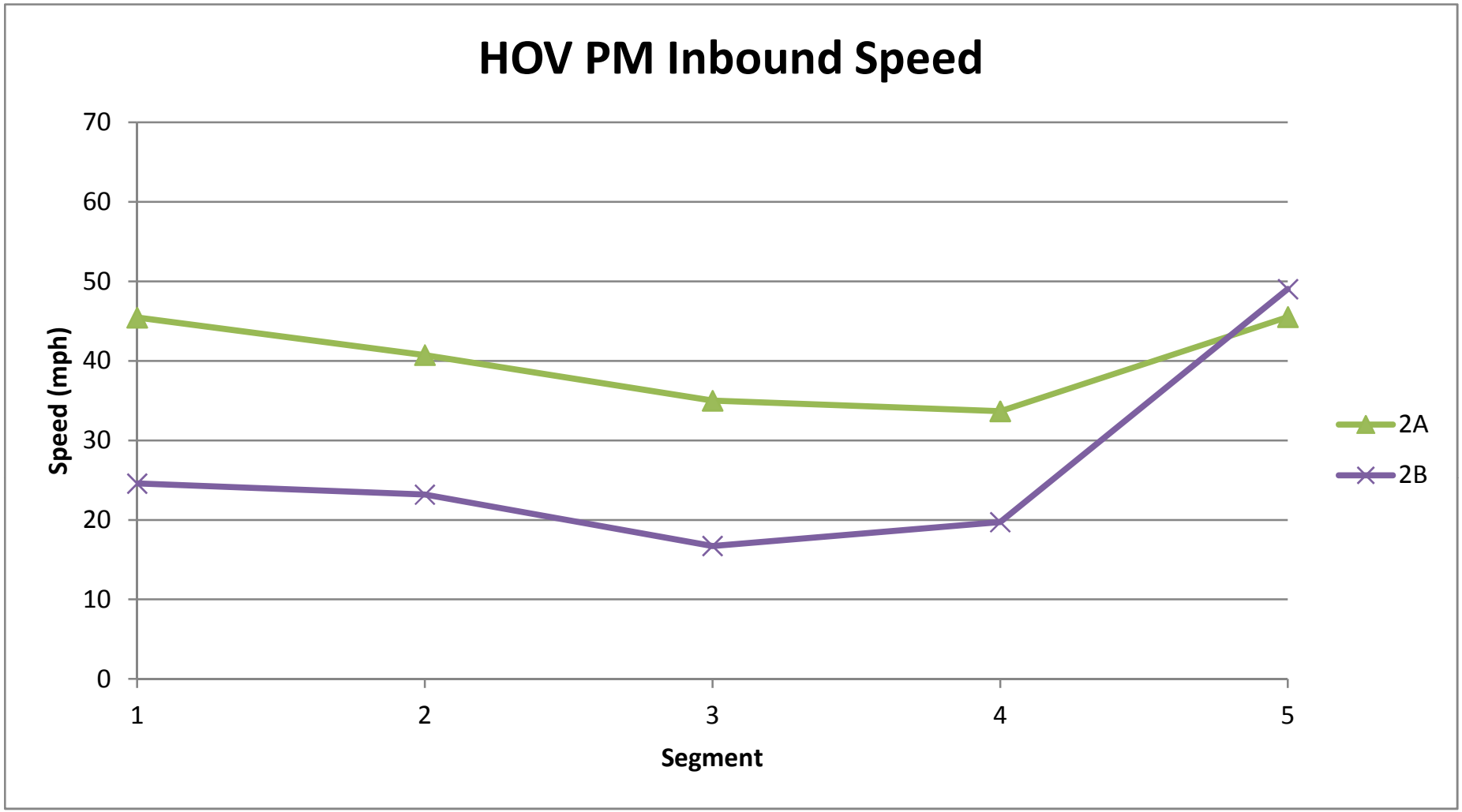

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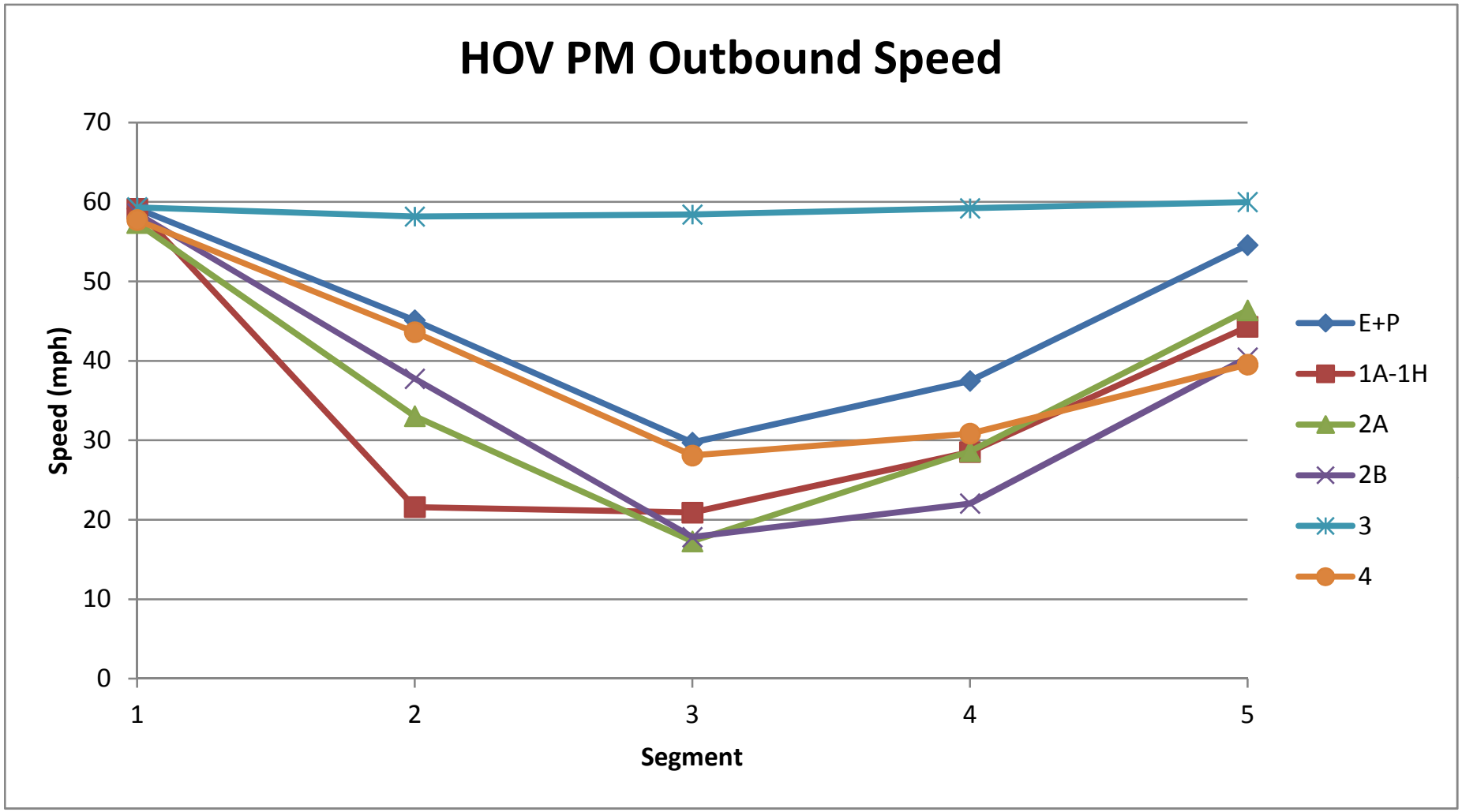

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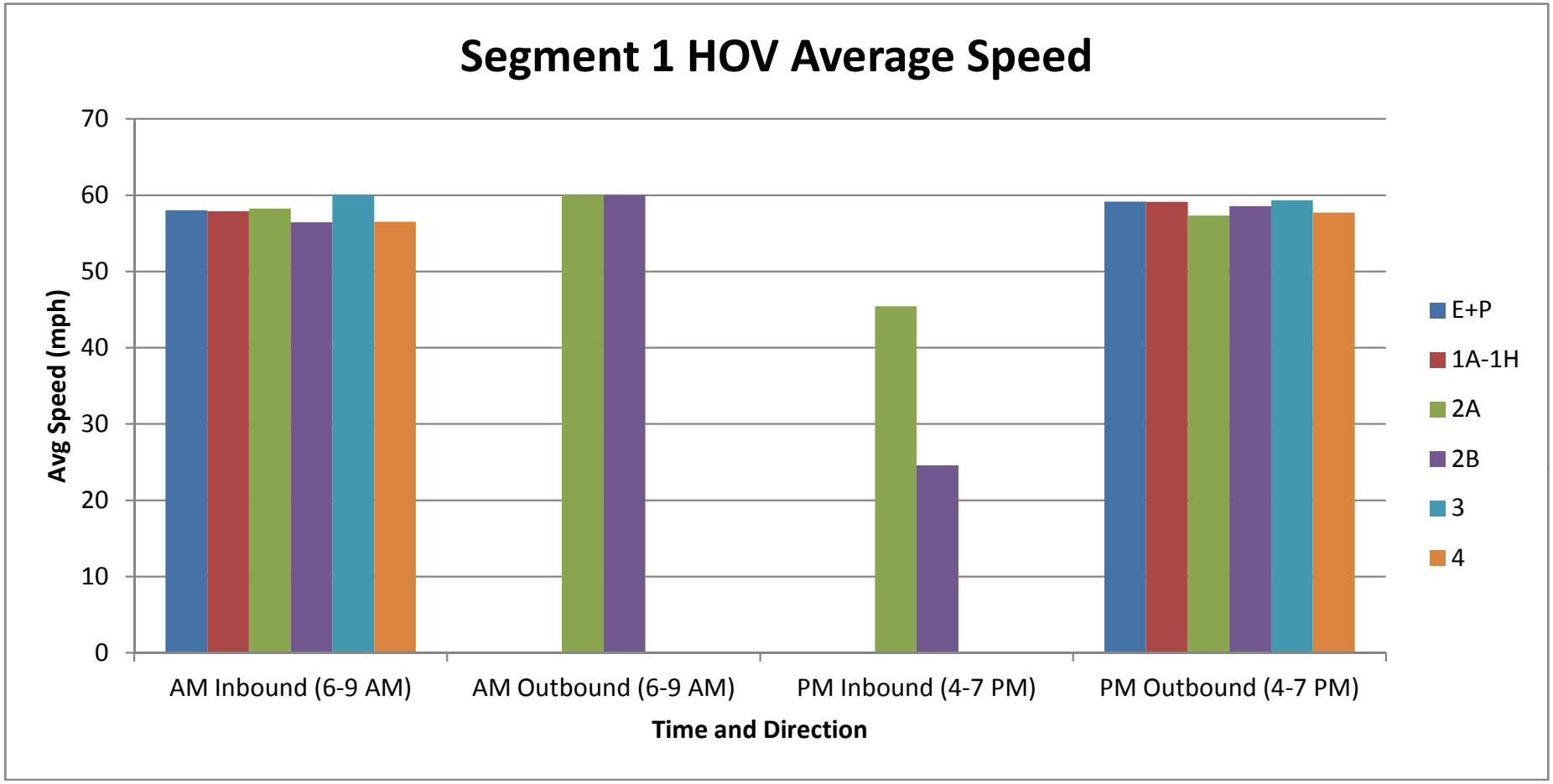

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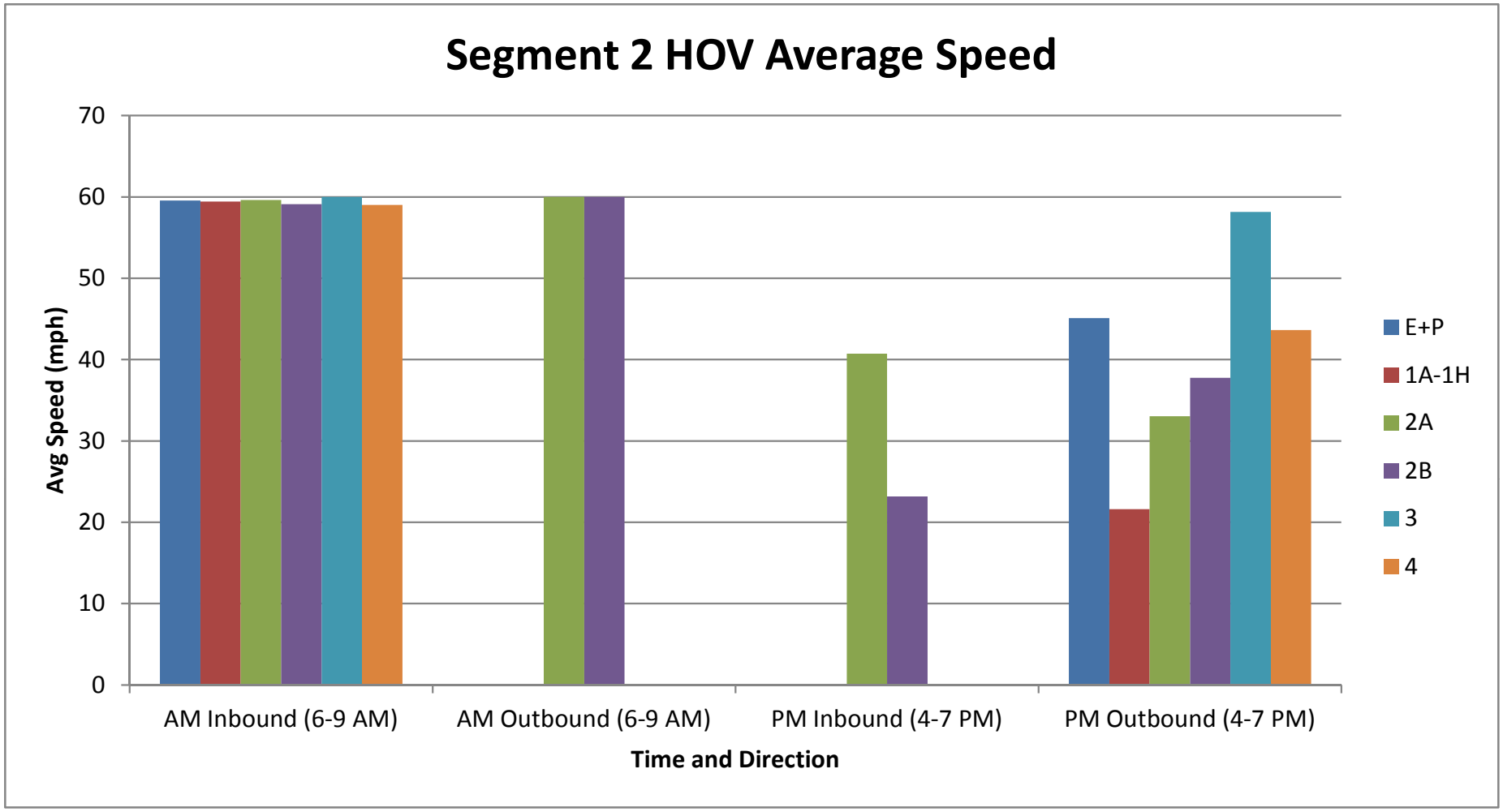

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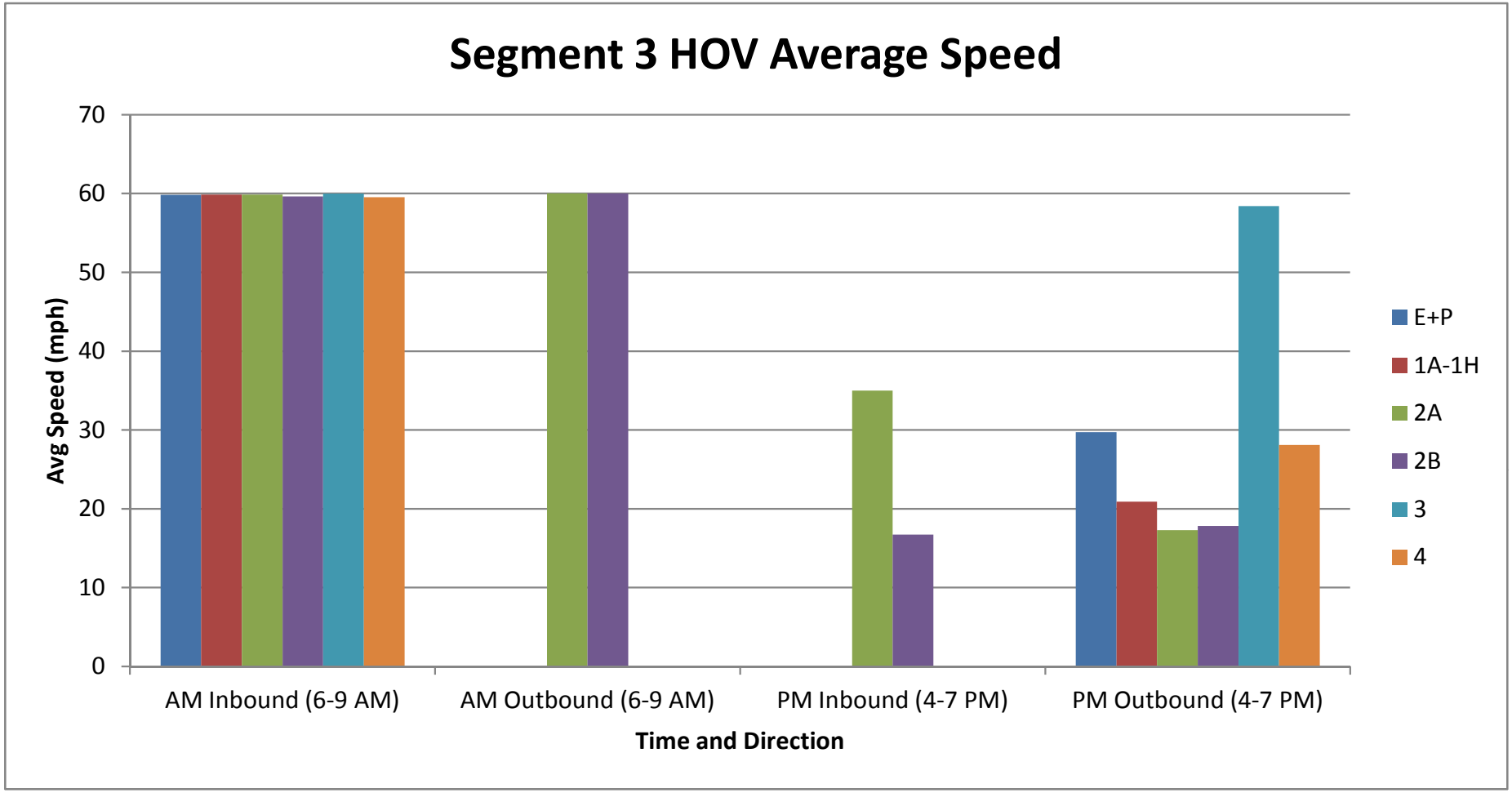

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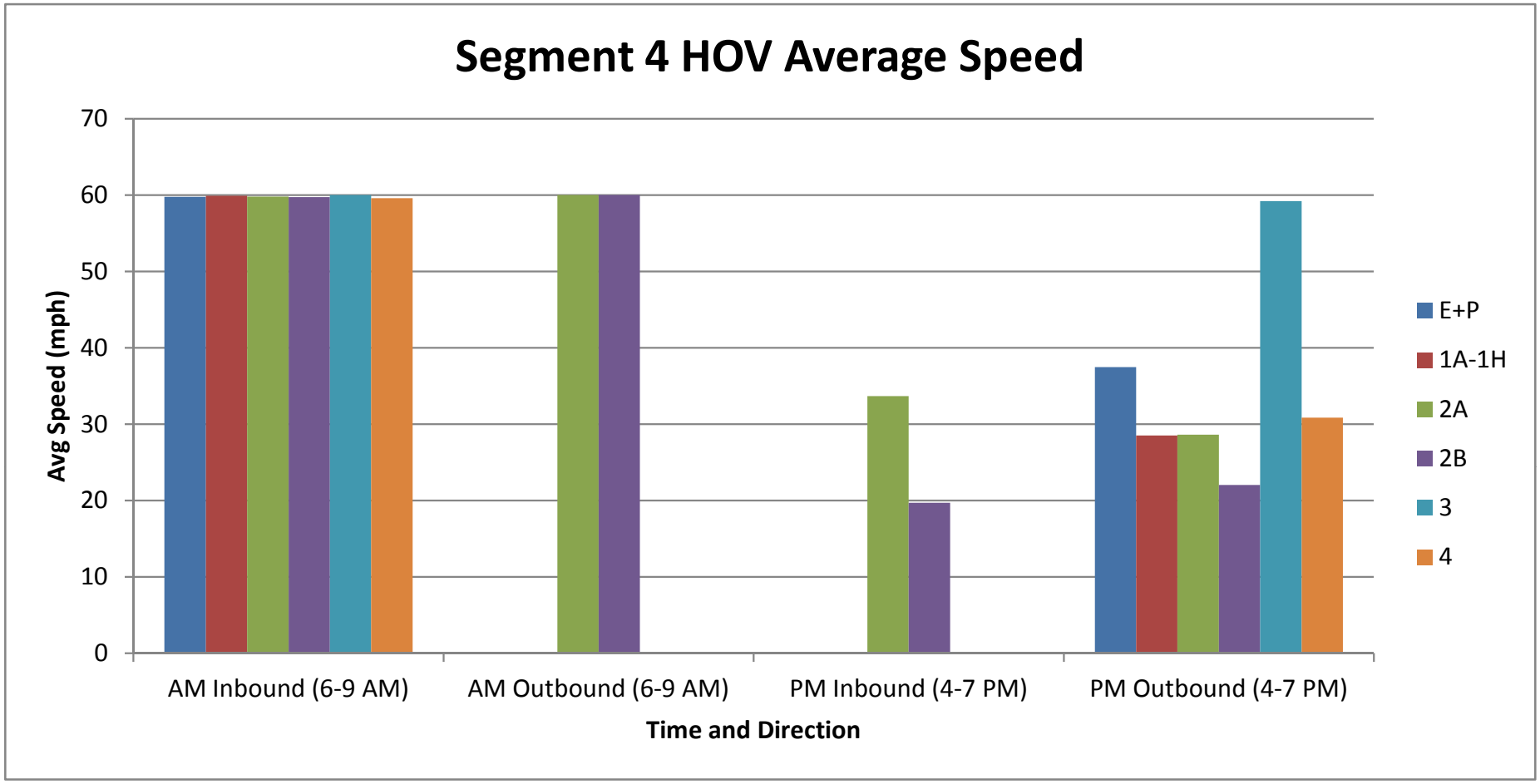

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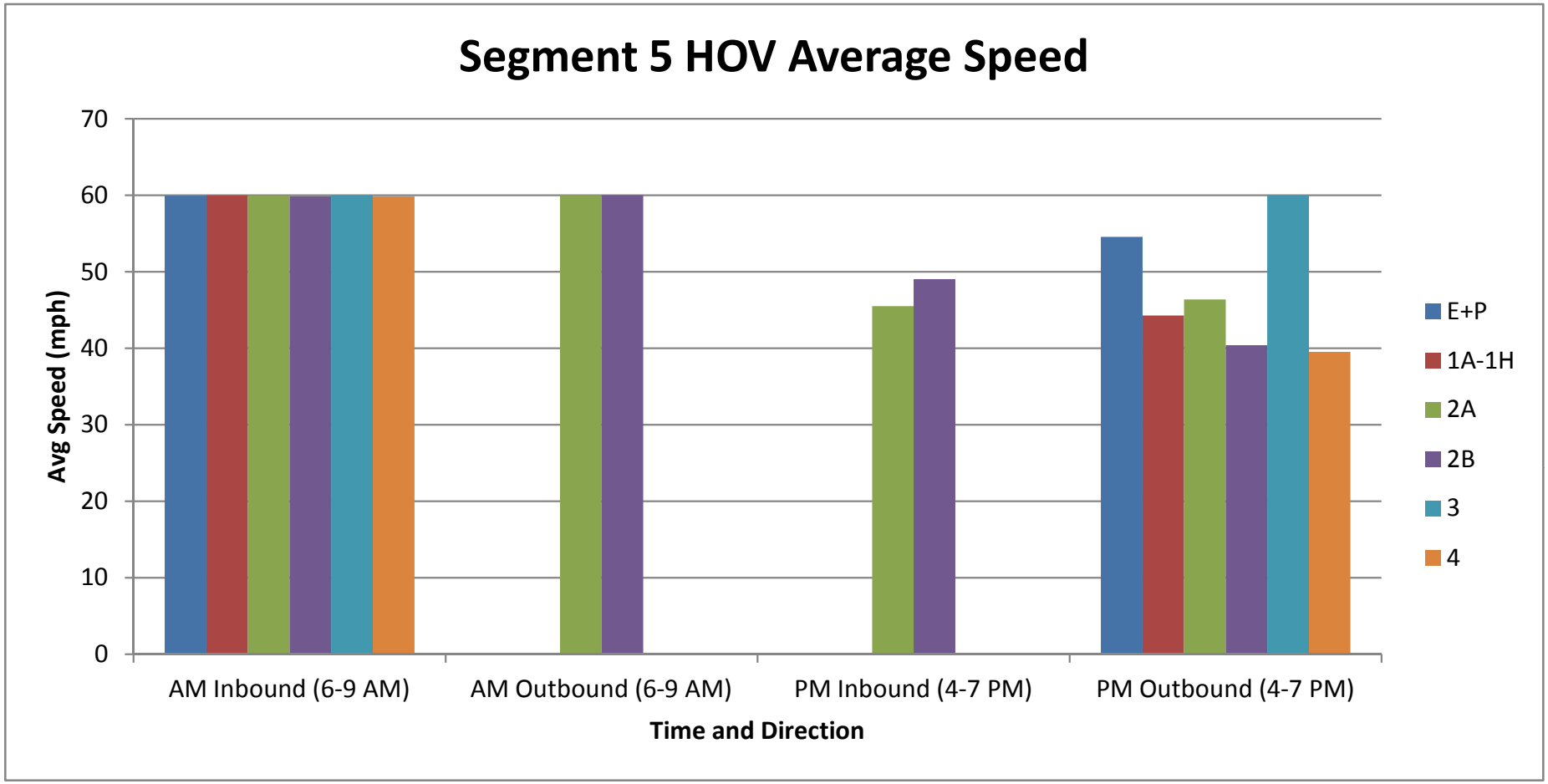

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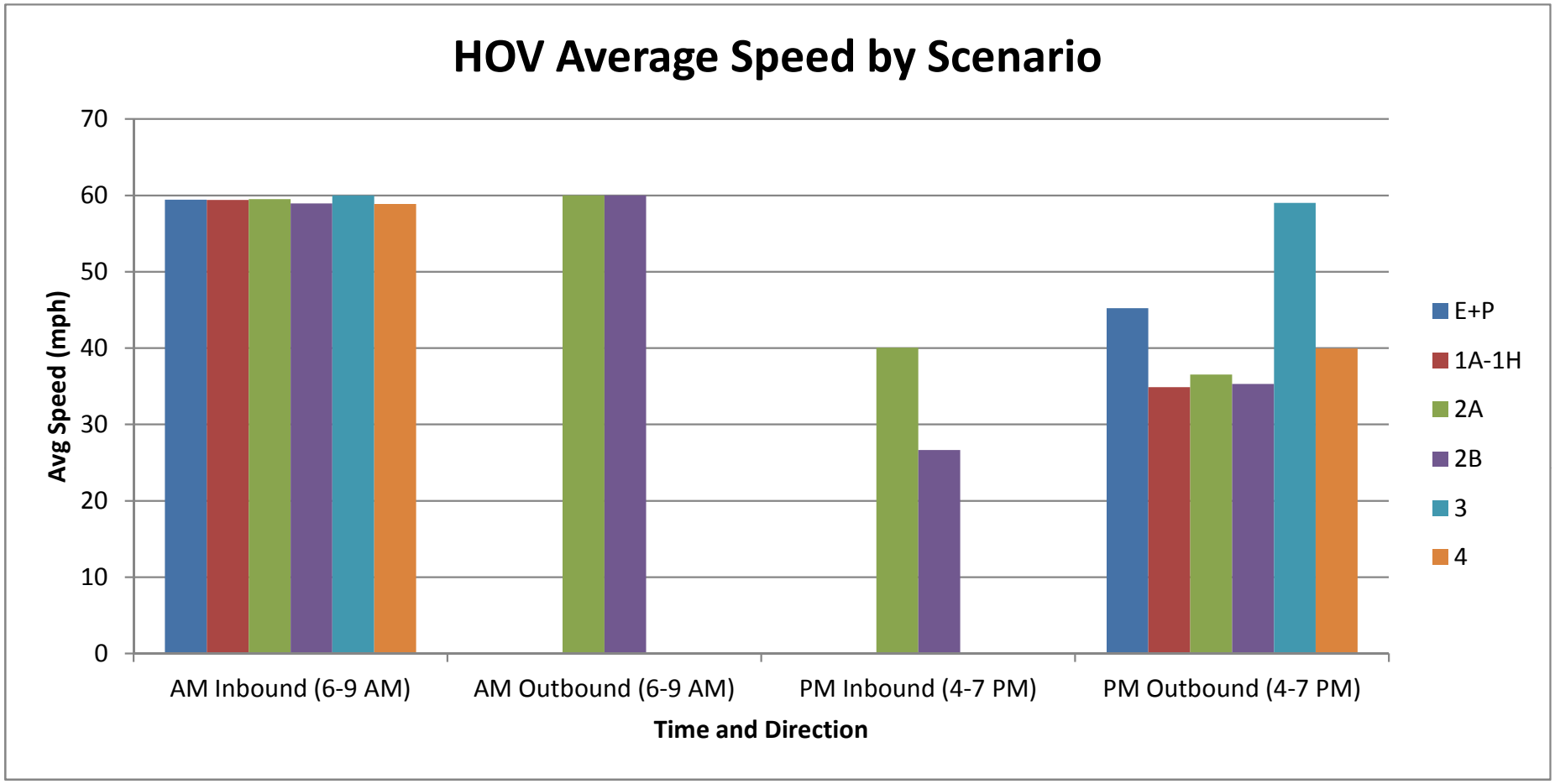

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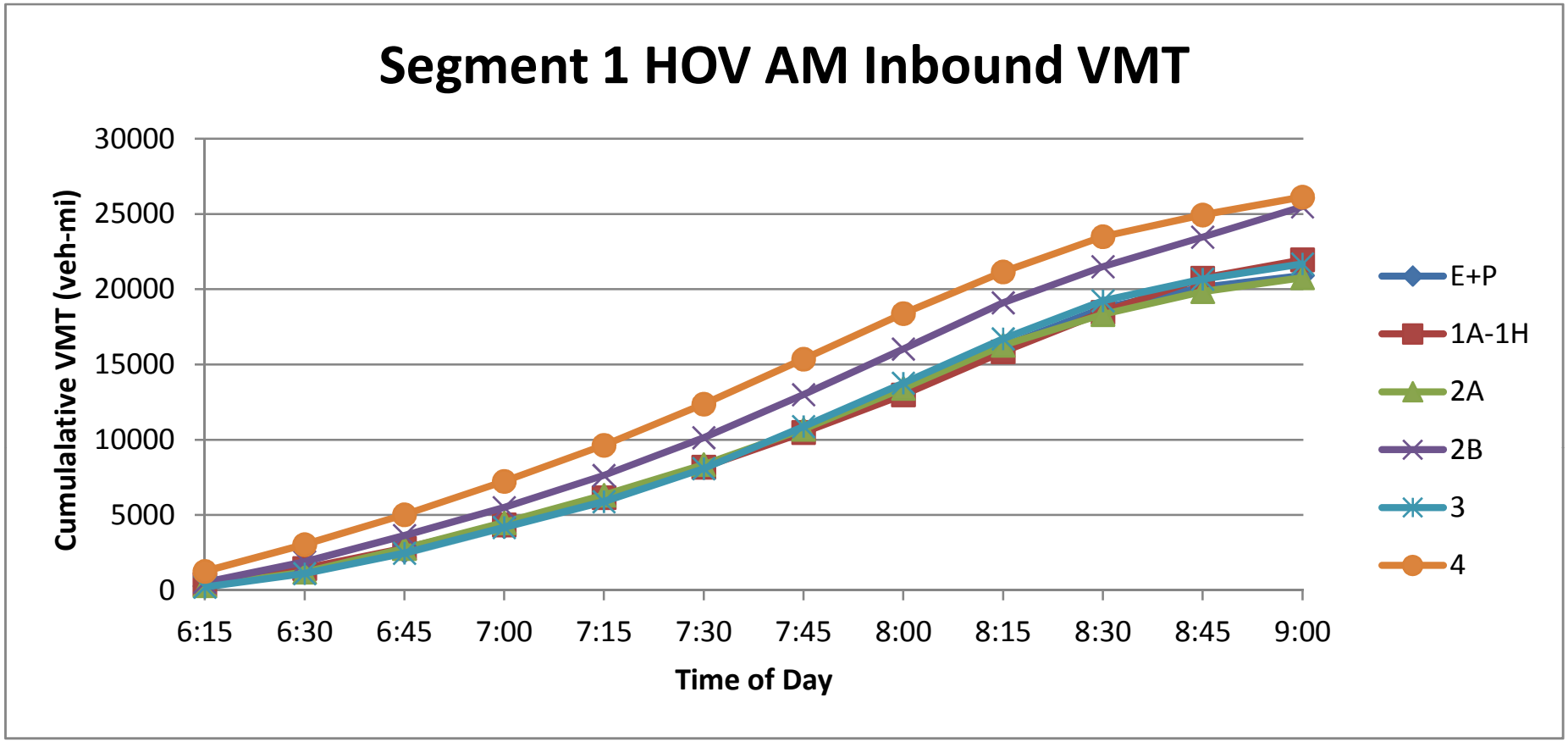
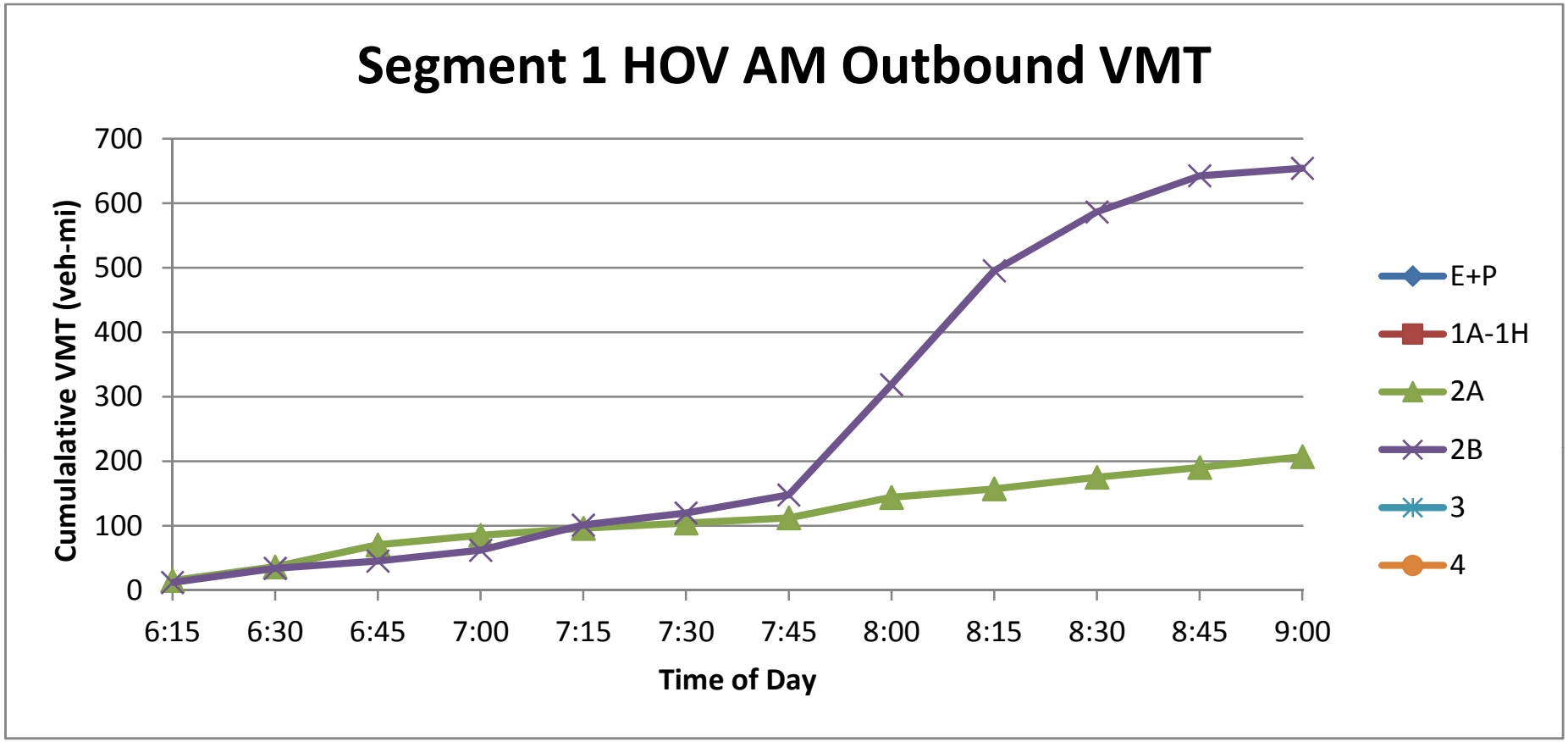
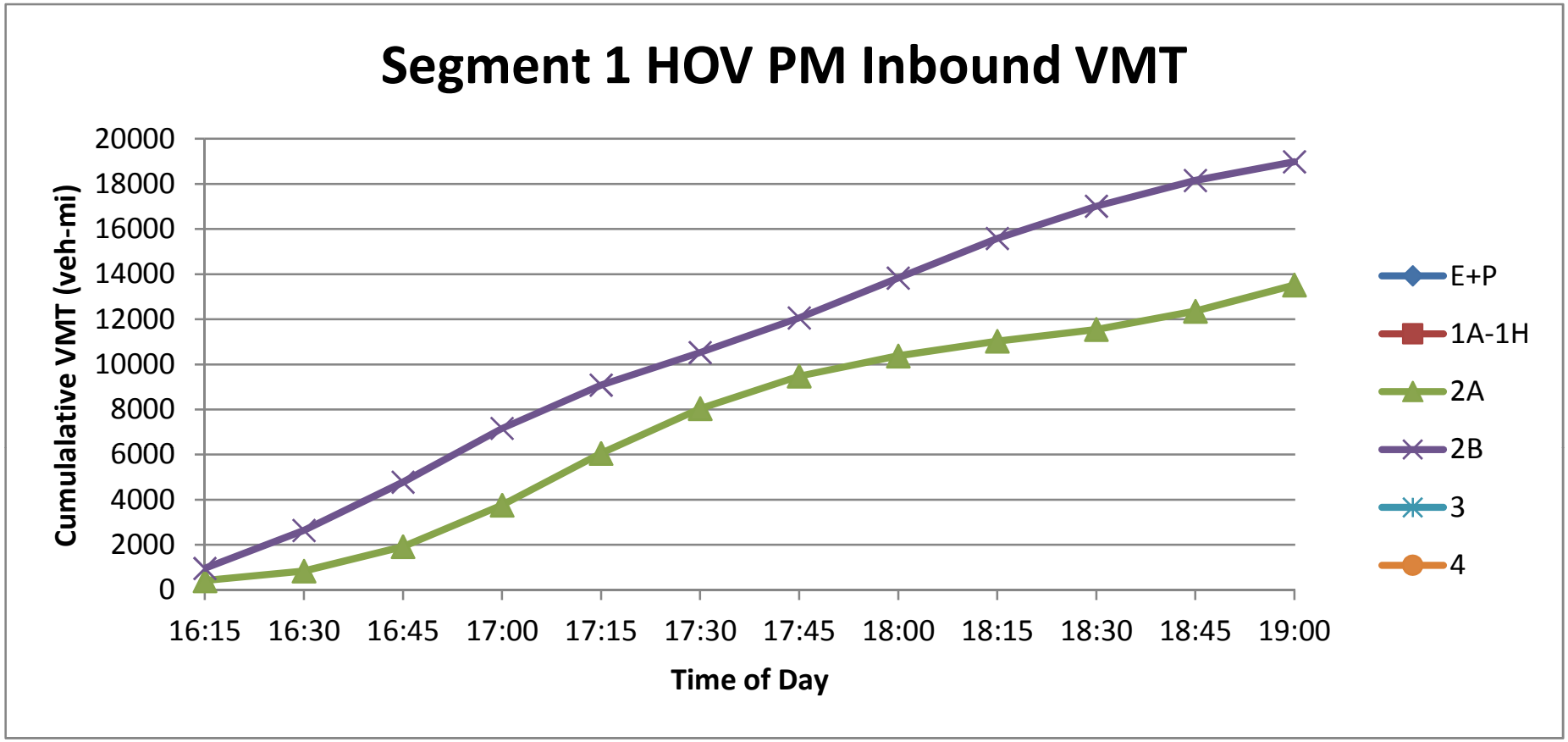


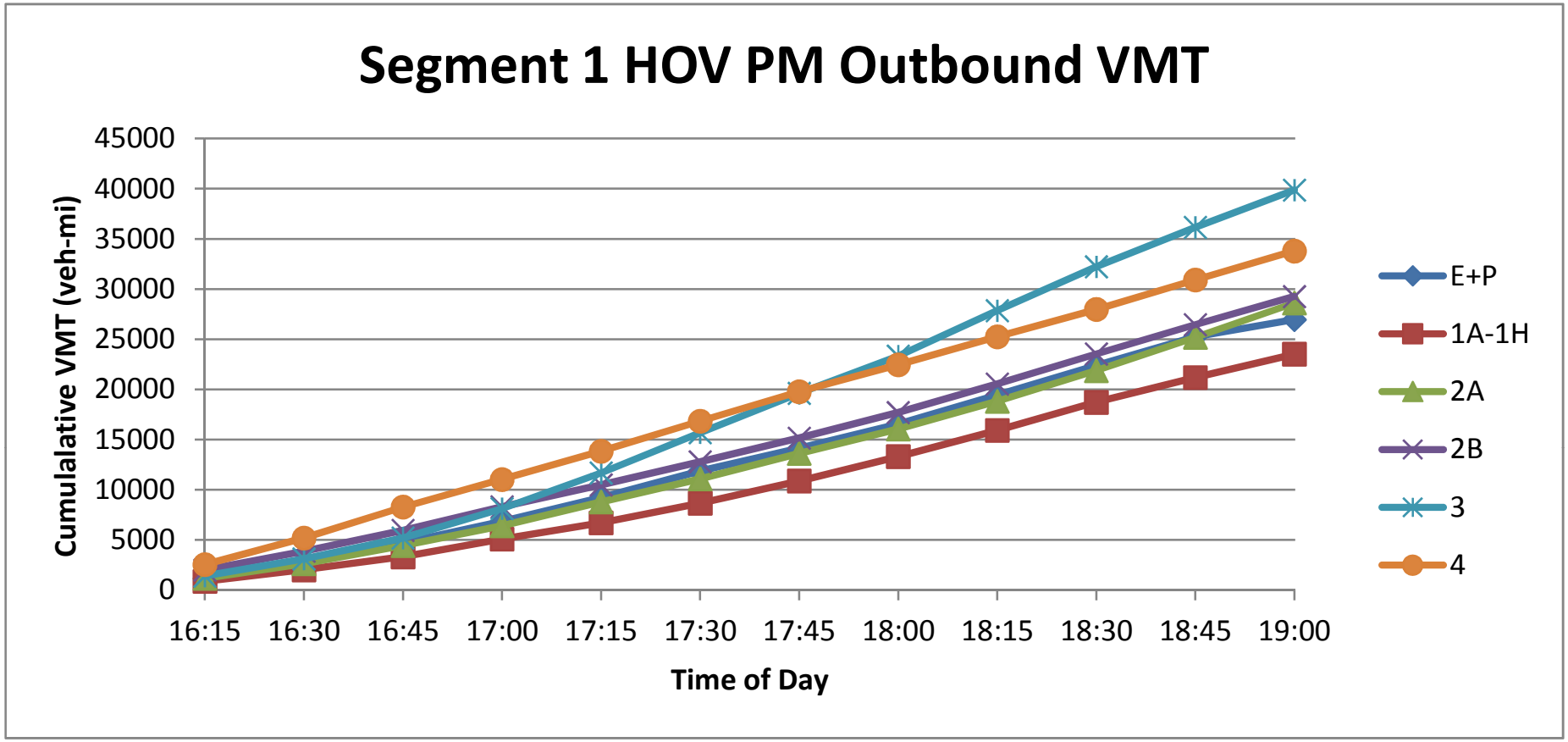
2011 DynusT Results - H-GAC Models



2011 DynusT Results - H-GAC Models



2011 DynusT Results - H-GAC Models



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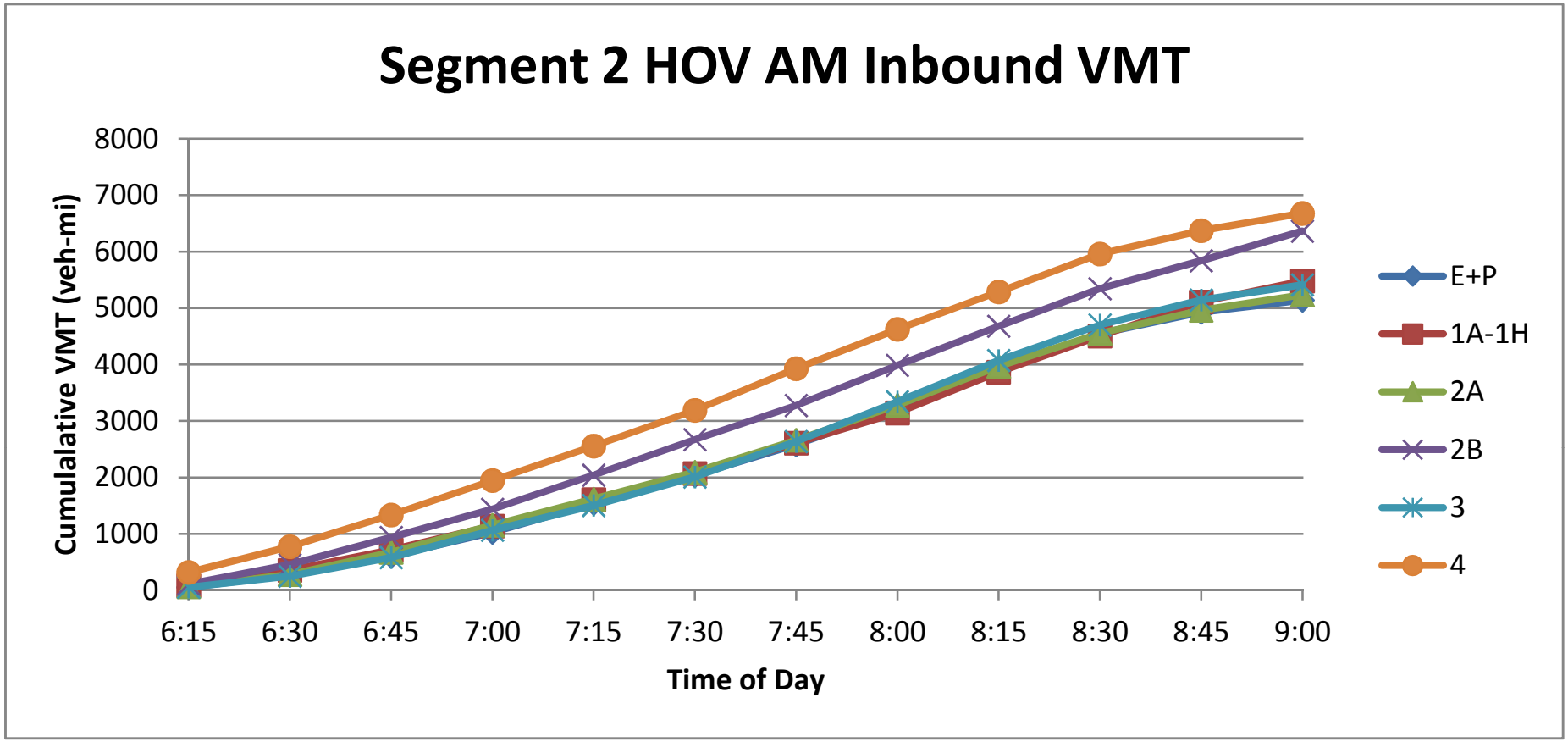

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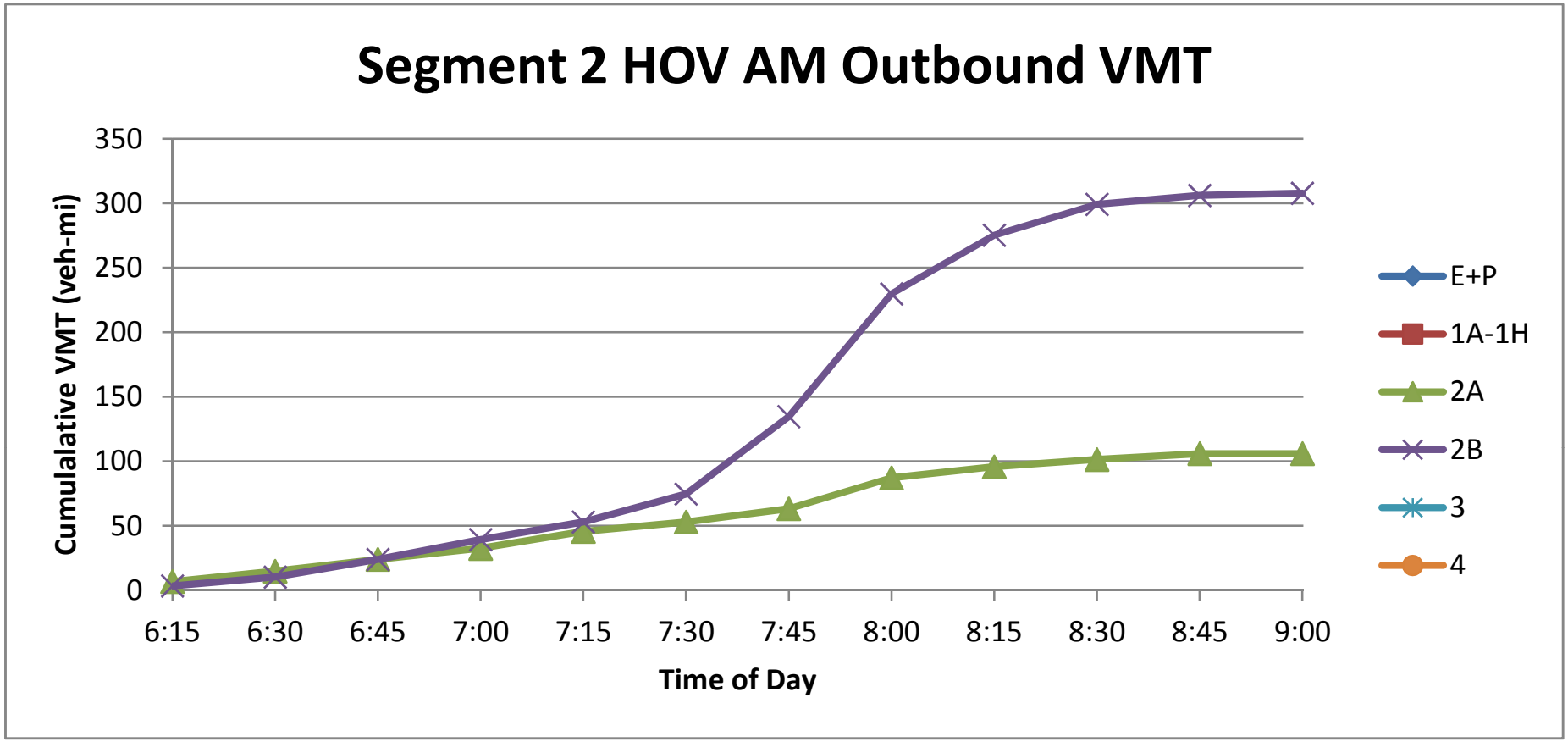

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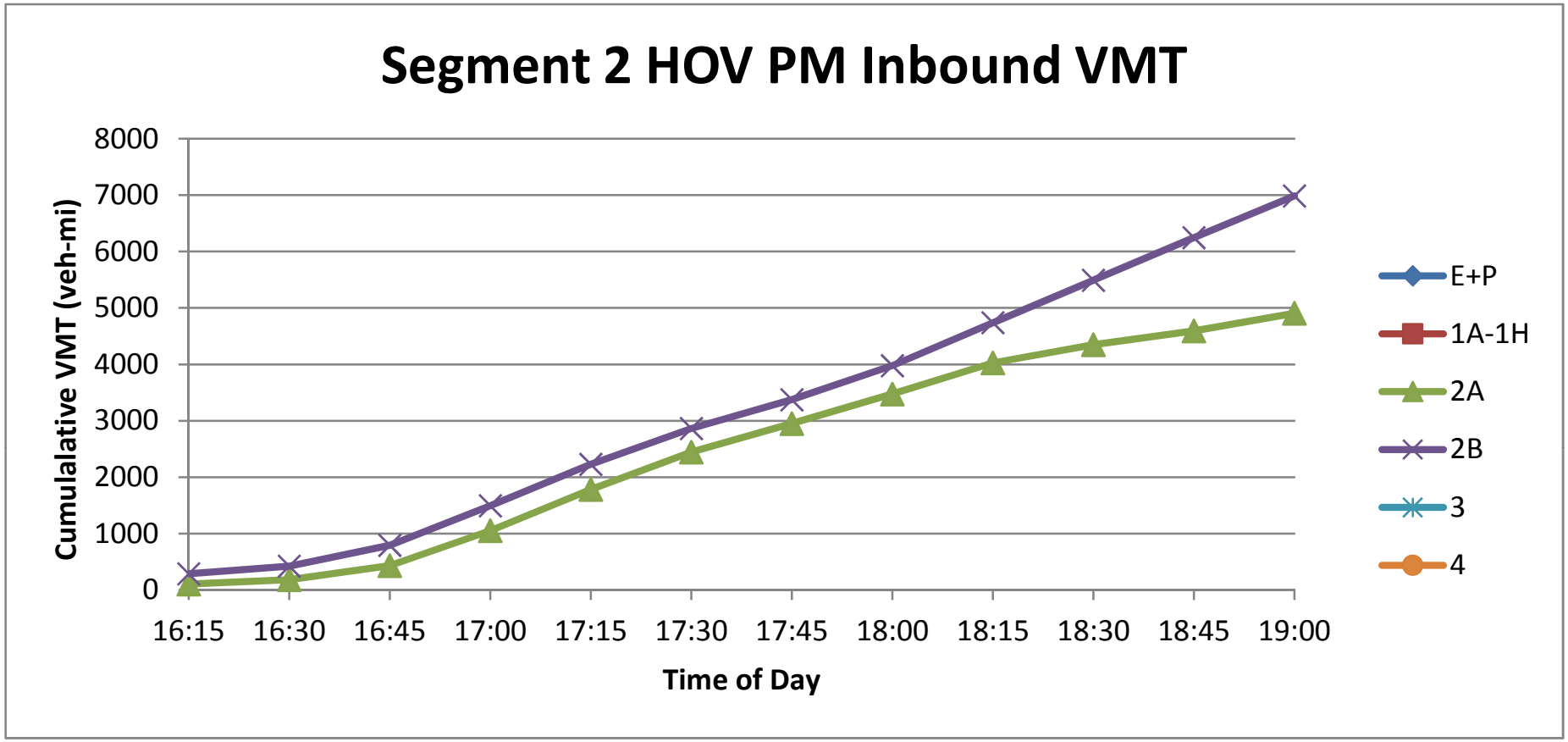

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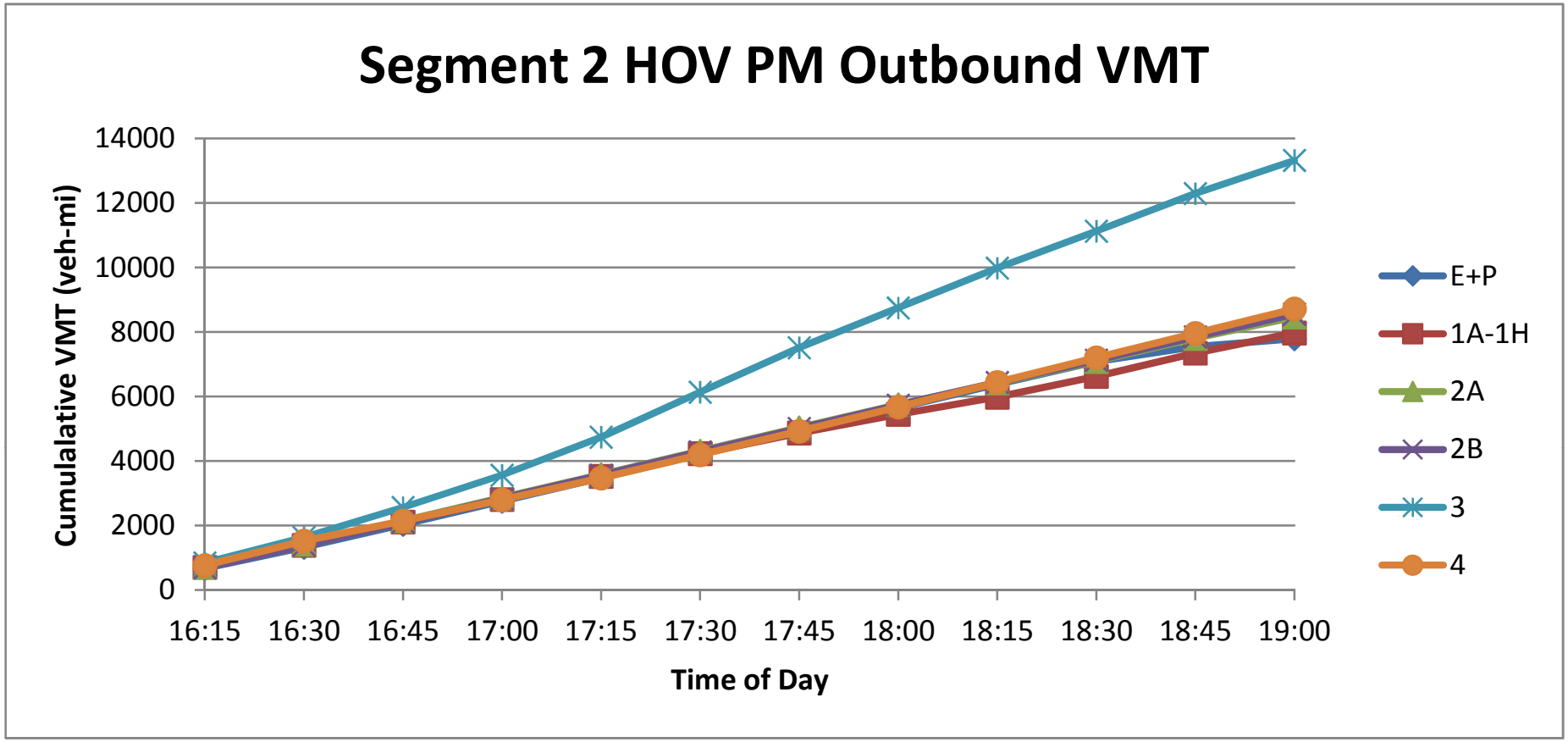

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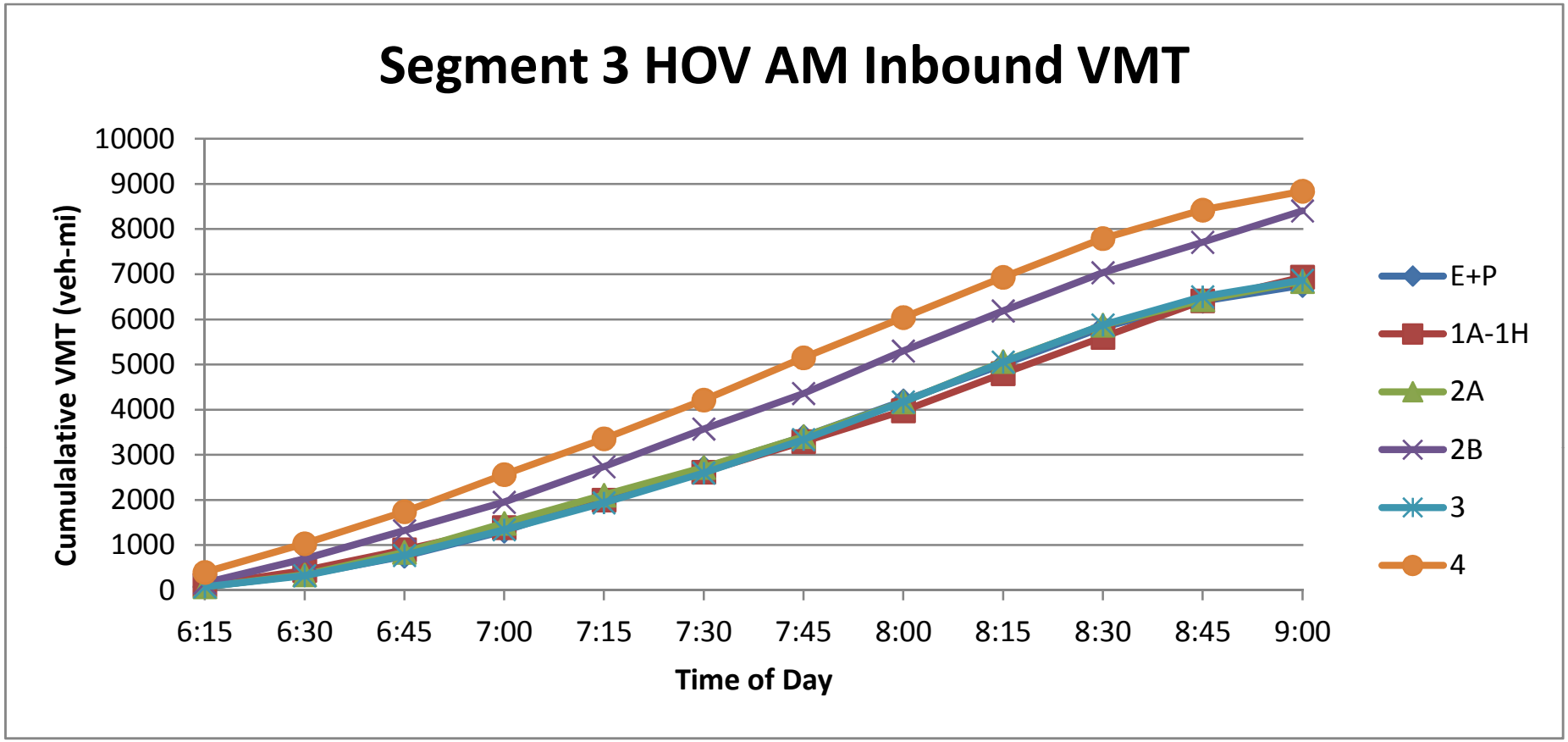

