STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Traffic & Safety Section

222 South 6th Street, Room 100
Grand Junction, Colorado 81501
(970) 683-6287 Fax: 970-683-6290

Date: October 12, 2010
To: City/County Transportation Officials
From: Alisa Babler
Permit Unit Engineer
Subject: CDOT Region 3 Intersection Analysis and Prioritization Request for Applications

CDOT Region 3 Traffic and Safety (CDOT) has commissioned Fehr and Peers to complete the Intersection Analysis and Prioritization Study. The intent of this study is to update the study done in 2007, develop a methodology, and prioritize intersection improvements for the use of the TPR and CDOT in a multi-year funding program. Up to three intersections per county will be analyzed in-depth and ranked, to assist in developing priorities for CDOT and the TPR. The study will analyze the intersections, identifying long and short term improvements to address deficiencies, and recommend prioritization for future funding.

At this time we are requesting intersection applications for the study. Intersections for consideration should have safety or operational issues and be located on the state highway system. We are requesting that counties submit up to three intersections for inclusion in the study. Additionally, please provide the application packet to cities within your respective county for additional submittals by the city if desired. All intersections submitted will be compiled and an initial evaluation done to establish the top three intersections in the county for an in-depth analysis and inclusion in the study. Intersections not included in the in-depth analysis will be provided as a list in the appendix for future reference.

Any supporting data and documentation available, as it relates to the intersection, will be useful in determining applicable improvements and the final priority of the intersection. The application should include as many specifics as possible regarding deficiencies of the intersection, time of day, impacts of weather, geometric constraints, right of way constraints, crash history, and any other site specific information available.

Please provide your applications no later than **December 15, 2010.** Completed applications should be sent to:

Emily Gloeckner, P.E.
Fehr & Peers Transportation Consultants
621 17th Street, Ste. 2301
Denver, CO 80293
E.Gloeckner@fehrandpeers.com

Phone: 303-296-4300
Fax: 303-296-4302

Thank you for assisting us in the development of this program. Should you have any questions, please feel free to contact the CDOT project manager, Alisa Babler at 970-683-6271 or the Fehr & Peers project manager, Emily Gloeckner, at 303-296-4300.

Region 3 Intersection Analysis and Prioritization Intersection Application

Requesting Agency

Agency Name	Town of Carbondale
Contact Person	Larry Ballenger
Title	Public Works Director
Email	larryb@sopris.net
Phone Number	970-963-1307
Mailing Address	511 Colorado AvenueCarbondale, CO 81623

Intersection Location			
Highway (example, US 50)	SHW 133		
Highway Milepost	66.80		
Local Cross Street name	Snowmass Drive		

Is the Cross Street (check one) [✓ Public ROW] Private Drive Other

Intersection Information

Type of Intersection (check one)	Signal	[✓ Minor St Stop]	All Way Stop	Other:
Nearby Driveways	[✓ Yes:] Distance between intersections: Approximately 465' to Roaring Fork Ave. (to the South)			No
Traffic Mix (check all that apply)	[✓ Trucks]	[✓ Pedestrians]	[✓ Bicycles]	Other:
Intersection Issues	Please describe the types of safety or operational issues at the intersection.			
Safety Issues:	The Snowmass Drive and HW 133 intersection receives a significant amount of pedestrian traffic, mainly related to school activity. The Town has a middle school at the corner of Snowmass Dr. and HW 133, and an elementary school a short distance to the north, on Snowmass Dr. While a formal pedestrian gap assessment has not been performed, the distance pedestrians must travel to cross HW 133 at this location is greater than the Hendrick Dr. intersection. The Town utilizes a police officer as a crossing guard in order to assist pedestrians and cyclists during morning and afternoon peak hours. The Town feels that the increased amount of pedestrian traffic traveling primarily to the two schools combined with the crossing length is cause for concern with regard to pedestrian safety.			
Operational Issues:	The Town has received complaints from its residents experiencing difficulty completing adequate turning movements at this intersection during morning and afternoon peak hours. Existing traffic counts performed in 2008 (Felsburg Holt & Ullvig, 2009) calculate the minor leg approaches operating at a LOS of C and D. FH&U projected short term (2011) future traffic conditions to result in LOS D and E for the approaches, if left unsignalized. The Town feels that the increased school traffic has accelerated this timeframe and that the intersection is performing worse than FH&U originally anticipated. Under current operating conditions a crossing guard is implemented at the intersection of HW 133 and Snowmass Dr. per CDOT's recommendations, in order to assist with safe pedestrian crossings during peak morning and afternoon hours. The police department currently provides the school district with this service resulting in an added strain on the Town's Police Department.			

Intersection Deficiencies

Please provide a brief description of the existing intersection deficiencies and associated safety concerns, including time of the concerns (day of the week/hour(s)/seasons/time/weekday/weekend/holiday/etc):

As mentioned above the HW133/Snowmass Drive intersection experiences high traffic volumes during the morning and afternoon peak hours, particularly during the school year. Existing traffic counts performed in 2008 (Felsburg Holt & Ullvig, 2009) calculate the minor leg approaches operating at a LOS of C and D. FH&U projected short term (2011) future traffic conditions to result in LOS D and E for the approaches, if left unsignalized. The Town feels that the increased school traffic has accelerated this timeframe and that the intersection is performing worse than FH&U originally anticipated during the AM and PM peak hours. The result is significantly long que lengths during the morning and afternoon peak hours throughout the school year.

Mitigation

Please provide a brief description of possible mitigations, improvements, and/or projects to mitigate the safety concerns at the intersection:

The SH 133 Corridor Feasibility Study (PBS&J, 2002) recommended the HW 133 Snowmass Drive intersection be improved to a signalized intersection in order to accommodate future traffic volumes and provide acceptable Levels of Service by 2025. The Town of Carbondale is requesting that CDOT review the intersection and provide a recommendation that will alleviate the immediate peak traffic problems during the school year, and accommodate future traffic volumes consistent with the Feasibility Study.

Are there any existing plans for improvements for this intersection? Yes/[✓ No.] If yes, please explain:

Are any additional funding sources available for this project: [✓ Yes]/No. If yes, please explain:

The Town of Carbondale would like to treat this project as a Local Agency project. Associated matching fund requirements can be met

Does this intersection have impacts to adjacent intersections, roadways, etc? If yes, please explain:

None

Additional Information

To assist in analyzing the intersection please attach the following information if available/applicable:

- Accident data, including police reports if available
- Traffic Volumes, such as AADT/ADT, peak hour volumes, peak hour turning movement counts
- Traffic Studies
- Pedestrian Counts
- Bicycle Counts
- Existing signal timing or Synchro files
- Existing construction plans
- Survey data
- Aerial photos
- Photographs of the intersection
- Right of Way maps
- Any other data/documentation to assist in analyzing the intersection

List of Attachments:

* SH 133 Corridor Feasibility Study; PBS&J, 2002
* Carbondale Elementary School Redevelopment Traffic Impact Analysis; Felsburg Holt & Ullveg, 2009

1.0 INTRODUCTION

The Town of Carbondale in partnership with the Colorado Department of Transportation prepared the *State Highway (SH) 133 Corridor Feasibility Study*. The study limits are between SH 82 and Meadowood Drive (milepost 68.82 to 66.46), approximately 2.3 miles. During the corridor study, two separate areas were analyzed: the SH 133 corridor from the existing bridge over the Roaring Fork River to Meadowood Drive and the SH 133 and SH 82 intersection including the existing Roaring Fork River bridge. The study corridor is shown in Figure 1.1.

The purpose of the study is to review the current and projected conditions, make corridor improvement recommendations, and identify programming cost estimates. A traffic analysis was completed for existing and future anticipated traffic volumes. The SH 133 intersections with SH 82, Cowen Drive, Village Road, Delores Way, Industrial Place, Neislanik Avenue, Main Street, Garfield Avenue, Sopris Avenue, Hendrick Road, Weant Boulevard, Snowmass Drive, Roaring Fork Avenue, and Meadowood Drive were analyzed in detail as part of the study. An environmental overview was also completed to evaluate environmental constraints in the area. Additionally, multiple interchange alternatives were evaluated for the intersection of SH 133 and SH 82.

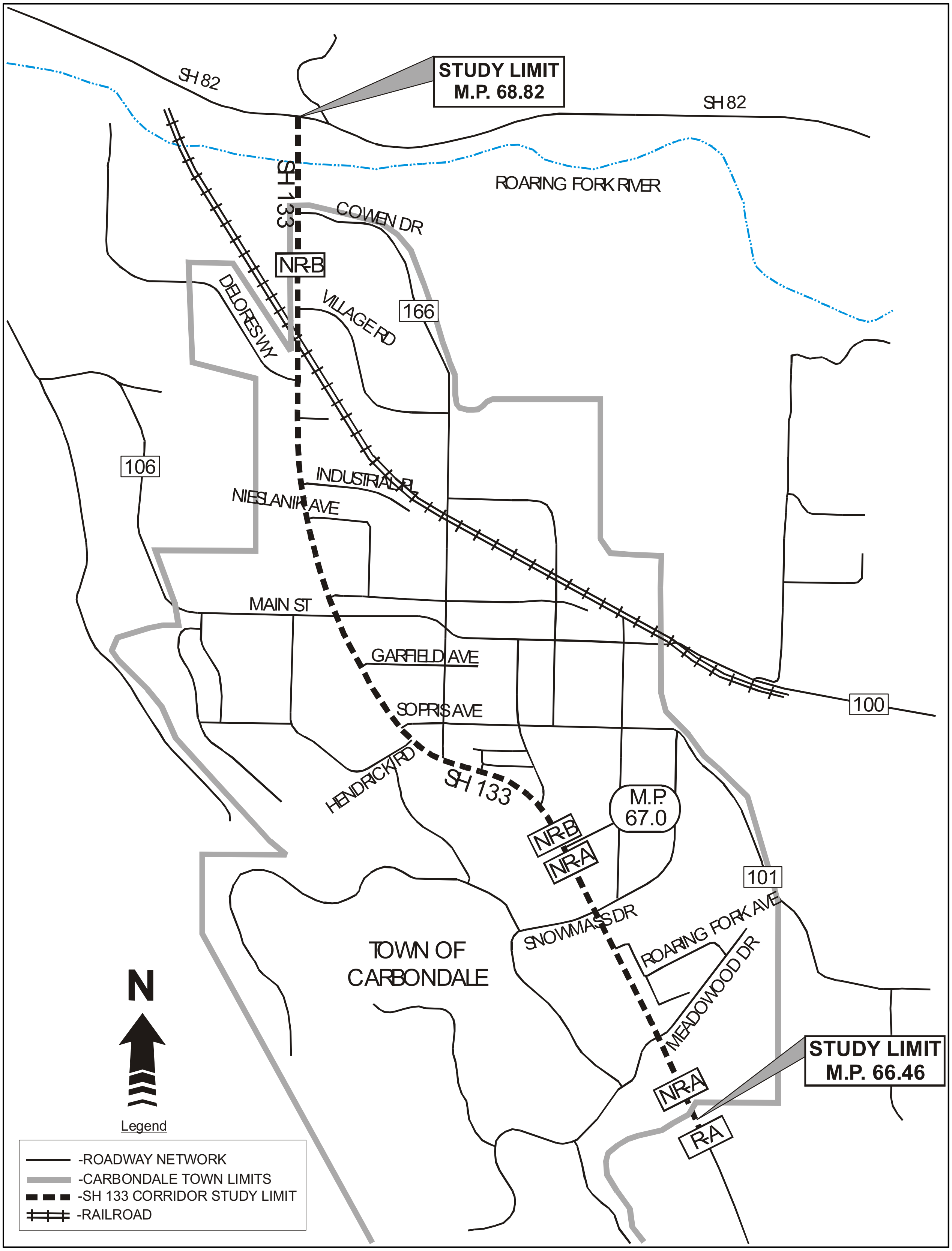
The corridor study included the completion of the SH 133 Access Management Plan (see Appendix A). This plan evaluated the existing access points along SH 133 and recommended appropriate modifications. The purpose of the access plan is to:

- Improve traffic flow
- Improve traffic safety
- Reduce traffic conflicts
- Provide appropriate access to adjacent land uses

In 1998, a group of local citizens completed a study of the SH 133 corridor within the Town of Carbondale. The study, *Report of the Highway (SH) 133 Citizens Task Force*, March 1998 defined a vision and mission for the corridor. The Task Force vision was "A street that connects the town rather than divides it" and the mission was "To Address Issues of Safety, Circulation and Beautification". The study task force developed the following recommendations for the corridor.

