Appendix A
Traffic Report

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List of Acronyms

FEIS	Final Environmental Impact Statement
LOS	Level of Service
MP	milepost
mph	miles per hour
WHI	weighted hazard index

This report documents the existing and future alternative traffic conditions for the US 160 project corridor study area, and supplements the Final Environmental Impact Statement (FEIS) being prepared for this proposed roadway project. This report documents the existing (2001) and future year (2025) seasonal peak traffic conditions for roadways and intersections within the study area. The future year conditions examined consist of the No Action Alternative and other action alternatives that are described in detail in Chapter 2, Alternatives, of the FEIS. The action alternatives analyzed in this report represent the alternatives that were carried forward for detailed analysis in the FEIS.

The traffic study area is located in La Plata County, Colorado. The project length on US 160 would be 16.2 miles, extending from milepost (MP) 88.0, located east of Durango, to MP 104.2, located east of Bayfield. The project length on US 550 would be 1.2 miles, extending from MP 16.6, located at the US 160/US 550 (south) intersection, to MP 15.4, located south of the US 550/CR 220 intersection. The study area is shown in Figure 1, Location Map. The highway corridor includes four distinguishable geographic sections that have similar land use and traffic issues. The alternative analysis will focus on the four sections separately. The four sections are:

- **Grandview section** – US 160 from MP 88.0 to MP 91.8, and a portion of US 550 from MP 16.6 to MP 15.4.
- **Florida Mesa and Valley section** – US 160 from MP 91.8 to MP 94.2.
- **Dry Creek and Gem Village section** – US 160 from MP 94.2 to MP 101.6.
- **Bayfield section** – US 160 from MP 101.6 to MP 104.2.

Legend

Project Corridor (17.5 miles)

US 160 Environmental Impact Statement

Figure 1
US 160 DEIS Traffic Report
Location Map

This section summarizes the existing traffic volumes and Level of Service (LOS) for the roadways and intersections along the US 160 project corridor. The existing conditions analysis year used for this report is 2001. All traffic count data were collected by Bechtolt Engineering, LLC, on weekdays in June 2001. Since the traffic counts were conducted in June, they are representative of peak season traffic volumes.

3.1 EXISTING (2001) TRAFFIC VOLUMES

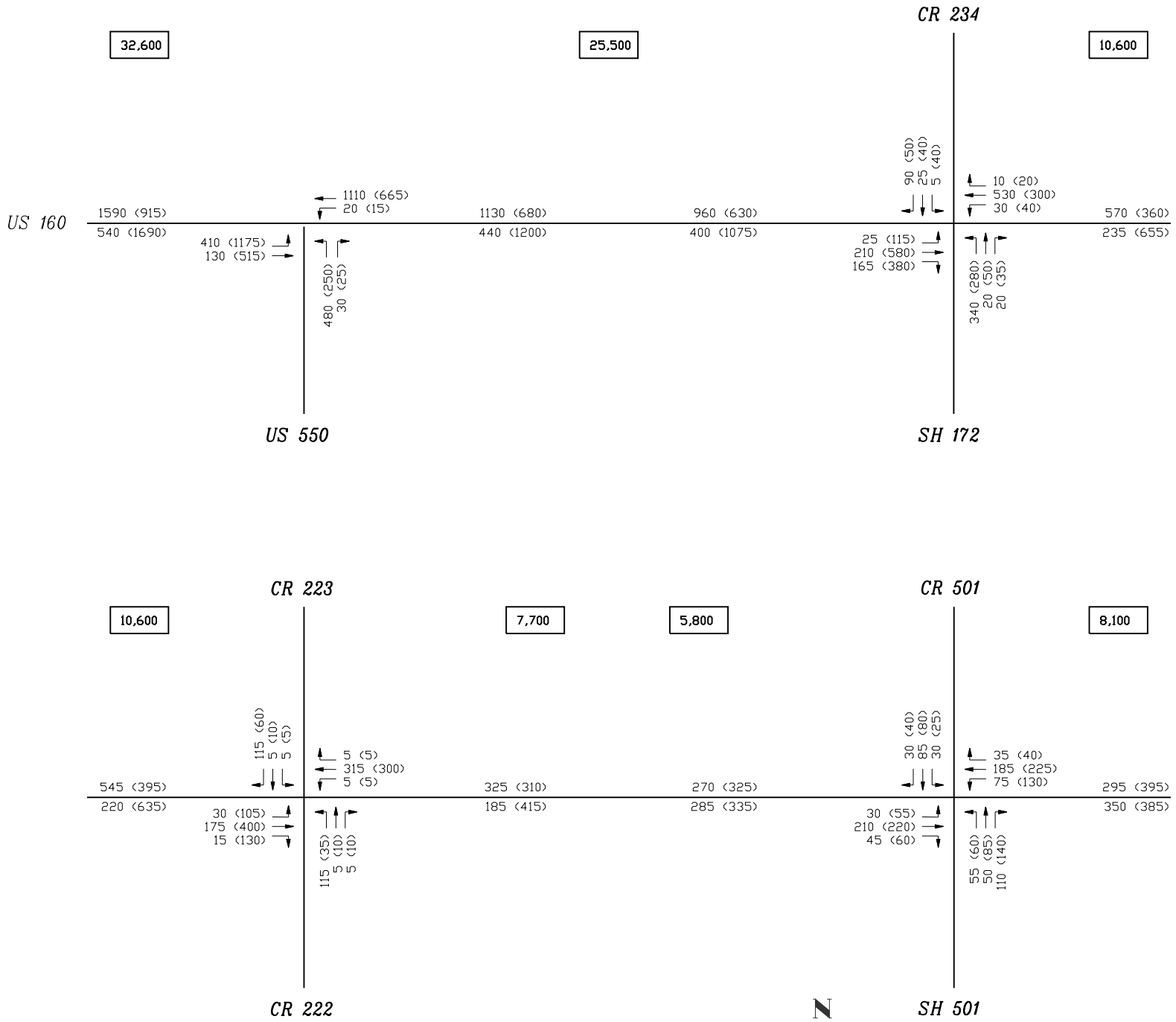
Twenty-four-hour machine traffic counts were conducted at the following locations:

- US 160 east and west of US 550 (south) (June 18-22, 2001)
- US 160 east and west of CR 222/CR 223 (west) (June 6-8, 2001)
- US 160 west of CR 508 (June 18-20, 2001)
- US 160 east and west of US 160 Business Route (US 160B) (east) (June 13-15, 2001)
- US 550 south of US 160 (June 18-22, 2001)
- SH 172/CR 234 north and south of US 160 (June 11-13, 2001)
- CR 222/CR 223 (west) north and south of US 160 (June 6-8, 2001)
- US 160B (east) south of US 160 (June 13-15, 2001)

Morning and evening peak-period turning movement count data were also collected at the following intersection locations:

- US 160 and US 550 (south) (June 5, 2001)
- US 160 and SH 172/CR 234 (June 12, 2001)
- US 160 and CR 222/CR 223 (west) (June 7, 2001)
- US 160 and CR 501 (June 20, 2001)

The existing daily and peak-hour turning movement traffic volume counts are shown in Figure 2, Existing (2001) Daily and Peak-Hour Traffic Volumes.



LEGEND

##,### – *Daily Volume*

(###) – *AM (PM) Peak Hour Volume*

US 160 DEIS TRAFFIC REPORT

Figure 2

Existing (2001) Daily and Peak Hour Traffic Volumes

3.2 EXISTING (2001) TRAFFIC OPERATIONS

The existing (2001) levels of service for the highway segments and intersections along the project corridor were estimated using the existing lane configuration, the peak-hour traffic volumes shown in Figure 2, Existing (2001) Daily and Peak-Hour Traffic Volumes, and the procedures documented in the *Highway Capacity Manual 2000* (HCM 2000). The following subsections summarize the results of these evaluations. The capacity analysis worksheets for the existing highway segment analyses and the intersection analyses are included in Attachments A and B, respectively.

3.2.1 Existing (2001) Highway Segment Analysis

Grandview Section

Through the Grandview section, US 160 is a two-lane highway with a passing lane eastbound from the intersection with US 550 (south) to the CR 233 (east) intersection. Passing is not permitted for 25 percent of the eastbound, and 100 percent of the westbound direction. The capacity analysis results indicate that during the AM peak hour, US 160 is currently operating at LOS C in the eastbound direction, and LOS F in the westbound direction. In addition, this analysis shows that during the PM peak hour, US 160 is operating at LOS D in the eastbound direction, and LOS E in the westbound direction.

Florida Mesa and Valley Section

Through the Florida Mesa and Valley section, US 160 is a two-lane highway. Passing is not permitted for 42 percent of the eastbound and 44 percent of the westbound direction. The capacity analysis results indicate that during the AM peak hour, US 160 is currently operating at LOS D in the eastbound direction, and LOS E in the westbound direction. In addition, this analysis shows US 160 is operating at LOS E in both the eastbound and westbound directions during the PM peak hour.

Dry Creek and Gem Village Section

Through the Dry Creek and Gem Village section, US 160 is a two-lane highway. Passing is not permitted for 58 percent of the eastbound, and 57 percent of the westbound direction. The capacity analysis results indicate that during the AM peak hour, US 160 is currently operating at LOS D in the eastbound direction, and LOS E in the westbound direction. In addition, this analysis shows that during the PM peak hour, US 160 is operating at LOS E in the eastbound direction, and LOS D in the westbound direction.

Bayfield Section

Through the Bayfield section, US 160 is a two-lane highway. Passing is not permitted for 72 percent of the eastbound, and 65 percent of the westbound direction. The capacity analysis results indicate that during the AM peak hour, US 160 is currently operating at LOS E in both the eastbound and westbound directions. In addition, this analysis shows that during the PM

peak hour, US 160 is operating at LOS E in the eastbound direction, and LOS D in the westbound direction.

3.2.2 Existing (2001) Intersection Analysis

Grandview Section

In the Grandview section, there are currently two signalized intersections on US 160 at US 550 (south) and SH 172/CR 234. The capacity analysis results indicate that the US 160 intersection with US 550 (south) is currently operating at LOS C during the AM and PM peak hours. The US 160 intersection with SH 172/CR 234 is currently operating at LOS C during the AM peak hour, and LOS D during the PM peak hour.

Florida Mesa and Valley Section

In the Florida Mesa and Valley section, an unsignalized intersection analysis was performed for the CR 222/CR 223 (west) intersection with US 160. The analysis indicates that all critical movements at this intersection are currently operating at LOS D or better.

Dry Creek and Gem Village Section

In the Dry Creek and Gem Village section, all of the intersections are minor unsignalized county roads, and, therefore, no intersections were analyzed in this section.

Bayfield Section

In the Bayfield section, there is currently one signalized intersection on US 160 at CR 501. The capacity analysis results indicate that this intersection is currently operating at LOS C during the AM and PM peak hours.

3.2.3 Existing (2001) Operational Analysis Summary

Table 3.1, Existing US 160 Highway Segment Traffic Analysis Summary, summarizes the existing traffic operations for the US 160 highway segments along the project corridor.

Table 3.1
Existing US 160 Highway Segment Traffic Analysis Summary

Highway Segment	Eastbound		Westbound	
	AM Peak LOS	PM Peak LOS	AM Peak LOS	PM Peak LOS
Grandview section				
US 550 (south) to SH 172/CR 234	C	D	F	E
Florida Mesa and Valley section				
SH 172/CR 234 to CR 222/CR 223 (west)	D	E	E	E
Dry Creek and Gem Village section				
CR 222/CR 223 (west) to Gem Village	D	E	E	D

Table 3.1
Existing US 160 Highway Segment Traffic Analysis Summary

Highway Segment	Eastbound		Westbound	
	AM Peak LOS	PM Peak LOS	AM Peak LOS	PM Peak LOS
Bayfield section				
Gem Village to Bayfield	E	E	E	D

As seen in Table 3.1, most of the highway segments along the US 160 project corridor are operating at LOS D, or worse, during both the AM and PM peak hours. The poor operating conditions are a result of high traffic volumes in conjunction with steep grades and insufficient lanes for passing.

Table 3.2, Existing US 160 Signalized Intersection Traffic Analysis Summary, summarizes the existing intersection traffic operations at the signalized intersections along the US 160 corridor.

Table 3.2
Existing US 160 Signalized Intersection Traffic Analysis Summary

US 160 Intersection	Eastbound		Westbound	
	Delay (sec./veh.)	LOS	Delay (sec./veh.)	LOS
Grandview section				
US 550 (south)	23.6	C	25.0	C
SH 172/CR 234	31.9	C	35.9	D
Bayfield section				
CR 501	24.7	C	26.7	C

As seen in Table 3.2, the signalized intersections along the US 160 corridor are operating at LOS D, or better, during both the AM and PM peak hours.

US 160 has a higher-than-average number and severity of accidents in the state. Contributing to this rating is uncontrolled access; lack of shoulders, turning lanes, and wildlife crossings; and steep grades with insufficient lanes for passing. These problems are compounded by the increasingly high traffic demands that are being placed on this section of highway. Design improvements for US 160 are needed to reduce both the accident rates and the severity of the accidents, as well as mitigate wildlife collisions through the use of wildlife crossings.

During the 5-year period from December 31, 1996, through December 31, 2001, 532 accidents occurred on US 160 from west of the US 160/US 550 (south) intersection (MP 88.0) to east of Bayfield (MP 104.2). Of those accidents, 34 percent resulted in injuries and 1.3 percent resulted in fatalities. The most frequent accident types were rear-end (32 percent), animal (27 percent), and overturning (8 percent). Also, 42 percent of the accidents occurred at intersections, were intersection-related, or occurred at driveway accesses. Accidents typically occurred during daylight (65 percent) and under dry conditions (83 percent).

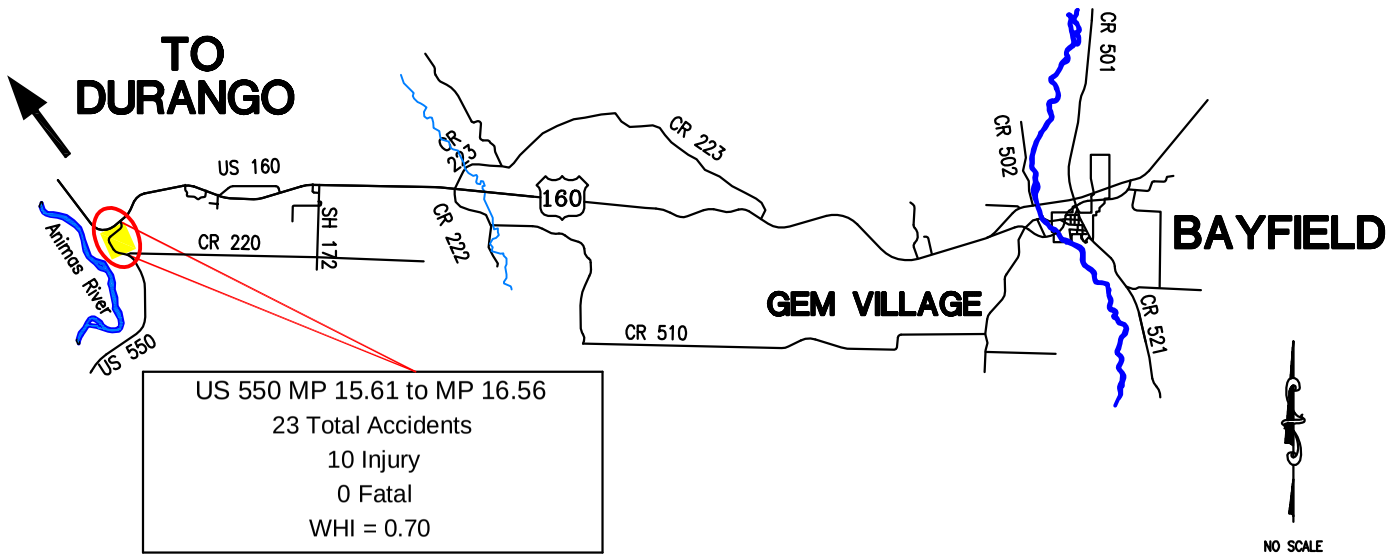
The accident data suggest that the most frequent accident types occurred at locations on US 160 with similar physical features. Rear-end, turning, and overturning accidents occurred most frequently in areas that lack turning lanes and have large numbers of access points, insufficient shoulders, steep grades, and steep embankments.

Specific segments of the corridor exhibited a higher frequency of animal-related accidents. These segments, typically 1,000 to 1,500 feet in length, are likely deer/elk migration routes that intersect the US 160 project corridor. Contributing factors to animal-related accidents are lack of wildlife crossings, insufficient shoulders, steep grades, and steep embankments. The highway characteristics described above contributed to the overall accident rate by forcing wildlife onto the highway and by limiting the ability of motorists to stop or make evasive maneuvers.

4.1 SAFETY ISSUES BY SECTION

The US 160 project corridor was divided into four sections for this accident analysis. US 550 from CR 220 to US 160 was also reviewed. Figures 3 through 7 are accident histograms depicting the types of accidents and accident severity for each highway section during the 5-year period of December 31, 1996, through December 31, 2001. An analysis of more recent data indicated similar traffic accident trends in the project corridor when compared to the 1996-2001 data. As development, tourism, and traffic increase, accident rates and severity are also expected to increase throughout the project corridor if no improvements are made.

Following is an analysis of the types and severity of accidents for each section of US 160. Hazardous sections of roadway are identified through calculation of the weighted hazard index (WHI). WHI is a statistic computed by considering accident frequency, accident severity, and traffic volumes, and comparing these data with the accident history of similar highways. Positive values of the WHI indicate highway sections that have an accident frequency and severity higher than the statewide average. All of the US 160 and US 550 sections analyzed yielded hazard indexes higher than the statewide average, demonstrating that the majority of the US 160 project corridor and the connecting US 550 segment are in need of improvement to reduce unsafe conditions.



NO SCALE

LEGEND

+4 HIGHER THAN AVERAGE

+2

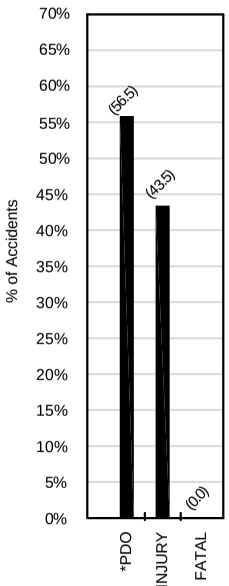
0 AVERAGE=0.0 WHI

-2 LOWER THAN AVERAGE

WHI = WEIGHTED HAZARD INDEX
MP = MILE POST
% = PERCENT

ACCIDENT DATA SUMMARY

ACCIDENT SEVERITY



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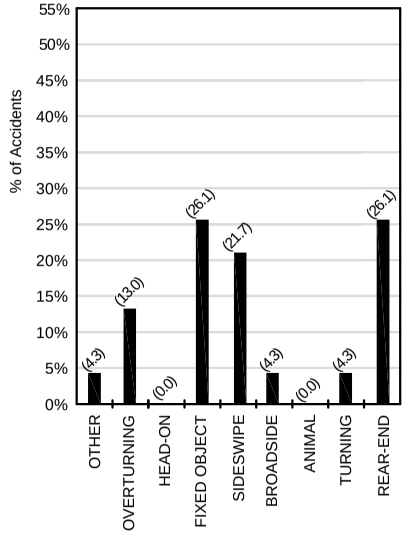

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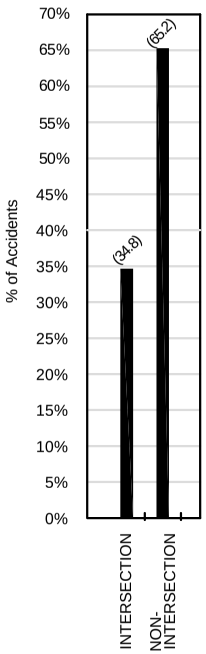

*PDO = PROPERTY DAMAGE ONLY

US 160 Environmental Impact Statement

Figure 3

US 550 Accident Histogram
from CR 220 to US 160

December 1996 through December 2001

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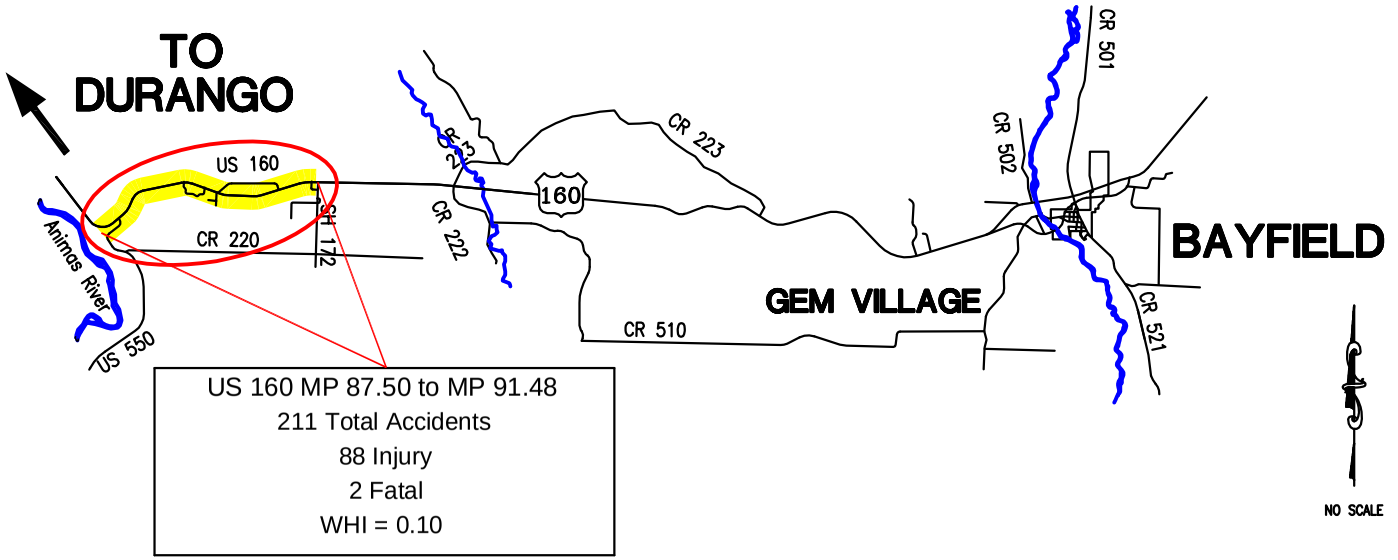


NO SCALE

LEGEND

+4 HIGHER THAN AVERAGE

+2

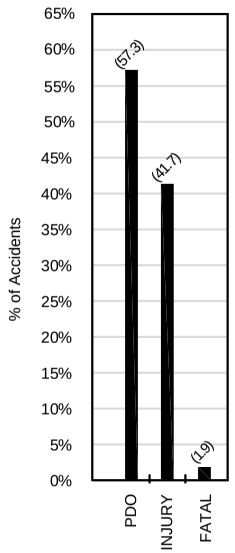
0 AVERAGE=0.0 WHI

-2 LOWER THAN AVERAGE

WHI = WEIGHTED HAZARD INDEX
MP = MILE POST
% = PERCENT

ACCIDENT DATA SUMMARY

ACCIDENT SEVERITY



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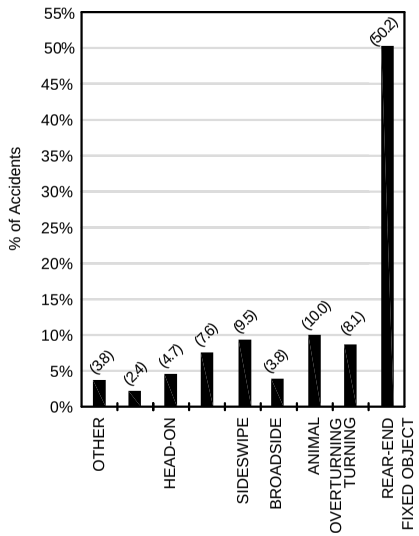
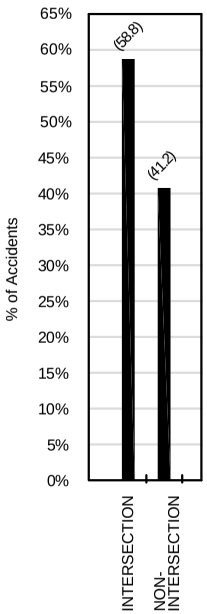
ACCIDENT TYPE



ACCIDENT LOCATION



US 160 Environmental Impact Statement
Figure 4
US 160 Accident Histogram
West of Farmington Hill to SH 172/CR 234
December 1996 through December 2001

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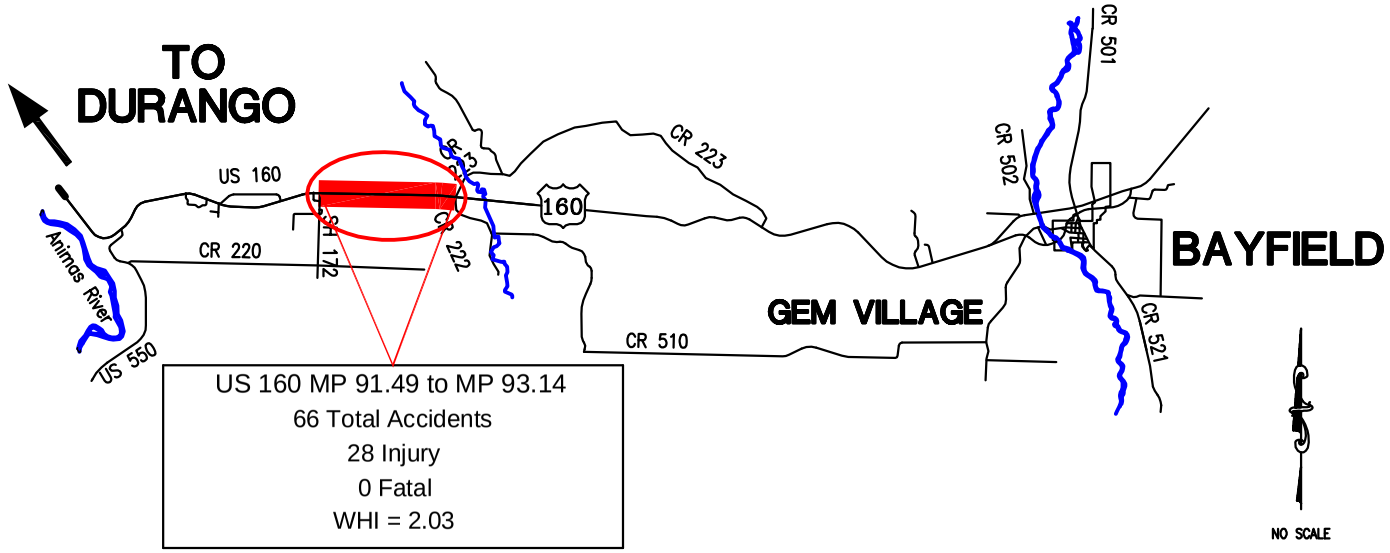
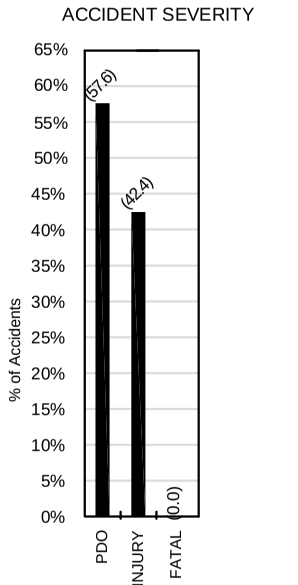


LEGEND

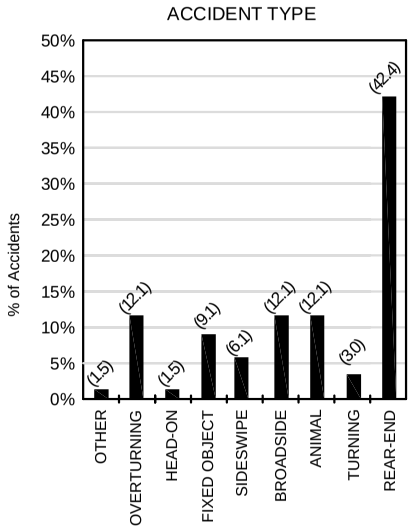
+4
+2 HIGHER THAN AVERAGE
0 AVERAGE=0.0 WHI
-2 LOWER THAN AVERAGE

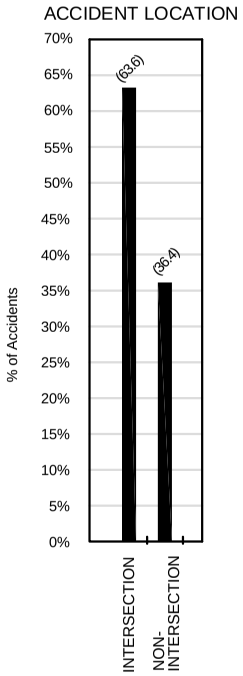
WHI = WEIGHTED HAZARD INDEX
MP = MILE POST
% = PERCENT

ACCIDENT DATA SUMMARY



*PDO = PROPERTY DAMAGE ONLY





US 160 Environmental Impact Statement
Figure 5
US 160 Accident Histogram
SH 172/CR 234 to CR 222/CR 223 (west)
December 1996 through December 2001

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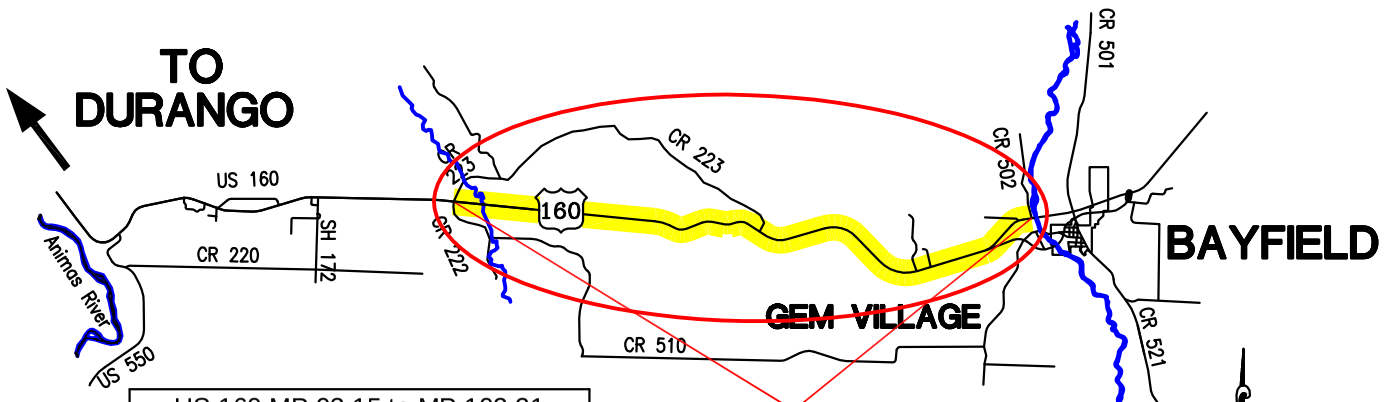


US 160 MP 93.15 to MP 102.21
199 Total Accidents
49 Injury
4 Fatal
WHI = 0.24

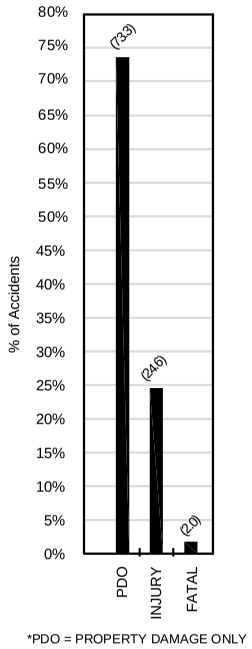
LEGEND

+4
+2 HIGHER THAN AVERAGE
0 AVERAGE=0.0 WHI
-2 LOWER THAN AVERAGE

WHI = WEIGHTED HAZARD INDEX
MP = MILE POST
% = PERCENT

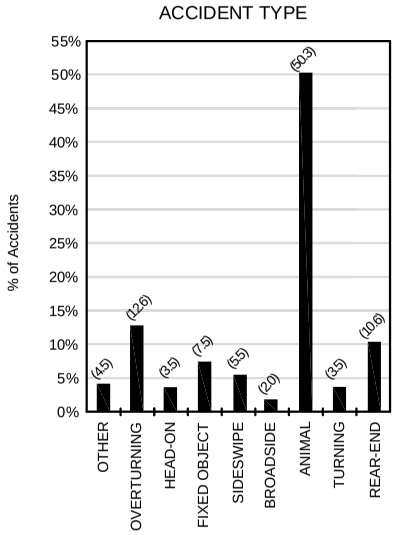
ACCIDENT DATA SUMMARY

ACCIDENT SEVERITY

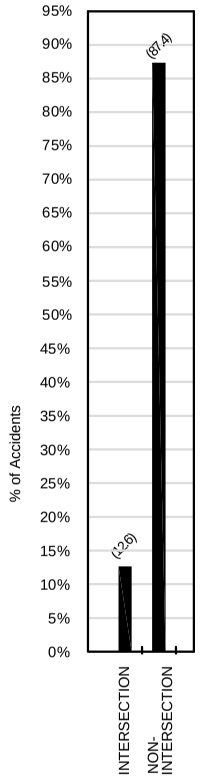


*PDO = PROPERTY DAMAGE ONLY

ACCIDENT TYPE



ACCIDENT LOCATION



US 160 Environmental Impact Statement
Figure 6
US 160 Accident Histogram
CR 222/CR 223 (west) to CR 502
December 1996 through December 2001

