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I-25 South Gap Work Zone Performance Measures Report

APPLIED RESEARCH & INNOVATION BRANCH

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Department of Transportation

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16. Abstract
Following the FHWA report, A Primer on Work Zone Safety and Mobility Performance Measurement, September 2011, regarding work zone safety and mobility measures, CDOT has prioritized the research of select methods to evaluate the performance of the I-25 Gap work zone and future CDOT construction projects. Work zone performance measures provide comparative metrics that quantify the level of impact a work zone has on travelers, residents, businesses and workers. CDOT has identified the need to research and apply performance measures to the I-25 Gap construction project; establishing a foundation to improve the decisions that are made during planning, design and construction for the remainder of the I-25 Gap project and for future CDOT highway construction projects.

This report defines the prescribed performance measure categories based on traffic volume, crash data and travel time. The performance measures discussed in this report are based on the construction impacts, identified by comparing data from before construction began to continuously recorded data being collected as the project progresses. The result of this study is the establishment of key performance metrics that can be measured during construction to monitor the impacts for this and future projects.

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EXECUTIVE SUMMARY

The Interstate 25 (I-25) corridor serves as the main route for travelers moving between Denver, Colorado Springs, and Pueblo. The Interstate 25 (I-25) Gap study corridor represents a crucial north-south travel artery that currently provides two lanes of travel for each direction, connecting Monument to Castle Rock. Alternative routes to the I-25 study corridor include State Highways (SH) 83 and SH 105 (which becomes County Road 105 between Wolfensberger Road and Monument). These routes represent significant detours and cause increased travel time delays. Consistent population growth along the Colorado Front Range has steadily increased travel demand which correlates to increased congestion and total crashes along the I-25 Gap segment. In response to the corridors' high traffic demand, the Colorado Department of Transportation (CDOT) has prioritized the addition of one through Express Toll Lane (ETL) in each direction to meet the growing needs of users.

The corridor's regular posted speed limit of 75 miles per hour (mph) coupled with significant uphill and downhill segments make construction impact mitigation measures more difficult to implement and monitor. As a result, CDOT has undertaken extensive measure to monitor travel conditions and improve incident management during the course of the construction project. The following list identifies these specific measures:

- Initiating Traffic Incident Management Plan (TIMP)
- Bi-weekly emergency responders meetings
- Quick clearance strategy and TIM training
- Two Courtesy Patrol Tow vehicles
- Quick Response Vehicles (QRV) for Fire Departments
- Equipment Staging for predictable weather related incidents
- Project Operations Center (POC)
- Three POC Operators (7 days a week)
- Emergency Pullout Areas (2 every mile)
- Smart work zone technologies
- Social Media
- Responder Construction project access roads
- Uniformed Traffic Control (Lane Closures)
- Law Enforcement
- Speed Limit Reductions
- Accident and Incident data tracking
- Proactive traffic safety monitoring

With the integration of these measures, CDOT has improved the effectiveness of the mitigation team in an effort to better serve the public. The I-25 Gap construction project was initiated September 2018 and extends from mile marker 161 to 182 as illustrated in **Figure ES-1**.

Figure ES- 1. I-25 Gap Project Area

Following the FHWA report, *A Primer on Work Zone Safety and Mobility Performance Measurement*, September 2011, regarding work zone safety and mobility measures, CDOT has prioritized the research of select methods to evaluate the performance of the I-25 Gap work zone and future CDOT construction projects. Work zone performance measures provide comparative metrics that quantify the level of impact a work zone has on travelers, residents, businesses and workers. CDOT has identified the need to research and apply performance measures to the I-25 Gap construction project; establishing a foundation to improve the decisions that are made during planning, design and construction for the remainder of the I-25 Gap project and for future CDOT highway construction projects.

The FHWA report identifies three basic categories for performance measures:

- Exposure Measures
    - Identifies the extent of activity the work zone affects by looking at work activity periods, impacted roadway space, vehicle travel counts, and project duration.

- Safety Performance Measures

- Identifies the change in crash risk experienced by the traveler as a result of the work zone relative to pre-work zone levels.

- Mobility (Traffic Operations) Performance Measures
  - Identifies the work zone impact on travel mobility through travel time delay metrics, queue length metrics and queue duration metrics.

This report defines the prescribed performance measure categories based on traffic volume, crash data and travel time. The performance measures discussed in this report are based on the construction impacts, identified by comparing data from before construction began to continuously recorded data being collected as the project progresses. The result of this study is the establishment of key performance metrics that can be measured during construction to monitor the impacts for this and future projects. Based on the evaluation and analysis of traffic volume, travel time and crash data, the following conclusions and recommendations are made in this report.

- Exposure Measures
  - Evaluation of CDOT traffic count data from a nearby Automatic Traffic Recorder (ATR) which measures the total average daily traffic (ADT) before construction compared to during construction. The stable traffic volumes are likely an indication that mitigation such as quick identification and clearance of crashes aided by the POC, smart work zone systems and speed harmonization have resulted in maintaining acceptable travel times. In addition, in this case, there are very few alternate routes and they are longer distances on slower speed roadways.

- Safety Performance Measures
  - The crash analysis provided important conclusions regarding the safety of travelers to the I-25 Gap work zone. This process has established performance metrics based on the CDOT Crash Data which measure the total number of crashes before construction compared to the total number of crashes during construction. In addition to evaluating the total number of crashes, related evaluation has also been completed comparing the total number of severe crashes (fatal plus injury crashes).

Combined, these metrics provide information about the influence the construction zone has on the frequency and severity of crashes within the study area.

- Through the crash analysis comparison, multiple data sources were identified and analyzed for accuracy and consistency. During the course of the construction project, CDOT was able to allocate more resources to expand and improve the POC operations. Further investigation revealed that the quality of the crash data collected likely improved after the expanded POC operations but we were only able to analyze a small amount of this data. Thus, CDOT might consider additional work to verify that the field data collected after June 2019 accurately represents the total crashes along the corridor. Once the additional CDOT Crash Records are made available, a comparison against the recent field data could be done to measure correlation. If this comparison shows that these two datasets are comparable, then CDOT will have confidence that the field data collection process provides a template for future POC operations to allow for continuous evaluation of the safety performance metrics during construction activities.

- The safety performance metrics measured during this study have identified that there have been increases in total crashes along the I-25 Gap project comparing before construction to during construction. Despite the fact that most of the construction activities were in the southbound direction, the crash frequency increases were significantly higher in the northbound direction than in the southbound direction. However, examination of sever crash trends reveals that, in the northbound direction, the number of severe crashes did not increase significantly and therefore the increased crashes are mostly property damage only crashes. For the southbound direction, a more moderate increase in both total and severe crashes was observed. Analysis of crash trends during peak hours indicate that the increased crash rate observed in the northbound direction is more pronounced during the peak hours.

- As CDOT implements similar construction work zone safety measures on future projects, a more comprehensive understanding will be established to guide the policy discussion regarding project target safety performance metrics.

- Mobility Performance Measures
  - The travel time analyses completed for this study provided important conclusions regarding the mobility of travelers in the I-25 Gap work zone. The corridor travel time results have been analyzed using two metrics, the Travel Time Index (TTI) and Planning Time Index (PTI) to provide information about how travel time reliability has changed pre-construction versus during construction. In general, the TTI represents the ratio of average peak hour travel times to average free flow travel times. TTI gives an indication of unexpected delay during average traffic flow. PTI values represent the ratio of the 95 percentile travel time to free flow travel times. PTI gives an indication of unexpected delay during congested traffic flow. These index values provide key measurements in understanding the impact that the I-25 Gap work zone has had on traveler mobility.

  - The travel time indices evaluation revealed small increases to the TTI in both directions during most days and periods indicating that construction has had little impact to mobility during average travel conditions. More significant increases in PTI was experienced during construction, especially during weekday daytime travel indicating more significant impact to mobility during delay incidents. This is likely due to construction impacts along the corridor, including the installation of concrete barriers which restrict pull out areas and exacerbate delays when incidents occur on the corridor. In addition, the analysis revealed significant impacts to the TTI and PTI during nighttime hours when lane shifts and lane closures occur along the corridor, which is expected for a construction project of this magnitude. Overall, the analysis of the TTI and PTI indices indicate a construction zone which does not have a large impact on mobility during average travel times, but one where incidents and nighttime lane closures can cause significant impact to mobility.

- As CDOT implements similar construction work zone mobility measures on future projects, a more comprehensive understanding will be established to guide the policy discussion regarding project target mobility performance metrics.

1 INTRODUCTION

The Interstate (I-25) corridor serves as the main route for travelers moving between Denver, Colorado Springs, and Pueblo. The Interstate 25 (I-25) Gap study corridor represents a crucial north-south travel artery connecting Monument to Castle Rock. Alternative routes to the I-25 corridor include State Highways (SH) 83 and SH 105 (which becomes County Road 105 between Wolfensberger Road and Monument), these routes represent significant detours and cause increased travel time compared to I-25. Using google maps, parallel routes from Castle Rock to Monument were selected and necessitated increased travel times between 33 and 50 percent. Consistent population growth along the Colorado Front Range has steadily increased travel demand which correlates to increased congestion and total crashes along the I-25 Gap segment.

Prior to construction the facility included two through lanes in each direction. Outside of construction boundaries, previous CDOT projects have widened the highway to three through travel lanes in each direction, resulting in the project segment being called the Gap. In response to the corridors high traffic demand, the Colorado Department of Transportation (CDOT) has prioritized the addition of one through Express Toll Lane (ETL) lane in each direction to meet the growing needs of users. The corridor's initial posted speed limit of 75 miles per hour (mph) coupled with significant uphill and downhill segments made construction impact mitigation measures more difficult to implement and monitor. As a result, CDOT has undertaken extensive measure to monitor travel conditions and ensure prompt incident management during the course of the construction project. The following list identifies these specific measures:

- Initiating Traffic Incident Management Plan (TIMP)
- Bi-weekly emergency responders meetings
- Quick clearance strategy and TIM training
- Two Courtesy Patrol Tow vehicles
- Quick Response Vehicles (QRV) for Fire Departments
- Equipment Staging for predictable weather related incidents
- Project Operations Center (POC)
- Three POC Operators (7 days a week)
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- Smart work zone technologies
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- Uniformed Traffic Control (Lane Closures)
- Law Enforcement
- Speed Limit Reductions
- Accident and Incident data tracking
- Proactive traffic safety monitoring

With the integration of these measures, CDOT has improved the effectiveness of the mitigation team in an effort to better serve the public. Construction activities on the I-25 Gap construction project was initiated September 2018 and extends from mile marker 161 to 182 as illustrated in **Figure 1**.

Figure 1. I-25 Gap Project Area

This report seeks to identify and study performance measures based on traffic volume, crash data and travel time. The performance measures discussed in this report are based on the construction impacts, measured by comparing system performance based on data collected before construction to system performance based on data collected as construction progressed. The result of this study is the establishment of key performance metrics that can be measured during construction to monitor the impacts for this project and future projects.

1.1 Project Background

Following the FHWA report, *A Primer on Work Zone Safety and Mobility Performance Measurement*, September 2011, regarding work zone safety and mobility measures, CDOT has prioritized the research of select methods to evaluate the performance of the I-25 Gap work zone and future CDOT construction projects. Work zone performance measures provide comparative metrics that quantify the level of impact a work zone has on travelers, residents, businesses and workers. To ensure optimal safety and mobility, the unique needs of each work zone must be understood so that appropriate strategies can be implemented which steer project design decisions, work phasing, sequencing operations and project impact mitigation strategies. CDOT has identified the need to research and apply performance measures to the I-25 Gap construction project; establishing a foundation to improve the decisions that are made during planning, design and construction.

Using the report, this study defines work zone performance measures for use by CDOT. The FHWA report identifies three basic categories for performance measures:

- Exposure Measures
    - Identifies the extent of activity the work zone affects by looking at work activity periods, impacted roadway space, vehicle travel counts, and project duration.

- Safety Performance Measures
    - Identifies the change in crash risk experienced by the traveler as a result of the work zone relative to pre-work zone levels.

- Mobility (Traffic Operations) Performance Measures
    - Identifies the work zone impact on travel mobility through travel time metrics, queue length metrics and queue duration metrics.

Each of these performance measure categories quantify the impacts from a construction work zone, and when reviewed in whole provide insights about the relative success of construction impact mitigation strategies.

1.2 Research objectives

The objectives of this report are to research, specify, and evaluate performance measures associated with the I-25 Gap corridor project and future CDOT construction projects. The focus has been to compare performance before construction to measurements collected during construction. Once established, CDOT can apply these performance measures to future projects and provide recommendations where the data collection process can be improved to facilitate such future efforts. Using the FHWA report as guidance, performance measures have been identified by CDOT which fall within each of the three main categories:

- Exposure Measures – Volume Comparison
    - Objective – Measure the number of travelers that use the I-25 Gap corridor before and during construction.

- Safety Performance Measures – Crash Analysis
    - Objective – Measure the number of crashes occurring in the I-25 Gap study area before and during construction.

- Mobility (traffic operations) Performance Measures – Travel Time Reliability Metrics
    - Objective – Measure the amount of travel time delay occurring in the I-25 Gap study area before and during construction.

The remainder of this report focuses on each of these three performance metrics. Sub-sections for each measure focus on the data collection process, data validation, calculation of the metric, visualization of results, and discussion of the findings.

- Section 2 evaluates the exposure measure using a volume comparison
- Section 3 evaluates the safety performance measure using a crash analysis
- Section 4 evaluates the mobility performance measure using travel time reliability metrics

2 EXPOSURE MEASURES

This section presents the results of a volume comparison conducted for the I-25 Gap project aimed at understanding how many travelers are served by the corridor before and during construction. The goal for the evaluation is to establish a comparison methodology for vehicular volume data that can be updated as the project progresses. This report includes a volume comparison which shows the difference in volume during three years starting in 2017 and continuing through 2019. The performance metric quantifies the number of travelers that have been exposed to the I-25 Gap work zone.

2.1 Data Collection

The data collection process relied on Automatic Traffic Recorder (ATR) and Microwave Radar Detection (MVRD) devices located in the project study area. The ATR device is designed to continuously collect vehicular volume data and is located on I-25 at mile marker 180. This device was selected for the performance metric based on its ability to provide data starting at least a year before construction started and continuing through construction until June 2019. Following June 2019, the analysis transitioned to an MVRD deployed at a similar location, given that the data consistency of the ATR became questionable. The MVRD device provided point speed and volume data for the study area.

2.2 Data Validation

Following acquisition of the ATR counts, the raw data was reviewed to ensure consistency and completeness. It was important to review the dataset to ensure that the count data does not have errors and/or outlier data points from construction activity that would drastically impact the calculated metrics. Following review, the ATR device was shown to have inconsistent data from July through December 2019. Potential reasons for errors and outlier data points include frequent lane shifts, potentially causing devices to count incorrectly if not properly reset. This device review confirmed accurate data from 2017 through June of 2019, following this time period the MVRD data was used to supplement data collection. The following analysis shows the overlay of the associated monthly volumes from both the ATR and MVRD devices.

2.3 Data Analysis

The volume data associated with the ATR and MVRD devices from mile marker 180 is graphically presented from 2017-2019. **Figures 2** and **3** display the northbound and southbound volumes, respectively. Overall, this analysis reveals uniform traffic volumes during the length of the evaluation period indicating that the corridor is continuing to serve the same number of users during construction compared to before construction began. **Appendix A** contains the ADT summary tables used to prepare the calculations.

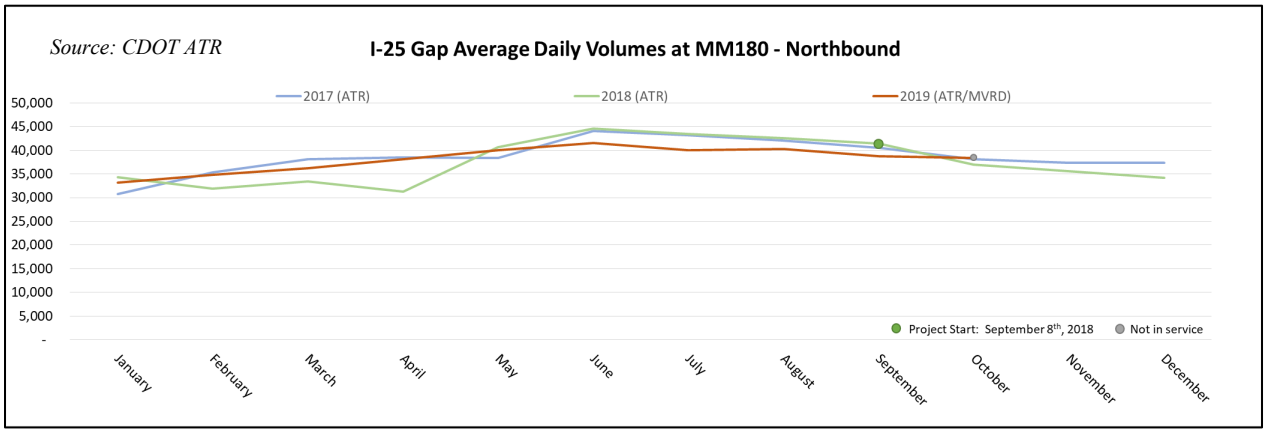


Figure 2. Northbound I-25 Gap Average Daily Volume

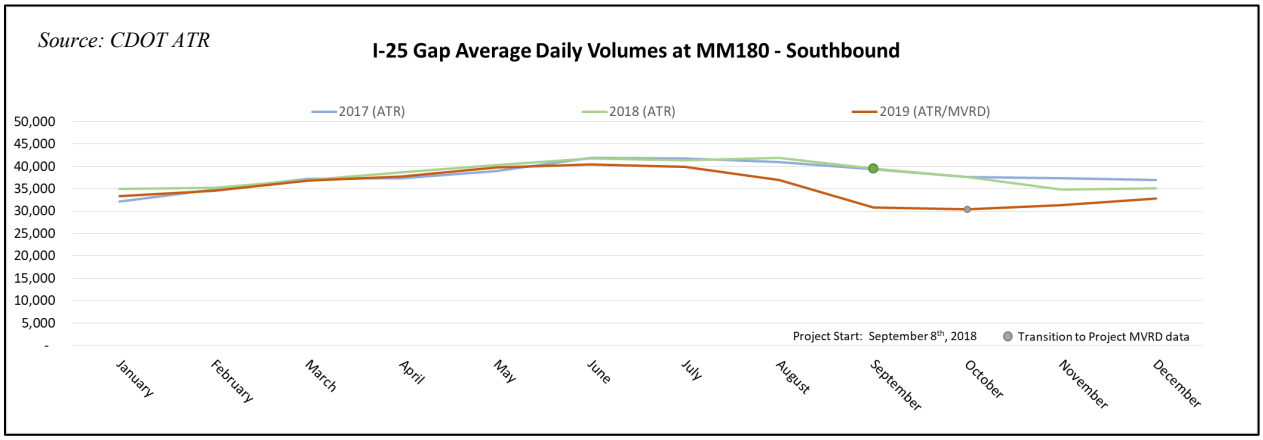


Figure 3. Southbound I-25 Gap Average Daily Volume

2.4 Conclusion

The volume analysis provided important conclusions regarding the exposure of travelers to the I-25 Gap work zone. Exposure defines the number of travelers that are regularly impacted by the construction zone. Over the course of three years the corresponding volume on the corridor remained consistent with a monthly average ranging from 30,000 to 45,000 travelers. In particular, this monthly average vehicle count remained unchanged by the construction of the I-25 Gap work zone beginning September 2018. These monthly vehicle counts continue to maintain consistent numbers through June 2019. The performance of this metric confirms that construction scheduling and phasing along the project has been able to accommodate the same level of travel as was exhibited before construction and that construction activities have not caused a significant amount of traffic to divert to other routes. The stable traffic volumes area also likely an indication that mitigation such as quick identification and clearance of crashes aided by the POC, smart work zone systems and speed harmonization have resulted maintaining acceptable travel times. In addition, in this case, there are very few alternate routes and they are longer distances on slower speed roadways. To help quantify the impacts of the work zone on travelers, the following sections will provide safety and travel time reliability measurements.

3 SAFETY PERFORMANCE MEASURES

This section presents the results of a crash data comparison conducted for the I-25 Gap project. The goal for the evaluation is to establish a comparison methodology for crash data collected before and during construction that can be updated as the project progresses. This evaluation considered I-25 (025A) between mileposts 160 and 181.

3.1 Data Collection

The data collection process focused on identifying all available data sources for crash information, research to understand the underlying data collection process and characteristics, and determination about the most reliable and high quality data for use during the performance metric evaluation. The following four crash data sources were identified:

- COGNOS – Within the CDOT COGNOS database, information about known crashes are recorded. Data is collected by operators at the Colorado Transportation Management

Center (CTMC) during the course of statewide transportation management activities. The operators record crashes when witnessed on the statewide system, but given the breadth of management activities, this data source does not, and is not expected to, record all crash data along particular highway segments. The data for this study was pulled from the Courtesy Patrol report specific to Mile High Courtesy Patrol, representing the operators that patrol I-25.

  - Data collection from this source is ongoing.

- Project Specific Courtesy Patrol – CDOT utilizes courtesy patrol along the corridor to monitor traffic flow and assist drivers when necessary. Courtesy patrol drivers providing this service keep records of incidents along the corridor including information about the date and time, duration, location, type, severity, and a description of the event. These records are recorded into a database which was made available for use during this evaluation.