- Build safe bike and pedestrian facilities
- Construct landscaped medians and roadway edges
- Widen the existing roadway to improve traffic operations
- Widen the existing bridge over the Roaring Fork River
- Relocate overhead utilities underground
- Create standards for lighting, signs, fencing and maintenance
- Maintain view-plane including Mount Sopris and Red Hill
- Consolidate access points
- Provide clear definition that you have arrived in the heart of Carbondale

Figure 1.1
Study Area Map



2.0 EXISTING CONDITIONS

2.1 EXISTING TRAFFIC ANALYSIS

Existing conditions in the study area were observed, evaluated, and relevant data including lane configurations, traffic controls, and peak hour traffic volumes were obtained. Existing levels of service (LOS) at the different intersections were determined using these existing conditions.

2.1.1 Existing Traffic Volumes

Existing traffic volumes, including average daily traffic volumes (ADT) and turning movement counts were obtained at study intersections during October 2001. Peak hour turning movement counts were conducted for the 7:00–9:00 AM and the 4:00–6:00 PM peak periods. Turning movement counts for the SH 133 and SH 82 intersection were collected in July 2001. Turning movement counts for the Industrial Place, Nieslanik Avenue, and Main Street intersections were collected in October 2000 as a part of the *Crystal River Traffic Impact Study* and have been adjusted to represent 2001 volumes. Figure 2.1 illustrates the existing (2001) traffic volume counts obtained in the study area.

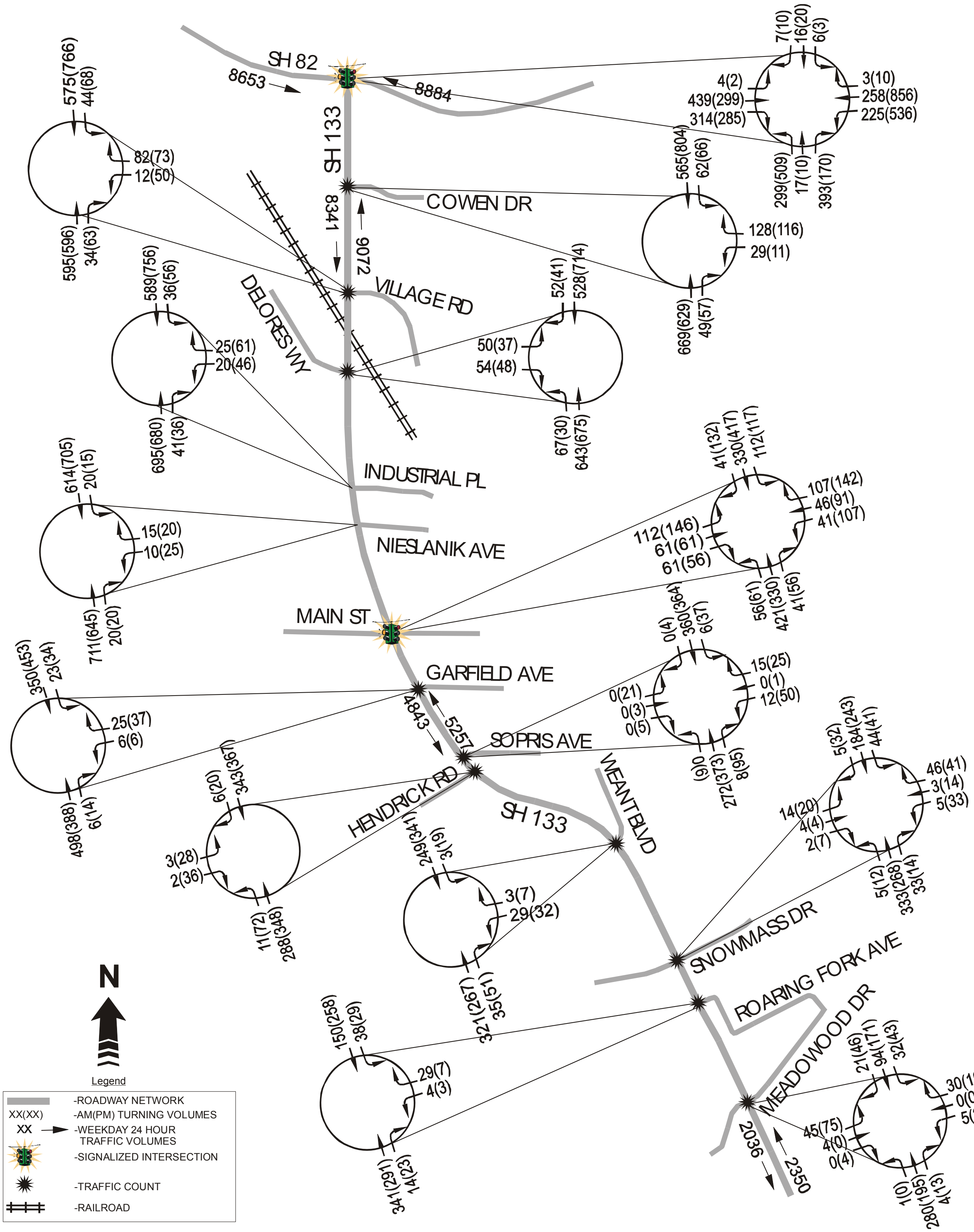
2.1.2 Level of Service

LOS is a rating system commonly used in traffic engineering to measure the effectiveness of the operational conditions of roadways. Traffic control, travel speeds, and roadway geometry are some of the factors that influence the maneuverability of the driver that in turn, determine the LOS for the facility. Generally, there are six levels of service designated by letters A through F. LOS "A" is defined as being ideal flow conditions with little or no delays whereas LOS "F" is defined as conditions where extremely high delays under unstable traffic conditions could be encountered, necessitating mitigation. Each level is used to describe traffic flow in terms of delays experienced by road users. Table 2.1 summarizes the correlation between LOS and delay for signalized and unsignalized intersections.

Table 2.1
Level of Service and Delay Correlation

	Delay (seconds per vehicle)	
LOS	Signalized Intersections	Two-way Stop Controlled Intersections
A	≤ 10	0-10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

Figure 2.1
Existing (2001) Traffic Volumes



LOS analysis was conducted for both signalized and unsignalized intersections in the study area. LOS for a signalized intersection is determined by the average control delay for the intersection in seconds per vehicle. LOS at an unsignalized intersection is determined by the highest approach delay in seconds per vehicle.

LOS for the existing conditions was analyzed using the SYNCHRO computer model based on the *2000 Highway Capacity Manual* methodology. LOS was determined for peak hour volumes occurring in the AM and PM peak periods. The results of LOS analysis along with the respective delays are listed in Table 2.2. The LOS for existing conditions is shown in Figure 2.2. A detailed report for LOS analysis of individual intersections is provided in Appendix D. An acceptable LOS for SH 133 is defined as LOS “C” desirable with LOS “D” acceptable. LOS “E” and LOS “F” are considered unacceptable and indicate that mitigation measures are needed to improve operations.

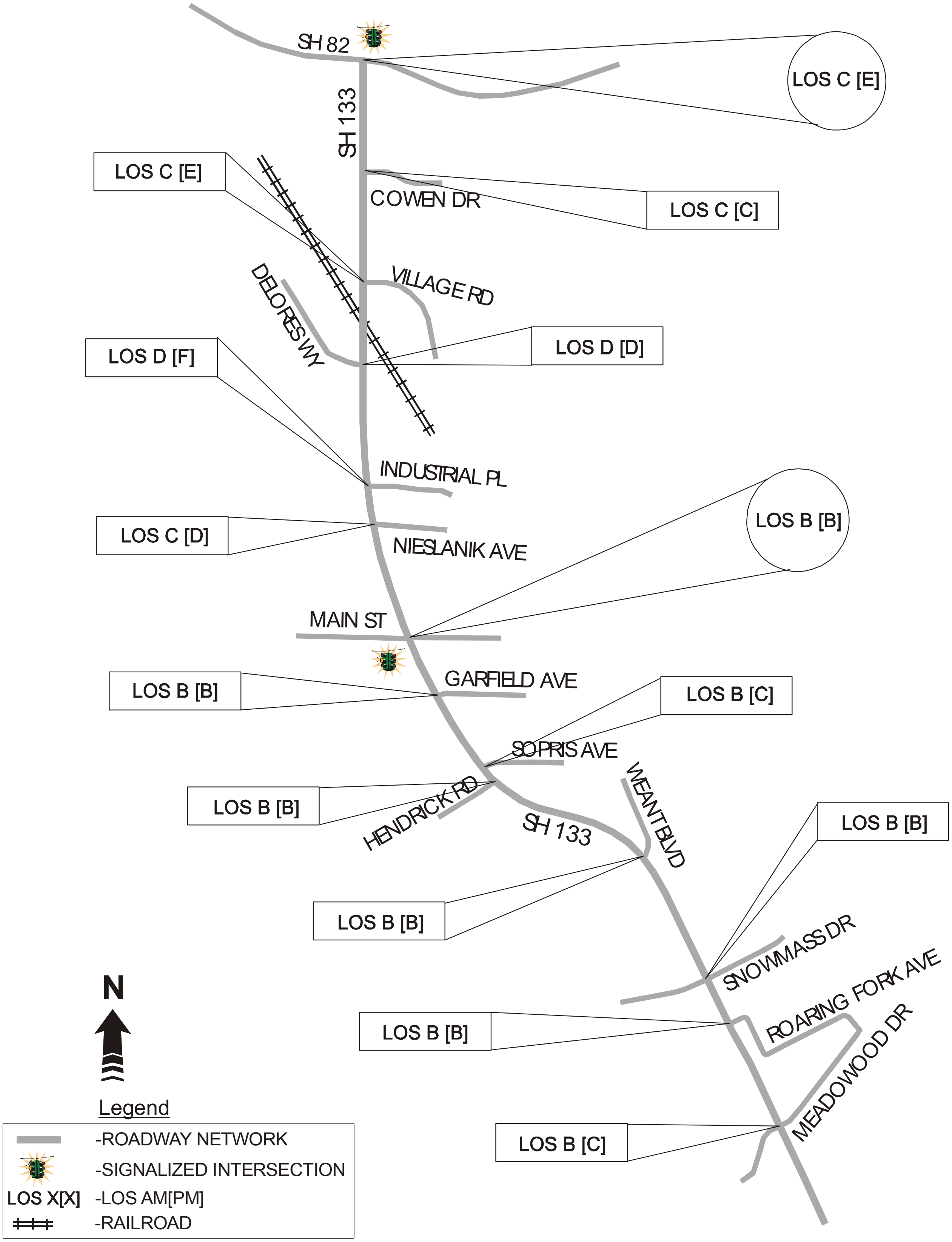
Table 2.2
Existing Intersection Level of Service

Level of Service					
		AM		PM	
Intersection		LOS	Delay seconds per vehicle	LOS	Delay seconds per vehicle
SH 133 and SH 82	Signalized	C	29.3	E	55.6
* SH 133 and Cowen Dr	Unsignalized	C	22.1	C	19.0
* SH 133 and Village Rd	Unsignalized	C	16.5	E	38.5
* SH 133 and Delores Way	Unsignalized	D	29.0	D	31.2
* SH 133 and Industrial Pl	Unsignalized	D	26.2	F	58.0
* SH 133 and Nieslanik Ave	Unsignalized	C	23.2	D	29.7
SH 133 and Main St	Signalized	B	11.0	B	15.3
* SH 133 and Garfield Ave	Unsignalized	B	13.6	B	12.5
* SH 133 and Sopris Ave	Unsignalized	B	11.8	C	17.5
* SH 133 and Hendrick Rd	Unsignalized	B	12.6	B	14.8
* SH 133 and Weant Blvd	Unsignalized	B	13.4	B	14.2
* SH 133 and Snowmass Dr	Unsignalized	B	11.4	B	13.9
* SH 133 and Roaring Fork Ave	Unsignalized	B	11.1	B	11.3
* SH 133 and Meadowood Dr	Unsignalized	B	14.2	C	15.1

** LOS at unsignalized intersections is determined by the highest approach delay.*

Based on the comments received from the public, vehicles are unable to turn left onto SH 133 from Cowen Drive due to northbound SH 133 traffic queing through the intersection. The local traffic pattern is to travel south on Cowen Drive and Eighth Street to Main Street.

Figure 2.2
Level of Service for Existing Conditions



The analysis indicates that all of the intersections operate at an acceptable LOS for the AM peak period. However, the intersections of SH 133 and SH 82, and Village Road, and Industrial Place operate at an unacceptable LOS ("E" or "F") in the PM peak period. The SH 133 and Village Road and Industrial Place intersections are unsignalized intersections and the LOS reported is determined by the highest delay experienced on the cross street. Results from the analysis indicate that these intersections "fail" due to the high delay experienced by the westbound left-turning vehicles. The SH 133 and SH 82 intersection is signalized and operates at LOS E due to the heavy northbound and westbound left-turn traffic volumes. Currently, the northbound left-turn vehicles use a shared through and left-turn lane. There has been a proposal to add another left turn bay to the existing shared through and left turn lane that would allow the intersection to operate at LOS D (PM peak).

