EL PASO COUNTY
COLORADO

COMMISSIONERS:
CAMI BREMER (CHAIR)
CARRIE GEITNER (VICE-CHAIR)

HOLLY WILLIAMS
STAN VANDERWERF
LONGINOS GONZALEZ, JR.

## DEPARTMENT OF PUBLIC WORKS

**TO:** **El Paso County Planning Commission**
**Thomas Bailey, Chair**

**FROM:** **Howard A. Schwartz, P.E., Engineer III, DPW**
**Kevin Mastin, Department of Public Works, Executive Director**

**RE:** **MP-23-001 Adoption of the Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan into the El Paso County Master Plan**

| | |
|---|---|
| First Planning Commission Hearing Date: | 10/05/2023 |
| Second Planning Commission Hearing Date: | 11/02/2023 |

**Commissioner District:** **All**

**EXECUTIVE SUMMARY**

The El Paso County Department of Public Works (DPW) requests adoption of the Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan into the El Paso County Master Plan. The Briargate Parkway–Stapleton Road corridor is an integral part of a larger transportation system in the Pikes Peak Region. The corridor will ultimately connect I-25 to US Highway 24 on the north side of the greater Colorado Springs area. The portion of this corridor under consideration as part of this study, between Black Forest Road and Meridian Road, is mostly undeveloped at this time, with some portions containing existing roadways of various types and phases of construction associated with adjacent development.

The study area begins at Black Forest Road, which is the eastern boundary of the Wolf Ranch subdivision and coincides with the eastern boundary of the City of Colorado Springs. The terminus of the study area is along Stapleton Road at Meridian Road. There is a significant amount of development occurring in this rapidly developing area of the City and the County. Most of the study corridor falls under the jurisdiction of El Paso County; however, it will likely be incorporated into the City of Colorado Springs as development progresses.

2880 INTERNATIONAL CIRCLE
OFFICE: (719) 520 – 6300

COLORADO SPRINGS, CO 80910
PLNWEB@ELPASOCO.COM

WWW.ELPASOCO.COM

The study identifies needed capacity and mobility improvements for the corridor and a phasing plan to implement those improvements. The Corridor Preservation Plan component of the El Paso County 2016 *Major Transportation Corridors Plan* (2016 MTCP) identifies the ultimate need for a four-lane section throughout the project corridor, both to meet forecasted travel demand and to fulfill broader county system and connectivity needs. The 2016 MTCP included specific recommendations regarding functional classification, transportation modes, and other uses for the Briargate-Stapleton corridor. The 2016 MTCP indicates that Briargate-Stapleton is expected to be a four-lane principal arterial from the eastern city limits of Colorado Springs (Black Forest Road) to Judge Orr Road. Additional mobility provisions, such as bike routes, pedestrian accommodations, and public transit, that are necessary also have been identified. This study will ensure the appropriate spacing of proposed development activity access along the corridor to maintain the functionality appropriate for the corridor's functional classification. Also, recommendations for both interim and ultimate improvements that address capacity and safety improvements based upon the findings of the study, along with potential future funding limitations, are identified. Multiple developments have submitted filings along this corridor and are in various approval, construction, and completion stages. The corridor alignment took these planned developments into consideration.

The State of Colorado State Highway Access Code, last updated March 2002, Section 2.12, states that a local authority may develop an ACP for a road segment that defines access locations and type. Creating an ACP allows the local authorities to plan all access points along a roadway segment as a network rather than at individual access locations. Intersection spacing, traffic movements, land use, topography, and other local plans may be considered in developing an ACP.

An ACP provides a framework to ensure that future development and access will not affect the roadway's functionality. This is particularly relevant to arterial roads as it can allow for more continuous traffic movement and reduce delays due to intersection or turning movements. Access management has several benefits:

- Improves Safety - Fewer decision points and conflict points.
- Accommodates Travel Demand - Strategically limits entrance/exit point, reduces congestion, and lessens travel times.
- Preserves Economic Viability - Captures a broader market by providing a consistent development environment, allowing for easy access to businesses and residential areas.
- Enhanced Aesthetics - Defined sidewalks and medians provide opportunities for streetscaping.

The El Paso County *Engineering Criteria Manual* (ECM) has guidance for the minimum intersection spacing required, based on the roadway classification. Since this is essentially a new corridor, multiple developments have submitted filings along the corridor and are in various approvals, construction, and completion stages. An ACP benefits this corridor by limiting the amount and type of access made to the corridor, per the ECM requirements.
All current development filings have been examined, and the access for those developments has been studied. The study results indicate that the currently proposed intersections should be implemented either as full-access or right-in/right out (RIRO) intersections. All future filings should be examined to ensure that they comply with the results of this ACP.

## A. REQUEST/AUTHORIZATION

**Request:** Adoption of the Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan (PCD File No: MP-23-001).

## B. EFFECT OF APPROVAL OF AN AMENDMENT TO THE MASTER PLAN

Colorado Revised Statute C.R.S. § 30-28-106 et. seq. provides that it is the duty of the Planning Commission to make and adopt the County Master Plan. The Statute requires careful studies to be made prior to plan adoption.

If adopted by the Planning Commission, the Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan will become the principal Master Plan for further planning and development of the Briargate Parkway/ Stapleton Road corridor within unincorporated El Paso County.

The Briargate Parkway/Stapleton Road Corridor Preservation Plan is legally considered to be advisory only. The review criteria for many of the land use applications processed by the Planning and Community Development Department include a requirement that the application be in conformance, general conformance, or consistent with the Master Plan. The Briargate Parkway/Stapleton Road Corridor Preservation Plan will be utilized to evaluate and inform development proposals and land use and 1041 permit applications; be a foundation for revising or developing regulations; coordinate regional and local initiatives; inform Capital Improvement Programs and Budget initiatives; identify additional studies and future action steps; and be an information source for policy makers and citizens.

## C. APPLICABLE RESOLUTION

See attached PC Resolution

## D. GENERAL LOCATION

The Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan study area begins at Black Forest Road, which is the eastern boundary of the Wolf Ranch subdivision and coincides with the eastern boundary of the City of Colorado Springs. The terminus of the study area is along Stapleton Road at Meridian Road.

## E. BACKGROUND

### What is required by Colorado Revised Statute?

Counties are authorized to prepare comprehensive plans as a long-range guiding document for a community to achieve its vision and goals. The Planning Commission is charged with preparing the master plan. The comprehensive plan (or master plan) provides the policy framework for regulatory tools like zoning, subdivision regulations, annexations, and other policies. A comprehensive plan promotes the community's vision, goals, objectives, and policies, establishes a process for orderly growth and development, addresses both current and long-term needs, and provides for a balance between the natural and built environment. (See C.R.S. § 30-28-106) Elements addressed in a comprehensive plan (master plan) may include: recreation and tourism (required by state statutes), transportation, land use, economic development, affordable housing, environment, parks and open space, natural and cultural resources, hazards, capital improvements, water supply and conservation, efficiency in government, sustainability, energy, and urban design. The statutory basis regarding master plans is included as an attachment.

### Development of this Plan

The RFQ for development of the Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan was issued in 2019 and Wilson & Company was selected as the consultant and began work in early 2020. Throughout the process, DPW staff provided support for presentations, recording, advertisements, press releases, web support and publications.

In developing the Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan, DPW staff were committed to encouraging a broad spectrum of County residents to participate in an open and transparent public

input process. This process was designed to provide citizens information about the purpose of the Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan and the facilities and services provided by the County, and to solicit ideas and priorities related to the study.

The community engagement process was comprehensive to both gather information and engage citizens, staff, partners, and other key stakeholders. Participants were presented with information and encouraged to provide their perspectives and insights. Opportunities included:

- Stakeholder meetings
    - Four virtual meetings were held representing developer organizations, homeowner associations, and governmental agencies.
- Project website at https://www.briargate-stapleton.com
- Virtual Public Open House
    - Open for 3 weeks w/additional 30-day comment period
- Public Comment Period on Final Report
    - 41 comments received and responses provided

Development of this Plan occurred during the Covid-19 global pandemic, which challenged the consultant, County staff, review agencies, and public in the completion of the project.

**What does this Plan include?**

The study identifies needed capacity and mobility improvements for the corridor and a phasing plan to implement those improvements. Also, recommendations for both interim and ultimate improvements that address capacity and safety improvements based upon the findings of the study, along with potential future funding limitations, are identified. The study considered multiple facets as part of the planning process including existing conditions, mobility, roadway geometry, access needs and impacts, drainage requirements and impacts, as well as compatibility with other existing planning documents that include the study area.

**What will this Plan be used for?**

The Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan is legally considered to be advisory only. The review criteria for many of the land use applications processed by the Planning and Community Development

Department include a requirement that the application be in conformance, general conformance, or consistent with the Master Plan. The Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan will be utilized to evaluate and inform development proposals, land use, and 1041 permit applications; be a foundation for revising or developing regulations; coordinate regional and local initiatives; inform Capital Improvement Programs and Budget initiatives; identify additional studies and future action steps; and be an information source for policy makers and citizens.

## F. STATUS OF MAJOR ISSUES

Through stakeholder and public outreach, the strongest sentiments expressed regarding the Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan were concerns by the land development community surrounding perceived restrictions in direct access to their properties through the implementation of the Access Control Plan and perceived loss of the rural ambience of the study area was expressed by current area residents. These concerns have been thoroughly considered and addressed in the Study including a process outlined in the Access Control Plan for amending the Plan if certain criteria related to the ECM are met. Additionally, all parties from whom comments were received during the course of the Study on all subjects of concern have had responses to their comments provided to them.

## G. APPROVAL CRITERIA

### 1. EL PASO COUNTY MASTER PLAN CONSISTENCY AND POLICY PLAN COMPLIANCE

The Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan will be a component of the Your El Paso Master Plan.

### 2. COMPLIANCE WITH COUNTY PROCEDURES AND GUIDELINES

The procedures performed in completion of the Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan are consistent with documented County policies and guidelines.

Certifications to the municipal planning commissions and to the Board of County Commissioners are required after adoption of the Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan by the Planning Commission.

### 3. OTHER FACTORS

C.R.S. § 30-28-106 et. seq. governs adoption of a county master plan. The statute allows the Planning Commission to adopt new or amended County Master Plans "in whole or in parts".

The Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan will become the principal Master Plan for further planning and development of the Briargate Parkway / Stapleton Road corridor within unincorporated El Paso County.

## H. PUBLIC COMMENT AND NOTICE

The public was invited to engage at each phase in development of the Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan. This included development of a project website, media and press releases, social media, and emails to interested organizations and individuals. The El Paso County Public Information Office was instrumental in the public involvement process. Information regarding the Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan has been provided continuously on the DPW website, project webpage, and periodically on the County's main website.

Legal Notice for both Planning Commission hearings was published in *The Gazette* on September 22, 2023.

The draft Plan is available for public review online on the project webpage at: https://www.briargate-stapleton.com/ and is also accessible through the Public Works Department webpage at: https://publicworks.elpasoco.com/road-bridge/construction-maintenance-projects/

Additional certifications are required after adoption by the Planning Commission.

## I. STAFF RECOMMENDATION

Staff recommends adoption of the Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan with the following conditions and notations:

### CONDITIONS

1. C.R.S. § 30-28-109 requires the Planning Commission to certify a copy of the Master Plan, or any adopted part or amendment thereof or addition thereto, to

the Board of County Commissioners and to the Planning Commission of all municipalities in the County. The Planning Commission's action to amend the Master Plan shall not be considered final until a minimum of ten (10) complete sets of the final documents are provided and such documents are certified by the Chairman of the County Planning Commission and distributed as required by law.

2. Upon adoption by the El Paso County Planning Commission, the effect of this document is adoption of the Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan into the Master Plan for El Paso County.

**NOTATIONS**

1. Certification of the documents to the municipalities within the County pursuant to Condition No. 1 above is determined to be satisfied upon transmittal of summary information and maps along with a clear description of the locations where the complete documents are available for inspection, along with an offer to provide a given municipality a complete copy of the documents if requested. The transmittal may be in the form of a digital copy.

2. In approving this document, it is understood that minor editorial and formatting changes will be made in conjunction with the final publication process. These modifications may include pagination, correction of typographical errors, clarifications, insertion of photographs, insertion of references and/or corrections to factual information, or inclusion of comments and modifications associated with the Planning Commission hearings. In no case will substantive changes be made to the text without reconsideration by the Planning Commission.

## J. ATTACHMENTS

Draft Briargate Parkway/Stapleton Road Corridor Preservation Plan and Access Control Plan
Legal Notice

El Paso County, Colorado

December 2021

# Corridor Preservation Plan

## Briargate Parkway/Stapleton Road Corridor Study

*On-Call CON 17-067Z*
*Task Release #17-067-51*

WILSON & COMPANY

PT Report Packet
Page 476 of 476

# CORRIDOR PRESERVATION PLAN

Briargate Parkway–Stapleton Road Corridor Study for El Paso County

December 2021

## Table of Contents

## Technical Appendices

## List of Figures



## List of Tables

# 1 Introduction and Overview

The Briargate Parkway–Stapleton Road (in some locations referred to as Stapleton Drive) corridor is an integral part of a larger transportation system in the Pikes Peak Region. The corridor will ultimately connect I-25 to US Highway 24 on the north side of the greater Colorado Springs area. The portion of this corridor under consideration as part of this study, between Black Forest Road and Meridian Road, is mostly undeveloped at this time, with some portions containing existing roadways of various types and phases of construction associated with adjacent development.

## 1.1 Project Summary

The study area begins at Black Forest Road, which is the eastern boundary of the Wolf Ranch subdivision and coincides with the eastern boundary of the city of Colorado Springs, as shown in **Figure 1.1**. The terminus of the study area is along the Stapleton Road right-of-way (ROW) at Meridian Road. There is a significant amount of development occurring in this rapidly developing area of the city and the county.

Most of the study corridor falls under the jurisdiction of El Paso County (EPC or the County); however, it will likely be incorporated into the city as development progresses. Close coordination will be required with the City of Colorado Springs (COS or the City) throughout the project.

## 1.2 Purpose of the Study

This study identifies needed capacity and mobility improvements for the corridor and a phasing plan to implement those improvements.

The Corridor Preservation Plan component of the El Paso County 2016 *Major Transportation Corridors Plan* (2016 MTCP) identifies the ultimate need for a four-lane section throughout the project corridor both to meet forecasted travel demand and to fulfill broader county system and connectivity needs. The 2016 MTCP included specific recommendations regarding functional classification, transportation modes, and other uses for the Briargate-Stapleton corridor. The 2016 MTCP indicates that Briargate-Stapleton is expected to be a four-lane principal arterial from the eastern city limits of Colorado Springs (Black Forest Road) to Judge Orr Road. Additional mobility provisions, such as bike routes, pedestrian accommodations, and public transit, that are necessary also have been identified. This study will ensure the appropriate spacing of proposed development activity access along the corridor to maintain the functionality appropriate for the corridor's functional classification.

Also, recommendations for both interim and ultimate improvements that address capacity and safety improvements based upon the findings of the study, along with potential future funding limitations, are identified.

The preferred alternative will reflect corridor improvements that optimize public safety, needs, and preferences while balancing enhanced capacity, access management, and development.

## 1.3 Existing Conditions

The study corridor extends from Black Forest Road to Meridian Road, about 5.5 miles. Approximately 4.3 miles of the corridor have not been constructed yet. The sections that have been built are not consistent with the proposed roadway classification and use.

From the west, about 0.2 miles of two-lane, 24'-wide asphalt roadway exists to the east of Black Forest Road east. The ROW indicates that 120' has been set aside for this corridor. Through the Wolf Ridge development, Briargate Parkway is a four-lane divided section with curb and gutter and a 30' raised median. In this area, 160' of ROW has been set aside for the roadway.

Similarly, from the east, Stapleton Drive/Road exists for about 1.0 miles as a two-lane, 24'-wide asphalt roadway from Meridian Road to west of Towner Avenue. ROW that has been set aside in this area varies from 120' to 160'. East of the project, Stapleton Drive/Road is a two-lane section with open drainage and an intermittent painted median.

## 1.4 Corridor Issues

Existing conditions and study scope were presented to corridor residents and identified stakeholders through the project website. Community and stakeholder input helped shape the final recommendations presented in the preferred alternative by identifying corridor improvements that optimize mobility, needs, and preferences while balancing enhanced capacity, access management, and development. This input was used to define solutions and as a basis to refine alternatives. Recurring elements identified include:

- Mobility
- Roadway Geometry
- Access Needs and Impacts
- Drainage Requirements and Impacts

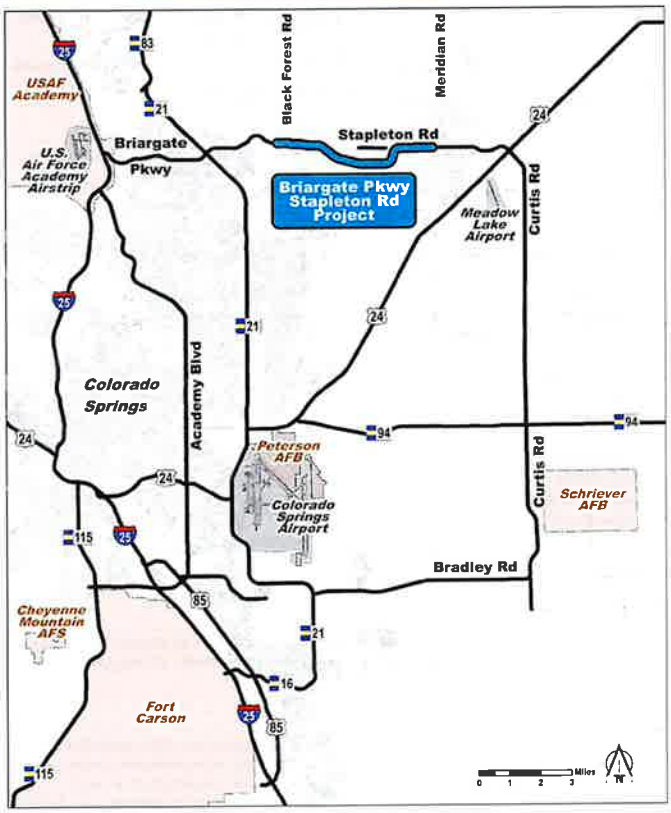
### 1.4.1 Mobility

This corridor is expected to play an essential role in the mobility and connectivity of the region by providing a northern connection from I-25 to US 24. The proposed corridor typical section will include a 4-lane section with shoulders, turn lanes, pedestrian/bicycle facilities. These facilities will improve the mobility of motorists, transit, bicycles, and pedestrians.

### 1.4.2 Roadway Geometry

Limited roadway geometry exists in the proposed corridor. With approximately 1.2 miles of the 5.5-mile corridor currently constructed. For the roadway that does exist, geometry upgrades that can improve corridor mobility and provide necessary carrying capacity include:

- Flattening curves and grades
- Providing new and/or wider shoulders
- Adding turn, acceleration, and deceleration lanes
- Increasing lane widths and/or number of lanes
- Adding accommodations for pedestrians and bicyclists
- Providing adequate roadside clear zones
- Upgrading intersections (e.g., adding turn bays, control upgrades)




### 1.4.3 Access Needs and Impacts

Multiple developments have submitted filings along this corridor and are in various stages of approvals, construction, and completion. The corridor alignment took these planned developments under consideration. Adjacent planned developments include the list below.

- Wolf Ridge
- Eagle Wing
- Wolf Ranch
- Highland Park
- Eagle Rising
- Wild Ridge
- Sterling Ranch
- Sterling Ranch Homestead
- Indian Wells
- The Ranch
- Stapleton Estates
- The Meadows
- Paint Brush Hills

Figure 1.2 depicts the locations of these developments relative to the proposed corridor alignment.


Figure 1.2 Development Plans along the Briargate-Stapleton Corridor

### 1.4.4 Drainage Requirements and Impacts

The Briargate-Stapleton corridor traverses three major drainage basins - Cottonwood Creek, Sand Creek, and Falcon Watershed. The conceptual drainage investigation used data from the available Drainage Basin Planning Studies (DBPS), Major Development Drainage Plans, and Final Drainage Reports. Hydrologic and hydraulic data taken from these reports was used to estimate the off-site drainage needs.

Off-site drainage traverses the Briargate-Stapleton corridor at approximately 30 locations. The most significant crossing locations are Cottonwood Creek, Sand Creek, West Tributary of Falcon Watershed, and East Tributary of Falcon Watershed. Conceptual culvert sizes for all crossings range from 24" pipe to multi-cell concrete box culverts.

On-site drainage was estimated to include 17 outfall locations along the corridor. The off-site runoff will not be allowed to drain onto the roadway section and mix with the on-site runoff. The pavement runoff will be collected in curb box inlets and routed to the outfall locations via storm drains. The on-site runoff will be treated for water quality, and detention will be provided to reduce flows to the required levels.

Key drainage considerations include:

- Managing Off-site and On-site run off appropriately,
- Accounting for any necessary wetland mitigation,
- Sizing culverts to convey peak flows under roadway,
- Including water quality detention and treatment features to mitigate runoff impacts,
- Providing and/or relocating curb and gutter within urban sections.

## 1.5 Current Regional Transportation Studies

Two regional planning documents related to this Corridor have been published:

- El Paso County 2016 MTCP Update (December 2016)
- Pikes Peak Area Council of Governments 2045 *Moving Forward* RTP (2045 RTP, January 2020)

### 1.5.1 El Paso County 2016 Major Transportation Corridors Plan Update (2016 MTCP)

In 2016 El Paso County completed the MTCP update. The purpose of the plan is "to accommodate mobility needs associated with [county] growth in population and economic activity, the transportation system is carefully planned by the County, led by the Public Works Department. The 2016 MTCP is the long-range plan focusing on the multimodal transportation system in unincorporated El Paso County." (p.3). The 2016 MTCP includes specific recommendations regarding functional classification, transportation modes, and other uses for the Corridor.

The 2016 MTCP identifies the Briargate-Stapleton corridor as a secondary truck route and portions of it as a proposed bicycle route. The Corridor Preservation element of the 2016 MTCP call for this Corridor to be constructed to a 4-lane principal arterial along the entire length of the project. Anticipated phasing for the widening of the full corridor to 4-lanes is considered to be a long-term need, needed in the year 2040 or beyond.

### 1.5.2 Pikes Peak Area Council of Governments 2045 Moving Forward Update (2045 RTP Update)

The Pikes Peak Area Council of Governments (PPACG) 2045 Regional Transportation Plan (RTP) was adopted in January 2020. The 2045 RTP identifies the Corridor as a 4-lane principal arterial consistent with the County's 2016 MTCP. Any construction recommended by this study is not currently included on the project lists for the Pikes Peak Regional Transportation Authority (PPRTA).

The 2045 RTP Update lists the Briargate-Stapleton corridor as a gap in the current non-motorized transportation system. Improvements to this corridor are important for the connectivity and safety of non-motorized travel in the corridor. Potential funding sources identified in the document include:

- Municipal/County Capital Improvement Programs
- Pikes Peak Rural Transportation Authority
- Trails and Open Space Funding
- Bike Tax Funds (where applicable)
- LiveWell Colorado
- State public health funds
- Colorado Health Foundation – Physical activity infrastructure grant (October 2014)
- Kaiser Permanente – Walk and Wheel
- FAST Act
- Safe Routes to School
- Tiger Discretionary Grants
- Community Development Block Grant Programs (CDBGP)
- Colorado Lottery – Giving Back
- Great Outdoors Colorado (GOCO)
- FTA Funding
- Formula Grants for Rural Access (populations under 50,000)
- Crowd Sourcing
- Enhanced Mobility for Seniors and Individuals with Disabilities (FTA 5310)

## 1.6 Relevant Corridor and Access Control Studies

### 1.6.1 Stapleton Road Corridor Study (2006)

The Stapleton Road Corridor Study (2006) is related to the preferred alignment for Stapleton Road in the area between the drainage structure west of Eastonville Road and the intersection of Judge Orr Road and Curtis Road and is not relevant to this study.

### 1.6.2 Stapleton Road Access Control Plan (2003)

The Stapleton Road Access Control Plan states that the project area extends from the intersection of Stapleton Road and Meridian Road, including the drainage structure east of the intersection, to the intersection of Judge Orr Road and Curtis Road. However, all the exhibits in the document show an alignment beginning west of Eastonville Road and extending southeast to the intersection of Judge Orr Road and Curtis Road. The results of the Stapleton Road Access Control Plan are for an area adjacent to the areas of this planning study, and the roadway in that area has been built.

### 1.6.3 Stapleton Road US Highway 24 to Judge Orr Road Transportation Impact Study

The area of the 2013 Stapleton Road South Extension: U.S. 24 to Judge Orr Road Transportation Impact Study is adjacent to the area of the Briargate-Stapleton planning study. The 2013 report updated the traffic impacts and forecasts of the Stapleton Road Access Control Plan. However, since Stapleton Road has been constructed between Meridian Road and US Highway 24, the results of this study do not have a significant effect on the Briargate-Stapleton planning study.

### 1.6.3 El Paso County Parks and Leisure Services Master Plan (2005)

The El Paso County Parks and Leisure Services Master Plan identifies the project corridor for an on-road paved bicycle route. It also identifies future trail facilities with a direct connection to the Briargate-Stapleton corridor. Guidance is included in the Master Plan relative to configuration, function, and use of on-road paved bicycle facilities.

Paved shoulders of 8' width and 10' width, located on both sides of the roadway, will support the use of the project corridor for bicycle travel following the County's standards and guidelines. Bicycle lane signage and striping, per adopted standards, should be included in the preliminary and final design and should be implemented for interim and ultimate implementation phases.

### 1.6.4 Black Forest Preservation Plan (1987)

The Black Forest Preservation Plan is a small-area plan providing future land-use guidance for the unincorporated area of El Paso County north of Colorado Springs. Its northern boundary is contiguous with County Line Road, and its southern boundary extends as far south as Woodmen Road. The planning area extends west to I-25 and east to Eastonville Road; the Briargate-Stapleton corridor is located within the bounds of this planning area. Briargate-Stapleton will serve as part of the arterial roadway system that is needed to allow Black Forest and Colorado Springs residents to travel quickly and safely over a substantial distance between homes, workplaces, and shopping and from I-25 to US Highway 24. For roads like Briargate-Stapleton that are designated for this purpose, individual access points should be kept to a minimum. Further, the County recommends a spacing of one mile between accesses (cross streets or driveways) to roadways that are classified as principal or minor arterials.

### 1.6.5 Black Forest Preservation Plan Trails Addendum

The Trails Addendum to the Black Forest Preservation Plan (1999) provides planning for a network of non-motorized, multi-use trails within the Black Forest Planning Area. A proposed trail would travel along the Briargate-Stapleton corridor.

## 1.7 Master Plan Conformance

State statutes allow for the adoption of a master plan as a whole, in parts, or by functional subject matter (CRS 30-29-108). El Paso County's approach is to adopt an overall countywide policy plan augmented by a series of small area plans that respond to conditions and circumstances unique to different areas of the county. As articulated in Section 6.1 of the El Paso County Policy Plan, it is the expectation that private and public bodies will rely on small-area master plans for site-specific land use guidance. The Master Plan is further supported by and related to a series of subject-matter element plans. The overarching county plan is referred to as the County Policy Plan. Other county and city plans and master plan elements that are relevant to this project as well as adjacent Colorado Springs master plan elements include:

### 1.7.1 El Paso County Policy Plan

The El Paso County Policy Plan (updated 1994) lists goals and policies to address specific transportation issues such as mobility and land-use efficiency. The plan is intended to be implemented through use as a source of guidance in the design and review of land-use applications within the county.

The County Policy Plan supports the identification of ROW needed to serve future travel demand and requires preservation of corridors for transportation facilities through the land development process. The Policy Plan also encourages corridor preservation for pedestrian and bicycle facilities.

Access management policies require limits on direct access to major facilities but also request a balance between support of regional mobility and provision of local access onto major facilities. Another relevant policy requests the provision of noise and visual screening through setbacks, buffers, vegetation, and/or other treatments. This could include noise abatement treatment, if warranted.

### 1.7.2 City of Colorado Springs Comprehensive Plan Update

The PlanCOS update (2019) designated the area adjacent to the west of the Briargate-Stapleton corridor as an emerging neighborhood. When the area within the Briargate-Stapleton corridor is annexed into Colorado Springs, it would fall into the Future Neighborhoods category.

For Emerging Neighborhoods, PlanCOS recommends:

- Enhancing Off-Street Trail System Interior to the Neighborhood and Providing Connection to Major Trail Systems
- Create Additional Pedestrian / Trail Connections
- Incorporate Higher Density and Mix of Housing Types on Remaining Parcels
- Utilize Drainageway and Small Spaces for Neighborhood Amenities.

For Future Neighborhoods, PlanCOS recommends:

- Integrate Diversity of Housing Types
- Provide Neighborhood Parks and Gathering Places
- Connect to Regional Trails and Open Space
- Utilize Smart Technology and Efficient Utility Infrastructure
- Maximize Connectivity with Paths, Alleys, and Short Blocks

## 1.8 Conclusions

Several themes consistently run through the planning documents that were reviewed for the Briargate-Stapleton Corridor Study. They include corridor preservation; accommodating multimodal transportation, especially pedestrian/bicycle mobility; providing adequate carrying capacity; and access management.

## 2 Purpose and Need

The overall purpose for this Corridor Preservation Plan was discussed in Section 1.2, "Purpose of the Study," but Section 2 discusses the purpose and need for undertaking a proposed action. Articulating the purpose and need to take action to preserve the corridor and to construct the Stapleton Road–Briargate Parkway roadway connection provides the foundation for assessing alternatives. The term "purpose and need" is largely synonymous with the documentation required for federal approvals under the National Environmental Policy Act (NEPA), for which the implementing regulations published by the President's Council on Environmental Quality state: "The [environmental document] statement shall briefly specify the underlying purpose and need for the proposed action." (CFR 1502.13) If any federal funding is ever secured for corridor improvements, a Purpose and Need statement will then be required.

A good explanation of the difference between project purpose and project needs is provided below, from the Colorado Department of Transportation (CDOT) *National Environmental Policy Act Manual* (CDOT 2020),

> The project purpose statement is a broad statement of the primary intended transportation result and other related objectives to be achieved by a proposed transportation improvement. The purpose must be written clearly and must be supported by the identified needs. It should not include planning decisions or be written so that the selection of a specific alternative is predetermined.
>
> The need for the project is a more detailed explaining, with supporting data, of the specific transportation problems, deficiencies, or opportunities that exist or are expected to exist in the future that justifies the Proposed Action. The needs should be demonstrated through specific quantitative investigation. Each need for action should enable decision-makers to evaluate alternatives by providing measurable objectives or specifications. (p. 4-12–13)

### 2.1 Project Purpose

The purpose for constructing an arterial roadway in the Briargate-Stapleton corridor is to provide a continuous roadway connection between I-25 and US Highway 24 in northern El Paso County both for regional system connectivity and to serve the substantial transportation demand that is anticipated from planned development in this area.

### 2.2 Project Need

The portion of northern El Paso County in the study area is already experiencing substantial growth, and east-west roadway options are extremely limited. Connections to I-25 are limited for the six miles where it exists on United State Air Force Academy (USAFA) property, between Academy Boulevard (Exist 150) and North Gate Boulevard (Exit 156). See **Figure 2.1**. USAFA is a designated National Historic Landmark where no additional interstate access will be granted. Briargate Parkway has access (Exit 151), and sufficient capacity to accommodate the demand from planned urban development.

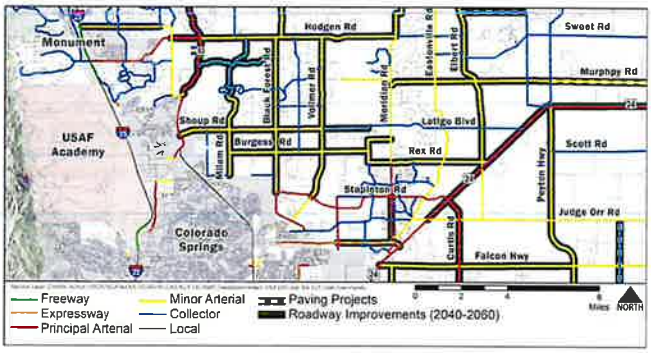



**Figure 2.1. Excerpt from El Paso County Major Transportation Corridors Plan**

In the absence of improved east-west connectivity, increased traffic generation in the study area would place a substantial burden on the modest north-south roadways that access Woodmen Road, an already heavily burdened east-west expressway in Colorado Springs.

For this reason, the 2016 MTCP identified the need for the Briargate-Stapleton corridor to improve the east-west continuity of the El Paso County roadway grid. The plan included specific recommendations regarding functional classification, transportation modes, and other uses for the Briargate-Stapleton corridor. The 2016 MTCP indicates that the corridor is expected to be a four-lane principal arterial from the eastern city limits of Colorado Springs (Black Forest Road) to Judge Orr Road.

It is anticipated that this project will plan for the ultimate improvements but that interim phases of capacity and safety improvements may be warranted based upon study findings and funding limitations. The corridor will also be evaluated to determine if additional mobility provisions such as bike routes, pedestrian accommodations, and public transit are necessary. The area currently has no transit service from the region's transit provider, Mountain Metro Transit, because much of the area is undeveloped.

The preferred alternative will reflect corridor improvements that optimize public safety, needs, and preferences while balancing enhanced capacity, access management, and development. The new developments will need safe, adequate access, but access management will ensure that the roadway can safely accommodate through traffic at desired arterial speed.

Approximately 1.2 miles of the 5.5-mile corridor, between Black Forest Road and Rising Eagle Place, between Tomahawk Trail and Arroya Lane, and between Towner Avenue and Meridian Road, already have an existing roadway. The proposed improvements would connect these segments and upgrade them to a standardized configuration. For the roadway that does exist, geometry upgrades that can improve corridor mobility and provide necessary carrying capacity include:

- Flattening curves and grades
- Providing new and/or wider shoulders
- Adding turn, acceleration, and deceleration lanes
- Increasing lane widths and/or number of lanes
- Adding accommodations for pedestrians and bicyclists
- Providing adequate roadside clear zones
- Upgrading intersection capacity (e.g., adding turn bays, signalizations, roundabouts)

## 3 Alternatives Analysis

A "no-build" option was not an alternative considered for this corridor. The current lack of roadway and the oncoming development requires a "build" alternative to be developed to ensure that the roadway will meet the planned classification and function. Based on public and stakeholder input, which was collected via a project website, issues were identified and considered. A full range of improvement alternatives was then developed, evaluated, and iteratively refined to provide:

- Local and Regional Mobility
- Roadway Alignment and Cross Section
- Intersection Layout and Control
- Access Management and Connectivity
- Roadway Drainage

Because the eastern corridor is located at the interface of El Paso County and the City of Colorado Springs, the City was engaged early and through all phases in the planning process. An initial preferred alignment and a hybrid cross section were identified through collaborative engagement. Recommendations were vetted with corridor developers and presented to public stakeholders. Chapter 7 details the public engagement process. Input provided, and resolution of comments are summarized in **Appendix F.**

Technical components of alternatives evaluation included baseline and future build alternatives analysis. The baseline and future scenarios were evaluated concerning traffic operations, mobility, constructability, cost, and potential project impacts (social, economic, and environmental).

Cost estimates were also prepared by the consultant team for "short-listed" alternatives. Final concept-level cost estimates for the preferred alternatives are detailed in Section 6.4 "Opinion of Probable Costs."

### 3.1 Roadway Design

The roadway design element of the Briargate-Stapleton corridor alternatives analysis began with a thorough review of the existing horizontal and vertical alignments, as well as the typical roadway cross sections. Existing conditions were compared to County, City, and American Association of State Highway and Transportation Officials (AASHTO) design criteria and the roadway cross section and functional classification specified by the 2016 MTCP.

The corridor currently falls under El Paso County jurisdiction; however, it is anticipated that with the development occurring, much of the area along the corridor may be annexed into Colorado Springs in the future. As such, the City of Colorado Springs design criteria was also considered.

#### 3.1.1 Design Criteria: Four-Lane Principal Arterial

The 2016 MTCP lists the Briargate-Stapleton corridor as a four-lane principal arterial. The current speed limit west of the project area (in Wolf Ranch Subdivision in Colorado Springs) is 35 mph, which is inconsistent with the City's classification of the roadway as a principal arterial. The current speed limit east of the project area (at Meridian Road in El Paso County) is 45 mph, which is consistent with the County's classification of the roadway as an urban principal arterial. The El Paso County *Engineering Criteria Manual* (ECM) rural and urban standards are shown in **Table 3.1**. The major difference between the EPC rural and urban standards is in the handling of the edges of the roadway: in the urban cross section curb and gutter are used, whereas the rural section uses an open system to carry water away from the roadway corridor. Both systems of handling runoff are used through the phasing of this project.

Design criteria from the City were also used to develop ultimate alternatives for the corridor. The COS *Traffic Criteria Manual* (TCM) standards for a four-lane principal arterial are also shown in **Table 3.1**.

**Table 3.1. Roadway Design Criteria for 4-Lane Principal Arterials**

| Design Criteria | EPC Urban | EPC Rural | COS |
|---|---|---|---|
| Design Speed/Posted Speed | 50/45 | 70/65 | 50/45 |
| Clear Zone | 20' | 34' | n/a |
| Centerline Curve Radius (Min.) | 930'[1] | 2,050'[1] | 1,040' |
| Trip Length | n/a | n/a | 1–2 miles |
| Number of Thru Lanes | 4 | 4 | 4 |
| Lane Width | 12' | 12' | 11' |
| Right-of-Way | 130' | 180' | 107' |
| Paved Width | 36'[2] (excluding gutter pan) | 38'[2] | 28'[2] |
| Median Width | 19' (including curb & gutter) | 24' | 17' raised |
| Outside Shoulder Width | 8' (excluding gutter) | 12" (10' paved/2' gravel) | 4' |
| Inside Shoulder Width | 4" (excluding gutter) | 6' (4' paved/2" gravel) | 4' |
| Required Curb/Gutter Type | 6" vertical | n/a | n/a |
| Sidewalk Width (@ FL) | 6' detached | n/a | 6' detached |
| Design ADT | 40,000 | 40,000 | 10,000–25,000 |
| Design Vehicle | WB-67 | WB-67 | WB-67 |
| Bike Lanes Permitted | Yes | n/a | 6' Multi-Use Shoulder |
| Tree Lawn Width | n/a | n/a | 7' |
| Access | Not Permitted | Not Permitted | Full Control |
| Intersection Spacing | ½mile | n/a | ½ mile (signalized)<br>¼ mile (unsignalized) |
| Parking Permitted | No | No | No |
| Min. Flowline Grade of Curb | 0.50% | 1% | n/a |
| Centerline Grade (Min.-Max.) | 0.5–6% | 1–5% | 1–4% |
| Intersection Grades (Min.-Max) | 0.5–3% | 1–3% | 1% min |
| Intersection Sight Distance | 555' | n/a | 500' |

[1]Assumes 4% superelevation, 6% for 70 MPH design speeds.
[2]Pavement width in each direction for divided roadways.

*Source*: Data from El Paso County *Engineering Criteria Manual*, Table 2-4. Roadway Design Standards for Rural Expressways and Arterials, Table 2-6. Roadway Design Standards for Urban Expressways and Arterials. October 14, 2020.

City of Colorado Springs, *Engineering Criteria Manual*, "Section 11: Traffic Criteria Manual," Table 10: Traffic Engineering Design Standards (Freeways, Expressways and Arterials), p. 39.

### 3.1.2 Design Criteria: Other Design Criteria

Additional El Paso County and City of Colorado Springs design criteria address roadway alignment and its relationship to sight distance adequacy. The County design criteria are specified in 10 mph increments and mirror design criteria that are provided in AASHTO's *A Policy on Geometric Design of Highways and Streets*, The AASHTO design speed values at 5 mph increments on a level terrain are summarized in **Table 3.2**.

**Table 3.2. Design Controls for Stopping Sight Distance**

| | | Rate of Vertical Curvature, K1 For Crest Curves | | Rate of Vertical Curvature, K1 For Sag Curves | |
|---|---|---|---|---|---|
| Design Speed (mph) | Stopping Sight Distance (feet) | Calculated | Design | Calculated | Design |
| 30 | 200 | 18.5 | 19 | 36.4 | 37 |
| 35 | 250 | 29.0 | 29 | 49.0 | 49 |
| 40 | 305 | 43.1 | 44 | 63.4 | 64 |
| 45 | 360 | 60.1 | 61 | 78.1 | 79 |
| 50 | 425 | 83.7 | 84 | 95.7 | 96 |
| 55 | 495 | 113.5 | 114 | 114.9 | 115 |
| 60 | 570 | 150.6 | 151 | 135.7 | 136 |
| 65 | 645 | 192.8 | 193 | 156.5 | 157 |
| 70 | 730 | 246.9 | 247 | 180.3 | 181 |

*Note:* Rate of vertical curvature, K, is the length of the curve per percent algebraic difference in intersection grades (A), K=LIA
*Source:* AASHTO, *A Policy on Geometric Design of Highways and Streets*, 7th Edition, 2018

### 3.1.3 Typical Sections

The El Paso County Rural Principal Arterial typical section, as shown in **Figure 3.1**, includes two 12' thru lanes in each direction, with a 6' inside shoulder, a 10' outside shoulder, a depressed 24' median, and graded ditches for drainage. This cross section was used in design primarily for the edge conditions and open drainage system in the early phasing of the design, as discussed in **Chapter 6**.


**Figure 3.1 El Paso County Rural 4-Lane Principal Arterial**

The El Paso County Urban Principal Arterial, as shown in **Figure 3.2**, includes two 12' thru lanes in each direction, with a 4' inside shoulder, a 6' detached sidewalk, a 16' raised median, and an outside curb and gutter for drainage. This cross section was the basis for the design of the roadway in the early phasing, as discussed in Chapter 6.

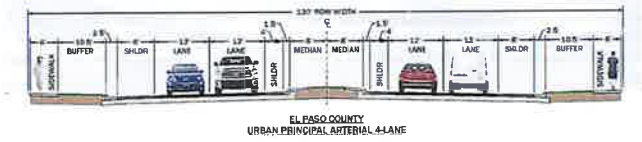



**Figure 3.2 El Paso County Urban 4-Lane Principal Arterial**

West of Black Forest Road, the City's plan shows a Principal Arterial. The City of Colorado Springs typical section for a Principal Arterial, as shown in **Figure 3.3**, includes a 17' raised median, two 11' thru lanes in each direction, a 6' outside shoulder, a 6' detached sidewalk, and an outside curb and gutter for drainage.

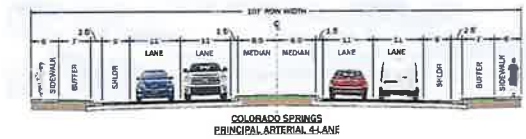



**Figure 3.3 City of Colorado Springs 4-Lane Principal Arterial**

### 3.1.4 Existing Conditions

Input from the design level survey of the corridor was used to construct CAD modeling of the full roadway alignment within the project corridor. This included the development of a Digital Terrain Model (DTM) to accurately represent the existing and proposed vertical alignment of the roadway. The adherence of the existing condition to a hybrid of the County and the City typical section was then evaluated.
The City's design criteria were used for design.

#### 3.1.4.1 Existing Horizontal and Vertical Alignment

Very little of the proposed corridor has been constructed. The segments that have been constructed are horizontally tangential in nature and meet design criteria for vertical alignments. The typical section used for these constructed sections is undersized for their eventual usage and constructed in locations that will not necessarily align with the proposed pavement sections.

### 3.1.4.2 Proposed Horizontal and Vertical Alignment

Much of the corridor is previously untouched prairie or grazing land. The new roadway will alter the existing landscape. Adjustments will be made to the landscape to conform to design standards. These adjustments will include two bridges or box culverts, retaining walls, and earthwork.

Developers along the corridor have proposed both ROW corridors and locations for access to the corridor. The proposed accesses from the developers do not meet the criteria for minimum spacing of accesses and are discussed in Section 3.1.6. The ROW proposed by the developers is adequate for the construction of the new roadway.

### 3.1.5 Alignment Analysis

To determine the recommended horizontal alignment, research was conducted on plats that had been approved and development plans that had been submitted to either El Paso County or the City of Colorado Springs. Based on this research, two alternative alignments were developed and screened. Both alternatives begin on the west at Black Forest Road and follow the same alignment to Vollmer Road. At Vollmer Road, the northern alternative connects existing roadway segments and follows a direct route between Vollmer Road and Meridian Road. The southern alternative follows the northern alignment and continues to an alignment approximately half a mile south of the existing Stapleton Road before curving north and tying in with the existing road. The southern alignment more closely matched the corridors proposed on the submitted plats.

The southern alternative was selected as the preferred alignment due to ROW constraints and its conformance with the submitted plats. This alternative meets the County's design criteria for horizontal curves based on the design speed, but the curve on the southern alignment is substandard based on the City's design criteria.

Figure 3.4. Corridor Alignment Alternatives

### 3.1.6 Intersections

An analysis of the existing and proposed intersection locations was performed. Based on both EPC and COS design standards, on principal arterials, intersections should be spaced at ½ mile (2,640'), with COS allowing unsignalized intersections to be spaced at ¼ mile (1,320') increments. Full-movement access is limited to major intersections, and minor intersections are limited to right-in/right-out (RIRO) access.

**Table 3.3. Intersection Spacing**

| Western Road | Eastern Road | Full Access Spacing |
|---|---|---|
| Black Forest Road | Rising Eagle Place | 2,775' (0.52 mi.) |
| Rising Eagle Place | Loch Linneh Place | |
| Loch Linneh Place | Lochwinnoch Lane | 1,975' (0.37 mi.) |
| Lochwinnoch Lane | *Commercial Collector* (proposed) | 2,525' (0.48 mi.) |
| *Commercial Collector* (proposed) | Vollmer Road | 1,000' (0.19 mi.) |
| Vollmer Road | Wheatland Drive (RIRO access) | 3,375' (0.64 mi.) |
| Wheatland Drive (RIRO access) | *Potential Access* (limited to RIRO) | |
| *RIRO Access* (potential) | Sterling Ranch Road (proposed) | |
| Sterling Ranch Road (proposed) | Sterling Ranch Collector (proposed RIRO) | 3,550' (0.67 mi.) |
| Sterling Ranch Collector (proposed RIRO) | Banning Lewis Parkway (proposed) | |
| Banning Lewis Parkway (proposed) | *Potential Access* (limited to RIRO) | 2,330' (0.44 mi.) |
| *RIRO Access* (potential) | *The Ranch Collector West* (proposed) | |
| *The Ranch Collector West* (proposed) | Woodmen Hills Drive/Raygor Road (proposed) | 1,550' (0.29 mi.) |
| Woodmen Hills Drive/Raygor Road (proposed) | *The Ranch Collector East* (proposed) | 3,000' (0.57 mi.) |
| *The Ranch Collector East* (proposed) | Towner Avenue | 2,525' (0.48 mi.) |
| Towner Avenue | Prairie Dove Drive (RIRO) | 4,250' (0.80 mi.) |
| Prairie Dove Drive (RIRO) | Liberty Grove Drive (RIRO) | |
| Liberty Grove Drive (RIRO) | Meridian Road | |

Note: Roads in italics are currently unnamed.

#### 3.1.6.1 Intersection Layout and Control

Locations of intersections along the future corridor were identified based on platting and filed master plans for developments that are located adjacent to the study corridor. Locations of potential future intersections were also identified for undeveloped area along the corridor for which development plans are yet unknown.

#### 3.1.6.2 Intersection Left Turn Lane Lengths

The table below shows the storage, deceleration, taper lengths, and rate for each of the intersections in the corridor.

**Table 3.4. Left-Turn Lengths**

| Intersecting Road | Direction | Storage | Decel | Taper | Rate | Total |
|---|---|---|---|---|---|---|
| Black Forest Road | EB | 200' | 435' | 165' | 15:1 | 800' |
| | WB | 200' | 435' | 165' | 15:1 | 800' |
| | NB | 200' | 530' | 180' | 15:1 | 910' |
| | SB | 200' | 530' | 180' | 15:1 | 910' |
| Rising Eagle Place | RIRO; No Left Turns | | | | | |
| Loch Linneh Place | EB | 200' | 435' | 165' | 15:1 | 800' |
| | WB | 200' | 435' | 165' | 15:1 | 800' |
| | NB | No NB/SB Dedicated Left Turn Lane | | | | |
| | SB | | | | | |
| Lochwinnoch Lane | EB | 200' | 435' | 165' | 15:1 | 800' |
| | WB | 200' | 435' | 165' | 15:1 | 800' |
| | NB | No NB/SB Dedicated Left Turn Lane | | | | |
| | SB | | | | | |
| *Commercial Collector* (proposed) | EB | 200' | 435' | 165' | 15:1 | 800' |
| | WB | 200' | 435' | 165' | 15:1 | 800' |
| | NB | 100' | 235' | 180' | 15:1 | 515' |
| | SB | 100' | 235' | 180' | 15:1 | 515' |
| Vollmer Road | EB | 200' | 435' | 165' | 15:1 | 800' |
| | WB | 200' | 435' | 165' | 15:1 | 800' |
| | NB | 100' | 435' | 180' | 15:1 | 715' |
| | SB | 100' | 435' | 180' | 15:1 | 715' |
| Wheatland Drive (proposed) | RIRO; No Left Turns | | | | | |
| Sterling Ranch Road (proposed) | EB | 3-Legged Intersection; No EB Left Turn | | | | |
| | WB | 200' | 435' | 165' | 15:1 | 800' |
| | NB | 100' | 435' | 180' | 15:1 | 715' |
| | SB | 3-Legged Intersection; No SB Left Turn | | | | |
| *Sterling Ranch Collector* (proposed) | RIRO; No Left Turns | | | | | |
| Banning Lewis Parkway (proposed) | EB | 3-Legged Intersection; No EB Left Turn | | | | |
| | WB | 200' | 435' | 165' | 15:1 | 800' |
| | NB | 100' | 435' | 180' | 15:1 | 715' |
| | SB | 3-Legged Intersection; No SB Left Turn | | | | |
| *The Ranch Collector West* (proposed) | EB | 3-Legged Intersection; No EB Left Turn | | | | |
| | WB | 200' | 435' | 165' | 15:1 | 800' |
| | NB | 100' | 320' | 180' | 15:1 | 600' |
| | SB | 3-Legged Intersection; No SB Left Turn | | | | |

**Table 3.4. Left Turn Lengths (continued)**

| Intersecting Road | Direction | Storage | Decel | Taper | Rate | Total |
|---|---|---|---|---|---|---|
| *The Ranch Collector West* (proposed) | EB | 3-Legged Intersection; No EB Left Turn | | | | |
| | WB | 200' | 435' | 165' | 15:1 | 800' |
| | NB | 100' | 320' | 180' | 15:1 | 600' |
| | SB | 3-Legged Intersection; No SB Left Turn | | | | |
| Woodmen Hills Drive/Raygor Road (proposed) | EB | 200' | 435' | 165' | 15:1 | 800' |
| | WB | 200' | 435' | 165' | 15:1 | 800' |
| | NB | 100' | 435' | 180' | 15:1 | 715' |
| | SB | 100' | 435' | 180' | 15:1 | 715' |
| *The Ranch Collector East* (proposed) | EB | 3-Legged Intersection; No EB Left Turn | | | | |
| | WB | 200' | 435' | 165' | 15:1 | 800' |
| | NB | 100' | 320' | 180' | 15:1 | 600' |
| | SB | 3-Legged Intersection; No SB Left Turn | | | | |
| Towner Avenue | EB | 200' | 435' | 165' | 15:1 | 800' |
| | WB | 200' | 435' | 165' | 15:1 | 800' |
| | NB | 100' | 235' | 180' | 15:1 | 515' |
| | SB | 100' | 235' | 180' | 15:1 | 515' |
| Scenic Brush Drive | Intersection to be RIRO; No Left Turns | | | | | |
| Liberty Grove Drive | Intersection to be RIRO; No Left Turns | | | | | |
| Meridian Road | EB | 200' | 435' | 165' | 15:1 | 800' |
| | WB | 200' | 435' | 165' | 15:1 | 800' |
| | NB | Match Existing | | | | |
| | SB | Match Existing | | | | |

*Note:* Roads in italics are currently unnamed

### 3.1.7 Bicycles and Pedestrians

The study corridor includes a proposed bicycle route that will be important in pedestrian connectivity within the region. As such, in the ultimate configuration, bike lanes, a detached sidewalk, and a larger detached pedestrian trail will be included in the cross section. See the cross sections included in Section 6.3.

### 3.1.8 Utilities

Overhead utilities exist on the north side of Stapleton Road, west of Meridian Road to just east of Scenic Brush Drive in the Scenic View at Paint Brush Hills subdivision. There are several locations where overhead utilities cross the corridor, including Black Forest Road, Vollmer Road, and Meridian Road. Also, there is a major electric transmission line crossing west of Towner Road. Underground utilities may exist at some locations in the project area where development has occurred adjacent to the corridor. Utility easements likely exist along all platted parcels even if actual utilities are not present.

### 3.1.9 Drainage

An overall drainage review was completed for the Briargate-Stapleton corridor to identify existing drainage issues. Drainage improvements will be required along with the project. Local, state, and federal criteria will need to be followed when addressing drainage improvements.

#### 3.1.9.1 Drainage Criteria

The City of Colorado Springs *Drainage Criteria Manual* (COS-DCM) was followed for this report. It requires culverts and ditches carry the 100-year event for arterial streets. This corridor crosses Federal Emergency Management Agency (FEMA)-regulated Zone A and Zone AE floodplains. Floodplains impacted by the improvements shall comply with the National Flood Insurance Program (NFIP).

The western portion of the corridor is adjacent to the urban municipal separate storm sewer system (MS4) permit area and may require water quality treatment by the Colorado Department of Public Health and Environment (CDPHE).

Existing roadway drainage, where developed, is an open system.

## 3.2 Access

The Transportation Research Board (TRB) *Access Management Manual Second Edition* (2014, p. 6-10) identifies the following 10 "Principles of Access Management":

1. Provide a specialized roadway system.
2. Limit direct access to major roadways.
3. Promote intersection hierarchy.
4. Locate signals to favor through movements.
5. Preserve the functional area of intersections and interchanges.
6. Limit the number of conflict points.
7. Separate conflict area.
8. Remove turning vehicles from through-traffic lanes.
9. Use non-traversable medians to manage left-turn movements.
10. Provide a supporting street and circulation system.

Both the EPC *Engineering Criteria Manual* and the COS *Traffic Criteria Manual* permit intersections along a principal arterial to be spaced at ½ mile intervals. EPC does not permit access to principal arterials between intersections. COS allows for one access drive per property ownership which may be jointly shared with adjacent properties. COS permits median cuts at a spacing between ¼ mile and ½ mile at major or significant street intersections.

Access management alternatives, including selected access closures, were considered as means to preserve the functionality of the roadway. Most of the proposed roadway does not exist. Planned/approved future access was identified based on development plans filed with the County. To evaluate the potential to consolidate access, parcels and subdivisions were grouped by access commonalities to identify direct access locations to the Briargate-Stapleton corridor.

The corridor currently falls under El Paso County jurisdiction; however, it is anticipated that with the development occurring, much of the area along the corridor may be annexed into Colorado Springs. As such, both El Paso County and City of Colorado Springs access spacing criteria were considered.

An analysis of the spacing between existing and proposed access locations was performed to evaluate and support the development of the Access Control Plan. Based on both EPC and COS design standards, principal arterial intersections should be spaced at ½ mile (2,640'), with COS allowing unsignalized intersection to be spaced at ¼ mile (1,320') increments. Access spacing for existing and proposed access locations are summarized in **Table 3.5** and in **Figure 3.5**.

**Table 3.5. Intersection Spacing**

| Eastern Road | Western Road | Spacing |
|---|---|---|
| Black Forest Road | Rising Eagle Place | 1,075' (0.20mi) |
| Rising Eagle Place | Loch Linneh Place | 1,700' (0.32mi) |
| Loch Linneh Place | Lochwinnoch Lane | 1,975' (0.37mi) |
| Lochwinnoch Lane | *Commercial Collector (proposed)* | 1,925' (0.36mi) |
| *Commercial Collector (proposed)* | Vollmer Road | 1,600' (0.30mi) |
| Vollmer Road | Wheatland Drive | 750' (0.14mi) |
| Wheatland Drive (proposed) | Sterling Ranch Road (proposed) | 2,625' (0.50mi) |
| Sterling Ranch Road (proposed) | *Sterling Ranch Collector* (proposed) | 2,475' (0.47mi) |
| *Sterling Ranch Collector* (proposed) | Banning Lewis Parkway (Proposed) | 1,075' (0.20 mi) |
| Banning Lewis Parkway (proposed) | *The Ranch Collector West* (proposed) | 2,325' (0.44 mi) |
| *The Ranch Collector West* (proposed) | Woodmen Hills Drive/Raygor Road (proposed) | 1,550' (0.29 mi) |
| Woodmen Hills Drive/Raygor Road (proposed) | *The Ranch Collector East* (proposed) | 3,000' (0.57 mi) |
| *The Ranch Collector East* (proposed) | Towner Avenue | 2,525' (0.48 mi) |
| Towner Avenue | Prairie Dove Drive | 1,350' (0.26 mi) |
| Prairie Dove Drive | Liberty Grove Drive | 1,450' (0.27 mi) |
| Liberty Grove Drive | Meridian Road | 1,450' (0.27 mi) |

*Note:* Roads in italics are currently unnamed

## 3.3 Conceptual Roadway Design

The conceptual design for the preferred alignment (see Chapter 6) incorporates a balance of County and City roadway design criteria and implements the intersection, pedestrian and bicycle facilities, drainage, access management recommendations developed during alternatives analysis. The conceptual plan and profile design for the interim four-lane principal arterial section is included as **Appendix A**.

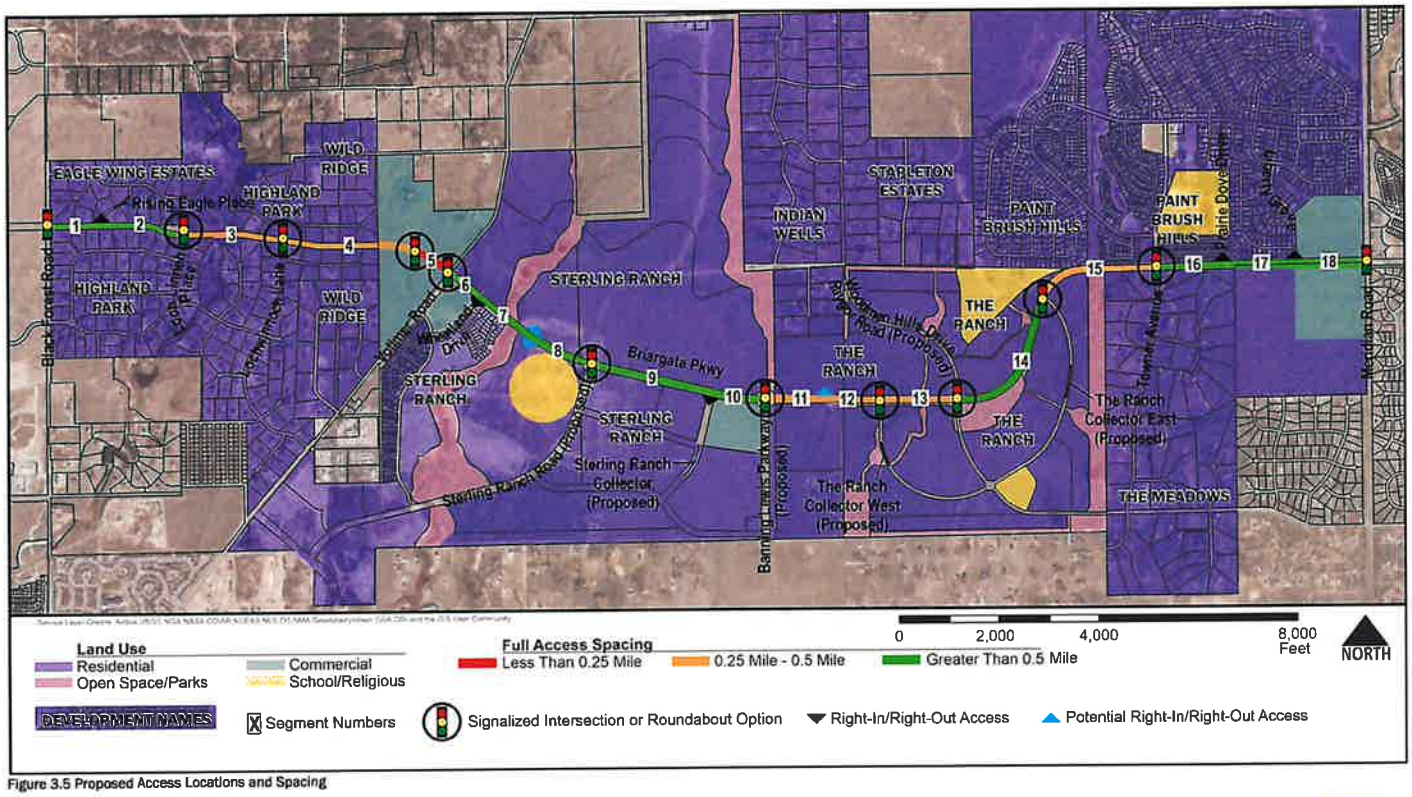



Figure 3.5 Proposed Access Locations and Spacing

# 4 Traffic Analysis

## 4.1 Methodology

To evaluate traffic operations for future improvement options, existing peak hour traffic volume data was collected, and estimates of future traffic volumes were prepared. Microsimulation (Synchro/SimTraffic) was used to evaluate traffic operations performance for future improvement alternatives. Parallel analysis of roundabout alternatives was also conducted using Synchro and Highway Capacity Software (HCS). *Highway Capacity Manual 6th Edition* (TRB, 2016) performance metrics, as detailed below in Section 4.2, were used for both analysis methodologies to evaluate the performance of alternative improvement options. Specific methodologies used for traffic forecasts and traffic operations analysis as well as a more detailed summary of analyses findings are included in Appendix B – Traffic Report.

### 4.1.1 Traffic Count Data

Available traffic count data was assembled for use in this traffic analysis for the Briargate-Stapleton corridor Study from sources including the Colorado Department of Transportation (CDOT) traffic statistics database, the Pikes Peak Area Council of Governments (PPACG), El Paso County (traffic count data and recent development Traffic Impact studies), and the City of Colorado Springs (traffic count data and recent development Traffic Impact studies). Count data from these sources included: weekday peak period turn movement counts, 48-hour counts, hourly counts, and adjusted Average Daily Traffic (ADT) counts. Additional peak hour intersection turning movement counts were collected at five existing intersections. Directional counts were also conducted hourly at five locations on Stapleton Drive (east of the project corridor, Meridian Road (north and south of the project corridor), Vollmer Road, and Black Forest Road (south of the proposed alignment).

### 4.1.1 Traffic Forecasts

The unadjusted 2045 forecast volumes, as shown in **Figure 4.1**, are compatible with a four-lane roadway section, a Principal Arterial functional classification, and applicable Colorado Springs or El Paso County access spacing. The Principal Arterial classification is also consistent with the functional classification and capacity envisioned by both the El Paso County 2016 MTCP and the 2045 PPACG *Moving Forward* RTP.

The PPACG 2045 fiscally constrained RTP model scenario is coded with four lanes east of Black Forest Road and six lanes west of Black Forest Road. Forecast 2045 daily traffic flows for the project corridor range from 16,000 ADT to 25,000 ADT to the east of Towner Avenue and to the east of Black Forest Road, respectively, consistent the capacity of a four-lane roadway section. The PPACG and City of Colorado Springs plans specify a Principal Arterial with a six-lane cross section west of Black Forest Road. Forecast 2045 daily traffic flows west range from 35,000 ADT to 40,000 ADT, west of Black Forest Road and Union Boulevard, respectively.


**Figure 4.1. Forecast 2045 Average Daily Traffic Flow Volumes**

### 4.1.2 Traffic Operations Analysis

The "operation" of any given intersection or stretch of roadway relates to how well or how poorly it functions given a specific volume of traffic. Analyses of existing traffic operations for the Briargate-Stapleton corridor were completed using the Synchro/SimTraffic software package.

In general, the use of this software involves the development of a Synchro network, adjustment of the model to reflect actual measured conditions to verify the accuracy of the model network and use of the adjusted model to analyze future-year conditions under various scenarios. For the base, the Synchro network was developed by coding the existing geometrics, traffic control conditions, and traffic volumes for each study intersection into the network. Specifically, this coded data included the following:

Per Intersection

- Number and type of approach lanes
- Widths of lanes
- Lengths of turn lanes
- Existing traffic volumes
- Existing signal timing parameters
- Percentage of heavy vehicles

Per Link (Roadway Segment)

- Link distances (intersection to intersection)
- Speed limits
- Widths of travel lanes
- Grade of roadway segment

Network Settings: (Corridor Signal Timing/Phasing)

- Minimum cycle length, maximum cycle length, reference phase
- Control type
- Yellow time, all red time
- Minimum splits
- Lead/lag optimization (allowed/not allowed)

### 4.1.3 Level of Service Measures and Criteria

Once existing data was coded into the software, Synchro was used to perform a level of service (LOS) evaluation, which measures how well an intersection or stretch of roadway functions (or operates) when a specific volume of traffic is present. This methodology is consistent with the procedures outlined in the Highway Capacity Manual 6th Edition (HCM6, Transportation Research Board, 2016) and the predecessor HCM2010 (Transportation Research Board 2010).

The HCM2010 utilizes measures, including operating speed and delay (in seconds per vehicle), to characterize roadway and intersection operations or LOS. Level of service evaluation results in a LOS grade that ranges from LOS A to LOS F, where LOS A is representative of little or no delay and free-flow traffic, and LOS F represents excessive delay and breakdown in traffic flow. A typical minimum acceptable LOS for peak hour conditions, and that observed by El Paso County, is LOS D, which represents moderate delay. Signalized intersections are given a LOS grade based on the overall functionality of the intersection. In other words, it is a qualitative evaluation of that intersection's ability to accommodate the travel demand. Unsignalized intersections, however, are graded based on the movement that suffers the greatest delay, otherwise known as the critical movement (e.g., a left-turning movement from a minor street onto a major street). In the case of a single lane approach on a minor street (also referred to as the *minor approach*), the entire approach will be assigned a LOS grade because all movements from that approach would suffer the same delay. Conditions associated with individual levels of service, as defined by the HCM2010, are summarized in **Table 4.1** and **Table 4.2**. Levels of service for roundabouts are defined by HCM2010, as shown in **Table 4.3**. HCM2010 criteria were used for Synchro/SimTraffic analysis of baseline conditions (existing and future no-build) and for assessment of traffic operations for future intersection improvement options. Roundabouts will be evaluated as alternatives to signalized intersections during preliminary and final design.

**Table 4.1. Level of Service Criteria for Two-Way Stop-Controlled Intersections**

| Level of Service | Description - Delay to Minor Street Traffic | Average Control Delay (sec/veh) |
|---|---|---|
| A | Little or no delay | 0-10 |
| B | Short traffic delays | >10-15 |
| C | Average traffic delays | >15-25 |
| D | Long traffic delays | >25-35 |
| E | Very long traffic delays | >35-50 |
| F | When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing that may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improving the intersection. | >50 |

*Note:* For two-way stop-controlled (TWSC) intersections, level of service is determined by the control delay for each minor movement. LOS is not defined for the intersection as a whole.
*Source: HCM2010*, p 18-6

**Table 4.2. Level of Service Criteria for Signalized Intersections**

| Level of Service | Description - Intersection Signal Delay | Control Delay (sec/veh) |
|---|---|---|
| A | Progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may contribute to low delay. | <=10 |
| B | Good progression, short cycle lengths, or both. More vehicles stop than with LOS A. | >10 and <=20 |
| C | Fair progression, longer cycle lengths, or both. The number of vehicles stopping is significant, though many still pass through without stopping. | >20 and <=35 |
| D | Longer delays result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity (v/c) ratios. Many vehicles stop. | >35 and <=55 |
| E | High delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences. | >55 and <=80 |
| F | This level often occurs with over-saturation when arrival flow rates exceed the capacity of the intersection. Poor progression and long cycle lengths may be major contributing factors to such delay levels. | >80 |

*Source:* Transportation Research Board, *HCM2010*, p 19-2

**Table 4.3. Level of Service Criteria for Roundabout Intersections**

| (Control Delay (sec/veh) | Level of Service Metrics (Control Delay/Volume-to-Capacity Ratio[1] | |
|---|---|---|
| | v/c ≤ 1.0 | v/c > 1.0 |
| 0-10 | A | F |
| >10-15 | B | F |
| >15-25 | C | F |
| >25-35 | D | F |
| >35-50 | E | F |
| >50 | F | F |

*Note: For approaches and intersection wide assessment, LOS is defined solely by unsignalized control delay. Source: HCM2010, p. 21-4.*

### 4.1.4 Existing Conditions Intersection Traffic Operations

The LOS and delay measures shown in **Table 4.4** are for 2021 existing traffic volumes, roadway geometry and traffic control, as detailed in **Appendix B – Traffic Report**. The results show that all the analyzed intersections currently operate at LOS C or better. Full Synchro reports are also included in **Appendix B**.

**Table 4.4. 2021 Intersection Level of Service Summary**

| Control | Intersection | LOS/Delay (in seconds/vehicle) (Critical Movement) | |
|---|---|---|---|
| | | AM Peak Hour | PM Peak Hour |
| TWSC | Briargate Parkway & Black Forest Road | b / 12.3 (WB Approach) | b / 13.6 (WB Approach) |
| AWSC | Stapleton Road & Towner Avenue | A / 9.6 | A / 8.4 |
| TWSC | Stapleton Road & Prairie Dove Drive | b / 13.4 (SB Approach) | b / 11.2 (SB Approach) |
| TWSC | Stapleton Road & Liberty Grove Drive | b / 14.9 (SB LT) | b / 11.5 (SB LT) |
| Signal | Stapleton Road & Meridian Road | C / 28.6 | B / 19.0 |

### 4.1.5 Future Intersection Traffic Operations

The LOS and delay measures shown in **Table 4.5** are for 2045 forecast traffic volumes and proposed roadway geometry. Proposed full-access intersections were evaluated under signalized traffic control. As shown in **Table 4.3**, similar or better LOS results would be experienced for roundabout alternatives. The results show that, other than at the western and eastern study limits, the analyzed intersections are projected to operate at LOS C or better during the AM and PM peak hours. The Stapleton Rd/Meridian Rd intersection is projected to operate at LOS D during the AM and PM peak hours. The Briargate Pkwy/Black Forest Rd intersection is projected to operate at LOS E during the AM peak hour and LOS D during the PM peak hour. The projected level of service at Briargate Pkwy/Black Forest Rd indicates a potential need for three through lanes in each direction of Briargate Pkwy across Black Forest Rd at some point in time. Additional detail and full Synchro reports are included in **Appendix B**.

**Table 4.5. 2045 Intersection Level of Service Summary**

| Control | Intersection | LOS/Delay (in seconds/vehicle) (Critical Movement) | |
|---|---|---|---|
| | | AM Peak Hour | PM Peak Hour |
| Signal | Briargate Parkway & Black Forest Road | E / 60.6 | D / 54.8 |
| TWSC | Briargate Parkway & Rising Eagle Place | c / 16.3 (SB RT) | b / 14.7 (SB RT) |
| Signal | Briargate Parkway & Loch Linneh Place | A / 1.4 | A / 1.5 |
| Signal | Briargate Parkway & Lochwinnoch Lane | A / 2.9 | A / 2.7 |
| Signal | Briargate Parkway & Commercial Collector | A / 6.7 | B / 13.9 |
| Signal | Briargate Parkway & Vollmer Road | B / 17.7 | C / 24.0 |
| TWSC | Briargate Parkway & Wheatland Drive | b / 13.5 (NB RT) | c / 16.2 (NB RT) |
| Signal | Briargate Parkway & Sterling Ranch Road | B / 12.7 | B / 15.9 |
| TWSC | Briargate Parkway & Sterling Ranch Collector | b / 13.0 (NB RT) | b / 14.6 (NB RT) |
| Signal | Briargate Pkwy-Stapleton Rd & Banning Lewis Pkwy | C / 27.1 | C / 28.7 |
| Signal | Stapleton Road & The Ranch Collector West | A / 1.5 | A / 2.0 |
| Signal | Stapleton Road & Woodmen Hills-Raygor | B / 10.8 | B / 12.1 |
| Signal | Stapleton Road & The Ranch Collector East | A / 5.5 | A / 7.5 |
| Signal | Stapleton Road & Towner Avenue | C / 26.7 | B / 17.7 |
| TWSC | Stapleton Road & Prairie Dove Drive | b / 11.4 (SB RT) | b / 10.0 (SB RT) |
| TWSC | Stapleton Road & Liberty Grove Drive | b / 12.1 (SB RT) | b / 10.1 (SB RT) |
| Signal | Stapleton Road & Meridian Road | D / 37.2 | D / 41.4 |

### 4.1.6 Future Queuing Analysis

The queuing analysis results for the left-turn movements at the signalized intersections based on the 2045 AM and PM peak-hour traffic conditions are summarized in **Table 4.6**. The values in the table are the 95th percentile queue lengths as reported by Synchro. As shown in the table, the majority of the left-turn movements are projected to have queues of less than 200 feet in length, with exceptions at Black Forest Rd, Sterling Ranch Rd, Banning Lewis Pkwy, and Meridian Rd. Full Synchro reports are also included in **Appendix B**.

**Table 4.6. 2045 Left Turn Queuing Summary**

| Intersecting Road | Approach Direction | 95th Percentile Vehicle Queue Length (in feet) | |
|---|---|---|---|
| | | AM Peak Hour | PM Peak Hour |
| Black Forest Road | EB | 131* | 117 |
| | WB | 108* | 251* |
| | NB | 331* | 285* |
| | SB | 112 | 105* |
| Loch Linneh Place | WB | 3† | 0† |
| Lochwinnoch Lane | EB | 2† | 6† |
| | WB | 0† | 4† |
| | NB | 42 | 35 |
| | SB | 56 | 42 |
| Commercial Collector | EB | 129 | 18 |
| | WB | 3† | 80† |
| | NB | 96 | 118 |
| | SB | 84 | 73 |
| Vollmer Road | EB | 13† | 23† |
| | WB | 103 | 158 |
| | NB | 74 | 114 |
| | SB | 92 | 85 |
| Sterling Ranch Road | WB | 12† | 49† |
| | NB | 236 | 280 |
| Banning Lewis Pkwy | WB | 189 | 167 |
| | NB | 287 | 309 |
| The Ranch Collector West | WB | 6 | 18 |
| | NB | 42 | 42 |
| Woodmen Hills-Raygor | EB | 3 | 3 |
| | WB | 40 | 18 |
| | NB | 107 | 138 |
| | SB | 26 | 38 |
| The Ranch Collector East | WB | 6† | 5† |
| | NB | 96 | 143 |

**Table 4.6. 2045 Left Turn Queuing Summary (continued)**

| Intersecting Road | Approach Direction | 95th Percentile Vehicle Queue Length (in feet) | |
|---|---|---|---|
| | | AM Peak Hour | PM Peak Hour |
| Towner Avenue | EB | 45 | 34 |
| | WB | 6† | m7† |
| | NB | 50 | 47 |
| | SB | 113 | 153 |
| Meridian Road | EB | 37 | 28† |
| | WB | 255 | 140 |
| | NB | 134 | 174 |
| | SB | 112 | 104 |

** The 95th percentile volume exceeds capacity, queue may be longer*
*† The volume for 95th percentile queue is metered by upstream signal.*

# 5 Environmental Resources, Mitigation, and Permitting

At the Corridor Preservation Plan milestone of overall project development, quantified project impacts cannot be determined, but it is possible to identify the types of resources that would likely be affected and to identify the general types of mitigation and permitting requirements that may apply. Addressed in this section are the following topics:

5.1 Floodplain Permitting
5.2 Wetlands Mitigation and Permitting
5.3 Water Quality Permits
5.4 Farmland Protection
5.5 Wildlife (Senate Bill 40 Certification)
5.6 Hazardous Waste and Materials (Environmental Site Assessment)
5.7 Noise Analysis
5.8 Air Quality
5.9 Wildflowers and Noxious Weeds

## 5.1 Floodplain Permitting

Floodplain hazards are mapped nationally by FEMA. FEMA's floodplain maps are used as the basis for determining whether or not floodplain insurance can be issued and used to compensate affected property owners for flood damage. Construction within a floodplain has the potential to modify that floodplain and thus affect additional properties. Under such circumstances, it is necessary to model the effects of that construction and to update the floodplain hazard maps, if impacted.