  - Data collection from this source has been collected for:
    - September 2018 – October 2018 – 7am-7pm, Monday-Friday
    - November 2018 – June 25, 2019 – 7am-7pm, Monday-Saturday
    - June 26, 2019 – March 2020 – 6am-6pm, Monday-Saturday

- Project Operations Center (POC) – CDOT and the contractor for the I-25 Gap construction project have established a POC to monitor traffic and coordinate incident response. The Center is responsible for monitoring video throughout the project corridor and for deploying Colorado State Patrol and/or courtesy patrol when incidents occur. The operators overseeing these efforts keep records of incidents along the corridor including information about the date and time, duration, location, type, severity, and a description of the event. These records are recorded into a database which was made available for use during this evaluation. The reporting template used by operators has been included as **Appendix B**.

  - Data collection from this source has been collected for:

- September 2018 – June 25, 2019 – Weekdays (Mon.-Fri.), 8am-4pm
- June 26, 2019 – December 2019 – Weekdays, (Mon.-Fri.), 5am-8pm
- November 2019 – February 2020 - Weekends (Sat.-Sun.), 7am-5pm
- March 2020 – Present – Weekend (Sat.), 7am-5pm

- Colorado State Patrol (CSP) Crash Records – Crash records are completed by the CSP during routine operations. These reports are provided to the Colorado Department of Revenue, which in turn provides the reports to CDOT. These reports are recorded during all incident responses and are comprehensive in nature, recording the date and time, location, type, severity, a description of the crash causes and a detailed narrative recording the crash circumstances. The Colorado State Patrol crash reporting template used by officers has been included in **Appendix B**.

    - Data collection from this source is ongoing. Once the reports are received by CDOT staff, a quality control review is conducted for each new batch of crash reports. This includes a review of the crash report fields and a reading of the narrative to ensure accurate information is input into the database. Where appropriate, revisions are made to individual fields. These data entry procedures result in some of the time delay along with the need to conduct the process in batches. Due to this process, these records are received by CDOT and made available for safety evaluations approximately 6-8 months after the dates of capture. The records are made available in major releases which occur approximately twice a year.

Given the time overlap of the available data sources, data aggregation was undertaken to consolidate available sources and build the most comprehensive crash listings for performance metric evaluation. This process resulted in two combined data collections and one standalone dataset. These collections are described below and referenced by the assigned names throughout the remainder of the report.

- Early Field Data (September 2018 – June 25, 2019) – This data collection combines available COGNOS, Project Specific Courtesy Patrol data, and POC data. After combining these data sources, all of the records were vetted to identify duplication and inconsistency. A manual process was undertaken to review each record in this database to identify redundant records by location, time period, and description so that we could identify and remove duplicative entries. Due to the purpose of the Project Specific Courtesy Patrol and POC processes, many different incident types such as stalled and abandoned vehicles were included in this database. To provide an accurate evaluation, only crashes have been included in this final dataset. A separate process was also undertaken to understand how the field data might be used to classify crash type severity. Within the dataset, data collectors were asked to provide comments about the incident and in some cases this resulted in a description that included information about injuries or property damage only incidences. In general, this incident description field that indicates if the crash was an injury or fatal crash is incomplete resulting in 25-50% of crashes by month severity being unknown. As a result, all further evaluation only considers total recorded crashes.

- Later Field Data (June 26, 2019 – ongoing) – Following June 26th 2019, additional resources became available, with CDOT allocating additional POC operators and extended operating hours. The Later Field Data contains the same incident types as the early field data but has been distinguished from the Early Field Data as a result of the operational changes to the POC. Starting June 26, 2019, dedicated staff was hired to work in the POC and focus solely on incident response along the corridor. In addition, the POC operating hours were greatly extended resulting in a greater capture of crashes and incident management. All of the crash records were again reviewed to identify duplication and inconsistency within the combined data.

- CDOT Crash Records (January 2017 – June 30, 2019) – This data was collected from the CDOT database and is a source of highest quality which has been used to provide a baseline understanding of crashes along the corridor. Given the availability of crash records in the CDOT database, there is complete overlap between the dataset and the

Early Field Data and only five days of overlap (June 26th through June 30th, 2019) with the Later Field Data.

A timeline representation of the data collection periods is provided as **Figure 4**.

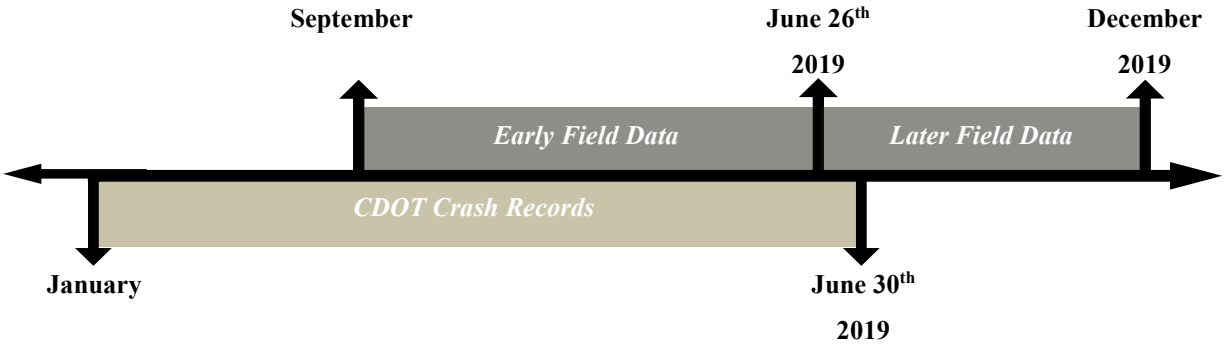


Figure 4. Data Collection Timeline and Sources

3.2 Data Validation

To understand the completeness and accuracy of the Early Field Data and Later Field Data a comparison was completed using graphical representations of each of these datasets by direction. **Figures 5** and **6** compare the northbound and southbound data, respectively.

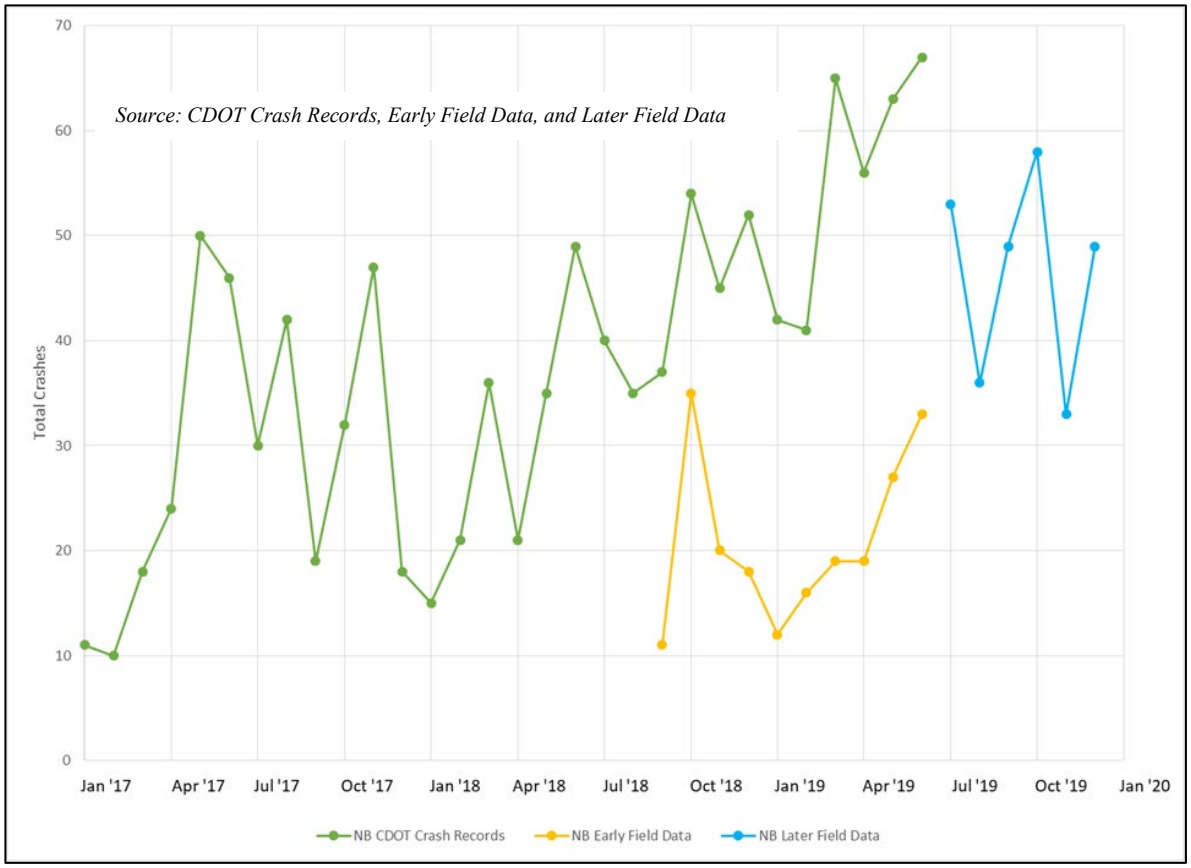


Figure 5. Northbound Crash Dataset Comparison

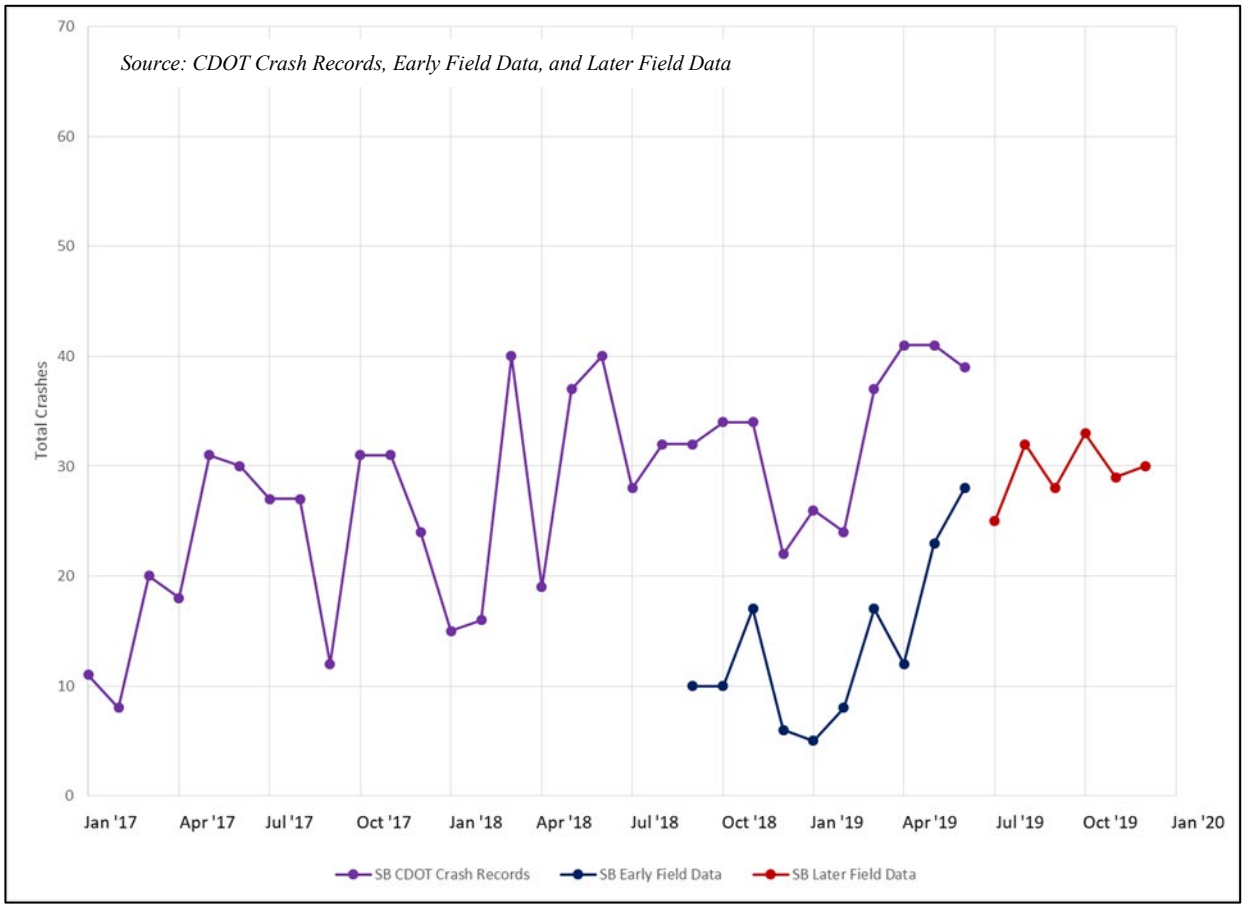


Figure 6. Southbound Crash Dataset Comparison

Examination of these data sources reveals that the Early Field Data follows a similar trend as the CDOT Crash Records trends but contains under 50% of the total crashes occurring on the corridor. Starting in July 2019, with the Later Field Data there is clearly an increased number of crashes being identified, but unfortunately CDOT Crash Records were not available for the same time period during our analysis, and therefore, it cannot be known whether changes to the POC staffing and hours have begun to capture the total number of crashes.

As a result of this comparison, it has been determined that additional work needs to be done to verify that the Later Field Data accurately represents the total crashes along the corridor and can be directly compared against before construction CDOT Crash Records. It is recommended that when additional CDOT Crash Records are made available they be compared against the Later Field Data to measure correlation. Also, as future data is collected by the Project Specific Courtesy Patrol and the POC, an increased emphasis should be placed on collection of crash severity data

to maintain complete records. This will allow for an analysis of injury crashes to be completed for the corridor in the future.

3.3 Data Analysis

To ensure accurate correlations between before and during construction crash trends, evaluation for the safety performance metric has relied on only CDOT Crash Records of total crashes. Given the available data, the following figures demonstrate crash comparisons month-over-month using the CDOT Crash Records. These figures compare before construction data (collected between September 2017 and June 2018) and during construction data (collected between September 2018 and June 2019).

Figure 7 provides the northbound direction comparison for the ten months period. An average crash rate has also been calculated before and during construction, which reveals an average crash rate increase of 78% between the two periods. No fatal crashes were recorded in the northbound direction during the study period.

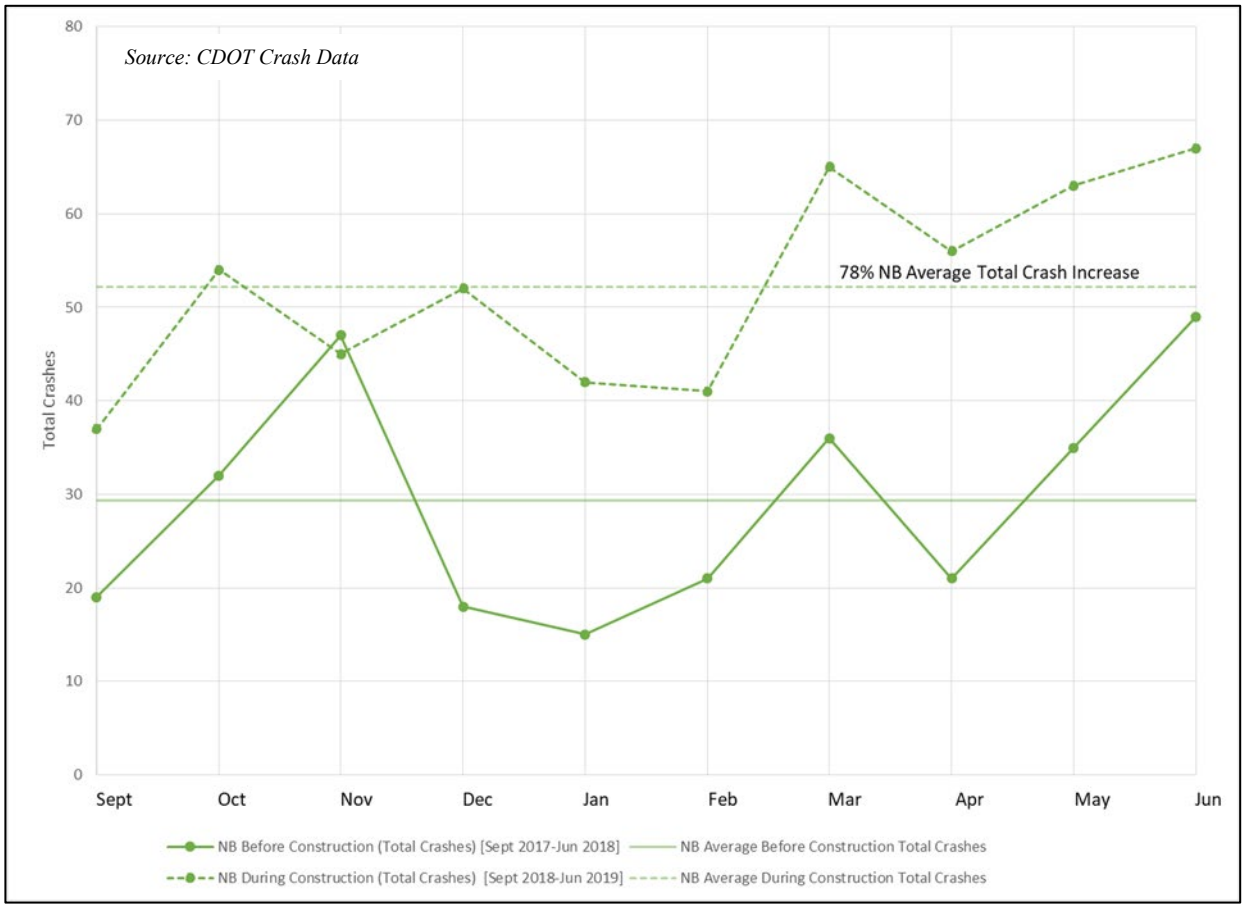


Figure 7. Northbound Total Crash Analysis

Figure 8 provides the southbound direction comparison for the ten months period. An average crash rate has also been calculated before and during construction, which reveals an average crash rate increase of 25% between the two periods.

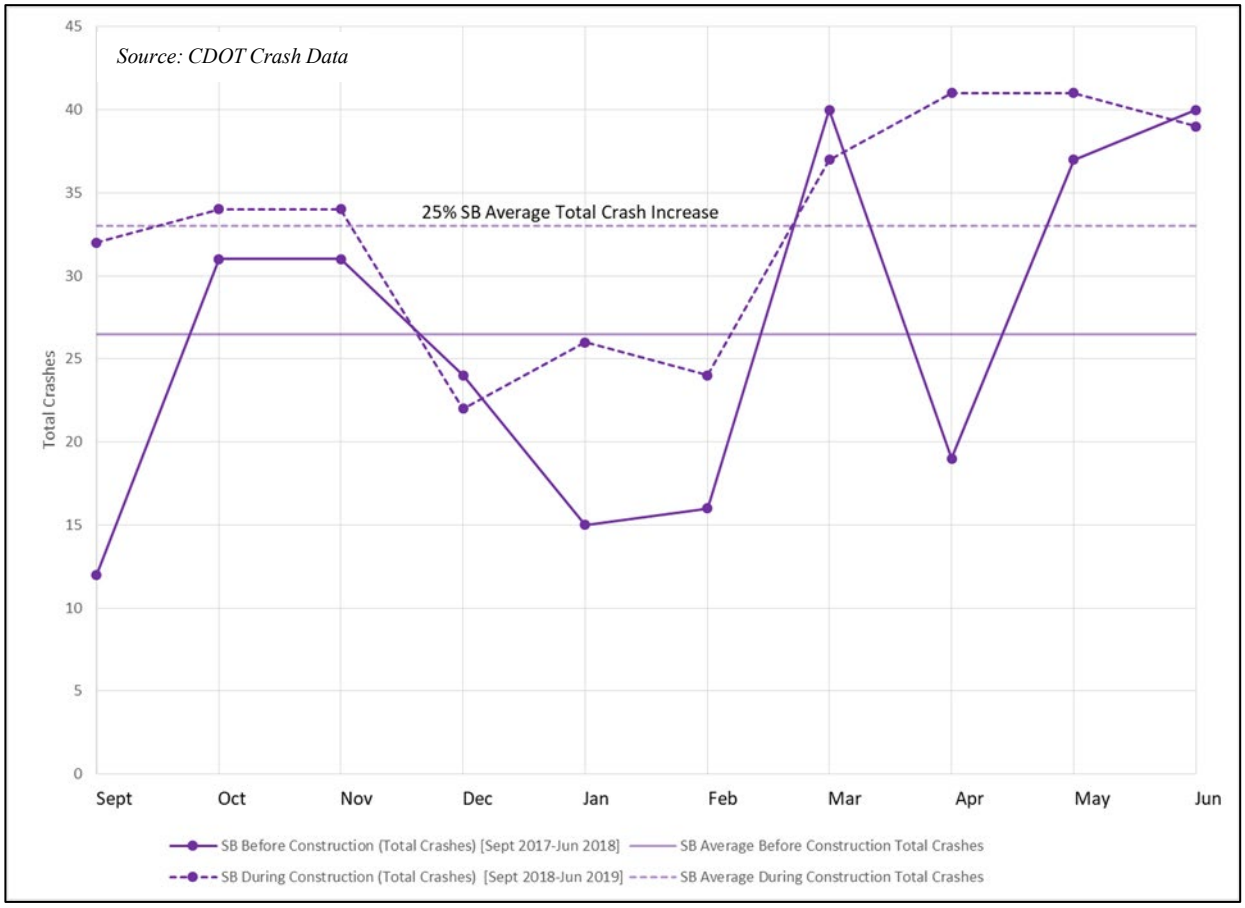


Figure 8. Southbound Total Crash Analysis

Two fatal crashes were recorded in the southbound direction before construction (at mileposts 162.3 and 168.4) and one fatal crash was recorded in the southbound direction during construction (at milepost 160.82).