2.2 LAND USE

2.2.1 Proposed Future Developments

The existing land uses surrounding SH 133 are predominantly commercial between SH 82 and Main Street and predominantly residential between Main Street and Meadowood Drive. Increased development is forecasted along the SH 133 corridor in the Town of Carbondale. Four specific developments are anticipated and were included in this analysis. The traffic from these developments would significantly affect the operations on the SH 133 corridor. The four developments are listed below and a description of each follows.

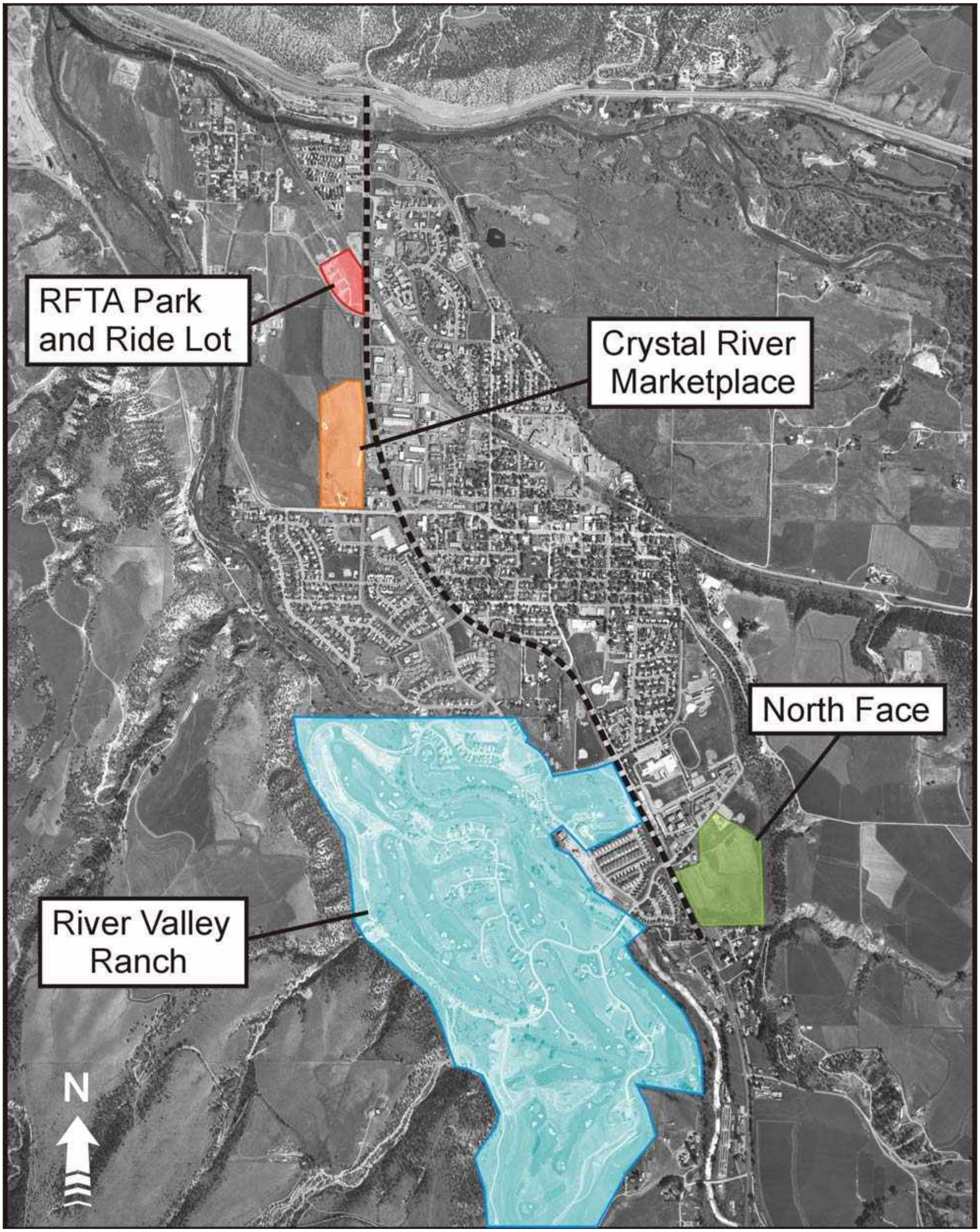
- Roaring Fork Transit Authority Park and Ride facility (RFTA)
- Crystal River Market Place
- River Valley Ranch
- North Face Development

River Valley Ranch currently exists however, the development has not reached full build out. The RFTA Park and Ride, Crystal River Market Place and North Face Development are all potential projects that have been discussed but have not received Town Planning Board approval. If the projects are constructed the size, type, and location of the final development may be significantly different than what has been included in the study. The developments were included to represent likely potential future traffic conditions. Each development will require a traffic study to determine their effects on the SH 133 roadway.

2.2.2 RFTA Park and Ride Facility

The potential RFTA commuter rail line between Glenwood Springs and Aspen would cross SH 133 within the existing railroad Right-of-Way between Village Road and Delores Way. There is an identified need for a park and ride lot in the Town of Carbondale to service existing bus transit, carpool, and the future RFTA commuter rail. A park and ride facility on the northwest corner of SH 133 and Delores Way is one potential location. For the purposes of this study it was assumed that this park and ride lot would be accessed off of Delores Way and the majority of the traffic would be oriented towards SH 82. This facility is expected to provide 600 parking spaces.

Figure 2.3
Proposed Future Developments



2.2.3 Crystal River Market Place

The Crystal River Market Place development has been proposed in the Town of Carbondale over the past several years. This proposed development would be located on the northwest corner of SH 133 and Main Street. An initial submittal was reviewed by the Town and resulted in a reduction in the total proposed square footage of retail development. The most recent proposal for the development anticipates a 275,000 square foot retail development. The final development approval may be even less. This development would have direct access to SH 133 opposite Neislanik Avenue and indirect access to SH 133 from Main Street. The developer is currently preparing an updated traffic study to include the reduction in square footage.

2.2.4 River Valley Ranch

The River Valley Ranch development was recently constructed on the west side of SH 133 between Snowmass Drive and Meadowood Drive. This development is a residential golf course community that is currently not fully built out. The final build out is anticipated to include 685 single-family dwelling units. This development has access to SH 133 at Snowmass Drive and Meadowood Drive.

2.2.5 Northface Development

The proposed Northface development is located on the southeast corner of SH 133 and Meadowood Drive. This study analyzed the development as a residential development with 204 apartment units, 68 units of duplex housing and 68 single-family housing units. The Northface has not been submitted for approval and could be a commercial or residential proposal at that time. The development would not be granted direct access to SH 133 as access to Meadowood Drive is available. No site specific traffic studies have been completed for this proposed development.

2.2.6 Trip Generation

The trip generation rates used for all the four developments were obtained from the Institute of Transportation Engineers (ITE) *Trip Generation*, Sixth Edition. These generation rates were used to estimate the number of trips made to and from the site during the AM and PM peak hours on an average weekday. These volumes represent the highest volume of traffic generated during a one-hour period between 7:00 and 9:00 AM and 4:00 and 6:00 PM. Table 2.3 summarizes the ITE land use codes for the different types of development occurring within the study area.

Table 2.3
ITE Land Use Codes

Development	ITE Land Use	Size	ITE Code	Trip Estimation Method	AM Rate		PM Rate	
					In	Out	In	Out
Park-N-Ride	Parking Facility	600 spaces	090	Average Rate	0.60	0.15	0.14	0.49
Crystal River Market Place	Retail	275,000 sq.ft.	820	Average Rate	0.62	0.40	1.79	1.95
River Valley Ranch	Single-Family	348 DU	210	Average Rate	0.18	0.56	0.64	0.36
North Face Development	Single-Family	68 DU	210	Average Rate	0.18	0.56	0.64	0.36
	Apartment	204 DU	220	Average Rate	0.08	0.43	0.42	0.20
	Duplex	60 DU	230	Average Rate	0.07	0.37	0.36	0.18

The estimated two-way peak hour volumes are 1,184 vehicles per hour during the AM peak hour and 1,996 vehicles per hour during the PM peak hour. Average weekday trips per parcel and net trips generated by the site are summarized in Table 2.4.

Table 2.4
Trip Generation by Development

Development	Land Use	AM		PM	
		Enter	Exit	Enter	Exit
Park-N-Ride	Parking Facility	360	90	84	294
Crystal River Market Place	Retail	171	113	495	537
River Valley Ranch	Single-Family Detached Housing	66	198	226	129
North Face Development	Single-Family Detached Housing	13	39	45	25
	Apartment	16	88	84	41
	Duplex	5	25	24	12
	Totals	631	553	958	1,038
		1,184		1,996	

2.2.7 Trip Distribution

Trips were distributed to the network based on existing and anticipated traffic patterns for each proposed development. The trip distributions for each development were based on accessibility options available and the location of the development with respect to surrounding parcels and the land uses of these parcels. The following distribution percentages were used to assign the vehicle-trips to the roadway network:

- Sixty-seven percent oriented to/from the north (SH 82) on SH 133
- Twenty percent oriented to/from the south on SH 133

- Ten percent oriented to/from the east on Main Street
- Three percent oriented to/from the west on Main Street

These percentages represent the overall trip distribution within the SH 133 corridor. Individual development distributions may vary slightly.

2.3 FUTURE NO-BUILD TRAFFIC CONDITIONS

The study design year is 2025. A 24-year growth factor of 1.80 percent over the study period was assumed for traffic growth on SH 133, SH 82, and Main Street. This growth rate was an average for the entire study area based on information obtained from the most recent CDOT traffic data. A 24-year growth factor of 1.25 percent was assumed for future traffic on the other intersecting side roads. The future traffic volumes were determined by increasing the existing volumes by the annual compounded growth over the study period (2025) and adding the proposed development traffic (See Section 2.2.1). The future turning movement volumes are illustrated in Figure 2.4.

The intersection LOS for the future conditions were analyzed using the SYNCHRO model based on the *Highway Capacity Manual Methodology*. LOS was determined for the peak hour within the 7:00 and 9:00 AM and 4:00 and 6:00 PM peak periods. The results from these analyses are illustrated in Figure 2.5. Table 2.5 summarizes the LOS at all the intersections in the corridor with the respective delays. A detailed report for LOS analysis of individual intersections is enclosed in Appendix D. The analysis indicates that all intersections in the study area fail except Roaring Fork Avenue. Such poor LOS is observed at all the intersections because no improvements to the existing geometry or intersection control were assumed to keep up with the growth in traffic. The future LOS at the study area intersections indicates that some form of mitigation is necessary to render the intersections operational.

Table 2.5
Future No-Build Intersection Level of Service
(Without Improvements)

Level of Service					
		AM		PM	
Intersection		LOS	Delay in secs/ veh	LOS	Delay in secs/veh
SH 133 and SH 82	Signalized	F	>100	F	>100
* SH 133 and Cowen Dr	Unsignalized	F	>100	F	>100
* SH 133 and Village Rd	Unsignalized	F	>100	F	>100
* SH 133 and Delores Way	Unsignalized	F	>100	F	>100
* SH 133 and Industrial Pl	Unsignalized	F	>100	F	>100
* SH 133 and Nieslanik Ave	Unsignalized	F	>100	F	>100
SH 133 and Main St	Signalized	F	98.1	F	>100
* SH 133 and Garfield Ave	Unsignalized	F	62	F	71.8
* SH 133 and Sopris Ave	Unsignalized	E	36.4	F	>100
* SH 133 and Hendrick Rd	Unsignalized	E	40.7	F	>100
* SH 133 and Weant Blvd	Unsignalized	F	62.4	F	>100
* SH 133 and Snowmass Dr	Unsignalized	F	>100	F	>100
* SH 133 and Roaring Fork Ave	Unsignalized	C	20.7	D	27.5
* SH 133 and Meadowood Dr	Unsignalized	F	55.8	F	>100