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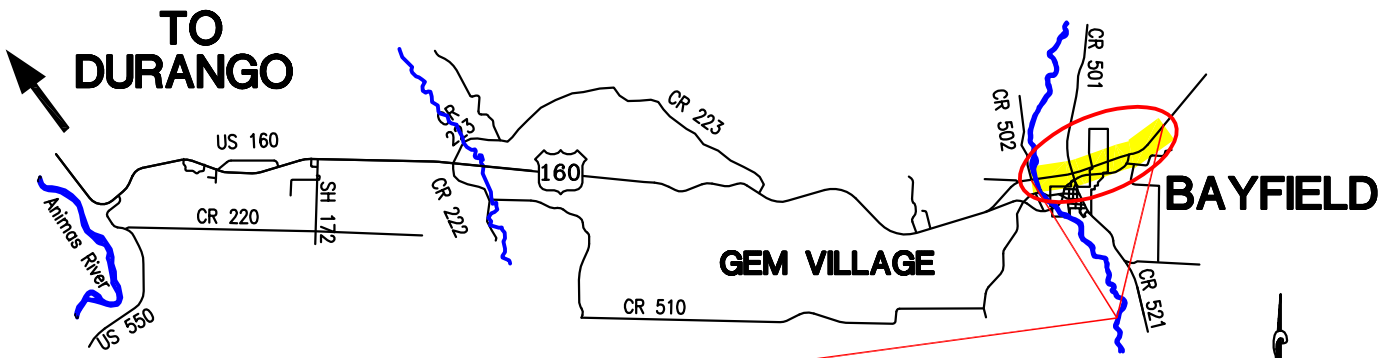


US 160 MP 102.22 to MP 105.00
56 Total Accidents
16 Injury
1 Fatal
WHI = 1.63

LEGEND

+4
+2
0
-2

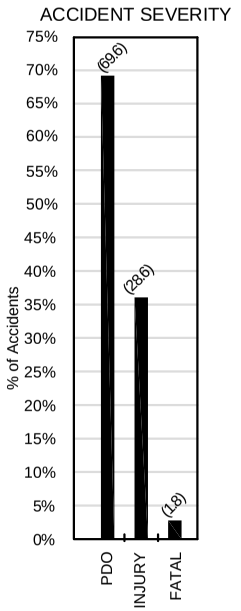
HIGHER THAN AVERAGE

AVERAGE=0.0 WHI

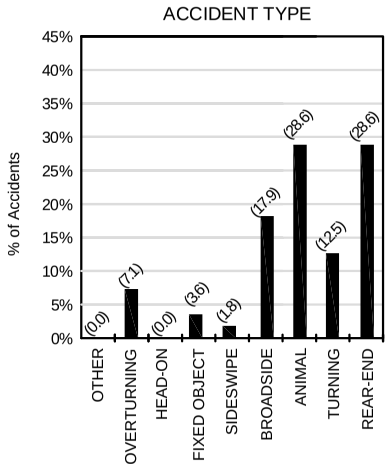
LOWER THAN AVERAGE

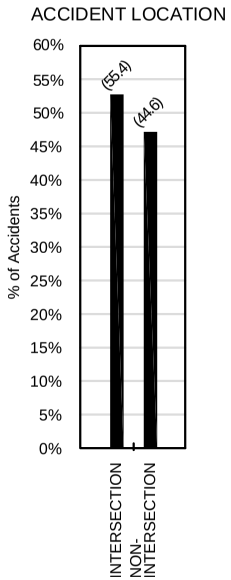
WHI = WEIGHTED HAZARD INDEX
MP = MILE POST
% = PERCENT

ACCIDENT DATA SUMMARY



*PDO = PROPERTY DAMAGE ONLY





US 160 Environmental Impact Statement
Figure 7
US 160 Accident Histogram
CR 502 to East of Bayfield
December 1996 through December 2001

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US 550 – From CR 220 to US 160

This section of US 550 extends south from the US 160/US 550 (south) intersection as a two-lane highway, ascending from the Animas River valley to the Florida Mesa in an area known as Farmington Hill (Photo 1). The roadway is cut into the side of the Farmington Hill embankment and follows the sharp horizontal curves of the hillside at a steep grade, rising over 200 feet in approximately 0.66 mile. There are minimal paved shoulders of 2 feet or less. The traversable ground surface outside the roadway is as narrow as 5 feet in many places, and only one-third of the section has guardrail along the downward slope embankment, leaving little room for driver error or emergency stops. Outside the traversable area, the embankment both above and below the roadway is steep: approximately 34 degrees. The embankment below the roadway ranges from 46 to 290 feet in height. The north-facing slope of the road surface makes this area prone to winter icing. The steep embankment above the roadway comprises decomposed shale overlain by sandy cobbles and boulders, which are prone to sloughing onto the roadway surface, creating hazards for drivers. Because of the sharp horizontal curves, driver visibility along the road is short—as little as 100 feet at some locations; hence, assuming a 30-miles per hour (mph) travel speed, drivers have only 2.0 seconds to react to roadway hazards.

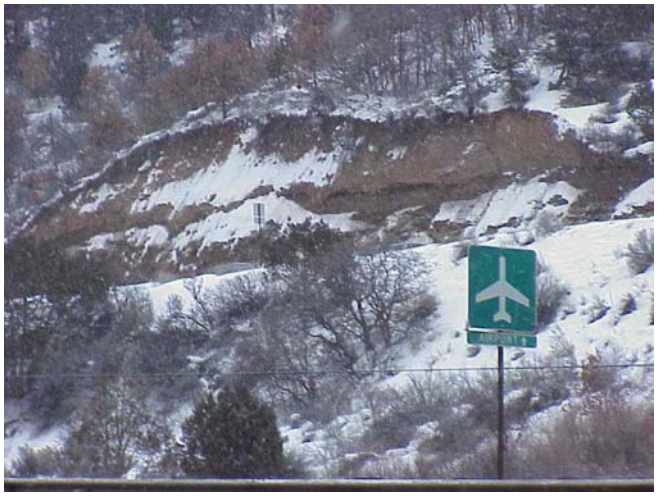


Photo 1
Farmington Hill

The roadway conditions are factors in the type and severity of accidents occurring on Farmington Hill (Figure 3, US 550 Accident Histogram from CR 220 to US 160). The steep winding roadway, icing conditions, and roadway obstructions contribute to drivers losing control of their vehicles. If drivers lose control, the narrow shoulders, lack of guardrails, and steep embankments make it difficult for them to regain control once their vehicles leave the roadway. Accidents on Farmington Hill generally fall into two categories: drivers lose the ability to slow or stop their vehicles due to the steep grade and either strike vehicles located in front of them or run out into the US 160/US 550 (south) intersection, or drivers lose control and run off the roadway surface and down the steep embankment below the roadway.

US 160 – From West of the US 160/US 550 (South) Intersection to and Including the SH 172/CR 234 Intersection

This section (Figure 4, US 160 Accident Histogram West of Farmington Hill to SH 172/CR 234) is one of the most developed along the project corridor, and development in this area is increasing. Development is residential, commercial, and industrial. The existing traffic volumes in this section are the highest in the project corridor and are projected to more than double within the next 20 years. This segment also includes the heavily traveled Farmington Hill and the SH

172/CR 234 intersection with US 160. The data indicate that uncontrolled access and lack of turning lanes are contributing factors to accidents in this section.

US 160 – From the SH 172/CR 234 Intersection to and Including the CR 222/CR 223 (west) Intersection

This section [Figure 5, US 160 Accident Histogram SH 172/CR 234 to CR 222/CR 223 (west)] is semi-rural with sparse residential and commercial development. Development is expected to accelerate as residential density increases in the Grandview area and pushes growth to the east. The data indicate that uncontrolled access, lack of turning lanes, and insufficient shoulders are contributing factors to accidents in this section.

US 160 – From the CR 222/CR 223 (west) Intersection to and Including CR 502

This section [Figure 6, US 160 Accident Histogram CR 222/CR 223 (west) to CR 502] is rural with sparse residential and commercial development, with the exception of Gem Village. Development along US 160 in this region is generally occurring at a slower rate than other sections. However, development along the county road system is increasing, resulting in additional traffic demands at the existing county road connections.

The high percentage of animal-related accidents is due to this area being a prime migration corridor for wintering elk and mule deer. The data indicate that lack of wildlife crossings, insufficient shoulders, steep grades, and steep embankments are contributing factors to accidents in this section.

US 160 – From CR 502 to East of Bayfield

This is one of the more developed sections (Figure 7, US 160 Accident Histogram CR 502 to East of Bayfield) along the project corridor. Additionally, there are commercial developments currently in the planning and construction phases. Development consists of residential and commercial. The accident data along this section indicate that intersections, driveways, and lack of wildlife crossings are contributing factors to accidents, as well as insufficient shoulders and steep embankments.

There were two action alternatives, in addition to the No Action Alternative, in each of the four sections that were carried forward for detailed analysis and are analyzed in this report. These are described below.

5.1 GRANDVIEW SECTION

Alternative G Modified

From the west project limit to the US 160/US 550 (south) intersection, US 160 would be four lanes with an eastbound climbing lane and a westbound auxiliary lane. From the US 550 (south) intersection to the intersection with SH 172/CR 234, US 160 would be four lanes. There would be single point urban interchanges at CR 233 (west) and SH 172/CR 234. US 160 would remain on the existing alignment except near the SH 172/CR 234 intersection, where it would be shifted north to avoid Crestview Memorial Gardens.

US 550 would be four lanes from CR 220 to the intersection with US 160. US 550 would be realigned to the east of the existing US 550 and skirt the western edge of the Florida Mesa before connecting to US 160 with a trumpet interchange approximately 0.6 miles east of the existing US 160/US 550 (south) intersection.

Alternative F Modified

From the west project limit to the US 160/US 550 (south) intersection, US 160 would be four lanes with an eastbound climbing lane and a westbound auxiliary lane. From the US 550 (south) intersection to the intersection with SH 172/CR 234, US 160 would be four lanes. There would be a single point urban interchange at SH 172/CR 234. US 160 would remain on the existing alignment except near the SH 172/CR 234 intersection, where it would be shifted north to avoid Crestview Memorial Gardens.

US 550 would be four lanes from CR 220 to the intersection with US 160. US 550 would be realigned to the east of the existing US 550 and cross the top of the Florida Mesa before connecting to US 160 with a single point urban interchange at the existing US 160/CR 233(west) intersection location.

5.2 FLORIDA MESA AND VALLEY SECTION

Alternative C

US 160 would be four lanes and generally remain on the existing alignment, with slight shifts as necessary to avoid residential structures on the north side of US 160 and the Griffin Dairy farm complex on the south side of US 160. Continuous access roads would be constructed both north and south of the highway. CR 222 and CR 223 would be realigned and connect to access roads on both sides of US 160. A new intersection with US 160 would be created approximately 4,500 feet east of the existing CR 222/CR 223 (west) intersection. Because this is on the east side of the Florida River, new roadway connections would be made to CR 510 on the south and CR 223 on the north.

Alternative A

US 160 would be four lanes and generally remain on the existing alignment, with slight shifts as necessary to avoid residential structures on the north side of US 160 and the Griffin Dairy Farm complex on the south side of US 160. Continuous access roads would be constructed both north and south of the highway. CR 222 and CR 223 would be realigned and connect to US 160 at a new intersection approximately 500 feet west of the existing CR 222/CR 223 (west) intersection with US 160.

5.3 DRY CREEK AND GEM VILLAGE SECTION

Alternative H

US 160 would be four lanes and generally remain on the existing alignment with improvements for curvature, grades, and sight distance from the CR 222/CR 223 (west) intersection to the CR 223 (east) intersection. CR 223 would be realigned and connect to US 160 approximately 1,500 feet west of the existing US 160/CR 223 (east) intersection. To reduce impacts to high quality wetlands, a 36-foot median would be used from MP 98 to MP 99 to separate opposing travel lanes. A 46-foot median would be used in all other areas. Access roads are provided on both sides of US 160 between MP 94 and MP 95 and on the north side of US 160 between MP 96 and MP 97 to consolidate direct highway access and reduce out-of-direction travel. East of the US 160/CR 223 (east) intersection, US 160 would be realigned and bypass Gem Village to the south. The realigned US 160 would leave the existing US 160 on the west side of Gem Village near MP 100 and rejoin it near MP 101. No access roads would be constructed, but access would be provided at the east end of Gem Village. A one-way slip ramp would provide access for westbound traffic at the west end of Gem Village.

Alternative C

US 160 would be four lanes and generally remain on the existing alignment with improvements for curvature, grades, and sight distance. CR 223 would be realigned and connect to US 160 approximately 1,500 feet west of the existing US 160/CR 223 (east) intersection. To reduce impacts to high quality wetlands, a 36-foot median would be used at this intersection to separate opposing travel lanes. A 46-foot median would be used in all other areas. Access roads are provided on both sides of US 160 between MP 94 and MP 95 and on the north side of US 160 between MP 96 and MP 97 to consolidate direct highway access and reduce out-of-direction travel. In Gem Village, US 160 would be widened to the south. Access roads would be constructed on both sides of US 160 and access would be provided at the west end of Gem Village.

5.4 BAYFIELD SECTION

Alternative B

US 160 would be four lanes and generally remain on the existing alignment with improvements for curvature, grades, and sight distance. Three closely spaced intersections with US 160 [US 160B (west), CR 506, and CR 502] would be consolidated into a single unsignalized

intersection. CR 502 would be realigned and connect to US 160 approximately 1,500 feet west of the existing US 160/CR 502 intersection. The realigned CR 502 would intersect CR 506 north of US 160 and continue south of US 160 to intersect with US 160B. This realignment would eliminate both of the existing US 160 intersections with CR 502 and CR 506. Access to US 160B would be maintained through an access road on the south side of US 160. The US 160/CR 501 intersection would remain a signalized intersection at its present location. The intersections of US 160B/CR 501 and US 160B/CR 521 would be reconstructed as a roundabout.

Alternative A

US 160 would be four lanes and generally remain on the existing alignment with improvements for curvature, grades, and sight distance. Three closely spaced intersections with US 160 [US 160B (west), CR 506, and CR 502] would be consolidated into a single unsignalized intersection. CR 502 would be realigned and connect to US 160 approximately 1,500 feet west of the existing US 160/CR 502 intersection. The realigned CR 502 would intersect CR 506 north of US 160 and continue south of US 160 to intersect with US 160B. This realignment would eliminate both of the existing US 160 intersections with CR 502 and CR 506. Access to US 160B would be maintained through an access road on the south side of US 160. CR 501 would be realigned and connect to US 160 approximately 800 feet west of the existing US 160/CR 501 intersection. This new intersection with US 160 would be a diamond interchange. From US 160 to the US 160B/CR 521 intersection, the existing CR 501 would be eliminated.

This section summarizes the development of the 2025 daily and peak-hour traffic volumes for the peak season conditions.

6.1 TRAFFIC VOLUMES

Traffic volumes for the project corridor were estimated using available data in the area including traffic impact reports, the US 550 and US 160 Feasibility Study, the *Grandview Area Plan*, and through coordination with CDOT, the City of Durango, and La Plata County. The following paragraphs describe the methodology used for assessing the design year 2025 traffic volumes for each of the sections along the corridor.

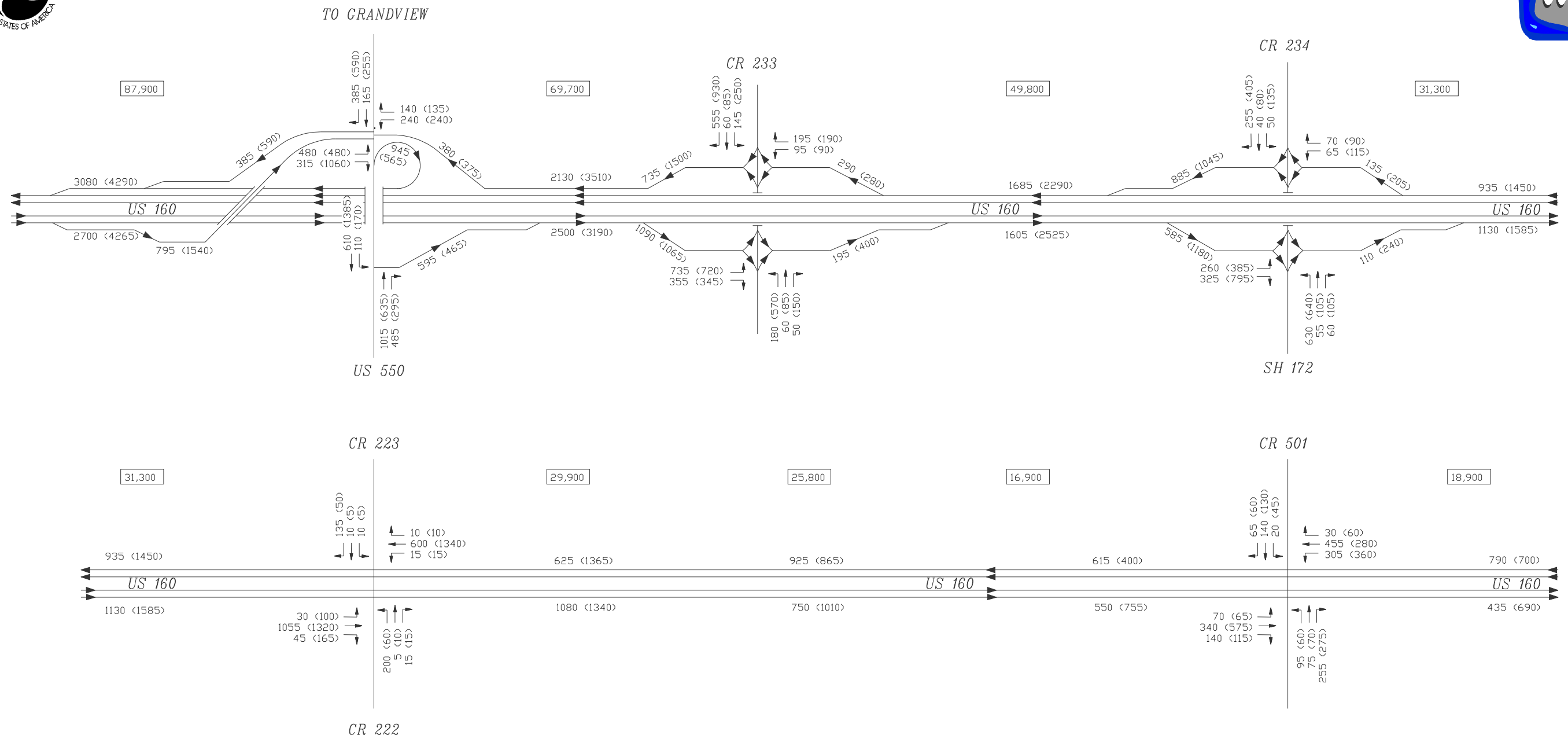
6.1.1 Grandview Section

The City of Durango's *Grandview Area Plan* provided the basis for development of traffic volumes in the Grandview section. Through coordination with the City of Durango and La Plata County, the trips generated by the Grandview development were estimated according to the proposed land uses and the Institute of Transportation Engineer's Trip Generation Manual. The trip generation tables for the Grandview section development are included in Attachment C, Grandview Section Trip Generation Tables. As shown in the trip generation tables, the total trips were reduced by 20 percent in Subareas I and III to account for internal and pass-by trips. This trip diversion rate was approved by the City of Durango, La Plata County, and CDOT. The trips were distributed based on the same distribution used for current traffic studies in the area (75 percent to/from the west, 20 percent to/from the east, and 5 percent to/from the north and south).

A 2025 seasonal background daily volume of 42,500 (a number approved by CDOT, the City of Durango, and La Plata County) was applied to the west of the project and used as a control volume for the project corridor through Grandview. The AM peak-hour background traffic was assigned using an AM peak hour to daily percentage of 6.4 percent, with a directional split of 35 percent eastbound and 65 percent westbound. The PM peak-hour background traffic was assigned using a PM peak hour to daily percentage of 10 percent, with a directional split of 56 percent eastbound and 44 percent westbound. The background volume does not include trips generated by the Grandview development. The trips generated by the Grandview development (shown in the trip generation tables in Attachment C, Grandview Section Trip Generation Tables) were added to the background traffic to estimate the total 2025 seasonal daily traffic. The 2025 seasonal daily and peak-hour volumes for Alternative G Modified and Alternative F Modified are shown in Figures 8 and 9, respectively.

6.1.2 Florida Mesa and Valley Section

The 2025 seasonal traffic volumes in the Florida Mesa and Valley section were developed according to the volumes entering and exiting the east end of the Grandview section. The turning volumes at the CR 222/CR 223 (west) intersection with US 160 were developed using a growth rate of 2.19 percent per year based on the state demographer's population forecasts. The 2025 seasonal daily and peak hour volumes for Alternative C and Alternative A are shown in Figures 8 and 9, respectively. The only difference between these two alternatives is the location of the CR 222/CR 223 (west) intersection; therefore, the traffic volumes are the same for both alternatives.



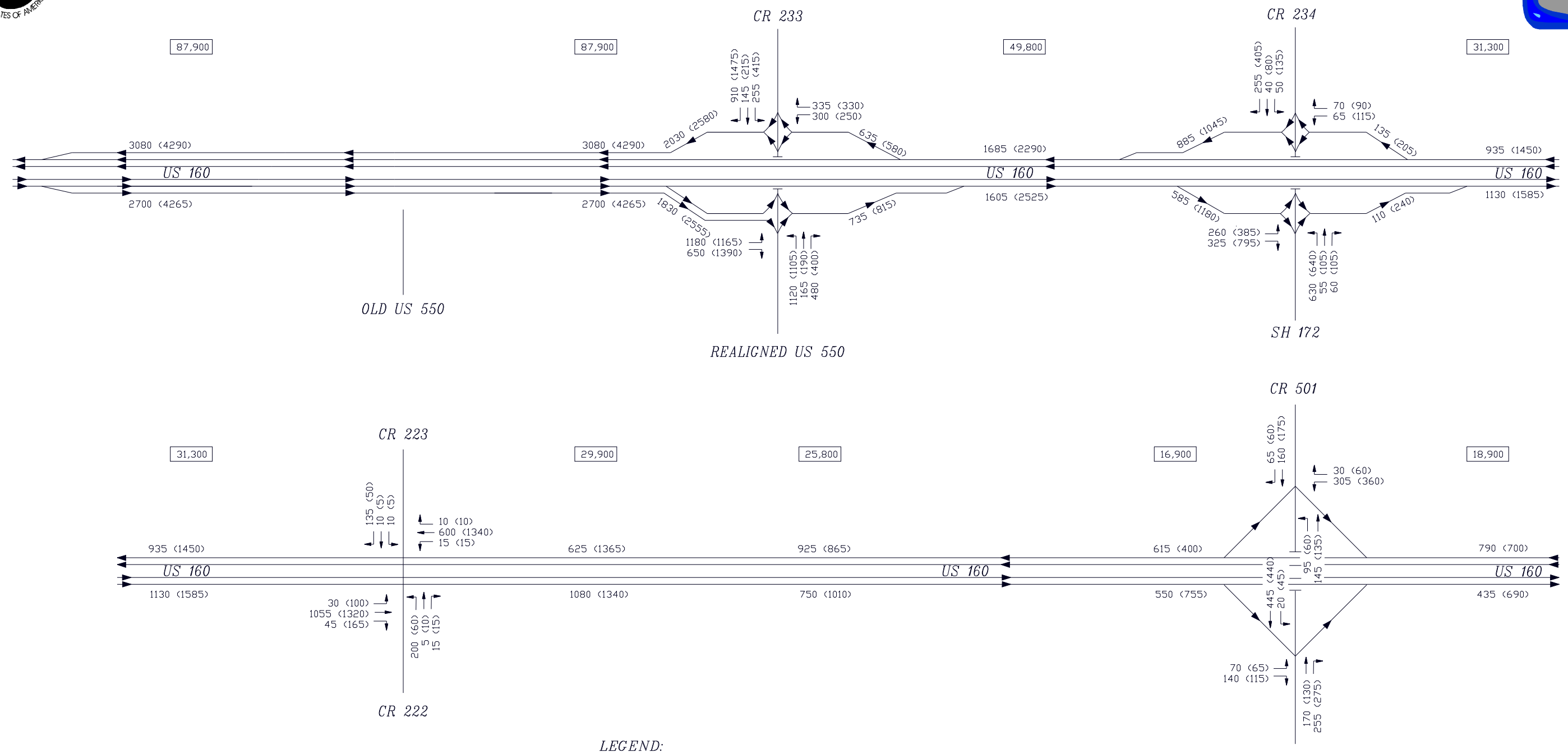
LEGEND:
(###) – AM (PM) PEAK HOUR VOLUME
– DAILY TRAFFIC VOLUME

N

NTS

US 160 DEIS TRAFFIC REPORT
Figure 8
2025 Seasonal Daily & Peak Hour Traffic Volumes & Mainline Laneage

(Grandview Alternative G Modified, Florida Mesa and Valley Alternative C, Dry Creek and Gem Village Alternative H, and Bayfield Alternative B)



LEGEND:

(###) – AM (PM) PEAK HOUR VOLUME

– *DAILY TRAFFIC VOLUME*

N

NTS

US 160 DEIS TRAFFIC REPORT

Figure 9

2025 Seasonal Daily & Peak Hour Traffic Volumes & Mainline Laneage

(Grandview Alternative F Modified, Florida Mesa and Valley Alternative A, Dry Creek and Gem Village Alternative C, and Bayfield Alternative A)

6.1.3 Dry Creek and Gem Village Section

The 2025 seasonal traffic volumes in the Dry Creek and Gem Village section were developed according to the volumes entering and exiting the east end of the Florida Mesa and Valley section, and the volumes entering and exiting the west end of the Bayfield section. There are no major intersections in the Dry Creek and Gem Village section; therefore, analysis was performed only for the US 160 main lane. The 2025 seasonal daily and peak-hour volumes for Alternative H and Alternative C are shown in Figures 8 and 9, respectively. The traffic volumes for theses alternatives are the same since the only difference between the alternatives is the alignment.

6.1.4 Bayfield Section

The 2025 seasonal traffic volumes in the Bayfield section were developed according to 2020 traffic projections from the 1999 Traffic Memorandum for US 160 in Bayfield, by URS Corporation. The 2020 traffic volumes from this memorandum were increased by 1.79 percent per year for five years to reflect the 2025 condition. This growth rate was based on the state demographer's population growth projection from 2020 to 2025. The 2025 seasonal daily and peak-hour volumes for Alternative B and Alternative A are shown in Figures 8 and 9, respectively.

This section documents the analysis of alternative options that were carried forward for analysis on this traffic study. The analysis focuses on two options that were considered but dismissed due to operational deficiencies and safety concerns. These two options are described in the following subsections.

Intersection Options in the Grandview Section

For Grandview section Alternative G Modified and Alternative F Modified, single-point urban interchanges were recommended on US 160 at the intersections of CR 233 (west) and SH 172/CR 234. These two locations were originally analyzed as intersections and the results are summarized in Table 7.1, Grandview Section Alternative Options Intersection Analysis Summary.

Table 7.1
Grandview Section Alternative Options Intersection Analysis Summary

	Alternative G Modified				Alternative F Modified			
	AM Peak		PM Peak		AM Peak		PM Peak	
US 160 Intersection	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service
SH 172/CR 234								
Eastbound left	53.1	D	57.1	E	53.1	D	57.1	E
Eastbound through	35.8	D	68.2	E	35.8	D	68.2	E
Eastbound right	8.7	A	22.0	C	8.7	A	22.0	C
Westbound left	48.6	D	47.8	D	48.6	D	47.8	D
Westbound through	30.3	C	49.6	D	30.3	C	49.6	D
Westbound right	7.0	A	8.2	A	7.0	A	8.2	A
Northbound left	50.9	D	77.3	E	50.9	D	77.3	E
Northbound through	53.6	D	68.3	E	53.6	D	68.3	E
Northbound right	35.3	D	34.2	C	35.3	D	34.2	C
Southbound left	36.5	D	42.5	D	36.5	D	42.5	D
Southbound through	52.5	D	56.7	E	52.5	D	56.7	E
Southbound right	45.2	D	80.8	F	45.2	D	80.8	F
Overall	36.8	D	55.5	E	36.8	D	55.5	E
CR 233 (west) *								
Eastbound left	79.5	E	208.2	F	253.0	F	244.8	F
Eastbound through	50.9	D	225.0	F	78.6	E	496.0	F
Eastbound right	15.1	B	11.2	B	27.6	C	350.7	F
Westbound left	38.5	D	44.7	D	37.4	D	36.8	D
Westbound through	48.6	D	191.0	F	155.6	F	496.0	F
Westbound right	13.1	B	9.8	A	16.5	B	16.5	B
Northbound left	58.9	E	245.5	F	220.7	F	212.6	F
Northbound through	53.9	D	58.1	E	164.0	F	225.3	F
Northbound right	26.3	C	33.9	C	45.7	D	35.8	D
Southbound left	54.7	D	52.3	D	36.8	D	39.2	D
Southbound through	53.9	D	58.1	E	123.2	F	293.1	F
Southbound right	0.1	A	0.7	A	0.7	A	18.2	B
Overall	45.1	D	157.7	F	119.2	F	278.3	F

* For Alternative F Modified, US 550 is realigned to connect to US 160 at CR 233 (west).

As seen in Table 7.1, an intersection at US 160 and SH 172/CR 234 would operate the same for both Alternative G Modified and Alternative F Modified. Overall, this intersection would operate at LOS D during the AM peak hour and LOS E during the PM peak hour. During the PM peak hour, six movements are projected to operate at LOS E and one movement at LOS F. The intersection at US 160/CR 233 (west) is projected to operate at LOS D during the AM peak hour and LOS F during the PM peak hour for Alternative G Modified and LOS F during both the AM and PM peak hours for Alternative F Modified. Several movements at this intersection are projected to operate at LOS F during the peak hours.

The results of the signalized intersection analysis for these two intersections would not meet the level of service criteria for the Grandview section; therefore, interchanges were recommended at these locations.

Three-Lane Highway Option

A three-lane highway option was considered for the US 160 corridor from US 550 (south) to Bayfield. The three-lane alternative was an improved two-lane that provided one 12-foot travel lane in each direction and a center passing lane for use by only one travel direction at a time.

The traffic operations of a three-lane highway are similar to that of a two-lane highway. The direction of travel that has the passing lane would have an improved level of service but the opposing single travel lane would still result in unacceptable levels of service (LOS E or LOS F). This is due to the inability of the single lane of travel to pass slower-moving vehicles. Rolling terrain and truck percentages in excess of 5.0 percent also contribute to increased traffic congestion along the corridor.

The three-lane alternative also results in unrestricted access to US 160, with left turns allowed at all accesses to provide reasonable access to property owners along the corridor. The unrestricted access results in more conflict points along the corridor which increases the potential for accidents.

The three-lane option was dismissed as an alternative due to the safety concerns and the undesirable levels of service for the single-lane direction of travel.

This section documents the operational analysis conducted in support of the US 160 FEIS from Durango to Bayfield. The 2025 traffic operations for the highway sections and intersections were evaluated for the No Action Alternative as well as the two action alternatives in each of the four sections. The purpose of this analysis is to provide an objective and thorough evaluation of the traffic operations for each alternative, and a comparison between the alternatives. The 2025 peak hour levels of service were estimated using the peak-hour traffic volumes shown in Figures 8 and 9, and the methodologies described in the *Highway Capacity Manual 2000* (HCM 2000).

8.1 2025 GRANDVIEW SECTION OPERATIONAL ANALYSIS

Operational analyses were performed in the Grandview section for the No Action Alternative, Alternative G Modified, and Alternative F Modified. The capacity analysis worksheets for the Grandview section highway analyses and the intersection analyses are included as Attachments D and E, respectively.

8.1.1 2025 Grandview Section Highway Analysis

No Action Alternative

The No Action Alternative would include a safety improvement currently under construction that would provide an additional lane westbound from SH 172/CR 234 to approximately 0.5 mile east of the US 550 (south) intersection with US 160. The resulting four-lane highway section from east of the US 160/US 550 (south) intersection to the US 160/CR 233 (west) intersection is projected to operate at LOS D eastbound, and LOS C westbound during the AM peak hour. It is projected to operate at LOS E eastbound, and LOS F westbound during the PM peak hour. Since the fourth lane westbound would end east of the US 160/US 550 (south) intersection, this transition back to a three-lane highway would be a bottleneck and result in additional congestion in this section. The four-lane highway section on US 160 between the CR 233 (west) and SH 172/CR 234 intersections is projected to operate at LOS B eastbound and westbound during the AM peak hour, and LOS C eastbound and westbound during the PM peak hour. Additional congestion would occur in this section due to the bottleneck east of SH 172/CR 234, as US 160 transitions back to a two-lane highway.

Alternative G Modified

Alternative G Modified would provide an access-controlled US 160 through the Grandview section. US 550 would be realigned to the east of the existing location and would also provide access from the north of US 160. There would be interchanges along US 160 at US 550 (south), CR 233 (west), and SH 172/CR 234. US 160 would be four lanes (two lanes in each direction) east of the US 550 (south) interchange, and four lanes (two lanes in each direction) plus an auxiliary lane and a climbing lane (one lane in each direction) west of the US 550 (south) interchange. Table 8.1, Alternative G Modified, Highway Segment Traffic Operations Summary, summarizes the US 160 highway segment levels of service along the corridor in the Grandview section for this alternative. Table 8.2, Alternative G Modified, Ramp Merge/Diverge and Weaving Area Traffic Operations Summary, summarizes the highway ramp junction

merge/diverge and weaving area levels of service along US 160 in the Grandview section for this alternative.