Crash severity is an important aspect of safety assessments. Crashes are categorized as either fatal, injury, or property damage only (PDO). Using the CDOT Crash Data, total crashes along with severe crashes, designated by crashes with an injury or fatality, were analyzed. This analysis highlights the change in crash type along the corridor, specifically, if more frequent high severity crashes occur further evaluation and potential mitigation actions might be required. **Figures 9** and **10** provide the before and during construction crash trends by severity in the northbound and southbound directions, respectively.

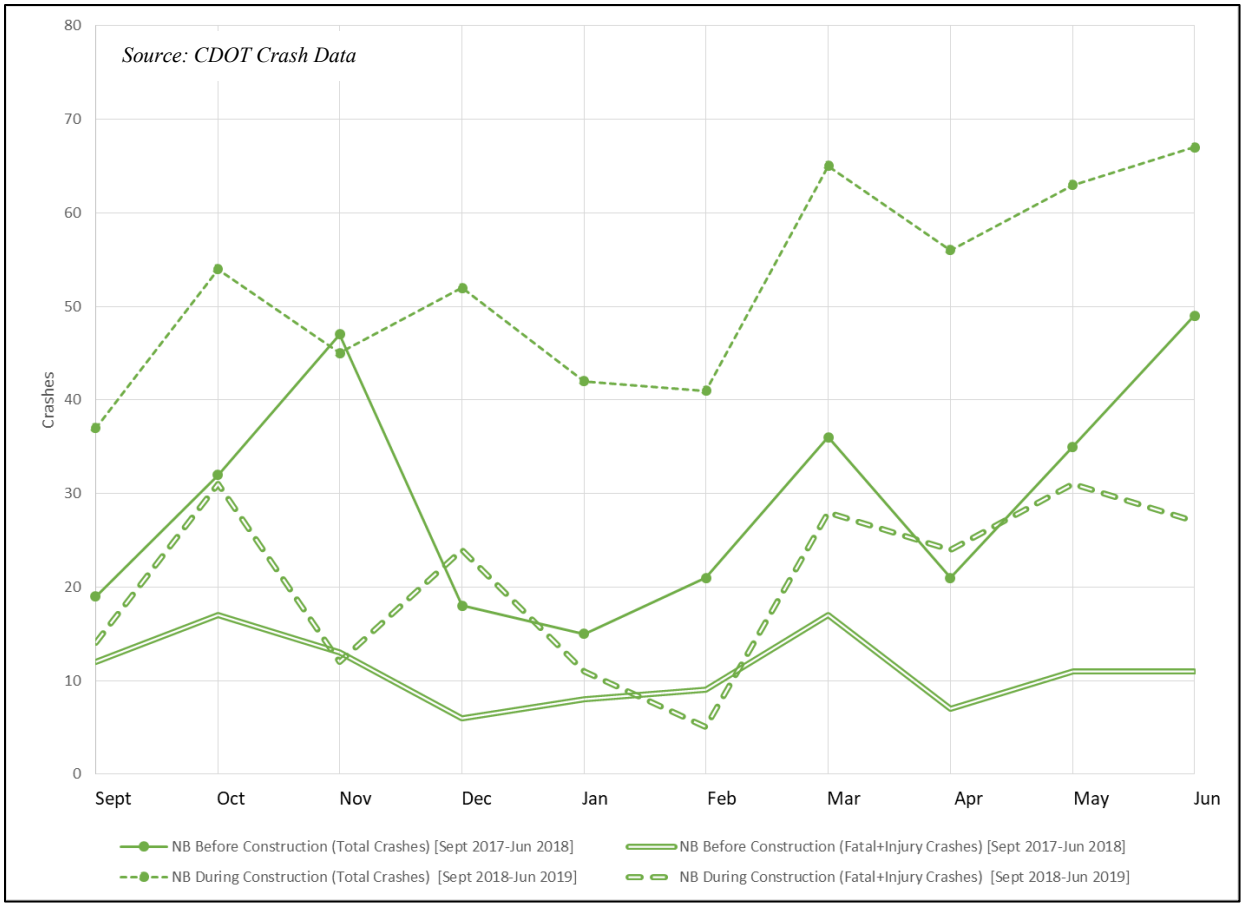


Figure 9. Comparison of Northbound Severe and Total Crashes

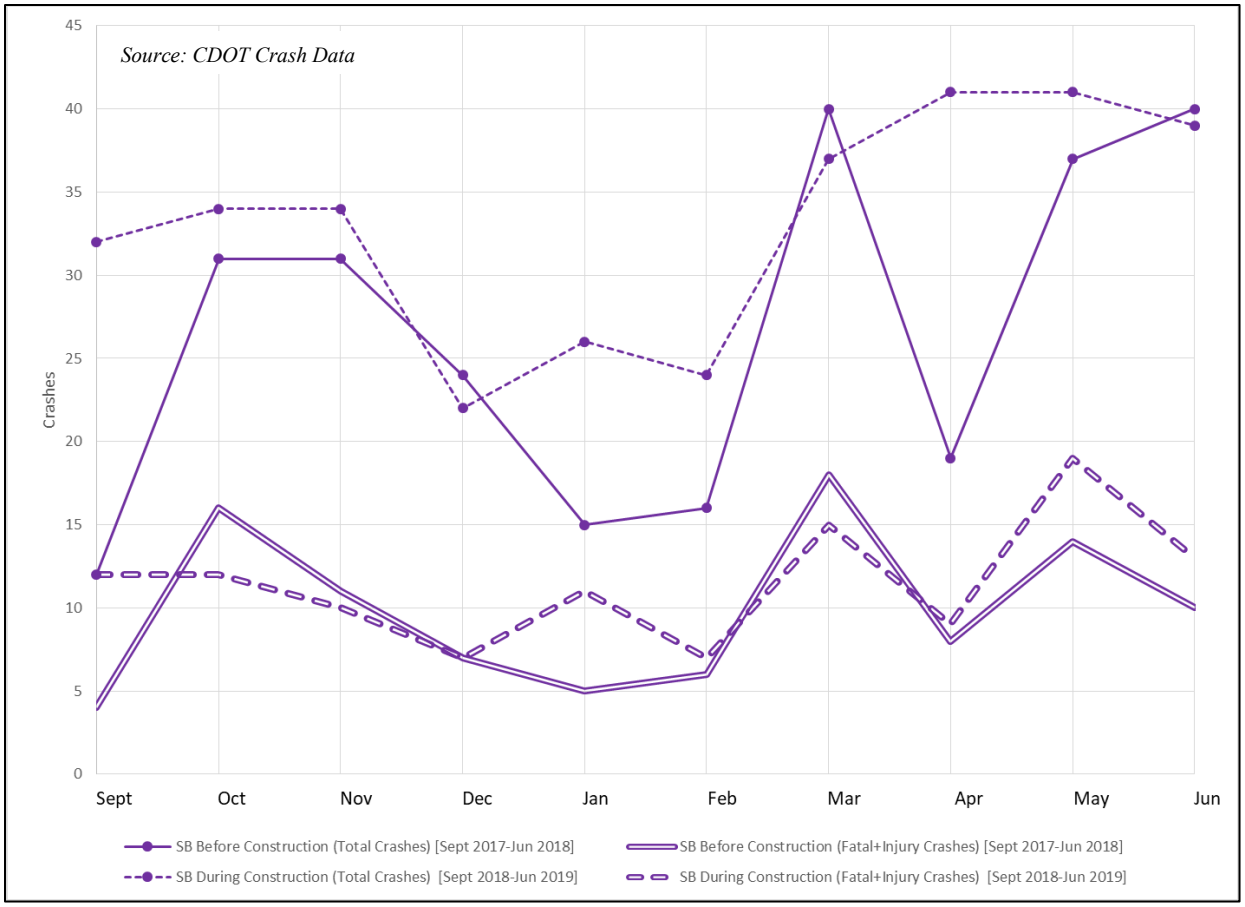


Figure 10. Comparison of Southbound Severe and Total Crashes

Examination of this dataset reveals that in the northbound direction, while a significant increase in total crashes occurred during construction compared to the before construction period, the number of severe (injury plus fatal) crashes increased some but not nearly as much. This indicates that during construction, increased property damage only crashes account for most of the observed increased total crashes and fatal and injury crashes only had a minor increase due to construction activities. The southbound direction crash data shows that both total and sever crashes only had minor increases. In the southbound direction this chart also indicates that the major differences in total crashes occurred in September and April, leaving the rest of the study period with very comparable totals per month.

In order to understand the frequency of crashes during the peak hours, additional analysis has been completed which examines crashes during the AM peak period (7-9am) and PM peak period (4-6pm) in the northbound and southbound directions. This analysis is provided as **Figure 11** and **Figure 12** for the AM peak period and PM peak period, respectively. The evaluation reveals

significant increases in crash frequency in the northbound direction with an increase from 15 to 53 total crashes in the AM peak period and an increase from 11 to 24 total crashes in the PM peak period indicating that the increased crash rate observed in the northbound direction is more pronounce during the peak hours. Similar to the daily evaluation, there was a very little or no increase in crash frequency in the southbound direction during the peak periods.

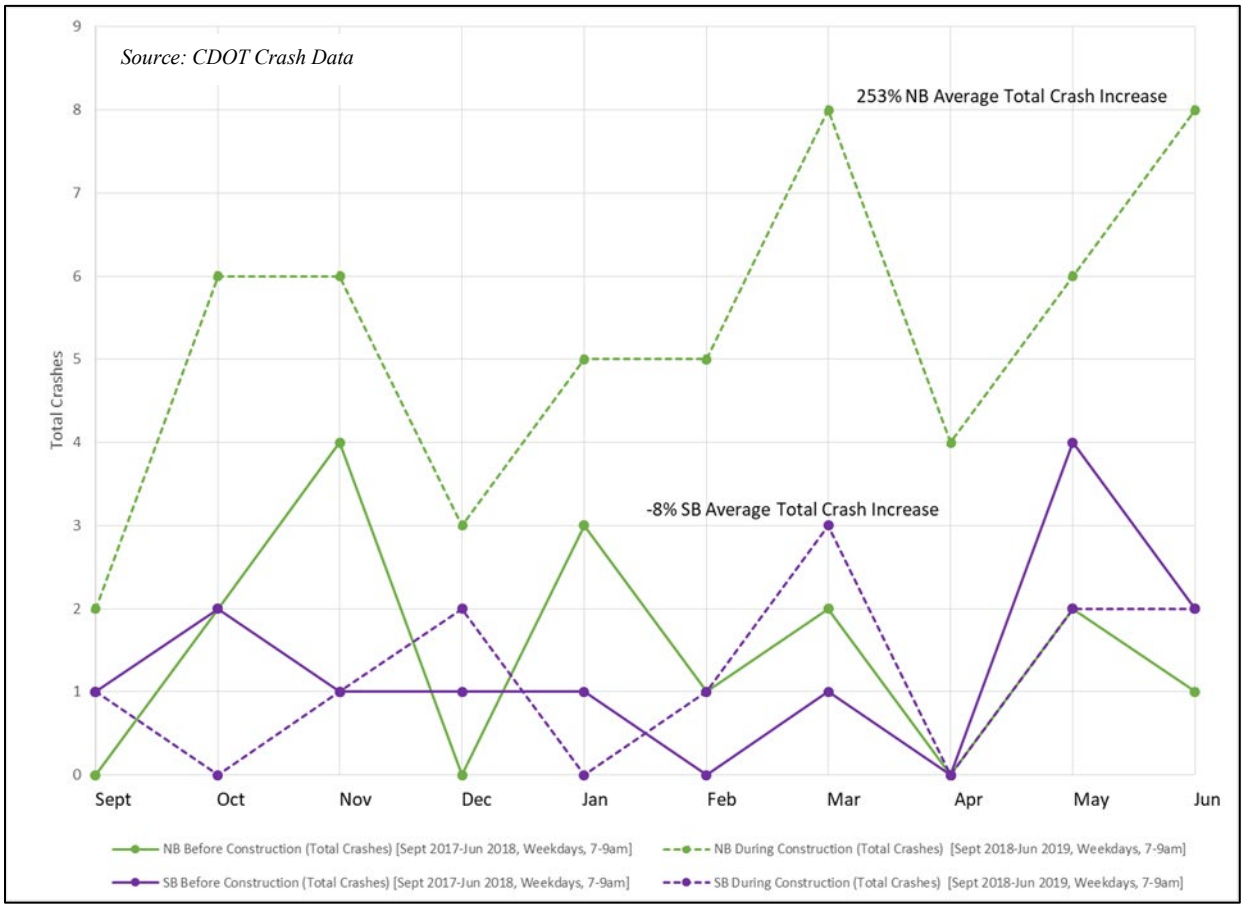


Figure 11. AM Peak Period Northbound and Southbound Total Crashes

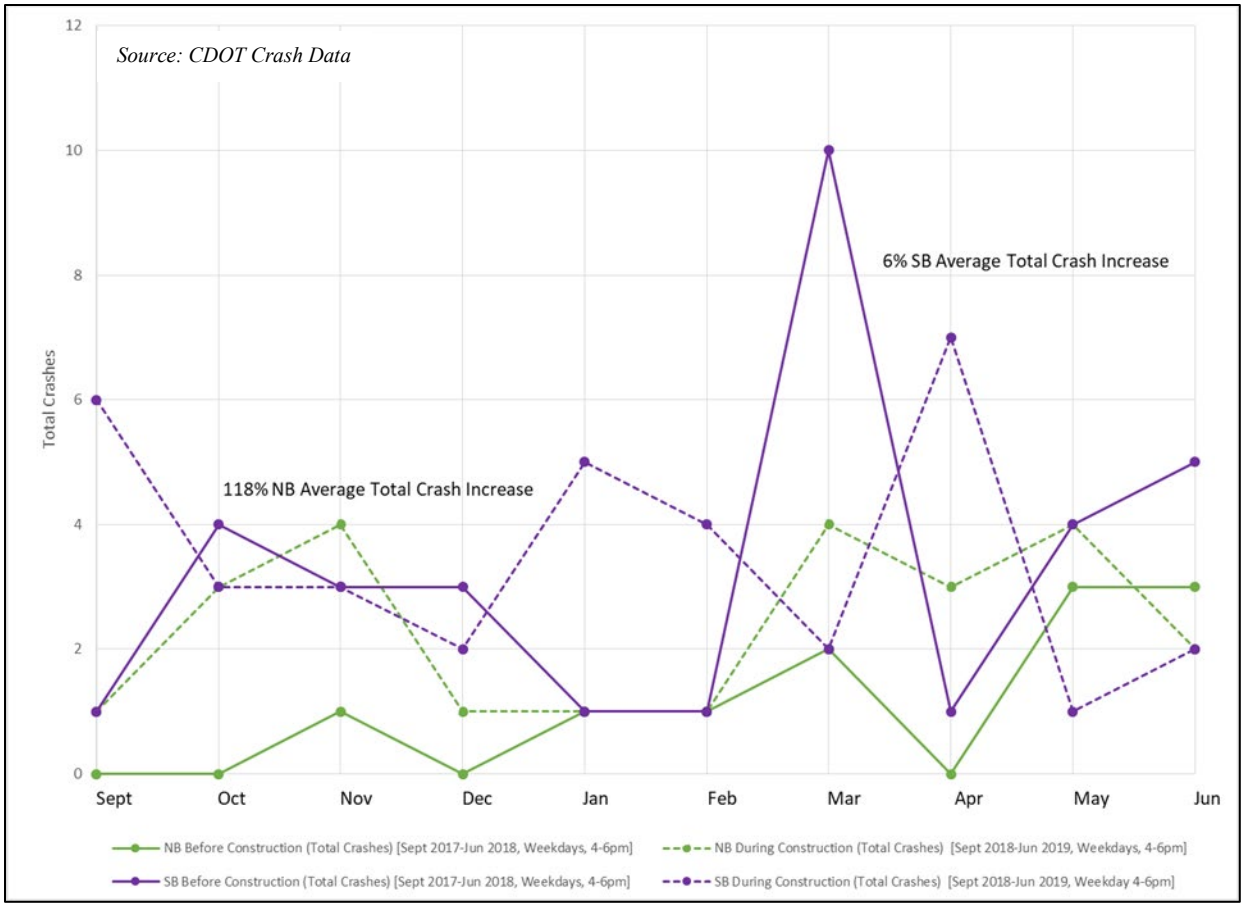


Figure 12. PM Peak Period Northbound and Southbound CDOT Crashes

3.4 Conclusion

The crash analysis provided important conclusions regarding the safety of travelers to the I-25 Gap work zone. This process has established performance metrics based on the CDOT Crash Data which measure the total number of crashes before construction compared to the total number of crashes during construction. In addition to evaluating the total number of crashes, related evaluation has also been completed comparing the total number of severe crashes (fatal plus injury crashes). Combined, these metrics provide information about the construction zone's influence on the frequency and severity of crashes within the study area.

The analysis of these safety performance metrics completed for this study have identified that there have been increases in total recorded crashes, especially for the northbound direction, in the I-25 Gap project corridor during construction. However, examination of severe crash trends reveals that, in the northbound direction, the number of severe crashes did not increase significantly and

therefore the increased crashes are mostly property damage only crashes. For the southbound direction, a more moderate increase in both total and severe crashes. Analysis of crash trends during peak hours indicate that the increased crash rate observed in the northbound direction is more pronounced during the peak hours.

4 MOBILITY PERFORMANCE MEASURES

This section identifies the process for measuring and comparing travel times through the I-25 Gap construction project. This evaluation pertains to the I-25 (025A) corridor between mileposts 160 and 181 and provides a comparative analysis regarding travel time reliability measures for pre-construction versus construction periods.

The corridor travel time results have been analyzed using two metrics, the Travel Time Index (TTI) and Planning Time Index (PTI) to provide information about how travel time reliability has changed pre-construction versus during construction. In general, the TTI represents the ratio of average peak hour travel times to average free flow travel times. TTI gives an indication of unexpected delay during average traffic flow. PTI values represent the ratio of the 95th percentile travel time to free flow travel times. PTI gives an indication of unexpected delay during congested traffic flow. These index values provide key measurements in understanding the impact that the I-25 Gap work zone has had on traveler mobility.

4.1 Data Collection

The travel time analysis relies on Inrix data made available through an on-going statewide CDOT contract with the data vendor. Inrix travel time data relies on various data streams from local transport authorities, road network sensors, and fleet vehicles to establish appropriate data records. Utilizing this data source has provided the ability to directly compare travel time for time periods before and during construction. The performance metrics have been evaluated during the following date ranges:

- Pre-construction time period: January 2017 – May 2018
- During construction time period: January 2019 – February 2020

4.2 Data Validation

The first step in the travel time analysis process was to verify the accuracy of the travel time data that was obtained from Inrix. Bluetooth detection devices that measure travel time deployed along the I-25 Gap as part of the work zone project provided a comparable data source to the associated Inrix data. The travel times obtained from the Bluetooth devices along the project were aggregated to provide estimates for the following sections of the project:

- Northbound – Larkspur to Plum Creek Parkway
- Southbound – Castle Rock to Larkspur

To effectively compare the travel times from each data source, an associated segment ID range was selected within Inrix to match the segmentation used for the Bluetooth device data. In general, Inrix provides travel time data for 1, 5, 10, 15, 30 and 60 min bins. In order to keep the calculations as accurate as possible, the rawest form of the data was utilized at the 1 minute bin interval. Using the Inrix segmentation, the R script programming language was used to aggregate the raw Inrix data to one minute bins, making the travel times directly comparable with the Bluetooth data. Once processed, the travel times recorded by the two different methodologies were then graphically overlaid to compare the travel time measurements across a 24-hour period. As seen in **Figure 13**, daily northbound results for the second week in July 2019 indicate strong correlation between the Inrix data and Bluetooth data. Further, after examining multiple weeks of similar results (July 2019 & November 2019), it was determined that the Inrix data provided a consistent and valid data source for the travel time analysis.