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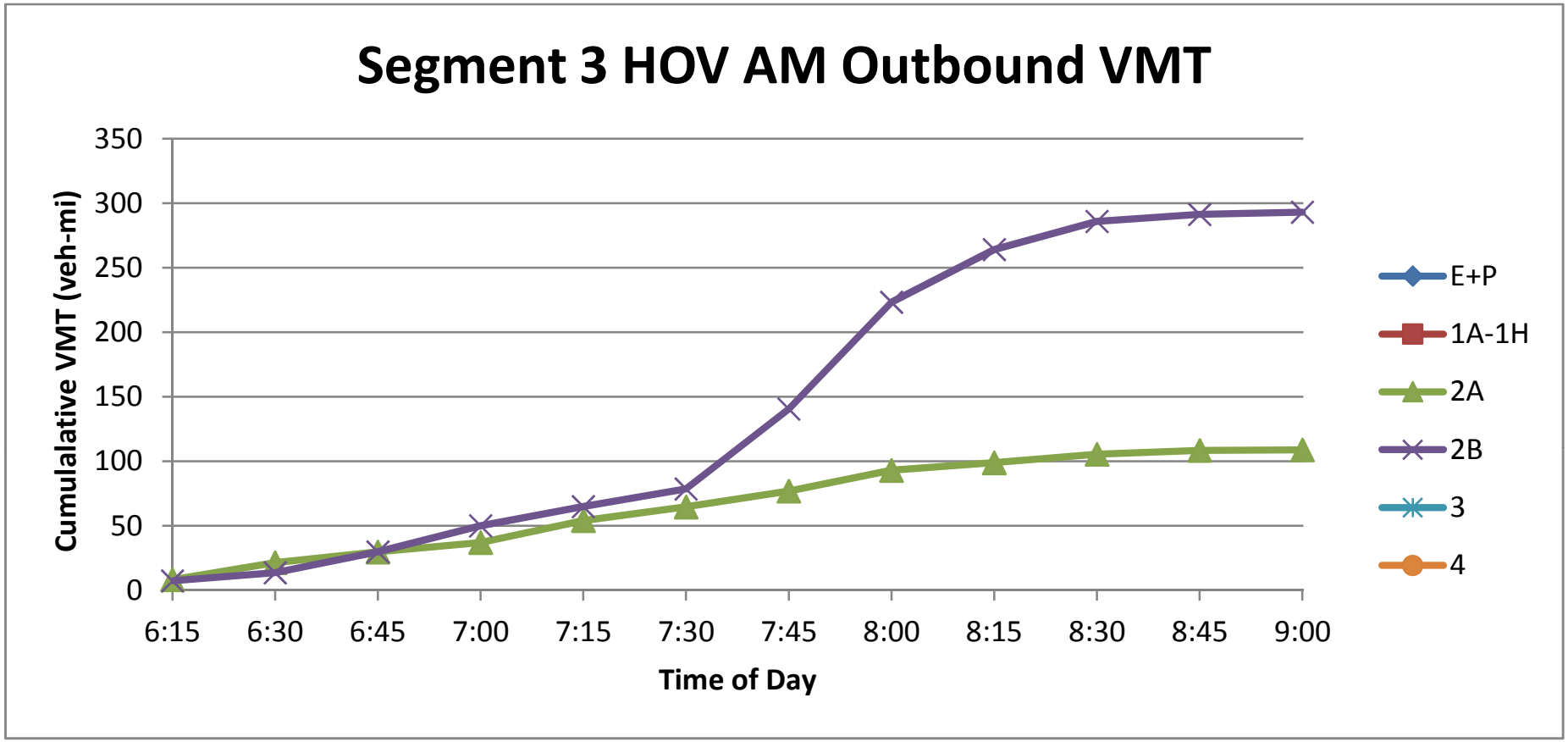

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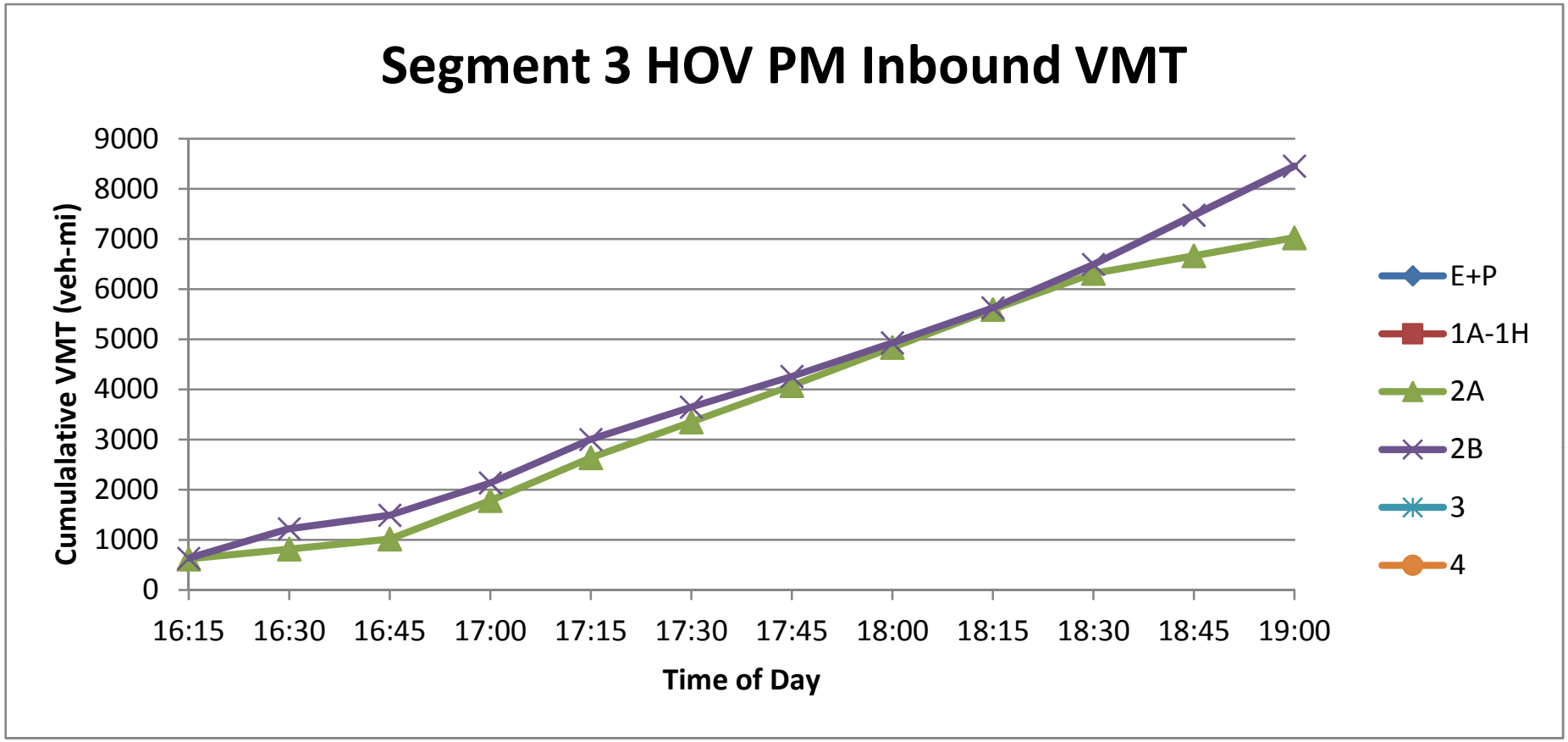

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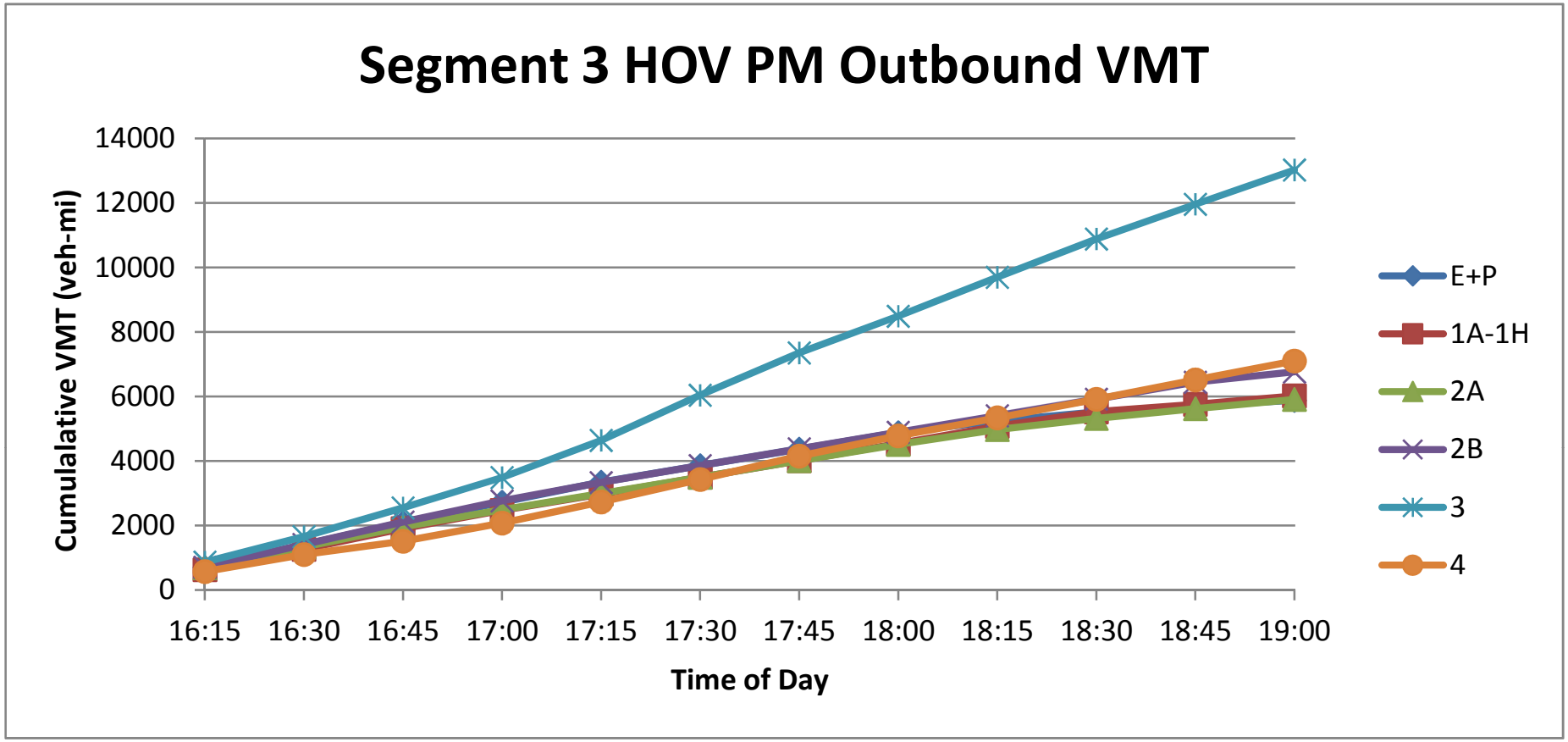

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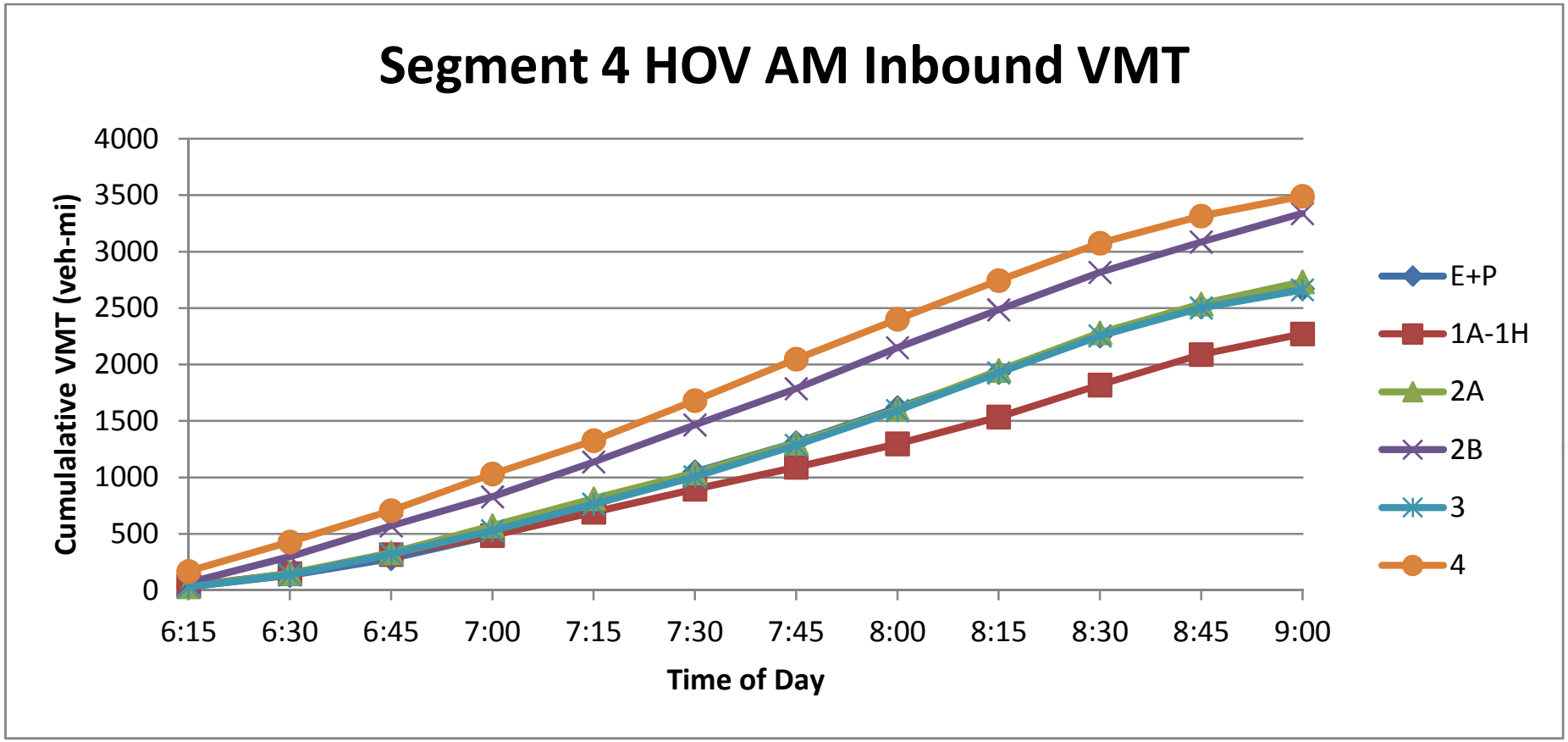

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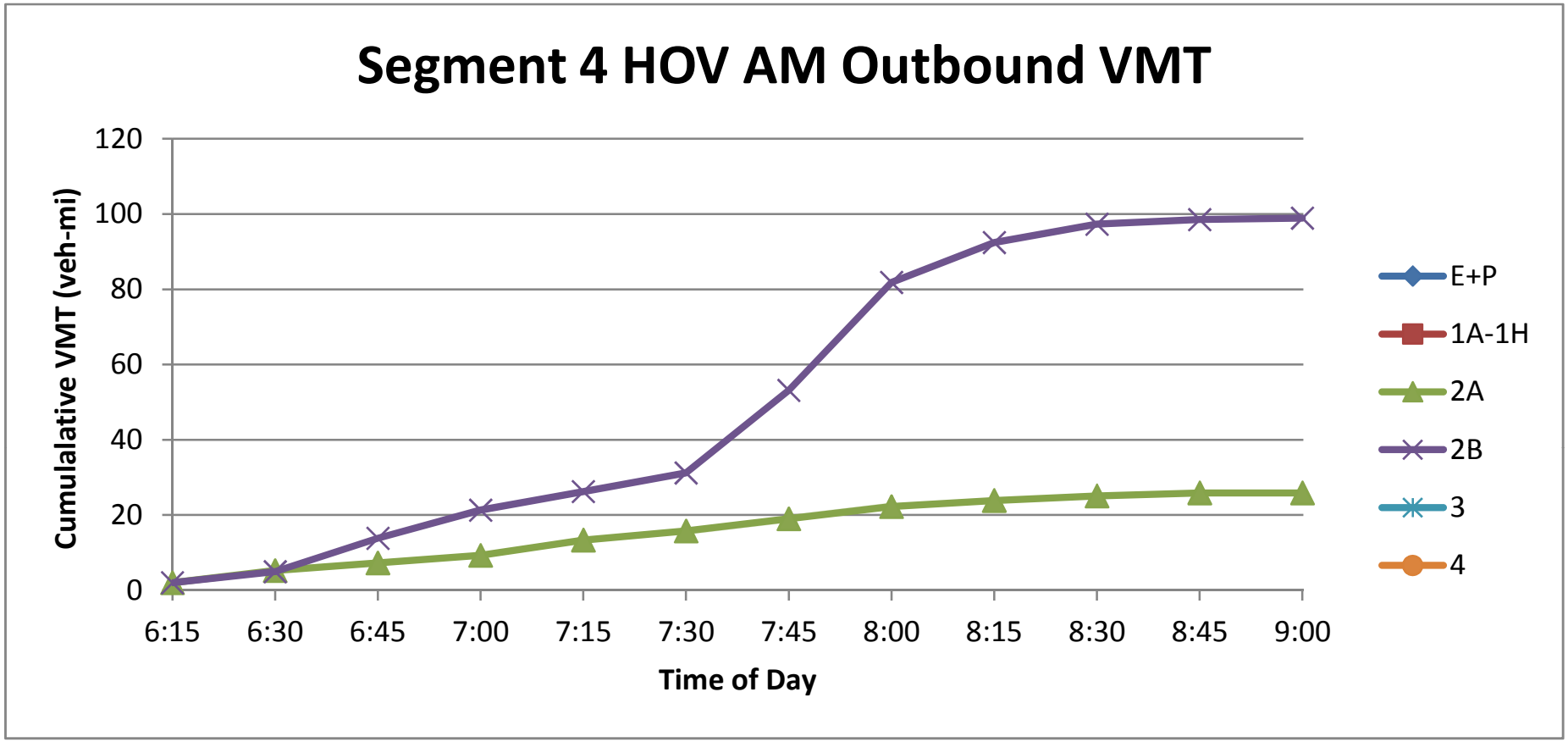

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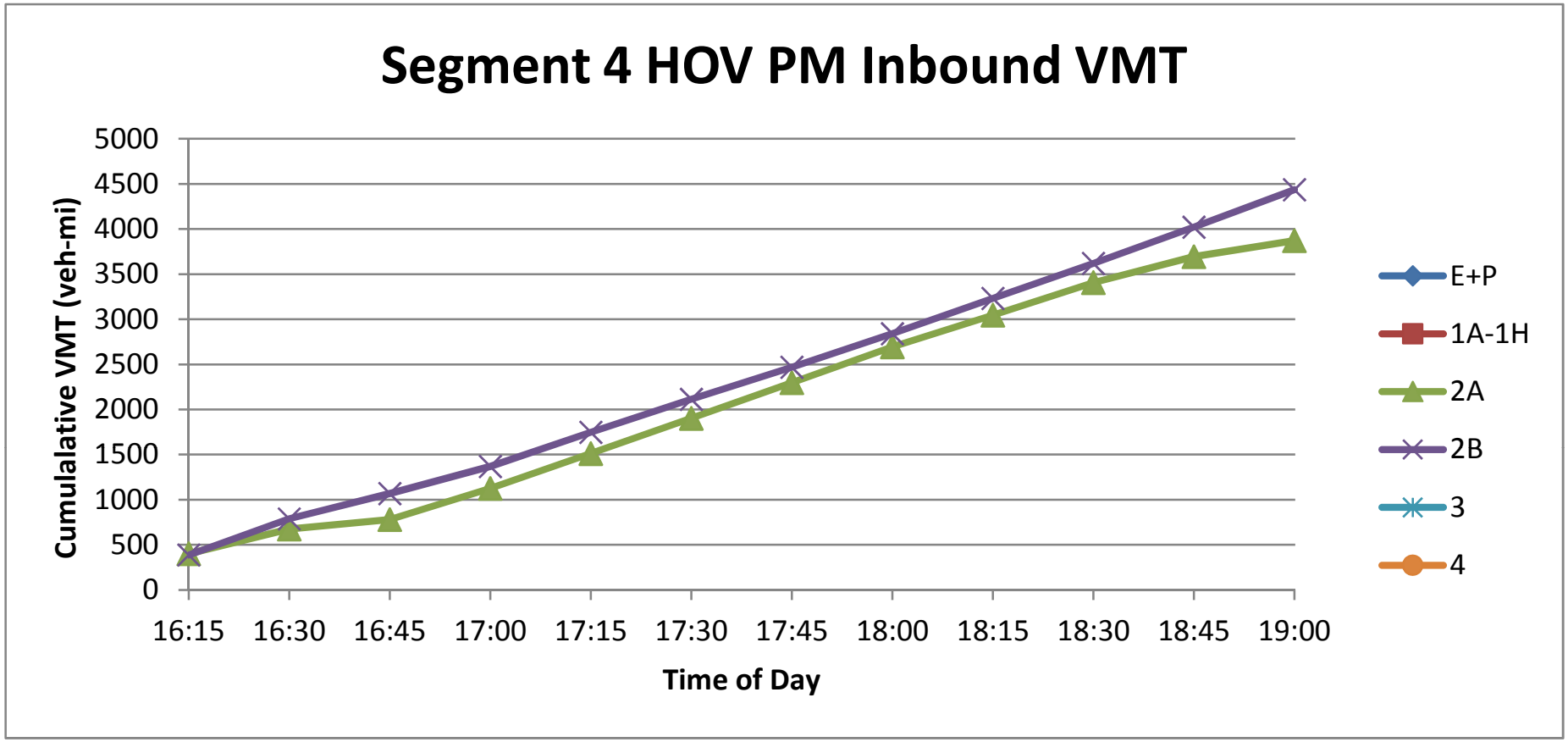

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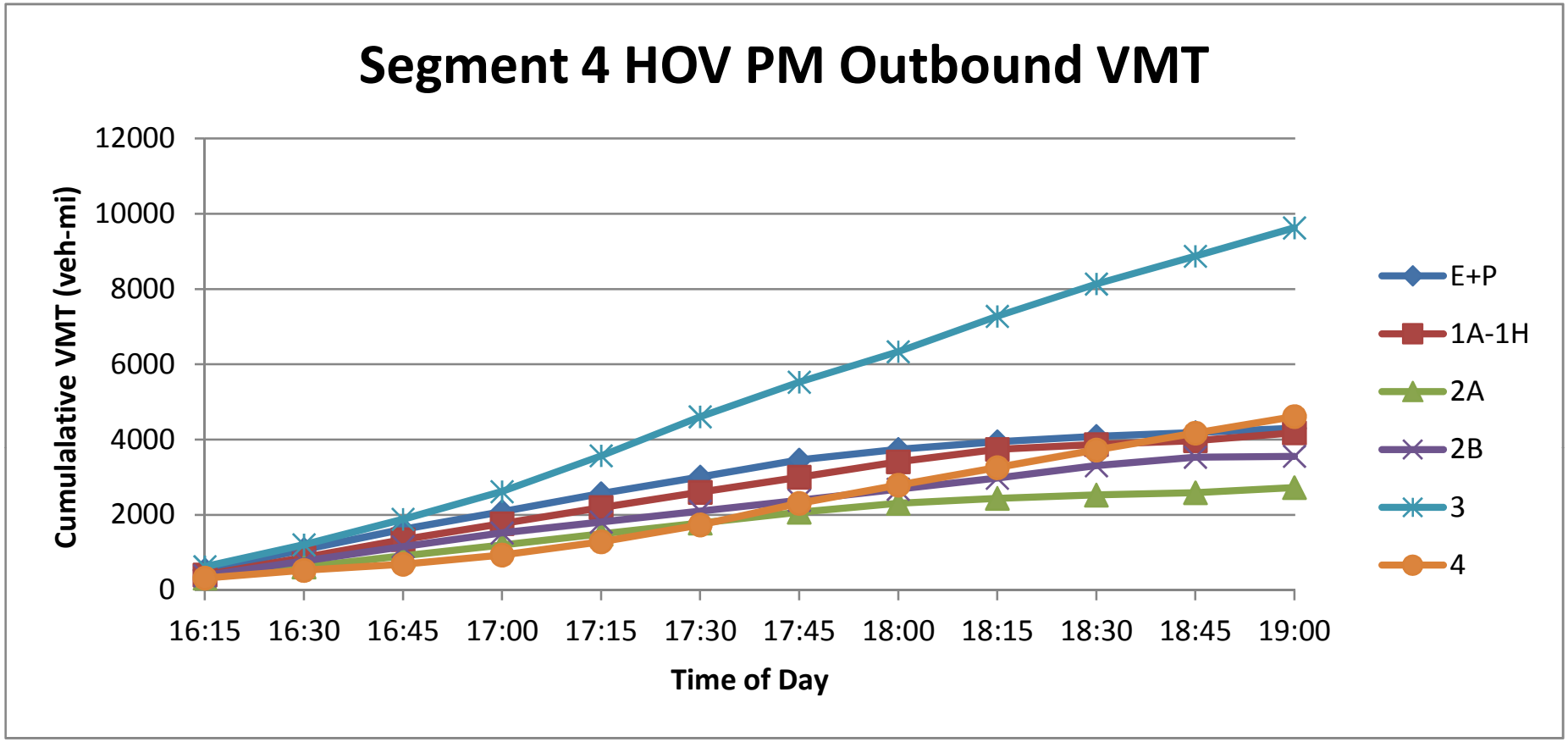

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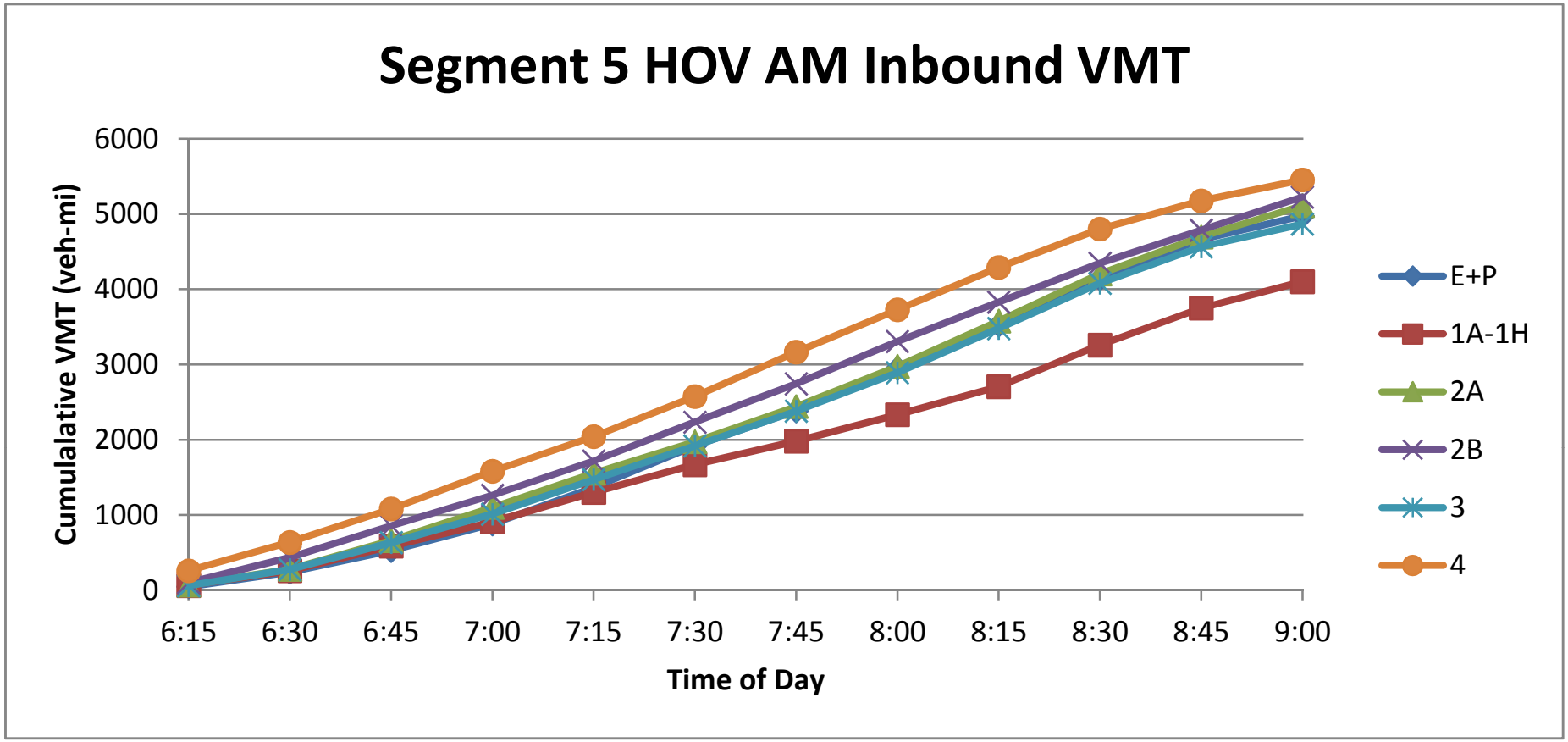

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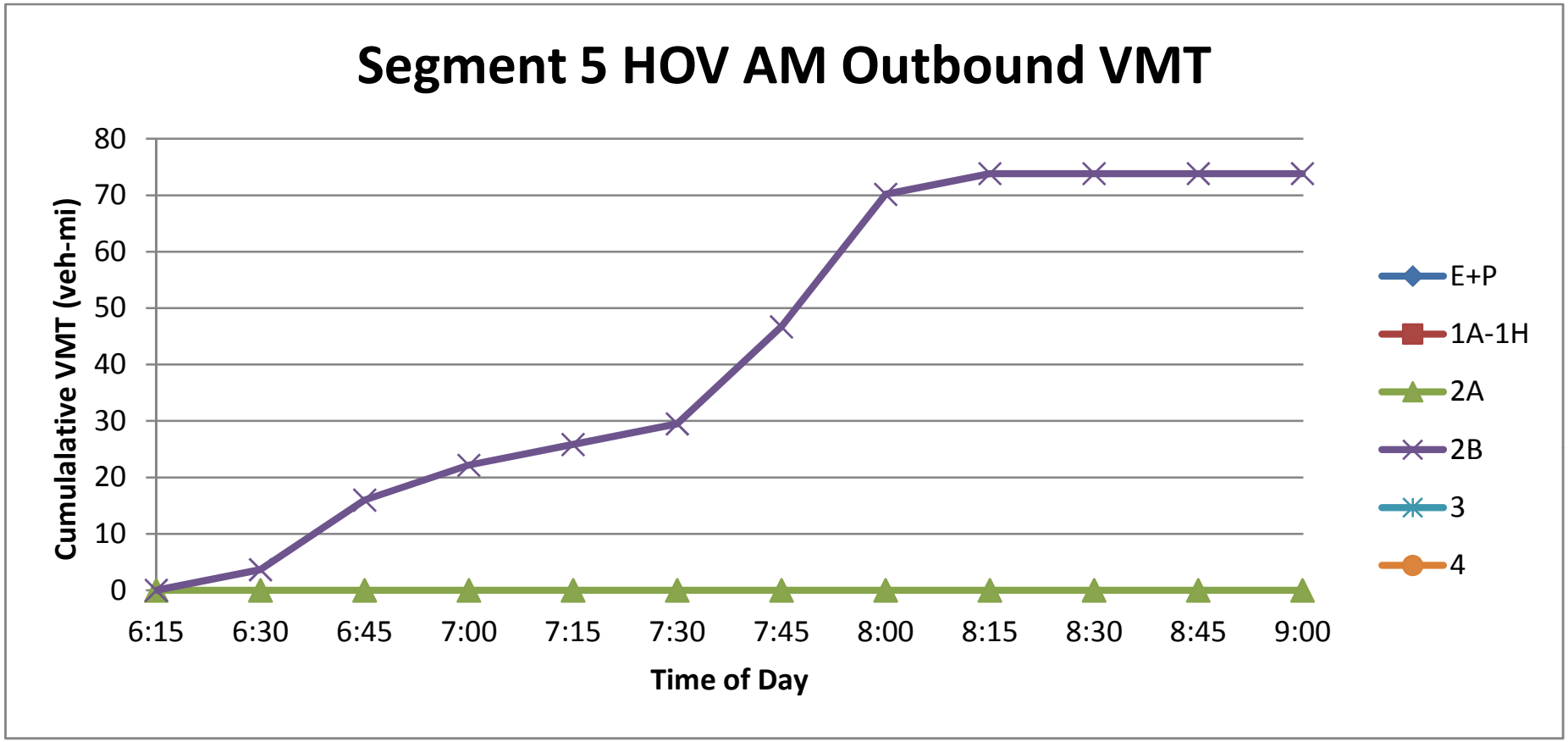
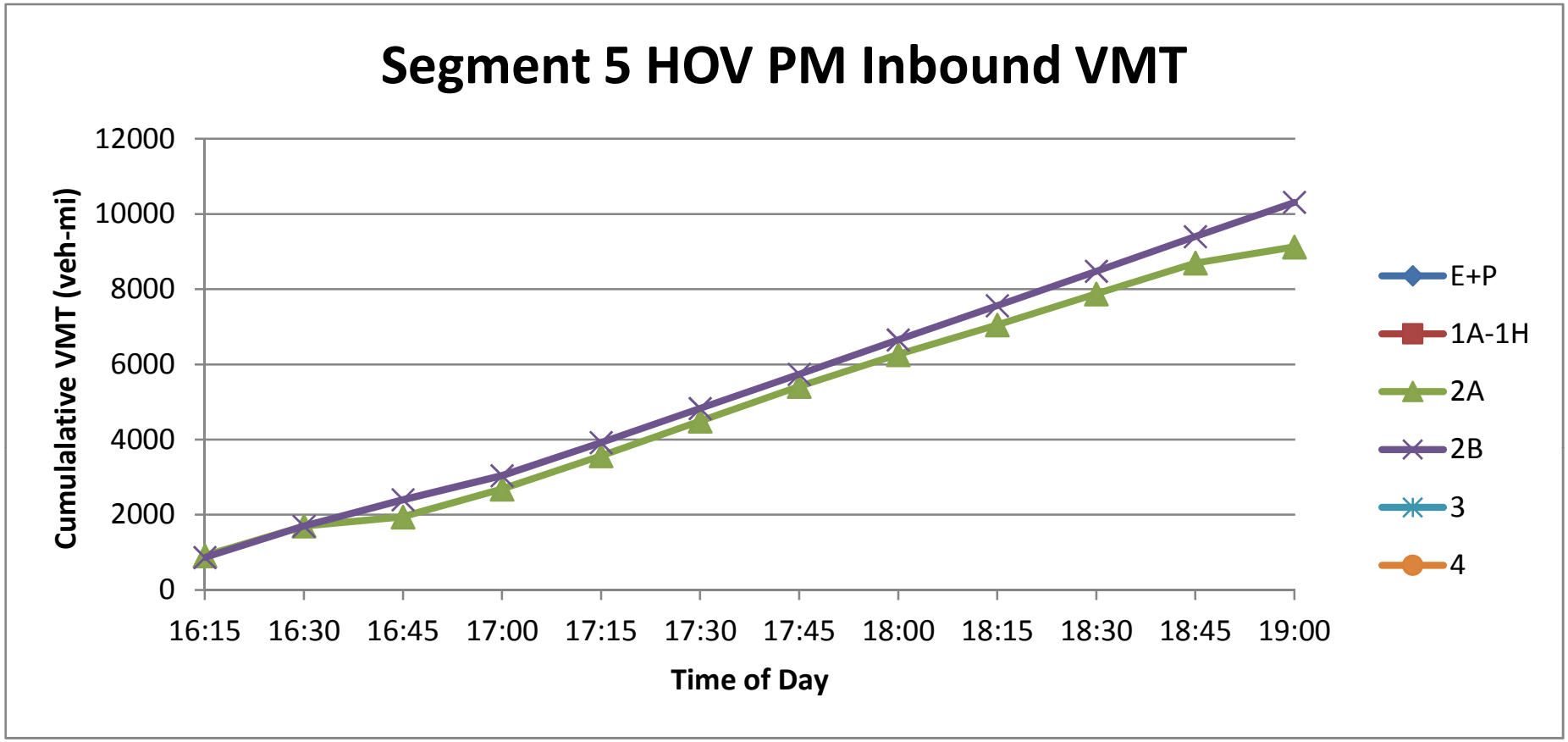
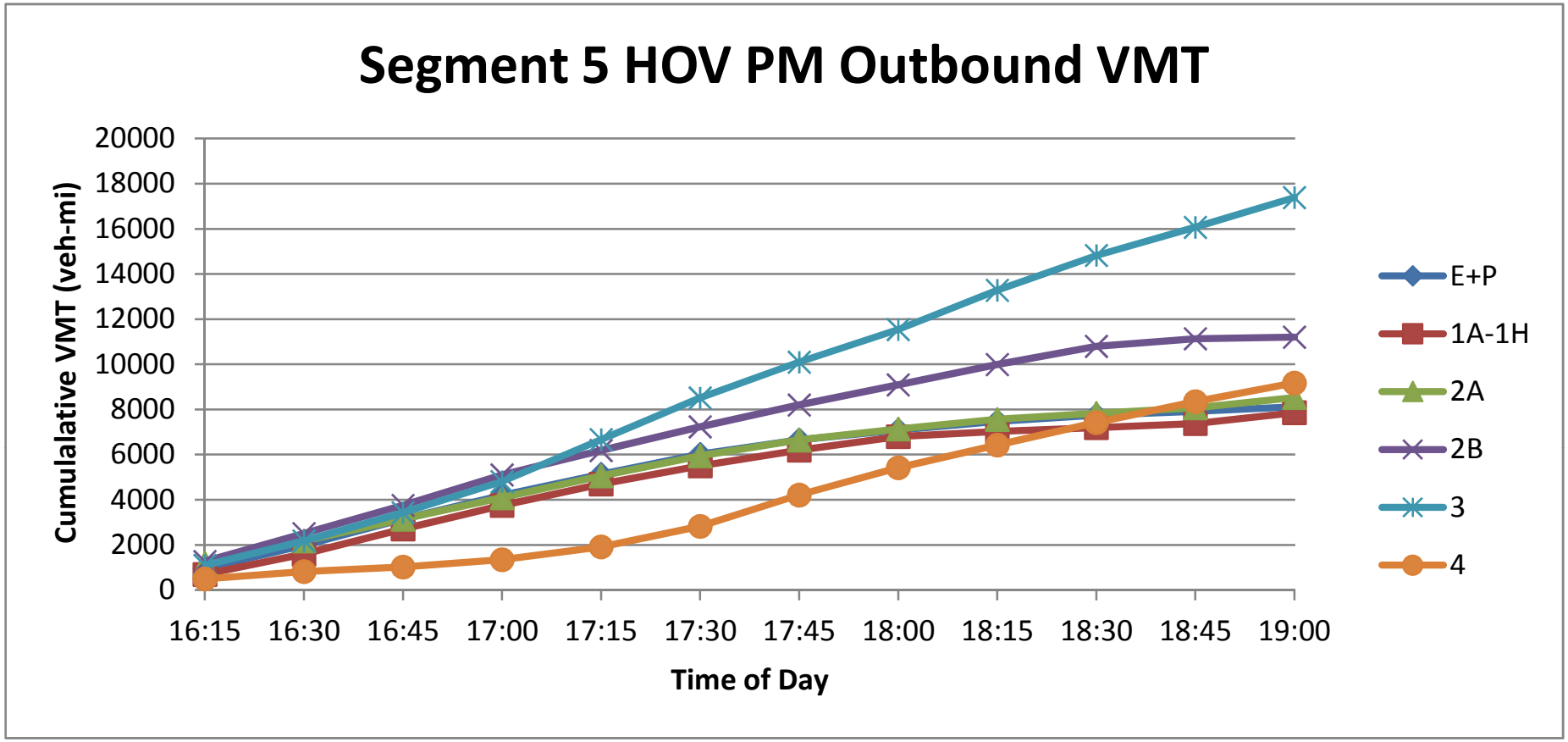


2011 DynusT Results - H-GAC Models



2011 DynusT Results - H-GAC Models



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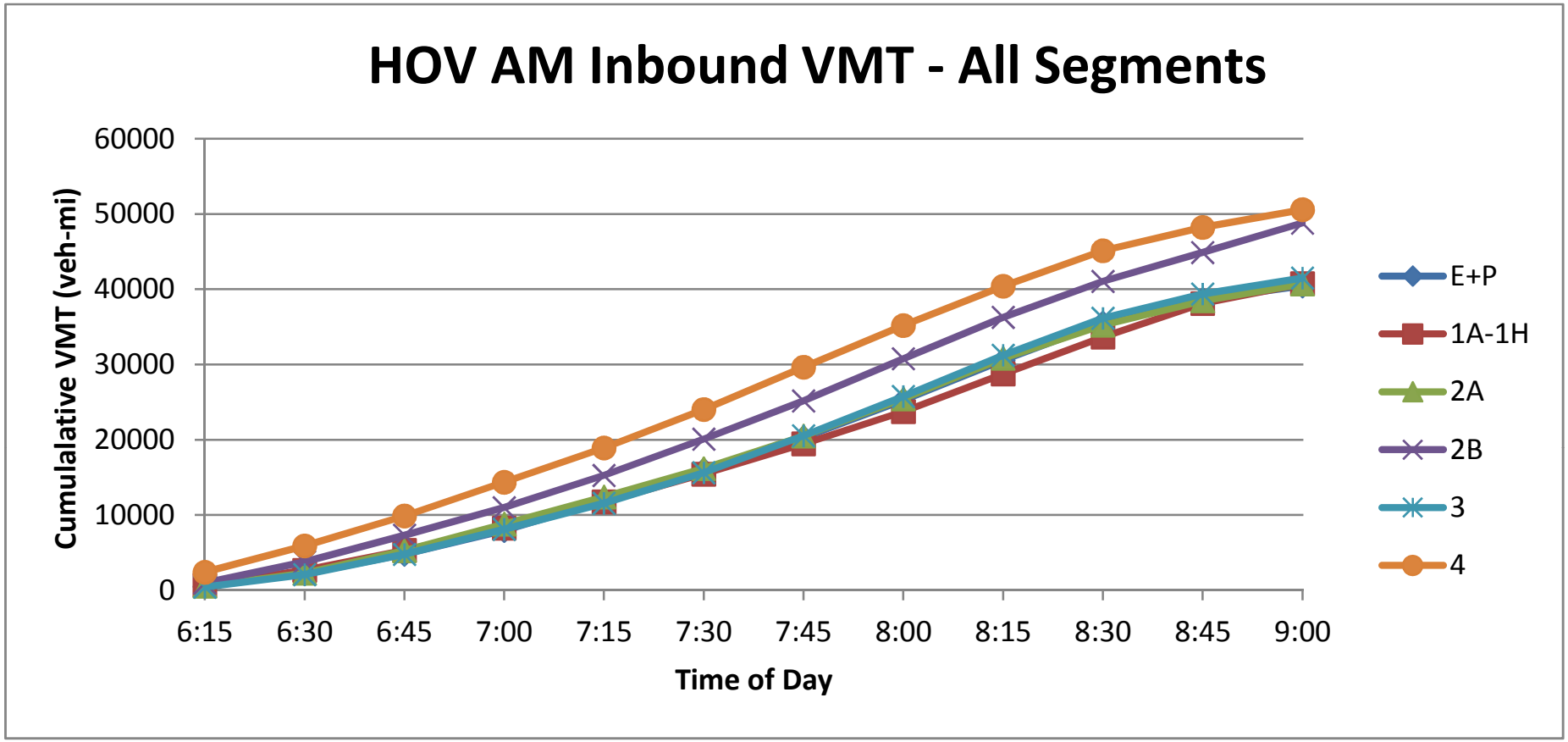
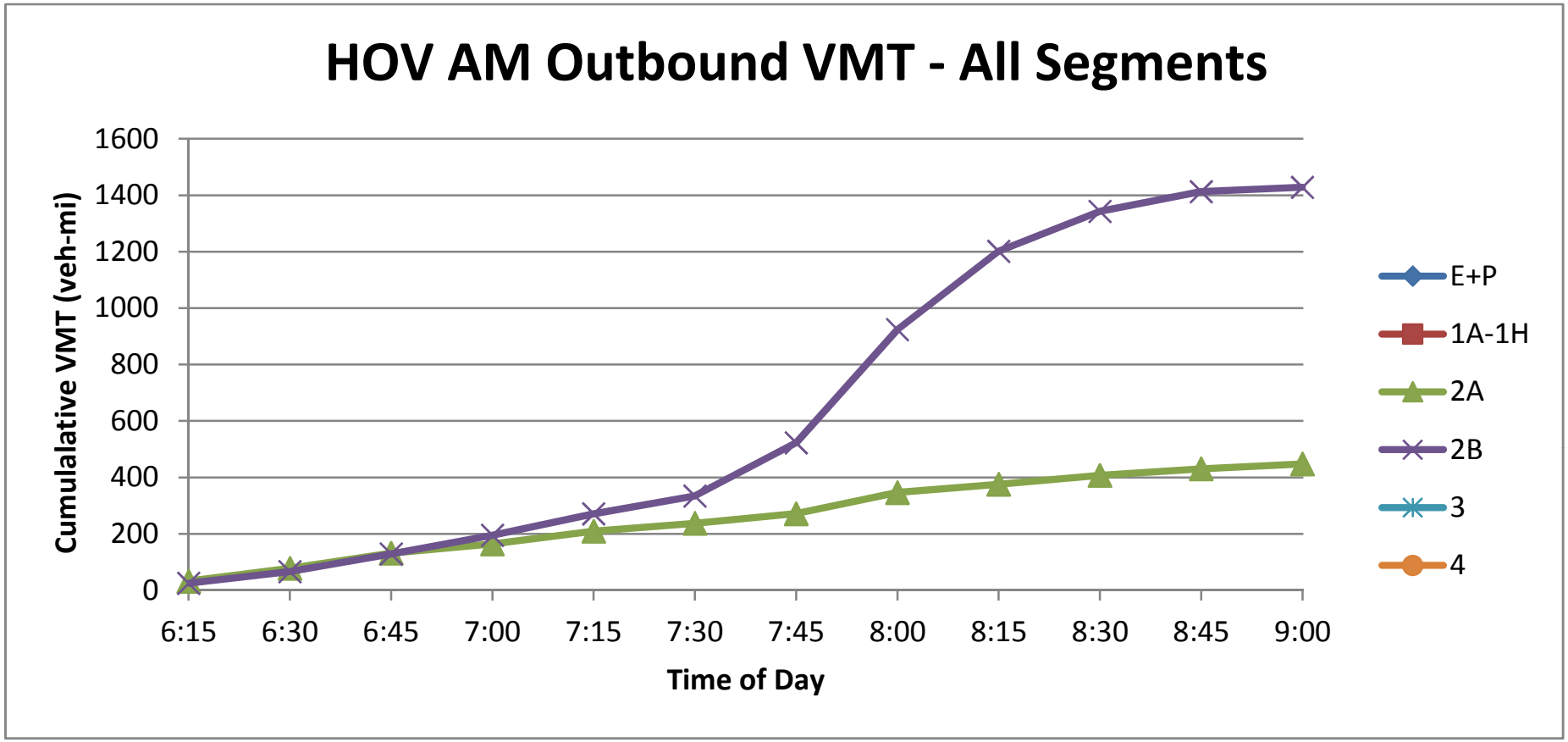
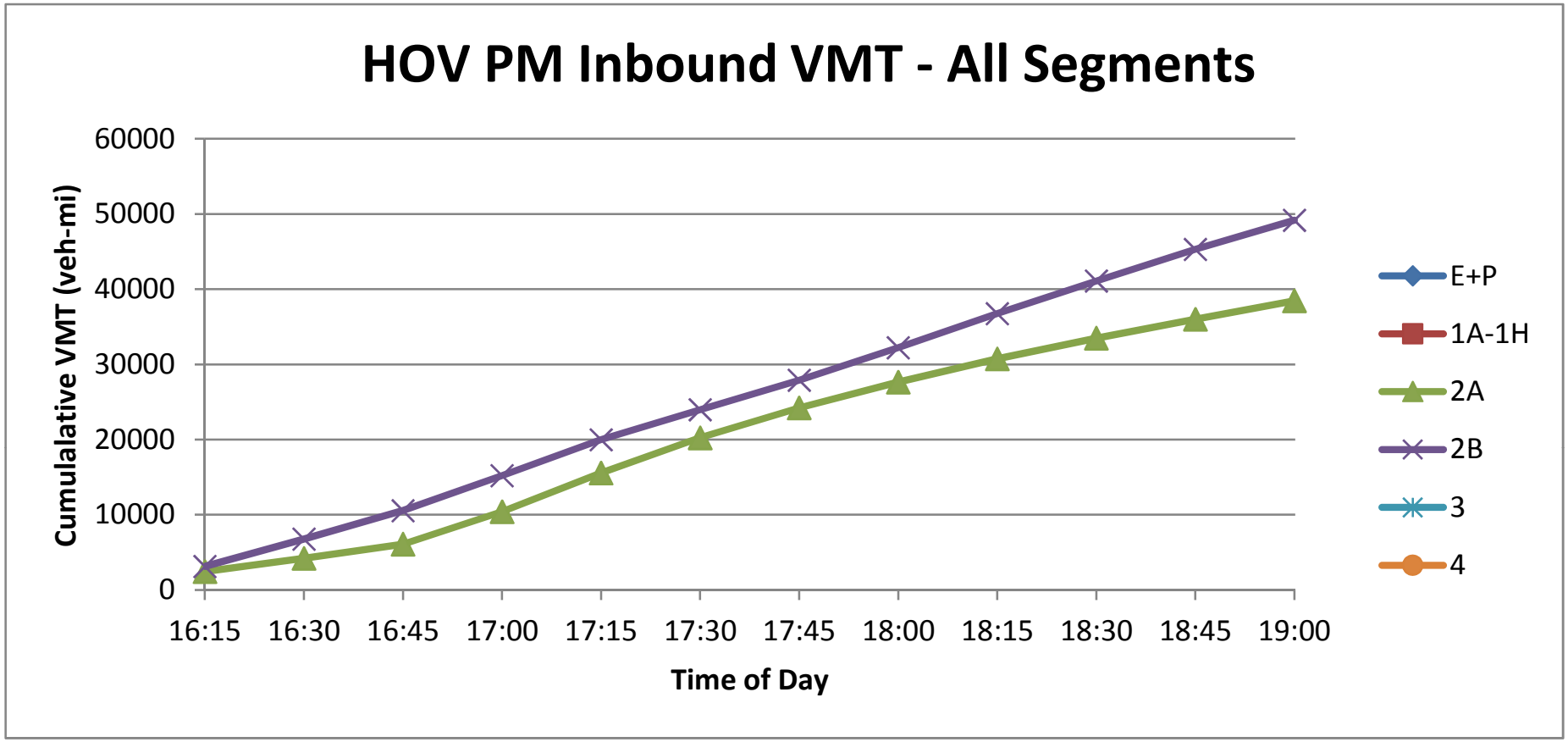


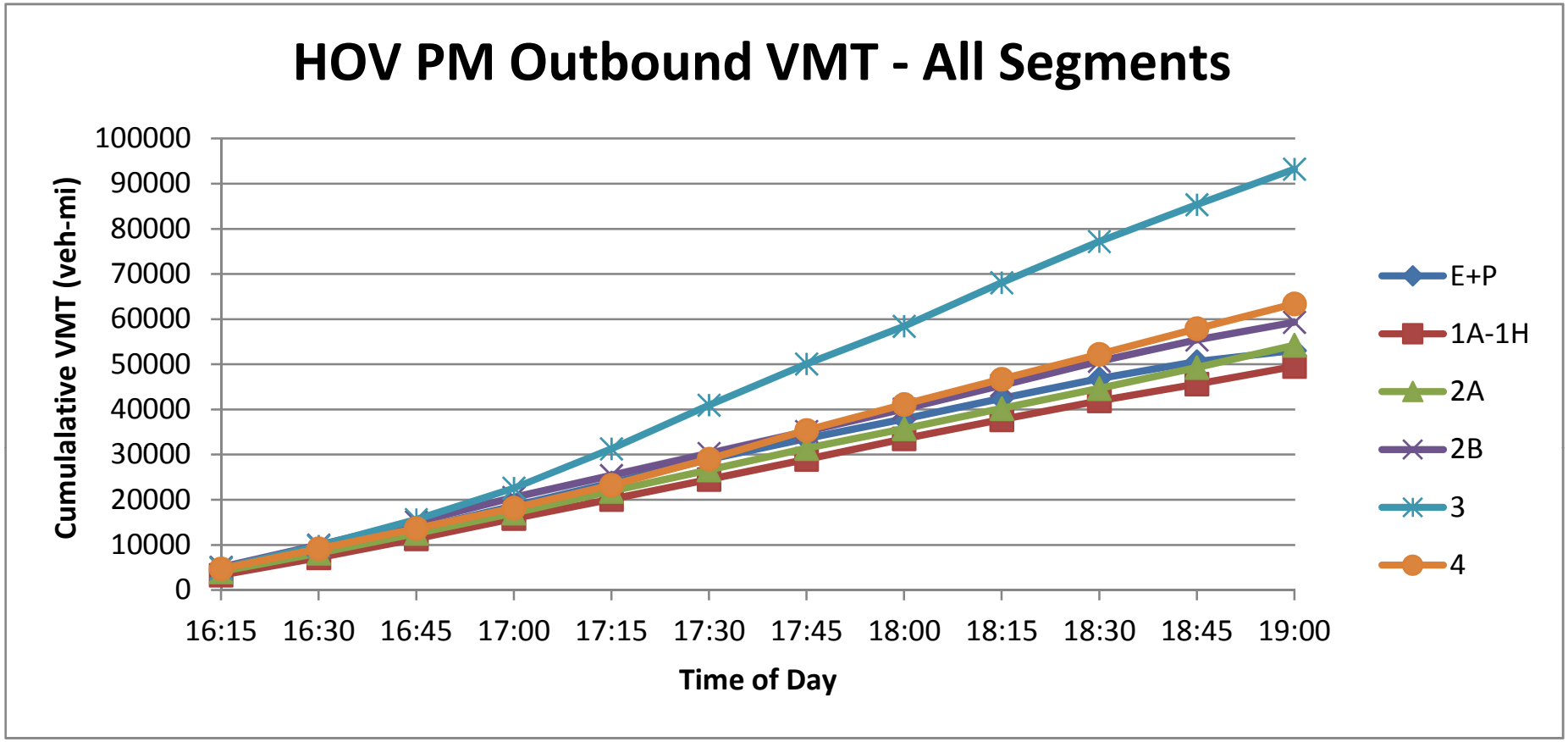
2011 DynusT Results - H-GAC Models



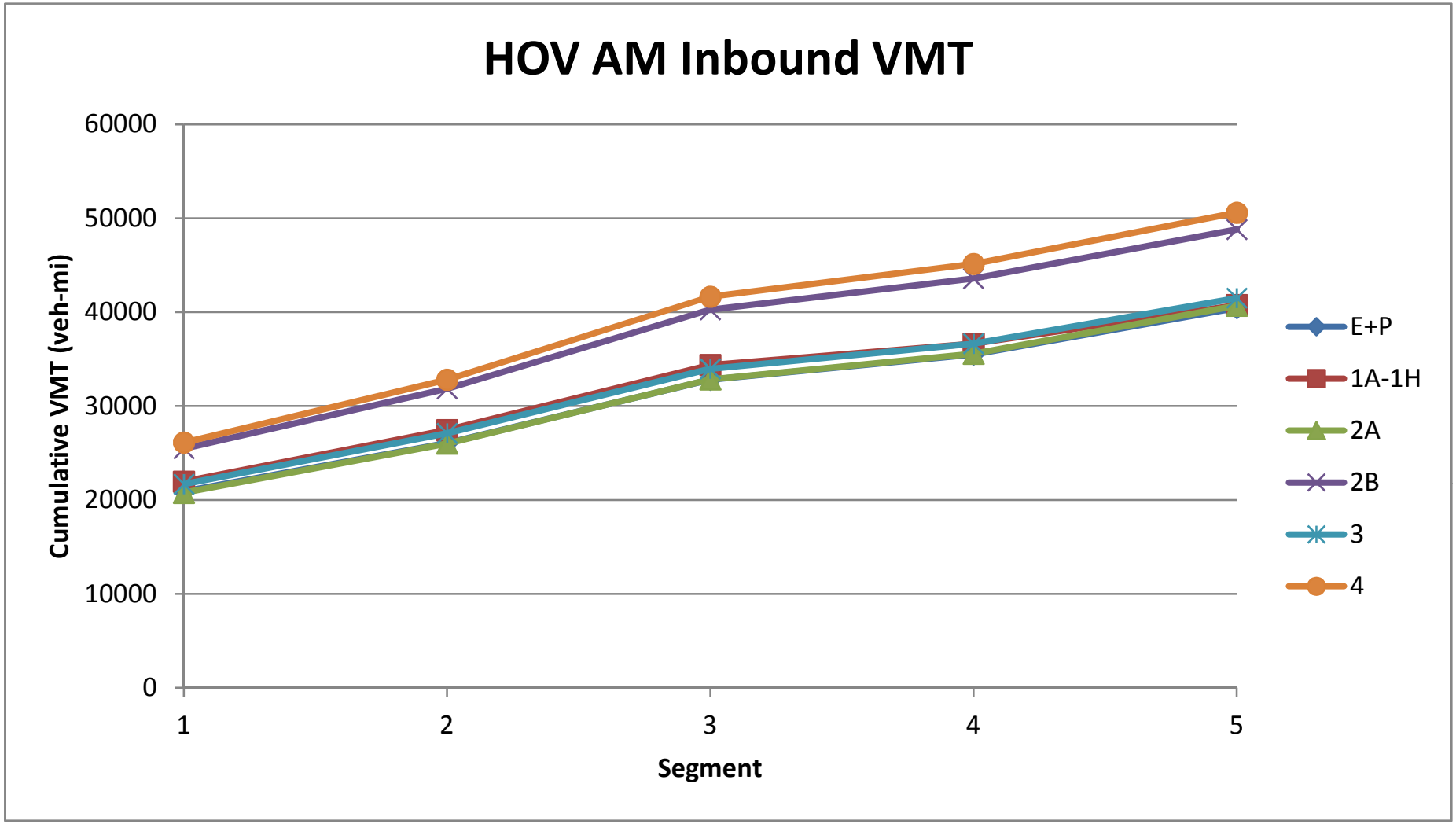
2011 DynusT Results - H-GAC Models



2011 DynusT Results - H-GAC Models



2011 DynusT Results - H-GAC Models



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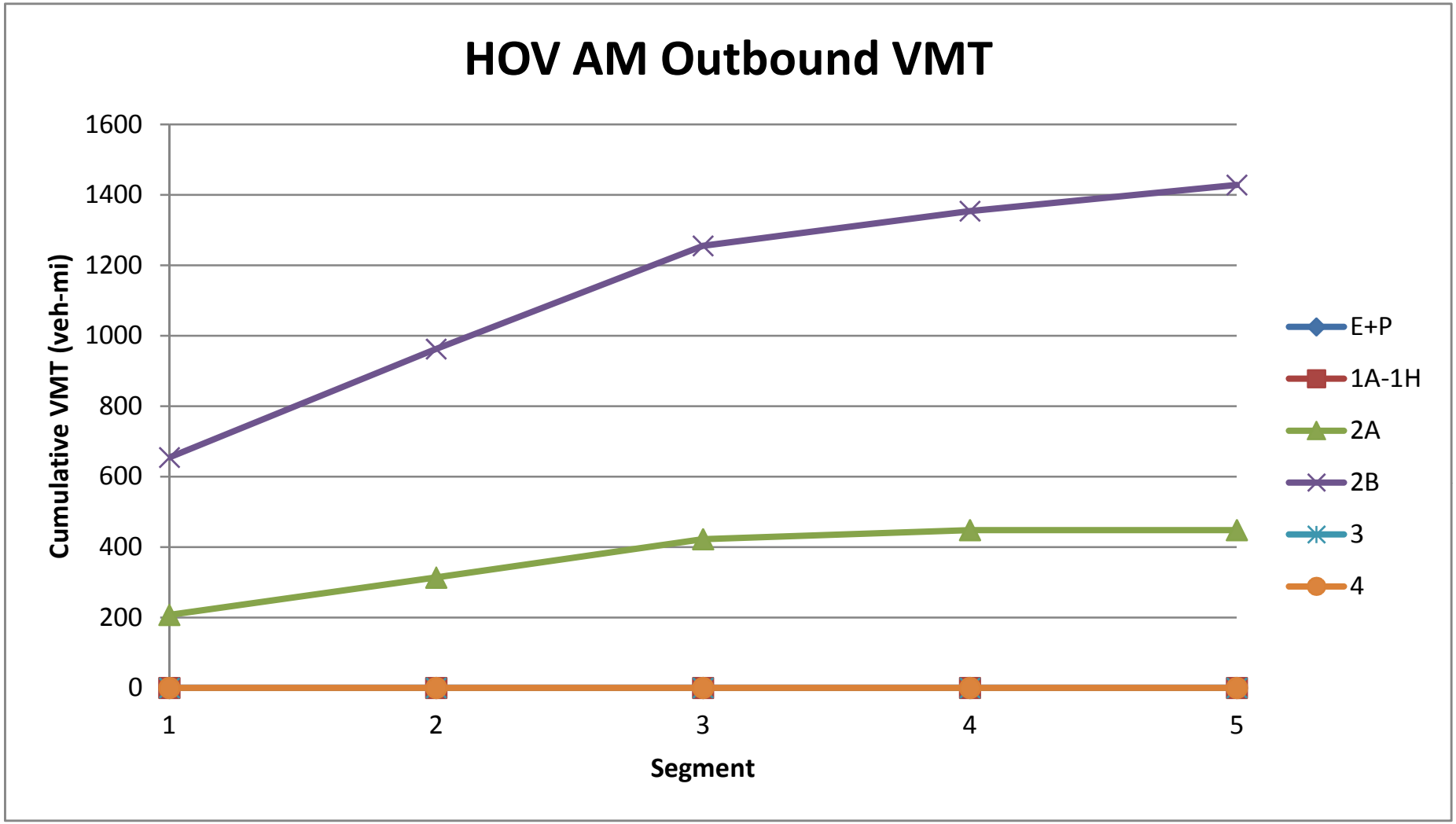