** LOS at unsignalized intersections is determined by the highest approach delay.*

Figure 2.4
Future (2025)
TrafficVolumes

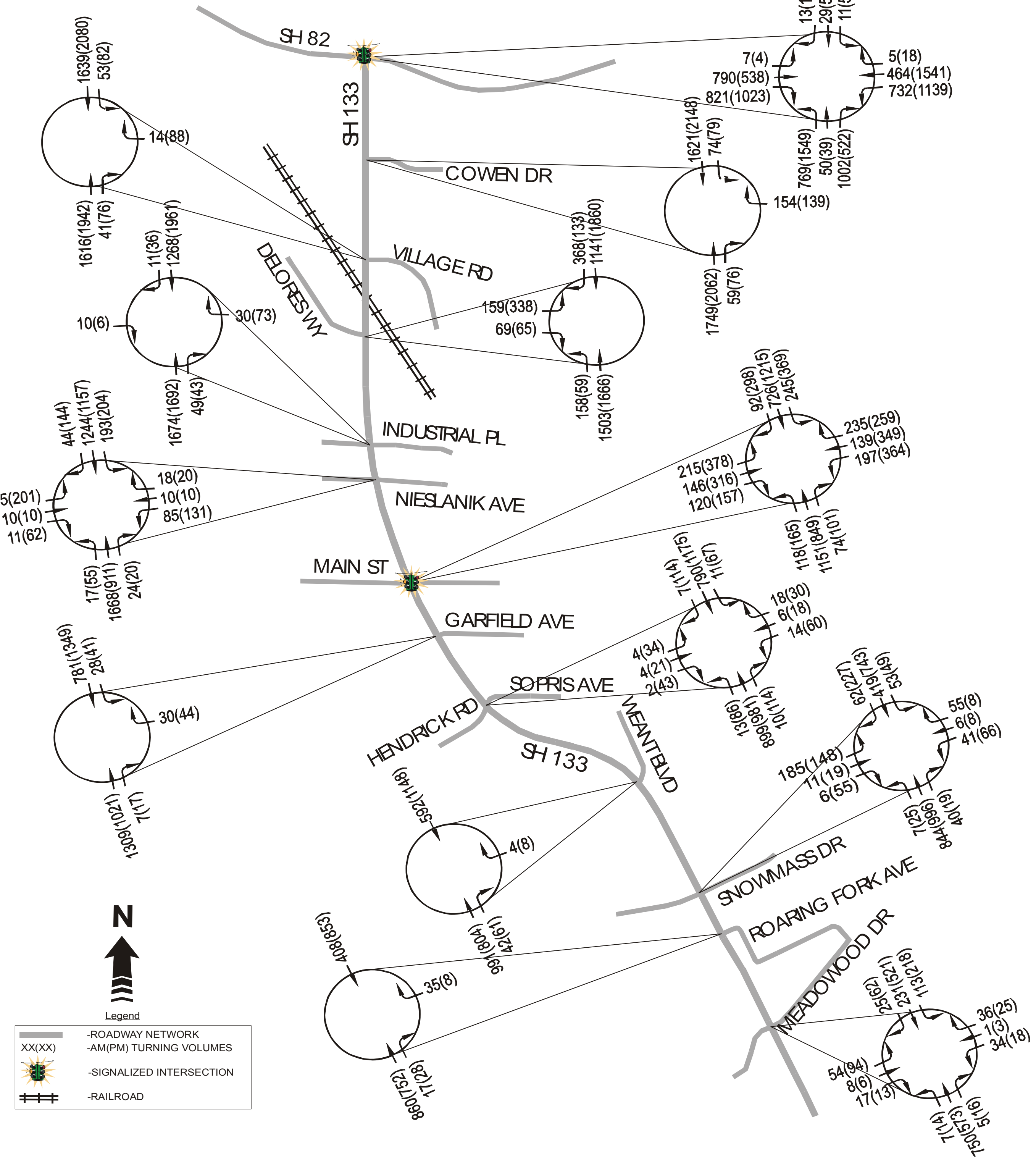
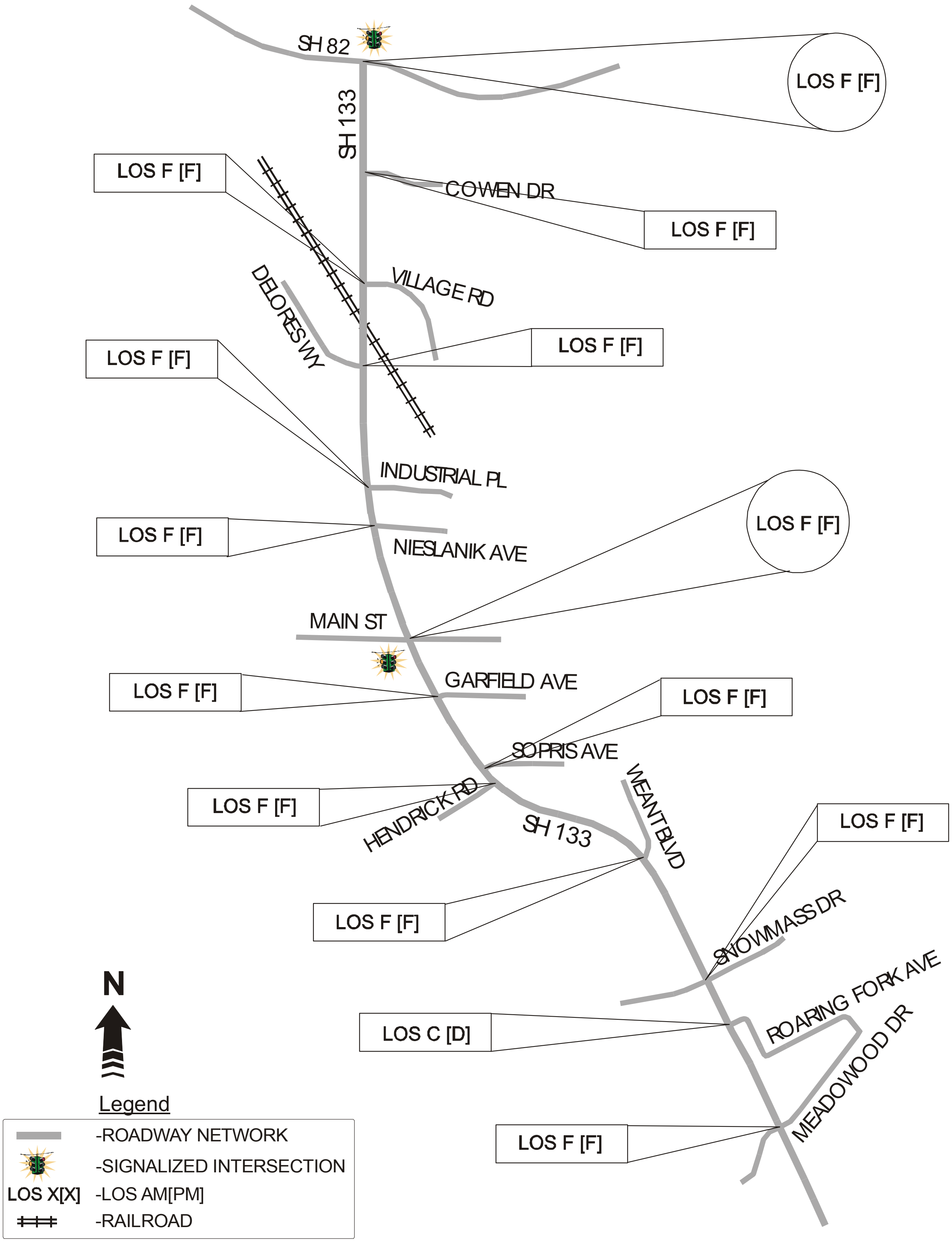


Figure 2.5
Levels of Service for Future Traffic Volumes
(Without Improvements)



2.4 SAFETY ANALYSIS

A safety analysis was conducted using historical accident data in the study area. Accident records were examined along the SH 133 corridor and at the SH 133 and SH 82 intersection for 1997, 1998, 1999, and 2000. Accident data was obtained from CDOT. Accident rates and frequencies for the study area are summarized in Table 2.6.

Table 2.6
Accident Rates (1998 to 2000)

Location	Mile Point	Type of Facility	Statewide Average Accident Rate (MVMT)	Existing Average Accident Rate 1998-2000 (MVMT)
SH 133 (From SH 82 to Meadowood Drive)	66.00-68.82	Non-Federal SH	2.25	2.78
SH 133 and SH 82 Intersection	11.20-12.20	Federal Aid Primary-Rural	1.25	2.45

2.4.1 SH 133

SH 133 corridor accident data for the three-year period 1998 to 2000 indicates that the frequency of accidents is 2.78 per million vehicle miles traveled (MVMT). This is greater than the State Average accident rate of 2.25 per MVMT for the year 1999. The accident summary reports are included in Appendix E.

There were a total of 88 accidents that occurred along this segment of SH 133 for the three-year period 1998 to 2000. Approximately 34 percent of these 88 accidents resulted in injuries and 67 percent in property damage. More than 50 percent of the total accidents were rear end crashes. Broadside crashes were 12.5 percent of the total accidents. More than 90 percent of the accidents occurred in clear weather and almost 70 percent of these accidents occurred in dry pavement conditions. The known cause for the majority of the accidents was driver inattention while 43 percent of the accidents were caused due to no apparent contributing factor. Since the majority of the intersections along the SH 133 corridor are stop-sign-controlled Tee-intersections and a majority of the accidents occurred at these locations, intersection geometry, movement and control mitigation could help reduce a significant amount of the accidents along this corridor.

2.4.2 SH 82

SH 133 and SH 82 intersection accident data for the three-year period 1998 to 2000 indicates that the frequency of accidents is 2.45 per MVMT. This is greater than the state average accident rate of 1.25 per MVMT for the year 1999. The accident summary reports are included in Appendix E.

Almost 60 percent of the 68 accidents resulted in injuries (1 accident was a fatality) and 40 percent in property damage. The fatality was caused when a heavy vehicle performing a westbound left turn collided with a utility van traveling eastbound. Inattention of the heavy vehicle driver was listed as cause of the accident.

There were a total of 68 accidents that occurred at the SH 133/SH 82 intersection for the three-year period 1998 to 2000. Approximately one-third of the total 68 accidents were rear end accidents and more than one-fourth of the total accidents occurred during turning movements. More than two-thirds of these accidents occurred in clear weather and almost 60 percent of the total accidents occurred during daylight and under dry pavement conditions. The known cause for the majority of the accidents was driver inattention while 40 percent of the accidents were caused due to no apparent contributing factor. A majority of the accidents occurring at this intersection are rear-end accidents. Since the east leg of the intersection is on a reverse curve, the accidents could be happening due to inadequate sight distance where the westbound traffic is unable to see the back of the queue at the intersection. The crash data also indicates that the total accident rate is almost twice the state average accident rate. Therefore, the intersection geometry should be mitigated to reduce the occurrence of accidents.

2.5 LOCAL CIRCULATION

Presently, there are very few streets that provide connectivity within the Town of Carbondale. SH 133 is the primary connector running from north to south through the Town. Eighth Street also provides a north-south connection from Cowen Drive south to Main Street. Vehicles experience significant delay when turning left onto SH 133 from Cowen Drive and Village Drive. Due to this delay, many vehicles utilize Eighth Street to travel south to Main Street.

Main Street is one of the few routes that provide east-west connectivity through Town. In order to provide additional street connectivity, the Town of Carbondale may at some point extend Industrial Place east to Eighth Street. In order to provide traffic relief to SH 133 and Main Street, there is a need to construct additional street connections. This would accommodate local trips on the local streets rather than on SH 133.

2.6 EXISTING BRIDGE CONDITION INVESTIGATION

The existing Roaring Fork River bridge (structure number G-08-B), was constructed in 1957 and inspected by CDOT on May 21, 1996. Appendix G contains a copy of the load factor rating summary. The current bridge has been dedicated as a Veterans Memorial Bridge. Any new bridge constructed shall include the dedication for the Veterans Memorial Bridge.

2.7 ENVIRONMENTAL OVERVIEW

A field review of the study area was conducted on November 2, 2001 to assess potential wetland, wildlife, recreational, noise, cultural resource, and Environmental Justice (EJ) issues. The environmental overview was based on the requirements of the National Environmental Policy Act (NEPA). The following defines the regulations related to each environmental resource:

- Wetlands are governed by the US Army Corp of Engineers (USACE) *Wetland Delineation Manual* (1987) and include Waters of the US.
- Wildlife includes threatened and endangered (T&E) species of flora and fauna that are in danger or approaching danger of extinction throughout all or a significant portion of their range. T&E status is determined by the US Fish and Wildlife Service (USFWS).

- Recreational sites are those public land holdings that provide a means of active or passive recreation and are eligible for protection under Section 4(f) of the Department of Transportation Act.
- Noise sensitive sites are land uses included under Land Use Category B as described in *23 CFR 772*. These land uses generally include: picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motel, hotels, schools, churches, libraries, and hospitals.
- Cultural resources are properties included in or eligible for the *National Register of Historic Places* (NRHP) or the *Colorado State Register of Historic Properties* (CRHP). Cultural resources also include areas of significance to Native Americans. These resources are protected under Section 106 of the National Historic Preservation Act.
- EJ protects low income and minority populations from disproportionately high and adverse effects.