Table 8.1
Alternative G Modified, Highway Segment
Traffic Operations Summary

US 160 Highway Segment	Eastbound		Westbound	
	AM Peak LOS	PM Peak LOS	AM Peak LOS	PM Peak LOS
West of US 550 (south)	B	D	C	D
US 550 (south) to CR 233 (west)	C	D	C	D
CR 233 (west) to SH 172/CR 234	B	C	B	C

Table 8.2
Alternative G Modified, Ramp Merge/Diverge and Weaving Area Traffic Operations Summary

US 160 Location	Alternative G Modified			
	Merge/Diverge Area		Weaving Area	
	AM Peak LOS	PM Peak LOS	AM Peak LOS	PM Peak LOS
Eastbound				
Off-Ramp to US 550 (south)	B	D		
On-Ramp from US 550 (south)	C	D		
Off-Ramp to CR 233 (west)	C	D		
On-Ramp to CR 233 (west)	B	C		
Off-Ramp to SH 172/CR 234	B	C		
On-Ramp to SH 172/CR 234	B	B		
Westbound				
Off-Ramp to SH 172/CR 234	B	B		
On-Ramp to SH 172/CR 234	B	C		
Off-Ramp to CR 233 (west)	B	C		
On-Ramp to CR 233 (west)	N/A	N/A		
Between CR 233 (west) On-Ramp and US 550 (south) Off-Ramp			B	D
On-Ramp from northbound US 550 (south) (Loop)	B	C		
On-Ramp from southbound US 550 (south)	B	C		

Alternative F Modified

Alternative F Modified would provide an access-controlled US 160 through the Grandview section. US 550 would be realigned to connect with US 160 at CR 233 (west). Interchanges would be provided at the US 550 (south)/CR 233 (west) intersection and the SH 172/CR 234 intersection. US 160 would be four lanes (two lanes in each direction) between the US 550 (south)/CR 233 (west) and SH 172/CR 234 interchanges, and four lanes (two lanes in each direction) plus an auxiliary lane and a climbing lane (one lane in each direction) west of the US 550 (south)/CR 233 (west) interchange. Table 8.3, Alternative F Modified, Highway

Segment Traffic Operations Summary, summarizes the US 160 highway segment levels of service along the corridor in the Grandview section for this alternative. Table 8.4, Alternative F Modified, Ramp Merge/Diverge and Weaving Area Traffic Operations Summary, summarizes the highway ramp junction merge/diverge and weaving area levels of service along US 160 in the Grandview section for this alternative.

Table 8.3
Alternative F Modified, Highway Segment Traffic Operations Summary

US 160 Highway Segment	Eastbound		Westbound	
	AM Peak LOS	PM Peak LOS	AM Peak LOS	PM Peak LOS
West of US 550 (south)/CR 233 (west)	B	D	C	D
US 550 (south)/CR 233 (west) to SH 172/CR 234	B	C	B	C

Table 8.4
Alternative F Modified, Ramp Merge/Diverge and Weaving Area Traffic Operations Summary

US 160 Location	Alternative F Modified			
	Merge/Diverge Area		Weaving Area	
	AM Peak LOS	PM Peak LOS	AM Peak LOS	PM Peak LOS
Eastbound				
Off-Ramp to US 550 (south)	N/A	N/A		
On-Ramp from US 550 (south)	N/A	N/A		
Off-Ramp to CR 233 (west)	B	B		
On-Ramp to CR 233 (west)	B	C		
Off-Ramp to SH 172/CR 234	B	C		
On-Ramp to SH 172/CR 234	B	B		
Westbound				
Off-Ramp to SH 172/CR 234	B	B		
On-Ramp to SH 172/CR 234	B	C		
Off-Ramp to CR 233 (west)	B	C		
On-Ramp to CR 233 (west)	C	D		
Between CR 233 On-Ramp and US 550 (south) Off-Ramp			N/A	N/A
On-Ramp from northbound US 550 (south) (Loop)	N/A	N/A		
On-Ramp from southbound US 550 (south)	N/A	N/A		

8.1.2 2025 Grandview Section Highway Analysis Comparison Summary

Table 8.5, Grandview Section Highway Segment Alternative Comparison Summary, shows an alternative comparison of the levels of service for the highway segments along US 160 in the Grandview section.

Table 8.5
Grandview Section Highway Segment Alternative Comparison Summary

	No Action Alternative				Alternative G Modified				Alternative F Modified			
	Eastbound		Westbound		Eastbound		Westbound		Eastbound		Westbound	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
US 160 Highway Segment	LOS	LOS	LOS	LOS	LOS	LOS	LOS	LOS	LOS	LOS	LOS	LOS
West of US 550 (south)	D	F	D	F	B	D	C	D	B	D	C	D
US 550 (south) to CR 233 (west)	D	E	C	F	C	D	C	D	*	*	*	*
CR 233 (west) to SH 172/CR 234	B	C	B	C	B	C	B	C	B	C	B	C

* For Alternative F Modified, US 550 is realigned to connect with CR 233

As seen in Table 8.5, the No Action Alternative would not provide the needed capacity for the 2025 design year. Although the safety improvement, currently under construction, would provide acceptable levels of service through a portion of the Grandview section, bottlenecks would occur at each end of the improvement as US 160 transitions back to existing lane geometry. The main lane segments for Alternative G Modified and Alternative F Modified are expected to operate at the same level of service.

Table 8.6, Grandview Section Ramp Merge/Diverge and Weaving Area Alternative Comparison Summary, shows a comparison of the levels of service for the ramp merge/diverge and weaving areas between Alternative G Modified and Alternative F Modified. The No Action Alternative does not include interchanges with ramps; therefore, it was not included in the comparison table.

Table 8.6
Grandview Section Ramp Merge/Diverge and Weaving Area Alternative Comparison Summary

	Alternative G Modified				Alternative F Modified			
	Merge/Diverge Area		Weaving Area		Merge/Diverge Area		Weaving Area	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
US 160 Location	LOS	LOS	LOS	LOS	LOS	LOS	LOS	LOS
Eastbound								
Off-Ramp to US 550 (south)	B	D			N/A	N/A		
On-Ramp from US 550 (south)	C	D			N/A	N/A		
Off-Ramp to CR 233 (west)	C	D			B	B		
On-Ramp from CR 233 (west)	B	C			B	C		
Off-Ramp to SH 172/CR 234	B	C			B	C		
On-Ramp from SH 172/CR 234	B	B			B	B		
Westbound								
Off-Ramp to SH 172/CR 234	B	B			B	B		
On-Ramp from SH 172/CR 234	B	C			B	C		
Off-Ramp to CR 233 (west)	B	C			B	C		
On-Ramp from CR 233 (west)	N/A	N/A			C	D		

Table 8.6
Grandview Section Ramp Merge/Diverge and Weaving Area Alternative Comparison Summary

	Alternative G Modified				Alternative F Modified			
	Merge/Diverge Area		Weaving Area		Merge/Diverge Area		Weaving Area	
US 160 Location	AM Peak LOS	PM Peak LOS	AM Peak LOS	PM Peak LOS	AM Peak LOS	PM Peak LOS	AM Peak LOS	PM Peak LOS
Between CR 233 (west) On-Ramp and US 550 (south) Off-Ramp			B	D			N/A	N/A
On-Ramp from northbound US 550 (south) (Loop)	B	C			N/A	N/A		
On-Ramp from southbound US 550 (south)	B	C			N/A	N/A		

Table 8.6 indicates that all ramp merge/diverge and weaving areas are projected to operate at LOS D or better for both alternatives. Alternative G Modified and Alternative F Modified are projected to have similar main lane merge/diverge traffic operations in the design year.

8.1.3 2025 Grandview Section Intersection Analysis

No Action Alternative

Signalized intersection analyses were performed for the No Action Alternative on US 160 at US 550 (south), CR 233 (west), and SH 172/CR 234. The results of the analyses indicate that all three intersections are projected to operate at LOS F during the AM and PM peak hours under the No Action Alternative.

Alternative G Modified

Alternative G Modified would have an interchange at the realigned US 160/US 550 (south) intersection with a signalized intersection on the north side and an unsignalized intersection on the south side of US 160. There are single-point urban interchanges on US 160 at the intersections with CR 233 (west) and SH 172/CR 234. Table 8.7, Alternative G Modified, Signalized Intersection Operations Summary, summarizes the results of the signalized intersections for this alternative at these locations in the Grandview section.

Table 8.7
Alternative G Modified,
Signalized Intersection Operations Summary

US 160 Intersection	Alternative G Modified			
	AM Peak		PM Peak	
	Delay sec/veh	Level of Service	Delay sec/veh	Level of Service
SH 172/CR 234 (west)				
Eastbound left	23.3	C	42.6	D
Eastbound right	33.4	C	34.2	C
Westbound left	22.3	C	35.6	D
Westbound right	23.3	C	9.0	A
Northbound left	28.7	C	10.6	B
Northbound through	28.3	C	40.6	D
Northbound right	8.0	A	22.4	C
Southbound left	22.8	C	9.3	A
Southbound through	28.0	C	38.5	D
Southbound right	9.3	A	39.8	D
Overall	24.7	C	28.8	C
CR 233 (west)				
Eastbound left	22.3	C	34.8	C
Eastbound right	30.5	C	18.7	B
Westbound left	17.9	B	25.0	C
Westbound right	23.4	C	16.1	B
Northbound left	21.2	C	17.0	B
Northbound through	37.6	D	38.8	D
Northbound right	9.2	A	15.6	B
Southbound left	21.0	C	15.1	B
Southbound through	37.6	D	38.8	D
Southbound right	0.1	A	0.7	A
Overall	18.7	B	17.5	B
US 550 (south) (north side)				
Eastbound left	22.1	C	26.2	C
Eastbound right	0.1	A	1.5	A
Westbound left	5.9	A	9.0	A
Westbound right	28.0	C	29.7	C
Northbound through	28.6	C	23.1	C
Southbound through	30.7	C	26.4	C
Southbound right	0.1	A	0.2	A
Overall	12.9	B	10.2	B

Alternative F Modified

Alternative F Modified would have single-point urban interchanges along US 160 at the US 550 (south)/CR 233 (west) and SH 172/CR 234 intersections. Table 8.8, Alternative F Modified, Signalized Intersection Operations Summary, summarizes the results of the signalized intersections for Alternative F Modified at these locations in the Grandview section.

Table 8.8
Alternative F Modified, Signalized Intersection Operations Summary

US 160 Intersection	Alternative F Modified			
	AM Peak		PM Peak	
	Delay sec/veh	Level of Service	Delay sec/veh	Level of Service
SH 172/CR 234 (west)				
Eastbound left	23.3	C	42.6	D
Eastbound right	33.4	C	34.2	C
Westbound left	22.3	C	35.6	D
Westbound right	23.3	C	9.0	A
Northbound left	28.7	C	10.6	B
Northbound through	28.3	C	40.6	D
Northbound right	8.0	A	22.4	C
Southbound left	22.8	C	9.3	A
Southbound through	28.0	C	38.5	D
Southbound right	9.3	A	39.8	D
Overall	24.7	C	28.8	C
US 550 (south)/CR 233 (west)				
Eastbound left	54.1	D	63.3	E
Eastbound right	Free-flow	Free-flow	Free-flow	Free-flow
Westbound left	25.9	C	26.8	C
Westbound right	33.9	C	35.9	D
Northbound left	54.3	D	63.5	E
Northbound through	54.7	D	49.2	D
Northbound right	18.1	B	15.1	B
Southbound left	26.9	C	30.0	C
Southbound through	51.3	D	52.7	D
Southbound right	Free-flow	Free-flow	Free-flow	Free-flow
Overall	44.2	D	49.5	D

8.1.4 2025 Grandview Section Intersection Analysis Comparison Summary

Table 8.9, 2025 Grandview Section Signalized Intersection Alternative Comparison Summary, shows an alternative comparison of the signalized intersection levels of service for the Grandview section.

Table 8.9
2025 Grandview Section Signalized Intersection Alternative Comparison Summary

	No Action Alternative				Alternative G Modified				Alternative F Modified			
	AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
US 160 Intersection	Delay sec./veh.	Level of Service	Delay sec./veh.	Level of Service	Delay sec./veh.	Level of Service	Delay sec./veh.	Level of Service	Delay sec./veh.	Level of Service	Delay sec./veh.	Level of Service
SH 172/CR 234												
Eastbound left	326.6	F	444.3	F	23.3	C	42.6	D	23.3	C	42.6	D
Eastbound through	260.9	F	471.1	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Eastbound right	7.4	A	18.4	B	33.4	C	34.2	C	33.4	C	34.2	C
Westbound left	51.9	D	52.2	D	22.3	C	35.6	D	22.3	C	35.6	D
Westbound through	124.1	F	406.3	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Westbound right	6.0	A	7.1	A	23.3	C	9.0	A	23.3	C	9.0	A
Northbound left	280.1	F	369.2	F	28.7	C	10.6	B	28.7	C	10.6	B
Northbound through	53.6	D	68.3	E	28.3	C	40.6	D	28.3	C	40.6	D
Northbound right	37.8	D	36.7	D	8.0	A	22.4	C	8.0	A	22.4	C
Southbound left	34.9	C	39.7	D	22.8	C	9.3	A	22.8	C	9.3	A
Southbound through	52.5	D	56.7	E	28.0	C	38.5	D	28.0	C	38.5	D
Southbound right	52.2	D	112.0	F	9.3	A	39.8	D	9.3	A	39.8	D
Overall	180.6	F	300.1	F	24.7	C	28.8	C	24.7	C	28.8	C
CR 233 (west)												
Eastbound left	900.4	F	884.2	F	22.3	C	34.8	C	54.1	D	63.3	E
Eastbound through	48.4	D	235.8	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Eastbound right	16.9	B	16.7	B	30.5	C	18.7	B	Free-flow	Free-flow	Free-flow	Free-flow
Westbound left	36.0	D	35.9	D	17.9	B	25.0	C	25.9	C	26.8	C
Westbound through	43.3	D	209.8	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Westbound right	16.5	B	16.4	B	23.4	C	16.1	B	33.9	C	35.9	D
Northbound left	221.6	F	1445.0	F	21.2	C	17.0	B	54.3	D	63.5	E
Northbound through	53.9	D	58.1	E	37.6	D	38.8	D	54.7	D	49.2	D
Northbound right	24.3	C	26.3	C	9.2	A	15.6	B	18.1	B	15.1	B
Southbound left	91.5	F	317.2	F	21.0	C	15.1	B	26.9	C	30.0	C
Southbound through	53.9	D	58.1	E	37.6	D	38.8	D	51.3	D	52.7	D
Southbound right	344.1	F	804.4	F	0.1	A	0.7	A	Free-flow	Free-flow	Free-flow	Free-flow
Overall	265.7	F	478.3	F	18.7	B	17.5	B	44.2	D	49.5	D
US 550 (south)												
Eastbound left	N/A	N/A	N/A	N/A	22.1	C	26.2	C	N/A	N/A	N/A	N/A
Eastbound through	302.5	F	334.5	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Eastbound right	2.2	A	12.8	B	0.1	A	1.5	A	N/A	N/A	N/A	N/A
Westbound left	428.0	F	428.0	F	5.9	A	9.0	A	N/A	N/A	N/A	N/A
Westbound through	Free-flow	Free-flow	Free-flow	Free-flow	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Westbound right	N/A	N/A	N/A	N/A	28.0	C	29.7	C	N/A	N/A	N/A	N/A
Northbound left	378.7	F	357.5	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 8.9
2025 Grandview Section Signalized Intersection Alternative Comparison Summary

	No Action Alternative				Alternative G Modified				Alternative F Modified			
	AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
US 160 Intersection	Delay sec./veh.	Level of Service	Delay sec./veh.	Level of Service	Delay sec./veh.	Level of Service	Delay sec./veh.	Level of Service	Delay sec./veh.	Level of Service	Delay sec./veh.	Level of Service
Northbound through	N/A	N/A	N/A	N/A	28.6	C	23.1	C	N/A	N/A	N/A	N/A
Northbound right	30.1	C	35.5	D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Southbound left	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Southbound through	N/A	N/A	N/A	N/A	30.7	C	26.4	C	N/A	N/A	N/A	N/A
Southbound right	N/A	N/A	N/A	N/A	0.1	A	0.2	A	N/A	N/A	N/A	N/A
Overall	274.0	F	261.1	F	12.9	B	10.2	B	N/A	N/A	N/A	N/A

Table 8.9 indicates that the three signalized intersections under the No Action Alternative are projected to operate at LOS F during the AM and PM peak hours and would not provide the capacity needed for the design year.

The intersection at US 160 and SH 172/CR 234 would operate the same for Alternative G Modified and Alternative F Modified. All movements at this intersection are projected to operate at LOS D or better during the AM and PM peak hours.

For the US 160/CR 233 (west) intersection, US 550 is realigned to join US 160 at the CR 233 (west) interchange under Alternative F Modified. Under Alternative G Modified, the US 160/US 550 (south) interchange is located to the west of the US 160/CR 233 (west) interchange. The US 160/CR 233 (west) interchange is projected to operate at LOS B overall during both the AM and PM peak hours for Alternative G Modified and LOS D during the AM and PM peak hours for Alternative F Modified. Table 8.9 indicates that the US 160/CR 233 (west) intersection in the Grandview G Modified alternative would have reserve capacity to accommodate additional growth beyond the 2025 design year. In comparison, for Alternative F Modified, this intersection is near capacity and would not accommodate any additional growth beyond the 2025 design year.

8.2 2025 FLORIDA MESA AND VALLEY SECTION OPERATIONAL ANALYSIS

Operational analyses were performed in the Florida Mesa and Valley section for the No Action Alternative, Alternative C, and Alternative A. The capacity analysis worksheets for the Florida Mesa and Valley section highway analyses and the intersection analyses are included in Attachments F and G, respectively.

8.2.1 2025 Florida Mesa and Valley Section Highway Analysis

No Action Alternative

Under the No Action Alternative, the existing roadway conditions would remain in the Florida Mesa and Valley section. US 160 is projected to operate at LOS E in the eastbound and

westbound directions during the AM peak hour, and LOS F in both directions during the PM peak hour.

Alternative C

Alternative C would provide four lanes (two in each direction) on US 160 through the Florida Mesa and Valley section, and would follow the existing alignment. US 160 is projected to operate at LOS A in both directions during the AM peak hour, and LOS B in both directions during the PM peak hour.

Alternative A

Alternative A would provide four lanes (two in each direction) on US 160 through the Florida Mesa and Valley section, and would follow the existing alignment. US 160 is projected to operate at LOS A in both directions during the AM peak hour, and LOS B in both directions during the PM peak hour.

8.2.2 2025 Florida Mesa and Valley Section Intersection Analysis

No Action Alternative

Under the No Action Alternative, the existing roadway conditions would remain in the Florida Mesa and Valley section. The critical movements at the US 160 and CR 222/CR 223 (west) unsignalized intersection are projected to operate at LOS E or worse during the AM peak hour, and LOS F during the PM peak hour.

Alternative C

Under Alternative C, the intersection of CR 222/CR 223 (west) with US 160 would be relocated to the east of the existing intersection and signalized. The signalized intersection is projected to operate at LOS C during the AM and PM peak hours.

Alternative A

Under Alternative A, the intersection of CR 222/CR 223 (west) with US 160 would be relocated to the west of the existing intersection and signalized. The signalized intersection is projected to operate at LOS C during the AM and PM peak hours.

8.2.3 2025 Florida Mesa and Valley Section Operational Analysis Summary

The No Action Alternative would not provide the needed capacity for the 2025 design year through the Florida Mesa and Valley section. US 160 is projected to operate at LOS E in both directions during the AM peak hour, and LOS F in both directions during the PM peak hour. The unsignalized intersection at CR 222/CR 223 (west) is projected to have failing critical movements during the AM and PM peak hours.

Alternative C and Alternative A are projected to operate the same through the Florida Mesa and Valley section. The only difference between the two action alternatives is the location of the

CR 222/CR 223 (west) intersection. US 160 is projected to operate at LOS A in both directions during the AM peak hour, and LOS B in both directions during the PM peak hours. The CR 222/CR 223 (west) signalized intersection with US 160 is projected to operated at LOS C during both the AM and PM peak hour. Alternative C and Alternative A would operate the same in this section and provide the needed capacity to accommodate the traffic demand beyond the 2025 design year.

8.3 2025 DRY CREEK AND GEM VILLAGE SECTION OPERATIONAL ANALYSIS

Operational analyses were performed in the Dry Creek and Gem Village section for the No Action Alternative, Alternative H, and Alternative C. The capacity analysis worksheets for the Dry Creek and Gem Village section highway analyses are included in Attachment H, 2025 Dry Creek and Gem Village Section Highway Analyses. The intersections along US 160 through the Dry Creek and Gem Village area are minor unsignalized county roads and were not analyzed for this report.

8.3.1 2025 Dry Creek and Gem Village Section Highway Analysis

No Action Alternative

Under the No Action Alternative, the existing roadway conditions would remain in the Dry Creek and Gem Village section. US 160 is projected to operate at LOS E in the eastbound and westbound directions during the AM and PM peak hours.

Alternative H

Alternative H would provide four lanes (two in each direction) on US 160 through the Florida Mesa and Valley section. This alternative would realign US 160 as a bypass south of Gem Village, and would rejoin the existing alignment at the east and west ends of Gem Village. US 160 is projected to operate at LOS A in both directions during the AM peak hour, and LOS B in both directions during the PM peak hour.

Alternative C

Alternative C would provide four lanes (two in each direction) on US 160 through the Dry Creek and Gem Village section. This alternative would remain on the existing alignment through this section. US 160 is projected to operate at LOS A in both directions during the AM peak hour, and LOS B in both directions during the PM peak hour.

8.3.2 2025 Dry Creek and Gem Village Operational Analysis Summary

The No Action Alternative would not provide the needed capacity for the 2025 design year through the Dry Creek and Gem Village section. US 160 is projected to operate at LOS E in both directions during the AM and PM peak hours.

Alternative H and Alternative C are projected to operate the same through the Dry Creek and Gem Village section. The only difference between these alternatives is the alignment of US 160

through Gem Village. US 160 is projected to operate at LOS A in both directions during the AM peak hour, and LOS B in both directions during the PM peak hour.

8.4 2025 BAYFIELD SECTION OPERATIONAL ANALYSIS

Operational analyses were performed in the Bayfield section for the No Action Alternative, Alternative B, and Alternative A. The capacity analysis worksheets for the Bayfield section highway analyses and the intersection analyses are included in Attachments I and J, respectively.

8.4.1 2025 Bayfield Section Highway Analysis

No Action Alternative

Under the No Action Alternative, the existing roadway conditions would remain in the Bayfield section. US 160 is projected to operate at LOS E in the eastbound and westbound directions during the AM and PM peak hours.

Alternative B

Alternative B would provide four lanes (two in each direction) on US 160 through the Bayfield section and would follow the existing alignment. US 160 is projected to operate at LOS A in both directions during the AM and PM peak hours.

Alternative A

Alternative A would provide four lanes (two in each direction) on US 160 through the Bayfield section and would follow the existing alignment. US 160 is projected to operate at LOS A in both directions during the AM and PM peak hours.

8.4.2 2025 Bayfield Section Intersection Analysis

No Action Alternative

Under the No Action Alternative, the existing roadway conditions would remain in the Bayfield section. The signalized intersection at US 160/CR 501 is projected to operate at LOS D overall during the AM peak hour, with the westbound and northbound approaches operating at LOS E. During the PM peak hour, the intersection is projected to operate at LOS F.

Alternative B

Under Alternative B, the intersection at US 160/CR 501 would remain a signalized intersection. The analysis results indicate the intersection is projected to operate at LOS C during the AM and PM peak hours.

Alternative A

Under Alternative A, a diamond interchange would be provided at the US 160/CR 501 intersection. The ramp terminal intersections on the north and south of US 160 are projected to operate at LOS C or better during the AM and PM peak hours.

8.4.3 2025 Bayfield Section Operations Analysis Summary

The No Action Alternative would not provide the needed capacity for the 2025 design year through the Bayfield section. US 160 is projected to operate at LOS E in both directions during the AM and PM peak hours. The US 160/CR 501 intersection is projected to operate at LOS D during the AM peak hour, and LOS F during the PM peak hour.

Although Alternative A would provide free flow movements through the Bayfield section, due to the diamond interchange at US 160/CR 501, the interchange would not be needed to provide acceptable levels of service through this section. US 160 is projected to operate at LOS A for both Alternative B and Alternative A through the Bayfield section. The intersections for both alternatives are projected to operate at LOS C or better during both the AM and PM peak hours.

8.5 SUMMARY

The No Action Alternative would not meet the capacity needs for the design year in any of the sections along the US 160 corridor.

The following subsections provide a summary of the traffic operational comparisons between the two action alternatives in each section along the US 160 corridor.

Grandview Section

- Alternative G Modified and Alternative F Modified would both provide acceptable levels of service in the Grandview section.
- Alternative G Modified provides three interchanges along US 160 in the Grandview section at US 550 (south), CR 233 (west), and SH 172/CR 234. These interchanges provide three access points to the north that distribute traffic onto US 160 from the projected residential commercial and hospital development on the north side of US 160.
- Alternative F Modified provides two interchanges along US 160 in this section at US 550 (south)/CR 233 (west) and SH 272/CR 234. This alternative provides two access points to the north for the projected development on the north side of US 160.
- The single-point urban interchange at US 160 and SH 172/CR 234 would operate the same for both action alternatives.
- The single-point urban interchange at US 160/CR 233 (west) would operate better under Alternative G Modified (LOS B) than Alternative F Modified (LOS D). Under Alternative F Modified, this intersection is near capacity and would not accommodate any additional growth beyond the design year 2025. Under Alternative G Modified, this intersection would have reserve capacity to accommodate additional growth beyond the 2025 design year.

Florida Mesa and Valley Section

Traffic operations for the two action alternatives in this section would be the same. The only difference between the action alternatives is the location of the CR 222/CR 223 (west) intersection with US 160.

Dry Creek and Gem Village Section

Traffic operations for the two action alternatives in this section would be the same. The only difference between the action alternatives is the alignment of US 160.

Bayfield Section

Traffic operations for the two action alternatives in this section would be similar. The only difference between the action alternatives is that Alternative A has a diamond interchange at US 160/CR 501 and Alternative B has an intersection. Both alternatives provide acceptable levels of service at the US 160/CR 501 intersection.

Highway Capacity Manual, 2000. 2000. Transportation Research Board, National Research Council. Washington, D.C.

Trip Generation Manual. 2003. 7th edition. Institute of Transportation Engineers. Washington, D.C.

Attachment A
Existing Highway Segment Analyses

HCS2000: Two-Lane Highways Release 4.1d

URS Corporation

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	DEA
Agency/Co.	URS
Date Performed	3/19/2005
Analysis Time Period	AM PEAK
Highway	EB US 160
From/To	US 550 TO SH 172/CR 234
Jurisdiction	
Analysis Year	EXISTING
Description US 160	

Input Data

Highway class	Class 1		Peak-hour factor, PHF	0.95	
Shoulder width	6.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length		mi	% No-passing zones	25	%
Up/down		%	Access points/mi	12	/mi

Analysis direction volume, Vd 440 veh/h
Opposing direction volume, Vo 1130 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.9		1.5	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor, (note-5) fHV	0.957		0.976	
Grade adj. factor, (note-1) fG	0.93		0.99	
Directional flow rate, (note-2) vi	520	pc/h	1232	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, (note-3) S FM	-	mi/h
Observed volume, (note-3) Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, (note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access points, (note-3) fA	3.0	mi/h
Free-flow speed, FFSd	57.0	mi/h
Adjustment for no-passing zones, fnp	0.6	mi/h
Average travel speed, ATSd	42.8	mi/h

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.5		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.976		1.000	
Grade adjustment factor, (note-1) fG	0.94		1.00	
Directional flow rate, (note-2) vi	505	pc/h	1189	pc/h
Base percent time-spent-following, (note-4) BPTSFd	85.6	%		
Adjustment for no-passing zones, fnp	1.3			
Percent time-spent-following, PTSFd	86.9	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.31	
Peak 15-min vehicle-miles of travel, VMT15	347	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1320	veh-mi
Peak 15-min total travel time, TT15	8.1	veh-h

Notes:
1. If the highway is extended segment (level) or rolling terrain, fG = 1.0
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Passing Lane Analysis

Total length of analysis segment, Lt	3.0	mi
Length of two-lane highway upstream of the passing lane, Lu	0.5	mi
Length of passing lane including tapers, Lpl	2.4	mi
Average travel speed, ATSd (from above)	42.8	mi/h
Percent time-spent-following, PTSFd (from above)	86.9	
Level of service, (note-1) LOSd (from above)	E	

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	1.70	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-1.60	mi
Adj. factor for the effect of passing lane on average speed, fpl	1.10	
Average travel speed including passing lane, (note-2) ATSpl	46.4	

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	7.26	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-7.16	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	0.61	
Percent time-spent-following including passing lane, (note-3) PTSFpl	58.6	%

Level of Service and Other Performance Measures (note-4)

Level of service including passing lane, LOSpl	C	
Peak 15-min total travel time, TT15	7.5	veh-h

Notes:
1. If LOSd = F, passing lane analysis cannot be performed.
2. If Ld < 0, use alternative Equation 20-22.
3. If Ld < 0, use alternative Equation 20-20.
4. v/c, VMT15 , and VMT60 are calculated on Directional Two-Lane Highway Segment Worksheet.