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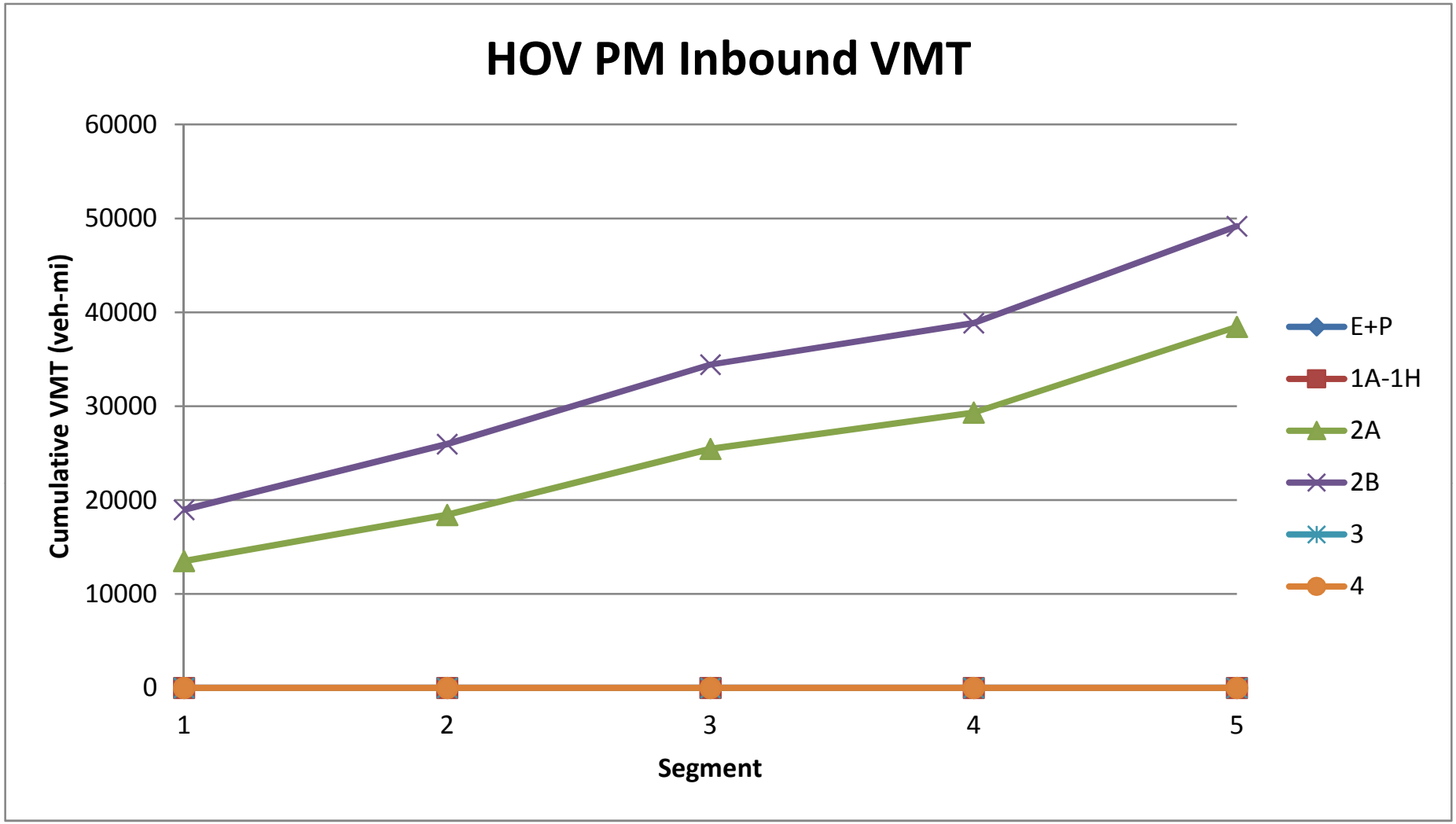

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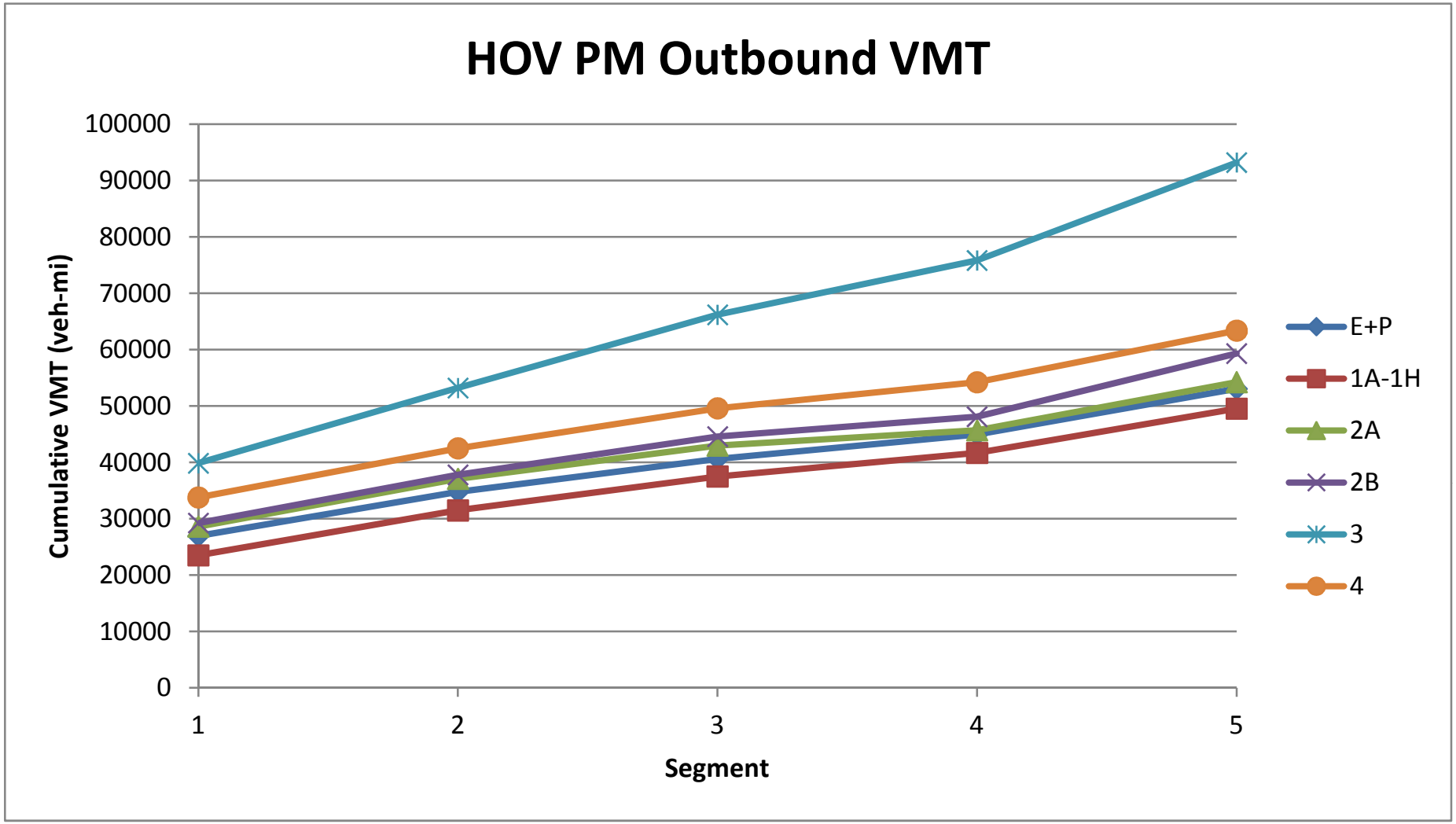

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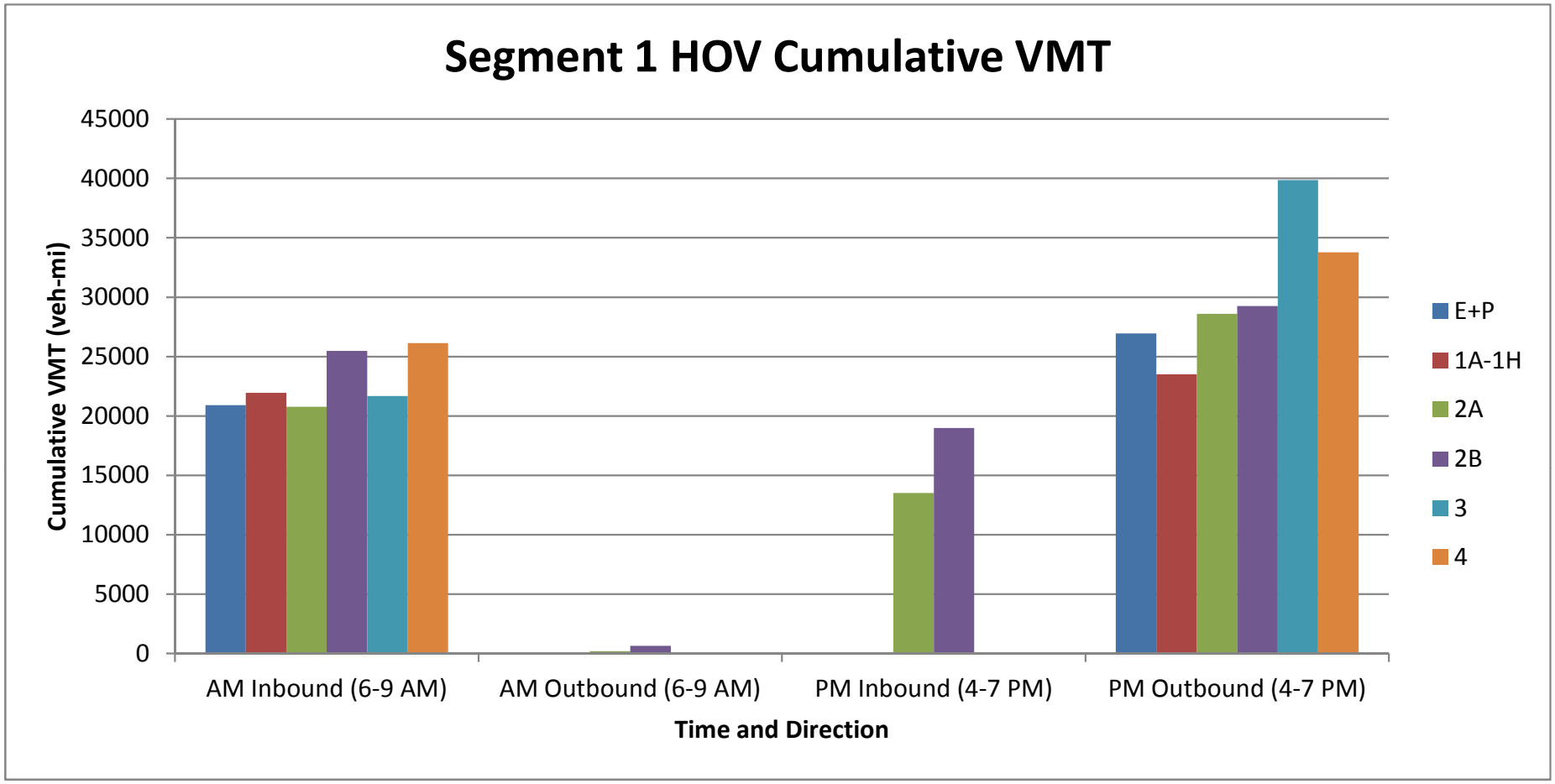

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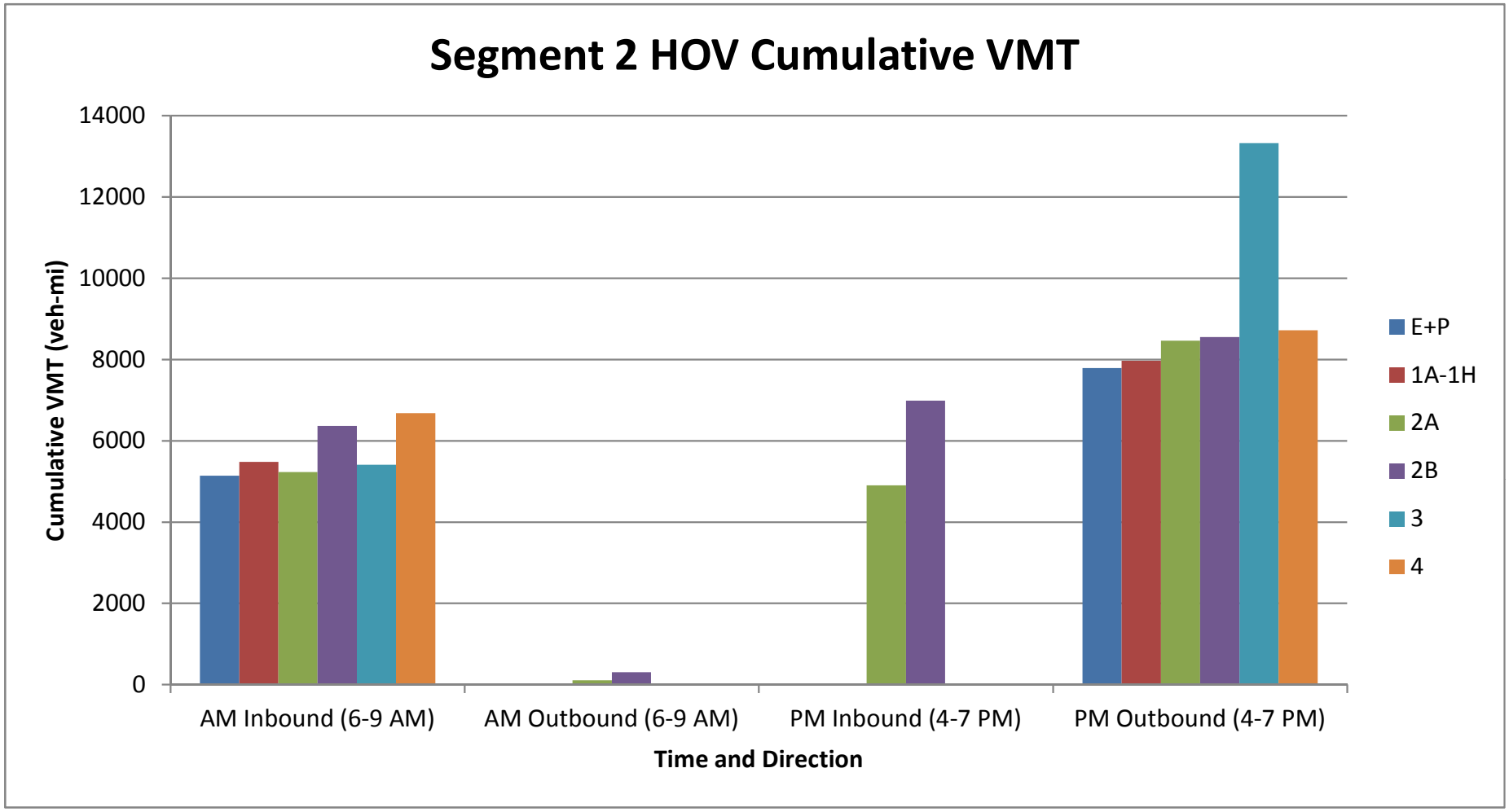

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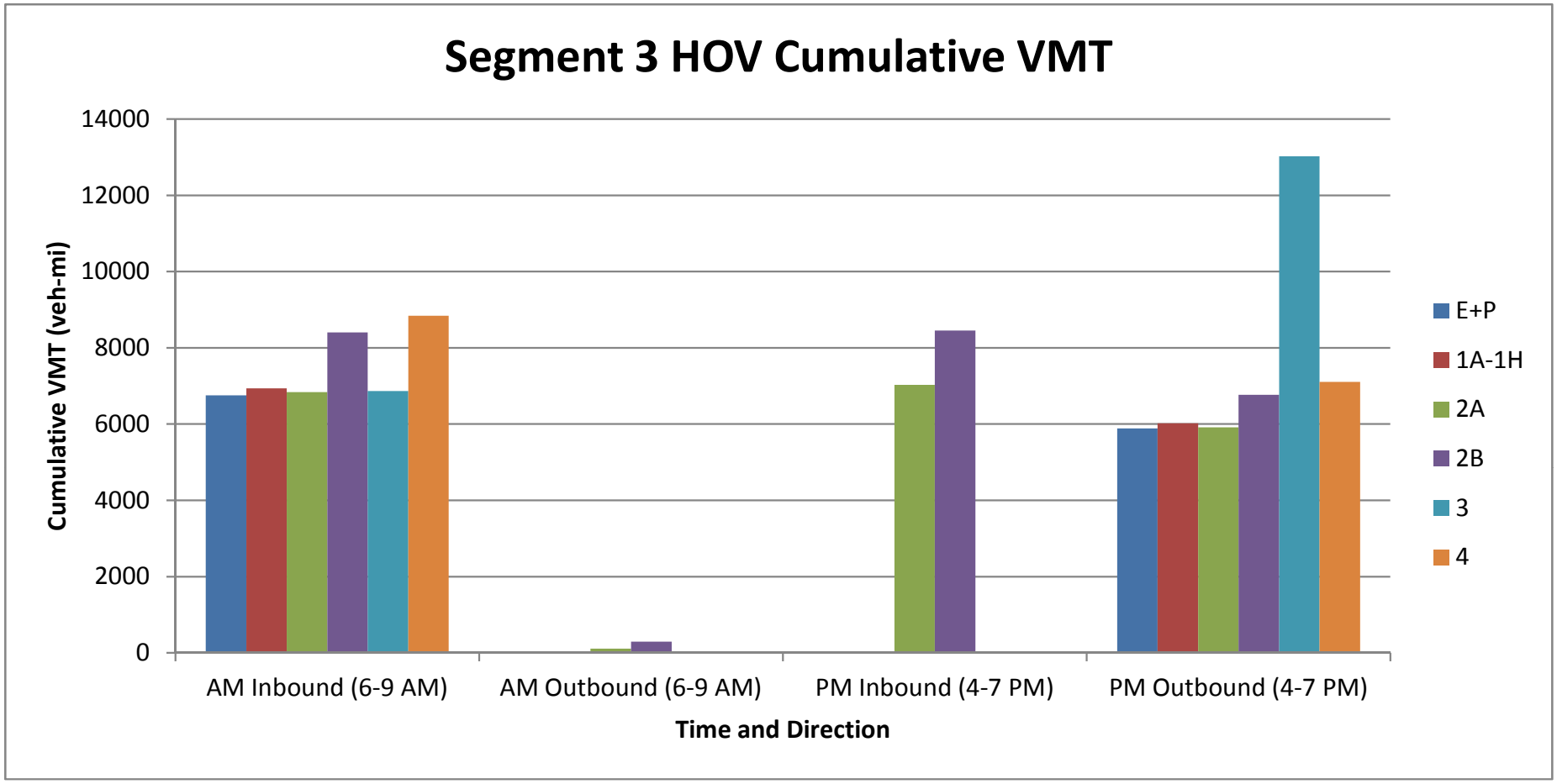

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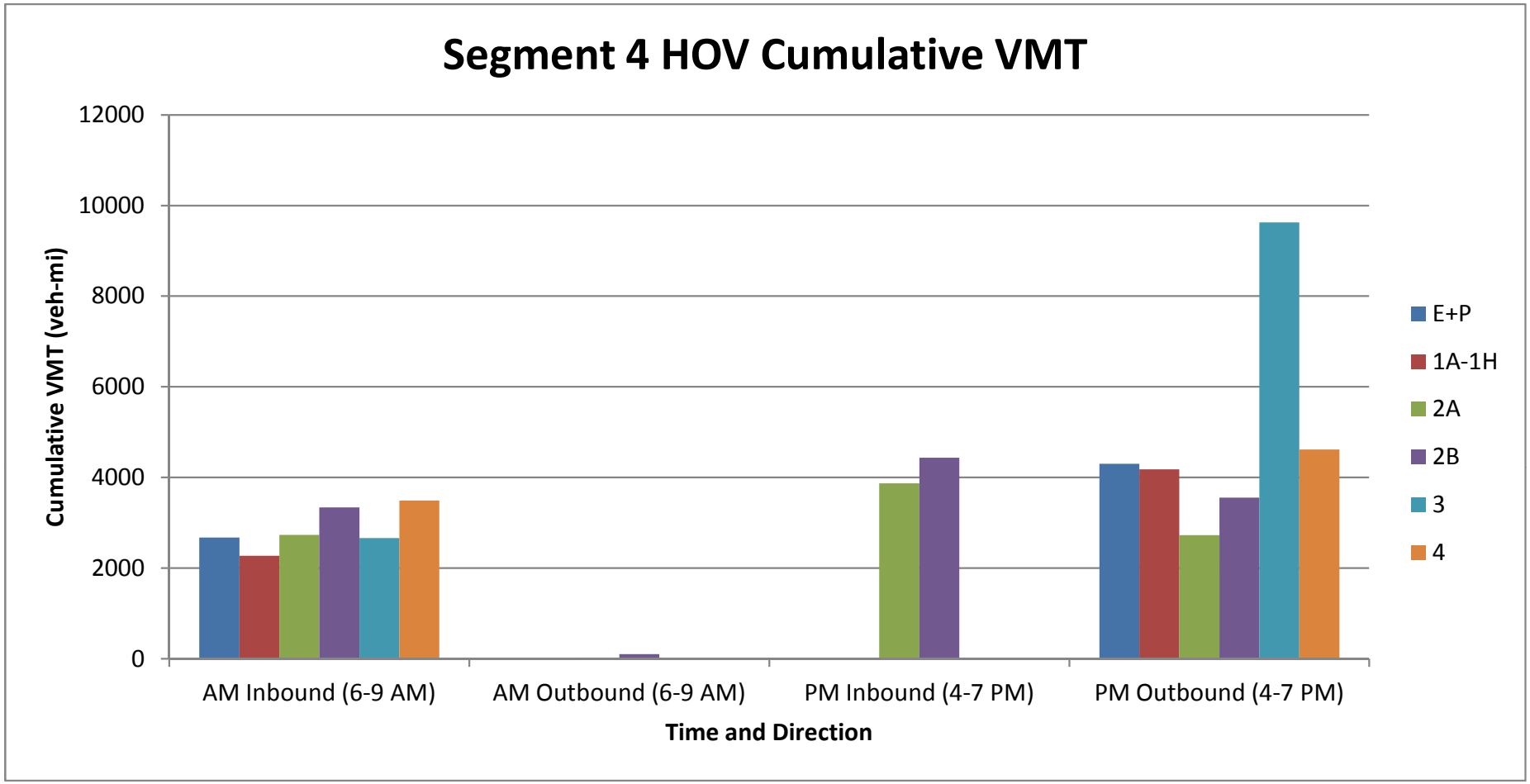

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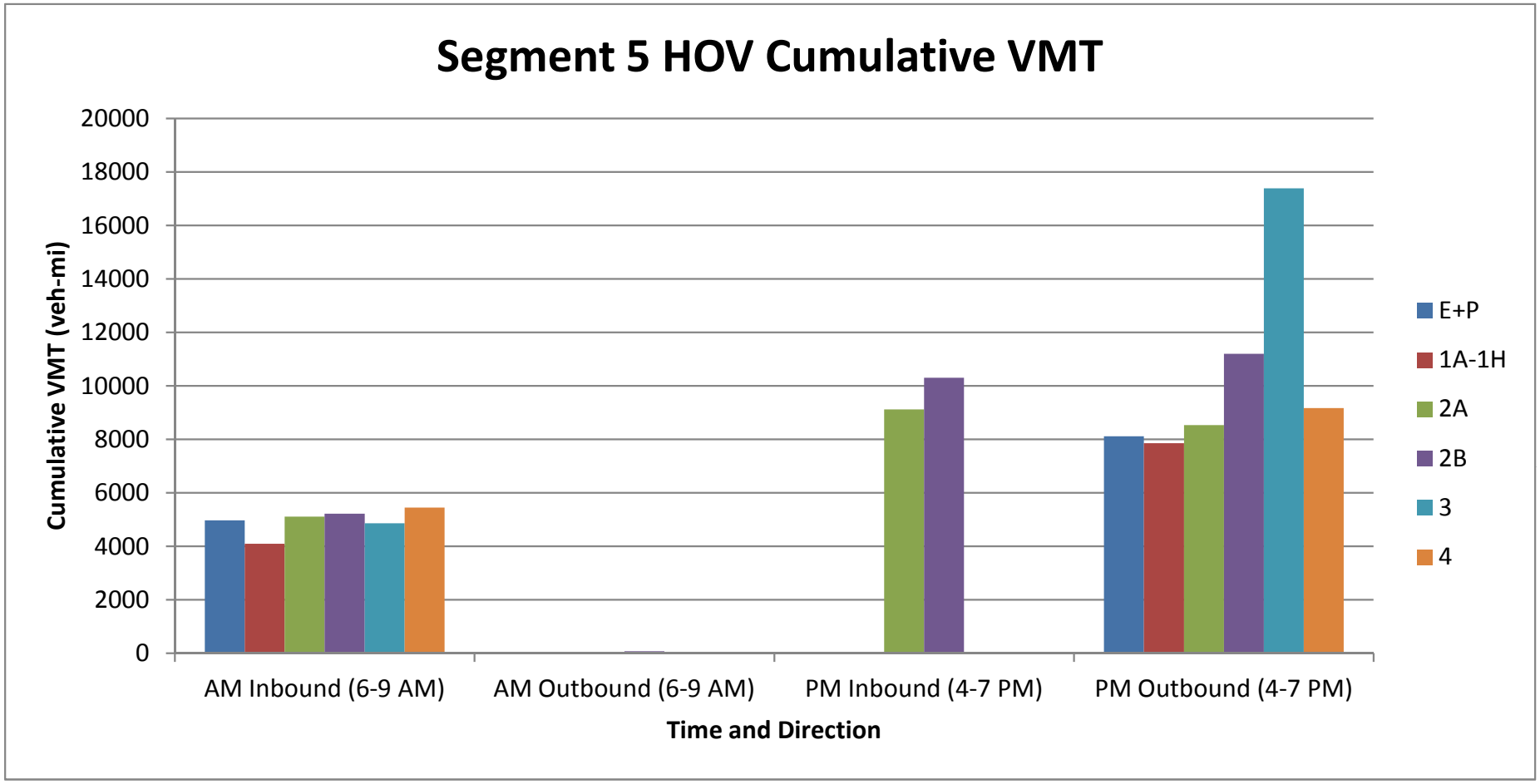

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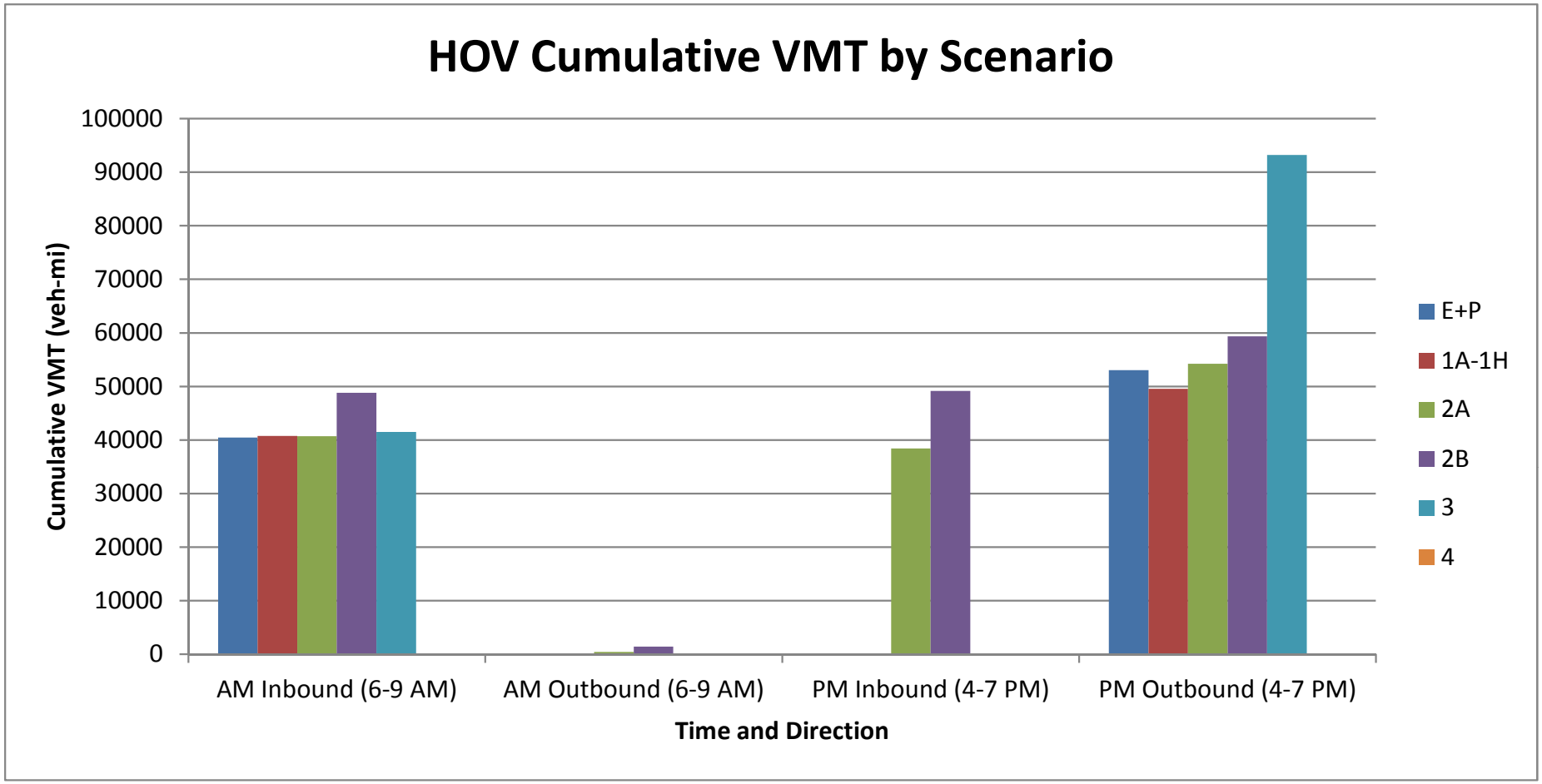

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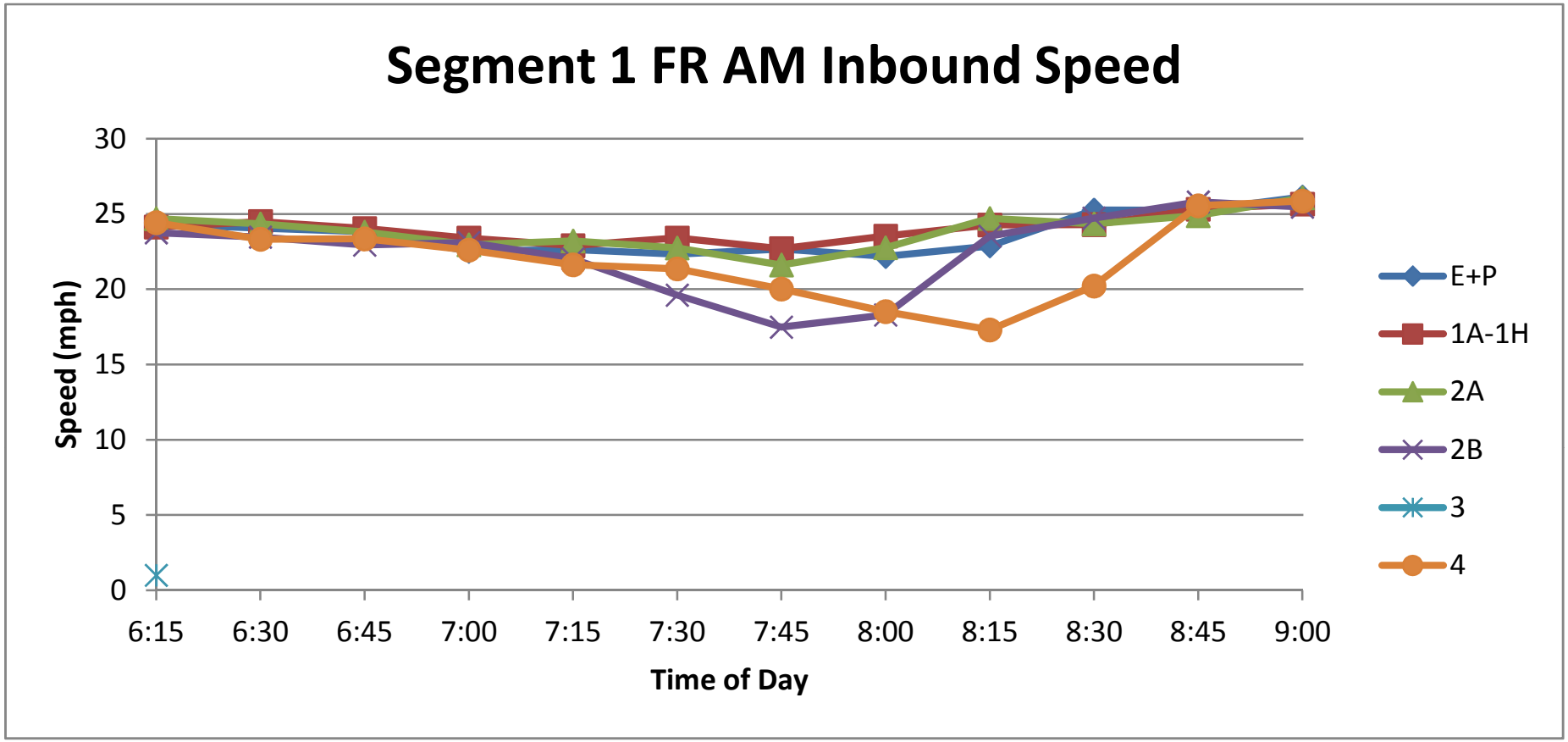

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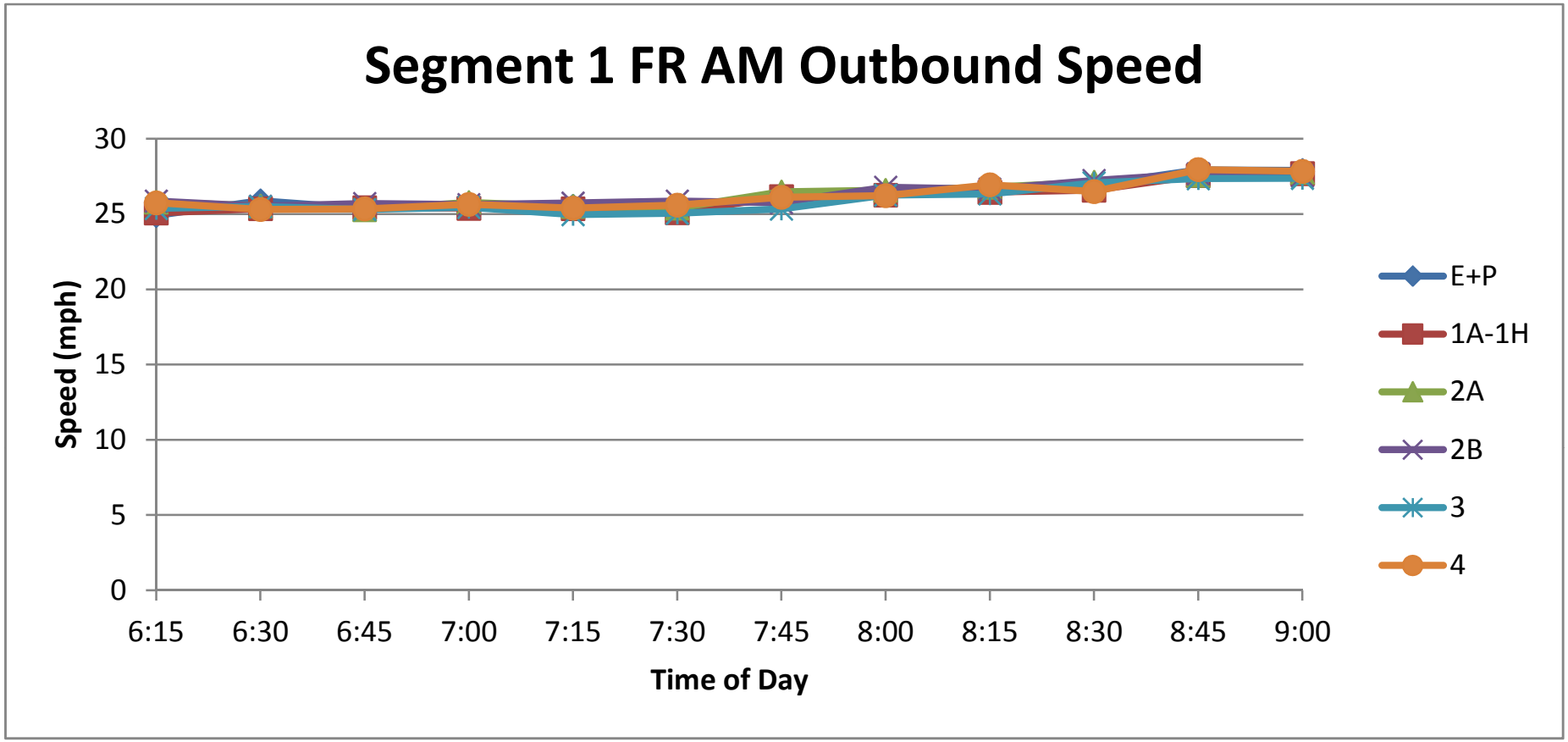

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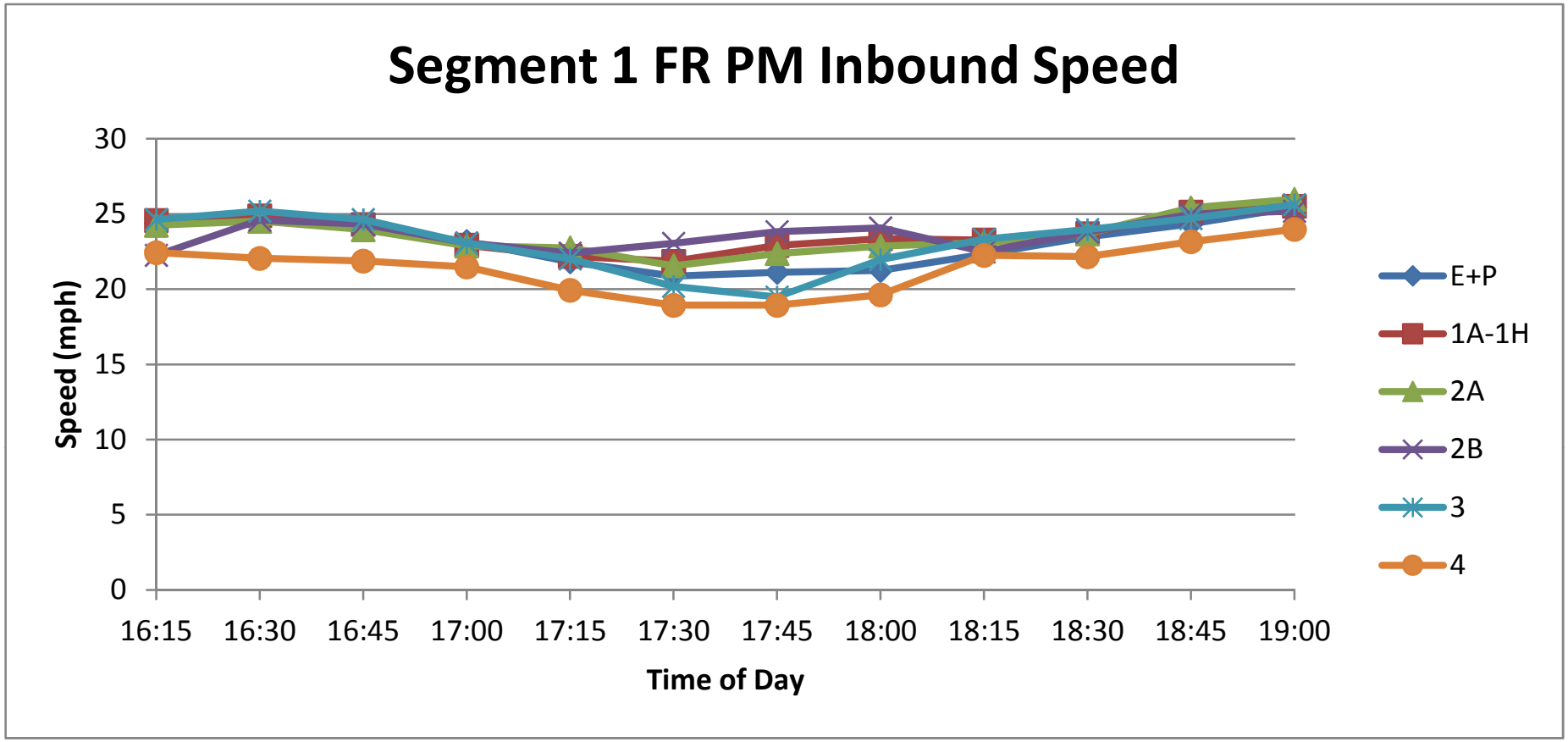

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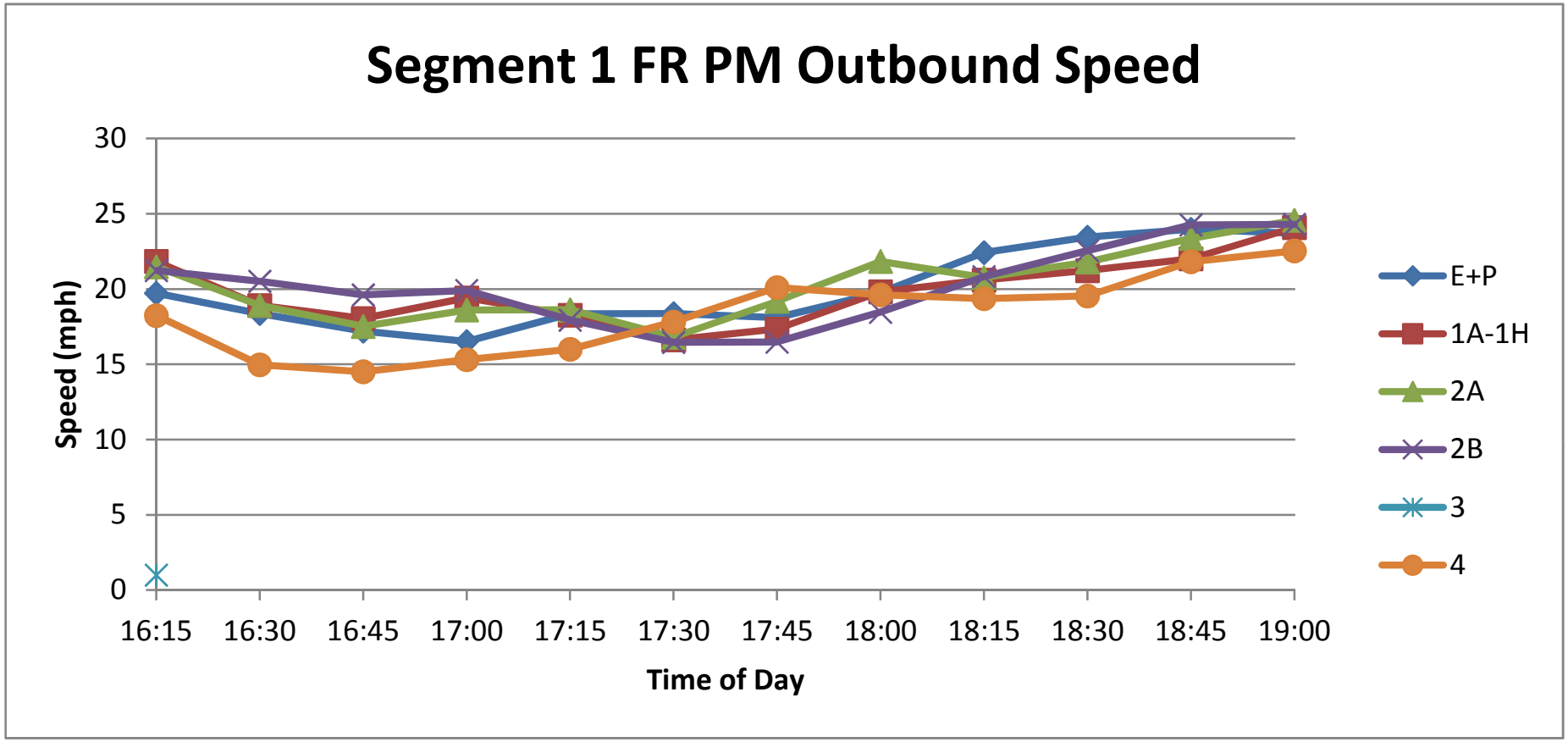

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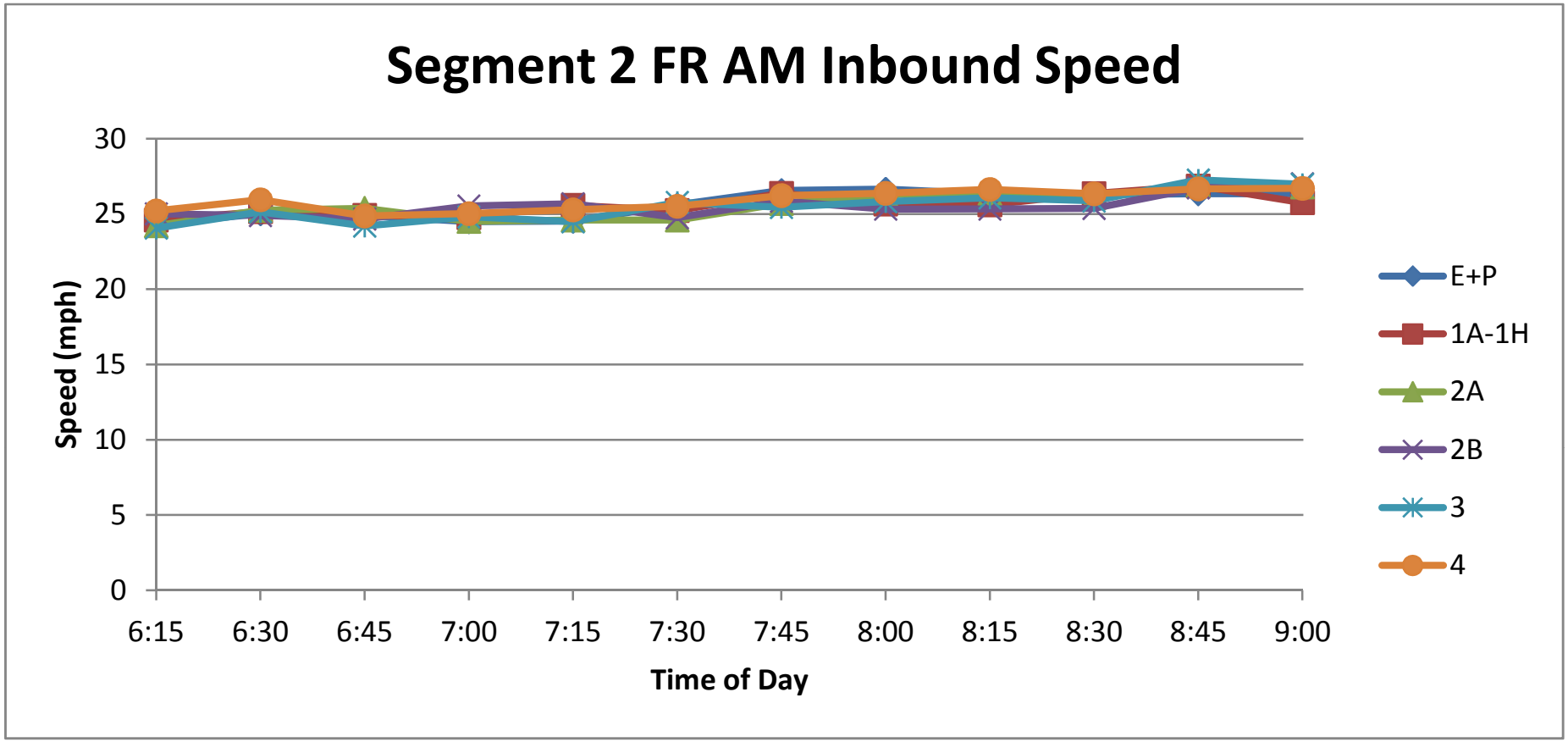

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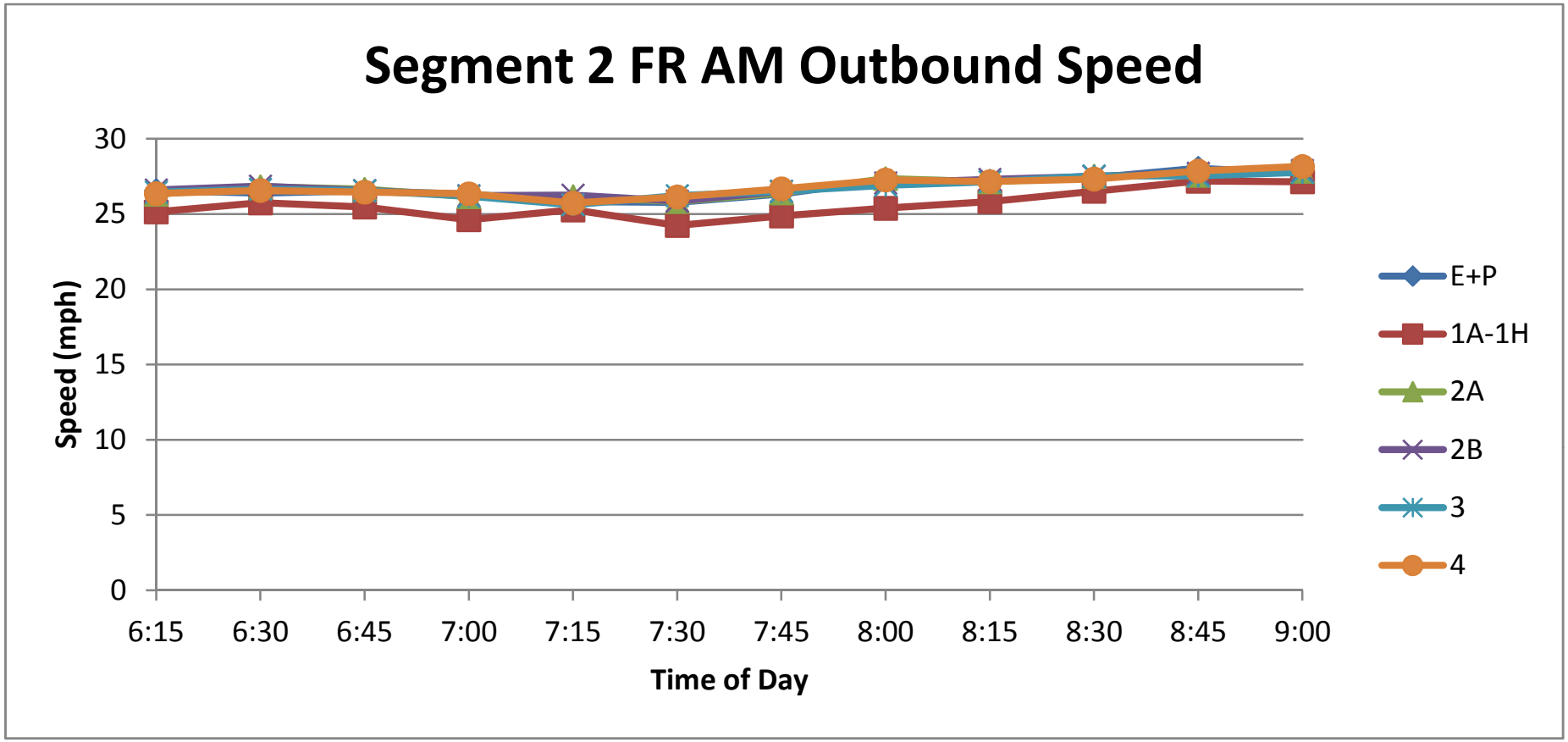

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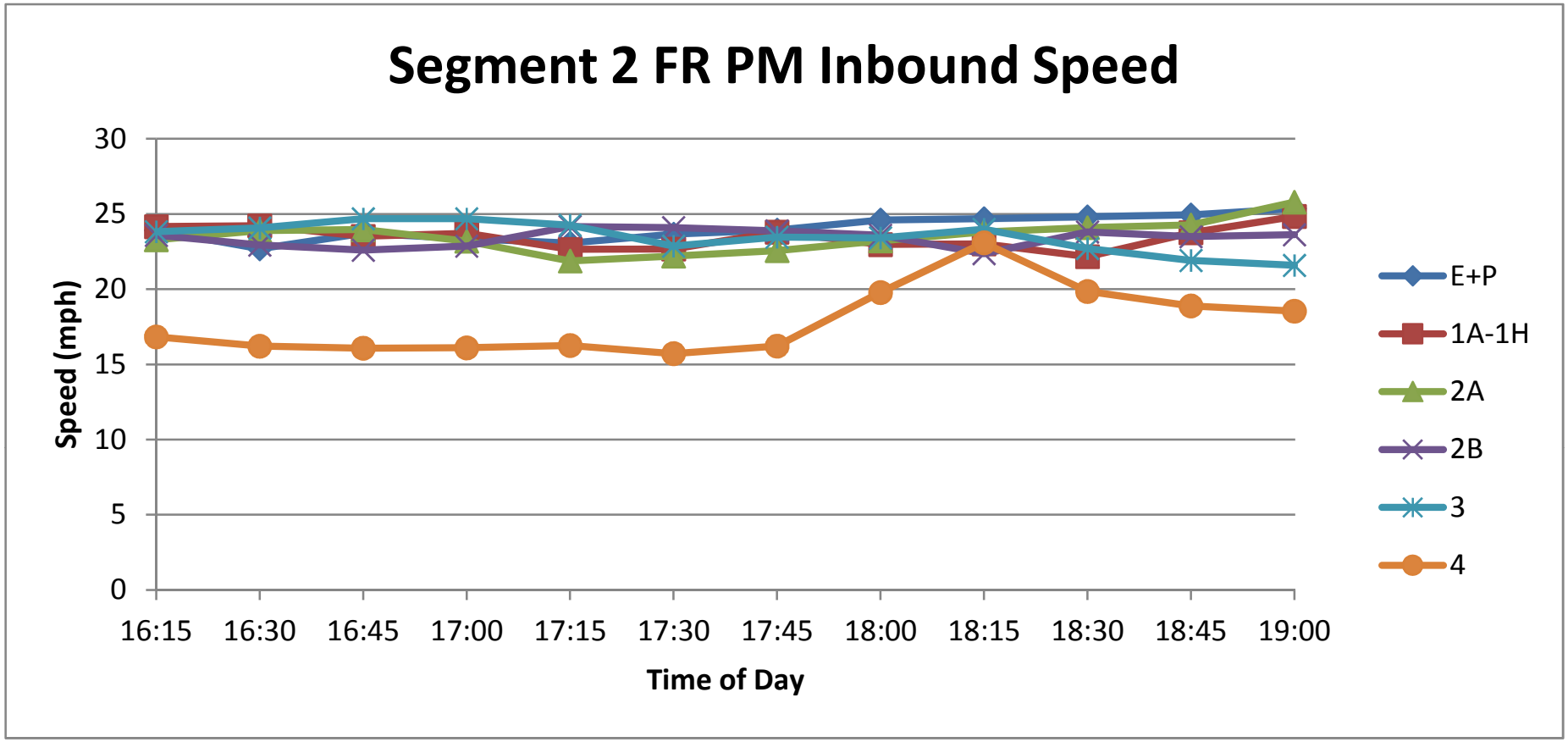

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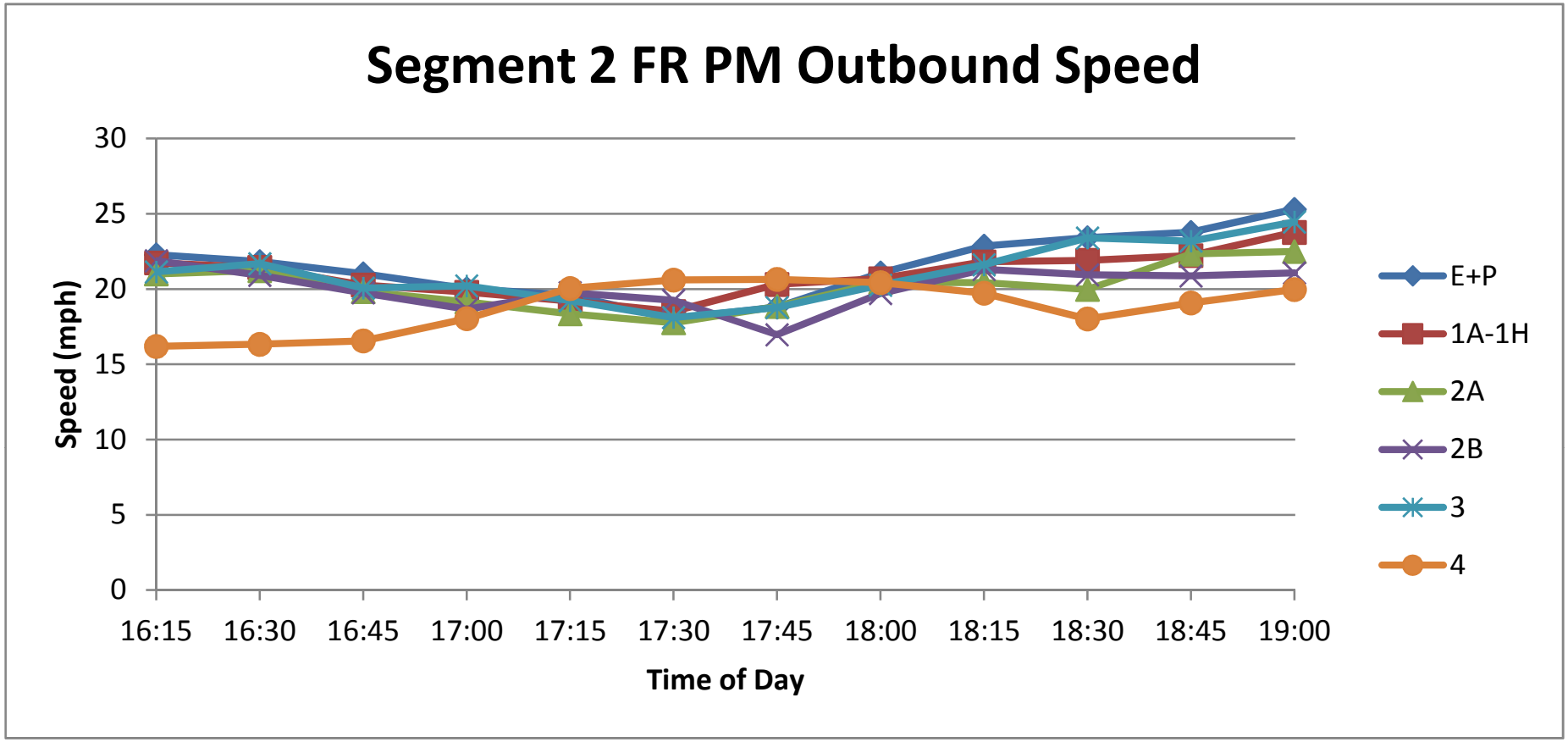