A key concept in the FEMA mapping system is identification of areas that are interpreted as having a 1 percent chance of inundation in any given year, and thus are expected to flood once over a period of 100 years. This is commonly known as the 100-year floodplain. A FEMA permit is necessary to undertake construction in the 100-year floodplain.

FEMA maps for the Briargate-Stapleton corridor were reviewed for this Corridor Preservation Plan. Most of the study corridor is classified as areas of Minimal Flood Hazard (Zone X). But there are two locations where the east-west corridor crosses north-south drainages that are classified as Zone AE, meaning 100-year floodplain. These are approximately halfway between Black Forest Road and Vollmer Road and east of Vollmer Road, as shown in **Figure 5.1**.

Accordingly, key drainage considerations for design of the roadway will include:

- accounting for any necessary wetland mitigation.
- sizing culverts to convey peak flows under roadway.
- adding water quality treatment features to mitigate runoff impacts.
- providing and/or relocating curb and gutter within urban sections.

The roadway design will need to be evaluated using an appropriate modeling approach (normally the U.S. Army Corps of Engineers Hydrologic Engineering Center's River Analysis System, or HEC-RAS).

A FEMA floodplain permit will be needed for the project. This should be coordinated through the Regional Floodplain Coordinator at the Pikes Peak Regional Building Center.

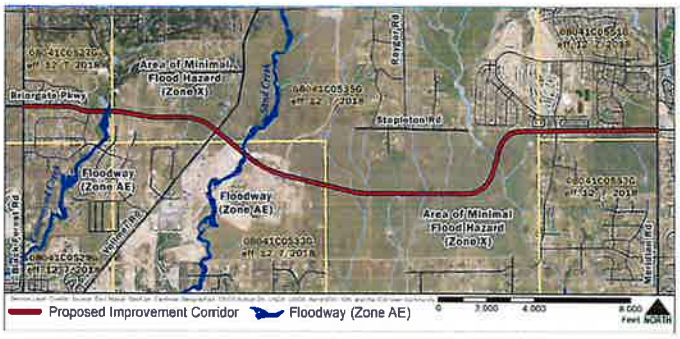



**Figure 5.1 FEMA Floodplain Map Information for the Briargate-Stapleton Corridor.**
*Source:* FEMA, 2021.

## 5.2 Wetlands Mitigation and Permitting

Wetlands are valuable ecological resources that have numerous benefits for wildlife, flood control, and water quality. Wetlands associated with waters of the United States (WUS) fall under the jurisdiction of the U.S. Army Corps of Engineers (USACE). Presidential Executive Order 11990, "Protection of Wetlands" (42 FR 26961, 3 CFR, 1977 Comp., p. 121), instructs all federal agencies to "take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities."

An on-site field delineation of wetlands in the Briargate-Stapleton corridor was outside the scope of this Corridor Preservation Plan and, therefore, was not conducted. Wetland size and location can change over time due to development and other factors, so delineation should be done after a specific alignment has been determined so that project impacts can be determined with increased certainty.

To identify the potential for wetland impacts in the corridor, CORVUS Environmental Consulting reviewed available data online from the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI). The NWI data makes informed assumptions about possible wetlands based on the interpretation of satellite imagery. Though useful for screening purposes, it is not adequate for regulatory compliance. See **Figure 5.2**.

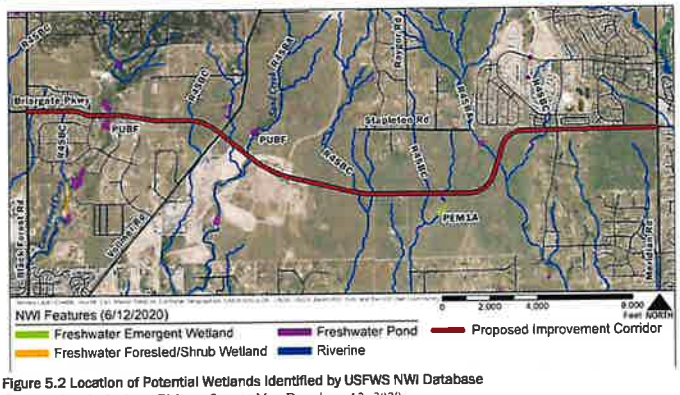



**Figure 5.2 Location of Potential Wetlands Identified by USFWS NWI Database**
*Source:* Colorado Springs, El Paso County Map Date June 12, 2020.

**Figure 5.2** includes some USFWS codes that indicate the type of wetland that may be present. The first letter "R" stands for riverine (associated with a stream); the first letter "P" stands for palustrine, associated with a pond. Here is a decoding of the four abbreviations shown in the figure:

- R4SBA – Riverine, Intermittent, Streambed, Temporarily Flooded
- R4SBC – Riverine, Intermittent, Streambed, Seasonally Flooded
- PUBF – Palustrine, Unconsolidated Bottom, Semipermanently Flooded
- PEM1A – Palustrine, Emergent, Persistent, Temporarily Flooded

Given that the Briargate-Stapleton roadway corridor crosses approximately 13 of these drainages, it seems likely that the project would indeed impact wetlands in one or more of them. Cottonwood Creek and Sand Creek appear to be the most likely locations for impacts. These are also the most likely locations for riparian wildlife impacts, discussed later.

Efforts will be needed in the design process to avoid, minimize, and mitigate both temporary and permanent wetland impacts. If wetlands or other WUS would be affected, a permit for construction affecting wetlands and other waters will be needed from USACE, based on a formal wetland delineation and a USACE Jurisdictional Determination (JD).

Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged or fill material into WUS, including wetlands. This requirement is administered through the USACE Section 404 Permit Program. USACE has developed a system of streamlined permits for common types of projects with minimal impacts and has updated these Nationwide Permits (NWPs) effective March 2021. NWP 14, Linear Transportation Projects, is available for projects with impacts totaling 0.5 acres or less.

For projects with greater impacts, an Individual Permit could be required, which takes significantly more time for processing (USACE 2021).

## 5.3 Water Quality Permits

Protection of water quality is an important national priority addressed by numerous federal laws, including the Clean Water Act (CWA) of 1977 and the Water Quality Act of 1987. These are geared in part to control the release of contaminants into the WUS.

This is relevant to the Briargate-Stapleton roadway corridor; the roadway alignment would cross a number of drainages that flow to Monument Creek, then Fountain Creek, and then the Arkansas River.

Roadway construction projects in urban areas are required to include design features and construction practices that prevent soil erosion and capture stormwater runoff to treat it (e.g., by letting the sediment settle out) before stormwater is discharged to receiving waters. Temporary and permanent Best Management Practices (BMPs) are required under federal and Colorado regulations.

The U.S. Environmental Protection Agency (EPA) has delegated authority for enforcement of the CWA to the CDPHE. Under this authority, the Colorado Water Quality Control Act was passed, and Colorado's Water Quality Control Commission (WQCC) was created to provide regulations to be implemented by CDPHE to keep Colorado in compliance with the CWA.

Based on requirements promulgated under Section 402 of the CWA, the WQCC has implemented regulations identifying the City of Colorado Springs and El Paso County as regulated MS4 areas. By definition, a separate storm sewer system includes not only a storm drainage system but also ditches, gutters, and other similar means of collecting and conveying stormwater runoff that does not connect with a wastewater collection system or wastewater treatment facility.

**Figure 5.3** shows a map of El Paso County's MS4 area, shaded in yellow. The Colorado Springs MS4 area is shaded in gray. In between is a planned urban growth area that is unincorporated now but could be annexed into the city in the foreseeable future. This includes much of the Briargate-Stapleton corridor. Logically, it makes sense to assume that the entire study area will soon be subject to MS4 permit requirements and to design and construct the roadway accordingly.

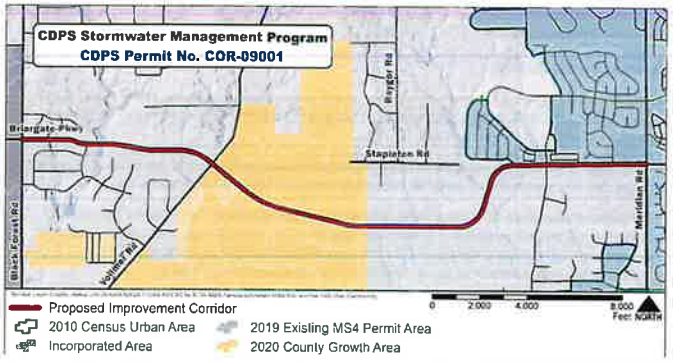



**Figure 5.3 2019 El Paso County MS4 Permit Area.**
*Source:* El Paso County, 2021.

Construction projects that disturb one acre or more or that are part of a larger common plan of development require a Colorado Department of Public Safety (CDPS) Construction Stormwater Permit from the Water Quality Control Division (WQCD) and a Stormwater Management Plan (SWMP). The SWMP is prepared in the final design phase of the project before the submission of the CDPS construction permit application submitted to the WQCD at least 30 days before construction. Sites that must discharge groundwater from a construction site to a surface water body also require a CDPS Dewatering Permit.

In addition to the above requirements, CWA Section 401 mandates that a federal agency may not issue a permit or license to conduct any activity that may result in any discharge into WUS unless either a Section 401 water quality certification is issued that verifies compliance with water quality requirements or certification is waived. States and authorized tribes where the discharge would originate are generally responsible for issuing water quality certifications.

## 5.4 Farmland Protection

Farmland protection is a nonissue in the Briargate-Stapleton corridor due to the lack of farmland in the area.

The Farmland Protection Policy Act (FPPA), enacted in 1980, seeks to minimize the impact that federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. FPPA regulations are found in Title 7, Part 658 of the *Code of Federal Regulations*. These requirements are under the jurisdiction of the U.S. Department of Agriculture (USDA), and within the USDA, farmland statistics are kept by the Natural Resources Conservation Service (NRCS). The FPPA further seeks to ensure that federal actions are compatible with private, local, and state programs and policies to protect farmlands.

The availability of suitable climate, soils, and water supply is critical to agricultural feasibility. Good farming conditions are not prevalent in El Paso County, especially in its northern portion at a higher elevation. Some farming occurs in the southern part of the county, with irrigation from Monument Creek. According to the USDA 2017 Census of Agriculture, El Paso County has 0.2 percent of the state's total number of farms and 0.1 percent of its total agricultural acreage. The market value of agricultural products in El Paso County was estimated at $32 million in 2017, with half of this attributed to cattle and calves. About a third of the total market value is attributed to the crop category of "nursery, greenhouse, floriculture, and sod." Another 7 percent was attributable to other crops and hay. (USDA 2017)

For farmland protection purposes, USDA specifically defines the terms "prime farmland," "unique farmland," "other than prime or unique farmland of statewide importance," and "other than prime or unique farmland of local importance." Prime farmland is defined as land that has the best combination of physical and chemical characteristics for the production of food, feed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor and without intolerable soil erosion. Prime farmland includes land that possesses the above characteristics but is currently being used to produce livestock and timber.

The NRCS Soil Data Access (SDA) Prime and Other Important Farmlands database identifies 125 different soil types in El Paso County and classifies 104 of them as "not prime farmland." The remaining 21 soil types are considered "prime farmland if irrigated," and six of these also have other conditions.

Due to lack of water for irrigation in the area, no soils in the Briargate-Stapleton corridor are considered prime farmland under the FPPA (USDA 2021). A review of aerial photography confirms there is no evidence of irrigated farming in the study area. The area traditionally has been used for cattle grazing, as seen in **Figure 5.4**.


**Figure 5.4 Cattle Grazing Adjacent to Stapleton Road at Raygor Road.**
*Source:* Google, Google Maps street view of Stapleton Road and Raygor Road, accessed 2021, https://www.google.com/maps/.

## 5.5 Wildlife (Senate Bill 40 Certification)

Construction of a new arterial roadway will convert undeveloped grassland to impervious surfaces. In addition to creating a barrier to wildlife movement, a road carries traffic with noise and nighttime light, which creates a disturbance zone that degrades adjacent habitat. Wildlife and wildlife habitats are afforded some protection by the Colorado law commonly referred to as Senate Bill (SB) 40. Per SB 40, roadway impacts to three key classifications of fish and wildlife and their habitat need to be assessed: 1) protected sensitive species, 2) common wildlife (especially roadway crossing by large game animals), and 3) riparian and aquatic species.

### 5.5.1 Threatened and Endangered Species – Possibly Present

In northern El Paso County, the protected sensitive species of primary concern is Preble's Meadow Jumping Mouse (PMJM), or *Zapus hudsonius preblei*. This rodent species was listed as Threatened by the USFWS in 1998. In December 2011, USFWS designated approximately 411 miles of rivers and streams and 34,935 acres of streamside habitat in seven Colorado counties as critical habitat that is essential for the survival of this species.

According to USFWS, this largely nocturnal mouse lives primarily in heavily vegetated, shrub-dominated riparian (streamside) habitats and immediately adjacent upland habitats along the foothills of southeastern Wyoming south to Colorado Springs along the eastern edge of the Front Range of Colorado. Typical habitat for PMJM comprises well-developed plains riparian vegetation with adjacent, relatively undisturbed grassland communities and a nearby water source. The eastern boundary for the PMJM is likely defined by the dry shortgrass prairie, which may present a barrier to eastward expansion (USFWS 2021).

The closest USFWS-designated Critical Habitat for PMJM is located about four miles northwest of the western terminus (Black Forest Road) of the Briargate-Stapleton corridor study area, as shown in **Figure 5.5.** Critical Habitat identifies specific areas that are essential to the conservation of PMJM and that may require special management considerations or protections.

The entire Briargate-Stapleton study corridor is located within the potential range of PMJM, but this species is only found in riparian areas ("riparian" is derived from the Latin word *ripa*, which means riverbank). Based on available USFWS mapping, there are approximately 13 places where the proposed east-west Briargate-Stapleton roadway could cross north-south drainages with potential riparian areas. These are shown in **Figure 5.6.** These riparian areas are drainages that flow southward from the Black Forest into four watersheds: Cotton Creek, Sand Creek, East Fork Sand Creek, and Black Squirrel Creek. Importantly, the southward-flowing Black Squirrel Creek at the eastern end of the study area, which does not have designated critical habitat, is different from the westward-flowing Black Squirrel Creek to the north, which does have designated critical habitat.

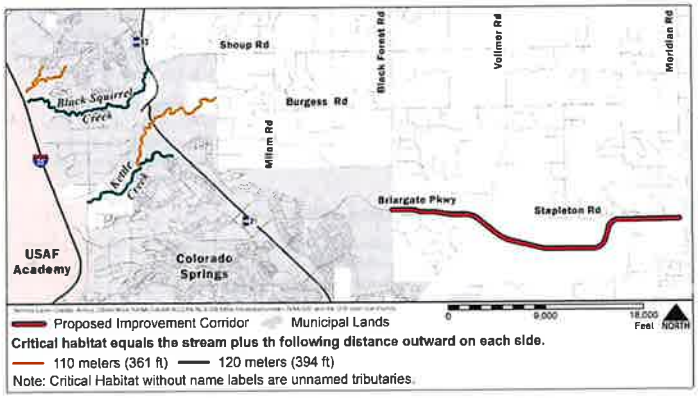



**Figure 5.5 Location of Briargate-Stapleton Study Area in Relation to PMJM Critical Habitat**


**Figure 5.6 Potential Riparian Areas Along Briargate-Stapleton Corridor**

*Note:* Riparian areas are shown in yellow.
*Source:* CORVUS Environmental Consulting.

The next step needed in PMJM evaluation is to conduct an on-site habitat evaluation, which is outside the scope of this Corridor Preservation Study. The priority locations for site visits are perennial streams with consistent shrubby vegetation, such as Cotton Creek and possibly Sand Creek. Documentation of no suitable habitat would be sufficient to obtain USFWS concurrence with a determination of No Effect on PMJM.

If suitable PMJM habitat is present, however, trapping efforts may be needed to determine the presence/absence of PMJM in such locations. Note that trapping cannot be performed during the animal's hibernation season (September/October through May/June). If PMJM were determined to be present, preparation of a Biological Assessment and a USFWS Biological Opinion would be needed, and mitigation would be required.

### 5.5.2 Other Threatened and Endangered Species – Not Present

The USFWS online screening tool called Information for Planning and Consultation (IPAC) identifies several other federally listed threatened or endangered species that occur within El Paso County, but these do no impact the Briargate-Stapleton corridor due to lack of suitable habitat (USFWS 2021).

- Mexican Spotted Owl (Strix occidentalis lucida) – Threatened. Habitat is in rocky canyons near the mountains, but not on eastern grasslands.
- Greenback Cutthroat Trout (Oncorhynchus clarkii stomias) – Threatened. Found in cold-water streams near Pikes Peak, but not in drainages of the eastern grasslands.
- South Platte River species downstream in Nebraska: (1) Least tern, (2) Piping Plover, (3) Whooping Crane, (4) Pallid Sturgeon, (5) Western Prairie Fringed Orchid –Threatened. Not applicable, as all drainages in the study area feed into the Arkansas River; they do not flow northward to reach the South Platte River.
- Ute Ladies'-tresses Orchid (Spiranthes diluvialis) – Threatened. This orchid occurs along riparian edges, gravel bars, old oxbows, high-flow channels, and moist to wet meadows along perennial streams. It typically occurs in stable wetland and seepy areas associated with old landscape features within historical floodplains of major rivers. It also is found in wetland and seepy areas near freshwater lakes or springs. Drainages in the study area may have riparian edges but do not include major rivers or the other riverine features listed above.

### 5.5.3 Common Wildlife – Game Species

The study area almost certainly contains common wildlife species that are prevalent along the Colorado Front Range grasslands, for example, coyotes, foxes, raccoons, rabbits, skunks, squirrels, mice, voles, snakes, and a variety of birds, including raptors such as the red-tailed hawk. These species currently do not have federal or state protection under the Endangered Species Act. Larger mammals also are present, including mule deer, white-tailed deer, elk, and occasionally black bears and mountain lions, some visiting from the nearby Black Forest to the north and the U.S. Air Force Academy (a large natural campus against the mountain foothills). Also present is the pronghorn (antelope), a grassland animal that requires large expanses of open space.

Some of these animals will be displaced by the planned urban land uses along Briargate-Stapleton corridor, forcing them to retreat to the Black Forest, the mountain foothills, or the plains (pronghorn). The smaller mammals, including coyotes, will adapt to urban development.

For this Briargate-Stapleton study, CORVUS Environmental Consulting examined available data from Colorado Parks and Wildlife to determine if there are any known migration routes for elk or other large mammals. The CPW data confirmed that the study area is part of the known range for a number of game animals but identified no known migration routes. The game animals identified by CPW were mule deer, white-tailed deer, black bear, pronghorn, and wild turkey. The CPW data did not include elk in the area.

There does not appear to be a need for planned wildlife crossings along the Briargate-Stapleton corridor. Wildlife movement will become confined to major drainages such as Cottonwood Creek and Sand Creek. At both locations, roadway bridges will be needed for hydraulic reasons, and animals will be able to cross under the roadway. The higher the clearance provided under these bridges, the more likely they would be to accommodate wildlife crossing. Small-animal roadkill can be expected in the area due to a relatively high roadway speed, minimal lighting, and traffic volumes of 30,000 vehicles per day. This is a common occurrence throughout Colorado Springs, even on less-traveled streets with less traffic.

As noted above, numerous bird species are present in the study area. Most are protected by the Migratory Bird Treaty Act (MBTA) of 1918, which makes it unlawful to harm these birds, their eggs, or their nests during the breeding season. The Corvus analysis of CPW indicated that 11 species have breeding areas within the Briargate-Stapleton study area. These are:

1. Lewis Woodpecker*
2. Band-tailed Pigeon
3. Brewer Sparrow
4. Brown-capped Rosy Finch
5. Grasshopper Sparrow
6. Lazuli Bunting
7. Northern Harrier
8. Prairie Falcon
9. Rufous Hummingbird
10. Swainson Hawk
11. Virginia Warbler

* The Lewis Woodpecker is not threatened or endangered but is the only species on this list identified by USFWS as a Bird of Conservation Concern (BCC).

### 5.5.4 Riparian Species – Senate Bill 40

Enacted in 1969, Colorado SB 40 requires any state agency (usually CDOT) to obtain wildlife certification when it plans to undertake construction "in any stream or its banks or tributaries (CRS Title 33, Article 5, Protection of Fishing Streams). The purpose of this certification is to identify potential impacts to riparian fish and wildlife and to avoid, minimize, and mitigate impacts as feasible. SB 40 states:

> It is declared to be the policy of this state that its fish and wildlife resources, and particularly the fishing waters within the state, are to be protected and preserved from the actions of any state agency to the end that they are available for all time and without change in their existing natural state, except as may be necessary and appropriate after due consideration of all factors involved.
>
> No agency of the state, referred to in this article as an "applicant," shall obstruct, damage, diminish, destroy, change, modify, or vary the natural existing shape and form of any stream or its banks or tributaries by any type of construction without first notifying the commission of such planned construction. Such notice shall be on forms furnished by the commission and shall be submitted not less than ninety days prior to the date of the commencement of planned construction. The notice shall include detailed plans and specifications of so much of the project as may or will affect, as set forth in this section, any stream. (CO Rev. Stat. § 33-5-101-102, 2018)

Whether or not SB 40 applies to the Briargate-Stapleton roadway project, Cottonwood Creek and Sand Creek are the two key locations where impacts to riparian habitat and wildlife should be explored. These are key locations for PMJM assessment, wetland assessment, and floodplain impact evaluation. Any efforts to protect PMJM habitat and minimize wetland impacts will also tend to be beneficial for riparian species in general.

## 5.6 Hazardous Waste and Materials (Environmental Site Assessment)

The Briargate- Stapleton corridor largely traverses undeveloped ranch land, which does not have past urban or industrial uses and does not have any former landfills.

A hazmat database records search was performed in January 2021 for a one-mile radius around the expected Briargate-Stapleton alignment from Black Forest Road to Meridian Road. This records search, which is a standard component of an Initial Site Assessment (ISA) and included 76 different federal and state hazardous materials databases, found only one record within the search area. This listing comes from the CDPHE database of solid waste disposal facilities, transfer stations, recyclers, waste tire registrants, and waste grease registrants.

The listing named Hauling by Steve, a business located at 7465 Forestgate Drive. The record indicates that this business involves the transportation of waste tires. This address is south of Briargate-Stapleton and slightly west of Vollmer Road. Google Maps and the El Paso County Assessor's records confirm that this is the proprietor's home residence and not a place of business.

On the basis of this records search, there appear to be no environmental restraints for the Briargate-Stapleton corridor with regard to hazardous materials.

## 5.7 Noise Analysis

Construction of an arterial roadway in the Briargate-Stapleton corridor will introduce traffic noise in an area that is relatively quiet. This noise likely will be unwelcome to existing residents in the area, who enjoy the relative tranquility of the countryside. However, they do live in a planned growth area within a rapidly growing metropolitan area.

Land developers have the option to include berms in their development designs and to locate non-sensitive land uses near the roadway, rather than build homes lined up right next to it, as often happens. Fortunately, a relatively wide ROW is planned, which will mitigate the noise impact because noise levels decline with increased distance. Factors that can increase noise include high-speed limits, motorcycles, heavy trucks, and steep grades that lead to loud braking. As seen in Figure 5.7, the Briargate-Stapleton corridor is identified as a secondary truck route on El Paso County's 2016 MTCP Update. Briargate-Stapleton is expected to carry roughly 30,000 vehicles per day in 2045.

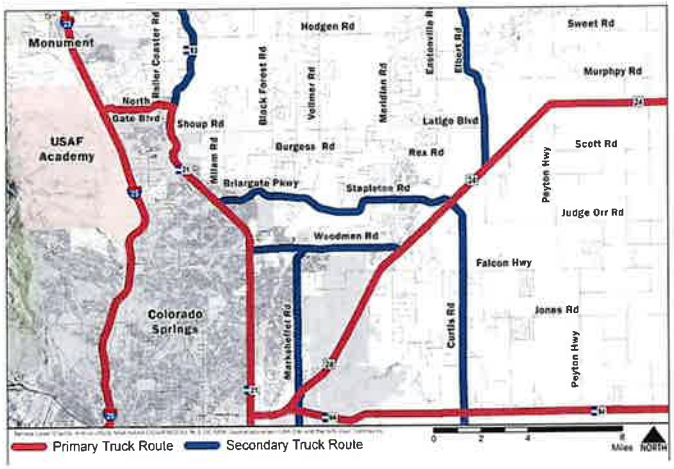



**Figure 5.7 Excerpt from MTCP - Truck Route Map.**
*Source:* El Paso County, 2016, Map 16, p. 62.

The Federal Highway Administration (FHWA) and CDOT have detailed noise analysis and abatement guidelines involving the use of computer noise modeling, but the Briargate-Stapleton corridor is not expected to be funded with state or federal highway funds. Because noise barriers are expensive to build, the federal and state guidelines specify a cost-benefit approach whereby an isolated residence will not qualify for mitigation, but numerous noise "receptors" close together can meet the cost-effectiveness criteria.

Noise barriers in Colorado are common in urban areas along high-speed, heavily traveled Interstate highways, where the criteria are met. Noise barriers are relatively rare along city streets. Barriers typically provide noise reduction benefit for the first row of (closest) receptors and minimal benefit to other receptors behind them. If a person can see the roadway, that means there is not an intervening obstacle to block the noise, and the person can likely hear the noise from vehicles that pass by.

The FHWA guidelines for noise modeling (not applicable to this local project) call for the modeling of receptors within 500 feet of the roadway. Figure 5.8 illustrates this modeling area on an aerial photo of the corridor. It is rare for receptors beyond 500 feet from the traveled lane to experience traffic noise levels exceeding the FHWA/CDOT threshold that triggers analysis of noise barrier feasibility and reasonableness. The threshold level equates to two people being able to hold an outdoor conversation from six feet apart. If this cannot happen due to traffic noise, that property is considered to be an impacted receptor.

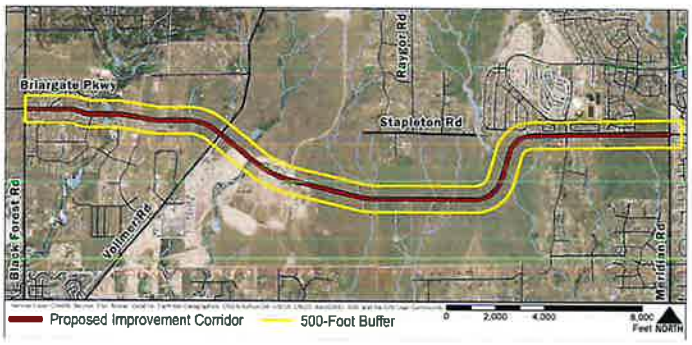



**Figure 5.8 Buffer Area 500 Feet from the Proposed Travel Lanes.**

## 5.8 Air Quality

Air quality in the Pikes Peak region is generally good, and it is presumably even better in the Briargate-Stapleton corridor due to lack of dense urban development nearby. Vehicle-related emissions of carbon monoxide resulted in violations of national air quality standards in the 1970s and 1980s, but improved vehicle technology has eliminated this problem. Today, with a much greater regional population and much more vehicle travel, highest recorded carbon monoxide concentrations are about 70 percent lower than they were three decades ago. The primary air pollution concern today is ground-level ozone.

### 5.8.1 Ozone Pollution

Ground-level ozone (not the atmospheric ozone layer, which protects the planet from solar radiation) is formed in the atmosphere by various chemical reactions, typically on hot, sunny days, and thus elevated ozone concentrations occur during summer months. The U.S. EPA revised the primary (public health) and secondary (public welfare) eight-hour ozone standards from 75 parts per billion to 70 parts per billion, effective on December 28, 2015. The Pikes Peak region has been teetering at the attainment/nonattainment threshold since that time, so far avoiding a violation.

The region has two ozone monitoring stations: one in Manitou Springs and one at the U.S. Air Force Academy. Because air heats up and rises on warm days, and the pollution created at lower elevations rises during the day, both monitoring stations are located at elevations higher than downtown Colorado Springs.

The PPACG is the designated lead air quality management agency for Park, Teller, and El Paso Counties. In January 2020, PPACG committed to the Ozone Advance Program, a voluntary action plan aimed at raising public awareness of ozone pollution and taking steps to reduce the precursor pollutants that cause it—volatile organic compounds (VOCs) and nitrogen oxides (NOx).

Ozone precursor pollutants are emitted by all aspects of urban life, that is, any activity involving the use of fuels or chemicals. Vehicle use, power plants, paint, and household chemicals are just a few examples. In northern Colorado, gas and oil production are additional contributors.

Ozone concentrations are worse in Denver, which has a much larger population, but the Pikes Peak Region has grown steadily by about 100,000 persons per decade since 1990, and more population creates more ozone pollution. The planned development along the Briargate-Stapleton corridor is part of this ongoing trend. Local air pollution in the Briargate-Stapleton corridor will increase due to the conversion of vacant grassland to urban land use, including the motor vehicle use associated with the new land uses. However, no localized violations of national ambient air quality standards would result.

### 5.8.2 Fugitive Dust

Although the Pikes Pak Region is in attainment for EPA-regulated particulate matter (including dust) for both coarse (10 microns or smaller) and fine (2.5 microns or smaller) particulates, statewide regulations from the CDPHE and El Paso County regulations apply to construction activities that cause a large amount of ground disturbance.

Section 5.6 of the El Paso County Board of Health Regulations requires a Construction Activity Permit whenever construction may result in a disturbed area of one or more acres. El Paso County Public Health issues permits for periods not to exceed six months when the disturbed area will be at least 1 acre but less than 25 acres. CDPHE's Air Quality Control Division issues permits when the disturbed area is 25 acres or larger. For the Briargate-Stapleton road construction, the disturbed area is expected to be greater than 25 acres and thus requires the CDPHE Construction Air Quality Permit.

To obtain an air quality permit, which is legally enforceable and revocable, the applicant must submit and execute a plan to minimize and control fugitive dust emissions that could result from the construction activity. The dust control plan typically should:

- Indicate what vehicle speed control measures will be in place.
- Indicate what limited disturbed area practices will be in place (explain, phasing, etc.).
- Indicate what revegetation methods will be applied.
- Detail mulch application (if applicable).
- Describe compaction methods (specify the location, number, and type of equipment).
- Detail watering times per day or as needed.
- Indicate frequency of use and location of chemical stabilizers (if applicable).
- Describe how steep slopes will be controlled.
- Detail windbreaks (snow, solid fence, berm, furrows, vegetation, etc.).
- Detail stockpile controls.
- Indicate plans for establishment and maintenance of temporary construction haul roads.
- Detail control of haul roads (specify control, frequency of cleanups, etc.).

### 5.8.3 Air Pollution Due to Wildfires

Air pollution can also occur due to wildfires, such as the Black Forest Fire, which burned an estimated 14,280 acres and destroyed over 500 homes in June 2013. This occurred in unincorporated El Paso County, immediately to the north of the Briargate-Stapleton corridor. Other major wildfires in the region (2002 Hayman Fire, 2012 Waldo Canyon Fire), the state (2020 East Troublesome and Cameron Peak Fires), and even fires from out of state have occasionally caused significant degradation to air quality in Colorado Springs. Although these are considered exceptional events, it is foreseeable that similar situations will occur in the future.

## 5.9 Wildflowers and Noxious Weeds

Soil disturbance resulting from roadway construction needs to be mitigated to prevent erosion and also to minimize invasion by noxious weeds. In areas that do not have urban roadside landscaping, revegetation with native plant species is the standard approach. Native plant species include wildflowers, which can be desirable for aesthetic reasons, subject to any maintenance constraints. Native species are adapted to local climatic and soil conditions and do not need ongoing artificial irrigation.

### 5.9.1 Wildflowers

The Briargate-Stapleton corridor is expected to be developed with local funds and thus would not subject to federal roadway development requirements. Nevertheless, federal initiatives regarding native plant species are instructive. Section 130 of the Surface Transportation and Uniform Relocation Assistance Act of 1987 amended 23 U.S.C. 319 by adding a requirement that native wildflower seeds or seedlings or both be planted as part of any landscaping project undertaken on the federal-aid highway system. At least one-quarter of one percent of funds expended for a landscaping project must be used to plant native wildflowers on that project. This provision requires every landscaping project to include the planting of native wildflowers unless a waiver has been granted. The FHWA Colorado Division Administrator can grant a waiver if the State certifies that native wildflowers or seedlings cannot be grown satisfactorily or there is a scarcity of available planting areas. (FHWA 2021).

Related best vegetation practices also found in 23 U.S.C. 319 address the important, emerging focus on the encouragement of pollinator habitat, as follows. In cooperation with willing States, the Secretary of the U.S. Department of Transportation is instructed to (1) encourage integrated vegetation management practices on roadsides and other transportation ROWs, including reduced mowing; and (2) encourage the development of habitat and forage for Monarch butterflies, other native pollinators, and honey bees through plantings of native forbs and grasses, including noninvasive, native milkweed species that can serve as migratory way stations for butterflies and facilitate migrations of other pollinators.

The opposite of desirable wildflowers is an infestation of disturbed soil areas by noxious weeds. Federal law and Colorado law recognize the ecological and economic harm (damage to agriculture) posed by noxious weeds. Under Colorado law, it is ultimately the responsibility of all landowners to employ methods and strategies to manage noxious weeds found on their property. This applies to both the public and private sectors. Roadways are well-known corridors for the spread of noxious weed seeds as the result of vehicles passing through.

### 5.9.2 Noxious Weeds

Agricultural agencies at the federal, state, and even county levels have developed lists of specific weed species that need to be eradicated. Typically, these lists have three levels, A, B, and C. In El Paso County's Weed Management Plan (2017, p.4):

- "List A" identifies rare noxious weed species that are subject to eradication wherever detected statewide in order to protect neighboring lands and the state as a whole.
- "List B" identifies noxious weed species with discrete statewide distributions that are subject to eradication, containment, or suppression in portions of the state designated by the commissioner in order to stop the continued spread of these species.
- "List C" identifies widespread and well-established noxious weed species for which control is recommended but not required by the state, although local governing bodies may require management.

This noxious weed list, last updated in 2018, is available through El Paso County or the Colorado Department of Agriculture. The County lists 32 noxious weed species, as summarized in Table 5.1.

The Briargate-Stapleton corridor has not been surveyed to identify existing vegetation, including wildflowers and noxious weeds. Both are likely present to a limited degree. Causal observation via Google Maps (driver's view) clearly shows extensive infestation of C-listed common mullein at both ends of the study corridor.

During construction, noxious weed management efforts can be undertaken, and the inclusion of wildflower seeds as part of the native species revegetation can be considered.

**Table 5.1. Noxious Weed List**

| "A" List (8) | "B" List (20) | "C" List (4) |
|---|---|---|
| Cypress spurge | Absinth wormwood | Common mullein |
| Dyer's woad | Bouncingbet | Downy brome / Cheatgrass |
| Knotweeds: Giant, Japanese & Bohemian | Bull thistle | Field bindweed |
| Myrtle spurge | Canada thistle | Poison hemlock |
| Orange hawkweed | Chinese clematis | |
| Purple loosestrife | Common teasel | |
| | Dalmatian toadflax | |
| | Diffuse knapweed | |
| | Hoary cress (whitetop) | |
| | Houndstongue | |
| | Leafy spurge. | |
| | Musk thistle | |
| | Perennial pepperweed | |
| | Russian knapweed | |
| | Russian olive | |
| | Scentless chamomile | |
| | Scotch thistle | |
| | Spotted knapweed | |
| | Tamarisk (Salt cedar) | |
| | Yellow toadflax | |

Source: Data from El Paso County, Community Services Department, Environmental Division, *Noxious Weeds and Control Methods*, updated 2018, https://assets-communityservices.elpasoco.com/wp-content/uploads/Environmental-Division-Picture/Noxious-Weeds/Noxious-Weed-Control-Book.pdf.

# 6 Conceptual Roadway Design

## 6.1 Corridor Preservation Basis

As part of the corridor study, concept-level plan and profile design was completed as the basis for the identification of ROW requirements and for the development of conceptual cost estimates. The plan and profile design are based on an ultimate four-lane configuration of Briargate=Stapleton. As part of the process of the plan and profile development, conceptual earthwork cross sections were developed and used as a basis for determining the need for retaining walls and/or additional ROW slope easements.

## 6.2 Alignment

As discussed in Section 3.1.5, the southern proposed alternative was selected as the recommended horizontal alignment. With no current vertical alignment in place, the proposed profile was designed to meet City of Colorado Springs criteria for grade and matched with existing grades at proposed intersection locations at Black Forest Road, Vollmer Road, and Towner Avenue to Meridian Road. Although the corridor is under El Paso County jurisdiction, the City's design criteria was used because it requires a more conservative design.

## 6.3 Plan and Profile

The conceptual plan and profile design for the interim four-lane principal arterial section is included as **Appendix A**. ROW has been confirmed and will require a 168' corridor to meet the requirements of the City and the County throughout the life of the corridor. Parcel limits are shown to provide a preliminary understanding of proposed ROW. Required future ROW limits are indicated on the plan views by virtue of toe of slope limits and retaining wall locations.

## 6.4 Phasing

Major corridor funding does not often become available in lump sum packages. To help facilitate implementation as funding does become available, the corridor improvements are broken into standalone phases, in which distinct improvement packages are proposed.

The following describes each phase and the proposed improvements. The bases for the estimated costs for each phase are detailed **in Section 6.3.1**. Initial Phase is the first priority for final design and construction when funding becomes available.

### 6.4.1 Initial Phase

Due to the forecasted traffic volumes in this area, it is recommended to use a hybrid of EPC's urban and rural Principal Arterial sections and the COS Principal Arterial section.

As a result of lower anticipated volumes immediately upon construction, it becomes more financially viable to construct only half of the roadway during initial construction. In the Initial Phase, a two-lane roadway, made up of the westbound lanes of the Interim Phase Section, as shown in **Figure 7.1**, would be striped to allow for travel in both directions.

**Figure 6.1 Initial Hybrid Section**

### 6.4.2 Interim Phase

As development occurs, the Briargate-Stapleton roadway can grow to meet development demands. The interim phase, as shown in Figure 7.2, will more closely resemble an EPC typical section with a 28' raised median to allow for double left-turn lanes, inside curb and gutter, a 4' inside shoulder, two 12' thru lanes in each direction, an 8' outside shoulder, and graded ditches for drainage. Additionally, a 12' bike trail would be included on the edge of the ROW. This bike path would be separated from the sidewalk by a dedicated utility corridor.

**Figure 6.2 Interim Hybrid Section**

### 6.4.3 Ultimate Phase

The ultimate phase cross section, as shown in Figure 7.3, will more closely resemble the City of Colorado Springs typical section with 11' thru lanes in each direction and a 6' outside shoulder. In this phase, the outer edge will be defined by a curb. The 6' outside shoulder provides a shared facility for bicycles, and a 6' detached sidewalk ensures increased pedestrian safety. This phase will require the removal of 8 feet of previously constructed pavement from each side of the roadway.

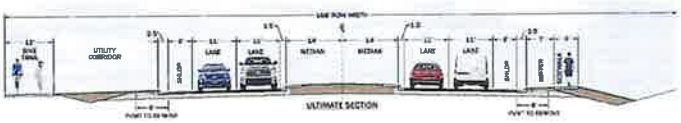


**Figure 6.3 Ultimate Hybrid Section**

## 6.5 Opinion of Probable Costs

### 6.5.1 Estimated Costs

The Briargate-Stapleton corridor study identified overall project safety, geometry, and capacity to improve the corridor. The planning level cost estimate for Initial improvements is approximately $52.9M, and approximately an additional $40.7M to upgrade the roadway to the interim phase section. To upgrade the interim phase section to the ultimate phase section is approximately $28M. Phased construction is estimated to be approximately $121.6M.

There is an economy of scale. The planning level estimate for immediately constructing the Interim phase section is $88.9M, a savings of $4.7M over the phased approach to achieve the same cross section. Similarly, constructing the Ultimate phase section without other phases is estimated at approximately $86M, a savings of $35.6M over the phased approach. The cost estimate for the Ultimate build-out is included in the table below; the remaining estimates are included in **Appendix E** Cost Estimates.

**Table 6.1. Phased Opinion of Probable Costs**

| Item No. | Item Description | Unit | Unit Cost | Quantity | Cost |
|---|---|---|---|---|---|
| 202-00240 | Rem Asphalt Mat (Planning) | SY | $2.60 | 54,000 | $140,400 |
| 203-00060 | Embankment Material (CIP) | CY | $17.00 | 412,500 | $7,012,500 |
| 304-06000 | ABC (CL 6) | TON | $29.00 | 107,000 | $3,103,000 |
| 403-34721 | HMA (Gr SX) (75) (PG 58-28) | TON | $93.00 | 79,000 | $7,347,000 |
| 606-00301 | Guardrail Type 3 (6-3) | LF | $37.00 | 6,000 | $222,000 |
| 606-00910 | Guardrail Type 9 (Style CA) | LF | $110.00 | 600 | $66,000 |
| 608-00000 | Concrete Sidewalk | SY | $85.00 | 57,600 | $4,896,000 |
| 609-21010 | Curb and Gutter Type 2 I-B | LF | $36.00 | 60,500 | $2,178,000 |
| 609-21020 | Curb and Gutter Type 2 II-B | LF | $35.00 | 60,500 | $2,117,500 |
| 610-00026 | Median Cover (6 In Pattern Conc) | SF | $12.00 | 64,800 | $777,600 |
| 613-10000 | Wiring | L SUM | $75,000.00 | 2 | $150,000 |
| 613-13000 | Luminaire (LED) (Special) | EACH | $1,700.00 | 8 | $13,600 |
| 614-70150 | Pedestrian Sig Face (16) (Countdown | EACH | $670.00 | 16 | $10,720 |
| 614-70336 | Traffic Signal Face (12-12-12) | EACH | $890.00 | 30 | $26,700 |
| 614-70560 | Traffic Signal Face (12-12-12-12-12) | EACH | $1,400.00 | 10 | $14,000 |
| 614-72860 | Pedestrian Push Button | EACH | $840.00 | 16 | $13,440 |
| 614-72886 | Intersection Detect System (Camera) | EACH | $7,500.00 | 8 | $60,000 |
| 614-81150 | Signal-Light Pole Steel | EACH | $21,000.00 | 8 | $168,000 |
| 614-84000 | Traffic Signal Pedestrian Pole Steel | EACH | 3,300.00 | 16 | $52,800 |
| 614-86240 | Controller (Type 170) | EACH | 7,100.00 | 2 | $14,200 |
| 900- | Bridge | SF | $150.00 | 7,500 | $1,125,000 |
| 900- | Drainage (estimate by project team) | L SUM | $13,920,000.00 | 1 | $13,920,000 |
| 900- | Wall | SF | $80.00 | 12,000 | $960,000 |
| | | | ITEM COST SUBTOTAL: | | $44,388,000 |
| | | | Contingency* | 30% | $13,317,000.00 |
| | | | Item Cost with Contingency | | $57,705,000 |
| | | | Mobilization | 10% | $5,771,000 |
| | | | Utilities | 5% | $2,886,000 |
| | | | Right-of-Way | 2% | $1,155,000 |
| | | | Force Account Provision | 10% | $5,771,000 |
| | | | CONSTRUCTION SUBTOTAL: | | $15,583,000 |
| | | | Engineering and Environmental Fees | | |
| | | | Design Fee | 10% | $5,771,000 |
| | | | Environmental Clearance Fee | 2% | $1,155,000 |
| | | | Construction Engineering | 10% | $5,771,000 |
| | | | FEE SUBTOTAL: | | $12,697,000 |
| | | | TOTAL PROGRAM COST | | $86,000,000 |

* The design upon which this opinion of the probable cost was based is highly conceptual. As a result, we recommend that a 30% contingency be used to cover additional costs.

*Note:* Costs highlighted in gray are percentages applied to the Item Cost with Contingency Subtotal. All values are rounded to the nearest $1000.

### 6.5.2 Basis of Costs

Unit costs and contingencies used to estimate Briargate-Stapleton improvement costs were derived from CDOT cost data for recent local highway projects. Quantities were calculated from concept level design drawings (plans and profiles) for Initial, Interim, and Ultimate Phases, as applicable.

# 7 Public Process

## 7.1 Project Website

A full-function website was developed for the project (go to: Corridor Study | Briargate-Stapleton Project for Mobility). The scrolling Home Page (see **Figure 7.1**) begins with a Welcome and Project News banner that includes links to frequently visited site Features. The website includes: a Project Overview, a library of Project Resources and a Questions & Answers posting (see **Figure 7.2**). Public and stakeholder input is facilitated by both an interactive Comment Map (see **Figure 7.3**) and an online Comment Form (see **Figure 7.4**).

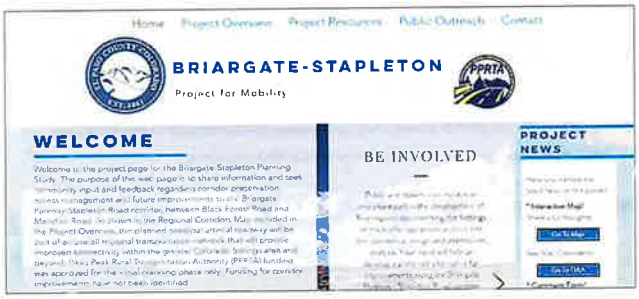



Figure 7.1 Project Website - Front Page Banner

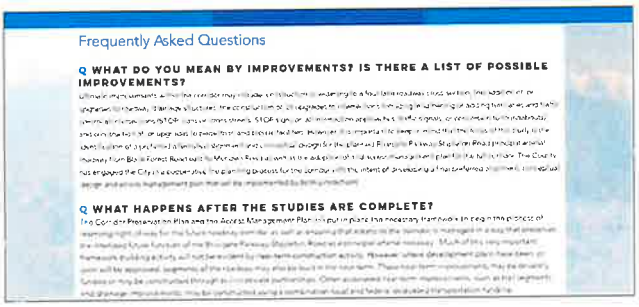



Figure 7.2 Website Frequently Q&A Posting


Figure 7.3 Website Comment Map – Example Comment and Response

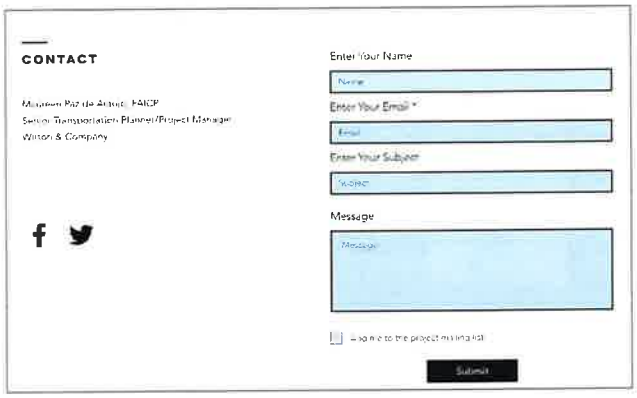



Figure 7.4 Website Comment Form

## 7.2 Virtual Public Open House

A 360-visualization application was used to create an online, hands-on Public Open House experience (go to: Virtual Public Open House). The virtual platform allowed users to pan through a 3-D meeting room to topic area stations and then pull-up and view topical exhibits, as illustrated by the sampling below. The public comment period extended from April 2021 through May 2021. The meeting remains open to view.


Figure 7.5 Virtual Public Open House – Welcome & Project Overview


Figure 7.5 Virtual Public Open House – Alignment & Typical Sections


Figure 7.6 Virtual Public Open House – Access & Environmental Considerations


Figure 7.7 Virtual Public Open House – Floodplains Exhibit

### 7.3 Stakeholder Coordination

Three agency stakeholder virtual meetings were held (2/19/2020, 3/25/2020 and 4/08/2020) to coordinate integration of El Paso County (County) and City of Colorado Springs (City) engineering design criteria, access spacing criteria, and development approvals into planning for the corridor. A separate developer stakeholder meeting was held (11/10/2020) to review the proposed alignment, hybrid (County/City) typical section (County/City) as well as planning for pedestrian/bicycle accommodations. Colorado Springs Utilities was also included in this meeting as a "developer" of a proposed gas line extension. Copies of presentation slides or materials for each of the four stakeholder meetings are included in **Appendix F.**

### 7.4 Corridor Preservation Plan Adoption

The Briargate Parkway-Stapleton Road Corridor Preservation Plan (CPP) will be presented to the Highway Advisory Committee and the Board of County Commissioners for review and approval. The County utilizes a two-step process whereby review and approval by the Highway Advisory Committee (HAC) will precede review and adoption of the CPP by the Board of County Commissioners. Following adoption of the CPP, the El Paso County Master Plan will be amended to include the CPP and the associated Access Control Plan.

### 7.4 Access Control Plan Intergovernmental Agreement Execution

It is the intent of the County to ensure that the Access Control Plan will be enforced equally throughout the corridor. Because there is potential for portions of the corridor to be annexed into the City of Colorado Springs, an Intergovernmental Agreement (IGA) to enforce the Access Control Plan was prepared as part of the was prepared as a part of the CPP. The IGA will be executed by the City and the County upon adoption of the CPP and ACP by El Paso County. Although the City will not adopt the CPP, City staff has been engaged in the study throughout the planning process and provided input and concurrence on the final alignment, ACP, and hybrid typical section for the corridor as well as planning for pedestrian/bicycle accommodations. The final Access Control Plan IGA that were developed collaboratively by the county and City are included as **Appendix D.**

### 7.5 Summary of Public Comments

The Briargate Parkway-Stapleton Road Corridor Study website included two optional formats for public comment. A standard online comment form as well as location-based comment map comprise two available comment options. Links to each option are provided on the website Welcome Page as well as on each review comment option opportunity page, e.g., on the instructions/link page for the Virtual Public Open House. Full detail of the public comments received that were and the responses that were provided are included in **Appendix F.**

## 8 References


Colorado Department of Transportation. n.d. *Online Traffic Information System (OTIS)*. http://dtdapps.coloradodot.info/otis

El Paso County. 2017. *Noxious Weed Management Plan*. https://assets-communityservices.elpasoco.com/wp-content/uploads/Environmental-Division-Picture/Noxious-Weeds/Weed-Management-Plan-December-2017.pdf

El Paso County. 2018. *Noxious Weeds and Control Methods*. https://assets-communityservices.elpasoco.com/wp-content/uploads/Environmental-Division-Picture/Noxious-Weeds/Noxious-Weed-Control-Book.pdf

**El Paso County. 2021. "2021 El Paso County MS4 Permit Area – Urban Areas."** https://assets-publicworks.elpasoco.com/wp-content/uploads/Stormwater/General_Documents/NPDES_2021.pdf

Federal Highway Administration, U.S. Department of Transportation. 2009. *Manual on Uniform Traffic Control Devices* (MUTCD). Revised, Washington, DC: FHWA, 2012. https://mutcd.fhwa.dot.gov/pdfs/2009r1r2/mutcd2009r1r2edition.pdf.

Felsburg Holt & Ullevig. 2016. *El Paso County 2016 Major Transportation Corridors Plan*. Colorado Springs, CO: El Paso County Department of Public Works. https://publicworks.elpasoco.com/road-bridge-planning-mcpp/.

FEMA. 2021. "Federal Emergency Management Agency Flood Map Service Center – Products for Unincorporated El Paso County." https://msc.fema.gov/portal/search?AddressQuery=monument%20co#searchresultsanchor.

FHWA. 2021. "Environmental Toolkit: Roadside Use of Native Plants." https://www.environment.fhwa.dot.gov/env_topics/ecosystems/roadside_use/vegmgmt_rdus3_1.aspx.

Pedersen, N. J., and D. R. Samdahl. 1982. *National Cooperative Highway Research Program (NCHRP) Report 255, Highway Traffic Data for Urbanized Area Project Planning and Design*. Washington, DC: National Academies Press. http://dtrcharmonica.com/bin/PDF/nchrp255.pdf.

Transportation Research Board.2014. *National Cooperative Highway Research Program (NCHRP) Report 765, Analytical Travel Forecasting Approaches for Project-Level Planning and Design*. Washington, DC. National Academies Press. https://www.nap.edu/download/22365.

Transportation Research Board. 2010. *Highway Capacity Manual* (HCM2010), 5th edition. National Academies Press: Washington, DC

Transportation Research Board. 2016. *Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis* (HCM6), National Academies Press: Washington, DC.

USACE, 2021. "U.S. Army Corps of Engineers Summary of the 2021 Nationwide Permits." https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll7/id/16820

USDA, 2017. "2017 Census of Agriculture County Profile: El Paso County." https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Colorado/cp08041.pdf

USDA, NRCS. 2021. "Soil Data Access (SDA) Prime and Other Important Farmlands" database. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcseprd1336623.html

USFWS. 2010. "Endangered and Threatened Wildlife Species and Plants; Revised Critical Habitat for Preble's Meadow Jumping Mouse in Colorado; Final Rule." https://www.fws.gov/mountain-prairie/species/mammals/preble/CRITICAL%20HABITAT/12142010TempFR.pdf

USFWS. 2021. "Endangered Species | Mammals: Mountain Prairie Region: Preble's Meadow Jumping Mouse." https://fws.gov/mountain-prairie/es/preblesMeadowJumpingMouse.php

El Paso County, Colorado
October 2021

# Appendix A
# Conceptual Plan and Profile
## Briargate Parkway/Stapleton Road Corridor Study

*On-Call CON 17-067Z*
*Task Release #17-067-51*

WILSON & COMPANY

# EL PASO COUNTY

BRIARGATE PARKWAY-STAPLETON ROAD STUDY

PRELIMINARY DESIGN

**EL PASO COUNTY**

Project #_____-__

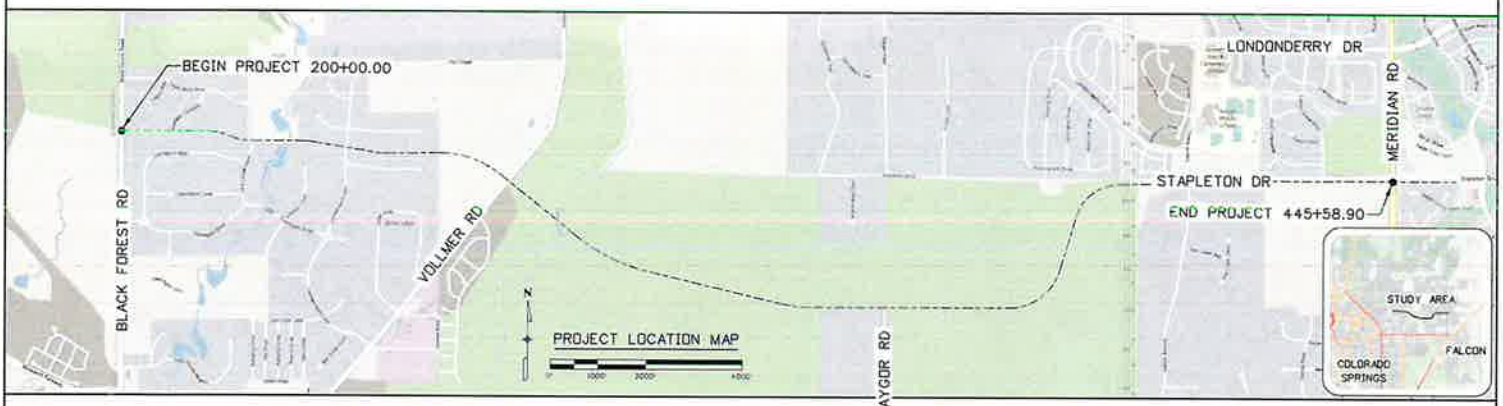
Bid #____-____

**TABULATION OF LENGTH & DESIGN DATA**

| STATION | FEET ROADWAY BRIARGATE PKWY/ STAPLETON RD |
|---|---|
| BEGIN = STA. 200+00.00 | 24558.9 |
| END = STA. 445+58.90 | |
| TOTAL | 24558.9 |

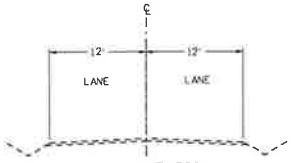
| SUMMARY OF PROJECT LENGTH | FEET | MILES |
|---|---|---|
| ROADWAY (NET LENGTH) | 24558.9 | 4.65 |

| SHEET NO. | INDEX OF SHEETS |
|---|---|
| 1 | TITLE SHEET |
| 2 | TYPICAL SECTIONS |
| 3-30 | ROADWAY PLANS AND PROFILES |

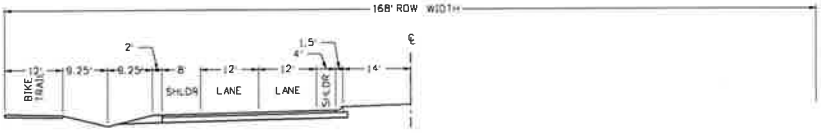



| | | | | | | |
|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | Sheet Revisions | | | WILSON & COMPANY 5755 Mark Dabling Blvd Suite 200 Colorado Springs, CO 80918 Phone: 719-520-5400 FAX: 719-520-0108 | AS-CONSTRUCTED | Contract Information | Project No./Code |
| File Name: 0060005_TitleSht.dgn | Date: | Comments | Init. | | No Revisions: | Contractor: | Project #____-__ |
| Horiz. Scale: 1:1 Vert. Scale: As Noted | | | | | Revised: | City Engineer: | Bid #__-____ |
| Unit Information Unit Leader Initials | | | | | Void: | Project Engineer: | Sheet Number |
| | | | | | | PROJECT STARTED: ACCEPTED: | |
| | | | | | | Comments: | |

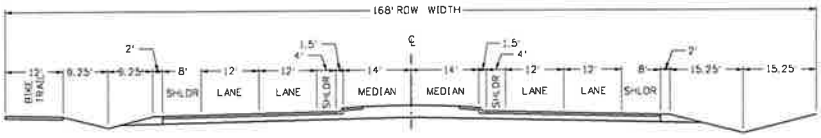
Know what's below. Call before you dig.



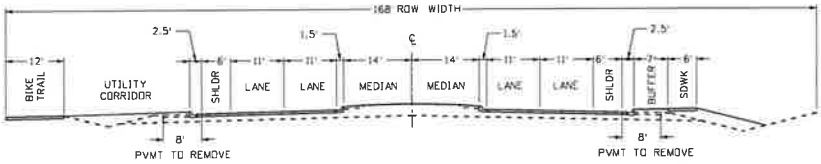

EXISTING TYPICAL
STA 435+31 TO STA 487+45




INITIAL SECTION




INTERIM SECTION



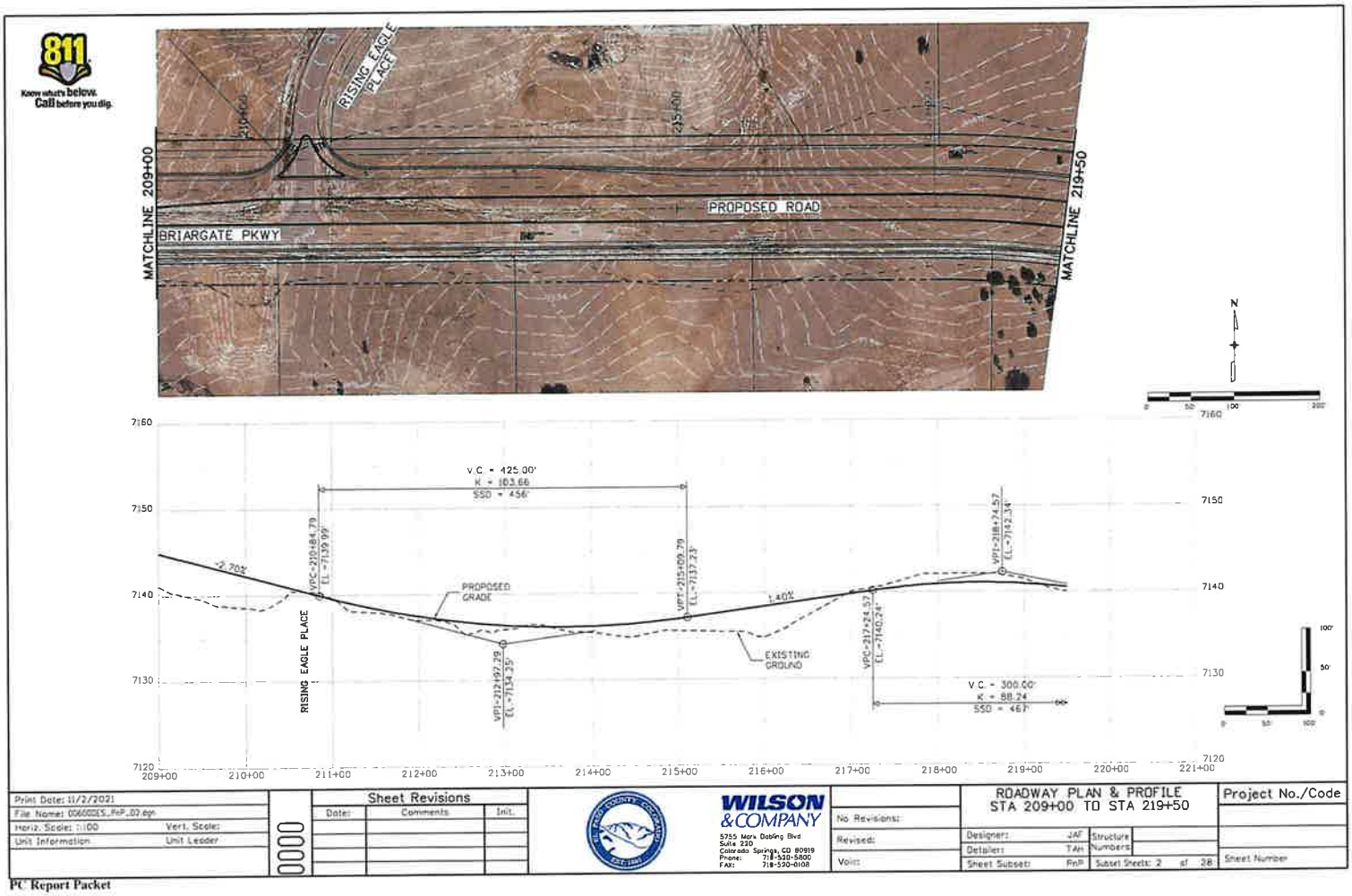

ULTIMATE SECTION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | | TYPICAL SECTIONS | Project No./Code |
| File Name: D0600DES..TypSec..01.dgn | | Date: | Comments | Init. | No Revisions: | | |
| Horiz. Scale: 1:20 | Vert. Scale: | | | | Revised: | Designer: JAF | Structure Numbers |
| Unit Information | Unit Leader | | | | Void: | Detailer: TAH | |
| | 0000 | | | | | Sheet Subset: TYPSEC | Subset Sheets: 1 of 1 |

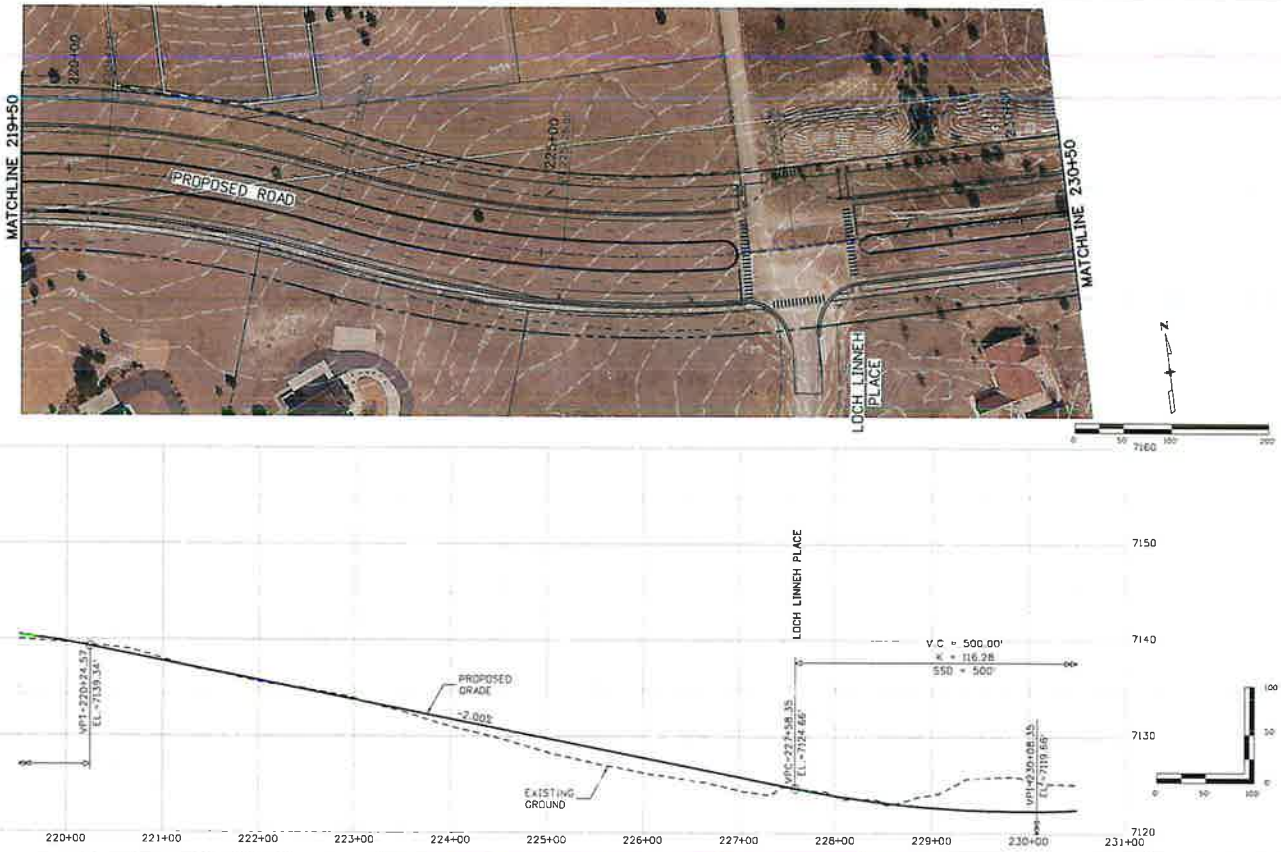
WILSON & COMPANY
5755 Mark Dabling Blvd
Suite 220
Colorado Springs, CO 80919
Phone: 719-520-5800
FAX: 719-520-0108

Sheet Number

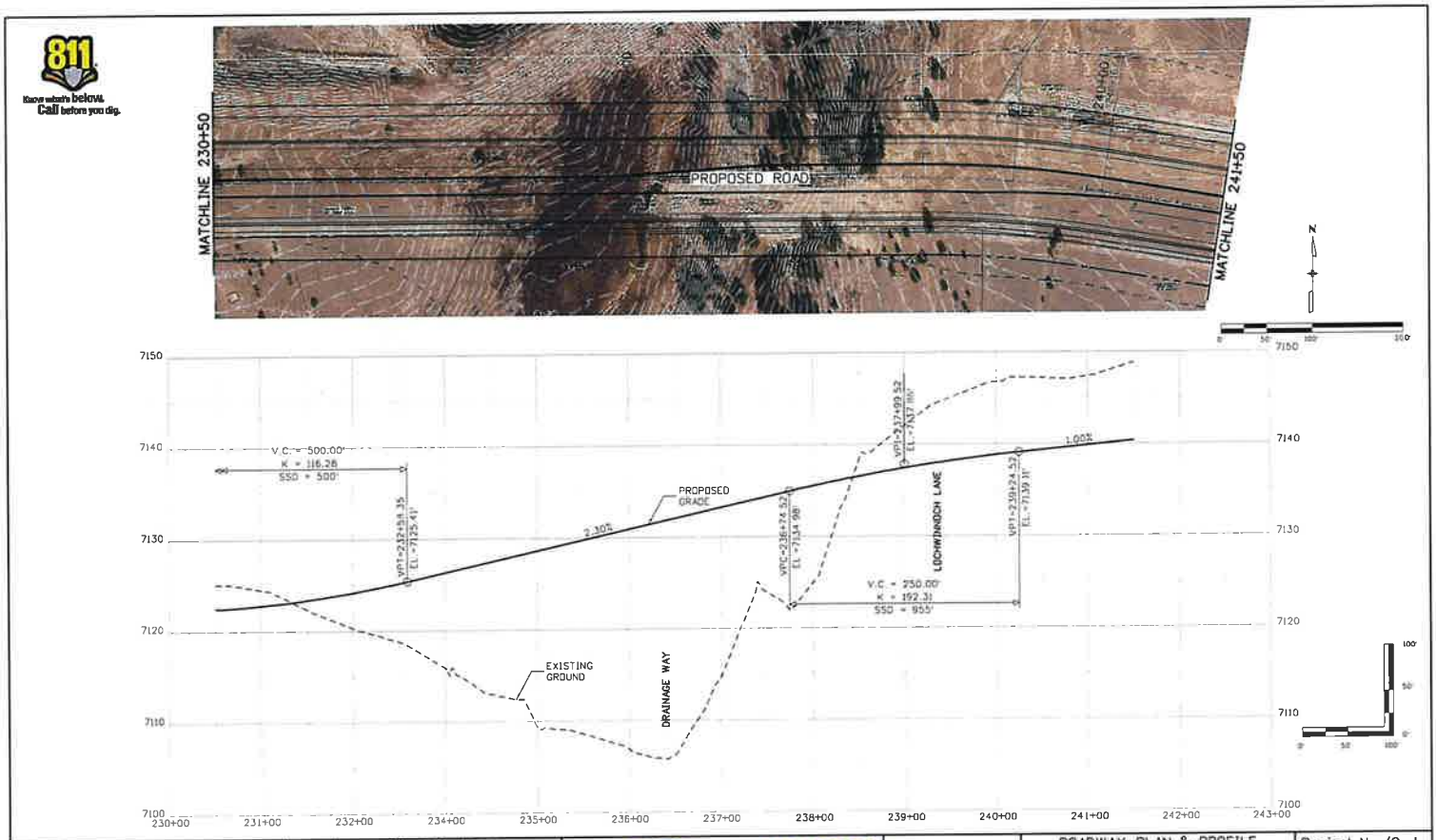

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | Sheet Revisions | | | WILSON & COMPANY | No Revisions: | ROADWAY PLAN & PROFILE STA 200+00 TO STA 209+00 | Project No./Code |
| File Name: 006000ES_PnP_01.dgn | Date | Comments | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0100 | Revised: | Designer: JAF Structure Numbers: | |
| Horiz. Scale: 1:100 Vert. Scale: | | | | | Void: | Detailer: TAH | |
| Unit Information Unit Leader | | | | | | Sheet Subset: PnP Sheet Sheets: 1 of 28 | Sheet Number |



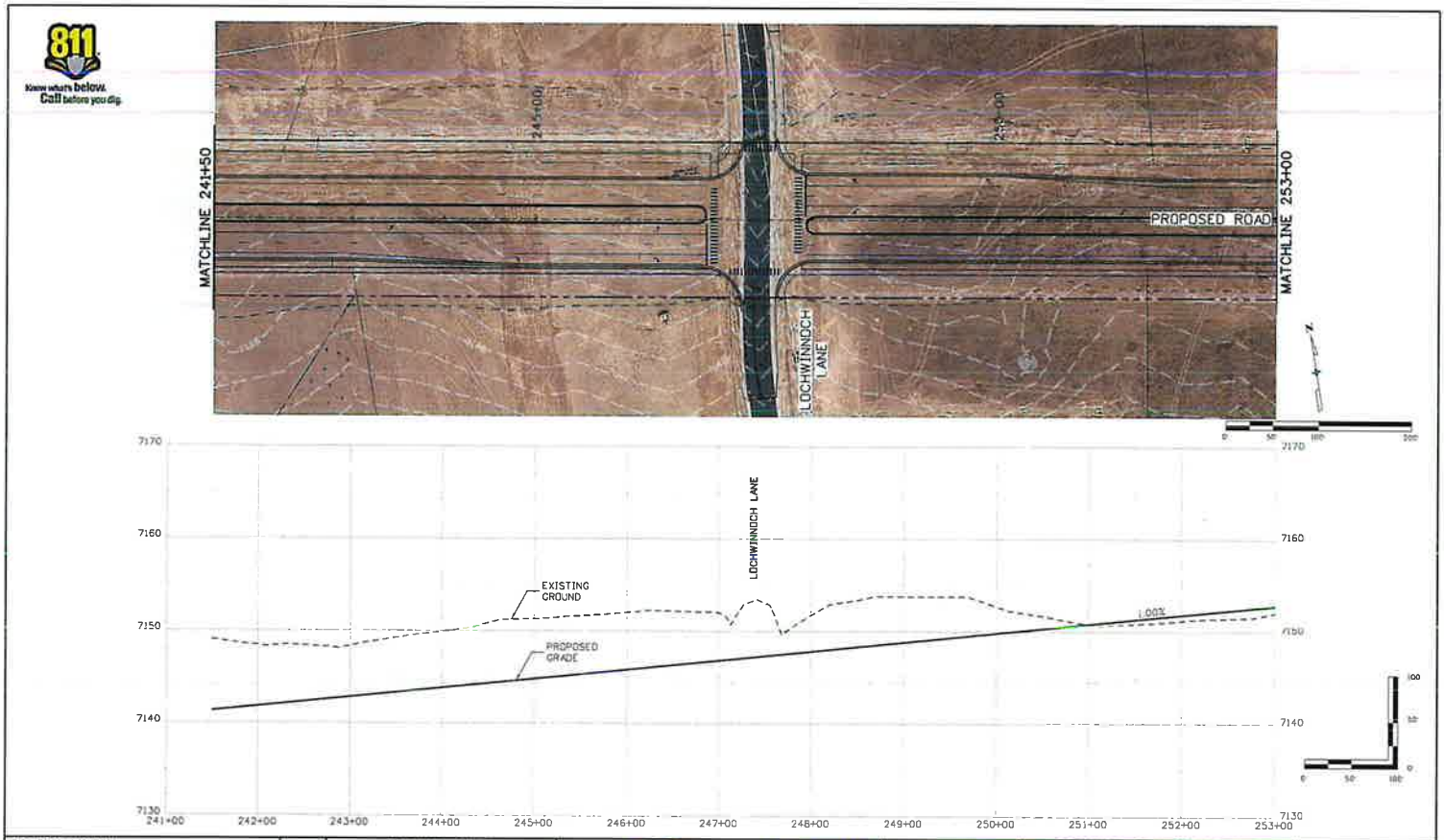

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | 0000 | Sheet Revisions | | | WILSON & COMPANY | No Revisions: | ROADWAY PLAN & PROFILE STA 209+00 TO STA 219+50 | Project No./Code |
| File Name: 0660DES_RePP_02.dgn | | Date: | Comments: | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 Fax: 719-520-0108 | Revised: | Designer: JAF Structure Numbers | |
| Horiz. Scale: 1:100 Vert. Scale: | | | | | | Void: | Detailer: TAH | |
| Unit Information: Unit Leader | | | | | | | Sheet Subset: Prin Subset Sheets: 2 of 28 | Sheet Number |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON &COMPANY | | ROADWAY PLAN & PROFILE STA 219+50 TO STA 230+50 | Project No./Code |
| File Name: 006000ES_PnP_03.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108 | No Revisions: | Designer: JAF | Structure Numbers |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Revised: | Detailer: TAH | |
| Unit Information | Unit Leader | | | | | Void: | Sheet Subset: PnP | Subset Sheets: 3 of 28 |
| | | | | | | | | Sheet Number |