2.7.1 Jurisdictional Wetlands

Impacts to jurisdictional wetlands and Waters of the US will be minimal. Impacts to roadside ditches and an isolated pond are possible with the proposed improvements, but these types of wetlands are not generally considered jurisdictional by the USACE. The wetland delineation will be completed as the project progresses into preliminary design. Impacts to wetlands and waters of the US will be calculated at that time. Bridge construction, in the vicinity of the Roaring Fork River, should include temporary and permanent best management practices in the stormwater management plan to prevent eroded soils and stormwater runoff from entering the Roaring Fork River. It should be noted that complex jurisdictional wetland systems are located approximately 0.5 miles south of the proposed construction limits. If the project limits are extended south, avoidance of these wetland systems is highly recommended.

2.7.2 Wildlife

On November 2, 2001, PBS&J met with Matt Thorpe (District Wildlife Manager, Colorado Division of Wildlife [CDOW]) in CDOW's Glenwood Springs Office. In CDOW's opinion, the project is not likely to impact any state or federally protected wildlife species. The project corridor is within winter range for elk and mule deer. Bears and foxes are also likely to occur within the project limits, but most of CDOW's concerns relate to construction in the vicinity of the Roaring Fork River. Wild Trout Waters are found approximately 20 miles upstream of the bridge, and the river is labeled a Gold Medal Trout Stream 0.5 miles downstream from the bridge. CDOW requests that a detailed Stormwater Management Plan (SWMP) be developed during design. The SWMP should carefully consider water quality, erosion, and hazardous material impacts to the clear and clean trout waters of the Roaring Fork River.

Another item of concern is known bald eagle nesting and roosting areas at the southern end of the project along the Crystal River. The tall cottonwoods along the Crystal River and abundance of trout from the CDOW fish hatchery provide an ideal nesting situation for bald eagles. Bald eagles are currently listed as threatened under the Endangered Species Act. Delisting of bald eagles has been recommended and should occur before 2003, but they will still receive protection under the Migratory Bird Treaty Act. If bald eagle nests are present during final design, coordination between CDOT, CDOW, and the USFWS should be initiated. CDOW and USFWS may prohibit roadway construction within 0.3 miles from the nest during nesting season. It should be noted that a CDOW fish hatchery is located approximately 1 mile south of the current construction limits. If the limits are extended south, avoidance of this site is recommended.

2.7.3 Recreational Resources

Depending on the alignment, direct and indirect impacts to Hendrick Ranch Park and River Valley Ranch Park are possible. These parks are administered by the Town of Carbondale. Hendrick Ranch Park is located about 1.5 miles south of SH 82 on the west side of SH 133. This park offers a playground for kids, a soccer field, and a restroom. River Valley Ranch Park is located approximately 2 miles south of SH 82 on the west side of SH 133 and is found within the River Valley Ranch Subdivision. It offers a playground for kids, a soccer field, a baseball field, and a restroom.

Located on the east side of SH 133 and just south of Weant Boulevard are the Carbondale Middle School and Carbondale Elementary School. Both schools have outdoor recreational resources adjacent to SH 133 that appear to be open to the general public. A playground is associated with the elementary school, while the middle school has a multi-use ball field with bleachers.

As part of the wildlife conversation with CDOW, PBS&J learned CDOW administers a boat ramp located in the northwest quadrant of the SH 133 Bridge over the Roaring Fork River. This boat ramp provides a place to park vehicles, and access to fishing and rafting on the Roaring Fork River.

Located on both sides of SH 133 throughout the project limits are paved bike paths. Rollerbladers, walkers, and bikers were observed using the trails the day of the field review. A bike path is proposed along the existing RFTA railroad bed as part of the commuter rail system that will connect Glenwood Springs with Aspen. Crossing issues for bikes and pedestrians will be addressed with the intersection improvements.

SH 133 has been designated by CDOT and FHWA as the West Elk Loop Scenic Byway. Often, scenic byways have management plans. More research is needed to determine if the West Elk Loop Scenic Byway has a management plan, and if the plan requires any special provisions during reconstruction.

2.7.4 Noise

As part of the field review, noise sensitive sites adjacent to SH 133 were noted. At least two mobile home parks, 10 single family home sites, two multi-family home sites, one subdivision, one Chamber of Commerce building, one elementary school, and four public parks were recorded adjacent to SH 133 within the study limits. In addition, two open fields adjacent to SH 133 are currently zoned for residential use, and construction of a mixed-use development is slated to start within the next year on land in another open field.

Noise impacts to Category B receptors (residential, hotels, churches, parks, etc) are possible along the corridors. Noise readings and preliminary noise modeling were conducted to provide the basis for this conclusion. Readings were taken on November 2, 2001 with a Larson Davis Type 2 Sound Level Meter for a period of 10 minutes at each location. Noise readings measure decibels (dB) on the "A" weighted scale. The "A" weighted scale most closely approximates the range of frequencies a human can hear. STAMINA 2.0 was utilized to accomplish the noise modeling. Table 2.7 illustrates the results of the measured noise readings.

Table 2.7
Measured Noise Levels

Location	Time	Cars	Medium Trucks	Heavy Trucks	Speed	dBA (Leq)
Crystal River MHP	4:15 PM	NB-65 SB-55	NB-0 SB-0	NB-1 SB-2	35	65.7
Hendricks Park	4:35 PM	NB-60 SB-60	NB-1 SB-0	NB-1 SB-1	40	61.4
Hendricks Park (#2)	4:45 PM	NB-47 SB-55	NB-0 SB-2	NB-0 SB-0	40	60.5
River Valley Ranch	5:00 PM	NB-22 SB-60	NB-0 SB-0	NB-0 SB-0	45	*54.8
River Valley Ranch	5:15 PM	NB-25 SB-50	NB-1 SB-0	NB-0 SB-0	45	61.7

**A berm, approximately 8 feet high, shielded the single family home from the direct noise sources of SH 133.*

None of the readings exceeded CDOT's Noise Abatement Criteria (NAC) of 66 dBA.

Noise isopleths, representing 66 dBA, were calculated using the STAMINA 2.0 noise model. Noise isopleths, or contours, are lines of equal noise energy. Noise isopleths are commonly used prior to detailed noise modeling to develop a preliminary understanding of potential noise impacts. Sites classified under Land Use Category B that are predicted to fall within the 66 dBA isopleth could be considered an impact. Of course, detailed noise modeling with the most current design year traffic is required when potential noise abatement measures may be required. To develop the isopleths, the design year ADT was broken down into hourly traffic volumes for each roadway segment. The following assumptions were made:

- Peak hour factor (K) = 10 percent
- Truck factor (T) = 3 percent

The results of the isopleth modeling are shown in Table 2.8. The 66 dBA isopleth lines are included on the conceptual roadway design plans in Appendix B.

Table 2.8
66 dBA Noise Isopleth Limits

Segment	Speed		
	45mph	40mph	35mph
Meadowood Drive to Main Street	55 feet	45 feet	35 feet
Main Street to SH 82	85 feet	75 feet	60 feet

Note: Distance is measured from the edge of the nearest travel lane.

2.7.5 Cultural Resources

The corridor was screened using the Colorado Office of Archaeology and Historic Preservation's Directory of Colorado State Register Properties. This directory provides a list of historic resources eligible for, or listed on, the NRHP. According to the March 2001 directory, no sites adjacent to the corridor are currently eligible, or listed on, the NRHP. The closest site, the Satank Bridge, is located on County Road 106 at the Roaring Fork River Crossing. There were a number of sites; however, listed in the *Town of Carbondale's Comprehensive Plan 2000* structures inventory. One site of importance, the Historical Society Museum, is located at Weant Blvd. and SH 133. It is a classic log structure built in the early 1900's indicative of agricultural heritage, but the town has not yet considered efforts to protect this potentially significant historic structure.

Based on information from Lisa Schoch (CDOT Historian), there are no recent additions to the NRHP for the SH 133 corridor.

2.7.6 Environmental Justice

Environmental justice (EJ) was enacted in 1994 as part of Presidential Executive Order 12898. It is defined as: *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*. It directs federal agencies to take the appropriate and necessary steps to identify and address disproportionately high and adverse effect of federal projects on the health or environment of minority and low-income populations to the greatest extent practicable and permitted by law. EJ issues associated with this project might arise if low income families living along the corridor are disproportionately impacted compared to higher income families living along the corridor. More research and public involvement is required in order to determine if families living along the corridor are at a household median income at or below the Department of Health and Human Services (DHHS) poverty guidelines. This median income is updated each year by DHHS. EJ issues are investigated by holding public meetings and researching US Census information to determine if minority and/or low-income populations are present along the corridor. Documentation of EJ issues are only required when a project involves federal participation.

3.0 ALTERNATIVE DEVELOPMENT AND EVALAUTION

3.1 CONCEPTUAL ROADWAY DESIGN

An evaluation of feasible alternatives was completed to determine the recommended improvements for the corridor. The evaluation was completed for two areas, the SH 133 corridor from Cowen Drive to Meadowood Drive and the SH 133 and SH 82 intersection including the existing bridge over the Roaring Fork River.

In addition to conducting numerous studies and inventories, public and agency input was used to develop specific alternative recommendations. Public Open Houses were held on December 12, 2001 and May 8, 2002. The summary of public comment is included in Appendix C. Additional input was received from one-on-one meetings with property owners as part of the SH 133 Access Management Plan. Progress meetings were held on a monthly basis with a design team comprised of the Colorado Department of Transportation (CDOT) and the Town of Carbondale.

Both build and no-build alternatives were reviewed. For the projected 2025 traffic volumes, most intersections experience failing levels of service (LOS). With the projected growth in vehicular traffic throughout the corridor and high existing accident rates there is a definite need for roadway improvements. The no-build alternative does not achieve the project goals of improved safety and capacity and is not recommended. The alternative evaluation will review the proposed improvements recommended for the SH 133 corridor.

Several design issues were evaluated including:

- Limiting the improvements to within existing CDOT Right-of-way (120 feet)
- Location of bike and pedestrian facilities
- Bike lane and shoulder width
- Requirements for and location of auxiliary lanes
- Travel lane width
- Location of SH 133 centerline

3.1.1 Design Criteria

Conceptual roadway design plans were prepared to evaluate the necessary improvements and develop proposed improvements for the SH 133 corridor. The conceptual designs were completed using aerial photography (fall 2001). Design criteria is based on *American Association of State Highway and Transportation Officials A Policy on the Geometric Design of Streets and Highways 2001* (ASSHTO), *Colorado Department of Transportation Design Guide* (1995), AASHTO's *Guide for Development of Bicycle Facilities*, 1999 and the *Colorado State Highway Access Code,* 1998. Tables 3.1 and 3.2 list the design criteria for SH 133 and SH 82.

Table 3.1
SH 133 Corridor
Roadway Design Criteria

Design Criteria	SH 133	SH 133	Reference
Location	1257’ N of Roaring Fork Dr to 32’ N of Village Dr.	517’ S of Meadowood Dr to 1257’ N of Roaring Fork Dr.	SH Access Category Schedule
State Highway Access Category	NR-B	NR-A	SH Access Category Schedule
Posted Speed (Existing)	35 mph	40 mph	
Design Speed	35 mph	40 mph	
Travel Lane Width[1]	12’	12’	7-20 CDOT
Left Turn Lane Width (with 2’ raised median)	11’	11’	9-46 CDOT
Right Turn Lane Width	11’	11’	9-56 CDOT
Accel Length (From stop position)	270’	380’	SH Access Code Section 4
Decel Length	310’	370’	SH Access Code Section 4
Left Turn Decel Lane	taper + storage	decel length + storage*	SH Access Code Section 4
Right Turn Decel Lane	taper + storage	decel length*	SH Access Code Section 4
Accel Lane	accel length*	accel length*	SH Access Code Section 4
Transition Taper	10:1	12:1	SH Access Code Section 4
Shoulder Width (Urban Curbed Section):**			
outside	5’	5’	7-21 CDOT & AASHTO Pg. 326
inside	1’	1’	7-21 CDOT & AASHTO Pg. 326
Bike Lane Width[2]	shoulder	shoulder	AASHTO2
Grade (max.)[3]	7%	6%	AASHTO, Pg. 476
Horizontal Curvature:			
with 4% Superelevation	345’ radius	665’ radius	AASHTO, Pg. 197
with Normal Crown	425’ radius	830’ radius	AASHTO, Pg. 196
Stopping Sight Distance[3]	250’	360’	AASHTO, Pg. 112
Decision Sight Distance (Maneuver A)	275’	395’	AASHTO, Pg. 116
K Value Crest & Sag	29’	61’	AASHTO, Pg. 274
Pavement Cross-Slope (Normal Crown)	2%	2%	4-1 CDOT, AASHTO, Pg. 309
Horizontal Clearance to Obstruction[4]	3.0’	3.0’	7-35 CDOT
Lateral Clearance to Bridge Parapet, Rail, or Barrier (min.)	Same As the Approach Road Width		7-34 CDOT
Curb Offset to edge of traveled way	2’ (min.)	2’ (min.)	4-6 CDOT
Design Vehicle	WB-40	WB-40	AASHTO, Pg. 20,31
Level of Service, Desirable/(Acceptable)	C (D)	C (D)	8-2 CDOT