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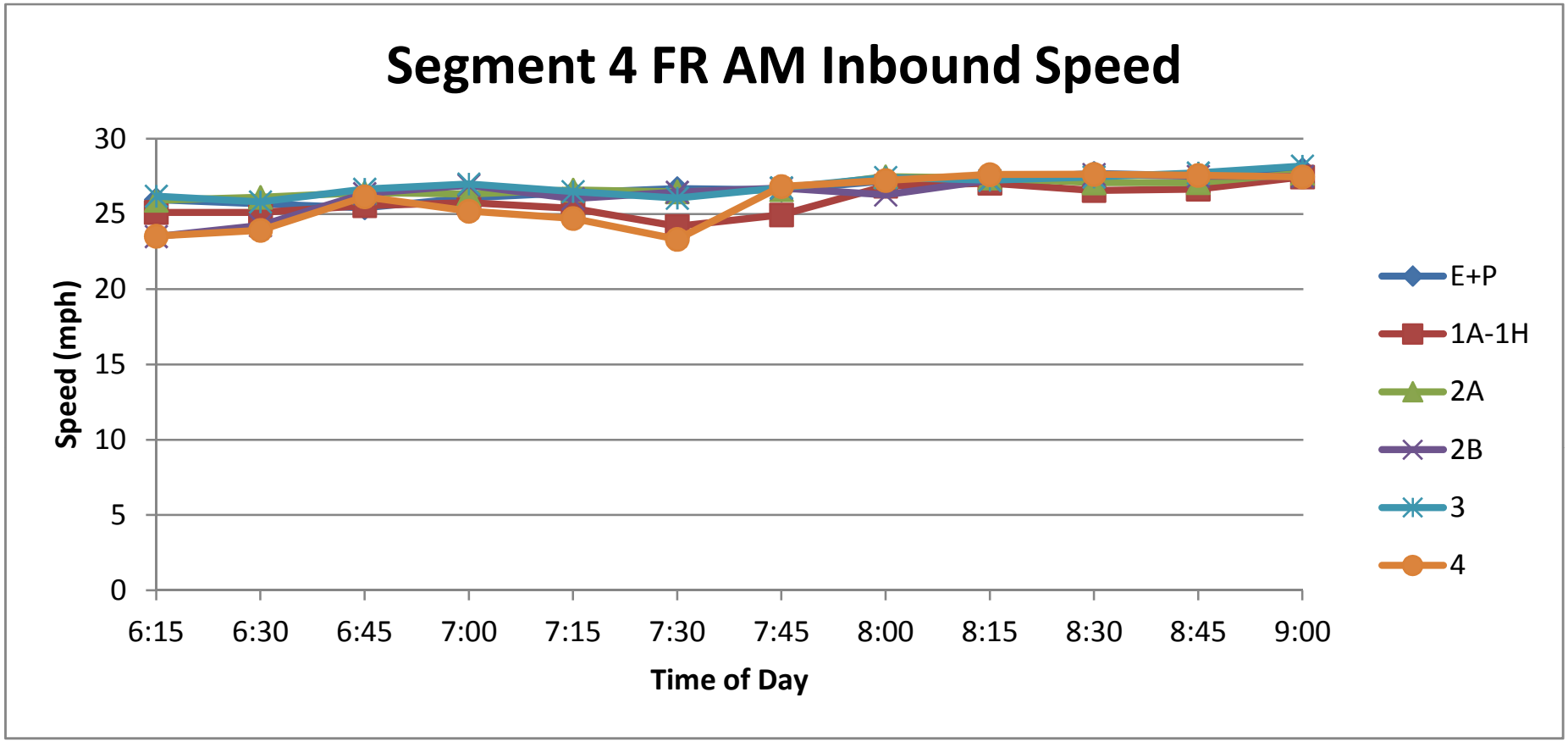

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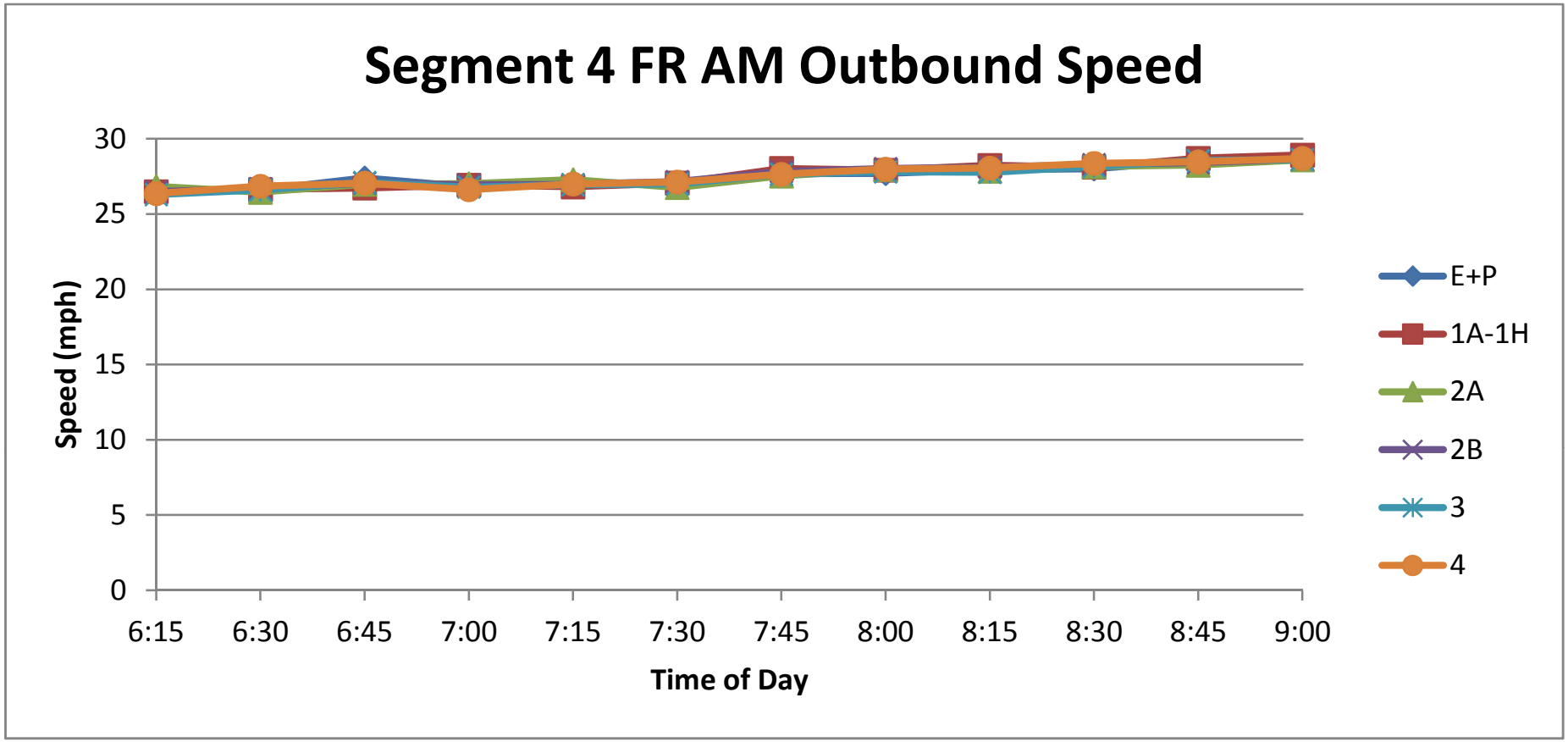

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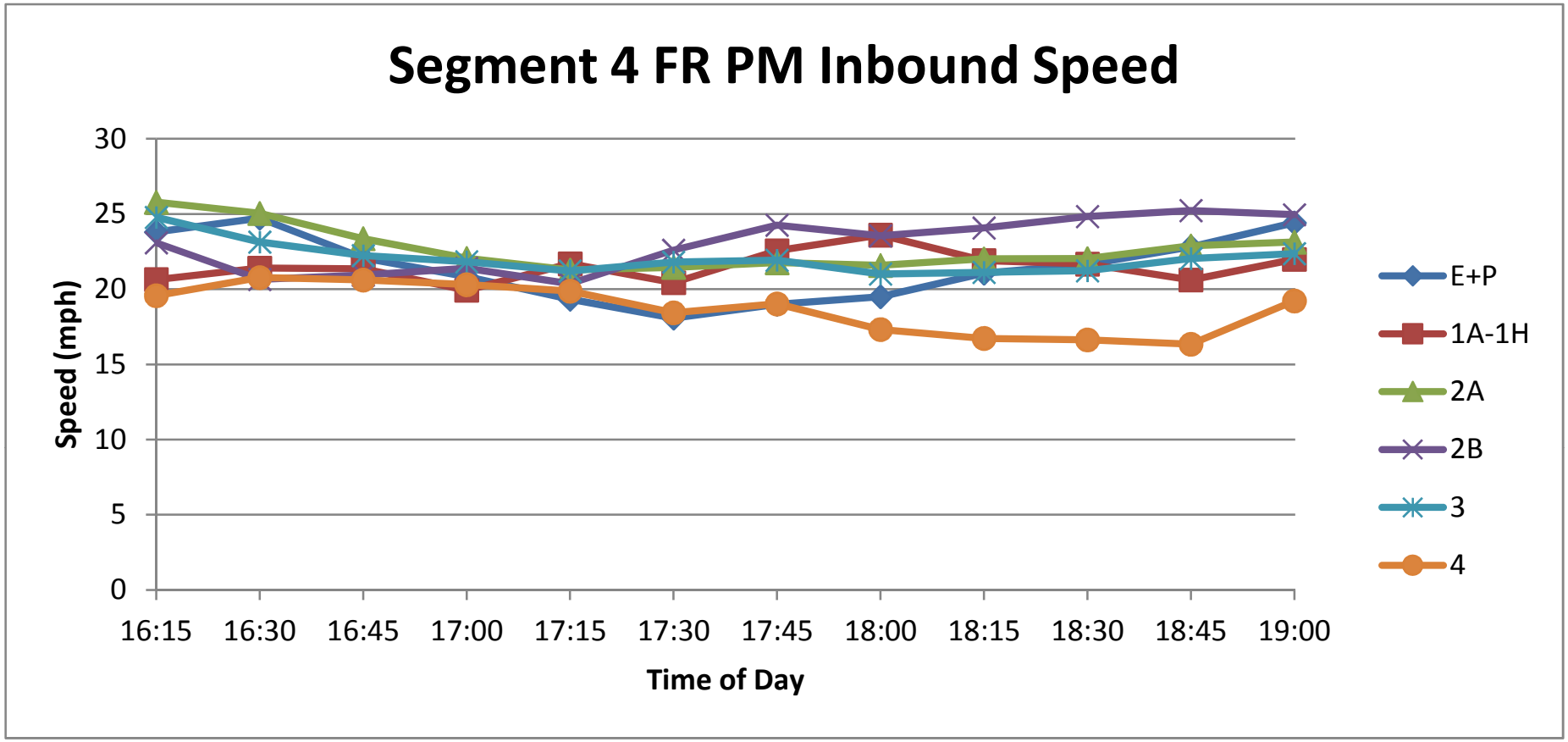

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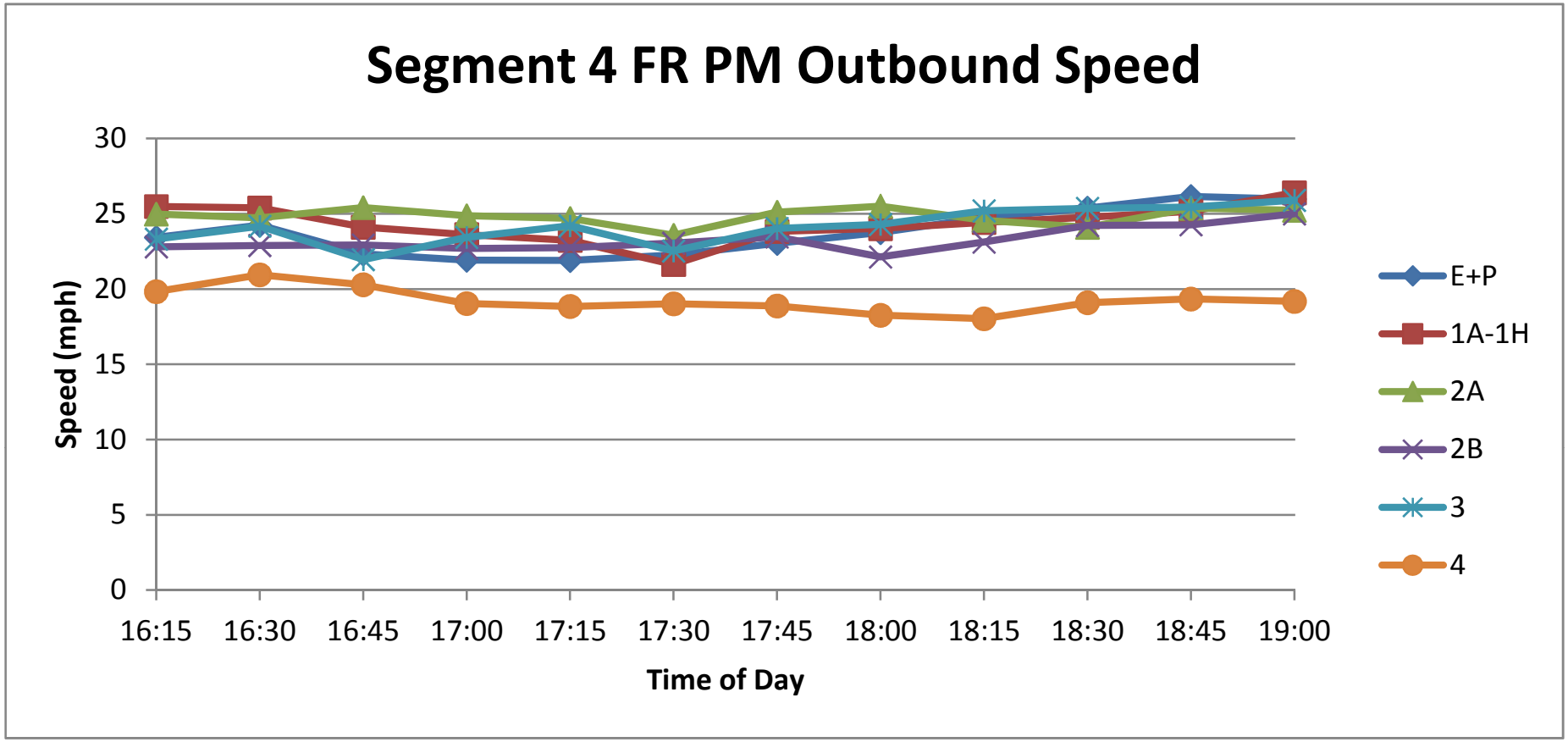

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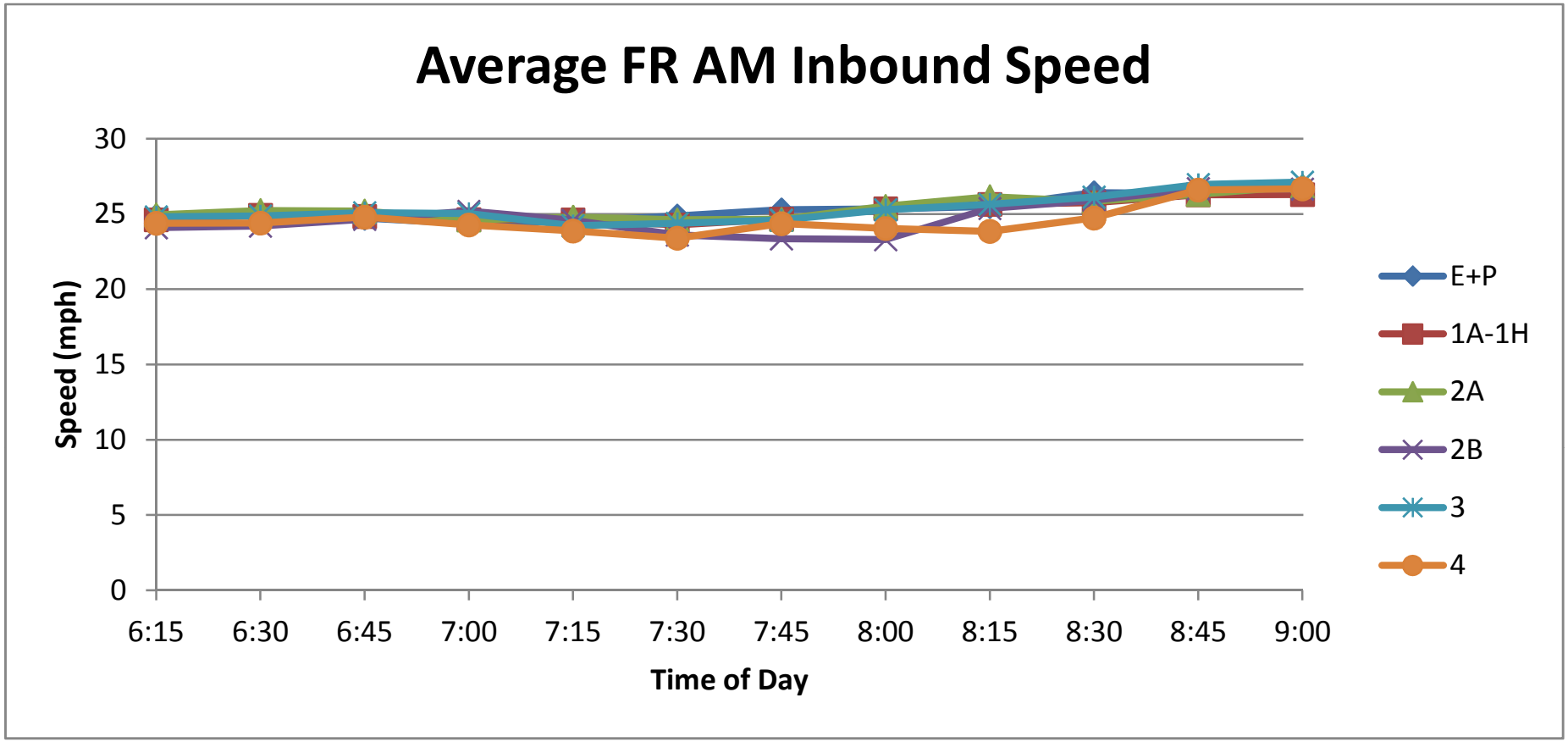

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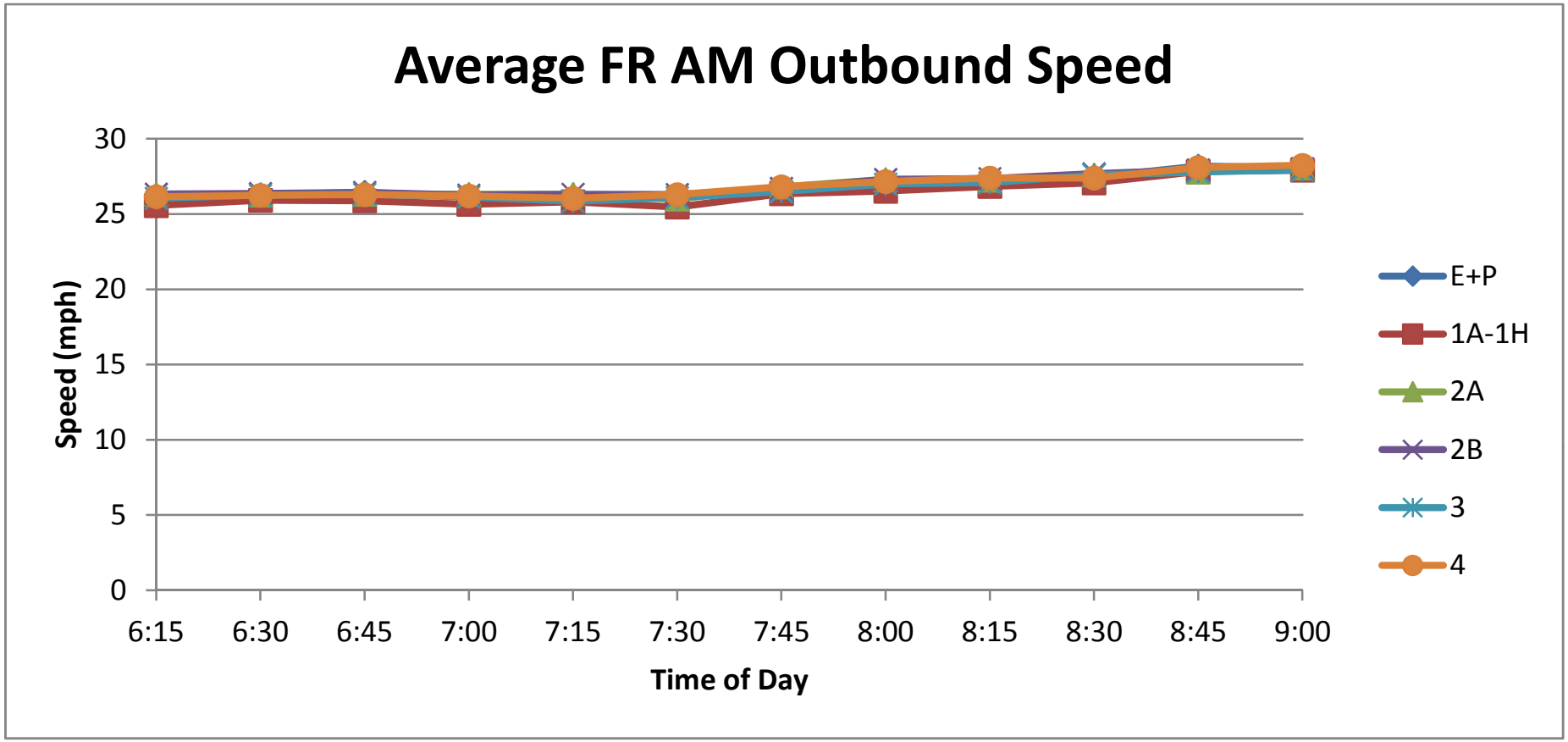

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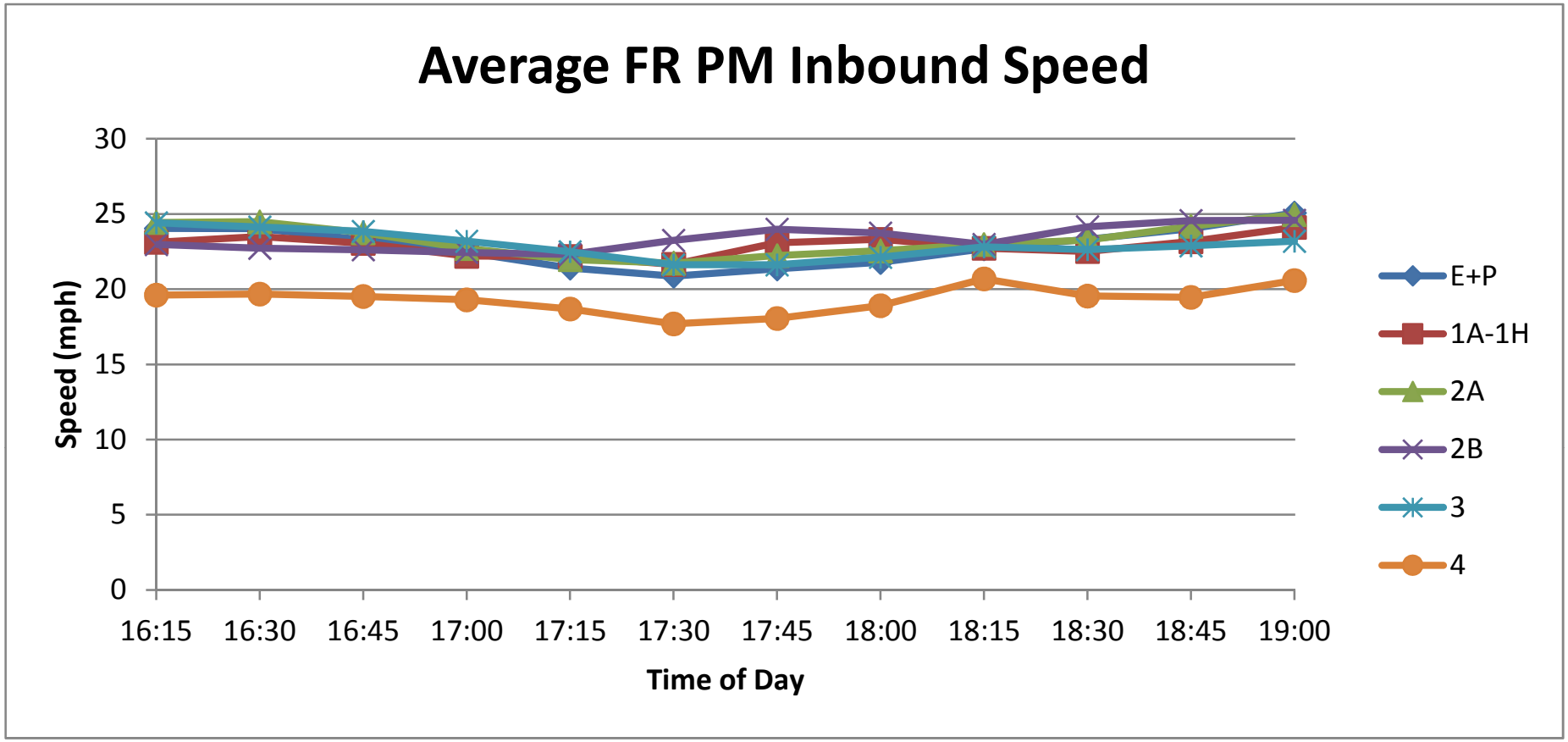

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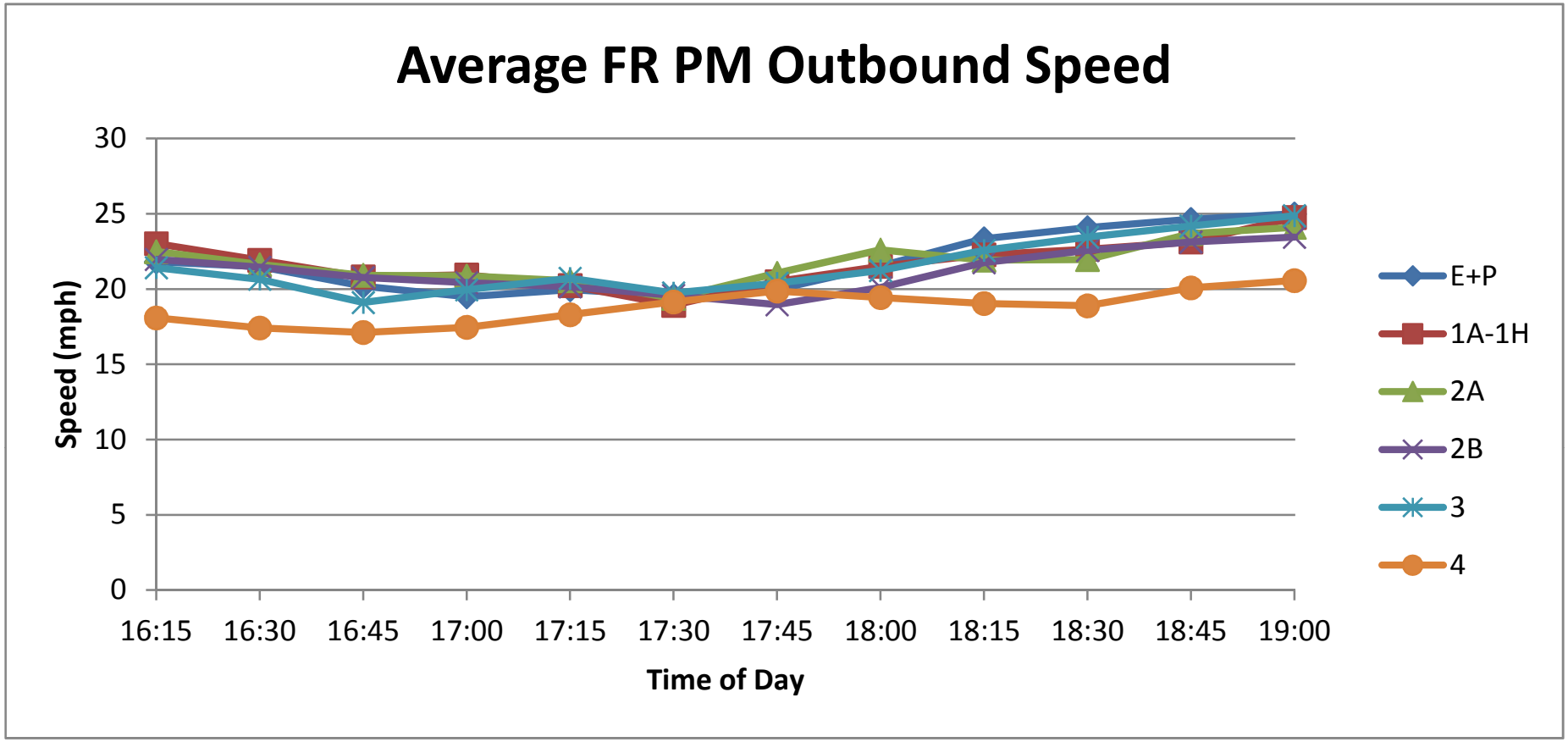

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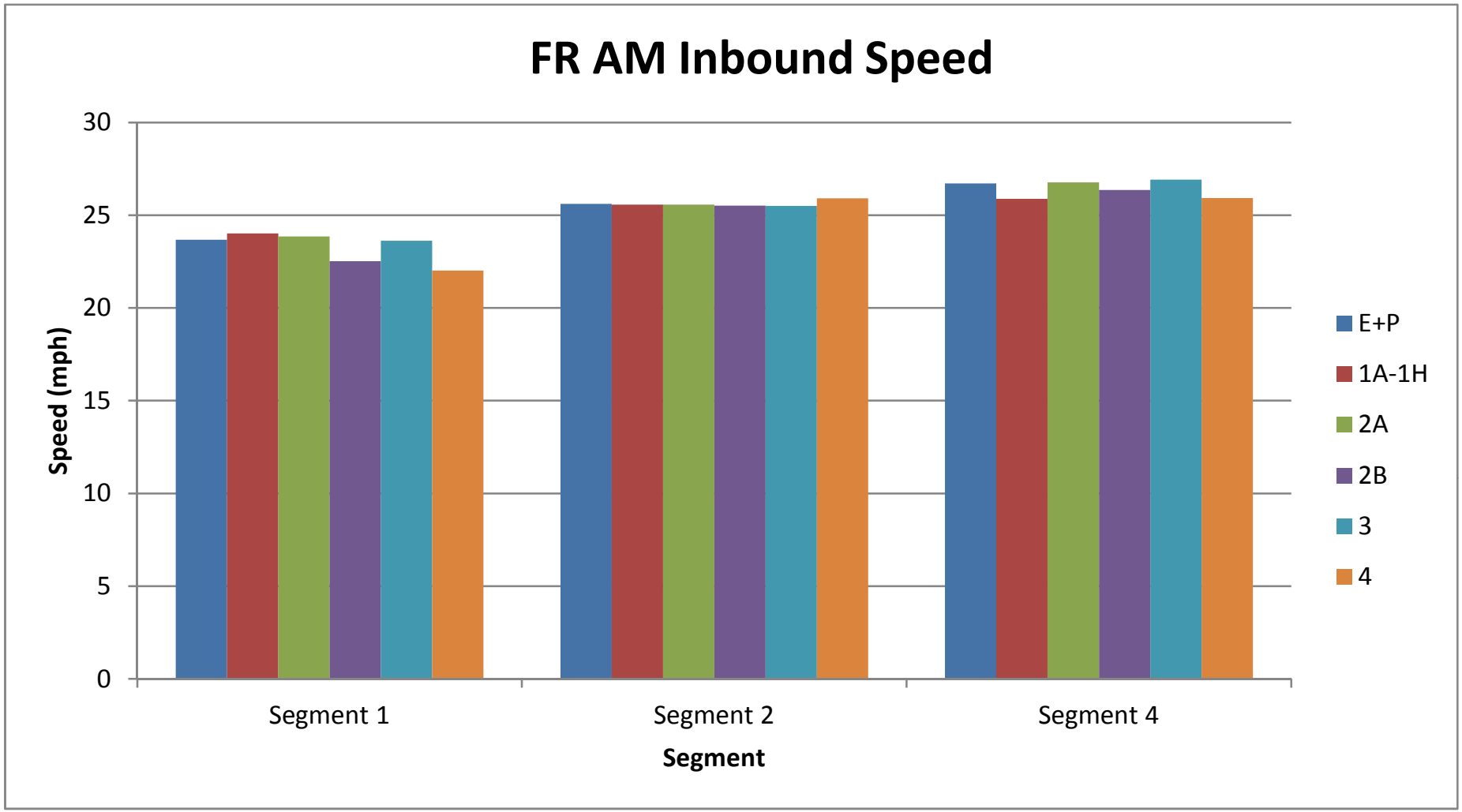

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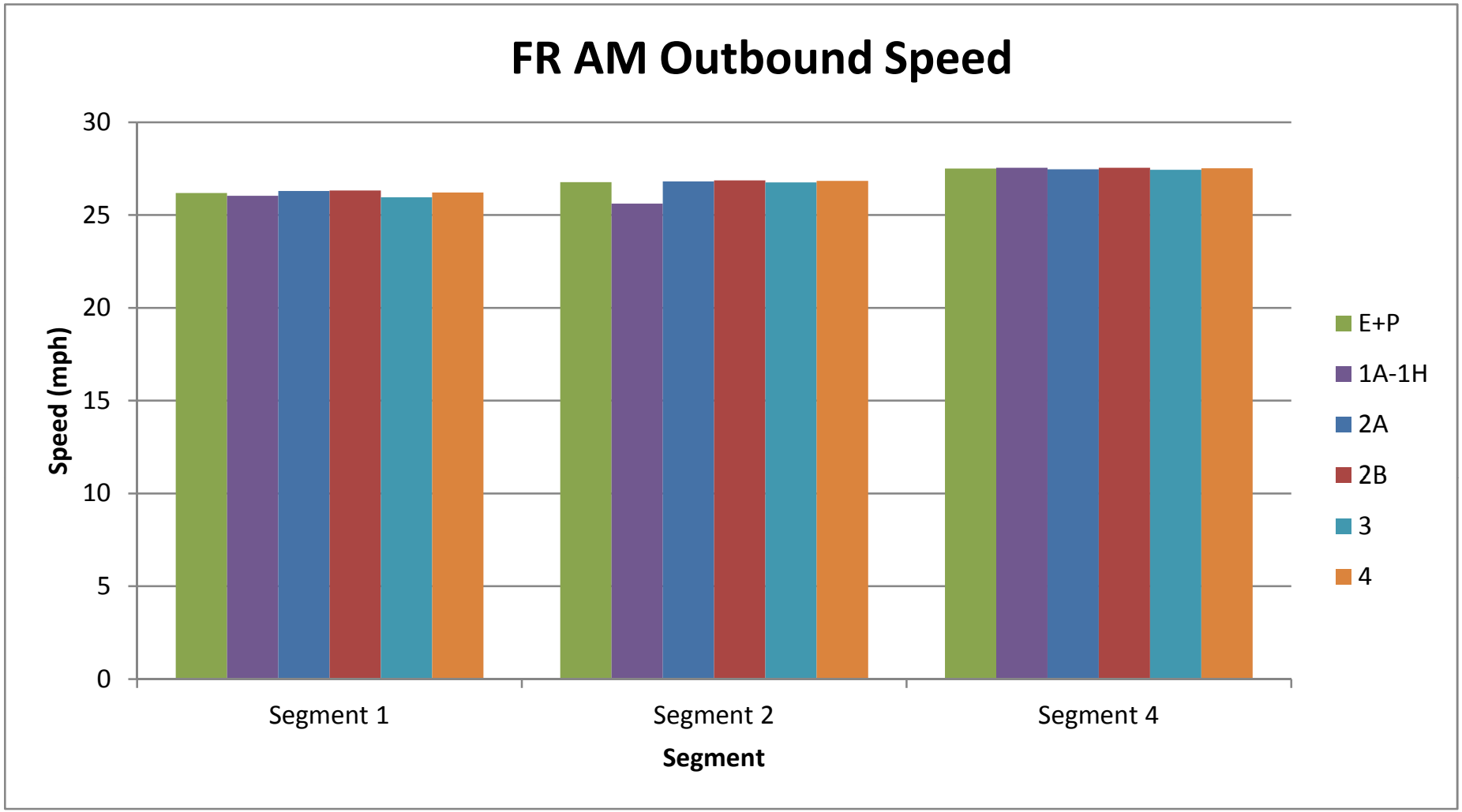

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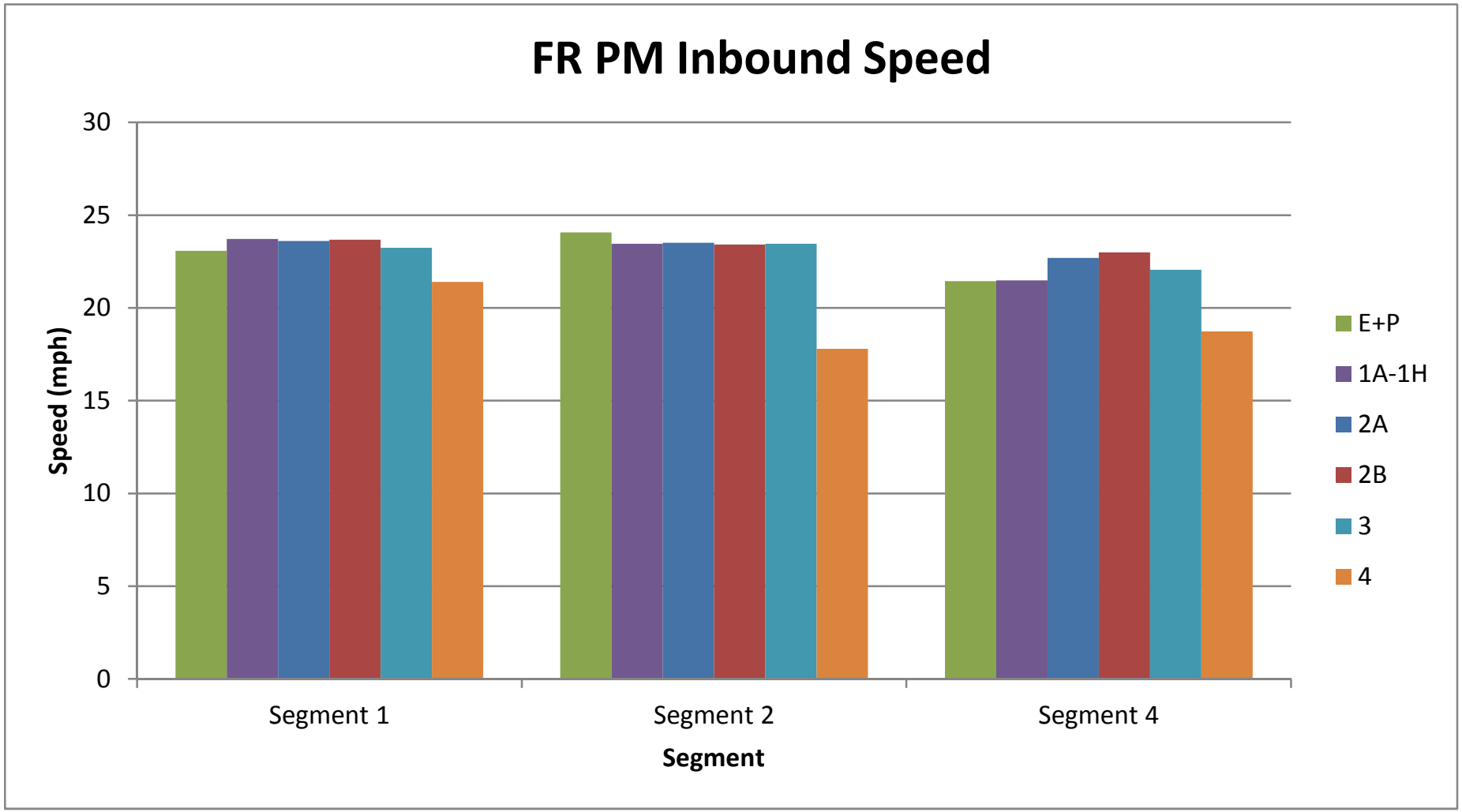

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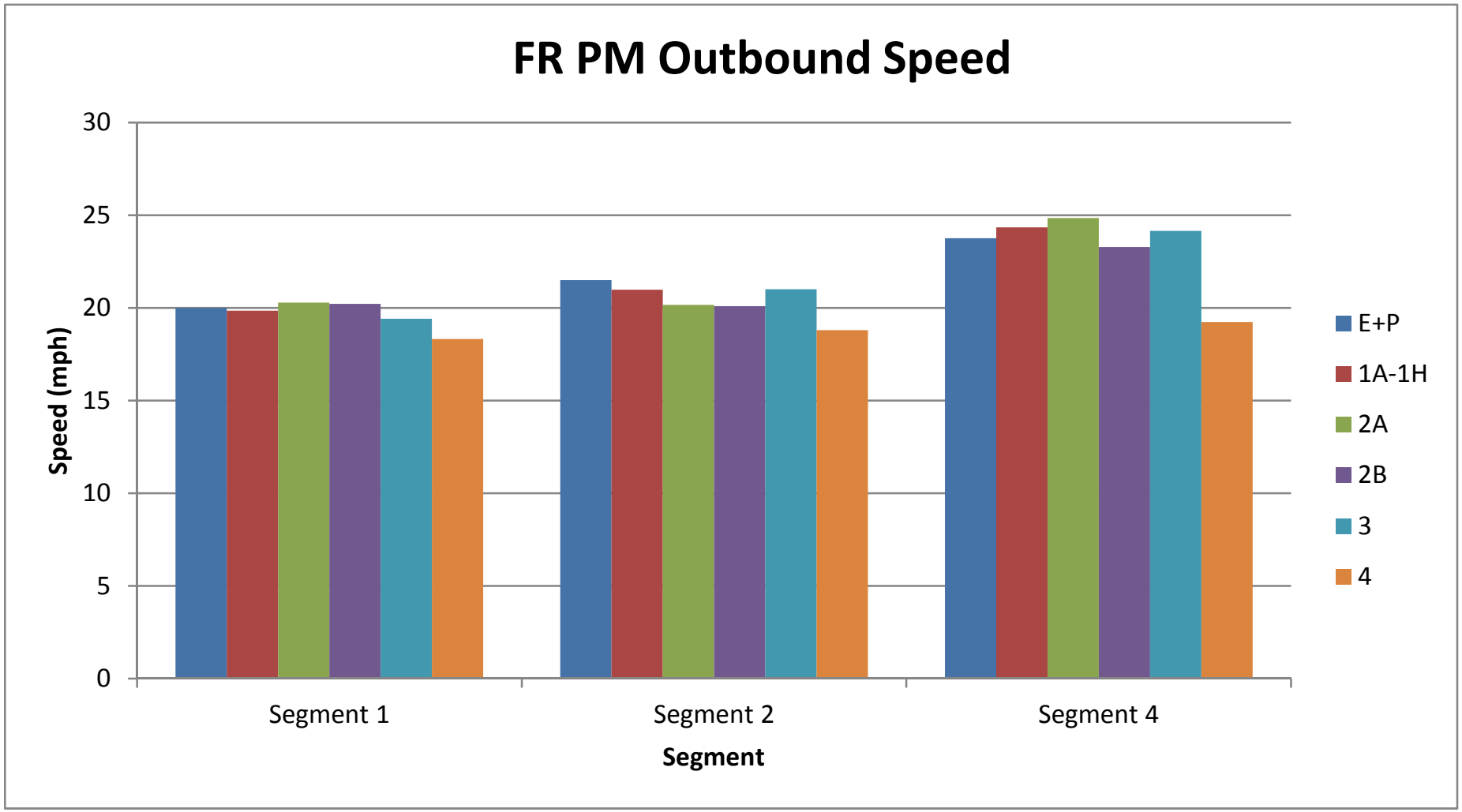

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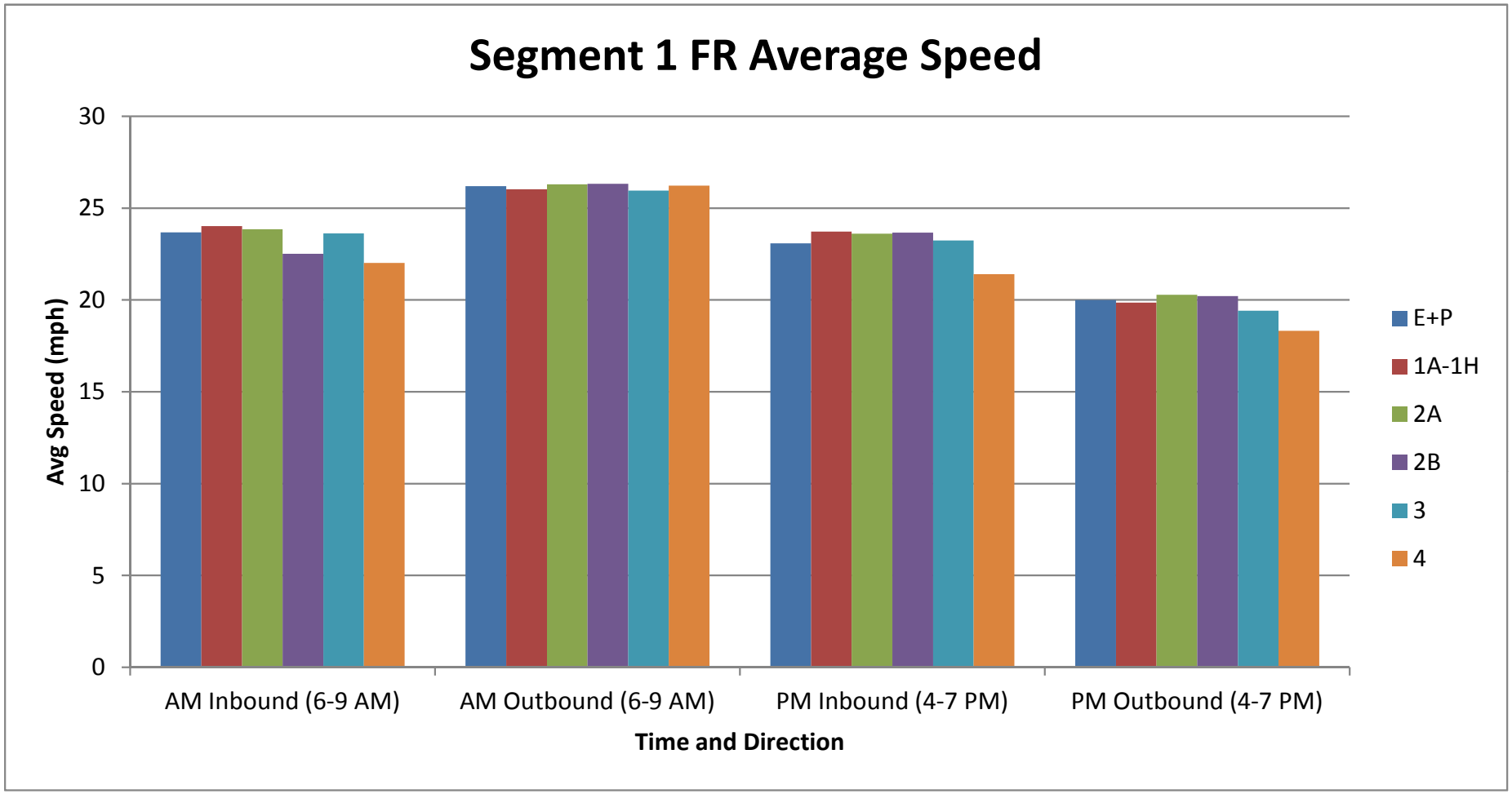

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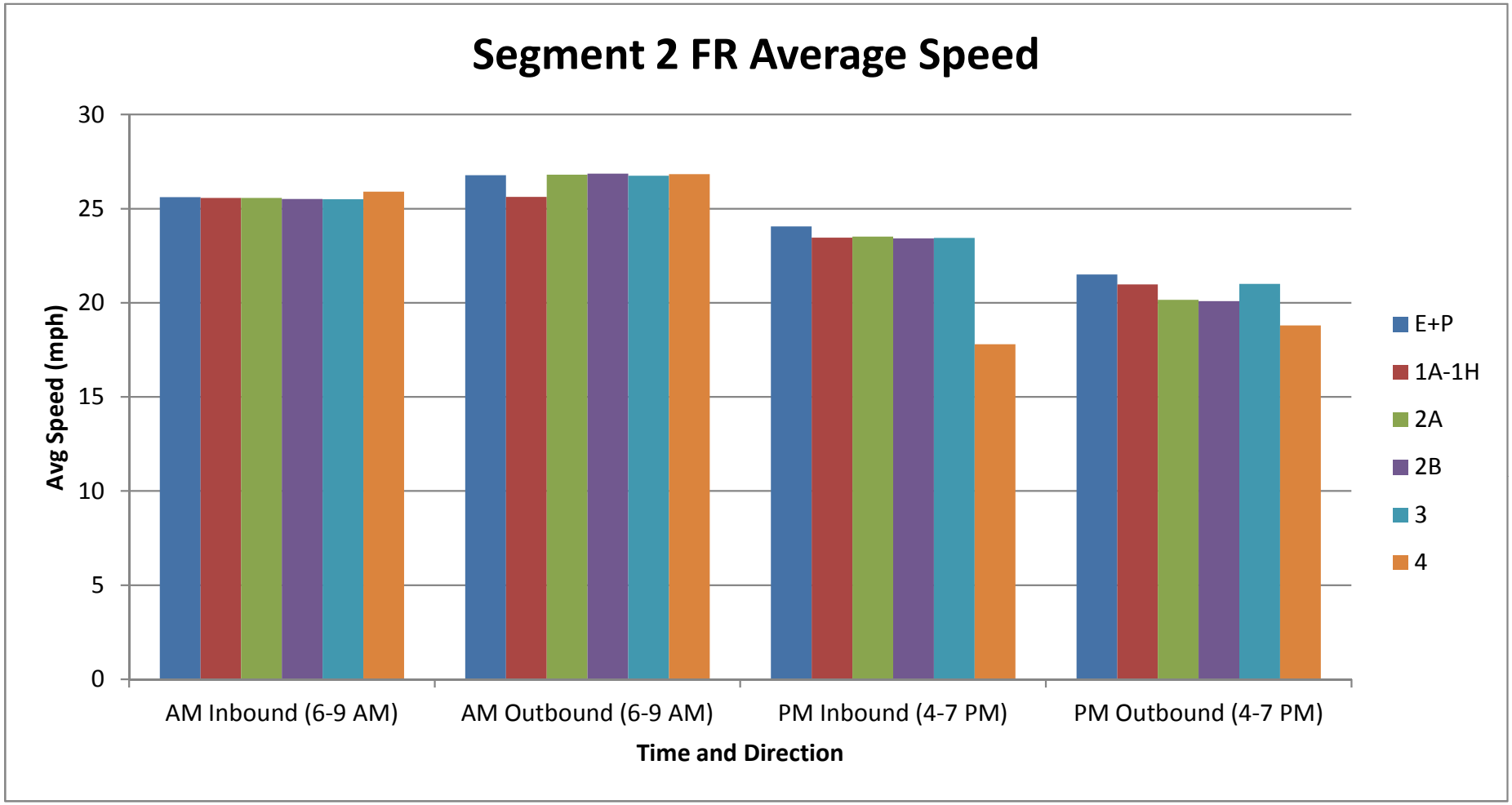

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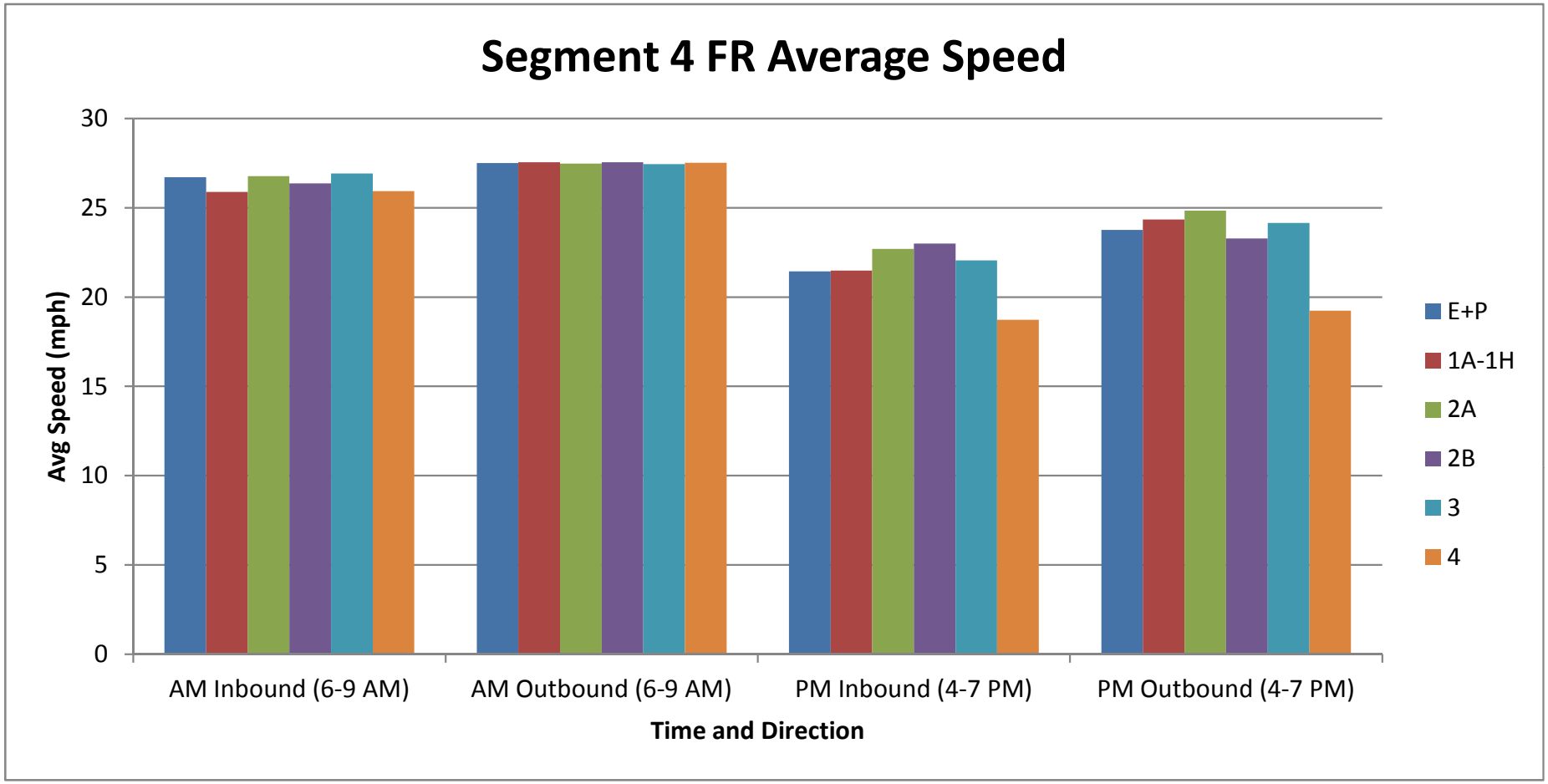

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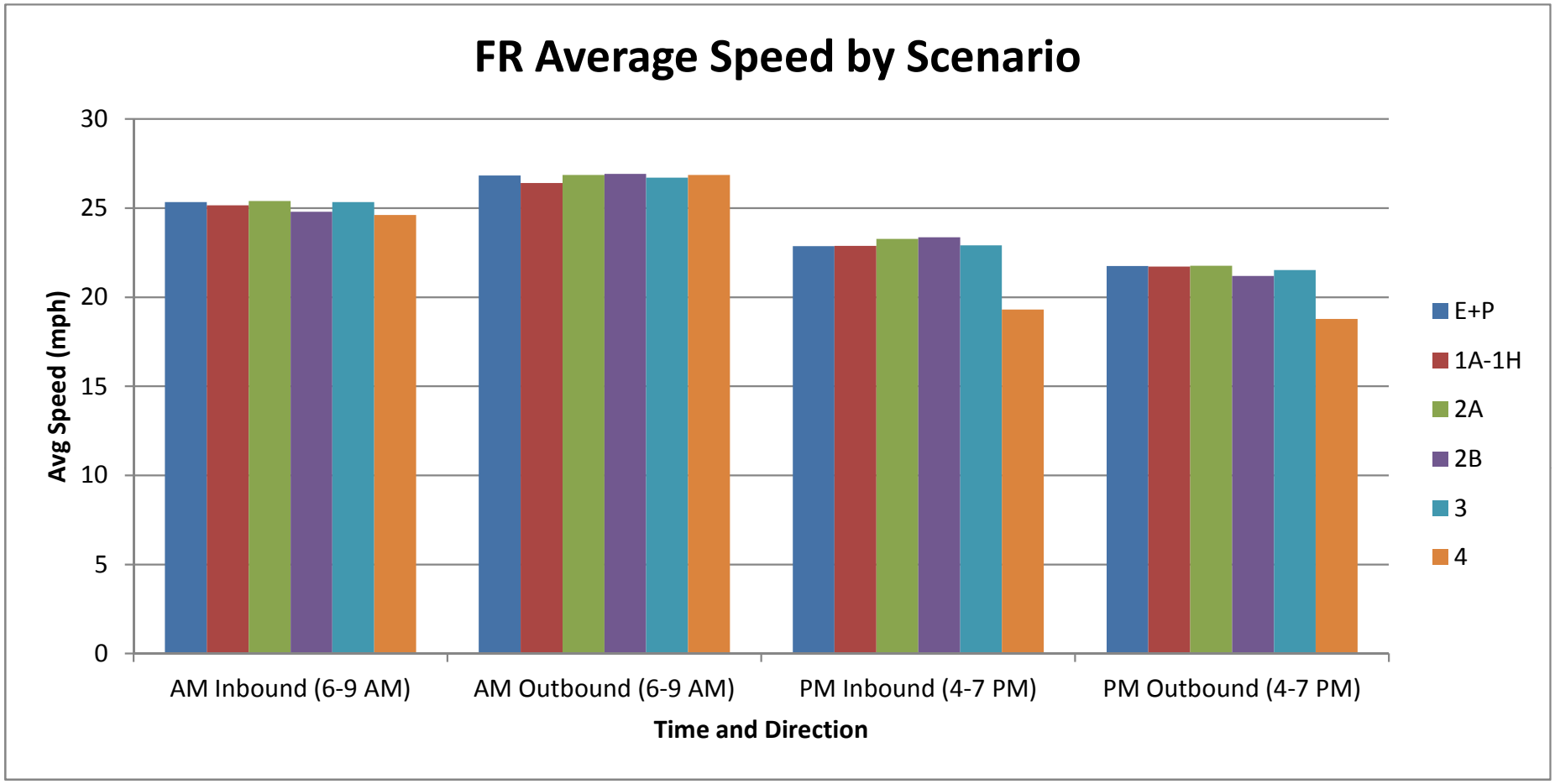

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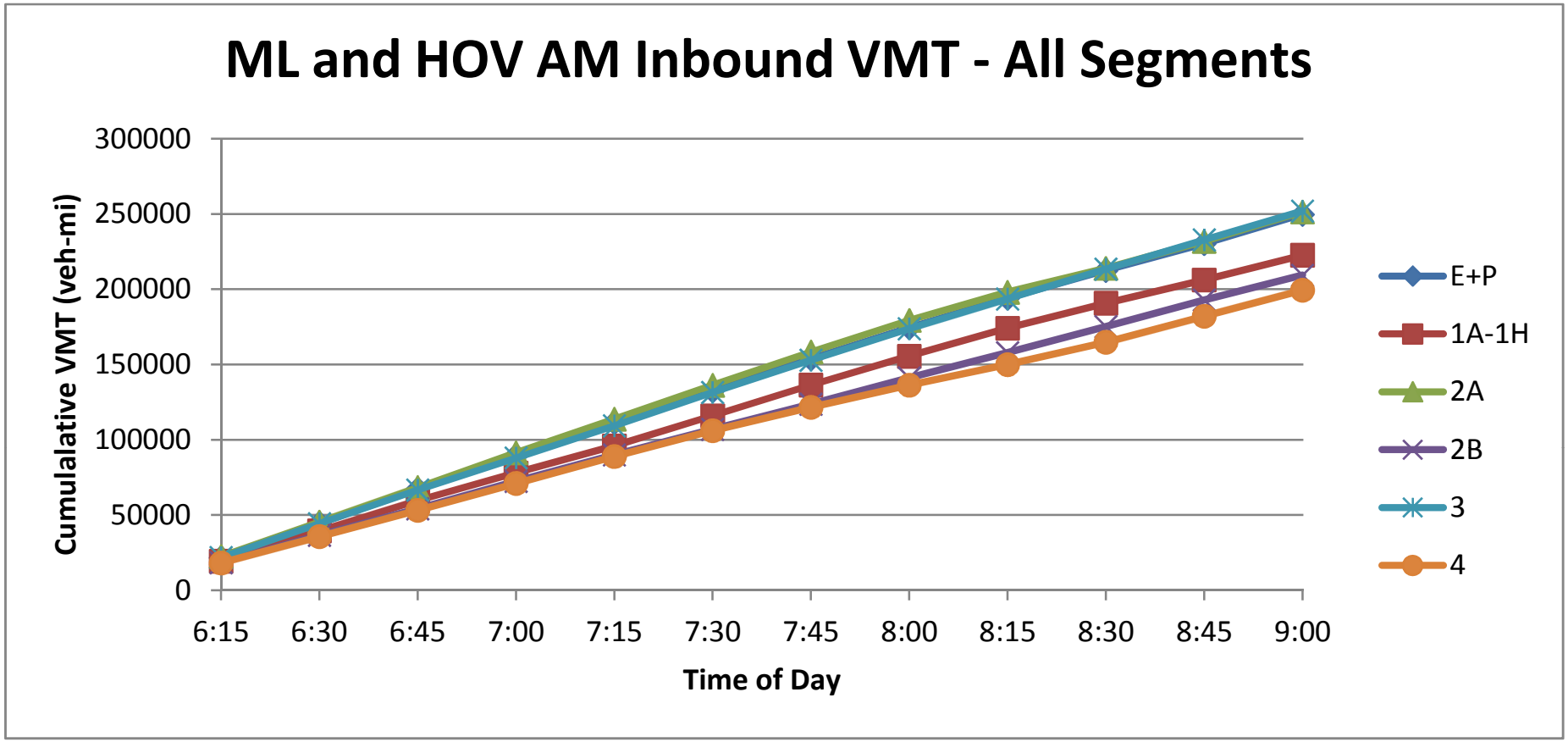