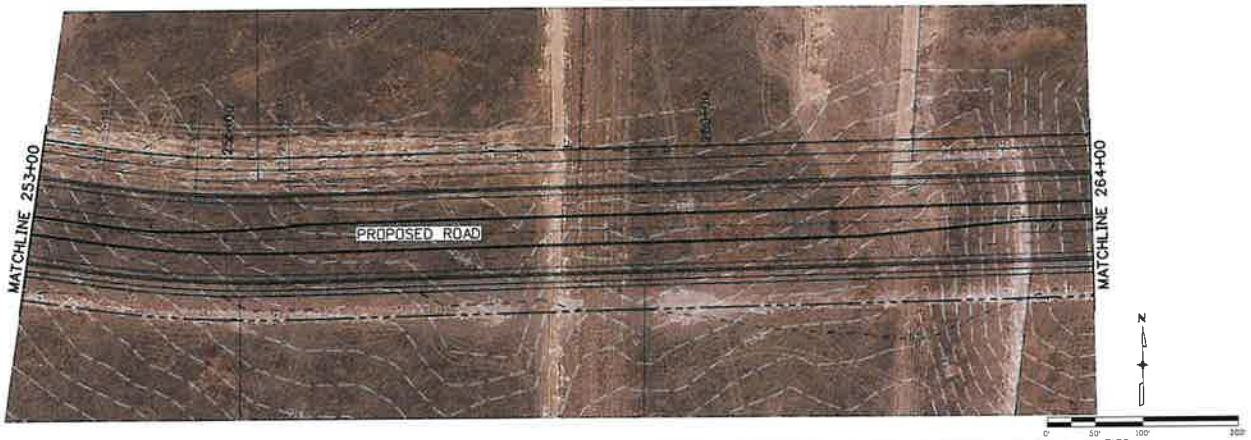


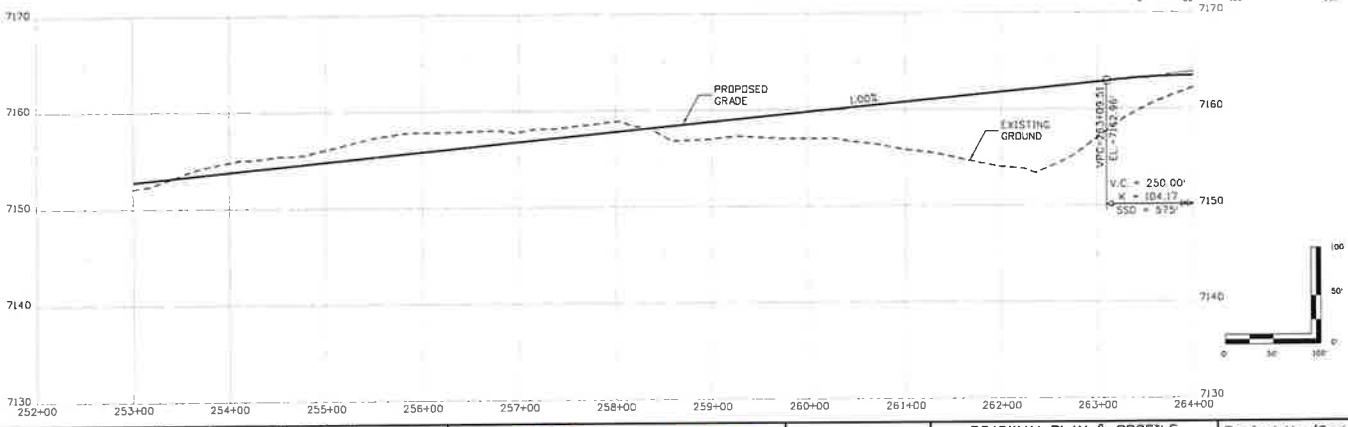

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | | ROADWAY PLAN & PROFILE STA 230+50 TO STA 241+50 | Project No./Code |
| File Name: 006000ES_PnP_04.dgn | | Date: | Comments | Init. | 5755 Mark Dooley Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-0800 Fax: 719-520-0108 | No Revisions: | | |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Revised: | Designer: JAF | Structure Numbers |
| Unit Information | Unit Leader | | | | | Void: | Detailer: TAH | |
| | | | | | | | Sheet Subset: Prof | Subset Sheets: # of 28 |
| | | | | | | | | Sheet Number |



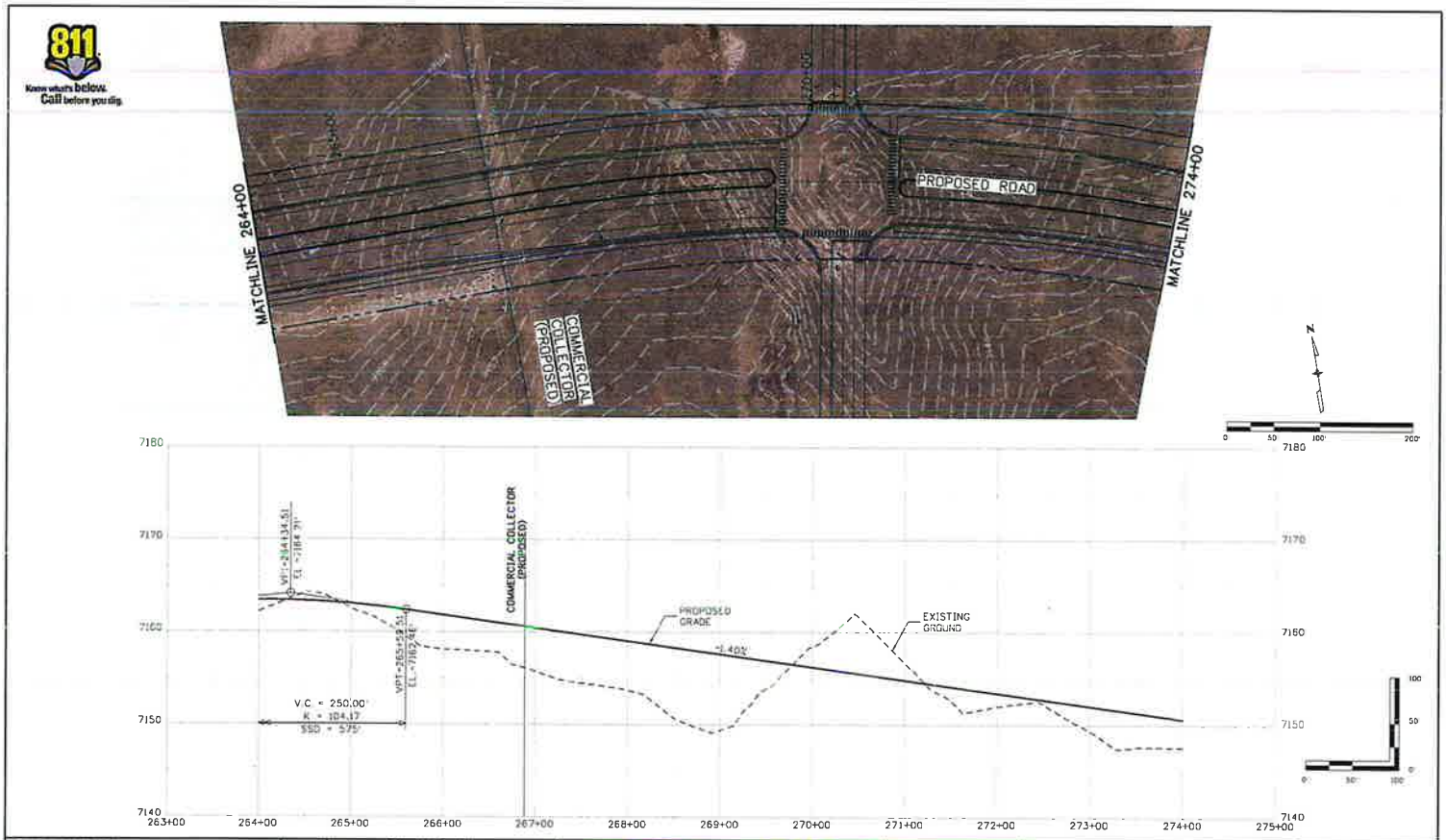

| | | | | | |
|---|---|---|---|---|---|
| Print Date: 11/2/2021 | 0000 | Sheet Revisions | | | ROADWAY PLAN & PROFILE STA 241+50 TO STA 253+00 | Project No./Code |
| File Name: 006000ES_PnP_05.dgn | | Date: | Comments | Init. | | |
| Horiz. Scale: 1:100 Vert. Scale: | | | | | No Revisions: | |
| Unit Information Unit Leader | | | | | Revised: | Designer: JAF Structure Numbers |
| | | | | | Void: | Detailer: TAH |
| | | | | | | Sheet Subset: PnP Subset Sheets: 5 of 28 Sheet Number |

WILSON & COMPANY
5755 Mark Dabling Blvd
Suite 220
Colorado Springs, CO 80919
Phone: 719-520-5800
FAX: 719-520-0108

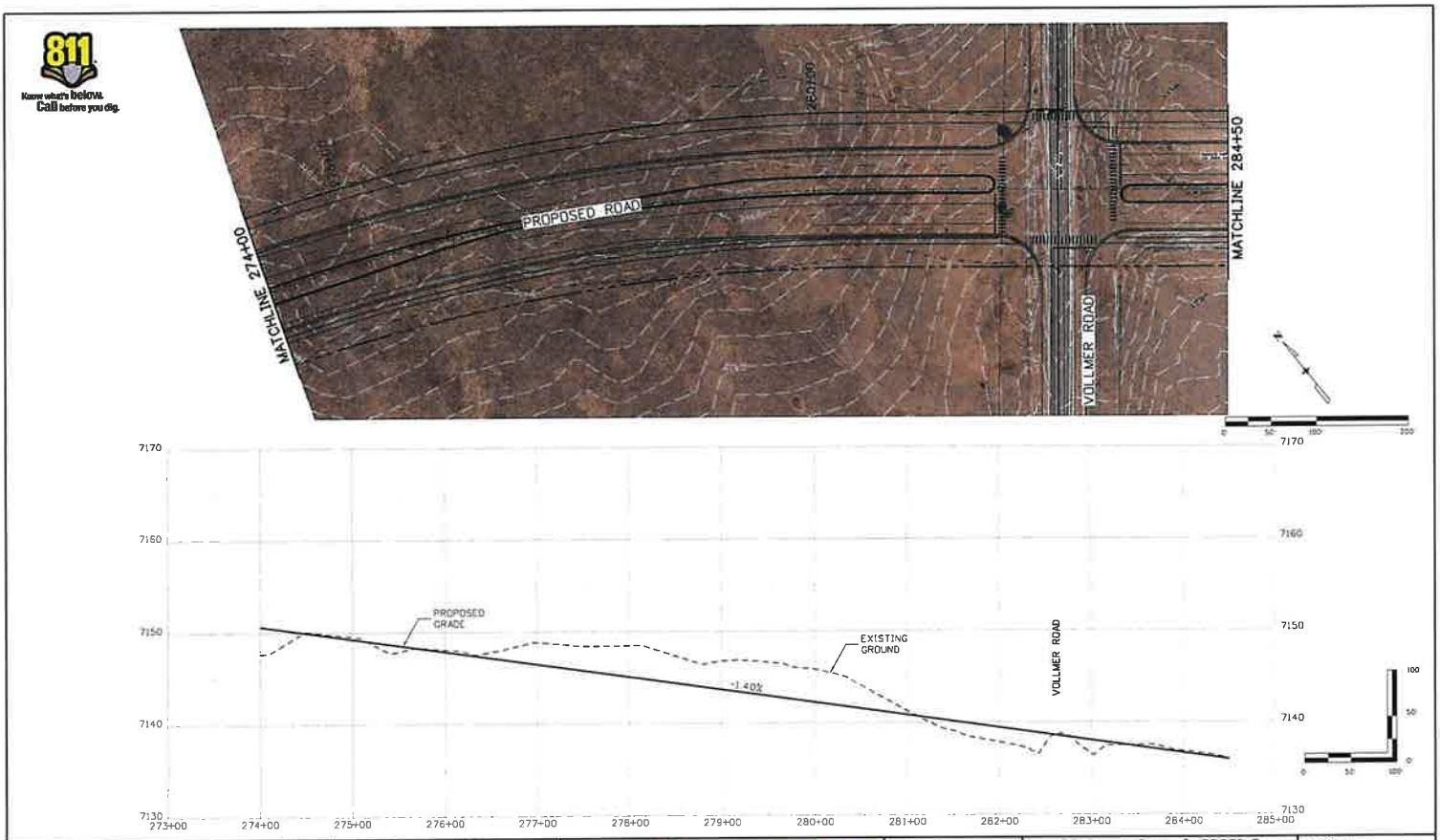


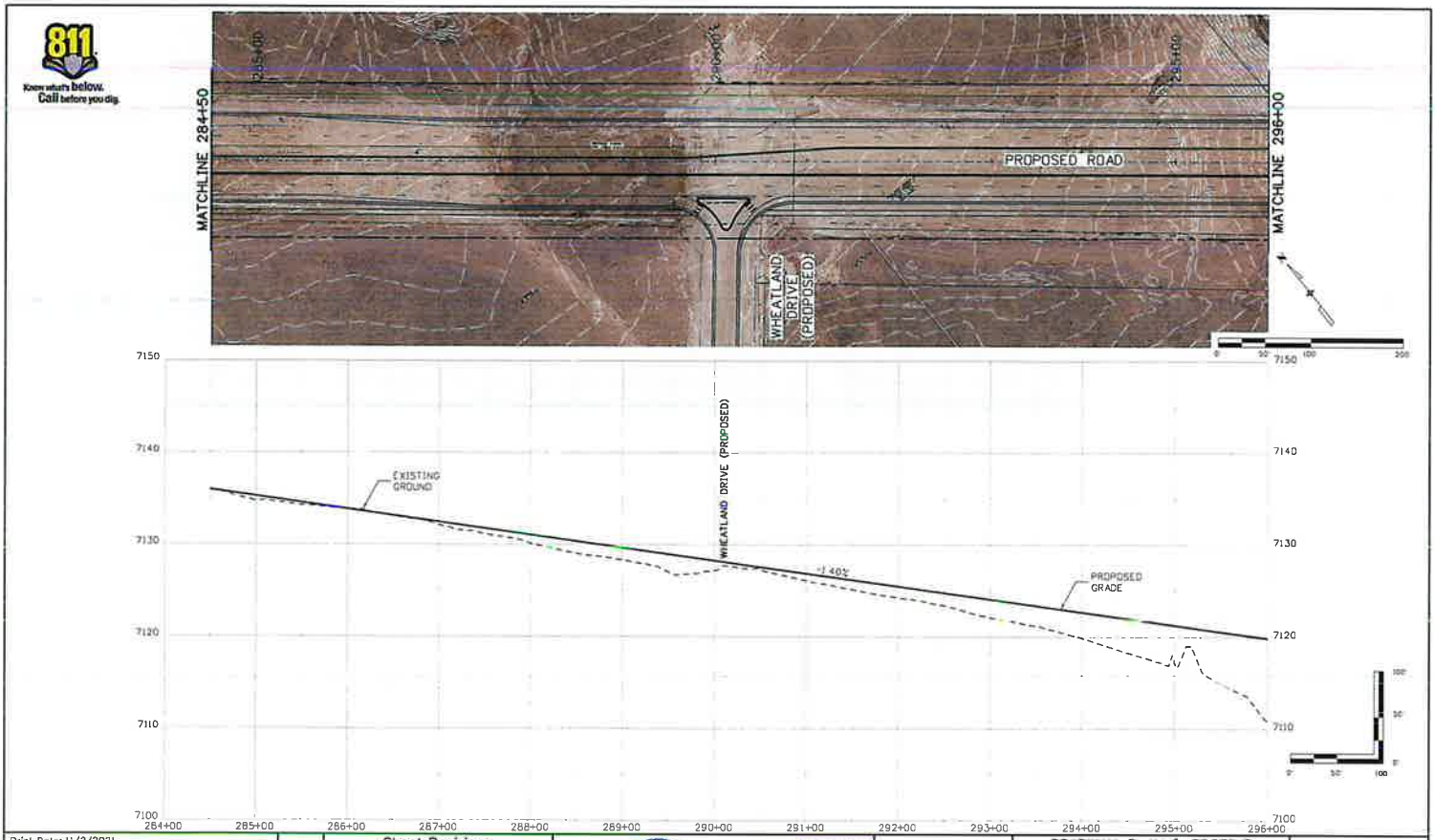

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | No Revisions: | ROADWAY PLAN & PROFILE STA 253+00 TO STA 264+00 | Project No./Code |
| File Name: 006000ES_PnP_08.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108 | Revised: | Designer: JAF Structure Numbers | |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Void: | Detailer: TAH | |
| Unit Information | Unit Leader | | | | | | Sheet Subset: PnP Subset Sheets: 6 of 28 | Sheet Number |



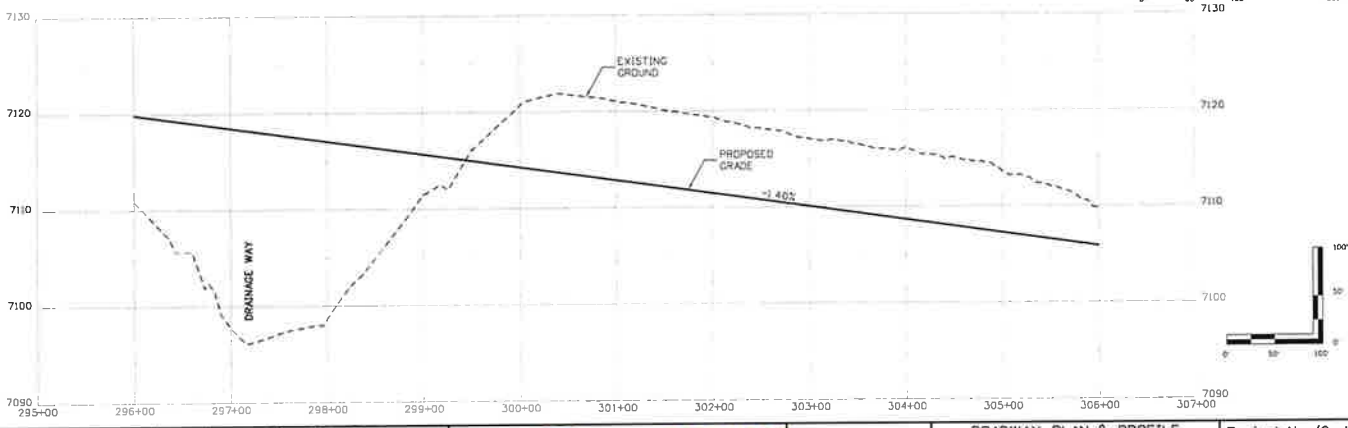

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | | ROADWAY PLAN & PROFILE STA 264+00 TO STA 274+00 | Project No./Code |
| File Name: 006000ES_PnP_07.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd. Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108 | No Revisions: | | |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Revised: | Designer: JAF / Detailer: TAH | Structure Numbers |
| Unit Information | Unit Leader | | | | | Void: | Sheet Subset: PnP | Subset Sheets: 7 of 26 |
| | | | | | | | | Sheet Number |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | | ROADWAY PLAN & PROFILE STA 274+00 TO STA 284+50 | Project No./Code |
| File Name: 056000ES_PnP_08.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108 | No Revisions: | Designer: JAF | Structure Numbers |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Revised: | Detailer: TAH | |
| Unit Information | Unit Leader | | | | | Void: | Sheet Subset: PnP | Subset Sheets: 8 of 28 |
| | 0000 | | | | | | | Sheet Number |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | | ROADWAY PLAN & PROFILE STA 284+50 TO STA 296+00 | Project No./Code |
| File Name: 006000ES_PnP_08.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 270 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108 | No Revisions: | Designer: JAF | Structure Numbers |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Revised: | Detailer: TAH | |
| Unit Information | Unit Leader | | | | | Void: | Sheet Subset: PnP | Sheet Number |
| | | | | | | | Subset Sheets: 9 of 28 | |

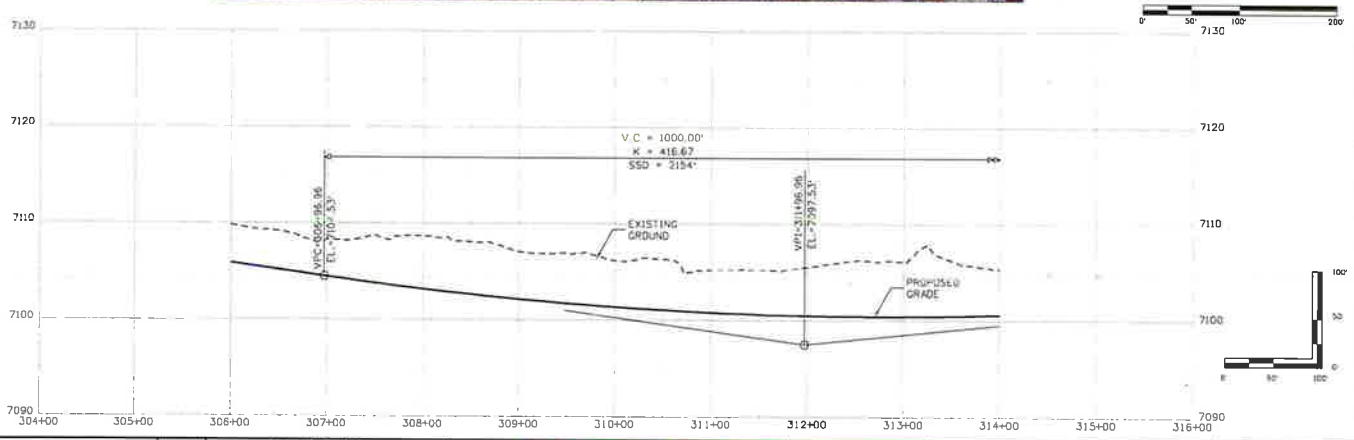

| | | | | | |
|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | ROADWAY PLAN & PROFILE STA 296+00 TO STA 306+00 |
| File Name: 0060DES_PnP_10.dgn | | Date: | Comments | Init. | |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | |
| Unit Information | Unit Leader | | | | |
| | | | | | |

WILSON & COMPANY
5755 Mark Dabling Blvd
Suite 220
Colorado Springs, CO 80919
Phone: 719-520-5800
FAX: 719-520-0108

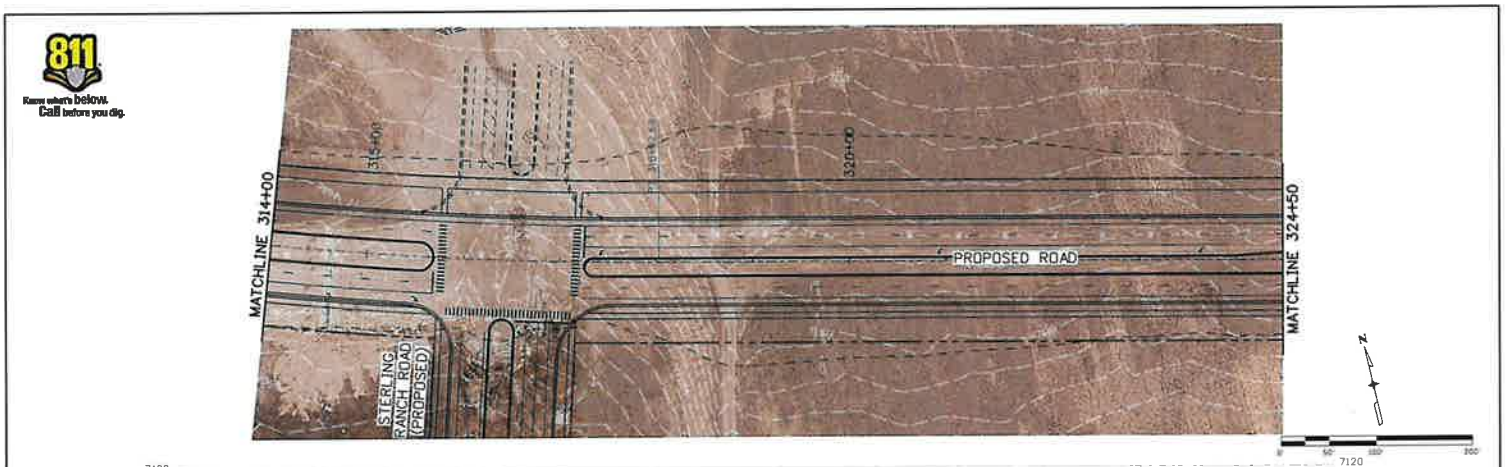
| | | | |
|---|---|---|---|
| No Revisions: | | | |
| Revised: | | | |
| Void: | | | |
| Designer: | JAF | Structure Numbers | |
| Detailer: | TAH | | |
| Sheet Subset: | PnP | Subset Sheets: 10 of 28 | |

Project No./Code

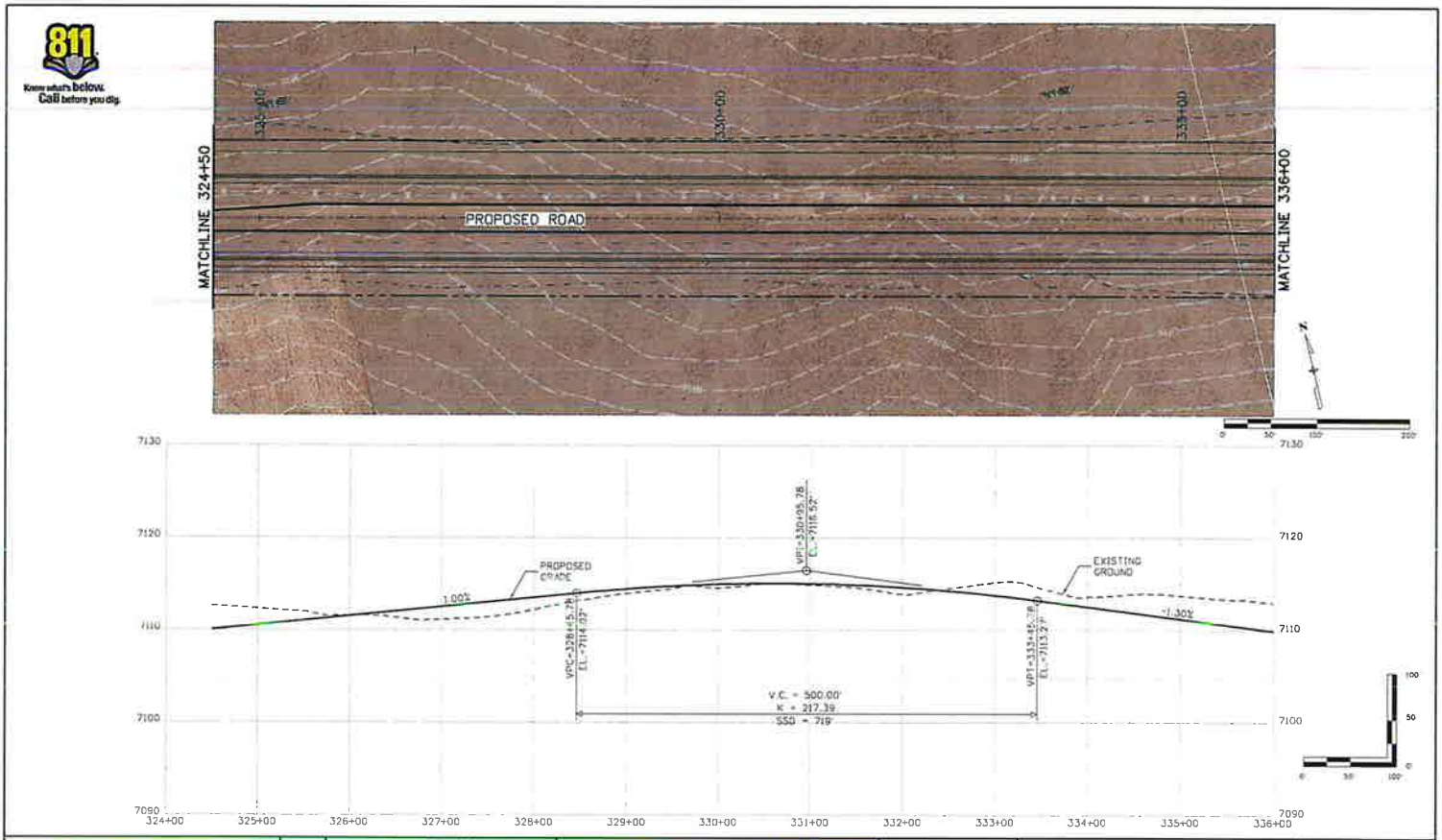
Sheet Number

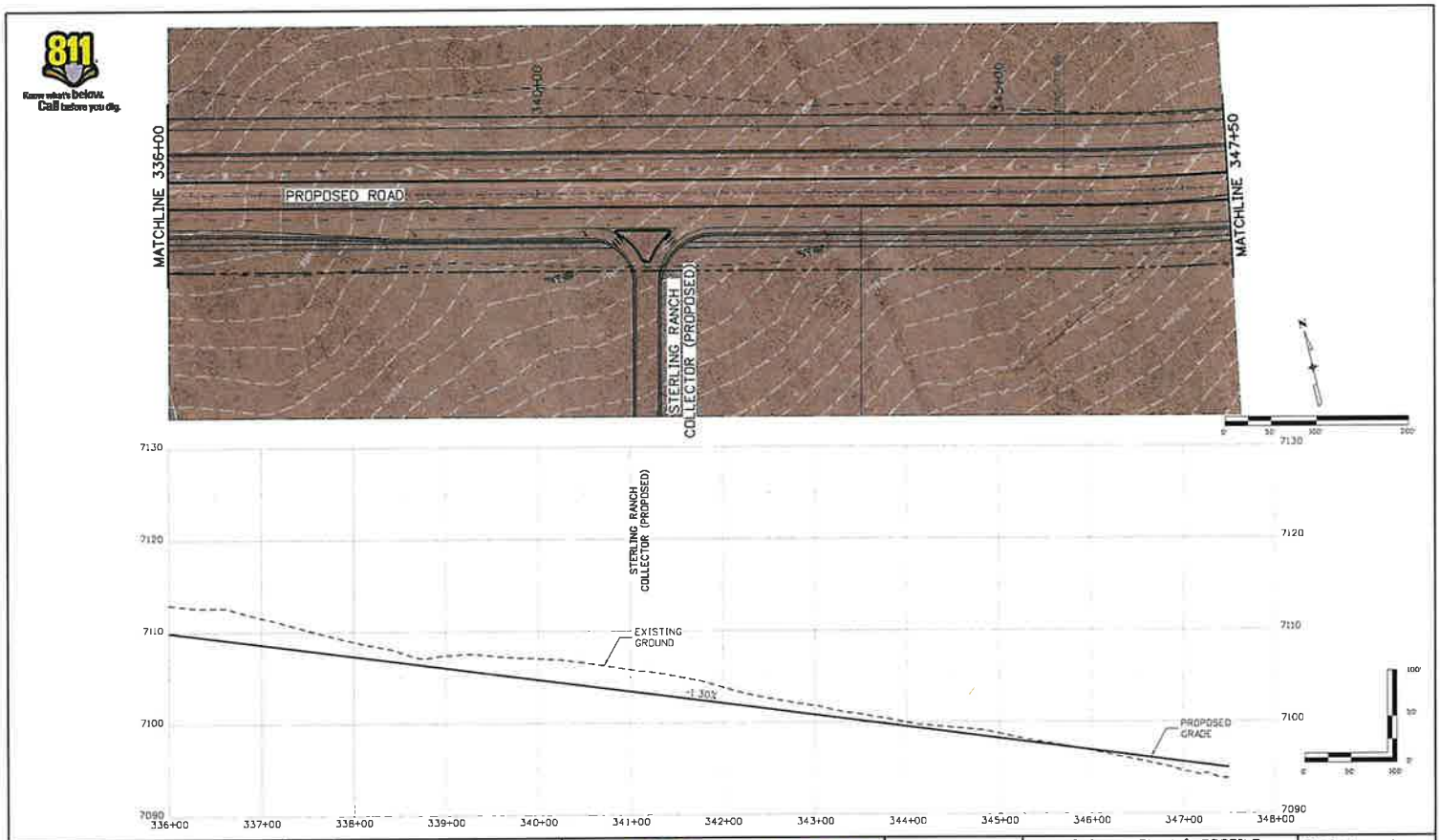

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/3/2021 | | | Sheet Revisions | | | WILSON & COMPANY | ROADWAY PLAN & PROFILE STA 306+00 TO STA 314+00 | Project No./Code |
| File Name: 0060005_PnP_11.dgn | | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 320 Colorado Springs, CO 80918 Phone: 719-520-5800 FAX: 719-520-0108 | | |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | No Revisions: | Designer: JAF | Structure Numbers |
| Unit Information | Unit Leader | 0000 | | | | Revised: | Detailer: TAH | |
| | | | | | | Void: | Sheet Subset: PnP | Sheet Number |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | No Revisions: | ROADWAY PLAN & PROFILE STA 314+00 TO STA 324+50 | Project No./Code |
| File Name: D06000ES_PnP_12.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108 | Revised: | Designer: JAF Structure Numbers | |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Void: | Detailer: TAH | |
| Unit Information | Unit Leader | | | | | | Sheet Subset: PnP Subset Sheets: 12 of 28 | Sheet Number |
| | 0000 | | | | | | | |

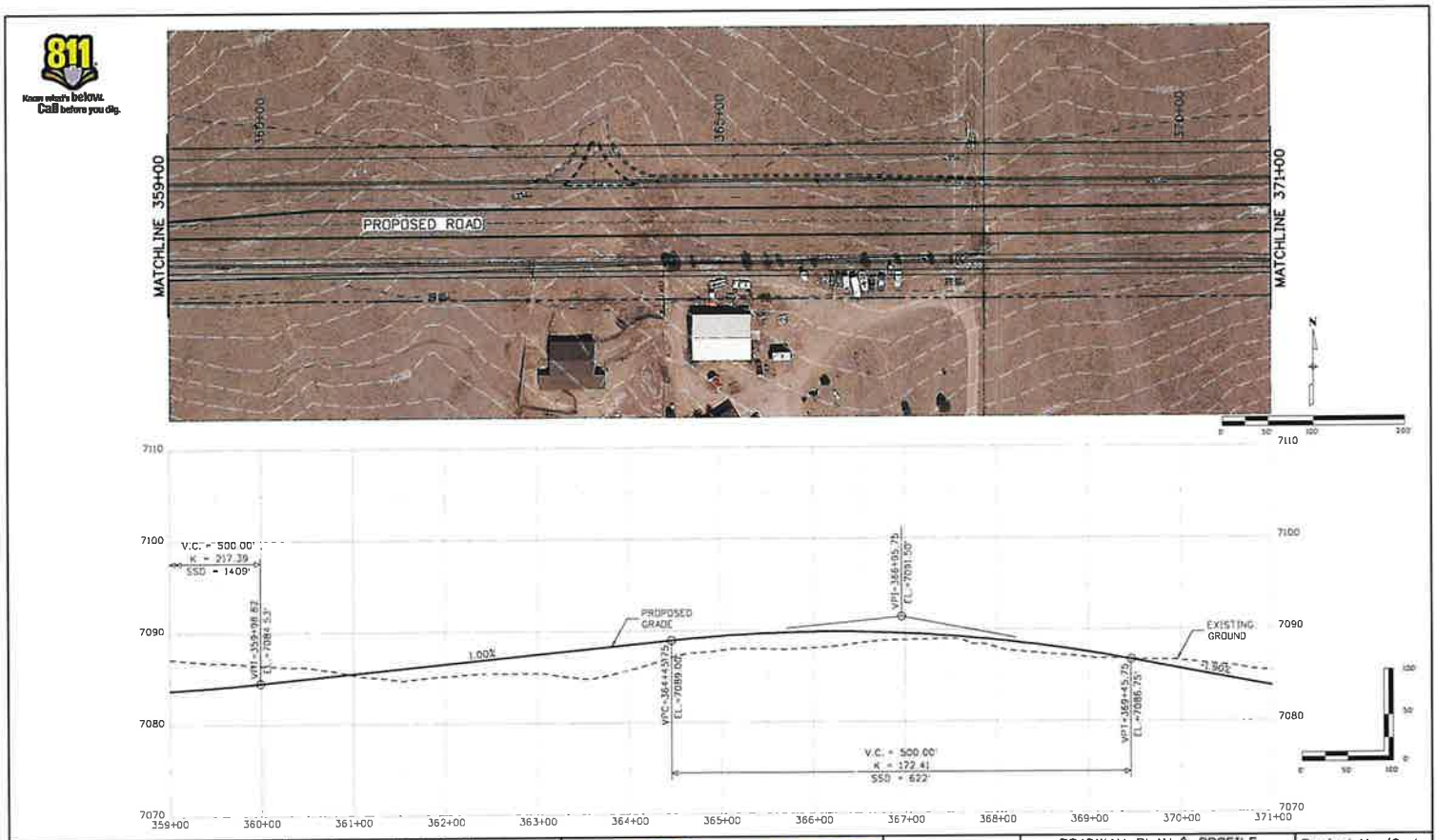



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | | ROADWAY PLAN & PROFILE STA 324+50 TO STA 336+00 | Project No./Code |
| File Name: 006000ES_PnP_13.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108 | No Revisions: | | |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Revised: | Designer: JAF | Structure Number: |
| Unit Information | Unit Leader | | | | | Void: | Detailer: TAH | |
| | | | | | | | Sheet Subset: PnP | Subset Sheets: 13 of 28 |
| | | | | | | | | Sheet Number |

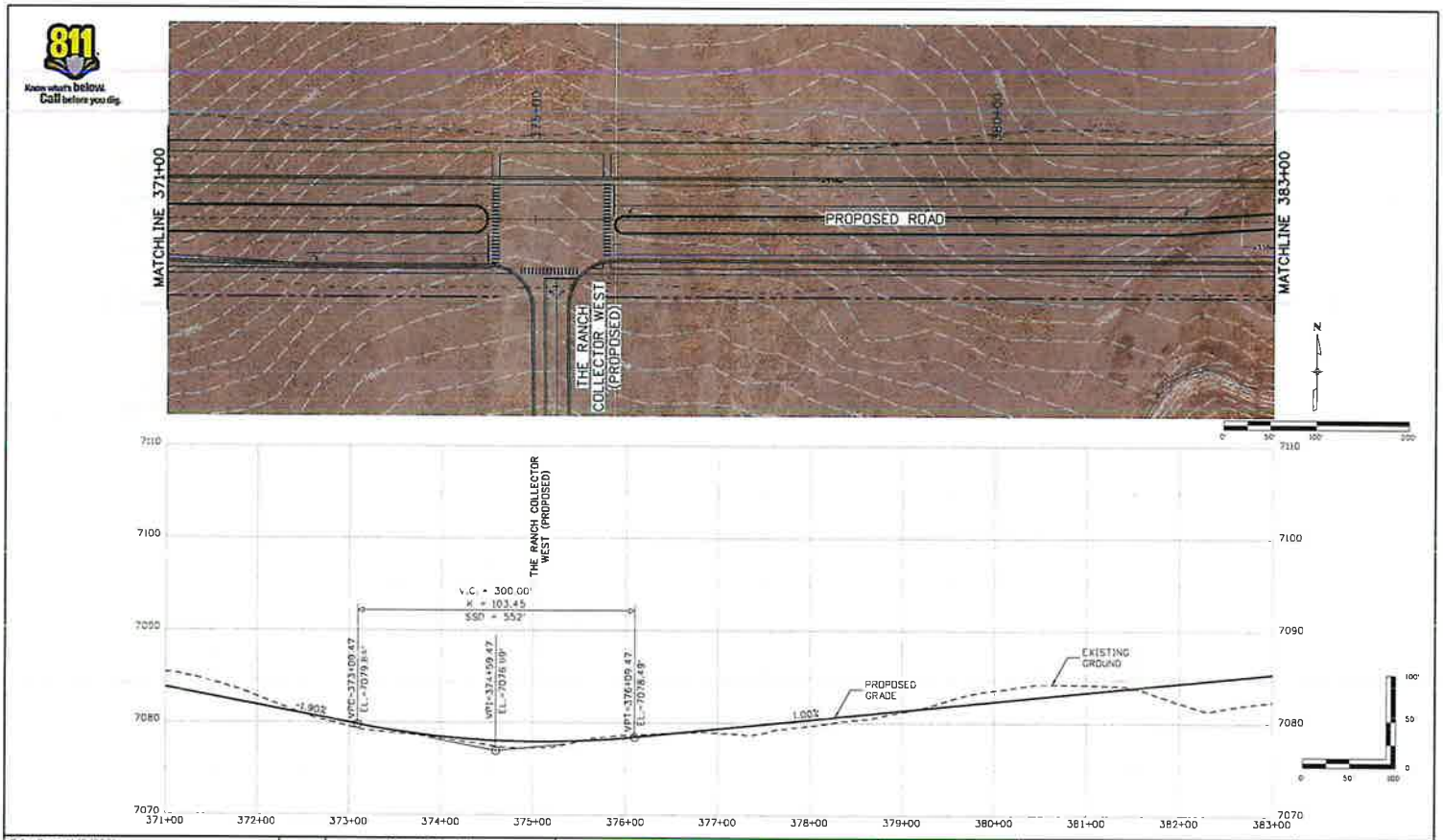



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | | ROADWAY PLAN & PROFILE STA 336+00 TO STA 347+50 | Project No./Code |
| File Name: 006000ES_PnP_14.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd. Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108 | No Revisions: | | |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Revised: | Designer: JAF Structure | |
| Unit Information | Unit Leader | | | | | Void: | Detailer: TAH Numbers | |
| | | | | | | | Sheet Subset: PnP Subset Sheets: 14 of 28 | Sheet Number |


| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON &COMPANY | | ROADWAY PLAN & PROFILE STA 347+50 TO STA 359+00 |
| File Name: 006000ES_PnP_15.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80918 Phone: 719-520-5800 FAX: 719-520-0108 | No Revisions: | Project No./Code |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Revised: | Designer: JAF Structure Numbers |
| Unit Information | Unit Leader | | | | | Void: | Detailer: TAH |
| | | | | | | | Sheet Subset: PnP Subset Sheets: 15 of 28 |
| | | | | | | | Sheet Number |



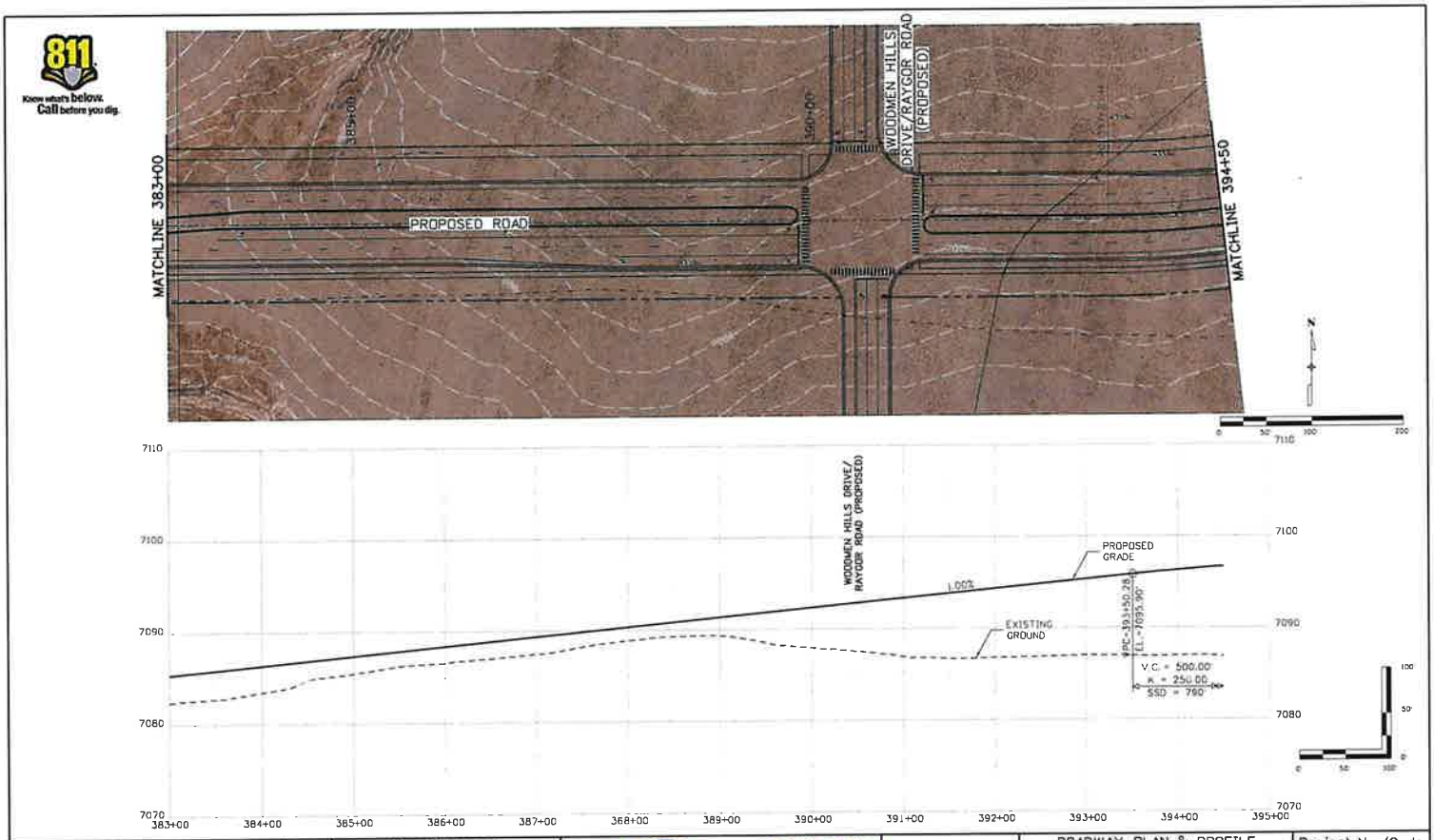

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | | ROADWAY PLAN & PROFILE STA 359+00 TO STA 371+00 | Project No./Code |
| File Name: 056000ES_PnP_16.dgn | | Date | Comments | Init. | 5755 Mark Dabling Blvd Suite 320 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108 | No Revisions: | | |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Revised: | Designer: JAF Structure | |
| Unit Information | Unit Leader | | | | | Void: | Detailer: TAH Numbers | |
| | | | | | | | Sheet Subset: PnP Subset Sheets: 16 of 28 | Sheet Number |



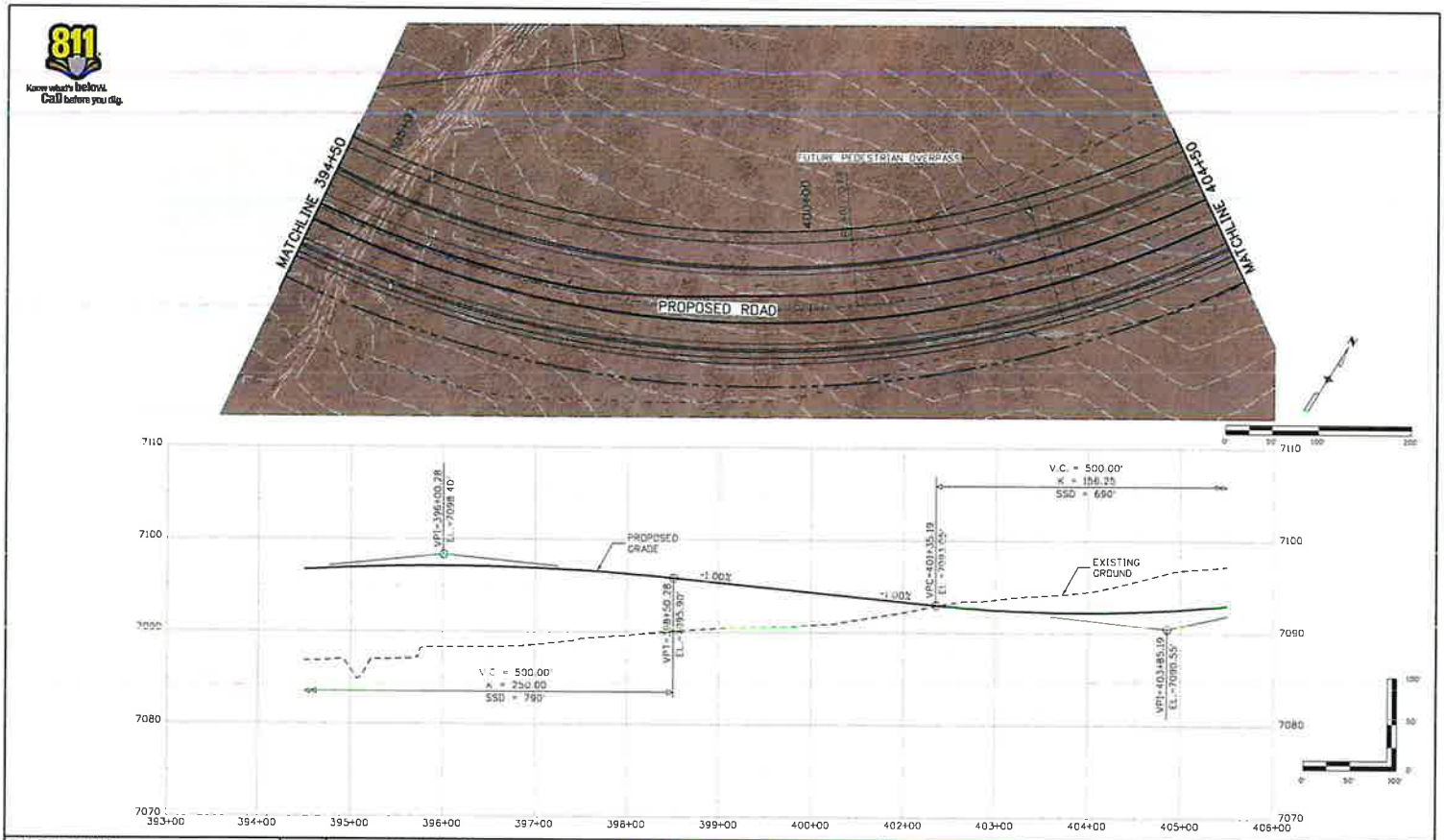

| | | | | | |
|---|---|---|---|---|---|
| Print Date: 11/3/2021 | | Sheet Revisions | | | ROADWAY PLAN & PROFILE STA 371+00 TO STA 383+00 |
| File Name: 0060005_PnP_17.dgn | | Date: | Comments | Init. | Project No./Code |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | |
| Unit Information | Unit Leader | | | | |
| 0000 | | | | | |

WILSON & COMPANY
5755 Mark Dabling Blvd
Suite 220
Colorado Springs, CO 80919
Phone: 719-520-5800
FAX: 719-520-0108

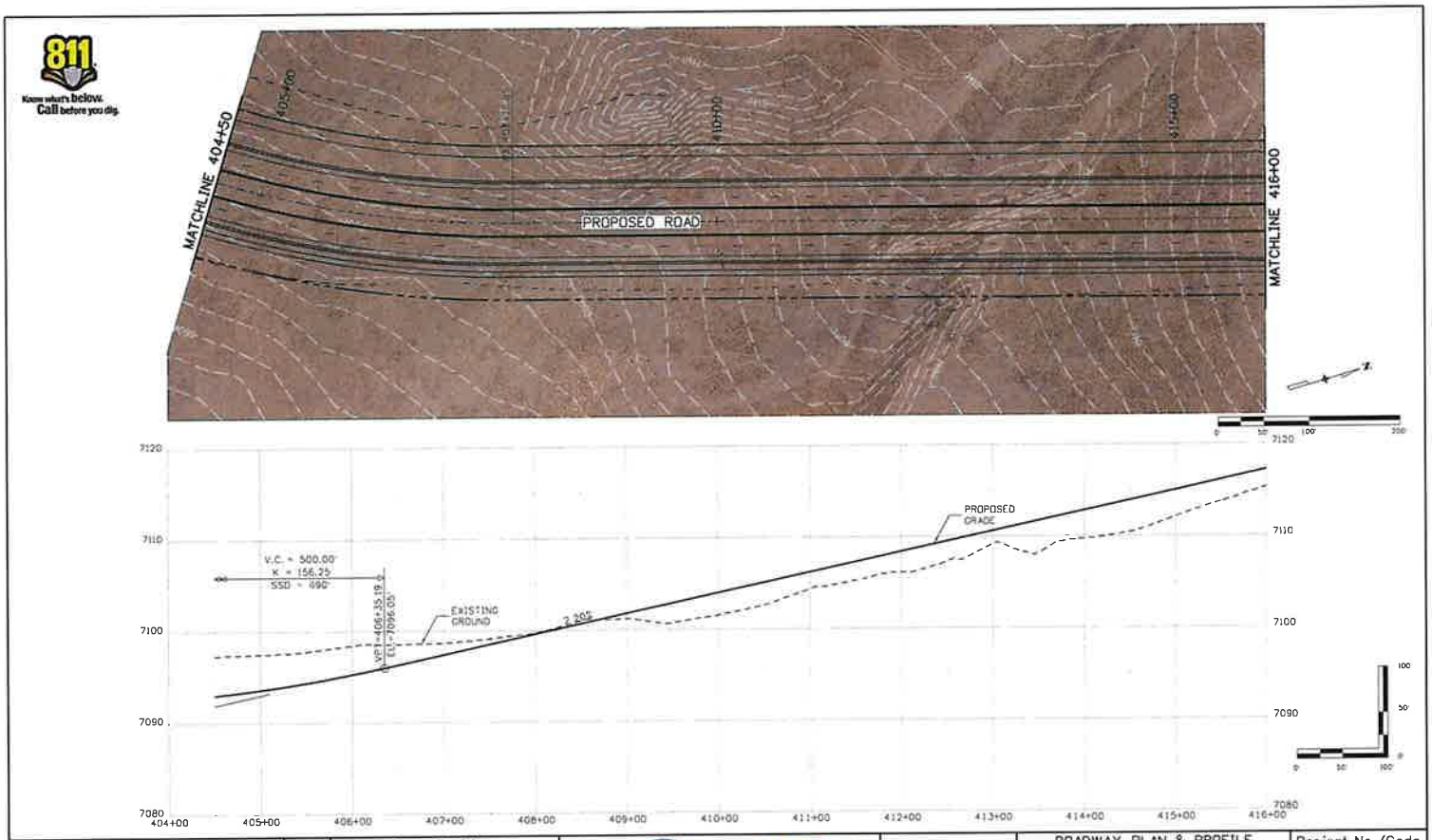
| | | | |
|---|---|---|---|
| No Revisions: | | | |
| Revised: | Designer: JAF | Structure Number's | |
| Void: | Detailer: TAH | | |
| | Sheet Subset: PnP | Subset Sheets: 17 of 28 | Sheet Number |



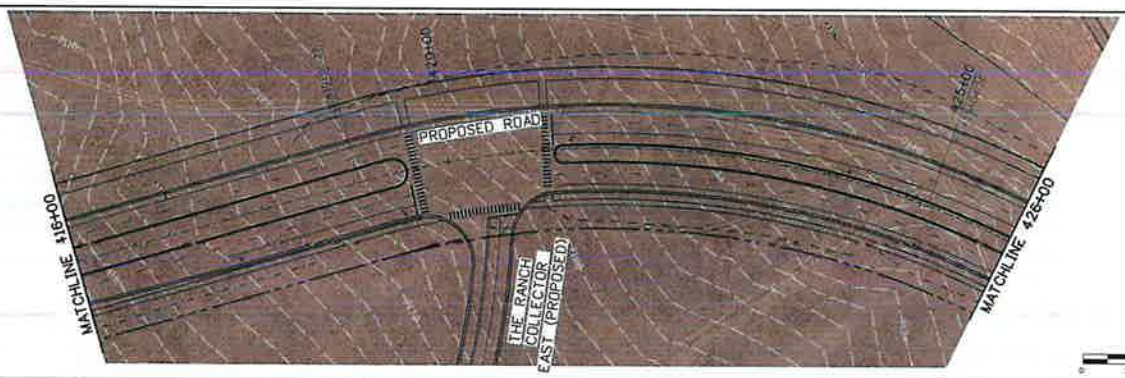

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | | ROADWAY PLAN & PROFILE STA 383+00 TO STA 394+50 | Project No./Code |
| File Name: 056000ES_PnP_18.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-0800 FAX: 719-520-0108 | No Revisions: | | |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Revised: | Designer: JAF | Structure Numbers |
| Unit Information | Unit Leader | | | | | Void: | Detailer: TAH | |
| | 0000 | | | | | | Sheet Subset: PnP | Subset Sheets: 18 of 28 |

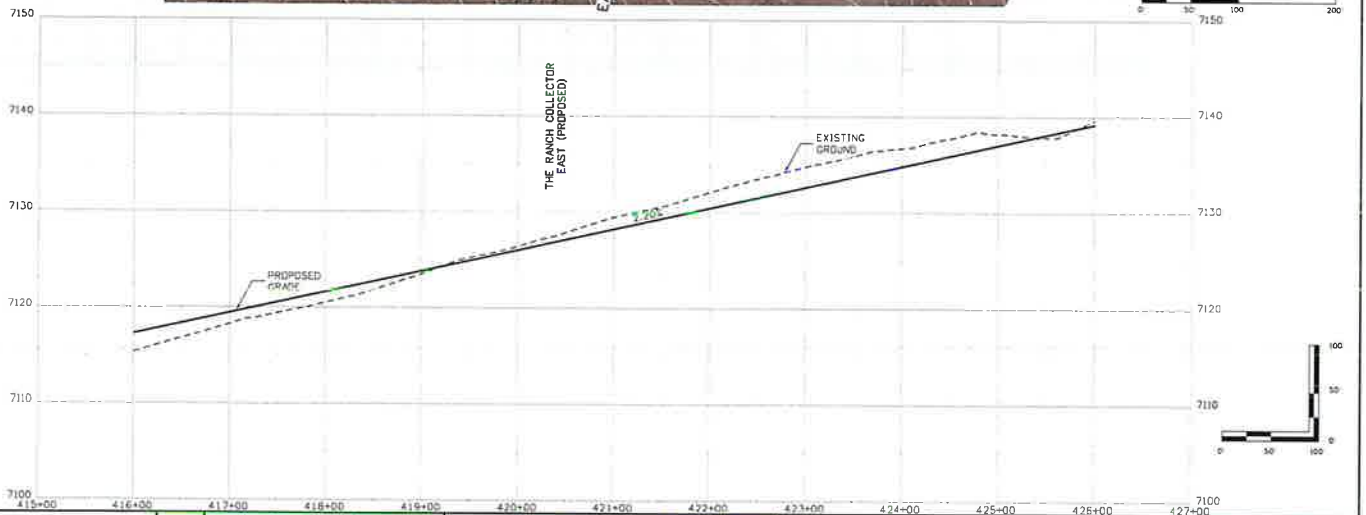



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | | ROADWAY PLAN & PROFILE STA 394+50 TO STA 404+50 |
| File Name: 806000ES_PnP_19.dgn | | Date: | Comments: | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108 | No Revisions: | Designer: JAF / Detailer: TAH / Sheet Subset: PnP / Subset Sheets: 19 of 28 |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Revised: | Structure Numbers |
| Unit Information | Unit Leader | | | | | Void: | Project No./Code |
| | | | | | | | Sheet Number |

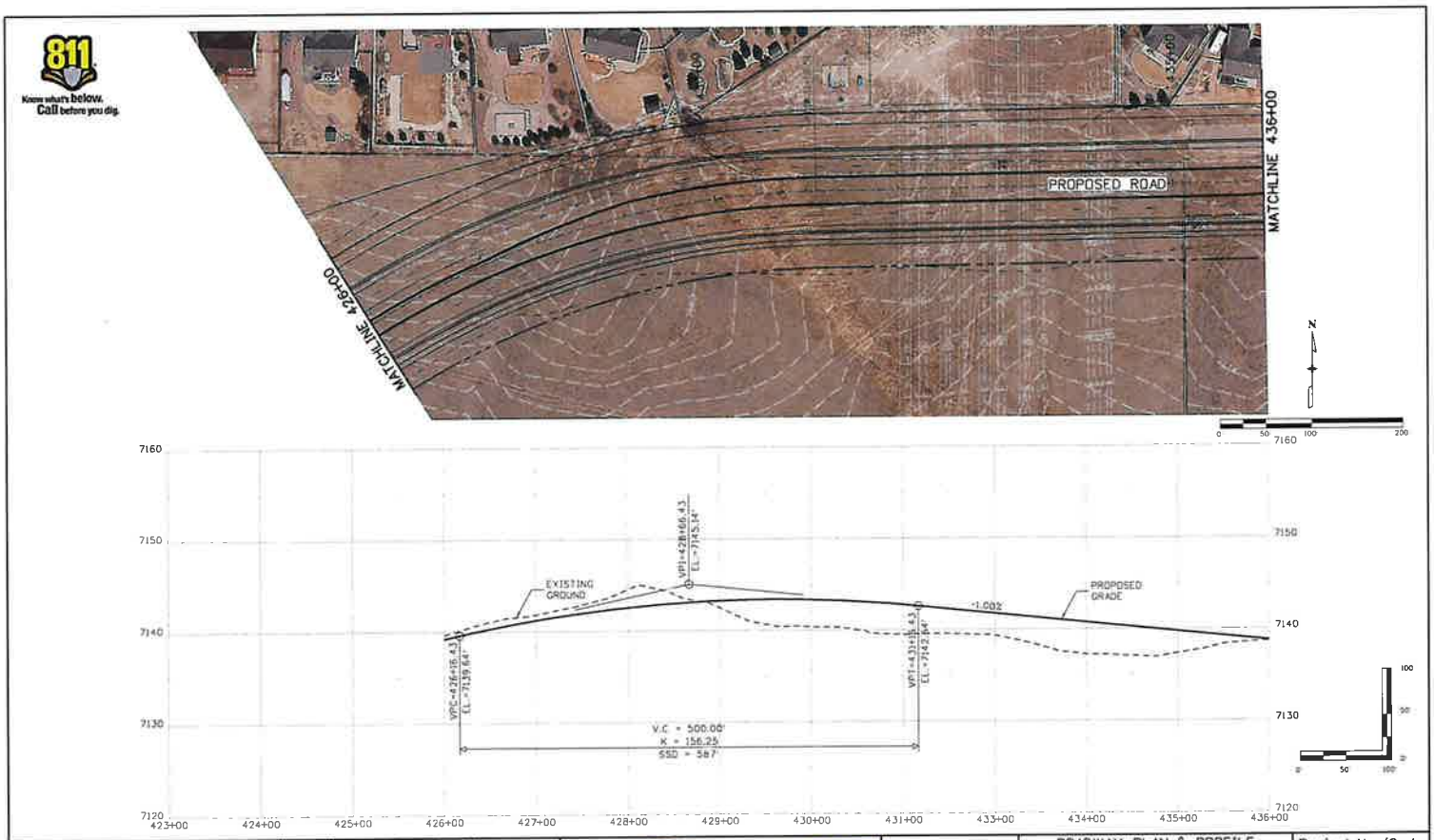



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | No Revisions: | ROADWAY PLAN & PROFILE STA 404+50 TO STA 416+00 | Project No./Code |
| File Name: 004000ES_PnP_20.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108 | Revised: | Designer: JAF Structure Numbers | |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Void: | Detailer: TAH | |
| Unit Information | Unit Leader | | | | | | Sheet Subset: PnP Subset Sheets: 20 of 28 | Sheet Number |

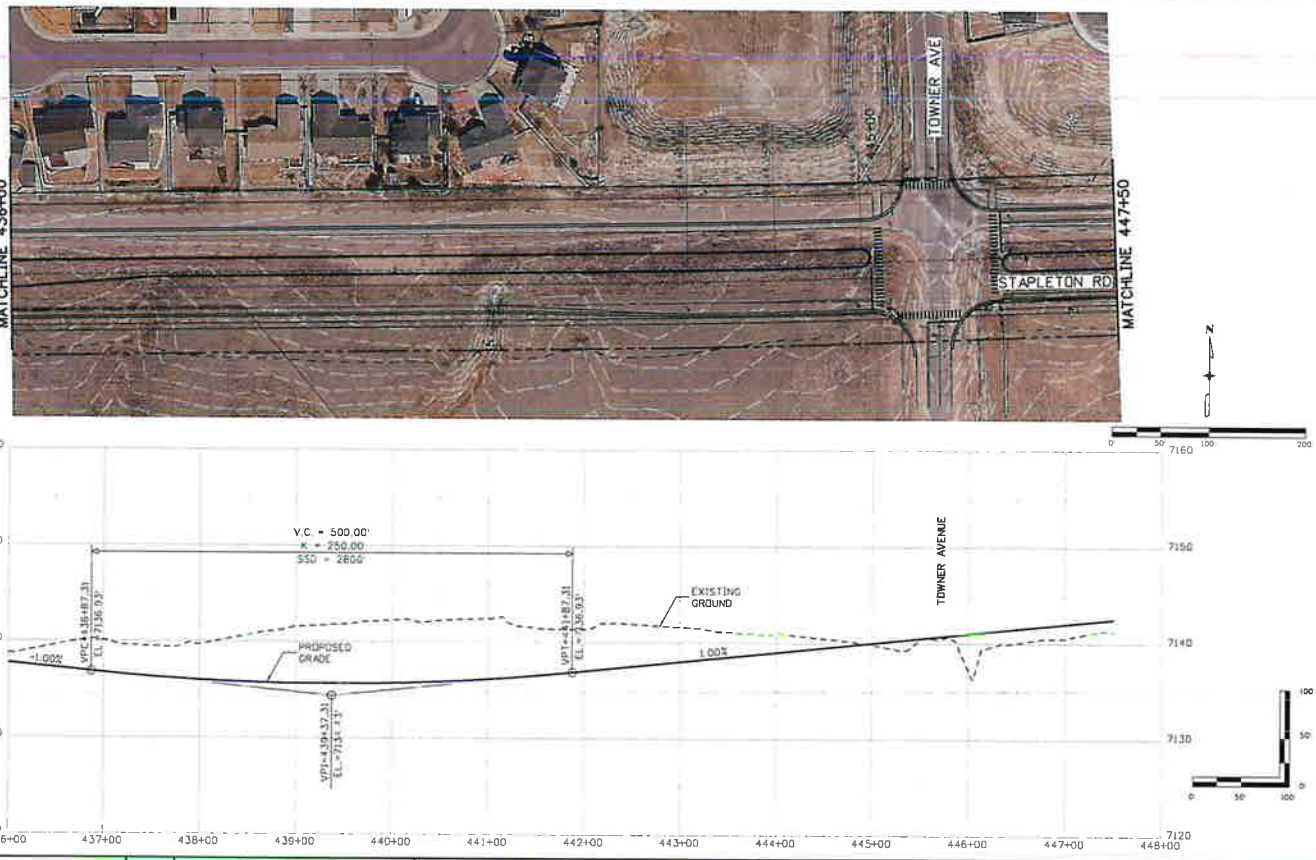



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | No Revisions: | ROADWAY PLAN & PROFILE STA 416+00 TO STA 426+00 | Project No./Code |
| File Name: 0060005_PnP_21.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 Fax: 719-520-0108 | Revised: | Designer: JAF | Structure Numbers |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Void: | Detailer: TJH | |
| Unit Information | Unit Leader | | | | | | Sheet Subset: PnP | Subset Sheets: 21 of 28 |
| | | | | | | | | Sheet Number |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | No Revisions: | ROADWAY PLAN & PROFILE STA 426+00 TO STA 436+00 | Project No./Code |
| File Name: 006000ES..PnP_22.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5500 FAX: 719-520-0108 | Revised: | Designer: JAF Structure Numbers: | |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Void: | Detailer: TAH | |
| Unit Information | Unit Leader | | | | | | Sheet Subset: PnP Subset Sheets: 22 of 38 | Sheet Number |




811 Know what's below. Call before you dig.

| | | | |
|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | |
| File Name: 006000ES_PnP_23.dgn | | Date: | Comments: Init. |
| Horiz. Scale: 1:100 | Vert. Scale: | | |
| Unit Information | Unit Leader | | |

0000

WILSON & COMPANY
5755 Mark Dabling Blvd
Suite 220
Colorado Springs, CO 80919
Phone: 719-520-5800
FAX: 719-520-0108

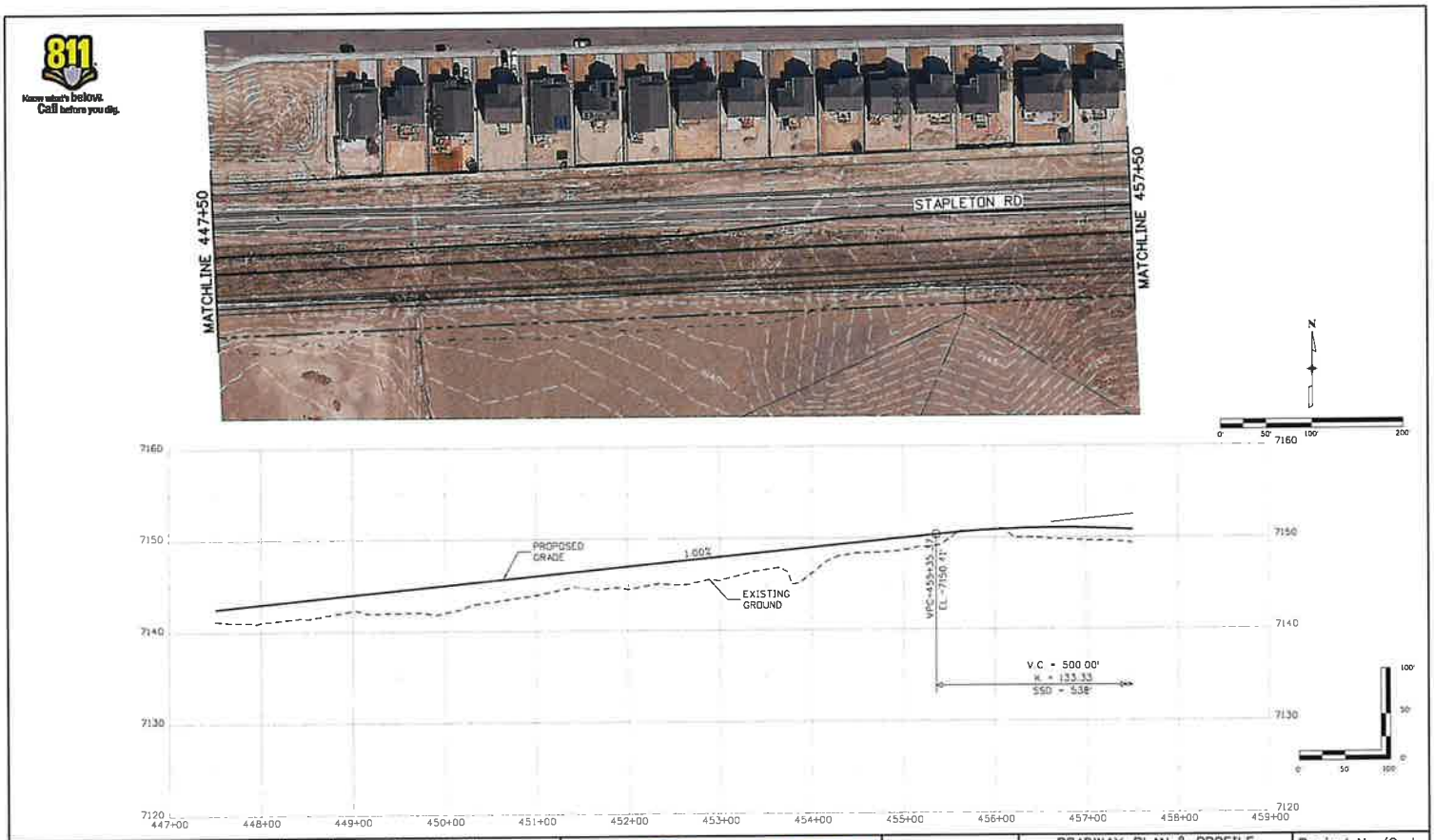
No Revisions:
Revised:
Void:

ROADWAY PLAN & PROFILE
STA 436+00 TO STA 447+50

Designer: JAF
Detailer: TAH
Sheet Subset: PnP
Structure Numbers:
Subset Sheets: 23 of 28