HCS2000: Two-Lane Highways Release 4.1d

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Directional Two-Lane Highway Segment Analysis

Analyst	DEA
Agency/Co.	URS
Date Performed	3/19/2005
Analysis Time Period	PM PEAK
Highway	EB US 160
From/To	US 550 TO SH 172/CR 234
Jurisdiction	
Analysis Year	EXISTING
Description US 160	

Input Data

Highway class	Class 1		Peak-hour factor, PHF	0.95	
Shoulder width	6.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length		mi	% No-passing zones	25	%
Up/down		%	Access points/mi	12	/mi

Analysis direction volume, Vd 1200 veh/h
Opposing direction volume, Vo 680 veh/h

Average Travel Speed

Direction	Analysis (d)	Opposing (o)
PCE for trucks, ET	1.5	1.5
PCE for RVs, ER	1.1	1.1
Heavy-vehicle adj. factor, (note-5) fHV	0.976	0.976
Grade adj. factor, (note-1) fG	0.99	0.99
Directional flow rate, (note-2) vi	1308 pc/h	741 pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, (note-3) S FM	-	mi/h
Observed volume, (note-3) Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, (note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access points, (note-3) fA	3.0	mi/h
Free-flow speed, FFSd	57.0	mi/h
Adjustment for no-passing zones, fnp	0.7	mi/h
Average travel speed, ATSd	40.4	mi/h

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor, (note-1) fG	1.00		1.00	
Directional flow rate, (note-2) vi	1263	pc/h	716	pc/h
Base percent time-spent-following, (note-4) BPTSFd	87.6	%		
Adjustment for no-passing zones, fnp	4.2			
Percent time-spent-following, PTSFd	91.7	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.77	
Peak 15-min vehicle-miles of travel, VMT15	947	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3600	veh-mi
Peak 15-min total travel time, TT15	23.5	veh-h

Notes:
1. If the highway is extended segment (level) or rolling terrain, fG = 1.0
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Passing Lane Analysis

Total length of analysis segment, Lt	3.0	mi
Length of two-lane highway upstream of the passing lane, Lu	0.5	mi
Length of passing lane including tapers, Lpl	2.4	mi
Average travel speed, ATSd (from above)	40.4	mi/h
Percent time-spent-following, PTSFd (from above)	91.7	
Level of service, (note-1) LOSd (from above)	E	

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	1.70	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-1.60	mi
Adj. factor for the effect of passing lane on average speed, fpl	1.11	
Average travel speed including passing lane, (note-2) ATSpl	44.0	

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	3.60	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-3.50	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	0.62	
Percent time-spent-following including passing lane, (note-3) PTSFpl	62.7	%

Level of Service and Other Performance Measures (note-4)

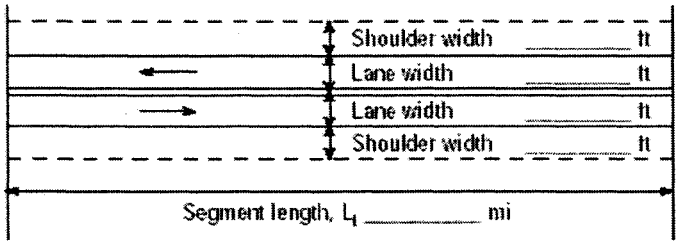
Level of service including passing lane, LOSpl	D	
Peak 15-min total travel time, TT15	21.5	veh-h

Notes:
1. If LOSd = F, passing lane analysis cannot be performed.
2. If Ld < 0, use alternative Equation 20-22.
3. If Ld < 0, use alternative Equation 20-20.
4. v/c, VMT15 , and VMT60 are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	WB US 160
Agency or Company	URS	From/To	US 550 TO SH 172/CR 234
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	EXISTING

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 100

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 12

Analysis direction vol., V_d 1130veh/h

Opposing direction vol., V_o 440veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.9
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.957
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.93
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	1232	520

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS} (Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	57.0 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	3.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	2.3 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	57.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	41.1 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.0	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	0.976
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	1.00	0.94
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	1189	505
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	84.3	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	16.3	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	100.5	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	F
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.72
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	892
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	3390
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	21.7

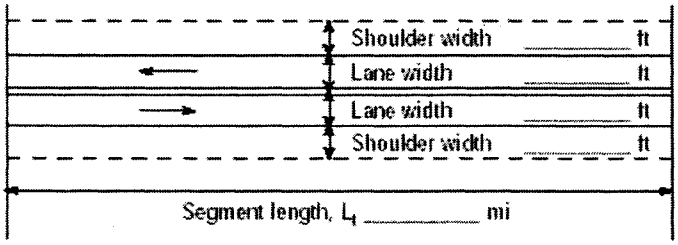
Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	WB US 160
Agency or Company	URS	From/To	US 550 TO SH 172/CR 234
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	EXISTING

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 100

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 12

Analysis direction vol., V_d 680veh/h

Opposing direction vol., V_o 1200veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.99
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	741	1308

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	57.0 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	3.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	1.0 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	57.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	40.1 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	716	1263
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	88.6	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	3.2	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	91.9	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.44
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	537
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	2040
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	13.4

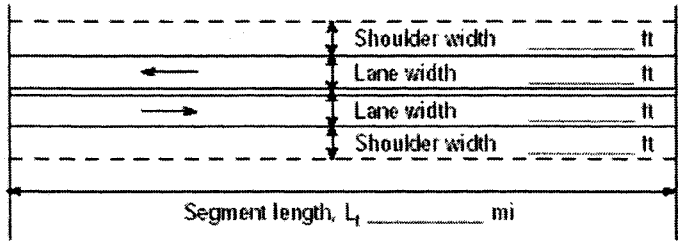
Notes

1.If the highway is extended segment (level) or rolling terrain, f_G=1.0 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	EB US 160
Agency or Company	URS	From/To	SH 172/CR 234 TO CR 222/223
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	EXISTING

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 42

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 8

Analysis direction vol., V_d 235veh/h

Opposing direction vol., V_o 570veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.9	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.957	0.976
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.93	0.99
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	278	621

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed[3], S_{FM}	mi/h	Base free-flow speed[3], $BFFS_{FM}$	60.0 mi/h
Observed volume[3], V_f	veh/h	Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.0 mi/h	Adj. for access points[3], f_A (Exhibit 20-5)	2.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	1.2 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	49.8 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.5	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	1.000
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	0.94	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	270	600
Base percent time-spent-following[4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	63.6	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	7.7	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	71.2	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.16
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	62
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	235
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	1.2

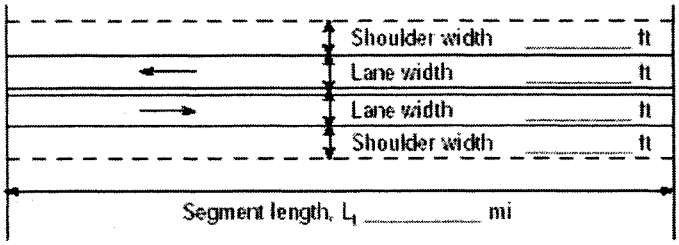
Notes

1.If the highway is extended segment (level) or rolling terrain, f_G=1.0 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	EB US 160
Agency or Company	URS	From/To	SH 172/CR 234 TO CR 222/223
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	EXISTING

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 42

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 8

Analysis direction vol., V_d 655veh/h

Opposing direction vol., V_o 360veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.9
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.957
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.93
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	714	426

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS} (Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.0 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	2.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	1.9 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	47.2 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.0	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	0.976
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	1.00	0.94
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	689	413
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	73.6	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	12.0	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	85.6	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.42
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	172
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	655
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	3.6

Notes

1.If the highway is extended segment (level) or rolling terrain, f_G=1.0 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	WB US 160
Agency or Company	URS	From/To	SH 172/CR 234 TO CR 222/223
Date Performed	3/19/2005	Jurisdiction	
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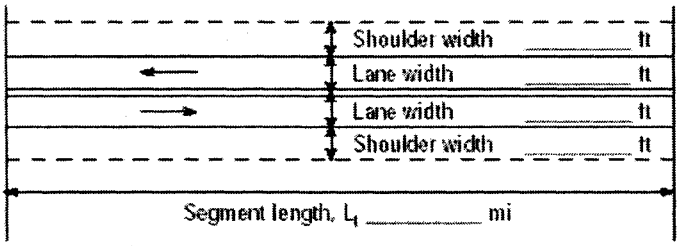
Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 44

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 8

Analysis direction vol., V_d 570veh/h

Opposing direction vol., V_o 235veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.9
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.957
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.93
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	621	278

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.0 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	2.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	2.6 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	48.5 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.0	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	0.976
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	1.00	0.94
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	600	270
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	73.7	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	16.9	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	90.6	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.37
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	150
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	570
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	3.1

Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	WB US 160
Agency or Company	URS	From/To	SH 172/CR 234 TO CR 222/223
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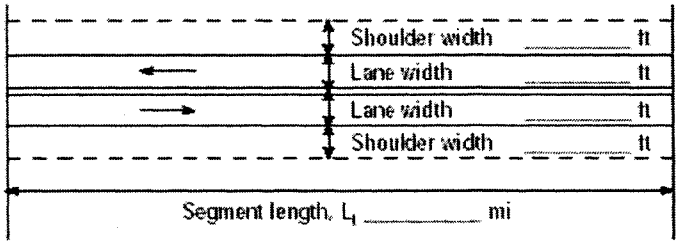
Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 44

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 8

Analysis direction vol., V_d 360veh/h

Opposing direction vol., V_o 655veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.9	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.957	0.976
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.93	0.99
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	426	714

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.0 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	2.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	1.1 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	48.1 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.5	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	1.000
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	0.94	1.00
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	413	689
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	73.9	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	6.5	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	80.4	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.25
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	95
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	360
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	2.0

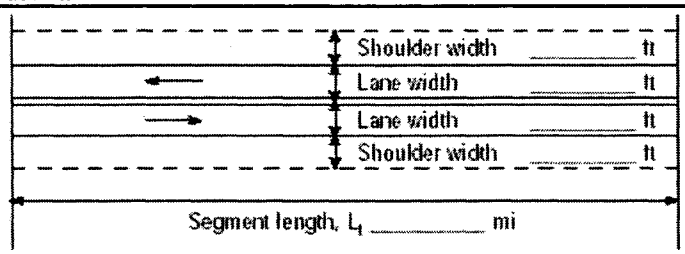
Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If $v_i(v_d$ or $v_o) >=1,700$ pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	EB US 160
Agency or Company	URS	From/To	CR 222/223 TO GEM VILLAGE
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	EXISTING

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 58

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 5

Analysis direction vol., V_d 185veh/h

Opposing direction vol., V_o 325veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	2.5	1.9
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.930	0.957
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.71	0.93
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	295	384

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS} (Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.8 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	1.3 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	2.5 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.8 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	51.0 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.8	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.962	0.976
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	0.77	0.94
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	263	373
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	57.2	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	15.9	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	73.1	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.17
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	292
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	1110
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	5.7

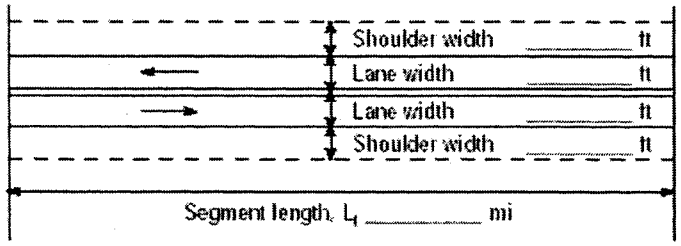
Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	EB US 160
Agency or Company	URS	From/To	CR 222/223 TO GEM VILLAGE
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	EXISTING

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 58

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 5

Analysis direction vol., V_d 415veh/h

Opposing direction vol., V_o 310veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.9	1.9
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.957	0.957
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.93	0.93
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	491	367

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.8 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	1.3 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	2.6 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.8 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	49.5 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	0.94	0.94
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	476	356
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	69.0	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	16.7	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	85.7	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.29
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	655
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	2490
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	13.2

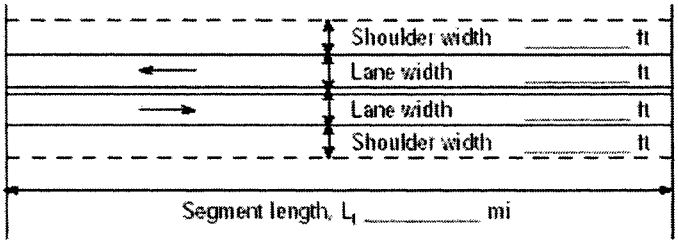
Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	WB US 160
Agency or Company	URS	From/To	CR 222/223 TO GEM VILLAGE
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	EXISTING

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 57

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 5

Analysis direction vol., V_d 325veh/h

Opposing direction vol., V_o 185veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.9	2.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.957	0.930
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.93	0.71
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	384	295

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS} (Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.8 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	1.3 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	3.0 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.8 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	50.5 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.5	1.8
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.962
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	0.94	0.77
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	373	263
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	62.7	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	20.7	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	83.3	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.23
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	513
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	1950
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	10.2

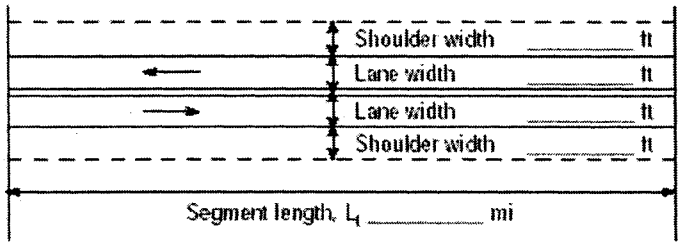
Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If $v_i(v_d$ or $v_o) >=1,700$ pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	WB US 160
Agency or Company	URS	From/To	CR 222/223 TO GEM VILLAGE
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	EXISTING

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 57

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 5

Analysis direction vol., V_d 310veh/h

Opposing direction vol., V_o 415veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.9	1.9
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.957	0.957
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.93	0.93
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	367	491

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.8 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	1.3 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	2.0 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.8 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	50.1 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	0.94	0.94
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	356	476
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	65.2	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	12.6	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	77.8	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.22
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	489
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	1860
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	9.8

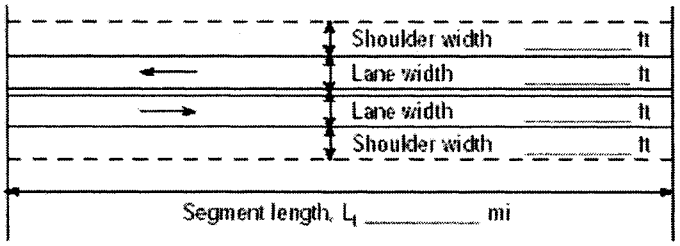
Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	EB US 160
Agency or Company	URS	From/To	GEM VILLAGE TO BAYFIELD
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	EXISTING

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 72

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 4

Analysis direction vol., V_d 285veh/h

Opposing direction vol., V_o 270veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.9	1.9
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.957	0.957
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.93	0.93
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	337	319

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	59.0 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	1.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	3.1 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	59.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	50.8 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	0.94	0.94
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	327	310
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	62.3	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	20.2	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	82.5	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.20
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	150
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	570
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	3.0

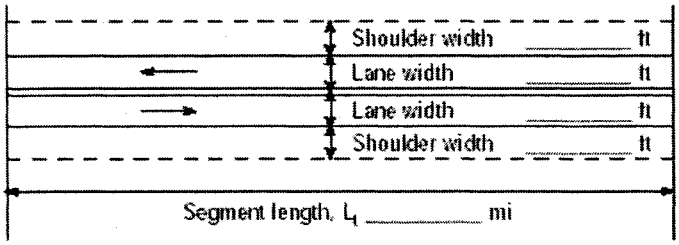
Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	EB US 160
Agency or Company	URS	From/To	GEM VILLAGE TO BAYFIELD
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	EXISTING

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 72

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 4

Analysis direction vol., V_d 335veh/h

Opposing direction vol., V_o 325veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.9	1.9
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.957	0.957
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.93	0.93
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	396	384

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	59.0 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	1.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	2.7 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	59.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	50.2 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	0.94	0.94
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	385	373
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	64.3	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	17.1	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	81.3	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.23
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	176
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	670
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	3.5

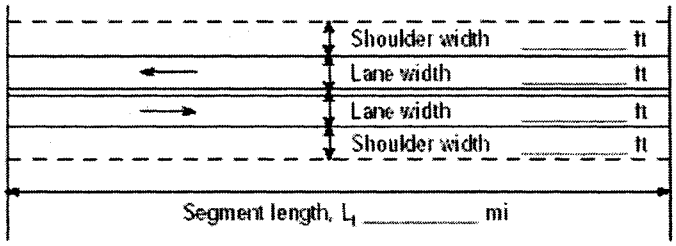
Notes

1.If the highway is extended segment (level) or rolling terrain, f_G=1.0 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	WB US 160
Agency or Company	URS	From/To	GEM VILLAGE TO BAYFIELD
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	EXISTING

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 65

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 4

Analysis direction vol., V_d 270veh/h

Opposing direction vol., V_o 285veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.9	1.9
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.957	0.957
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.93	0.93
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	319	337

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed[3], S_{FM}	mi/h	Base free-flow speed[3], $BFFS_{FM}$	60.0 mi/h
Observed volume[3], V_f	veh/h	Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	59.0 mi/h	Adj. for access points[3], f_A (Exhibit 20-5)	1.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	2.9 mi/h	Free-flow speed, FFS_d ($FSS=BFFS-f_{LS}-f_A$)	59.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	51.0 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	0.94	0.94
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	310	327
Base percent time-spent-following[4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	61.3	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	18.8	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	80.1	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.19
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	142
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	540
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	2.8

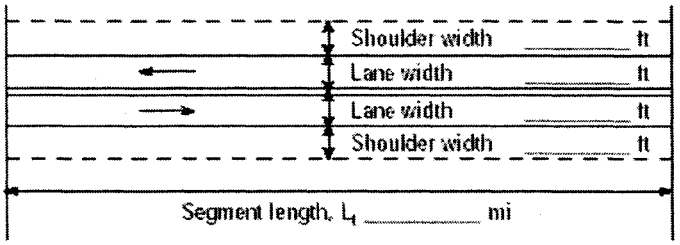
Notes

1.If the highway is extended segment (level) or rolling terrain, f_G=1.0 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	WB US 160
Agency or Company	URS	From/To	GEM VILLAGE TO BAYFIELD
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	EXISTING

Input Data



Show North Arrow

☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 65

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 4

Analysis direction vol., V_d 325veh/h

Opposing direction vol., V_o 335veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.9	1.9
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.957	0.957
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.93	0.93
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	384	396

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed[3], S_{FM}	mi/h	Base free-flow speed[3], $BFFS_{FM}$	60.0 mi/h
Observed volume[3], V_f	veh/h	Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	59.0 mi/h	Adj. for access points[3], f_A (Exhibit 20-5)	1.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	2.6 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	59.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	50.4 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	0.94	0.94
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	373	385
Base percent time-spent-following[4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	63.1	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	16.0	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	79.1	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.23
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	171
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	650
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	3.4

Notes

1.If the highway is extended segment (level) or rolling terrain, f_G=1.0 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Attachment B
Existing Intersection Analyses

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/18/2005
Period: AM PEAK HOUR
Project ID: US 160
E/W St: US 160

Inter.: US 160 / US 550
Area Type: All other areas
Jurisd:
Year : EXISTING 2001

N/S St: US 550

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	1	1	0	0	1	0	1	0	0	0
LGConfig		T	R	L			L		R			
Volume		410	130	20			480		30			
Lane Width		12.0	12.0	12.0			12.0		12.0			
RTOR Vol			0						0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left					NB	Left	A			
	Thru		A				Thru				
	Right		A				Right	A			
	Peds						Peds				
WB	Left	A				SB	Left				
	Thru						Thru				
	Right						Right				
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right					WB	Right				
Green		12.0	28.0					35.0			
Yellow		4.0	4.0					4.0			
All Red		1.0	1.0					1.0			

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
T	1070	3438	0.40	0.31	24.7	C	19.5	B
R	1162	1538	0.12	0.76	3.0	A		
Westbound								
L	229	1719	0.09	0.13	34.4	C		
							34.4	C
Northbound								
L	669	1719	0.75	0.39	28.7	C		
							27.5	C
R	889	1538	0.04	0.58	8.2	A		
Southbound								

Intersection Delay = 23.6 (sec/veh) Intersection LOS = C

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/18/2005
Period: PM PEAK HOUR
Project ID: US 160
E/W St: US 160

Inter.: US 160 / US 550
Area Type: All other areas
Jurisd:
Year : EXISTING 2001

N/S St: US 550

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	1	1	0	0	1	0	1	0	0	0
LGConfig		T	R	L			L		R			
Volume		1175	515	15			250		25			
Lane Width		12.0	12.0	12.0			12.0		12.0			
RTOR Vol			0						0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left					NB	Left	A			
	Thru		A				Thru				
	Right		A				Right	A			
	Peds						Peds				
WB	Left	A				SB	Left				
	Thru						Thru				
	Right						Right				
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right					WB	Right				
Green		12.0	35.0					26.0			
Yellow		4.0	4.0					4.0			
All Red		1.0	1.0					1.0			

Cycle Length: 88.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
T	1367	3438	0.90	0.40	33.8	C	24.9	C
R	1154	1538	0.47	0.75	4.5	A		
Westbound								
L	234	1719	0.07	0.14	33.3	C		
							33.3	C
Northbound								
L	508	1719	0.52	0.30	26.7	C		
							25.4	C
R	752	1538	0.03	0.49	11.7	B		
Southbound								

Intersection Delay = 25.0 (sec/veh) Intersection LOS = C

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/18/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/SH 172-CR 234
Area Type: All other areas
Jurisd:
Year : EXISTING 2001

N/S St: SH 172/CR 234

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	0	1	1	0	1	1
LGConfig	L	T	R	L	T	R		LT	R		LT	R
Volume	25	210	165	30	530	10	340	20	20	5	25	90
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0		12.0	12.0		12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left		A			NB	Left	A			
	Thru			A			Thru	A			
	Right			A			Right	A			
	Peds						Peds				
WB	Left		A			SB	Left	A			
	Thru			A			Thru	A			
	Right			A			Right	A			
	Peds						Peds				
NB	Right		A			EB	Right				
SB	Right		A			WB	Right				
Green			10.0	48.0				47.0			
Yellow			4.0	4.0				4.0			
All Red			1.0	1.0				1.0			

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	148	1770	0.18	0.08	51.7	D		
T	724	1810	0.31	0.40	24.8	C	26.4	C
R	633	1583	0.27	0.40	24.5	C		
Westbound								
L	148	1770	0.22	0.08	52.1	D		
T	724	1810	0.77	0.40	36.3	D	36.9	D
R	633	1583	0.02	0.40	21.8	C		
Northbound								
LT	522	1332	0.73	0.39	36.1	D	34.9	C
R	818	1583	0.03	0.52	14.2	B		
Southbound								
LT	693	1769	0.04	0.39	22.6	C	16.9	B
R	818	1583	0.12	0.52	15.0	B		

Intersection Delay = 31.9 (sec/veh) Intersection LOS = C

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/18/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/SH 172-CR 234
Area Type: All other areas
Jurisd:
Year : EXISTING 2001

N/S St: SH 172/CR 234

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	0	1	1	0	1	1
LGConfig	L	T	R	L	T	R		LT	R		LT	R
Volume	115	580	380	40	300	20	280	50	35	40	40	50
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0		12.0	12.0		12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left		A			NB	Left	A			
	Thru			A			Thru	A			
	Right			A			Right	A			
	Peds						Peds				
WB	Left		A			SB	Left	A			
	Thru			A			Thru	A			
	Right			A			Right	A			
	Peds						Peds				
NB	Right		A			EB	Right				
SB	Right		A			WB	Right				
Green			15.0	50.0				40.0			
Yellow			4.0	4.0				4.0			
All Red			1.0	1.0				1.0			

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	221	1770	0.55	0.13	52.2	D		
T	754	1810	0.81	0.42	37.5	D	36.0	D
R	660	1583	0.61	0.42	28.9	C		
Westbound								
L	221	1770	0.19	0.13	47.5	D		
T	754	1810	0.42	0.42	25.1	C	27.3	C
R	660	1583	0.03	0.42	20.7	C		
Northbound								
LT	413	1238	0.84	0.33	51.7	D	48.2	D
R	792	1583	0.05	0.50	15.4	B		
Southbound								
LT	389	1168	0.22	0.33	29.0	C	23.8	C
R	792	1583	0.07	0.50	15.6	B		

Intersection Delay = 35.9 (sec/veh) Intersection LOS = D

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*DEA*
Agency/Co.	*URS*
Date Performed	*3/19/2005*
Analysis Time Period	*AM PEAK*

Site Information

Intersection	*US 160/CR 222/223*
Jurisdiction	
Analysis Year	*EXISTING 2001*

Project Description *US 160*

East/West Street: *US 160* | North/South Street: *CR 222/CR 223*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*30*	*175*	*15*	*5*	*315*	*5*
Peak-hour factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate (veh/h)	*31*	*184*	*15*	*5*	*331*	*5*
Proportion of heavy vehicles, P_{HV}	*2*	--	--	*2*	--	--
Median type	*Undivided*					
RT Channelized?			*0*			*0*
Lanes	*0*	*1*	*1*	*0*	*1*	*0*
Configuration	*LT*		*R*	*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*115*	*5*	*5*	*5*	*5*	*115*
Peak-hour factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate (veh/h)	*121*	*5*	*5*	*5*	*5*	*121*
Proportion of heavy vehicles, P_{HV}	*2*	*2*	*2*	*2*	*2*	*2*
Percent grade (%)		*0*			*0*	
Flared approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized?			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*	*LTR*		*LTR*			*LTR*	
Volume, v (vph)	*31*	*5*		*131*			*131*	
Capacity, c_m (vph)	*1223*	*1373*		*316*			*668*	
v/c ratio	*0.03*	*0.00*		*0.41*			*0.20*	
Queue length (95%)	*0.08*	*0.01*		*1.96*			*0.72*	
Control Delay (s/veh)	*8.0*	*7.6*		*24.2*			*11.7*	

LOS	A	A	C	B
Approach delay (s/veh)	--	--	24.2	11.7
Approach LOS	--	--	C	B

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*DEA*
Agency/Co.	*URS*
Date Performed	*3/19/2005*
Analysis Time Period	*PM PEAK*

Site Information

Intersection	*US 160/CR 222/223*
Jurisdiction	
Analysis Year	*EXISTING 2001*

Project Description *US 160*

East/West Street: *US 160* | North/South Street: *CR 222/CR 223*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*105*	*400*	*130*	*5*	*300*	*5*
Peak-hour factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate (veh/h)	*110*	*421*	*136*	*5*	*315*	*5*
Proportion of heavy vehicles, P_{HV}	*2*	--	--	*2*	--	--
Median type	*Undivided*					
RT Channelized?			*0*			*0*
Lanes	*0*	*1*	*1*	*0*	*1*	*0*
Configuration	*LT*		*R*	*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*35*	*10*	*10*	*5*	*10*	*60*
Peak-hour factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate (veh/h)	*36*	*10*	*10*	*5*	*10*	*63*
Proportion of heavy vehicles, P_{HV}	*2*	*2*	*2*	*2*	*2*	*2*
Percent grade (%)		*0*			*0*	
Flared approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized?			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*	*LTR*		*LTR*			*LTR*	
Volume, v (vph)	*110*	*5*		*56*			*78*	
Capacity, c_m (vph)	*1240*	*1014*		*210*			*460*	
v/c ratio	*0.09*	*0.00*		*0.27*			*0.17*	
Queue length (95%)	*0.29*	*0.01*		*1.04*			*0.60*	
Control Delay (s/veh)	*8.2*	*8.6*		*28.3*			*14.4*	

LOS	A	A	D	B
Approach delay (s/veh)	--	--	28.3	14.4
Approach LOS	--	--	D	B

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/18/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 501
Area Type: All other areas
Jurisd:
Year : EXISTING 2001

N/S St: CR 501

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Volume	30	210	45	75	185	35	55	50	110	30	85	30
Lane Width	12.0	12.0		12.0	12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru	A			
	Right		A				Right	A			
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru	A			
	Right		A				Right	A			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		15.0	30.0					30.0			
Yellow		4.0	4.0					4.0			
All Red		1.0	1.0					1.0			

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	295	1770	0.11	0.17	32.0	C		
TR	590	1771	0.45	0.33	24.1	C	25.0	C
Westbound								
L	295	1770	0.27	0.17	33.2	C		
TR	591	1774	0.39	0.33	23.4	C	25.9	C
Northbound								
LTR	513	1538	0.44	0.33	24.1	C	24.1	C
Southbound								
LTR	547	1641	0.28	0.33	22.3	C	22.3	C

Intersection Delay = 24.7 (sec/veh) Intersection LOS = C

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/18/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 501
Area Type: All other areas
Jurisd:
Year : EXISTING 2001

N/S St: CR 501

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Volume	55	220	60	130	225	40	60	85	140	25	80	40
Lane Width	12.0	12.0		12.0	12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	A				NB Left	A			
Thru		A			Thru	A			
Right		A			Right	A			
Peds					Peds				
WB Left	A				SB Left	A			
Thru		A			Thru	A			
Right		A			Right	A			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	17.0	30.0				28.0			
Yellow	4.0	4.0				4.0			
All Red	1.0	1.0				1.0			

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	334	1770	0.17	0.19	30.9	C		
TR	587	1762	0.50	0.33	24.7	C	25.7	C
Westbound								
L	334	1770	0.41	0.19	32.9	C		
TR	592	1776	0.47	0.33	24.3	C	27.2	C
Northbound								
LTR	488	1569	0.61	0.31	28.7	C	28.7	C
Southbound								
LTR	512	1646	0.30	0.31	23.9	C	23.9	C

Intersection Delay = 26.7 (sec/veh) Intersection LOS = C

Attachment C
Grandview Section Trip Generation Tables

Table 5.1 Trip Generation in 2025 - Sub Area I

Land Use	Unit	Quantity	No. of Trips per Unit	AM Peak Hour Trips per Unit	PM Peak Hour Trips per Unit	Daily Trips Generated	AM Peak Hour Trips Generated	AM Peak Hour Trips In	AM Peak Hour Trips Out	PM Peak Hour Trips Generated	PM Peak Hour Trips In	PM Peak Hour Trips Out	Notes
Single Family Detached Housing	Dwelling Unit	725	9.57	0.75	1.01	6,938	544	136	408	732	461	271	ITE Code 210
Singl e Family Attached Housing	Dwelling Unit	599	5.86	0.44	0.52	3,510	264	45	219	311	209	103	ITE Code 230
Multi-Family Housing	Dwelling Unit	462	6.59	0.46	0.58	3,045	213	45	168	268	174	94	ITE Code 221
Regional Commercial	1000 sf Gross Floor Area	328	49.21	1.84	3.87	16,141	604	308	296	1,269	622	647	ITE Code 813
Specialty Commercial	1000 sf Gross Floor Area	162	44.32	0.71	2.71	7,180	115	78	37	439	193	246	ITE Code 814
Mixed Comm/Light Industrial Space	1000 sf Gross Floor Area	201	6.97	0.92	0.98	1,401	185	163	22	197	24	173	ITE Code 110
Mixed-Use Space	1000 sf Gross Floor Area	706	16.87	1.99	2.01	11,910	1,405	1,012	393	1,419	426	993	ITE Code 710 plus ITE Code 230
Institutional/Hospital area	1000 sf Gross Floor Area	342	17.57	1.20	1.18	6,009	410	275	135	404	133	270	ITE Code 610
Institutional/School area	1000 sf Gross Floor Area	130	13.72	4.03	1.67	1,784	524	314	210	217	109	109	ITE Codes 520+522+530/3
Reginal Parks/Recreation Area	Acres	170	4.57	0.15	0.26	777	26	15	11	44	19	25	ITE Code 417
Neighborhood Parks	Acres	4	1.59	0.01	0.06	6	0	0	0	0	0	0	ITE Code 411 for Daily, ITE Code 412 for Peak Hour
Total						**58,701**	**4,288**	**2,390**	**1,899**	**5,301**	**2,370**	**2,931**	
Total with 20% diversion						**46,961**	**3,430**	**1,912**	**1,519**	**4,241**	**1,896**	**2,345**	

Table 5.2 Trip Generation in 2025 - Sub Area II

Land Use	Unit	Quantity	No. of Trips per Unit	AM Peak Hour Trips per Unit	PM Peak Hour Trips per Unit	Daily Trips Generated	AM Peak Hour Trips Generated	AM Peak Hour Trips In	AM Peak Hour Trips Out	PM Peak Hour Trips Generated	PM Peak Hour Trips In	PM Peak Hour Trips Out	Notes
Single Family Detached Housing	Dwelling Unit	92	9.57	0.75	1.01	880	69	17	52	93	59	34	ITE Code 210
Singl e Family Attached Housing	Dwelling Unit	0	5.86	0.44	0.52	0	0	0	0	0	0	0	ITE Code 230
Multi-Family Housing	Dwelling Unit	269	6.59	0.46	0.58	1,773	124	26	98	156	101	55	ITE Code 221
Regional Commercial	1000 sf Gross Floor Area		49.21	1.84	3.87	0	0	0	0	0	0	0	ITE Code 813
Specialty Commercial	1000 sf Gross Floor Area	212	44.32	0.71	2.71	9,396	151	102	48	575	253	322	ITE Code 814
Mixed Comm/Light Industrial Space	1000 sf Gross Floor Area	403	6.97	0.92	0.98	2,809	371	326	44	395	47	348	ITE Code 110
Mixed-Use Space	1000 sf Gross Floor Area		16.87	1.99	2.01	0	0	0	0	0	0	0	ITE Code 710 plus ITE Code 230
Institutional/Hospital area	1000 sf Gross Floor Area		17.57	1.20	1.18	0	0	0	0	0	0	0	ITE Code 610
Institutional/School area	1000 sf Gross Floor Area		13.72	4.03	1.67	0	0	0	0	0	0	0	ITE Codes 520+522+530/3
Reginal Parks/Recreation Area	Acres		4.57	0.15	0.26	0	0	0	0	0	0	0	ITE Code 417
Neighborhood Parks	Acres		1.59	0.01	0.06	0	0	0	0	0	0	0	ITE Code 411 for Daily, ITE Code 412 for Peak Hour
Total						**14,858**	**714**	**472**	**242**	**1,218**	**460**	**758**	
Total with 0% diversion						**14,858**	**714**	**472**	**242**	**1,218**	**460**	**758**	

Table 5.3 Trip Generation in 2025 - Subarea III

Land Use	Unit	Quantity	No. of Trips per Unit	AM Peak Hour Trips per Unit	PM Peak Hour Trips per Unit	Daily Trips Generated	AM Peak Hour Trips Generated	AM Peak Hour Trips In	AM Peak Hour Trips Out	PM Peak Hour Trips Generated	PM Peak Hour Trips In	PM Peak Hour Trips Out	Notes
Single Family Detached Housing	Dwelling Unit	150	9.57	0.75	1.01	1,436	113	28	84	152	95	56	ITE Code 210
Singl e Family Attached Housing	Dwelling Unit	45	5.86	0.44	0.52	264	20	3	16	23	16	8	ITE Code 230
Multi-Family Housing	Dwelling Unit	231	6.59	0.46	0.58	1,522	106	22	84	134	87	47	ITE Code 221
Regional Commercial	1000 sf Gross Floor Area		49.21	1.84	3.87	0	0	0	0	0	0	0	ITE Code 813
Specialty Commercial	1000 sf Gross Floor Area	175	44.32	0.71	2.71	7,756	124	84	40	474	209	266	ITE Code 814
Mixed Comm/Light Industrial Space	1000 sf Gross Floor Area		6.97	0.92	0.98	0	0	0	0	0	0	0	ITE Code 110
Multiple-Use Space	1000 sf Gross Floor Area	360	16.87	1.99	2.01	6,073	716	516	201	724	217	507	ITE Code 710 plus ITE Code 230
Institutional/Hospital area	1000 sf Gross Floor Area		17.57	1.20	1.18	0	0	0	0	0	0	0	ITE Code 610
Institutional/School area	1000 sf Gross Floor Area		13.72	4.03	1.67	0	0	0	0	0	0	0	ITE Codes 520+522+530/3
Reginal Parks/Recreation Area	Acres		4.57	0.15	0.26	0	0	0	0	0	0	0	ITE Code 417
Neighborhood Parks	Acres		1.59	0.01	0.06	0	0	0	0	0	0	0	ITE Code 411 for Daily, ITE Code 412 for Peak Hour
Total						**17,051**	**1,079**	**654**	**425**	**1,507**	**624**	**883**	
Total with 20% diversion						**13,641**	**863**	**523**	**340**	**1,205**	**499**	**706**	