[1] *Urban arterial lane widths may vary from 11 to 12 ft. The 11 ft. lanes are used quite extensively for urban arterial streets. (7-20 CDOT)*

[2] *Refer to AASHTO's Guide for Development of Bicycle Facilities, 1999*

[3] *Level Roadway*

[4] *Curbed Street - Desirable clearance curb face to object*

** Taper length is included within stated accel or decel length*

*** Shoulder widths may not apply when roadway has curb & gutter, speed-change lanes, etc*

Table 3.2
SH 133 and SH 82 Intersection
Roadway Design Criteria

<table>
<tr><th colspan="2">Design Criteria</th><th>SH 82</th><th>SH 133</th><th>Ramps</th><th>Loops</th><th>Reference</th></tr>
<tr><td colspan="2">State Highway Access Code</td><td>E-X</td><td>R-A</td><td></td><td></td><td>SH Access Code</td></tr>
<tr><td colspan="2">Posted Speed (Existing)</td><td>55 mph</td><td>35 mph</td><td>45 mph</td><td>25 mph</td><td></td></tr>
<tr><td colspan="2">Design Speed</td><td>65 mph</td><td>35 mph</td><td>45 mph</td><td>25 mph</td><td></td></tr>
<tr><td colspan="2">Ramp Lane Width</td><td>12’</td><td>12’</td><td>12’</td><td>12’</td><td>8-2 CDOT</td></tr>
<tr><td colspan="2">Accel Length</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">From stop condition</td><td>1410’</td><td>280’</td><td>560’</td><td>N/A</td><td>AASHTO Pg. 851</td></tr>
<tr><td colspan="2">From 25 mph</td><td>1220’</td><td>N/A</td><td>N/A</td><td>N/A</td><td>AASHTO Pg. 851</td></tr>
<tr><td colspan="2">Transition Taper Ratio</td><td>25:1</td><td>10:1</td><td>25:1</td><td>25:1</td><td>SH Access Code</td></tr>
<tr><td colspan="2">Shoulder Width</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Outside</td><td>10’</td><td>5’</td><td>6’ min.</td><td>6’ min.</td><td>8-2 & 10-36 CDOT</td></tr>
<tr><td colspan="2">Inside</td><td>4’</td><td>1’</td><td>4’</td><td>4’</td><td>8-2 & 10-36 CDOT</td></tr>
<tr><td colspan="2">Redirect Taper Ratio</td><td>65:1</td><td>20:1</td><td>N/A</td><td>N/A</td><td>SH Access Code</td></tr>
<tr><td colspan="2">Grade (maximum)</td><td>5%</td><td>7%</td><td>5%</td><td>5%</td><td>8-2 & 10-29 CDOT</td></tr>
<tr><td colspan="2">Superelevation (maximum)</td><td>6%</td><td>4%</td><td>6%</td><td>6%</td><td>3-25 CDOT</td></tr>
<tr><td colspan="2">Horizontal Curvature</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">with 4% Superelevation</td><td>N/A</td><td>345’</td><td>730’ radius</td><td>205’ radius</td><td>AASHTO, Pg. 161 & 197</td></tr>
<tr><td colspan="2">with 6% Superelevation</td><td>1660’</td><td>320’</td><td>660’ radius</td><td>185’ radius</td><td>AASHTO, Pg. 161 & 197</td></tr>
<tr><td colspan="2">Stopping Sight Distance</td><td>645’</td><td>250’</td><td>360’</td><td>155’</td><td>AASHTO, Pg. 112</td></tr>
<tr><td colspan="2">Decision Sight Distance (Maneuver A)</td><td>695’</td><td>275’</td><td>395’</td><td>220’</td><td>AASHTO, Pg. 116</td></tr>
<tr><td rowspan="2">K Value</td><td>Crest</td><td>400</td><td>29</td><td>120</td><td>20</td><td>3-42 CDOT, AASHTO, Pg. 274</td></tr>
<tr><td>Sag</td><td>180</td><td>29</td><td>90</td><td>30</td><td>3-42 CDOT, AASHTO, Pg. 274</td></tr>
<tr><td colspan="2">Lateral Clearance to Bridge Parapet, Rail, or Barrier (min.)</td><td colspan="4">Same As the Approach Road Width</td><td>7-34 CDOT</td></tr>
<tr><td colspan="2">Vertical Clearance</td><td>16.5’</td><td>16.5’</td><td>N/A</td><td>N/A</td><td>7-5 & 8-3 CDOT</td></tr>
<tr><td colspan="2">Level of Service, Desirable/ (Acceptable)</td><td>C (D)</td><td>C (D)</td><td>C (D)</td><td>C (D)</td><td>8-2 CDOT</td></tr>
</table>

3.1.2 SH 133 Corridor

In accordance with the *State Highway Access Code*, SH 133 is classified as a Non-Rural Arterial (NR-B) between Weant Boulevard and Cowen Drive. The access category Non-Rural Principal Highway (NR-A) was used to classify the section of SH 133 from Weant Boulevard to Meadowood Drive. The roadway presently consists of two travel lanes, one in each direction with auxiliary lanes at specific locations. Also, a striped two-way left-turn lane median is present at some locations along the corridor.

A recommendation of the *State Highway 133 Citizen's Task Force Report* was to lower the speed limit7 throughout the corridor. In response a speed study was conducted by CDOT in March 1998 and the speed limit was reduced to its current 35 miles per hour (mph) from SH 82 to Sopris Drive and 45 mph from Weant Boulevard to Meadowood Drive.

A summary of the proposed SH 133 improvements between Cowen Drive and Meadowood Drive are described in the following sections.

3.1.2.1 Typical Section

The SH 133 proposed typical section consists of four travel lanes with outside shoulder/bike lanes. During preliminary and final design the travel lanes widths will be reviewed and may be reduced to 11 feet. Smaller lanes typically have a traffic calming effect, slowing vehicles down and also increasing pedestrian safety by creating shorter crossing distance. The Citizens Task Force requested that the minimum pavement width be constructed.

The recommended improvements include a raised median along the project corridor to control access. The Town of Carbondale Planning Department and Citizens Task Force requested that the raised landscaped median be eliminated south of Main Street to Meadowood Drive. Where constructed, the median area will likely include landscaping. All costs related to the median landscaping would be paid for by the Town. There is the possibility that future and existing developments could be responsible for some of the landscaping and maintenance adjacent to their frontages. The four-lane typical section option is shown in Figure 3.1.

At the River Valley Ranch development between Snowmass Drive and Meadowood Drive curb and gutter and roadside landscaping is present. The conceptual design anticipates maintaining these improvements.

3.1.2.2 Typical Intersection with Auxiliary Lanes

Left and right-turn acceleration and deceleration lanes shall be located where required for operational requirements to achieve an acceptable LOS at each intersection. A comment from the Citizens Task Force was to eliminate the right-turn acceleration/deceleration lanes at all locations. During preliminary and final design the need for and location of auxiliary lanes will be coordinated.

In areas where a right-turn deceleration lane is required, the trail can be an 8-foot sidewalk attached to the curb to minimize Right-of-way requirements. Final locations for the sidewalks will depend on adjacent private developments and will be determined during final design. In locations where left-turn deceleration lanes are required there will be a 5-foot raised hardscape median. The typical intersection with auxiliary lane option is shown in Figure 3.2.

3.1.2.3 Frontage Road Typical Section

Presently there are ten full-movement driveways on the east side of SH 133 between Roaring Fork Avenue and Weant Boulevard. The existing 10-foot bike/pedestrian trail runs along the front of the properties. Vehicles currently utilize the trail as a frontage road and for parking. This creates a safety issue with bikes and pedestrians using the trail. A one-way frontage road separated from SH 133 is proposed from Roaring Fork Avenue north to Weant Boulevard. The new frontage road would be constructed in a similar location as the existing trail. Two options were developed and are described below. The two frontage road options are shown in Figures 3.3 and 3.4.

- Option #1 includes a 12-foot northbound frontage road with a 5-foot attached bike lane. Restricting parking on the bike lane will be a local police enforcement issue. The width of pavement was kept to 17 feet to discourage two-way traffic. This option does not include curb and gutter and would minimize disturbance to adjacent properties.
- Option #2 includes a 12-foot travel lane and an 8-foot sidewalk separated by a mountable curb and gutter. This option provides a barrier between the pedestrian and vehicular activities. Curb cuts would be constructed for the existing driveways.

For both options it would be desirable to connect Roaring Fork Avenue North to Snowmass Drive within existing Town of Carbondale right-of-way. This would allow for access from the rear of the properties south of Snowmass Drive. The frontage road would then end at Snowmass Drive.

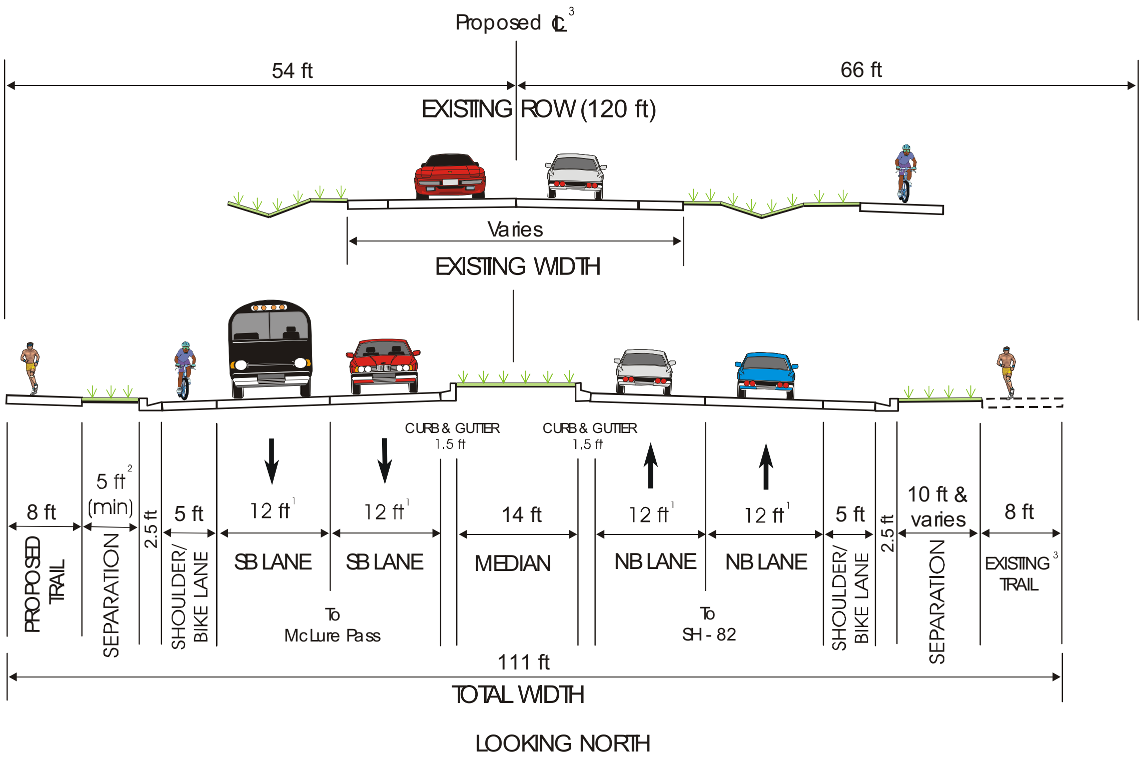
3.1.2.4 Realignment of Cowen Drive Intersection

Cowen Drive is currently a Tee-intersection on the east side of SH 133. There is an existing north/south roadway located on the west side of SH 133 that is located behind the properties adjacent to the roadway. The roadway is not currently within the Town limits and the construction would require coordination with Garfield County. The extension of Cowen Drive connecting this road and SH 133 through the existing Thunder River Lodge property is desirable. The road would then act as a Frontage Road and would allow for the elimination of several left-turn accesses onto SH 133. This connection is shown in the conceptual design plans located in Appendix B.

3.1.2.5 Realignment of Sopris Avenue/Hendrick Road

The realignment of Sopris Avenue with Hendrick Road is recommended to improve pedestrian mobility and safety and for improved traffic operations. The proposed realignment would take part of the queue area for the drive thru at the bank on the northwest corner of the intersection. This realignment would not require the relocation of any existing structures but would require Right-of-way acquisition from the bank. The proposed realignment is shown in the conceptual design plans located in Appendix B.