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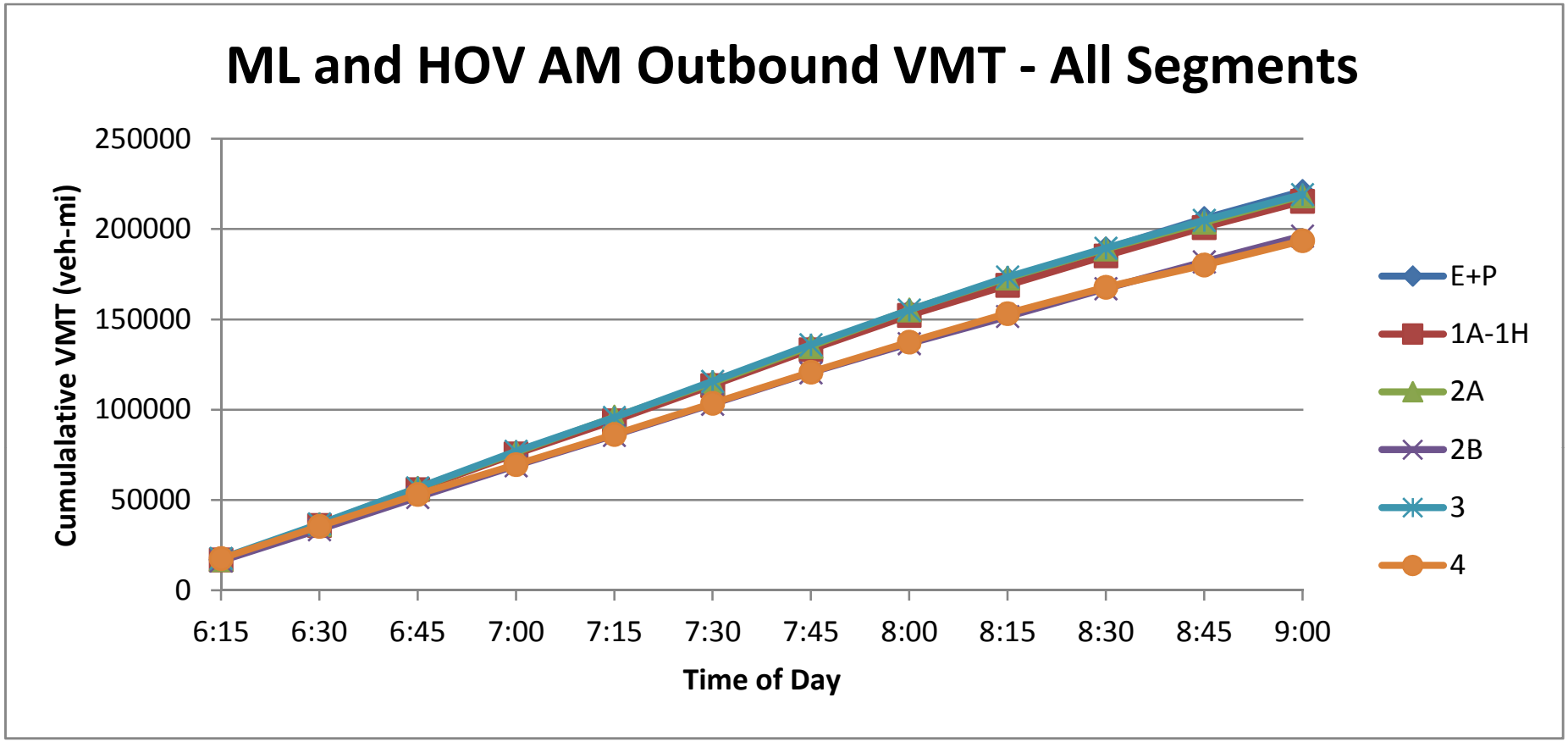

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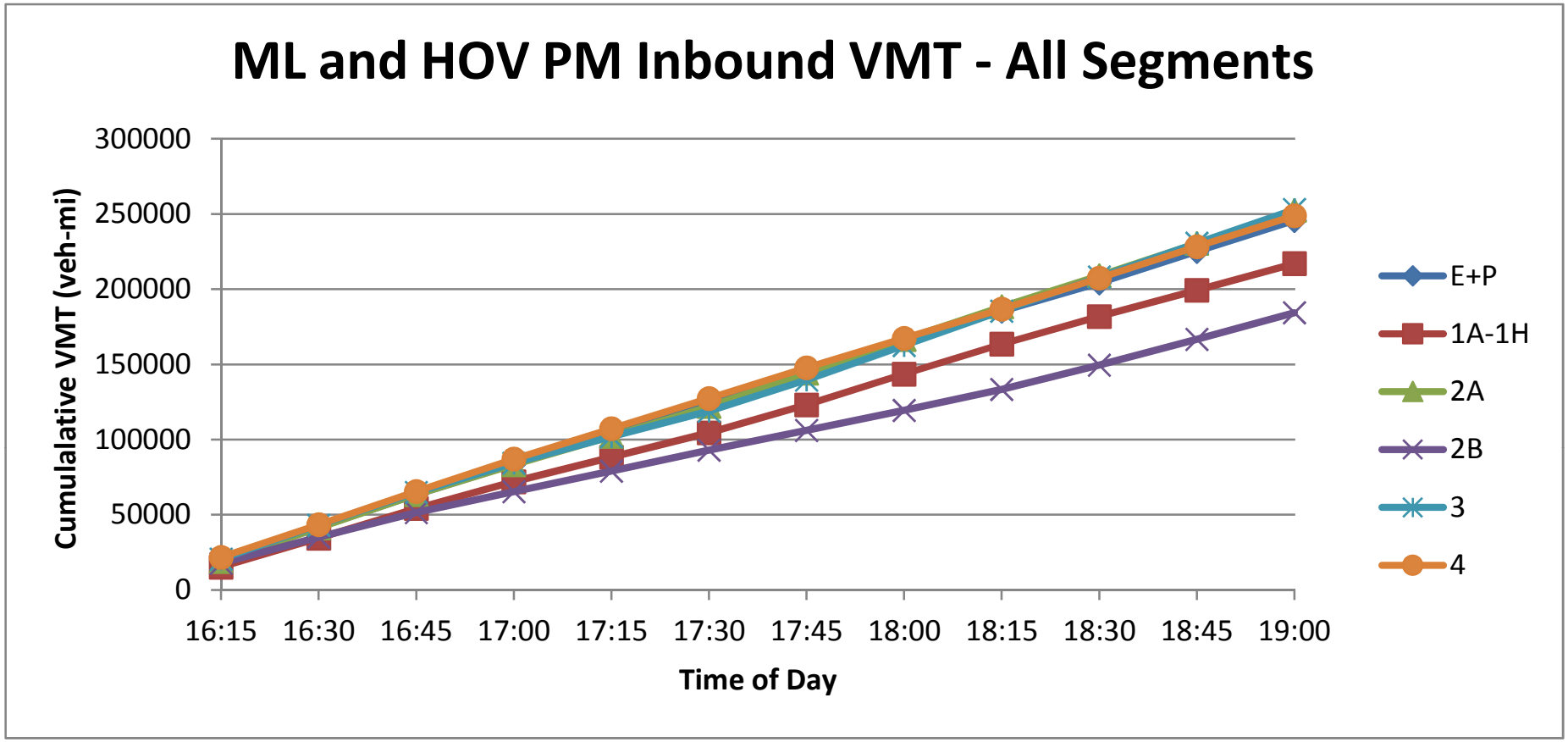

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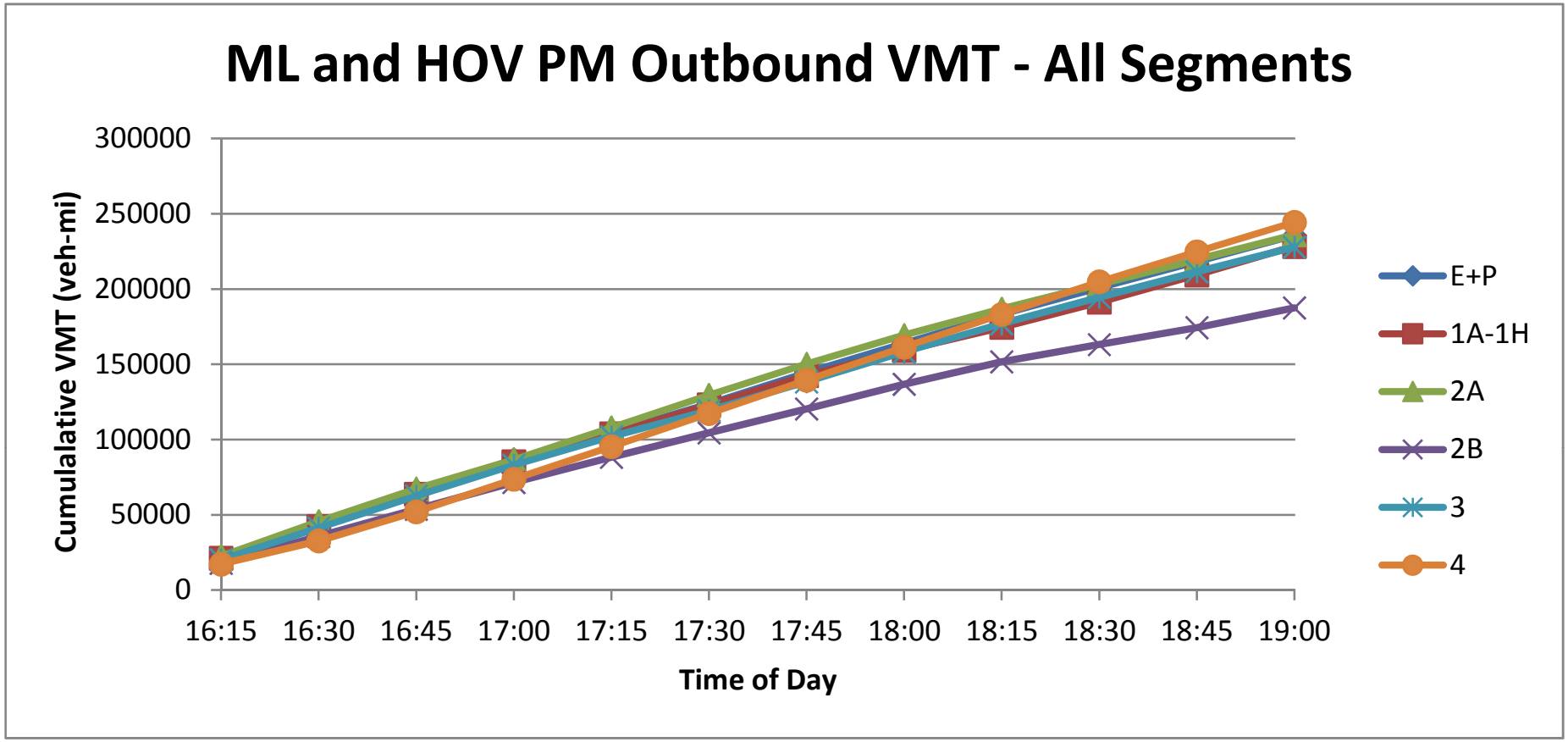

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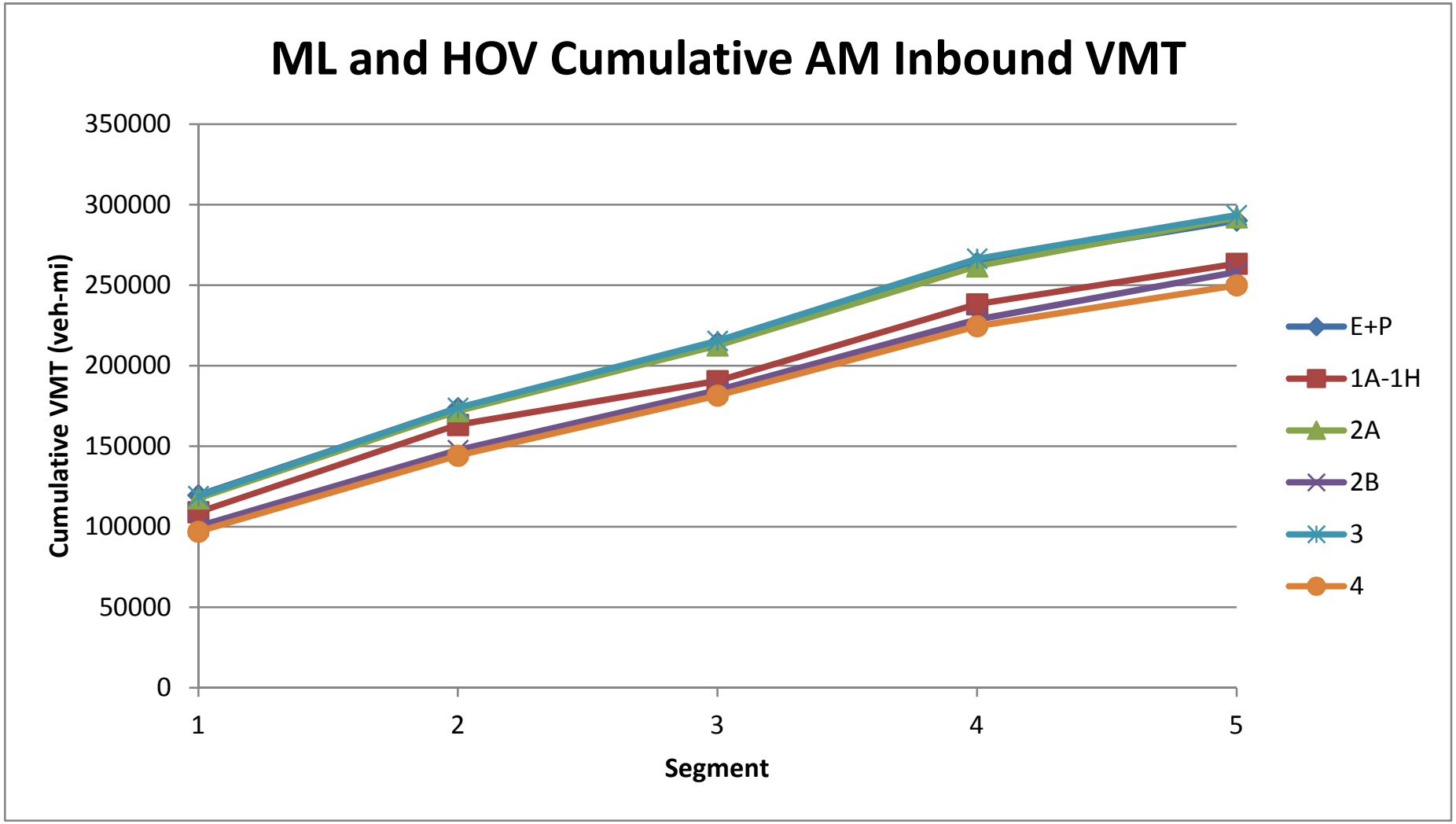

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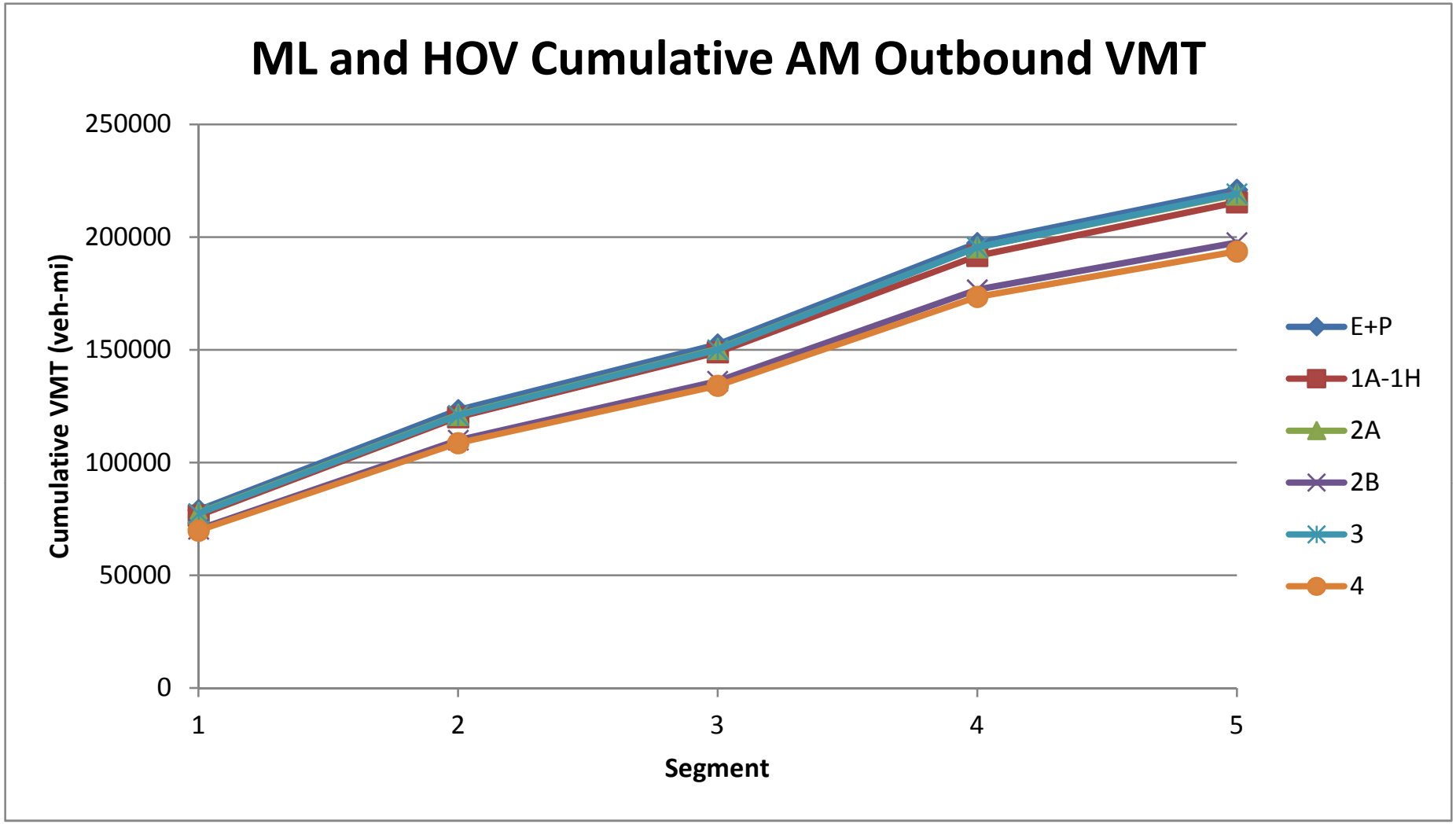

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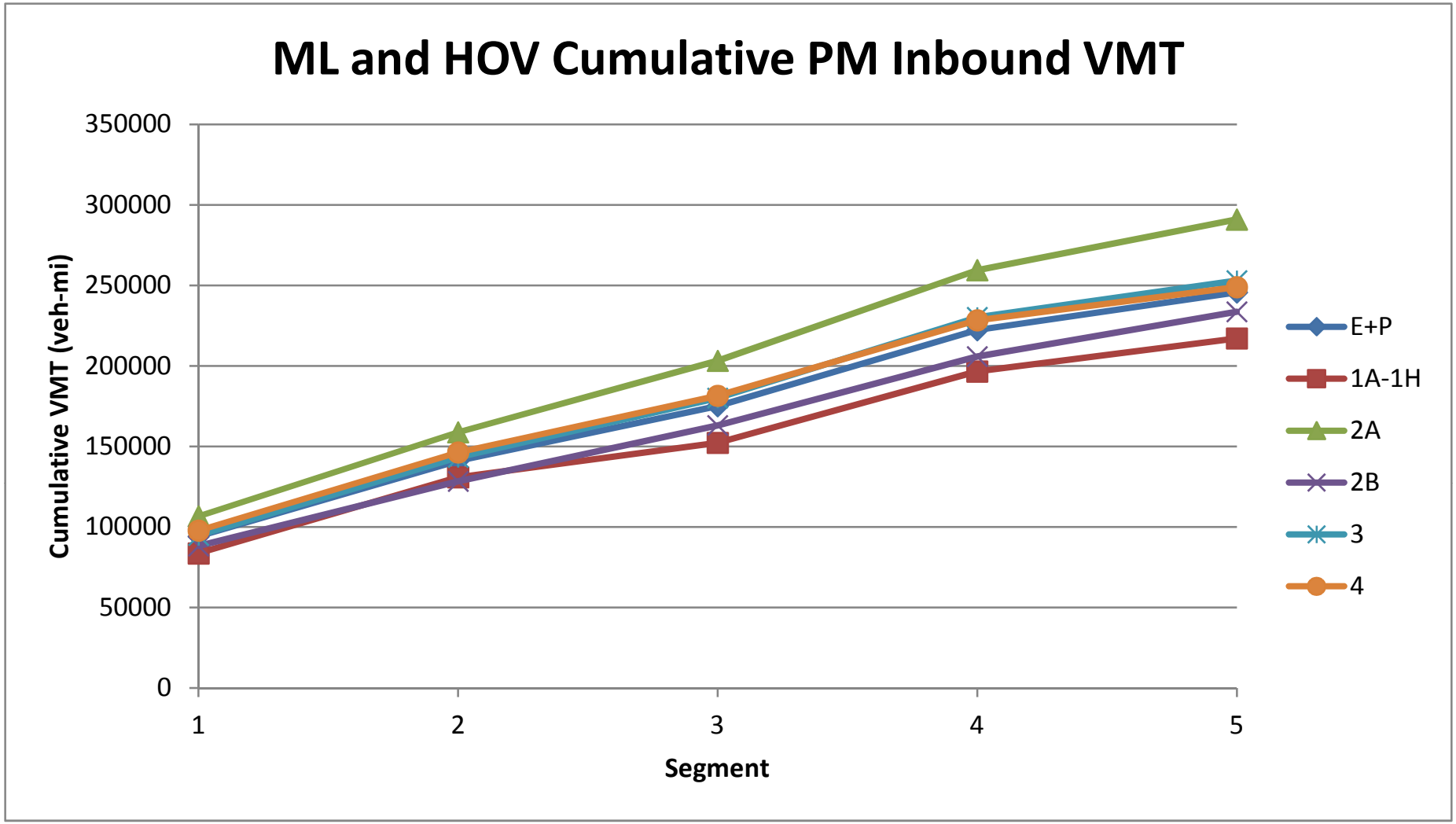

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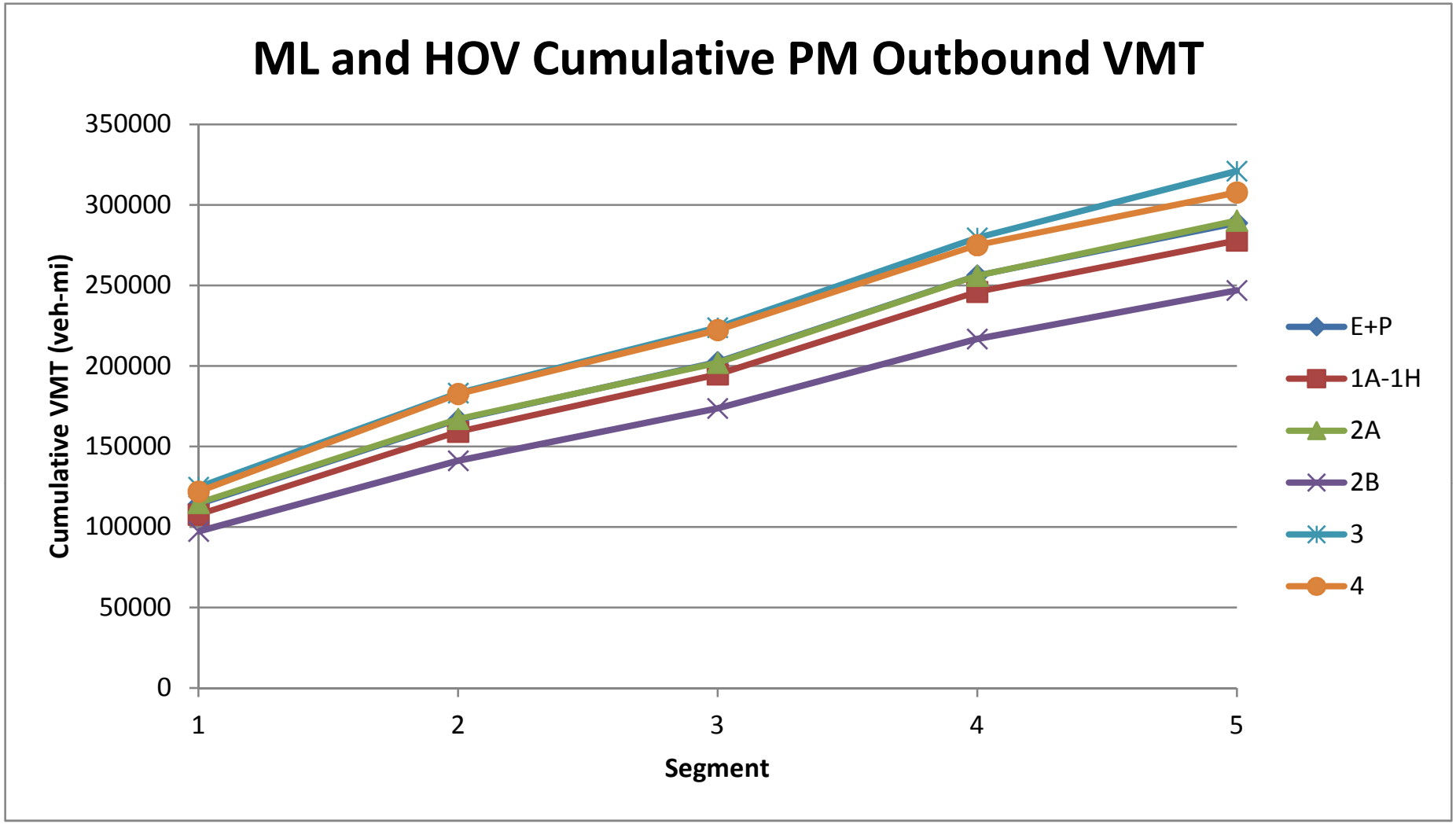

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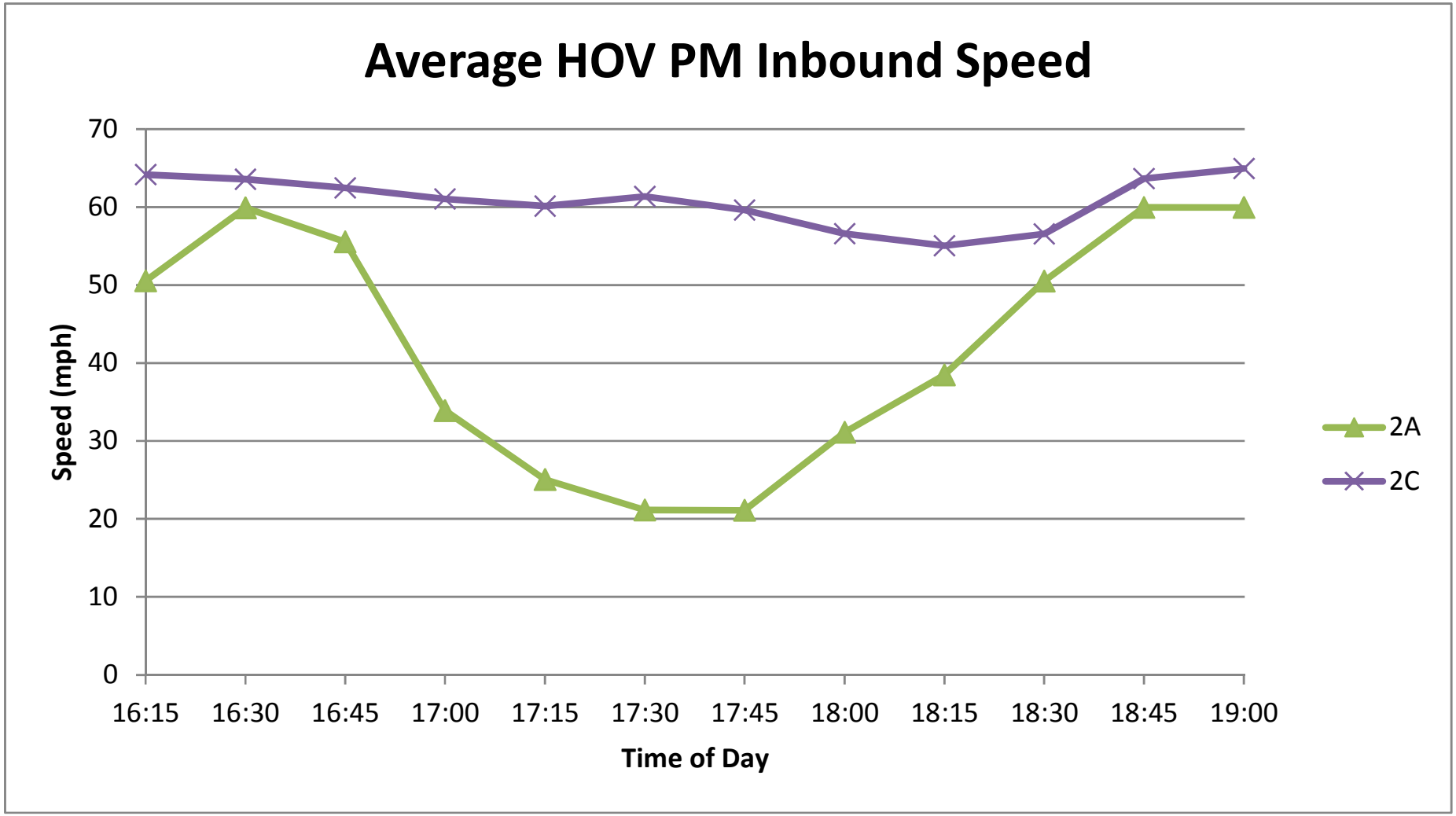

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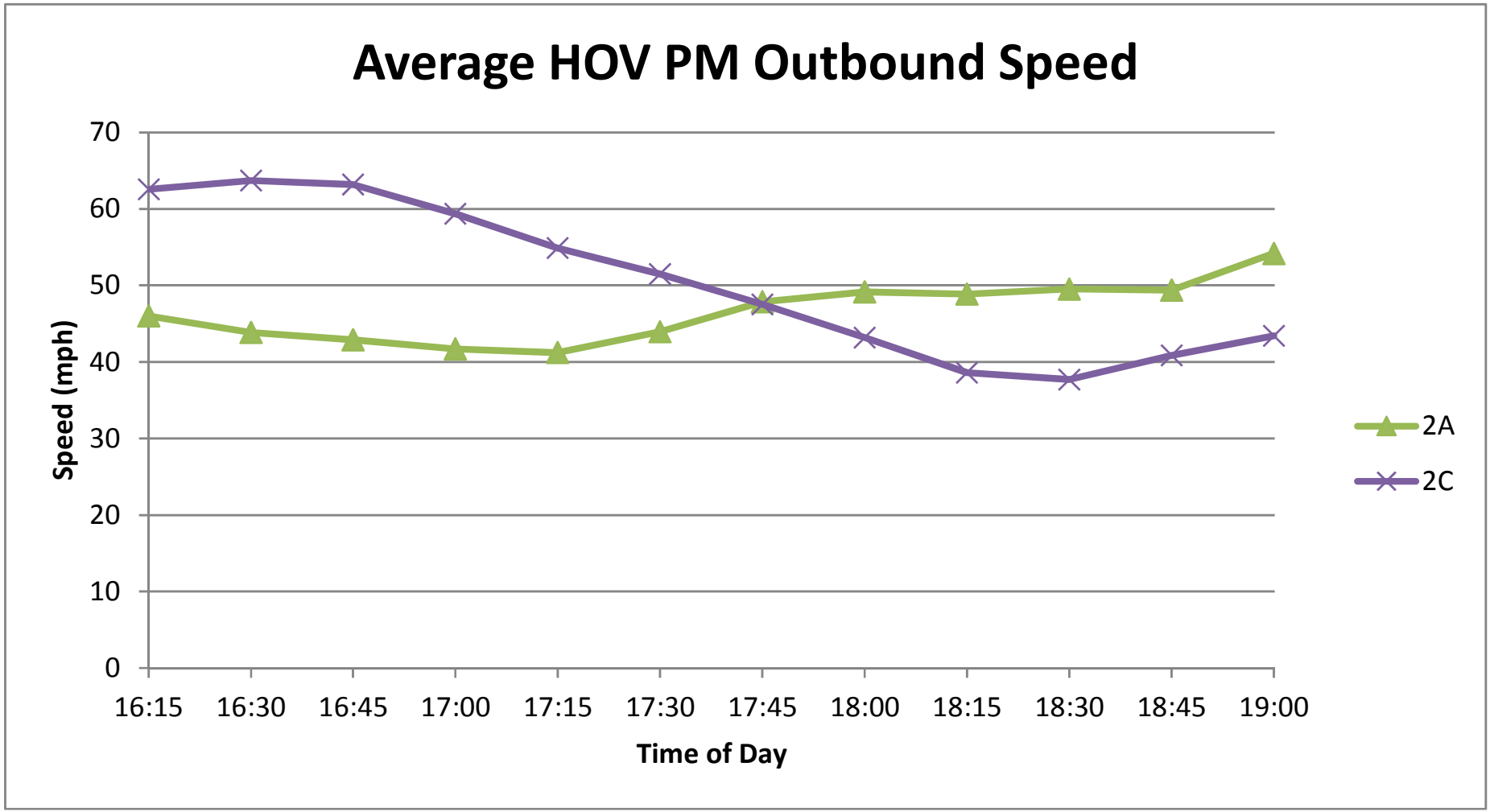

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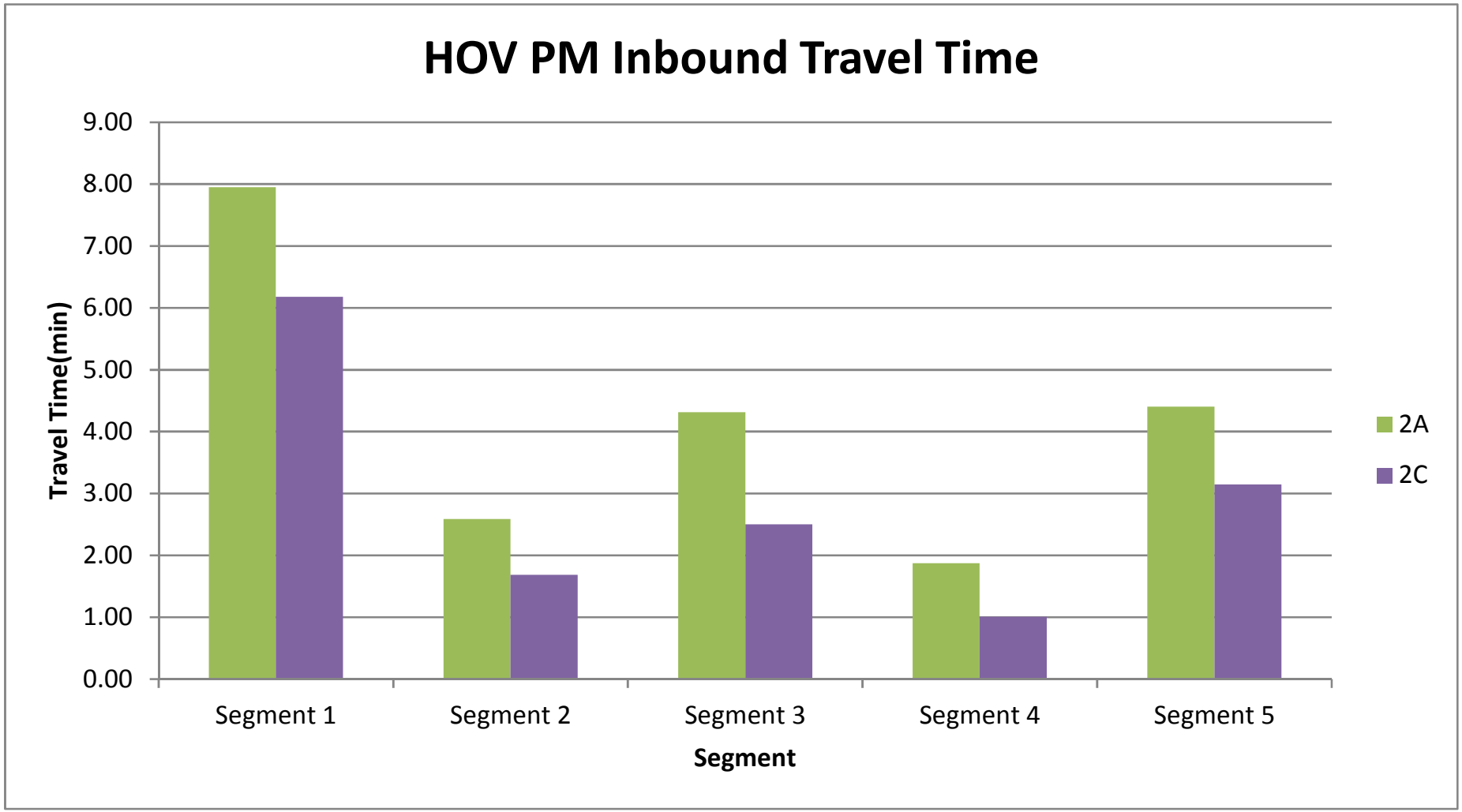

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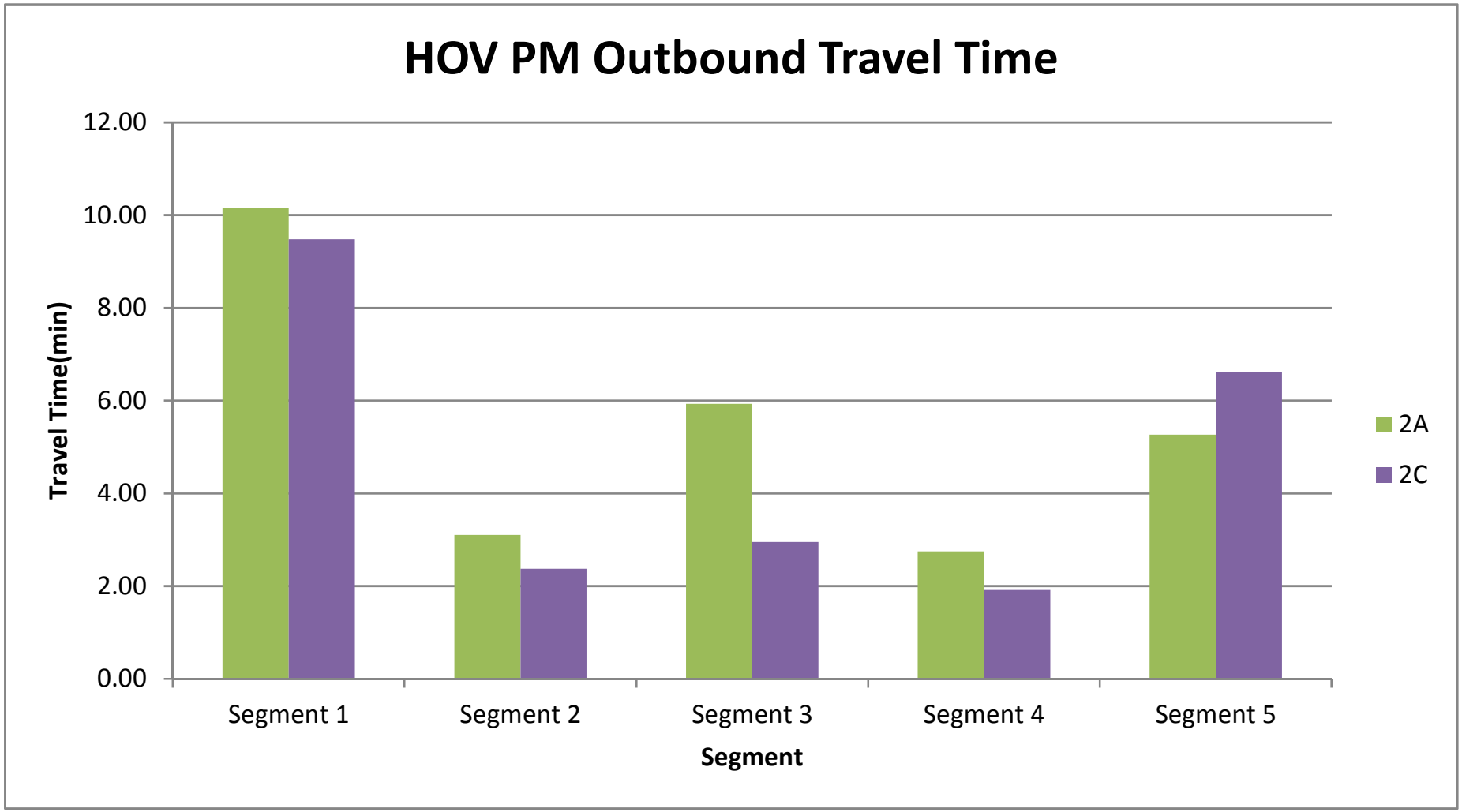

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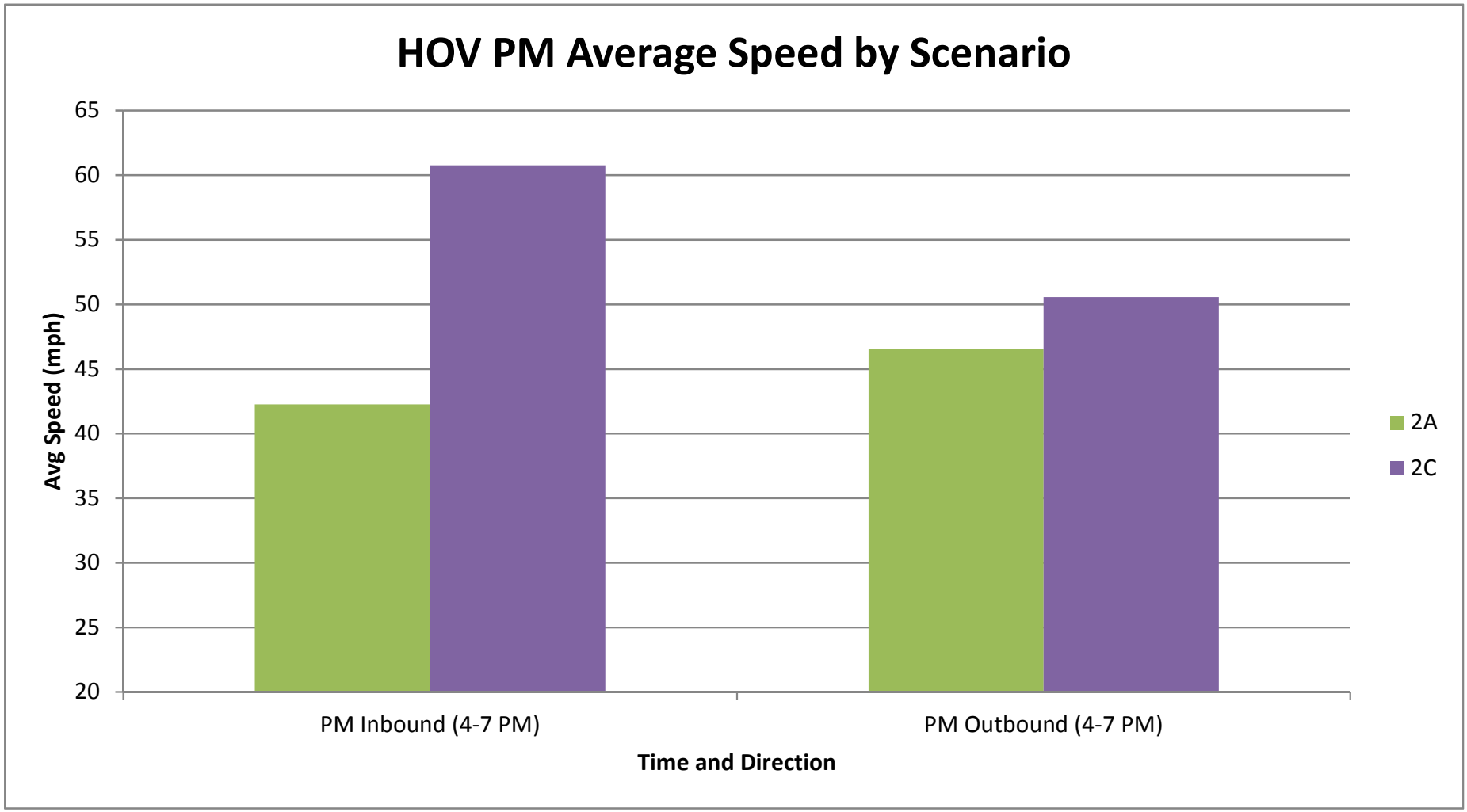

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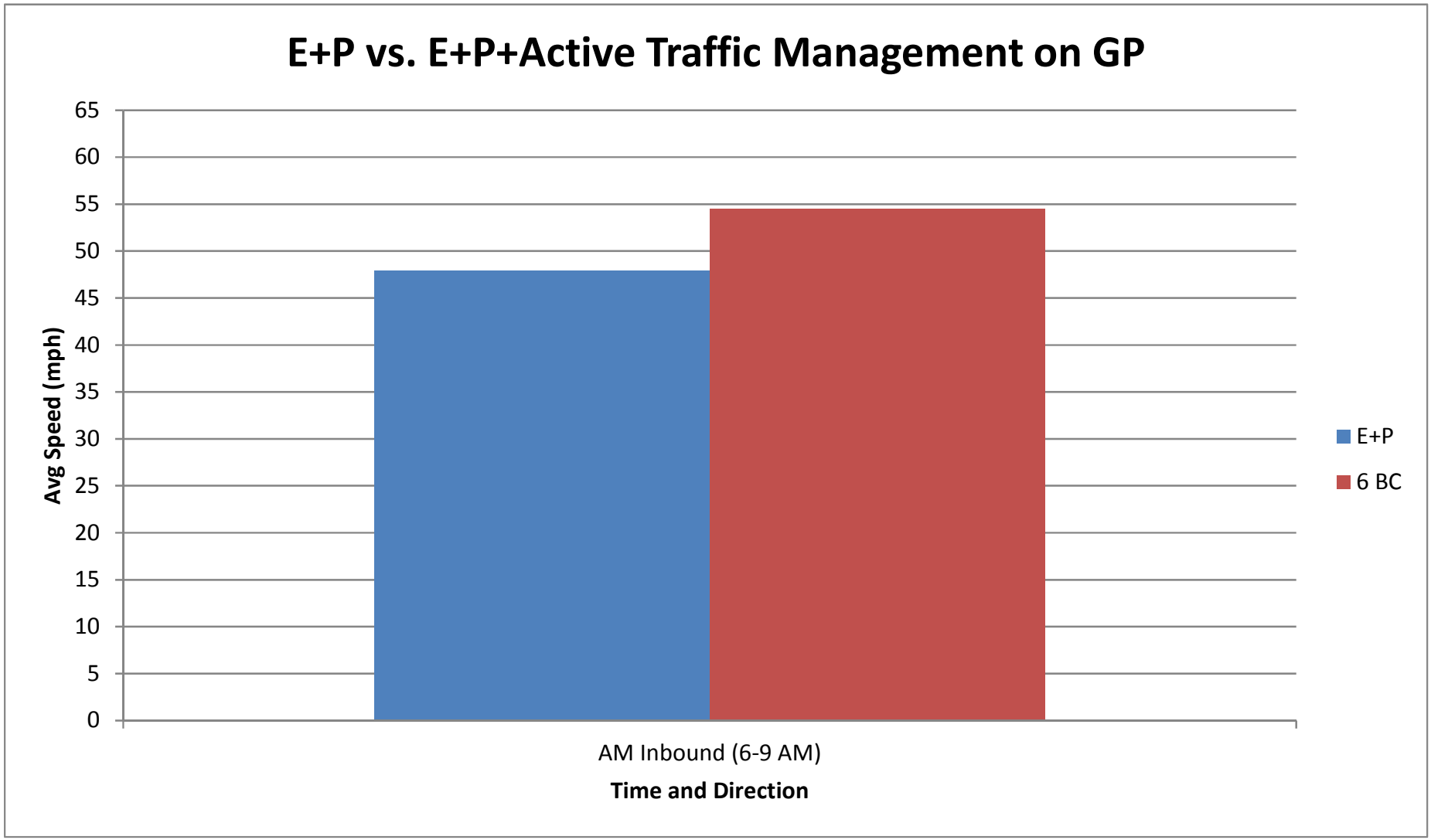

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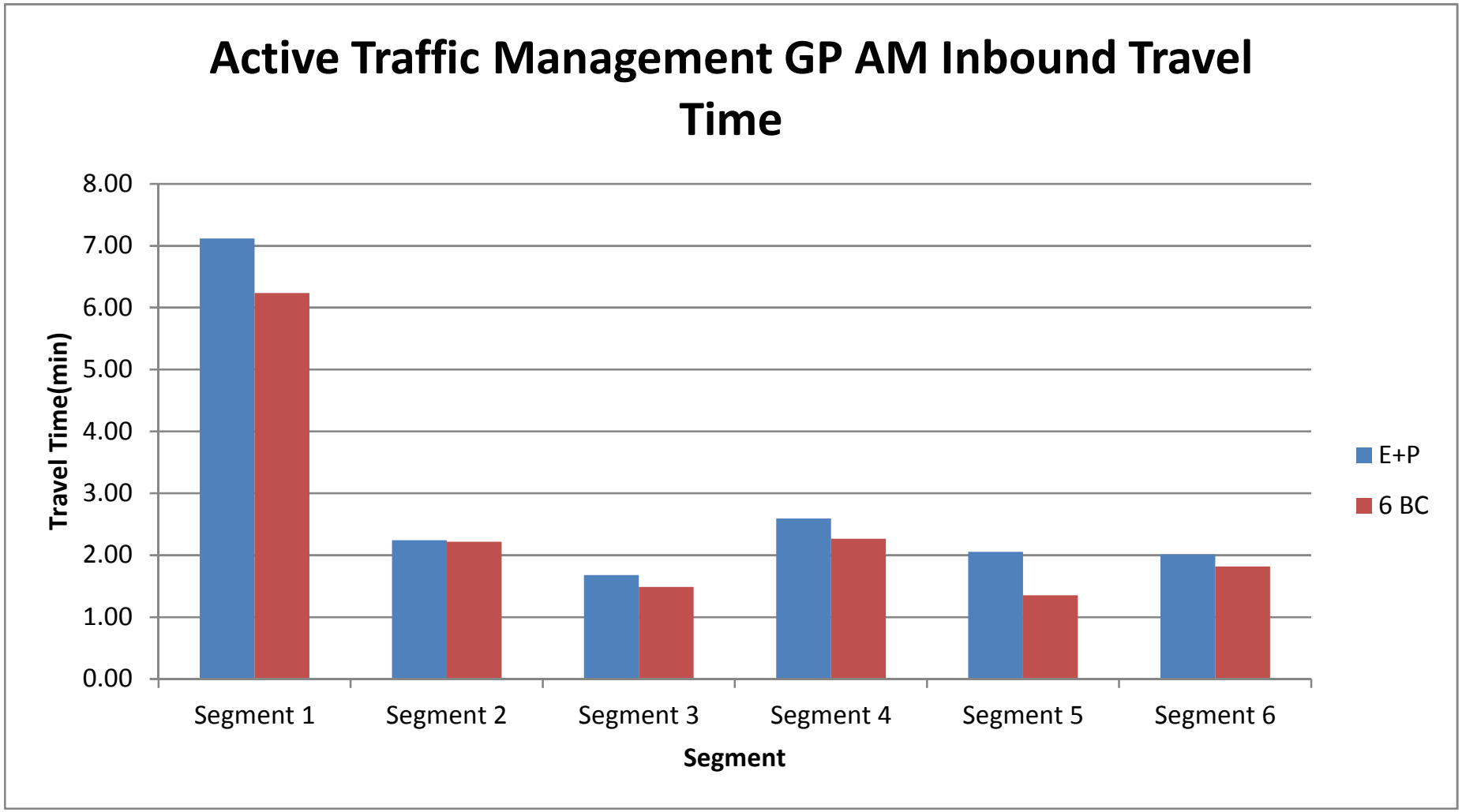

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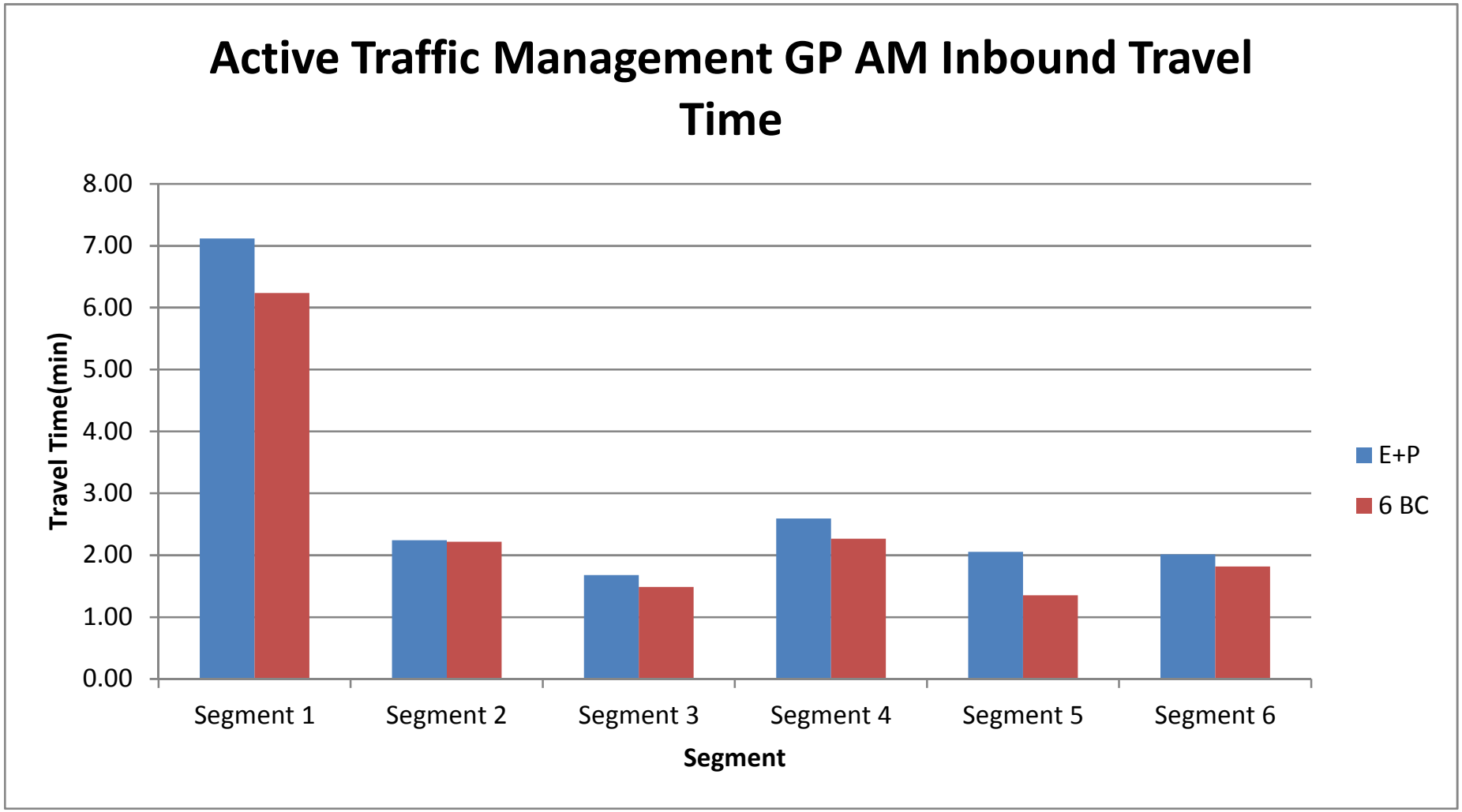

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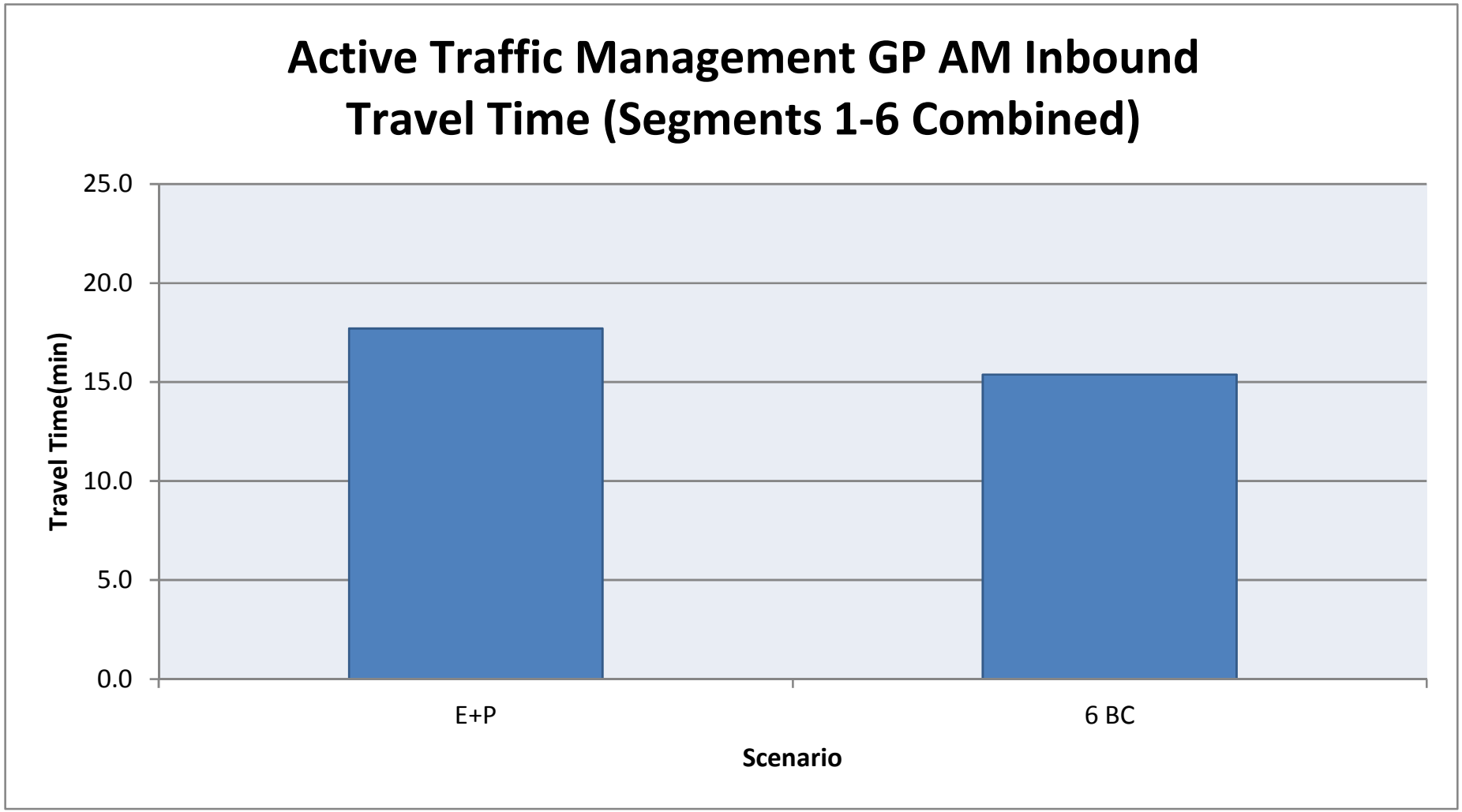

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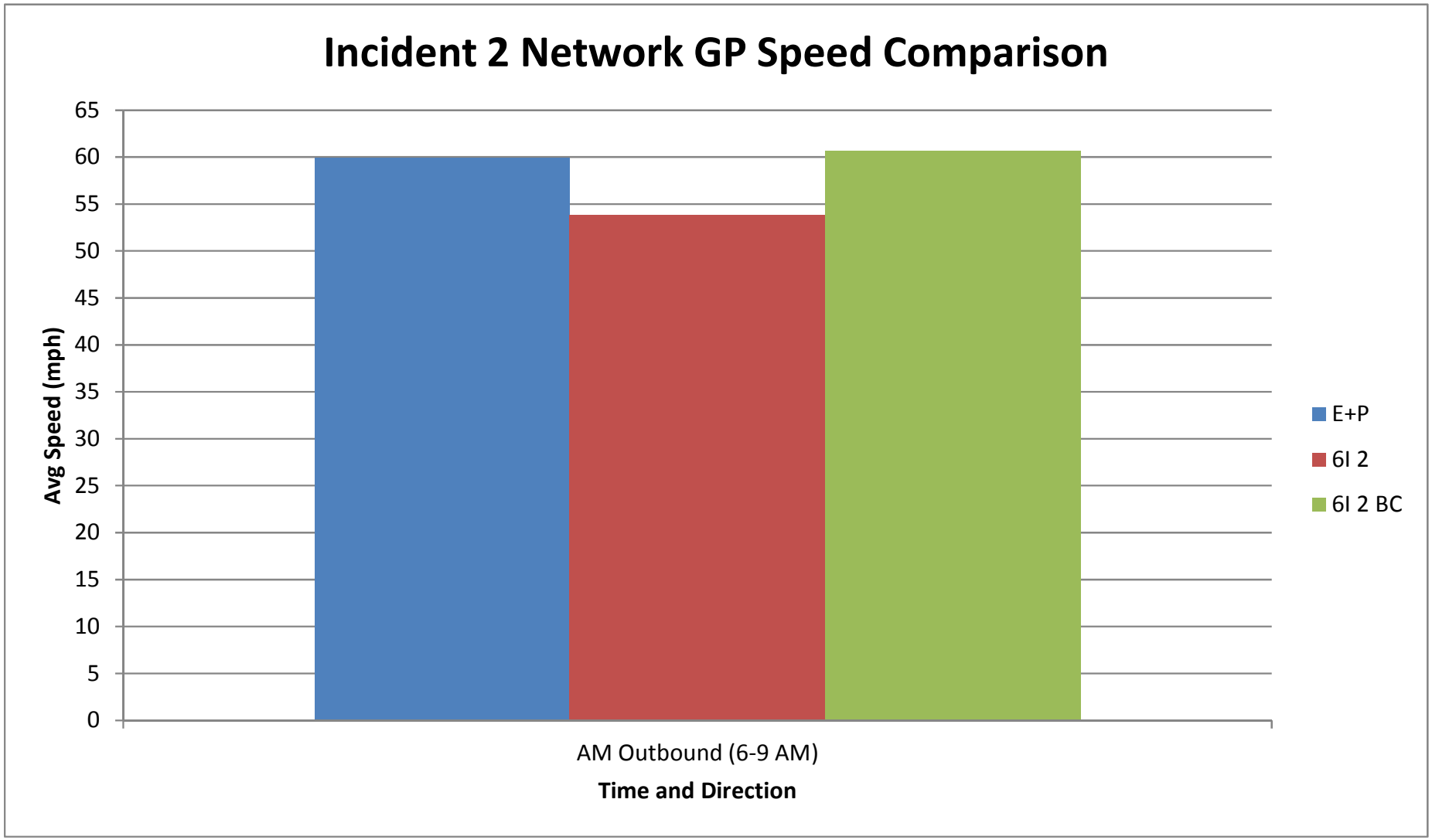