Table 5.4 Trip Generation in 2025 - Sub Area IV

Land Use	Unit	Quantity	No. of Trips per Unit	AM Peak Hour Trips per Unit	PM Peak Hour Trips per Unit	Daily Trips Generated	AM Peak Hour Trips Generated	AM Peak Hour Trips In	AM Peak Hour Trips Out	PM Peak Hour Trips Generated	PM Peak Hour Trips In	PM Peak Hour Trips Out	Notes
Single Family Detached Housing	Dwelling Unit		9.57	0.75	1.01	0	0	0	0	0	0	0	ITE Code 210
Singl e Family Attached Housing	Dwelling Unit		5.86	0.44	0.52	0	0	0	0	0	0	0	ITE Code 230
Multi-Family Housing	Dwelling Unit		6.59	0.46	0.58	0	0	0	0	0	0	0	ITE Code 221
Regional Commercial	1000 sf Gross Floor Area		49.21	1.84	3.87	0	0	0	0	0	0	0	ITE Code 813
Specialty Commercial	1000 sf Gross Floor Area	152	44.32	0.71	2.71	6,737	108	73	35	412	181	231	ITE Code 814
Mixed Comm/Light Industrial Space	1000 sf Gross Floor Area		6.97	0.92	0.98	0	0	0	0	0	0	0	ITE Code 110
Mixed-Use Space	1000 sf Gross Floor Area		16.87	1.99	2.01	0	0	0	0	0	0	0	ITE Code 710 plus ITE Code 230
Institutional/Hospital area	1000 sf Gross Floor Area		17.57	1.20	1.18	0	0	0	0	0	0	0	ITE Code 610
Institutional/School area	1000 sf Gross Floor Area		13.72	4.03	1.67	0	0	0	0	0	0	0	ITE Codes 520+522+530/3
Reginal Parks/Recreation Area	Acres		4.57	0.15	0.26	0	0	0	0	0	0	0	ITE Code 417
Neighborhood Parks	Acres		1.59	0.01	0.06	0	0	0	0	0	0	0	ITE Code 411 for Daily, ITE Code 412 for Peak Hour
Total						**6,737**	**108**	**73**	**35**	**412**	**181**	**231**	
Total with 0% diversion						**6,737**	**108**	**73**	**35**	**412**	**181**	**231**	

Table 5.5 Trip Generation in 2025 - Sub Area V

Land Use	Unit	Quantity	No. of Trips per Unit	AM Peak Hour Trips per Unit	PM Peak Hour Trips per Unit	Daily Trips Generated	AM Peak Hour Trips Generated	AM Peak Hour Trips In	AM Peak Hour Trips Out	PM Peak Hour Trips Generated	PM Peak Hour Trips In	PM Peak Hour Trips Out	Notes
Single Family Detached Housing	Dwelling Unit	153	9.57	0.75	1.01	1,464	115	29	86	155	97	57	ITE Code 210
Singl e Family Attached Housing	Dwelling Unit		5.86	0.44	0.52	0	0	0	0	0	0	0	ITE Code 230
Multi-Family Housing	Dwelling Unit		6.59	0.46	0.58	0	0	0	0	0	0	0	ITE Code 221
Regional Commercial	1000 sf Gross Floor Area		49.21	1.84	3.87	0	0	0	0	0	0	0	ITE Code 813
Specialty Commercial	1000 sf Gross Floor Area	51	44.32	0.71	2.71	2,260	36	25	12	138	61	77	ITE Code 814
Mixed Comm/Light Industrial Space	1000 sf Gross Floor Area		6.97	0.92	0.98	0	0	0	0	0	0	0	ITE Code 110
Mixed-Use Space	1000 sf Gross Floor Area		16.87	1.99	2.01	0	0	0	0	0	0	0	ITE Code 710 plus ITE Code 230
Institutional/Hospital area	1000 sf Gross Floor Area		17.57	1.20	1.18	0	0	0	0	0	0	0	ITE Code 610
Institutional/School area	1000 sf Gross Floor Area		13.72	4.03	1.67	0	0	0	0	0	0	0	ITE Codes 520+522+530/3
Reginal Parks/Recreation Area	Acres		4.57	0.15	0.26	0	0	0	0	0	0	0	ITE Code 417
Neighborhood Parks	Acres		1.59	0.01	0.06	0	0	0	0	0	0	0	ITE Code 411 for Daily, ITE Code 412 for Peak Hour
Total						**3,725**	**151**	**53**	**98**	**293**	**158**	**135**	
						3,725	**151**	**53**	**98**	**293**	**158**	**135**	

Table 5.6 Trip Generation in 2025 - Grandview Area

Land Use	Unit	Quantity	No. of Trips per Unit	AM Peak Hour Trips per Unit	PM Peak Hour Trips per Unit	Daily Trips Generated	AM Peak Hour Trips Generated	AM Peak Hour Trips In	AM Peak Hour Trips Out	PM Peak Hour Trips Generated	PM Peak Hour Trips In	PM Peak Hour Trips Out	Notes
Single Family Detached Housing	Dwelling Unit	1,120	9.57	0.75	1.01	10,718	840	210	630	1,131	713	419	ITE Code 210
Singl e Family Attached Housing	Dwelling Unit	644	5.86	0.44	0.52	3,774	283	48	235	335	224	111	ITE Code 230
Multi-Family Housing	Dwelling Unit	962	6.59	0.46	0.58	6,340	443	93	350	558	363	195	ITE Code 221
Regional Commercial	1000 sf Gross Floor Area	328	49.21	1.84	3.87	16,141	604	308	296	1,269	622	647	ITE Code 813
Specialty Commercial	1000 sf Gross Floor Area	752	44.32	0.71	2.71	33,329	534	363	171	2,038	897	1,141	ITE Code 814
Mixed Comm/Light Industrial Space	1000 sf Gross Floor Area	604	6.97	0.92	0.98	4,210	556	489	67	592	71	521	ITE Code 110
Mixed-Use Space/Multiple Use	1000 sf Gross Floor Area	1,066	16.87	1.99	2.01	17,983	2,121	1,527	594	2,143	643	1,500	ITE Code 710 plus ITE Code 230
Institutional/Hospital area	1000 sf Gross Floor Area	342	17.57	1.20	1.18	6,009	410	275	135	404	133	270	ITE Code 610
Institutional/School area	1000 sf Gross Floor Area	130	13.72	4.03	1.67	1,784	524	314	210	217	109	109	ITE Codes 520+522+530/3
Reginal Parks/Recreation Area	Acres	170	4.57	0.15	0.26	777	26	15	11	44	19	25	ITE Code 417
Neighborhood Parks	Acres	4	1.59	0.01	0.06	6	0	0	0	0	0	0	ITE Code 411 for Daily, ITE Code 412 for Peak Hour
Total						**101,070**	**6,340**	**3,642**	**2,698**	**8,731**	**3,793**	**4,938**	
Total with diversion						**85,920**	**5,267**	**3,033**	**2,233**	**7,369**	**3,195**	**4,175**	

Attachment D
2025 Grandview Section Highway Analyses

Attachment D-1
2025 Grandview Section, No Action Alternative, Highway Analyses

HCS2000: Multilane Highways Release 4.1d

URS Corporation

9960 Federal Drive, Suite 300
Colorado Springs, CO 80920

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	DEA
Agency/Co:	URS
Date:	3/15/2005
Analysis Period:	AM PEAK
Highway:	US 160
From/To:	WEST OF US 550
Jurisdiction:	
Analysis Year:	2025 NO ACTION
Project ID:	US 160 (DIRECTION 1 = EASTBOUND)

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	4		4	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	1.0	mph	1.0	mph
Free-flow speed	59.0	mph	59.0	mph

VOLUME

Direction	1		2	
Volume, V	2700	vph	3080	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	711		811	
Trucks and buses	5	%	5	%
Recreational vehicles	0	%	0	%
Terrain type	Rolling		Rolling	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	2.5		2.5	
Recreational vehicles PCE, ER	2.0		2.0	
Heavy vehicle adjustment, fHV	0.930		0.930	
Flow rate, vp	1527	pcphpl	1742	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1527	pcphpl	1742	pcphpl
Free-flow speed, FFS	59.0	mph	59.0	mph
Avg. passenger-car travel speed, S	58.6	mph	57.4	mph
Level of service, LOS	D		D	
Density, D	26.1	pc/mi/ln	30.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS2000: Multilane Highways Release 4.1d

URS Corporation

9960 Federal Drive, Suite 300
Colorado Springs, CO 80920

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	DEA
Agency/Co:	URS
Date:	3/15/2005
Analysis Period:	PM PEAK
Highway:	US 160
From/To:	WEST OF US 550
Jurisdiction:	
Analysis Year:	2025 NO ACTION
Project ID:	US 160 (DIRECTION 1 = EASTBOUND)

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	4		4	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	1.0	mph	1.0	mph
Free-flow speed	59.0	mph	59.0	mph

VOLUME

Direction	1		2	
Volume, V	4265	vph	4290	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	1122		1129	
Trucks and buses	5	%	5	%
Recreational vehicles	0	%	0	%
Terrain type	Rolling		Rolling	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	2.5		2.5	
Recreational vehicles PCE, ER	2.0		2.0	
Heavy vehicle adjustment, fHV	0.930		0.930	
Flow rate, vp	2413	pcphpl	2427	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	2413	pcphpl	2427	pcphpl
Free-flow speed, FFS	59.0	mph	59.0	mph
Avg. passenger-car travel speed, S		mph		mph
Level of service, LOS	F		F	
Density, D		pc/mi/ln		pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS2000: Multilane Highways Release 4.1d

URS Corporation

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OPERATIONAL ANALYSIS

Analyst:	DEA
Agency/Co:	URS
Date:	3/15/2005
Analysis Period:	AM PEAK
Highway:	US 160
From/To:	EAST OF US 550 TO CR 233
Jurisdiction:	
Analysis Year:	2025 NO ACTION
Project ID:	US 160 (DIRECTION 1 = EASTBOUND)

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	12		12	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	3.0	mph	3.0	mph
Free-flow speed	57.0	mph	57.0	mph

VOLUME

Direction	1		2	
Volume, V	2870	vph	2375	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	755		625	
Trucks and buses	5	%	5	%
Recreational vehicles	0	%	0	%
Terrain type	Rolling		Rolling	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	2.5		2.5	
Recreational vehicles PCE, ER	2.0		2.0	
Heavy vehicle adjustment, fHV	0.930		0.930	
Flow rate, vp	1623	pcphpl	1343	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1623	pcphpl	1343	pcphpl
Free-flow speed, FFS	57.0	mph	57.0	mph
Avg. passenger-car travel speed, S	56.1	mph	57.0	mph
Level of service, LOS	D		C	
Density, D	28.9	pc/mi/ln	23.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

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OPERATIONAL ANALYSIS

Analyst:	DEA
Agency/Co:	URS
Date:	3/15/2005
Analysis Period:	PM PEAK
Highway:	US 160
From/To:	EAST OF US 550 TO CR 233
Jurisdiction:	
Analysis Year:	2025 NO ACTION
Project ID:	US 160 (DIRECTION 1 = EASTBOUND)

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	12		12	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	3.0	mph	3.0	mph
Free-flow speed	57.0	mph	57.0	mph

VOLUME

Direction	1		2	
Volume, V	3500	vph	3965	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	921		1043	
Trucks and buses	5	%	5	%
Recreational vehicles	0	%	0	%
Terrain type	Rolling		Rolling	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	2.5		2.5	
Recreational vehicles PCE, ER	2.0		2.0	
Heavy vehicle adjustment, fHV	0.930		0.930	
Flow rate, vp	1980	pcphpl	2243	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1980	pcphpl	2243	pcphpl
Free-flow speed, FFS	57.0	mph	57.0	mph
Avg. passenger-car travel speed, S	53.9	mph		mph
Level of service, LOS	E		F	
Density, D	36.7	pc/mi/ln		pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

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OPERATIONAL ANALYSIS

Analyst:	DEA
Agency/Co:	URS
Date:	3/15/2005
Analysis Period:	AM PEAK
Highway:	US 160
From/To:	CR 233 TO SH 172/CR 234
Jurisdiction:	
Analysis Year:	2025 NO ACTION
Project ID:	US 160 (DIRECTION 1 = EASTBOUND)

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	12		12	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	3.0	mph	3.0	mph
Free-flow speed	57.0	mph	57.0	mph

VOLUME

Direction	1		2	
Volume, V	1605	vph	1685	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	422		443	
Trucks and buses	5	%	5	%
Recreational vehicles	0	%	0	%
Terrain type	Rolling		Rolling	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	2.5		2.5	
Recreational vehicles PCE, ER	2.0		2.0	
Heavy vehicle adjustment, fHV	0.930		0.930	
Flow rate, vp	908	pcphpl	953	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	908	pcphpl	953	pcphpl
Free-flow speed, FFS	57.0	mph	57.0	mph
Avg. passenger-car travel speed, S	57.0	mph	57.0	mph
Level of service, LOS	B		B	
Density, D	15.9	pc/mi/ln	16.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

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OPERATIONAL ANALYSIS

Analyst:	DEA
Agency/Co:	URS
Date:	3/15/2005
Analysis Period:	PM PEAK
Highway:	US 160
From/To:	CR 233 TO SH 172/CR 234
Jurisdiction:	
Analysis Year:	2025 NO ACTION
Project ID:	US 160 (DIRECTION 1 = EASTBOUND)

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	12		12	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	3.0	mph	3.0	mph
Free-flow speed	57.0	mph	57.0	mph

VOLUME

Direction	1		2	
Volume, V	2525	vph	2290	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	664		603	
Trucks and buses	5	%	5	%
Recreational vehicles	0	%	0	%
Terrain type	Rolling		Rolling	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	2.5		2.5	
Recreational vehicles PCE, ER	2.0		2.0	
Heavy vehicle adjustment, fHV	0.930		0.930	
Flow rate, vp	1428	pcphpl	1295	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1428	pcphpl	1295	pcphpl
Free-flow speed, FFS	57.0	mph	57.0	mph
Avg. passenger-car travel speed, S	56.9	mph	57.0	mph
Level of service, LOS	C		C	
Density, D	25.1	pc/mi/ln	22.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Attachment D-2
2025 Grandview Section, Alternative G Modified (Preferred Alternative), Highway Analyses

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Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	AM PEAK
Freeway/Direction:	EASTBOUND US 160
From/To:	WEST OF US 550
Jurisdiction:	
Analysis Year:	2025 ALT 1G
Description: US 160	

Flow Inputs and Adjustments

Volume, V	2700	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	711	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1018	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1018	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	3	
Density, D	17.0	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	PM PEAK
Freeway/Direction:	EASTBOUND US 160
From/To:	WEST OF US 550
Jurisdiction:	
Analysis Year:	2025 ALT 1G
Description: US 160	

Flow Inputs and Adjustments

Volume, V	4265	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1122	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1609	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1609	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	3	
Density, D	26.8	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	AM PEAK
Freeway/Direction:	EASTBOUND US 160
From/To:	US 550 TO CR 233
Jurisdiction:	
Analysis Year:	2025 ALT 1G
Description: US 160	

Flow Inputs and Adjustments

Volume, V	2500	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	658	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1414	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1414	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	2	
Density, D	23.6	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	PM PEAK
Freeway/Direction:	EASTBOUND US 160
From/To:	US 550 TO CR 233
Jurisdiction:	
Analysis Year:	2025 ALT 1G
Description: US 160	

Flow Inputs and Adjustments

Volume, V	3190	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	839	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1805	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1805	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	59.6	mi/h
Number of lanes, N	2	
Density, D	30.3	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	AM PEAK
Freeway/Direction:	EASTBOUND US 160
From/To:	CR 233 to SH 172/CR 234
Jurisdiction:	
Analysis Year:	2025 ALT 1G
Description: US 160	

Flow Inputs and Adjustments

Volume, V	1605	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	422	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	908	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	908	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	2	
Density, D	15.1	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	DEA
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Date Performed:	4/21/2005
Analysis Time Period:	PM PEAK
Freeway/Direction:	EASTBOUND US 160
From/To:	CR 233 to SH 172/CR 234
Jurisdiction:	
Analysis Year:	2025 ALT 1G
Description: US 160	

Flow Inputs and Adjustments

Volume, V	2525	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	664	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1429	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1429	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	2	
Density, D	23.8	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	AM PEAK
Freeway/Direction:	WESTBOUND US 160
From/To:	SH 172/CR 234 TO CR 233
Jurisdiction:	
Analysis Year:	2025 ALT 1G
Description: US 160	

Flow Inputs and Adjustments

Volume, V	1685	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	443	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	953	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	953	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	2	
Density, D	15.9	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	PM PEAK
Freeway/Direction:	WESTBOUND US 160
From/To:	SH 172/CR 234 TO CR 233
Jurisdiction:	
Analysis Year:	2025 ALT 1G
Description: US 160	

Flow Inputs and Adjustments

Volume, V	2290	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	603	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1296	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1296	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	2	
Density, D	21.6	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

URS Corporation

9960 Federal Drive, Suite 300
Colorado Springs, CO 80920

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	AM PEAK
Freeway/Direction:	WESTBOUND US 160
From/To:	CR 233 TO US 550
Jurisdiction:	
Analysis Year:	2025 ALT 1G
Description: US 160	

Flow Inputs and Adjustments

Volume, V	2130	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	561	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1205	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1205	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	2	
Density, D	20.1	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

URS Corporation

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Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	PM PEAK
Freeway/Direction:	WESTBOUND US 160
From/To:	CR 233 TO US 550
Jurisdiction:	
Analysis Year:	2025 ALT 1G
Description: US 160	

Flow Inputs and Adjustments

Volume, V	3510	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	924	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1986	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1986	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	58.1	mi/h
Number of lanes, N	2	
Density, D	34.2	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

URS Corporation

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Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	AM PEAK
Freeway/Direction:	WESTBOUND US 160
From/To:	WEST OF US 550
Jurisdiction:	
Analysis Year:	2025 ALT 1G
Description: US 160	

Flow Inputs and Adjustments

Volume, V	3080	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	811	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1162	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1162	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	3	
Density, D	19.4	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

URS Corporation

9960 Federal Drive, Suite 300
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Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	PM PEAK
Freeway/Direction:	WESTBOUND US 160
From/To:	WEST OF US 550
Jurisdiction:	
Analysis Year:	2025 ALT 1G
Description: US 160	

Flow Inputs and Adjustments

Volume, V	4290	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1129	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1618	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1618	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	3	
Density, D	27.0	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

URS

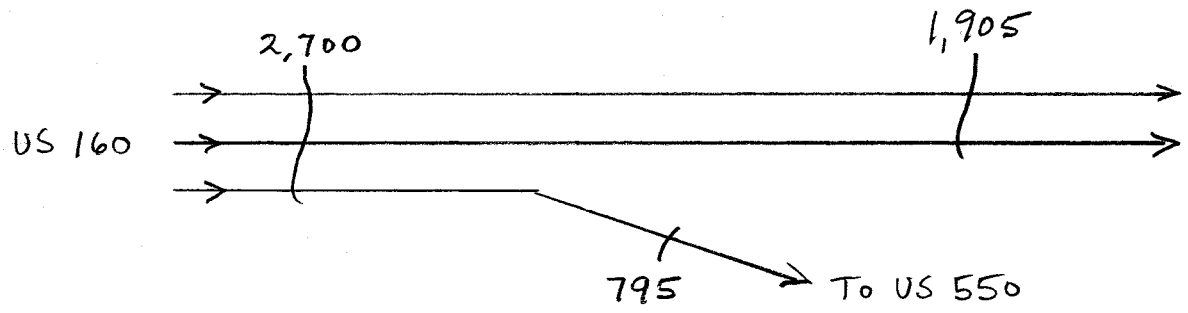
Page 1 of 1

Job US 160 ALT 1G | Project No. | Sheet ___ of ___

Description Eastbound US 160 Off-Ramp to US 550 Am Peak | Computed by | Date

Checked by | Date 3/15/05

Reference



ANALYZED AS A LANE DROP AT OFF-RAMP

Upstream of Off-Ramp

2700 vph / 0.95 * 0.93 = 3,056 / 3 = 1,019 pcphpl

Density = 1,019 / 60 = 16.98 (LOS B)

Downstream of Off-Ramp

1,905 vph / 0.95 * 0.93 = 2,156 / 2 = 1,078 pcphpl

Density = 1,078 / 6 = 17.97 (LOS B)

Ramp

795 vph / 0.95 x 0.971 = 862 pcph < 2,100 (maximum for 1-lane ramp)

∴ under capacity

URS

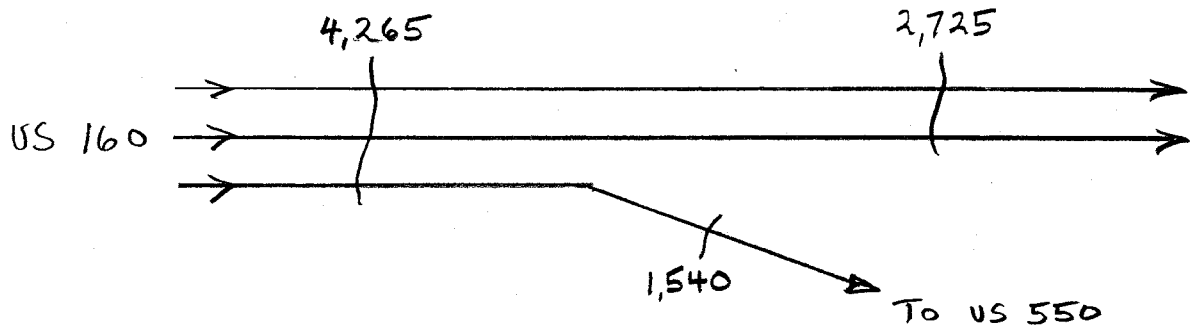
Page 1 of 1

Job US 160 ALT 1G — Project No. — Sheet — of

Description Eastbound US 160 Off-Ramp to US 550 PM Peak — Computed by — Date

Checked by — Date 3/15/05

Reference



ANALYZED AS A LANE DROP AT OFF-RAMP

Upstream of Off-Ramp

4,265 vph / 0.95 * 0.93 = 4,827 / 3 = 1,609 pcphpl

Density = 1,609 / 60 = 26.82 (LOS D)

Downstream of Off-Ramp

2,725 vph / 0.95 * 0.93 = 3,084 / 2 = 1,542 pcphpl

Density = 1,542 / 60 = 25.7 (LOS C)

Ramp

1,540 vph / 0.95 * 0.971 = 1,669 pcph < 2,100 (maximum for 1-lane ramp)

∴ under capacity

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	ON FROM US 550
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft	S_{FF} = 60.0 mph S_{FR} = 40.0 mph	L_{down} = ft
Vu = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1905	0.95	Rolling	5	0	0.930	1.00	2156
Ramp	595	0.95	Rolling	2	0	0.971	1.00	645
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation (Exhibit 25-5)

V_{12}= 2156 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2801	4600	No
V_{R12}	2801	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 23.3 (pc/ mi /ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.337 (Exibit 25-19)

S_R= 53.9 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S= 53.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	ON FROM US 550
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☒ On		☐ Yes ☐ On
☒ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	2725	0.95	Rolling	5	0	0.930	1.00	3084
Ramp	465	0.95	Rolling	2	0	0.971	1.00	504
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation (Exhibit 25-5)

V_{12}= 3084 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3588	4600	No
V_{R12}	3588	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 29.5 (pc/ mi /ln)

LOS = D (Exhibit 25-4)

Speed Estimation

M_S = 0.414 (Exibit 25-19)

S_R= 52.5 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S= 52.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	OFF TO CR 233
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	2500	0.95	Rolling	5	0	0.930	1.00	2829
Ramp	1090	0.95	Rolling	2	0	0.971	1.00	1182
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} =1.000 using Equation (Exhibit 25-11)

V_{12} = 2829 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	2829	4600	No
V_{12}	2829	4400:All	No
$V_{FO} = V_F - V_R$	1647	4600	No
V_R	1182	2100	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = 25.9 (pc/ mi /ln)

LOS= C (Exhibit 25-4)

Speed Estimation

D_s = 0.469 (Exhibit 25-19)

S_R= 51.6 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 51.6 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	OFF TO CR 233
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	3190	0.95	Rolling	5	0	0.930	1.00	3610
Ramp	1065	0.95	Rolling	2	0	0.971	1.00	1155
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} =1.000 using Equation (Exhibit 25-11)

V_{12} = 3610 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	3610	4600	No
V_{12}	3610	4400:All	No
$V_{FO} = V_F - V_R$	2455	4600	No
V_R	1155	2100	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.0009 L_D$

D_R = 32.6 (pc/ mi /ln)

LOS= D (Exhibit 25-4)

Speed Estimation

D_s = 0.467 (Exhibit 25-19)

S_R= 51.6 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 51.6 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	ON FROM CR 233
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft	S_{FF} = 60.0 mph S_{FR} = 40.0 mph	L_{down} = ft
Vu = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1410	0.95	Rolling	5	0	0.930	1.00	1596
Ramp	195	0.95	Rolling	2	0	0.971	1.00	211
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation (Exhibit 25-5)

V_{12}= 1596 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	1807	4600	No
V_{R12}	1807	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 15.7 (pc/ mi /ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.297 (Exibit 25-19)

S_R= 54.7 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S= 54.7 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	ON FROM CR 233
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft	S_{FF} = 60.0 mph S_{FR} = 40.0 mph	L_{down} = ft
Vu = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	2125	0.95	Rolling	5	0	0.930	1.00	2405
Ramp	400	0.95	Rolling	2	0	0.971	1.00	434
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation (Exhibit 25-5)

V_{12}= 2405 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2839	4600	No
V_{R12}	2839	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 23.7 (pc/ mi /ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.340 (Exibit 25-19)

S_R= 53.9 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S= 53.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	OFF TO SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D,V_R,V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1605	0.95	Rolling	5	0	0.930	1.00	1816
Ramp	585	0.95	Rolling	2	0	0.971	1.00	634
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} =1.000 using Equation (Exhibit 25-11)

V_{12} = 1816 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	1816	4600	No
V_{12}	1816	4400:All	No
$V_{FO} = V_F - V_R$	1182	4600	No
V_R	634	2100	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = 17.2 (pc/ mi /ln)

LOS= B (Exhibit 25-4)

Speed Estimation

D_s = 0.420 (Exhibit 25-19)

S_R= 52.4 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 52.4 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	OFF TO SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	2525	0.95	Rolling	5	0	0.930	1.00	2857
Ramp	1180	0.95	Rolling	2	0	0.971	1.00	1279
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} =1.000 using Equation (Exhibit 25-11)

V_{12} = 2857 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	2857	4600	No
V_{12}	2857	4400:All	No
$V_{FO} = V_F - V_R$	1578	4600	No
V_R	1279	2100	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = 26.1 (pc/ mi /ln)

LOS= C (Exhibit 25-4)

Speed Estimation

D_s = 0.478 (Exhibit 25-19)

S_R= 51.4 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 51.4 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	ON FROM SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft	S_{FF} = 60.0 mph S_{FR} = 40.0 mph	L_{down} = ft
Vu = veh/h	Sketch (show lanes, L_A, L_D,V_R,V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1020	0.95	Rolling	5	0	0.930	1.00	1154
Ramp	110	0.95	Rolling	2	0	0.971	1.00	119
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation (Exhibit 25-5)

V_{12}= 1154 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	1273	4600	No
V_{R12}	1273	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 11.6 (pc/ mi /ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.287 (Exibit 25-19)

S_R= 54.8 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= 54.8 mph (Exhibit 25-14)	S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	ON FROM SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D,V_R,V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1345	0.95	Rolling	5	0	0.930	1.00	1522
Ramp	240	0.95	Rolling	2	0	0.971	1.00	260
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation (Exhibit 25-5)

V_{12}= 1522 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	1782	4600	No
V_{R12}	1782	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 15.5 (pc/ mi /ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.296 (Exibit 25-19)

S_R= 54.7 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= 54.7 mph (Exhibit 25-14)	S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	WESTBOUND US 160
Agency or Company	URS	Junction	OFF TO SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	935	0.95	Rolling	5	0	0.930	1.00	1058
Ramp	135	0.95	Rolling	2	0	0.971	1.00	146
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} =1.000 using Equation (Exhibit 25-11)

V_{12} = 1058 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	1058	4600	No
V_{12}	1058	4400:All	No
$V_{FO} = V_F - V_R$	912	4600	No
V_R	146	2100	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = 10.7 (pc/ mi /ln)

LOS= B (Exhibit 25-4)

Speed Estimation

D_s = 0.376 (Exhibit 25-19)

S_R= 53.2 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 53.2 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	WESTBOUND US 160
Agency or Company	URS	Junction	OFF TO SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1450	0.95	Rolling	5	0	0.930	1.00	1641
Ramp	205	0.95	Rolling	2	0	0.971	1.00	222
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} =1.000 using Equation (Exhibit 25-11)

V_{12} = 1641 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	1641	4600	No
V_{12}	1641	4400:All	No
$V_{FO} = V_F - V_R$	1419	4600	No
V_R	222	2100	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = 15.7 (pc/ mi /ln)

LOS= B (Exhibit 25-4)

Speed Estimation

D_s = 0.383 (Exhibit 25-19)

S_R= 53.1 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 53.1 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	WESTBOUND US 160
Agency or Company	URS	Junction	ON FROM SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D,V_R,V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	800	0.95	Rolling	5	0	0.930	1.00	905
Ramp	885	0.95	Rolling	2	0	0.971	1.00	960
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation (Exhibit 25-5)

V_{12}= 905 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	1865	4600	No
V_{R12}	1865	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 15.8 (pc/ mi /ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.298 (Exibit 25-19)

S_R= 54.6 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= 54.6 mph (Exhibit 25-14)	S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	WESTBOUND US 160
Agency or Company	URS	Junction	ON FROM SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☒ On		☐ Yes ☐ On
☒ No ☐ Off		☒ No ☐ Off
L_{up} = ft	S_{FF} = 60.0 mph S_{FR} = 40.0 mph	L_{down} = ft
Vu = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1245	0.95	Rolling	5	0	0.930	1.00	1409
Ramp	1045	0.95	Rolling	2	0	0.971	1.00	1133
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation (Exhibit 25-5)

V_{12}= 1409 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2542	4600	No
V_{R12}	2542	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 21.0 (pc/ mi /ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.323 (Exibit 25-19)

S_R= 54.2 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.0009 L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= 54.2 mph (Exhibit 25-14)	S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	WESTBOUND US 160
Agency or Company	URS	Junction	OFF TO CR 233
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D,V_R,V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1685	0.95	Rolling	5	0	0.930	1.00	1907
Ramp	290	0.95	Rolling	2	0	0.971	1.00	314
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} =1.000 using Equation (Exhibit 25-11)

V_{12} = 1907 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	1907	4600	No
V_{12}	1907	4400:All	No
$V_{FO} = V_F - V_R$	1593	4600	No
V_R	314	2100	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = 18.0 (pc/ mi /ln)

LOS= B (Exhibit 25-4)

Speed Estimation

D_s = 0.391 (Exhibit 25-19)

S_R= 53.0 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 53.0 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	WESTBOUND US 160
Agency or Company	URS	Junction	OFF TO CR 233
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☑ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☑ No ☑ Off
L_{up} = ft	S_{FF} = 60.0 mph S_{FR} = 40.0 mph	L_{down} = ft
Vu = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	2290	0.95	Rolling	5	0	0.930	1.00	2591
Ramp	280	0.95	Rolling	2	0	0.971	1.00	304
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} =1.000 using Equation (Exhibit 25-11)

V_{12} = 2591 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	2591	4600	No
V_{12}	2591	4400:All	No
$V_{FO} = V_F - V_R$	2287	4600	No
V_R	304	2100	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = 23.8 (pc/ mi /ln)

LOS= C (Exhibit 25-4)

Speed Estimation

D_s = 0.390 (Exhibit 25-19)

S_R= 53.0 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 53.0 mph (Exhibit 25-15)

FREEWAY WEAVING WORKSHEET

General Information

Analyst	DEA
Agency/Company	URS
Date Performed	3/15/2005
Analysis Time Period	AM PEAK

Site Information

Freeway/Dir of Travel	WESTBOUND US 160
Weaving Seg Location	CR 233 ON TO US 550 OFF
Jurisdiction	
Analysis Year	2025 ALT 1G

Inputs

Freeway free-flow speed, SFF (mi/h)	60	Weaving type	A
Weaving number of lanes, N	3	Volume ratio, VR	0.49
Weaving seg length, L (ft)	2070	Weaving ratio, R	0.33
Terrain	Rolling		

Conversions to pc/h Under Base Conditions

(pc/h)	V	PHF	Truck %	RV %	E_T	E_R	f_{HV}	f_p	v
Vo1	1053	0.95	5	0	2.5	2.0	0.930	1.00	1191
Vo2	38	0.95	5	0	2.5	2.0	0.930	1.00	42
Vw1	342	0.95	5	0	2.5	2.0	0.930	1.00	386
Vw2	697	0.95	5	0	2.5	2.0	0.930	1.00	788
Vw				1174	Vnw				1233
V									2407

Weaving and Non-Weaving Speeds

	Unconstrained		Constrained	
	Weaving (i = w)	Non-Weaving (i = nw)	Weaving (i = w)	Non-Weaving (= nw)
a (Exhibit 24-6)			0.15	0.00
b (Exhibit 24-6)			4.00	4.00
c (Exhibit 24-6)			0.97	1.30
d (Exhibit 24-6)			0.80	0.75
Weaving intensity factor, Wi			1.22	0.19
Weaving and non-weaving speeds, Si (mi/h)			37.47	57.00