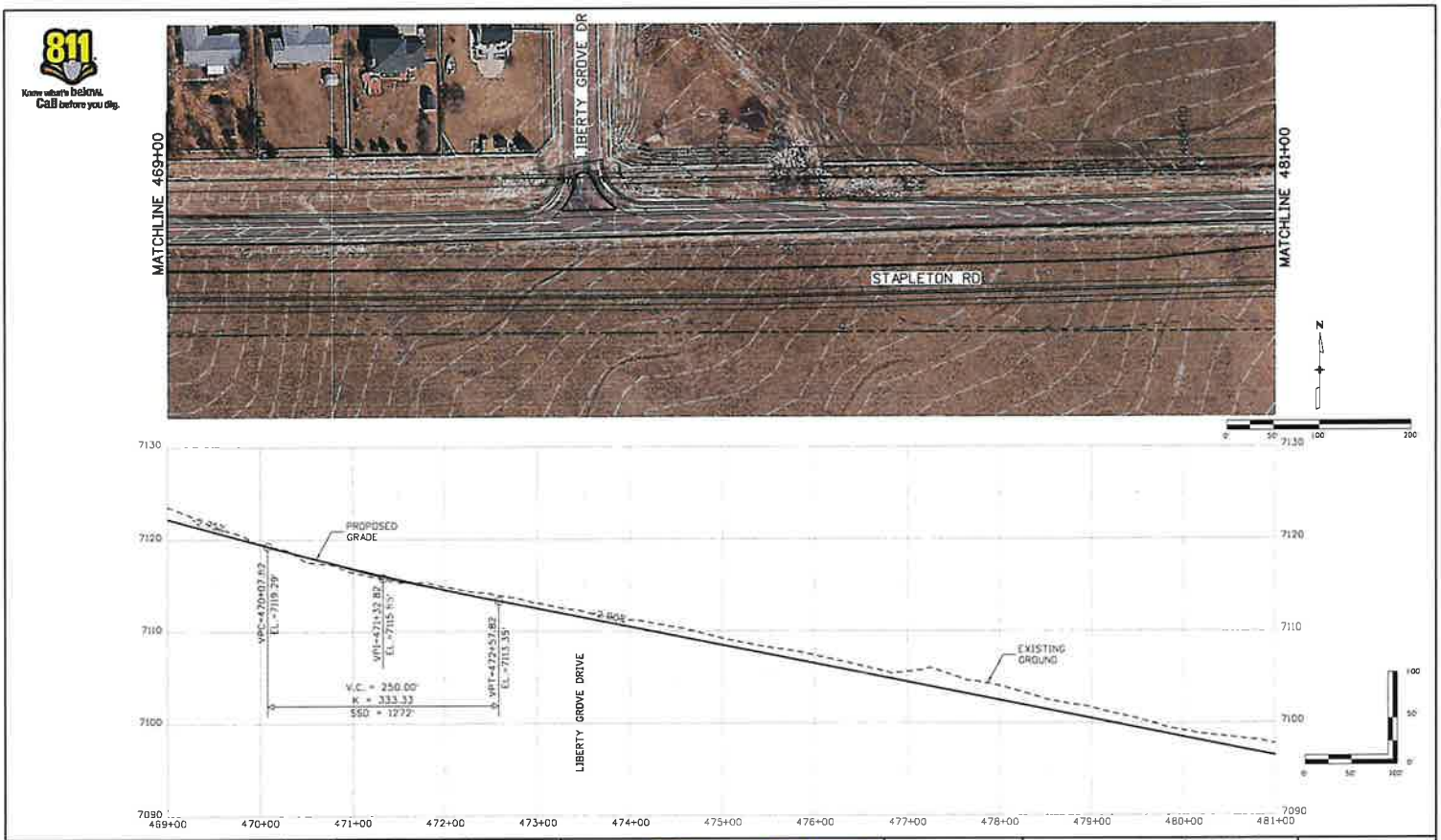
Project No./Code

Sheet Number

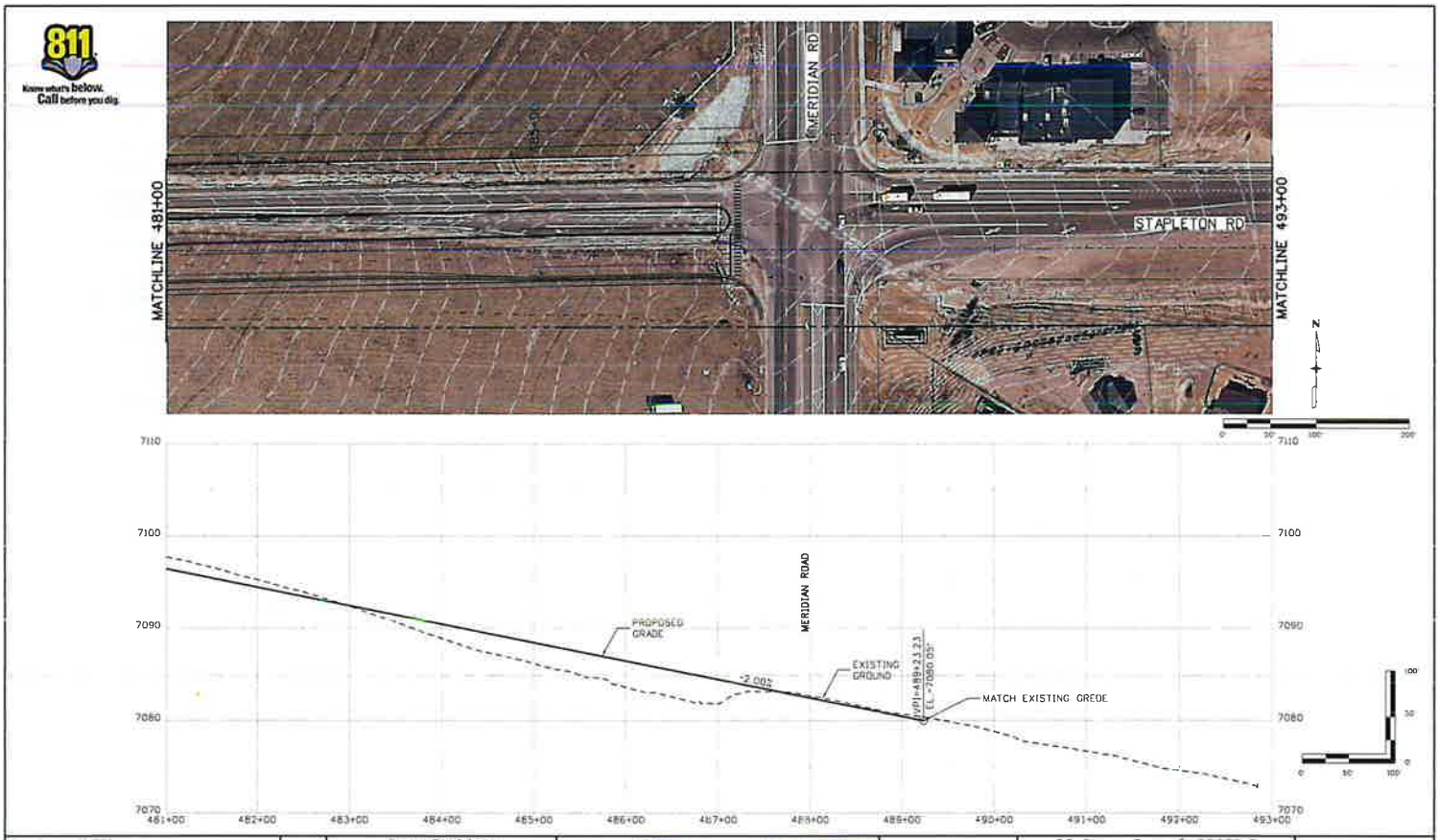



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | 0000 | Sheet Revisions | | | WILSON & COMPANY | No Revisions: | ROADWAY PLAN & PROFILE STA 447+50 TO STA 457+50 | Project No./Code |
| File Name: 006000ES_PnP_24.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108 | Revised: | Designer: JAF | Structure Numbers |
| Horiz. Scale: 1:100 Vert. Scale: | | | | | | Void: | Detailer: TAH | |
| Unit Information Unit Leader | | | | | | | Sheet Subset: PnP | Subset Sheet: 24 of 28 |
| | | | | | | | | Sheet Number |

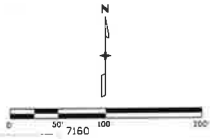

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | | ROADWAY PLAN & PROFILE STA 457+50 TO STA 469+00 | Project No./Code |
| File Name: D0600ES_PnP_25.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 200 Colorado Springs, CO 80918 Phone: 719-520-5800 FAX: 719-520-0108 | No. Revisions: | | |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Revised: | Designer: JAF | Structure Numbers: |
| Unit Information | Unit Leader | | | | | Void: | Detailer: Tax | |
| | | | | | | | Sheet Subset: PnP | Subset Sheet: 25 of 28 |
| | 0000 | | | | | | | Sheet Number |

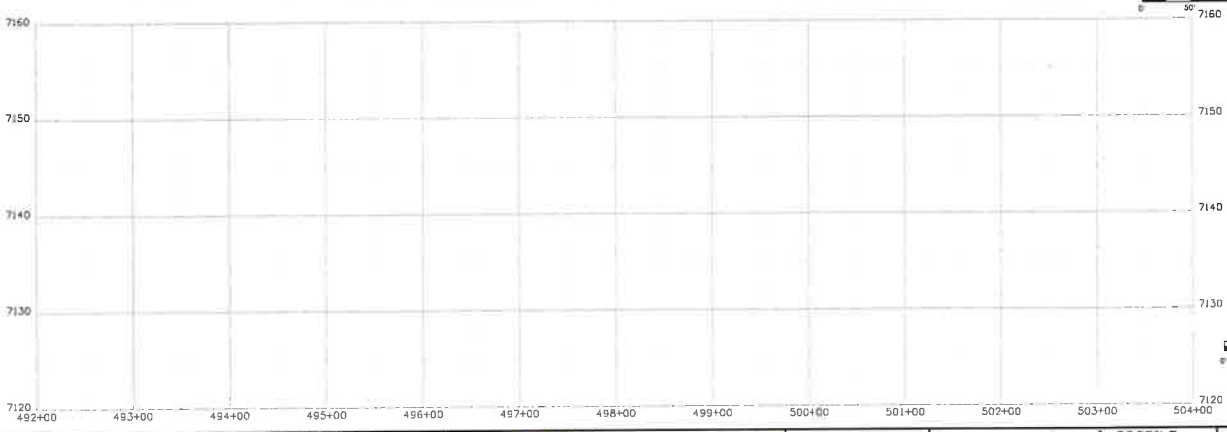


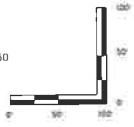

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | | Sheet Revisions | | | WILSON & COMPANY | No Revisions: | ROADWAY PLAN & PROFILE STA 469+00 TO STA 481+00 | Project No./Code |
| File Name: 00600DES_PnP_26.dgn | | Date: | Comments | Init. | 5755 Mark Dabling Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-6108 | Revised: | Designer: JAF Structure | |
| Horiz. Scale: 1:100 | Vert. Scale: | | | | | Void: | Detailer: TAH Numbers | |
| Unit Information | Unit Leader | | | | | | Sheet Subset: PnP Subset Sheets: 26 of 28 | Sheet Number |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Print Date: 11/2/2021 | Sheet Revisions | | | WILSON & COMPANY | | ROADWAY PLAN & PROFILE STA 481+00 TO STA 493+00 | Project No./Code |
| File Name: 006000ES_PnP_27.dgn | Date: | Comments | Init. | 5755 North Nevada Blvd Suite 220 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108 | No Revisions: | | |
| Horiz. Scale: 1:100 Vert. Scale: | | | | | Revised: | Designer: JAF Structure Numbers | |
| Unit Information Unit Leader | | | | | Void: | Detailer: TAH | |
| | | | | | | Sheet Subset: PnP Subset Sheets: 27 of 28 | Sheet Number |


Know what's below. Call before you dig.

| | | | | | |
|---|---|---|---|---|---|
| Print Date: 11/2/2021 | Sheet Revisions | | | | ROADWAY PLAN & PROFILE STA 493+00 TO STA 500+92 |
| File Name: 006000ES_PnP_38.dgn | Date: | Comments | Init. | No Revisions: | Designer: JAF / Structure Numbers: |
| Horiz. Scale: 1:100 Vert. Scale: | | | | Revised: | Detailer: TAH |
| Unit Information: Unit Leader | | | | Void: | Sheet Subset: PnP / Subset Sheets: 28 of 28 |
| 0000 | | | | | Project No./Code: Sheet Number: |

WILSON & COMPANY
5755 Mark Dabling Blvd
Suite 320
Colorado Springs, CO 80919
Phone: 719-520-5800
FAX: 719-520-0108

WILSON
& COMPANY
6755 Mark Dabling Boulevard, Suite 220
Colorado Springs, CO 80919
719-520-5800 Office
719-520-0108 Fax
www.wilsonco.com

# Briargate-Stapleton Corridor Study

## Appendix B: Traffic Report

El Paso County Department of Public Works

On-Call Contract:
#17-067-51 12/09/2021

**DRAFT**

# Briargate-Stapleton Corridor Study

## Appendix B: Traffic Report

Prepared for

El Paso County Department of Public Works
On-Call Contract: #17-067-51

**DRAFT**

December 9, 2021

Prepared by

WILSON & COMPANY

5755 Mark Dabling Boulevard, Suite 220
Colorado Springs, CO 80919
719-520-5800

# Table of Contents

# List of Tables



# List of Figures

# List of Acronyms and Definitions

| Acronym/ Term/ Phrase | Definition |
|---|---|
| **AM** | Refers to the morning weekday peak traffic period, which includes primarily work and school trips. |
| **ADT** | **Average Daily Traffic:** The amount of vehicular traffic that crosses an imaginary line across a roadway in a 24-hour period. ADT information typically includes both directions of vehicle travel (if on a two-way street).). |
| **AWDT** | **Average Weekday Daily Traffic:** When the term ADT is used specifically to mean typical weekday traffic, it is often called AWDT. |
| **AWSC** | **All-Way Stop Controlled:** All intersection approaches are controlled by STOP signs. |
| **CDOT** | **Colorado Department of Transportation:** CDOT has jurisdiction over Colorado's State Highway System, including facilities within the project study area. |
| **Gap in Traffic** | A gap in traffic is the space between vehicles approaching the pedestrian crossing. Gaps are typically measured in seconds, not distance, as it is the length of the gap in time in which a pedestrian must be able to cross the street. A directional gap is the gap between vehicles approaching in a single direction. A directional gap can be measured between vehicles in a single lane, or between vehicles approaching in the same direction but in different lanes on a multi-lane approach. If there is no median refuge at the crossing, a pedestrian will need to find an acceptable gap in traffic approaching from two directions at once. This is much more challenging than finding a gap in each approach direction separately. |
| **HCM** | ***Highway Capacity Manual***: A publication of the U.S. Transportation Research Board of the National Academies of Science. It contains concepts, guidelines, and computational procedures for computing the capacity and quality of service of various highway facilities, including freeways, highways, arterial roads, roundabouts, signalized and unsignalized intersections, rural highways, and the effects of mass transit, pedestrians, and bicycles on the performance of these systems. The *Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis* (HCM6) was used as part of this study. |
| **Lane** | A portion of the roadway surface designated for motor vehicle travel, typically in a single direction, that is delineated by pavement marking stripes. Types of lanes include: "through lanes" for travel along the length of the roadway, often through intersections; "turn lanes," which are typically on intersection approaches and provide space for left- or right-turning motorists; "bike lanes," which are designated for bicycle travel in the same direction as the automobile travel, are typically narrower than vehicle lanes, and are usually located along the outside edges of the roadway. |

| | |
|---|---|
| **LT** | **Left Turn:** Refers to traffic that turns left at an intersection, often using a designated left-turn lane and sometimes afforded a dedicated left-turn phase in traffic signal timing. |
| **LOS** | **Level of Service:** A qualitative measure used to relate the quality of traffic service. LOS is used to analyze highways by categorizing traffic flow and assigning quality levels of traffic based on performance measure like speed, density, etc. |
| **MPO** | **Metropolitan Planning Organization:** A federally mandated and federally funded transportation policy-making organization that is composed of representatives from local government and governmental transportation authorities. MPOs were introduced by the Federal-Aid Highway Act of 1962, which required the formation of an MPO for any urbanized area with more than 50,000 residents. |
| **NCRHP** | **National Cooperative Highway Research Program:** A forum for coordinated and collaborative research, addressing issues integral to the state Departments of Transportation and transportation professionals at all levels of government and the private sector. |
| **NB** | **Northbound:** Refers to traffic flowing from the south toward the north, and the lanes that carry such traffic. |
| **OTIS)** | **Online Transportation Information System:** A publicly available website maintained by the Colorado Department of Transportation, providing information on current and projected traffic volumes, state highway attributes, summary roadway statistics, demographics, and geographic data. It was used in this study as a data source for historical trends-based annual and 20-year traffic growth factors. |
| **PPACG** | **Pikes Peak Area Council of Governments:** A voluntary organization of municipal and county governments serving as the federally mandated Metropolitan Planning Organization serving El Paso County, Park County, Teller County, Alma, Calhan, Colorado Springs, Cripple Creek, Fairplay, Fountain, Green Mountain Falls, Manitou Springs, Monument, Palmer Lake, Ramah, Victor, and Woodland Park. |
| **PM** | Refers to the afternoon/evening weekday peak traffic period, which includes work trips plus other trip types. |
| **RIRO** | **Right-In/Right-Out** |
| **ROW** | **Right-of Way** |
| **RT** | **Right Turn:** Refers to traffic that turns right at an intersection, sometimes using a designated right-turn lane. |
| **(SB)** | **Southbound:** Refers to traffic flowing from the north toward the south, and the lanes that carry such traffic. |
| **Through/Right Turn** | Refers to traffic (and the lane that carries it) at an intersection that is continuing forward straight through without turning, together with traffic that turns right at the intersection. |
| **TWSC** | **Two-Way Stop Controlled:** Cross street minor approaches are controlled by STOP signs. |
| **Turning-Movement Counts** | Traffic counts for a given time interval that specify how many vehicles turn left or right, as well as counting vehicles that proceed straight forward through the intersection. |

| | |
|---|---|
| **V/C Ratio** | **Volume-to-Capacity Ratio:** Measures roadway level of congestion, or degree of saturation, by dividing the existing or future volume of traffic by the capacity of roadway. |
| **VPD** | **Vehicles Per Day** |
| **Vehicle Queue** | A line of stopped vehicles in a single travel lane, commonly caused by traffic control at an intersection. |
| **WB** | **Westbound:** Refers to one-way traffic flowing from the east to the west (e.g., from Colorado Springs toward Manitou Springs), and the lanes that carry such traffic. |

# 1.0 Introduction

## 1.1 Background

The Briargate Parkway–Stapleton Road corridor is an integral part of a larger transportation system in the Pikes Peak Region. The full 14-mile-long corridor will ultimately connect I-25 to US Highway 24 on the north side of the greater Colorado Springs area as shown in **Figure 1.1**. The 5.5-mile-long project corridor for the Briargate-Stapleton Traffic Study extends from Meridian Road on the east to Black Forest Road on the west. The project corridor is mostly undeveloped at this time, with some portions containing existing roadways of various types and phases of construction associated with adjacent development, most notably a nearly one-mile-long segment west of Meridian Road. There is, however, a significant amount of development occurring in this rapidly growing area of El Paso County.

### 1.1.1 Purpose and Objectives

The El Paso County 2016 *Major Transportation Corridors Plan* (2016 MTCP) identifies the ultimate need for a four-lane section throughout the Briargate Parkway–Stapleton Road project corridor both to meet forecasted travel demand and to fulfill broader county system and connectivity needs. The 2016 MTCP also includes specific recommendations regarding functional classification, transportation modes, and other uses for the Briargate-Stapleton corridor. The 2016 MTCP identifies the Briargate Parkway–Stapleton Road project corridor as a principal arterial from the eastern city limits of Colorado Springs (Black Forest Road) to Judge Orr Road (southeast of US 24). Additional mobility provisions that are necessary, such as bike routes, pedestrian accommodations, and public transit, are also identified for the corridor by the 2016 MTCP. This study was undertaken to confirm and ensure the appropriate spacing of proposed development access along the corridor to maintain operational functionality appropriate for the corridor's functional classification.

The Briargate-Stapleton Traffic Study is a component of the Briargate Parkway–Stapleton Road Corridor Preservation Plan. The purpose of the study is to evaluate existing and future (2045) traffic operations along the roadway, to confirm the proposed number of travel lanes and intersection traffic controls shown in the conceptual design plans, and to devlelop conceptual design for the full corridor. To address this overarching purpose, this study includes: an evaluation of current corridor traffic operations, forecasts of 2045 traffic volumes, an evaluation of traffic operations for the forecasted 2045 conditions, and a confirmation of the feasibility of the planned intersection spacing and access restrictions (e.g., full-access, right-in/right-out (RIRO) only access).

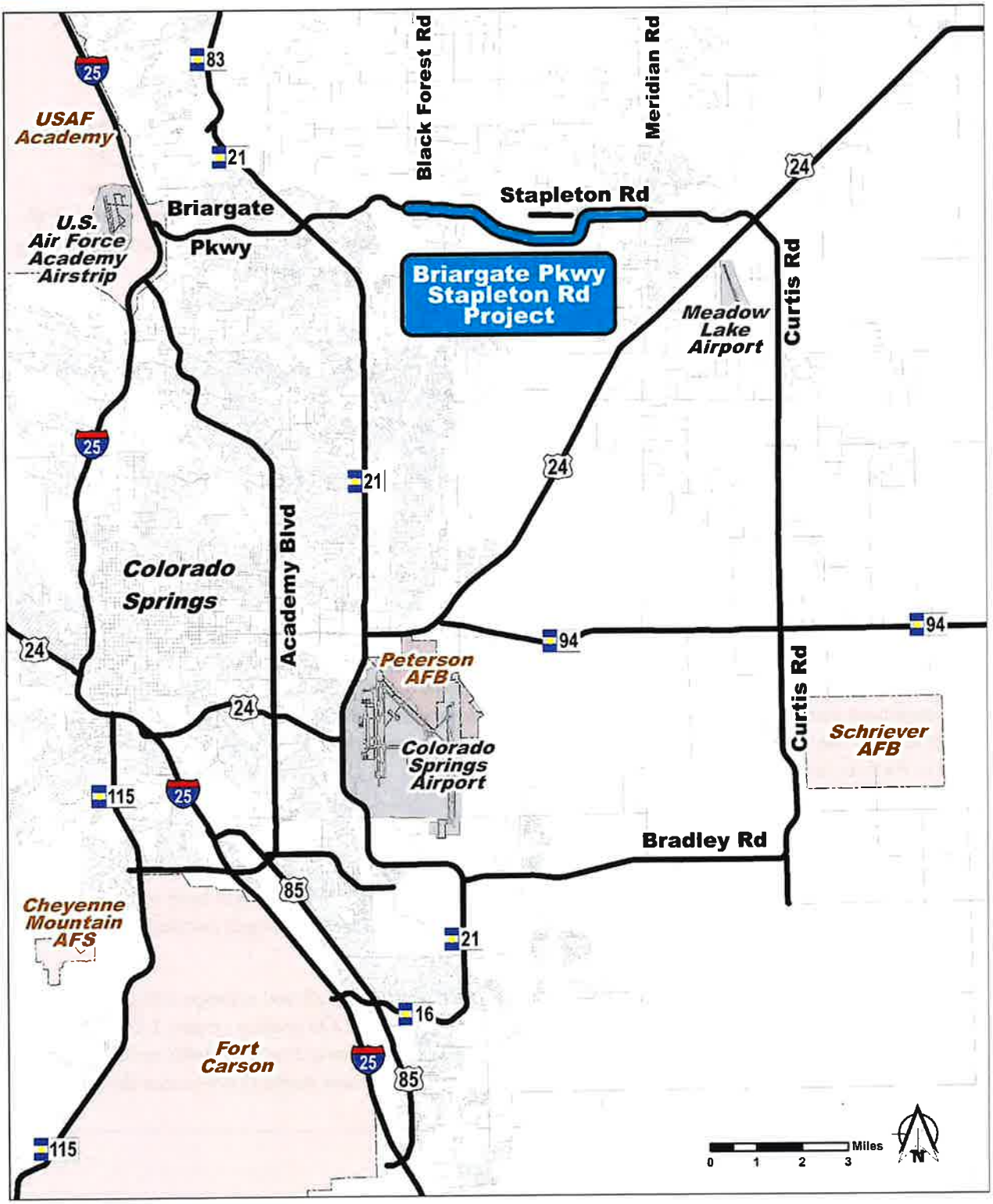



Figure 1.1 Project Corridor Location Map

# 1.1.2 Methodology and Assumptions

## Software Packages

Synchro version 11 software, implementing the Transportation Research Board's *Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis* (HCM6, 2016) delay and Level of Service (LOS) evaluation criteria, was used to perform the traffic operations analysis. Travel demand forecasts were developed using the Pikes Peak Area Council of Governments (PPACG) travel model as a foundation. Full and partial runs of the PPACG travel model and analysis of model inputs and outputs were performed using a PTV Group VISUM version 18 software platform per PPACG model use guidance.

## Analysis Area

The analysis area includes the full project corridor extending from Black Forest Road to Meridian Road. Intersection traffic volume forecasts were prepared only for existing and proposed intersections along the project corridor. Existing average daily traffic (ADT) volume counts were collected for a larger area, which included Meridian Road, Woodmen Road, Briargate Parkway (west of Black Forest Road), and Vollmer Road, to support travel demand model validation and adjustment of 2045 traffic forecasts.

## Travel Demand Forecasts

The current PPACG VISUM version 18 travel model was used to develop travel demand forecasts for the Briargate Parkway–Stapleton Road corridor study area. Full model scenarios for a 2020 base year and 2045 planning horizon were run for each of these scenarios. Raw traffic assignment volumes produced by the model were adjusted using modeled percent growth and absolute growth in traffic flows between the 2020 and 2045 model scenarios, together with observed traffic count data for 2020, as input. Adjustments to base, raw assignment volumes were made in accordance with industry standard guidance.[1] Adjusted assignment results for 2050 were post-processed to generate balanced peak period intersection turning movements as input to the Synchro-based analyses.

## Intersection Analysis

The traffic operations analysis addressed unsignalized and signalized intersection operations using the procedures and methodologies contained in the HCM6 for weekday AM and PM peak hour traffic operations. Study intersection operations were evaluated using LOS and queue length calculations as analyzed in the Synchro version 11 software.

To measure and describe the operational status of the local roadway network and corresponding intersections, transportation engineers and planners commonly use the LOS grading system. LOS is a description of an intersection's operation, ranging from a LOS A (indicating free flow traffic conditions with little or no delay) to a LOS F (representing oversaturated conditions where traffic flows exceed design capacity, resulting in long queues and delays).

### Signalized Intersections

At signalized intersections, traffic conditions were evaluated using procedures and methodologies contained in the HCM6. The operational analysis uses various intersection characteristics (such as traffic volumes, lane

[1] NCHRP Report 255 – Highway Traffic Data for Urbanized Area Project Planning and Design, 1982; NCHRP Report 765 – Analytical Travel Forecasting Approaches for Project-Level Planning and Design, 2014.

geometry, and signal phasing) to estimate the intersection's volume-to-capacity (v/c) ratio. For signalized intersections, the HCM6 defines the LOS as the average delay per vehicle for the overall intersection. **Table 1.1** summarizes the relationship between delay and LOS for signalized intersections.

**Table 1.1. LOS Criteria for Signalized Intersections**

| Level of Service | Interpretation | Control Delay (seconds/vehicle) |
|---|---|---|
| A | Progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may contribute to low delay. | ≤10 |
| B | Good progression, short cycle lengths, or both. More vehicles stop than with LOS A. | >10 – 20 |
| C | Fair progression, longer cycle lengths, or both. The number of vehicles stopping is significant, though many still pass through without stopping. | >20 – 35 |
| D | Longer delays result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop. | >35 – 55 |
| E | High delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences. | >55 – 80 |
| F | This level often occurs with oversaturation when arrival flow rates exceed the capacity of the intersection. Poor progression and long cycle lengths may be major contributing factors to such delays. | >80 |

*Source:* Transportation Research Board, *Highway Capacity Manual, 6th Edition: A Guide for Multimodal Mobility Analysis*, 2010, 19-2.

## Unsignalized Intersections

For unsignalized (all-way stop-controlled [AWSC] and two-way stop-controlled [TWSC]) intersections, the HCM6 was utilized. With this methodology, operations are defined by the average control delay per vehicle (measured in seconds) for each stop-controlled movement. The method incorporates delay associated with deceleration, acceleration, stopping, and moving up in the queue. For AWSC intersections, the HCM6 defines the LOS as the average delay per vehicle for the overall intersection. For TWSC intersections, LOS is reported for the approach with the highest average delay/vehicle. **Table 1.2** summarizes the relationship between delay and LOS for unsignalized intersections.

**Table 1.2. LOS Criteria for Unsignalized Intersections**

| Level of Service | Interpretation | Control Delay (seconds/vehicle) |
|---|---|---|
| A | Little or no delay | 0–10 |
| B | Short traffic delays | >10–15 |
| C | Average traffic delays | >15–25 |
| D | Long traffic delays | >25–35 |
| E | Very long traffic delays | >35–50 |
| F | When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing that may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improving the intersection. | >50 |

*Source:* Transportation Research Board, *Highway Capacity Manual, 6th Edition: A Guide for Multimodal Mobility Analysis*, 2010, 18-6.
*Note:* For TWSC intersections, level of service is determined by the control delay for each minor movement; LOS is not defined for the overall intersection.

# 2.0 EXISTING CONDITIONS

## 2.1 Roadway Classification

Although the study corridor extends approximately 5.5 miles, from Black Forest Road to Meridian Road, approximately 4.3 miles of the corridor has not yet been constructed. The sections that have been built are not consistent with the proposed roadway classification and use. Existing Briargate Parkway extends from the west at Interstate 25 and currently ends approximately one mile west of Black Forest Road. Through the Wolf Ridge development, Briargate Parkway is a 4-lane divided section with curb and gutter and a 30' raised median. In this area, 160' of right-of-way (ROW) has been set aside for the roadway. Another portion of Briargate Parkway currently exists as about 0.2 miles of two-lane, 24'-wide asphalt roadway extending east from Black Forest Road. The ROW indicates that 120' has been set aside for this corridor. Similarly, from the east, Stapleton Drive/Road exists for about 1.0 mile as a two-lane, 24'-wide asphalt roadway from Meridian Road to west of Towner Avenue. ROW that has been set aside in this area varies from 120' to 160'. East of the project, Stapleton Drive/Road is a two-lane section with open drainage and an intermittent painted median.

## 2.2 Existing Traffic and Roadway Conditions

Available traffic count data was assembled for use in this traffic analysis for the Briargate-Stapleton Corridor Study from sources including the Colorado Department of Transportation (CDOT) traffic statistics database, the PPACG, and both El Paso County and the City of Colorado Springs (traffic count data and recent development traffic impact studies). Count data from these sources included: weekday peak period turning-movement counts, 48-hour counts, hourly counts, and adjusted average daily traffic (ADT) counts. Additional peak hour intersection turning-movement counts were collected at five existing intersections. Directional counts were also conducted hourly at five locations on Stapleton Drive (east of the project corridor), Meridian Road (north and south of the project corridor), Vollmer Road, and Black Forest Road (south of the proposed alignment) in August 2021. **Figure 2.1** shows the existing weekday AM and PM peak hour intersection turning-movement counts. **Figure 2.2** shows the existing lane geometry and traffic control at the study intersections. The raw traffic count data is included in **Attachment A**.

## 2.3 Traffic Operations

The LOS and delay measures shown in **Table 2.1** are for 2021 existing traffic volumes, roadway geometry, and traffic control. The results show that all the analyzed intersections currently operate at LOS C or better. The Synchro LOS outputs are included in **Attachment B**.

**Table 2.1. 2021 Existing Conditions Traffic Operations Summary**

| Control | Intersection | LOS/Delay [in seconds/vehicle] (Critical Movement) | |
|---|---|---|---|
| | | AM Peak Hour | PM Peak Hour |
| TWSC | Briargate Parkway & Black Forest Road | b / 12.3 (WB Approach) | b / 13.6 (WB Approach) |
| AWSC | Stapleton Road & Towner Avenue | A / 9.6 | A / 8.4 |
| TWSC | Stapleton Road & Prairie Dove Drive | b / 13.4 (SB Approach) | b / 11.2 (SB Approach) |
| TWSC | Stapleton Road & Liberty Grove Drive | b / 14.9 (SB LT) | b / 11.5 (SB LT) |
| Signal | Stapleton Road & Meridian Road | C / 28.6 | B / 19.0 |

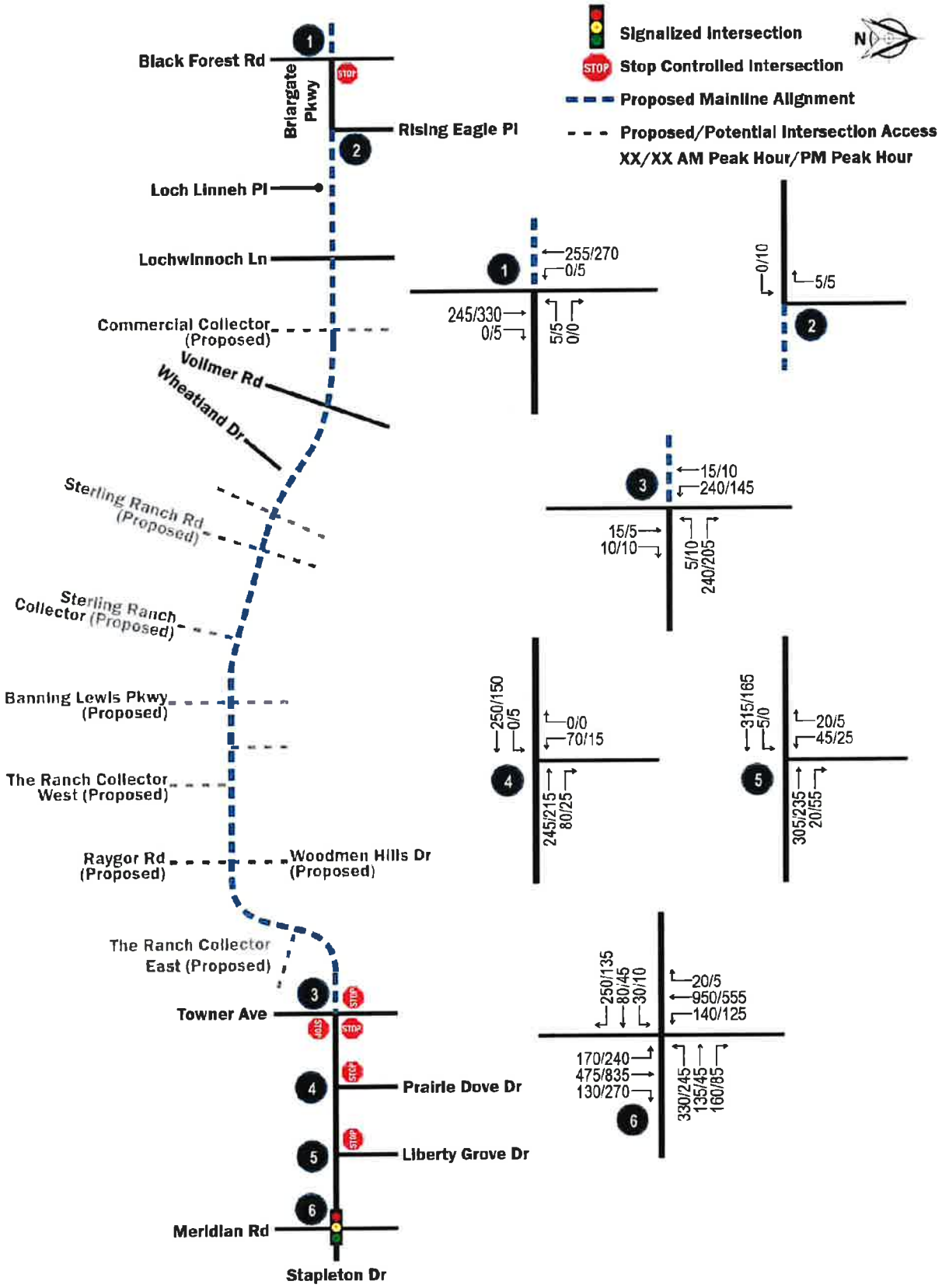



Figure 2.1 Existing Intersection Peak Hour Turning-Movement Volumes

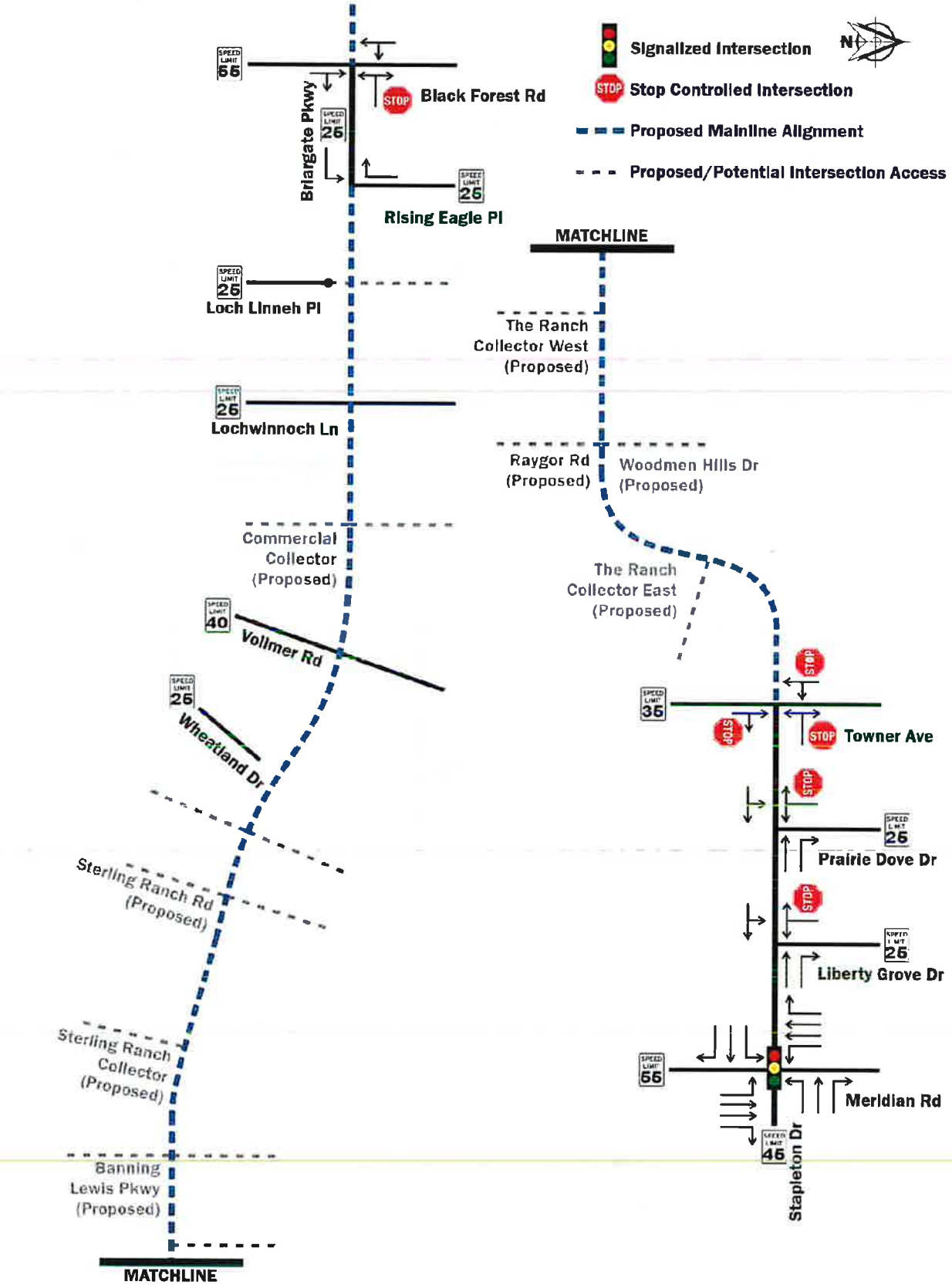



Figure 2.2 Existing Intersection Geometry and Traffic Control

# 3.0 TRAVEL DEMAND FORECASTS

## 3.1 Methodology

Forecasts for 2045 total traffic volumes were developed using a synthesis of historic trends-based methods and regional travel model–based methods that incorporated estimates of development site-generated traffic in a consistent manner.

The PPACG 2045 fiscally constrained RTP model was used to develop future ADT volume forecasts along the corridor. The model scenario is coded with four lanes east of Black Forest Road and six lanes west of Black Forest Road. The model results were used in conjunction with traffic studies for other projects within the area to develop intersection peak hour turning-movement traffic volumes. Reference studies included the Black Forest Road Widening Project Traffic Impact Study (February 2020) and traffic impact studies completed for Wolf Ranch, The Ranch, Sterling Ranch, Highland Park, and Eagle Rising developments.

## 3.2 2045 Traffic Forecasts

The traffic impact study included in the City of Colorado Springs Black Forest Road Corridor Study and traffic impact study submittals for the adjacent existing and proposed developments were used to estimate development traffic not included in 2045 regional forecasts. Trends-based 20-year growth factors for US 24, the closest state highway facility, were also obtained from the CDOT Online Traffic Information System (OTIS) database. The average 25-year growth factor was calculated from this data for the corridor segments of interest and was determined to be 1.6. The collected traffic count data is included as **Attachment A**.

The PPACG model and industry-standard adjustment procedures were used, as shown in **Table 3.1**, to calculate unadjusted 2045 forecasts and growth rates. Calculated growth factors were compared, balanced, and applied to 2021 intersection volumes to calculate 2045 total traffic intersection volumes.

**Figure 3.1** shows PPACG travel model raw assignment volumes for the 2020 base year model scenario, and **Figure 3.2** shows raw assignment volume for the adopted 2045 PPACG Regional Transportation Plan model scenario.

**Figure 3.3** shows the adjusted, forecasted 2045 ADT volumes along the corridor, which range from 16,000 vehicles per day (vpd) west of Meridian Road, at the east end of the study limits, to 25,000 vpd east of Black Forest Road, at the west end of the study limits.

**Table 3.1. 2021 Forecast Background Traffic Growth Rate Calculations**

| SEGMENT LOCATION | ADT VOLUMES | | | | | | | | | | Adjusted 2045 ADT Volume |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground Count Volumes | | | PPACG Model Volumes | | | Difference | | % Difference | | |
| | Year | Count | Adj. Count | 2020 | 2040 | 2045 | 2020 vs Count | % Difference | 2020 vs Count | 2045 vs 2020 | |
| BLACK FOREST ROAD | | | | | | | | | | | |
| Black Forest Road North of Briargate Parkway | 2021* | 4,000 | 4,000 | 4,200 | 8,000 | 8,250 | 200 | 5% | 105% | 196% | 8,450 |
| Black Forest Road South of Briargate Parkway | 2021* | 15,000 | 15,000 | 15,000 | 33,800 | 35,000 | 0 | 0% | 100% | 233% | 35,000 |
| BLACK FOREST ROAD AVERAGE | | 9,500 | 9,500 | 9,600 | 20,900 | 21,625 | 100 | 3% | 103% | 215% | 21,725 |
| | | | | | | | | | | | |
| TOWNER AVENUE | | | | | | | | | | | |
| Towner Avenue North of Stapleton Drive | 2021* | 4,275 | 4,275 | 100 | 225 | 310 | -4,175 | 98% | 2% | 310% | 2,398 |
| TOWNER AVENUE AVERAGE | | 4,275 | 4,275 | 100 | 225 | 310 | -4,175 | 98% | 2% | 310% | 2,398 |
| | | | | | | | | | | | |
| STAPLETON DRIVE | | | | | | | | | | | |
| Stapleton Drive East of Towner Avenue | 2021* | 3,500 | 3,500 | 500 | 13,500 | 14,000 | -3,000 | 86% | 14% | 2,800% | 15,250 |
| Stapleton Drive West of Meridian Road | 2021* | 6,250 | 6,250 | 1,700 | 14,500 | 15,000 | -4,550 | 73% | 27% | 882% | 19,050 |
| Stapleton Drive East of Meridian Road | 2021 | 8,900 | 8,900 | 4,800 | 15,400 | 16,000 | -4,100 | 46% | 54% | 333% | 19,500 |
| STAPLETON DRIVE AVERAGE | | 6,217 | 6,217 | 2,333 | 14,467 | 15,000 | -3,883 | 68% | 32% | 1,339% | 17,933 |
| | | | | | | | | | | | |
| MERIDIAN ROAD | | | | | | | | | | | |
| North of Stapleton Drive | 2021 | 8,000 | 8,000 | 8,000 | 12,200 | 12,700 | 0 | 0% | 100% | 159% | 12,700 |
| South of Stapleton Drive | 2021 | 23,000 | 23,000 | 11,000 | 21,200 | 22,000 | -12,000 | 52% | 48% | 200% | 34,000 |
| MERIDIAN ROAD AVERAGE | | 15,500 | 15,500 | 9,500 | 16,700 | 17,350 | -6,000 | 26% | 74% | 179% | 23,350 |
| | | | | | | | | | | | |
| US 24 | | | | | | | | | | | |
| North of Falcon Highway | 2020 | 16,000 | 16,000 | 16,000 | 22,400 | 24,000 | 0 | 0% | 100% | 150% | 24,000 |
| North of Woodmen Road | 2020 | 11,000 | 11,000 | 11,000 | 16,000 | 17,200 | 0 | 0% | 100% | 156% | 17,200 |
| North Judge Orr Road | 2020 | 11,000 | 11,000 | 11,000 | 16,000 | 17,200 | 0 | 0% | 100% | 156% | 17,200 |
| US 24 AVERAGE | | 12,667 | 12,667 | 12,667 | 18,133 | 19,467 | 0 | 0% | 100% | 154% | 19,467 |

*ADT volume was estimated from a peak hour intersection collected at the indicated intersection approaches.

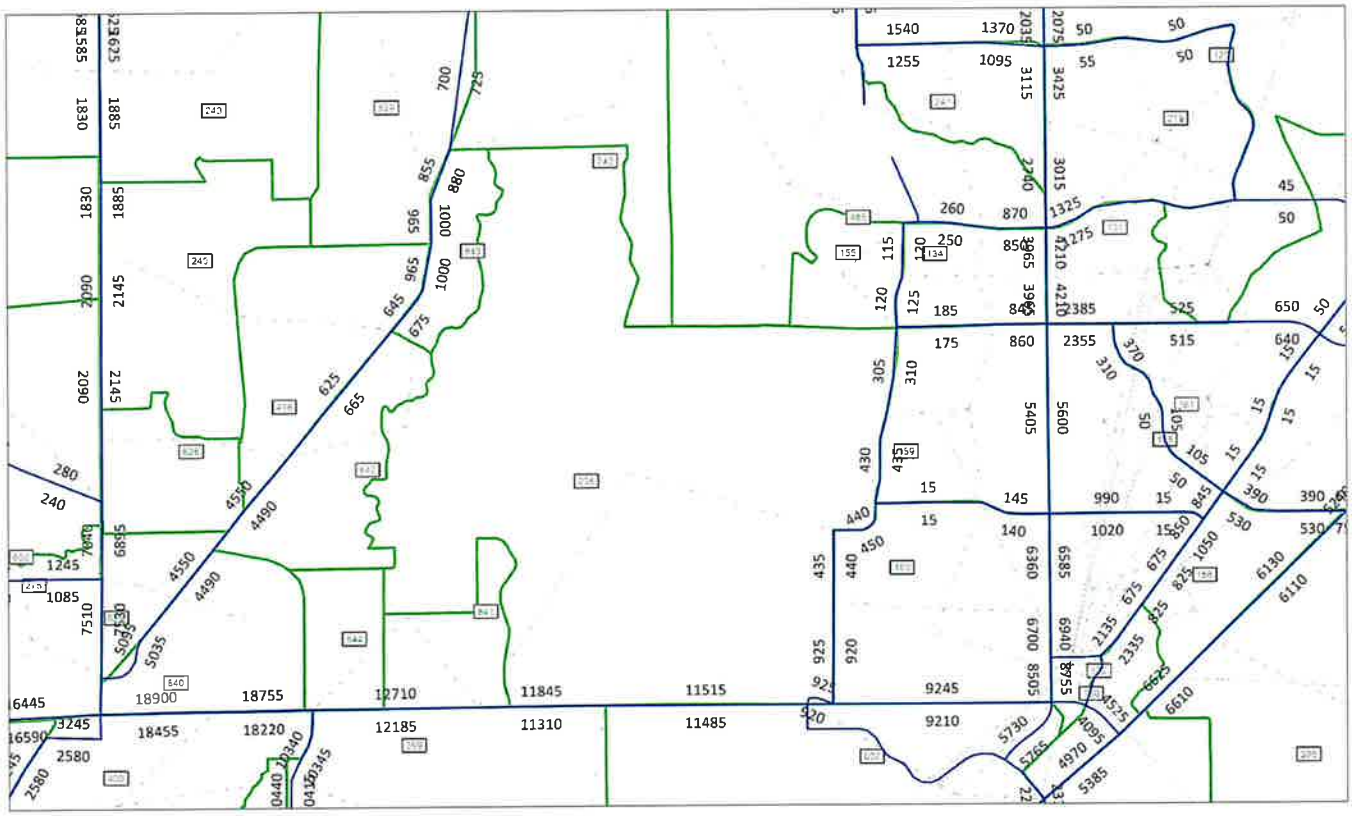



Figure 3.1 PPACG Model 2020 Network and 2020 ADT Traffic Assignment

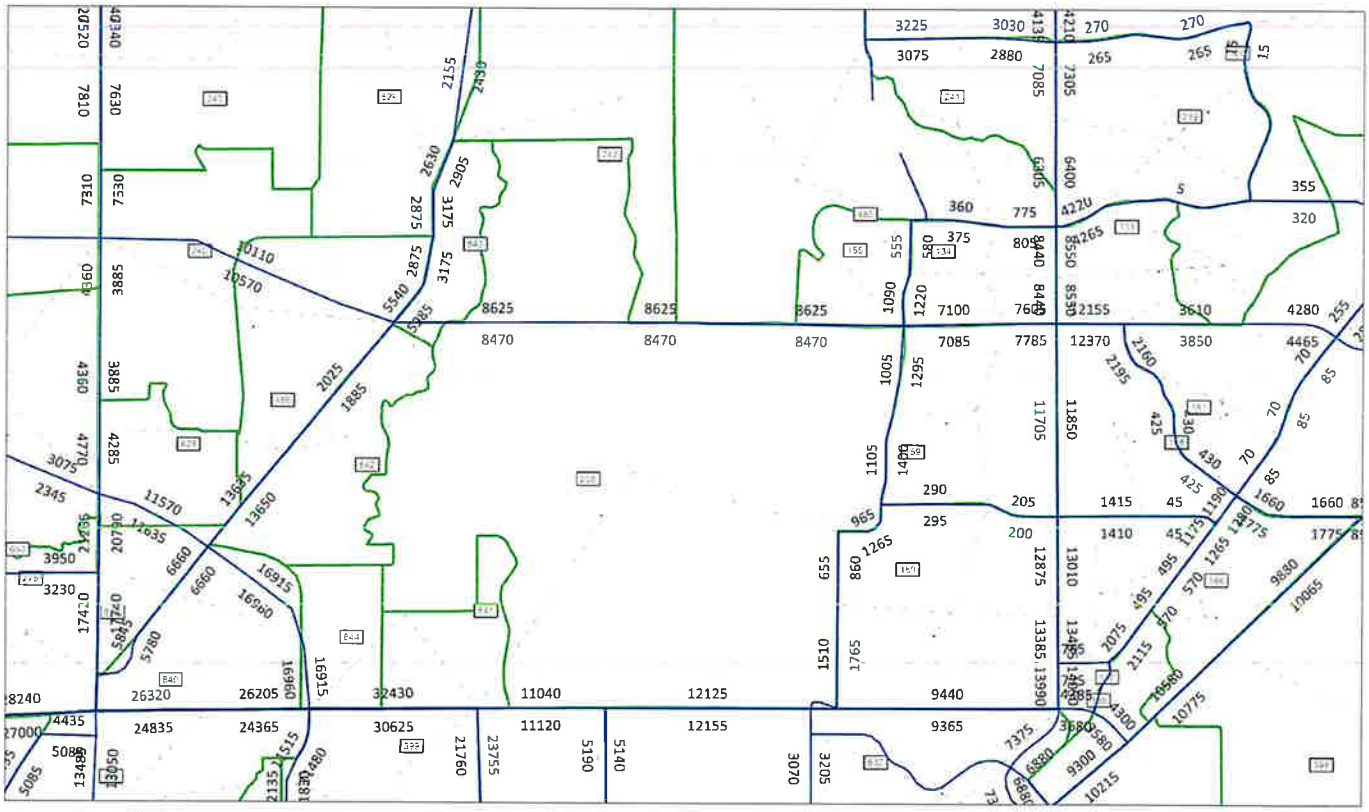


Figure 3.2 PPACG Model 2045 Network and 2045 ADT Traffic Assignment

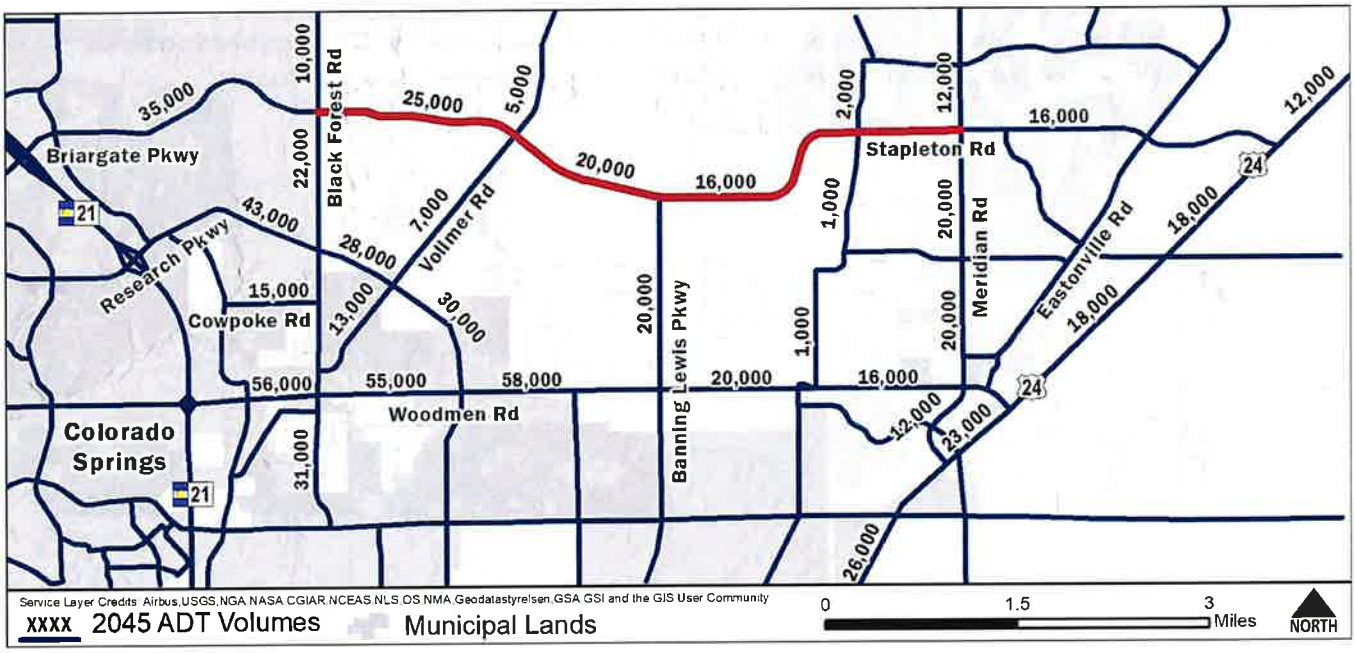



Figure 3.3 2045 Forecast ADT Traffic Volumes

# 4.0 SIGNAL WARRANT ANALYSIS

## 4.1 Existing Conditions

There are six intersections along the existing segments of Briargate Parkway–Stapleton Drive/Stapleton Road. These intersections are located at Black Forest Road, Rising Eagle Place, Towner Avenue, Prairie Dove Drive, Liberty Grove Drive, and Meridian Road. There is an existing traffic signal at the intersection of Stapleton Drive and Meridian Road. The other five unsignalized intersections currently experience relatively low traffic volumes. None of these intersections currently meet warrants for signalization.

## 4.2 Proposed Improvements

The proposed ultimate corridor improvements will include a total of 12 full-access intersections. With forecast daily traffic flow along the corridor ranging from 16,000 to 25,000 ADT, all the full-access intersections are expected to warrant signalization to accommodate forecasted 2045 traffic flow. This traffic study assumed signalized control for purposes of 2045 traffic operations analysis. Both signalized and roundabout alternatives will be evaluated as a part of the preliminary and final roadway design.

# 5.0 ANALYSIS OF FUTURE CONDITIONS

## 5.1 Forecast Intersection Traffic Volumes

**Figures 5.1** and **5.2** show the 2045 forecast peak hour intersection turning-movement volumes for the west and east segments of the proposed corridor intersections, respectively. Locations at which additional right-in/right-out-only access or additional intersection legs may be allowed are also shown in the figures' key maps.

## 5.2 Intersection Level of Service

**Figure 5.3** shows the proposed lane geometry and traffic control at the study intersections. The intersection LOS and delay measures for the 2045 traffic conditions are shown in **Table 5.1**. As shown in the table, other than at the western and eastern study limits, the analyzed intersections are projected to operate at LOS C or better during the AM and PM peak hours. The Stapleton Road/Meridian Road intersection is projected to operate at LOS D during the AM and PM peak hours. The Briargate Parkway/Black Forest Road intersection is projected to operate at LOS E during the AM peak hour and LOS D during the PM peak hour. The projected level of service at Briargate Parkway/Black Forest Road indicates a potential need for three through lanes in each direction of Briargate Parkway across Black Forest Road at some point in time. The Synchro LOS outputs are included in **Attachment B**.

**Table 5.1. 2045 Intersection Level of Service Summary**

| Control | Intersection | LOS/Delay [in seconds/vehicle] (Critical Movement) | |
|---|---|---|---|
| | | AM Peak Hour | PM Peak Hour |
| Signal | Briargate Parkway & Black Forest Road | E / 60.6 | D / 54.8 |
| TWSC | Briargate Parkway & Rising Eagle Place | c / 16.3 (SB RT) | b / 14.7 (SB RT) |
| Signal | Briargate Parkway & Loch Linnch Place | A / 1.4 | A / 1.5 |
| Signal | Briargate Parkway & Lochwinnoch Lane | A / 2.9 | A / 2.7 |
| Signal | Briargate Parkway & Commercial Collector | A / 6.7 | B / 13.9 |
| Signal | Briargate Parkway & Vollmer Road | B / 17.7 | C / 24.0 |
| TWSC | Briargate Parkway & Wheatland Drive | b / 13.5 (NB RT) | c / 16.2 (NB RT) |
| Signal | Briargate Parkway & Sterling Ranch Road | B / 12.7 | B / 15.9 |
| TWSC | Briargate Parkway & Sterling Ranch Collector | b / 13.0 (NB RT) | b / 14.6 (NB RT) |
| Signal | Briargate Pkwy-Stapleton Rd & Banning Lewis Pkwy | C / 27.1 | C / 28.7 |
| Signal | Stapleton Road & The Ranch Collector West | A / 1.5 | A / 2.0 |
| Signal | Stapleton Road & Woodmen Hills-Raygor Road | B / 10.8 | B / 12.1 |
| Signal | Stapleton Road & The Ranch Collector East | A / 5.5 | A / 7.5 |
| Signal | Stapleton Road & Towner Avenue | C / 26.7 | B / 17.7 |
| TWSC | Stapleton Road & Prairie Dove Drive | b / 11.4 (SB RT) | b / 10.0 (SB RT) |
| TWSC | Stapleton Road & Liberty Grove Drive | b / 12.1 (SB RT) | b / 10.1 (SB RT) |
| Signal | Stapleton Road & Meridian Road | D / 37.2 | D / 41.4 |

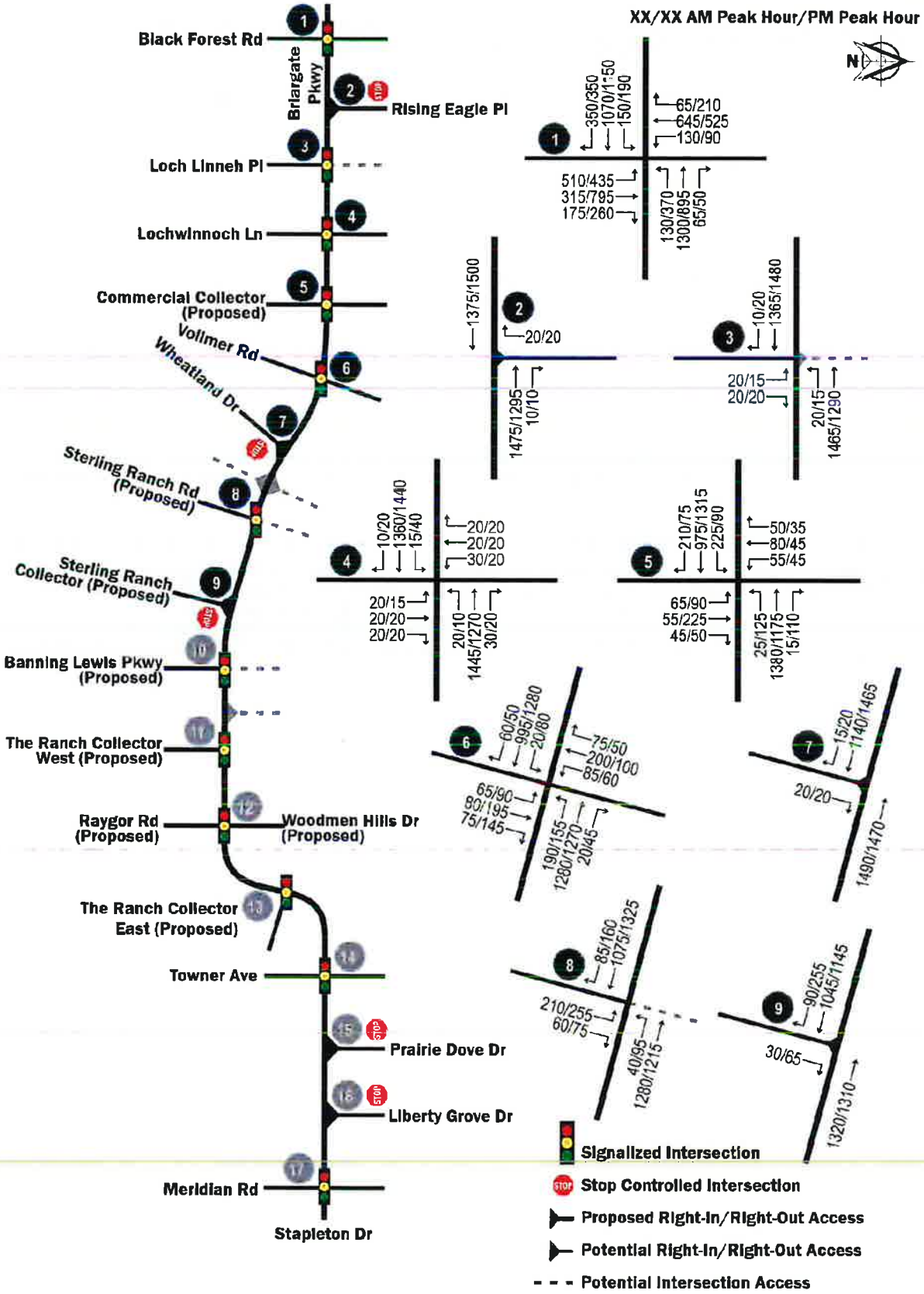



Figure 5.1 2045 Forecast Intersection Peak Hour Turning-Movement Volumes – West Segment

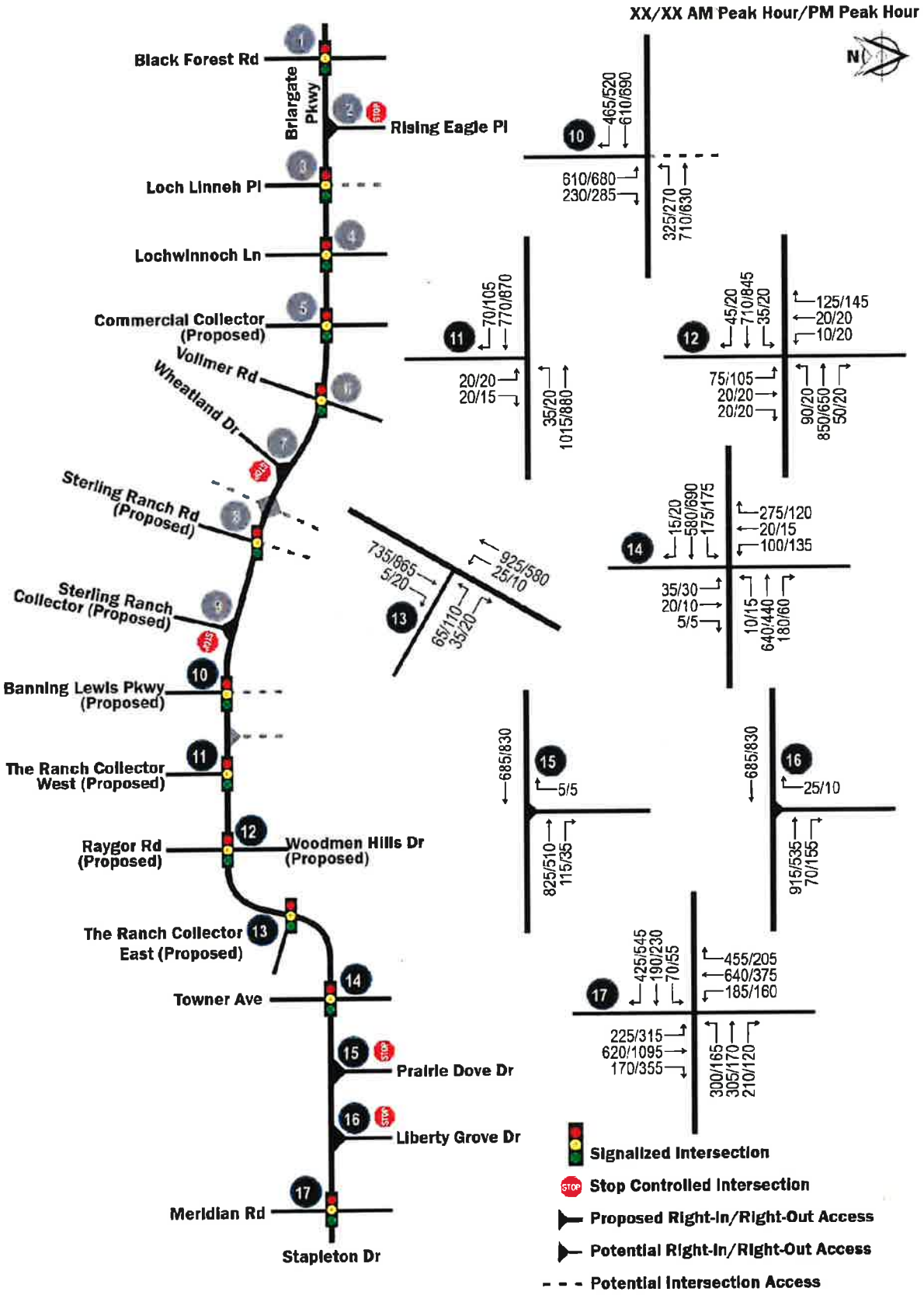



Figure 5.2 2045 Forecast Intersection Peak Hour Turning-Movement Volumes – East Segment

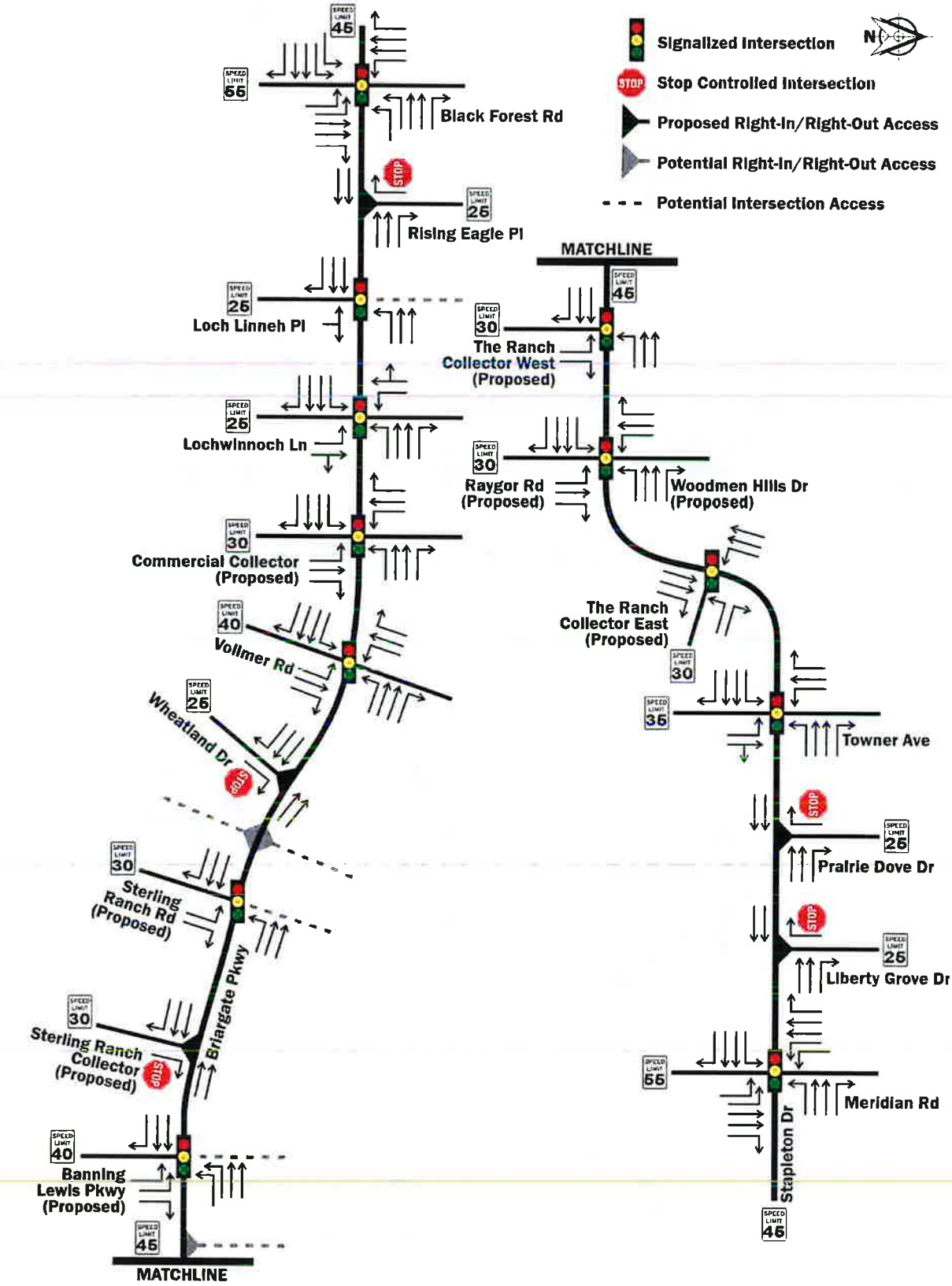



Figure 5.3 2045 Intersection Geometry and Traffic Control

# 5.3 Queuing Analysis

The queuing analysis results for the left-turn movements at the signalized intersections based on the 2045 AM and PM peak hour traffic conditions are summarized in **Table 5.2**.

The values in the table are the 95th percentile queue lengths as reported by Synchro. As shown, most left-turn movements are projected to have queues of less than 200 feet in length. Exceptions are at Black Forest Road (AM Peak Hour - NB 331'/PM Peak Hour - WB 251' and NB 285'), Sterling Ranch Road (AM Peak Hour - NB 236'/PM Peak Hour – 280'), Banning Lewis Parkway (AM Peak Hour - NB 287'/PM Peak Hour – 309'), and Meridian Road (AM Peak Hour - WB 255'). Synchro Queuing Reports are included in **Attachment B**.

| Table 5.2 2045 Left Turn Queuing Summary | | | |
|---|---|---|---|
| Intersecting Road | Approach Direction | 95th Percentile Vehicle Queue Length [in feet] | |
| | | AM Peak Hour | PM Peak Hour |
| Black Forest Road | EB | 131* | 117 |
| | WB | 108* | 251* |
| | NB | 331* | 285* |
| | SB | 112 | 105* |
| Loch Linneh Place | WB | 3† | 0† |
| Lochwinnoch Lane | EB | 2† | 6† |
| | WB | 0† | 4† |
| | NB | 42 | 35 |
| | SB | 56 | 42 |
| Commercial Collector | EB | 129 | 18 |
| | WB | 3† | 80† |
| | NB | 96 | 118 |
| | SB | 84 | 73 |
| Vollmer Road | EB | 13† | 23† |
| | WB | 103 | 158 |
| | NB | 74 | 114 |
| | SB | 92 | 85 |
| Sterling Ranch Road | WB | 12† | 49† |
| | NB | 236 | 280 |
| Banning Lewis Pkwy | WB | 189 | 167 |
| | NB | 287 | 309 |
| The Ranch Collector West | WB | 6 | 18 |
| | NB | 42 | 42 |
| Woodmen Hills-Raygor | EB | 3 | 3 |
| | WB | 40 | 18 |
| | NB | 107 | 138 |
| | SB | 26 | 38 |
| The Ranch Collector East | WB | 6† | 5† |
| | NB | 96 | 143 |
| Towner Avenue | EB | 45 | 34 |
| | WB | 6† | m7† |
| | NB | 50 | 47 |
| | SB | 113 | 153 |
| Meridian Road | EB | 37 | 28† |
| | WB | 255 | 140 |
| | NB | 134 | 174 |
| | SB | 112 | 104 |

*The 95th percentile volume exceeds capacity; queue may be longer.
†The volume for 95th percentile queue is metered by upstream signal.

# 6.0 CONCLUSIONS & RECOMMENDATIONS

## 6.1 Proposed Functional Classification

The forecasted 2045 ADT volumes range from 16,000 vpd west of Meridian Road, at the east end of the study limits, to 25,000 vpd east of Black Forest Road, at the west end of the study limits. These forecasted daily traffic volumes are within the range of a four-lane principal arterial (10,000–25,000 vpd), as specified in the City of Colorado Springs "Traffic Criteria Manual" (Section III, *Engineering Criteria Manual*, year)

Furthermore, the traffic operations analysis of the forecasted 2045 weekday AM and PM peak hour traffic conditions confirm that the Briargate Parkway–Stapleton Road corridor will function acceptably as a four-lane arterial. All analyzed intersections are projected to operate at LOS D or better during the peak hours, except at the Briargate Parkway/Black Forest Road intersection, which is projected to operate at LOS E during the AM peak hour. The projected level of service at Briargate Parkway/Black Forest Road indicates a potential need for three through lanes in each direction of Briargate Parkway across Black Forest Road at some point in time.

## 6.2 Intersection Geometry and Traffic Control

Ultimate intersection layouts will be designed for RIRO and full-access intersections and a four-lane section with center median. Full-access intersections may be configured as signalized intersections or roundabout intersections, with alternatives analysis and selection to be determined during preliminary and final design. Conceptual layouts of ultimate RIRO, signalized, and roundabout alternatives are illustrated in **Figure 6.1**, **Figure 6.2**, and **Figure 6.3**, respectively.