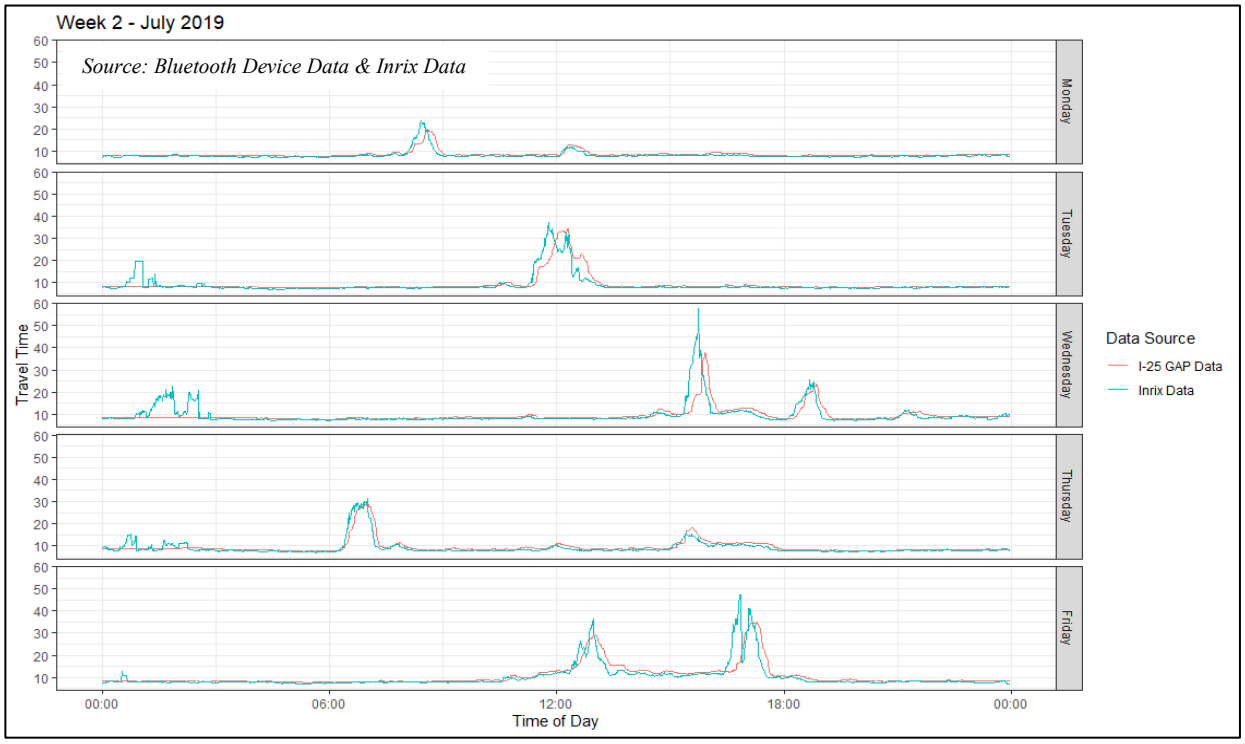


Figure 13. Travel Time Comparison (Inrix Data vs. Bluetooth Data) – Week 2, July 2019

4.3 Data Analysis

This section provides an overview of the travel time reliability metrics, and the associated calculations used to identify the I-25 Gap work zones impact on traveler mobility. A comparison of Travel Time Index (TTI) and Planning Time Index (PTI) values before and during construction were used as mobility performance measures for the I-25 Gap Corridor. The evaluation of these indexes provide information about how travel time reliability has changed pre-construction versus during construction.

The TTI value represents a ratio of travel times during peak periods to travel times that occur during free-flow speeds.

$$Travel\ Time\ Index\ (TTI) = \frac{\text{Average Travel Time (minutes)}}{\text{Minimum Travel Time (minutes)}}$$

TTI represents the average additional time required during average traffic conditions compared to light traffic. A TTI close to one indicates very little variability in travel time throughout the day. For reference, research conducted by the Texas Transportation Institute found that the Denver-Aurora metropolitan area had a TTI of 1.31 in 2017.

PTI values represent the ratio of the 95 percentile travel time to free flow travel times.

$$Planning\ Time\ Index\ (PTI) = \frac{\text{95th Percentile Travel Time (minutes)}}{\text{Minimum Travel Time (minutes)}}$$

PTI represent the average additional time required during delayed traffic conditions compared to light traffic. A PTI close to one indicates very little delay or congestions throughout the day. For reference, research conducted by the Texas Transportation Institute found that the Denver-Aurora metropolitan area had a PTI of 1.83 in 2017.

Following the data aggregation, a detailed review of the Inrix travel time data revealed the need to remove some low outlying data points within the dataset. In particular, these points represented unreasonably low travel time values that correspond with impossibly high speeds through the study area and therefore data anomalies that should be removed from the data. To alleviate this data issue, the 5th percentile travel time was calculated and used as the minimum travel time to ensure the validity and accuracy of the associated calculations. The resulting minimum travel time results in a value that represents free-flow travel time in the TTI and PTI calculations.

The goal for the evaluation of these performance metrics is to compare the TTI and PTI measured during construction to TTI and PTI measured before construction. Ideally, successful construction management creates a resilient corridor so that when a delayed condition occurs, the issue can be quickly identified and remedied, minimizing long travel delays. Thus, by examining the difference between the TTI and PTI before and during construction we can identify the impact that has occurred in response to delayed conditions.

After verifying the accuracy of the Inrix data, time periods for the pre-construction and during construction phases were identified for comparison.

- Pre-construction time period: January 2017 – May 2018
- During construction time period: January 2019 – February 2020

Using these time periods, the Inrix data was acquired and analyzed through the R-programming scripts. The results of these scripts provided the travel time statistics necessary to calculate the

Planning Time Index (PTI), and Travel Time Index (TTI) for this analysis. **Appendix C** contains a data table used to develop the following figures. The following figures highlight the results of the comparison and provide information about the impact that the I-25 Gap construction project had on travel time reliability through the corridor.

Figure 14 shows the average weekday (Monday through Friday) Northbound hourly TTI and PTI comparison for the pre-construction and construction phases.

The blue lines show small increases in the weekday hourly TTI, increasing the weekday hourly average over a 24-hour period by approximately 6% between the pre-construction and construction phases. Separate hourly volume analysis indicates that CDOT has continued to serve almost the same number of travelers during construction which is expected because there are not many alternative routes available to travelers and those alternative routes are circuitous. Combined, these two results prove that northbound travelers have experienced minimal construction related delay. These TTI results indicate that construction has had a relatively minimal impact on the average mobility of travelers utilizing the corridor.

The orange lines show the PTI comparison between the pre-construction and construction phases. These lines indicate that the PTI has increased substantially, likely as a result of the construction work zone activities. Specifically, the weekday hourly average over a 24-hour period of the PTI increases from the pre-construction to construction phases by approximately 33%. This indicates that delay events have a bigger impact on traffic flow during the construction time period. This is expected considering the construction impacts along the corridor, including the absence of shoulders and presence of concrete barriers along each side of the highway and the resulting difficulty in clearing the incidents and returning to typical operating speeds.

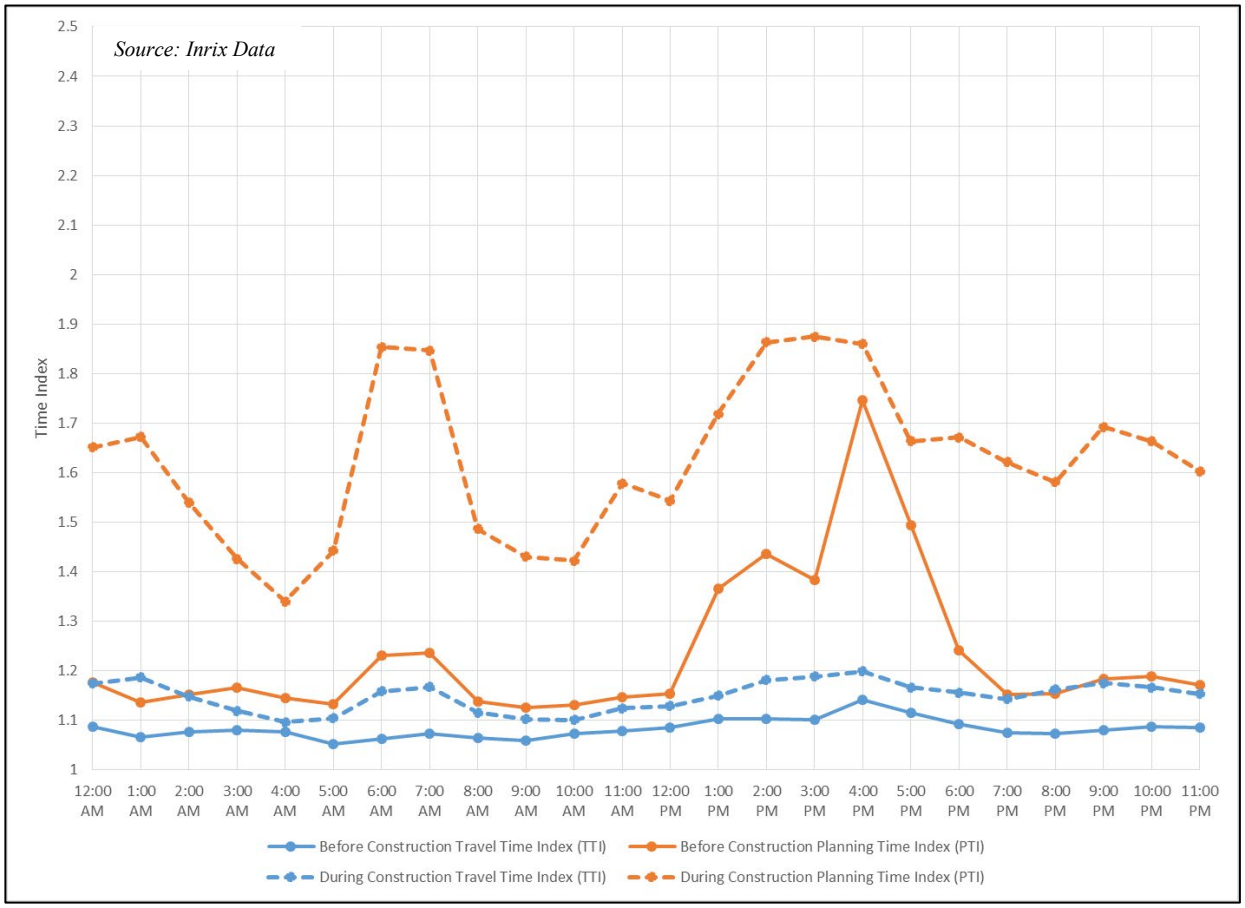


Figure 14. Northbound Weekday TTI and PTI Comparison

Figure 15 shows the average weekday (Monday through Friday) Southbound TTI and PTI compared during the pre-construction and construction phases.

The blue lines in the southbound direction also show that the construction has caused a slight increase in the TTI, increasing the weekday hourly average over a 24-hour period by approximately 9% from pre-construction to construction phases. Separate hourly volume analysis indicates that CDOT has continued to serve the same number of travelers during construction. Combined, these two results prove that southbound travelers have experienced minimal construction related increased delay during average conditions.

The orange lines show the associated PTI comparison from the pre-construction to construction phases. These lines indicate that there is significant impact to the PTI in the southbound direction. Specifically, the weekday hourly average over a 24-hour period of the PTI increases from the pre-construction to construction phases by approximately 35%. This indicates that delay events have

a more significant impact on travel through the corridor during the construction time period likely due to the lack of shoulders and controlled access which results in longer times to clear incidents. Interestingly, the PM peak period (4 PM to 6 PM) the PTI measured during construction is much closer to the value of the PTI measured before construction. This may indicate that the PTI is mostly impacted by congestion during this time period which remains relatively consistent before and during construction.

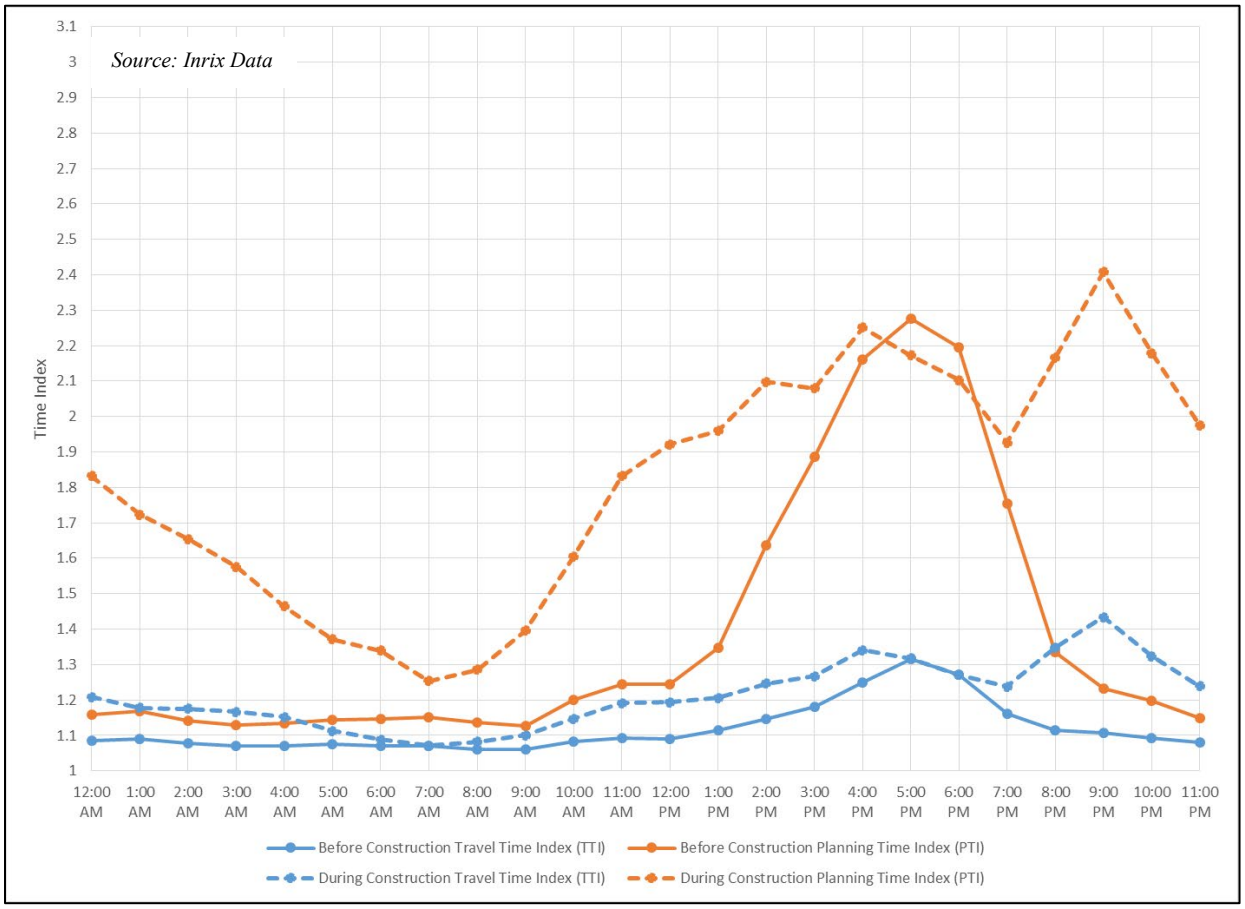


Figure 15. Southbound Weekday TTI and PTI Comparison

The I-25 Gap corridor allows travelers to access multiple recreational areas scattered throughout Castle Rock, Larkspur, and Monument. Further, we deduced that different travel patterns would be present during the weekend hours versus the weekday hours. **Figures 16** and **17** provides a visual representation of the northbound and southbound TTI and PTI associated with the pre-construction versus during construction period for Saturday and Sunday.

The blue lines in the northbound direction show on **Figure 16** indicate that the weekend hourly TTI has increased approximately 6% on average over a 24-hour period from pre-construction to construction phases during the weekends. In general, northbound travelers have experienced minimal construction related delay which is reflected in the low TTI values associated with each time period before and during construction. These TTI results indicate that construction project has caused minimal impact to mobility for travelers under normal weekend traffic conditions.

The orange lines shown on **Figure 16** show the associated PTI comparison from the pre-construction to construction phases. These lines indicate that there is a significant impact to the PTI in the northbound direction. Specifically, the weekend hourly average in PTI increased from the pre-construction to construction phases by approximately 24%. As the graph indicates, delayed events occurring on the corridor, especially during daytime hours, accounted for a large variation in the travel times before construction and the addition of the construction zone has amplified this.

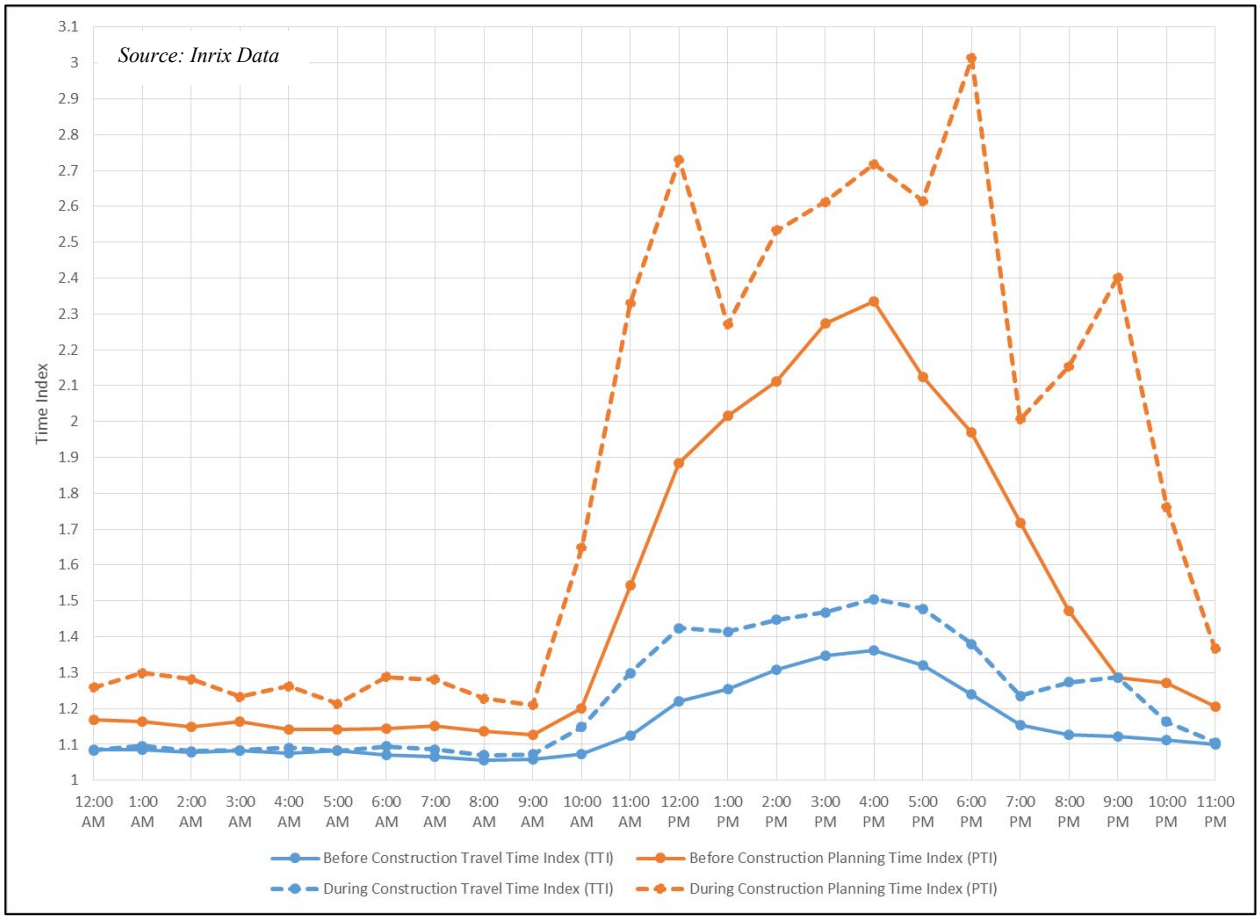


Figure 16. Northbound Weekend TTI and PTI Comparison

Figure 17 provides a visual representation of the southbound TTI and PTI associated with the pre-construction versus during construction period for Saturday and Sunday.

The blue lines in the southbound direction show that the construction has caused a minimal increase in the weekend hourly average TTI, increasing 3% from pre-construction to construction phases during the day. The graph demonstrates significant impact to the TTI at night, from 7 pm to 1 am. With the values remaining consistently close through pre-construction and construction phases we can deduce that a minimal impact to the mobility of travelers during normal conditions.

The orange lines show the associated PTI comparison from the pre-construction to construction phases. These lines indicate that there is a significant increased impact to the PTI in the southbound direction for nighttime hours. Overall, the weekend hourly average PTI increases from the pre-construction to construction phases by approximately 19%. The majority of this increase is clearly

attributed to PTI increases during the nighttime hours, similar to the results measured in TTI during the same period.