Number of lanes required for unconstrained operation, Nw 1.62
Maximum number of lanes, Nw (max) 1.40

☐ If Nw < Nw(max) unconstrained operation ☑ if Nw > Nw (max) constrained operation

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment speed, S (mi/h)	45.45
Weaving segment density, D (pc/mi/ln)	17.65
Level of service, LOS	B
Capacity of base condition, c_b (pc/h)	4948
Capacity as a 15-minute flow rate, c (veh/h)	4603
Capacity as a full-hour volume, c_h (veh/h)	4373

Notes

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

FREEWAY WEAVING WORKSHEET

General Information

Analyst	DEA
Agency/Company	URS
Date Performed	3/15/2005
Analysis Time Period	PM PEAK

Site Information

Freeway/Dir of Travel	WESTBOUND US 160
Weaving Seg Location	CR 233 ON TO US 550 OFF
Jurisdiction	
Analysis Year	2025 ALT 1G

Inputs

Freeway free-flow speed, SFF (mi/h)	60	Weaving type	A
Weaving number of lanes, N	3	Volume ratio, VR	0.51
Weaving seg length, L (ft)	2070	Weaving ratio, R	0.19
Terrain	Rolling		

Conversions to pc/h Under Base Conditions

(pc/h)	V	PHF	Truck %	RV %	E_T	E_R	fHV	fp	v
Vo1	1673	0.95	5	0	2.5	2.0	0.930	1.00	1893
Vo2	38	0.95	5	0	2.5	2.0	0.930	1.00	42
Vw1	337	0.95	5	0	2.5	2.0	0.930	1.00	381
Vw2	1462	0.95	5	0	2.5	2.0	0.930	1.00	1654
Vw				2035	Vnw				1935
V									3970

Weaving and Non-Weaving Speeds

	Unconstrained		Constrained	
	Weaving (i = w)	Non-Weaving (i = nw)	Weaving (i = w)	Non-Weaving (= nw)
a (Exhibit 24-6)			0.15	0.00
b (Exhibit 24-6)			4.00	4.00
c (Exhibit 24-6)			0.97	1.30
d (Exhibit 24-6)			0.80	0.75
Weaving intensity factor, Wi			2.06	0.39
Weaving and non-weaving speeds, Si (mi/h)			31.32	50.97

Number of lanes required for unconstrained operation, Nw 1.77
Maximum number of lanes, Nw (max) 1.40

☐ If Nw < Nw(max) unconstrained operation ☑ if Nw > Nw (max) constrained operation

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment speed, S (mi/h)	38.57
Weaving segment density, D (pc/mi/ln)	34.31
Level of service, LOS	D
Capacity of base condition, c_b (pc/h)	4948
Capacity as a 15-minute flow rate, c (veh/h)	4603
Capacity as a full-hour volume, c_h (veh/h)	4373

Notes

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

URS

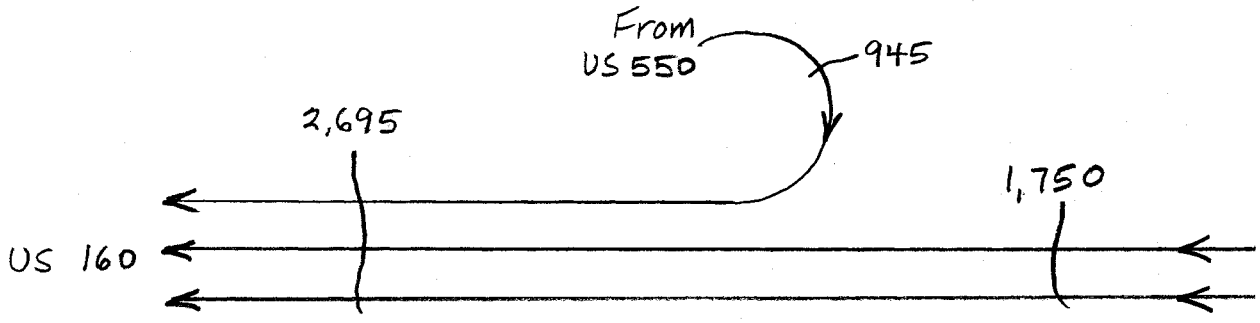
Page 1 of 1

Job US 160 ALT 1G — Project No. — Sheet — of

Description Westbound US 160 On-Ramp from Northbound US 550 AM Peak — Computed by — Date

Checked by — Date 3/15/05

Reference



ANALYZED AS A LANE ADDITION AT ON-RAMP

Upstream of On-Ramp

1,750 vph / 0.95 * 0.93 = 1,981 / 2 = 991 pcphpl

Density = 991 / 60 = 16.52 (LOS B)

Downstream of On-Ramp

2,695 vph / 0.95 * 0.93 = 3,050 / 3 = 1,017 pcphpl

Density = 1,017 / 60 = 16.95 (LOS B)

Ramp

945 vph / 0.95 * 0.971 = 1,024 pcph < 2,000 (maximum for 1-lane loop ramp)

∴ under capacity

URS

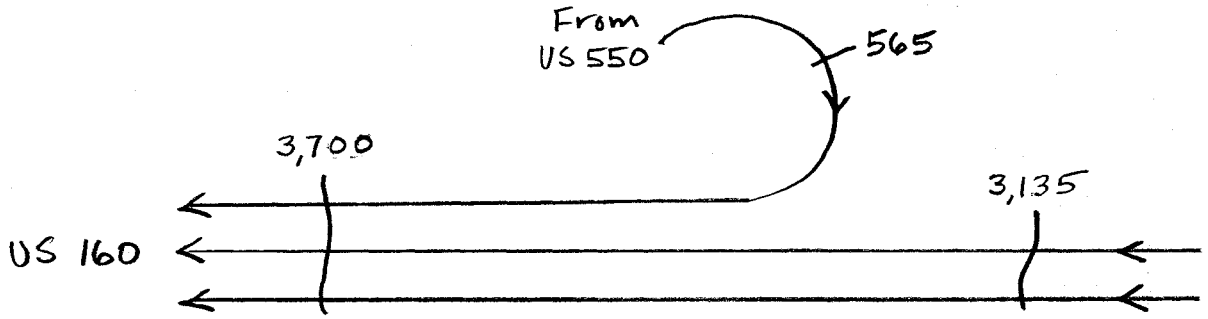
Page 1 of 1

Job US 160 ALT 1G — Project No. — Sheet ___ of ___

Description Westbound US 160 On-Ramp from Northbound US 550 PM Peak — Computed by — Date

Checked by — Date 3/15/05

Reference



ANALYZED AS A LANE ADDITION AT ON-RAMP

Upstream of On-Ramp

3,135 vph / 0.95 * 0.93 = 3,548 / 2 = 1,774 pcphpl

Density = 1,774 / 60 = 29.57 (LOS D)

Downstream of On-Ramp

3,700 vph / 0.95 * 0.93 = 4,188 / 3 = 1,396 pcphpl

Density = 1,396 / 60 = 23.27 (LOS C)

Ramp

565 vph / 0.95 * 0.971 = 612 pcph < 2,000 (maximum for 1-lane loop ramp)

∴ under capacity

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	WESTBOUND US 160
Agency or Company	URS	Junction	ON FROM SOUTHBOUND US 550
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

00 Upstream Adj Ramp ☑ Yes ☑ On ☐ No ☐ Off L_{up} = 1700 ft Vu = 945 veh/h	Terrain Rolling S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	Downstream Adj Ramp ☐ Yes ☐ On ☑ No ☐ Off L_{down} = ft VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	2695	0.95	Rolling	5	0	0.930	1.00	3050
Ramp	385	0.95	Rolling	2	0	0.971	1.00	417
UpStream	945	0.95	Rolling	2	0	0.971	1.00	1025
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 0.594 using Equation (Exhibit 25-5)

V_{12}= 1813 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3467	6900	No
V_{R12}	2230	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 18.9 (pc/ mi /ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.309 (Exibit 25-19)

S_R= 54.4 mph (Exhibit 25-19)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.0009 L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0=	N/A mph (Exhibit 25-19)	S_0=	mph (Exhibit 25-19)
S=	55.4 mph (Exhibit 25-14)	S =	mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	WESTBOUND US 160
Agency or Company	URS	Junction	ON FROM SOUTHBOUND US 550
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1G

Project Description US 160

Inputs

00 Upstream Adj Ramp ☑ Yes ☑ On ☐ No ☐ Off L_{up} = 1700 ft Vu = 565 veh/h	Terrain Rolling S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	Downstream Adj Ramp ☐ Yes ☐ On ☑ No ☐ Off L_{down} = ft VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	3700	0.95	Rolling	5	0	0.930	1.00	4187
Ramp	590	0.95	Rolling	2	0	0.971	1.00	640
UpStream	565	0.95	Rolling	2	0	0.971	1.00	613
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 0.594 using Equation (Exhibit 25-5)

V_{12}= 2488 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4827	6900	No
V_{R12}	3128	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 25.8 (pc/ mi /ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.362 (Exibit 25-19)

S_R= 53.5 mph (Exhibit 25-19)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0=	N/A mph (Exhibit 25-19)	S_0=	mph (Exhibit 25-19)
S=	54.2 mph (Exhibit 25-14)	S =	mph (Exhibit 25-15)

Attachment D-3
2025 Grandview Section, Alternative F Modified, Highway Analyses

HCS2000: Basic Freeway Segments Release 4.1d

URS Corporation

9960 Federal Drive, Suite 300
Colorado Springs, CO 80920

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	AM PEAK
Freeway/Direction:	EASTBOUND US 160
From/To:	WEST OF US 550/CR 233
Jurisdiction:	
Analysis Year:	2025 ALT 1F
Description: US 160	

Flow Inputs and Adjustments

Volume, V	2700	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	711	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1018	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1018	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	3	
Density, D	17.0	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

URS Corporation

9960 Federal Drive, Suite 300
Colorado Springs, CO 80920

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	PM PEAK
Freeway/Direction:	EASTBOUND US 160
From/To:	WEST OF US 550/CR 233
Jurisdiction:	
Analysis Year:	2025 ALT 1F
Description: US 160	

Flow Inputs and Adjustments

Volume, V	4265	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1122	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1609	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1609	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	3	
Density, D	26.8	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

URS Corporation

9960 Federal Drive, Suite 300
Colorado Springs, CO 80920

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	AM PEAK
Freeway/Direction:	EASTBOUND US 160
From/To:	550/CR 233 to SH 172/CR 234
Jurisdiction:	
Analysis Year:	2025 ALT 1F
Description: US 160	

Flow Inputs and Adjustments

Volume, V	1605	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	422	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	908	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	908	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	2	
Density, D	15.1	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

URS Corporation

9960 Federal Drive, Suite 300
Colorado Springs, CO 80920

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	PM PEAK
Freeway/Direction:	EASTBOUND US 160
From/To:	550/CR 233 to SH 172/CR 234
Jurisdiction:	
Analysis Year:	2025 ALT 1F
Description: US 160	

Flow Inputs and Adjustments

Volume, V	2525	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	664	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1429	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1429	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	2	
Density, D	23.8	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

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Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	AM PEAK
Freeway/Direction:	WESTBOUND US 160
From/To:	SH 172/CR 234 to US 550/CR 233
Jurisdiction:	
Analysis Year:	2025 ALT 1F
Description: US 160	

Flow Inputs and Adjustments

Volume, V	1685	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	443	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	953	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	953	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	2	
Density, D	15.9	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

URS Corporation

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Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	PM PEAK
Freeway/Direction:	WESTBOUND US 160
From/To:	SH 172/CR 234 to US 550/CR 233
Jurisdiction:	
Analysis Year:	2025 ALT 1F
Description: US 160	

Flow Inputs and Adjustments

Volume, V	2290	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	603	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1296	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1296	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	2	
Density, D	21.6	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

URS Corporation

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Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	AM PEAK
Freeway/Direction:	WESTBOUND US 160
From/To:	WEST OF US 550/CR 233
Jurisdiction:	
Analysis Year:	2025 ALT 1F
Description: US 160	

Flow Inputs and Adjustments

Volume, V	3080	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	811	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1162	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1162	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	3	
Density, D	19.4	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

URS Corporation

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Operational Analysis

Analyst:	DEA
Agency or Company:	URS
Date Performed:	4/21/2005
Analysis Time Period:	PM PEAK
Freeway/Direction:	WESTBOUND US 160
From/To:	WEST OF US 550/CR 233
Jurisdiction:	
Analysis Year:	2025 ALT 1F
Description: US 160	

Flow Inputs and Adjustments

Volume, V	4290	veh/h
Peak-hour factor, PHF	0.95	
Peak 15-min volume, v15	1129	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, fp	1.00	
Flow rate, vp	1618	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	60.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	60.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1618	pc/h/ln
Free-flow speed, FFS	60.0	mi/h
Average passenger-car speed, S	60.0	mi/h
Number of lanes, N	3	
Density, D	27.0	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

URS

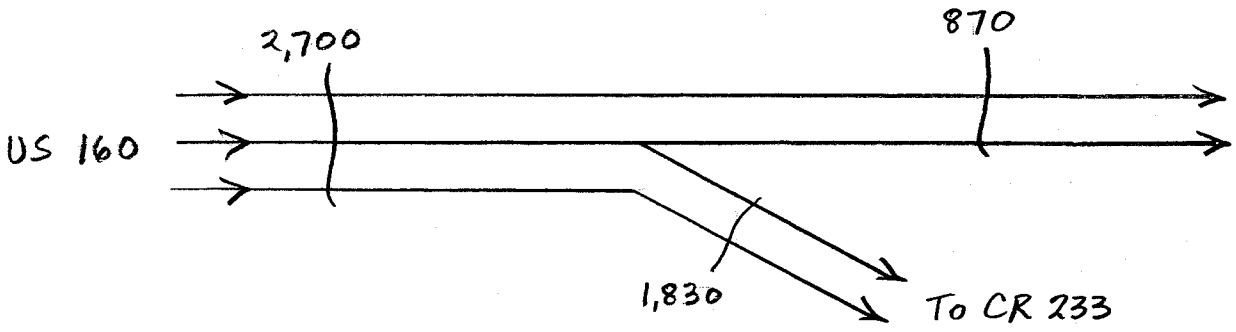
Page 1 of 1

Job US 160 ALT 1F — Project No. — Sheet — of

Description Eastbound US 160 Off-Ramp to CR 233 AM Peak — Computed by — Date

Checked by — Date 3/15/05

Reference



ANALYZED AS A MAJOR DIVERGE

Upstream of Off-Ramp

2,700 vph / 0.95 * 0.93 = 3,056 / 3 = 1,019 pcphpl

Density = 1,019 * 0.0109 = 11.11 (LOS B)

Downstream of Off-Ramp

870 vph / 0.95 * 0.93 = 985 / 2 = 493 pcphpl

Density = 493 / 60 = 8.22 (LOS A)

Ramp

1,830 vph / 0.95 * 0.971 = 1,984 pcph < 4,100 (maximum for 2-lane ramp)

∴ under capacity

URS

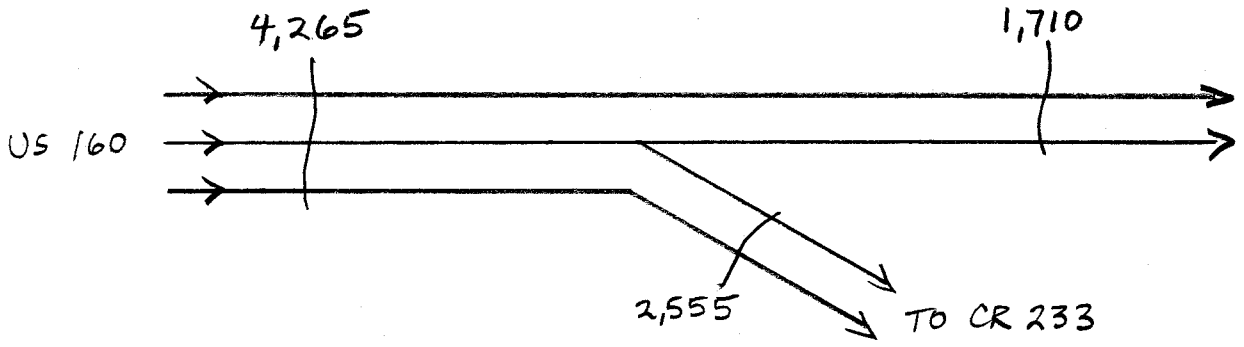
Page 1 of 1

Job US 160 ALT 1F | Project No. | Sheet ___ of ___

Description Eastbound US 160 Off-Ramp to CR 233 PM Peak | Computed by | Date

Checked by | Date 3/15/05

Reference



ANALYZED AS A MAJOR DIVERGE

Upstream of Off-Ramp

4,265 vph / 0.95 * 0.93 = 4,827 / 3 = 1,609 pcphpl

Density = 1,609 * 0.0109 = 17.54 (LOS B)

Downstream of Off-Ramp

1,710 vph / 0.95 * 0.93 = 1,935 / 2 = 968 pcphpl

Density = 968 / 60 = 16.13 (LOS B)

Ramp

2,555 vph / 0.95 * 0.971 = 2,770 pcph < 4,100 (maximum for 2-lane ramp)

∴ under capacity

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	ON FROM CR 233
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1F
Project Description	US 160		

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft	S_{FF} = 60.0 mph S_{FR} = 40.0 mph	L_{down} = ft
Vu = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	870	0.95	Rolling	5	0	0.930	1.00	984
Ramp	735	0.95	Rolling	2	0	0.971	1.00	797
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation (Exhibit 25-5)

V_{12}= 984 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	1781	4600	No
V_{R12}	1781	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 15.2 (pc/ mi /ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.296 (Exibit 25-19)

S_R= 54.7 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S= 54.7 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	ON FROM CR 233
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1F

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft	S_{FF} = 60.0 mph S_{FR} = 40.0 mph	L_{down} = ft
Vu = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1710	0.95	Rolling	5	0	0.930	1.00	1935
Ramp	815	0.95	Rolling	2	0	0.971	1.00	884
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation (Exhibit 25-5)

V_{12}= 1935 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2819	4600	No
V_{R12}	2819	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 23.3 (pc/ mi /ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.338 (Exibit 25-19)

S_R= 53.9 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S= 53.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	OFF TO SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1F

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1605	0.95	Rolling	5	0	0.930	1.00	1816
Ramp	585	0.95	Rolling	2	0	0.971	1.00	634
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} =1.000 using Equation (Exhibit 25-11)

V_{12} = 1816 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	1816	4600	No
V_{12}	1816	4400:All	No
$V_{FO} = V_F - V_R$	1182	4600	No
V_R	634	2100	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = 17.2 (pc/ mi /ln)

LOS= B (Exhibit 25-4)

Speed Estimation

D_s = 0.420 (Exhibit 25-19)

S_R= 52.4 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 52.4 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	OFF TO SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1F

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D,V_R,V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	2525	0.95	Rolling	5	0	0.930	1.00	2857
Ramp	1180	0.95	Rolling	2	0	0.971	1.00	1279
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} =1.000 using Equation (Exhibit 25-11)

V_{12} = 2857 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	2857	4600	No
V_{12}	2857	4400:All	No
$V_{FO} = V_F - V_R$	1578	4600	No
V_R	1279	2100	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.0009 L_D$

D_R = 26.1 (pc/ mi /ln)

LOS= C (Exhibit 25-4)

Speed Estimation

D_s = 0.478 (Exhibit 25-19)

S_R= 51.4 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 51.4 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	ON FROM SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1F

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☒ Yes ☐ On		☒ Yes ☐ On
☒ No ☐ Off		☒ No ☐ Off
L_{up} = ft	S_{FF} = 60.0 mph S_{FR} = 40.0 mph	L_{down} = ft
Vu = veh/h	Sketch (show lanes, L_A, L_D,V_R,V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1020	0.95	Rolling	5	0	0.930	1.00	1154
Ramp	110	0.95	Rolling	2	0	0.971	1.00	119
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation (Exhibit 25-5)

V_{12}= 1154 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	1273	4600	No
V_{R12}	1273	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 11.6 (pc/ mi /ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.287 (Exibit 25-19)

S_R= 54.8 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.0009 L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= 54.8 mph (Exhibit 25-14)	S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	EASTBOUND US 160
Agency or Company	URS	Junction	ON FROM SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1F

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☒ Yes ☒ On		☒ Yes ☒ On
☒ No ☒ Off		☒ No ☒ Off
L_{up} = ft	S_{FF} = 60.0 mph S_{FR} = 40.0 mph	L_{down} = ft
Vu = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1345	0.95	Rolling	5	0	0.930	1.00	1522
Ramp	240	0.95	Rolling	2	0	0.971	1.00	260
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation (Exhibit 25-5)

V_{12}= 1522 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	1782	4600	No
V_{R12}	1782	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 15.5 (pc/ mi /ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.296 (Exibit 25-19)

S_R= 54.7 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= 54.7 mph (Exhibit 25-14)	S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	WESTBOUND US 160
Agency or Company	URS	Junction	OFF TO SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1F

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D,V_R,V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	935	0.95	Rolling	5	0	0.930	1.00	1058
Ramp	135	0.95	Rolling	2	0	0.971	1.00	146
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} =1.000 using Equation (Exhibit 25-11)

V_{12} = 1058 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	1058	4600	No
V_{12}	1058	4400:All	No
$V_{FO} = V_F - V_R$	912	4600	No
V_R	146	2100	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = 10.7 (pc/ mi /ln)

LOS= B (Exhibit 25-4)

Speed Estimation

D_s = 0.376 (Exhibit 25-19)

S_R= 53.2 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 53.2 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	WESTBOUND US 160
Agency or Company	URS	Junction	OFF TO SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1F

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D,V_R,V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1450	0.95	Rolling	5	0	0.930	1.00	1641
Ramp	205	0.95	Rolling	2	0	0.971	1.00	222
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} =1.000 using Equation (Exhibit 25-11)

V_{12} = 1641 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	1641	4600	No
V_{12}	1641	4400:All	No
$V_{FO} = V_F - V_R$	1419	4600	No
V_R	222	2100	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = 15.7 (pc/ mi /ln)

LOS= B (Exhibit 25-4)

Speed Estimation

D_s = 0.383 (Exhibit 25-19)

S_R= 53.1 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 53.1 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	WESTBOUND US 160
Agency or Company	URS	Junction	ON FROM SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1F

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☒ No ☐ Off		☒ No ☐ Off
L_{up} = ft	S_{FF} = 60.0 mph S_{FR} = 40.0 mph	L_{down} = ft
Vu = veh/h	Sketch (show lanes, L_A, L_D,V_R,V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	800	0.95	Rolling	5	0	0.930	1.00	905
Ramp	885	0.95	Rolling	2	0	0.971	1.00	960
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation (Exhibit 25-5)

V_{12}= 905 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	1865	4600	No
V_{R12}	1865	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 15.8 (pc/ mi /ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.298 (Exibit 25-19)

S_R= 54.6 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= 54.6 mph (Exhibit 25-14)	S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	WESTBOUND US 160
Agency or Company	URS	Junction	ON FROM SH 172/CR 234
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1F

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☒ Off		☐ No ☒ Off
L_{up} = ft	S_{FF} = 60.0 mph S_{FR} = 40.0 mph	L_{down} = ft
Vu = veh/h	Sketch (show lanes, L_A, L_D,V_R,V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1245	0.95	Rolling	5	0	0.930	1.00	1409
Ramp	1045	0.95	Rolling	2	0	0.971	1.00	1133
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation (Exhibit 25-5)

V_{12}= 1409 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2542	4600	No
V_{R12}	2542	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 21.0 (pc/ mi /ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.323 (Exibit 25-19)

S_R= 54.2 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = (pc/ mi /ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= 54.2 mph (Exhibit 25-14)	S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	WESTBOUND US 160
Agency or Company	URS	Junction	OFF TO CR 233
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 ALT 1F

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
Vu = veh/h	S_{FF} = 60.0 mph S_{FR} = 40.0 mph Sketch (show lanes, L_A, L_D,V_R,V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1685	0.95	Rolling	5	0	0.930	1.00	1907
Ramp	635	0.95	Rolling	2	0	0.971	1.00	688
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} =1.000 using Equation (Exhibit 25-11)

V_{12} = 1907 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	1907	4600	No
V_{12}	1907	4400:All	No
$V_{FO} = V_F - V_R$	1219	4600	No
V_R	688	2100	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = 18.0 (pc/ mi /ln)

LOS= B (Exhibit 25-4)

Speed Estimation

D_s = 0.425 (Exhibit 25-19)

S_R= 52.4 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 52.4 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DEA	Freeway/Dir of Travel	WESTBOUND US 160
Agency or Company	URS	Junction	OFF TO CR 233
Date Performed	3/15/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 ALT 1F

Project Description US 160

Inputs

Upstream Adj Ramp	Terrain	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft	S_{FF} = 60.0 mph S_{FR} = 40.0 mph	L_{down} = ft
Vu = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	2290	0.95	Rolling	5	0	0.930	1.00	2591
Ramp	580	0.95	Rolling	2	0	0.971	1.00	629
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= using Equation (Exhibit 25-5)

V_{12}= pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = (pc/ mi /ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S= mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} =1.000 using Equation (Exhibit 25-11)

V_{12} = 2591 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	2591	4600	No
V_{12}	2591	4400:All	No
$V_{FO} = V_F - V_R$	1962	4600	No
V_R	629	2100	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.0009 L_D$

D_R = 23.8 (pc/ mi /ln)

LOS= C (Exhibit 25-4)

Speed Estimation

D_s = 0.420 (Exhibit 25-19)

S_R= 52.4 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 52.4 mph (Exhibit 25-15)

URS

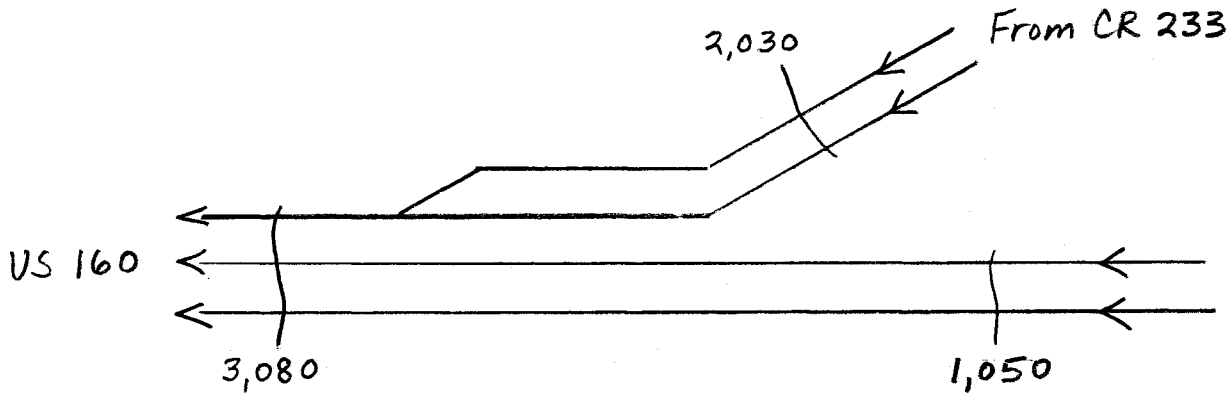
Page 1 of 1

Job US 160 ALT 1F — Project No. — Sheet — of

Description Westbound US 160 On-Ramp from CR 233 Am Peak — Computed by — Date

Checked by — Date 3/15/05

Reference



ANALYZED AS A MAJOR MERGE

Upstream of On-Ramp

1,050 vph / 0.95 * 0.93 = 1,188 / 2 = 594 pcphpl

Density = 594/60 = 9.90 (LOS A)

Downstream of On-Ramp

3,080 vph / 0.95 * 0.93 = 3,486 / 3 = 1,162 pcphpl

Density = 1,162/60 = 19.37 (LOS C)

Ramp

2,030 vph / 0.95 * 0.971 = 2,201 pcph < 4,100 (maximum for 2-lane ramp)

∴ under capacity

URS

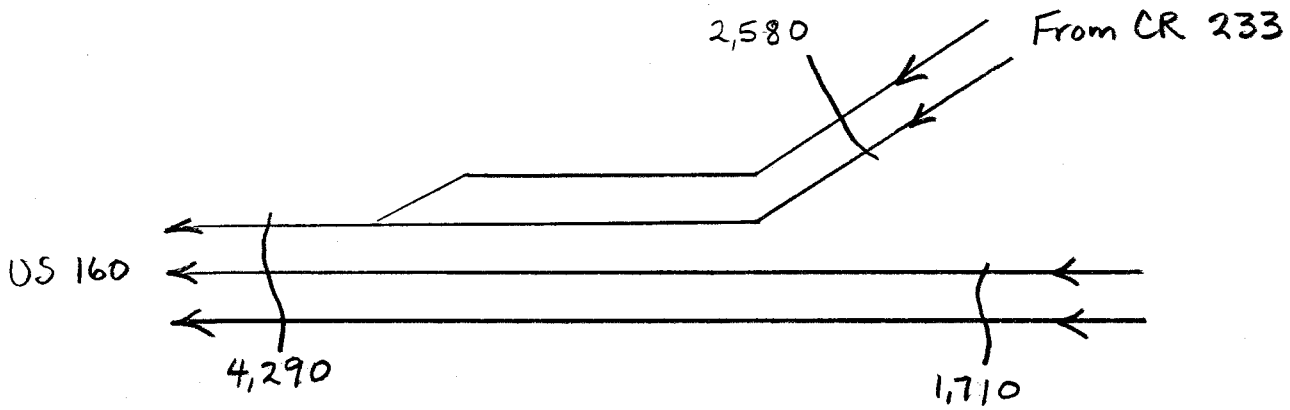
Page 1 of 1

Job US 160 ALT 1F — Project No. — Sheet — of

Description Westbound US 160 On-Ramp from CR 233 PM Peak — Computed by — Date

Checked by — Date 3/15/05

Reference



ANALYZED AS A MAJOR MERGE

Upstream of On-Ramp

1,710 vph / 0.95 * 0.93 = 1,935 / 2 = 968 pcphpl

Density = 968 / 60 = 16.13 (LOS B)

Downstream of On-Ramp

4,290 vph / 0.95 * 0.93 = 4,856 / 3 = 1,619 pcphpl

Density = 1619 / 60 = 26.98 (LOS D)

Ramp

2,580 vph / 0.95 * 0.971 = 2,797 pcph < 4,100 (maximum for 2-lane ramp)

∴ under capacity

Attachment E
2025 Grandview Section Intersection Analyses

Attachment E-1
2025 Grandview Section, No Action Alternative, Intersection Analyses

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: AM PEAK HOUR
Project ID: US 160
E/W St: US 160

Inter.: US 160 / US 550
Area Type: All other areas
Jurisd:
Year : 2025 NO ACTION

N/S St: US 550

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	1	1	0	0	1	0	1	0	0	0
LGConfig		T	R	L			L		R			
Volume		2385	315	240			945		485			
Lane Width		12.0	12.0	12.0			12.0		12.0			
RTOR Vol			0						0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left					NB Left	A		
Thru		A			Thru			
Right		A			Right	A		
Peds					Peds			
WB Left	A				SB Left			
Thru					Thru			
Right					Right			
Peds					Peds			
NB Right	A				EB Right	A		
SB Right					WB Right			
Green	10.0	55.0			40.0			
Yellow	4.0	4.0			4.0			
All Red	1.0	1.0			1.0			

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
T	1576	3438	1.59	0.46	302.5	F	267.4	F
R	1282	1538	0.26	0.83	2.2	A		
Westbound								
L	143	1719	1.77	0.08	428.0	F		
							428.0	F
Northbound								
L	573	1719	1.74	0.33	378.7	F		
							260.4	F
R	705	1538	0.72	0.46	30.1	C		
Southbound								

Intersection Delay = 274.0 (sec/veh) Intersection LOS = F

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: PM PEAK HOUR
Project ID: US 160
E/W St: US 160

Inter.: US 160 / US 550
Area Type: All other areas
Jurisd:
Year : 2025 NO ACTION

N/S St: US 550

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	1	1	0	0	1	0	1	0	0	0
LGConfig		T	R	L			L		R			
Volume		3205	1060	240			565		295			
Lane Width		12.0	12.0	12.0			12.0		12.0			
RTOR Vol			0						0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left					NB	Left	A			
	Thru		A				Thru				
	Right		A				Right	A			
	Peds						Peds				
WB	Left	A				SB	Left				
	Thru						Thru				
	Right						Right				
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right					WB	Right				
Green		10.0	70.0					25.0			
Yellow		4.0	4.0					4.0			
All Red		1.0	1.0					1.0			

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
T	2005	3438	1.68	0.58	334.5	F	254.5	F
R	1282	1538	0.87	0.83	12.8	B		
Westbound								
L	143	1719	1.77	0.08	428.0	F		
							428.0	F
Northbound								
L	358	1719	1.66	0.21	357.5	F		
							247.0	F
R	513	1538	0.61	0.33	35.5	D		
Southbound								

Intersection Delay = 261.1 (sec/veh) Intersection LOS = F

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/6/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 233
Area Type: All other areas
Jurisd:
Year : 2025 NO ACTION