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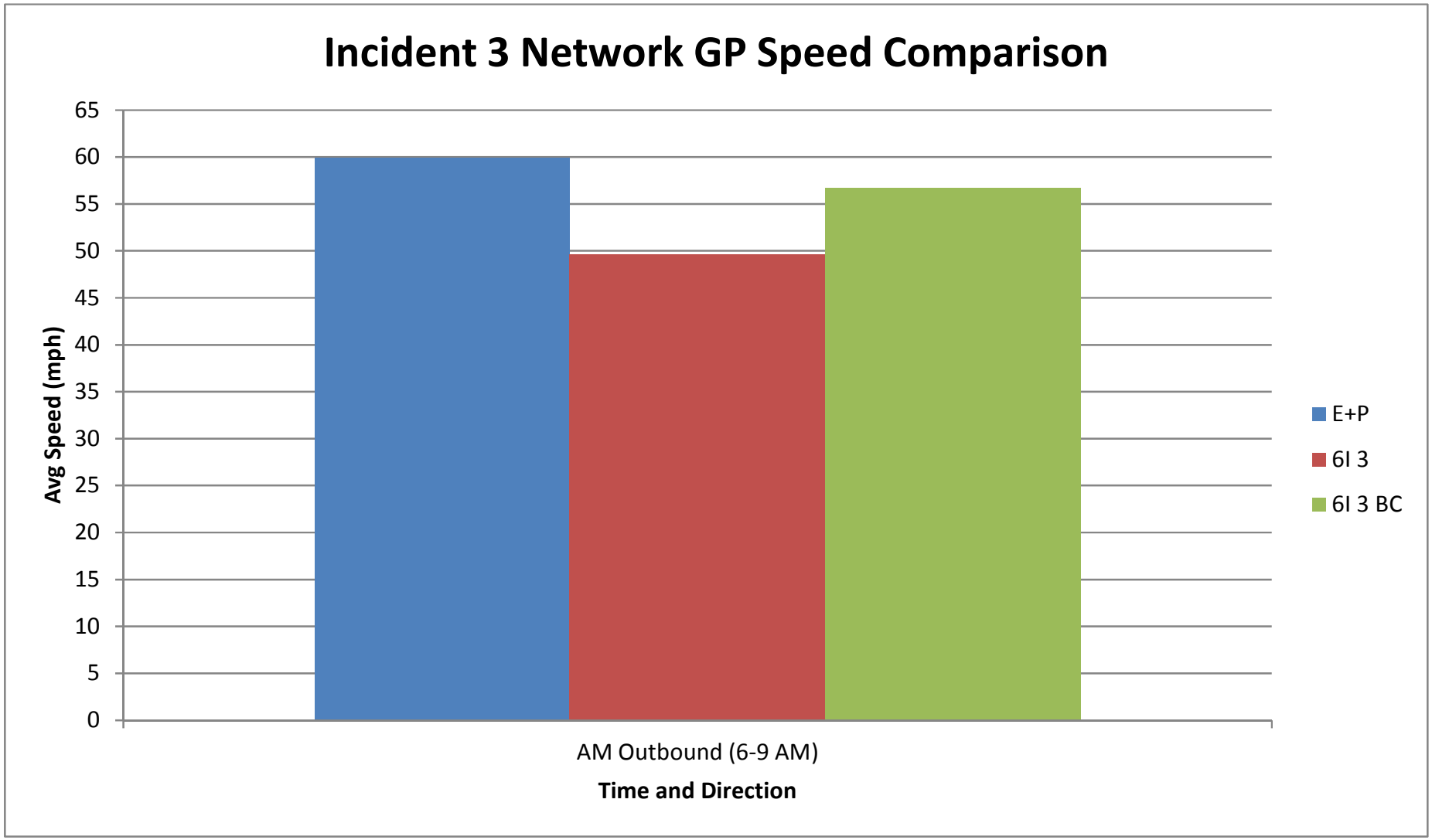

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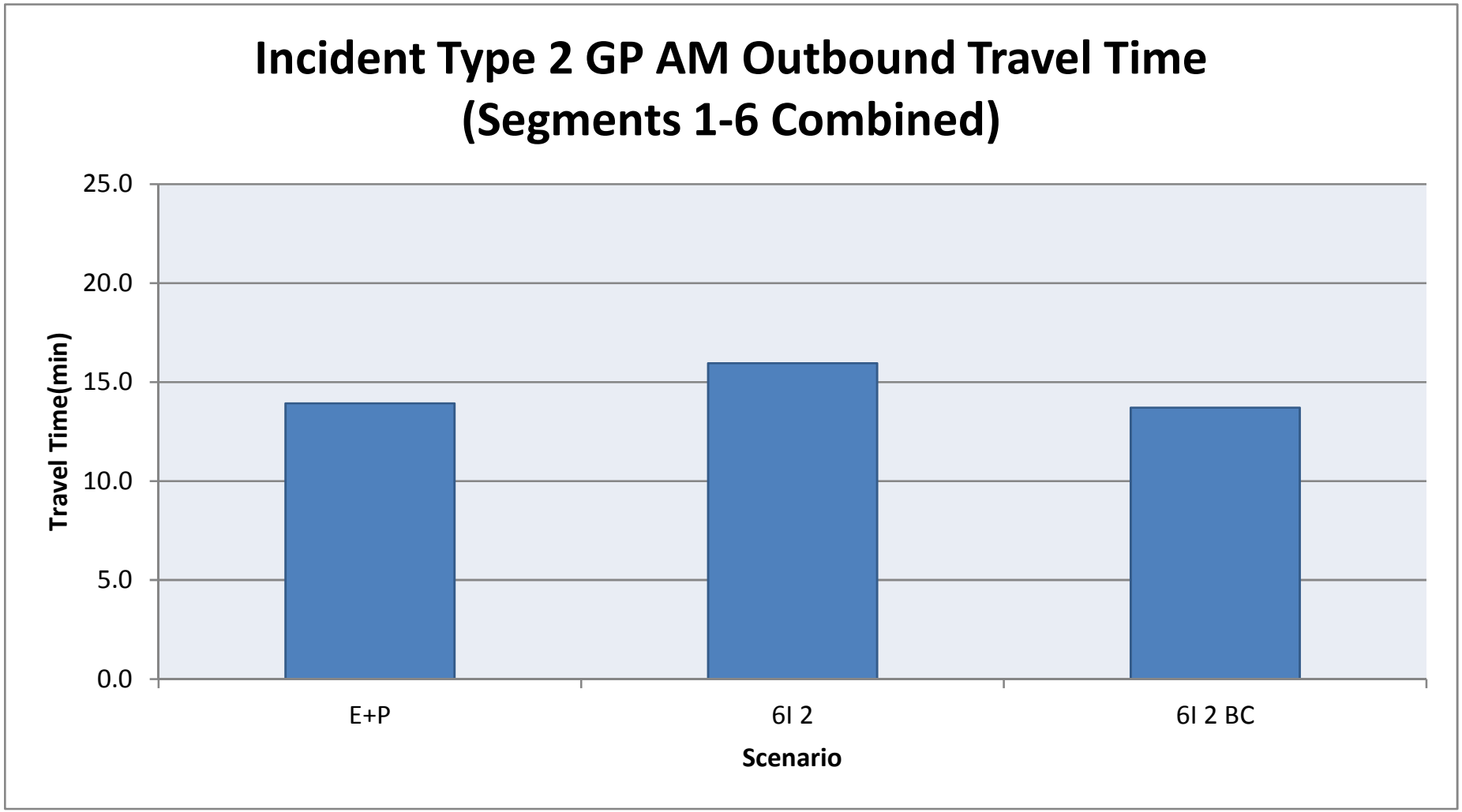

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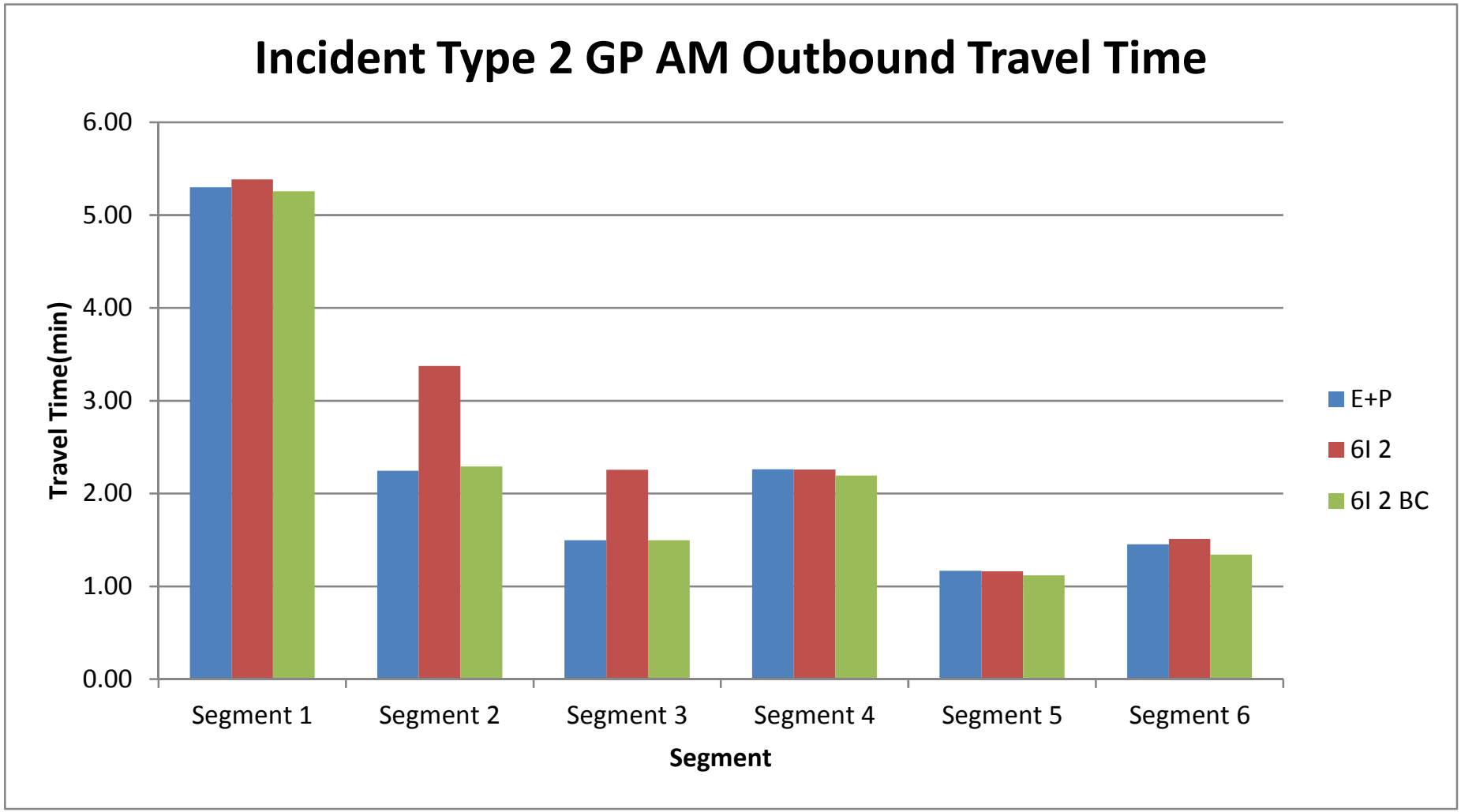
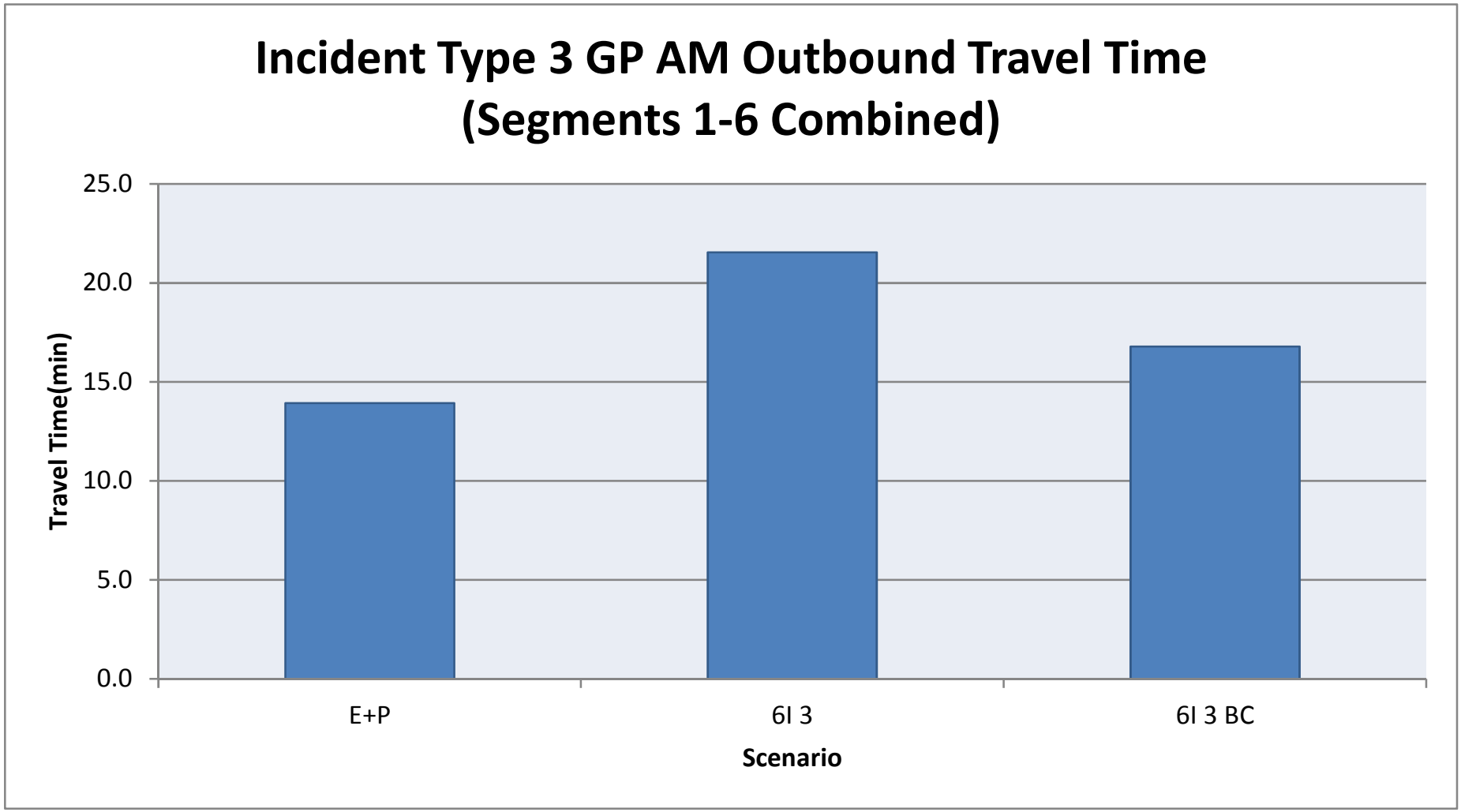
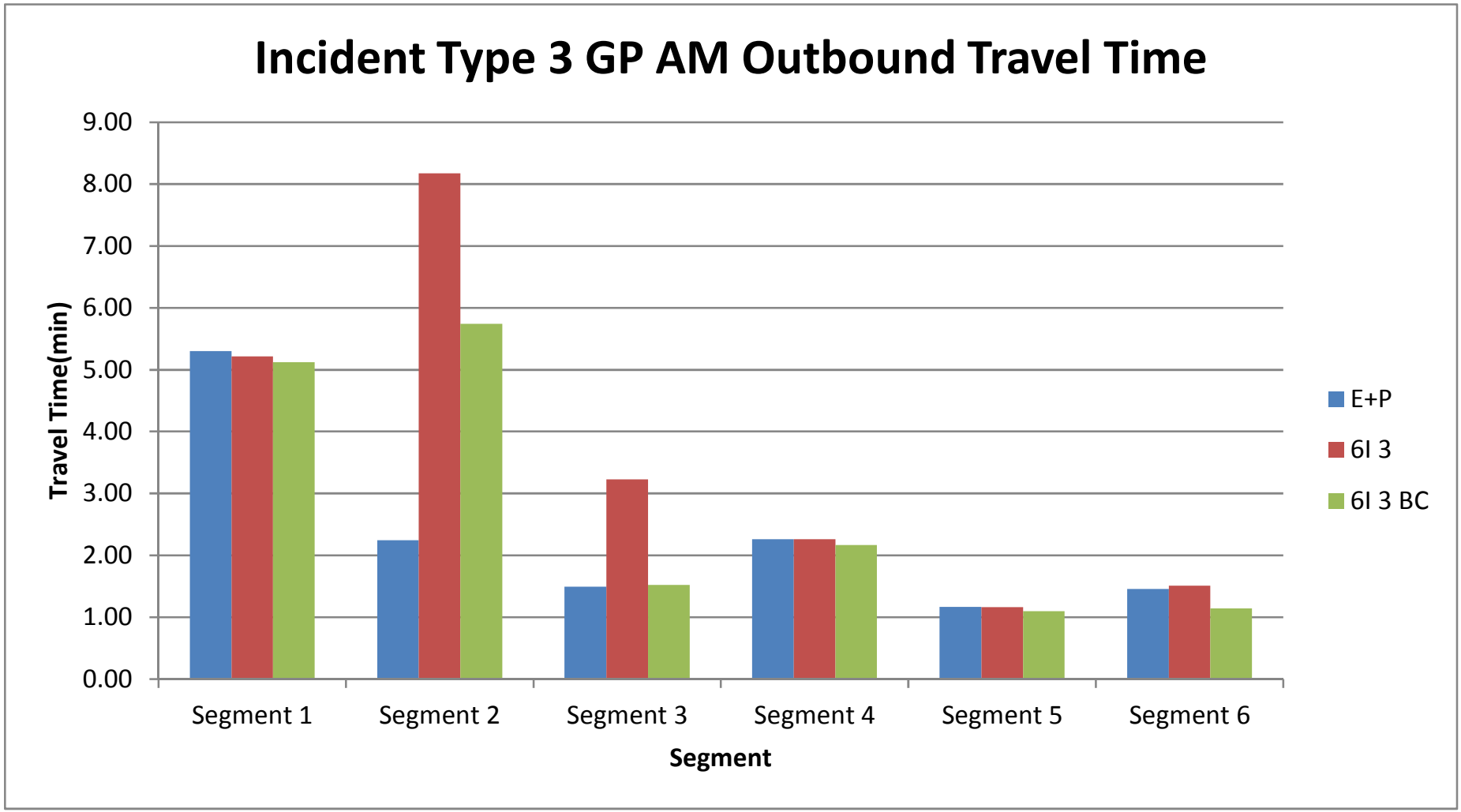


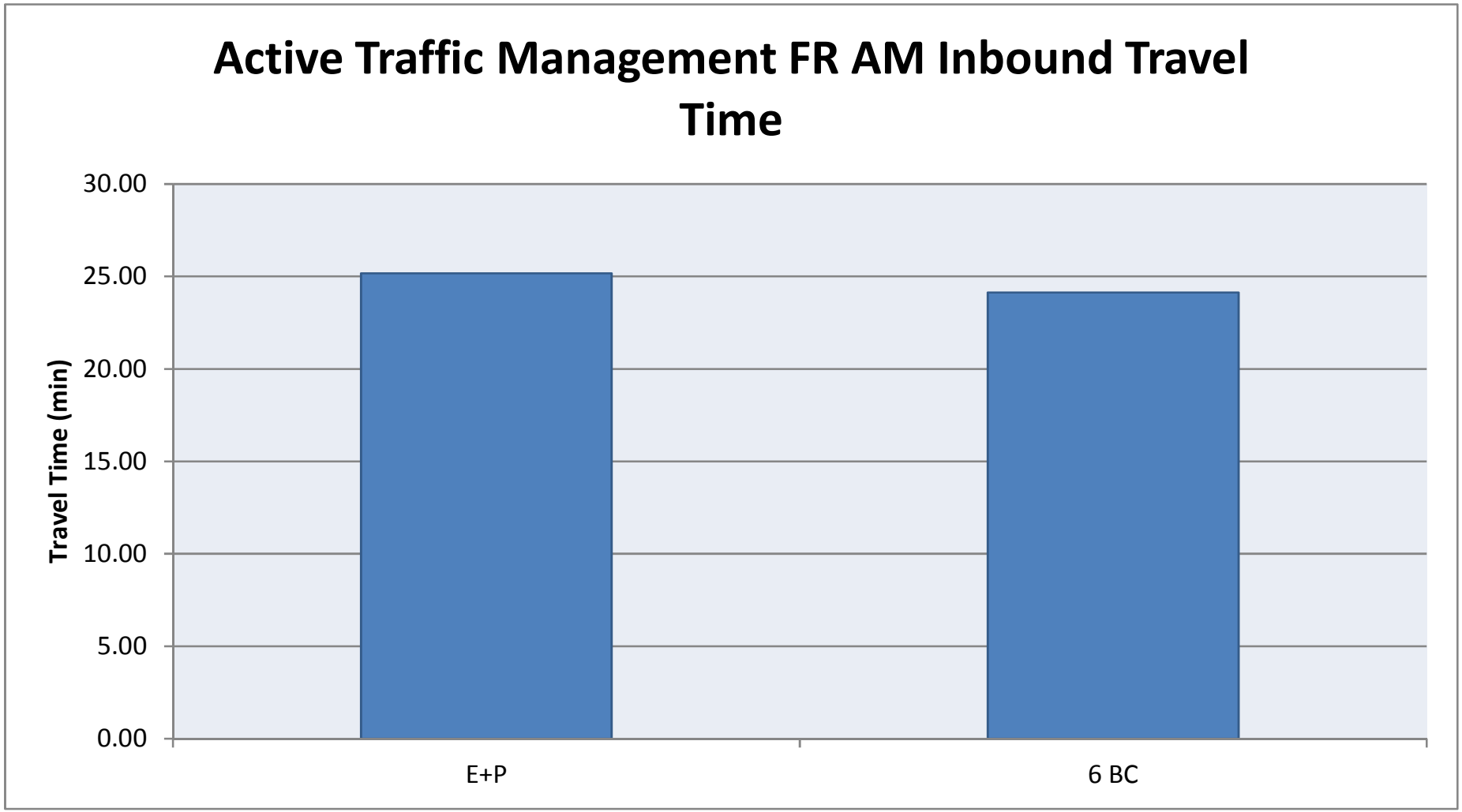
2011 DynusT Results - H-GAC Models



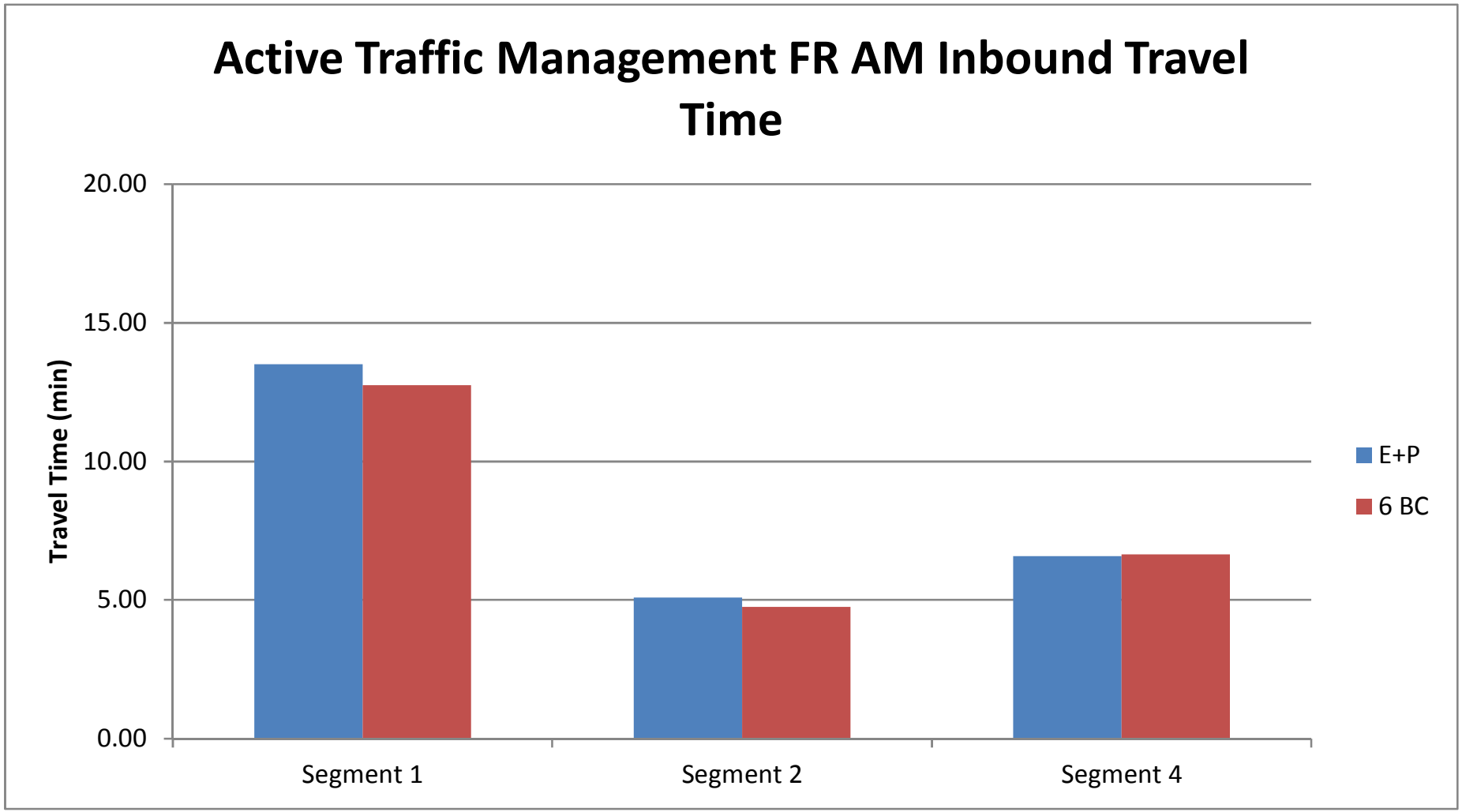
2011 DynusT Results - H-GAC Models



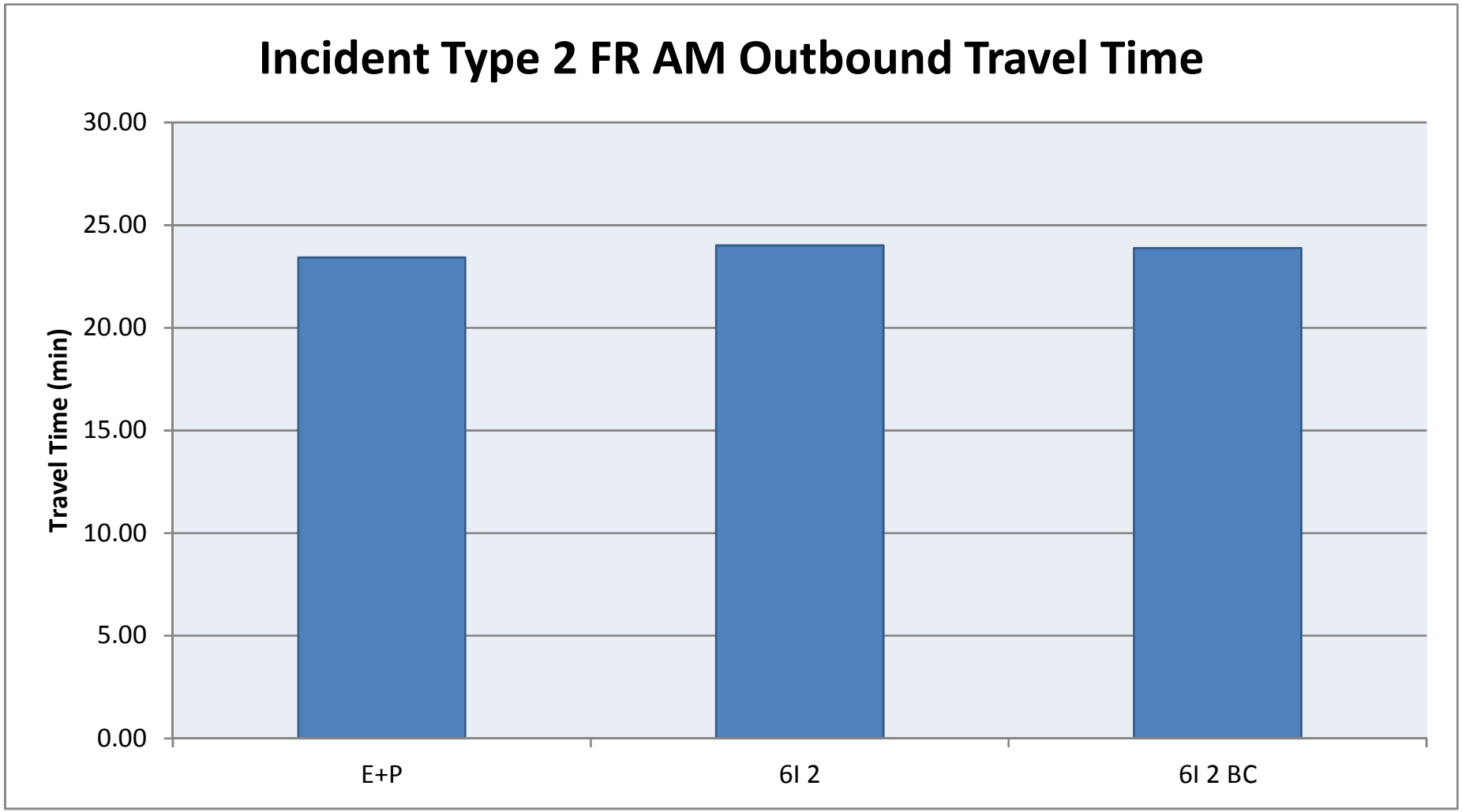
2011 DynusT Results - H-GAC Models



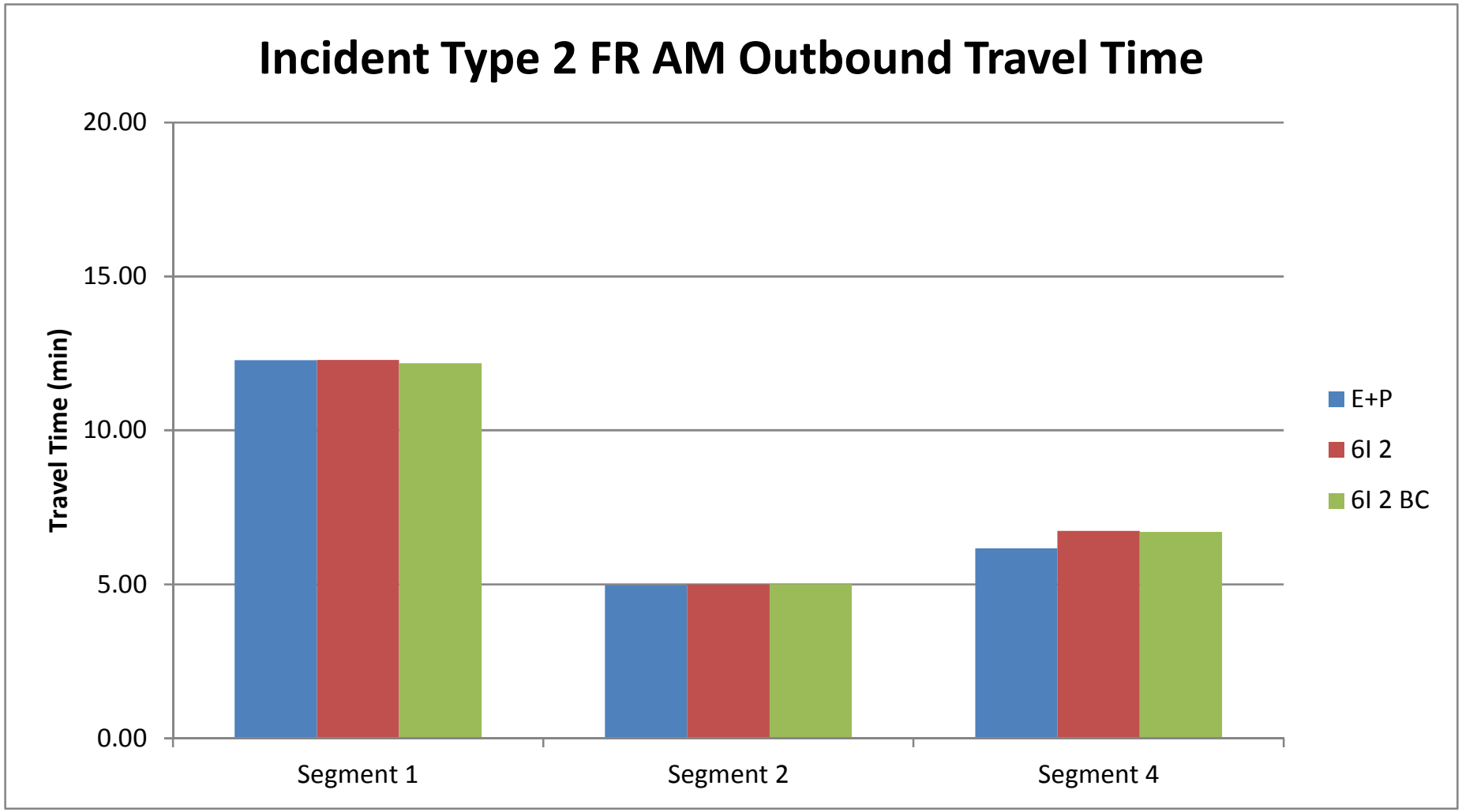
2011 DynusT Results - H-GAC Models



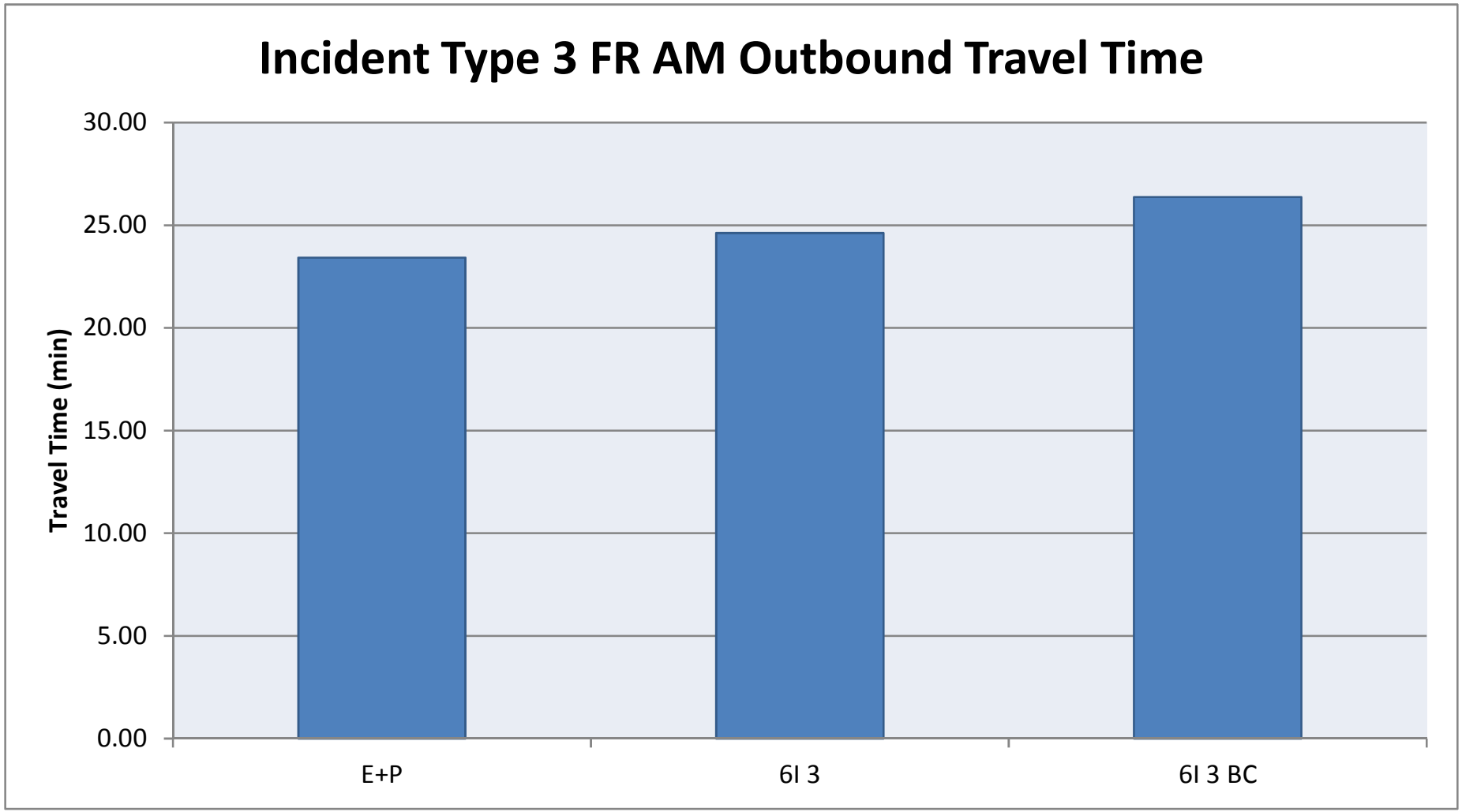
2011 DynusT Results - H-GAC Models



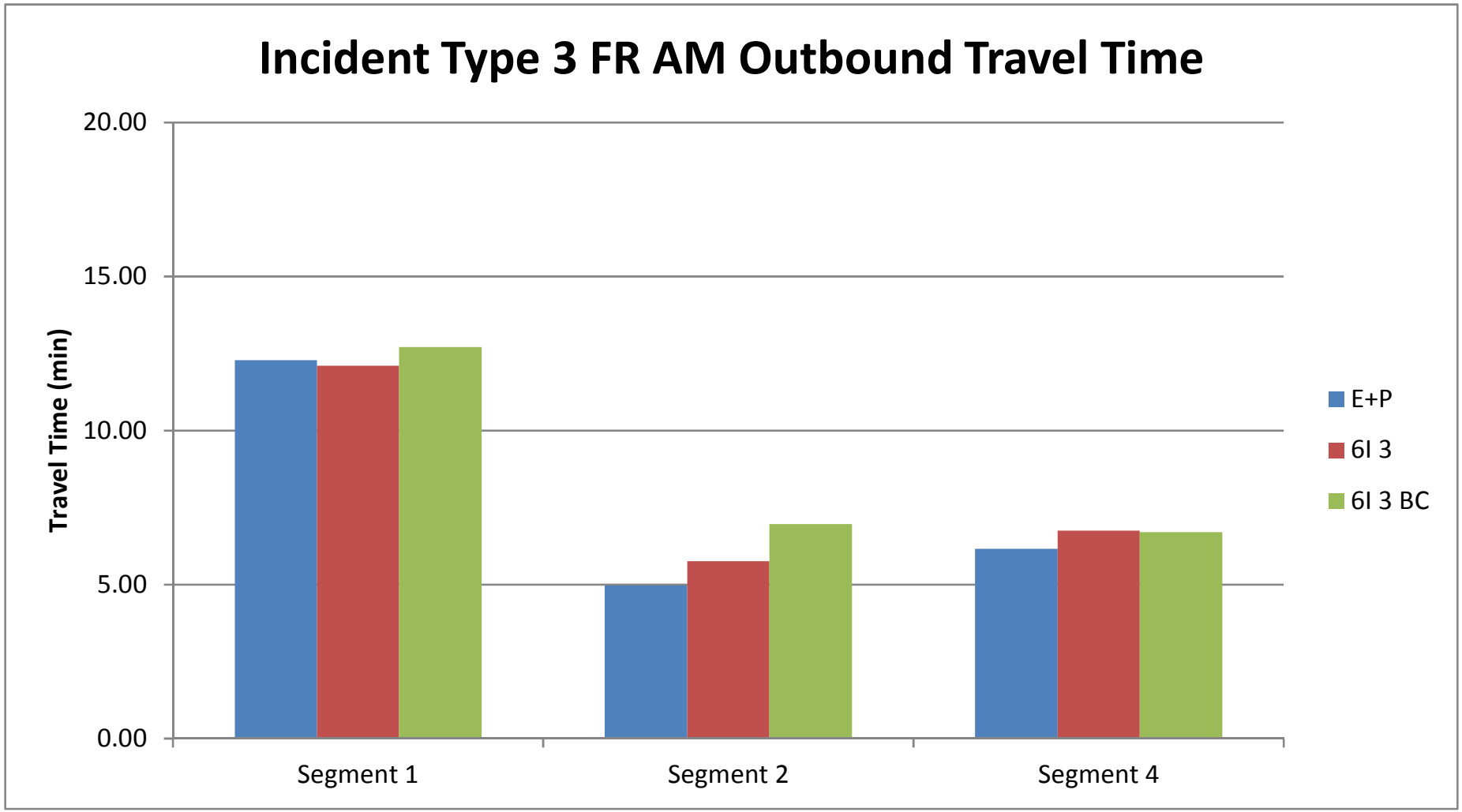
2011 DynusT Results - H-GAC Models



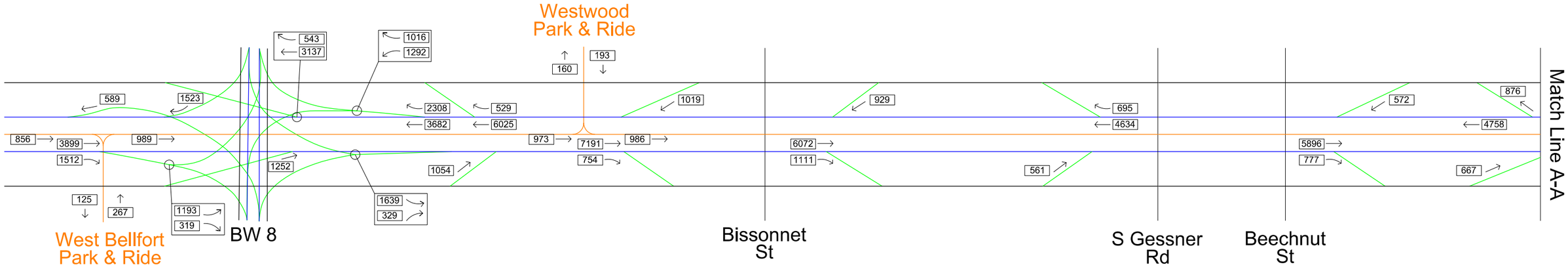
2011 DynusT Results - H-GAC Models

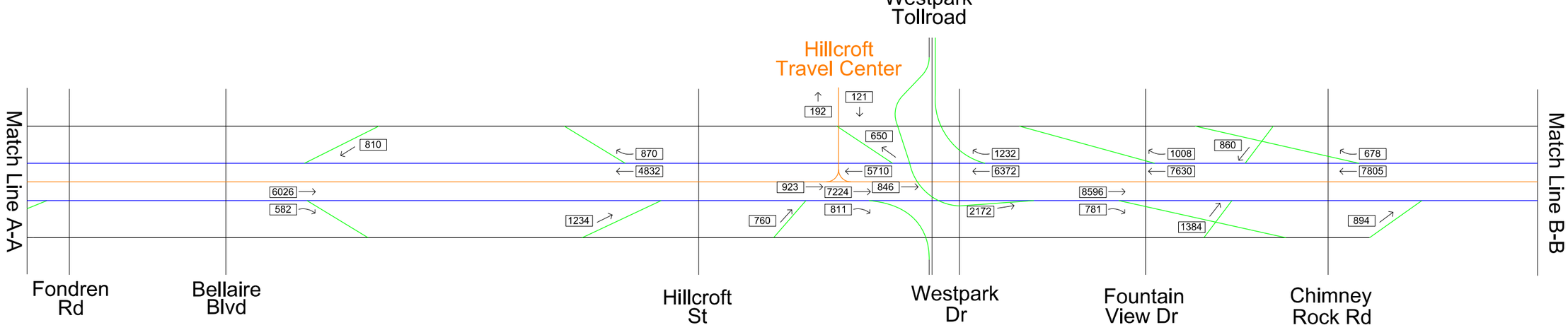


2011 DynusT Results - H-GAC Models



2011 DynusT Base Conditions Volumes





NOT TO SCALE

US 59 / IH-69 Rider 42
Corridor Congestion
Mitigation Plan

2011 AM DYNUST VOLUMES

Recieved from H-GAC January 2015

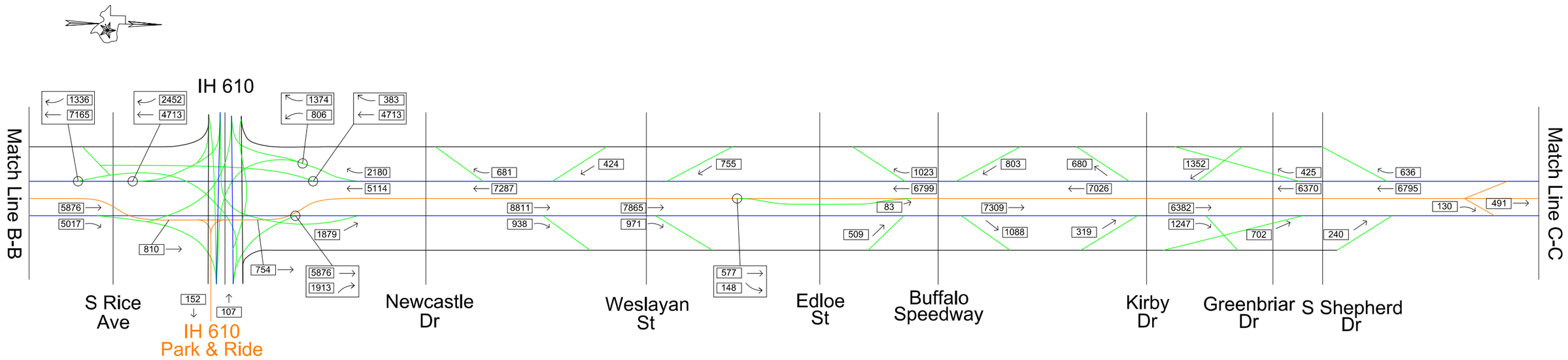
LEGEND

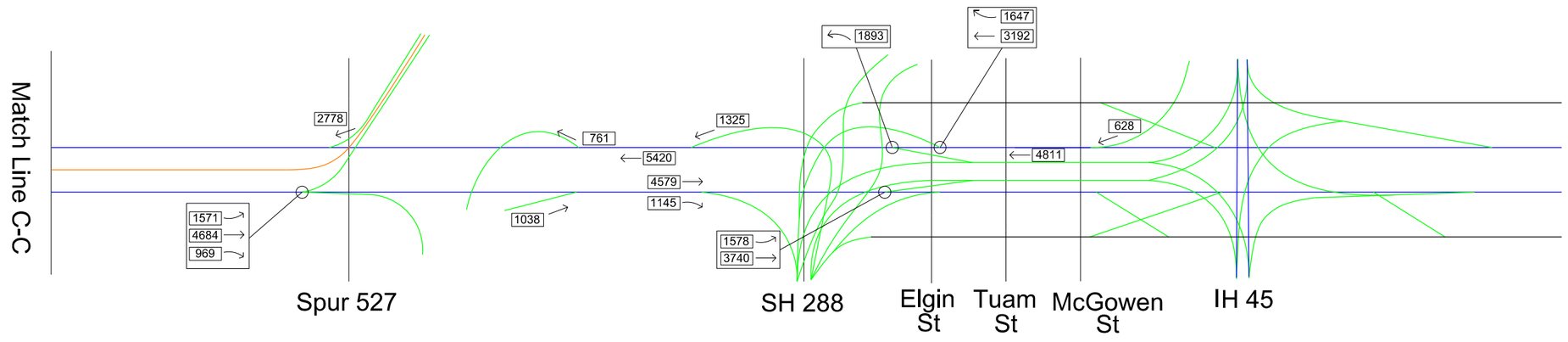
- MAINLANE
- FRONTAGE ROAD
- HOT/HOV LANE
- RAMP

→ DIRECTION OF TRAVEL

TRAFFIC VOLUME

ALLIANCE TRANSPORTATION GROUP
TBPE FIRM REGISTRATION NO. 812
11500 METRIC BLVD, BLDG M-1, STE 150
AUSTIN, TEXAS 78758
PHONE 512-821-2081
FAX 512-821-2085
http://www.alliance-transportation.com/





NOT TO SCALE

US 59 / IH-69 Rider 42
Corridor Congestion Mitigation Plan

2011 AM DYNUST VOLUMES

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LEGEND

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→ DIRECTION OF TRAVEL

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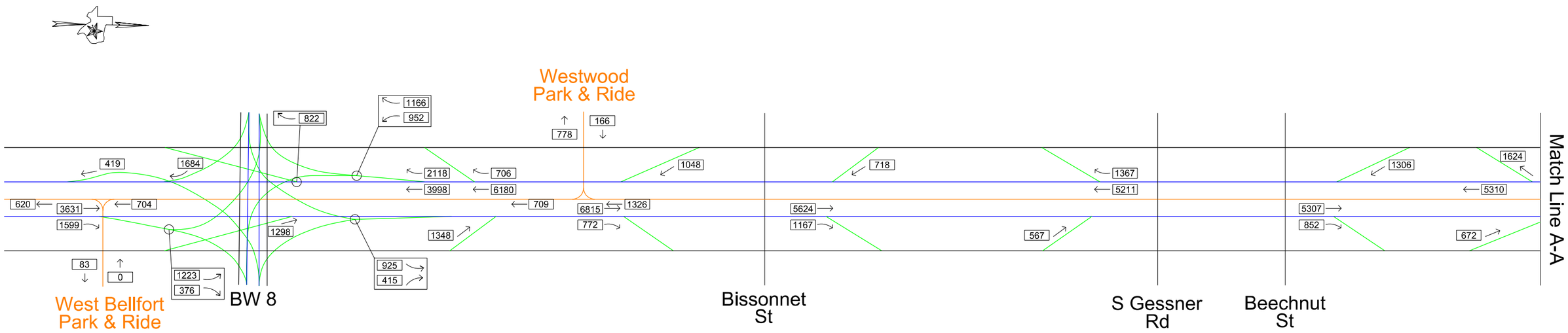

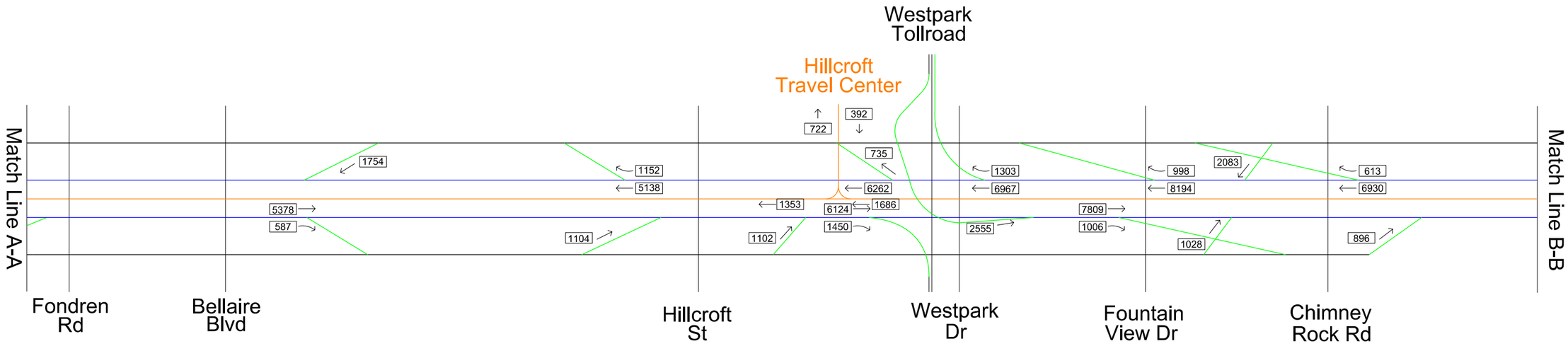

NOT TO SCALE

US 59 / IH-69 Rider 42
Corridor Congestion
Mitigation Plan

2011 PM DYNUST VOLUMES

Recieved from H-GAC January 2015

LEGEND

- MAINLANE
- FRONTAGE ROAD
- HOT/HOV LANE
- RAMP

→ DIRECTION OF TRAVEL

TRAFFIC VOLUME

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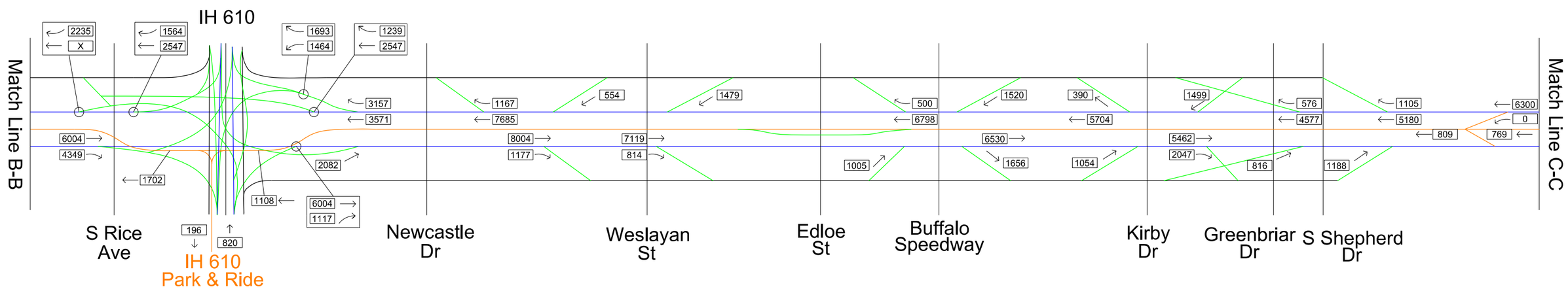

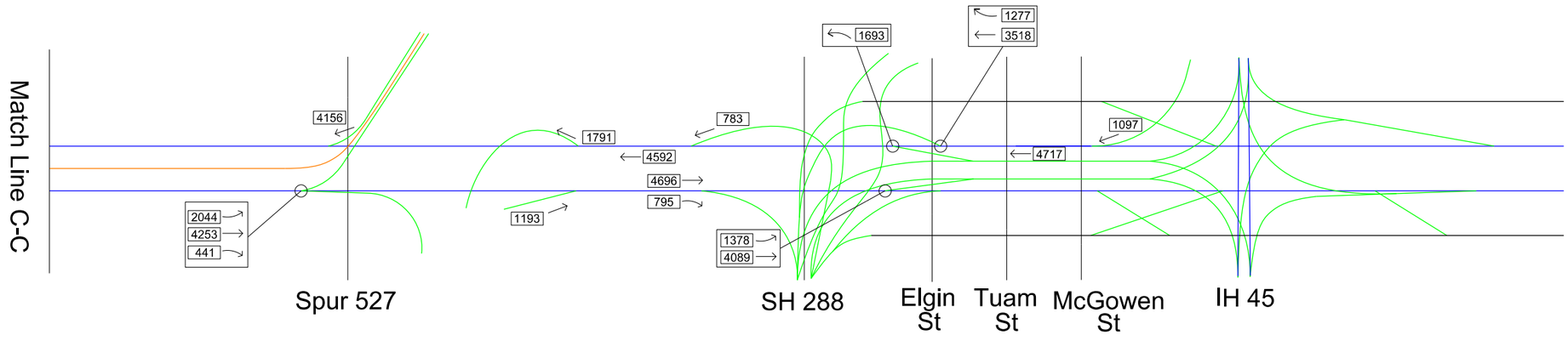

NOT TO SCALE

US 59 / IH-69 Rider 42
Corridor Congestion
Mitigation Plan

2011 PM DYNUST VOLUMES

Recieved from H-GAC January 2015

LEGEND

- MAINLANE
- FRONTAGE ROAD
- HOT/HOV LANE
- RAMP

→ DIRECTION OF TRAVEL

TRAFFIC VOLUME

ALLIANCE TRANSPORTATION GROUP
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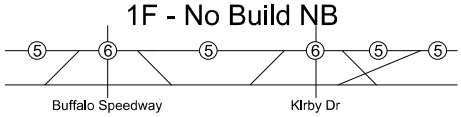
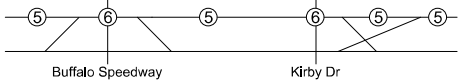
SCENARIO 1F ALTERNATIVES

NORTHBOUND

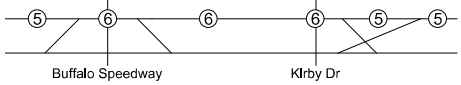
1F - No Build NB



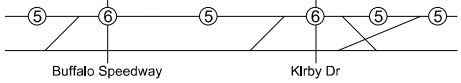
1F - Alternative 1A NB



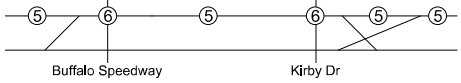
1F - Alternative 1B NB



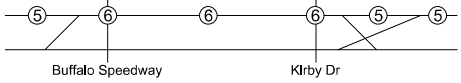
1F - Alternative 2 NB



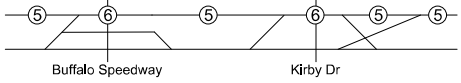
1F - Alternative 3A NB



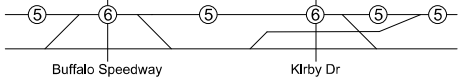
1F - Alternative 3B NB



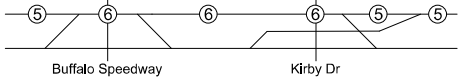
1F - Alternative 4 NB



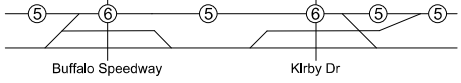
1F - Alternative 5A NB



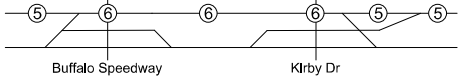
1F - Alternative 5B NB



1F - Alternative 6A NB

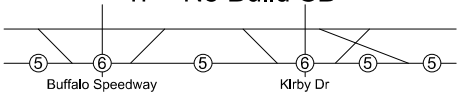


1F - Alternative 6B NB

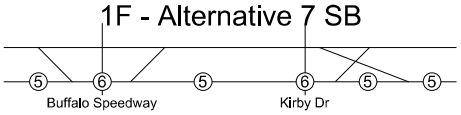


SOUTHBOUND

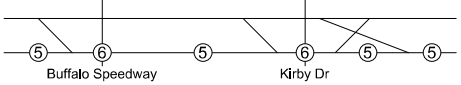
1F - No Build SB



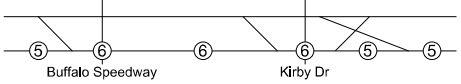
1F - Alternative 7 SB



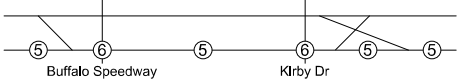
1F - Alternative 8A SB



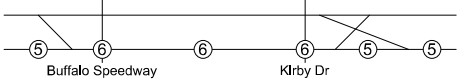
1F - Alternative 8B SB



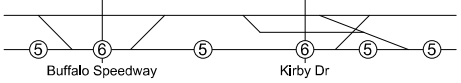
1F - Alternative 9A SB



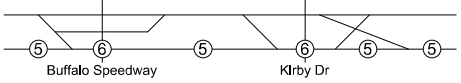
1F - Alternative 9B SB



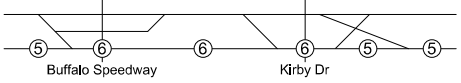
1F - Alternative 10 SB



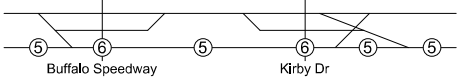
1F - Alternative 11A SB



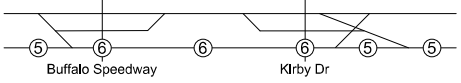
1F - Alternative 11B SB



1F - Alternative 12A SB



1F - Alternative 12B SB



NOT TO SCALE

US 59 / IH-69 Rider 42 Corridor Congestion Mitigation Plan

LEGEND

→ Direction of Travel

(#) Number of Lanes

ALLIANCE TRANSPORTATION GROUP
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http://www.alliance-transportation.com/