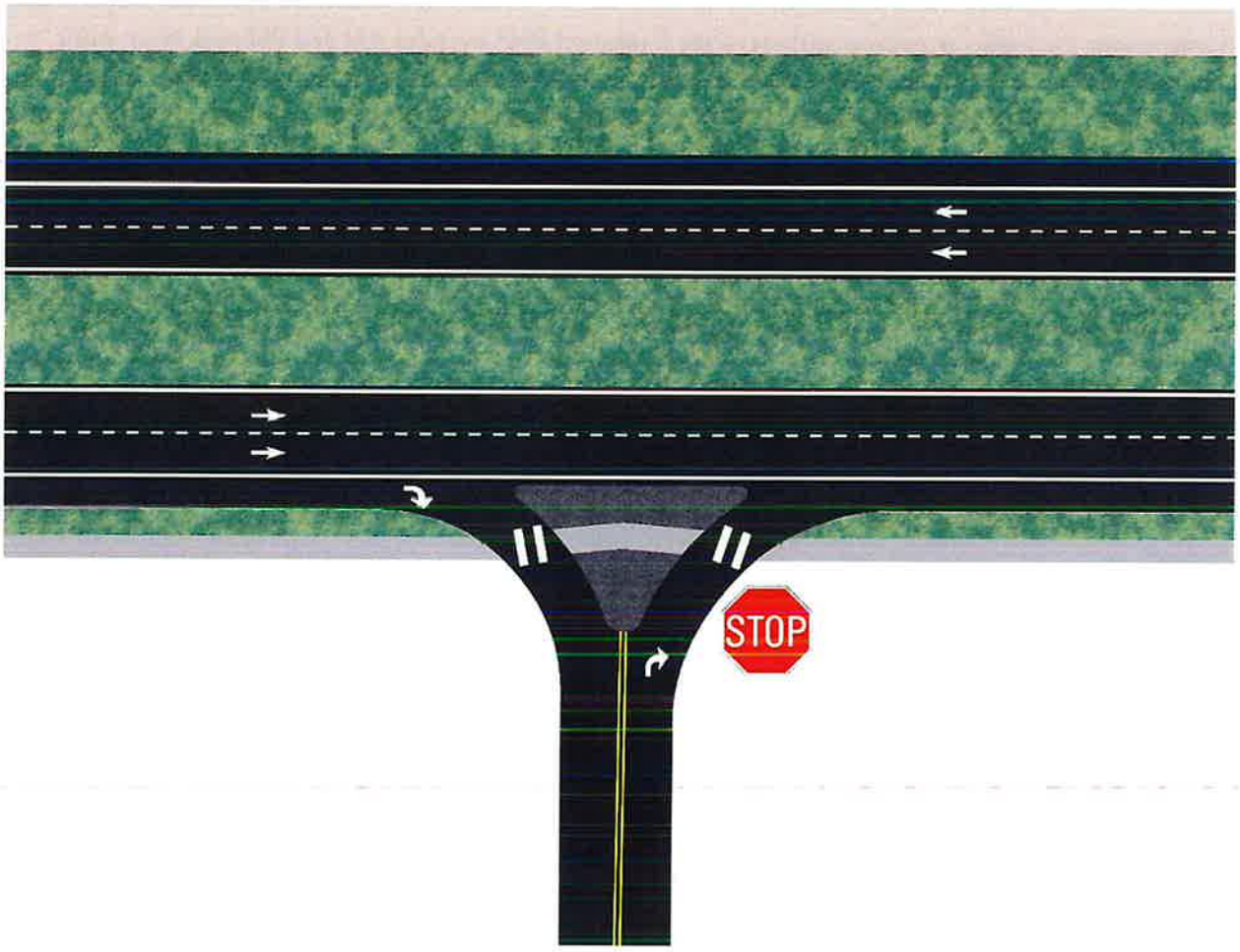



Figure 6.1 Typical Right-In/Right-Out Only Intersection Layout

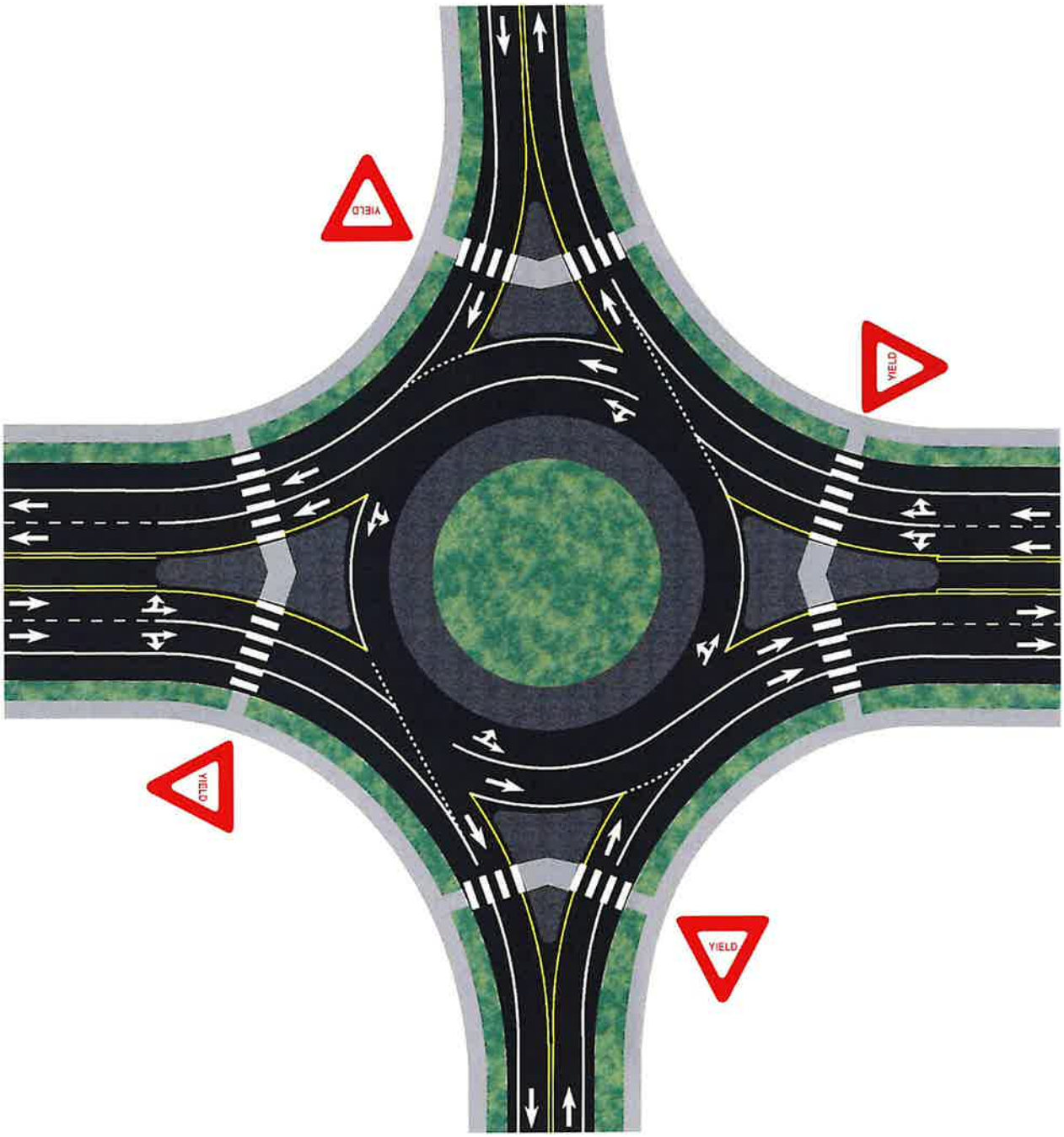



Figure 6.2 Typical Roundabout Intersection Layout

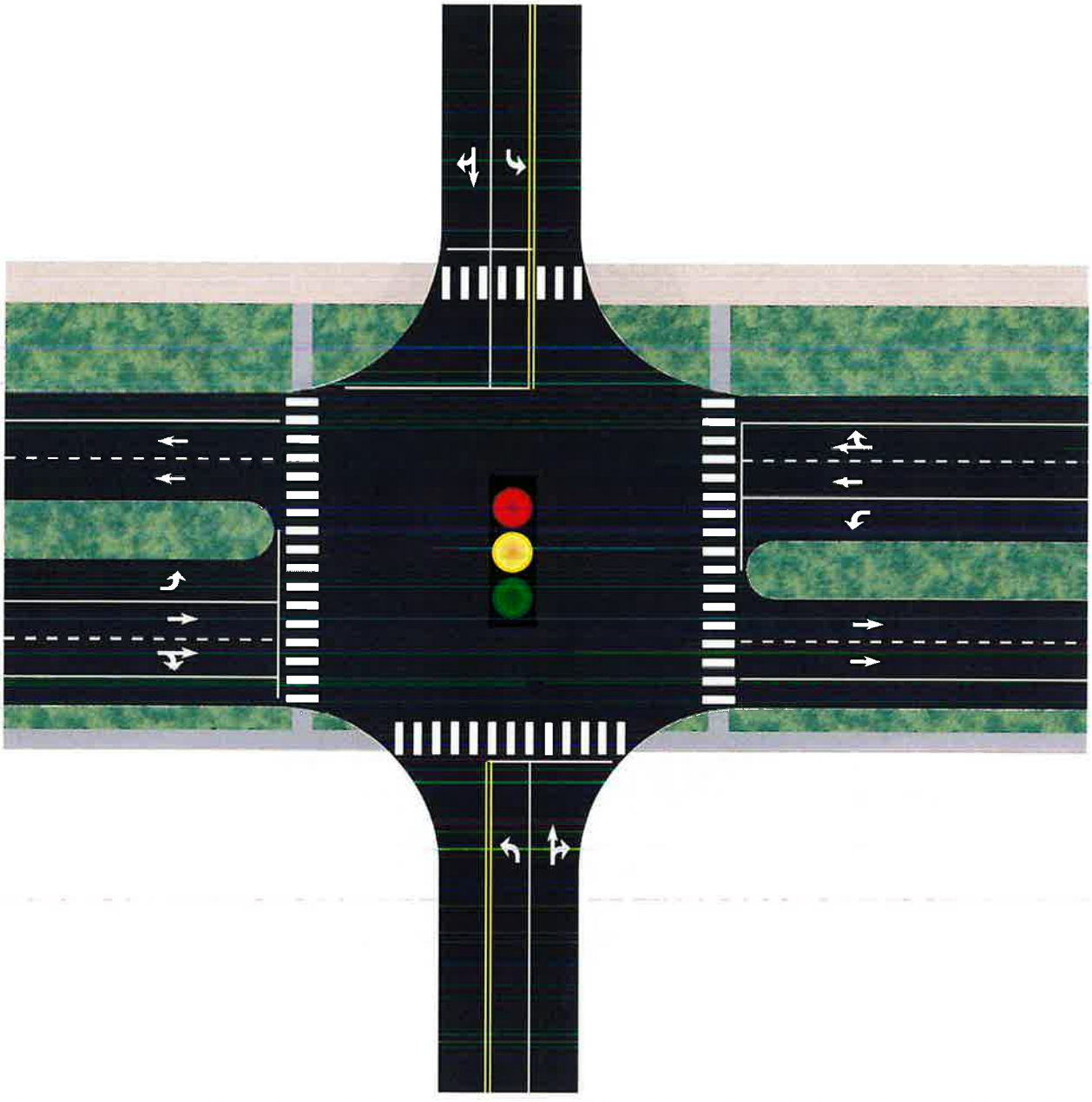


Figure 6.3 Typical Signalized Intersection Layout

WILL REPLACE WITH VERSION WITH DEDICATED RT LANES

# Attachment A – Traffic Count Data

# All Traffic Data Services

www.alltrafficdata.net



Date Start: 10-Aug-21
Site Code: 6
Station ID: 6
BLACK FOREST RD S.O. BRIARGATE PKWY

| Start Time | 10-Aug-21 Tue | NB | SB | Total |
|---|---|---|---|---|
| 12:00 AM | | 9 | 7 | 16 |
| 01:00 | | 4 | 4 | 8 |
| 02:00 | | 0 | 2 | 2 |
| 03:00 | | 4 | 3 | 7 |
| 04:00 | | 6 | 13 | 19 |
| 05:00 | | 28 | 39 | 67 |
| 06:00 | | 116 | 161 | 277 |
| 07:00 | | 206 | 232 | 438 |
| 08:00 | | **243** | **250** | **493** |
| 09:00 | | 192 | 236 | 428 |
| 10:00 | | 190 | 203 | 393 |
| 11:00 | | 180 | 222 | 402 |
| 12:00 PM | | 206 | 216 | 422 |
| 01:00 | | 194 | 258 | 452 |
| 02:00 | | 234 | 221 | 455 |
| 03:00 | | 271 | 278 | 549 |
| 04:00 | | **318** | 273 | **591** |
| 05:00 | | 287 | **298** | 585 |
| 06:00 | | 234 | 192 | 426 |
| 07:00 | | 150 | 121 | 271 |
| 08:00 | | 99 | 81 | 180 |
| 09:00 | | 62 | 48 | 110 |
| 10:00 | | 37 | 27 | 64 |
| 11:00 | | 20 | 12 | 32 |
| Total | | 3290 | 3397 | 6687 |
| Percent | | 49.2% | 50.8% | |
| AM Peak | - | 08:00 | 08:00 | 08:00 |
| Vol. | - | 243 | 250 | 493 |
| PM Peak | - | 16:00 | 17:00 | 16:00 |
| Vol. | - | 318 | 298 | 591 |
| Grand Total | | 3290 | 3397 | 6687 |
| Percent | | 49.2% | 50.8% | |
| ADT | | ADT 6,687 | AADT 6,687 | |

# All Traffic Data Services

www.alltrafficdata.net



Date Start: 10-Aug-21
Site Code: 7
Station ID: 7
VOLLMER RD N.O. GLIDER LOOP

| Start Time | 10-Aug-21 Tue | NB | SB | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 12:00 AM | | 7 | 2 | | | | | | | 9 |
| 01:00 | | 2 | 1 | | | | | | | 3 |
| 02:00 | | 5 | 4 | | | | | | | 9 |
| 03:00 | | 2 | 6 | | | | | | | 8 |
| 04:00 | | 5 | 18 | | | | | | | 23 |
| 05:00 | | 14 | 47 | | | | | | | 61 |
| 06:00 | | 60 | 139 | | | | | | | 199 |
| 07:00 | | **189** | **236** | | | | | | | **425** |
| 08:00 | | 180 | 217 | | | | | | | 397 |
| 09:00 | | 170 | 172 | | | | | | | 342 |
| 10:00 | | 144 | 182 | | | | | | | 326 |
| 11:00 | | 176 | 206 | | | | | | | 382 |
| 12:00 PM | | 208 | **209** | | | | | | | 417 |
| 01:00 | | 171 | 189 | | | | | | | 360 |
| 02:00 | | 148 | 172 | | | | | | | 320 |
| 03:00 | | 224 | 198 | | | | | | | 422 |
| 04:00 | | 228 | 199 | | | | | | | 427 |
| 05:00 | | **237** | 195 | | | | | | | **432** |
| 06:00 | | 185 | 136 | | | | | | | 321 |
| 07:00 | | 120 | 80 | | | | | | | 200 |
| 08:00 | | 86 | 60 | | | | | | | 146 |
| 09:00 | | 53 | 24 | | | | | | | 77 |
| 10:00 | | 36 | 11 | | | | | | | 47 |
| 11:00 | | 14 | 11 | | | | | | | 25 |
| Total | | 2664 | 2714 | | | | | | | 5378 |
| Percent | | 49.5% | 50.5% | | | | | | | |
| AM Peak | - | 07:00 | 07:00 | - | - | - | - | - | - | 07:00 |
| Vol. | - | 189 | 236 | - | - | - | - | - | - | 425 |
| PM Peak | - | 17:00 | 12:00 | - | - | - | - | - | - | 17:00 |
| Vol. | - | 237 | 209 | - | - | - | - | - | - | 432 |
| Grand Total | | 2664 | 2714 | | | | | | | 5378 |
| Percent | | 49.5% | 50.5% | | | | | | | |
| ADT | | ADT 5,378 | | AADT 5,378 | | | | | | |

# All Traffic Data Services

www.alltrafficdata.net



Date Start: 10-Aug-21
Site Code: 8
Station ID: 8
MERIDIAN RD N.O. STAPLETON DR

| Start Time | 10-Aug-21 Tue | NB | SB | Total |
|---|---|---|---|---|
| 12:00 AM | | 34 | 13 | 47 |
| 01:00 | | 19 | 12 | 31 |
| 02:00 | | 17 | 8 | 25 |
| 03:00 | | 15 | 17 | 32 |
| 04:00 | | 15 | 73 | 88 |
| 05:00 | | 63 | 229 | 292 |
| 06:00 | | 262 | 643 | 905 |
| 07:00 | | **667** | **1110** | **1777** |
| 08:00 | | 499 | 673 | 1172 |
| 09:00 | | 405 | 550 | 955 |
| 10:00 | | 462 | 559 | 1021 |
| 11:00 | | 479 | 569 | 1048 |
| 12:00 PM | | 578 | 603 | 1181 |
| 01:00 | | 589 | 539 | 1128 |
| 02:00 | | 684 | 569 | 1253 |
| 03:00 | | 815 | **841** | **1656** |
| 04:00 | | 876 | 722 | 1598 |
| 05:00 | | **931** | 687 | 1618 |
| 06:00 | | 735 | 498 | 1233 |
| 07:00 | | 528 | 317 | 845 |
| 08:00 | | 402 | 249 | 651 |
| 09:00 | | 249 | 128 | 377 |
| 10:00 | | 115 | 73 | 188 |
| 11:00 | | 64 | 31 | 95 |
| Total | | 9503 | 9713 | 19216 |
| Percent | | 49.5% | 50.5% | |
| AM Peak | - | 07:00 | 07:00 | 07:00 |
| Vol. | - | 667 | 1110 | 1777 |
| PM Peak | - | 17:00 | 15:00 | 15:00 |
| Vol. | - | 931 | 841 | 1656 |
| Grand Total | | 9503 | 9713 | 19216 |
| Percent | | 49.5% | 50.5% | |

ADT ADT 19,216 AADT 19,216

# All Traffic Data Services

www.alltrafficdata.net



Date Start: 10-Aug-21
Site Code: 9
Station ID: 9
MERIDIAN RD S.O. STAPLETON DR

| Start Time | 10-Aug-21 Tue | NB | SB | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 12:00 AM | | 59 | 20 | | | | | | | 79 |
| 01:00 | | 28 | 16 | | | | | | | 44 |
| 02:00 | | 22 | 18 | | | | | | | 40 |
| 03:00 | | 16 | 35 | | | | | | | 51 |
| 04:00 | | 12 | 123 | | | | | | | 135 |
| 05:00 | | 59 | 344 | | | | | | | 403 |
| 06:00 | | 276 | 918 | | | | | | | 1194 |
| 07:00 | | **775** | **1528** | | | | | | | **2303** |
| 08:00 | | 587 | 896 | | | | | | | 1483 |
| 09:00 | | 539 | 793 | | | | | | | 1332 |
| 10:00 | | 601 | 802 | | | | | | | 1403 |
| 11:00 | | 659 | 827 | | | | | | | 1486 |
| 12:00 PM | | 774 | 821 | | | | | | | 1595 |
| 01:00 | | 806 | 734 | | | | | | | 1540 |
| 02:00 | | 967 | 848 | | | | | | | 1815 |
| 03:00 | | 1120 | **1072** | | | | | | | 2192 |
| 04:00 | | 1185 | 959 | | | | | | | 2144 |
| 05:00 | | **1349** | 934 | | | | | | | **2283** |
| 06:00 | | 1090 | 695 | | | | | | | 1785 |
| 07:00 | | 787 | 450 | | | | | | | 1237 |
| 08:00 | | 615 | 338 | | | | | | | 953 |
| 09:00 | | 384 | 202 | | | | | | | 586 |
| 10:00 | | 169 | 93 | | | | | | | 262 |
| 11:00 | | 102 | 45 | | | | | | | 147 |
| Total | | 12981 | 13511 | | | | | | | 26492 |
| Percent | | 49.0% | 51.0% | | | | | | | |
| AM Peak | - | 07:00 | 07:00 | - | - | - | - | - | - | 07:00 |
| Vol. | - | 775 | 1528 | - | - | - | - | - | - | 2303 |
| PM Peak | - | 17:00 | 15:00 | - | - | - | - | - | - | 17:00 |
| Vol. | - | 1349 | 1072 | - | - | - | - | - | - | 2283 |
| Grand Total | | 12981 | 13511 | | | | | | | 26492 |
| Percent | | 49.0% | 51.0% | | | | | | | |
| ADT | | ADT 5,378 | | AADT 5,378 | | | | | | |

# All Traffic Data Services

www.alltrafficdata.net



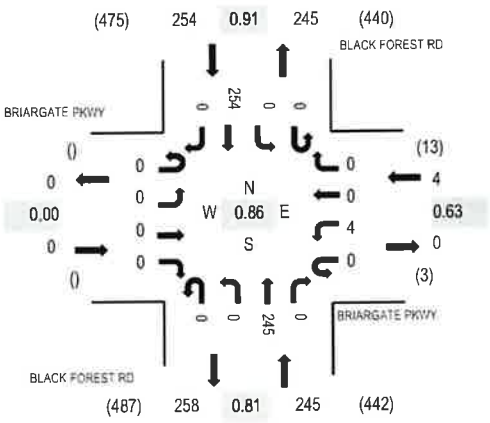
Date Start: 10-Aug-21
Site Code: 10
Station ID: 10
STAPLETON DR E.O. MERIDIAN RD

| Start Time | 10-Aug-21 Tue | EB | WB | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 12:00 AM | | 23 | 9 | | | | | | | 32 |
| 01:00 | | 4 | 3 | | | | | | | 7 |
| 02:00 | | 7 | 6 | | | | | | | 13 |
| 03:00 | | 4 | 12 | | | | | | | 16 |
| 04:00 | | 7 | 43 | | | | | | | 50 |
| 05:00 | | 46 | 102 | | | | | | | 148 |
| 06:00 | | 175 | 316 | | | | | | | 491 |
| 07:00 | | **348** | **622** | | | | | | | **970** |
| 08:00 | | 211 | 294 | | | | | | | 505 |
| 09:00 | | 203 | 261 | | | | | | | 464 |
| 10:00 | | 223 | 290 | | | | | | | 513 |
| 11:00 | | 213 | 265 | | | | | | | 478 |
| 12:00 PM | | 248 | 266 | | | | | | | 514 |
| 01:00 | | 247 | 243 | | | | | | | 490 |
| 02:00 | | 276 | **403** | | | | | | | 679 |
| 03:00 | | **493** | 381 | | | | | | | **874** |
| 04:00 | | 366 | 383 | | | | | | | 749 |
| 05:00 | | 442 | 377 | | | | | | | 819 |
| 06:00 | | 364 | 281 | | | | | | | 645 |
| 07:00 | | 258 | 196 | | | | | | | 454 |
| 08:00 | | 195 | 138 | | | | | | | 333 |
| 09:00 | | 111 | 89 | | | | | | | 200 |
| 10:00 | | 49 | 24 | | | | | | | 73 |
| 11:00 | | 33 | 17 | | | | | | | 50 |
| Total | | 4546 | 5021 | | | | | | | 9567 |
| Percent | | 47.5% | 52.5% | | | | | | | |
| AM Peak | - | 07:00 | 07:00 | - | - | - | - | - | - | 07:00 |
| Vol. | - | 348 | 622 | - | - | - | - | - | - | 970 |
| PM Peak | - | 15:00 | 14:00 | - | - | - | - | - | - | 15:00 |
| Vol. | - | 493 | 403 | - | - | - | - | - | - | 874 |
| Grand Total | | 4546 | 5021 | | | | | | | 9567 |
| Percent | | 47.5% | 52.5% | | | | | | | |
| ADT | | ADT 9,567 | | AADT 9,567 | | | | | | |

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

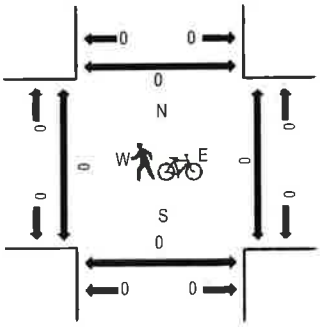
**Location:** 1 BLACK FOREST RD & BRIARGATE PKWY AM
**Date:** Tuesday, August 10, 2021
**Peak Hour:** 07:45 AM - 08:45 AM
**Peak 15-Minutes:** 08:15 AM - 08:30 AM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk



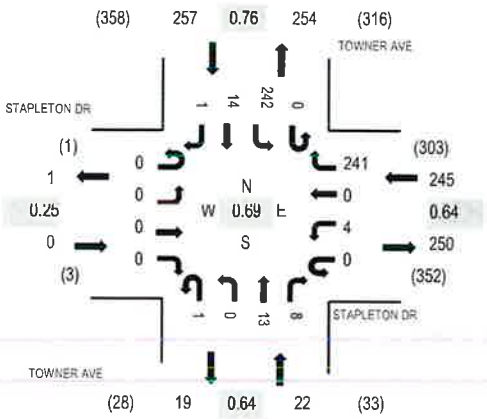

## Traffic Counts

| Interval Start Time | BRIARGATE PKWY Eastbound | | | | BRIARGATE PKWY Westbound | | | | BLACK FOREST RD Northbound | | | | BLACK FOREST RD Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 7:00 AM | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 38 | 1 | 0 | 0 | 50 | 0 | 92 | 438 | 0 | 0 | 0 | 0 |
| 7:15 AM | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 45 | 0 | 0 | 0 | 49 | 0 | 96 | 451 | 0 | 0 | 0 | 0 |
| 7:30 AM | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 60 | 0 | 0 | 0 | 65 | 0 | 129 | 502 | 0 | 0 | 0 | 0 |
| 7:45 AM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 59 | 0 | 0 | 0 | 61 | 0 | 121 | 503 | 0 | 0 | 0 | 0 |
| 8:00 AM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 48 | 0 | 0 | 0 | 56 | 0 | 105 | 492 | 0 | 0 | 0 | 0 |
| 8:15 AM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 76 | 0 | 0 | 0 | 70 | 0 | 147 | | 0 | 0 | 0 | 0 |
| 8:30 AM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 62 | 0 | 0 | 0 | 67 | 0 | 130 | | 0 | 0 | 0 | 0 |
| 8:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52 | 1 | 0 | 1 | 56 | 0 | 110 | | 0 | 0 | 0 | 0 |
| Count Total | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 440 | 2 | 0 | 1 | 474 | 0 | 930 | | 0 | 0 | 0 | 0 |
| Peak Hour | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 245 | 0 | 0 | 0 | 254 | 0 | 503 | | 0 | 0 | 0 | 0 |

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

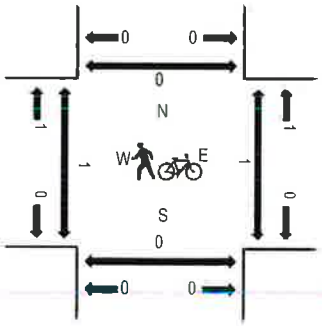
**Location:** 2 TOWNER AVE & STAPLETON DR AM
**Date:** Tuesday, August 10, 2021
**Peak Hour:** 07:00 AM - 08:00 AM
**Peak 15-Minutes:** 07:15 AM - 07:30 AM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk



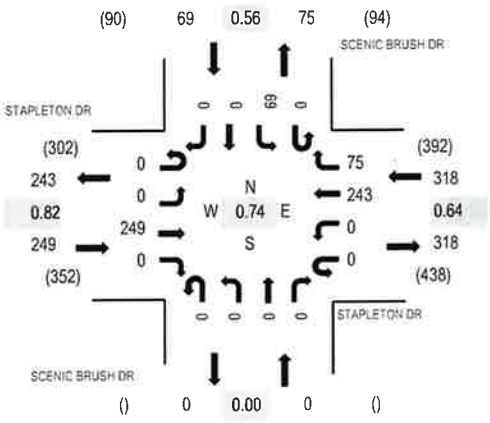

## Traffic Counts

| Interval Start Time | STAPLETON DR Eastbound | | | | STAPLETON DR Westbound | | | | TOWNER AVE Northbound | | | | TOWNER AVE Southbound | | | | Total | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | | | West | East | South | North |
| 7:00 AM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 34 | 0 | 0 | 0 | 4 | 0 | 57 | 3 | 0 | 99 | 524 | 0 | 0 | 0 | 0 |
| 7:15 AM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 95 | 1 | 0 | 7 | 1 | 0 | 74 | 10 | 1 | 190 | 463 | 0 | 1 | 0 | 0 |
| 7:30 AM | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 71 | 0 | 0 | 5 | 0 | 0 | 75 | 1 | 0 | 154 | 312 | 1 | 0 | 0 | 0 |
| 7:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41 | 0 | 0 | 1 | 3 | 0 | 36 | 0 | 0 | 81 | 211 | 0 | 0 | 0 | 0 |
| 8:00 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 2 | 3 | 0 | 20 | 2 | 0 | 38 | 173 | 1 | 0 | 1 | 0 |
| 8:15 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 24 | 1 | 0 | 39 | | 0 | 0 | 0 | 0 |
| 8:30 AM | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 3 | 0 | 28 | 5 | 0 | 53 | | 0 | 0 | 0 | 0 |
| 8:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 0 | 0 | 1 | 2 | 0 | 20 | 1 | 0 | 43 | | 0 | 0 | 0 | 0 |
| Count Total | 0 | 1 | 2 | 0 | 0 | 4 | 0 | 299 | 1 | 0 | 16 | 16 | 0 | 334 | 23 | 1 | 697 | | 2 | 1 | 1 | 0 |
| Peak Hour | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 241 | 1 | 0 | 13 | 8 | 0 | 242 | 14 | 1 | 524 | | 1 | 1 | 0 | 0 |

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

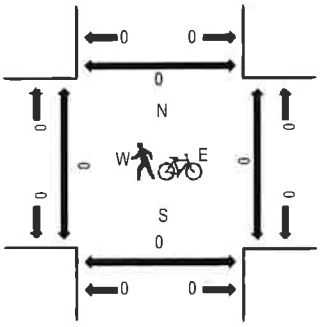
**Location:** 3 SCENIC BRUSH DR & STAPLETON DR AM
**Date:** Tuesday, August 10, 2021
**Peak Hour:** 07:00 AM - 08:00 AM
**Peak 15-Minutes:** 07:15 AM - 07:30 AM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk



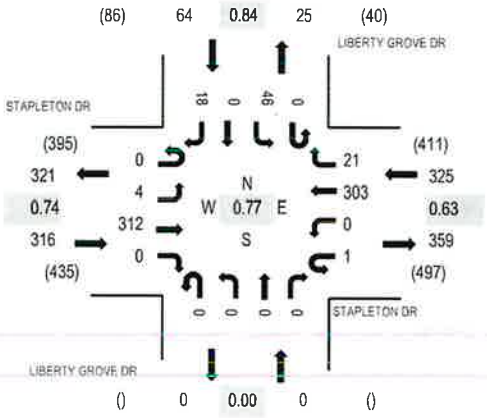

## Traffic Counts

| Interval Start Time | STAPLETON DR Eastbound | | | | STAPLETON DR Westbound | | | | SCENIC BRUSH DR Northbound | | | | SCENIC BRUSH DR Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 7:00 AM | 0 | 0 | 58 | 0 | 0 | 0 | 38 | 9 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 118 | 636 | 0 | 0 | 0 | 0 |
| 7:15 AM | 0 | 0 | 76 | 0 | 0 | 0 | 99 | 25 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 216 | 561 | 0 | 0 | 0 | 0 |
| 7:30 AM | 0 | 0 | 73 | 0 | 0 | 0 | 67 | 32 | 0 | 0 | 0 | 0 | 0 | 31 | 0 | 0 | 203 | 393 | 0 | 0 | 0 | 0 |
| 7:45 AM | 0 | 0 | 42 | 0 | 0 | 0 | 39 | 9 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 99 | 250 | 0 | 0 | 0 | 0 |
| 8:00 AM | 0 | 1 | 20 | 0 | 0 | 0 | 10 | 6 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 1 | 43 | 198 | 0 | 0 | 0 | 0 |
| 8:15 AM | 0 | 0 | 27 | 0 | 0 | 0 | 15 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 48 | | 0 | 0 | 0 | 0 |
| 8:30 AM | 0 | 1 | 31 | 0 | 0 | 0 | 13 | 7 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 1 | 60 | | 0 | 0 | 0 | 0 |
| 8:45 AM | 0 | 0 | 23 | 0 | 0 | 0 | 19 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 47 | | 0 | 0 | 0 | 0 |
| Count Total | 0 | 2 | 350 | 0 | 0 | 0 | 300 | 92 | 0 | 0 | 0 | 0 | 0 | 88 | 0 | 2 | 834 | | 0 | 0 | 0 | 0 |
| Peak Hour | 0 | 0 | 249 | 0 | 0 | 0 | 243 | 75 | 0 | 0 | 0 | 0 | 0 | 69 | 0 | 0 | 636 | | 0 | 0 | 0 | 0 |

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

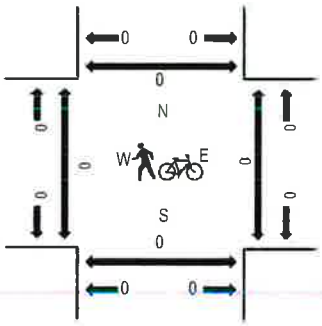
**Location:** 4 LIBERTY GROVE DR & STAPLETON DR AM
**Date:** Tuesday, August 10, 2021
**Peak Hour:** 07:00 AM - 08:00 AM
**Peak 15-Minutes:** 07:15 AM - 07:30 AM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk



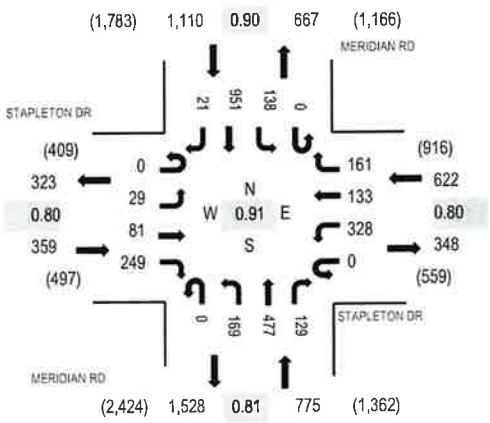

## Traffic Counts

| Interval Start Time | STAPLETON DR Eastbound | | | | STAPLETON DR Westbound | | | | LIBERTY GROVE DR Northbound | | | | LIBERTY GROVE DR Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 7:00 AM | 0 | 1 | 69 | 0 | 0 | 0 | 48 | 4 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 1 | 140 | 705 | 0 | 0 | 0 | 0 |
| 7:15 AM | 0 | 0 | 86 | 0 | 0 | 0 | 126 | 4 | 0 | 0 | 0 | 0 | 0 | 11 | 0 | 3 | 230 | 516 | 0 | 0 | 0 | 0 |
| 7:30 AM | 0 | 1 | 106 | 0 | 1 | 0 | 90 | 3 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 6 | 214 | 442 | 0 | 0 | 0 | 0 |
| 7:45 AM | 0 | 2 | 51 | 0 | 0 | 0 | 39 | 10 | 0 | 0 | 0 | 0 | 0 | 11 | 0 | 8 | 121 | 297 | 0 | 0 | 0 | 0 |
| 8:00 AM | 0 | 1 | 25 | 0 | 0 | 0 | 17 | 3 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 51 | 227 | 0 | 0 | 0 | 2 |
| 8:15 AM | 0 | 0 | 30 | 0 | 0 | 0 | 15 | 6 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 56 | | 0 | 0 | 0 | 0 |
| 8:30 AM | 0 | 0 | 39 | 0 | 0 | 0 | 19 | 3 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 1 | 69 | | 0 | 0 | 0 | 0 |
| 8:45 AM | 0 | 0 | 24 | 0 | 0 | 0 | 21 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 51 | | 0 | 0 | 0 | 0 |
| Count Total | 0 | 5 | 430 | 0 | 1 | 0 | 375 | 35 | 0 | 0 | 0 | 0 | 0 | 66 | 0 | 20 | 932 | | 0 | 0 | 0 | 2 |
| Peak Hour | 0 | 4 | 312 | 0 | 1 | 0 | 303 | 21 | 0 | 0 | 0 | 0 | 0 | 46 | 0 | 18 | 705 | | 0 | 0 | 0 | 0 |

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

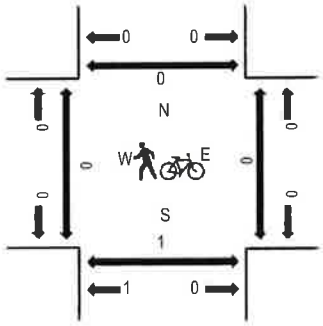
**Location:** 5 MERIDIAN RD & STAPLETON DR AM
**Date:** Tuesday, August 10, 2021
**Peak Hour:** 07:00 AM - 08:00 AM
**Peak 15-Minutes:** 07:30 AM - 07:45 AM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk



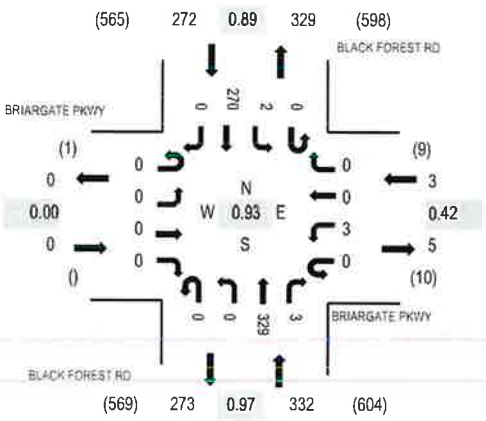

## Traffic Counts

| Interval Start Time | STAPLETON DR Eastbound | | | | STAPLETON DR Westbound | | | | MERIDIAN RD Northbound | | | | MERIDIAN RD Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 7:00 AM | 0 | 2 | 17 | 66 | 0 | 95 | 19 | 27 | 0 | 33 | 76 | 39 | 0 | 21 | 236 | 1 | 632 | 2,866 | 0 | 0 | 1 | 0 |
| 7:15 AM | 0 | 4 | 22 | 71 | 0 | 89 | 57 | 48 | 0 | 65 | 108 | 30 | 0 | 24 | 205 | 12 | 735 | 2,680 | 0 | 0 | 0 | 0 |
| 7:30 AM | 0 | 12 | 35 | 65 | 0 | 81 | 64 | 50 | 0 | 29 | 127 | 27 | 0 | 44 | 262 | 4 | 790 | 2,407 | 0 | 0 | 0 | 0 |
| 7:45 AM | 0 | 11 | 7 | 47 | 0 | 63 | 3 | 36 | 0 | 42 | 166 | 33 | 0 | 49 | 248 | 4 | 709 | 2,052 | 0 | 0 | 0 | 0 |
| 8:00 AM | 0 | 4 | 5 | 21 | 0 | 62 | 2 | 20 | 1 | 16 | 119 | 14 | 0 | 33 | 148 | 1 | 446 | 1,692 | 0 | 0 | 0 | 0 |
| 8:15 AM | 0 | 2 | 9 | 24 | 0 | 29 | 4 | 23 | 0 | 17 | 130 | 30 | 0 | 18 | 175 | 1 | 462 | | 0 | 0 | 0 | 0 |
| 8:30 AM | 0 | 4 | 5 | 35 | 0 | 63 | 4 | 19 | 0 | 20 | 86 | 36 | 0 | 17 | 146 | 0 | 435 | | 0 | 0 | 0 | 0 |
| 8:45 AM | 0 | 2 | 3 | 24 | 0 | 50 | 1 | 17 | 0 | 20 | 73 | 25 | 0 | 16 | 118 | 0 | 349 | | 0 | 0 | 0 | 0 |
| Count Total | 0 | 41 | 103 | 353 | 0 | 532 | 144 | 240 | 1 | 242 | 885 | 234 | 0 | 222 | 1,538 | 23 | 4,558 | | 0 | 0 | 1 | 0 |
| Peak Hour | 0 | 29 | 81 | 249 | 0 | 328 | 133 | 161 | 0 | 169 | 477 | 129 | 0 | 138 | 951 | 21 | 2,866 | | 0 | 0 | 1 | 0 |

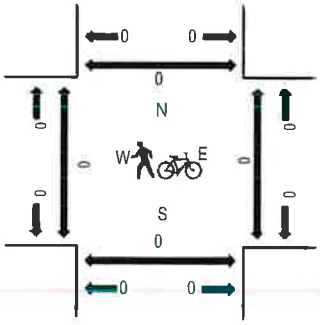
ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

**Location:** 1 BLACK FOREST RD & BRIARGATE PKWY PM
**Date:** Tuesday, August 10, 2021
**Peak Hour:** 04:30 PM - 05:30 PM
**Peak 15-Minutes:** 05:15 PM - 05:30 PM

## Peak Hour - All Vehicles




## Peak Hour - Pedestrians/Bicycles on Crosswalk




Note: Total study counts contained in parentheses.

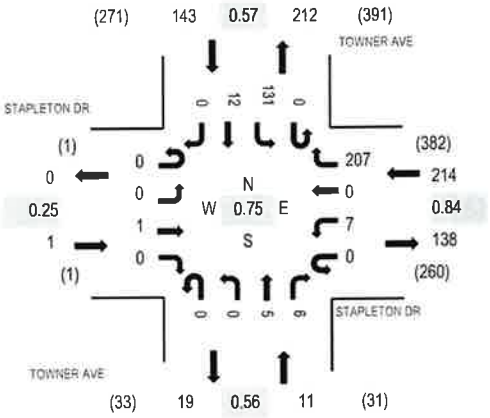
## Traffic Counts

| Interval Start Time | BRIARGATE PKWY Eastbound | | | | BRIARGATE PKWY Westbound | | | | BLACK FOREST RD Northbound | | | | BLACK FOREST RD Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 4:00 PM | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 66 | 0 | 0 | 1 | 76 | 0 | 145 | 587 | 0 | 0 | 0 | 0 |
| 4:15 PM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 73 | 2 | 0 | 0 | 68 | 0 | 144 | 588 | 0 | 0 | 0 | 0 |
| 4:30 PM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 85 | 0 | 0 | 0 | 64 | 0 | 150 | 607 | 0 | 0 | 0 | 0 |
| 4:45 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 85 | 1 | 0 | 0 | 62 | 0 | 148 | 607 | 0 | 0 | 0 | 0 |
| 5:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 82 | 1 | 0 | 0 | 63 | 0 | 146 | 591 | 0 | 0 | 0 | 0 |
| 5:15 PM | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 77 | 1 | 0 | 2 | 81 | 0 | 163 | | 0 | 0 | 0 | 0 |
| 5:30 PM | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 66 | 1 | 0 | 0 | 80 | 0 | 150 | | 0 | 0 | 0 | 0 |
| 5:45 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 0 | 0 | 1 | 67 | 0 | 132 | | 0 | 0 | 0 | 0 |
| Count Total | 0 | 0 | 0 | 0 | 0 | 8 | 1 | 0 | 0 | 0 | 598 | 6 | 0 | 4 | 561 | 0 | 1,178 | | 0 | 0 | 0 | 0 |
| Peak Hour | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 329 | 3 | 0 | 2 | 270 | 0 | 607 | | 0 | 0 | 0 | 0 |

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

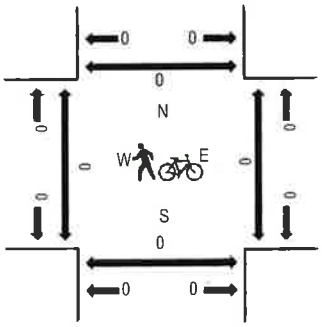
**Location:** 2 TOWNER AVE & STAPLETON DR PM
**Date:** Tuesday, August 10, 2021
**Peak Hour:** 04:45 PM - 05:45 PM
**Peak 15-Minutes:** 05:30 PM - 05:45 PM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk



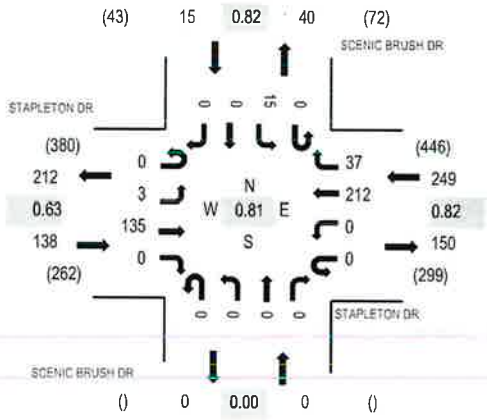

## Traffic Counts

| Interval Start Time | STAPLETON DR Eastbound | | | | STAPLETON DR Westbound | | | | TOWNER AVE Northbound | | | | TOWNER AVE Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 4:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 45 | 0 | 0 | 1 | 1 | 0 | 26 | 4 | 0 | 78 | 319 | 0 | 0 | 0 | 0 |
| 4:15 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41 | 0 | 0 | 2 | 2 | 0 | 25 | 1 | 0 | 71 | 319 | 0 | 0 | 0 | 0 |
| 4:30 PM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 45 | 0 | 0 | 5 | 3 | 0 | 35 | 4 | 0 | 93 | 339 | 0 | 0 | 0 | 0 |
| 4:45 PM | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 45 | 0 | 0 | 2 | 0 | 0 | 25 | 2 | 0 | 77 | 369 | 0 | 0 | 0 | 0 |
| 5:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 46 | 0 | 0 | 0 | 0 | 0 | 29 | 3 | 0 | 78 | 366 | 0 | 0 | 0 | 0 |
| 5:15 PM | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 60 | 0 | 0 | 3 | 5 | 0 | 18 | 1 | 0 | 91 | | 0 | 0 | 0 | 0 |
| 5:30 PM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 56 | 0 | 0 | 0 | 1 | 0 | 59 | 6 | 0 | 123 | | 0 | 0 | 0 | 0 |
| 5:45 PM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 34 | 0 | 0 | 6 | 0 | 0 | 30 | 3 | 0 | 74 | | 0 | 0 | 0 | 0 |
| Count Total | 0 | 0 | 1 | 0 | 0 | 9 | 1 | 372 | 0 | 0 | 19 | 12 | 0 | 247 | 24 | 0 | 685 | | 0 | 0 | 0 | 0 |
| Peak Hour | 0 | 0 | 1 | 0 | 0 | 7 | 0 | 207 | 0 | 0 | 5 | 6 | 0 | 131 | 12 | 0 | 369 | | 0 | 0 | 0 | 0 |

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

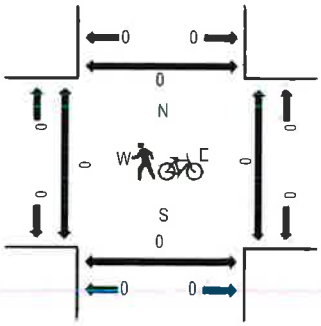
**Location:** 3 SCENIC BRUSH DR & STAPLETON DR PM
**Date:** Tuesday, August 10, 2021
**Peak Hour:** 04:45 PM - 05:45 PM
**Peak 15-Minutes:** 05:30 PM - 05:45 PM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk



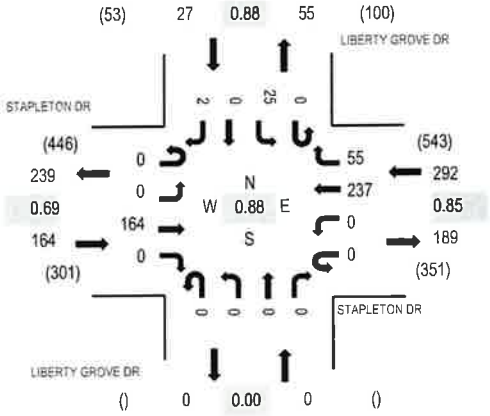

## Traffic Counts

| Interval Start Time | STAPLETON DR Eastbound | | | | STAPLETON DR Westbound | | | | SCENIC BRUSH DR Northbound | | | | SCENIC BRUSH DR Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 4:00 PM | 0 | 0 | 28 | 0 | 0 | 0 | 42 | 7 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 84 | 349 | 0 | 0 | 0 | 0 |
| 4:15 PM | 0 | 1 | 25 | 0 | 0 | 0 | 39 | 11 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 80 | 353 | 0 | 0 | 0 | 0 |
| 4:30 PM | 0 | 1 | 36 | 0 | 0 | 0 | 48 | 5 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 97 | 375 | 0 | 0 | 0 | 0 |
| 4:45 PM | 0 | 1 | 25 | 0 | 0 | 0 | 47 | 10 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 88 | 402 | 0 | 0 | 0 | 0 |
| 5:00 PM | 0 | 0 | 31 | 0 | 0 | 0 | 46 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 88 | 402 | 0 | 0 | 0 | 0 |
| 5:15 PM | 0 | 1 | 22 | 0 | 0 | 0 | 69 | 7 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 102 | | 0 | 0 | 0 | 0 |
| 5:30 PM | 0 | 1 | 57 | 0 | 0 | 0 | 50 | 9 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 124 | | 0 | 0 | 0 | 0 |
| 5:45 PM | 0 | 0 | 33 | 0 | 0 | 0 | 38 | 7 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 88 | | 0 | 0 | 0 | 0 |
| Count Total | 0 | 5 | 257 | 0 | 0 | 0 | 379 | 67 | 0 | 0 | 0 | 0 | 0 | 42 | 0 | 1 | 751 | | 0 | 0 | 0 | 0 |
| Peak Hour | 0 | 3 | 135 | 0 | 0 | 0 | 212 | 37 | 0 | 0 | 0 | 0 | 0 | 15 | 0 | 0 | 402 | | 0 | 0 | 0 | 0 |

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

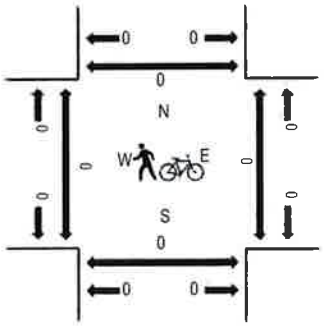
**Location:** 4 LIBERTY GROVE DR & STAPLETON DR PM
**Date:** Tuesday, August 10, 2021
**Peak Hour:** 05:00 PM - 06:00 PM
**Peak 15-Minutes:** 05:30 PM - 05:45 PM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk



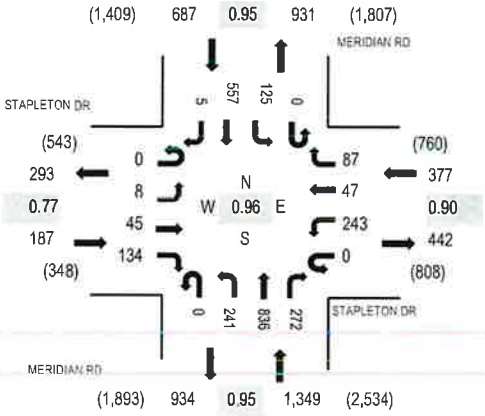

## Traffic Counts

| Interval Start Time | STAPLETON DR Eastbound | | | | STAPLETON DR Westbound | | | | LIBERTY GROVE DR Northbound | | | | LIBERTY GROVE DR Southbound | | | | Total | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | | | West | East | South | North |
| 4:00 PM | 0 | 1 | 35 | 0 | 0 | 0 | 46 | 7 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 93 | 414 | 0 | 0 | 0 | 0 |
| 4:15 PM | 0 | 0 | 26 | 0 | 0 | 0 | 50 | 16 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 98 | 429 | 0 | 0 | 0 | 0 |
| 4:30 PM | 0 | 0 | 43 | 0 | 0 | 0 | 53 | 13 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 117 | 449 | 0 | 0 | 0 | 0 |
| 4:45 PM | 0 | 0 | 32 | 0 | 0 | 0 | 58 | 8 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 106 | 470 | 0 | 0 | 0 | 0 |
| 5:00 PM | 0 | 0 | 31 | 0 | 0 | 0 | 58 | 13 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 108 | 483 | 0 | 0 | 0 | 0 |
| 5:15 PM | 0 | 0 | 26 | 0 | 0 | 0 | 76 | 11 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 118 | | 0 | 0 | 0 | 0 |
| 5:30 PM | 0 | 0 | 59 | 0 | 0 | 0 | 58 | 14 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 1 | 138 | | 0 | 0 | 0 | 0 |
| 5:45 PM | 0 | 0 | 48 | 0 | 0 | 0 | 45 | 17 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 1 | 119 | | 0 | 0 | 0 | 0 |
| Count Total | 0 | 1 | 300 | 0 | 0 | 0 | 444 | 99 | 0 | 0 | 0 | 0 | 0 | 51 | 0 | 2 | 897 | | 0 | 0 | 0 | 0 |
| Peak Hour | 0 | 0 | 164 | 0 | 0 | 0 | 237 | 55 | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 2 | 483 | | 0 | 0 | 0 | 0 |

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

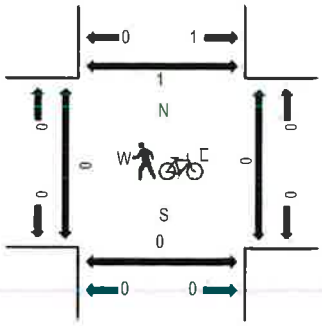
**Location:** 5 MERIDIAN RD & STAPLETON DR PM
**Date:** Tuesday, August 10, 2021
**Peak Hour:** 05:00 PM - 06:00 PM
**Peak 15-Minutes:** 05:30 PM - 05:45 PM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk



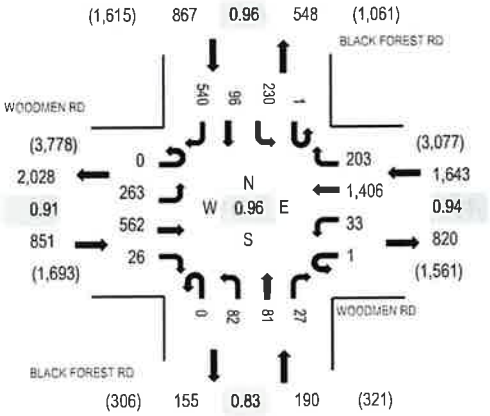

## Traffic Counts

| Interval Start Time | STAPLETON DR Eastbound | | | | STAPLETON DR Westbound | | | | MERIDIAN RD Northbound | | | | MERIDIAN RD Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 4:00 PM | 0 | 1 | 6 | 32 | 0 | 48 | 13 | 27 | 0 | 42 | 171 | 57 | 0 | 29 | 151 | 0 | 577 | 2,451 | 0 | 0 | 0 | 0 |
| 4:15 PM | 0 | 1 | 2 | 29 | 0 | 46 | 12 | 28 | 0 | 58 | 207 | 51 | 0 | 22 | 168 | 1 | 625 | 2,511 | 0 | 0 | 0 | 0 |
| 4:30 PM | 0 | 1 | 10 | 39 | 0 | 57 | 18 | 26 | 0 | 46 | 185 | 58 | 0 | 26 | 156 | 1 | 623 | 2,529 | 0 | 0 | 0 | 0 |
| 4:45 PM | 0 | 4 | 10 | 26 | 0 | 71 | 8 | 29 | 0 | 47 | 196 | 67 | 0 | 28 | 136 | 4 | 626 | 2,583 | 0 | 0 | 0 | 0 |
| 5:00 PM | 0 | 2 | 7 | 26 | 0 | 60 | 7 | 27 | 0 | 64 | 212 | 79 | 0 | 29 | 122 | 2 | 637 | 2,600 | 0 | 0 | 0 | 0 |
| 5:15 PM | 0 | 1 | 10 | 21 | 0 | 49 | 18 | 20 | 0 | 69 | 198 | 57 | 0 | 34 | 164 | 2 | 643 | | 0 | 0 | 0 | 0 |
| 5:30 PM | 0 | 4 | 14 | 43 | 0 | 60 | 13 | 17 | 0 | 58 | 217 | 64 | 0 | 35 | 151 | 1 | 677 | | 0 | 0 | 0 | 1 |
| 5:45 PM | 0 | 1 | 14 | 44 | 0 | 74 | 9 | 23 | 0 | 50 | 209 | 72 | 0 | 27 | 120 | 0 | 643 | | 0 | 0 | 0 | 0 |
| Count Total | 0 | 15 | 73 | 260 | 0 | 465 | 98 | 197 | 0 | 434 | 1,595 | 505 | 0 | 230 | 1,168 | 11 | 5,051 | | 0 | 0 | 0 | 1 |
| Peak Hour | 0 | 8 | 45 | 134 | 0 | 243 | 47 | 87 | 0 | 241 | 836 | 272 | 0 | 125 | 557 | 5 | 2,600 | | 0 | 0 | 0 | 1 |

All Traffic Data Services Inc
(303) 216-2439
www.alltrafficdata.net

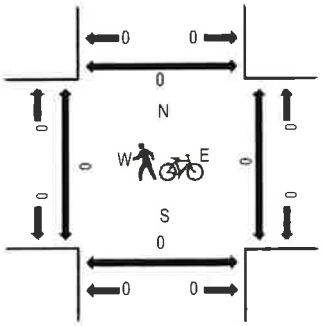
**Location:** 1 BLACK FOREST RD & WOODMEN RD AM
**Date:** Thursday, July 11, 2019
**Peak Hour:** 07:00 AM - 08:00 AM
**Peak 15-Minutes:** 07:45 AM - 08:00 AM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk




## Traffic Counts

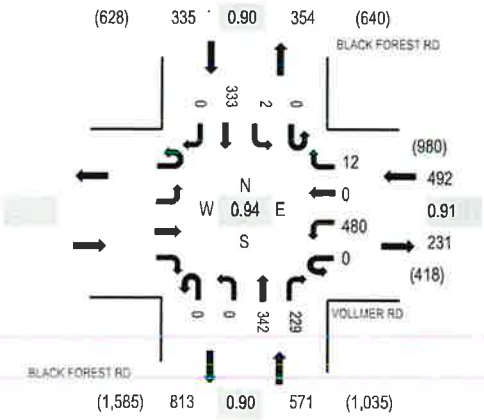
| Interval Start Time | WOODMEN RD Eastbound | | | | WOODMEN RD Westbound | | | | BLACK FOREST RD Northbound | | | | BLACK FOREST RD Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 6:30 AM | 0 | 43 | 129 | 18 | 1 | 4 | 308 | 40 | 0 | 10 | 6 | 3 | 0 | 54 | 17 | 113 | 746 | 3,313 | 0 | 0 | 0 | 0 |
| 6:45 AM | 0 | 68 | 139 | 20 | 1 | 7 | 338 | 36 | 0 | 13 | 19 | 3 | 0 | 59 | 24 | 120 | 847 | 3,473 | 0 | 0 | 0 | 0 |
| 7:00 AM | 0 | 47 | 133 | 9 | 1 | 8 | 321 | 33 | 0 | 16 | 25 | 7 | 1 | 71 | 28 | 112 | 812 | 3,551 | 0 | 0 | 0 | 0 |
| 7:15 AM | 0 | 48 | 151 | 6 | 0 | 9 | 376 | 52 | 0 | 18 | 16 | 5 | 0 | 60 | 23 | 144 | 908 | 3,461 | 0 | 0 | 0 | 0 |
| 7:30 AM | 0 | 82 | 130 | 4 | 0 | 9 | 353 | 55 | 0 | 27 | 15 | 4 | 0 | 57 | 23 | 147 | 906 | 3,393 | 0 | 0 | 0 | 0 |
| 7:45 AM | 0 | 86 | 148 | 7 | 0 | 7 | 356 | 63 | 0 | 21 | 25 | 11 | 0 | 42 | 22 | 137 | 925 | | 0 | 0 | 0 | 0 |
| 8:00 AM | 0 | 74 | 136 | 6 | 0 | 7 | 237 | 51 | 0 | 13 | 24 | 4 | 0 | 32 | 21 | 117 | 722 | | 0 | 0 | 0 | 0 |
| 8:15 AM | 0 | 68 | 134 | 7 | 0 | 4 | 337 | 63 | 0 | 11 | 21 | 4 | 0 | 42 | 16 | 133 | 840 | | 0 | 0 | 0 | 0 |
| Count Total | 0 | 516 | 1,100 | 77 | 3 | 55 | 2,626 | 393 | 0 | 129 | 151 | 41 | 1 | 417 | 174 | 1,023 | 6,706 | | 0 | 0 | 0 | 0 |
| Peak Hour | 0 | 263 | 562 | 26 | 1 | 33 | 1,406 | 203 | 0 | 82 | 81 | 27 | 1 | 230 | 96 | 540 | 3,551 | | 0 | 0 | 0 | 0 |

All Traffic Data Services Inc.

(303) 216-2439
www.alltrafficdata.net

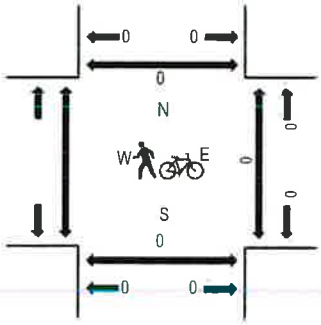
**Location:** 2 BLACK FOREST RD & VOLLMER RD AM
**Date:** Thursday, July 11, 2019
**Peak Hour:** 07:15 AM - 08:15 AM
**Peak 15-Minutes:** 07:30 AM - 07:45 AM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk



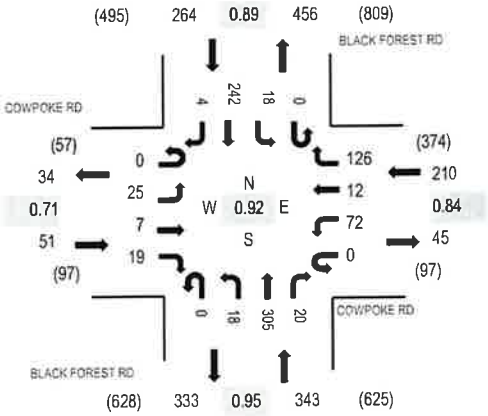

## Traffic Counts

| Interval Start Time | Eastbound | | | | VOLLMER RD Westbound | | | | BLACK FOREST RD Northbound | | | | BLACK FOREST RD Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 6:30 AM | | | | | 0 | 126 | 0 | 2 | 0 | 0 | 54 | 31 | 0 | 1 | 56 | 0 | 270 | 1,245 | 0 | 0 | 0 | 0 |
| 6:45 AM | | | | | 0 | 114 | 0 | 2 | 0 | 0 | 67 | 54 | 0 | 0 | 85 | 0 | 322 | 1,347 | 0 | 0 | 0 | 0 |
| 7:00 AM | | | | | 0 | 129 | 0 | 1 | 0 | 0 | 64 | 40 | 0 | 0 | 71 | 0 | 305 | 1,388 | 0 | 0 | 0 | 0 |
| 7:15 AM | | | | | 0 | 142 | 0 | 2 | 0 | 0 | 73 | 41 | 0 | 1 | 89 | 0 | 348 | 1,398 | 0 | 0 | 0 | 0 |
| 7:30 AM | | | | | 0 | 132 | 0 | 5 | 0 | 0 | 92 | 59 | 0 | 0 | 84 | 0 | 372 | 1,388 | 0 | 0 | 0 | 0 |
| 7:45 AM | | | | | 0 | 98 | 0 | 2 | 0 | 0 | 95 | 74 | 0 | 0 | 94 | 0 | 363 | | 0 | 0 | 0 | 0 |
| 8:00 AM | | | | | 0 | 108 | 0 | 3 | 0 | 0 | 82 | 55 | 0 | 1 | 66 | 0 | 315 | | 0 | 0 | 0 | 0 |
| 8:15 AM | | | | | 0 | 111 | 0 | 3 | 0 | 0 | 93 | 61 | 0 | 0 | 80 | 0 | 348 | | 0 | 0 | 0 | 0 |
| Count Total | | | | | 0 | 960 | 0 | 20 | 0 | 0 | 620 | 415 | 0 | 3 | 625 | 0 | 2,643 | | 0 | 0 | 0 | 0 |
| Peak Hour | | | | | 0 | 480 | 0 | 12 | 0 | 0 | 342 | 229 | 0 | 2 | 333 | 0 | 1,398 | | 0 | 0 | 0 | 0 |

All Traffic Data Services Inc.
(303) 216-2439
www.alltrafficdata.net

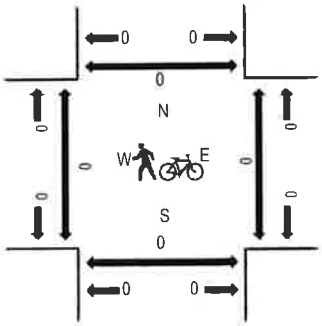
**Location:** 3 BLACK FOREST RD & COWPOKE RD AM
**Date:** Thursday, July 11, 2019
**Peak Hour:** 07:15 AM - 08:15 AM
**Peak 15-Minutes:** 07:45 AM - 08:00 AM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk



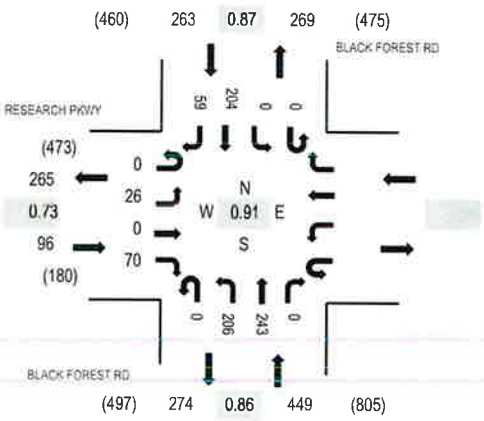

## Traffic Counts

| Interval Start Time | COWPOKE RD Eastbound | | | | COWPOKE RD Westbound | | | | BLACK FOREST RD Northbound | | | | BLACK FOREST RD Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 6:30 AM | 0 | 6 | 0 | 5 | 0 | 18 | 4 | 23 | 0 | 2 | 48 | 7 | 0 | 2 | 37 | 1 | 153 | 724 | 0 | 0 | 0 | 0 |
| 6:45 AM | 0 | 7 | 0 | 8 | 0 | 23 | 2 | 18 | 0 | 2 | 57 | 6 | 0 | 8 | 53 | 0 | 184 | 801 | 0 | 0 | 0 | 0 |
| 7:00 AM | 0 | 5 | 0 | 6 | 0 | 19 | 0 | 21 | 0 | 0 | 60 | 8 | 0 | 5 | 51 | 2 | 177 | 854 | 0 | 0 | 0 | 0 |
| 7:15 AM | 0 | 2 | 0 | 9 | 0 | 21 | 4 | 39 | 0 | 1 | 65 | 6 | 0 | 3 | 60 | 0 | 210 | 868 | 0 | 0 | 0 | 0 |
| 7:30 AM | 0 | 4 | 1 | 4 | 0 | 18 | 3 | 36 | 0 | 5 | 89 | 2 | 0 | 3 | 63 | 2 | 230 | 867 | 0 | 0 | 0 | 0 |
| 7:45 AM | 0 | 10 | 2 | 6 | 0 | 18 | 1 | 34 | 0 | 8 | 76 | 5 | 0 | 7 | 68 | 2 | 237 | | 0 | 0 | 0 | 0 |
| 8:00 AM | 0 | 9 | 4 | 0 | 0 | 15 | 4 | 17 | 0 | 4 | 75 | 7 | 0 | 5 | 51 | 0 | 191 | | 0 | 0 | 0 | 0 |
| 8:15 AM | 0 | 3 | 1 | 5 | 0 | 12 | 2 | 22 | 0 | 4 | 83 | 5 | 0 | 10 | 58 | 4 | 209 | | 0 | 0 | 0 | 0 |
| Count Total | 0 | 46 | 8 | 43 | 0 | 144 | 20 | 210 | 0 | 26 | 553 | 46 | 0 | 43 | 441 | 11 | 1,591 | | 0 | 0 | 0 | 0 |
| Peak Hour | 0 | 25 | 7 | 19 | 0 | 72 | 12 | 126 | 0 | 18 | 305 | 20 | 0 | 18 | 242 | 4 | 868 | | 0 | 0 | 0 | 0 |

All Traffic Data Services Inc.
(303) 216-2439
www.alltrafficdata.net

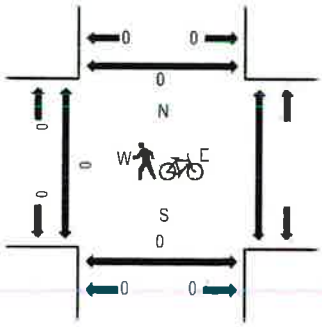
**Location:** 4 BLACK FOREST RD & RESEARCH PKWY AM
**Date:** Thursday, July 11, 2019
**Peak Hour:** 07:30 AM - 08:30 AM
**Peak 15-Minutes:** 07:30 AM - 07:45 AM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk




## Traffic Counts

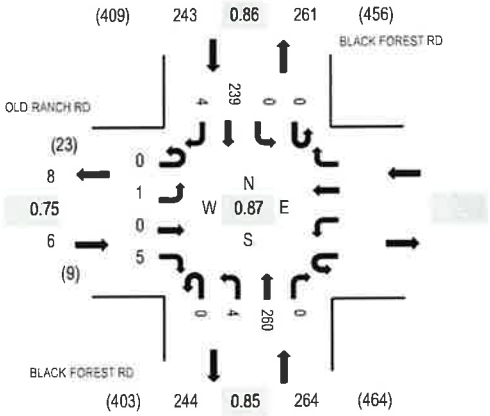
| Interval Start Time | RESEARCH PKWY Eastbound | | | | RESEARCH PKWY Westbound | | | | BLACK FOREST RD Northbound | | | | BLACK FOREST RD Southbound | | | | Total | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | | | West | East | South | North |
| 6:30 AM | 0 | 3 | 0 | 11 | | | | | 0 | 38 | 40 | 0 | 0 | 0 | 30 | 10 | 132 | 637 | 0 | | 0 | 0 |
| 6:45 AM | 0 | 3 | 0 | 22 | | | | | 0 | 37 | 47 | 0 | 0 | 0 | 37 | 9 | 155 | 726 | 0 | | 0 | 0 |
| 7:00 AM | 0 | 4 | 0 | 19 | | | | | 0 | 39 | 49 | 0 | 0 | 0 | 42 | 10 | 163 | 785 | 0 | | 0 | 0 |
| 7:15 AM | 0 | 9 | 0 | 13 | | | | | 0 | 55 | 51 | 0 | 0 | 0 | 49 | 10 | 187 | 790 | 0 | | 0 | 0 |
| 7:30 AM | 0 | 4 | 0 | 12 | | | | | 0 | 69 | 62 | 0 | 0 | 0 | 58 | 16 | 221 | 808 | 0 | | 0 | 0 |
| 7:45 AM | 0 | 8 | 0 | 15 | | | | | 0 | 54 | 61 | 0 | 0 | 0 | 55 | 21 | 214 | | 0 | | 0 | 0 |
| 8:00 AM | 0 | 6 | 0 | 18 | | | | | 0 | 46 | 48 | 0 | 0 | 0 | 42 | 8 | 168 | | 0 | | 0 | 0 |
| 8:15 AM | 0 | 8 | 0 | 25 | | | | | 0 | 37 | 72 | 0 | 0 | 0 | 49 | 14 | 205 | | 0 | | 0 | 0 |
| Count Total | 0 | 45 | 0 | 135 | | | | | 0 | 375 | 430 | 0 | 0 | 0 | 362 | 98 | 1,445 | | 0 | | 0 | 0 |
| Peak Hour | 0 | 26 | 0 | 70 | | | | | 0 | 206 | 243 | 0 | 0 | 0 | 204 | 59 | 808 | | 0 | | 0 | 0 |

All Traffic Data Services Inc.