N/S St: CR 233

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	1	1	2	1	1	1	1	2	1	1
LGConfig	L	T	R	L	T	R	L	T	R	L	T	R
Volume	1215	1300	355	95	1255	335	180	60	50	255	60	940
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A				NB	Left	A			
Thru		A				Thru		A		
Right		A				Right		A		
Peds						Peds				
WB Left	A				SB	Left	A			
Thru		A				Thru		A		
Right		A				Right		A		
Peds						Peds				
NB Right	A				EB	Right	A			
SB Right	A				WB	Right	A			
Green	30.0	50.0					10.0	10.0		
Yellow	4.0	4.0					4.0	4.0		
All Red	1.0	1.0					1.0	1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	443	1770	2.89	0.25	900.4	F		
T	1432	3438	0.96	0.42	48.4	D	405.2	F
R	857	1583	0.44	0.54	16.9	B		
Westbound								
L	443	1770	0.23	0.25	36.0	D		
T	1432	3438	0.92	0.42	43.3	D	37.6	D
R	857	1583	0.41	0.54	16.5	B		
Northbound								
L	148	1770	1.28	0.08	221.6	F		
T	155	1863	0.41	0.08	53.9	D	152.7	F
R	594	1583	0.09	0.38	24.3	C		
Southbound								
L	286	3433	0.94	0.08	91.5	F		
T	155	1863	0.41	0.08	53.9	D	279.0	F
R	594	1583	1.66	0.38	344.1	F		

Intersection Delay = 265.7 (sec/veh) Intersection LOS = F

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/6/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 233
Area Type: All other areas
Jurisd:
Year : 2025 NO ACTION

N/S St: CR 233

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	1	1	2	1	1	1	1	2	1	1
LGConfig	L	T	R	L	T	R	L	T	R	L	T	R
Volume	1200	1955	345	90	1875	325	570	85	150	420	85	1520
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A				WB	Right	A			
Green		30.0	50.0					10.0	10.0		
Yellow		4.0	4.0					4.0	4.0		
All Red		1.0	1.0					1.0	1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	443	1770	2.85	0.25	884.2	F		
T	1432	3438	1.44	0.42	235.8	F	436.5	F
R	857	1583	0.42	0.54	16.7	B		
Westbound								
L	443	1770	0.21	0.25	35.9	D		
T	1432	3438	1.38	0.42	209.8	F	175.5	F
R	857	1583	0.40	0.54	16.4	B		
Northbound								
L	148	1770	4.05	0.08	1445	F		
T	155	1863	0.57	0.08	58.1	E	1035	F
R	594	1583	0.27	0.38	26.3	C		
Southbound								
L	286	3433	1.55	0.08	317.2	F		
T	155	1863	0.57	0.08	58.1	E	672.2	F
R	594	1583	2.69	0.38	804.4	F		

Intersection Delay = 478.3 (sec/veh) Intersection LOS = F

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/18/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/SH 172-CR 234
Area Type: All other areas
Jurisd:
Year : 2025 NO ACTION

N/S St: SH 172/CR 234

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	1	1	1	1	1	1
LGConfig	L	T	R	L	T	R	L	T	R	L	T	R
Volume	260	1020	325	65	800	70	630	55	60	50	40	255
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A				WB	Right	A			
Green		12.0	48.0					30.0	10.0		
Yellow		4.0	4.0					4.0	4.0		
All Red		1.0	1.0					1.0	1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	177	1770	1.55	0.10	326.6	F		
T	724	1810	1.48	0.40	260.9	F	220.3	F
R	1095	1583	0.31	0.69	7.4	A		
Westbound								
L	177	1770	0.38	0.10	51.9	D		
T	724	1810	1.16	0.40	124.1	F	110.2	F
R	1095	1583	0.07	0.69	6.0	A		
Northbound								
L	443	1770	1.50	0.25	280.1	F		
T	155	1863	0.37	0.08	53.6	D	243.9	F
R	356	1583	0.18	0.22	37.8	D		
Southbound								
L	443	1770	0.12	0.25	34.9	C		
T	155	1863	0.27	0.08	52.5	D	49.7	D
R	356	1583	0.75	0.22	52.2	D		

Intersection Delay = 180.6 (sec/veh) Intersection LOS = F

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/18/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/SH 172-CR 234
Area Type: All other areas
Jurisd:
Year : 2025 NO ACTION

N/S St: SH 172/CR 234

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	1	1	1	1	1	1
LGConfig	L	T	R	L	T	R	L	T	R	L	T	R
Volume	385	1345	795	115	1245	90	640	105	105	135	80	405
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A				WB	Right	A			
Green		15.0	48.0					27.0	10.0		
Yellow		4.0	4.0					4.0	4.0		
All Red		1.0	1.0					1.0	1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	221	1770	1.83	0.13	444.3	F		
T	724	1810	1.96	0.40	471.1	F	324.5	F
R	1055	1583	0.79	0.67	18.4	B		
Westbound								
L	221	1770	0.55	0.13	52.2	D		
T	724	1810	1.81	0.40	406.3	F	353.4	F
R	1055	1583	0.09	0.67	7.1	A		
Northbound								
L	398	1770	1.69	0.22	369.2	F		
T	155	1863	0.72	0.08	68.3	E	290.8	F
R	396	1583	0.28	0.25	36.7	D		
Southbound								
L	398	1770	0.36	0.22	39.7	D		
T	155	1863	0.54	0.08	56.7	E	89.1	F
R	396	1583	1.08	0.25	112.0	F		

Intersection Delay = 300.1 (sec/veh) Intersection LOS = F

Attachment E-2
2025 Grandview Section, Alternative G Modified (Preferred Alternative), Intersection Analyses

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/11/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/US 550 NORTH SIDE
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1G

N/S St: US 550 NORTH SIDE

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	0	1	1	0	1	0	1	0	0	1	1
LGConfig	L		R	L		R		T			T	R
Volume	480		315	240		140		70			165	385
Lane Width	12.0		12.0	12.0		12.0		12.0			12.0	12.0
RTOR Vol			0			0						0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left				
	Thru						Thru	A			
	Right	A	A				Right				
	Peds						Peds				
WB	Left	A	A			SB	Left				
	Thru						Thru	A			
	Right		A				Right	A			
	Peds						Peds				
NB	Right					EB	Right	A			
SB	Right	A	A			WB	Right				
Green		32.0	23.0					20.0			
Yellow		4.0	4.0					4.0			
All Red		1.0	1.0					1.0			

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	1221	3433	0.41	0.36	22.1	C		
							13.4	B
R	1583	1583	0.21	1.00	0.1	A		
Westbound								
L	1180	1770	0.21	0.67	5.9	A		
							14.1	B
R	405	1583	0.36	0.26	28.0	C		
Northbound								
T	414	1863	0.18	0.22	28.6	C	28.6	C
Southbound								
T	414	1863	0.42	0.22	30.7	C	9.3	A
R	1583	1583	0.26	1.00	0.1	A		

Intersection Delay = 12.9 (sec/veh) Intersection LOS = B

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/11/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/US 550 NORTH SIDE
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1G

N/S St: US 550 NORTH SIDE

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	0	1	1	0	1	0	1	0	0	1	1
LGConfig	L		R	L		R		T			T	R
Volume	480		1060	240		135		70			255	590
Lane Width	12.0		12.0	12.0		12.0		12.0			12.0	12.0
RTOR Vol			0			0						0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left				
	Thru						Thru	A			
	Right	A	A				Right				
	Peds						Peds				
WB	Left	A	A			SB	Left				
	Thru						Thru	A			
	Right		A				Right	A			
	Peds						Peds				
NB	Right					EB	Right	A			
SB	Right	A	A			WB	Right				
Green		27.0	21.0					27.0			
Yellow		4.0	4.0					4.0			
All Red		1.0	1.0					1.0			

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	1030	3433	0.49	0.30	26.2	C		
							9.2	A
R	1583	1583	0.70	1.00	1.5	A		
Westbound								
L	1042	1770	0.24	0.59	9.0	A		
							16.4	B
R	369	1583	0.38	0.23	29.7	C		
Northbound								
T	559	1863	0.13	0.30	23.1	C	23.1	C
Southbound								
T	559	1863	0.48	0.30	26.4	C	8.1	A
R	1583	1583	0.39	1.00	0.2	A		

Intersection Delay = 10.2 (sec/veh) Intersection LOS = B

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*DEA*	Intersection	*US 160 RAMP/US 550 SOUTH SIDE*
Agency/Co.	*URS*	Jurisdiction	
Date Performed	*3/11/2005*	Analysis Year	*2025 ALT 1G*
Analysis Time Period	*AM PEAK*		

Project Description	*US 160*
East/West Street: *US 160 RAMP*	North/South Street: *US 550 SOUTH SIDE*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*1015*	*485*	*110*	*560*	*0*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*0*	*1068*	*510*	*115*	*589*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration						

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*						
v (vph)		*115*						
C (m) (vph)		*413*						
v/c		*0.28*						
95% queue length		*1.12*						
Control Delay		*17.0*						
LOS		*C*						
Approach Delay	--	--						
Approach LOS	--	--						

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*DEA*	Intersection	*US 160 RAMP/US 550 SOUTH SIDE*
Agency/Co.	*URS*	Jurisdiction	
Date Performed	*3/11/2005*	Analysis Year	*2025 ALT 1G*
Analysis Time Period	*PM PEAK*		

Project Description *US 160*

East/West Street: *US 160 RAMP* | North/South Street: *US 550 SOUTH SIDE*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*635*	*295*	*170*	*1230*	*0*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*0*	*668*	*310*	*178*	*1294*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration						

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*						
v (vph)		*178*						
C (m) (vph)		*701*						
v/c		*0.25*						
95% queue length		*1.01*						
Control Delay		*11.9*						
LOS		*B*						
Approach Delay	--	--						
Approach LOS	--	--						

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/6/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 233
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1G - SPUI

N/S St: CR 233

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	0	1	1	0	1	2	1	1	2	1	1
LGConfig	L		R	L		R	L	T	R	L	T	R
Volume	735		355	95		195	180	60	50	145	60	555
Lane Width	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru						Thru		A		
	Right						Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru						Thru		A		
	Right						Right	A	A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A				WB	Right	A			
Green		35.0						30.0	10.0		
Yellow		4.0						4.0	4.0		
All Red		1.0						1.0	1.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	1335	3433	0.58	0.39	22.3	C		
							25.0	C
R	528	1583	0.71	0.33	30.5	C		
Westbound								
L	688	1770	0.15	0.39	17.9	B		
							21.6	C
R	528	1583	0.39	0.33	23.4	C		
Northbound								
L	1144	3433	0.17	0.33	21.2	C		
T	207	1863	0.30	0.11	37.6	D	22.5	C
R	879	1583	0.06	0.56	9.2	A		
Southbound								
L	1144	3433	0.13	0.33	21.0	C		
T	207	1863	0.30	0.11	37.6	D	7.1	A
R	1583	1583	0.37	1.00	0.1	A		

Intersection Delay = 18.7 (sec/veh) Intersection LOS = B

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/6/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 233
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1G - SPUI

N/S St: CR 233

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	0	1	1	0	1	2	1	1	2	1	1
LGConfig	L		R	L		R	L	T	R	L	T	R
Volume	720		345	90		190	570	85	150	250	85	930
Lane Width	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru						Thru		A		
	Right						Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru						Thru		A		
	Right						Right	A	A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A				WB	Right	A			
Green		25.0						40.0	10.0		
Yellow		4.0						4.0	4.0		
All Red		1.0						1.0	1.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	954	3433	0.79	0.28	34.8	C		
							29.6	C
R	704	1583	0.52	0.44	18.7	B		
Westbound								
L	492	1770	0.19	0.28	25.0	C		
							19.0	B
R	704	1583	0.28	0.44	16.1	B		
Northbound								
L	1526	3433	0.39	0.44	17.0	B		
T	207	1863	0.43	0.11	38.8	D	19.0	B
R	704	1583	0.22	0.44	15.6	B		
Southbound								
L	1526	3433	0.17	0.44	15.1	B		
T	207	1863	0.43	0.11	38.8	D	6.1	A
R	1583	1583	0.62	1.00	0.7	A		

Intersection Delay = 17.5 (sec/veh) Intersection LOS = B

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 1/26/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/SH 172-CR 234
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1G - SPUI

N/S St: SH 172/CR 234

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	0	1	1	0	1	2	1	1	1	1	1
LGConfig	L		R	L		R	L	T	R	L	T	R
Volume	260		325	65		70	630	55	60	50	40	255
Lane Width	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru						Thru		A		
	Right						Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru						Thru		A		
	Right						Right		A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A				WB	Right	A			
Green		28.0						27.0	20.0		
Yellow		4.0						4.0	4.0		
All Red		1.0						1.0	1.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	1068	3433	0.26	0.31	23.3	C		
							28.9	C
R	475	1583	0.72	0.30	33.4	C		
Westbound								
L	551	1770	0.12	0.31	22.3	C		
							22.8	C
R	475	1583	0.16	0.30	23.3	C		
Northbound								
L	1030	3433	0.64	0.30	28.7	C		
T	414	1863	0.14	0.22	28.3	C	27.0	C
R	932	1583	0.07	0.59	8.0	A		
Southbound								
L	531	1770	0.10	0.30	22.8	C		
T	414	1863	0.10	0.22	28.0	C	13.5	B
R	932	1583	0.29	0.59	9.3	A		

Intersection Delay = 24.7 (sec/veh) Intersection LOS = C

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 1/26/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/SH 172-CR 234
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1G - SPUI

N/S St: SH 172/CR 234

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	0	1	1	0	1	2	1	1	1	1	1
LGConfig	L		R	L		R	L	T	R	L	T	R
Volume	385		795	115		90	640	105	105	135	80	405
Lane Width	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru						Thru		A		
	Right						Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru						Thru		A		
	Right						Right		A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A				WB	Right	A			
Green		14.0						51.0	10.0		
Yellow		4.0						4.0	4.0		
All Red		1.0						1.0	1.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	534	3433	0.76	0.16	42.6	D		
							36.9	D
R	897	1583	0.93	0.57	34.2	C		
Westbound								
L	275	1770	0.44	0.16	35.6	D		
							23.9	C
R	897	1583	0.11	0.57	9.0	A		
Northbound								
L	1945	3433	0.35	0.57	10.6	B		
T	207	1863	0.54	0.11	40.6	D	15.8	B
R	510	1583	0.22	0.32	22.4	C		
Southbound								
L	1003	1770	0.14	0.57	9.3	A		
T	207	1863	0.41	0.11	38.5	D	33.0	C
R	510	1583	0.84	0.32	39.8	D		

Intersection Delay = 28.8 (sec/veh) Intersection LOS = C

Attachment E-3
2025 Grandview Section, Alternative F Modified, Intersection Analyses

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/US 550/CR 233
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1F

N/S St: US 550/CR 233

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	0	0	2	0	1	2	1	1	2	1	0
LGConfig	L			L		R	L	T	R	L	T	
Volume	1180			300		335	1120	165	480	255	145	
Lane Width	12.0			12.0		12.0	12.0	12.0	12.0	12.0	12.0	
RTOR Vol						0			0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru						Thru		A		
	Right						Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru						Thru		A		
	Right						Right				
	Peds						Peds				
NB	Right	A				EB	Right				
SB	Right					WB	Right	A			
Green		45.0						43.0	17.0		
Yellow		4.0						4.0	4.0		
All Red		1.0						1.0	1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	1287	3433	0.97	0.38	54.1	D		
							54.1	D
Westbound								
L	1287	3433	0.25	0.38	25.9	C		
							30.1	C
R	567	1583	0.62	0.36	33.9	C		
Northbound								
L	1230	3433	0.96	0.36	54.3	D		
T	264	1863	0.66	0.14	54.7	D	44.5	D
R	884	1583	0.57	0.56	18.1	B		
Southbound								
L	1230	3433	0.22	0.36	26.9	C		
T	264	1863	0.58	0.14	51.3	D	35.8	D

Intersection Delay = 44.2 (sec/veh) Intersection LOS = D

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/US 550/CR 233
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1F

N/S St: US 550/CR 233

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	0	0	2	0	1	2	1	1	2	1	0
LGConfig	L			L		R	L	T	R	L	T	
Volume	1165			250		330	1105	190	400	415	215	
Lane Width	12.0			12.0		12.0	12.0	12.0	12.0	12.0	12.0	
RTOR Vol						0			0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A				NB	Left	A			
Thru						Thru		A		
Right						Right		A		
Peds						Peds				
WB Left	A				SB	Left	A			
Thru						Thru		A		
Right						Right				
Peds						Peds				
NB Right	A				EB	Right				
SB Right					WB	Right	A			
Green	43.0						41.0	21.0		
Yellow	4.0						4.0	4.0		
All Red	1.0						1.0	1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	1230	3433	1.00	0.36	63.3	E		
							63.3	E
Westbound								
L	1230	3433	0.21	0.36	26.8	C		
							32.0	C
R	541	1583	0.64	0.34	35.9	D		
Northbound								
L	1173	3433	0.99	0.34	63.5	E		
T	326	1863	0.61	0.17	49.2	D	50.5	D
R	910	1583	0.46	0.57	15.1	B		
Southbound								
L	1173	3433	0.37	0.34	30.0	C		
T	326	1863	0.69	0.17	52.7	D	37.7	D

Intersection Delay = 49.5 (sec/veh) Intersection LOS = D

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/SH 172-CR 234
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1F - SPUI

N/S St: SH 172/CR 234

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	0	1	1	0	1	2	1	1	1	1	1
LGConfig	L		R	L		R	L	T	R	L	T	R
Volume	260		325	65		70	630	55	60	50	40	255
Lane Width	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru						Thru		A		
	Right						Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru						Thru		A		
	Right						Right		A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A				WB	Right	A			
Green		28.0						27.0	20.0		
Yellow		4.0						4.0	4.0		
All Red		1.0						1.0	1.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	1068	3433	0.26	0.31	23.3	C		
							28.9	C
R	475	1583	0.72	0.30	33.4	C		
Westbound								
L	551	1770	0.12	0.31	22.3	C		
							22.8	C
R	475	1583	0.16	0.30	23.3	C		
Northbound								
L	1030	3433	0.64	0.30	28.7	C		
T	414	1863	0.14	0.22	28.3	C	27.0	C
R	932	1583	0.07	0.59	8.0	A		
Southbound								
L	531	1770	0.10	0.30	22.8	C		
T	414	1863	0.10	0.22	28.0	C	13.5	B
R	932	1583	0.29	0.59	9.3	A		

Intersection Delay = 24.7 (sec/veh) Intersection LOS = C

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 1/26/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/SH 172-CR 234
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1F - SPUI

N/S St: SH 172/CR 234

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	0	1	1	0	1	2	1	1	1	1	1
LGConfig	L		R	L		R	L	T	R	L	T	R
Volume	385		795	115		90	640	105	105	135	80	405
Lane Width	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru						Thru		A		
	Right						Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru						Thru		A		
	Right						Right		A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A				WB	Right	A			
Green		14.0						51.0	10.0		
Yellow		4.0						4.0	4.0		
All Red		1.0						1.0	1.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	534	3433	0.76	0.16	42.6	D		
							36.9	D
R	897	1583	0.93	0.57	34.2	C		
Westbound								
L	275	1770	0.44	0.16	35.6	D		
							23.9	C
R	897	1583	0.11	0.57	9.0	A		
Northbound								
L	1945	3433	0.35	0.57	10.6	B		
T	207	1863	0.54	0.11	40.6	D	15.8	B
R	510	1583	0.22	0.32	22.4	C		
Southbound								
L	1003	1770	0.14	0.57	9.3	A		
T	207	1863	0.41	0.11	38.5	D	33.0	C
R	510	1583	0.84	0.32	39.8	D		

Intersection Delay = 28.8 (sec/veh) Intersection LOS = C

Attachment E-4
2025 Grandview Section, Additional Analyses for At-Grade Options

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/6/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 233
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1G - AT GRADE

N/S St: CR 233

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	2	1	1	2	1	2	1	1	2	1	1
LGConfig	L	T	R	L	T	R	L	T	R	L	T	R
Volume	735	1410	355	95	1395	195	180	60	50	145	60	555
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right	A	A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A	A			WB	Right	A			
Green		27.0	53.0					10.0	10.0		
Yellow		4.0	4.0					4.0	4.0		
All Red		1.0	1.0					1.0	1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	772	3433	1.00	0.22	79.5	E		
T	1518	3438	0.98	0.44	50.9	D	54.2	D
R	897	1583	0.42	0.57	15.1	B		
Westbound								
L	398	1770	0.25	0.22	38.5	D		
T	1518	3438	0.97	0.44	48.6	D	43.9	D
R	897	1583	0.23	0.57	13.1	B		
Northbound								
L	286	3433	0.66	0.08	58.9	E		
T	155	1863	0.41	0.08	53.9	D	52.2	D
R	554	1583	0.10	0.35	26.3	C		
Southbound								
L	286	3433	0.53	0.08	54.7	D		
T	155	1863	0.41	0.08	53.9	D	14.8	B
R	1583	1583	0.37	1.00	0.1	A		

Intersection Delay = 45.1 (sec/veh) Intersection LOS = D

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/6/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 233
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1G - AT GRADE

N/S St: CR 233

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	2	1	1	2	1	2	1	1	2	1	1
LGConfig	L	T	R	L	T	R	L	T	R	L	T	R
Volume	720	2125	345	90	2010	190	570	85	150	250	85	930
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right	A	A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A	A			WB	Right	A			
Green		20.0	55.0					15.0	10.0		
Yellow		4.0	4.0					4.0	4.0		
All Red		1.0	1.0					1.0	1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	572	3433	1.33	0.17	208.2	F		
T	1576	3438	1.42	0.46	225.0	F	198.1	F
R	989	1583	0.37	0.63	11.2	B		
Westbound								
L	295	1770	0.32	0.17	44.7	D		
T	1576	3438	1.34	0.46	191.0	F	170.2	F
R	989	1583	0.20	0.63	9.8	A		
Northbound								
L	429	3433	1.40	0.13	245.5	F		
T	155	1863	0.57	0.08	58.1	E	186.4	F
R	462	1583	0.34	0.29	33.9	C		
Southbound								
L	429	3433	0.61	0.13	52.3	D		
T	155	1863	0.57	0.08	58.1	E	14.8	B
R	1583	1583	0.62	1.00	0.7	A		

Intersection Delay = 157.7 (sec/veh) Intersection LOS = F

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/US 550/CR 233
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1F - AT GRADE

N/S St: US 550/CR 233

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	2	1	2	2	1	2	1	1	2	1	1
LGConfig	L	T	R	L	T	R	L	T	R	L	T	R
Volume	1180	870	650	300	1050	335	1120	165	480	255	145	910
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right	A	A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A	A			WB	Right	A			
Green		30.0	30.0					30.0	10.0		
Yellow		4.0	4.0					4.0	4.0		
All Red		1.0	1.0					1.0	1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	858	3433	1.45	0.25	253.0	F		
T	903	3610	1.01	0.25	78.6	E	142.5	F
R	857	1583	0.80	0.54	27.6	C		
Westbound								
L	858	3433	0.37	0.25	37.4	D		
T	903	3610	1.22	0.25	155.6	F	106.9	F
R	857	1583	0.41	0.54	16.5	B		
Northbound								
L	858	3433	1.37	0.25	220.7	F		
T	155	1863	1.12	0.08	164.0	F	167.8	F
R	594	1583	0.85	0.38	45.7	D		
Southbound								
L	858	3433	0.31	0.25	36.8	D		
T	155	1863	0.99	0.08	123.2	F	21.3	C
R	1583	1583	0.61	1.00	0.7	A		

Intersection Delay = 119.2 (sec/veh) Intersection LOS = F

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/US 550/CR 233
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1F - AT GRADE

N/S St: US 550/CR 233

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	2	1	2	2	1	2	1	1	2	1	1
LGConfig	L	T	R	L	T	R	L	T	R	L	T	R
Volume	1165	1710	1390	250	1710	330	1105	190	400	415	215	1475
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right	A	A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A	A			WB	Right	A			
Green		30.0	30.0					30.0	10.0		
Yellow		4.0	4.0					4.0	4.0		
All Red		1.0	1.0					1.0	1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	858	3433	1.43	0.25	244.8	F		
T	903	3610	1.99	0.25	496.0	F	380.0	F
R	857	1583	1.71	0.54	350.7	F		
Westbound								
L	858	3433	0.31	0.25	36.8	D		
T	903	3610	1.99	0.25	496.0	F	376.8	F
R	857	1583	0.40	0.54	16.5	B		
Northbound								
L	858	3433	1.36	0.25	212.6	F		
T	155	1863	1.29	0.08	225.3	F	172.3	F
R	594	1583	0.71	0.38	35.8	D		
Southbound								
L	858	3433	0.51	0.25	39.2	D		
T	155	1863	1.46	0.08	293.1	F	50.4	D
R	1583	1583	0.98	1.00	18.2	B		

Intersection Delay = 278.3 (sec/veh) Intersection LOS = F

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 1/26/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/SH 172-CR 234
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1G/1F - AT GRADE

N/S St: SH 172/CR 234

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	2	1	1	2	1	2	1	1	1	1	1
LGConfig	L	T	R	L	T	R	L	T	R	L	T	R
Volume	260	1020	325	65	800	70	630	55	60	50	40	255
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A				WB	Right	A			
Green		15.0	47.0					28.0	10.0		
Yellow		4.0	4.0					4.0	4.0		
All Red		1.0	1.0					1.0	1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	429	3433	0.64	0.13	53.1	D		
T	1347	3438	0.80	0.39	35.8	D	33.1	C
R	1055	1583	0.32	0.67	8.7	A		
Westbound								
L	221	1770	0.31	0.13	48.6	D		
T	1347	3438	0.63	0.39	30.3	C	29.8	C
R	1055	1583	0.07	0.67	7.0	A		
Northbound								
L	801	3433	0.83	0.23	50.9	D		
T	155	1863	0.37	0.08	53.6	D	49.9	D
R	396	1583	0.16	0.25	35.3	D		
Southbound								
L	413	1770	0.13	0.23	36.5	D		
T	155	1863	0.27	0.08	52.5	D	44.8	D
R	396	1583	0.68	0.25	45.2	D		

Intersection Delay = 36.8 (sec/veh) Intersection LOS = D

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 1/26/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/SH 172-CR 234
Area Type: All other areas
Jurisd:
Year : 2025 ALT 1G/1F - AT GRADE

N/S St: SH 172/CR 234

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	2	1	1	2	1	2	1	1	1	1	1
LGConfig	L	T	R	L	T	R	L	T	R	L	T	R
Volume	385	1345	795	115	1245	90	640	105	105	135	80	405
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A				WB	Right	A			
Green		18.0	48.0					24.0	10.0		
Yellow		4.0	4.0					4.0	4.0		
All Red		1.0	1.0					1.0	1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	515	3433	0.79	0.15	57.1	E		
T	1375	3438	1.03	0.40	68.2	E	52.0	D
R	1016	1583	0.82	0.64	22.0	C		
Westbound								
L	266	1770	0.45	0.15	47.8	D		
T	1375	3438	0.95	0.40	49.6	D	46.8	D
R	1016	1583	0.09	0.64	8.2	A		
Northbound								
L	687	3433	0.98	0.20	77.3	E		
T	155	1863	0.72	0.08	68.3	E	70.8	E
R	435	1583	0.26	0.28	34.2	C		
Southbound								
L	354	1770	0.40	0.20	42.5	D		
T	155	1863	0.54	0.08	56.7	E	69.3	E
R	435	1583	0.98	0.28	80.8	F		

Intersection Delay = 55.5 (sec/veh) Intersection LOS = E

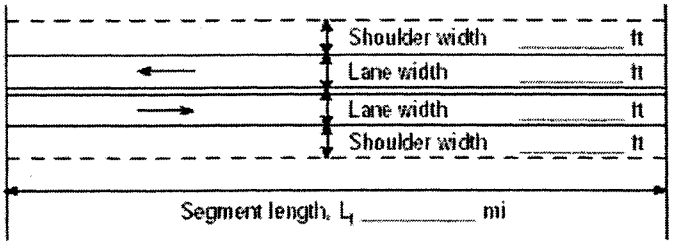
Attachment F
2025 Florida Mesa and Valley Section Highway Analyses

Attachment F-1
2025 Florida Mesa and Valley Section, No Action Alternative, Highway Analyses

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	EB US 160
Agency or Company	URS	From/To	FLORIDA MESA ~~I-CEN VILLAGE~~
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 NO ACTION

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 42

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 8

Analysis direction vol., V_d 1130veh/h

Opposing direction vol., V_o 935veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.99
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	1232	1019

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed[3], S_{FM}	mi/h	Base free-flow speed[3], $BFFS_{FM}$	60.0 mi/h
Observed volume[3], V_f	veh/h	Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.0 mi/h	Adj. for access points[3], f_A (Exhibit 20-5)	2.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	0.7 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	39.9 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	1189	984
Base percent time-spent-following[4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	89.6	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	3.0	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	92.6	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1{,}700$	0.72
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	892
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	3390
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	22.4

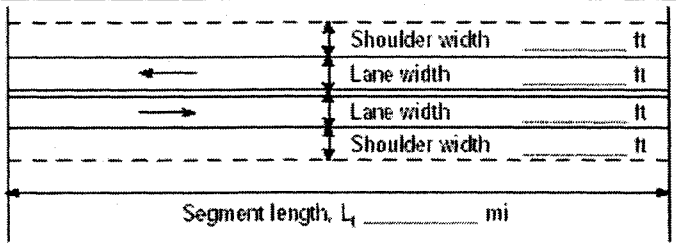
Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	EB US 160
Agency or Company	URS	From/To	FLORIDA MESA ~~& GEM VILLAGE~~
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 NO ACTION

Input Data



Show North Arrow

☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 42

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 8

Analysis direction vol., V_d 1585veh/h

Opposing direction vol., V_o 1450veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.99
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	1727	1580

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS} (Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.0 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	2.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	0.6 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	31.8 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	1668	1526
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	94.4	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	1.1	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	95.4	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	F
Volume to capacity ratio v/c $v/c=V_p/1{,}700$	1.02
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	1251
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	4755
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	39.4

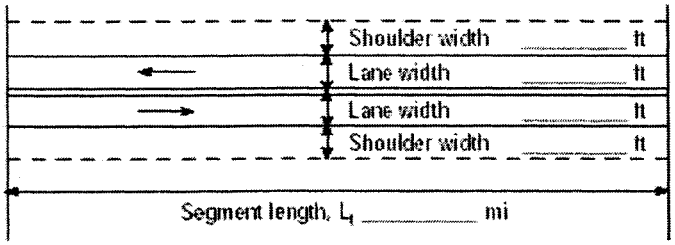
Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	WB US 160
Agency or Company	URS	From/To	FLORIDA MESA ~~[illegible]~~
Date Performed	3/19/2005		~~VILLAGE~~
Analysis Time Period	AM PEAK	Jurisdiction	
		Analysis Year	2025 NO ACTION

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 44

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 8

Analysis direction vol., V_d 935veh/h

Opposing direction vol., V_o 1130veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.99
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	1019	1232

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS} (Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.0 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	2.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	0.7 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	39.8 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	984	1189
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	89.7	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	2.1	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	91.8	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.60
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	738
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	2805
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	18.5

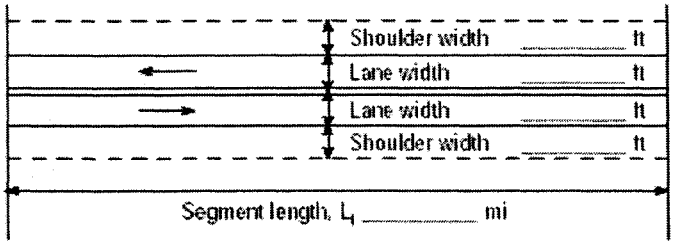
Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	WB US 160
Agency or Company	URS	From/To	FLORIDA MESA [illegible]
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 NO ACTION

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 44

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 8

Analysis direction vol., V_d 1450veh/h

Opposing direction vol., V_o 1585veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.99
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	1580	1727

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.0 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	2.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	0.6 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	31.8 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	1526	1668
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	94.3	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	0.9	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	95.2	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	F
Volume to capacity ratio v/c $v/c=V_p/1{,}700$	0.93
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	1145
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	4350
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	36.1

Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Attachment F-2
2025 Florida Mesa and Valley Section, Alternative C (Preferred Alternative) and Alternative A, Highway Analyses

HCS2000: Multilane Highways Release 4.1d

URS Corporation

9960 Federal Drive, Suite 300
Colorado Springs, CO 80920

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	DEA
Agency/Co:	URS
Date:	3/15/2005
Analysis Period:	AM PEAK
Highway:	US 160
From/To:	WEST OF CR 222/223
Jurisdiction:	
Analysis Year:	2025
Project ID:	US 160

FREE-FLOW SPEED

Direction	Eastbound 1		Westbound 2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	2		2	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.5	mph	0.5	mph
Free-flow speed	59.5	mph	59.5	mph

VOLUME

Direction	1		2	
Volume, V	1130	vph	935	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	297		246	
Trucks and buses	5	%	5	%
Recreational vehicles	0	%	0	%
Terrain type	Rolling		Rolling	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	2.5		2.5	
Recreational vehicles PCE, ER	2.0		2.0	
Heavy vehicle adjustment, fHV	0.930		0.930	
Flow rate, vp	639	pcphpl	529	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	639	pcphpl	529	pcphpl
Free-flow speed, FFS	59.5	mph	59.5	mph
Avg. passenger-car travel speed, S	59.5	mph	59.5	mph
Level of service, LOS	A		A	
Density, D	10.7	pc/mi/ln	8.9	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS2000: Multilane Highways Release 4.1d