Figure 3.1
Four-Lane Typical Section Option



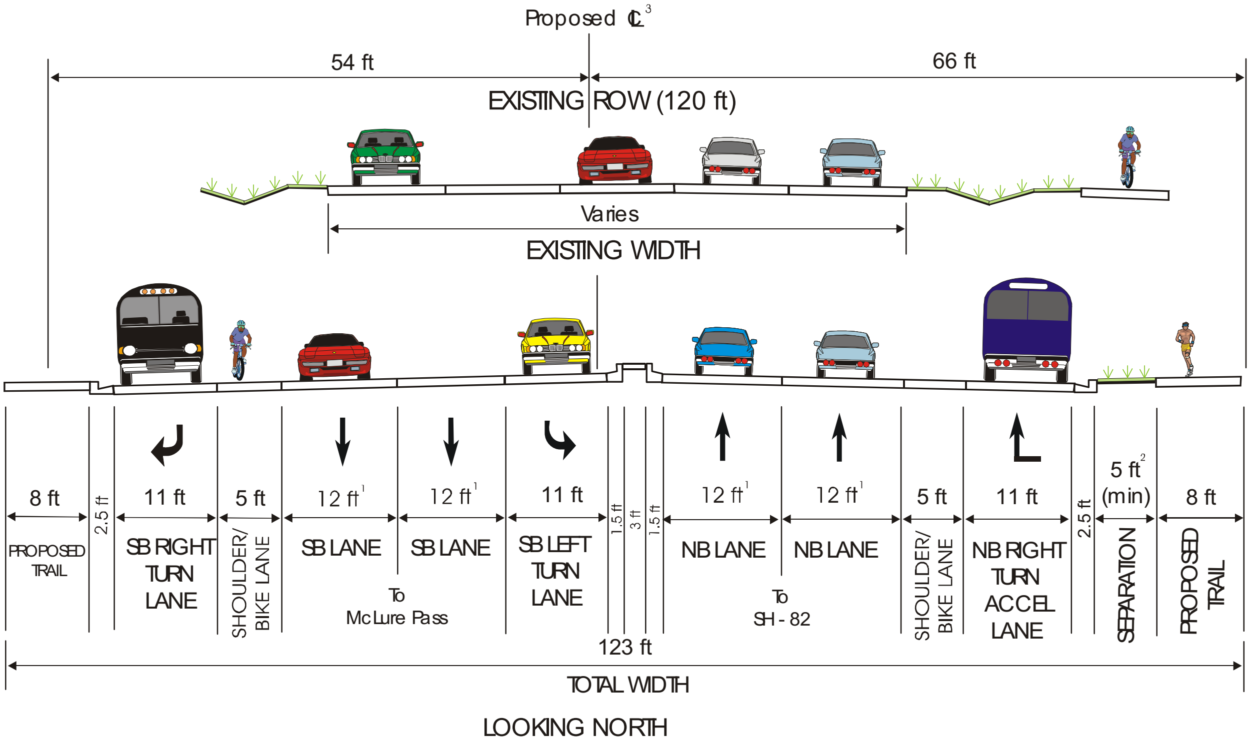
[1] Travel lane widths may be reduced to 11 feet. Further analysis will be completed during the final design of the project to determine the final dimensions.

[2] The separation between the curb and the trail will vary depending on the location and future adjacent developments. A 10-foot minimum separation is desirable wherever possible.

[3] The proposed roadway centerline has been located 6 feet west of the center of existing ROW to minimize impacts to the existing trail along the east side of SH 133 The roadway centerline shall be further analyzed during the final design of the project to determine the best location.

[4] The Town of Carbondale and Citizens Task Force requested that the raised median be eliminated south of Main Street to Meadowood Drive.

Figure 3.2
Typical Intersection With Auxiliary Lanes Option



[1] Travel lane widths may be reduced to 11 feet. Further analysis will be completed during the final design of the project to determine the final dimensions.

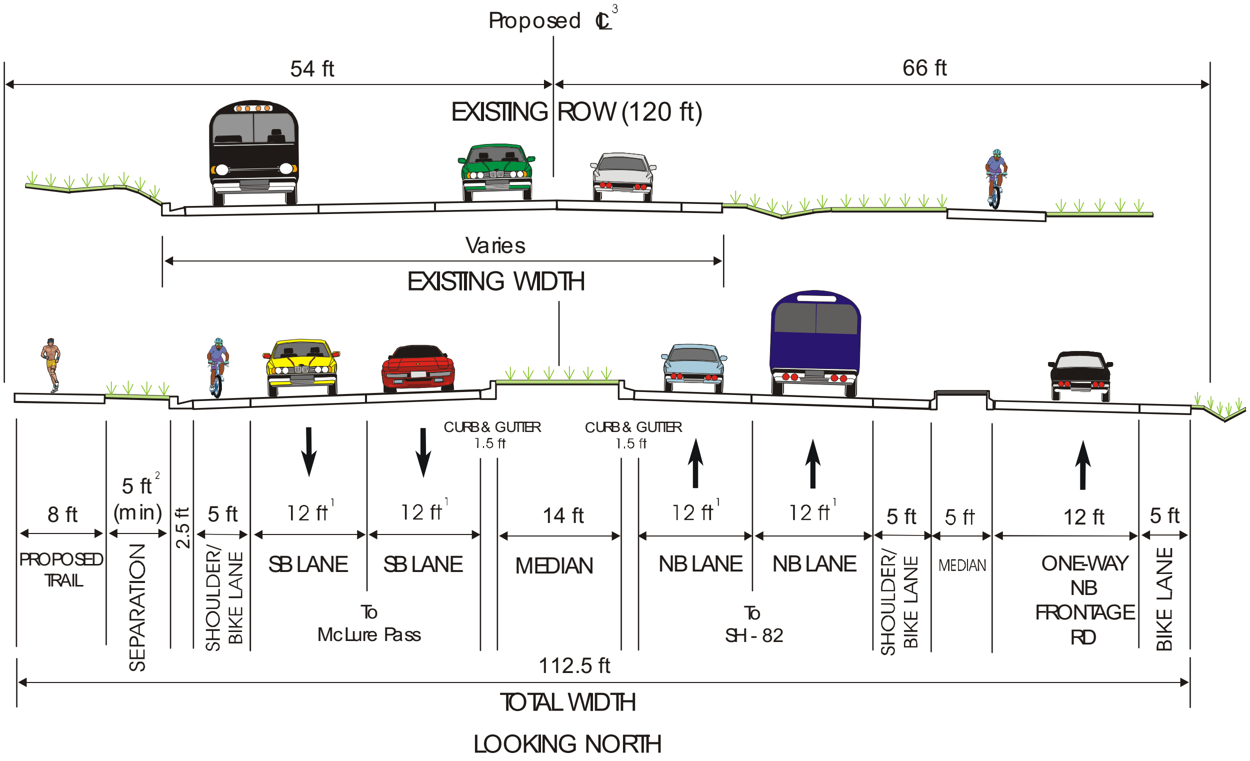
[2] The separation between the curb and the trail will vary depending on the location and future adjacent developments. A 10-foot minimum separation is desirable wherever possible.

[3] The proposed roadway centerline has been located 6 feet west of the center of existing ROW to minimize impacts to the existing trail along the east side of SH 133 The roadway centerline shall be further analyzed during the final design of the project to determine the best location.

[4] The locations of auxiliary lanes shall be as shown in the SH 133 Access Management Plan and Final Traffic Study.

[5] The Town of Carbondale and Citizens Task Force requested that the raised median be eliminated south of Main Street to Meadowood Drive.

Figure 3.3
Typical Section with Frontage Road Option 1



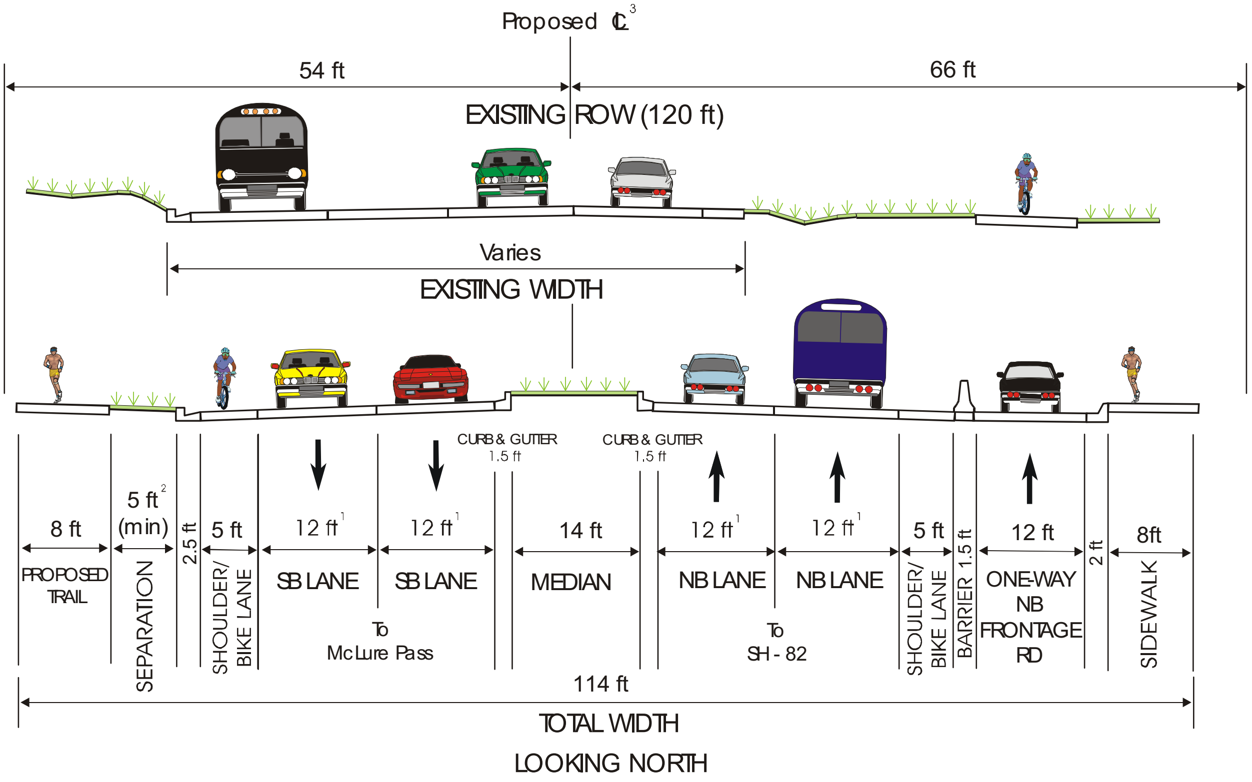
[1] Travel lane widths may be reduced to 11 feet. Further analysis will be completed during the final design of the project to determine the final dimensions.

[2] The separation between the curb and the trail will vary depending on the location and future adjacent developments. A 10-foot minimum separation is desirable wherever possible.

[3] The proposed roadway centerline has been located 6 feet west of the center of existing ROW to minimize impacts to the existing trail along the east side of SH 133 The roadway centerline shall be further analyzed during the final design of the project to determine the best location.

[4] The Town of Carbondale and Citizens Task Force requested that the raised median be eliminated south of Main Street to Meadow Drive.

Figure 3.4
Typical Section With Frontage Road Option 2



[1] Travel lane widths may be reduced to 11 feet. Further analysis will be completed during the final design of the project to determine the final dimensions.

[2] The separation between the curb and the trail will vary depending on the location and future adjacent developments. A 10-foot minimum separation is desirable wherever possible.

[3] The proposed roadway centerline has been located 6 feet west of the center of existing ROW to minimize impacts to the existing trail along the east side of SH 133 The roadway centerline shall be further analyzed during the final design of the project to determine the best location.

[4] The Town of Carbondale and Citizens Task Force requested that the raised median be eliminated south of Main Street to Meadowood Drive.

3.1.3 SH 133 and SH 82 Intersection

The SH 133 and SH 82 intersection presently operates at LOS C during the AM peak and LOS E during the PM peak periods. Traffic analysis determined that a signalized intersection would not be able to handle the projected traffic volumes. To accommodate the large anticipated future traffic volumes, a grade-separated interchange is recommended. Various alternatives were developed for a grade-separated interchange.

3.1.3.1 Initial Evaluation

The project goal was to develop a solution compatible with the environmental and Right-of-way considerations while providing the capacity required to accommodate the forecasted traffic. The full range of interchange forms that conceivably applied to the situation are outlined and discussed below. The interchange concepts were based on a policy of single exits and right-hand ramps, SH 133 designated as an arterial street of high standard, and the location classified to be in a rural environment.