(303) 216-2439
www.alltrafficdata.net

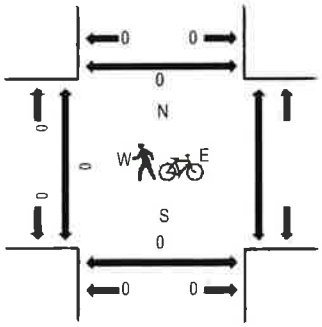
**Location:** 5 BLACK FOREST RD & OLD RANCH RD AM
**Date:** Thursday, July 11, 2019
**Peak Hour:** 07:30 AM - 08:30 AM
**Peak 15-Minutes:** 07:45 AM - 08:00 AM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk




## Traffic Counts

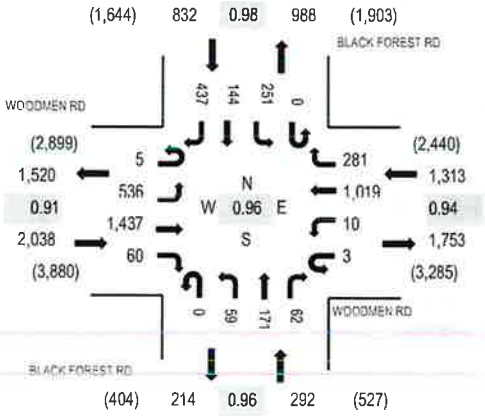
| Interval Start Time | OLD RANCH RD Eastbound | | | | Westbound | | | | BLACK FOREST RD Northbound | | | | BLACK FOREST RD Southbound | | | | Total | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | | | West | East | South | North |
| 6:30 AM | 0 | 1 | 0 | 0 | | | | | 0 | 2 | 41 | 0 | 0 | 0 | 37 | 2 | 83 | 369 | 0 | | 0 | 0 |
| 6:45 AM | 0 | 0 | 0 | 0 | | | | | 0 | 2 | 45 | 0 | 0 | 0 | 32 | 6 | 85 | 412 | 0 | | 0 | 0 |
| 7:00 AM | 0 | 1 | 0 | 0 | | | | | 0 | 1 | 52 | 0 | 0 | 0 | 37 | 0 | 91 | 475 | 0 | | 0 | 0 |
| 7:15 AM | 0 | 0 | 0 | 1 | | | | | 0 | 2 | 55 | 0 | 0 | 0 | 52 | 0 | 110 | 480 | 0 | | 0 | 0 |
| 7:30 AM | 0 | 0 | 0 | 2 | | | | | 0 | 0 | 53 | 0 | 0 | 0 | 71 | 0 | 126 | 513 | 0 | | 0 | 0 |
| 7:45 AM | 0 | 1 | 0 | 1 | | | | | 0 | 3 | 72 | 0 | 0 | 0 | 70 | 1 | 148 | | 0 | | 0 | 0 |
| 8:00 AM | 0 | 0 | 0 | 1 | | | | | 0 | 1 | 57 | 0 | 0 | 0 | 36 | 1 | 96 | | 0 | | 0 | 0 |
| 8:15 AM | 0 | 0 | 0 | 1 | | | | | 0 | 0 | 78 | 0 | 0 | 0 | 62 | 2 | 143 | | 0 | | 0 | 0 |
| Count Total | 0 | 3 | 0 | 6 | | | | | 0 | 11 | 453 | 0 | 0 | 0 | 397 | 12 | 882 | | 0 | | 0 | 0 |
| Peak Hour | 0 | 1 | 0 | 5 | | | | | 0 | 4 | 260 | 0 | 0 | 0 | 239 | 4 | 513 | | 0 | | 0 | 0 |

All Traffic Data Services Inc

(303) 216-2439
www.alltrafficdata.net

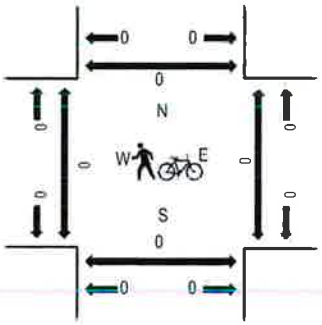
**Location:** 1 BLACK FOREST RD & WOODMEN RD PM
**Date:** Thursday, July 11, 2019
**Peak Hour:** 04:30 PM - 05:30 PM
**Peak 15-Minutes:** 04:45 PM - 05:00 PM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk




## Traffic Counts

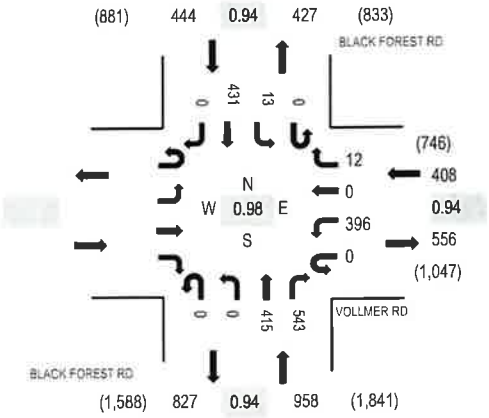
| Interval Start Time | WOODMEN RD Eastbound | | | | WOODMEN RD Westbound | | | | BLACK FOREST RD Northbound | | | | BLACK FOREST RD Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 4:30 PM | 2 | 135 | 330 | 17 | 1 | 4 | 260 | 66 | 0 | 18 | 50 | 8 | 0 | 53 | 28 | 102 | 1,074 | 4,475 | 0 | 0 | 0 | 0 |
| 4:45 PM | 0 | 135 | 407 | 16 | 0 | 2 | 246 | 72 | 0 | 11 | 39 | 23 | 0 | 63 | 37 | 114 | 1,165 | 4,451 | 0 | 0 | 0 | 0 |
| 5:00 PM | 1 | 130 | 328 | 12 | 0 | 1 | 276 | 73 | 0 | 18 | 40 | 16 | 0 | 70 | 39 | 104 | 1,108 | 4,412 | 0 | 0 | 0 | 0 |
| 5:15 PM | 2 | 136 | 372 | 15 | 2 | 3 | 237 | 70 | 0 | 12 | 42 | 15 | 0 | 65 | 40 | 117 | 1,128 | 4,263 | 0 | 0 | 0 | 0 |
| 5:30 PM | 1 | 122 | 329 | 11 | 1 | 4 | 251 | 54 | 0 | 15 | 40 | 6 | 0 | 58 | 38 | 120 | 1,050 | 4,016 | 0 | 0 | 0 | 0 |
| 5:45 PM | 0 | 132 | 377 | 20 | 0 | 4 | 234 | 65 | 0 | 9 | 55 | 10 | 0 | 66 | 26 | 128 | 1,126 | | 0 | 0 | 0 | 0 |
| 6:00 PM | 1 | 117 | 288 | 19 | 3 | 3 | 192 | 58 | 0 | 6 | 44 | 4 | 0 | 70 | 28 | 126 | 959 | | 0 | 0 | 0 | 0 |
| 6:15 PM | 1 | 136 | 274 | 14 | 1 | 2 | 196 | 59 | 0 | 7 | 33 | 6 | 0 | 39 | 21 | 92 | 881 | | 0 | 0 | 0 | 0 |
| Count Total | 8 | 1,043 | 2,705 | 124 | 8 | 23 | 1,892 | 517 | 0 | 96 | 343 | 88 | 0 | 484 | 257 | 903 | 8,491 | | 0 | 0 | 0 | 0 |
| Peak Hour | 5 | 536 | 1,437 | 60 | 3 | 10 | 1,019 | 281 | 0 | 59 | 171 | 62 | 0 | 251 | 144 | 437 | 4,475 | | 0 | 0 | 0 | 0 |

All Traffic Data Services Inc

(303) 216-2439
www.alltrafficdata.net

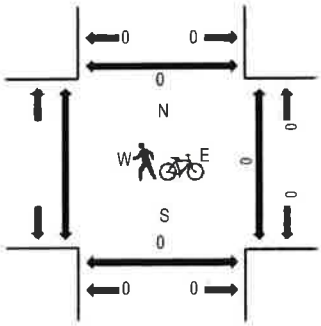
**Location:** 2 BLACK FOREST RD & VOLLMER RD PM
**Date:** Thursday, July 11, 2019
**Peak Hour:** 04:30 PM - 05:30 PM
**Peak 15-Minutes:** 05:00 PM - 05:15 PM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk



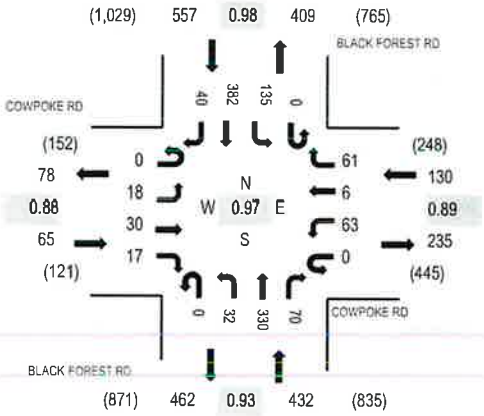

## Traffic Counts

| Interval Start Time | Eastbound | | | | VOLLMER RD Westbound | | | | BLACK FOREST RD Northbound | | | | BLACK FOREST RD Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 4:30 PM | | | | | 0 | 94 | 0 | 3 | 0 | 0 | 110 | 144 | 0 | 4 | 99 | 0 | 454 | 1,810 | | 0 | 0 | 0 |
| 4:45 PM | | | | | 0 | 97 | 0 | 1 | 0 | 0 | 100 | 140 | 0 | 3 | 113 | 0 | 454 | 1,776 | | 0 | 0 | 0 |
| 5:00 PM | | | | | 0 | 102 | 0 | 6 | 0 | 0 | 107 | 134 | 0 | 4 | 108 | 0 | 461 | 1,774 | | 0 | 0 | 0 |
| 5:15 PM | | | | | 0 | 103 | 0 | 2 | 0 | 0 | 98 | 125 | 0 | 2 | 111 | 0 | 441 | 1,735 | | 0 | 0 | 0 |
| 5:30 PM | | | | | 0 | 76 | 0 | 2 | 0 | 0 | 108 | 115 | 0 | 1 | 118 | 0 | 420 | 1,658 | | 0 | 0 | 0 |
| 5:45 PM | | | | | 0 | 94 | 0 | 4 | 0 | 0 | 101 | 133 | 0 | 2 | 118 | 0 | 452 | | | 0 | 0 | 0 |
| 6:00 PM | | | | | 0 | 84 | 0 | 1 | 0 | 0 | 104 | 106 | 0 | 2 | 125 | 0 | 422 | | | 0 | 0 | 0 |
| 6:15 PM | | | | | 0 | 75 | 0 | 2 | 0 | 0 | 84 | 132 | 0 | 0 | 71 | 0 | 364 | | | 0 | 0 | 0 |
| Count Total | | | | | 0 | 725 | 0 | 21 | 0 | 0 | 812 | 1,029 | 0 | 18 | 863 | 0 | 3,468 | | | 0 | 0 | 0 |
| Peak Hour | | | | | 0 | 396 | 0 | 12 | 0 | 0 | 415 | 543 | 0 | 13 | 431 | 0 | 1,810 | | | 0 | 0 | 0 |

All Traffic Data Services Inc.
(303) 216-2439
www.alltrafficdata.net

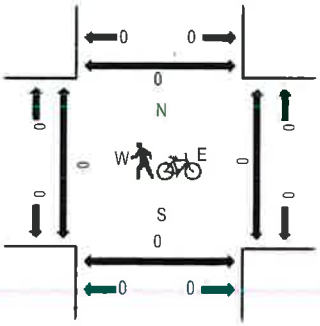
**Location:** 3 BLACK FOREST RD & COWPOKE RD PM
**Date:** Thursday, July 11, 2019
**Peak Hour:** 05:00 PM - 06:00 PM
**Peak 15-Minutes:** 05:45 PM - 06:00 PM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk




## Traffic Counts

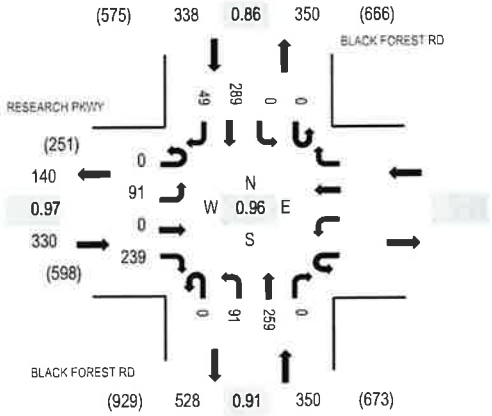
| Interval Start Time | COWPOKE RD Eastbound | | | | COWPOKE RD Westbound | | | | BLACK FOREST RD Northbound | | | | BLACK FOREST RD Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 4:30 PM | 0 | 2 | 3 | 3 | 0 | 13 | 1 | 12 | 0 | 8 | 79 | 27 | 0 | 23 | 98 | 14 | 283 | 1,152 | 0 | 0 | 0 | 0 |
| 4:45 PM | 0 | 8 | 10 | 3 | 0 | 19 | 1 | 14 | 0 | 10 | 76 | 15 | 0 | 33 | 88 | 6 | 283 | 1,162 | 0 | 0 | 0 | 0 |
| 5:00 PM | 0 | 6 | 7 | 7 | 0 | 19 | 2 | 12 | 0 | 10 | 80 | 19 | 0 | 36 | 85 | 14 | 297 | 1,184 | 0 | 0 | 0 | 0 |
| 5:15 PM | 0 | 5 | 7 | 4 | 0 | 14 | 0 | 11 | 0 | 5 | 81 | 20 | 0 | 40 | 94 | 8 | 289 | 1,175 | 0 | 0 | 0 | 0 |
| 5:30 PM | 0 | 5 | 9 | 3 | 0 | 13 | 3 | 19 | 0 | 5 | 81 | 15 | 0 | 34 | 100 | 6 | 293 | 1,081 | 0 | 0 | 0 | 0 |
| 5:45 PM | 0 | 2 | 7 | 3 | 0 | 17 | 1 | 19 | 0 | 12 | 88 | 16 | 0 | 25 | 103 | 12 | 305 | | 0 | 0 | 0 | 0 |
| 6:00 PM | 0 | 7 | 4 | 2 | 0 | 23 | 2 | 9 | 0 | 10 | 78 | 20 | 0 | 35 | 88 | 10 | 288 | | 0 | 0 | 0 | 0 |
| 6:15 PM | 0 | 7 | 4 | 3 | 0 | 16 | 1 | 7 | 0 | 3 | 57 | 20 | 0 | 16 | 53 | 8 | 195 | | 0 | 0 | 0 | 0 |
| Count Total | 0 | 42 | 51 | 28 | 0 | 134 | 11 | 103 | 0 | 63 | 620 | 152 | 0 | 242 | 709 | 78 | 2,233 | | 0 | 0 | 0 | 0 |
| Peak Hour | 0 | 18 | 30 | 17 | 0 | 63 | 6 | 61 | 0 | 32 | 330 | 70 | 0 | 135 | 382 | 40 | 1,164 | | 0 | 0 | 0 | 0 |

All Traffic Data Services Inc

(303) 216-2439
www.alltrafficdata.net

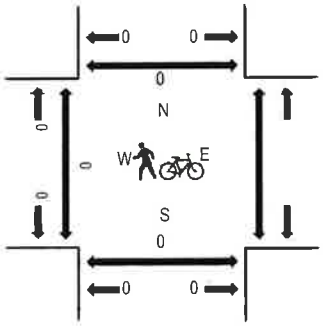
**Location:** 4 BLACK FOREST RD & RESEARCH PKWY PM
**Date:** Thursday, July 11, 2019
**Peak Hour:** 05:00 PM - 06:00 PM
**Peak 15-Minutes:** 05:30 PM - 05:45 PM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk



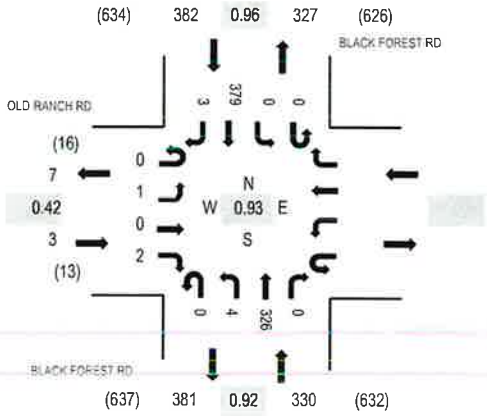

## Traffic Counts

| Interval Start Time | RESEARCH PKWY Eastbound | | | | Westbound | | | | BLACK FOREST RD Northbound | | | | BLACK FOREST RD Southbound | | | | | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | Total | | West | East | South | North |
| 4:30 PM | 0 | 23 | 0 | 40 | | | | | 0 | 25 | 65 | 0 | 0 | 0 | 68 | 5 | 226 | 956 | 0 | | 0 | 0 |
| 4:45 PM | 0 | 22 | 0 | 60 | | | | | 0 | 24 | 57 | 0 | 0 | 0 | 53 | 3 | 219 | 996 | 0 | | 0 | 0 |
| 5:00 PM | 0 | 27 | 0 | 56 | | | | | 0 | 27 | 70 | 0 | 0 | 0 | 63 | 11 | 254 | 1,018 | 0 | | 0 | 0 |
| 5:15 PM | 0 | 15 | 0 | 70 | | | | | 0 | 26 | 58 | 0 | 0 | 0 | 76 | 12 | 257 | 957 | 0 | | 0 | 0 |
| 5:30 PM | 0 | 29 | 0 | 51 | | | | | 0 | 22 | 66 | 0 | 0 | 0 | 68 | 10 | 266 | 880 | 0 | | 0 | 0 |
| 5:45 PM | 0 | 20 | 0 | 62 | | | | | 0 | 16 | 65 | 0 | 0 | 0 | 62 | 16 | 241 | | 0 | | 0 | 0 |
| 6:00 PM | 0 | 23 | 0 | 46 | | | | | 0 | 21 | 56 | 0 | 0 | 0 | 40 | 7 | 193 | | 0 | | 0 | 0 |
| 6:15 PM | 0 | 13 | 0 | 41 | | | | | 0 | 18 | 57 | 0 | 0 | 0 | 53 | 8 | 190 | | 0 | | 0 | 0 |
| Count Total | 0 | 172 | 0 | 426 | | | | | 0 | 179 | 494 | 0 | 0 | 0 | 503 | 72 | 1,846 | | 0 | | 0 | 0 |
| Peak Hour | 0 | 91 | 0 | 239 | | | | | 0 | 91 | 259 | 0 | 0 | 0 | 289 | 49 | 1,018 | | 0 | | 0 | 0 |

All Traffic Data
Services Inc.
(303) 216-2439
www.alltrafficdata.net

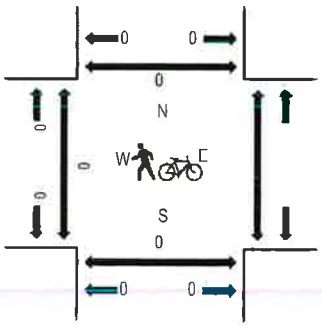
**Location:** 5 BLACK FOREST RD & OLD RANCH RD PM
**Date:** Thursday, July 11, 2019
**Peak Hour:** 05:00 PM - 06:00 PM
**Peak 15-Minutes:** 05:45 PM - 06:00 PM

## Peak Hour - All Vehicles




Note: Total study counts contained in parentheses.

## Peak Hour - Pedestrians/Bicycles on Crosswalk




## Traffic Counts

| Interval Start Time | OLD RANCH RD Eastbound | | | | Westbound | | | | BLACK FOREST RD Northbound | | | | BLACK FOREST RD Southbound | | | | Total | Rolling Hour | Pedestrian Crossings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | U-Turn | Left | Thru | Right | | | West | East | South | North |
| 4:30 PM | 0 | 0 | 0 | 1 | | | | | 0 | 1 | 71 | 0 | 0 | 0 | 62 | 1 | 136 | 646 | 0 | | 0 | 0 |
| 4:45 PM | 0 | 2 | 0 | 4 | | | | | 0 | 1 | 87 | 0 | 0 | 0 | 76 | 0 | 170 | 693 | 0 | | 0 | 0 |
| 5:00 PM | 0 | 1 | 0 | 0 | | | | | 0 | 0 | 73 | 0 | 0 | 0 | 91 | 0 | 165 | 715 | 0 | | 0 | 0 |
| 5:15 PM | 0 | 0 | 0 | 2 | | | | | 0 | 1 | 79 | 0 | 0 | 0 | 91 | 2 | 175 | 692 | 0 | | 0 | 0 |
| 5:30 PM | 0 | 0 | 0 | 0 | | | | | 0 | 2 | 83 | 0 | 0 | 0 | 97 | 1 | 183 | 633 | 0 | | 0 | 0 |
| 5:45 PM | 0 | 0 | 0 | 0 | | | | | 0 | 1 | 91 | 0 | 0 | 0 | 100 | 0 | 192 | | 0 | | 0 | 0 |
| 6:00 PM | 0 | 0 | 0 | 1 | | | | | 0 | 3 | 77 | 0 | 0 | 0 | 59 | 2 | 142 | | 0 | | 0 | 0 |
| 6:15 PM | 0 | 1 | 0 | 1 | | | | | 0 | 1 | 61 | 0 | 0 | 0 | 52 | 0 | 116 | | 0 | | 0 | 0 |
| Count Total | 0 | 4 | 0 | 9 | | | | | 0 | 10 | 622 | 0 | 0 | 0 | 628 | 6 | 1,279 | | 0 | | 0 | 0 |
| Peak Hour | 0 | 1 | 0 | 2 | | | | | 0 | 4 | 326 | 0 | 0 | 0 | 379 | 3 | 715 | | 0 | | 0 | 0 |

# Attachment B – Synchro Reports

# Existing Conditions LOS Analysis Reports

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 5 | 0 | 245 | 0 | 0 | 255 |
| Future Vol, veh/h | 5 | 0 | 245 | 0 | 0 | 255 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 5 | 0 | 266 | 0 | 0 | 277 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 543 | 266 | 0 | 0 | 266 | 0 |
| Stage 1 | 266 | - | - | - | - | - |
| Stage 2 | 277 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | - | - | 4.12 | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | - | - | 2.218 | - |
| Pot Cap-1 Maneuver | 501 | 773 | - | - | 1298 | - |
| Stage 1 | 779 | - | - | - | - | - |
| Stage 2 | 770 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 501 | 773 | - | - | 1298 | - |
| Mov Cap-2 Maneuver | 501 | - | - | - | - | - |
| Stage 1 | 779 | - | - | - | - | - |
| Stage 2 | 770 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 12.3 | 0 | 0 |
| HCM LOS | B | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | SBL | SBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 501 | 1298 | - |
| HCM Lane V/C Ratio | - | - | 0.011 | - | - |
| HCM Control Delay (s) | - | - | 12.3 | 0 | - |
| HCM Lane LOS | - | - | B | A | - |
| HCM 95th %tile Q(veh) | - | - | 0 | 0 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 9.6 |
| Intersection LOS | A |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 5 | 240 | 15 | 10 | 240 | 15 |
| Future Vol, veh/h | 5 | 240 | 15 | 10 | 240 | 15 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 5 | 261 | 16 | 11 | 261 | 16 |
| Number of Lanes | 1 | 0 | 1 | 0 | 0 | 1 |

| Approach | WB | NB | SB |
|---|---|---|---|
| Opposing Approach | | SB | NB |
| Opposing Lanes | 0 | 1 | 1 |
| Conflicting Approach Left | NB | | WB |
| Conflicting Lanes Left | 1 | 0 | 1 |
| Conflicting Approach Right | SB | WB | |
| Conflicting Lanes Right | 1 | 1 | 0 |
| HCM Control Delay | 8.9 | 7.8 | 10.4 |
| HCM LOS | A | A | B |

| Lane | NBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|
| Vol Left, % | 0% | 2% | 94% |
| Vol Thru, % | 60% | 0% | 6% |
| Vol Right, % | 40% | 98% | 0% |
| Sign Control | Stop | Stop | Stop |
| Traffic Vol by Lane | 25 | 245 | 255 |
| LT Vol | 0 | 5 | 240 |
| Through Vol | 15 | 0 | 15 |
| RT Vol | 10 | 240 | 0 |
| Lane Flow Rate | 27 | 266 | 277 |
| Geometry Grp | 1 | 1 | 1 |
| Degree of Util (X) | 0.035 | 0.303 | 0.363 |
| Departure Headway (Hd) | 4.595 | 4.097 | 4.719 |
| Convergence, Y/N | Yes | Yes | Yes |
| Cap | 776 | 879 | 762 |
| Service Time | 2.639 | 2.116 | 2.755 |
| HCM Lane V/C Ratio | 0.035 | 0.303 | 0.364 |
| HCM Control Delay | 7.8 | 8.9 | 10.4 |
| HCM Lane LOS | A | A | B |
| HCM 95th-tile Q | 0.1 | 1.3 | 1.7 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.5 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 0 | 250 | 245 | 80 | 70 | 0 |
| Future Vol, veh/h | 0 | 250 | 245 | 80 | 70 | 0 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | 285 | 0 | - |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 272 | 266 | 87 | 76 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 353 | 0 | - | 0 | 538 | 266 |
| Stage 1 | - | - | - | - | 266 | - |
| Stage 2 | - | - | - | - | 272 | - |
| Critical Hdwy | 4.12 | - | - | - | 6.42 | 6.22 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.42 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.42 | - |
| Follow-up Hdwy | 2.218 | - | - | - | 3.518 | 3.318 |
| Pot Cap-1 Maneuver | 1206 | - | - | - | 504 | 773 |
| Stage 1 | - | - | - | - | 779 | - |
| Stage 2 | - | - | - | - | 774 | - |
| Platoon blocked, % | | | - | - | - | |
| Mov Cap-1 Maneuver | 1206 | - | - | - | 504 | 773 |
| Mov Cap-2 Maneuver | - | - | - | - | 504 | - |
| Stage 1 | - | - | - | - | 779 | - |
| Stage 2 | - | - | - | - | 774 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 13.4 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1206 | - | - | - | 504 |
| HCM Lane V/C Ratio | - | - | - | - | 0.151 |
| HCM Control Delay (s) | 0 | - | - | - | 13.4 |
| HCM Lane LOS | A | - | - | - | B |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.5 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.3 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 5 | 315 | 305 | 20 | 45 | 20 |
| Future Vol, veh/h | 5 | 315 | 305 | 20 | 45 | 20 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | 115 | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 5 | 342 | 332 | 22 | 49 | 22 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 354 | 0 | - | 0 | 684 | 332 |
| Stage 1 | - | - | - | - | 332 | - |
| Stage 2 | - | - | - | - | 352 | - |
| Critical Hdwy | 4.12 | - | - | - | 6.42 | 6.22 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.42 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.42 | - |
| Follow-up Hdwy | 2.218 | - | - | - | 3.518 | 3.318 |
| Pot Cap-1 Maneuver | 1205 | - | - | - | 414 | 710 |
| Stage 1 | - | - | - | - | 727 | - |
| Stage 2 | - | - | - | - | 712 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1205 | - | - | - | 412 | 710 |
| Mov Cap-2 Maneuver | - | - | - | - | 412 | - |
| Stage 1 | - | - | - | - | 723 | - |
| Stage 2 | - | - | - | - | 712 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.1 | 0 | 13.5 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1205 | - | - | - | 412 | 710 |
| HCM Lane V/C Ratio | 0.005 | - | - | - | 0.119 | 0.031 |
| HCM Control Delay (s) | 8 | 0 | - | - | 14.9 | 10.2 |
| HCM Lane LOS | A | A | - | - | B | B |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.4 | 0.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 30 | 80 | 250 | 330 | 135 | 160 | 170 | 475 | 130 | 140 | 950 | 20 |
| Future Volume (veh/h) | 30 | 80 | 250 | 330 | 135 | 160 | 170 | 475 | 130 | 140 | 950 | 20 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 33 | 87 | 272 | 359 | 147 | 0 | 185 | 516 | 0 | 152 | 1033 | 22 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 450 | 656 | 556 | 410 | 656 | | 278 | 1247 | | 433 | 1203 | 537 |
| Arrive On Green | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.00 | 0.09 | 0.35 | 0.00 | 0.08 | 0.34 | 0.34 |
| Sat Flow, veh/h | 1241 | 1870 | 1585 | 1022 | 1870 | 1585 | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 |
| Grp Volume(v), veh/h | 33 | 87 | 272 | 359 | 147 | 0 | 185 | 516 | 0 | 152 | 1033 | 22 |
| Grp Sat Flow(s),veh/h/ln | 1241 | 1870 | 1585 | 1022 | 1870 | 1585 | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 |
| Q Serve(g_s), s | 1.6 | 2.7 | 11.5 | 27.3 | 4.7 | 0.0 | 5.7 | 9.4 | 0.0 | 4.7 | 23.2 | 0.8 |
| Cycle Q Clear(g_c), s | 6.4 | 2.7 | 11.5 | 30.0 | 4.7 | 0.0 | 5.7 | 9.4 | 0.0 | 4.7 | 23.2 | 0.8 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 450 | 656 | 556 | 410 | 656 | | 278 | 1247 | | 433 | 1203 | 537 |
| V/C Ratio(X) | 0.07 | 0.13 | 0.49 | 0.88 | 0.22 | | 0.66 | 0.41 | | 0.35 | 0.86 | 0.04 |
| Avail Cap(c_a), veh/h | 450 | 656 | 556 | 410 | 656 | | 287 | 1370 | | 464 | 1370 | 611 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 21.8 | 18.9 | 21.8 | 30.4 | 19.6 | 0.0 | 20.0 | 21.1 | 0.0 | 16.5 | 26.4 | 19.0 |
| Incr Delay (d2), s/veh | 0.1 | 0.1 | 0.7 | 18.6 | 0.2 | 0.0 | 5.5 | 0.2 | 0.0 | 0.5 | 5.2 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.5 | 1.1 | 4.0 | 9.1 | 1.9 | 0.0 | 2.4 | 3.5 | 0.0 | 1.7 | 9.4 | 0.3 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 21.9 | 19.0 | 22.5 | 49.0 | 19.8 | 0.0 | 25.5 | 21.3 | 0.0 | 17.0 | 31.5 | 19.0 |
| LnGrp LOS | C | B | C | D | B | | C | C | | B | C | B |
| Approach Vol, veh/h | | 392 | | | 506 | A | | 701 | A | | 1207 | |
| Approach Delay, s/veh | | 21.6 | | | 40.5 | | | 22.4 | | | 29.5 | |
| Approach LOS | | C | | | D | | | C | | | C | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 12.5 | 37.0 | | 36.0 | 13.6 | 36.0 | | 36.0 |
| Change Period (Y+Rc), s | 6.0 | 7.0 | | 6.0 | 6.0 | 7.0 | | 6.0 |
| Max Green Setting (Gmax), s | 8.0 | 33.0 | | 30.0 | 8.0 | 33.0 | | 30.0 |
| Max Q Clear Time (g_c+I1), s | 6.7 | 11.4 | | 13.5 | 7.7 | 25.2 | | 32.0 |
| Green Ext Time (p_c), s | 0.0 | 2.9 | | 1.3 | 0.0 | 3.8 | | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 28.6 |
| HCM 6th LOS | C |

**Notes**

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.2 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 5 | 0 | 330 | 5 | 5 | 270 |
| Future Vol, veh/h | 5 | 0 | 330 | 5 | 5 | 270 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 5 | 0 | 359 | 5 | 5 | 293 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 665 | 362 | 0 | 0 | 364 | 0 |
| Stage 1 | 362 | - | - | - | - | - |
| Stage 2 | 303 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | - | - | 4.12 | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | - | - | 2.218 | - |
| Pot Cap-1 Maneuver | 425 | 683 | - | - | 1195 | - |
| Stage 1 | 704 | - | - | - | - | - |
| Stage 2 | 749 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 423 | 683 | - | - | 1195 | - |
| Mov Cap-2 Maneuver | 423 | - | - | - | - | - |
| Stage 1 | 704 | - | - | - | - | - |
| Stage 2 | 745 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 13.6 | 0 | 0.1 |
| HCM LOS | B | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | SBL | SBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 423 | 1195 | - |
| HCM Lane V/C Ratio | - | - | 0.013 | 0.005 | - |
| HCM Control Delay (s) | - | - | 13.6 | 8 | 0 |
| HCM Lane LOS | - | - | B | A | A |
| HCM 95th %tile Q(veh) | - | - | 0 | 0 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.4 |
| Intersection LOS | A |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 10 | 205 | 5 | 10 | 145 | 10 |
| Future Vol, veh/h | 10 | 205 | 5 | 10 | 145 | 10 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 11 | 223 | 5 | 11 | 158 | 11 |
| Number of Lanes | 1 | 0 | 1 | 0 | 0 | 1 |

| Approach | WB | NB | SB |
|---|---|---|---|
| Opposing Approach | | SB | NB |
| Opposing Lanes | 0 | 1 | 1 |
| Conflicting Approach Left | NB | | WB |
| Conflicting Lanes Left | 1 | 0 | 1 |
| Conflicting Approach Right | SB | WB | |
| Conflicting Lanes Right | 1 | 1 | 0 |
| HCM Control Delay | 8.1 | 7.3 | 8.9 |
| HCM LOS | A | A | A |

| Lane | NBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|
| Vol Left, % | 0% | 5% | 94% |
| Vol Thru, % | 33% | 0% | 6% |
| Vol Right, % | 67% | 95% | 0% |
| Sign Control | Stop | Stop | Stop |
| Traffic Vol by Lane | 15 | 215 | 155 |
| LT Vol | 0 | 10 | 145 |
| Through Vol | 5 | 0 | 10 |
| RT Vol | 10 | 205 | 0 |
| Lane Flow Rate | 16 | 234 | 168 |
| Geometry Grp | 1 | 1 | 1 |
| Degree of Util (X) | 0.019 | 0.248 | 0.213 |
| Departure Headway (Hd) | 4.202 | 3.818 | 4.545 |
| Convergence, Y/N | Yes | Yes | Yes |
| Cap | 853 | 946 | 780 |
| Service Time | 2.22 | 1.82 | 2.629 |
| HCM Lane V/C Ratio | 0.019 | 0.247 | 0.215 |
| HCM Control Delay | 7.3 | 8.1 | 8.9 |
| HCM Lane LOS | A | A | A |
| HCM 95th-tile Q | 0.1 | 1 | 0.8 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.5 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 5 | 150 | 215 | 25 | 15 | 0 |
| Future Vol, veh/h | 5 | 150 | 215 | 25 | 15 | 0 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | 285 | 0 | - |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 5 | 163 | 234 | 27 | 16 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 261 | 0 | - | 0 | 407 | 234 |
| Stage 1 | - | - | - | - | 234 | - |
| Stage 2 | - | - | - | - | 173 | - |
| Critical Hdwy | 4.12 | - | - | - | 6.42 | 6.22 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.42 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.42 | - |
| Follow-up Hdwy | 2.218 | - | - | - | 3.518 | 3.318 |
| Pot Cap-1 Maneuver | 1303 | - | - | - | 600 | 805 |
| Stage 1 | - | - | - | - | 805 | - |
| Stage 2 | - | - | - | - | 857 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1303 | - | - | - | 598 | 805 |
| Mov Cap-2 Maneuver | - | - | - | - | 598 | - |
| Stage 1 | - | - | - | - | 802 | - |
| Stage 2 | - | - | - | - | 857 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.3 | 0 | 11.2 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1303 | - | - | - | 598 |
| HCM Lane V/C Ratio | 0.004 | - | - | - | 0.027 |
| HCM Control Delay (s) | 7.8 | 0 | - | - | 11.2 |
| HCM Lane LOS | A | A | - | - | B |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.1 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.7 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 0 | 165 | 235 | 55 | 25 | 5 |
| Future Vol, veh/h | 0 | 165 | 235 | 55 | 25 | 5 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | 115 | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 179 | 255 | 60 | 27 | 5 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 315 | 0 | - | 0 | 434 | 255 |
| Stage 1 | - | - | - | - | 255 | - |
| Stage 2 | - | - | - | - | 179 | - |
| Critical Hdwy | 4.12 | - | - | - | 6.42 | 6.22 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.42 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.42 | - |
| Follow-up Hdwy | 2.218 | - | - | - | 3.518 | 3.318 |
| Pot Cap-1 Maneuver | 1245 | - | - | - | 579 | 784 |
| Stage 1 | - | - | - | - | 788 | - |
| Stage 2 | - | - | - | - | 852 | - |
| Platoon blocked, % | | | - | - | - | |
| Mov Cap-1 Maneuver | 1245 | - | - | - | 579 | 784 |
| Mov Cap-2 Maneuver | - | - | - | - | 579 | - |
| Stage 1 | - | - | - | - | 788 | - |
| Stage 2 | - | - | - | - | 852 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 11.2 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1245 | - | - | - | 579 | 784 |
| HCM Lane V/C Ratio | - | - | - | - | 0.047 | 0.007 |
| HCM Control Delay (s) | 0 | - | - | - | 11.5 | 9.6 |
| HCM Lane LOS | A | - | - | - | B | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.1 | 0 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 10 | 45 | 135 | 245 | 45 | 85 | 240 | 835 | 270 | 125 | 555 | 5 |
| Future Volume (veh/h) | 10 | 45 | 135 | 245 | 45 | 85 | 240 | 835 | 270 | 125 | 555 | 5 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 11 | 49 | 147 | 266 | 49 | 0 | 261 | 908 | 0 | 136 | 603 | 5 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 469 | 524 | 444 | 424 | 524 | | 459 | 1206 | | 322 | 1028 | 459 |
| Arrive On Green | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 | 0.00 | 0.13 | 0.34 | 0.00 | 0.08 | 0.29 | 0.29 |
| Sat Flow, veh/h | 1356 | 1870 | 1585 | 1187 | 1870 | 1585 | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 |
| Grp Volume(v), veh/h | 11 | 49 | 147 | 266 | 49 | 0 | 261 | 908 | 0 | 136 | 603 | 5 |
| Grp Sat Flow(s),veh/h/ln | 1356 | 1870 | 1585 | 1187 | 1870 | 1585 | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 |
| Q Serve(g_s), s | 0.4 | 1.2 | 4.6 | 13.4 | 1.2 | 0.0 | 6.3 | 14.2 | 0.0 | 3.3 | 9.1 | 0.1 |
| Cycle Q Clear(g_c), s | 1.6 | 1.2 | 4.6 | 14.6 | 1.2 | 0.0 | 6.3 | 14.2 | 0.0 | 3.3 | 9.1 | 0.1 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 469 | 524 | 444 | 424 | 524 | | 459 | 1206 | | 322 | 1028 | 459 |
| V/C Ratio(X) | 0.02 | 0.09 | 0.33 | 0.63 | 0.09 | | 0.57 | 0.75 | | 0.42 | 0.59 | 0.01 |
| Avail Cap(c_a), veh/h | 737 | 894 | 758 | 659 | 894 | | 459 | 1869 | | 411 | 1869 | 834 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 17.3 | 16.7 | 17.9 | 22.1 | 16.7 | 0.0 | 13.5 | 18.4 | 0.0 | 14.9 | 19.1 | 15.9 |
| Incr Delay (d2), s/veh | 0.0 | 0.1 | 0.4 | 1.5 | 0.1 | 0.0 | 1.7 | 1.0 | 0.0 | 0.9 | 0.5 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.1 | 0.5 | 1.5 | 3.4 | 0.5 | 0.0 | 2.1 | 4.7 | 0.0 | 1.1 | 3.1 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 17.3 | 16.8 | 18.3 | 23.6 | 16.8 | 0.0 | 15.1 | 19.4 | 0.0 | 15.8 | 19.6 | 15.9 |
| LnGrp LOS | B | B | B | C | B | | B | B | | B | B | B |
| Approach Vol, veh/h | | 207 | | | 315 | A | | 1169 | A | | 744 | |
| Approach Delay, s/veh | | 17.9 | | | 22.5 | | | 18.4 | | | 18.9 | |
| Approach LOS | | B | | | C | | | B | | | B | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 10.9 | 28.3 | | 23.6 | 14.0 | 25.2 | | 23.6 | | | | |
| Change Period (Y+Rc), s | 6.0 | 7.0 | | 6.0 | 6.0 | 7.0 | | 6.0 | | | | |
| Max Green Setting (Gmax), s | 8.0 | 33.0 | | 30.0 | 8.0 | 33.0 | | 30.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 5.3 | 16.2 | | 6.6 | 8.3 | 11.1 | | 16.6 | | | | |
| Green Ext Time (p_c), s | 0.1 | 5.1 | | 0.7 | 0.0 | 3.5 | | 1.0 | | | | |

| Intersection Summary | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HCM 6th Ctrl Delay | | | 19.0 | | | | | | | | | |
| HCM 6th LOS | | | B | | | | | | | | | |

**Notes**

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

2045 Build LOS Analysis Reports

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 150 | 1070 | 350 | 130 | 1300 | 65 | 510 | 315 | 175 | 130 | 645 | 65 |
| Future Volume (veh/h) | 150 | 1070 | 350 | 130 | 1300 | 65 | 510 | 315 | 175 | 130 | 645 | 65 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 158 | 1126 | 164 | 137 | 1368 | 0 | 537 | 332 | 51 | 137 | 679 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 173 | 1392 | 621 | 173 | 1392 | 621 | 547 | 1007 | 449 | 394 | 711 | 317 |
| Arrive On Green | 0.05 | 0.39 | 0.39 | 0.02 | 0.13 | 0.00 | 0.16 | 0.28 | 0.28 | 0.08 | 0.20 | 0.00 |
| Sat Flow, veh/h | 3456 | 3554 | 1585 | 3456 | 3554 | 1585 | 3456 | 3554 | 1585 | 1781 | 3554 | 1585 |
| Grp Volume(v), veh/h | 158 | 1126 | 164 | 137 | 1368 | 0 | 537 | 332 | 51 | 137 | 679 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1728 | 1777 | 1585 | 1728 | 1777 | 1585 | 1728 | 1777 | 1585 | 1781 | 1777 | 1585 |
| Q Serve(g_s), s | 5.5 | 33.9 | 8.4 | 4.7 | 46.1 | 0.0 | 18.6 | 8.9 | 2.9 | 7.2 | 22.7 | 0.0 |
| Cycle Q Clear(g_c), s | 5.5 | 33.9 | 8.4 | 4.7 | 46.1 | 0.0 | 18.6 | 8.9 | 2.9 | 7.2 | 22.7 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 173 | 1392 | 621 | 173 | 1392 | 621 | 547 | 1007 | 449 | 394 | 711 | 317 |
| V/C Ratio(X) | 0.91 | 0.81 | 0.26 | 0.79 | 0.98 | 0.00 | 0.98 | 0.33 | 0.11 | 0.35 | 0.96 | 0.00 |
| Avail Cap(c_a), veh/h | 173 | 1392 | 621 | 173 | 1392 | 621 | 547 | 1007 | 449 | 394 | 711 | 317 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 0.33 | 0.33 | 0.33 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 56.7 | 32.5 | 24.8 | 58.4 | 51.8 | 0.0 | 50.3 | 34.0 | 31.8 | 34.2 | 47.5 | 0.0 |
| Incr Delay (d2), s/veh | 44.6 | 5.2 | 1.0 | 21.8 | 20.4 | 0.0 | 33.6 | 0.9 | 0.5 | 0.5 | 24.4 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 3.4 | 14.8 | 3.2 | 2.6 | 25.7 | 0.0 | 10.3 | 3.8 | 1.1 | 3.1 | 12.1 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 101.4 | 37.7 | 25.8 | 80.2 | 72.2 | 0.0 | 83.9 | 34.9 | 32.4 | 34.7 | 71.9 | 0.0 |
| LnGrp LOS | F | D | C | F | E | A | F | C | C | C | E | A |
| Approach Vol, veh/h | | 1448 | | | 1505 | | | 920 | | | 816 | |
| Approach Delay, s/veh | | 43.3 | | | 72.9 | | | 63.4 | | | 65.7 | |
| Approach LOS | | D | | | E | | | E | | | E | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 12.0 | 53.0 | 25.0 | 30.0 | 12.0 | 53.0 | 15.0 | 40.0 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 6.0 | 47.0 | 19.0 | 24.0 | 6.0 | 47.0 | 9.0 | 34.0 |
| Max Q Clear Time (g_c+I1), s | 6.7 | 35.9 | 20.6 | 24.7 | 7.5 | 48.1 | 9.2 | 10.9 |
| Green Ext Time (p_c), s | 0.0 | 5.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.1 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 60.6 |
| HCM 6th LOS | E |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | ↑↑ | ↑↑ | ↱ | | ↱ |
| Traffic Vol, veh/h | 0 | 1375 | 1475 | 10 | 0 | 20 |
| Future Vol, veh/h | 0 | 1375 | 1475 | 10 | 0 | 20 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | 150 | - | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 1447 | 1553 | 11 | 0 | 21 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | - | 0 | - | 0 | - | 777 |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |
| Critical Hdwy | - | - | - | - | - | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - |
| Follow-up Hdwy | - | - | - | - | - | 3.32 |
| Pot Cap-1 Maneuver | 0 | - | - | - | 0 | 340 |
| Stage 1 | 0 | - | - | - | 0 | - |
| Stage 2 | 0 | - | - | - | 0 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | - | - | - | - | - | 340 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 16.3 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|
| Capacity (veh/h) | - | - | - | 340 |
| HCM Lane V/C Ratio | - | - | - | 0.062 |
| HCM Control Delay (s) | - | - | - | 16.3 |
| HCM Lane LOS | - | - | - | C |
| HCM 95th %tile Q(veh) | - | - | - | 0.2 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↑↑ | ↱ | ↰ | ↑↑ | ↰ | |
| Traffic Volume (veh/h) | 1365 | 10 | 20 | 1465 | 20 | 20 |
| Future Volume (veh/h) | 1365 | 10 | 20 | 1465 | 20 | 20 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 1437 | 11 | 21 | 1542 | 21 | 21 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 2636 | 1176 | 333 | 2636 | 130 | 130 |
| Arrive On Green | 1.00 | 1.00 | 1.00 | 1.00 | 0.16 | 0.16 |
| Sat Flow, veh/h | 3647 | 1585 | 368 | 3647 | 821 | 821 |
| Grp Volume(v), veh/h | 1437 | 11 | 21 | 1542 | 43 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1777 | 1585 | 368 | 1777 | 1681 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 0.0 |
| Prop In Lane | | 1.00 | 1.00 | | 0.49 | 0.49 |
| Lane Grp Cap(c), veh/h | 2636 | 1176 | 333 | 2636 | 266 | 0 |
| V/C Ratio(X) | 0.55 | 0.01 | 0.06 | 0.59 | 0.16 | 0.00 |
| Avail Cap(c_a), veh/h | 2636 | 1176 | 333 | 2636 | 266 | 0 |
| HCM Platoon Ratio | 2.00 | 2.00 | 2.00 | 2.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.86 | 0.86 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 43.6 | 0.0 |
| Incr Delay (d2), s/veh | 0.8 | 0.0 | 0.3 | 0.8 | 1.3 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.3 | 0.0 | 0.0 | 0.3 | 1.2 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 0.8 | 0.0 | 0.3 | 0.8 | 44.9 | 0.0 |
| LnGrp LOS | A | A | A | A | D | A |
| Approach Vol, veh/h | 1448 | | | 1563 | 43 | |
| Approach Delay, s/veh | 0.8 | | | 0.8 | 44.9 | |
| Approach LOS | A | | | A | D | |

| Timer - Assigned Phs | 2 | | | | 6 | 8 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 95.0 | | | | 95.0 | 25.0 |
| Change Period (Y+Rc), s | 6.0 | | | | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 89.0 | | | | 89.0 | 19.0 |
| Max Q Clear Time (g_c+I1), s | 2.0 | | | | 2.0 | 4.7 |
| Green Ext Time (p_c), s | 15.4 | | | | 18.7 | 0.1 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 1.4 |
| HCM 6th LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 15 | 1360 | 10 | 20 | 1445 | 30 | 20 | 20 | 20 | 30 | 20 | 20 |
| Future Volume (veh/h) | 15 | 1360 | 10 | 20 | 1445 | 30 | 20 | 20 | 20 | 30 | 20 | 20 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 16 | 1432 | 11 | 21 | 1521 | 32 | 21 | 21 | 21 | 32 | 21 | 21 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 338 | 2971 | 1325 | 369 | 2971 | 1325 | 115 | 55 | 55 | 115 | 55 | 55 |
| Arrive On Green | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| Sat Flow, veh/h | 333 | 3554 | 1585 | 370 | 3554 | 1585 | 1365 | 858 | 858 | 1365 | 858 | 858 |
| Grp Volume(v), veh/h | 16 | 1432 | 11 | 21 | 1521 | 32 | 21 | 0 | 42 | 32 | 0 | 42 |
| Grp Sat Flow(s),veh/h/ln | 333 | 1777 | 1585 | 370 | 1777 | 1585 | 1365 | 0 | 1716 | 1365 | 0 | 1716 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.8 | 0.0 | 2.8 | 2.8 | 0.0 | 2.8 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.6 | 0.0 | 2.8 | 5.6 | 0.0 | 2.8 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.50 | 1.00 | | 0.50 |
| Lane Grp Cap(c), veh/h | 338 | 2971 | 1325 | 369 | 2971 | 1325 | 115 | 0 | 110 | 115 | 0 | 110 |
| V/C Ratio(X) | 0.05 | 0.48 | 0.01 | 0.06 | 0.51 | 0.02 | 0.18 | 0.00 | 0.38 | 0.28 | 0.00 | 0.38 |
| Avail Cap(c_a), veh/h | 338 | 2971 | 1325 | 369 | 2971 | 1325 | 244 | 0 | 272 | 244 | 0 | 272 |
| HCM Platoon Ratio | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.82 | 0.82 | 0.82 | 0.74 | 0.74 | 0.74 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 56.1 | 0.0 | 53.9 | 56.6 | 0.0 | 53.9 |
| Incr Delay (d2), s/veh | 0.2 | 0.5 | 0.0 | 0.2 | 0.5 | 0.0 | 0.8 | 0.0 | 2.2 | 1.3 | 0.0 | 2.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.2 | 0.0 | 0.0 | 0.2 | 0.0 | 0.6 | 0.0 | 1.3 | 1.0 | 0.0 | 1.3 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.2 | 0.5 | 0.0 | 0.2 | 0.5 | 0.0 | 56.9 | 0.0 | 56.1 | 57.9 | 0.0 | 56.1 |
| LnGrp LOS | A | A | A | A | A | A | E | A | E | E | A | E |
| Approach Vol, veh/h | | 1459 | | | 1574 | | | 63 | | | 74 | |
| Approach Delay, s/veh | | 0.5 | | | 0.5 | | | 56.3 | | | 56.9 | |
| Approach LOS | | A | | | A | | | E | | | E | |

| Timer - Assigned Phs | 2 | 4 | 6 | 8 |
|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 106.3 | 13.7 | 106.3 | 13.7 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 89.0 | 19.0 | 89.0 | 19.0 |
| Max Q Clear Time (g_c+I1), s | 2.0 | 7.6 | 2.0 | 6.6 |
| Green Ext Time (p_c), s | 16.1 | 0.2 | 18.5 | 0.1 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 2.9 |
| HCM 6th LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NRT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 225 | 975 | 210 | 25 | 1380 | 15 | 65 | 55 | 45 | 55 | 80 | 50 |
| Future Volume (veh/h) | 225 | 975 | 210 | 25 | 1380 | 15 | 65 | 55 | 45 | 55 | 80 | 50 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 237 | 1026 | 221 | 26 | 1453 | 16 | 68 | 58 | 47 | 58 | 84 | 53 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 417 | 2530 | 1128 | 403 | 2388 | 1065 | 150 | 213 | 181 | 170 | 213 | 181 |
| Arrive On Green | 0.13 | 1.00 | 1.00 | 0.05 | 1.00 | 1.00 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 |
| Sat Flow, veh/h | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 | 1252 | 1870 | 1585 | 1289 | 1870 | 1585 |
| Grp Volume(v), veh/h | 237 | 1026 | 221 | 26 | 1453 | 16 | 68 | 58 | 47 | 58 | 84 | 53 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 | 1252 | 1870 | 1585 | 1289 | 1870 | 1585 |
| Q Serve(g_s), s | 5.2 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 6.4 | 3.4 | 3.2 | 5.2 | 5.0 | 3.7 |
| Cycle Q Clear(g_c), s | 5.2 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 11.4 | 3.4 | 3.2 | 8.6 | 5.0 | 3.7 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 417 | 2530 | 1128 | 403 | 2388 | 1065 | 150 | 213 | 181 | 170 | 213 | 181 |
| V/C Ratio(X) | 0.57 | 0.41 | 0.20 | 0.06 | 0.61 | 0.02 | 0.45 | 0.27 | 0.26 | 0.34 | 0.39 | 0.29 |
| Avail Cap(c_a), veh/h | 584 | 2530 | 1128 | 493 | 2388 | 1065 | 206 | 296 | 251 | 228 | 296 | 251 |
| HCM Platoon Ratio | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.88 | 0.88 | 0.88 | 0.77 | 0.77 | 0.77 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 4.3 | 0.0 | 0.0 | 5.5 | 0.0 | 0.0 | 54.6 | 48.6 | 48.5 | 52.5 | 49.3 | 48.7 |
| Incr Delay (d2), s/veh | 1.1 | 0.4 | 0.3 | 0.1 | 0.9 | 0.0 | 2.1 | 0.7 | 0.8 | 1.2 | 1.2 | 0.9 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.4 | 0.1 | 0.1 | 0.2 | 0.3 | 0.0 | 2.1 | 1.6 | 1.3 | 1.7 | 2.4 | 1.5 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 5.4 | 0.4 | 0.3 | 5.5 | 0.9 | 0.0 | 56.7 | 49.3 | 49.3 | 53.7 | 50.5 | 49.6 |
| LnGrp LOS | A | A | A | A | A | A | E | D | D | D | D | D |
| Approach Vol, veh/h | | 1484 | | | 1495 | | | 173 | | | 195 | |
| Approach Delay, s/veh | | 1.2 | | | 1.0 | | | 52.2 | | | 51.2 | |
| Approach LOS | | A | | | A | | | D | | | D | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 8.9 | 91.4 | | 19.7 | 13.7 | 86.6 | | 19.7 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 | | 6.0 |
| Max Green Setting (Gmax), s | 9.8 | 74.0 | | 19.0 | 19.0 | 64.0 | | 19.0 |
| Max Q Clear Time (g_c+I1), s | 12.5 | 2.0 | | 10.6 | 7.2 | 2.0 | | 13.4 |
| Green Ext Time (p_c), s | 0.0 | 9.7 | | 0.5 | 0.5 | 15.3 | | 0.3 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 6.7 |
| HCM 6th LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 20 | 995 | 60 | 190 | 1280 | 20 | 65 | 80 | 75 | 85 | 200 | 75 |
| Future Volume (veh/h) | 20 | 995 | 60 | 190 | 1280 | 20 | 65 | 80 | 75 | 85 | 200 | 75 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 21 | 1047 | 63 | 200 | 1347 | 21 | 68 | 84 | 79 | 89 | 211 | 79 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 240 | 1977 | 882 | 460 | 2137 | 953 | 165 | 226 | 191 | 259 | 249 | 211 |
| Arrive On Green | 0.04 | 1.00 | 1.00 | 0.07 | 0.60 | 0.60 | 0.04 | 0.12 | 0.12 | 0.06 | 0.13 | 0.13 |
| Sat Flow, veh/h | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 | 1781 | 1870 | 1585 | 1781 | 1870 | 1585 |
| Grp Volume(v), veh/h | 21 | 1047 | 63 | 200 | 1347 | 21 | 68 | 84 | 79 | 89 | 211 | 79 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 | 1781 | 1870 | 1585 | 1781 | 1870 | 1585 |
| Q Serve(g_s), s | 0.6 | 0.0 | 0.0 | 5.6 | 29.2 | 0.6 | 4.0 | 5.0 | 5.5 | 5.2 | 13.2 | 5.5 |
| Cycle Q Clear(g_c), s | 0.6 | 0.0 | 0.0 | 5.6 | 29.2 | 0.6 | 4.0 | 5.0 | 5.5 | 5.2 | 13.2 | 5.5 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 240 | 1977 | 882 | 460 | 2137 | 953 | 165 | 226 | 191 | 259 | 249 | 211 |
| V/C Ratio(X) | 0.09 | 0.53 | 0.07 | 0.44 | 0.63 | 0.02 | 0.41 | 0.37 | 0.41 | 0.34 | 0.85 | 0.38 |
| Avail Cap(c_a), veh/h | 336 | 1977 | 882 | 595 | 2137 | 953 | 218 | 343 | 291 | 291 | 343 | 291 |
| HCM Platoon Ratio | 2.00 | 2.00 | 2.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.93 | 0.93 | 0.93 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 13.0 | 0.0 | 0.0 | 9.1 | 15.4 | 9.7 | 44.1 | 48.6 | 48.8 | 42.8 | 50.8 | 47.5 |
| Incr Delay (d2), s/veh | 0.1 | 0.9 | 0.1 | 0.6 | 1.4 | 0.0 | 1.7 | 1.0 | 1.4 | 0.8 | 13.5 | 1.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.2 | 0.3 | 0.0 | 2.0 | 11.0 | 0.2 | 1.8 | 2.4 | 2.2 | 2.3 | 7.0 | 2.2 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 13.2 | 0.9 | 0.1 | 9.7 | 16.8 | 9.7 | 45.7 | 49.6 | 50.2 | 43.6 | 64.3 | 48.6 |
| LnGrp LOS | B | A | A | A | B | A | D | D | D | D | E | D |
| Approach Vol, veh/h | | 1131 | | | 1568 | | | 231 | | | 379 | |
| Approach Delay, s/veh | | 1.1 | | | 15.8 | | | 48.7 | | | 56.2 | |
| Approach LOS | | A | | | B | | | D | | | E | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 13.9 | 72.8 | 11.4 | 21.9 | 8.5 | 78.2 | 12.8 | 20.5 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 7.0 | 48.0 | 9.0 | 22.0 | 9.0 | 56.0 | 9.0 | 22.0 |
| Max Q Clear Time (g_c+I1), s | 7.6 | 2.0 | 6.0 | 15.2 | 2.6 | 31.2 | 7.2 | 7.5 |
| Green Ext Time (p_c), s | 0.3 | 8.8 | 0.0 | 0.7 | 0.0 | 10.5 | 0.0 | 0.5 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 17.7 |
| HCM 6th LOS | B |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↑↑ | ↱ | | ↑↑ | | ↱ |
| Traffic Vol, veh/h | 1140 | 15 | 0 | 1490 | 0 | 20 |
| Future Vol, veh/h | 1140 | 15 | 0 | 1490 | 0 | 20 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | 200 | - | - | - | 0 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 1200 | 16 | 0 | 1568 | 0 | 21 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | - | - | - | 600 |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |
| Critical Hdwy | - | - | - | - | - | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - |
| Follow-up Hdwy | - | - | - | - | - | 3.32 |
| Pot Cap-1 Maneuver | - | - | 0 | - | 0 | 444 |
| Stage 1 | - | - | 0 | - | 0 | - |
| Stage 2 | - | - | 0 | - | 0 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | - | - | - | 444 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 13.5 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBT |
|---|---|---|---|---|
| Capacity (veh/h) | 444 | - | - | - |
| HCM Lane V/C Ratio | 0.047 | - | - | - |
| HCM Control Delay (s) | 13.5 | - | - | - |
| HCM Lane LOS | B | - | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | - |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↑↑ | ↱ | ↰ | ↑↑ | ↰ | ↱ |
| Traffic Volume (veh/h) | 1075 | 85 | 40 | 1280 | 210 | 60 |
| Future Volume (veh/h) | 1075 | 85 | 40 | 1280 | 210 | 60 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 1132 | 89 | 42 | 1347 | 221 | 63 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 2398 | 1070 | 355 | 2687 | 256 | 228 |
| Arrive On Green | 0.67 | 0.67 | 0.03 | 0.76 | 0.14 | 0.14 |
| Sat Flow, veh/h | 3647 | 1585 | 1781 | 3647 | 1781 | 1585 |
| Grp Volume(v), veh/h | 1132 | 89 | 42 | 1347 | 221 | 63 |
| Grp Sat Flow(s),veh/h/ln | 1777 | 1585 | 1781 | 1777 | 1781 | 1585 |
| Q Serve(g_s), s | 18.2 | 2.3 | 0.8 | 17.9 | 14.6 | 4.3 |
| Cycle Q Clear(g_c), s | 18.2 | 2.3 | 0.8 | 17.9 | 14.6 | 4.3 |
| Prop In Lane | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 2398 | 1070 | 355 | 2687 | 256 | 228 |
| V/C Ratio(X) | 0.47 | 0.08 | 0.12 | 0.50 | 0.86 | 0.28 |
| Avail Cap(c_a), veh/h | 2398 | 1070 | 433 | 2687 | 445 | 396 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 9.3 | 6.7 | 6.6 | 5.7 | 50.2 | 45.8 |
| Incr Delay (d2), s/veh | 0.7 | 0.2 | 0.1 | 0.7 | 8.4 | 0.7 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 6.3 | 0.7 | 0.3 | 5.2 | 7.1 | 1.7 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 10.0 | 6.9 | 6.7 | 6.4 | 58.6 | 46.5 |
| LnGrp LOS | A | A | A | A | E | D |
| Approach Vol, veh/h | 1221 | | | 1389 | 284 | |
| Approach Delay, s/veh | 9.8 | | | 6.4 | 55.9 | |
| Approach LOS | A | | | A | E | |

| Timer - Assigned Phs | 1 | 2 | | | | 6 | 8 |
|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 9.8 | 87.0 | | | | 96.7 | 23.3 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | | | | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 9.0 | 63.0 | | | | 78.0 | 30.0 |
| Max Q Clear Time (g_c+I1), s | 2.8 | 20.2 | | | | 19.9 | 16.6 |
| Green Ext Time (p_c), s | 0.0 | 10.0 | | | | 13.2 | 0.7 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 12.7 |
| HCM 6th LOS | B |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.2 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↑↑ | ↱ | | ↑↑ | | ↱ |
| Traffic Vol, veh/h | 1045 | 90 | 0 | 1320 | 0 | 30 |
| Future Vol, veh/h | 1045 | 90 | 0 | 1320 | 0 | 30 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | 200 | - | - | - | 0 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 1100 | 95 | 0 | 1389 | 0 | 32 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | - | - | - | 550 |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |
| Critical Hdwy | - | - | - | - | - | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - |
| Follow-up Hdwy | - | - | - | - | - | 3.32 |
| Pot Cap-1 Maneuver | - | - | 0 | - | 0 | 479 |
| Stage 1 | - | - | 0 | - | 0 | - |
| Stage 2 | - | - | 0 | - | 0 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | - | - | - | 479 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 13 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBT |
|---|---|---|---|---|
| Capacity (veh/h) | 479 | - | - | - |
| HCM Lane V/C Ratio | 0.066 | - | - | - |
| HCM Control Delay (s) | 13 | - | - | - |
| HCM Lane LOS | B | - | - | - |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 610 | 465 | 325 | 710 | 610 | 230 |
| Future Volume (veh/h) | 610 | 465 | 325 | 710 | 610 | 230 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 642 | 489 | 342 | 747 | 642 | 242 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 1830 | 816 | 405 | 2424 | 753 | 346 |
| Arrive On Green | 0.51 | 0.51 | 0.23 | 1.00 | 0.22 | 0.22 |
| Sat Flow, veh/h | 3647 | 1585 | 3456 | 3647 | 3456 | 1585 |
| Grp Volume(v), veh/h | 642 | 489 | 342 | 747 | 642 | 242 |
| Grp Sat Flow(s),veh/h/ln | 1777 | 1585 | 1728 | 1777 | 1728 | 1585 |
| Q Serve(g_s), s | 12.8 | 26.0 | 11.3 | 0.0 | 21.4 | 16.9 |
| Cycle Q Clear(g_c), s | 12.8 | 26.0 | 11.3 | 0.0 | 21.4 | 16.9 |
| Prop In Lane | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 1830 | 816 | 405 | 2424 | 753 | 346 |
| V/C Ratio(X) | 0.35 | 0.60 | 0.84 | 0.31 | 0.85 | 0.70 |
| Avail Cap(c_a), veh/h | 1830 | 816 | 605 | 2424 | 1037 | 476 |
| HCM Platoon Ratio | 1.00 | 1.00 | 2.00 | 2.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.95 | 0.95 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 17.2 | 20.4 | 44.9 | 0.0 | 45.1 | 43.3 |
| Incr Delay (d2), s/veh | 0.5 | 3.2 | 6.7 | 0.3 | 5.2 | 2.7 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 5.1 | 9.6 | 4.6 | 0.1 | 9.5 | 6.8 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 17.8 | 23.7 | 51.6 | 0.3 | 50.2 | 46.1 |
| LnGrp LOS | B | C | D | A | D | D |
| Approach Vol, veh/h | 1131 | | | 1089 | 884 | |
| Approach Delay, s/veh | 20.3 | | | 16.4 | 49.1 | |
| Approach LOS | C | | | B | D | |

| Timer - Assigned Phs | 1 | 2 | 6 | 8 |
|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 20.1 | 67.8 | 87.8 | 32.2 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 21.0 | 45.0 | 72.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 13.3 | 28.0 | 2.0 | 23.4 |
| Green Ext Time (p_c), s | 0.7 | 5.5 | 5.5 | 2.7 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 27.1 |
| HCM 6th LOS | C |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↑↑ | ↱ | ↰ | ↑↑ | ↰ | ↱ |
| Traffic Volume (veh/h) | 770 | 70 | 35 | 1015 | 20 | 20 |
| Future Volume (veh/h) | 770 | 70 | 35 | 1015 | 20 | 20 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 811 | 74 | 37 | 1068 | 21 | 21 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 3087 | 1377 | 605 | 3087 | 56 | 50 |
| Arrive On Green | 1.00 | 1.00 | 1.00 | 1.00 | 0.03 | 0.03 |
| Sat Flow, veh/h | 3647 | 1585 | 628 | 3647 | 1781 | 1585 |
| Grp Volume(v), veh/h | 811 | 74 | 37 | 1068 | 21 | 21 |
| Grp Sat Flow(s),veh/h/ln | 1777 | 1585 | 628 | 1777 | 1781 | 1585 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 1.6 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 1.6 |
| Prop In Lane | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 3087 | 1377 | 605 | 3087 | 56 | 50 |
| V/C Ratio(X) | 0.26 | 0.05 | 0.06 | 0.35 | 0.38 | 0.42 |
| Avail Cap(c_a), veh/h | 3087 | 1377 | 605 | 3087 | 327 | 291 |
| HCM Platoon Ratio | 2.00 | 2.00 | 2.00 | 2.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.92 | 0.92 | 0.93 | 0.93 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 57.0 | 57.0 |
| Incr Delay (d2), s/veh | 0.2 | 0.1 | 0.2 | 0.3 | 4.1 | 5.6 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.1 | 0.0 | 0.0 | 0.1 | 0.7 | 0.7 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 0.2 | 0.1 | 0.2 | 0.3 | 61.1 | 62.6 |
| LnGrp LOS | A | A | A | A | E | E |
| Approach Vol, veh/h | 885 | | | 1105 | 42 | |
| Approach Delay, s/veh | 0.2 | | | 0.3 | 61.9 | |
| Approach LOS | A | | | A | E | |

| Timer - Assigned Phs | 2 | | | | 6 | 8 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 110.2 | | | | 110.2 | 9.8 |
| Change Period (Y+Rc), s | 6.0 | | | | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 86.0 | | | | 86.0 | 22.0 |
| Max Q Clear Time (g_c+I1), s | 2.0 | | | | 2.0 | 3.6 |
| Green Ext Time (p_c), s | 6.4 | | | | 9.7 | 0.1 |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | 1.5 | |
| HCM 6th LOS | A | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 35 | 710 | 45 | 90 | 850 | 50 | 75 | 20 | 20 | 10 | 20 | 125 |
| Future Volume (veh/h) | 35 | 710 | 45 | 90 | 850 | 50 | 75 | 20 | 20 | 10 | 20 | 125 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 37 | 747 | 47 | 95 | 895 | 53 | 79 | 21 | 21 | 11 | 21 | 132 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 482 | 2517 | 1123 | 615 | 2554 | 1139 | 173 | 190 | 161 | 185 | 190 | 161 |
| Arrive On Green | 0.06 | 1.00 | 1.00 | 0.04 | 0.72 | 0.72 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Sat Flow, veh/h | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 | 1234 | 1870 | 1585 | 1365 | 1870 | 1585 |
| Grp Volume(v), veh/h | 37 | 747 | 47 | 95 | 895 | 53 | 79 | 21 | 21 | 11 | 21 | 132 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 | 1234 | 1870 | 1585 | 1365 | 1870 | 1585 |
| Q Serve(g_s), s | 0.7 | 0.0 | 0.0 | 1.7 | 11.4 | 1.2 | 7.5 | 1.2 | 1.4 | 0.9 | 1.2 | 9.8 |
| Cycle Q Clear(g_c), s | 0.7 | 0.0 | 0.0 | 1.7 | 11.4 | 1.2 | 8.7 | 1.2 | 1.4 | 2.1 | 1.2 | 9.8 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 482 | 2517 | 1123 | 615 | 2554 | 1139 | 173 | 190 | 161 | 185 | 190 | 161 |
| V/C Ratio(X) | 0.08 | 0.30 | 0.04 | 0.15 | 0.35 | 0.05 | 0.46 | 0.11 | 0.13 | 0.06 | 0.11 | 0.82 |
| Avail Cap(c_a), veh/h | 563 | 2517 | 1123 | 752 | 2554 | 1139 | 305 | 390 | 330 | 330 | 390 | 330 |
| HCM Platoon Ratio | 2.00 | 2.00 | 2.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.98 | 0.98 | 0.98 | 0.95 | 0.95 | 0.95 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 4.5 | 0.0 | 0.0 | 4.0 | 6.3 | 4.9 | 52.9 | 49.0 | 49.1 | 49.9 | 49.0 | 52.8 |
| Incr Delay (d2), s/veh | 0.1 | 0.3 | 0.1 | 0.1 | 0.4 | 0.1 | 1.9 | 0.3 | 0.4 | 0.1 | 0.3 | 9.7 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.2 | 0.1 | 0.0 | 0.5 | 3.6 | 0.3 | 2.4 | 0.6 | 0.6 | 0.3 | 0.6 | 4.3 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 4.6 | 0.3 | 0.1 | 4.1 | 6.7 | 5.0 | 54.8 | 49.2 | 49.4 | 50.1 | 49.2 | 62.6 |
| LnGrp LOS | A | A | A | A | A | A | D | D | D | D | D | E |
| Approach Vol, veh/h | | 831 | | | 1043 | | | 121 | | | 164 | |
| Approach Delay, s/veh | | 0.5 | | | 6.4 | | | 52.9 | | | 60.0 | |
| Approach LOS | | A | | | A | | | D | | | E | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 10.8 | 91.0 | | 18.2 | 9.5 | 92.3 | | 18.2 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 | | 6.0 |
| Max Green Setting (Gmax), s | 4.8 | 63.0 | | 25.0 | 9.0 | 68.0 | | 25.0 |
| Max Q Clear Time (g_c+I1), s | 3.7 | 2.0 | | 11.8 | 2.7 | 13.4 | | 10.7 |
| Green Ext Time (p_c), s | 0.1 | 5.6 | | 0.4 | 0.0 | 7.1 | | 0.3 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 10.8 |
| HCM 6th LOS | B |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 65 | 35 | 735 | 5 | 25 | 925 |
| Future Volume (veh/h) | 65 | 35 | 735 | 5 | 25 | 925 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | No | | | No |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 68 | 37 | 774 | 5 | 26 | 974 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 97 | 86 | 3005 | 1340 | 616 | 3005 |
| Arrive On Green | 0.05 | 0.05 | 0.85 | 0.85 | 0.85 | 0.85 |
| Sat Flow, veh/h | 1781 | 1585 | 3647 | 1585 | 693 | 3647 |
| Grp Volume(v), veh/h | 68 | 37 | 774 | 5 | 26 | 974 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1585 | 1777 | 1585 | 693 | 1777 |
| Q Serve(g_s), s | 4.5 | 2.7 | 5.2 | 0.1 | 0.9 | 7.0 |
| Cycle Q Clear(g_c), s | 4.5 | 2.7 | 5.2 | 0.1 | 6.1 | 7.0 |
| Prop In Lane | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Lane Grp Cap(c), veh/h | 97 | 86 | 3005 | 1340 | 616 | 3005 |
| V/C Ratio(X) | 0.70 | 0.43 | 0.26 | 0.00 | 0.04 | 0.32 |
| Avail Cap(c_a), veh/h | 386 | 343 | 3005 | 1340 | 616 | 3005 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.96 | 0.96 | 0.91 | 0.91 |
| Uniform Delay (d), s/veh | 55.8 | 54.9 | 1.8 | 1.4 | 2.4 | 2.0 |
| Incr Delay (d2), s/veh | 8.8 | 3.3 | 0.2 | 0.0 | 0.1 | 0.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 2.3 | 1.2 | 0.9 | 0.0 | 0.1 | 1.2 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 64.6 | 58.3 | 2.0 | 1.4 | 2.5 | 2.2 |
| LnGrp LOS | E | E | A | A | A | A |
| Approach Vol, veh/h | 105 | | 779 | | | 1000 |
| Approach Delay, s/veh | 62.3 | | 2.0 | | | 2.2 |
| Approach LOS | E | | A | | | A |

| Timer - Assigned Phs | 2 | | | 6 | 8 |
|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 107.5 | | | 107.5 | 12.5 |
| Change Period (Y+Rc), s | 6.0 | | | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 82.0 | | | 82.0 | 26.0 |
| Max Q Clear Time (g_c+I1), s | 7.2 | | | 9.0 | 6.5 |
| Green Ext Time (p_c), s | 5.7 | | | 8.2 | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 5.5 |
| HCM 6th LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 175 | 580 | 15 | 10 | 640 | 180 | 35 | 20 | 5 | 100 | 20 | 275 |
| Future Volume (veh/h) | 175 | 580 | 15 | 10 | 640 | 180 | 35 | 20 | 5 | 100 | 20 | 275 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 184 | 611 | 16 | 11 | 674 | 189 | 37 | 21 | 5 | 105 | 21 | 289 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 429 | 1995 | 890 | 458 | 1807 | 806 | 286 | 236 | 56 | 381 | 367 | 311 |
| Arrive On Green | 0.07 | 0.56 | 0.56 | 0.01 | 0.51 | 0.51 | 0.03 | 0.16 | 0.16 | 0.06 | 0.20 | 0.20 |
| Sat Flow, veh/h | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 | 1781 | 1460 | 348 | 1781 | 1870 | 1585 |
| Grp Volume(v), veh/h | 184 | 611 | 16 | 11 | 674 | 189 | 37 | 0 | 26 | 105 | 21 | 289 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 | 1781 | 0 | 1808 | 1781 | 1870 | 1585 |
| Q Serve(g_s), s | 5.7 | 10.9 | 0.5 | 0.4 | 13.8 | 8.0 | 2.1 | 0.0 | 1.5 | 5.8 | 1.1 | 21.5 |
| Cycle Q Clear(g_c), s | 5.7 | 10.9 | 0.5 | 0.4 | 13.8 | 8.0 | 2.1 | 0.0 | 1.5 | 5.8 | 1.1 | 21.5 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.19 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 429 | 1995 | 890 | 458 | 1807 | 806 | 286 | 0 | 293 | 381 | 367 | 311 |
| V/C Ratio(X) | 0.43 | 0.31 | 0.02 | 0.02 | 0.37 | 0.23 | 0.13 | 0.00 | 0.09 | 0.28 | 0.06 | 0.93 |
| Avail Cap(c_a), veh/h | 520 | 1995 | 890 | 569 | 1807 | 806 | 367 | 0 | 293 | 475 | 374 | 317 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.98 | 0.98 | 0.98 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 12.7 | 13.9 | 11.7 | 13.9 | 17.9 | 16.5 | 40.1 | 0.0 | 42.8 | 38.1 | 39.2 | 47.4 |
| Incr Delay (d2), s/veh | 0.7 | 0.4 | 0.0 | 0.0 | 0.6 | 0.7 | 0.2 | 0.0 | 0.1 | 0.4 | 0.1 | 32.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 2.1 | 4.2 | 0.2 | 0.1 | 5.5 | 3.0 | 0.9 | 0.0 | 0.7 | 2.6 | 0.5 | 11.2 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 13.3 | 14.3 | 11.7 | 13.9 | 18.5 | 17.1 | 40.3 | 0.0 | 42.9 | 38.5 | 39.3 | 79.7 |
| LnGrp LOS | B | B | B | B | B | B | D | A | D | D | D | E |
| Approach Vol, veh/h | | 811 | | | 874 | | | 63 | | | 415 | |
| Approach Delay, s/veh | | 14.1 | | | 18.1 | | | 41.3 | | | 67.2 | |
| Approach LOS | | B | | | B | | | D | | | E | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 7.5 | 73.4 | 9.5 | 29.6 | 13.9 | 67.0 | 13.7 | 25.4 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 9.0 | 54.0 | 9.0 | 24.0 | 14.0 | 49.0 | 14.0 | 19.0 |
| Max Q Clear Time (g_c+I1), s | 1.5 | 12.9 | 4.1 | 23.5 | 7.7 | 15.8 | 7.8 | 3.5 |
| Green Ext Time (p_c), s | 0.0 | 4.2 | 0.0 | 0.1 | 0.2 | 5.3 | 0.1 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 26.7 |
| HCM 6th LOS | C |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | ↑↑ | ↑↑ | ↱ | | ↱ |
| Traffic Vol, veh/h | 0 | 685 | 825 | 115 | 0 | 5 |
| Future Vol, veh/h | 0 | 685 | 825 | 115 | 0 | 5 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | 200 | - | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 721 | 868 | 121 | 0 | 5 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | - | 0 | - | 0 | - | 434 |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |
| Critical Hdwy | - | - | - | - | - | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - |
| Follow-up Hdwy | - | - | - | - | - | 3.32 |
| Pot Cap-1 Maneuver | 0 | - | - | - | 0 | 570 |
| Stage 1 | 0 | - | - | - | 0 | - |
| Stage 2 | 0 | - | - | - | 0 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | - | - | - | - | - | 570 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 11.4 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|
| Capacity (veh/h) | - | - | - | 570 |
| HCM Lane V/C Ratio | - | - | - | 0.009 |
| HCM Control Delay (s) | - | - | - | 11.4 |
| HCM Lane LOS | - | - | - | B |
| HCM 95th %tile Q(veh) | - | - | - | 0 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.2 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | ↑↑ | ↑↑ | ↱ | | ↱ |
| Traffic Vol, veh/h | 0 | 685 | 915 | 70 | 0 | 25 |
| Future Vol, veh/h | 0 | 685 | 915 | 70 | 0 | 25 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | 200 | - | - |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 721 | 963 | 74 | 0 | 26 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | - | 0 | - | 0 | - | 482 |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |
| Critical Hdwy | - | - | - | - | - | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - |
| Follow-up Hdwy | - | - | - | - | - | 3.32 |
| Pot Cap-1 Maneuver | 0 | - | - | - | 0 | 530 |
| Stage 1 | 0 | - | - | - | 0 | - |
| Stage 2 | 0 | - | - | - | 0 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | - | - | - | - | - | 530 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 12.1 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|
| Capacity (veh/h) | - | - | - | 530 |
| HCM Lane V/C Ratio | - | - | - | 0.05 |
| HCM Control Delay (s) | - | - | - | 12.1 |
| HCM Lane LOS | - | - | - | B |
| HCM 95th %tile Q(veh) | - | - | - | 0.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 70 | 190 | 425 | 300 | 305 | 210 | 225 | 620 | 170 | 185 | 640 | 455 |
| Future Volume (veh/h) | 70 | 190 | 425 | 300 | 305 | 210 | 225 | 620 | 170 | 185 | 640 | 455 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 74 | 200 | 216 | 316 | 321 | 0 | 237 | 653 | 58 | 195 | 674 | 251 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 433 | 1115 | 497 | 458 | 1236 | | 298 | 1198 | 534 | 256 | 1155 | 515 |
| Arrive On Green | 0.04 | 0.31 | 0.31 | 0.08 | 0.35 | 0.00 | 0.09 | 0.34 | 0.34 | 0.07 | 0.32 | 0.32 |
| Sat Flow, veh/h | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 | 3456 | 3554 | 1585 | 3456 | 3554 | 1585 |
| Grp Volume(v), veh/h | 74 | 200 | 216 | 316 | 321 | 0 | 237 | 653 | 58 | 195 | 674 | 251 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 | 1728 | 1777 | 1585 | 1728 | 1777 | 1585 |
| Q Serve(g_s), s | 3.4 | 4.9 | 13.0 | 9.0 | 7.8 | 0.0 | 8.1 | 17.9 | 3.0 | 6.6 | 19.0 | 15.2 |
| Cycle Q Clear(g_c), s | 3.4 | 4.9 | 13.0 | 9.0 | 7.8 | 0.0 | 8.1 | 17.9 | 3.0 | 6.6 | 19.0 | 15.2 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 433 | 1115 | 497 | 458 | 1236 | | 298 | 1198 | 534 | 256 | 1155 | 515 |
| V/C Ratio(X) | 0.17 | 0.18 | 0.43 | 0.69 | 0.26 | | 0.80 | 0.55 | 0.11 | 0.76 | 0.58 | 0.49 |
| Avail Cap(c_a), veh/h | 493 | 1115 | 497 | 458 | 1236 | | 403 | 1198 | 534 | 403 | 1155 | 515 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 26.1 | 29.9 | 32.7 | 30.4 | 28.1 | 0.0 | 53.8 | 32.3 | 27.4 | 54.5 | 33.7 | 32.5 |
| Incr Delay (d2), s/veh | 0.2 | 0.4 | 2.7 | 4.3 | 0.5 | 0.0 | 7.7 | 1.8 | 0.4 | 4.7 | 2.2 | 3.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.4 | 2.1 | 5.1 | 3.6 | 3.3 | 0.0 | 3.7 | 7.5 | 1.1 | 2.9 | 8.0 | 6.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 26.3 | 30.3 | 35.5 | 34.7 | 28.6 | 0.0 | 61.5 | 34.1 | 27.8 | 59.2 | 35.9 | 35.8 |
| LnGrp LOS | C | C | D | C | C | | E | C | C | E | D | D |
| Approach Vol, veh/h | | 490 | | | 637 | A | | 948 | | | 1120 | |
| Approach Delay, s/veh | | 32.0 | | | 31.6 | | | 40.6 | | | 39.9 | |
| Approach LOS | | C | | | C | | | D | | | D | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 15.0 | 43.7 | 16.3 | 45.0 | 10.9 | 47.7 | 14.9 | 46.4 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 9.0 | 34.0 | 14.0 | 39.0 | 9.0 | 34.0 | 14.0 | 39.0 |
| Max Q Clear Time (g_c+I1), s | 11.0 | 15.0 | 10.1 | 21.0 | 5.4 | 9.8 | 8.6 | 19.9 |
| Green Ext Time (p_c), s | 0.0 | 1.7 | 0.3 | 4.5 | 0.0 | 1.8 | 0.3 | 3.8 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 37.2 |
| HCM 6th LOS | D |