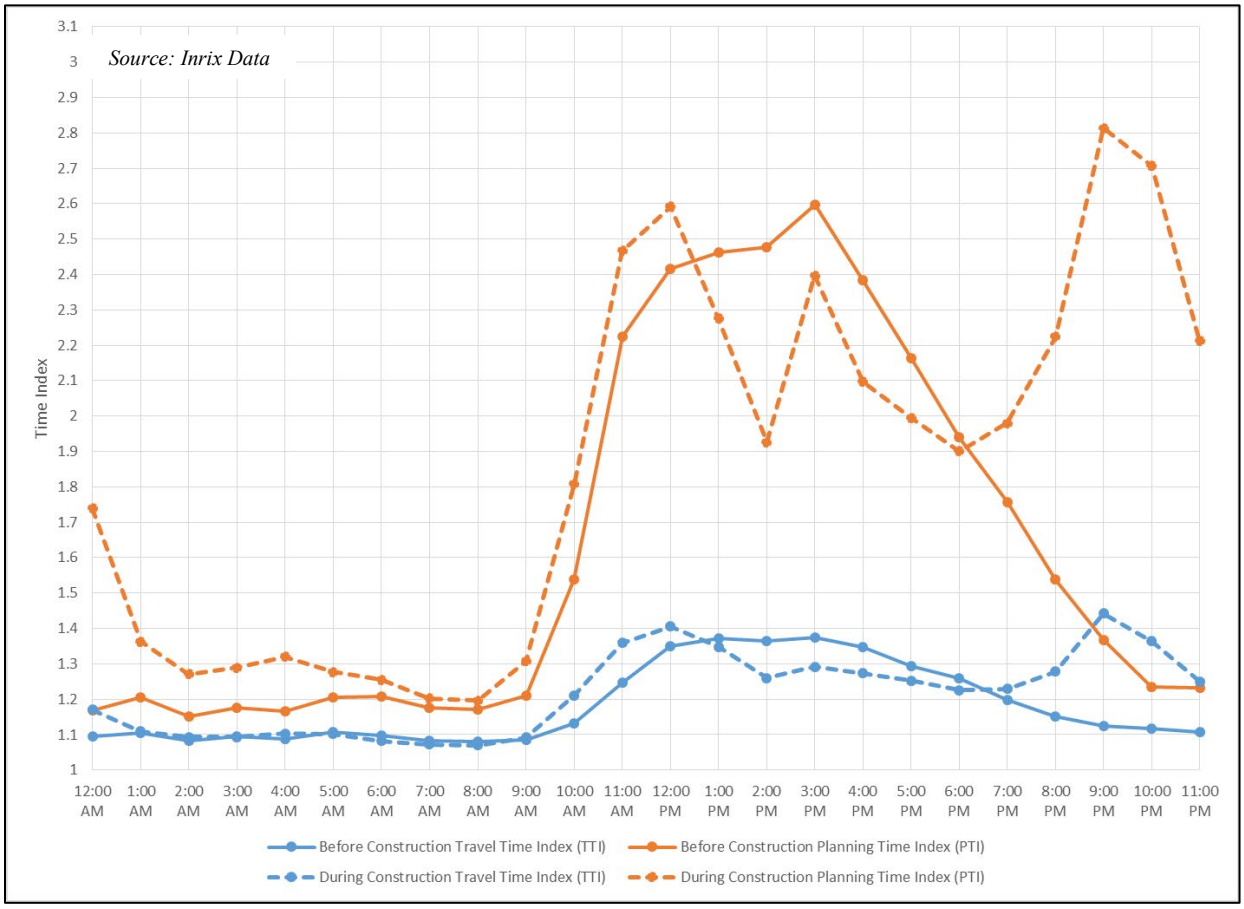


Figure 17. Southbound Weekend TTI and PTI Comparison

In order to gain a deeper understanding of the TTI and PTI increases measured during the nighttime hours, separate evaluation was done to identify the cause of the additional corridor delay. **Figure 18** and **Figure 19** graphically show the PTI and TTI values for the southbound direction separated for Saturday and Sunday, respectively.

These graphs clearly demonstrate that the spike in PTI can be attributed to additional travel time uncertainty during Sunday evening travel. The graph illustrates the spike in TTI and PTI values from 6 p.m. – 1 a.m. on Sunday, while no such spike occurs on Saturday. Given this result and knowledge of construction scheduling along the corridor, it is believed that the increase in the PTI

and TTI on the weekends was associated with planned lane closures occurring Sunday nights along the corridor.

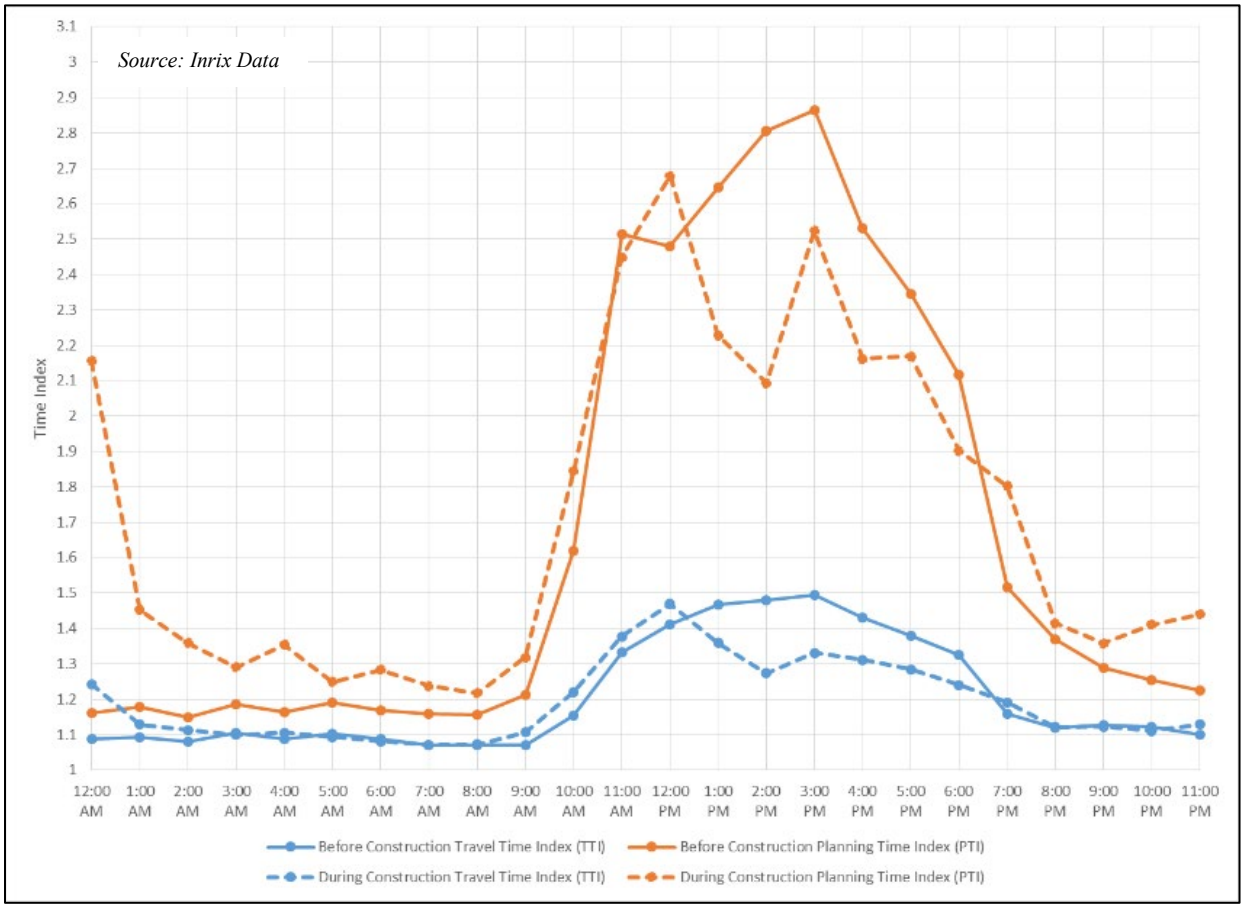


Figure 18. Southbound Saturday TTI and PTI

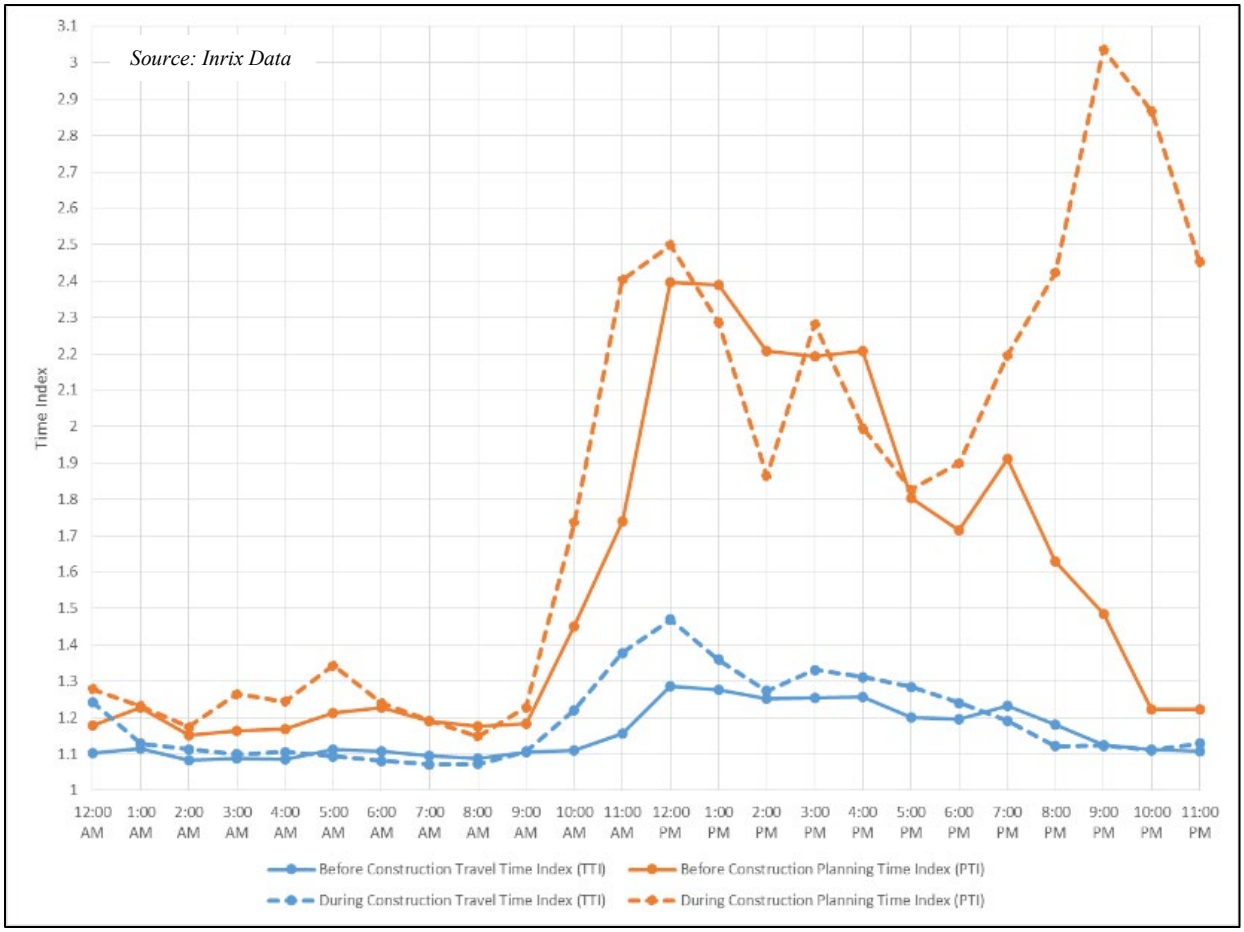


Figure 19. Southbound Sunday TTI and PTI

4.4 Conclusion

The travel time analyses completed for this study provided important conclusions regarding the mobility of travelers in the I-25 Gap work zone. The travel time indices evaluation revealed small increases to the TTI in both directions during most days and periods indicating that construction has had little impact to mobility during average travel conditions. More significant increases in PTI was experienced during construction, especially during weekday daytime travel indicating more significant impact to mobility during delay incidents. This is likely due construction impacts along the corridor, including the installation of concrete barriers which restrict pull out areas and exacerbate delays when incidents occur on the corridor. In addition, the analysis revealed significant impacts to the TTI and PTI during nighttime hours when lane shifts and lane closures occur along the corridor, which is expected for a construction project of this magnitude. Overall, the analysis of the TTI and PTI indices indicate a construction zone which not having a large

impact on mobility during average travel times, but one where incidents and nighttime lane closures can cause significant impact to mobility.

5 CONCLUSION AND RECOMMENDATIONS

This report has examined the impact of the I-25 Gap work zone on traffic flow, safety and mobility. Through this evaluation, the report also provides CDOT the foundation to build a set performance metrics for future construction projects. Using guidance from FHWA, this report identified a three pronged approach to measure the performance of the I-25 Gap work zone. The approach used available data to understand the construction project's impact on exposure, safety, and mobility. Based on the evaluation and analysis of traffic volume, travel time and crash data, the following conclusions and recommendations are made in this report.

- Exposure Measures
    - This process has established a performance metric based on CDOT traffic counts from a nearby Automatic Traffic Recorder (ATR) which measure the total average daily traffic (ADT) before construction compared to during construction.

- Safety Performance Measures
    - The crash analysis provided important conclusions regarding the safety of travelers to the I-25 Gap work zone. This process has established performance metrics based on the CDOT Crash Data which measure the total number of crashes before construction compared to the total number of crashes during construction. In addition to evaluating the total number of crashes, related evaluation has also been completed comparing the total number of severe crashes (fatal plus injury crashes). Combined, these metrics provide information about the influence the construction zone has on the frequency and severity of crashes within the study area.

    - Through the crash analysis comparison, multiple data sources were identified and analyzed for accuracy and consistency. During the course of the construction project, CDOT was able to allocate more resources to expand and improve the POC operations. Further investigation revealed that the quality of the crash data collected

likely improved after the expanded POC operations but we were only able to analyze a small amount of this data. Thus, CDOT might consider additional work to verify that the field data collected after June 2019 accurately represents the total crashes along the corridor. Once the additional CDOT Crash Records are made available, a comparison against the recent field data could be done to measure correlation. If this comparison shows that these two datasets are comparable, then CDOT will have confidence that the field data collection process provides a template for future POC operations to allow for continuous evaluation of the safety performance metrics during construction activities.

- The safety performance metrics measured during this study have identified that there have been increases in total crashes along the I-25 Gap project comparing before construction to during construction. Despite the fact that most of the construction activities were in the southbound direction, the crash frequency increases were significantly higher in the northbound direction than in the southbound direction. However, examination of sever crash trends reveals that, in the northbound direction, the number of severe crashes did not increase significantly and therefore the increased crashes are mostly property damage only crashes. For the southbound direction, a more moderate increase in both total and severe crashes was observed. Analysis of crash trends during peak hours indicate that the increased crash rate observed in the northbound direction is more pronounced during the peak hours.

As CDOT implements similar construction work zone safety measures on future projects, a more comprehensive understanding will be established to guide the policy discussion regarding project target safety performance metrics.

- Mobility Performance Measures
  - The travel time analyses completed for this study provided important conclusions regarding the mobility of travelers in the I-25 Gap work zone. The corridor travel time results have been analyzed using two metrics, the Travel Time Index (TTI)

and Planning Time Index (PTI) to provide information about how travel time reliability has changed pre-construction versus during construction. In general, the TTI represents the ratio of average peak hour travel times to average free flow travel times. TTI gives an indication of unexpected delay during average traffic flow. PTI values represent the ratio of the 95th percentile travel time to free flow travel times. PTI gives an indication of unexpected delay during congested traffic flow. These index values provide key measurements in understanding the impact that the I-25 Gap work zone has had on traveler mobility.

- The travel time indices evaluation revealed small increases to the TTI in both directions during most days and periods indicating that construction has had little impact to mobility during average travel conditions. More significant increases in PTI was experienced during construction, especially during weekday daytime travel indicating more significant impact to mobility during delay incidents. This is likely due to construction impacts along the corridor, including the installation of concrete barriers which restrict pull out areas and exacerbate delays when incidents occur on the corridor. In addition, the analysis revealed significant impacts to the TTI and PTI during nighttime hours when lane shifts and lane closures occur along the corridor, which is expected for a construction project of this magnitude. Overall, the analysis of the TTI and PTI indices indicate a construction zone which does not have a large impact on mobility during average travel times, but one where incidents and nighttime lane closures can cause significant impact to mobility.

- As CDOT implements similar construction work zone mobility measures on future projects, a more comprehensive understanding will be established to guide the policy discussion regarding project target mobility performance metrics.

APPENDIX A

The following tables provide the ATR volume data for the I-25 device located at mile marker 180 as discussed in the Exposure Measures section.

Northbound Volumes			
Month	**2017**	**2018**	**2019**
January	30,801	34,269	33,129
February	35,365	31,964	34,765
March	38,131	33,474	36,173
April	38,553	31,319	38,124
May	38,378	40,619	40,065
June	44,131	44,523	41,516
July	43,174	43,388	39,995
August	42,052	42,595	40,270
September	40,500	41,390	38,724
October	38,111	36,938	38,375
November	37,398	35,549	27,357
December	37,374	34,194	17,827
Yearly Average	38,664	37,519	35,527

Southbound Volumes			
Month	**2017**	**2018**	**2019**
January	32,080	34,991	33,412
February	34,765	35,264	34,582
March	37,223	36,903	36,790
April	37,375	38,684	37,758
May	39,016	40,272	39,768
June	41,957	41,811	40,391
July	41,707	41,329	39,934
August	40,945	41,890	36,909
September	39,414	39,527	30,799
October	37,599	37,626	30,372
November	37,388	34,835	31,308
December	36,975	35,018	32,836
Yearly Average	38,037	38,179	38,044

APPENDIX B – CRASH REPORT TEMPLATES

1 CDOT CSP Crash Data

The following link provides the crash data requirements identified by the state of Colorado. Through the link the initial report worksheets are provided along with the data model to clearly identify the goals and methodology associated with the resulting crash data. The results of this effort can be seen in the displayed table below.

- https://www.codot.gov/about/committees/strac/dr3447-the-new-state-of-colorado-traffic-crash-report-form-1

system	rte	sec	mp	date	time	severity	injlevel_1	injlevel_2	injlevel_3	injlevel_4	injlevel_5	agencyname	location	road_desc	vehicles	contour	condition	lighting	weather	limit1	county	latitude	longitude
INTERSTATE	25	A	160	7/11/2017	1530	PDO	2	0	0	0	0	CSP	ON	NON-INTERSECTION	2	STRAIGHT ON-GRADE	DRY	DAYLIGHT	NONE	75	EL PASO	39.081367	-104.859973
INTERSTATE	25	A	160	8/20/2017	1100	PDO	2	0	0	0	0	CSP	ON	NON-INTERSECTION	2	STRAIGHT ON-LEVEL	DRY	DAYLIGHT	NONE	75	EL PASO	39.081367	-104.859973
INTERSTATE	25	A	160	8/20/2017	1320	PDO	3	0	0	0	0	CSP	ON	NON-INTERSECTION	2	STRAIGHT ON-LEVEL	DRY	DAYLIGHT	NONE	75	EL PASO	39.081367	-104.859973
INTERSTATE	25	A	160	4/20/2018	1515	INJ	1	1	0	0	0	CSP	ON	NON-INTERSECTION	2	STRAIGHT ON-LEVEL	WET	DAYLIGHT	SNOW/SLEET/HAIL	75	EL PASO	39.081367	-104.859973
INTERSTATE	25	A	160	11/10/2018	1820	PDO	2	0	0	0	0	CSP	ON	NON-INTERSECTION	2	STRAIGHT ON-LEVEL	DRY	DARK-UNLIGHTED	NONE	75	EL PASO	39.081367	-104.859973
INTERSTATE	25	A	160	11/22/2018	1835	PDO	4	0	0	0	0	CSP	ON	NON-INTERSECTION	2	STRAIGHT ON-LEVEL	DRY	DARK-UNLIGHTED	NONE	75	EL PASO	39.081367	-104.859973
INTERSTATE	25	A	160	2/21/2017	1530	PDO	3	0	0	0	0	CSP	ON	NON-INTERSECTION	2	STRAIGHT ON-LEVEL	DRY	DAYLIGHT	NONE	75	EL PASO	39.081367	-104.859973

2 POC Crash Data

The following table provides an example of the standard incident report process initiated by each POC operator once an event occurs.

Date	Mile Post	Direction	Lane #	Event Type	Responders	Clearance Impact	PVSL	Notified	Detection Method	Time of Event	Time Event Closed	Incident Time	Operator	Description
6/10/2019	167-167.9	NB	Right Shoulder		Checked and cleared	Level 2 (30Min-2Hrs)		Kraemer/Golden TOC		0.569444444	0.613888889	0.044444444	Jerry	NB I-25 167.0 #2 shoulder Traffic stop multiple CSP/ DCSO on scene
6/11/2019	167-167.9	SB		Flat Tire	Checked and cleared	Level 3 (>2Hrs)		Kraemer/Golden TOC		0.479166667	0.567361111	0.088194444	Wardi/Jerry	SB I-25 167.5 stalled white box truck csp on scene, Start time 11:30/Clear time 13:37
6/11/2019	165-165.9	SB	Right Shou	Stall	Checked and cleared	Level 2 (30Min-2Hrs)		Kraemer/Golden TOC		0.708333333	0.759722222	0.051388889	Jerry	SB I-25 176.0 #2 shoulder breakdown lane waiting for tow per Courtesy Patrol, 17:00/Clea
6/11/2019	168-168.9	SB	Lane 2	Stall	Unavailible	Level 1 (<30Min)		Kreamer Chris Bellf/Golden TOC/CSP		0.823611111	0.84375	0.020138889	Jerry	SB I-25 164.0 #2 lane and shoulder, three disabled vehicles, CSP responding, Start time 19:
6/12/2019	176-176.9	NB	Lane 2	Crash	Unavailible	Level 1 (<30Min)		Golden TOC		0.223611111	0.266666667	0.043055556	Wardi	NB I-25 at MP 174, multi-vechcrash, Right lane blocked, FireEMS on scene.
6/12/2019	164-164.9	SB	Lane 2	Stall	Checked and cleared	Level 1 (<30Min)		Golden TOC/Kraemer/Roadsafe		0.338194444	0.344444444	0.00625	Wardi	SB I-25 at MP 175, stalledbox truck blocking the right lane
6/12/2019	174-174.9	SB	Lane 2		Checked and cleared	Level 2 (30Min-2Hrs)		Golden TOC/Kraemer/Roadsafe		0.378472222	0.402777778	0.024305556	Wardi	SB I-25 at MP 177 Crash,right lane blocked
6/12/2019	175-175.9	SB	Lane 2	Crash	Unknown	Level 2 (30Min-2Hrs)		CTMC Handled Incident		0.615972222	0.650694444	0.034722222	CTMC	SB I-25 #2 laneat MP 178.0, Crash #2 Lane Blocked, CSP/Maintenance on scene
6/12/2019	177-177.9	NB	Left Shoulc	Stall	Checked and towed	Level 1 (<30Min)		Kreamer Courtesy Patrol/Joe		0.675	0.690277778	0.015277778	Jerry	NB I-25 at MP 172.4, #1 shoulder, Disabled vehicle, Start time 16:12/Clear time 16:34
6/13/2019	178-178.9	NB	Lane 1		Checked and towed	Level 2 (30Min-2Hrs)		Kraemer Jeff S./ CTMC		0.260416667	0.309722222	0.049305556	Wardi	NB I-25 at MP 169 blockingthe left lane. CSP, first responderson scene
6/13/2019	172-172.9	SB	Lane 2		Checked and towed	Level 1 (<30Min)		Kreamer/CTMC		0.572916667	0.58125	0.008333333	Jerry	SB I-25 MP 178 #2 lane blocked, Courtesy patrol on scene, Start time 13:45/Clear time 13:5
6/13/2019	168-168.9	NB	Lane 3	Stall	Checked and cleared	Level 1 (<30Min)		Kreamer/Pueblo POC		0.595833333	0.611111111	0.015277778	Jerry	I-25 NB 163 #3 lane, Stalled tractor trailer, Lane blocked, CSP on scene, Start time 14:18/Cl

3 Courtesy Patrol Crash data

The following table provides an example of the standard reporting structure provided by the Courtesy Patrol operators following each day of events. Utilizing the provided Type Code Key, the data was classified into six different categories based on the event.