URS Corporation

9960 Federal Drive, Suite 300
Colorado Springs, CO 80920

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	DEA
Agency/Co:	URS
Date:	3/15/2005
Analysis Period:	PM PEAK
Highway:	US 160
From/To:	WEST OF CR 222/223
Jurisdiction:	
Analysis Year:	2025
Project ID:	US 160

FREE-FLOW SPEED

Direction	Eastbound 1		Westbound 2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	2		2	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.5	mph	0.5	mph
Free-flow speed	59.5	mph	59.5	mph

VOLUME

Direction	1		2	
Volume, V	1585	vph	1450	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	417		382	
Trucks and buses	5	%	5	%
Recreational vehicles	0	%	0	%
Terrain type	Rolling		Rolling	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	2.5		2.5	
Recreational vehicles PCE, ER	2.0		2.0	
Heavy vehicle adjustment, fHV	0.930		0.930	
Flow rate, vp	896	pcphpl	820	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	896	pcphpl	820	pcphpl
Free-flow speed, FFS	59.5	mph	59.5	mph
Avg. passenger-car travel speed, S	59.5	mph	59.5	mph
Level of service, LOS	B		B	
Density, D	15.1	pc/mi/ln	13.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Attachment G
2025 Florida Mesa and Valley Section Intersection Analyses

Attachment G-1
2025 Florida Mesa and Valley Section, No Action Alternative, Intersection Analyses

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*DEA*	Intersection	*US 160/CR 222/223*
Agency/Co.	*URS*	Jurisdiction	
Date Performed	*3/19/2005*	Analysis Year	*2025 NO ACTION*
Analysis Time Period	*AM PEAK*		

Project Description *US 160*

East/West Street: *US 160* | North/South Street: *CR 222/CR 223*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*30*	*1055*	*45*	*15*	*600*	*10*
Peak-hour factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate (veh/h)	*31*	*1110*	*47*	*15*	*631*	*10*
Proportion of heavy vehicles, P_{HV}	*2*	--	--	*2*	--	--
Median type	*Undivided*					
RT Channelized?			*0*			*0*
Lanes	*0*	*1*	*1*	*0*	*1*	*0*
Configuration	*LT*		*R*	*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*200*	*5*	*15*	*10*	*10*	*135*
Peak-hour factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate (veh/h)	*210*	*5*	*15*	*10*	*10*	*142*
Proportion of heavy vehicles, P_{HV}	*2*	*2*	*2*	*2*	*2*	*2*
Percent grade (%)		*0*			*0*	
Flared approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized?			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*	*LTR*		*LTR*			*LTR*	
Volume, v (vph)	*31*	*15*		*230*			*162*	
Capacity, c_m (vph)	*943*	*604*		*30*			*236*	
v/c ratio	*0.03*	*0.02*		*7.67*			*0.69*	
Queue length (95%)	*0.10*	*0.08*		*28.07*			*4.44*	
Control Delay (s/veh)	*8.9*	*11.1*		*3257*			*48.1*	

LOS	A	B	F	E
Approach delay (s/veh)	--	--	3257	48.1
Approach LOS	--	--	F	E

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*DEA*
Agency/Co.	*URS*
Date Performed	*3/19/2005*
Analysis Time Period	*PM PEAK*

Site Information

Intersection	*US 160/CR 222/223*
Jurisdiction	
Analysis Year	*2025 NO ACTION*

Project Description *US 160*

East/West Street: *US 160* | North/South Street: *CR 222/CR 223*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*100*	*1320*	*165*	*15*	*1340*	*10*
Peak-hour factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate (veh/h)	*105*	*1389*	*173*	*15*	*1410*	*10*
Proportion of heavy vehicles, P_{HV}	*2*	--	--	*2*	--	--
Median type	*Undivided*					
RT Channelized?			*0*			*0*
Lanes	*0*	*1*	*1*	*0*	*1*	*0*
Configuration	*LT*		*R*	*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*60*	*10*	*15*	*5*	*5*	*50*
Peak-hour factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate (veh/h)	*63*	*10*	*15*	*5*	*5*	*52*
Proportion of heavy vehicles, P_{HV}	*2*	*2*	*2*	*2*	*2*	*2*
Percent grade (%)		*0*			*0*	
Flared approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized?			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*	*LTR*		*LTR*			*LTR*	
Volume, v (vph)	*105*	*15*		*88*			*62*	
Capacity, c_m (vph)	*479*	*423*						
v/c ratio	*0.22*	*0.04*						
Queue length (95%)	*0.83*	*0.11*						
Control Delay (s/veh)	*14.6*	*13.8*						

LOS	B	B						
Approach delay (s/veh)	--	--						
Approach LOS	--	--						

Attachment G-2
2025 Florida Mesa and Valley Section, Alternative C (Preferred Alternative) and Alternative A, Intersection Analyses

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 222/223
Area Type: All other areas
Jurisd:
Year : 2025

N/S St: CR 222/223

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	1	1	2	1	1	1	1	1	1	1
LGConfig	L	T	R	L	T	R	L	T	R	L	T	R
Volume	30	1055	45	15	600	10	200	5	15	10	10	135
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	A				NB Left	A		
Thru		A			Thru		A	
Right		A			Right		A	
Peds					Peds			
WB Left	A				SB Left	A		
Thru		A			Thru		A	
Right		A			Right		A	
Peds					Peds			
NB Right	A				EB Right	A		
SB Right	A				WB Right	A		
Green	10.0	35.0				15.0	10.0	
Yellow	4.0	4.0				4.0	4.0	
All Red	1.0	1.0				1.0	1.0	

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	197	1770	0.16	0.11	36.6	D		
T	1337	3438	0.83	0.39	29.4	C	28.7	C
R	967	1583	0.05	0.61	7.0	A		
Westbound								
L	197	1770	0.08	0.11	36.1	D		
T	1337	3438	0.47	0.39	20.9	C	21.0	C
R	967	1583	0.01	0.61	6.9	A		
Northbound								
L	295	1770	0.72	0.17	43.5	D		
T	207	1863	0.02	0.11	35.7	D	42.0	D
R	440	1583	0.04	0.28	23.7	C		
Southbound								
L	295	1770	0.04	0.17	31.5	C		
T	207	1863	0.05	0.11	35.9	D	27.2	C
R	440	1583	0.32	0.28	26.2	C		

Intersection Delay = 27.7 (sec/veh) Intersection LOS = C

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 222/223
Area Type: All other areas
Jurisd:
Year : 2025

N/S St: CR 222/223

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	1	1	2	1	1	1	1	1	1	1
LGConfig	L	T	R	L	T	R	L	T	R	L	T	R
Volume	100	1320	165	15	1340	10	60	10	15	5	5	50
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A				WB	Right	A			
Green		10.0	40.0					10.0	10.0		
Yellow		4.0	4.0					4.0	4.0		
All Red		1.0	1.0					1.0	1.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	197	1770	0.53	0.11	40.6	D		
T	1528	3438	0.91	0.44	31.7	C	29.7	C
R	967	1583	0.18	0.61	7.7	A		
Westbound								
L	197	1770	0.08	0.11	36.1	D		
T	1528	3438	0.92	0.44	33.3	C	33.1	C
R	967	1583	0.01	0.61	6.9	A		
Northbound								
L	197	1770	0.32	0.11	37.8	D		
T	207	1863	0.05	0.11	35.9	D	35.1	D
R	440	1583	0.04	0.28	23.7	C		
Southbound								
L	197	1770	0.03	0.11	35.7	D		
T	207	1863	0.02	0.11	35.7	D	26.2	C
R	440	1583	0.12	0.28	24.4	C		

Intersection Delay = 31.3 (sec/veh) Intersection LOS = C

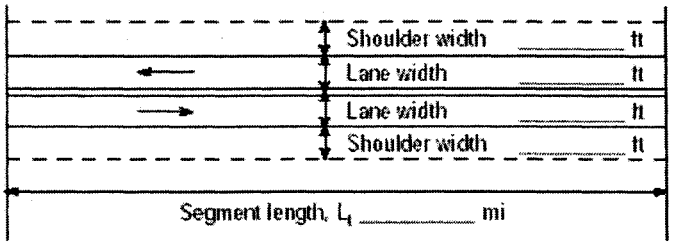
Attachment H
2025 Dry Creek and Gem Village Section Highway Analyses

Attachment H-1
2025 Dry Creek and Gem Village Section, No Action Alternative, Highway Analyses

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	EB US 160
Agency or Company	URS	From/To	GEM VILLAGE
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 NO ACTION

Input Data



Show North Arrow

☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 58

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 5

Analysis direction vol., V_d 750veh/h

Opposing direction vol., V_o 925veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.99
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	817	1008

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.8 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	1.3 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	0.9 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.8 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	43.7 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	789	974
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	86.7	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	3.9	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	90.7	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1{,}700$	0.48
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	1184
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	4500
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	27.1

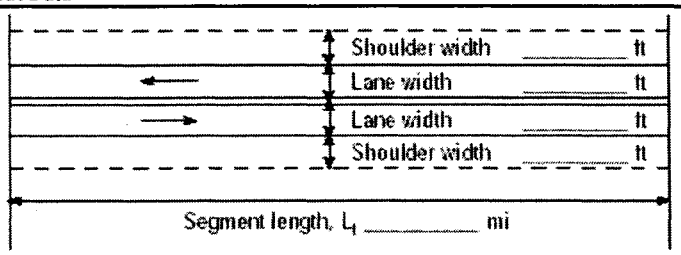
Notes

1.If the highway is extended segment (level) or rolling terrain, f_G=1.0 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	EB US 160
Agency or Company	URS	From/To	GEM VILLAGE
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 NO ACTION

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 58

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 5

Analysis direction vol., V_d 1010veh/h

Opposing direction vol., V_o 865veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.99
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	1101	943

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed[3], S_{FM}	mi/h	Base free-flow speed[3], $BFFS_{FM}$	60.0 mi/h
Observed volume[3], V_f	veh/h	Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.8 mi/h	Adj. for access points[3], f_A (Exhibit 20-5)	1.3 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	0.9 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.8 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	42.0 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	1063	911
Base percent time-spent-following[4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	88.8	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	4.6	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	93.3	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.65
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	1595
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	6060
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	38.0

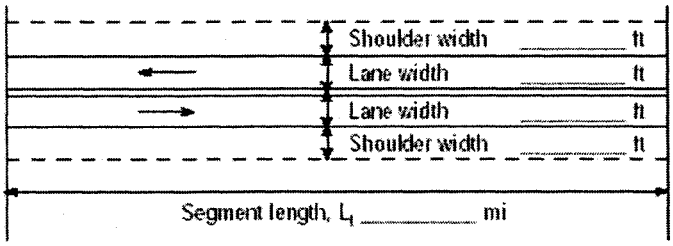
Notes

1.If the highway is extended segment (level) or rolling terrain, f_G=1.0 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	WB US 160
Agency or Company	URS	From/To	GEM VILLAGE
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 NO ACTION

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 57

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 5

Analysis direction vol., V_d 925veh/h

Opposing direction vol., V_o 750veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.99
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	1008	817

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.8 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	1.3 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	1.0 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.8 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	43.5 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	974	789
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	85.2	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	5.9	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	91.1	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.59
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	1461
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	5550
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	33.6

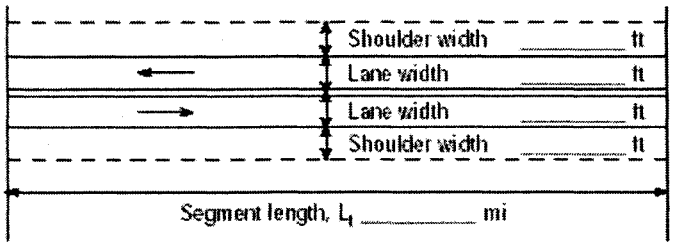
Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	WB US 160
Agency or Company	URS	From/To	GEM VILLAGE
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 NO ACTION

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 57

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 5

Analysis direction vol., V_d 865veh/h

Opposing direction vol., V_o 1010veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.99
Directional flow rate [2], v_i(pc/h) $v_i=V_f/(PHF*f_{HV}*f_G)$	943	1101

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS}(Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.8 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	1.3 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	0.8 mi/h	Free-flow speed, FFS_d (FSS=BFFS-f_{LS}-f_A)	58.8 mi/h
		Average travel speed, ATS ATS=FFS-0.00776v_p-f_{np}	42.1 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate [2], v_i(pc/h) $v_i=V_f/(PHF*f_{HV}*f_G)$	911	1063
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	88.5	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	3.2	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	91.7	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.55
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	1366
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	5190
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	32.5

Notes

1.If the highway is extended segment (level) or rolling terrain, f_G=1.0 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Attachment H-2
2025 Dry Creek and Gem Village Section, Alternative H (Preferred Alternative) and Alternative C, Highway Analyses

HCS2000: Multilane Highways Release 4.1d

URS Corporation

9960 Federal Drive, Suite 300
Colorado Springs, CO 80920

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	DEA
Agency/Co:	URS
Date:	3/15/2005
Analysis Period:	AM PEAK
Highway:	US 160
From/To:	CR 222/223 TO GEM VILLAGE
Jurisdiction:	
Analysis Year:	2025
Project ID:	US 160

FREE-FLOW SPEED

Direction	Eastbound 1		Westbound 2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	3		2	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.8	mph	0.5	mph
Free-flow speed	59.3	mph	59.5	mph

VOLUME

Direction	1		2	
Volume, V	1080	vph	625	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	284		164	
Trucks and buses	5	%	5	%
Recreational vehicles	0	%	0	%
Terrain type	Rolling		Rolling	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	2.5		2.5	
Recreational vehicles PCE, ER	2.0		2.0	
Heavy vehicle adjustment, fHV	0.930		0.930	
Flow rate, vp	611	pcphpl	353	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	611	pcphpl	353	pcphpl
Free-flow speed, FFS	59.3	mph	59.5	mph
Avg. passenger-car travel speed, S	59.3	mph	59.5	mph
Level of service, LOS	A		A	
Density, D	10.3	pc/mi/ln	5.9	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS2000: Multilane Highways Release 4.1d

URS Corporation

9960 Federal Drive, Suite 300
Colorado Springs, CO 80920

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	DEA
Agency/Co:	URS
Date:	3/15/2005
Analysis Period:	PM PEAK
Highway:	US 160
From/To:	CR 222/223 TO GEM VILLAGE
Jurisdiction:	
Analysis Year:	2025
Project ID:	US 160

FREE-FLOW SPEED

	Eastbound		Westbound	
Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	3		2	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.8	mph	0.5	mph
Free-flow speed	59.3	mph	59.5	mph

VOLUME

Direction	1		2	
Volume, V	1340	vph	1365	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	353		359	
Trucks and buses	5	%	5	%
Recreational vehicles	0	%	0	%
Terrain type	Rolling		Rolling	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	2.5		2.5	
Recreational vehicles PCE, ER	2.0		2.0	
Heavy vehicle adjustment, fHV	0.930		0.930	
Flow rate, vp	758	pcphpl	772	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	758	pcphpl	772	pcphpl
Free-flow speed, FFS	59.3	mph	59.5	mph
Avg. passenger-car travel speed, S	59.3	mph	59.5	mph
Level of service, LOS	B		B	
Density, D	12.8	pc/mi/ln	13.0	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

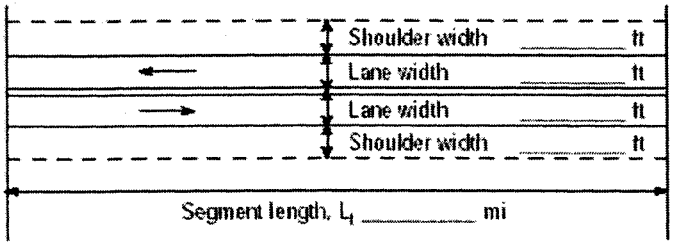
Attachment I
2025 Bayfield Section Highway Analyses

Attachment I-1
2025 Bayfield Section, No Action Alternative, Highway Analyses

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	EB US 160
Agency or Company	URS	From/To	Bayfield
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 NO ACTION

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 72

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 4

Analysis direction vol., V_d 550veh/h

Opposing direction vol., V_o 615veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.99
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	599	670

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS} (Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	59.0 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	1.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	1.6 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	59.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	47.6 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	579	647
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	77.1	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	9.4	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	86.5	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1{,}700$	0.35
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	289
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	1100
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	6.1

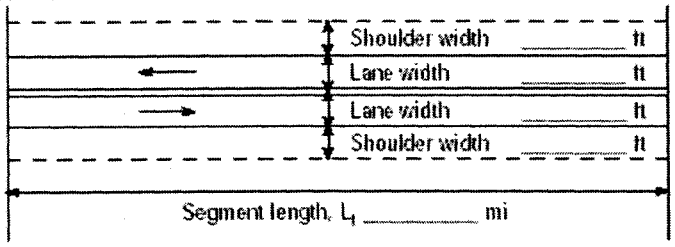
Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	EB US 160
Agency or Company	URS	From/To	BAYFIELD
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 NO ACTION

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 72

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 4

Analysis direction vol., V_d 755veh/h

Opposing direction vol., V_o 400veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.9
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.957
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.93
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	823	473

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS} (Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	59.0 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	1.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	2.3 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	59.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	46.6 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.0	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	0.976
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	1.00	0.94
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	795	459
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	77.7	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	14.1	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	91.8	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.48
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	397
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	1510
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	8.5

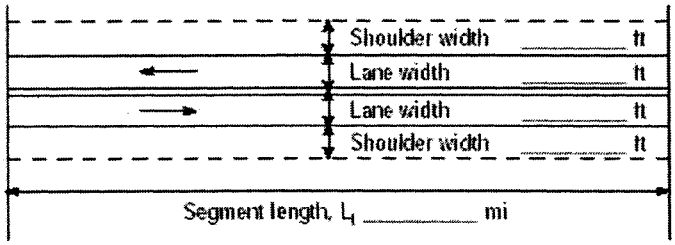
Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	WB US 160
Agency or Company	URS	From/To	BAYFIELD
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	AM PEAK	Analysis Year	2025 NO ACTION

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 65

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 5

Analysis direction vol., V_d 615veh/h

Opposing direction vol., V_o 550veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.5	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	0.976
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.99	0.99
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	670	599

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS} (Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	58.8 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	1.3 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	1.7 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	58.8 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	47.2 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	647	579
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	76.5	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	10.5	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	87.0	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.39
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	324
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	1230
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	6.9

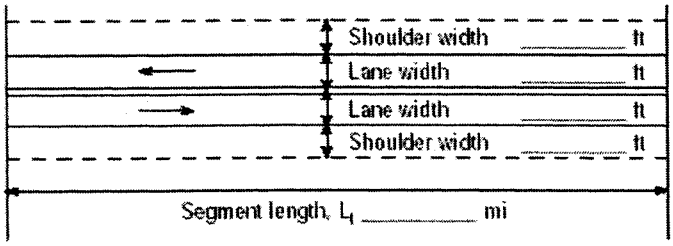
Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	DEA	Highway / Direction of Travel	WB US 160
Agency or Company	URS	From/To	BAYFIELD
Date Performed	3/19/2005	Jurisdiction	
Analysis Time Period	PM PEAK	Analysis Year	2025 NO ACTION

Input Data



☑ Class I highway ☐ Class II highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.95%

No-passing zone 65

% Trucks and Buses , P_T 5 %

% Recreational vehicles, P_R 0%

Access points/ mi 4

Analysis direction vol., V_d 400veh/h

Opposing direction vol., V_o 755veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.9	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.1	1.1
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.957	0.976
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	0.93	0.99
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	473	823

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed [3], S_{FM}	mi/h	Base free-flow speed [3], $BFFS_{FM}$	60.0 mi/h
Observed volume [3], V_f	veh/h	Adj. for lane width and shoulder width, [3] f_{LS} (Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	59.0 mi/h	Adj. for access points [3], f_A (Exhibit 20-5)	1.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	1.1 mi/h	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	59.0 mi/h
		Average travel speed, ATS $ATS=FFS-0.00776v_p-f_{np}$	47.8 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.5	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV} $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	1.000
Grade adjustment factor [1], f_G (Exhibit 20-8 or 20-14)	0.94	1.00
Directional flow rate [2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	459	795
Base percent time-spent-following [4], BPTSF(%) $BPTSF=100(1-e^{av_d^b})$	77.0	
Adj. for no-passing zone, f_{np}(%) (Exhibit. 20-20)	6.3	
Percent time-spent-following, PTSF(%) $PTSF=BPTSF+f_{np}$	83.2	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio v/c $v/c=V_p/1,700$	0.28
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $VMT_{15}=0.25L_t(V/PHF)$	211
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi) $VMT_{60}=V*L_t$	800
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}=VMT_{15}/ATS$	4.4

Notes

1.If the highway is extended segment (level) or rolling terrain, $f_G=1.0$ 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only. 4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Attachment I-2
2025 Bayfield Section, Alternative B (Preferred Alternative) and Alternative A, Highway Analyses

HCS2000: Multilane Highways Release 4.1d

URS Corporation

9960 Federal Drive, Suite 300
Colorado Springs, CO 80920

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	DEA
Agency/Co:	URS
Date:	3/15/2005
Analysis Period:	AM PEAK
Highway:	US 160
From/To:	GEM VILLAGE TO BAYFIELD
Jurisdiction:	
Analysis Year:	2025
Project ID:	US 160

FREE-FLOW SPEED

	Eastbound		Westbound	
Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	2		2	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.5	mph	0.5	mph
Free-flow speed	59.5	mph	59.5	mph

VOLUME

Direction	1		2	
Volume, V	750	vph	925	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	197		243	
Trucks and buses	5	%	5	%
Recreational vehicles	0	%	0	%
Terrain type	Rolling		Rolling	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	2.5		2.5	
Recreational vehicles PCE, ER	2.0		2.0	
Heavy vehicle adjustment, fHV	0.930		0.930	
Flow rate, vp	424	pcphpl	523	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	424	pcphpl	523	pcphpl
Free-flow speed, FFS	59.5	mph	59.5	mph
Avg. passenger-car travel speed, S	59.5	mph	59.5	mph
Level of service, LOS	A		A	
Density, D	7.1	pc/mi/ln	8.8	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS2000: Multilane Highways Release 4.1d

URS Corporation

9960 Federal Drive, Suite 300
Colorado Springs, CO 80920

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	DEA
Agency/Co:	URS
Date:	3/15/2005
Analysis Period:	PM PEAK
Highway:	US 160
From/To:	GEM VILLAGE TO BAYFIELD
Jurisdiction:	
Analysis Year:	2025
Project ID:	US 160

FREE-FLOW SPEED

Direction	Eastbound 1		Westbound 2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	2		2	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.5	mph	0.5	mph
Free-flow speed	59.5	mph	59.5	mph

VOLUME

Direction	1		2	
Volume, V	1010	vph	865	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	266		228	
Trucks and buses	5	%	5	%
Recreational vehicles	0	%	0	%
Terrain type	Rolling		Rolling	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	2.5		2.5	
Recreational vehicles PCE, ER	2.0		2.0	
Heavy vehicle adjustment, fHV	0.930		0.930	
Flow rate, vp	571	pcphpl	489	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	571	pcphpl	489	pcphpl
Free-flow speed, FFS	59.5	mph	59.5	mph
Avg. passenger-car travel speed, S	59.5	mph	59.5	mph
Level of service, LOS	A		A	
Density, D	9.6	pc/mi/ln	8.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Attachment J
2025 Bayfield Section Intersection Analyses

Attachment J-1
2025 Bayfield Section, No Action Alternative, Intersection Analyses

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/18/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 501
Area Type: All other areas
Jurisd:
Year : 2025 NO ACTION

N/S St: CR 501

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Volume	70	340	140	305	455	30	95	75	255	20	140	65
Lane Width	12.0	12.0		12.0	12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru	A			
	Right		A				Right	A			
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru	A			
	Right		A				Right	A			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		17.0	28.0					30.0			
Yellow		4.0	4.0					4.0			
All Red		1.0	1.0					1.0			

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	334	1770	0.22	0.19	31.2	C		
TR	543	1745	0.93	0.31	52.8	D	50.1	D
Westbound								
L	334	1770	0.96	0.19	75.0	E		
TR	559	1796	0.91	0.31	49.5	D	59.4	E
Northbound								
LTR	477	1430	0.94	0.33	55.4	E	55.4	E
Southbound								
LTR	566	1697	0.42	0.33	23.7	C	23.7	C

Intersection Delay = 51.9 (sec/veh) Intersection LOS = D

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/18/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 501
Area Type: All other areas
Jurisd:
Year : 2025 NO ACTION

N/S St: CR 501

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Volume	65	575	115	360	280	60	60	70	275	45	130	60
Lane Width	12.0	12.0		12.0	12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru	A			
	Right		A				Right	A			
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru	A			
	Right		A				Right	A			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		19.0	31.0					25.0			
Yellow		4.0	4.0					4.0			
All Red		1.0	1.0					1.0			

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	374	1770	0.18	0.21	29.4	C		
TR	611	1773	1.19	0.34	129.9	F	121.3	F
Westbound								
L	374	1770	1.01	0.21	85.5	F		
TR	610	1771	0.59	0.34	25.7	C	56.4	E
Northbound								
LTR	418	1506	1.02	0.28	81.5	F	81.5	F
Southbound								
LTR	383	1378	0.64	0.28	32.3	C	32.3	C

Intersection Delay = 81.9 (sec/veh) Intersection LOS = F

Attachment J-2
2025 Bayfield Section, Alternative B (Preferred Alternative), Intersection Analyses

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 501 NORTH SIDE
Area Type: All other areas
Jurisd:
Year : 2025 BAYFIELD B ALT.

N/S St: CR 501

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	1	0	1	1	1	0	0	1	1
LGConfig				L		R	L	T			T	R
Volume				305		30	95	145			160	65
Lane Width				12.0		12.0	12.0	12.0			12.0	12.0
RTOR Vol						0						0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left					NB Left	A		
Thru					Thru	A	A	
Right					Right			
Peds					Peds			
WB Left	A				SB Left			
Thru					Thru		A	
Right	A				Right		A	
Peds					Peds			
NB Right					EB Right			
SB Right	A				WB Right			
Green	30.0					15.0	30.0	
Yellow	4.0					4.0	4.0	
All Red	1.0					1.0	1.0	

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
Westbound								
L	590	1770	0.54	0.33	25.5	C		
							25.0	C
R	528	1583	0.06	0.33	20.5	C		
Northbound								
L	295	1770	0.34	0.17	33.8	C		
T	1035	1863	0.15	0.56	9.8	A	19.3	B
Southbound								
T	621	1863	0.27	0.33	22.2	C	16.9	B
R	1143	1583	0.06	0.72	3.7	A		

Intersection Delay = 21.0 (sec/veh) Intersection LOS = C

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 501 NORTH SIDE
Area Type: All other areas
Jurisd:
Year : 2025 BAYFIELD B ALT.

N/S St: CR 501

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	1	0	1	1	1	0	0	1	1
LGConfig				L		R	L	T			T	R
Volume				360		60	60	135			175	60
Lane Width				12.0		12.0	12.0	12.0			12.0	12.0
RTOR Vol						0						0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left					NB Left	A		
Thru					Thru	A	A	
Right					Right			
Peds					Peds			
WB Left	A				SB Left			
Thru					Thru		A	
Right	A				Right		A	
Peds					Peds			
NB Right					EB Right			
SB Right	A				WB Right			
Green	30.0					15.0	30.0	
Yellow	4.0					4.0	4.0	
All Red	1.0					1.0	1.0	

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
Westbound								
L	590	1770	0.64	0.33	27.8	C		
							26.9	C
R	528	1583	0.12	0.33	20.9	C		
Northbound								
L	295	1770	0.21	0.17	32.8	C		
T	1035	1863	0.14	0.56	9.7	A	16.8	B
Southbound								
T	621	1863	0.30	0.33	22.5	C	17.7	B
R	1143	1583	0.06	0.72	3.6	A		

Intersection Delay = 22.0 (sec/veh) Intersection LOS = C

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 501 SOUTH SIDE
Area Type: All other areas
Jurisd:
Year : 2025 BAYFIELD B ALT.

N/S St: CR 501

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	0	1	1	1	1	0
LGConfig	L		R					T	R	L	T	
Volume	70		140					170	255	20	445	
Lane Width	12.0		12.0					12.0	12.0	12.0	12.0	
RTOR Vol			0						0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left		A			NB	Left				
	Thru						Thru		A		
	Right		A				Right		A		
	Peds						Peds				
WB	Left					SB	Left	A			
	Thru						Thru	A	A		
	Right						Right				
	Peds						Peds				
NB	Right		A			EB	Right				
SB	Right					WB	Right				
Green			30.0					15.0	30.0		
Yellow			4.0					4.0	4.0		
All Red			1.0					1.0	1.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	590	1770	0.13	0.33	21.0	C		
							21.9	C
R	528	1583	0.28	0.33	22.3	C		
Westbound								
Northbound								
T	621	1863	0.29	0.33	22.4	C	11.5	B
R	1143	1583	0.23	0.72	4.3	A		
Southbound								
L	295	1770	0.07	0.17	31.7	C		
T	1035	1863	0.45	0.56	12.2	B	13.0	B

Intersection Delay = 14.1 (sec/veh) Intersection LOS = B

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 501 SOUTH SIDE
Area Type: All other areas
Jurisd:
Year : 2025 BAYFIELD B ALT.

N/S St: CR 501

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	0	1	1	1	1	0
LGConfig	L		R					T	R	L	T	
Volume	65		115					130	275	45	490	
Lane Width	12.0		12.0					12.0	12.0	12.0	12.0	
RTOR Vol			0						0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left		A			NB Left			
Thru					Thru	A		
Right		A			Right	A		
Peds					Peds			
WB Left					SB Left	A		
Thru					Thru	A	A	
Right					Right			
Peds					Peds			
NB Right		A			EB Right			
SB Right					WB Right			
Green		30.0				15.0	30.0	
Yellow		4.0				4.0	4.0	
All Red		1.0				1.0	1.0	

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	590	1770	0.12	0.33	20.9	C		
							21.5	C
R	528	1583	0.23	0.33	21.9	C		
Westbound								
Northbound								
T	621	1863	0.22	0.33	21.8	C	10.0-	A
R	1143	1583	0.25	0.72	4.4	A		
Southbound								
L	295	1770	0.16	0.17	32.4	C		
T	1035	1863	0.50	0.56	12.7	B	14.3	B

Intersection Delay = 13.9 (sec/veh) Intersection LOS = B

Attachment J-3
2025 Bayfield Section, Alternative A, Intersection Analyses

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: AM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 501
Area Type: All other areas
Jurisd:
Year : 2025 BAYFIELD A ALT.

N/S St: CR 501

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	1	1	2	1	1	1	1	1	1	1
LGConfig	L	T	R	L	T	R	L	T	R	L	T	R
Volume	70	340	140	305	455	30	95	75	255	20	140	65
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A				WB	Right	A			
Green		20.0	24.0					15.0	11.0		
Yellow		4.0	4.0					4.0	4.0		
All Red		1.0	1.0					1.0	1.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	393	1770	0.19	0.22	28.6	C		
T	917	3438	0.39	0.27	27.3	C	23.9	C
R	774	1583	0.19	0.49	13.1	B		
Westbound								
L	393	1770	0.82	0.22	45.9	D		
T	917	3438	0.52	0.27	28.7	C	34.7	C
R	774	1583	0.04	0.49	12.0	B		
Northbound								
L	295	1770	0.34	0.17	33.8	C		
T	228	1863	0.35	0.12	37.1	D	26.1	C
R	633	1583	0.42	0.40	20.0-	B		
Southbound								
L	295	1770	0.07	0.17	31.7	C		
T	228	1863	0.64	0.12	43.8	D	35.0-	C
R	633	1583	0.11	0.40	17.0	B		

Intersection Delay = 29.9 (sec/veh) Intersection LOS = C

HCS2000: Signalized Intersections Release 4.1d

Analyst: DEA
Agency: URS
Date: 3/15/2005
Period: PM PEAK
Project ID: US 160
E/W St: US 160

Inter.: US 160/CR 501
Area Type: All other areas
Jurisd:
Year : 2025 BAYFIELD A ALT.

N/S St: CR 501

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	1	1	2	1	1	1	1	1	1	1
LGConfig	L	T	R	L	T	R	L	T	R	L	T	R
Volume	65	575	115	360	280	60	60	70	275	45	130	60
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru		A				Thru		A		
	Right		A				Right		A		
	Peds						Peds				
NB	Right	A				EB	Right	A			
SB	Right	A				WB	Right	A			
Green		24.0	22.0					13.0	11.0		
Yellow		4.0	4.0					4.0	4.0		
All Red		1.0	1.0					1.0	1.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	472	1770	0.14	0.27	25.3	C		
T	840	3438	0.72	0.24	34.2	C	30.5	C
R	704	1583	0.17	0.44	15.2	B		
Westbound								
L	472	1770	0.80	0.27	40.5	D		
T	840	3438	0.35	0.24	28.4	C	33.4	C
R	704	1583	0.09	0.44	14.5	B		
Northbound								
L	256	1770	0.25	0.14	34.7	C		
T	228	1863	0.32	0.12	36.9	D	23.3	C
R	704	1583	0.41	0.44	17.4	B		
Southbound								
L	256	1770	0.18	0.14	34.2	C		
T	228	1863	0.60	0.12	41.8	D	33.4	C
R	704	1583	0.09	0.44	14.5	B		

Intersection Delay = 30.4 (sec/veh) Intersection LOS = C