**Notes**

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 190 | 1150 | 350 | 370 | 895 | 50 | 435 | 795 | 260 | 90 | 525 | 210 |
| Future Volume (veh/h) | 190 | 1150 | 350 | 370 | 895 | 50 | 435 | 795 | 260 | 90 | 525 | 210 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 200 | 1211 | 189 | 389 | 942 | 0 | 458 | 837 | 98 | 95 | 553 | 35 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 259 | 1333 | 594 | 403 | 1481 | 661 | 490 | 948 | 423 | 159 | 592 | 264 |
| Arrive On Green | 0.07 | 0.38 | 0.38 | 0.08 | 0.28 | 0.00 | 0.14 | 0.27 | 0.27 | 0.04 | 0.17 | 0.17 |
| Sat Flow, veh/h | 3456 | 3554 | 1585 | 3456 | 3554 | 1585 | 3456 | 3554 | 1585 | 1781 | 3554 | 1585 |
| Grp Volume(v), veh/h | 200 | 1211 | 189 | 389 | 942 | 0 | 458 | 837 | 98 | 95 | 553 | 35 |
| Grp Sat Flow(s),veh/h/ln | 1728 | 1777 | 1585 | 1728 | 1777 | 1585 | 1728 | 1777 | 1585 | 1781 | 1777 | 1585 |
| Q Serve(g_s), s | 6.8 | 38.8 | 10.2 | 13.5 | 27.9 | 0.0 | 15.7 | 27.1 | 5.8 | 5.0 | 18.4 | 2.3 |
| Cycle Q Clear(g_c), s | 6.8 | 38.8 | 10.2 | 13.5 | 27.9 | 0.0 | 15.7 | 27.1 | 5.8 | 5.0 | 18.4 | 2.3 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 259 | 1333 | 594 | 403 | 1481 | 661 | 490 | 948 | 423 | 159 | 592 | 264 |
| V/C Ratio(X) | 0.77 | 0.91 | 0.32 | 0.96 | 0.64 | 0.00 | 0.94 | 0.88 | 0.23 | 0.60 | 0.93 | 0.13 |
| Avail Cap(c_a), veh/h | 346 | 1333 | 594 | 403 | 1481 | 661 | 490 | 948 | 423 | 159 | 592 | 264 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 0.67 | 0.67 | 0.67 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 54.5 | 35.6 | 26.6 | 55.1 | 35.3 | 0.0 | 51.0 | 42.2 | 34.4 | 41.8 | 49.3 | 42.6 |
| Incr Delay (d2), s/veh | 7.5 | 10.7 | 1.4 | 35.6 | 2.1 | 0.0 | 25.5 | 11.7 | 1.3 | 6.1 | 23.8 | 1.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 3.2 | 17.8 | 3.9 | 7.9 | 12.8 | 0.0 | 8.3 | 13.0 | 2.3 | 2.6 | 9.9 | 0.9 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 62.0 | 46.2 | 28.0 | 90.7 | 37.4 | 0.0 | 76.5 | 54.0 | 35.7 | 47.9 | 73.1 | 43.6 |
| LnGrp LOS | E | D | C | F | D | A | E | D | D | D | E | D |
| Approach Vol, veh/h | | 1600 | | | 1331 | | | 1393 | | | 683 | |
| Approach Delay, s/veh | | 46.0 | | | 52.9 | | | 60.1 | | | 68.1 | |
| Approach LOS | | D | | | D | | | E | | | E | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 20.0 | 51.0 | 23.0 | 26.0 | 15.0 | 56.0 | 11.0 | 38.0 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 14.0 | 45.0 | 17.0 | 20.0 | 12.0 | 47.0 | 5.0 | 32.0 |
| Max Q Clear Time (g_c+I1), s | 15.5 | 40.8 | 17.7 | 20.4 | 8.8 | 29.9 | 7.0 | 29.1 |
| Green Ext Time (p_c), s | 0.0 | 2.9 | 0.0 | 0.0 | 0.2 | 5.7 | 0.0 | 1.5 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 54.8 |
| HCM 6th LOS | D |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | ↑↑ | ↑↑ | ↱ | | ↱ |
| Traffic Vol, veh/h | 0 | 1500 | 1295 | 10 | 0 | 20 |
| Future Vol, veh/h | 0 | 1500 | 1295 | 10 | 0 | 20 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | 150 | - | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 1579 | 1363 | 11 | 0 | 21 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | - | 0 | - | 0 | - | 682 |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |
| Critical Hdwy | - | - | - | - | - | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - |
| Follow-up Hdwy | - | - | - | - | - | 3.32 |
| Pot Cap-1 Maneuver | 0 | - | - | - | 0 | 392 |
| Stage 1 | 0 | - | - | - | 0 | - |
| Stage 2 | 0 | - | - | - | 0 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | - | - | - | - | - | 392 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 14.7 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|
| Capacity (veh/h) | - | - | - | 392 |
| HCM Lane V/C Ratio | - | - | - | 0.054 |
| HCM Control Delay (s) | - | - | - | 14.7 |
| HCM Lane LOS | - | - | - | B |
| HCM 95th %tile Q(veh) | - | - | - | 0.2 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 1480 | 20 | 15 | 1290 | 15 | 20 |
| Future Volume (veh/h) | 1480 | 20 | 15 | 1290 | 15 | 20 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 1558 | 21 | 16 | 1358 | 16 | 21 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 3092 | 1379 | 342 | 3092 | 21 | 28 |
| Arrive On Green | 1.00 | 1.00 | 1.00 | 1.00 | 0.03 | 0.03 |
| Sat Flow, veh/h | 3647 | 1585 | 324 | 3647 | 703 | 922 |
| Grp Volume(v), veh/h | 1558 | 21 | 16 | 1358 | 38 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1777 | 1585 | 324 | 1777 | 1669 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 0.0 |
| Prop In Lane | | 1.00 | 1.00 | | 0.42 | 0.55 |
| Lane Grp Cap(c), veh/h | 3092 | 1379 | 342 | 3092 | 50 | 0 |
| V/C Ratio(X) | 0.50 | 0.02 | 0.05 | 0.44 | 0.76 | 0.00 |
| Avail Cap(c_a), veh/h | 3092 | 1379 | 342 | 3092 | 264 | 0 |
| HCM Platoon Ratio | 1.33 | 1.33 | 2.00 | 2.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.90 | 0.90 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 57.8 | 0.0 |
| Incr Delay (d2), s/veh | 0.6 | 0.0 | 0.2 | 0.4 | 20.8 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.3 | 0.0 | 0.0 | 0.2 | 1.4 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 0.6 | 0.0 | 0.2 | 0.4 | 78.5 | 0.0 |
| LnGrp LOS | A | A | A | A | E | A |
| Approach Vol, veh/h | 1579 | | | 1374 | 38 | |
| Approach Delay, s/veh | 0.6 | | | 0.4 | 78.5 | |
| Approach LOS | A | | | A | E | |

| Timer - Assigned Phs | 2 | | | | 6 | 8 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 110.4 | | | | 110.4 | 9.6 |
| Change Period (Y+Rc), s | 6.0 | | | | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 89.0 | | | | 89.0 | 19.0 |
| Max Q Clear Time (g_c+I1), s | 2.0 | | | | 2.0 | 4.7 |
| Green Ext Time (p_c), s | 18.3 | | | | 14.5 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 1.5 |
| HCM 6th LOS | A |

**Notes**

User approved volume balancing among the lanes for turning movement.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 40 | 1440 | 20 | 10 | 1270 | 20 | 15 | 20 | 20 | 20 | 20 | 20 |
| Future Volume (veh/h) | 40 | 1440 | 20 | 10 | 1270 | 20 | 15 | 20 | 20 | 20 | 20 | 20 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 42 | 1516 | 21 | 11 | 1337 | 21 | 16 | 21 | 21 | 21 | 21 | 21 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 399 | 3000 | 1338 | 345 | 3000 | 1338 | 104 | 48 | 48 | 104 | 48 | 48 |
| Arrive On Green | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| Sat Flow, veh/h | 401 | 3554 | 1585 | 338 | 3554 | 1585 | 1365 | 858 | 858 | 1365 | 858 | 858 |
| Grp Volume(v), veh/h | 42 | 1516 | 21 | 11 | 1337 | 21 | 16 | 0 | 42 | 21 | 0 | 42 |
| Grp Sat Flow(s),veh/h/ln | 401 | 1777 | 1585 | 338 | 1777 | 1585 | 1365 | 0 | 1716 | 1365 | 0 | 1716 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 0.0 | 2.8 | 1.8 | 0.0 | 2.8 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.2 | 0.0 | 2.8 | 4.7 | 0.0 | 2.8 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.50 | 1.00 | | 0.50 |
| Lane Grp Cap(c), veh/h | 399 | 3000 | 1338 | 345 | 3000 | 1338 | 104 | 0 | 96 | 104 | 0 | 96 |
| V/C Ratio(X) | 0.11 | 0.51 | 0.02 | 0.03 | 0.45 | 0.02 | 0.15 | 0.00 | 0.44 | 0.20 | 0.00 | 0.44 |
| Avail Cap(c_a), veh/h | 399 | 3000 | 1338 | 345 | 3000 | 1338 | 244 | 0 | 272 | 244 | 0 | 272 |
| HCM Platoon Ratio | 2.00 | 2.00 | 2.00 | 1.33 | 1.33 | 1.33 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.87 | 0.87 | 0.87 | 0.83 | 0.83 | 0.83 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 56.9 | 0.0 | 54.8 | 57.1 | 0.0 | 54.8 |
| Incr Delay (d2), s/veh | 0.5 | 0.5 | 0.0 | 0.1 | 0.4 | 0.0 | 0.7 | 0.0 | 3.1 | 0.9 | 0.0 | 3.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.1 | 0.2 | 0.0 | 0.0 | 0.2 | 0.0 | 0.5 | 0.0 | 1.3 | 0.7 | 0.0 | 1.3 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.5 | 0.5 | 0.0 | 0.1 | 0.4 | 0.0 | 57.6 | 0.0 | 58.0 | 58.0 | 0.0 | 58.0 |
| LnGrp LOS | A | A | A | A | A | A | E | A | E | E | A | E |
| Approach Vol, veh/h | | 1579 | | | 1369 | | | 58 | | | 63 | |
| Approach Delay, s/veh | | 0.5 | | | 0.4 | | | 57.9 | | | 58.0 | |
| Approach LOS | | A | | | A | | | E | | | E | |

| Timer - Assigned Phs | 2 | 4 | 6 | 8 |
|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 107.3 | 12.7 | 107.3 | 12.7 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 89.0 | 19.0 | 89.0 | 19.0 |
| Max Q Clear Time (g_c+I1), s | 2.0 | 6.7 | 2.0 | 6.2 |
| Green Ext Time (p_c), s | 19.1 | 0.1 | 14.0 | 0.1 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 2.7 |
| HCM 6th LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 90 | 1315 | 75 | 125 | 1175 | 110 | 90 | 225 | 50 | 45 | 45 | 35 |
| Future Volume (veh/h) | 90 | 1315 | 75 | 125 | 1175 | 110 | 90 | 225 | 50 | 45 | 45 | 35 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 95 | 1384 | 79 | 132 | 1237 | 116 | 95 | 237 | 53 | 47 | 47 | 37 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 384 | 2227 | 993 | 280 | 2243 | 1000 | 267 | 335 | 284 | 125 | 335 | 284 |
| Arrive On Green | 0.04 | 0.63 | 0.63 | 0.09 | 1.00 | 1.00 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 |
| Sat Flow, veh/h | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 | 1314 | 1870 | 1585 | 1089 | 1870 | 1585 |
| Grp Volume(v), veh/h | 95 | 1384 | 79 | 132 | 1237 | 116 | 95 | 237 | 53 | 47 | 47 | 37 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 | 1314 | 1870 | 1585 | 1089 | 1870 | 1585 |
| Q Serve(g_s), s | 2.3 | 28.6 | 2.3 | 3.3 | 0.0 | 0.0 | 7.9 | 14.3 | 3.4 | 5.1 | 2.5 | 2.4 |
| Cycle Q Clear(g_c), s | 2.3 | 28.6 | 2.3 | 3.3 | 0.0 | 0.0 | 10.4 | 14.3 | 3.4 | 19.4 | 2.5 | 2.4 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 384 | 2227 | 993 | 280 | 2243 | 1000 | 267 | 335 | 284 | 125 | 335 | 284 |
| V/C Ratio(X) | 0.25 | 0.62 | 0.08 | 0.47 | 0.55 | 0.12 | 0.36 | 0.71 | 0.19 | 0.38 | 0.14 | 0.13 |
| Avail Cap(c_a), veh/h | 446 | 2227 | 993 | 335 | 2243 | 1000 | 295 | 374 | 317 | 148 | 374 | 317 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 2.00 | 2.00 | 2.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.86 | 0.86 | 0.86 | 0.72 | 0.72 | 0.72 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 7.0 | 13.7 | 8.8 | 11.7 | 0.0 | 0.0 | 45.9 | 46.3 | 41.8 | 55.4 | 41.5 | 41.4 |
| Incr Delay (d2), s/veh | 0.3 | 1.1 | 0.1 | 0.9 | 0.7 | 0.2 | 0.8 | 5.3 | 0.3 | 1.9 | 0.2 | 0.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.8 | 10.4 | 0.8 | 1.1 | 0.2 | 0.0 | 2.6 | 7.1 | 1.4 | 1.5 | 1.2 | 0.9 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 7.3 | 14.8 | 8.9 | 12.6 | 0.7 | 0.2 | 46.7 | 51.6 | 42.2 | 57.3 | 41.7 | 41.6 |
| LnGrp LOS | A | B | A | B | A | A | D | D | D | E | D | D |
| Approach Vol, veh/h | | 1558 | | | 1485 | | | 385 | | | 131 | |
| Approach Delay, s/veh | | 14.1 | | | 1.7 | | | 49.1 | | | 47.2 | |
| Approach LOS | | B | | | A | | | D | | | D | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 11.3 | 81.2 | | 27.5 | 10.8 | 81.7 | | 27.5 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 | | 6.0 |
| Max Green Setting (Gmax), s | 9.6 | 69.0 | | 24.0 | 9.0 | 69.0 | | 24.0 |
| Max Q Clear Time (g_c+I1), s | 5.3 | 30.6 | | 21.4 | 4.3 | 2.0 | | 16.3 |
| Green Ext Time (p_c), s | 0.1 | 13.1 | | 0.1 | 0.1 | 12.2 | | 1.1 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 13.9 |
| HCM 6th LOS | B |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 80 | 1280 | 50 | 155 | 1270 | 45 | 90 | 195 | 145 | 60 | 100 | 50 |
| Future Volume (veh/h) | 80 | 1280 | 50 | 155 | 1270 | 45 | 90 | 195 | 145 | 60 | 100 | 50 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 84 | 1347 | 53 | 163 | 1337 | 47 | 95 | 205 | 153 | 63 | 105 | 53 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 422 | 1973 | 880 | 320 | 1599 | 713 | 175 | 247 | 210 | 126 | 195 | 165 |
| Arrive On Green | 0.36 | 1.00 | 1.00 | 0.08 | 0.45 | 0.45 | 0.06 | 0.13 | 0.13 | 0.04 | 0.10 | 0.10 |
| Sat Flow, veh/h | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 | 1781 | 1870 | 1585 | 1781 | 1870 | 1585 |
| Grp Volume(v), veh/h | 84 | 1347 | 53 | 163 | 1337 | 47 | 95 | 205 | 153 | 63 | 105 | 53 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 | 1781 | 1870 | 1585 | 1781 | 1870 | 1585 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 7.1 | 39.8 | 2.0 | 6.1 | 12.8 | 8.9 | 0.0 | 6.4 | 2.6 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.0 | 7.1 | 39.8 | 2.0 | 6.1 | 12.8 | 8.9 | 0.0 | 6.4 | 2.6 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 422 | 1973 | 880 | 320 | 1599 | 713 | 175 | 247 | 210 | 126 | 195 | 165 |
| V/C Ratio(X) | 0.20 | 0.68 | 0.06 | 0.51 | 0.84 | 0.07 | 0.54 | 0.83 | 0.73 | 0.50 | 0.54 | 0.32 |
| Avail Cap(c_a), veh/h | 422 | 1973 | 880 | 363 | 1599 | 713 | 194 | 374 | 317 | 195 | 374 | 317 |
| HCM Platoon Ratio | 2.00 | 2.00 | 2.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.76 | 0.76 | 0.76 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 28.4 | 0.0 | 0.0 | 22.5 | 29.1 | 18.7 | 51.5 | 50.7 | 31.8 | 55.7 | 51.0 | 23.5 |
| Incr Delay (d2), s/veh | 0.2 | 1.5 | 0.1 | 1.3 | 5.4 | 0.2 | 2.6 | 9.1 | 4.8 | 3.0 | 2.3 | 1.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.6 | 0.4 | 0.0 | 3.0 | 17.0 | 0.8 | 2.8 | 6.5 | 3.6 | 1.9 | 3.1 | 1.5 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 28.6 | 1.5 | 0.1 | 23.8 | 34.4 | 18.9 | 54.1 | 59.9 | 36.6 | 58.7 | 53.3 | 24.6 |
| LnGrp LOS | C | A | A | C | C | B | D | E | D | E | D | C |
| Approach Vol, veh/h | | 1484 | | | 1547 | | | 453 | | | 221 | |
| Approach Delay, s/veh | | 3.0 | | | 32.8 | | | 50.8 | | | 48.0 | |
| Approach LOS | | A | | | C | | | D | | | D | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 15.1 | 72.6 | 13.8 | 18.5 | 27.7 | 60.0 | 10.4 | 21.9 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 12.0 | 51.0 | 9.0 | 24.0 | 9.0 | 54.0 | 9.0 | 24.0 |
| Max Q Clear Time (g_c+I1), s | 9.1 | 2.0 | 8.1 | 8.4 | 2.0 | 41.8 | 2.0 | 14.8 |
| Green Ext Time (p_c), s | 0.1 | 13.1 | 0.0 | 0.5 | 0.1 | 7.0 | 0.1 | 1.1 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 24.0 |
| HCM 6th LOS | C |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↑↑ | ↱ | | ↑↑ | | ↱ |
| Traffic Vol, veh/h | 1465 | 20 | 0 | 1470 | 0 | 20 |
| Future Vol, veh/h | 1465 | 20 | 0 | 1470 | 0 | 20 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | 200 | - | - | - | 0 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 1542 | 21 | 0 | 1547 | 0 | 21 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | - | - | - | 771 |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |
| Critical Hdwy | - | - | - | - | - | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - |
| Follow-up Hdwy | - | - | - | - | - | 3.32 |
| Pot Cap-1 Maneuver | - | - | 0 | - | 0 | 343 |
| Stage 1 | - | - | 0 | - | 0 | - |
| Stage 2 | - | - | 0 | - | 0 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | - | - | - | 343 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 16.2 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBT |
|---|---|---|---|---|
| Capacity (veh/h) | 343 | - | - | - |
| HCM Lane V/C Ratio | 0.061 | - | - | - |
| HCM Control Delay (s) | 16.2 | - | - | - |
| HCM Lane LOS | C | - | - | - |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↑↑ | ↱ | ↰ | ↑↑ | ↰ | ↱ |
| Traffic Volume (veh/h) | 1325 | 160 | 95 | 1215 | 255 | 75 |
| Future Volume (veh/h) | 1325 | 160 | 95 | 1215 | 255 | 75 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 1395 | 168 | 100 | 1279 | 268 | 79 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 2274 | 1014 | 266 | 2594 | 303 | 269 |
| Arrive On Green | 0.64 | 0.64 | 0.04 | 0.73 | 0.17 | 0.17 |
| Sat Flow, veh/h | 3647 | 1585 | 1781 | 3647 | 1781 | 1585 |
| Grp Volume(v), veh/h | 1395 | 168 | 100 | 1279 | 268 | 79 |
| Grp Sat Flow(s),veh/h/ln | 1777 | 1585 | 1781 | 1777 | 1781 | 1585 |
| Q Serve(g_s), s | 27.9 | 5.1 | 2.2 | 18.2 | 17.6 | 5.2 |
| Cycle Q Clear(g_c), s | 27.9 | 5.1 | 2.2 | 18.2 | 17.6 | 5.2 |
| Prop In Lane | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 2274 | 1014 | 266 | 2594 | 303 | 269 |
| V/C Ratio(X) | 0.61 | 0.17 | 0.38 | 0.49 | 0.89 | 0.29 |
| Avail Cap(c_a), veh/h | 2274 | 1014 | 328 | 2594 | 430 | 383 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 12.8 | 8.7 | 11.2 | 6.8 | 48.7 | 43.5 |
| Incr Delay (d2), s/veh | 1.2 | 0.4 | 0.9 | 0.7 | 14.6 | 0.6 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 10.1 | 1.7 | 0.8 | 5.7 | 9.1 | 2.1 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 14.1 | 9.1 | 12.1 | 7.5 | 63.3 | 44.1 |
| LnGrp LOS | B | A | B | A | E | D |
| Approach Vol, veh/h | 1563 | | | 1379 | 347 | |
| Approach Delay, s/veh | 13.5 | | | 7.8 | 58.9 | |
| Approach LOS | B | | | A | E | |

| Timer - Assigned Phs | 1 | 2 | | | | 6 | 8 |
|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 10.8 | 82.8 | | | | 93.6 | 26.4 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | | | | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 9.0 | 64.0 | | | | 79.0 | 29.0 |
| Max Q Clear Time (g_c+I1), s | 4.2 | 29.9 | | | | 20.2 | 19.6 |
| Green Ext Time (p_c), s | 0.1 | 13.3 | | | | 12.0 | 0.8 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 15.9 |
| HCM 6th LOS | B |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.3 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↑↑ | ↱ | | ↑↑ | | ↱ |
| Traffic Vol, veh/h | 1145 | 255 | 0 | 1310 | 0 | 65 |
| Future Vol, veh/h | 1145 | 255 | 0 | 1310 | 0 | 65 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | 200 | - | - | - | 0 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 1205 | 268 | 0 | 1379 | 0 | 68 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | - | - | - | 603 |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |
| Critical Hdwy | - | - | - | - | - | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - |
| Follow-up Hdwy | - | - | - | - | - | 3.32 |
| Pot Cap-1 Maneuver | - | - | 0 | - | 0 | 442 |
| Stage 1 | - | - | 0 | - | 0 | - |
| Stage 2 | - | - | 0 | - | 0 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | - | - | - | 442 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 14.6 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBT |
|---|---|---|---|---|
| Capacity (veh/h) | 442 | - | - | - |
| HCM Lane V/C Ratio | 0.155 | - | - | - |
| HCM Control Delay (s) | 14.6 | - | - | - |
| HCM Lane LOS | B | - | - | - |
| HCM 95th %tile Q(veh) | 0.5 | - | - | - |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↑↑ | ↱ | ↰↰ | ↑↑ | ↰↰ | ↱ |
| Traffic Volume (veh/h) | 690 | 520 | 270 | 630 | 680 | 285 |
| Future Volume (veh/h) | 690 | 520 | 270 | 630 | 680 | 285 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 726 | 547 | 284 | 663 | 716 | 300 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 1806 | 805 | 343 | 2336 | 839 | 385 |
| Arrive On Green | 0.51 | 0.51 | 0.20 | 1.00 | 0.24 | 0.24 |
| Sat Flow, veh/h | 3647 | 1585 | 3456 | 3647 | 3456 | 1585 |
| Grp Volume(v), veh/h | 726 | 547 | 284 | 663 | 716 | 300 |
| Grp Sat Flow(s),veh/h/ln | 1777 | 1585 | 1728 | 1777 | 1728 | 1585 |
| Q Serve(g_s), s | 15.2 | 31.1 | 9.5 | 0.0 | 23.8 | 21.2 |
| Cycle Q Clear(g_c), s | 15.2 | 31.1 | 9.5 | 0.0 | 23.8 | 21.2 |
| Prop In Lane | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 1806 | 805 | 343 | 2336 | 839 | 385 |
| V/C Ratio(X) | 0.40 | 0.68 | 0.83 | 0.28 | 0.85 | 0.78 |
| Avail Cap(c_a), veh/h | 1806 | 805 | 490 | 2336 | 1152 | 528 |
| HCM Platoon Ratio | 1.00 | 1.00 | 2.00 | 2.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.97 | 0.97 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 18.2 | 22.2 | 47.1 | 0.0 | 43.4 | 42.4 |
| Incr Delay (d2), s/veh | 0.7 | 4.6 | 7.6 | 0.3 | 4.8 | 5.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 6.0 | 11.8 | 4.0 | 0.1 | 10.4 | 8.6 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 18.9 | 26.8 | 54.7 | 0.3 | 48.2 | 47.5 |
| LnGrp LOS | B | C | D | A | D | D |
| Approach Vol, veh/h | 1273 | | | 947 | 1016 | |
| Approach Delay, s/veh | 22.3 | | | 16.6 | 48.0 | |
| Approach LOS | C | | | B | D | |

| Timer - Assigned Phs | 1 | 2 | | | | 6 | 8 |
|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 17.9 | 67.0 | | | | 84.9 | 35.1 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | | | | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 17.0 | 45.0 | | | | 68.0 | 40.0 |
| Max Q Clear Time (g_c+I1), s | 11.5 | 33.1 | | | | 2.0 | 25.8 |
| Green Ext Time (p_c), s | 0.5 | 5.2 | | | | 4.7 | 3.4 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 28.7 |
| HCM 6th LOS | C |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↑↑ | ↱ | ↰ | ↑↑ | ↰ | ↱ |
| Traffic Volume (veh/h) | 870 | 105 | 20 | 880 | 20 | 15 |
| Future Volume (veh/h) | 870 | 105 | 20 | 880 | 20 | 15 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | | No | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 916 | 111 | 21 | 926 | 21 | 16 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 3093 | 1380 | 538 | 3093 | 53 | 47 |
| Arrive On Green | 1.00 | 1.00 | 0.87 | 0.87 | 0.03 | 0.03 |
| Sat Flow, veh/h | 3647 | 1585 | 549 | 3647 | 1781 | 1585 |
| Grp Volume(v), veh/h | 916 | 111 | 21 | 926 | 21 | 16 |
| Grp Sat Flow(s),veh/h/ln | 1777 | 1585 | 549 | 1777 | 1781 | 1585 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.6 | 5.5 | 1.4 | 1.2 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.6 | 5.5 | 1.4 | 1.2 |
| Prop In Lane | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 3093 | 1380 | 538 | 3093 | 53 | 47 |
| V/C Ratio(X) | 0.30 | 0.08 | 0.04 | 0.30 | 0.40 | 0.34 |
| Avail Cap(c_a), veh/h | 3093 | 1380 | 538 | 3093 | 341 | 304 |
| HCM Platoon Ratio | 2.00 | 2.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.89 | 0.89 | 0.95 | 0.95 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 1.0 | 1.4 | 57.2 | 57.1 |
| Incr Delay (d2), s/veh | 0.2 | 0.1 | 0.1 | 0.2 | 4.8 | 4.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.1 | 0.0 | 0.0 | 0.6 | 0.7 | 0.5 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 0.2 | 0.1 | 1.2 | 1.6 | 62.0 | 61.3 |
| LnGrp LOS | A | A | A | A | E | E |
| Approach Vol, veh/h | 1027 | | | 947 | 37 | |
| Approach Delay, s/veh | 0.2 | | | 1.6 | 61.7 | |
| Approach LOS | A | | | A | E | |

| Timer - Assigned Phs | 2 | | | | 6 | 8 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 110.5 | | | | 110.5 | 9.5 |
| Change Period (Y+Rc), s | 6.0 | | | | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 85.0 | | | | 85.0 | 23.0 |
| Max Q Clear Time (g_c+I1), s | 2.0 | | | | 7.5 | 3.4 |
| Green Ext Time (p_c), s | 7.7 | | | | 7.7 | 0.1 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 2.0 |
| HCM 6th LOS | A |

| Movement | FBL | FBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 20 | 845 | 20 | 20 | 650 | 20 | 105 | 20 | 20 | 20 | 20 | 145 |
| Future Volume (veh/h) | 20 | 845 | 20 | 20 | 650 | 20 | 105 | 20 | 20 | 20 | 20 | 145 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 21 | 889 | 21 | 21 | 684 | 21 | 111 | 21 | 21 | 21 | 21 | 153 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 573 | 2520 | 1124 | 532 | 2520 | 1124 | 193 | 224 | 190 | 210 | 224 | 190 |
| Arrive On Green | 0.04 | 1.00 | 1.00 | 0.02 | 0.71 | 0.71 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 |
| Sat Flow, veh/h | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 | 1211 | 1870 | 1585 | 1365 | 1870 | 1585 |
| Grp Volume(v), veh/h | 21 | 889 | 21 | 21 | 684 | 21 | 111 | 21 | 21 | 21 | 21 | 153 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 | 1211 | 1870 | 1585 | 1365 | 1870 | 1585 |
| Q Serve(g_s), s | 0.4 | 0.0 | 0.0 | 0.4 | 8.3 | 0.5 | 10.8 | 1.2 | 1.4 | 1.7 | 1.2 | 11.3 |
| Cycle Q Clear(g_c), s | 0.4 | 0.0 | 0.0 | 0.4 | 8.3 | 0.5 | 12.0 | 1.2 | 1.4 | 2.9 | 1.2 | 11.3 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 573 | 2520 | 1124 | 532 | 2520 | 1124 | 193 | 224 | 190 | 210 | 224 | 190 |
| V/C Ratio(X) | 0.04 | 0.35 | 0.02 | 0.04 | 0.27 | 0.02 | 0.57 | 0.09 | 0.11 | 0.10 | 0.09 | 0.81 |
| Avail Cap(c_a), veh/h | 639 | 2520 | 1124 | 599 | 2520 | 1124 | 330 | 436 | 370 | 365 | 436 | 370 |
| HCM Platoon Ratio | 2.00 | 2.00 | 2.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 4.6 | 0.0 | 0.0 | 4.4 | 6.3 | 5.1 | 52.3 | 47.0 | 47.1 | 48.3 | 47.0 | 51.4 |
| Incr Delay (d2), s/veh | 0.0 | 0.4 | 0.0 | 0.0 | 0.3 | 0.0 | 2.7 | 0.2 | 0.3 | 0.2 | 0.2 | 7.8 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.1 | 0.1 | 0.0 | 0.1 | 2.7 | 0.1 | 3.4 | 0.6 | 0.6 | 0.6 | 0.6 | 4.9 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 4.6 | 0.4 | 0.0 | 4.5 | 6.5 | 5.2 | 55.0 | 47.2 | 47.4 | 48.5 | 47.2 | 59.2 |
| LnGrp LOS | A | A | A | A | A | A | E | D | D | D | D | E |
| Approach Vol, veh/h | | 931 | | | 726 | | | 153 | | | 195 | |
| Approach Delay, s/veh | | 0.5 | | | 6.4 | | | 52.9 | | | 56.8 | |
| Approach LOS | | A | | | A | | | D | | | E | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 8.5 | 91.1 | | 20.4 | 8.5 | 91.1 | | 20.4 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 | | 6.0 |
| Max Green Setting (Gmax), s | 7.6 | 67.0 | | 28.0 | 7.0 | 67.0 | | 28.0 |
| Max Q Clear Time (g_c+I1), s | 2.4 | 2.0 | | 13.3 | 2.4 | 10.3 | | 14.0 |
| Green Ext Time (p_c), s | 0.0 | 7.0 | | 0.5 | 0.0 | 4.9 | | 0.4 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 12.1 |
| HCM 6th LOS | B |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 110 | 20 | 865 | 20 | 10 | 580 |
| Future Volume (veh/h) | 110 | 20 | 865 | 20 | 10 | 580 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | No | | No | | | No |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 116 | 21 | 911 | 21 | 11 | 611 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 147 | 131 | 2905 | 1296 | 513 | 2905 |
| Arrive On Green | 0.08 | 0.08 | 0.82 | 0.82 | 0.82 | 0.82 |
| Sat Flow, veh/h | 1781 | 1585 | 3647 | 1585 | 601 | 3647 |
| Grp Volume(v), veh/h | 116 | 21 | 911 | 21 | 11 | 611 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1585 | 1777 | 1585 | 601 | 1777 |
| Q Serve(g_s), s | 7.7 | 1.5 | 7.5 | 0.3 | 0.5 | 4.5 |
| Cycle Q Clear(g_c), s | 7.7 | 1.5 | 7.5 | 0.3 | 8.1 | 4.5 |
| Prop In Lane | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Lane Grp Cap(c), veh/h | 147 | 131 | 2905 | 1296 | 513 | 2905 |
| V/C Ratio(X) | 0.79 | 0.16 | 0.31 | 0.02 | 0.02 | 0.21 |
| Avail Cap(c_a), veh/h | 445 | 396 | 2905 | 1296 | 513 | 2905 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.95 | 0.95 | 0.97 | 0.97 |
| Uniform Delay (d), s/veh | 54.0 | 51.2 | 2.7 | 2.0 | 3.7 | 2.4 |
| Incr Delay (d2), s/veh | 9.1 | 0.6 | 0.3 | 0.0 | 0.1 | 0.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 3.8 | 0.6 | 1.6 | 0.1 | 0.1 | 1.0 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 63.1 | 51.8 | 3.0 | 2.0 | 3.8 | 2.6 |
| LnGrp LOS | E | D | A | A | A | A |
| Approach Vol, veh/h | 137 | | 932 | | | 622 |
| Approach Delay, s/veh | 61.3 | | 2.9 | | | 2.6 |
| Approach LOS | E | | A | | | A |

| Timer - Assigned Phs | 2 | | | 6 | 8 |
|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 104.1 | | | 104.1 | 15.9 |
| Change Period (Y+Rc), s | 6.0 | | | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 78.0 | | | 78.0 | 30.0 |
| Max Q Clear Time (g_c+I1), s | 9.5 | | | 10.1 | 9.7 |
| Green Ext Time (p_c), s | 7.2 | | | 4.4 | 0.3 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 7.5 |
| HCM 6th LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 175 | 690 | 20 | 15 | 440 | 60 | 30 | 10 | 5 | 135 | 15 | 120 |
| Future Volume (veh/h) | 175 | 690 | 20 | 15 | 440 | 60 | 30 | 10 | 5 | 135 | 15 | 120 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 184 | 726 | 21 | 16 | 463 | 63 | 32 | 11 | 5 | 142 | 16 | 126 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 646 | 2313 | 1032 | 491 | 2174 | 970 | 161 | 51 | 23 | 267 | 196 | 166 |
| Arrive On Green | 0.06 | 0.65 | 0.65 | 0.02 | 0.61 | 0.61 | 0.03 | 0.04 | 0.04 | 0.09 | 0.10 | 0.10 |
| Sat Flow, veh/h | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 | 1781 | 1217 | 553 | 1781 | 1870 | 1585 |
| Grp Volume(v), veh/h | 184 | 726 | 21 | 16 | 463 | 63 | 32 | 0 | 16 | 142 | 16 | 126 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 | 1781 | 0 | 1771 | 1781 | 1870 | 1585 |
| Q Serve(g_s), s | 4.5 | 10.8 | 0.6 | 0.4 | 7.0 | 1.9 | 2.0 | 0.0 | 1.0 | 8.8 | 0.9 | 9.3 |
| Cycle Q Clear(g_c), s | 4.5 | 10.8 | 0.6 | 0.4 | 7.0 | 1.9 | 2.0 | 0.0 | 1.0 | 8.8 | 0.9 | 9.3 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.31 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 646 | 2313 | 1032 | 491 | 2174 | 970 | 161 | 0 | 74 | 267 | 196 | 166 |
| V/C Ratio(X) | 0.28 | 0.31 | 0.02 | 0.03 | 0.21 | 0.06 | 0.20 | 0.00 | 0.22 | 0.53 | 0.08 | 0.76 |
| Avail Cap(c_a), veh/h | 753 | 2313 | 1032 | 594 | 2174 | 970 | 320 | 0 | 280 | 314 | 296 | 251 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.96 | 0.96 | 0.96 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 7.4 | 9.2 | 7.4 | 8.5 | 10.4 | 9.4 | 53.0 | 0.0 | 55.6 | 47.3 | 48.5 | 52.3 |
| Incr Delay (d2), s/veh | 0.2 | 0.3 | 0.0 | 0.0 | 0.2 | 0.1 | 0.6 | 0.0 | 1.5 | 1.6 | 0.2 | 7.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.5 | 3.8 | 0.2 | 0.1 | 2.6 | 0.7 | 0.9 | 0.0 | 0.5 | 4.0 | 0.4 | 4.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 7.7 | 9.5 | 7.5 | 8.5 | 10.6 | 9.6 | 53.6 | 0.0 | 57.1 | 48.9 | 48.7 | 59.3 |
| LnGrp LOS | A | A | A | A | B | A | D | A | E | D | D | E |
| Approach Vol, veh/h | | 931 | | | 542 | | | 48 | | | 284 | |
| Approach Delay, s/veh | | 9.1 | | | 10.4 | | | 54.7 | | | 53.5 | |
| Approach LOS | | A | | | B | | | D | | | D | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 8.1 | 84.1 | 9.3 | 18.6 | 12.8 | 79.4 | 16.8 | 11.0 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 9.6 | 54.0 | 14.0 | 19.0 | 14.0 | 49.0 | 14.0 | 19.0 |
| Max Q Clear Time (g_c+I1), s | 12.4 | 12.8 | 4.0 | 11.3 | 6.5 | 9.0 | 10.8 | 3.0 |
| Green Ext Time (p_c), s | 0.0 | 5.2 | 0.0 | 0.2 | 0.3 | 3.2 | 0.1 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 17.7 |
| HCM 6th LOS | B |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | ↑↑ | ↑↑ | ↱ | | ↱ |
| Traffic Vol, veh/h | 0 | 830 | 510 | 35 | 0 | 5 |
| Future Vol, veh/h | 0 | 830 | 510 | 35 | 0 | 5 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | 200 | - | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 874 | 537 | 37 | 0 | 5 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | - | 0 | - | 0 | - | 269 |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |
| Critical Hdwy | - | - | - | - | - | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - |
| Follow-up Hdwy | - | - | - | - | - | 3.32 |
| Pot Cap-1 Maneuver | 0 | - | - | - | 0 | 729 |
| Stage 1 | 0 | - | - | - | 0 | - |
| Stage 2 | 0 | - | - | - | 0 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | - | - | - | - | - | 729 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 10 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|
| Capacity (veh/h) | - | - | - | 729 |
| HCM Lane V/C Ratio | - | - | - | 0.007 |
| HCM Control Delay (s) | - | - | - | 10 |
| HCM Lane LOS | - | - | - | B |
| HCM 95th %tile Q(veh) | - | - | - | 0 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | ↑↑ | ↑↑ | ↱ | | ↱ |
| Traffic Vol, veh/h | 0 | 830 | 535 | 155 | 0 | 10 |
| Future Vol, veh/h | 0 | 830 | 535 | 155 | 0 | 10 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | 200 | - | - |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 874 | 563 | 163 | 0 | 11 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | - | 0 | - | 0 | - | 282 |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |
| Critical Hdwy | - | - | - | - | - | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - |
| Follow-up Hdwy | - | - | - | - | - | 3.32 |
| Pot Cap-1 Maneuver | 0 | - | - | - | 0 | 715 |
| Stage 1 | 0 | - | - | - | 0 | - |
| Stage 2 | 0 | - | - | - | 0 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | - | - | - | - | - | 715 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - |
| Stage 1 | - | - | - | - | - | - |
| Stage 2 | - | - | - | - | - | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0 | 10.1 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|
| Capacity (veh/h) | - | - | - | 715 |
| HCM Lane V/C Ratio | - | - | - | 0.015 |
| HCM Control Delay (s) | - | - | - | 10.1 |
| HCM Lane LOS | - | - | - | B |
| HCM 95th %tile Q(veh) | - | - | - | 0 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 55 | 230 | 545 | 165 | 170 | 120 | 315 | 1095 | 355 | 160 | 375 | 205 |
| Future Volume (veh/h) | 55 | 230 | 545 | 165 | 170 | 120 | 315 | 1095 | 355 | 160 | 375 | 205 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 58 | 242 | 267 | 174 | 179 | 0 | 332 | 1153 | 138 | 168 | 395 | 60 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 477 | 1043 | 465 | 409 | 1183 | | 398 | 1303 | 581 | 224 | 1123 | 501 |
| Arrive On Green | 0.04 | 0.29 | 0.29 | 0.08 | 0.33 | 0.00 | 0.12 | 0.37 | 0.37 | 0.06 | 0.32 | 0.32 |
| Sat Flow, veh/h | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 | 3456 | 3554 | 1585 | 3456 | 3554 | 1585 |
| Grp Volume(v), veh/h | 58 | 242 | 267 | 174 | 179 | 0 | 332 | 1153 | 138 | 168 | 395 | 60 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 | 1728 | 1777 | 1585 | 1728 | 1777 | 1585 |
| Q Serve(g_s), s | 2.7 | 6.2 | 17.2 | 8.1 | 4.2 | 0.0 | 11.3 | 36.5 | 7.2 | 5.7 | 10.3 | 3.2 |
| Cycle Q Clear(g_c), s | 2.7 | 6.2 | 17.2 | 8.1 | 4.2 | 0.0 | 11.3 | 36.5 | 7.2 | 5.7 | 10.3 | 3.2 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 477 | 1043 | 465 | 409 | 1183 | | 398 | 1303 | 581 | 224 | 1123 | 501 |
| V/C Ratio(X) | 0.12 | 0.23 | 0.57 | 0.43 | 0.15 | | 0.83 | 0.88 | 0.24 | 0.75 | 0.35 | 0.12 |
| Avail Cap(c_a), veh/h | 547 | 1043 | 465 | 409 | 1183 | | 547 | 1303 | 581 | 259 | 1123 | 501 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 27.9 | 32.1 | 36.0 | 26.3 | 28.1 | 0.0 | 52.0 | 35.6 | 26.4 | 55.2 | 31.6 | 29.2 |
| Incr Delay (d2), s/veh | 0.1 | 0.5 | 5.1 | 0.7 | 0.3 | 0.0 | 7.8 | 9.0 | 1.0 | 10.0 | 0.9 | 0.5 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.1 | 2.7 | 6.9 | 3.4 | 1.8 | 0.0 | 5.1 | 16.2 | 2.7 | 2.7 | 4.3 | 1.2 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 28.0 | 32.6 | 41.1 | 27.0 | 28.4 | 0.0 | 59.8 | 44.7 | 27.3 | 65.2 | 32.4 | 29.7 |
| LnGrp LOS | C | C | D | C | C | | E | D | C | E | C | C |
| Approach Vol, veh/h | | 567 | | | 353 | A | | 1623 | | | 623 | |
| Approach Delay, s/veh | | 36.1 | | | 27.7 | | | 46.3 | | | 41.0 | |
| Approach LOS | | D | | | C | | | D | | | D | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 15.0 | 41.2 | 19.8 | 43.9 | 10.3 | 46.0 | 13.8 | 50.0 |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Max Green Setting (Gmax), s | 9.0 | 34.0 | 19.0 | 34.0 | 9.0 | 34.0 | 9.0 | 44.0 |
| Max Q Clear Time (g_c+I1), s | 10.1 | 19.2 | 13.3 | 12.3 | 4.7 | 6.2 | 7.7 | 38.5 |
| Green Ext Time (p_c), s | 0.0 | 2.0 | 0.6 | 2.3 | 0.0 | 1.0 | 0.1 | 3.3 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 41.4 |
| HCM 6th LOS | D |

**Notes**

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

2045 Queue Length Analysis Reports

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 150 | 1070 | 350 | 130 | 1300 | 65 | 510 | 315 | 175 | 130 | 645 | 65 |
| Future Volume (vph) | 150 | 1070 | 350 | 130 | 1300 | 65 | 510 | 315 | 175 | 130 | 645 | 65 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 200 | | 0 | 200 | | 150 | 300 | | 300 | 300 | | 300 |
| Storage Lanes | 2 | | 1 | 2 | | 1 | 2 | | 1 | 1 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Link Speed (mph) | | 45 | | | 45 | | | 45 | | | 45 | |
| Link Distance (ft) | | 1256 | | | 1075 | | | 1783 | | | 1083 | |
| Travel Time (s) | | 19.0 | | | 16.3 | | | 27.0 | | | 16.4 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 158 | 1126 | 368 | 137 | 1368 | 68 | 537 | 332 | 184 | 137 | 679 | 68 |
| v/c Ratio | 0.92 | 0.81 | 0.45 | 0.80 | 0.99 | 0.09 | 0.99 | 0.33 | 0.32 | 0.41 | 0.96 | 0.14 |
| Control Delay | 108.2 | 38.3 | 5.6 | 89.6 | 47.6 | 0.3 | 86.6 | 35.0 | 6.2 | 28.5 | 73.2 | 0.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 108.2 | 38.3 | 5.6 | 89.6 | 47.6 | 0.3 | 86.6 | 35.0 | 6.2 | 28.5 | 73.2 | 0.6 |
| Queue Length 50th (ft) | 63 | 404 | 15 | 50 | 595 | 0 | 216 | 107 | 0 | 67 | 276 | 0 |
| Queue Length 95th (ft) | #131 | 494 | 81 | #108 | #730 | m1 | #331 | 149 | 54 | 112 | #397 | 0 |
| Internal Link Dist (ft) | | 1176 | | | 995 | | | 1703 | | | 1003 | |
| Turn Bay Length (ft) | 200 | | | 200 | | 150 | 300 | | 300 | 300 | | 300 |
| Base Capacity (vph) | 171 | 1386 | 825 | 171 | 1386 | 736 | 543 | 1010 | 583 | 337 | 707 | 469 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.92 | 0.81 | 0.45 | 0.80 | 0.99 | 0.09 | 0.99 | 0.33 | 0.32 | 0.41 | 0.96 | 0.14 |

**Intersection Summary**

Area Type: Other

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

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 1365 | 10 | 20 | 1465 | 20 | 20 |
| Future Volume (vph) | 1365 | 10 | 20 | 1465 | 20 | 20 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | | 150 | 200 | | 100 | 0 |
| Storage Lanes | | 1 | 1 | | 0 | 0 |
| Taper Length (ft) | | | 25 | | 25 | |
| Right Turn on Red | | Yes | | | | Yes |
| Link Speed (mph) | 45 | | | 45 | 25 | |
| Link Distance (ft) | 1682 | | | 1976 | 502 | |
| Travel Time (s) | 25.5 | | | 29.9 | 13.7 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 1437 | 11 | 21 | 1542 | 42 | 0 |
| v/c Ratio | 0.55 | 0.01 | 0.10 | 0.59 | 0.15 | |
| Control Delay | 2.3 | 0.1 | 2.9 | 2.9 | 27.7 | |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | 2.3 | 0.1 | 2.9 | 2.9 | 27.7 | |
| Queue Length 50th (ft) | 38 | 0 | 1 | 56 | 14 | |
| Queue Length 95th (ft) | 47 | m0 | m3 | 72 | 47 | |
| Internal Link Dist (ft) | 1602 | | | 1896 | 422 | |
| Turn Bay Length (ft) | | 150 | 200 | | 100 | |
| Base Capacity (vph) | 2624 | 1176 | 208 | 2624 | 285 | |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | 0.55 | 0.01 | 0.10 | 0.59 | 0.15 | |

Intersection Summary

Area Type: Other

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 15 | 1360 | 10 | 20 | 1445 | 30 | 20 | 20 | 20 | 30 | 20 | 20 |
| Future Volume (vph) | 15 | 1360 | 10 | 20 | 1445 | 30 | 20 | 20 | 20 | 30 | 20 | 20 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 200 | | 200 | 200 | | 200 | 100 | | 0 | 100 | | 0 |
| Storage Lanes | 1 | | 1 | 1 | | 1 | 1 | | 0 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Link Speed (mph) | | 45 | | | 45 | | | 25 | | | 25 | |
| Link Distance (ft) | | 1976 | | | 1925 | | | 693 | | | 779 | |
| Travel Time (s) | | 29.9 | | | 29.2 | | | 18.9 | | | 21.2 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 16 | 1432 | 11 | 21 | 1521 | 32 | 21 | 42 | 0 | 32 | 42 | 0 |
| v/c Ratio | 0.07 | 0.47 | 0.01 | 0.08 | 0.50 | 0.02 | 0.22 | 0.30 | | 0.34 | 0.30 | |
| Control Delay | 1.9 | 1.7 | 0.0 | 0.8 | 2.4 | 0.1 | 57.1 | 36.8 | | 62.0 | 36.8 | |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Total Delay | 1.9 | 1.7 | 0.0 | 0.8 | 2.4 | 0.1 | 57.1 | 36.8 | | 62.0 | 36.8 | |
| Queue Length 50th (ft) | 1 | 52 | 0 | 1 | 364 | 1 | 16 | 16 | | 24 | 16 | |
| Queue Length 95th (ft) | m2 | 74 | m0 | m0 | 3 | m0 | 42 | 51 | | 56 | 51 | |
| Internal Link Dist (ft) | | 1896 | | | 1845 | | | 613 | | | 699 | |
| Turn Bay Length (ft) | 200 | | 200 | 200 | | 200 | 100 | | | 100 | | |
| Base Capacity (vph) | 246 | 3041 | 1364 | 274 | 3041 | 1365 | 215 | 290 | | 215 | 290 | |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Reduced v/c Ratio | 0.07 | 0.47 | 0.01 | 0.08 | 0.50 | 0.02 | 0.10 | 0.14 | | 0.15 | 0.14 | |

Intersection Summary

Area Type: Other

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 225 | 975 | 210 | 25 | 1380 | 15 | 65 | 55 | 45 | 55 | 80 | 50 |
| Future Volume (vph) | 225 | 975 | 210 | 25 | 1380 | 15 | 65 | 55 | 45 | 55 | 80 | 50 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 200 | | 200 | 200 | | 200 | 150 | | 0 | 150 | | 0 |
| Storage Lanes | 1 | | 1 | 1 | | 1 | 1 | | 1 | 1 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Link Speed (mph) | | 45 | | | 45 | | | 30 | | | 30 | |
| Link Distance (ft) | | 1925 | | | 1605 | | | 500 | | | 446 | |
| Travel Time (s) | | 29.2 | | | 24.3 | | | 11.4 | | | 10.1 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 237 | 1026 | 221 | 26 | 1453 | 16 | 68 | 58 | 47 | 58 | 84 | 53 |
| v/c Ratio | 0.68 | 0.39 | 0.18 | 0.06 | 0.65 | 0.02 | 0.54 | 0.32 | 0.17 | 0.45 | 0.47 | 0.19 |
| Control Delay | 39.7 | 1.5 | 0.5 | 1.6 | 3.9 | 0.0 | 66.1 | 53.8 | 1.3 | 60.9 | 58.6 | 1.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 39.7 | 1.5 | 0.5 | 1.6 | 3.9 | 0.0 | 66.1 | 53.8 | 1.3 | 60.9 | 58.6 | 1.5 |
| Queue Length 50th (ft) | 90 | 34 | 0 | 1 | 45 | 0 | 51 | 43 | 0 | 43 | 63 | 0 |
| Queue Length 95th (ft) | 129 | 45 | 0 | m3 | 70 | m0 | 96 | 82 | 0 | 84 | 110 | 0 |
| Internal Link Dist (ft) | | 1845 | | | 1525 | | | 420 | | | 366 | |
| Turn Bay Length (ft) | 200 | | 200 | 200 | | 200 | 150 | | | 150 | | |
| Base Capacity (vph) | 418 | 2627 | 1232 | 462 | 2242 | 1052 | 207 | 294 | 365 | 212 | 294 | 365 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.57 | 0.39 | 0.18 | 0.06 | 0.65 | 0.02 | 0.33 | 0.20 | 0.13 | 0.27 | 0.29 | 0.15 |

Intersection Summary

Area Type: Other

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 20 | 995 | 60 | 190 | 1280 | 20 | 65 | 80 | 75 | 85 | 200 | 75 |
| Future Volume (vph) | 20 | 995 | 60 | 190 | 1280 | 20 | 65 | 80 | 75 | 85 | 200 | 75 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 200 | | 200 | 200 | | 200 | 200 | | 200 | 200 | | 200 |
| Storage Lanes | 1 | | 1 | 1 | | 1 | 1 | | 1 | 1 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Link Speed (mph) | | 45 | | | 45 | | | 40 | | | 40 | |
| Link Distance (ft) | | 1605 | | | 749 | | | 1153 | | | 1264 | |
| Travel Time (s) | | 24.3 | | | 11.3 | | | 19.7 | | | 21.5 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 21 | 1047 | 63 | 200 | 1347 | 21 | 68 | 84 | 79 | 89 | 211 | 79 |
| v/c Ratio | 0.10 | 0.61 | 0.07 | 0.60 | 0.64 | 0.02 | 0.29 | 0.32 | 0.21 | 0.29 | 0.70 | 0.19 |
| Control Delay | 9.4 | 15.1 | 0.2 | 22.4 | 14.2 | 0.1 | 35.3 | 47.9 | 1.2 | 35.2 | 60.1 | 1.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 9.4 | 15.1 | 0.2 | 22.4 | 14.2 | 0.1 | 35.3 | 47.9 | 1.2 | 35.2 | 60.1 | 1.0 |
| Queue Length 50th (ft) | 4 | 132 | 0 | 66 | 310 | 0 | 40 | 58 | 0 | 52 | 157 | 0 |
| Queue Length 95th (ft) | m13 | 204 | 1 | 103 | 430 | m0 | 74 | 104 | 0 | 92 | 236 | 0 |
| Internal Link Dist (ft) | | 1525 | | | 669 | | | 1073 | | | 1184 | |
| Turn Bay Length (ft) | 200 | | 200 | 200 | | 200 | 200 | | 200 | 200 | | 200 |
| Base Capacity (vph) | 255 | 1725 | 869 | 393 | 2111 | 999 | 244 | 341 | 446 | 310 | 341 | 446 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.08 | 0.61 | 0.07 | 0.51 | 0.64 | 0.02 | 0.28 | 0.25 | 0.18 | 0.29 | 0.62 | 0.18 |

Intersection Summary

Area Type: Other

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↑↑ | ↱ | ↰ | ↑↑ | ↰ | ↱ |
| Traffic Volume (vph) | 1075 | 85 | 40 | 1280 | 210 | 60 |
| Future Volume (vph) | 1075 | 85 | 40 | 1280 | 210 | 60 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | | 200 | 200 | | 150 | 0 |
| Storage Lanes | | 1 | 1 | | 1 | 1 |
| Taper Length (ft) | | | 25 | | 25 | |
| Right Turn on Red | | Yes | | | | Yes |
| Link Speed (mph) | 45 | | | 45 | 30 | |
| Link Distance (ft) | 2623 | | | 2477 | 930 | |
| Travel Time (s) | 39.7 | | | 37.5 | 21.1 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 1132 | 89 | 42 | 1347 | 221 | 63 |
| v/c Ratio | 0.49 | 0.08 | 0.13 | 0.52 | 0.74 | 0.20 |
| Control Delay | 12.5 | 2.4 | 4.8 | 5.4 | 61.9 | 10.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 12.5 | 2.4 | 4.8 | 5.4 | 61.9 | 10.9 |
| Queue Length 50th (ft) | 396 | 11 | 2 | 29 | 164 | 0 |
| Queue Length 95th (ft) | 515 | m19 | m12 | 252 | 236 | 37 |
| Internal Link Dist (ft) | 2543 | | | 2397 | 850 | |
| Turn Bay Length (ft) | | 200 | 200 | | 150 | |
| Base Capacity (vph) | 2291 | 1055 | 359 | 2587 | 442 | 443 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.49 | 0.08 | 0.12 | 0.52 | 0.50 | 0.14 |

Intersection Summary

Area Type: Other

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 610 | 465 | 325 | 710 | 610 | 230 |
| Future Volume (vph) | 610 | 465 | 325 | 710 | 610 | 230 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | | 200 | 200 | | 200 | 0 |
| Storage Lanes | | 1 | 2 | | 1 | 1 |
| Taper Length (ft) | | | 25 | | 25 | |
| Right Turn on Red | | Yes | | | | Yes |
| Link Speed (mph) | 45 | | | 45 | 40 | |
| Link Distance (ft) | 1069 | | | 2325 | 1040 | |
| Travel Time (s) | 16.2 | | | 35.2 | 17.7 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 642 | 489 | 342 | 747 | 642 | 242 |
| v/c Ratio | 0.39 | 0.49 | 0.70 | 0.32 | 0.79 | 0.43 |
| Control Delay | 12.0 | 3.1 | 55.9 | 12.5 | 50.1 | 6.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 12.0 | 3.1 | 55.9 | 12.5 | 50.1 | 6.6 |
| Queue Length 50th (ft) | 37 | 0 | 129 | 133 | 241 | 0 |
| Queue Length 95th (ft) | 127 | 104 | 189 | 233 | 287 | 60 |
| Internal Link Dist (ft) | 989 | | | 2245 | 960 | |
| Turn Bay Length (ft) | | 200 | 200 | | 200 | |
| Base Capacity (vph) | 1663 | 1003 | 603 | 2345 | 1029 | 644 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.39 | 0.49 | 0.57 | 0.32 | 0.62 | 0.38 |

| Intersection Summary | |
|---|---|
| Area Type: | Other |

| Lane Group | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↑↑ | ↱ | ↰ | ↑↑ | ↰ | ↱ |
| Traffic Volume (vph) | 770 | 70 | 35 | 1015 | 20 | 20 |
| Future Volume (vph) | 770 | 70 | 35 | 1015 | 20 | 20 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | | 200 | 200 | | 100 | 0 |
| Storage Lanes | | 1 | 1 | | 1 | 1 |
| Taper Length (ft) | | | 25 | | 25 | |
| Right Turn on Red | | Yes | | | | Yes |
| Link Speed (mph) | 45 | | | 45 | 30 | |
| Link Distance (ft) | 2325 | | | 1550 | 1373 | |
| Travel Time (s) | 35.2 | | | 23.5 | 31.2 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 811 | 74 | 37 | 1068 | 21 | 21 |
| v/c Ratio | 0.25 | 0.05 | 0.06 | 0.34 | 0.20 | 0.19 |
| Control Delay | 3.7 | 1.7 | 1.3 | 1.1 | 57.9 | 24.1 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 3.7 | 1.7 | 1.3 | 1.1 | 57.9 | 24.1 |
| Queue Length 50th (ft) | 90 | 4 | 2 | 26 | 16 | 0 |
| Queue Length 95th (ft) | 247 | 15 | 6 | 56 | 42 | 26 |
| Internal Link Dist (ft) | 2245 | | | 1470 | 1293 | |
| Turn Bay Length (ft) | | 200 | 200 | | 100 | |
| Base Capacity (vph) | 3188 | 1433 | 581 | 3188 | 324 | 307 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.25 | 0.05 | 0.06 | 0.34 | 0.06 | 0.07 |

Intersection Summary

Area Type: Other

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 35 | 710 | 45 | 90 | 850 | 50 | 75 | 20 | 20 | 10 | 20 | 125 |
| Future Volume (vph) | 35 | 710 | 45 | 90 | 850 | 50 | 75 | 20 | 20 | 10 | 20 | 125 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 200 | | 200 | 200 | | 200 | 100 | | 0 | 100 | | 0 |
| Storage Lanes | 1 | | 1 | 1 | | 1 | 1 | | 1 | 1 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Link Speed (mph) | | 45 | | | 45 | | | 30 | | | 30 | |
| Link Distance (ft) | | 1550 | | | 3004 | | | 761 | | | 677 | |
| Travel Time (s) | | 23.5 | | | 45.5 | | | 17.3 | | | 15.4 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 37 | 747 | 47 | 95 | 895 | 53 | 79 | 21 | 21 | 11 | 21 | 132 |
| v/c Ratio | 0.08 | 0.31 | 0.04 | 0.17 | 0.34 | 0.04 | 0.56 | 0.11 | 0.09 | 0.08 | 0.11 | 0.47 |
| Control Delay | 1.3 | 4.4 | 0.3 | 3.7 | 7.8 | 3.0 | 65.7 | 48.0 | 0.8 | 47.4 | 48.0 | 13.7 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 1.3 | 4.4 | 0.3 | 3.7 | 7.8 | 3.0 | 65.7 | 48.0 | 0.8 | 47.4 | 48.0 | 13.7 |
| Queue Length 50th (ft) | 1 | 54 | 0 | 19 | 144 | 3 | 59 | 15 | 0 | 8 | 15 | 0 |
| Queue Length 95th (ft) | 3 | 23 | 0 | 40 | 201 | 9 | 107 | 39 | 0 | 26 | 39 | 57 |
| Internal Link Dist (ft) | | 1470 | | | 2924 | | | 681 | | | 597 | |
| Turn Bay Length (ft) | 200 | | 200 | 200 | | 200 | 100 | | | 100 | | |
| Base Capacity (vph) | 527 | 2444 | 1118 | 633 | 2606 | 1187 | 288 | 388 | 394 | 288 | 388 | 434 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.07 | 0.31 | 0.04 | 0.15 | 0.34 | 0.04 | 0.27 | 0.05 | 0.05 | 0.04 | 0.05 | 0.30 |

| Intersection Summary | |
|---|---|
| Area Type: | Other |

| Lane Group | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 65 | 35 | 735 | 5 | 25 | 925 |
| Future Volume (vph) | 65 | 35 | 735 | 5 | 25 | 925 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 100 | 0 | | 200 | 200 | |
| Storage Lanes | 1 | 1 | | 1 | 1 | |
| Taper Length (ft) | 25 | | | | 25 | |
| Right Turn on Red | | Yes | | Yes | | |
| Link Speed (mph) | 30 | | 45 | | | 45 |
| Link Distance (ft) | 772 | | 3004 | | | 2529 |
| Travel Time (s) | 17.5 | | 45.5 | | | 38.3 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 68 | 37 | 774 | 5 | 26 | 974 |
| v/c Ratio | 0.46 | 0.22 | 0.26 | 0.00 | 0.05 | 0.32 |
| Control Delay | 61.8 | 18.4 | 1.3 | 0.0 | 2.0 | 2.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 61.8 | 18.4 | 1.3 | 0.0 | 2.0 | 2.6 |
| Queue Length 50th (ft) | 51 | 0 | 1 | 0 | 2 | 54 |
| Queue Length 95th (ft) | 96 | 33 | 2 | m0 | m6 | 116 |
| Internal Link Dist (ft) | 692 | | 2924 | | | 2449 |
| Turn Bay Length (ft) | 100 | | | 200 | 200 | |
| Base Capacity (vph) | 383 | 371 | 2997 | 1341 | 564 | 2997 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.18 | 0.10 | 0.26 | 0.00 | 0.05 | 0.32 |

Intersection Summary

Area Type: Other

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 175 | 580 | 15 | 10 | 640 | 180 | 35 | 20 | 5 | 100 | 20 | 275 |
| Future Volume (vph) | 175 | 580 | 15 | 10 | 640 | 180 | 35 | 20 | 5 | 100 | 20 | 275 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 200 | | 200 | 200 | | 200 | 100 | | 0 | 100 | | 0 |
| Storage Lanes | 1 | | 1 | 1 | | 1 | 1 | | 0 | 1 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Link Speed (mph) | | 45 | | | 45 | | | 35 | | | 35 | |
| Link Distance (ft) | | 2529 | | | 1339 | | | 650 | | | 600 | |
| Travel Time (s) | | 38.3 | | | 20.3 | | | 12.7 | | | 11.7 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 184 | 611 | 16 | 11 | 674 | 189 | 37 | 26 | 0 | 105 | 21 | 289 |
| v/c Ratio | 0.34 | 0.24 | 0.01 | 0.02 | 0.32 | 0.18 | 0.22 | 0.22 | | 0.50 | 0.12 | 0.70 |
| Control Delay | 6.5 | 2.2 | 0.0 | 6.3 | 10.0 | 1.8 | 41.3 | 49.3 | | 49.2 | 49.2 | 15.2 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 |
| Total Delay | 6.5 | 2.2 | 0.0 | 6.3 | 10.0 | 1.8 | 41.3 | 49.3 | | 49.2 | 49.2 | 15.2 |
| Queue Length 50th (ft) | 20 | 21 | 0 | 2 | 84 | 3 | 24 | 16 | | 69 | 15 | 0 |
| Queue Length 95th (ft) | 45 | 30 | 0 | m6 | 130 | 20 | 50 | 44 | | 113 | 39 | 83 |
| Internal Link Dist (ft) | | 2449 | | | 1259 | | | 570 | | | 520 | |
| Turn Bay Length (ft) | 200 | | 200 | 200 | | 200 | 100 | | | 100 | | |
| Base Capacity (vph) | 585 | 2516 | 1164 | 603 | 2126 | 1026 | 194 | 290 | | 250 | 372 | 547 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.31 | 0.24 | 0.01 | 0.02 | 0.32 | 0.18 | 0.19 | 0.09 | | 0.42 | 0.06 | 0.53 |

Intersection Summary

Area Type: Other

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 70 | 190 | 425 | 300 | 305 | 210 | 225 | 620 | 170 | 185 | 640 | 455 |
| Future Volume (vph) | 70 | 190 | 425 | 300 | 305 | 210 | 225 | 620 | 170 | 185 | 640 | 455 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 200 | | 200 | 275 | | 275 | 380 | | 600 | 315 | | 280 |
| Storage Lanes | 1 | | 1 | 1 | | 1 | 2 | | 1 | 2 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Link Speed (mph) | | 45 | | | 45 | | | 55 | | | 55 | |
| Link Distance (ft) | | 1445 | | | 1276 | | | 1562 | | | 1226 | |
| Travel Time (s) | | 21.9 | | | 19.3 | | | 19.4 | | | 15.2 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 74 | 200 | 447 | 316 | 321 | 221 | 237 | 653 | 179 | 195 | 674 | 479 |
| v/c Ratio | 0.18 | 0.20 | 0.66 | 0.69 | 0.29 | 0.34 | 0.65 | 0.54 | 0.27 | 0.58 | 0.57 | 0.63 |
| Control Delay | 18.4 | 25.8 | 9.7 | 38.0 | 33.3 | 5.8 | 60.4 | 34.1 | 5.3 | 58.4 | 35.2 | 13.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 18.4 | 25.8 | 9.7 | 38.0 | 33.3 | 5.8 | 60.4 | 34.1 | 5.3 | 58.4 | 35.2 | 13.9 |
| Queue Length 50th (ft) | 33 | 47 | 8 | 174 | 102 | 0 | 91 | 214 | 0 | 75 | 226 | 85 |
| Queue Length 95th (ft) | 37 | 51 | 96 | 255 | 144 | 59 | 134 | 281 | 50 | 112 | 291 | 206 |
| Internal Link Dist (ft) | | 1365 | | | 1196 | | | 1482 | | | 1146 | |
| Turn Bay Length (ft) | 200 | | 200 | 275 | | 275 | 380 | | 600 | 315 | | 280 |
| Base Capacity (vph) | 422 | 1002 | 677 | 457 | 1102 | 645 | 400 | 1214 | 660 | 400 | 1189 | 756 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.18 | 0.20 | 0.66 | 0.69 | 0.29 | 0.34 | 0.59 | 0.54 | 0.27 | 0.49 | 0.57 | 0.63 |

| Intersection Summary | |
|---|---|
| Area Type: | Other |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 190 | 1150 | 350 | 370 | 895 | 50 | 435 | 795 | 260 | 90 | 525 | 210 |
| Future Volume (vph) | 190 | 1150 | 350 | 370 | 895 | 50 | 435 | 795 | 260 | 90 | 525 | 210 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 200 | | 0 | 200 | | 150 | 300 | | 300 | 300 | | 300 |
| Storage Lanes | 2 | | 1 | 2 | | 1 | 2 | | 1 | 1 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Link Speed (mph) | | 45 | | | 45 | | | 45 | | | 45 | |
| Link Distance (ft) | | 1256 | | | 1075 | | | 1783 | | | 1083 | |
| Travel Time (s) | | 19.0 | | | 16.3 | | | 27.0 | | | 16.4 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 200 | 1211 | 368 | 389 | 942 | 53 | 458 | 837 | 274 | 95 | 553 | 221 |
| v/c Ratio | 0.63 | 0.91 | 0.48 | 0.97 | 0.67 | 0.07 | 0.94 | 0.89 | 0.46 | 0.70 | 0.94 | 0.49 |
| Control Delay | 61.5 | 47.1 | 8.8 | 94.3 | 20.0 | 0.3 | 80.0 | 54.8 | 9.6 | 58.4 | 74.4 | 9.8 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 61.5 | 47.1 | 8.8 | 94.3 | 20.0 | 0.3 | 80.0 | 54.8 | 9.6 | 58.4 | 74.4 | 9.8 |
| Queue Length 50th (ft) | 77 | 464 | 41 | 135 | 351 | 0 | 183 | 328 | 21 | 50 | 225 | 0 |
| Queue Length 95th (ft) | 117 | #602 | 121 | #251 | 388 | 3 | #285 | #437 | 94 | #105 | #334 | 70 |
| Internal Link Dist (ft) | | 1176 | | | 995 | | | 1703 | | | 1003 | |
| Turn Bay Length (ft) | 200 | | | 200 | | 150 | 300 | | 300 | 300 | | 300 |
| Base Capacity (vph) | 343 | 1327 | 773 | 400 | 1411 | 746 | 486 | 943 | 596 | 135 | 589 | 448 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.58 | 0.91 | 0.48 | 0.97 | 0.67 | 0.07 | 0.94 | 0.89 | 0.46 | 0.70 | 0.94 | 0.49 |

Intersection Summary

Area Type: Other

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

| Lane Group | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 1480 | 20 | 15 | 1290 | 15 | 20 |
| Future Volume (vph) | 1480 | 20 | 15 | 1290 | 15 | 20 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | | 150 | 200 | | 100 | 0 |
| Storage Lanes | | 1 | 1 | | 0 | 0 |
| Taper Length (ft) | | | 25 | | 25 | |
| Right Turn on Red | | Yes | | | | Yes |
| Link Speed (mph) | 45 | | | 45 | 25 | |
| Link Distance (ft) | 1682 | | | 1976 | 502 | |
| Travel Time (s) | 25.5 | | | 29.9 | 13.7 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 1558 | 21 | 16 | 1358 | 37 | 0 |
| v/c Ratio | 0.49 | 0.01 | 0.06 | 0.43 | 0.31 | |
| Control Delay | 1.6 | 0.0 | 0.5 | 0.4 | 36.9 | |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | 1.6 | 0.0 | 0.5 | 0.4 | 36.9 | |
| Queue Length 50th (ft) | 24 | 0 | 0 | 2 | 12 | |
| Queue Length 95th (ft) | m22 | m0 | m0 | 2 | 47 | |
| Internal Link Dist (ft) | 1602 | | | 1896 | 422 | |
| Turn Bay Length (ft) | | 150 | 200 | | 100 | |
| Base Capacity (vph) | 3185 | 1426 | 253 | 3185 | 284 | |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | 0.49 | 0.01 | 0.06 | 0.43 | 0.13 | |