Date	Direction	MM Location	Day or Night	Time	Injuries (Y or N?)	# of Vehicles	Type Code	Courtesy Patrol Assist (Yes/No)	Type of Incident	Cause of Incident	Lane #	Case #	Notes	Damage to Property	Type of Property Hit	Number of Property Hit	General Description
09/04/18		163-163.9	Afternoon	3:54 PM	Yes	4	4	Yes	Crash			1C182623	4 car accident - 1 Person Injured				
09/04/18		171-171.9	Afternoon	12:23 PM	No	2	4	Yes	Crash	Rear End			Minor 2 Car accident				
09/04/18		173-173.9	Afternoon	1:54 PM	No	1	4	Yes	Stopped Vehicle	Breakdown							
09/04/18			Morning	11:02 AM	No	1	4	No	Stopped Vehicle	Voluntary Pull Over			Car pulled over to find paperwork				
09/04/18		178-178.9	Afternoon	12:02 PM	No	1	4	No	Stopped Vehicle	Voluntary Pull Over			Car pulled over then left				
09/05/18	NB	178-178.9	Morning	9:30 AM	No	1	4	Yes	Stopped Vehicle	Breakdown			Fuel pump went out on pickup, towed to gas station				
09/05/18	NB	177-177.9	Afternoon	12:43 PM	No	1	4	No	Stopped Vehicle	Fuel			Car ran out of gas and refused service				
09/05/18	NB	178-178.9	Afternoon	4:19 PM	No	1	4	Yes	Stopped Vehicle	Tire - Flat			Car had a flat tire, tire changed				
09/05/18		176-176.9	Morning	7:31 AM	No	1	4	No	Stopped Vehicle	Abandoned Vehicle			Abandoned BMW				
09/05/18	NB	178-178.9	Morning	9:30 AM	No	1	4	Yes	Stopped Vehicle	Breakdown			SUV broke down, towed to exit 181 Conoco Lot				
09/05/18		178-178.9	Afternoon	4:15 PM	No	1	4	Yes	Stopped Vehicle	Tire - Flat			Car had flat tire				
09/05/18		174-174.9	Morning	9:17 AM	No	1	4	No	Stopped Vehicle	Voluntary Pull Over			Pulled over to check temp of car				
09/06/18	NB	178-178.9	Morning	11:41 AM	No	1	4	Yes	Stopped Vehicle	Breakdown			Car overheated, towed to Tomah Rd. exit				
09/06/18	NB	177-177.9	Afternoon	4:58 PM	No	1	4	Yes	Stopped Vehicle	Fuel			Car ran out of gas, gave gas				
09/06/18	SB	177-177.9	Evening	5:18 PM	No	2	4	No	Crash	Rear End			2 Car accidents, both cars driveable				
09/06/18	SB	179-179.9	Evening	6:00 PM	No	1	4	No	Stopped Vehicle	Breakdown			Car broke down, driver refused service				
09/06/18	SB	179-179.9	Afternoon	3:50 PM	No	1	4	Yes	Stopped Vehicle	Breakdown			Clutch out on a car, towed to Tomah Rd. exit				
09/06/18	SB	177-177.9	Afternoon	4:15 PM	No	1	4	Yes	Stopped Vehicle	Breakdown			Pickup broke down				
09/06/18	SB	177-177.9	Afternoon	4:33 PM	No	1	4	Yes	Stopped Vehicle	Breakdown			Pickup transmission broke, towed to Tomah Rd. exit				

Type Code Key	
1	3rd party property damage as a result of construction activity
2	3rd party incident resulting in impacts to traffic movement outside of the workzone. No injures, no illegal activity. No lane closures in place.
3	3rd party incident resulting in injury or suspicion of illegal activity inside the work zone.
4	3rd party incident resulting in impacts to traffic movement with lane closures in place.
5	Traffic slowdowns as a result of construction traffic ingress/egress and lane closures.
6	Communicate information about traffic delays not caused by an incident. IE delays due to traffic volume.

4 Cognos crash data – Mile high courtesy patrol

The following table identifies the standard format for the Cognos crash data recorded by the TMC operators at the CDOT TMC headquarters during the off hours of the I-25 Gap project.

CP Company	Patrol	Road	Direction	Crossroad	Mile Mark	Lanes Imp	Total # of	# of Trave	Roadway Closure	Incident Type	Vehicle Type	Dispatch Date	Arrival Date	Clear Date	Duration (Incident Clearance)	Injury	Weather Related Dispatch	Agency Services	Total(Duration)	Total(Duration)
Mile High Courtesy Patrol	100) I-25 -- Colorado Springs	I 25	North		165	Unknown	1	0	No Information Available	Accident	Unknown	Sep 5, 2016 3:00:00 PM	Sep 5, 2016 3:36:00 PM	Sep 5, 2016 6:37:03 PM	3 hours 37 minutes			Protecting The Scene	3 hours 37 minutes	3 hours 37 minutes
Mile High Courtesy Patrol	71) C-470 -- Wadsworth to I70	I 25	North		166	Shoulder	1	0	No Lanes Closed	Mechanical	Passenger Vehicle 2WD		Jan 3, 2017 12:14:00 PM	Jan 3, 2017 12:25:00 PM	11 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	72) I-25 -- Lincoln to Founders	I 25	South	Plum Creek Pkwy	180.80	Shoulder	1	0	No Lanes Closed	Mechanical	Unknown		Jan 2, 2017 5:53:00 PM	Jan 2, 2017 6:09:00 PM	16 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	61) 6th Ave -- Kipling to Kalamath	I 25	North		165	Shoulder	1	0	No Lanes Closed	Miscellaneous	Passenger Vehicle 2WD	Jan 3, 2017 10:48:00 AM	Jan 3, 2017 12:15:00 PM	Jan 3, 2017 12:15:00 PM	1 hour 27 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	61) 6th Ave -- Kipling to Kalamath	I 25	South		164	Shoulder	1	0	No Lanes Closed	Mechanical	Passenger Vehicle 4WD		Jan 3, 2017 12:19:00 PM	Jan 3, 2017 12:35:00 PM	16 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		180	Shoulder	1	0	No Lanes Closed	Mechanical	Unknown		Jan 22, 2017 6:01:00 PM	Jan 22, 2017 6:31:00 PM	30 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	South		175	Shoulder	1	0	No Lanes Closed	Mechanical	Passenger Vehicle 2WD		Jan 15, 2017 10:17:00 AM	Jan 15, 2017 10:19:00 AM	2 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		162.50	Shoulder	1	0	No Lanes Closed	Mechanical	Passenger Vehicle 2WD		Jan 29, 2017 10:42:00 AM	Jan 29, 2017 10:48:00 AM	6 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P73) I-25 -- Lincoln to Plum Creek	I 25	North	Plum Creek Pkwy	180.80	Shoulder	1	0	No Lanes Closed	Mechanical	Passenger Vehicle 2WD		Jan 30, 2017 8:33:00 AM	Jan 30, 2017 9:07:00 AM	34 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	T72) I-25 -- Lincoln to Plum Creek	I 25	North	Plum Creek Pkwy	180.80	Shoulder	1	0	No Lanes Closed	Miscellaneous	Passenger Vehicle 2WD		Jan 31, 2017 6:37:00 PM	Jan 31, 2017 6:41:00 PM	4 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	T306) I-25 -- Castle Pines to Monument Hill	I 25	North		175	Shoulder	1	0	No Lanes Closed	Miscellaneous	Passenger Vehicle 2WD		Feb 5, 2017 4:31:00 PM	Feb 5, 2017 4:43:00 PM	12 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	T306) I-25 -- Castle Pines to Monument Hill	I 25	North		166	Shoulder	1	0	No Lanes Closed	Miscellaneous	Passenger Vehicle 4WD		Feb 12, 2017 11:54:00 AM	Feb 12, 2017 11:57:00 AM	3 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		162	Shoulder	1	0	No Lanes Closed	Mechanical	Passenger Vehicle 2WD		Feb 12, 2017 1:52:00 PM	Feb 12, 2017 1:52:00 PM	0 days		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		170	Shoulder	1	0	No Lanes Closed	Mechanical	Passenger Vehicle 2WD		Feb 19, 2017 10:51:00 AM	Feb 19, 2017 10:53:00 AM	2 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	T100) I-25 -- Johnstown to SH14	I 25	North	Plum Creek Pkwy	180.80	Unknown	1	0	No Information Available	Mechanical	Unknown		Feb 23, 2017 7:49:00 AM	Feb 23, 2017 7:57:00 AM	8 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		174	Shoulder	1	0	No Lanes Closed	Mechanical	Passenger Vehicle 2WD		Feb 26, 2017 11:42:00 AM	Feb 26, 2017 12:06:00 PM	24 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		170	Shoulder	1	0	No Lanes Closed	Mechanical	Passenger Vehicle 2WD		Mar 4, 2017 3:04:00 PM	Mar 4, 2017 3:22:00 PM	18 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		173	Shoulder	1	0	No Information Available	Mechanical	Passenger Vehicle 2WD		Mar 5, 2017 12:57:00 PM				No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North	Plum Creek Pkwy	180.80	Shoulder	1	0	No Lanes Closed	Miscellaneous	Passenger Vehicle 2WD		Mar 5, 2017 4:20:00 PM	Mar 5, 2017 4:25:00 PM	5 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	T306) I-25 -- Castle Pines to Monument Hill	I 25	North		176	#1,Mediar	2	1	Partial Closure	Accident	Passenger Vehicle 2WD	Mar 11, 2017 11:09:00 AM	Mar 11, 2017 11:15:00 AM	Mar 11, 2017 11:17:00 AM	8 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		167	Shoulder	1	0	No Lanes Closed	Mechanical	Unknown		Mar 11, 2017 5:47:00 PM	Mar 11, 2017 5:51:00 PM	4 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		168	Shoulder	1	0	No Lanes Closed	Mechanical	Unknown		Mar 11, 2017 5:52:00 PM	Mar 11, 2017 5:56:00 PM	4 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	T306) I-25 -- Castle Pines to Monument Hill	I 25	North		172	Shoulder	1	0	No Lanes Closed	Mechanical	Passenger Vehicle 2WD		Mar 12, 2017 11:18:00 AM	Mar 12, 2017 11:22:00 AM	4 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	T306) I-25 -- Castle Pines to Monument Hill	I 25	North		164	#7,Should	2	0	No Lanes Closed	Mechanical	Unknown		Mar 12, 2017 5:24:00 PM	Mar 12, 2017 5:49:00 PM	25 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		174	#1,Should	2	1	No Lanes Closed	Mechanical	Unknown		Mar 18, 2017 12:36:00 PM	Mar 18, 2017 1:27:00 PM	51 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		175	Unknown	1	0	No Information Available	Mechanical	Passenger Vehicle 4WD		Mar 19, 2017 11:14:00 AM	Mar 19, 2017 12:51:00 PM	1 hour 37 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	T306) I-25 -- Castle Pines to Monument Hill	I 25	North		171	Shoulder	1	0	No Lanes Closed	Mechanical	Unknown		Mar 19, 2017 3:36:00 PM				No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		162	Shoulder	1	0	No Lanes Closed	Mechanical	Unknown		Mar 19, 2017 5:53:00 PM	Mar 19, 2017 5:58:00 PM	5 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	T72) I-25 -- Lincoln to Plum Creek	I 25	North		176	Shoulder	1	0	No Lanes Closed	Mechanical	Unknown		Mar 24, 2017 6:14:00 PM	Mar 24, 2017 6:20:00 PM	6 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P73) I-25 -- Lincoln to Plum Creek	I 25	North		176	Shoulder	1	0	No Lanes Closed	Mechanical	Unknown		Mar 24, 2017 6:45:00 PM	Mar 24, 2017 6:49:00 PM	4 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		161	Shoulder	1	0	No Lanes Closed	Mechanical	Passenger Vehicle 2WD		Mar 25, 2017 5:03:00 PM	Mar 25, 2017 5:07:00 PM	4 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		168	Shoulder	1	0	No Lanes Closed	Accident	Unknown		Mar 25, 2017 5:18:00 PM	Mar 25, 2017 5:42:00 PM	24 minutes		No	Protecting The Scene		
Mile High Courtesy Patrol	P307) I-25 -- Castle Pines to Monument Hill	I 25	North		171	Shoulder	1	0	No Lanes Closed	Mechanical	Unknown		Mar 25, 2017 6:09:00 PM	Mar 25, 2017 6:22:00 PM	13 minutes		No	Protecting The Scene		

APPENDIX C – TRAVEL TIME SUMMARY TABLES

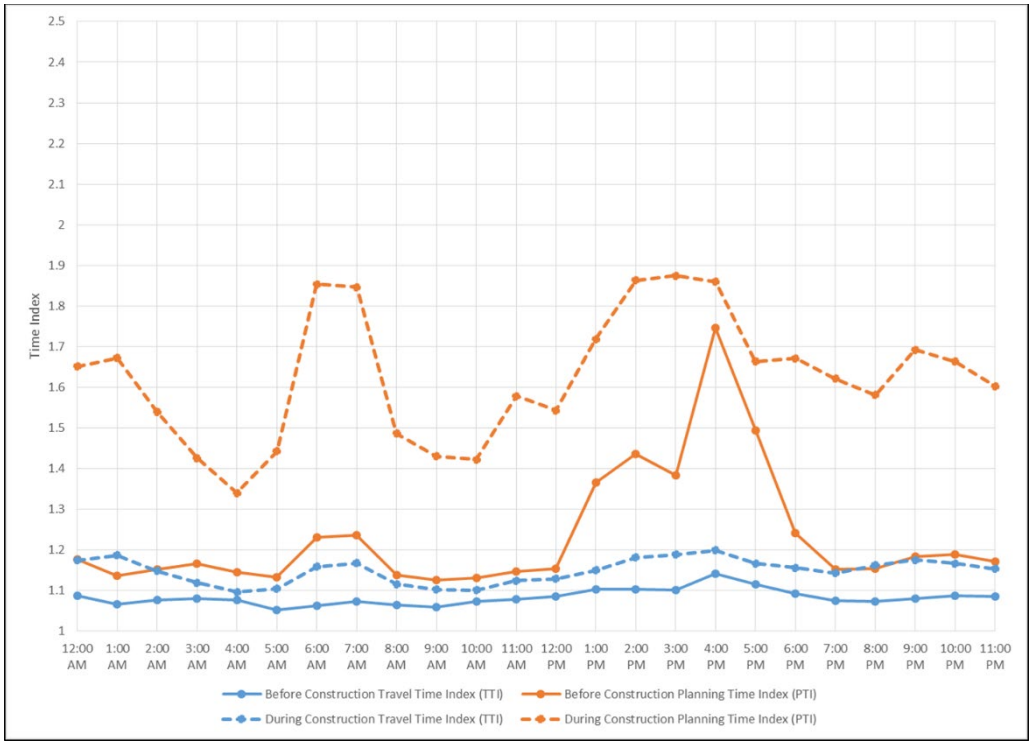
The following tables provide the summary tables created to analyze the travel times associated with the I-25 Gap work zone.

1 Northbound Weekday

Weekday (Mon - Fri) Northbound - Before Construction								
Hour	Time	TT_Count	TT_Min	TT_Sum	TT_Mean	TT_95	Before Construction Planning Time Index (PTI)	Before Construction Travel Time Index (TTI)
0	12:00 AM	21699	17.16	404482.5	18.64061	20.2	1.177156177	1.086282456
1	1:00 AM	21662	17.47	403752.1	18.63872	19.84	1.135661133	1.066898941
2	2:00 AM	21649	17.414	406067.7	18.75688	20.05	1.151372459	1.077115057
3	3:00 AM	21655	17.29	404437.5	18.6764	20.15	1.165413534	1.080185126
4	4:00 AM	21642	17.03	396486.2	18.32022	19.49	1.144450969	1.07576154
5	5:00 AM	21599	16.63	377974.7	17.49964	18.85	1.133493686	1.052293489
6	6:00 AM	21648	16.73	385123.4	17.79025	20.58	1.230125523	1.063374421
7	7:00 AM	21667	16.71	388336.7	17.92296	20.66	1.236385398	1.072588691
8	8:00 AM	21740	16.71	386876.4	17.7956	19.02	1.138240575	1.06496724
9	9:00 AM	21787	16.83	388369	17.82572	18.94	1.125371361	1.059163421
10	10:00 AM	21754	16.86	393580.5	18.09233	19.08	1.131672598	1.07309167
11	11:00 AM	21797	16.9	397464.8	18.23484	19.39	1.147337278	1.078984704
12	12:00 PM	21809	16.87	399146.8	18.30193	19.466	1.153882632	1.084880284
13	1:00 PM	21846	16.88	406486.9	18.60693	23.04	1.36492891	1.102306028
14	2:00 PM	21803	16.86	405603.8	18.60312	24.21	1.43594306	1.103387804
15	3:00 PM	21934	16.83	406261.8	18.52201	23.27	1.38265003	1.100535361
16	4:00 PM	21899	16.81	419899.7	19.17438	29.35	1.745984533	1.140652972
17	5:00 PM	21893	16.82	410950.7	18.77087	25.112	1.492984542	1.115985335
18	6:00 PM	21842	16.83	401252.2	18.37067	20.9	1.241830065	1.091543012
19	7:00 PM	21886	16.87	397129.4	18.14536	19.42	1.151155898	1.075599535
20	8:00 PM	21879	16.99	398668.2	18.2215	19.601	1.153678634	1.072483684
21	9:00 PM	21901	16.95	401197.5	18.31868	20.06	1.183480826	1.080748269
22	10:00 PM	21856	17.03	404347.8	18.50054	20.23	1.187903699	1.086349911
23	11:00 PM	21868	17.13	406395.6	18.58403	20.07	1.171628722	1.084882164

Weeday (Mon - Fri) Northbound - During Construction								
Hour	Time	TT_Count	TT_Min	TT_Sum	TT_Mean	TT_95	During Construction Planning Time Index (PTI)	During Construction Travel Time Index (TTI)
0	12:00 AM	17137	18.09	364121	21.24765	29.872	1.65129906	1.174552181
1	1:00 AM	17126	18.18	369529.6	21.57711	30.395	1.671892189	1.186859814
2	2:00 AM	17132	18.16	357250.3	20.85281	27.96	1.539647577	1.148282229
3	3:00 AM	17115	17.79	340839.9	19.91469	25.37	1.426082069	1.119431541
4	4:00 AM	17107	17.18	322163.1	18.83224	23.017	1.33975553	1.096172294
5	5:00 AM	17071	16.815	317054.4	18.57269	24.26	1.442759441	1.104530931
6	6:00 AM	17050	17.47	345144.5	20.24308	32.38	1.85346308	1.158733883
7	7:00 AM	17019	17.49	347369.4	20.41068	32.3	1.846769583	1.166991582
8	8:00 AM	16999	17.64	334482.9	19.67662	26.22	1.486394558	1.115454737
9	9:00 AM	16966	17.9	334704.7	19.72797	25.5975	1.430027933	1.102121002
10	10:00 AM	16957	17.978	335587	19.79047	25.57	1.422293915	1.100815965
11	11:00 AM	16908	17.99	342118.5	20.23412	28.3895	1.578071151	1.124742697
12	12:00 PM	16857	17.86	339923.2	20.16511	27.564	1.543337066	1.129065446
13	1:00 PM	16923	17.87	347637.4	20.5423	30.709	1.718466704	1.149541352
14	2:00 PM	16946	17.85	357324.7	21.08608	33.26	1.863305322	1.181293058
15	3:00 PM	16891	17.79	357088.6	21.14076	33.35	1.874648679	1.188350735
16	4:00 PM	16920	17.68	358663.6	21.19761	32.8805	1.859756787	1.198959904
17	5:00 PM	17015	17.62	349594.2	20.54623	29.31	1.663450624	1.166074603
18	6:00 PM	17055	17.48	344491.4	20.19885	29.22	1.671624714	1.155540729
19	7:00 PM	17067	17.32	337759.4	19.7902	28.077	1.621073903	1.142621303
20	8:00 PM	17074	17.74	352013.4	20.61693	28.04	1.580608794	1.162171654
21	9:00 PM	17076	18.1	363260.8	21.27318	30.625	1.69198895	1.175313807
22	10:00 PM	17075	18	358571	20.99977	29.933	1.662944444	1.16665362
23	11:00 PM	17066	18.07	355744.2	20.8452	28.97	1.60320974	1.153580575