VISSIM Results Summary

Alternative	Description	DynusT	AM Peak						PM Peak					
			No Build Speed (mph)	Alternative Speed (mph)	Speed Increase/Decrease	No Build VMT (veh-mi)	Alternative VMT (veh-mi)	VMT Increase/Decrease	No Build Speed (mph)	Alternative Speed (mph)	Speed Increase/Decrease	No Build VMT (veh-mi)	Alternative VMT (veh-mi)	VMT Increase/Decrease
1B	Remove NB HOT lane exit between Shepherd Dr. and SP 527	1B - NB HOV Entrance Removed	59.9	59.9	0%	12050	11920	-1%	-	-	-	-	-	-
1D	Remove NB entrance ramp from San Jacinto	1D- NB San Jacinto Entrance Removed	43.4	43.7	1%	11359	10322	-9%	37.7	53.1	41%	10757	9870	-8%
1E	Remove SB exit ramp to Newcastle / consider added frontage road lane	1E - SB Newcastle Exit Removed	56.4	54.0	-4%	29723	28815	-3%	41.7	51.6	24%	28316	27169	-4%
1F - Northbound	Remove NB/SB ramps between Buffalo Speedway and Kirby Dr. May result in the construction of possible frontage road bypasses	1F - Alternative 1A NB	46.8	41.3	-12%	31979	31474	-2%	17.3	30.3	75%	23085	28854	25%
		1F - Alternative 1B NB	46.8	49.5	6%	31979	32262	1%	17.3	36.9	113%	23085	29997	30%
		1F - Alternative 2 NB	46.8	45.6	-3%	31979	30809	-4%	17.3	23.1	33%	23085	21744	-6%
		1F - Alternative 3A NB	46.8	47.0	0%	31979	30899	-3%	17.3	27.8	60%	23085	22644	-2%
		1F - Alternative 3B NB	46.8	44.4	-5%	31979	30695	-4%	17.3	29.1	68%	23085	22723	-2%
		1F - Alternative 4 NB	46.8	43.9	-6%	31979	31050	-3%	17.3	24.0	39%	23085	22118	-4%
		1F - Alternative 5A NB	46.8	53.9	15%	31979	32246	1%	17.3	29.1	68%	23085	28239	22%
		1F - Alternative 5B NB	46.8	50.3	8%	31979	32040	0%	17.3	50.8	193%	23085	30958	34%
		1F - Alternative 6A NB	46.8	51.0	9%	31979	31327	-2%	17.3	28.6	65%	23085	22745	-1%
		1F - Alternative 6B NB	46.8	49.6	6%	31979	31278	-2%	17.3	29.0	67%	23085	22740	-1%
1F - Southbound	Remove NB/SB ramps between Buffalo Speedway and Kirby Dr. May result in the construction of possible frontage road bypasses	1F - Alternative 7 SB	57.0	56.9	0%	42893	42844	0%	43.7	42.8	-2%	38839	38813	0%
		1F - Alternative 8A SB	57.0	57.3	0%	42893	42148	-2%	43.7	54.5	25%	38839	37032	-5%
		1F - Alternative 8B SB	57.0	57.7	1%	42893	42150	-2%	43.7	54.4	25%	38839	36979	-5%
		1F - Alternative 9A SB	57.0	57.3	1%	42893	42097	-2%	43.7	54.3	24%	38839	37076	-5%
		1F - Alternative 9B SB	57.0	57.4	1%	42893	42096	-2%	43.7	54.4	25%	38839	37106	-4%
		1F - Alternative 10 SB	57.0	56.9	0%	42893	42996	0%	43.7	42.8	-2%	38839	38896	0%
		1F - Alternative 11A SB	57.0	53.6	-6%	42893	42488	-1%	43.7	51.4	18%	38839	37604	-3%
		1F - Alternative 11B SB	57.0	54.1	-5%	42893	42492	-1%	43.7	51.6	18%	38839	37625	-3%
		1F - Alternative 12A SB	57.0	53.3	-6%	42893	42582	-1%	43.7	51.3	18%	38839	37787	-3%
		1F - Alternative 12B SB	57.0	53.6	-6%	42893	42593	-1%	43.7	51.3	17%	38839	37768	-3%
1G	Remove SB exit ramp and NB ent. ramp between Bissonet and BW 8	1G - NB Bellfort Entrance Removed	56.1	57.2	2%	30995	29605	-4%	57.5	57.1	-1%	28948	26680	-8%
1G	Remove SB exit ramp and NB ent. ramp between Bissonet and BW 8	1G - SB Bellfort Exit Removed	55.4	55.5	0%	23499	22555	-4%	52.5	42.8	-19%	25803	23364	-9%
1H	Remove SB exit ramp between Fountain View Dr. and Westpark Dr.	1H - SB Westpark Dr Exit Removed	52.0	51.1	-2%	24247	23755	-2%	45.6	43.1	-5%	24018	23471	-2%
		1H Alternative 2 - Added Auxiliary Lane	52.0	55.7	7%	24247	24276	0%	45.6	52.2	15%	24018	24206	1%
4	Add SB ramp metering from Greenbriar to Newcastle	4 - Ramp Metering	57.0	56.4	-1%	42893	43432	1%	43.7	46.1	5%	38839	48603	25%
Southbound Combined Access Modification Improvements - 1E, 1F-11B, 1H-alt 2			56.9	58.3	2%	92236	92263	0%	44.2	51.9	17%	89618	90240	1%
Northbound Combined Access Modification Improvements - 1D, 1F-5B			33.4	36.4	9%	92341	94000	2%	43.9	52.7	20%	93769	95755	2%

APPENDIX D

Benefit/Cost Methodology

Assumptions in Multiple Areas of Analysis

Value of Time (2011$/veh-hr)	26.46
Annualization Factor (days/yr)	260
Growth Rate (%)	0.79
Inflation Rate (%)	2.52
Discount Rate (%)	3.0
B/C Timeline (yrs)	20
Duration of Congestion Factor	3.65xPeak Hour, AM northbound
	3.66xPeak Hour, AM southbound
	5.36xPeak Hour, PM northbound
	5.30xPeak Hour, PM southbound

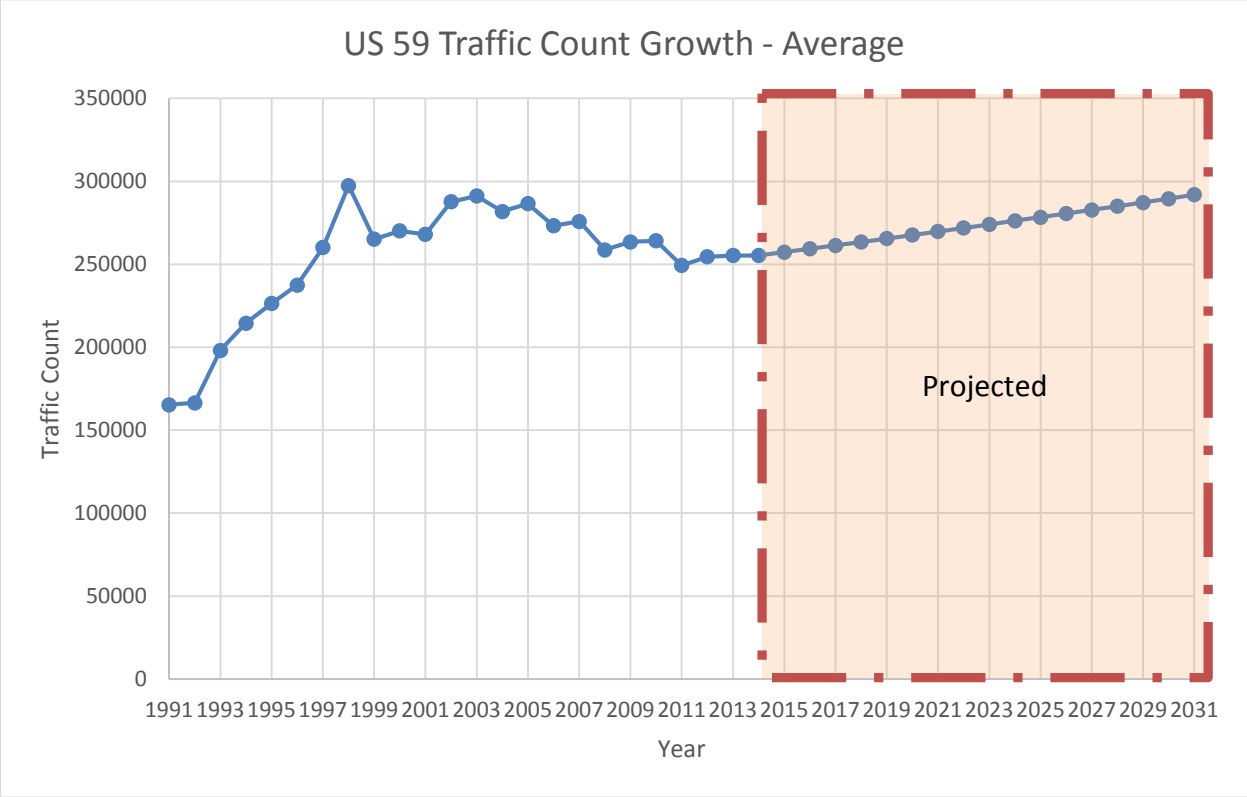
System Modifications

Benefit

The system modification benefit analysis compared VISSIM travel time outputs from the No-Build network and the network with ramp modifications. The change in travel time was used as the basis of public benefit. The peak hour savings were calculated using the TTI 2011 value of time, which coincides with the 2011 volume output from DynusT. A time of day factor was applied to the peak hour savings to determine daily savings. The duration of congestion factor was based on permanent count station volume to capacity ratios for AM and PM congested hours. The congested hours were determined using TranStar 2011 historical data. The AM peak was 6-10 AM, while the PM peak was 2-8 PM. An annualization factor of 260 days was applied to determine the annual benefit.

Using the 2011 annual benefit, annual benefit over a 20 year timeline of 2021 to 2041 was determined. The present value was then calculated for 2015 dollars. This timeline is based on expected completion date for the system modifications, which includes a bypass at Kirby and US 59 NBFR and a bypass at Buffalo Speedway and US 59 SBFR. The 2011 savings were adjusted by year based on a 0.79% growth rate, 2.52% inflation rate, and 3% discount rate. The 2.52% inflation rate is based on CPI data from 1991 to 2011. The growth rate was determined using historical traffic counts. **Figure 1** shows that the growth has flattened over the last several years. 2031 volumes were estimated based on an average of the highest traffic counts and the additional traffic due to increased VMT from system modifications.

Figure 1: US 59 Historical and Projected Traffic Counts



Cost

The cost for the system modifications includes construction, schematic, PS&E, and O&M cost in 2015 dollars. The construction, schematic, PS&E, and O&M costs utilized 2014 TxDOT bid tabs and were adjusted to the current year based on a 4% inflation rate and a 3% discount rate.

HOV/HOT Lanes

Benefit

The HOV/HOT bi-directional lanes benefit analysis focused on the benefit of providing a managed lane to reverse commute travelers. The travel time savings associated with using the managed lanes for the AM outbound and PM inbound instead of the general purpose lanes was calculated using DynusT outputs. The savings and volume were for peak hour and then adjusted based on the time of day factor described in the system modification benefit summary. Average trip length for METRO buses and passenger vehicles along the managed lanes was calculated based on average entering and exiting location. The number of buses was assumed based on current bus routes and frequency of routes. In addition, ridership was estimated based on current METRO ridership. The AM peak was 6-10 AM, while the PM peak was 2-8 PM. An annualization factor of 260 days was applied to determine the annual benefit.

Using the 2011 annual benefit, benefit was estimated for the 20 year timeline of 2025 to 2045. The present value was then calculated for 2015 dollars. This timeline is based on expected completion date for the bidirectional managed lanes. The 2011 savings were adjusted by year based on a 0.79% growth rate, 2.52% inflation rate, and 3% discount rate.

In addition to delay benefit, revenue was estimated based on two case studies: the I-95 express corridor in Miami and I-10 Katy Managed Lanes. The estimated revenue is $3.5 million per year for bidirectional lanes and 7.0 million per year for bidirectional lanes with variable pricing. The variable pricing revenue is higher because of dynamic pricing, resulting in higher average toll rates, and the assumption that the managed lanes would operate under a 3+ policy, resulting in a greater percentage of paying vehicles versus non-paying vehicles.

Cost

The cost for the managed lanes includes construction, schematic, PS&E, and O&M cost in 2015 dollars. The construction, schematic, PS&E, and O&M costs utilized 2014 TxDOT bid tabs and were adjusted to the current year based on a 4% inflation rate and a 3% discount rate.

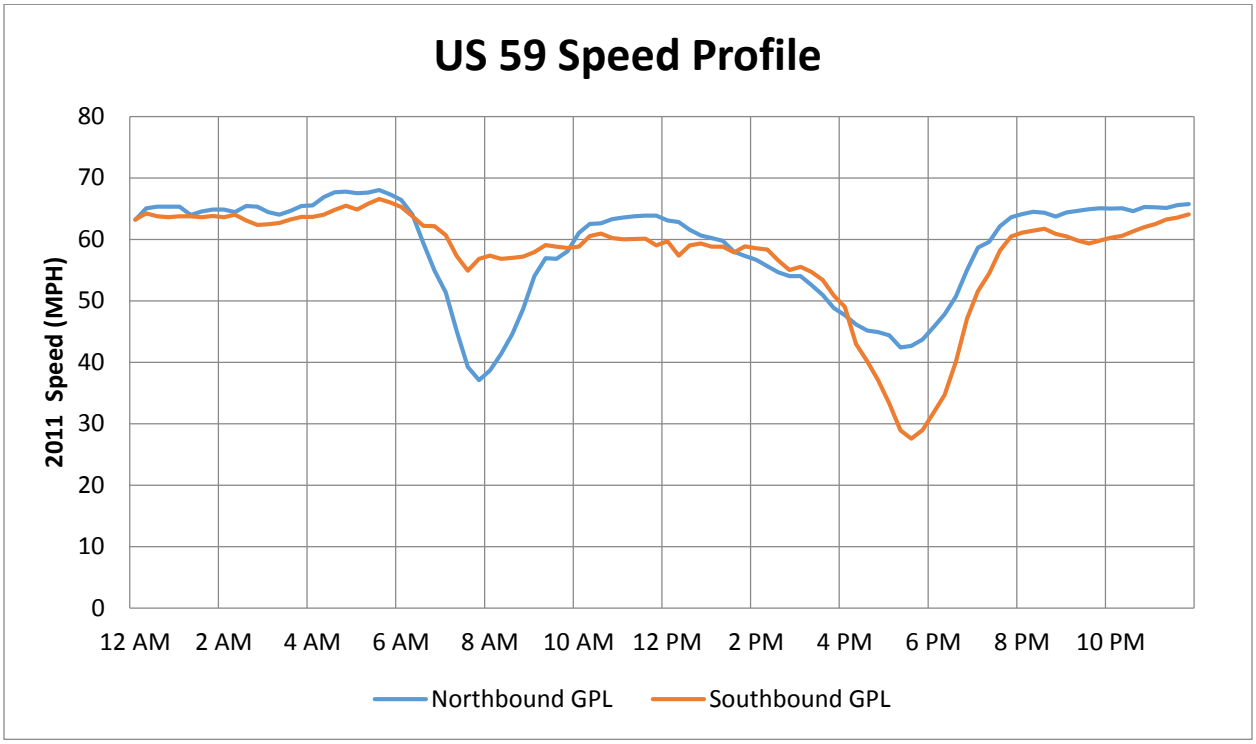
Active Traffic Management

Benefit

Active Traffic Management benefit analysis utilized four areas of benefit: recurring congestion, 2-lane accidents, all-lane accidents, and crash reduction.

Recurring congestion benefit analysis utilized active traffic management during the AM inbound traffic. The travel time savings in DynusT were calculated and used to determine 2011 annual benefit for AM inbound traffic. An annualization factor of 260 days was applied to determine the annual benefit. The PM outbound benefit was assumed to be equal to the AM inbound benefit. This is a conservative assumption, considering the PM outbound traffic has lower speeds and a longer duration of congestion than AM inbound traffic. **Figure 2** shows the 2011 TranStar historical speeds along the US 59 corridor.

Figure 2: 2011 TranStar Historical Speed Profile along US 59



The benefit during 2-lane and all-lane accidents was determined based on travel time savings in DynusT model runs for these accident types. The duration of the travel time savings was set at 3 hours and the CRIS data was used to determine the number of accidents matching each incident type during the average year.

The safety benefit from crash reductions was determined based on case studies. A FHWA 2007 report, Active Traffic Management: The Next Step in Congestion Management, identifies a 15% reduction in injury crashes, and a 30% reduction in property-damage only (PDO) crashes. The 30% reduction was adjusted to 20% as a means to make a conservative estimate on PDO crash reduction. Using the average number of crashes per year, by type, and economic cost of crashes based on a National Safety Council 2012 report, an annual cost savings was determined.

The benefit over 20 years was calculated for 2018-2038, based on the expected project completion date. The benefit was determined using a 0.79% growth rate, 2.52% inflation rate, and 3% discount rate. The yearly values were then converted back to 2015 dollars.

Cost

The construction, schematic, PS&E, and O&M costs for active traffic management were determined based on a combination of sources. Washington DOT and Caltran reports for I-5 and I-80, respectively, were used to help determine the costs associated with active traffic management implementation along a freeway corridor. 2014 and 2015 TxDOT bid tabs were used for a majority of the construction items. DMS prices for lane assignment DMS, detour DMS, and full color DMS were estimated using product manufacturer information. The number of hours for maintenance and requirements for integration and staffing were determined based on the I-5 and I-80 active traffic management cost estimates.

The operation and maintenance costs were calculated for years 2018-2038 using inflation rate of 2.52% and discount rate of 3%, then returned to 2015 dollar present value for the B/C ratio.

Strategy	Model	Annual Delay Benefit (2011 $)			Safety Benefit (2011 $)	Construction Cost (2015 $)	Schematic Cost (2015 $)	PS&E Design (2015 $)	O&M Cost (2015 $)	PV of O&M Cost (2015 $)	Life-Cycle Timeline	Life-Cycle Benefit (2015 $)	Life-Cycle Cost (2015 $)	Life-Cycle B/C
		AM	PM	Total										
System Modifications - Combined NB	Vissim	$6,182,000	$14,722,000	$20,904,000	-	$6,970,797	$209,124	$731,718	$904,462	$904,462	20	$275,039,000	$8,816,000	31.2
System Modifications - Combined SB	Vissim	$965,000	$11,000,000	$11,965,000	-	$7,714,350	$231,270	$825,470	$1,141,704	$1,141,704	20	$157,426,000	$9,913,000	15.9
Bidirectional with Variable Pricing [1]	DynusT	$10,617,000			-	$198,429,900	$5,952,897	$19,842,990	$16,671,504	$16,671,504	20	$267,983,000	$240,897,000	1.1
Active Traffic Management - Congestion	DynusT	$10,756,000	$10,756,000											
Active Traffic Management- 2-Lane Incident [2]	DynusT	$6,116,000		$28,445,000	$7,533,000	$36,840,000			$2,560,000	$35,900,000	20	$550,311,000	$72,227,352	7.6
Active Traffic Management - All-Lane Incident [3]	DynusT	$817,000												

[1] Revenue of $7,500,000 per year based on usage and Case Studies

[2] 428 2-lane accidents per year (based on 2010-2013 RIMS data)

[3] 27 all-lane accidents per year (based on 2010-2013 RIMS data)

System Modifications Delay Benefit Calculation

No Build

	AM		PM	
	NB	SB	NB	SB
Veh-Miles	92341	92236	93769	89618
Veh-Hrs	2803	1621	2183	2028
Veh-Min	168187	97258	130989	121686
Avg Speed	33	57	43	44
Min/Mile	1.82	1.05	1.40	1.36
Total Volume In	19690	21601	23084	26422
	4.69	4.27	4.06	3.39

System Modifications

	AM		PM	
	NB	SB	NB	SB
Veh-Miles	91991	91894	95711	90031
Veh-Hrs	2755	1580	1839	1743
Veh-Min	165280	94791	110314	104563
Avg Speed	33	58	52	52
Min/Mile	1.80	1.03	1.15	1.16
Total Volume In	18787	21592	23284	26572
	4.90	4.26	4.11	3.39

Differences in Values

	AM		PM	
	NB	SB	NB	SB
Veh-Miles	-349	-342	1942	413
Veh-Hrs	-48	-41	-345	-285
Veh-Min	-2907	-2467	-20675	-17124
Avg Speed	0	1	9	7
Min/Mile	-0.02	-0.02	-0.24	-0.20
Total Volume In	-903	-9	200	150

Note: NB Volume In is reduced due to removed ramp at San Jacinto St.

Segment Length	14.1	14.1	14.1	14.1
No-Build (min/mile)	1.82	1.05	1.40	1.36
Build (min/mile)	1.80	1.03	1.15	1.16
Min/mile savings	(0.02)	(0.02)	(0.24)	(0.20)
Avg Miles	4.90	4.26	4.11	3.39
Avg Savings	(0.12)	(0.10)	(1.00)	(0.67)
Avg Vehicles	18787	21592	23284	26572
Avg. Peak Hour Savings (Hours)	(2,270.16)	(2,106.14)	(23,388.04)	(17,684.40)
Duration of Congestion*	3.65	3.66	5.36	5.30
Peak Period Savings (Hours)	(138.19)	(128.56)	(2,089.10)	(1,560.65)
Annualization (Work Days)	260	260	260	260
Savings Per Year	(35,929.90)	(33,425.25)	(543,165.36)	(405,768.54)
Value of Time	$ 26.46	$ 26.46	$ 26.46	$ 26.46
Annual Benefit	$ 951,000.00	$ 884,000.00	$ 14,372,000.00	$ 10,737,000.00

*Based on Transtar US 59 speed data and permanent count station analysis

Estimated HOV/HOT Current Operation Improvement

			Speed (mph)*			
			Base (2011)		Bi-Directional with Variable Pricing (2011)	
Point A	Point B	Distance (miles)	AM Inbound	PM Outbound	AM Inbound	PM Outbound
Westwood	Hillcroft	4.7	58	59.2	58	59.2
Hillcroft	IH 610	2.2	59.7	37.4	59.7	45
IH 610	Edloe	1.7	59.8	37.5	59.8	45
Edloe	HOV Entrance/Exit	1.8	59.8	37.5	59.8	45
HOV Exit	Spur 527	1.1	59.9	54.6	59.9	54.6

**Based on DynusT model runs from H-GAC in December 2014*

			Travel Time (min)*				Travel Time Savings	
			Base (2011)		Bi-Directional with Variable Pricing (2011)			
Point A	Point B	Distance (miles)	AM Inbound	PM Outbound	AM Inbound	PM Outbound	AM Inbound	PM Outbound
Westwood	Hillcroft	4.7	4.9	4.8	4.9	4.8	0.0	0.0
Hillcroft	IH 610	2.2	2.2	3.5	2.2	2.9	0.0	0.6
IH 610	Edloe	1.7	1.7	2.7	1.7	2.3	0.0	0.5
Edloe	HOV Entrance/Exit	1.8	1.8	2.9	1.8	2.4	0.0	0.5
HOV Exit	Spur 527	1.1	1.1	1.2	1.1	1.2	0.0	0.0
**Based on DynusT model runs from H-GAC in December 2014*						Total	0.0	1.5

		AM Outbound	PM Inbound
METRO Delay Savings ($)	Persons/bus	40	40
	Buses @ Kirby	21	18
	Assumed # of buses	21	18
	Value of Time ($/per-hr)	17.52	17.52
	Days/Year	260	260
	Average Length of Bus Use	6.8	6.8
	Benefit	$0	$49,000
	Total	$49,000	

Estimated HOV/HOT Added Direction Operation Improvement

			Speed (mph)*			
			Base (2011)		Bi-Directional with Variable Pricing (2011)	
Point A	Point B	Distance (miles)	AM Outbound (Mainlane)	PM Inbound (Mainlane)	AM Outbound	PM Inbound
Westwood	Hillcroft	4.7	59.9	42.9	60	58.5
Hillcroft	IH 610	2.2	60	42.55	60	60
IH 610	Edloe	1.7	60	26.5	60	60
Edloe	HOV Exit	1.8	60	26.5	60	60
HOV Exit	Spur 527	1.1	58.9	17.6	60	60

**Based on DynusT model runs from H-GAC in December 2014*

			Travel Time (min)*				Travel Time Savings	
			Base (2011)		Bi-Directional with Variable Pricing (2011)			
Point A	Point B	Distance (miles)	AM Outbound (Mainlane)	PM Inbound (Mainlane)	AM Outbound	PM Inbound	AM Outbound	PM Inbound
Westwood	Hillcroft	4.7	4.7	6.6	4.7	4.8	0.0	1.8
Hillcroft	IH 610	2.2	2.2	3.1	2.2	2.2	0.0	0.9
IH 610	Edloe	1.7	1.7	3.8	1.7	1.7	0.0	2.1
Edloe	HOV Exit	1.8	1.8	4.1	1.8	1.8	0.0	2.3
HOV Exit	Spur 527	1.1	1.1	3.8	1.1	1.1	0.0	2.7
**Based on DynusT model runs from H-GAC in December 2014*						Total	0.0	9.7

		AM Outbound	PM Inbound
METRO Delay Savings ($)	Persons/bus	20	20
	Buses @ Kirby	21	18
	Assumed # of buses	21	18
	Value of Time ($/per-hr)	17.52	17.52
	Days/Year	260	260
	Average Length of Bus Use	6.8	6.8
	Benefit	$1,000	$157,000
	Total	$158,000	

Active Traffic Management during recurring congestion

AM Inbound (6 to 9)			
deltaTT (min)		2.32	
Value of Time ($/hr)		26.46	
VMT		283321	
Miles		14	
User Cost Savings	$	41,369	per weekday
	$	**10,756,045**	per year

Active Traffic Management during Incident 2

Per Incident			
deltaTT (min)		2.25	
Value of Time ($/hr)		26.46	
AADT		230646	
Impact Duration (hr)		3	
User Cost Savings	$	14,291	per accident
Accidents per year		428	
	$	**6,116,393**	per year

Active Traffic Management during Incident 3

Per Incident			
deltaTT (min)		4.76	
Value of Time ($/hr)		26.46	
AADT		230646	
Impact Duration (hr)		3	
User Cost Savings	$	30,267	per accident
Accidents per year		27	
	$	**817,214**	per year

Active Traffic Management Safety Benefit

	Number per Year	Percent Reduction*	Reduction per Year	Cost per Avoided Collission**	Total Cost Savings
PDO Collisions	1245	20%	249	8900	$2,216,100
Death	10	15%	1	1410000	$1,410,000
Incapacitating Injury	45	15%	6	72700	$436,200
Non-incapacitating Injury	267	15%	40	23400	$936,000
Possible Injury	1286	15%	192	13200	$2,534,400
				Total	**$7,532,700**

*Based on FHWA 2007: Active Traffic Management: The Next Step in Congestion Management

**Based on National Safety Council 2012 Report: Estimating the Costs of Unintentional injuries

Lane Assignment DMS

Conceptual cost for ATM Sign Bridge Location — New Over 5 Lane Section Estimate

TxDOT	Item	Unit	Unit Price	Quantity	Cost
650 2103	INS OH SN SUP(100 FT BRDG)	EA	52500	1	$ 52,500
416 2008	DRILL SHAFT (60 IN)	LF	$300.00	100	$ 30,000
	LED ATM 48"x48"*	EA	$15,000.00	6	$ 90,000
	Large Lift Face Amber LED sign*	EA	$50,000.00	1	$ 50,000
	Sign Controllers**	EA	$1,980.00	7	$ 13,860
6900 2002	LCS CABINET FOUNDATION	EA	8000	2	$ 16,000
618 2018	CONDT (PVC) (SCHD 40) (2")	LF	$14.00	320	$ 4,480
6014 2011	FIBER OPTIC CBL (SNGLE-MODE)(12 FIBER)	LF	$3.00	1000	$ 3,000
628 2100	ELC SRV TY D 120/240 070 (NS)SS(E)SP(O	EA	$4,000.00	1	$ 4,000
8821 2001	RADAR VEHICLE SENSING DEVICE	EA	$9,500.00	1	$ 9,500
6920 2001	CCTV FIELD EQUIPMENT	EA	$7,000.00	1	$ 7,000
8282 2001	CAMERA POLE STRUCTURE W/CABINET	EA	$11,500.00	1	$ 11,500
514 2004	PERM CONC TRF BARR (SGL SLP)(TY 1)(42"	LF	$48.00	150	$ 7,200
540 6017	MTL BM GD FEN (LONG SPAN SYSTEM)	LF	$23.00	150	$ 3,450
				Total	**$ 302,490**

*Based on product pricing from Skyline Products

**Based on 2008 WsDOT Active Traffic Management Concept of Operations updated with inflation

Integration Expense*	LS	$ 58,801	1	$ 58,801
TESC	5%			$ 15,125
Provision for "Basic Safety Improvements"	5%			$ 15,125
Traffic control, mobilization, contigency	50%			$ 151,245
			Construction Subtotal	$ 542,785
Sales Tax	8.25%			$ 44,780
			Construction Subtotal with tax	$ 587,564
Environmental Clearance & P E	8%			$ 43,423
Final Design and CE (12%+15%)	27%			$ 146,552
			Project Subtotal per Sign	$ 777,539
General contingency	30%			$ 233,262
			Estimated Project Cost per ATM Sign Location	**$ 1,011,000**

NB Sign Locations	19
SB Sign Locations	13
ATM Bridge Total Cost	**$ 32,352,000**

Full Color Matrix DMS

	Large Lift Face Amber LED sign	EA	$50,000.00		5	$ 250,000
8791 2001	INSTALL DMS (POLE MTD CABINET)	EA	16000.00		5	$ 80,000
8791 2002	INSTALL DMS (FOUNDATION MTD CABINET)	EA	13500.00		5	$ 67,500
650 2022	INS OH SN SUP(25 FT CANT)	EA	17000.00		5	$ 85,000
416 6023	DRILL SHAFT (SIGN MTS) (54 IN)	LF	450		250	$ 112,500
654 6006	SIGN WALKWAY (48 IN) WITH HNDRL	LF	170		125	$ 21,250
				Total		$ 616,250
	TESC		5%			$ 30,813
	Provision for "Basic Safety Improvements"		5%			$ 30,813
	Traffic control, mobilization, contigency		50%			$ 308,125
				Construction Subtotal		$ 986,000
	Sales Tax		8.25%			$ 81,345
				Construction Subtotal with tax		$ 1,067,345
	Environmental Clearance & P E		8%			$ 78,880
	Final Design and CE (12%+15%)		27%			$ 266,220
				Project Subtotal per Sign		$ 1,412,445
	General contingency		30%			$ 423,734
				Estimated Large DMS Total		**$ 1,836,000**

Detour DMS

	DMS Detour	EA	$10,000.00		36	$ 360,000
618 2018	CONDT (PVC) (SCHD 40) (2")	LF	$14.00		1800	$ 25,200
	Sign Controllers*	EA	$1,980.00		36	$ 71,280
				Total		$ 456,480
	TESC		5%			$ 22,824
	Provision for "Basic Safety Improvements"		5%			$ 22,824
	Traffic control, mobilization, contigency		50%			$ 228,240
				Construction Subtotal		$ 730,368
	Sales Tax		8.25%			$ 60,255
				Construction Subtotal with tax		$ 790,623
	Environmental Clearance & P E		8%			$ 58,429
	Final Design and CE (12%+15%)		27%			$ 197,199
				Project Subtotal per Sign		$ 1,046,252
	General contingency		30%			$ 313,876
				Estimated Trail Blazer DMS Total		**$ 1,360,000**

Adaptive Ramp Metering (see TxDOT Bid Item Sheet)

Estimated Adaptive Ramp Metering Total	**$ 1,292,000**

Total Construction Cost

Active Traffic Management Strategy Construction Cost	**$36,840,000**

Unit Rates

Work Activity	Qty	Details	Cost	Unit
Labor		Maintenance Technicians for Traffic Control and Repair	130	per person per hour
		Bridge Inspectors (Structural Engineers)	150	per person per hour
Equipment		Man Lift	27	per hour
		Pickup	20	per hour
		Van	15	per hour
		Truck-Mounted Impact Attenuator	6	per hour
Materials		Varies	-	

Summary of O&M Annual Costs

Activity	Cost
Structural Inspection	57600
VMS Full Matrix Maintenance	415000
Data Station Maintenance	85600
Variable Speed Limit, Lane Control, and Detour DMS Maintenance	1615000
Adaptive Ramp Metering Maintenance	104400
Added Operation Cost	282000
Total O&M Costs	2560000

Sign Bridge Inspection

*Once every 2 years based on TxDOT bridge recommendations

Estimated Time 4 hours

Work Activity	Qty	Details	Cost
Labor	4	Maintenance Technicians for Traffic Control and Repair	2080
	2	Bridge Inspectors (Structural Engineers)	1200
Equipment	1	Man Lift	108
	1	Pickup	80
	2	Van	120
	1	Truck-Mounted Impact Attenuator	24
		Total Cost per Structure (every 2 years)	3600
		Total Cost per Structure (annually)	1800
		Number of Structures	32
		Total Cost (annually)	57600

Variable Message Signs

Major Preventive Maintenance

*Once a year

	Estimated Time		8 hours
Work Activity	Qty	Details	Cost
Labor	6	Maintenance Technicians for Traffic Control and Repair	6240
Equipment	2	Man Lift	432
	1	Pickup	160
	1	Van	120
	2	Truck-Mounted Impact Attenuator	96
Materials		arrow board trucks, numerous signs and barrels	500
		Total Cost per Sign (annually)	7500

Minor Preventive Maintenance

*11 times a year

	Estimated Time		1 hours
Work Activity	Qty	Details	Cost
Labor	1	Maintenance Technicians for Traffic Control and Repair	130
Equipment	0	Man Lift	0
	0	Pickup	0
	1	Van	15
	0	Truck-Mounted Impact Attenuator	0
Materials		arrow board trucks, numerous signs and barrels	0
		Total Cost per Sign (per visit)	145
		Total Cost per Sign (annually)	1600

Repair (VMS over Traffic)

*Once every 3 years

	Estimated Time		6 hours
Work Activity	Qty	Details	Cost
Labor	6	Maintenance Technicians for Traffic Control and Repair	4680
Equipment	2	Man Lift	324
	1	Pickup	120
	1	Van	90
	2	Truck-Mounted Impact Attenuator	72
Materials		Repair parts and materials	2000
		Total Cost per Sign (every 3 years)	7300
		Total Cost per Sign (annually)	2433.333

	VMS
Total Cost per Sign (annually)	11533.33
Number of Signs	36
Total Cost (annually)	415000

Data Stations

Major Preventive Maintenance

*Once a year

	Estimated Time		6	hours
Work Activity	Qty	Details	Cost	
Labor	1	Maintenance Technicians for Traffic Control and Repair	780	
Equipment	0	Man Lift	0	
	0	Pickup	0	
	1	Van	90	
	0	Truck-Mounted Impact Attenuator	0	
Materials		various	100	
		Total Cost per Data Station (annually)	970	

Minor Preventive Maintenance

*3 times a year

	Estimated Time		2	hours
Work Activity	Qty	Details	Cost	
Labor	1	Maintenance Technicians for Traffic Control and Repair	260	
Equipment	0	Man Lift	0	
	0	Pickup	0	
	1	Van	30	
	0	Truck-Mounted Impact Attenuator	0	
Materials		various	100	
		Total Cost per Data Station (per visit)	390	
		Total Cost per Data Station (annually)	1170	
		Total Cost per Data Station (annually)	2140	
		Number of Data Stations	40	one per sign bridge and ramp meter
		Total Cost (annually)	85600	

Variable Speed Limit, Lane Control DMS, and Detour DMS

Major Preventive Maintenance

*Once a year

	Estimated Time		6 hours
Work Activity	Qty	Details	Cost
Labor	6	Maintenance Technicians for Traffic Control and Repair	4680
Equipment	2	Man Lift	324
	1	Pickup	120
	1	Van	90
	2	Truck-Mounted Impact Attenuator	72
Materials			200
		Total Cost per Sign (annually)	5500

Minor Preventive Maintenance

*11 times a year

	Estimated Time		1 hours
Work Activity	Qty	Details	Cost
Labor	1	Maintenance Technicians for Traffic Control and Repair	130
Equipment	0	Man Lift	0
	0	Pickup	0
	1	Van	15
	0	Truck-Mounted Impact Attenuator	0
Materials		arrow board trucks, numerous signs and barrels	0
		Total Cost per Sign (per visit)	145
		Total Cost per Sign (annually)	1600

Repair (VMS over Traffic)

*Once every 5 years

	Estimated Time		6 hours
Work Activity	Qty	Details	Cost
Labor	6	Maintenance Technicians for Traffic Control and Repair	4680
Equipment	2	Man Lift	324
	1	Pickup	120
	1	Van	90
	2	Truck-Mounted Impact Attenuator	72
Materials		Repair parts and materials	400
		Total Cost per Sign (every 5 years)	5700
		Total Cost per Sign (annually)	1140

	VMS
Total Cost per Sign (annually)	8240
Number of Signs	196
Total Cost (annually)	1615000

Adaptive Ramp Metering

Major Preventive Maintenance

*Once a year

	Estimated Time		6 hours
Work Activity	Qty	Details	Cost
Labor	6	Maintenance Technicians for Traffic Control and Repair	4680
Equipment	0	Man Lift	0
	1	Pickup	120
	1	Van	90
	0	Truck-Mounted Impact Attenuator	0
Materials			200
		Total Cost per ARM (annually)	5100

Minor Preventive Maintenance

*3 times a year

	Estimated Time		4 hours
Work Activity	Qty	Details	Cost
Labor	2	Maintenance Technicians for Traffic Control and Repair	1040
Equipment	0	Man Lift	0
	0	Pickup	0
	1	Van	60
	0	Truck-Mounted Impact Attenuator	0
Materials		arrow board trucks, numerous signs and barrels	100
		Total Cost per ARM (per visit)	1200
		Total Cost per ARM (annually)	3600
		Number of ARM	12
		Total Cost (annually)	104400

Operation Cost

At least one operator 24/7

Assume that operation would take place at existing TranStar facility, there is 24/7 monitor at the existing facility

Sign	Qty	Power Required (kW)		Cost	Cost/year
VMS	32	1.07	0.12		35993
Large VMS	4	3	0.12		12614
Lane Assignment/Detour DMS	196	0.32	0.12		65931
Adaptive Ramp Meter	12	0.8	0.12		10092
Data Stations	36	0.2	0.12		7569
					132199

Software	
Full Time Employees	3
Annual Salary	50,000
Total Cost (annually)	282000

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 4 - Adaptive Ramp Metering
Limits:	
Length:	
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Total Construction	**$**	**1,362,816**	Schematic Development (3%)	$ 40,884
			PS&E Design (10%)	$ 136,282
			Operation & Maintenance (20 years)	$ 150,000
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 1,689,982**

Highway:	US59				
County:	Harris				
CSJ:					
Filename:					
Description:	Strategy 4 - Adaptive Ramp Metering				
Limits:					
Length:					
Estimate By:	BGE-Transportation Systems				
Date:	6/3/2015				1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	CTMS/Signals				
Traffic Signals	Single Intersection Strain Poles	Per Int	3.00	$150,000.00	$450,000.00
				Sub Total CTMS/Signal	**$450,000.00**
Miscellaneous	**Additional Items**				
Detection	Detector Locations		20.00	$15,000.00	$300,000.00
				Sub Total Additional Items	**$300,000.00**
				Sub Total of All Above	**$750,000.00**
500	**Mobilization**	LS	1.00	10 %	**$75,000.00**
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	**$75,000.00**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	6.00	$25,000.00	$150,000.00
				Sub Total Traffic Control	**$150,000.00**
Project Sub Total					**$1,050,000.00**
Contingencies				**20%**	**$210,000.00**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$1,260,000.00**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$1,310,400.00**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$1,362,816.00**

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 3 - Two Reversible HOT/HOV Lanes Using Shoulder ROW
Limits:	
Length:	
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

Total Construction	**$ 24,811,537**	Schematic Development (3%)	$ 744,346
		PS&E Design (10%)	$ 2,481,154
		Operation & Maintenance (20 years)	$ 3,169,260
		Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 31,206,297**

Design and Construction Issues:
1) Widen all T-ramp structures
2) Requires taking a mainlane and shoulder on each side through BW 8
3) Requires reconstruction of Westpark Toll Road direct connector
4) Widen elevated structures on east and west side of IH-610
5) Requires design variance width through colums at IH-610

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 3 - Two Reversible HOT/HOV Lanes Using Shoulder ROW
Limits:	
Length:	
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

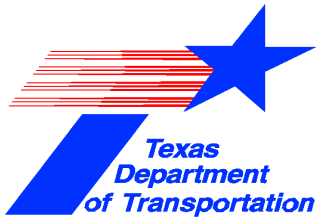
ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	95,360.00	$50.00	$4,768,000.00
512	Port Conc Traffic Barrier (Stkpl) (Safety Sh) (Ty 1)	LF	95,360.00	$15.00	$1,430,400.00
				Sub Total Roadway	**$6,198,400.00**
	Bridge				
Bridge	Pre-stressed Concrete I-Beam On System	SF	92,840.00	$50.00	$4,642,000.00
Bridge	Steel Trapezoidal Box Girder On System	SF	12,625.00	$165.00	$2,083,125.00
				Sub Total Bridge	**$6,725,125.00**
	Signing				
Signing	Other Roadways	MI	11.74	$30,000.00	$352,140.00
				Sub Total Signing	**$352,140.00**
	Pavement Markings				
Striping	Freeway 4 Lanes	MI	5.87	$75,000.00	$440,175.00
				Sub Total Pavement Markings	**$440,175.00**
				Sub Total of All Above	**$13,715,840.00**
500	**Mobilization**	LS	1.00	25%	**$3,428,960.00**
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	**$1,371,584.00**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Complex Projects (Fwy Reconstruction)	MO	12.00	$50,000.00	$600,000.00
				Sub Total Traffic Control	**$600,000.00**
Project Sub Total					**$19,116,384.00**
Contingencies				**20%**	**$3,823,276.80**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$22,939,660.80**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$23,857,247.23**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$24,811,537.12**

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 2C - Strategy 2A with Variable Pricing
Limits:	
Length:	3.89 mile elevated, 10.07 mile at grade, 1.42 mile HOV removal
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

New Roadway	$	25,674,000	Schematic Development (3%)	$	6,128,163
	$	168,360,336	PS&E Design (10%)	$	20,427,210
			Operation & Maintenance (20 years)	$	11,222,600
Exist HOV	$	10,237,762			
			Total construction, Schematic Dev.,		
Total Construction	**$**	**204,272,097**	**Design, and Operation & Maintenance**	**$**	**242,050,070**

Design and Construction Issues:
1) Requires the use of a shoulder and mainlane, each direction under Beltway 8
2) Possible mainlane encroachment at base of T-ramps.
3) Two-way elevated option from IH 610 to Edloe not feasible due to TxDOT adding westbound Chimney Rock exit ramp.
4) Costly elevated structure.

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 2C - Strategy 2A with Variable Pricing
Limits:	
Length:	3.89 Mile Elevated
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015



DESCRIPTION	UNITS	EST. QTY.	COST PER MILE	AMOUNT
2-Lane Curb and Gutter Frontage Road Section (One Direction)	MI	3.89	$5,500,000.00	$21,395,000.00
			20% Contingencies	**$4,279,000.00**
			Total	**$25,674,000.00**

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 2C - Strategy 2A with Variable Pricing
Limits:	
Length:	3.89 Mile elevated, 1.42 HOV Removal
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
100	Preparing ROW	AC	18.87	$18,000.00	$339,660.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	41,128.00	$50.00	$2,056,400.00
512	Port Conc Traffic Barrier (Move) (Sgl Slp) (Ty 1)	LF	15,000.00	$10.00	$150,000.00
512	Port Conc Traffic Barrier (Stkpl) (Sgl Slp) (Ty 1)	LF	15,000.00	$10.00	$150,000.00
				Sub Total Roadway	**$2,696,060.00**
	Bridge				
Bridge	Pre-stressed Concrete Box Beam On System	SF	462,480.00	$75.00	$34,686,000.00
Bridge	Steel Plate Girder On System	SF	360,080.00	$150.00	$54,012,000.00
				Sub Total Bridge	**$88,698,000.00**
	Drainage				
Storm Drains	Freeway Mainlanes & Frontage Roads	MI	3.89	$2,500,000.00	$9,725,000.00
SW3P	Stormwater Pollution Prevention Plan - Major	MI	3.89	$62,000.00	$241,180.00
				Sub Total Drainage	**$9,966,180.00**
	Illumination				
Lighting	High Mast Continuous 175' Mounting Height	MI	3.89	$750,400.00	$2,919,056.00
				Sub Total Illumination	**$2,919,056.00**
	Signing				
Signing	Other Roadways	MI	3.89	$30,000.00	$116,700.00
				Sub Total Signing	**$116,700.00**
	Pavement Markings				
Striping	Freeway 4 Lanes	MI	5.31	$75,000.00	$398,250.00
				Sub Total Pavement Markings	**$398,250.00**
	CTMS/Signals				
CTMS	Conduit	MI	3.89	$300,000.00	$1,167,000.00
CTMS	Devices	MI	3.89	$250,000.00	$972,500.00
Landscaping	Complete w/ Irrigation	SF	50,000.00	$3.25	$162,500.00
				Sub Total Landscaping	**$162,500.00**
				Sub Total of All Above	**$107,096,246.00**

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
500	**Mobilization**	LS	1.00	10 %	**$10,709,624.60**
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	**$10,709,624.60**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Complex Projects (Fwy Reconstruction)	MO	24.00	$50,000.00	$1,200,000.00
				Sub Total Traffic Control	**$1,200,000.00**
Project Sub Total					**$129,715,495.20**
Contingencies				**20%**	**$25,943,099.04**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$155,658,594.24**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$161,884,938.01**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$168,360,335.53**

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 2C - Strategy 2A with Variable Pricing
Limits:	
Length:	10.07 Mile Proposed at grade
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

9/4/2008

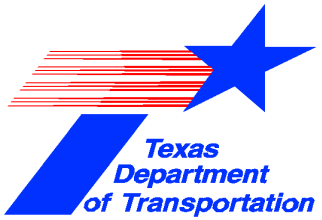
ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
6	**Traffic Barrier & Guard Fence**				
540	Metal W Beam Guard Fence (Ty II) (Timber Post)	LF	0.00	$30.00	$0.00
512	Concrete Traffic Barrier (Furnish & Install)	LF	62,193.00	$45.00	$2,798,685.00
544	Guardrail End Treatment (Inst) (Wood Post) (Ty II)	EA	0.00	$2,500.00	$0.00
545	Crash Cushion Attenuator (Install) (REACT) (N)	EA	0.00	$14,000.00	$0.00
7	**Signing, Lighting & Pavement Markings**				
Signing	Freeway - Mainlanes	MI	10.07	$25,000.00	$251,750.00
Striping	Freeway 4 Lanes	MI	10.07	$75,000.00	$755,250.00
8	**Traffic Signals & Computerized Traffic Management**				
CTMS	Devices	MI	10.07	$250,000.00	$2,517,500.00
				Sub-Total of All the Above	**$6,323,185.00**
13	**Mobilization**	LS	1.00	10 %	$632,318.50
14	**Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas**	LS	1.00	10 %	$632,318.50
15	**Traffic Control (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	12.00	$25,000.00	$300,000.00
				Project Sub Total Estimate	$7,887,822.00
				Contingency (20%)	$1,577,564.40
				Total TxDOT Cost for Current FY	$9,465,386.40
				Total TxDOT Cost for FY+1	$9,844,001.86
				Total TxDOT Cost for FY+2	$10,237,761.93

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 2B - Bidirectional HOV/HOT Lanes Using GP Lane ROW
Limits:	
Length:	
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

New Roadway	$	405,900	Schematic Development (3%)	$	543,008
	$	11,527,033	PS&E Design (10%)	$	1,810,026
			Operation & Maintenance (20 years)	$	1,344,680
Exist HOV	$	6,167,326			
			Total construction, Schematic Dev.,		
Total Construction	**$**	**18,100,259**	**Design, and Operation & Maintenance**	**$**	**21,797,973**

Design and Construction Issues:
1) Requires taking shoulder through BW8
2) Requires taking of shoulder at T-ramp landings.
3) Requires widening of the existing elevated HOV lane on both sides of IH-610 interchange
4) Proposed HOV lane requires weaving through columns under IH-610

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 2B - Bidirectional HOV/HOT Lanes Using GP Lane ROW
Limits:	
Length:	.12 Miles Prop HOV lane through IH-610
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015



DESCRIPTION	UNITS	EST. QTY.	COST PER MILE	AMOUNT
1-Lane Curb and Gutter Road Section	MI	0.12	$2,750,000.00	$338,250.00
			20% Contingencies	**$67,650.00**
			Total	**$405,900.00**

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 2B - Bidirectional HOV/HOT Lanes Using GP Lane ROW
Limits:	S Rice Ave to Newcastle Dr.
Length:	0.95 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
100	Preparing ROW	AC	2.00	$18,000.00	$36,000.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	5,016.00	$50.00	$250,800.00
512	Port Conc Traffic Barrier (Move) (Sgl Slp) (Ty 1)	LF	10,032.00	$10.00	$100,320.00
512	Port Conc Traffic Barrier (Stkpl) (Sgl Slp) (Ty 1)	LF	10,032.00	$10.00	$100,320.00
				Sub Total Roadway	**$487,440.00**
	Bridge				
Bridge	Pre-stressed Concrete I-Beam On System	SF	41,310.00	$50.00	$2,065,500.00
Bridge	Steel Plate Girder On System	SF	9,000.00	$150.00	$1,350,000.00
				Sub Total Bridge	**$3,415,500.00**
	Drainage				
Storm Drains	Freeway Mainlanes & Frontage Roads	MI	0.95	$2,500,000.00	$2,375,000.00
SW3P	Stormwater Pollution Prevention Plan - Major	MI	0.95	$62,000.00	$58,900.00
				Sub Total Drainage	**$2,433,900.00**
	Signing				
Signing	Other Roadways	MI	0.95	$30,000.00	$28,500.00
				Sub Total Signing	**$28,500.00**
	Pavement Markings				
Striping	Freeway 4 Lanes	MI	0.48	$75,000.00	$35,625.00
				Sub Total Pavement Markings	**$35,625.00**
				Sub Total of All Above	**$6,400,965.00**
500	**Mobilization**	LS	1.00	10 %	**$640,096.50**
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	**$640,096.50**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Complex Projects (Fwy Reconstruction)	MO	24.00	$50,000.00	$1,200,000.00
				Sub Total Traffic Control	**$1,200,000.00**

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
Project Sub Total					$8,881,158.00
Contingency				20%	$1,776,231.60
For this Fiscal Year (FY 0)				Project Total for Current FY	$10,657,389.60
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				Project Total FY+1 yr	$11,083,685.18
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				Project Total FY+2 yr	$11,527,032.59

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 2B - Bidirectional HOV/HOT Lanes Using GP Lane ROW
Limits:	
Length:	10.07 Mile Proposed at grade
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

9/4/2008

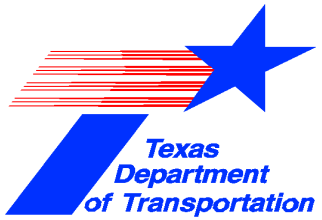
ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
6	**Traffic Barrier & Guard Fence**				
512	Concrete Traffic Barrier (Furnish & Install)	LF	53,200.00	$45.00	$2,394,000.00
512	Port Conc Traffic Barrier (Move) (Sgl Slp) (Ty 1)	LF	53,200.00	$10.00	$532,000.00
512	Port Conc Traffic Barrier (Stkpl) (Sgl Slp) (Ty 1)	LF	53,200.00	$10.00	$532,000.00
7	**Signing, Lighting & Pavement Markings**				
Signing	Freeway - Mainlanes	MI	10.07	$25,000.00	$251,750.00
				Sub-Total of All the Above	**$3,709,750.00**
13	**Mobilization**	LS	1.00	10 %	**$370,975.00**
14	**Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas**	LS	1.00	10 %	**$370,975.00**
15	**Traffic Control (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	12.00	$25,000.00	**$300,000.00**
				Project Sub Total Estimate	**$4,751,700.00**
				Contingency (20%)	**$950,340.00**
				Total TxDOT Cost for Current FY	**$5,702,040.00**
				Total TxDOT Cost for FY+1	**$5,930,121.60**
				Total TxDOT Cost for FY+2	**$6,167,326.46**

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 2A - Bidirectional HOT/HOV Lanes
Limits:	
Length:	3.89 mile elevated, 10.07 mile at grade, 1.42 mile HOV removal
Estimate By:	BGE-Transportation Systems
Date:	6-3-2015

New Roadway	$	25,674,000	Schematic Development (3%)	$	6,010,532
	$	168,360,336	PS&E Design (10%)	$	20,035,108
			Operation & Maintenance (20 years)	$	11,222,600
Exist HOV	$	6,316,746			
			Total construction, Schematic Dev.,		
Total Construction	**$**	**200,351,081**	**Design, and Operation & Maintenance**	**$**	**237,619,322**

Design and Construction Issues:
1) Requires the use of a shoulder and mainlane, each direction under Beltway 8
2) Possible mainlane encroachment at base of T-ramps.
3) Two-way elevated option from IH 610 to Edloe not feasible due to TxDOT adding westbound Chimney Rock exit ramp.
4) Costly elevated structure.

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 2A - Bidirectional HOT/HOV Lanes
Limits:	
Length:	3.89 Mile Elevated
Estimate By:	BGE-Transportation Systems
Date:	6-3-2015



DESCRIPTION	UNITS	EST. QTY.	COST PER MILE	AMOUNT
2-Lane Curb and Gutter Frontage Road Section (One Direction)	MI	3.89	$5,500,000.00	$21,395,000.00
			20% Contingencies	**$4,279,000.00**
			Total	**$25,674,000.00**

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 2A - Bidirectional HOT/HOV Lanes
Limits:	
Length:	3.89 Mile elevated, 1.42 HOV Removal
Estimate By:	BGE-Transportation Systems
Date:	6-3-2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
100	Preparing ROW	AC	18.87	$18,000.00	$339,660.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	41,128.00	$50.00	$2,056,400.00
512	Port Conc Traffic Barrier (Move) (Sgl Slp) (Ty 1)	LF	15,000.00	$10.00	$150,000.00
512	Port Conc Traffic Barrier (Stkpl) (Sgl Slp) (Ty 1)	LF	15,000.00	$10.00	$150,000.00
				Sub Total Roadway	**$2,696,060.00**
	Bridge				
Bridge	Pre-stressed Concrete Box Beam On System	SF	462,480.00	$75.00	$34,686,000.00
Bridge	Steel Plate Girder On System	SF	360,080.00	$150.00	$54,012,000.00
				Sub Total Bridge	**$88,698,000.00**
	Drainage				
Storm Drains	Freeway Mainlanes & Frontage Roads	MI	3.89	$2,500,000.00	$9,725,000.00
SW3P	Stormwater Pollution Prevention Plan - Major	MI	3.89	$62,000.00	$241,180.00
				Sub Total Drainage	**$9,966,180.00**
	Illumination				
Lighting	High Mast Continuous 175' Mounting Height	MI	3.89	$750,400.00	$2,919,056.00
				Sub Total Illumination	**$2,919,056.00**
	Signing				
Signing	Other Roadways	MI	3.89	$30,000.00	$116,700.00
				Sub Total Signing	**$116,700.00**
	Pavement Markings				
Striping	Freeway 4 Lanes	MI	5.31	$75,000.00	$398,250.00
				Sub Total Pavement Markings	**$398,250.00**
	CTMS/Signals				
CTMS	Conduit	MI	3.89	$300,000.00	$1,167,000.00
CTMS	Devices	MI	3.89	$250,000.00	$972,500.00
Landscaping	Complete w/ Irrigation	SF	50,000.00	$3.25	$162,500.00
				Sub Total Landscaping	**$162,500.00**
				Sub Total of All Above	**$107,096,246.00**

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
500	**Mobilization**	LS	1.00	10 %	$10,709,624.60
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	$10,709,624.60
502	**Traffic Control Plan (TCP)**				
Traffic Control	Complex Projects (Fwy Reconstruction)	MO	24.00	$50,000.00	$1,200,000.00
				Sub Total Traffic Control	$1,200,000.00
Project Sub Total					**$129,715,495.20**
Contingencies				**20%**	**$25,943,099.04**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$155,658,594.24**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$161,884,938.01**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$168,360,335.53**

Highway:	US59
County:	Harris
CSJ:	
Filename:	
Description:	Strategy 2A - Bidirectional HOT/HOV Lanes
Limits:	
Length:	10.07 Mile Proposed at grade
Estimate By:	BGE-Transportation Systems
Date:	6-3-2015

Texas Department of Transportation

9/4/2008

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
6	**Traffic Barrier & Guard Fence**				
512	Concrete Traffic Barrier (Furnish & Install)	LF	62,193.00	$45.00	$2,798,685.00
7	**Signing, Lighting & Pavement Markings**				
Signing	Freeway - Mainlanes	MI	10.07	$25,000.00	$251,750.00
Striping	Freeway 4 Lanes	MI	10.07	$75,000.00	$755,250.00
13	**Mobilization**	LS	1.00	10 %	$380,568.50
14	**Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas**	LS	1.00	10 %	$380,568.50
15	**Traffic Control (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	12.00	$25,000.00	$300,000.00
				Project Sub Total Estimate	$4,866,822.00
				Contingency (20%)	$973,364.40
				Total TxDOT Cost for Current FY	$5,840,186.40
				Total TxDOT Cost for FY+1	$6,073,793.86
				Total TxDOT Cost for FY+2	$6,316,745.61

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1H Alternative 2 - Additional Auxiliary Lane at SB Westpark Toll Exit
Description:	
Limits:	
Length:	0.44 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

Total Construction	**$**	**166,783**	Schematic Development (3%)	$ 5,003
			PS&E Design (20%)	$ 33,357
			Operation & Maintenance (20 years)	$ 276,000

Design and Construction Issues:
1) Shoulder elimination required.

Total construction, Schematic Dev., Design, and Operation & Maintenance **$ 481,143**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1H Alternative 2 - Additional Auxiliary Lane at SB Westpark Toll Exit
Description:	
Limits:	
Length:	0.44 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.44	$100,000.00	$44,000.00
				Sub Total Pavement Markings	**$44,000.00**
				Sub Total of All Above	**$69,000.00**
500	**Mobilization**	LS	1.00	25 %	**$17,250.00**
	Unit Cost Factor Due to Small Quantities / Project			25%	**$17,250.00**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	**$25,000.00**
Project Sub Total					**$128,500.00**
Contingencies				**20%**	**$25,700.00**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$154,200.00**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$160,368.00**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$166,782.72**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1H Alternative 1 - Removal of Westpark Dr. Exit Ramp and Extend Aux. Lane to Westpark Toll Exit
Description:	
Limits:	
Length:	0.44 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

Total Construction	**$**	**258,578**	Schematic Development (3%)	$ 7,757
			PS&E Design (20%)	$ 51,716
			Operation & Maintenance (20 years)	$ 276,000
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 594,051**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1H Alternative 1 - Removal of Westpark Dr. Exit Ramp and Extend Aux. Lane to Westpark Toll Exit
Description:	
Limits:	
Length:	0.44 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	2,225.00	$7.00	$15,575.00
360	Conc Curb (Ty II) (6")	LF	350.00	$4.50	$1,575.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	600.00	$50.00	$30,000.00
				Sub Total Roadway	**$47,150.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.44	$100,000.00	$44,000.00
				Sub Total Pavement Markings	**$44,000.00**
				Sub Total of All Above	**$116,150.00**
500	**Mobilization**	LS	1.00	25 %	**$29,037.50**
	Unit Cost Factor Due to Small Quantities / Project			25%	**$29,037.50**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	**$25,000.00**
Project Sub Total					**$199,225.00**
Contingencies				**20%**	**$39,845.00**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$239,070.00**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$248,632.80**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$258,578.11**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1G - Ramp Removals from BW8 Frontage Roads
Description:	
Limits:	
Length:	0.29 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

Total Construction	**$**	**230,253**	Schematic Development (3%)	$	6,908
			PS&E Design (20%)	$	46,051
			Operation & Maintenance (20 years)	$	179,640
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$**	**462,851**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1G - Ramp Removals from BW8 Frontage Roads
Description:	
Limits:	
Length:	0.29 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	3,165.00	$7.00	$22,155.00
360	Conc Curb (Ty II) (6")	LF	850.00	$4.50	$3,825.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	840.00	$50.00	$42,000.00
				Sub Total Roadway	**$67,980.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
Signing	Frontage Roads Both Sides	MI	0.50	$30,000.00	$15,000.00
				Sub Total Signing	**$40,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.03	$100,000.00	$3,200.00
Striping	Rural Frontage Roads - Both Sides - 3 Lanes	MI	0.04	$45,000.00	$1,710.00
				Sub Total Pavement Markings	**$4,910.00**
				Sub Total of All Above	**$112,890.00**
500	**Mobilization**	LS	1.00	10 %	**$11,289.00**
	Unit Cost Factor Due to Small Quantities / Project			25%	**$28,222.50**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	**$25,000.00**
Project Sub Total					**$177,401.50**
Contingencies				**20%**	**$35,480.30**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$212,881.80**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$221,397.07**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$230,252.95**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 7- Remove Exit Ramp
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Strategy 1F NB Alternatives	Total Construction, Schematic Dev., Design, and Operation & Maintenance
7	$ 398,753
8A	$ 423,936
8B	$ 654,144
9A	$ 916,439
9B	$ 1,063,516
10	$ 11,957,412
11A	$ 8,907,136
11B	$ 9,122,415
12A	$ 20,864,547
12B	$ 21,002,087

Design and Construction Issues:
1) Bypass lanes seem unnecessary due to high cost for small benefit.