Intersection Summary

Area Type: Other

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 40 | 1440 | 20 | 10 | 1270 | 20 | 15 | 20 | 20 | 20 | 20 | 20 |
| Future Volume (vph) | 40 | 1440 | 20 | 10 | 1270 | 20 | 15 | 20 | 20 | 20 | 20 | 20 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 200 | | 200 | 200 | | 200 | 100 | | 0 | 100 | | 0 |
| Storage Lanes | 1 | | 1 | 1 | | 1 | 1 | | 0 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Link Speed (mph) | | 45 | | | 45 | | | 25 | | | 25 | |
| Link Distance (ft) | | 1976 | | | 1925 | | | 693 | | | 779 | |
| Travel Time (s) | | 29.9 | | | 29.2 | | | 18.9 | | | 21.2 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 42 | 1516 | 21 | 11 | 1337 | 21 | 16 | 42 | 0 | 21 | 42 | 0 |
| v/c Ratio | 0.13 | 0.49 | 0.02 | 0.04 | 0.44 | 0.02 | 0.19 | 0.33 | | 0.25 | 0.33 | |
| Control Delay | 1.6 | 1.1 | 0.1 | 3.0 | 3.9 | 1.4 | 57.6 | 39.0 | | 59.9 | 39.0 | |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Total Delay | 1.6 | 1.1 | 0.1 | 3.0 | 3.9 | 1.4 | 57.6 | 39.0 | | 59.9 | 39.0 | |
| Queue Length 50th (ft) | 1 | 25 | 0 | 1 | 74 | 1 | 12 | 16 | | 16 | 16 | |
| Queue Length 95th (ft) | m6 | 61 | m0 | m4 | 167 | m2 | 35 | 52 | | 42 | 52 | |
| Internal Link Dist (ft) | | 1896 | | | 1845 | | | 613 | | | 699 | |
| Turn Bay Length (ft) | 200 | | 200 | 200 | | 200 | 100 | | | 100 | | |
| Base Capacity (vph) | 312 | 3067 | 1375 | 252 | 3067 | 1375 | 215 | 290 | | 215 | 290 | |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Reduced v/c Ratio | 0.13 | 0.49 | 0.02 | 0.04 | 0.44 | 0.02 | 0.07 | 0.14 | | 0.10 | 0.14 | |

Intersection Summary

Area Type: Other

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 90 | 1315 | 75 | 125 | 1175 | 110 | 90 | 225 | 50 | 45 | 45 | 35 |
| Future Volume (vph) | 90 | 1315 | 75 | 125 | 1175 | 110 | 90 | 225 | 50 | 45 | 45 | 35 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 200 | | 200 | 200 | | 200 | 150 | | 0 | 150 | | 0 |
| Storage Lanes | 1 | | 1 | 1 | | 1 | 1 | | 1 | 1 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Link Speed (mph) | | 45 | | | 45 | | | 30 | | | 30 | |
| Link Distance (ft) | | 1925 | | | 1605 | | | 500 | | | 446 | |
| Travel Time (s) | | 29.2 | | | 24.3 | | | 11.4 | | | 10.1 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 95 | 1384 | 79 | 132 | 1237 | 116 | 95 | 237 | 53 | 47 | 47 | 37 |
| v/c Ratio | 0.32 | 0.63 | 0.08 | 0.50 | 0.56 | 0.11 | 0.42 | 0.77 | 0.16 | 0.47 | 0.15 | 0.11 |
| Control Delay | 5.2 | 7.4 | 0.7 | 20.6 | 7.2 | 0.9 | 49.8 | 63.9 | 4.3 | 59.1 | 42.1 | 0.7 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 5.2 | 7.4 | 0.7 | 20.6 | 7.2 | 0.9 | 49.8 | 63.9 | 4.3 | 59.1 | 42.1 | 0.7 |
| Queue Length 50th (ft) | 8 | 64 | 0 | 16 | 96 | 0 | 66 | 177 | 0 | 33 | 31 | 0 |
| Queue Length 95th (ft) | 18 | 262 | 1 | m80 | 132 | m6 | 118 | 258 | 16 | 73 | 65 | 1 |
| Internal Link Dist (ft) | | 1845 | | | 1525 | | | 420 | | | 366 | |
| Turn Bay Length (ft) | 200 | | 200 | 200 | | 200 | 150 | | | 150 | | |
| Base Capacity (vph) | 326 | 2186 | 1009 | 280 | 2203 | 1028 | 270 | 372 | 382 | 122 | 372 | 382 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.29 | 0.63 | 0.08 | 0.47 | 0.56 | 0.11 | 0.35 | 0.64 | 0.14 | 0.39 | 0.13 | 0.10 |

Intersection Summary

Area Type: Other

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 80 | 1280 | 50 | 155 | 1270 | 45 | 90 | 195 | 145 | 60 | 100 | 50 |
| Future Volume (vph) | 80 | 1280 | 50 | 155 | 1270 | 45 | 90 | 195 | 145 | 60 | 100 | 50 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 200 | | 200 | 200 | | 200 | 200 | | 200 | 200 | | 200 |
| Storage Lanes | 1 | | 1 | 1 | | 1 | 1 | | 1 | 1 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Link Speed (mph) | | 45 | | | 45 | | | 40 | | | 40 | |
| Link Distance (ft) | | 1605 | | | 749 | | | 1153 | | | 1264 | |
| Travel Time (s) | | 24.3 | | | 11.3 | | | 19.7 | | | 21.5 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 84 | 1347 | 53 | 163 | 1337 | 47 | 95 | 205 | 153 | 63 | 105 | 53 |
| v/c Ratio | 0.33 | 0.75 | 0.06 | 0.69 | 0.68 | 0.05 | 0.50 | 0.66 | 0.36 | 0.36 | 0.47 | 0.15 |
| Control Delay | 12.5 | 10.2 | 0.1 | 41.7 | 16.7 | 0.1 | 53.2 | 57.7 | 5.0 | 53.2 | 54.6 | 0.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 12.5 | 10.2 | 0.1 | 41.7 | 16.7 | 0.1 | 53.2 | 57.7 | 5.0 | 53.2 | 54.6 | 0.9 |
| Queue Length 50th (ft) | 8 | 67 | 0 | 94 | 324 | 0 | 67 | 153 | 0 | 45 | 77 | 0 |
| Queue Length 95th (ft) | m23 | #198 | m0 | 158 | 397 | m0 | 114 | 224 | 30 | 85 | 127 | 0 |
| Internal Link Dist (ft) | | 1525 | | | 669 | | | 1073 | | | 1184 | |
| Turn Bay Length (ft) | 200 | | 200 | 200 | | 200 | 200 | | 200 | 200 | | 200 |
| Base Capacity (vph) | 260 | 1806 | 901 | 256 | 1971 | 966 | 192 | 372 | 469 | 225 | 372 | 469 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.32 | 0.75 | 0.06 | 0.64 | 0.68 | 0.05 | 0.49 | 0.55 | 0.33 | 0.28 | 0.28 | 0.11 |

Intersection Summary

Area Type: Other

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

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↑↑ | ↱ | ↰ | ↑↑ | ↰ | ↱ |
| Traffic Volume (vph) | 1325 | 160 | 95 | 1215 | 255 | 75 |
| Future Volume (vph) | 1325 | 160 | 95 | 1215 | 255 | 75 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | | 200 | 200 | | 150 | 0 |
| Storage Lanes | | 1 | 1 | | 1 | 1 |
| Taper Length (ft) | | | 25 | | 25 | |
| Right Turn on Red | | Yes | | | | Yes |
| Link Speed (mph) | 45 | | | 45 | 30 | |
| Link Distance (ft) | 2623 | | | 2477 | 930 | |
| Travel Time (s) | 39.7 | | | 37.5 | 21.1 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 1395 | 168 | 100 | 1279 | 268 | 79 |
| v/c Ratio | 0.66 | 0.17 | 0.41 | 0.51 | 0.79 | 0.22 |
| Control Delay | 4.2 | 0.3 | 16.3 | 8.2 | 62.9 | 9.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 4.2 | 0.3 | 16.3 | 8.2 | 62.9 | 9.4 |
| Queue Length 50th (ft) | 51 | 0 | 27 | 186 | 199 | 0 |
| Queue Length 95th (ft) | 62 | m0 | m49 | 136 | 280 | 39 |
| Internal Link Dist (ft) | 2543 | | | 2397 | 850 | |
| Turn Bay Length (ft) | | 200 | 200 | | 150 | |
| Base Capacity (vph) | 2108 | 996 | 262 | 2508 | 427 | 442 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.66 | 0.17 | 0.38 | 0.51 | 0.63 | 0.18 |

Intersection Summary

Area Type: Other

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 690 | 520 | 270 | 630 | 680 | 285 |
| Future Volume (vph) | 690 | 520 | 270 | 630 | 680 | 285 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | | 200 | 200 | | 200 | 0 |
| Storage Lanes | | 1 | 2 | | 1 | 1 |
| Taper Length (ft) | | | 25 | | 25 | |
| Right Turn on Red | | Yes | | | | Yes |
| Link Speed (mph) | 45 | | | 45 | 40 | |
| Link Distance (ft) | 1069 | | | 2325 | 1040 | |
| Travel Time (s) | 16.2 | | | 35.2 | 17.7 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 726 | 547 | 284 | 663 | 716 | 300 |
| v/c Ratio | 0.44 | 0.53 | 0.67 | 0.29 | 0.80 | 0.47 |
| Control Delay | 17.6 | 4.2 | 59.5 | 9.9 | 48.0 | 6.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 17.6 | 4.2 | 59.5 | 9.9 | 48.0 | 6.0 |
| Queue Length 50th (ft) | 80 | 0 | 96 | 91 | 267 | 0 |
| Queue Length 95th (ft) | 152 | 111 | 167 | 161 | 309 | 62 |
| Internal Link Dist (ft) | 989 | | | 2245 | 960 | |
| Turn Bay Length (ft) | | 200 | 200 | | 200 | |
| Base Capacity (vph) | 1639 | 1026 | 493 | 2257 | 1144 | 727 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.44 | 0.53 | 0.58 | 0.29 | 0.63 | 0.41 |

Intersection Summary

Area Type: Other

| Lane Group | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↑↑ | ↱ | ↰ | ↑↑ | ↰ | ↱ |
| Traffic Volume (vph) | 870 | 105 | 20 | 880 | 20 | 15 |
| Future Volume (vph) | 870 | 105 | 20 | 880 | 20 | 15 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | | 200 | 200 | | 100 | 0 |
| Storage Lanes | | 1 | 1 | | 1 | 1 |
| Taper Length (ft) | | | 25 | | 25 | |
| Right Turn on Red | | Yes | | | | Yes |
| Link Speed (mph) | 45 | | | 45 | 30 | |
| Link Distance (ft) | 2325 | | | 1550 | 1373 | |
| Travel Time (s) | 35.2 | | | 23.5 | 31.2 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 916 | 111 | 21 | 926 | 21 | 16 |
| v/c Ratio | 0.29 | 0.08 | 0.04 | 0.29 | 0.20 | 0.15 |
| Control Delay | 0.8 | 0.2 | 4.3 | 3.6 | 57.9 | 25.7 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 0.8 | 0.2 | 4.3 | 3.6 | 57.9 | 25.7 |
| Queue Length 50th (ft) | 13 | 0 | 1 | 13 | 16 | 0 |
| Queue Length 95th (ft) | 46 | 2 | 18 | 188 | 42 | 23 |
| Internal Link Dist (ft) | 2245 | | | 1470 | 1293 | |
| Turn Bay Length (ft) | | 200 | 200 | | 100 | |
| Base Capacity (vph) | 3188 | 1437 | 521 | 3188 | 339 | 316 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.29 | 0.08 | 0.04 | 0.29 | 0.06 | 0.05 |

Intersection Summary

Area Type: Other

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 20 | 845 | 20 | 20 | 650 | 20 | 105 | 20 | 20 | 20 | 20 | 145 |
| Future Volume (vph) | 20 | 845 | 20 | 20 | 650 | 20 | 105 | 20 | 20 | 20 | 20 | 145 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 200 | | 200 | 200 | | 200 | 100 | | 0 | 100 | | 0 |
| Storage Lanes | 1 | | 1 | 1 | | 1 | 1 | | 1 | 1 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Link Speed (mph) | | 45 | | | 45 | | | 30 | | | 30 | |
| Link Distance (ft) | | 1550 | | | 3004 | | | 761 | | | 677 | |
| Travel Time (s) | | 23.5 | | | 45.5 | | | 17.3 | | | 15.4 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 21 | 889 | 21 | 21 | 684 | 21 | 111 | 21 | 21 | 21 | 21 | 153 |
| v/c Ratio | 0.04 | 0.34 | 0.02 | 0.04 | 0.26 | 0.02 | 0.65 | 0.09 | 0.08 | 0.12 | 0.09 | 0.46 |
| Control Delay | 1.2 | 2.1 | 0.1 | 5.3 | 9.8 | 1.6 | 66.2 | 44.7 | 0.6 | 45.7 | 44.7 | 11.7 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 1.2 | 2.1 | 0.1 | 5.3 | 9.8 | 1.6 | 66.2 | 44.7 | 0.6 | 45.7 | 44.7 | 11.7 |
| Queue Length 50th (ft) | 1 | 22 | 0 | 5 | 137 | 0 | 83 | 15 | 0 | 15 | 15 | 0 |
| Queue Length 95th (ft) | 3 | 40 | 0 | 18 | 175 | 5 | 138 | 37 | 0 | 38 | 37 | 58 |
| Internal Link Dist (ft) | | 1470 | | | 2924 | | | 681 | | | 597 | |
| Turn Bay Length (ft) | 200 | | 200 | 200 | | 200 | 100 | | | 100 | | |
| Base Capacity (vph) | 596 | 2600 | 1184 | 488 | 2600 | 1184 | 323 | 434 | 432 | 323 | 434 | 486 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.04 | 0.34 | 0.02 | 0.04 | 0.26 | 0.02 | 0.34 | 0.05 | 0.05 | 0.07 | 0.05 | 0.31 |

| Intersection Summary | |
|---|---|
| Area Type: | Other |

| Lane Group | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 110 | 20 | 865 | 20 | 10 | 580 |
| Future Volume (vph) | 110 | 20 | 865 | 20 | 10 | 580 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 100 | 0 | | 200 | 200 | |
| Storage Lanes | 1 | 1 | | 1 | 1 | |
| Taper Length (ft) | 25 | | | | 25 | |
| Right Turn on Red | | Yes | | Yes | | |
| Link Speed (mph) | 30 | | 45 | | | 45 |
| Link Distance (ft) | 772 | | 3004 | | | 2529 |
| Travel Time (s) | 17.5 | | 45.5 | | | 38.3 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 116 | 21 | 911 | 21 | 11 | 611 |
| v/c Ratio | 0.60 | 0.11 | 0.33 | 0.02 | 0.02 | 0.22 |
| Control Delay | 62.9 | 18.4 | 1.1 | 0.1 | 2.8 | 2.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 62.9 | 18.4 | 1.1 | 0.1 | 2.8 | 2.5 |
| Queue Length 50th (ft) | 87 | 0 | 33 | 1 | 1 | 30 |
| Queue Length 95th (ft) | 143 | 24 | 3 | 0 | m5 | 52 |
| Internal Link Dist (ft) | 692 | | 2924 | | | 2449 |
| Turn Bay Length (ft) | 100 | | | 200 | 200 | |
| Base Capacity (vph) | 442 | 411 | 2795 | 1254 | 445 | 2795 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.26 | 0.05 | 0.33 | 0.02 | 0.02 | 0.22 |

Intersection Summary

Area Type: Other

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 175 | 690 | 20 | 15 | 440 | 60 | 30 | 10 | 5 | 135 | 15 | 120 |
| Future Volume (vph) | 175 | 690 | 20 | 15 | 440 | 60 | 30 | 10 | 5 | 135 | 15 | 120 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 200 | | 200 | 200 | | 200 | 100 | | 0 | 100 | | 0 |
| Storage Lanes | 1 | | 1 | 1 | | 1 | 1 | | 0 | 1 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Link Speed (mph) | | 45 | | | 45 | | | 35 | | | 35 | |
| Link Distance (ft) | | 2529 | | | 1339 | | | 650 | | | 600 | |
| Travel Time (s) | | 38.3 | | | 20.3 | | | 12.7 | | | 11.7 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 184 | 726 | 21 | 16 | 463 | 63 | 32 | 16 | 0 | 142 | 16 | 126 |
| v/c Ratio | 0.27 | 0.29 | 0.02 | 0.03 | 0.21 | 0.06 | 0.21 | 0.16 | | 0.59 | 0.10 | 0.47 |
| Control Delay | 3.4 | 3.3 | 0.1 | 5.1 | 6.5 | 0.3 | 45.1 | 46.0 | | 53.9 | 50.9 | 13.2 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 |
| Total Delay | 3.4 | 3.3 | 0.1 | 5.1 | 6.5 | 0.3 | 45.1 | 46.0 | | 53.9 | 50.9 | 13.2 |
| Queue Length 50th (ft) | 14 | 29 | 0 | 1 | 26 | 0 | 24 | 8 | | 101 | 12 | 0 |
| Queue Length 95th (ft) | 34 | 57 | 1 | m7 | 75 | m0 | 47 | 32 | | 153 | 34 | 50 |
| Internal Link Dist (ft) | | 2449 | | | 1259 | | | 570 | | | 520 | |
| Turn Bay Length (ft) | 200 | | 200 | 200 | | 200 | 100 | | | 100 | | |
| Base Capacity (vph) | 710 | 2467 | 1144 | 559 | 2155 | 1017 | 253 | 285 | | 259 | 294 | 365 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.26 | 0.29 | 0.02 | 0.03 | 0.21 | 0.06 | 0.13 | 0.06 | | 0.55 | 0.05 | 0.35 |

Intersection Summary

Area Type: Other

m Volume for 95th percentile queue is metered by upstream signal.

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 55 | 230 | 545 | 165 | 170 | 120 | 315 | 1095 | 355 | 160 | 375 | 205 |
| Future Volume (vph) | 55 | 230 | 545 | 165 | 170 | 120 | 315 | 1095 | 355 | 160 | 375 | 205 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 200 | | 200 | 275 | | 275 | 380 | | 600 | 315 | | 280 |
| Storage Lanes | 1 | | 1 | 1 | | 1 | 2 | | 1 | 2 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Link Speed (mph) | | 45 | | | 45 | | | 55 | | | 55 | |
| Link Distance (ft) | | 1445 | | | 1276 | | | 1562 | | | 1226 | |
| Travel Time (s) | | 21.9 | | | 19.3 | | | 19.4 | | | 15.2 | |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 58 | 242 | 574 | 174 | 179 | 126 | 332 | 1153 | 374 | 168 | 395 | 216 |
| v/c Ratio | 0.13 | 0.24 | 0.76 | 0.40 | 0.16 | 0.20 | 0.71 | 0.89 | 0.46 | 0.67 | 0.37 | 0.34 |
| Control Delay | 15.9 | 23.9 | 13.4 | 27.1 | 31.6 | 1.4 | 58.2 | 45.1 | 4.6 | 67.6 | 34.3 | 5.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 15.9 | 23.9 | 13.4 | 27.1 | 31.6 | 1.4 | 58.2 | 45.1 | 4.6 | 67.6 | 34.3 | 5.9 |
| Queue Length 50th (ft) | 24 | 65 | 182 | 87 | 54 | 0 | 127 | 437 | 0 | 66 | 126 | 0 |
| Queue Length 95th (ft) | m28 | 66 | 70 | 140 | 85 | 7 | 174 | #544 | 63 | 104 | 177 | 57 |
| Internal Link Dist (ft) | | 1365 | | | 1196 | | | 1482 | | | 1146 | |
| Turn Bay Length (ft) | 200 | | 200 | 275 | | 275 | 380 | | 600 | 315 | | 280 |
| Base Capacity (vph) | 469 | 1003 | 755 | 439 | 1111 | 628 | 543 | 1302 | 819 | 257 | 1081 | 633 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.12 | 0.24 | 0.76 | 0.40 | 0.16 | 0.20 | 0.61 | 0.89 | 0.46 | 0.65 | 0.37 | 0.34 |

Intersection Summary

Area Type: Other

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

m Volume for 95th percentile queue is metered by upstream signal.

Prepared by

WILSON &COMPANY

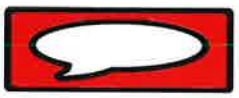
5755 Mark Dabling Boulevard, Suite 220
Colorado Springs, CO 80919
719-520-5800

# Briargate-Stapleton Corridor Study

## Appendix C: Drainage Report

El Paso County Department of Public Works

On-Call Contract: #17-067-51
8/17/2021



# Briargate-Stapleton Corridor Study

## Appendix C: Drainage Report

Prepared for

El Paso County Department of Public Works
On-Call Contract: #17-067-51

August 17, 2021

Prepared by

WILSON & COMPANY

5755 Mark Dabling Boulevard, Suite 220
Colorado Springs, CO 80919
719-520-5800

# Table of Contents

# List of Tables



# List of Figures



# List of Abbreviations

| Abbreviation | Term/Phrase/Name |
|---|---|
| AE | FEMA Special Flood Hazard Area Designation |
| AMC | Antecedent Moisture Condition |
| CBC | Concrete Box Culvert |
| CC-DBPS | Cottonwood Creek Drainage Basin Planning Study |
| CDOT | Colorado Department of Transportation |
| cfs | cubic feet per second |
| CLOMR | Conditional Letter of Map Revision |
| COS-DCM | City of Colorado Springs Drainage Criteria Manual |
| DBPS | Drainage Basin Planning Study |
| F-DBPS | Falcon Drainage Basin Planning Study |
| FDR | Final Drainage Reports |
| FEMA | Federal Emergency Management Agency |
| FH-MDDP | Falcon Hills Master Development Drainage Plans |
| FIRM | Flood Insurance Rate Map |
| FIS | Flood Insurance Study |
| FSEDB | Full Spectrum Extended Detention Basins |
| HDS | Hydraulic Design Series |
| HSG | Hydrologic Soil Group |
| HW/D | Headwater Depth to Structure Depth Ratio |
| LOMR | Letter of Map Revision |
| MDDP | Master Development Drainage Plans |
| MHFD | Mile High Flood District |
| NOAA | National Oceanic and Atmospheric Administration |
| NRCS | Natural Resources Conservation Service |
| ROW | Right of Way |
| SC-DBPS | Sand Creek Drainage Basin Planning Study |
| SCS | Soil Conservation Service. SCS Method is also known as the SCS Runoff Curve Number method. |
| SR-MDDP | Sterling Ranch Master Development Drainage Plans |
| TR-55 | Technical Resource 55. Simplified procedure for estimating runoff and peak discharges in small watersheds. |
| US | United States |
| WQCV | Water Quality Capture Volume |

# Executive Summary

The portion of the Briargate Parkway – Stapleton Road project corridor considered in this drainage analysis begins at Black Forest Road and runs about 5.7 miles eastward to Meridian Road. The proposed roadway has an initial, interim, and ultimate section to allow flexibility with the corridor improvements' phasing. This report mainly addresses the drainage need associated with the ultimate roadway section. The City of Colorado Springs Drainage Criteria Manual was followed for this report.

The Briargate/Stapleton corridor traverses three major drainage basins - Cottonwood Creek, Sand Creek, and Falcon Watershed. The conceptual drainage investigation was performed using data from the available Drainage Basin Planning Studies, Major Development Drainage Plans, and Final Drainage Reports. Hydrologic and hydraulic data taken from these reports was used where applicable to estimate the off-site drainage needs. Off site drainage traverses the Briargate/Stapleton corridor at approximately 30 locations. The conceptual culvert sizes range in size from a 24" pipe to multi-cell concrete box culverts.

The most significant crossing locations are at Cottonwood Creek, Sand Creek, West Tributary of Falcon Watershed, and East Tributary of Falcon Watershed. CLOMR/LOMR analyses will likely be required for the Cottonwood Creek and Sand Creek crossings.

On-site drainage was estimated to include 17 outfall locations along the corridor. A primary assumption for the conceptual design is that the off-site runoff will not be allowed to drain onto the roadway section and mix with the on-site runoff. The pavement runoff will be collected in curb box inlets and routed to the outfall locations via storm drains.

Keeping the off-site runoff separate from the on-site runoff is the preferred option for establishing water quality and detention requirements. The on-site runoff will need to be treated for water quality, and detention will be provided to reduce flows to required levels using Full-Spectrum Extended Detention Basins. Future facilities recommended in the pertinent DBPS and MDDP could also provide water quality and detention for the corridor.

Portions of the off-site and on-site drainage systems, including potential roadside ditches, will require ROW or Drainage Easements in addition to that shown for the typical roadway section.

# 1 Project Overview & Purpose

The Briargate Parkway – Stapleton Road (hereafter Briargate/Stapleton) project corridor forms a vital link in the Pikes Peak Region's transportation system. Ultimately, this corridor will connect US Highway 24 with I-25 on the north side of the greater Colorado Springs area. The portion under consideration for this drainage analysis begins at Black Forest Road and runs about 5.7 miles eastward to Meridian Road.

Jurisdiction of the corridor falls to the County; however, as development progresses, we understand that much of the area will likely be incorporated into the City of Colorado Springs. As such, the City of Colorado Springs drainage design criteria was considered.

This Drainage Report was prepared in conjunction with the Briargate Parkway – Stapleton Road Corridor Preservation Plan. The purpose of this report is to describe the existing drainage conditions for the Briargate/Stapleton corridor and to conceptualizes the drainage and water quality requirements for implementing the project. This report's recommendations require verification by detailed analyses, which are not included in this study.

## 1.1 General Location and Description

The Briargate/Stapleton corridor is on the northeast side of Colorado Springs and lies within the southern part of *Township 12 South, Range 65 West of the 6th Principal Meridian.* The corridor is in the Cottonwood Creek, Sand Creek, and Falcon drainage basins through this area. The Cottonwood Creek basin generally drains southwest, and the Sand Creek basin and its tributaries drain south and southwest. The Falcon basin drains southeast.

Primarily large lot (2.5 ac) residential developments exist along the westernmost section of the corridor from Black Forest Road to Cottonwood Creek. The corridor aligns with the existing Briargate Parkway in this area. Continuing from Cottonwood Creek to Vollmer Road, the corridor turns southeast and has other large-lot developments currently under construction, as well as some undeveloped land. The corridor then runs through the proposed Sterling Ranch development, consisting of primarily residential areas along the corridor (ranging from 3-5 to 5-8 dwelling units per acre) and commercial areas. Part of this plan is currently under construction at Vollmer Road. The corridor continues east and then north across undeveloped land and finally turns east to align with existing Stapleton Drive. There are existing single-family residential lot (0.5 ac or less) developments along most of the north part of the corridor in this location and large lot residential or undeveloped land to the south. There is a large undeveloped lot in the northwest quadrant of Stapleton Drive and Meridian Road. The corridor ends at Meridian Road.

The undeveloped areas along the corridor are grasslands, and the few trees are at Cottonwood Creek and some of the residential areas. The ground slope ranges from 0% to 8%, and the dominant soil types along the corridor are Columbine gravelly sandy loam (HSG A) and Pring coarse sandy loam (HSG B), with some Stapleton sandy loam (HSG B) and a little Blakeland loamy sand (HSG A). See Exhibits for NRCS Soils Map.

The proposed roadway has an initial, interim, and ultimate section to allow for flexibility with the corridor improvements' phasing. See Exhibits for Typical Sections. The ultimate cross-section is a hybrid of the El Paso County and the Colorado Springs principal arterial roadway section. The 4-lane roadway has 11 ft thru lanes with a 28 ft raised median and 6 ft shoulders defined by curb and gutter. With a sidewalk on one side and bike lane on the other, along with ditches, the total road ROW width is 168 ft.

The length of the corridor is about 5.7 miles long. The project area within the ROW, excluding potential drainage or construction easements, is about 116 acres.

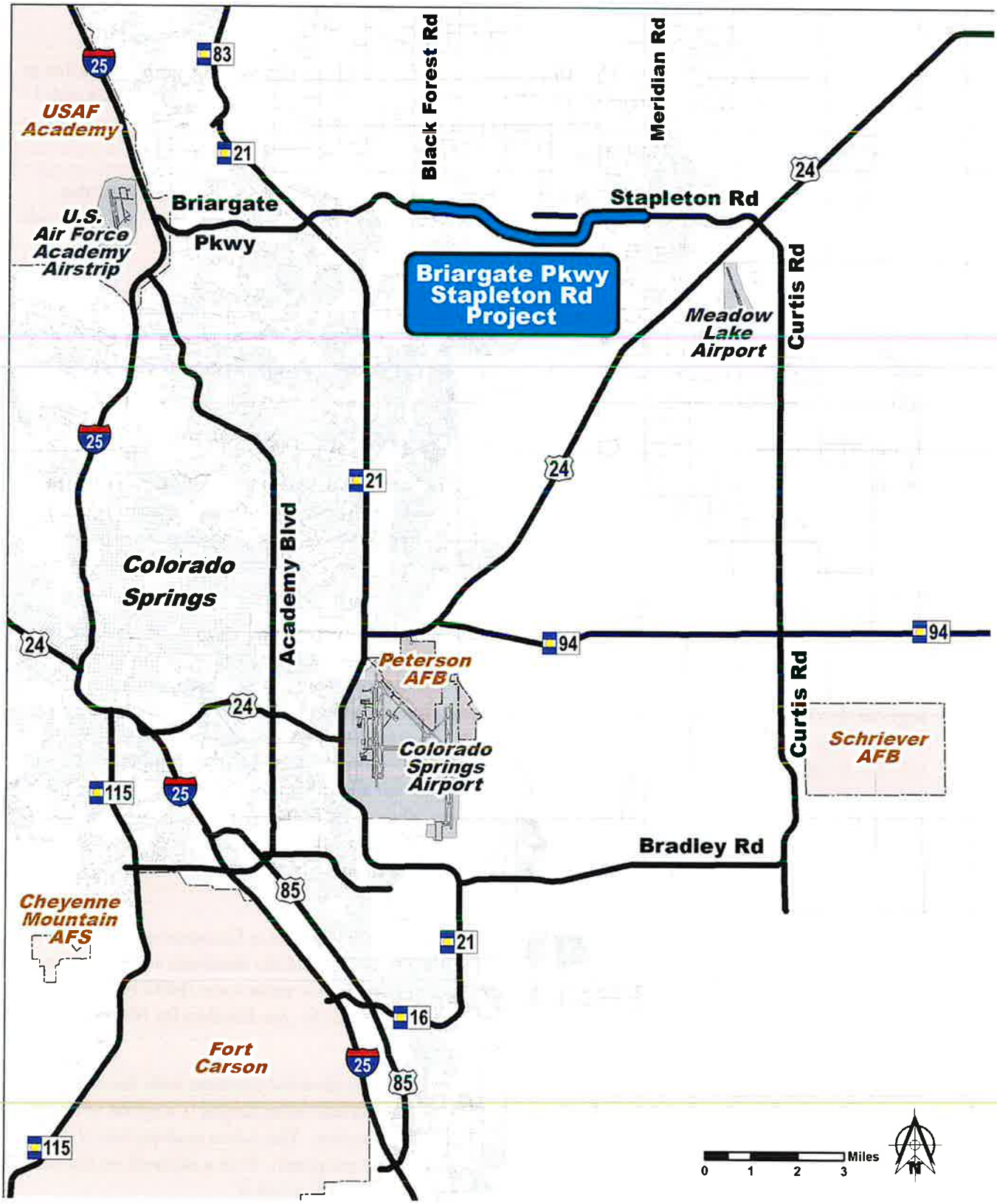



*Figure 1 Study Area Vicinity Map*

# 1.2 Drainage Design Criteria

Though the project is currently under El Paso County jurisdiction, portions of the area will likely be annexed into the City of Colorado Springs in the future. Therefore, the City of Colorado Springs Drainage Criteria Manual (COS-DCM) was followed for this report.

# 1.3 Pertinent Studies and Reports

Various levels of studies and reports exist for the area through which the Briargate/Stapleton corridor passes. Federally, FEMA issues Flood Insurance Studies that establish regulated floodplains and floodways across the country. Locally, Drainage Basin Planning Studies (DBPS) guide the overall hydrologic and hydraulic design approach within a stream's watershed. Master Development Drainage Plans (MDDP) then direct the drainage design for large, multi-phase developments to keep with the priorities laid out in the DBPS. Finally, Drainage Reports give the detailed hydrologic and hydraulic designs for the drainage systems of individual developments to be constructed in keeping with the DBPS and, if part of a multi-phase endeavor, the MDDP.

The following describes the relevant portions of the available reports for the Briargate/Stapleton corridor when this study was conducted.

## Cottonwood Creek DBPS

The west end of the corridor lies in the northeast portion of the Cottonwood Creek drainage basin and crosses Cottonwood Creek. The current Cottonwood Creek Drainage Basin Planning Study (CC-DBPS) was published in 2019.

Per the CC-DBPS, the Briargate/Stapleton corridor passes through slightly erodible soils. Still, there was no observable erosion at the stream, and no stream deficiencies were noted for that reach. There are no planned detention facilities for this area.

There are no general conservation areas listed in the DBPS for the corridor area. Still, there are Palustrine Emergent Wetlands and Palustrine Scrub/Shrub Wetlands at the Cottonwood Creek stream channel crossing. The corridor area does not impact the Preble's Meadow Jumping Mouse block clearance.

The CC-DBPS hydrologic modeling was performed using the SCS method with NOAA Atlas 2 precipitation data and the 24-hour design storm distribution. The model was then calibrated to runoff gage data. The corridor's crossing of Cottonwood Creek is just upstream of the CC-DBPS's hydrologic model junction JUC126, which shows a drainage area of 2.63 square miles. The existing condition and future condition flows for that junction are in Table 1.

**Table 1. Existing and Future Flows of Cottonwood Creek from CC-DBPS near corridor crossing.**

| Return Interval | 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year |
|---|---|---|---|---|---|---|
| Existing Q (cfs) | 48 | 120 | 210 | 470 | 630 | 820 |
| Future Q (cfs) | 48 | 120 | 210 | 470 | 630 | 820 |

The flows are identical for the following reason, as stated in the CC-DBPS:

> *All future development on sites greater than one acre in size will be required to provide on-site full-spectrum detention storage if sub-regional or regional detention is not provided for the project as part of this study or by a Master Development Drainage Plan. Therefore, currently undeveloped areas in this category were represented in the future condition runoff model using pre-development runoff parameters so that downstream peak flows in the future condition model represents post-development projects with on-site detention. (CC-DBPS Section 3.9, Pg 3-6)*

There are two existing ponds at the Cottonwood Creek crossing location, one directly north and the other directly south of the alignment. These ponds are described as stock ponds in the CC-DBPS and were not considered as detention facilities. The ponds were accounted for in the CC-DBPS hydrologic model by being represented as broad, flat reaches in the stream. Subsequent investigation as part of this Drainage Report revealed that the north pond is listed as part of the Park Forest Water Department Reservoir System.

## Flood Insurance Study - El Paso County, Colorado, and Inc. Areas (2018) - Cottonwood Creek

The corridor crosses Cottonwood Creek about 1000 feet downstream of the limits of the 100-year regulatory floodplain Zone AE with floodway. From the study's flood profiles, the 100-year water surface elevation at the crossing location is approximately 7112 at the upstream pond and 7090 just downstream of the crossing. The floodplain width is about 260 feet on FIRM 08041C0527G (NAVD88). The north dam crest elevation as represented in the flood profile is approximately 7107, and the south dam does not appear on the profile. Per the field survey completed as part of this corridor study, which also uses the NAVD88 datum, the north dam crest elevation is about 7130. Site specific flow values are not available in the Flood Insurance Study, however the FEMA Q100 flow of Cottonwood Creek at the confluence with Monument Creek is 10,000 cfs. This location is approximately 9.5 miles upstream of the confluence with Monument Creek. The original FIS was published in 1997, and it is possible that the pond was regraded after the FIS issuance.

## Sand Creek DBPS

The center part of the Briargate/Stapleton corridor lies in the northern end of the Sand Creek and East Fork Sand Creek drainage basins, from just east of Cottonwood Creek to just west of the Stapleton Road / Rockingham Drive intersection. The corridor crosses both Sand Creek and East Fork Sand Creek and several unnamed drainage ways. The current Sand Creek Drainage Basin Planning Study (SC-DBPS) was published in 1993 and last revised in 1996.

Per the SC-DBPS, the corridor is in an area with wetlands in the shallow drainage ways and seeps and springs. Some of these wetlands have been disturbed to establish stock ponds and are heavily grazed by cattle. Otherwise, the area is described as good quality riparian/wetland, with some sections having dry channel conditions. For the corridor area, a selective improvement concept using localized channel bank stabilization and grade control structures was recommended to limit long-term stream degradation.

The SC-DBPS recommends a regional detention basin strategy over an on-site detention approach. The proposed locations of the detention basins, and other improvements, begin about 1.5 miles south of the corridor, at Woodmen Road, and continue downstream. The only improvements in the corridor area shown on the Preliminary Design of Selected Alternative plans are bank linings and grade control structures. The plan and profile sheets give the peak discharge data for the reaches at Sand Creek and East Fork Sand Creek's

corridor crossings. The discharge values in Table 2 correspond to those in the recommended plan. The SCS 24-hour Type II-A storm was used, with an AMC of II and design storm rainfall depths of P10= 3.0 inches and P100= 4.4 inches.

**Table 2. Discharge Values from SC-DBPS at the corridor crossings**

| Return Interval | 10 Yr | 100 Yr |
|---|---|---|
| Sand Creek – Q (cfs) | 700 | 2380 |
| East Fork S.C. – Q (cfs) | 530 | 980 |

The structures recommended in the SC-DBPS are a 4 x 8'H x 10'W CBC for the Sand Creek crossing and an 8'H x 10'W CBC for the East Fork Sand Creek crossing.

Our understanding is that the SC-DPBS is currently being updated but was not available at the time of this report.

## Flood Insurance Study - El Paso County, Colorado, and Inc. Areas (2018) - Sand Creek

The corridor crosses the 100-year regulatory floodplain (Zone AE with floodway) of Sand Creek near the cross-section labeled DH in the FIS. From the study's flood profiles, the 100-year water surface elevation is approximately 7100 at the crossing. The floodplain width is about 100 feet on the FIRM (08041C0533G). Site specific flow values are not available in the Flood Insurance Study, however the FEMA Q100 flow of Sand Creek upstream of the confluence with East Fork Sand Creek is 5,660 cfs. 1.7 miles upstream of the City of Colorado Springs corporate limits is 4,450 cfs.

## Falcon DBPS

The east end of the Briargate/Stapleton corridor lies in the northern part of the Falcon drainage basin, from just west of the Stapleton Road / Rockingham Drive intersection to Meridian Road and crosses the West Tributary and East Tributary of the Falcon Watershed. The current Falcon Drainage Basin Planning Study (F-DBPS) was published in 2015.

Per the F-DBPS, the corridor passes through highly erodible soils with some herbaceous riparian vegetation areas adjacent to the streams. Both the West Tributary and the East Tributary showed signs of erosion with deficiencies in the drainage systems coming from the developments to the north of the corridor.

The recommended F-DBPS Conceptual Plan includes roadside ditch improvements, drop structures, and protect-in-place strategies to mitigate stream erosion for both West and East Tributaries. Improvement of existing detention facilities and installing new detention facilities are also part of the Conceptual Plan. Some of these recommendations are for the Briargate/Stapleton corridor area or upstream developments adjacent to the corridor. The plan and profile sheets generated for the Conceptual Plan also delineate an approximate

100-year floodplain for planning purposes only. In this area, there are no FEMA designated Zone AE locations.

The hydrologic modeling was performed using the SCS method and NOAA Atlas 2 precipitation data with the 24-hour Type IIa storm distribution. The spatial distribution of the rainfall was uniformly modeled across the Falcon Watershed. The West Tributary's corridor crossing generally corresponds to the F-DBPS hydrologic model junction JWT172, with JET020 for the East Tributary. Table 3 gives the future peak flows, without detention, at the hydrologic model junctions for the crossings.

**Table 3. Future Peak Flows from F-DBPS at the corridor crossings**

| Return Interval | 2 Yr | 5 Yr | 10 Yr | 25 Yr | 50 Yr | 100 Yr |
|---|---|---|---|---|---|---|
| **West Tributary – Q (cfs)** | 99 | 210 | 320 | 600 | 760 | 960 |
| **East Tributary – Q (cfs)** | 74 | 130 | 170 | 270 | 330 | 390 |

## Flood Insurance Study - El Paso County, Colorado, and Inc. Areas (2018) - Falcon Watershed

The Briargate/Stapleton corridor section in the Falcon Watershed is in Zone X and does not cross a FEMA designated Zone AE floodplain per FIRMs 08041C0551G and 08041C0535G. No FEMA flow data is available since the location is outside of the study limits for the FIS.

## Sterling Ranch Master Development Drainage Plan (2018)

Sterling Ranch is a proposed 1444-acre development located in the Sand Creek drainage basin traversed by the Briargate/Stapleton corridor. The Sterling Ranch MDDP (SR-MDDP) takes the following approach to the conceptual drainage design for the development:

> *In general, developed runoff produced within Sterling Ranch is to be conveyed in both natural and manmade channels, storm conveyance facilities and directed to the main branch of Sand Creek Channel and to existing swales located within the East Fork of Sand Creek Watershed. Where future development is anticipated, full spectrum water quality detention facilities are planned to reduce developed runoff rates prior to being discharged to downstream facilities. (SR-MDDP, Pg 5)*

This approach differs from the SC-DBPS, which recommended a regional detention basin strategy. The SR-MDDP gives the following explanation for this change in approach.

> *To better control the full range of runoff rates that pass thru detention facilities and subsequently further reduce impacts caused by the urbanized runoff to the existing drainage ways, both the City of Colorado Springs and El Paso County have opted to move away from typical regional online detention with multi- stage discharge and have embraced the concept of offline Full Spectrum Detention. (SR-MDDP, Pg 5)*

The hydrologic design in the MDDP for developed conditions uses Full Spectrum Detention to provide Water Quality treatment for the runoff and reduce the flows to historic levels.

Another critical item in the MDDP that would affect the hydrology in this area is a recommended diversion of a portion of the East Fork Sand Creek drainage basin into the Sand Creek drainage basin. Per the MDDP, this diversion's feasibility was analyzed in the 2011 Upper Sand Creek Watershed Study, which confirmed that the downstream facilities would be sufficient to handle the additional runoff. Additionally, a CLOMR/LOMR will be required to revise Sand Creek's hydrology and the drainage basin boundaries.

The 100-year peak flow rate given in the SC-DBPS for the Briargate/Stapleton corridor crossing of Sand Creek is 2380 cfs. The SR-MDDP hydrologic model produces an existing condition 100-year flowrate of 1870 cfs compared to the developed condition's flowrate of 1776 cfs given for the revised hydrology. The SR-MDDP also lists the Effective 100-year flowrate as 2600 cfs.

For the East Fork Sand Creek runoff, the SC-DBPS gives the 100-year design discharge value of 980 cfs. The SR-MDDP revised hydrologic model diverts a portion of the existing East Fork drainage basin into the main Sand Creek drainage basin and then routes the remaining developed runoff through full-spectrum detention basins. This runoff will cross Briargate/Stapleton corridor at two locations (Sta 314+50 and 353+20) with 100-year peak flow rates of 156 cfs and 101 cfs, respectively.

## Falcon Hills Master Development Drainage Plan (2002)

The Falcon Hills is an established mixed-use subdivision located in the Falcon drainage basin adjacent to the Briargate/Stapleton corridor's north side. At the time the Falcon Hills MDDP (FH-MDDP) was produced, the current DBPS was the Falcon Area DBPS (2000), which has been superseded by the Falcon DBPS (2015). Detention basins were used to reduce peak flowrates to existing flowrates.

## Drainage Reports for Developments

The Briargate/Stapleton corridor has developments at the east and west ends; most are existing, but a few are under construction at the time of this report. Some current developments are not on the corridor alignment but are close enough upstream to provide some information. The available Final Drainage Reports (FDR) for the pertinent developments were retrieved and reviewed as part of this study. The reports' data is used in conjunction with the DBPS and MDDP to assess the corridor's off-site drainage needs.

While drainage reports were retrieved for most of the developments along the corridor, a few were not available. Still, the missing pieces are not crucial to the completion of the corridor study. Also, more recent reports tend to be more detailed than older reports. Table 4 lists the drainage reports found for the existing and proposed developments from west to east and gives the approximate station to station limits for the development.

**Table 4. Final Drainage Reports for Briargate/Stapleton Corridor Developments**

| Development Name | Year of Report | Approx. Sta. to Sta. | Development Name | Year of Report | Approx. Sta. to Sta. |
|---|---|---|---|---|---|
| Eagle Wing Estates | 2003 | 200+00 to 227+00 | Paint Brush Hills Fil No. 10-12 | 2003 | 395+00 to 445+00 |
| Highland Park Filing No. 3 | 2016 | 240+00 to 266+00 | Scenic View at Paint Brush Hills | 2014 | 445+00 to 460+00 |

**Table 4. Final Drainage Reports for Briargate/Stapleton Corridor Developments**

| Development Name | Year of Report | Approx. Sta. to Sta. | Development Name | Year of Report | Approx. Sta. to Sta. |
|---|---|---|---|---|---|
| Sterling Ranch Filing No. 1 | 2017 | 283+00 to 295+00 | Paint Brush Hills Fil No. 4 | 1986 | 460+00 to 488+00 |
| Indian Wells Sub Fil. No. 1 | 1982 | 354+00 to 368+00 (north of Stapleton Dr) | Meridian Ranch Filing 4B | 2014 | 488+00 to 500+92 (north of Stapleton Dr) |
| Bow Valley Sub | 1980 | 354+00 to 368+00 (South of Stapleton Dr) | Woodmen Hills Fil No. 11 | 2001 | 488+00 to 500+92 (south of Stapleton Dr) |
| Stapleton Est. Fil No. 1 & 2 | 1982 | 368+00 to 395+00 (north of Stapleton Dr) | | | |

## 1.4 Off-site Drainage

The analysis below deals with concept-level drainage investigation only. Future preliminary and final design will need to include a more detailed analysis of the hydrologic and hydraulic conditions present along the project corridor and address such items as culvert size, type, location, cover requirements, energy dissipation, etc.

Off-site runoff flowing to the Briargate-Stapleton corridor along its 5.7-mile length will have to be passed through the area safely. A review of the available studies and reports indicates at least 30 locations where off-site runoff will traverse the corridor. Roadway overtopping in the major storm is not allowed at culvert crossing structures for principal arterials. A 2-foot freeboard must be maintained between the high-water elevation and the edge of the roadway shoulder. Structures designated as bridge crossing structures are required to be designed with a minimum of 2 feet of clearance measured from the low chord of the structure to the top of the water surface elevation for the major storm. Each culvert crossing structure will need energy dissipation at the culvert's ends to satisfy maximum velocity requirements as defined in the COS-DCM. See the Exhibits for a summary of the Offsite Drainage and a Conceptual Plan showing the crossing locations.

There are existing culverts at about half of the off-site runoff locations because of the existing roads at the beginning and end of the corridor. The sizes and flowrates for these culverts were obtained from the reports, and the dimensions were verified by field survey. These culverts will likely need to be replaced or extended to accommodate the proposed road section as its being built.

For most of the proposed culvert locations, the flowrates were also obtained from either the MDDP or FDR. The flowrates for the remaining sites were estimated using the TR-55 methodology. For detailed design of the culverts, which is beyond this drainage report's scope, design flows should be developed as appropriate using the relevant hydrologic and hydraulic criteria and a thorough investigation of the drainage basins.

Conceptual culvert sizing is as described below. Final design, beyond the scope of this report, requires a detailed analysis to ensure the culverts and bridges are per the COS-DCM.

If not given in the reports, the proposed sizes of smaller culverts were estimated for the 100-year design storm using the HDS No. 5 Chart 1B (inlet control of concrete pipes) with an HW/D of 1.2 per the DCM.

If the resultant culvert sizes were larger than 60" for a single culvert, the size required for dual culverts was also estimated.

The larger drainage crossings are the Cottonwood Creek, Sand Creek, West Tributary Falcon Watershed and East Tributary Falcon Watershed locations. The required box culvert sizes were estimated using HDS No. 5 Chart 8B (inlet control of box culverts) with an HW/D selected in keeping with the conditions presented in pertinent FIS, DBPS, MDDP, or FDR.

At Cottonwood Creek, the estimated design flow is Q100= 820 cfs. The alignment passes between two ponds that are directly on the stream. The north pond retains water until the dam overtops. The water then flows directly into the south pond. Considerable work is needed to establish an appropriate way to convey the flow from the north pond across the corridor and downstream since the crossing impacts the regulatory floodway and the north pond dam. Additionally, there is a discrepancy in the top of dam elevation between the current FIS and the field survey discussed earlier in the report. A CLOMR/LOMR is needed for the corridor crossing. Also, because of the complexities of this crossing, a 100-yr flow depth is not readily available to estimate the size of the culvert. Per the Highland Park Filing No. 2 FDR, the next crossing of Cottonwood Creek is about 1800 cfs downstream at Forestgate Road. The structure there is a 10'H x 12'W CBC carrying with a 100-yr design flow of 1220 cfs (HW/D of 1.1). Assuming an HW/D of 1.0 for the Briargate-Stapleton corridor crossing of Cottonwood Creek, the estimated culvert size is 8'H x 12'W CBC, used for cost estimating purposes. A bridge at this location could also be considered in the future to limit floodplain and other environmental impacts.

At the Sand Creek crossing, the SR-MDDP gives the culvert's estimated size as a four-cell 8.5'H x 10'W CBC and indicates that this size will pass the revised developed flow rate of Q100= 1776 cfs (HW/D=0.70), as well as the existing flow rate (Q100= 1870 cfs, HW/D= 0.73). Should the revised hydrology of the CLOMR/LOMR not be approved, the structure would have to be sized to pass the Effective 100-year flow rate of 2600 cfs, which at an HW/D of 0.7 would be a four-cell 8.5'H x 14'W CBC. The four-cell 8.5'H x 10'W CBC is assumed for cost estimating purposes.

At the West Tributary Falcon corridor crossing, the F-DBPS gives a future peak flow of Q100= 960 cfs. The stream is not well defined in this location, and the flow, as shown on the F-DBPS West Tributary Conceptual Plan, is broad and shallow at about 250 ft wide and about 3.5 ft deep. This crossing's estimated culvert size is a four-cell 4.5'H x 10'W CBC with an HW/D of 0.9.

At the East Tributary Falcon corridor crossing, the F-DBPS gives a future peak flow of Q100= 390 cfs and recommends a sub-regional pond whose outflow would be Q100= 200 cfs. The existing double 2.5'H x 6'W CBC is listed as deficient for current conditions. The proposed replacement culvert in the F-DBPS Conceptual Plan is a double 4'H x 12'W CBC which is adequate for the un-detained future peak flow (HW/D= 0.8). Increasing the culvert height at this location will necessitate downstream channel reconstruction or raising of the intersection.

Culvert inlet and outlet protection, channel transitions, and outlet energy dissipators will be required as necessary to stabilize the drainage ways upstream and downstream of the culvert crossings.

The culvert quantities for the conceptual ultimate section condition are assumed for cost estimating purposes.

The analyses in this report deal with concept-level drainage investigation only. Future preliminary and final design will include a more detailed analysis of the hydrologic and hydraulic conditions present along the project corridor.

# 1.5 Onsite Drainage

This analysis's primary assumption is that the off-site runoff will not drain onto the roadway in the ultimate section condition. Instead, off-site drainage will be directed via roadside ditches to the previously described culvert crossing locations.

For the initial and interim conditions, the on-site pavement runoff is collected in roadside ditches. Runoff from the upstream side must then be conveyed across the roadway corridor and discharged downstream. To keep off-site and on-site drainage separate for water quality treatment purposes, the on-site runoff should be directed to the ultimate section storm sewer outfall points and conveyed through partially constructed and/or modified storm sewer crossings. The partially built or modified crossings would be used as part of the ultimate section condition storm sewer systems. The storm sewer quantities for the conceptual ultimate section condition are assumed for cost estimating purposes.

The on-site runoff for the ultimate roadway section of the Briargate-Stapleton corridor is comprised of pavement runoff collected via curb and gutter. The runoff is delivered to a series of curb inlets, and storm sewer runs that outlet at various locations along the corridor. The assumed outlet points include places near the start and end of the roadway and the vertical sag curves along the profile. Several other outlet points were included to break up long stretches of grade and generally keep runoff consistent with existing drainage patterns. An 8 ft long D-10-R curb inlet was used throughout the corridor to estimate the inlet spacing needed to accommodate the major storm per COS-DCM criteria. Other considerations for curb inlets' spacing include superelevation of the roadway section at curves and the locations of crossroads. For this conceptual plan, 17 locations were estimated for discharging the on-site runoff for the ultimate section condition. See the Exhibits for a summary of the Onsite Drainage and a Conceptual Plan showing the outfall locations.

Water quality treatment for the initial, interim, and ultimate section condition is discussed below.

Future drainage design, not performed for this study, will need to include detailed analysis following the COS-DCM to determine the curb inlets' locations and the storm sewer connectivity and outlet points, as well as the required outlet protection, for construction purposes.

# 1.6 Water Quality and Detention

Keeping the off-site runoff separate from the on-site runoff is the preferred approach for water quality treatment for the project. This approach allows for a smaller water quality treatment ROW footprint since only that runoff from the roadway is required to pass through the treatment facility. However, keeping the off-site and on-site flows separate for the initial and interim section conditions may not be practical because the roadside ditches will also intercept off-site runoff as well as pavement runoff. The pavement runoff for the initial and interim section conditions does receive some water quality treatment before being concentrated in the roadside ditches. It is discharged via sheet flow across the unpaved, permeable shoulder slopes. For the shoulder slopes of the interim roadway section, this type of treatment could reduce the WQCV by about 40%-70% depending on the receiving soil's infiltration rate. In-situ soil testing along the corridor would help obtain infiltration rates for selecting which soil type should be used for future analyses.

Future ditch design will need to include detailed analysis following the COS-DCM to assess ditch flow capacity, stability, etc.

Additional water quality enhancements occur as the runoff is conveyed through shallow, low gradient, vegetated roadside ditches such as sedimentation, uptake of pollutants by vegetation, and additional volume

reduction through infiltration. Should the WQCV Runoff Reduction from the sheet flow across the unpaved shoulders and the conveyance in the vegetated roadside ditches not treat enough stormwater runoff, additional measures, such as constructing a sand filter facility, will need to be used. Suppose the initial and interim condition runoff is routed through the partially constructed or modified storm sewer crossings. In that case, permanent Full Spectrum Extended Detention Basins (FSEDB) could be built, which would also serve the ultimate section condition.

For the ultimate section condition, an FSEDB is likely to be required at the outfall of each storm sewer to provide water quality treatment and detention for the pavement's runoff. As an example of the ROW needs generated by the required water quality and detention treatment, the FSEDB requirements for a representative 1000 ft length of roadway were estimated using the Mile High Flood District spreadsheet for detention design. (Note: The final basin sizes, storm sewer outlet points, water quality treatment, etc., will be determined by future detailed analysis not within the scope of this report). Per the MHFD-Detention Basin spreadsheet calculations, for every 1000 ft of ultimate section condition roadway, the estimated WQCV is 0.10 ac-ft. The approximate 100-yr detention volume is 0.40 ac-ft (see Exhibits for calculations). For the approximately 30,000 ft corridor length, total volumes of about three ac-ft for WQCV and about 12 ac-ft for 100-yr detention are needed.

The CC-DBPS requires that future developments greater than 1 acre must provide on-site full-spectrum detention storage. The FSEDB needed for future developments could be sized to accommodate runoff from the roadway if the roadway is built concurrently with the development. The roadway runoff could be treated along with the development runoff before being released downstream. Similarly, the SR-MDDP shows four FSEDB facilities along the Briargate-Stapleton corridor as part of the drainage plan. The F-DBPS Conceptual Plan recommends a sub-regional detention facility just downstream of the corridor crossings. These future facilities could be used to treat runoff from the roadway.

Temporary BMPs during construction will be required in accordance with pertinent City/County criteria to mitigate erosion, sedimentation, and contamination. These measures may include, but are not limited to, surface roughing, mulching, ditch check dams, silt fence, sediment control logs and sediment control basins, concrete washout areas, and stockpile management.

## 1.7 Right of Way Considerations

The off-site drainage crossings will likely require ROW or Drainage Easements in addition to the 168 ft shown for the roadway sections. The culvert barrels and the inlet and outlet headwalls may project beyond the roadway corridor ROW limits. Additionally, each culvert will require some sort of outlet protection which may require additional ROW space. If any on-site runoff is combined with off-site runoff, additional ROW or Drainage Easement may be needed to accommodate the FSEDB facility.

The on-site drainage outlets will likely require ROW or Drainage Easements in addition to that shown for the roadway sections. The storm sewer outlet pipes and headwalls may project beyond the roadway corridor ROW limits. The FSEDB required at each outfall will also likely need a dedicated ROW or Drainage Easement area.

The roadside ditches' geometry required to convey off-site runoff to the culvert crossing locations may also require additional ROW or Drainage Easements.

The future detailed drainage design, which is beyond the scope of this conceptual report, should include detailed analyses of the culverts and storm sewers for the corridor, including the extent of outlet protection and FSEDB facilities' size. These analyses are necessary to establish additional ROW or Drainage Easement needs fully.

# 2 Opinion of Probable Costs for Drainage

The cost estimate for the off-site drainage structures was developed for the ultimate section condition. The unit prices of items were derived from available CDOT cost data. The following assumptions were made for the off-site drainage quantity estimates:

- The typical unskewed culvert length is 200 feet
- Pipe culverts are Reinforced Concrete Pipe
- Concrete end sections are used for pipe culverts with diameters 48" and less
- Concrete headwalls are used for pipe culverts with diameters 54" and above
- Outlet protection for the pipe culverts is riprap with dimensions based on the MHFD Low Tailwater Riprap Basin
- Concrete box culvert costs are based on cubic yards of concrete and pounds of reinforcing steel
- Concrete box culverts have headwalls and wing walls
- Inlet transition/protection for concrete box culverts is reinforced concrete, and outlet transition/protection is grouted boulders

The cost estimate for the on-site drainage system was developed for the ultimate section condition. The unit prices of items were derived from available CDOT cost data. The following assumptions were made for the on-site drainage quantity estimates:

- The conceptual curb inlet locations determine the lengths of the storm drains
- The storm drains are Reinforced Concrete Pipe, and a 30" diameter is assumed for setting the unit price
- Concrete end sections are used at the outlets of the storm sewer systems
- Each storm sewer system discharges into a Full-Spectrum Extended Detention Basin (FSEDB)
- The FSEDB unit cost is based on the runoff volume required to be detained for the median on-site basin size

The cost estimate for the erosion control items was developed for the ultimate section condition. The unit prices of items were derived from available CDOT cost data.

**Table 5. Conceptual Drainage Cost Estimate**

| Item | Estimated Cost |
|---|---|
| **Offsite** | $ 8,280,343 |
| **On-site (incl. Water Quality and Detention)** | $ 4,057,518 |
| **Erosion Control** | $ 1,581,320 |
| **TOTAL** | **$ 13,919,181** |

(see Appendix F for details of items, quantities, and unit prices)

Costs associated with the partial or modified construction of the drainage systems to accommodate the initial or interim roadway section were not included in this estimate.

# 3 Summary and Recommendations

The Briargate Parkway – Stapleton Road project corridor forms a vital link in the Pikes Peak Region's transportation system. The portion considered in this drainage analysis begins at Black Forest Road and runs about 5.7 miles eastward to Meridian Road. The proposed roadway has an initial, interim, and ultimate section to allow for flexibility with the phasing of the corridor improvements. This report mainly addresses the drainage need associated with the ultimate roadway section. The City of Colorado Springs Drainage Criteria Manual was followed for this report.

The Briargate/Stapleton corridor traverses three major drainage basins - Cottonwood Creek, Sand Creek, and Falcon Watershed. The conceptual drainage investigation was performed using data from the available Drainage Basin Planning Studies, Major Development Drainage Plans, and Final Drainage Reports. Hydrologic and hydraulic data taken from these reports was used where applicable to estimate the off-site drainage needs.

Off-site drainage traverses the Briargate/Stapleton corridor at approximately 30 locations. The conceptual culvert sizes range in size from a 24" pipe to multi-cell concrete box culverts. The most significant crossing locations are at Cottonwood Creek, Sand Creek, West Tributary of Falcon Watershed, and East Tributary of Falcon Watershed.

On-site drainage was estimated to include 17 outfall locations along the corridor. A primary assumption for the conceptual design is that the off-site runoff will not be allowed to drain onto the roadway section and mix with the on-site runoff. The pavement runoff will be collected in curb box inlets and routed to the outfall locations via storm drains. The curb box inlets' conceptual spacing was based on the flow interception capacity of an 8 ft long D-10-R inlet.

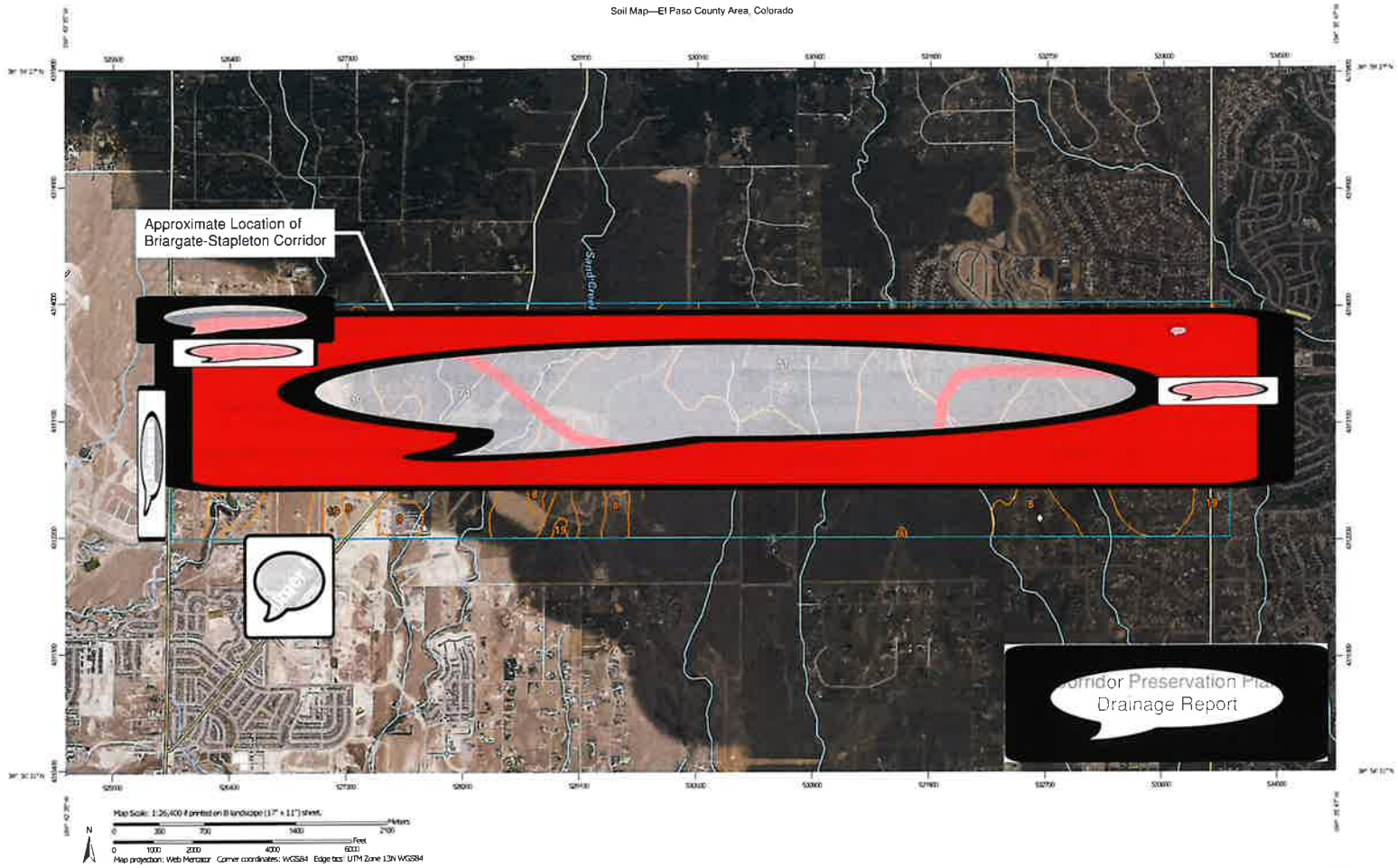
Keeping the off-site runoff separate from the on-site runoff is the preferred option for establishing water quality and detention requirements to reduce the ROW footprint. The on-site runoff will need to be treated for water quality, and detention will be provided to reduce flows to required levels using Full-Spectrum Extended Detention Basins. Future facilities recommended in the pertinent DBPS and MDDP could also provide water quality and detention for the corridor.

Portions of the off-site and on-site drainage systems, including potential roadside ditches, will require ROW or Drainage Easements in addition to that shown for the typical roadway section.

Based on the conceptual analyses presented in this report, the following items are recommended:

- A CLOMR/LOMR be undertaken for the Cottonwood Creek crossing to amend the FIS as part of a future detailed hydrologic and hydraulic analysis for the project
- A CLOMR/LOMR be undertaken for the Sand Creek crossing to amend the FIS for the hydrologic changes recommended in the Sterling Ranch MDDP as part of a future detailed hydrologic and hydraulic analysis for the project
- A Digital Terrain Model be established for the corridor to assist in establishing ROW and Drainage Easement needs

# Appendix A – NRCS Soils Map




Map Scale: 1:26,400 if printed on B landscape (17" x 11") sheet.

N

0 300 700 1400 2100 Meters

0 1000 2000 4000 6000 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

**Special Point Features**
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 19, 2018—Oct 20, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| 8 | Blakeland loamy sand, 1 to 9 percent slopes | 259.3 | 7.1% |
| 9 | Blakeland-Fluvaquentic Haplaquolls | 23.4 | 0.6% |
| 19 | Columbine gravelly sandy loam, 0 to 3 percent slopes | 1,410.8 | 38.5% |
| 41 | Kettle gravelly loamy sand, 8 to 40 percent slopes | 0.0 | 0.0% |
| 71 | Pring coarse sandy loam, 3 to 8 percent slopes | 1,691.4 | 46.1% |
| 83 | Stapleton sandy loam, 3 to 8 percent slopes | 209.9 | 5.7% |
| 85 | Stapleton-Bernal sandy loams, 3 to 20 percent slopes | 60.6 | 1.7% |
| 96 | Truckton sandy loam, 0 to 3 percent slopes | 12.4 | 0.3% |
| **Totals for Area of Interest** | | **3,667.8** | **100.0%** |

# El Paso County Area, Colorado

## 19—Columbine gravelly sandy loam, 0 to 3 percent slopes

### Map Unit Setting

*National map unit symbol:* 367p
*Elevation:* 6,500 to 7,300 feet
*Mean annual precipitation:* 14 to 16 inches
*Mean annual air temperature:* 46 to 50 degrees F
*Frost-free period:* 125 to 145 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Columbine and similar soils:* 97 percent
*Minor components:* 3 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Columbine

#### Setting

*Landform:* Fans, flood plains, fan terraces
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Alluvium

#### Typical profile

*A - 0 to 14 inches:* gravelly sandy loam
*C - 14 to 60 inches:* very gravelly loamy sand

#### Properties and qualities

*Slope:* 0 to 3 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Well drained
*Runoff class:* Very low
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water capacity:* Very low (about 2.5 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 4e
*Land capability classification (nonirrigated):* 6e
*Hydrologic Soil Group:* A
*Ecological site:* R049XB215CO - Gravelly Foothill
*Hydric soil rating:* No

### Minor Components

#### Pleasant

*Percent of map unit:* 1 percent

*Landform:* Depressions
*Hydric soil rating:* Yes

**Other soils**
*Percent of map unit:* 1 percent
*Hydric soil rating:* No

**Fluvaquentic haplaquolls**
*Percent of map unit:* 1 percent
*Landform:* Swales
*Hydric soil rating:* Yes

## Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

# El Paso County Area, Colorado

## 71—Pring coarse sandy loam, 3 to 8 percent slopes

### Map Unit Setting

*National map unit symbol:* 369k
*Elevation:* 6,800 to 7,600 feet
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Pring and similar soils:* 85 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Pring

#### Setting

*Landform:* Hills
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Arkosic alluvium derived from sedimentary rock

#### Typical profile

*A - 0 to 14 inches:* coarse sandy loam
*C - 14 to 60 inches:* gravelly sandy loam

#### Properties and qualities

*Slope:* 3 to 8 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Well drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water capacity:* Low (about 6.0 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 3e
*Hydrologic Soil Group:* B
*Ecological site:* R048AY222CO
*Hydric soil rating:* No

### Minor Components

#### Pleasant

*Percent of map unit:*
*Landform:* Depressions
*Hydric soil rating:* Yes

**Other soils**

*Percent of map unit:*
*Hydric soil rating:* No

## Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

# El Paso County Area, Colorado

## 83—Stapleton sandy loam, 3 to 8 percent slopes

### Map Unit Setting

*National map unit symbol:* 369z
*Elevation:* 6,500 to 7,300 feet
*Mean annual precipitation:* 14 to 16 inches
*Mean annual air temperature:* 46 to 48 degrees F
*Frost-free period:* 125 to 145 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Stapleton and similar soils:* 97 percent
*Minor components:* 3 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Stapleton

#### Setting

*Landform:* Hills
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Sandy alluvium derived from arkose

#### Typical profile

*A - 0 to 11 inches:* sandy loam
*Bw - 11 to 17 inches:* gravelly sandy loam
*C - 17 to 60 inches:* gravelly loamy sand

#### Properties and qualities

*Slope:* 3 to 8 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Well drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water capacity:* Low (about 4.7 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 3e
*Hydrologic Soil Group:* B
*Ecological site:* R049XB215CO - Gravelly Foothill
*Hydric soil rating:* No

**Minor Components**

**Pleasant**
*Percent of map unit:* 1 percent
*Landform:* Depressions
*Hydric soil rating:* Yes

**Other soils**
*Percent of map unit:* 1 percent
*Hydric soil rating:* No

**Fluvaquentic haplaquolls**
*Percent of map unit:* 1 percent
*Landform:* Swales
*Hydric soil rating:* Yes

## Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

# El Paso County Area, Colorado

## 8—Blakeland loamy sand, 1 to 9 percent slopes

### Map Unit Setting

*National map unit symbol:* 369v
*Elevation:* 4,600 to 5,800 feet
*Mean annual precipitation:* 14 to 16 inches
*Mean annual air temperature:* 46 to 48 degrees F
*Frost-free period:* 125 to 145 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Blakeland and similar soils:* 98 percent
*Minor components:* 2 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Blakeland

#### Setting

*Landform:* Hills, flats
*Landform position (three-dimensional):* Side slope, talf
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

#### Typical profile

*A - 0 to 11 inches:* loamy sand
*AC - 11 to 27 inches:* loamy sand
*C - 27 to 60 inches:* sand

#### Properties and qualities

*Slope:* 1 to 9 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Somewhat excessively drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum content:* 5 percent
*Available water capacity:* Low (about 4.5 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 3e
*Land capability classification (nonirrigated):* 6e
*Hydrologic Soil Group:* A
*Ecological site:* R049XB210CO - Sandy Foothill
*Hydric soil rating:* No

**Minor Components**

**Pleasant**

*Percent of map unit:* 1 percent
*Landform:* Depressions
*Hydric soil rating:* Yes

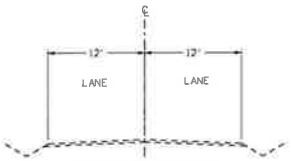
**Other soils**

*Percent of map unit:* 1 percent
*Hydric soil rating:* No

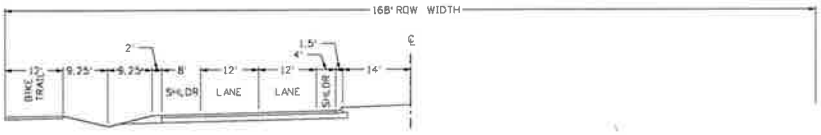
## Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

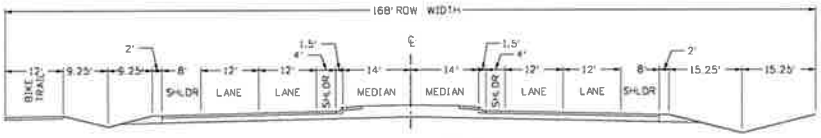
# Appendix B – Typical Sections



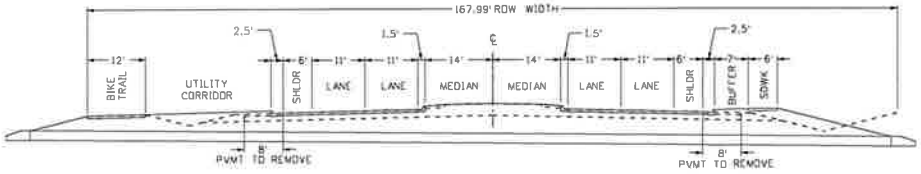

EXISTING TYPICAL
STA. 435+31 TO STA. 487+45




INITIAL SECTION



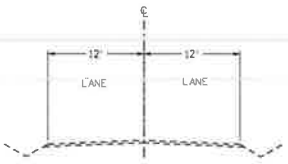

INTERIM SECTION



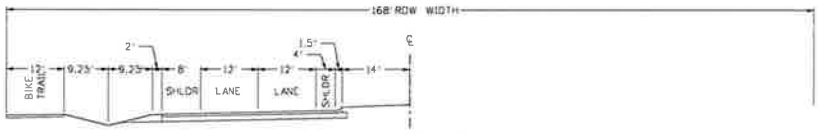

ULTIMATE SECTION

TYPICAL CULVERT SECTION

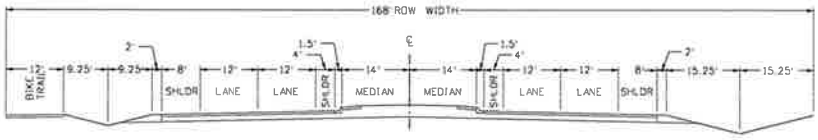
Briargate Parkway - Stapleton Road
Corridor Preservation Plan
Drainage Report



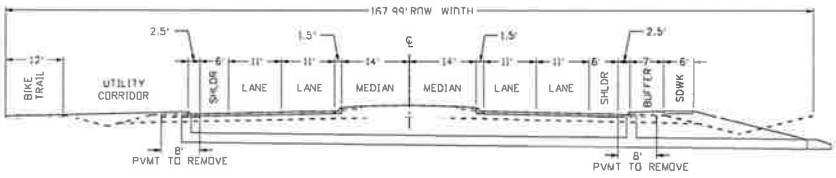

EXISTING TYPICAL
STA. 435+31 TO STA. 487+45




INITIAL SECTION




INTERIM SECTION




ULTIMATE SECTION

TYPICAL STORM SEWER SECTION

Briargate Parkway - Stapleton Road
Corridor Preservation Plan
Drainage Report