Percent Change		
Time	PTI	TTI
12:00 AM	40.27867	8.125854
1:00 AM	47.21752	11.24388
2:00 AM	33.72281	6.607202
3:00 AM	22.36704	3.633305
4:00 AM	17.06535	1.897331
5:00 AM	27.28429	4.964151
6:00 AM	50.67268	8.967628
7:00 AM	49.36844	8.801406
8:00 AM	30.58703	4.740756
9:00 AM	27.07165	4.055803
10:00 AM	25.68069	2.583591
11:00 AM	37.54204	4.240838
12:00 PM	33.75165	4.072814
1:00 PM	25.90155	4.285137
2:00 PM	29.76178	7.060551
3:00 PM	35.58374	7.979332
4:00 PM	6.516223	5.111715
5:00 PM	11.41781	4.488345
6:00 PM	34.60978	5.86305
7:00 PM	40.8214	6.231108
8:00 PM	37.00599	8.362642
9:00 PM	42.96716	8.750006
10:00 PM	39.98984	7.392067
11:00 PM	36.83599	6.332339

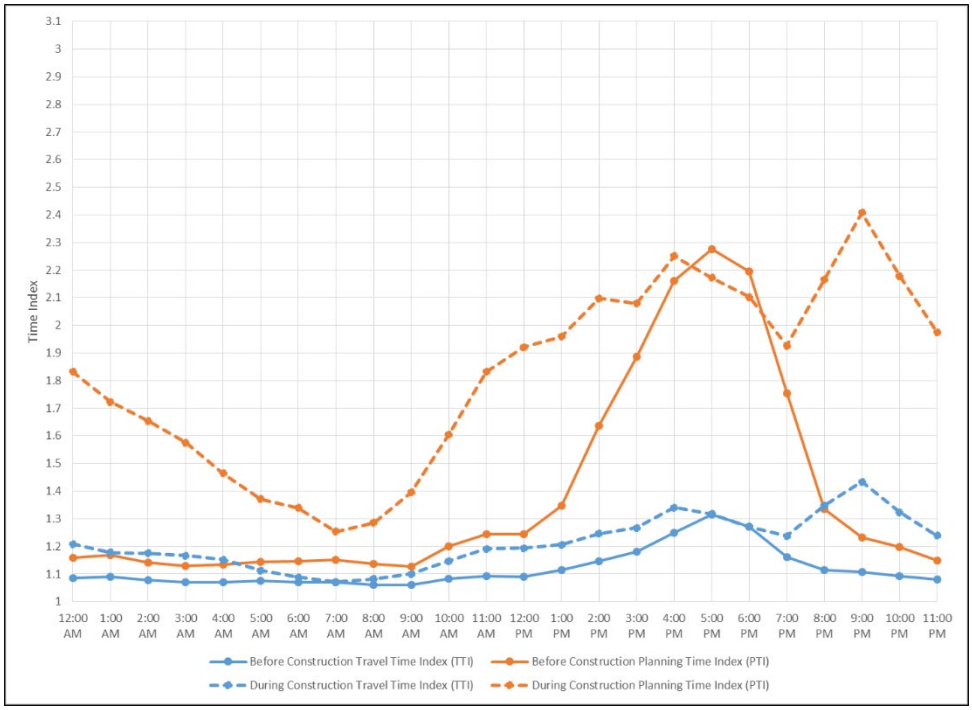


2 Southbound Weekday

Weekday (Mon - Fri) Southbound - Before Construction								
Hour	Time	TT_Count	TT_Min	TT_Sum	TT_Mean	TT_95	Before Construction Planning Time Index (PTI)	Before Construction Travel Time Index (TTI)
0	12:00 AM	21699	17.83	419704.4	19.342107	20.68	1.159842961	1.084806899
1	1:00 AM	21662	17.9	422517.9	19.5050291	20.92	1.168715084	1.089666429
2	2:00 AM	21649	18.17	423694.8	19.5711003	20.75	1.141992295	1.077110637
3	3:00 AM	21655	18.13	420456.6	19.4161422	20.46	1.128516271	1.070940002
4	4:00 AM	21653	18.02	418042.4	19.3064425	20.43	1.133740289	1.071389707
5	5:00 AM	21659	17.55	409120.4	18.8891634	20.07	1.143589744	1.076305607
6	6:00 AM	21708	17.13	397719.7	18.321341	19.64	1.146526562	1.069547051
7	7:00 AM	21705	16.97	394416.4	18.1716839	19.53	1.150854449	1.070812254
8	8:00 AM	21740	16.98	391113.7	17.990512	19.32	1.137809187	1.059511894
9	9:00 AM	21787	17.143	396348.6	18.1919746	19.3	1.125823951	1.061189673
10	10:00 AM	21754	17.22	405789.9	18.6535764	20.65	1.199186992	1.083250659
11	11:00 AM	21797	17.28	411118.5	18.8612419	21.52	1.24537037	1.091507055
12	12:00 PM	21809	17.29	411210	18.8550617	21.516	1.244418739	1.090518315
13	1:00 PM	21846	17.33	422210	19.3266484	23.34	1.346797461	1.115213408
14	2:00 PM	21803	17.3	432815.8	19.8512035	28.327	1.637398844	1.147468411
15	3:00 PM	21934	17.37	449628.8	20.4991721	32.78	1.887161773	1.180148075
16	4:00 PM	21899	17.45	477273.9	21.7943253	37.72	2.161604585	1.248958471
17	5:00 PM	21893	17.34	499732.4	22.8261248	39.468	2.276124567	1.316385513
18	6:00 PM	21842	17.24	479119.8	21.9357124	37.8395	2.194866589	1.272373108
19	7:00 PM	21886	17.11	435125	19.8814297	30.03	1.755113968	1.161977188
20	8:00 PM	21879	17.22	419817.3	19.1881402	22.981	1.334552846	1.114293857
21	9:00 PM	21901	17.32	419565.7	19.1573773	21.34	1.232101617	1.106084139
22	10:00 PM	21856	17.38	415423.5	19.0072982	20.81	1.19735328	1.093630508
23	11:00 PM	21868	17.73	418480.5	19.1366627	20.35	1.147772138	1.079337998

Weekday (Mon - Fri) Southbound - During Construction								
Hour	Time	TT_Count	TT_Min	TT_Sum	TT_Mean	TT_95	During Construction Planning Time Index (PTI)	During Construction Travel Time Index (TTI)
0	12:00 AM	17137	18.74	388061.5	22.6446595	34.322	1.831483458	1.208359632
1	1:00 AM	17126	18.88	380869.8	22.2392742	32.53	1.722987288	1.177927659
2	2:00 AM	17132	18.76	377727.6	22.048072	31.0445	1.654824094	1.175270364
3	3:00 AM	17115	18.54	370251.6	21.6331627	29.22	1.57605178	1.166837256
4	4:00 AM	17107	17.95	353755.3	20.6789817	26.277	1.463899721	1.152032407
5	5:00 AM	17071	17.59	333987.4	19.5646055	24.12	1.371233655	1.112257275
6	6:00 AM	17082	17.9	332759.5	19.4801259	23.9695	1.339078212	1.088275188
7	7:00 AM	17079	18.05	330366	19.3434054	22.621	1.253240997	1.071656806
8	8:00 AM	17000	18.12	333398.1	19.61165	23.301	1.285927152	1.08232064
9	9:00 AM	16966	18.44	344153.6	20.2848986	25.7375	1.39574295	1.100048732
10	10:00 AM	16957	18.57	361263	21.3046553	29.812	1.60538503	1.147261998
11	11:00 AM	16908	18.59	374460.2	22.1469269	34.0665	1.832517483	1.191335497
12	12:00 PM	16857	18.49	371882.5	22.061012	35.524	1.921254732	1.193132074
13	1:00 PM	16923	18.46	376857.3	22.2689429	36.176	1.959696641	1.206334933
14	2:00 PM	16946	18.48	390383.7	23.0369249	38.7775	2.098349567	1.246586847
15	3:00 PM	16891	18.47	395372.3	23.4072772	38.4	2.079047103	1.267313332
16	4:00 PM	16920	18.51	419858.7	24.8143457	41.66	2.250675311	1.340591342
17	5:00 PM	17015	18.58	416303.3	24.4668393	40.37	2.172766416	1.31683742
18	6:00 PM	17055	18.47	400504.5	23.483114	38.833	2.102490525	1.271419277
19	7:00 PM	17067	18.23	385143.7	22.5665723	35.11	1.925946242	1.237881093
20	8:00 PM	17074	18.61	428361	25.0884995	40.3135	2.166227834	1.348119262
21	9:00 PM	17076	18.75	459137	26.8878561	45.14	2.407466667	1.43401899
22	10:00 PM	17075	18.69	422493.8	24.7434114	40.73	2.179240235	1.323885041
23	11:00 PM	17066	18.76	396740.3	23.2474112	37.065	1.975746269	1.239201025

	Percent Change	
Time	PTI	TTI
12:00 AM	57.90788	11.3893757
1:00 AM	47.42578	8.09983931
2:00 AM	44.90677	9.11324456
3:00 AM	39.65698	8.95449362
4:00 AM	29.12126	7.52692499
5:00 AM	19.90608	3.34028443
6:00 AM	16.79435	1.75103443
7:00 AM	8.896568	0.07887028
8:00 AM	13.01782	2.15275981
9:00 AM	23.97524	3.66183913
10:00 AM	33.87279	5.90918992
11:00 AM	47.14639	9.14592735
12:00 PM	54.38973	9.40963182
1:00 PM	45.5079	8.17077022
2:00 PM	28.1514	8.63801005
3:00 PM	10.16793	7.38595938
4:00 PM	4.120584	7.33674288
5:00 PM	-4.54097	0.03432939
6:00 PM	-4.20873	-0.0749648
7:00 PM	9.733401	6.53230601
8:00 PM	62.31863	20.9841779
9:00 PM	95.39514	29.6482735
10:00 PM	82.00478	21.0541432
11:00 PM	72.1375	14.8112109

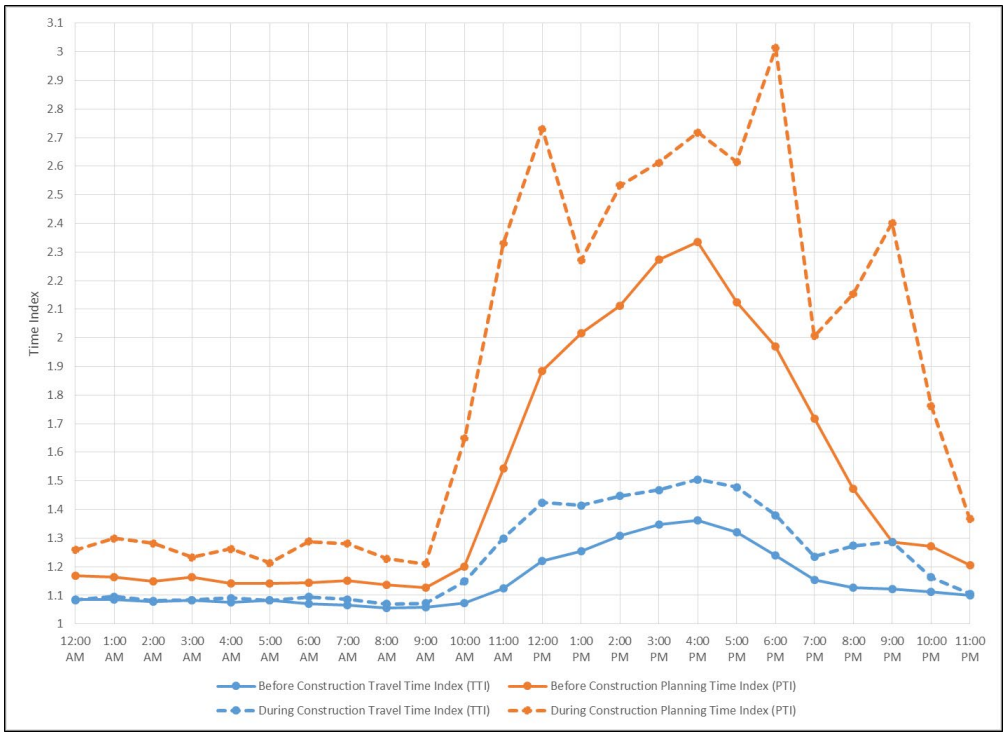


3 Northbound Weekend

Weekend (Sat - Sun) Northbound - Before Construction								
Hour	Time	TT_Count	TT_Min	TT_Sum	TT_Mean	TT_95	Before Construction Planning Time Index (PTI)	Before Construction Travel Time Index (TTI)
0	12:00 AM	8731	17.09	161905.8	18.54379	19.95	1.167349327	1.085066635
1	1:00 AM	8716	17.34	163939.5	18.80903	20.19	1.164359862	1.084719243
2	2:00 AM	8543	17.44	160649.4	18.8048	20.049	1.149598624	1.078256972
3	3:00 AM	8661	17.37	163054.3	18.82627	20.21	1.163500288	1.083838197
4	4:00 AM	8646	17.29	160850.3	18.60402	19.725	1.140832851	1.075998596
5	5:00 AM	8659	17.02	159587.5	18.43024	19.431	1.141656874	1.08285803
6	6:00 AM	8630	16.86	155906.6	18.06565	19.27	1.142941874	1.071509425
7	7:00 AM	8585	16.81	153899.1	17.92651	19.36	1.151695419	1.066419266
8	8:00 AM	8609	16.83	153132.9	17.78753	19.12	1.136066548	1.056894404
9	9:00 AM	8606	16.8	153020.5	17.78067	18.92	1.126190476	1.058373311
10	10:00 AM	8623	16.88	156136.2	18.10695	20.269	1.200770142	1.072686681
11	11:00 AM	8589	16.97	163896.5	19.08214	26.206	1.544254567	1.124462961
12	12:00 PM	8554	16.98	177079	20.70131	31.9935	1.884187279	1.219158658
13	1:00 PM	8509	17	181469.2	21.32674	34.276	2.016235294	1.254514182
14	2:00 PM	8523	16.99	189426.9	22.22538	35.89	2.11241907	1.308144627
15	3:00 PM	8556	16.97	195788.3	22.88316	38.595	2.274307602	1.348447939
16	4:00 PM	8547	17.04	198475.6	23.22167	39.77	2.333920188	1.362773831
17	5:00 PM	8540	17.05	192173.5	22.50276	36.21	2.123753666	1.319809762
18	6:00 PM	8512	16.9	178299.1	20.94679	33.2725	1.968786982	1.239454915
19	7:00 PM	8566	16.86	166627.4	19.45218	28.9425	1.716637011	1.153747166
20	8:00 PM	8583	16.89	163504.9	19.04985	24.88	1.473060983	1.127877632
21	9:00 PM	8629	16.86	163099.9	18.90137	21.666	1.285053381	1.121077412
22	10:00 PM	8602	16.82	160742.3	18.68662	21.4	1.272294887	1.110976252
23	11:00 PM	8586	17	160375.9	18.67877	20.49	1.205294118	1.098751319

Weekend (Sat - Sun) Southbound - During Construction								
Hour	Time	TT_Count	TT_Min	TT_Sum	TT_Mean	TT_95	During Construction Planning Time Index (PTI)	During Construction Travel Time Index (TTI)
0	12:00 AM	6837	17.7	131125.7	19.17883	22.28	1.258757062	1.083549794
1	1:00 AM	6839	17.76	133090.1	19.46047	23.06	1.298423423	1.095746984
2	2:00 AM	6779	17.87	130925.9	19.31346	22.912	1.282148853	1.080775392
3	3:00 AM	6840	17.49	129602	18.94767	21.56	1.232704403	1.083342863
4	4:00 AM	6837	17.268	128746.2	18.8308	21.792	1.261987491	1.090502498
5	5:00 AM	6837	17.05	126189	18.45677	20.69	1.213489736	1.08250862
6	6:00 AM	6839	16.86	126194.9	18.45224	21.72	1.288256228	1.094438741
7	7:00 AM	6834	16.96	125874.1	18.4188	21.72	1.280660377	1.086013985
8	8:00 AM	6837	17.25	126238.7	18.46405	21.172	1.227362319	1.070379881
9	9:00 AM	6834	17.4	127555.3	18.66481	21.05	1.209770115	1.072690469
10	10:00 AM	6833	17.82	139807.3	20.4606	29.37	1.648148148	1.148181738
11	11:00 AM	6835	17.8	158025	23.11996	41.474	2.33	1.298874432
12	12:00 PM	6787	17.94	173357.2	25.54253	48.972	2.729765886	1.423775435
13	1:00 PM	6838	17.92	173355.5	25.35178	40.6945	2.270898438	1.414719934
14	2:00 PM	6817	18.03	177914.3	26.09862	45.664	2.532667776	1.447510713
15	3:00 PM	6835	18.067	181277.2	26.5219	47.203	2.612663973	1.467974951
16	4:00 PM	6833	17.86	183647.7	26.87659	48.546	2.718141097	1.504848105
17	5:00 PM	6827	17.93	180883.8	26.49535	46.9	2.61572783	1.47771075
18	6:00 PM	6835	17.89	168739.6	24.68758	53.914	3.013638904	1.379965104
19	7:00 PM	6833	17.59	148410.3	21.71964	35.284	2.00591245	1.234771862
20	8:00 PM	6840	17.56	152871.3	22.3496	37.826	2.154100228	1.272756481
21	9:00 PM	6840	17.87	157250.3	22.98981	42.9205	2.401818691	1.286503156
22	10:00 PM	6840	17.79	141484.4	20.68486	31.353	1.762394604	1.162723818
23	11:00 PM	6780	17.71	132779.3	19.58397	24.1905	1.365923207	1.105814174

	Percent Change	
Time	PTI	TTI
12:00 AM	7.830367	-0.13979
1:00 AM	11.51393	1.016645
2:00 AM	11.53013	0.233564
3:00 AM	5.947924	-0.0457
4:00 AM	10.61984	1.347948
5:00 AM	6.291983	-0.03227
6:00 AM	12.71406	2.139908
7:00 AM	11.19784	1.837431
8:00 AM	8.036129	1.275953
9:00 AM	7.421448	1.352751
10:00 AM	37.25759	7.037941
11:00 AM	50.88186	15.51065
12:00 PM	44.87763	16.78344
1:00 PM	12.63063	12.77034
2:00 PM	19.89419	10.65372
3:00 PM	14.87734	8.864044
4:00 PM	16.46247	10.42537
5:00 PM	23.16531	11.96392
6:00 PM	53.07085	11.33645
7:00 PM	16.85129	7.022743
8:00 PM	46.23293	12.84526
9:00 PM	86.9042	14.75596
10:00 PM	38.52092	4.657846
11:00 PM	13.32696	0.642807

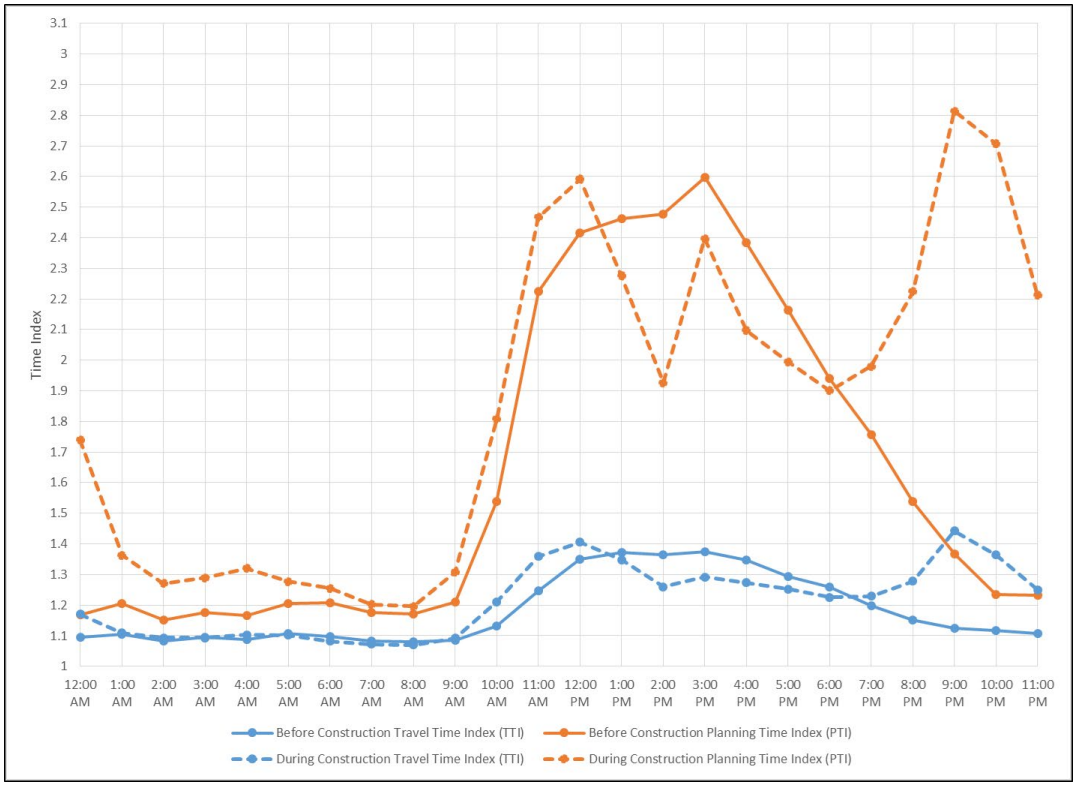


4 Southbound Weekend

Weekend (Sat - Sun) Southbound - Before Construction								
Hour	Time	TT_Count	TT_Min	TT_Sum	TT_Mean	TT_95	Before Construction Planning Time Index (PTI)	Before Construction Travel Time Index (TTI)
0	12:00 AM	8731	17.51	167428.9	19.17637	20.48	1.169617362	1.095166916
1	1:00 AM	8716	17.7	170280.7	19.53656	21.32	1.204519774	1.103760472
2	2:00 AM	8543	17.941	165863.5	19.41514	20.66	1.15155231	1.082165917
3	3:00 AM	8661	17.67	167685.8	19.36102	20.76	1.174872666	1.09570029
4	4:00 AM	8646	17.82	167387.3	19.36008	20.77	1.165544332	1.086424426
5	5:00 AM	8659	17.44	167296.2	19.3205	21.02	1.205275229	1.107826772
6	6:00 AM	8630	17.23	163341.9	18.92722	20.82	1.208357516	1.098503513
7	7:00 AM	8585	16.99	158046.1	18.40957	19.97	1.175397293	1.08355314
8	8:00 AM	8609	17.01	158064.9	18.36042	19.906	1.170252792	1.0793898
9	9:00 AM	8606	17.02	159025.9	18.47849	20.5975	1.21019389	1.085692544
10	10:00 AM	8623	17.14	167433.1	19.41703	26.37	1.538506418	1.132849097
11	11:00 AM	8589	17.26	184858.5	21.5227	38.38	2.22363847	1.246969871
12	12:00 PM	8554	17.37	200628.5	23.45435	41.9635	2.415860679	1.35027915
13	1:00 PM	8509	17.34	202341.3	23.77968	42.722	2.46378316	1.371377318
14	2:00 PM	8523	17.41	202534.7	23.76332	43.129	2.477254451	1.364923362
15	3:00 PM	8556	17.46	205266.1	23.9909	45.3625	2.598081329	1.374049253
16	4:00 PM	8547	17.473	201194.3	23.53976	41.645	2.383391518	1.3472077
17	5:00 PM	8540	17.45	192735.2	22.56852	37.75	2.163323782	1.293324856
18	6:00 PM	8512	17.38	186324.7	21.88965	33.7145	1.939844649	1.259473663
19	7:00 PM	8566	17.18	176204.4	20.57021	30.19	1.757275902	1.197334767
20	8:00 PM	8583	17.19	169877.1	19.79228	26.445	1.538394415	1.151383368
21	9:00 PM	8629	17.22	167102.9	19.36526	23.526	1.366202091	1.124579838
22	10:00 PM	8602	17.13	164640.7	19.13981	21.159	1.235201401	1.117327077
23	11:00 PM	8586	17.28	164347.7	19.14136	21.3075	1.233072917	1.107717613