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 7- Remove Exit Ramp
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Total Construction	**$**	**195,051**	Schematic Development (3%)	$ 5,852
			PS&E Design (20%)	$ 39,010
			Operation & Maintenance (20 years)	$ 158,840
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 398,753**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 7- Remove Exit Ramp
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	5/28/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	1,780.00	$7.00	$12,460.00
360	Conc Curb (Ty II) (6")	LF	300.00	$4.50	$1,350.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	600.00	$50.00	$30,000.00
				Sub Total Roadway	**$43,810.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.13	$100,000.00	$13,000.00
Striping	Rural Frontage Roads - Both Sides - 3 Lanes	MI	0.04	$45,000.00	$1,710.00
				Sub Total Pavement Markings	**$14,710.00**
				Sub Total of All Above	**$83,520.00**
500	**Mobilization**	LS	1.00	25 %	**$20,880.00**
	Unit Cost Factor Due to Small Quantities / Project			25%	**$20,880.00**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	**$25,000.00**
Project Sub Total					**$150,280.00**
Contingencies				**20%**	**$30,056.00**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$180,336.00**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$187,549.44**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$195,051.42**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 8A- Remove Entrance Ramp
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

Total Construction	**$**	**198,274**	Schematic Development (3%)	$ 5,948
			PS&E Design (20%)	$ 39,655
			Operation & Maintenance (20 years)	$ 180,060
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 423,936**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 8A- Remove Entrance Ramp
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	1,780.00	$7.00	$12,460.00
360	Conc Curb (Ty II) (6")	LF	600.00	$4.50	$2,700.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	500.00	$50.00	$25,000.00
				Sub Total Roadway	**$40,160.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.17	$100,000.00	$17,000.00
Striping	Rural Frontage Roads - Both Sides - 3 Lanes	MI	0.07	$45,000.00	$3,015.00
				Sub Total Pavement Markings	**$20,015.00**
				Sub Total of All Above	**$85,175.00**
500	**Mobilization**	LS	1.00	25 %	**$21,293.75**
	Unit Cost Factor Due to Small Quantities / Project			25%	**$21,293.75**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	**$25,000.00**
Project Sub Total					**$152,762.50**
Contingencies				**20%**	**$30,552.50**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$183,315.00**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$190,647.60**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$198,273.50**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 8B- Remove Entrance Ramp & Add Auxiliary Lane
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	5/28/2015

Texas Department of Transportation

Total Construction	**$**	**268,361**	Schematic Development (3%)	$ 8,051
			PS&E Design (20%)	$ 53,672
			Operation & Maintenance (20 years)	$ 324,060
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 654,144**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 8B- Remove Entrance Ramp & Add Auxiliary Lane
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	1,780.00	$7.00	$12,460.00
360	Conc Curb (Ty II) (6")	LF	600.00	$4.50	$2,700.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	500.00	$50.00	$25,000.00
				Sub Total Roadway	**$40,160.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.53	$100,000.00	$53,000.00
Striping	Rural Frontage Roads - Both Sides - 3 Lanes	MI	0.07	$45,000.00	$3,015.00
				Sub Total Pavement Markings	**$56,015.00**
				Sub Total of All Above	**$121,175.00**
500	**Mobilization**	LS	1.00	25 %	**$30,293.75**
	Unit Cost Factor Due to Small Quantities / Project			25%	**$30,293.75**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	**$25,000.00**
Project Sub Total					**$206,762.50**
Contingencies				**20%**	**$41,352.50**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$248,115.00**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$258,039.60**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$268,361.18**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 9A- Remove Entrance & Exit Ramps
Description:	
Limits:	
Length:	0.44 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

Total Construction	**$**	**408,975**	Schematic Development (3%)	$ 12,269
			PS&E Design (20%)	$ 81,795
			Operation & Maintenance (20 years)	$ 413,400
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 916,439**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 9A- Remove Entrance & Exit Ramps
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	5/28/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	3,560.00	$7.00	$24,920.00
360	Conc Curb (Ty II) (6")	LF	1,140.00	$4.50	$5,130.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	1,200.00	$50.00	$60,000.00
				Sub Total Roadway	**$90,050.00**
	Signing				
Signing	Freeway Mainlanes	MI	2.00	$25,000.00	$50,000.00
				Sub Total Signing	**$50,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.43	$100,000.00	$43,000.00
Striping	Rural Frontage Roads - Both Sides - 3 Lanes	MI	0.23	$45,000.00	$10,350.00
				Sub Total Pavement Markings	**$53,350.00**
				Sub Total of All Above	**$193,400.00**
500	**Mobilization**	LS	1.00	25 %	**$48,350.00**
	Unit Cost Factor Due to Small Quantities / Project			25%	**$48,350.00**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	**$25,000.00**
Project Sub Total					**$315,100.00**
Contingencies				**20%**	**$63,020.00**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$378,120.00**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$393,244.80**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$408,974.59**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 9B- Remove Entrance & Exit Ramps & Add Auxiliary Lane
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

Total Construction	**$**	**453,753**	Schematic Development (3%)	$ 13,613
			PS&E Design (20%)	$ 90,751
			Operation & Maintenance (20 years)	$ 505,400
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 1,063,516**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 9B- Remove Entrance & Exit Ramps & Add Auxiliary Lane
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	3,560.00	$7.00	$24,920.00
360	Conc Curb (Ty II) (6")	LF	1,140.00	$4.50	$5,130.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	1,200.00	$50.00	$60,000.00
				Sub Total Roadway	**$90,050.00**
	Signing				
Signing	Freeway Mainlanes	MI	2.00	$25,000.00	$50,000.00
				Sub Total Signing	**$50,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.66	$100,000.00	$66,000.00
Striping	Rural Frontage Roads - Both Sides - 3 Lanes	MI	0.23	$45,000.00	$10,350.00
				Sub Total Pavement Markings	**$76,350.00**
				Sub Total of All Above	**$216,400.00**
500	**Mobilization**	LS	1.00	25 %	**$54,100.00**
	Unit Cost Factor Due to Small Quantities / Project			25%	**$54,100.00**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	**$25,000.00**
Project Sub Total					**$349,600.00**
Contingencies				**20%**	**$69,920.00**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$419,520.00**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$436,300.80**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$453,752.83**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 10- Remove Entrance Ramp & Add Bypass
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

Total Construction	**$**	**10,122,783**	Schematic Development (3%)	$ 303,683
			PS&E Design (10%)	$ 1,012,278
			Operation & Maintenance (20 years)	$ 518,667
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 11,957,412**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 10- Remove Exit Ramp & Add Bypass
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	1,780.00	$7.00	$12,460.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	600.00	$50.00	$30,000.00
				Sub Total Roadway	**$42,460.00**
	Bridge				
Bridge	Steel Plate Girder On System	SF	35,200.00	$150.00	$5,280,000.00
				Sub Total Bridge	**$5,280,000.00**
	Drainage				
Storm Drains	Urban Roadway 4-Lane Curb & Gutter w/ Center Left Turn Lane	MI	0.10	$1,600,000.00	$160,000.00
				Sub Total Drainage	**$160,000.00**
	Illumination				
Lighting	High Mast Continuous 150' Mounting Height	MI	0.22	$662,000.00	$145,640.00
				Sub Total Illumination	**$145,640.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.13	$100,000.00	$13,000.00
				Sub Total Pavement Markings	**$13,000.00**
				Sub Total of All Above	**$5,666,100.00**
500	**Mobilization**	LS	1.00	25 %	**$1,416,525.00**
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	**$566,610.00**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	6.00	$25,000.00	$150,000.00
				Sub Total Traffic Control	**$150,000.00**
Project Sub Total					**$7,799,235.00**
Contingencies				**20%**	**$1,559,847.00**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$9,359,082.00**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$9,733,445.28**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$10,122,783.09**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 11A- Remove Entrance Ramp & Add Bypass
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Total Construction	**$**	**7,503,291**	Schematic Development (3%)	$ 225,099
			PS&E Design (10%)	$ 750,329
			Operation & Maintenance (20 years)	$ 428,417
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 8,907,136**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 11A- Remove Entrance Ramp & Add Bypass
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
100	Preparing ROW	AC	0.53	$18,000.00	$9,540.00
104	Removing Concrete (Pavement)	SY	1,780.00	$7.00	$12,460.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	500.00	$50.00	$25,000.00
				Sub Total Roadway	**$47,000.00**
	Bridge				
Bridge	Steel Plate Girder On System	SF	25,000.00	$150.00	$3,750,000.00
				Sub Total Bridge	**$3,750,000.00**
	Drainage				
Storm Drains	Urban Roadway 4-Lane Curb & Gutter w/ Center Left Turn Lane	MI	0.10	$1,600,000.00	$160,000.00
				Sub Total Drainage	**$160,000.00**
	Illumination				
Lighting	High Mast Continuous 150' Mounting Height	MI	0.26	$662,000.00	$172,120.00
				Sub Total Illumination	**$172,120.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.17	$100,000.00	$17,000.00
				Sub Total Pavement Markings	**$17,000.00**
				Sub Total of All Above	**$4,171,120.00**
500	**Mobilization**	LS	1.00	25 %	**$1,042,780.00**
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	**$417,112.00**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	6.00	$25,000.00	$150,000.00
				Sub Total Traffic Control	**$150,000.00**
Project Sub Total					**$5,781,012.00**
Contingencies				**20%**	**$1,156,202.40**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$6,937,214.40**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$7,214,702.98**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$7,503,291.10**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 11B- Entrance Ramp Removal & Add Bypass & Add Auxiliary Lane
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Total Construction	**$**	**7,566,370**	Schematic Development (3%)	$ 226,991
			PS&E Design (10%)	$ 756,637
			Operation & Maintenance (20 years)	$ 572,417
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 9,122,415**

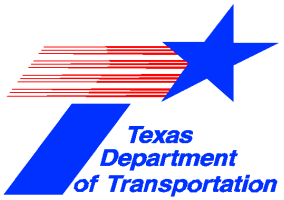
Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 11B- Entrance Ramp Removal & Add Bypass & Add Auxiliary Lane
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
100	Preparing ROW	AC	0.53	$18,000.00	$9,540.00
104	Removing Concrete (Pavement)	SY	1,780.00	$7.00	$12,460.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	500.00	$50.00	$25,000.00
				Sub Total Roadway	**$47,000.00**
	Bridge				
Bridge	Steel Plate Girder On System	SF	25,000.00	$150.00	$3,750,000.00
				Sub Total Bridge	**$3,750,000.00**
	Drainage				
Storm Drains	Urban Roadway 4-Lane Curb & Gutter w/ Center Left Turn Lane	MI	0.10	$1,600,000.00	$160,000.00
				Sub Total Drainage	**$160,000.00**
	Illumination				
Lighting	High Mast Continuous 150' Mounting Height	MI	0.26	$662,000.00	$172,120.00
				Sub Total Illumination	**$172,120.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.53	$100,000.00	$53,000.00
				Sub Total Pavement Markings	**$53,000.00**
				Sub Total of All Above	**$4,207,120.00**
500	**Mobilization**	LS	1.00	25 %	**$1,051,780.00**
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	**$420,712.00**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	6.00	$25,000.00	$150,000.00
				Sub Total Traffic Control	**$150,000.00**
Project Sub Total					**$5,829,612.00**
Contingencies				**20%**	**$1,165,922.40**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$6,995,534.40**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$7,275,355.78**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$7,566,370.01**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 12A- Remove Entrance & Exit Ramps & Add Two Bypass Lanes
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015



Total Construction	**$**	**17,626,074**	Schematic Development (3%)	$ 528,782
			PS&E Design (10%)	$ 1,762,607
			Operation & Maintenance (20 years)	$ 947,083
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 20,864,547**

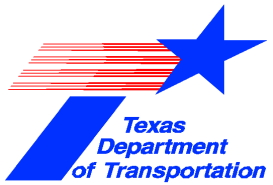
Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 12A- Remove Entrance & Exit Ramps & Add Two Bypass Lanes
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
100	Preparing ROW	AC	0.53	$18,000.00	$9,540.00
104	Removing Concrete (Pavement)	SY	3,560.00	$7.00	$24,920.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	1,100.00	$50.00	$55,000.00
				Sub Total Roadway	**$89,460.00**
	Bridge				
Bridge	Steel Plate Girder On System	SF	60,200.00	$150.00	$9,030,000.00
				Sub Total Bridge	**$9,030,000.00**
	Drainage				
Storm Drains	Urban Roadway 4-Lane Curb & Gutter w/ Center Left Turn Lane	MI	0.20	$1,600,000.00	$320,000.00
				Sub Total Drainage	**$320,000.00**
	Illumination				
Lighting	High Mast Continuous 150' Mounting Height	MI	0.48	$662,000.00	$317,760.00
				Sub Total Illumination	**$317,760.00**
	Signing				
Signing	Freeway Mainlanes	MI	2.00	$25,000.00	$50,000.00
				Sub Total Signing	**$50,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.30	$100,000.00	$30,000.00
				Sub Total Pavement Markings	**$30,000.00**
				Sub Total of All Above	**$9,837,220.00**
500	**Mobilization**	LS	1.00	25 %	**$2,459,305.00**
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	**$983,722.00**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	12.00	$25,000.00	$300,000.00
				Sub Total Traffic Control	**$300,000.00**
Project Sub Total					**$13,580,247.00**
Contingencies				**20%**	**$2,716,049.40**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$16,296,296.40**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$16,948,148.26**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$17,626,074.19**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 12B - Remove Entrance & Exit Ramps & Add Two Bypass Lanes & Add Auxiliary Lane
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015



Total Construction	**$**	**17,666,375**	Schematic Development (3%)	$ 529,991
			PS&E Design (10%)	$ 1,766,637
			Operation & Maintenance (20 years)	$ 1,039,083
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 21,002,087**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 12B- Remove Entrance & Exit Ramps & Add Two Bypass Lanes & Add Auxiliary Lane
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
100	Preparing ROW	AC	0.53	$18,000.00	$9,540.00
104	Removing Concrete (Pavement)	SY	3,560.00	$7.00	$24,920.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	1,100.00	$50.00	$55,000.00
				Sub Total Roadway	**$89,460.00**
	Bridge				
Bridge	Steel Plate Girder On System	SF	60,200.00	$150.00	$9,030,000.00
				Sub Total Bridge	**$9,030,000.00**
	Drainage				
Storm Drains	Urban Roadway 4-Lane Curb & Gutter w/ Center Left Turn Lane	MI	0.20	$1,600,000.00	$320,000.00
				Sub Total Drainage	**$320,000.00**
	Illumination				
Lighting	High Mast Continuous 150' Mounting Height	MI	0.48	$662,000.00	$317,760.00
				Sub Total Illumination	**$317,760.00**
	Signing				
Signing	Freeway Mainlanes	MI	2.00	$25,000.00	$50,000.00
				Sub Total Signing	**$50,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.53	$100,000.00	$53,000.00
				Sub Total Pavement Markings	**$53,000.00**
				Sub Total of All Above	**$9,860,220.00**
500	**Mobilization**	LS	1.00	25 %	**$2,465,055.00**
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	**$986,022.00**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	12.00	$25,000.00	$300,000.00
				Sub Total Traffic Control	**$300,000.00**
Project Sub Total					**$13,611,297.00**
Contingencies				**20%**	**$2,722,259.40**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$16,333,556.40**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$16,986,898.66**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$17,666,374.60**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Northbound Alternatives 1A - 6B
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Strategy 1F NB Alternatives	Total Construction, Schematic Dev., Design, and Operation & Maintenance
1A	$ 346,125
1B	$ 630,048
2	$ 426,615
3A	$ 830,021
3B	$ 970,704
4	$ 3,811,908
5A	$ 8,143,437
5B	$ 8,406,497
6A	$ 11,907,505
6B	$ 12,218,464

Design and Construction Issues:
1) Bypass lanes seem unnecessary due to high cost for small benefit.

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 1A - Remove Entrance Ramp
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

Total Construction	**$**	**167,338**	Schematic Development (3%)	$ 5,020
			PS&E Design (20%)	$ 33,468
			Operation & Maintenance (20 years)	$ 140,300
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 346,125**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 1A - Remove Entrance Ramp
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	1,780.00	$7.00	$12,460.00
360	Conc Curb (Ty II) (6")	LF	500.00	$4.50	$2,250.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	390.00	$50.00	$19,500.00
				Sub Total Roadway	**$34,210.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.08	$100,000.00	$7,600.00
Striping	Rural Frontage Roads - Both Sides - 3 Lanes	MI	0.06	$45,000.00	$2,475.00
				Sub Total Pavement Markings	**$10,075.00**
				Sub Total of All Above	**$69,285.00**
500	**Mobilization**	LS	1.00	25 %	**$17,321.25**
	Unit Cost Factor Due to Small Quantities / Project			25%	$17,321.25
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	**$25,000.00**
Project Sub Total					**$128,927.50**
Contingencies				**20%**	**$25,785.50**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$154,713.00**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$160,901.52**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$167,337.58**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 1B - Remove Entrance Ramp & Add Auxilary Lane Using Existing Shoulder
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Total Construction	**$**	**253,779**	Schematic Development (3%)	$ 7,613
			PS&E Design (20%)	$ 50,756
			Operation & Maintenance (20 years)	$ 317,900
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 630,048**

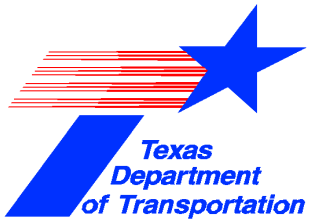
Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 1B - Remove Entrance Ramp & Add Auxilary Lane Using Existing Shoulder
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	1,780.00	$7.00	$12,460.00
360	Conc Curb (Ty II) (6")	LF	500.00	$4.50	$2,250.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	390.00	$50.00	$19,500.00
				Sub Total Roadway	**$34,210.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.52	$100,000.00	$52,000.00
Striping	Rural Frontage Roads - Both Sides - 3 Lanes	MI	0.06	$45,000.00	$2,475.00
				Sub Total Pavement Markings	**$54,475.00**
				Sub Total of All Above	**$113,685.00**
500	**Mobilization**	LS	1.00	25 %	**$28,421.25**
	Unit Cost Factor Due to Small Quantities / Project			25%	**$28,421.25**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	**$25,000.00**
Project Sub Total					**$195,527.50**
Contingencies				**20%**	**$39,105.50**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$234,633.00**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$244,018.32**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$253,779.05**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 2 - Remove Exit Ramp
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015



Total Construction	**$ 196,801**	Schematic Development (3%)	$	5,904
		PS&E Design (20%)	$	39,360
		Operation & Maintenance (20 years)	$	184,550
		Total construction, Schematic Dev., Design, and Operation & Maintenance	**$**	**426,615**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 2 - Remove Exit Ramp
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	1,845.00	$7.00	$12,915.00
360	Conc Curb (Ty II) (6")	LF	500.00	$4.50	$2,250.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	800.00	$50.00	$40,000.00
				Sub Total Roadway	**$55,165.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.19	$100,000.00	$19,000.00
Striping	Rural Frontage Roads - Both Sides - 3 Lanes	MI	0.05	$45,000.00	$2,137.50
				Sub Total Pavement Markings	**$21,137.50**
				Sub Total of All Above	**$101,302.50**
500	**Mobilization**	LS	1.00	25 %	**$25,325.63**
	Unit Cost Factor Due to Small Quantities / Project			25%	**$25,325.63**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	**$25,000.00**
Project Sub Total					**$151,628.13**
Contingencies				**20%**	**$30,325.63**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$181,953.75**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$189,231.90**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$196,801.18**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 3A - Remove Exit & Entrance Ramps
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Total Construction	**$**	**402,139**	Schematic Development (3%)	$ 12,064
			PS&E Design (20%)	$ 80,428
			Operation & Maintenance (20 years)	$ 335,390
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 830,021**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 3A - Remove Exit & Entrance Ramps
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

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ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	3,625.00	$7.00	$25,375.00
360	Conc Curb (Ty II) (6")	LF	1,000.00	$4.50	$4,500.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	1,190.00	$50.00	$59,500.00
				Sub Total Roadway	**$89,375.00**
	Signing				
Signing	Freeway Mainlanes	MI	2.00	$25,000.00	$50,000.00
				Sub Total Signing	**$50,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.30	$100,000.00	$30,000.00
Striping	Rural Frontage Roads - Both Sides - 3 Lanes	MI	0.09	$45,000.00	$3,847.50
				Sub Total Pavement Markings	**$33,847.50**
				Sub Total of All Above	**$173,222.50**
500	**Mobilization**	LS	1.00	25 %	**$43,305.63**
	Unit Cost Factor Due to Small Quantities / Project			25%	**$43,305.63**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	2.00	$25,000.00	$50,000.00
				Sub Total Traffic Control	**$50,000.00**
Project Sub Total					**$309,833.75**
Contingencies				**20%**	**$61,966.75**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$371,800.50**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$386,672.52**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$402,139.42**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 3B - Remove Exit & Entrance Ramps & Add Auxiliary Lane
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Total Construction	**$ 444,971**	Schematic Development (3%)	$	13,349
		PS&E Design (20%)	$	88,994
		Operation & Maintenance (20 years)	$	423,390
		Total construction, Schematic Dev., Design, and Operation & Maintenance	**$**	**970,704**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 3B - Remove Exit & Entrance Ramps & Add Auxiliary Lane
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

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ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	3,625.00	$7.00	$25,375.00
360	Conc Curb (Ty II) (6")	LF	1,000.00	$4.50	$4,500.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	1,190.00	$50.00	$59,500.00
				Sub Total Roadway	**$89,375.00**
	Signing				
Signing	Freeway Mainlanes	MI	2.00	$25,000.00	$50,000.00
				Sub Total Signing	**$50,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.52	$100,000.00	$52,000.00
Striping	Rural Frontage Roads - Both Sides - 3 Lanes	MI	0.09	$45,000.00	$3,847.50
				Sub Total Pavement Markings	**$55,847.50**
				Sub Total of All Above	**$195,222.50**
500	**Mobilization**	LS	1.00	25 %	**$48,805.63**
	Unit Cost Factor Due to Small Quantities / Project			25%	**$48,805.63**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	2.00	$25,000.00	$50,000.00
				Sub Total Traffic Control	**$50,000.00**
Project Sub Total					**$342,833.75**
Contingencies				**20%**	**$68,566.75**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$411,400.50**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$427,856.52**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$444,970.78**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 4 - Remove Exit Ramp & Add Bypass
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Total Construction	**$ 3,098,082**	Schematic Development (3%)	$	92,942
		PS&E Design (10%)	$	309,808
		Operation & Maintenance (20 years)	$	311,075
		Total construction, Schematic Dev., Design, and Operation & Maintenance	**$**	**3,811,908**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 4 - Remove Exit Ramp & Add Bypass
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

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ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
100	Preparing ROW	AC	0.29	$18,000.00	$5,292.00
104	Removing Concrete (Pavement)	SY	1,845.00	$7.00	$12,915.00
423	Retaining Wall (Cast in Place)	SF	10,500.00	$48.00	$504,000.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	800.00	$50.00	$40,000.00
				Sub Total Roadway	**$562,207.00**
	Bridge				
Bridge	Steel Plate Girder On System	SF	6,000.00	$150.00	$900,000.00
				Sub Total Bridge	**$900,000.00**
	Drainage				
Storm Drains	Urban Roadway 4-Lane Curb & Gutter w/ Center Left Turn Lane	MI	0.10	$1,600,000.00	$160,000.00
				Sub Total Drainage	**$160,000.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.10	$100,000.00	$9,800.00
				Sub Total Pavement Markings	**$9,800.00**
				Sub Total of All Above	**$1,657,007.00**
500	**Mobilization**	LS	1.00	25 %	**$414,251.75**
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	**$165,700.70**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	6.00	$25,000.00	$150,000.00
				Sub Total Traffic Control	**$150,000.00**
Project Sub Total					**$2,386,959.45**
Contingencies				**20%**	**$477,391.89**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$2,864,351.34**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$2,978,925.39**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$3,098,082.41**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 5A - Remove Entrance Ramp & Add Bypass
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

Total Construction	**$ 6,812,297**	Schematic Development (3%)	$	204,369
		PS&E Design (10%)	$	681,230
		Operation & Maintenance (20 years)	$	445,542
		Total construction, Schematic Dev., Design, and Operation & Maintenance	**$**	**8,143,437**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 5A - Remove Entrance Ramp & Add Bypass
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

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ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	1,780.00	$7.00	$12,460.00
423	Retaining Wall (Cast in Place)	SF	10,100.00	$48.00	$484,800.00
496	Remov Str (Bridge, 100' - 499', length)	EA	1.00	$55,000.00	$55,000.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	630.00	$50.00	$31,500.00
				Sub Total Roadway	**$583,760.00**
	Bridge				
Bridge	Steel Plate Girder On System	SF	20,000.00	$150.00	$3,000,000.00
				Sub Total Bridge	**$3,000,000.00**
	Drainage				
Storm Drains	Urban Roadway 4-Lane Curb & Gutter w/ Center Left Turn Lane	MI	0.10	$1,600,000.00	$160,000.00
				Sub Total Drainage	**$160,000.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.08	$100,000.00	$8,000.00
				Sub Total Pavement Markings	**$8,000.00**
				Sub Total of All Above	**$3,776,760.00**
500	**Mobilization**	LS	1.00	25 %	**$944,190.00**
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	**$377,676.00**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	6.00	$25,000.00	$150,000.00
				Sub Total Traffic Control	**$150,000.00**
Project Sub Total					**$5,248,626.00**
Contingencies				**20%**	**$1,049,725.20**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$6,298,351.20**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$6,550,285.25**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$6,812,296.66**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 5B - Remove Entrance Ramp & Add Bypass & Add Auxiliary Lar
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Total Construction	**$ 6,889,393**	Schematic Development (3%)	$ 206,682
		PS&E Design (10%)	$ 688,939
		Operation & Maintenance (20 years)	$ 621,482
		Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 8,406,497**

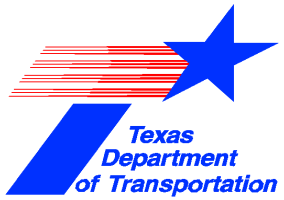
Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 5B - Remove Entrance Ramp & Add Bypass & Add Auxiliary Lane
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	1,780.00	$7.00	$12,460.00
423	Retaining Wall (Cast in Place)	SF	10,100.00	$48.00	$484,800.00
496	Remov Str (Bridge, 100' - 499', length)	EA	1.00	$55,000.00	$55,000.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	630.00	$50.00	$31,500.00
				Sub Total Roadway	**$583,760.00**
	Bridge				
Bridge	Steel Plate Girder On System	SF	20,000.00	$150.00	$3,000,000.00
				Sub Total Bridge	**$3,000,000.00**
	Drainage				
Storm Drains	Urban Roadway 4-Lane Curb & Gutter w/ Center Left Turn Lane	MI	0.10	$1,600,000.00	$160,000.00
				Sub Total Drainage	**$160,000.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.52	$100,000.00	$52,000.00
				Sub Total Pavement Markings	**$52,000.00**
				Sub Total of All Above	**$3,820,760.00**
500	**Mobilization**	LS	1.00	25 %	**$955,190.00**
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	**$382,076.00**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	6.00	$25,000.00	$150,000.00
				Sub Total Traffic Control	**$150,000.00**
Project Sub Total					**$5,308,026.00**
Contingencies				**20%**	**$1,061,605.20**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$6,369,631.20**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$6,624,416.45**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$6,889,393.11**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 6A - Remove Exit & Entrance Ramps & Add Two Bypass Lanes
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015



Total Construction	**$ 9,896,362**	Schematic Development (3%)	$	296,891
		PS&E Design (10%)	$	989,636
		Operation & Maintenance (20 years)	$	724,617
		Total construction, Schematic Dev., Design, and Operation & Maintenance	**$**	**11,907,505**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 6A - Remove Exit & Entrance Ramps & Add Two Bypass Lanes
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
100	Preparing ROW	AC	0.29	$18,000.00	$5,292.00
104	Removing Concrete (Pavement)	SY	3,625.00	$7.00	$25,375.00
423	Retaining Wall (Cast in Place)	SF	20,600.00	$48.00	$988,800.00
496	Remov Str (Bridge, 100' - 499', length)	EA	1.00	$55,000.00	$55,000.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	1,430.00	$50.00	$71,500.00
				Sub Total Roadway	**$1,145,967.00**
	Bridge				
Bridge	Steel Plate Girder On System	SF	26,000.00	$150.00	$3,900,000.00
				Sub Total Bridge	**$3,900,000.00**
	Drainage				
Storm Drains	Urban Roadway 4-Lane Curb & Gutter w/ Center Left Turn Lane	MI	0.20	$1,600,000.00	$320,000.00
				Sub Total Drainage	**$320,000.00**
	Signing				
Signing	Freeway Mainlanes	MI	2.00	$25,000.00	$50,000.00
				Sub Total Signing	**$50,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.10	$100,000.00	$9,800.00
				Sub Total Pavement Markings	**$9,800.00**
				Sub Total of All Above	**$5,425,767.00**
500	**Mobilization**	LS	1.00	25 %	**$1,356,441.75**
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	**$542,576.70**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	12.00	$25,000.00	$300,000.00
				Sub Total Traffic Control	**$300,000.00**
Project Sub Total					**$7,624,785.45**
Contingencies				**20%**	**$1,524,957.09**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$9,149,742.54**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$9,515,732.24**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$9,896,361.53**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 6B - Remove Exit & Entrance Ramps & Add Two Bypass Lanes & Add Auxiliary Lane
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

Total Construction	**$ 9,987,476**	Schematic Development (3%)	$ 299,624
		PS&E Design (10%)	$ 998,748
		Operation & Maintenance (20 years)	$ 932,617
		Total construction, Schematic Dev., Design, and Operation & Maintenance	$ 12,218,464

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1F Alternative 6B - Remove Exit & Entrance Ramps & Add Two Bypass Lanes & Add Auxiliary Lane
Description:	
Limits:	
Length:	1.02 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
100	Preparing ROW	AC	0.29	$18,000.00	$5,292.00
104	Removing Concrete (Pavement)	SY	3,625.00	$7.00	$25,375.00
423	Retaining Wall (Cast in Place)	SF	20,600.00	$48.00	$988,800.00
496	Remov Str (Bridge, 100' - 499', length)	EA	1.00	$55,000.00	$55,000.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	1,430.00	$50.00	$71,500.00
				Sub Total Roadway	**$1,145,967.00**
	Bridge				
Bridge	Steel Plate Girder On System	SF	26,000.00	$150.00	$3,900,000.00
				Sub Total Bridge	**$3,900,000.00**
	Drainage				
Storm Drains	Urban Roadway 4-Lane Curb & Gutter w/ Center Left Turn Lane	MI	0.20	$1,600,000.00	$320,000.00
				Sub Total Drainage	**$320,000.00**
	Signing				
Signing	Freeway Mainlanes	MI	2.00	$25,000.00	$50,000.00
				Sub Total Signing	**$50,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.62	$100,000.00	$61,800.00
				Sub Total Pavement Markings	**$61,800.00**
				Sub Total of All Above	**$5,477,767.00**
500	**Mobilization**	LS	1.00	25 %	**$1,369,441.75**
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	**$547,776.70**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	12.00	$25,000.00	$300,000.00
				Sub Total Traffic Control	**$300,000.00**
Project Sub Total					**$7,694,985.45**
Contingencies				**20%**	**$1,538,997.09**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$9,233,982.54**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$9,603,341.84**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$9,987,475.52**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1E - SB Newcastle Dr. Exit Ramp Removal
Description:	
Limits:	
Length:	0.19 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

Total Construction	**$**	**157,905**	Schematic Development (3%)	$ 4,737
			PS&E Design (20%)	$ 31,581
			Operation & Maintenance (20 years)	$ 112,100
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 306,323**

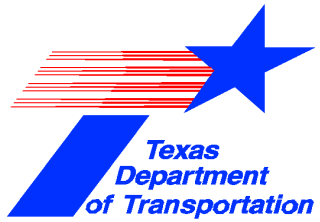
Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1E - SB Newcastle Dr. Exit Ramp Removal
Description:	
Limits:	
Length:	0.19 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
104	Removing Concrete (Pavement)	SY	1,645.00	$7.00	$11,515.00
360	Conc Curb (Ty II) (6")	LF	200.00	$4.50	$900.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	480.00	$50.00	$24,000.00
				Sub Total Roadway	**$36,415.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.02	$100,000.00	$1,600.00
Striping	Rural Frontage Roads - Both Sides - 2 Lanes	MI	0.05	$30,000.00	$1,425.00
				Sub Total Pavement Markings	**$3,025.00**
				Sub Total of All Above	**$64,440.00**
500	**Mobilization**	LS	1.00	25%	**$16,110.00**
	Unit Cost Factor Due to Small Quantities / Project			25%	**$16,110.00**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	$25,000.00
Project Sub Total					**$121,660.00**
Contingencies				**20%**	**$24,332.00**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$145,992.00**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$151,831.68**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$157,904.95**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1D - NB San Jacinto St. Entrance Ramp Removal
Description:	
Limits:	
Length:	0.21 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015



Total Construction	**$**	**120,880**	Schematic Development (3%)	$ 3,626
			PS&E Design (20%)	$ 24,176
			Operation & Maintenance (20 years)	$ 108,250
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 256,933**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1D - NB San Jacinto St. Entrance Ramp Removal
Description:	
Limits:	
Length:	0.21 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
360	Conc Curb (Ty II) (6")	LF	80.00	$4.50	$360.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	360.00	$50.00	$18,000.00
				Sub Total Roadway	**$18,360.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 4 Lanes	MI	0.03	$75,000.00	$2,062.50
				Sub Total Pavement Markings	**$2,062.50**
				Sub Total of All Above	**$45,422.50**
500	**Mobilization**	LS	1.00	25%	**$11,355.63**
	Unit Cost Factor Due to Small Quantities / Project			25%	**$11,355.63**
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	**$25,000.00**
Project Sub Total					**$93,133.75**
Contingencies				**20%**	**$18,626.75**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$111,760.50**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$116,230.92**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$120,880.16**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1C - HOV/HOT Access
Description:	
Limits:	
Length:	0.34 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

Total Construction **$ 478,712**

Schematic Development (3%)	$	14,361
PS&E Design (20%)	$	95,742
Operation and Maintenance (20 years)	$	304,000
Total construction, Schematic Dev., Design, and Operation & Maintenance	**$**	**892,816**

Design and Construction Issues:

1) Adding entrance/exit lanes at Hillcroft encroaches into shoulders

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1C - HOV/HOT Access
Description:	
Limits:	
Length:	0.34 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	1,270.00	$50.00	$63,500.00
512	Port Conc Traffic Barrier (Move) (Safety Sh) (Ty 1)	LF	1,320.00	$6.00	$7,920.00
512	Port Conc Traffic Barrier (Stkpl) (Safety Sh) (Ty 1)	LF	1,320.00	$15.00	$19,800.00
545	Crash Cushion Atten (Instl) (REACT) (N)	EA	3.00	$14,000.00	$42,000.00
				Sub Total Roadway	**$133,220.00**
	Signing				
Signing	Freeway Mainlanes	MI	1.00	$25,000.00	$25,000.00
				Sub Total Signing	**$25,000.00**
	Pavement Markings				
Striping	Freeway 4 Lanes	MI	0.68	$75,000.00	$51,000.00
				Sub Total Pavement Markings	**$51,000.00**
Miscellaneous	**Additional Items**				
Gate	Traffic Gate	EA	2.00	$10,000.00	$20,000.00
				Sub Total Additional Items	**$20,000.00**
				Sub Total of All Above	**$229,220.00**
500	**Mobilization**	LS	1.00	25%	$57,305.00
	Unit Cost Factor Due to Small Quantities / Project			25%	$57,305.00
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	**$25,000.00**
Project Sub Total					**$368,830.00**
Contingencies				**20%**	**$73,766.00**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$442,596.00**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$460,299.84**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$478,711.83**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1B - Removal of NB HOV/HOT Exit Ramp
Description:	
Limits:	
Length:	0.36 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Total Construction	**$**	**277,035**	Schematic Development (3%)	$ 8,311
			PS&E Design (20%)	$ 55,407
			Operation & Maintenance (20 years)	$ 73,880
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$ 414,632**

Highway:	US59/ IH69
County:	Harris
CSJ:	
Filename:	Strategy 1B - Removal of NB HOV/HOT Exit Ramp
Description:	
Limits:	
Length:	0.36 Miles
Estimate By:	BGE-Transportation Systems
Date:	6/3/2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	1,590.00	$50.00	$79,500.00
512	Port Conc Traffic Barrier (Move) (Safety Sh) (Ty 1)	LF	1,260.00	$6.00	$7,560.00
512	Port Conc Traffic Barrier (Stkpl) (Safety Sh) (Ty 1)	LF	1,260.00	$15.00	$18,900.00
545	Crash Cushion Atten (Remove) (REACT)	EA	1.00	$1,200.00	$1,200.00
				Sub Total Roadway	**$107,160.00**
	Signing				
Signing	Freeway Mainlanes	MI	0.50	$25,000.00	$12,500.00
				Sub Total Signing	**$12,500.00**
	Pavement Markings				
Striping	Freeway 6 Lanes	MI	0.06	$100,000.00	$5,970.00
				Sub Total Pavement Markings	**$5,970.00**
				Sub Total of All Above	**$125,630.00**
500	**Mobilization**	LS	1.00	25%	$31,407.50
	Unit Cost Factor Due to Small Quantities / Project			25%	$31,407.50
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	1.00	$25,000.00	$25,000.00
				Sub Total Traffic Control	**$25,000.00**
Project Sub Total					**$213,445.00**
Contingencies				**20%**	**$42,689.00**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$256,134.00**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$266,379.36**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$277,034.53**

Highway:	US59
County:	Harris
CSJ:	
Filename:	Strategy 1A - Frontage Road Addition
Description:	
Limits:	
Length:	1.48 Mile Proposed Frontage, and .25 Mile Reconstruction
Estimate By:	BGE-Transportation Systems
Date:	6-3-15

Texas Department of Transportation

NBFR	$	93,532,178	Schematic Development (3%)	$	3,370,649
SBFR	$	18,822,775	PS&E Design (10%)	$	11,235,495
			Operation & Maintenance (20 years)	$	2,559,600
Total Construction	**$**	**112,354,953**			
			Total construction, Schematic Dev., Design, and Operation & Maintenance	**$**	**129,520,697**

Design and Construction Issues:

Southbound Frontage Road:

1) Reconstruction of US 59 to IH 610 direct connector.
2) Reconstruction of IH 610 frontage road.
3) Reconstruction of Post Oak Blvd.
4) Weave through IH 610 columns.

Northbound Frontage Road:

1) Tunneling flooding and high cost.
2) High cost structure over S. Rice Blvd
3) ROW acquisition needed east of IH 610

Highway:	US59
County:	Harris
CSJ:	
Filename:	Strategy 1A - Frontage Road Addition
Description:	NBFR
Limits:	
Length:	1.13 Mile Proposed Frontage
Estimate By:	BGE-Transportation Systems
Date:	6-3-2015

DESCRIPTION	UNITS	EST. QTY.	COST PER MILE	AMOUNT
2-Lane Curb and Gutter Frontage Road Section (One Direction)	MI	1.13	$5,500,000.00	$6,215,000.00
			Subtotal	$6,215,000.00
			Contingencies 20%	**$1,243,000.00**
			TOTAL	**$7,458,000.00**

Highway:	US59
County:	Harris
CSJ:	
Filename:	Strategy 1A - Frontage Road Addition
Description:	
Limits:	NBFR
Length:	1.13 Mile Proposed Frontage
Estimate By:	BGE-Transportation Systems
Date:	6-3-2015

Texas Department of Transportation

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ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
100	Preparing ROW	AC	4.54	$18,000.00	$81,720.00
416	Drilled Shaft 78"	LF	2,500.00	$510.00	$1,275,000.00
512	Port Conc Traffic Barrier (Furn & Install) (Sgl Slp) (Ty 1)	LF	5,000.00	$50.00	$250,000.00
				Sub Total Roadway	**$1,606,720.00**
	Bridge				
Bridge	Pre-stressed Concrete Box Beam On System	SF	60,000.00	$75.00	$4,500,000.00
				Sub Total Bridge	**$4,500,000.00**
	Drainage				
Detention	Detention Pond - Not Including Cost of Land or Special Structures	AC-FT	3.00	$52,500.00	$157,500.00
Detention	Inline Detention System (10' x 10' Box Culvert)	MI	0.51	$5,500,000.00	$2,805,000.00
Storm Drains	Freeway Mainlanes & Frontage Roads	MI	0.62	$2,500,000.00	$1,550,000.00
Pump Stations	New	CFS	200.00	$19,000.00	$3,800,000.00
SW3P	Stormwater Pollution Prevention Plan - Major	MI	1.13	$62,000.00	$70,060.00
				Sub Total Drainage	**$8,382,560.00**
	Illumination				
Lighting	High Mast Continuous 175' Mounting Height	MI	0.62	$750,400.00	$465,248.00
Lighting	Safety - Underpass (Induction Flouresent)	EA	27.00	$36,000.00	$972,000.00
				Sub Total Illumination	**$1,437,248.00**
	Signing				
Signing	Other Roadways	MI	1.13	$30,000.00	$33,900.00
				Sub Total Signing	**$33,900.00**
	Pavement Markings				
Striping	Freeway 4 Lanes	MI	1.13	$75,000.00	$84,750.00
				Sub Total Pavement Markings	**$84,750.00**

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	CTMS/Signals				
CTMS	Conduit	MI	1.13	$300,000.00	$339,000.00
CTMS	Devices	MI	1.13	$250,000.00	$282,500.00
				Sub Total CTMS/Signal	**$621,500.00**
	Landscaping				
Landscaping	Complete w/ Irrigation	SF	30,000.00	$3.25	$97,500.00
				Sub Total Landscaping	**$97,500.00**
Miscellaneous	**Additional Items**				
Roadway	Excavation and Structure Support (Tunnel)		0.51	$75,000,000.00	$38,250,000.00
				Sub Total Additional Items	**$38,250,000.00**
				Sub Total of All Above	**$55,014,178.00**
500	**Mobilization**	LS	1.00	10 %	$5,501,417.80
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	$5,501,417.80
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	12.00	$25,000.00	$300,000.00
				Sub Total Traffic Control	$300,000.00
Project Sub Total					**$66,317,013.60**
Contingencies				**20%**	**$13,263,402.72**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$79,580,416.32**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$82,763,632.97**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$86,074,178.29**

Highway:	US59
County:	Harris
CSJ:	
Filename:	Strategy 1A - Frontage Road Addition
Description:	SBFR
Limits:	
Length:	0.35 Mile Proposed Frontage, and 0.25 Mile Reconstruction
Estimate By:	BGE-Transportation Systems
Date:	6-3-2015

DESCRIPTION	UNITS	EST. QTY.	COST PER MILE	AMOUNT
2-Lane Curb and Gutter Frontage Road Section (One Direction)	MI	0.35	$5,500,000.00	$1,925,000.00
4-Lane Divided Curb and Gutter Section (16' Flush Median)	MI	0.25	$10,100,000.00	$2,525,000.00
			Sub Total	**$4,450,000.00**
			Contingencies 20%	**$890,000.00**
			TOTAL	**$5,340,000.00**

Highway:	US59
County:	Harris
CSJ:	
Filename:	Strategy 1A - Frontage Road Addition
Description:	
Limits:	SBFR
Length:	0.35 Mile Proposed Frontage, and 0.25 Mile Reconstruction
Estimate By:	BGE-Transportation Systems
Date:	6-3-2015

Texas Department of Transportation

1/14/2014

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	Roadway				
100	Preparing ROW	AC	1.00	$18,000.00	$18,000.00
104	Removing Concrete (Pavement)	SY	56,195.00	$7.00	$393,365.00
423	Retaining Wall (Drill Shaft) - Includes Wall + Drill Shafts	SF	34,500.00	$85.00	$2,932,500.00
512	Port Conc Traffic Barrier (Furn & Install) (Safety Sh) (Ty 1)	LF	950.00	$45.00	$42,750.00
512	Port Conc Traffic Barrier (Move) (Safety Sh) (Ty 1)	LF	950.00	$6.00	$5,700.00
512	Port Conc Traffic Barrier (Stkpl) (Safety Sh) (Ty 1)	LF	950.00	$15.00	$14,250.00
				Sub Total Roadway	**$3,406,565.00**
	Bridge				
Bridge	Pre-stressed Concrete Box Beam On System	SF	18,370.00	$75.00	$1,377,750.00
				Sub Total Bridge	**$1,377,750.00**
	Drainage				
Detention	Detention Pond - Not Including Cost of Land or Special Structures	AC-FT	2.00	$52,500.00	$105,000.00
Storm Drains	Freeway Mainlanes & Frontage Roads	MI	0.35	$2,500,000.00	$875,000.00
Pump Stations	New	CFS	100.00	$19,000.00	$1,900,000.00
SW3P	Stormwater Pollution Prevention Plan - Major	MI	0.35	$62,000.00	$21,700.00
				Sub Total Drainage	**$2,901,700.00**
	Illumination				
Lighting	High Mast Continuous 175' Mounting Height	MI	0.35	$750,400.00	$262,640.00
				Sub Total Illumination	**$262,640.00**
	Signing				
Signing	Frontage Roads Both Sides	MI	0.35	$30,000.00	$10,500.00
Signing	Other Roadways	MI	0.25	$30,000.00	$7,500.00
				Sub Total Signing	**$18,000.00**
	Pavement Markings				
Striping	Freeway 4 Lanes	MI	0.60	$75,000.00	$45,000.00
				Sub Total Pavement Markings	**$45,000.00**

ITEM	DESCRIPTION	UNITS	EST. QTY.	UNIT COST	AMOUNT
	CTMS/Signals				
CTMS	Conduit	MI	0.60	$300,000.00	$180,000.00
CTMS	Devices	MI	0.60	$250,000.00	$150,000.00
				Sub Total CTMS/Signal	**$330,000.00**
	Landscaping				
Landscaping	Complete w/ Irrigation	SF	20,000.00	$3.25	$65,000.00
				Sub Total Landscaping	**$65,000.00**
				Sub Total of All Above	**$8,406,655.00**
500	**Mobilization**	LS	1.00	10 %	$840,665.50
	Premium Charged for Accelerated / Special Projects or Projects w/ Confined Work Areas	LS	1.00	10 %	$840,665.50
502	**Traffic Control Plan (TCP)**				
Traffic Control	Major Projects (Fwy Construction)	MO	12.00	$25,000.00	$300,000.00
				Sub Total Traffic Control	$300,000.00
Project Sub Total					**$10,387,986.00**
Contingencies				**20%**	**$2,077,597.20**
For this Fiscal Year (FY 0)				**Project Total for Current FY**	**$12,465,583.20**
For FY + 1 : FY 1 = FY 0 x 1.04 (4% Inflation per Year)				**Project Total FY+1 yr**	**$12,964,206.53**
For FY + 2 : FY 2 = FY 1 x 1.04 (4% Inflation per Year)				**Project Total FY+2 yr**	**$13,482,774.79**

APPENDIX E1-E5

OVERVIEW OF IMPROVEMENTS

Benefit	Travel Time	$60-90 M/yr
	Reliability	
	Safety	
Cost	$200-300 M Construction $3-5 M/yr O&M	

Access Modifications
Ramp Modifications
-SB Extension of auxiliary lane to Westpark Toll

Access Modifications
Access Points
-Added NB entrance ramp to managed lanes
-Added SB exit ramp from managed lanes

Access Modifications
Ramp Removal
-SB Newcastle Dr. exit ramp removal

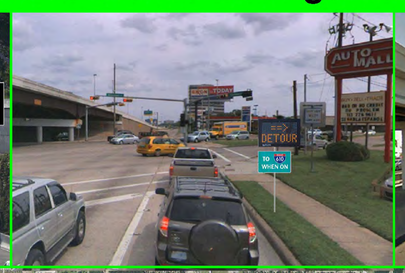
Access Modifications
Ramp Modifications - SB
-SB Kirby Dr. Entrance ramp removal
-SB bypass over Buffalo Speedway on SBFR
-SB auxiliary lane from Kirby Dr. to Buffalo Speedway

Access Modifications
Ramp Modifications - NB
-NB Kirby Dr. entrance ramp removal
-NB bypass for the Buffalo Speedway Entrance ramp over Kirby Dr.
-NB auxiliary lane from Buffalo Speedway to Kirby Dr.

Access Modifications
Ramp Removal
-NB San Jacinto St. entrance ramp removal

Managed Lanes
Bidirectional with Variable Pricing
-Bidirectional, 24-hour managed lanes using existing shoulder
-Variable pricing

Active Traffic Management



INTERSTATE 610
INTERSTATE 45
SPUR 527
288 TEXAS
BELTWAY 8
59
WESTPARK TOLLWAY

RICHMOND
GULFTON
BELLAIRE
EDLOE
NEWCASTLE
WESLEYAN
BUFFALO SPEEDWAY
KIRBY
GREENBRIAR
SHEPHERD
BISSONNET
HILLCROFT
CHIMNEY ROCK
RICE
FONDREN
GESSNER

N

LEGEND
= Site-Specific Improvements
= Corridor-Wide Improvements

DRAFT

my SOUTHWEST FREEWAY

US 59 / I-69
Rider 42 Corridor
Congestion Mitigation Study

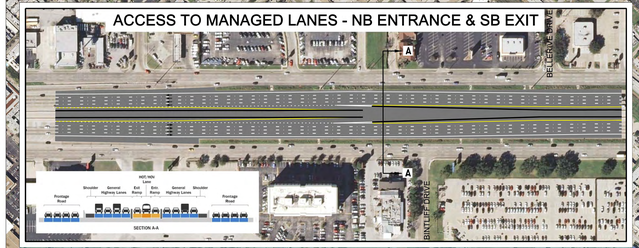
DRAFT

US 59 / I-69 RIDER 42 CORRIDOR CONGESTION MITIGATION STUDY - ACCESS MODIFICATIONS

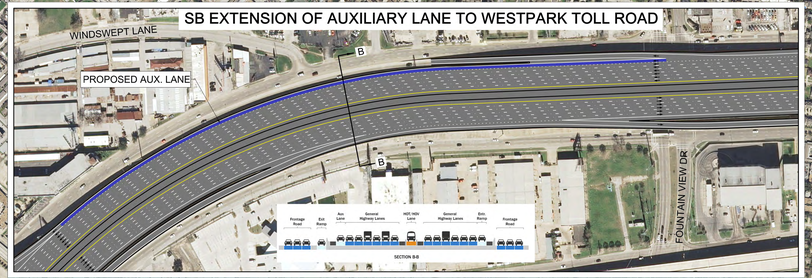
my SOUTHWEST FREEWAY

H-GAC | BGE | ALLIANCE TRANSPORTATION GROUP

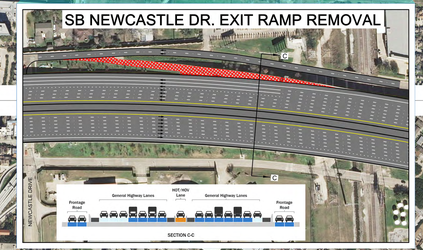
ACCESS TO MANAGED LANES - NB ENTRANCE & SB EXIT



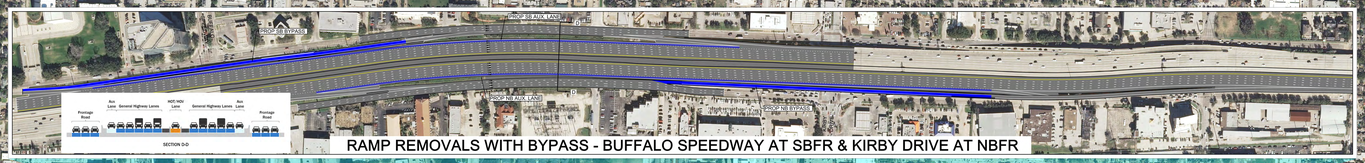
SB EXTENSION OF AUXILIARY LANE TO WESTPARK TOLL ROAD



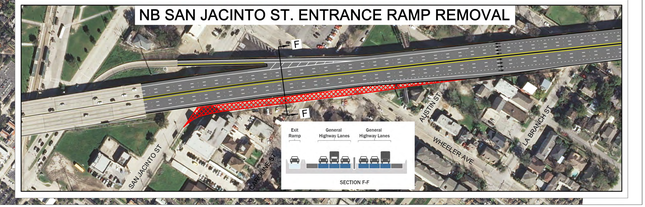
SB NEWCASTLE DR. EXIT RAMP REMOVAL



RAMP REMOVALS WITH BYPASS - BUFFALO SPEEDWAY AT SBFR & KIRBY DRIVE AT NBFR



NB SAN JACINTO ST. ENTRANCE RAMP REMOVAL



ACTIVE TRAFFIC MANAGEMENT DEVICE LOCATIONS

Benefit	**Travel Time**	**$30-40 M/yr**
	Reliability	
	Safety	
Cost	**$30-40 M Construction $1.5-3.5 M/yr O&M**	
Benefit/Cost (20 year)	**7.6**	

LEGEND

- = EXISTING DMS LOCATION
- = EXISTING RAMP METER
- = EXISTING CCTV LOCATION
- = PROPOSED FULL-COLOR MATRIX DMS LOCATION
- = PROPOSED DMS RAMP METER
- = HIGH CONGESTION AND CRASH AREA (Over 100 Annual Incidents/Mile & Under 30 MPH During Peak)
- = PROPOSED LANE ASSIGNMENT DMS (0.5 MILE INCREMENTS)
- = PROPOSED DETOUR DMS
- = CITY OF HOUSTON PROPOSED ARTERIAL DMS

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ACTIVE TRAFFIC MANAGEMENT (ATM)

The ability to dynamically manage recurrent and non-recurrent congestion based on prevailing and predicted traffic conditions. Focusing on trip reliability, it maximizes the effectiveness and efficiency of the facility. It increases throughput and safety through the use of integrated systems.

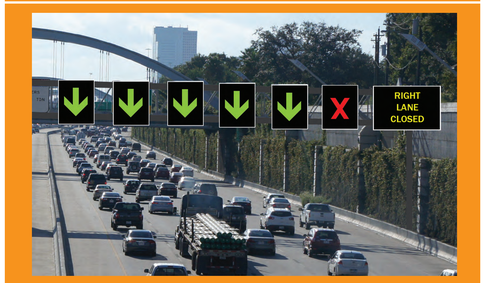
Queue Warning

Real-time displays of warning messages on dynamic message signs are used to alert motorists that queues or significant slowdowns are ahead, thus reducing rear-end crashes and improving safety. Traffic conditions are monitored continuously and warning messages are dynamic based on the location and severity of the queues and slowdowns.

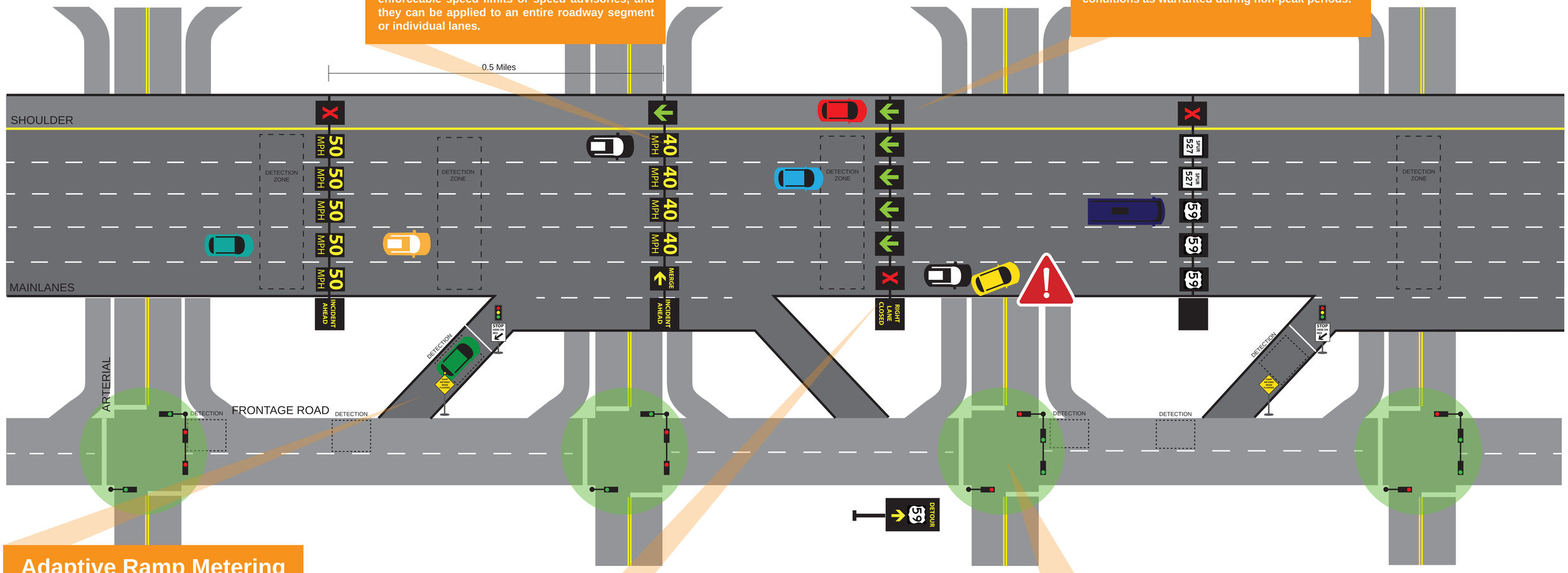
Dynamic Speed Limits

Speed limits are monitored and adjusted based on real-time traffic, roadway, and/or weather conditions. Dynamic speed limits can either be enforceable speed limits or speed advisories, and they can be applied to an entire roadway segment or individual lanes.

Dynamic Shoulder Lanes



The temporary use of shoulder lane as a travel lane is allowed based on congestion levels during peak periods and in response to incidents or other conditions as warranted during non-peak periods.



Adaptive Ramp Metering

Traffic signals on freeway entrance ramps are used to dynamically control the rate vehicles enter the main lanes using real-time and anticipated traffic volumes. Adaptive ramp metering is integrated with automated incident detection and adjacent arterial traffic signal operations. Based on the conditions, the ramp meter rates will be adjusted dynamically allowing efficient use of existing freeway capacity.

Dynamic Lane Use Control

Individual traffic lanes are continuously monitored with sensors and are closed or opened based on traffic conditions including crashes and periods of high congestion. Along with speed advisory signs this will reduce rear-end and other secondary crashes.

Adaptive Traffic Signal Control

Arterial traffic conditions and the queuing at intersections are continuously monitored and signal timing is adjusted to optimize one or more operational objective.

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my SOUTHWEST FREEWAY

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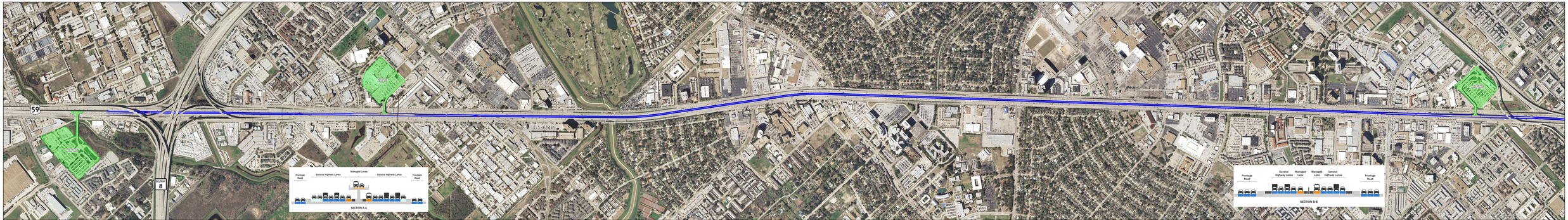
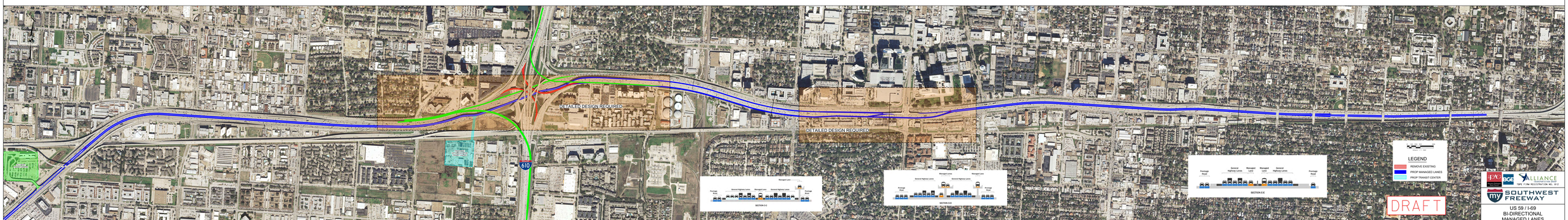

59
8
Frontage Road
General Highway Lanes
Managed Lanes
General Highway Lanes
Frontage Road
SECTION A-A
Frontage Road
General Highway Lanes
Managed Lane
Managed Lane
General Highway Lanes
Frontage Road
SECTION B-B


DETAILED DESIGN REQUIRED
DETAILED DESIGN REQUIRED
610
Managed Lanes
General Highway Lanes
Frontage Road
SECTION C-C
Managed Lanes
General Highway Lanes
Frontage Road
SECTION D-D
Frontage Road
General Highway Lanes
Managed Lane
Managed Lane
General Highway Lanes
Frontage Road
SECTION E-E
LEGEND
REMOVE EXISTING
PROP MANAGED LANES
PROP TRANSIT CENTER
DRAFT
ALLIANCE
TRANSPORTATION GROUP
TBPE FIRM REGISTRATION NO. F-3
SOUTHWEST FREEWAY
US 59 / I-69
BI-DIRECTIONAL
MANAGED LANES