Weekend (Sat - Sun) Southbound - During Construction								
Hour	Time	TT_Count	TT_Min	TT_Sum	TT_Mean	TT_95	During Construction Planning Time Index (PTI)	During Construction Travel Time Index (TTI)
0	12:00 AM	6837	18.22	145778.3	21.32197	31.684	1.738968167	1.170250672
1	1:00 AM	6839	18.35	139237.7	20.35937	25.011	1.362997275	1.109502282
2	2:00 AM	6779	18.23	135128	19.93332	23.17	1.270981898	1.09343527
3	3:00 AM	6840	18.12	135417.1	19.79782	23.35	1.288631347	1.092595094
4	4:00 AM	6837	17.99	135611.5	19.83493	23.754	1.320400222	1.102553358
5	5:00 AM	6837	17.83	134262.9	19.63769	22.776	1.277397644	1.101385019
6	6:00 AM	6839	17.68	130844.8	19.13216	22.18	1.254524887	1.08213548
7	7:00 AM	6834	17.6	128903	18.86201	21.1535	1.201903409	1.071705061
8	8:00 AM	6837	17.72	129562.6	18.95021	21.19	1.195823928	1.069425144
9	9:00 AM	6834	18.04	134663.4	19.70492	23.58	1.307095344	1.092290277
10	10:00 AM	6833	18.11	149858.4	21.93157	32.756	1.808724462	1.211019815
11	11:00 AM	6835	18.27	169700.4	24.82814	45.063	2.466502463	1.358956865
12	12:00 PM	6787	18.39	175449	25.85074	47.67	2.592169657	1.405695548
13	1:00 PM	6838	18.33	169026.7	24.71873	41.703	2.27512275	1.348539746
14	2:00 PM	6817	18.39	157859.9	23.1568	35.432	1.926699293	1.259205886
15	3:00 PM	6835	18.517	163534.6	23.92605	44.378	2.396608522	1.292112876
16	4:00 PM	6833	18.71	162707.4	23.812	39.224	2.096419027	1.272688277
17	5:00 PM	6827	18.613	159145.2	23.31114	37.135	1.995110944	1.252411812
18	6:00 PM	6835	18.52	155133.8	22.69697	35.19	1.900107991	1.225538574
19	7:00 PM	6833	18.31	153858.9	22.51703	36.26	1.980338613	1.229766906
20	8:00 PM	6840	18.46	161373.1	23.59256	41.05	2.223726977	1.278036992
21	9:00 PM	6840	18.41	181687.3	26.56248	51.8105	2.814258555	1.442828713
22	10:00 PM	6840	18.33	171066.5	25.00972	49.62	2.707037643	1.364414423
23	11:00 PM	6780	18.43	156209.8	23.0398	40.76	2.211611503	1.250124765

	Percent Change	
Time	PTI	TTI
12:00 AM	48.67838	6.855919
1:00 AM	13.1569	0.520204
2:00 AM	10.37118	1.04137
3:00 AM	9.682639	-0.2834
4:00 AM	13.28614	1.484588
5:00 AM	5.983896	-0.58148
6:00 AM	3.820671	-1.49003
7:00 AM	2.255077	-1.09345
8:00 AM	2.185095	-0.92317
9:00 AM	8.007102	0.607698
10:00 AM	17.56366	6.900365
11:00 AM	10.92192	8.98073
12:00 PM	7.297978	4.10407
1:00 PM	-7.65735	-1.6653
2:00 PM	-22.2244	-7.7453
3:00 PM	-7.75468	-5.96313
4:00 PM	-12.0405	-5.5314
5:00 PM	-7.77567	-3.1634
6:00 PM	-2.04845	-2.69439
7:00 PM	12.69366	2.708694
8:00 PM	44.54856	11.00013
9:00 PM	105.9914	28.29936
10:00 PM	119.1576	22.11415
11:00 PM	79.35772	12.85591

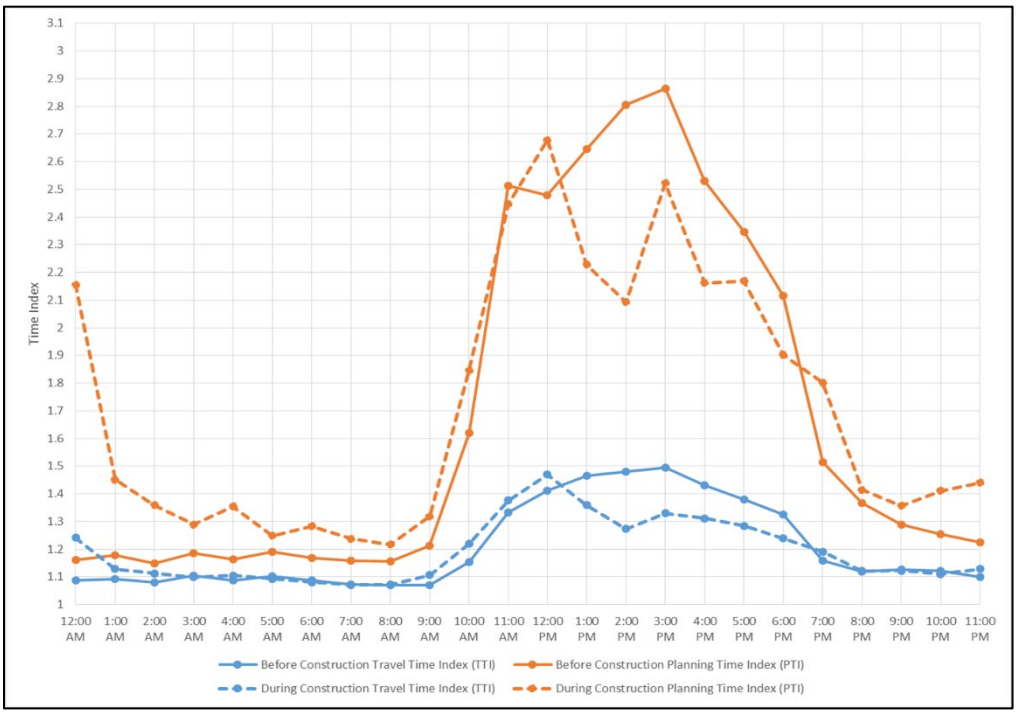


6 Southbound Saturday

Saturday Southbound - Before Construction								
Hour	Time	TT_Count	TT_Min	TT_Sum	TT_Mean	TT_95	Before Construction Planning Time Index (PTI)	Before Construction Travel Time Index (TTI)
0	12:00 AM	4369	17.66	83998.16	19.22595	20.5	1.160815402	1.088671939
1	1:00 AM	4371	17.79	84886.13	19.4203	20.95	1.177627881	1.091641355
2	2:00 AM	4362	17.93	84544.61	19.38207	20.6	1.148912437	1.080985763
3	3:00 AM	4340	17.49	83779.46	19.30402	20.721	1.184734134	1.103717727
4	4:00 AM	4323	17.81	83798.58	19.38436	20.729	1.163896687	1.088397422
5	5:00 AM	4354	17.43	83666.06	19.21591	20.74	1.189902467	1.102461687
6	6:00 AM	4360	17.33	82151.43	18.84207	20.2705	1.169676861	1.08725165
7	7:00 AM	4323	16.97	78616.21	18.18557	19.65	1.157925751	1.0716304
8	8:00 AM	4307	17.02	78515.84	18.22982	19.697	1.157285546	1.071082328
9	9:00 AM	4277	17.09	78211.27	18.28648	20.72	1.212404915	1.070010465
10	10:00 AM	4289	17.25	85369.5	19.90429	27.93	1.619130435	1.153871887
11	11:00 AM	4292	17.41	99513.11	23.18572	43.7615	2.513584147	1.331747268
12	12:00 PM	4262	17.42	104828.2	24.59602	43.197	2.479735936	1.411941349
13	1:00 PM	4256	17.33	108153	25.41188	45.865	2.646566647	1.466352245
14	2:00 PM	4251	17.44	109774.5	25.82323	48.94	2.806192661	1.480689514
15	3:00 PM	4259	17.48	111330.2	26.13998	50.054	2.863501144	1.495422132
16	4:00 PM	4258	17.61	107320.4	25.20441	44.563	2.530550823	1.4312553
17	5:00 PM	4245	17.62	103222.9	24.31636	41.332	2.345743473	1.380043023
18	6:00 PM	4188	17.3535	96386.37	23.01489	36.7265	2.116374218	1.326239234
19	7:00 PM	4270	17.15	84861.54	19.8739	25.9955	1.515772595	1.158827811
20	8:00 PM	4297	17.15	82563.79	19.21429	23.47	1.36851312	1.120366572
21	9:00 PM	4286	17.13	82753.52	19.30787	22.0575	1.28765324	1.127137623
22	10:00 PM	4295	17.1	82441.33	19.19472	21.433	1.253391813	1.122498349
23	11:00 PM	4297	17.17	81179.18	18.89206	21.042	1.22550961	1.100294675

Saturday Southbound - During Construction								
Hour	Time	TT_Count	TT_Min	TT_Sum	TT_Mean	TT_95	During Construction Planning Time Index (PTI)	During Construction Travel Time Index (TTI)
0	12:00 AM	3420	18.3495	77951.04	22.7927	39.554	2.155590071	1.242142933
1	1:00 AM	3419	18.49	71341.94	20.86632	26.846	1.451919957	1.128519072
2	2:00 AM	3419	18.269	69500.51	20.32773	24.831	1.359187695	1.11268982
3	3:00 AM	3420	18.1795	68377.69	19.99348	23.45	1.289914464	1.099781436
4	4:00 AM	3418	18.2585	68956.07	20.17439	24.72	1.353889969	1.104931482
5	5:00 AM	3419	17.93	67005.56	19.598	22.4	1.249302844	1.093028411
6	6:00 AM	3420	17.83	65884.07	19.26435	22.872	1.282781828	1.080445763
7	7:00 AM	3419	17.79	65171.9	19.06168	22.012	1.23732434	1.07148312
8	8:00 AM	3417	17.9	65584.74	19.19366	21.786	1.217094972	1.07227157
9	9:00 AM	3416	18.3	69166.08	20.24768	24.125	1.318306011	1.106430683
10	10:00 AM	3417	18.53	77249.38	22.60737	34.194	1.845331894	1.220041502
11	11:00 AM	3417	18.548	87264.39	25.53831	45.408	2.44813457	1.376876511
12	12:00 PM	3415	18.49	92785.92	27.17011	49.533	2.678907518	1.469448802
13	1:00 PM	3418	18.5185	86012.18	25.16448	41.2505	2.227529228	1.358883079
14	2:00 PM	3401	18.56	80394.14	23.63838	38.85	2.093211207	1.273619764
15	3:00 PM	3418	18.56	84401.31	24.69319	46.8215	2.522710129	1.330451836
16	4:00 PM	3419	18.769	84160.95	24.61566	40.584	2.162288881	1.311506339
17	5:00 PM	3418	18.6885	82015.47	23.99516	40.5345	2.16895417	1.283953439
18	6:00 PM	3419	18.5	78413.41	22.9346	35.19	1.902162162	1.239708307
19	7:00 PM	3414	18.25	74236.02	21.74459	32.8905	1.802219178	1.191484219
20	8:00 PM	3420	18.35	70372.17	20.57666	25.948	1.414059946	1.121343754
21	9:00 PM	3420	18.2495	70053.03	20.48334	24.772	1.357407052	1.122405661
22	10:00 PM	3420	18.129	68826.46	20.1247	25.58	1.410998952	1.110083066
23	11:00 PM	3360	18.14	68759.96	20.46427	26.12	1.439911797	1.128129758

	Percent Change	
Time	PTI	TTI
12:00 AM	85.6962	14.09708
1:00 AM	23.29191	3.37819
2:00 AM	18.30211	2.932884
3:00 AM	8.877969	-0.35664
4:00 AM	16.3239	1.51912
5:00 AM	4.992038	-0.85566
6:00 AM	9.669762	-0.62597
7:00 AM	6.856967	-0.01374
8:00 AM	5.168079	0.111032
9:00 AM	8.734796	3.403725
10:00 AM	13.97055	5.734572
11:00 AM	-2.60383	3.388724
12:00 PM	8.031967	4.072935
1:00 PM	-15.8332	-7.32901
2:00 PM	-25.4074	-13.9847
3:00 PM	-11.9012	-11.0317
4:00 PM	-14.5526	-8.36671
5:00 PM	-7.5366	-6.9628
6:00 PM	-10.1217	-6.52453
7:00 PM	18.89773	2.818055
8:00 PM	3.328198	0.08722
9:00 PM	5.417127	-0.41982
10:00 PM	12.57445	-1.10604
11:00 PM	17.49494	2.529784



7 Southbound Sunday

Sunday Southbound - Before Construction								
Hour	Time	TT_Count	TT_Min	TT_Sum	TT_Mean	TT_95	Before Construction Planning Time Index (PTI)	Before Construction Travel Time Index (TTI)
0	12:00 AM	4362	17.36	83430.75	19.12672	20.4395	1.177390553	1.10176955
1	1:00 AM	4345	17.64	85394.53	19.65352	21.63	1.226190476	1.114144937
2	2:00 AM	4181	17.98	81318.92	19.44963	20.72	1.152391546	1.081737156
3	3:00 AM	4321	17.87	83906.37	19.41828	20.8	1.163961947	1.086641067
4	4:00 AM	4323	17.83	83588.7	19.33581	20.83	1.168255749	1.084453644
5	5:00 AM	4305	17.462	83630.14	19.42628	21.18	1.212919482	1.112488894
6	6:00 AM	4270	17.17	81190.44	19.01415	21.07	1.227140361	1.107405624
7	7:00 AM	4262	17.03	79429.93	18.63677	20.2895	1.191397534	1.094349607
8	8:00 AM	4302	17.01	79549.02	18.49117	20	1.175778954	1.087076517
9	9:00 AM	4329	16.91	80814.59	18.66819	19.99	1.182140745	1.103973327
10	10:00 AM	4334	17.07	82063.58	18.93484	24.75	1.449912127	1.109246408
11	11:00 AM	4297	17.18	85345.36	19.86162	29.902	1.740512224	1.156089353
12	12:00 PM	4292	17.34	95800.27	22.32066	41.538	2.39550173	1.287235258
13	1:00 PM	4253	17.35	94188.34	22.14633	41.464	2.389855908	1.276445513
14	2:00 PM	4272	17.36	92760.21	21.71353	38.34	2.208525346	1.250779511
15	3:00 PM	4297	17.43	93935.97	21.86083	38.244	2.194148021	1.254206894
16	4:00 PM	4289	17.4	93873.97	21.88715	38.4	2.206896552	1.257881965
17	5:00 PM	4295	17.35	89512.21	20.84103	31.303	1.804207493	1.201211918
18	6:00 PM	4324	17.41	89938.35	20.7998	29.865	1.715393452	1.19470439
19	7:00 PM	4296	17.24	91342.89	21.26231	32.965	1.91212297	1.233312729
20	8:00 PM	4286	17.25	87313.35	20.37176	28.0875	1.62826087	1.180971413
21	9:00 PM	4343	17.29	84349.35	19.42191	25.662	1.484210526	1.123302997
22	10:00 PM	4307	17.16	82199.34	19.08506	20.99	1.223193473	1.112182802
23	11:00 PM	4289	17.52	83168.54	19.39113	21.416	1.222374429	1.106799437

Sunday Southbound - During Construction								
Hour	Time	TT_Count	TT_Min	TT_Sum	TT_Mean	TT_95	During Construction Planning Time Index (PTI)	During Construction Travel Time Index (TTI)
0	12:00 AM	3417	18.16	67827.25	19.84994	23.222	1.278744493	1.093058451
1	1:00 AM	3420	18.22	67895.77	19.85256	22.44	1.231613611	1.089602872
2	2:00 AM	3360	18.2	65627.5	19.53199	21.36	1.173626374	1.073186486
3	3:00 AM	3420	18.06	67039.42	19.60217	22.8505	1.265254707	1.08539145
4	4:00 AM	3419	17.84	66655.38	19.49558	22.187	1.243665919	1.092801438
5	5:00 AM	3418	17.73	67257.36	19.6774	23.82	1.343485618	1.109836548
6	6:00 AM	3419	17.559	64960.74	18.99992	21.771	1.239876986	1.082061846
7	7:00 AM	3415	17.45	63731.07	18.6621	20.776	1.190601719	1.069461293
8	8:00 AM	3420	17.5995	63977.87	18.70698	20.2105	1.148356487	1.062926761
9	9:00 AM	3418	17.84	65497.32	19.16247	21.91	1.228139013	1.074129444
10	10:00 AM	3416	17.9	72609.03	21.25557	31.085	1.736592179	1.187462058
11	11:00 AM	3418	18.1485	82435.96	24.11819	43.604	2.402622806	1.328935508
12	12:00 PM	3372	18.35	82663.06	24.51455	45.8515	2.498719346	1.335942737
13	1:00 PM	3420	18.26	83014.52	24.27325	41.7605	2.286993428	1.329312785
14	2:00 PM	3416	18.32	77465.74	22.67732	34.1375	1.863400655	1.237845216
15	3:00 PM	3417	18.48	79133.27	23.1587	42.178	2.282359307	1.253176282
16	4:00 PM	3414	18.64	78546.43	23.00716	37.179	1.994581545	1.234289476
17	5:00 PM	3409	18.54	77129.69	22.62531	33.864	1.826537217	1.220351263
18	6:00 PM	3416	18.53	76720.41	22.45914	35.1925	1.899217485	1.212041901
19	7:00 PM	3419	18.429	79622.86	23.28835	40.455	2.195181507	1.26367939
20	8:00 PM	3420	18.6395	91000.96	26.60847	45.181	2.42393841	1.427531202
21	9:00 PM	3420	18.73	111634.3	32.64161	56.87	3.036305392	1.742744854
22	10:00 PM	3420	18.68	102240	29.89474	53.5425	2.866300857	1.600360645
23	11:00 PM	3420	18.73	87449.88	25.57014	45.9345	2.452455953	1.365197029

	Percent Change	
Time	PTI	TTI
12:00 AM	8.608353	-0.79065
1:00 AM	0.442275	-2.20277
2:00 AM	1.842675	-0.79046
3:00 AM	8.702412	-0.115
4:00 AM	6.454937	0.76977
5:00 AM	10.76462	-0.23842
6:00 AM	1.037911	-2.28857
7:00 AM	-0.0668	-2.27426
8:00 AM	-2.33228	-2.22153
9:00 AM	3.891099	-2.70332
10:00 AM	19.77224	7.051242
11:00 AM	38.04113	14.95093
12:00 PM	4.30881	3.783883
1:00 PM	-4.30413	4.141757
2:00 PM	-15.6269	-1.0341
3:00 PM	4.020298	-0.08217
4:00 PM	-9.62052	-1.87557
5:00 PM	1.237647	1.593336
6:00 PM	10.71614	1.451197
7:00 PM	14.80336	2.462203
8:00 PM	48.86671	20.87771
9:00 PM	104.5738	55.14468
10:00 PM	134.3293	43.89367
11:00 PM	100.6305	23.34638