The interchange forms considered included:

- Tight Diamond
- Trumpet Type A
- Single Point Urban
- Directional 3-level Flyover
- Trumpet Type B

3.1.3.2 Site Constraints

A significant consideration is the Red Hill embankment slope immediately to the north of SH 82 at the SH 133 intersection. Also just north of the intersection is a local access roadway as well as a gravel parking area that is being used as a car pool and recreational lot. There was a Roaring Fork Transit Authority (RFTA) parking lot located on Cowen Drive that was eliminated. On weekdays the lot is typically at capacity. Each interchange alternative would likely require relocation of this lot. The lot could possibly be located across the river within the Town of Carbondale and access to the Red Hill Area would be via the interchange bridge.

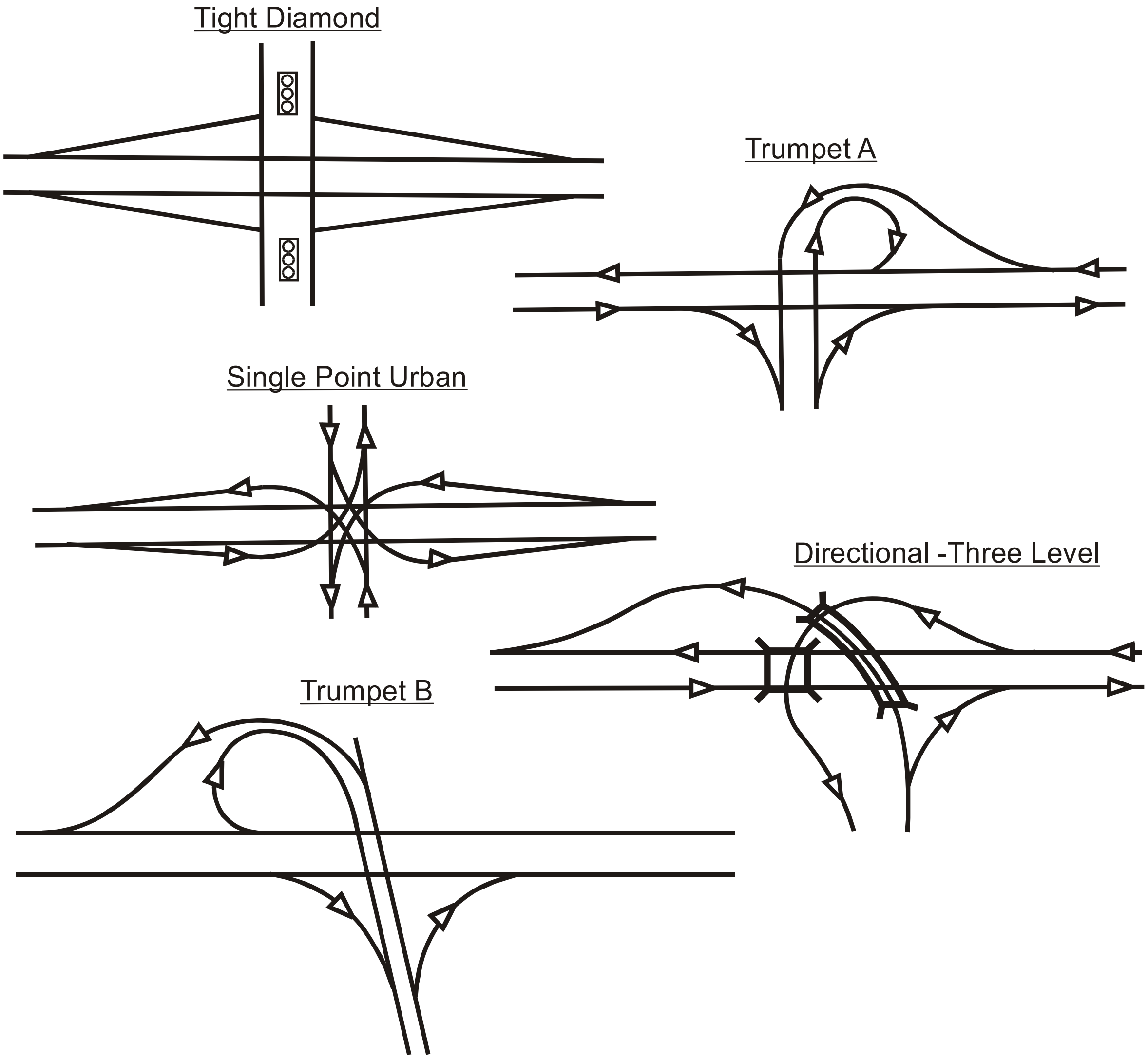
The Roaring Fork River is located just south of SH 82 and crosses SH 133 approximately 500 feet from the intersection.

There is an existing reverse curve in the SH 82 horizontal alignment near the SH 133 intersection. The existing alignment creates poor horizontal sight distance at the existing signalized intersection.

3.1.3.3 Evaluation of Interchange Options

The interchange forms that were evaluated are shown in schematic form in Figure 3.5 and are described as follows.

Figure 3.5
Interchange Forms Evaluated



Conventional Tight Diamond

The conventional tight diamond was considered as a desirable interchange form for the intersecting roadway classification, location, and the anticipated traffic volumes. Both of the ramps would be signalized. The conventional tight diamond interchange configuration is shown in Appendix A.

Trumpet Type A

The trumpet type A interchange form was eliminated due to encroachments on the Red Hill embankment slope in the northeast quadrant.

Single Point Urban

The single point urban interchange was eliminated due to the high structure costs associated with this type of geometric configuration. The conventional tight diamond provides similar traffic operation, with more reasonable costs.

Trumpet Type B

The trumpet type B was considered as a desirable interchange form due to large forecasted traffic volumes for the northbound to westbound traffic movement. Both traffic movements would have direct connections between both state highways and there would be no signalized intersections. Access to the local roadway to Red Hill would be difficult especially for the southbound to eastbound SH 82 movement. The Trumpet Type B interchange configuration is shown is Appendix B.

Directional 3-level Flyover

The directional 3-level flyover interchange was considered as a desirable interchange form due to large forecasted traffic volumes for the northbound to westbound traffic movement. Both traffic movements would have direct connections between both state highways and there would be no signalized intersections. Local roadway access to Red Hill would be difficult especially for the southbound to eastbound SH 82 movement.

3.1.3.4 Alternative Evaluation

As part of the evaluation process the interchanges were developed to different levels of design. The conventional tight diamond, directional 3-level flyover and trumpet type B**,** were considered to be the feasible options and were evaluated against applicable design criteria as shown in Table 3.3.

The conventional tight diamond, trumpet type B, and directional 3-level flyover grade-separated interchange options shall all be carried forward for further evaluation. The conventional tight diamond and trumpet type B were ranked similarly. (The directional 3-level flyover would have higher construction costs and more complicated constructability. However, this interchange form could provide some phasing advantages and shall also be analyzed in greater detail)

3.1.3.5 SH 133 and SH 82 Interchange Study Summary

This study included a limited evaluation of the SH 133 and SH 82 intersection alternatives and has identified that there is a need to complete a more detailed interchange feasibility study. This study would reevaluate possible interchange configurations, determine a recommended configuration, and identify a phasing plan for the construction.

The construction of a new grade separated interchange will require the completion of the Colorado Procedural Directive 1601 Interchange Approval Process. The process would include a System and Project Level Feasibility Study, approval of the Colorado Transportation Commission, completion of the appropriate environmental documentation (EA/FONSI anticipated), approval of FHWA, and the preparation of construction plans.

Table 3.3
Interchange Alternative Ranking Summary

Plan Alternative		No Build		Conventional Tight Diamond		Directional 3-level Flyover		Trumpet Type B	
ITEM	Scale Value	Rating	Score Value	Rating	Score Value	Rating	Score Value	Rating	Score Value
OPERATIONAL									
Capacity/LOS	15	5	75	10	150	10	150	10	150
Flexibility	5	5	25	9	45	10	50	8	40
Geometric alignment	5	5	25	9	45	8	40	8	40
SAFETY									
Operational	15	5	75	9	135	10	150	10	150
Roadside	5	5	25	9	45	10	50	10	50
COSTS									
Construction	10	10	100	8	80	6	60	7	70
Right-of-Way	10	10	100	10	100	10	100	5	50
Operating	5	5	25	10	50	7	35	10	50
IMPLEMENTATION									
Staging-Construction	5	10	50	5	25	5	25	9	45
Maintenance of Traffic	10	10	100	5	50	5	50	9	90
ENVIRONMENTAL									
Traffic Accessibility	5	5	25	8	40	6	30	6	30
Impact on Land Use	10	10	100	8	80	8	80	8	80
	100								
Possible 1000	TOTAL		725		845		820		845

3.1.4 Construction Phasing

Due to the initial costs to construct the proposed improvements all at one time, it may be desirable to phase the proposed improvements over several years. The project priorities were identified with input from the Town of Carbondale, CDOT and the public. The priorities are as include:

1. Widen existing bridge over Roaring Fork River and improve the SH 133 and SH 82 intersection.
2. Reconstruct SH 133 between Cowen Drive and Main Street.
3. Reconstruct SH 133 between Main Street and Meadowood Drive.

Opportunities to phase the widening of the existing bridge over the Roaring Fork River and construction of the proposed SH 133 and SH 82 interchange were evaluated and are described in the following section.

3.1.4.1 Widen Existing SH 133 Bridge over Roaring Fork River

A major traffic capacity constraint for the SH 133 and SH 82 intersection is the existing Roaring Fork River Bridge. The bridge is presently two lanes wide (one lane each direction) without shoulders or pedestrian facilities. It is anticipated that widening of this bridge would only provide improvements that would achieve an acceptable intersection LOS for less than 10 years.

Alternatives to accommodate the need for additional traffic lanes and pedestrian facilities on the SH 133 Bridge would include widening the existing structure, complete reconstruction, and construction of a separate bridge for one direction of travel. Additional detailed analysis is required to determine the desirable construction. Phasing opportunities assume that the initial construction will consist of widening the existing bridge over the Roaring Fork River. Subsequent phases would require that SH 82 be reconstructed and realigned over the top of SH 133. Both the conventional tight diamond and trumpet type B could be constructed with SH 82 going over SH 133. This would allow the initial construction of the bridge widening to remain.

The directional 3-level flyover interchange configuration could easily accommodate phased construction. The initial phase would likely include the construction of a flyover for the northbound to westbound traffic. This would remove significant traffic from the existing intersection and is anticipated to achieve an acceptable intersection LOS for several years before it would be necessary to complete the subsequent phases of the interchange.

3.2 FUTURE TRAFFIC CONDITIONS

The projected future traffic volume analysis with existing conditions indicates that to achieve an acceptable LOS D or better, significant improvements are required for the SH 133 corridor. Some of the proposed improvements are the addition of travel and turn lanes, signalization of some intersections, and restriction of certain turning movements at other intersections. A detailed discussion of recommended improvements to the SH 133 corridor follows.

3.2.1 SH 133

Currently, SH 133 is a two-lane, two-way roadway. Analyses of future volumes indicate that SH 133 should be widened to a four-lane, two-way roadway. This improvement would ensure that SH 133 could accommodate the future traffic volumes and operate at an acceptable LOS. The present SH 133 and SH 82 intersection is operating at LOS E (PM peak) under existing volumes and the queues from the northbound traffic approach extend south of Cowen Drive. The future traffic volumes on SH 133 and SH 82 are projected to be significantly higher than the existing conditions. A grade separated interchange has been recognized as an effective method of accommodating these high turning volumes and ensuring that SH 82 and SH 133 operates efficiently and safely. The recommended improvements on SH 133 will be beneficial only if the SH 133 and SH 82 intersection is mitigated to operate adequately. The poor level of vehicle service on SH 133 is a result of the long queues that would extend from the unmitigated SH 133 and SH 82 intersection on the SH 133 corridor causing gridlock. A Synchro computer analysis indicates that with no improvements the queue from the unmitigated intersection of SH 133 and SH 82 could extend past Main Street in the year 2025. Therefore, the traffic analysis of the

SH 133 corridor was conducted assuming that the SH 133 and SH 82 intersection would be mitigated and would operate at an acceptable level of service in the design year (2025). Recommendations for the corridor were based on the assumption of an improved SH 82 and SH 133 intersection. Table 3.4 summarizes the recommended intersections improvements on SH 133.

Table 3.4
Recommended Intersection Improvements
Design Year (2025) Conditions

Cross Street	Control		Movement	
	Existing	Proposed	Existing	Proposed
*Cowen	Unsignalized	Signalized	Full Movement	Full Movement
Village	Unsignalized	Unsignalized	Full Movement	3/4 Movement
*Delores	Unsignalized	Signalized	Full Movement	Full Movement
*Industrial	Unsignalized	Signalized	Full Movement	Right-in/Right-out
*Nieslanik	Unsignalized	Signalized	Full Movement	Full Movement
Garfield	Unsignalized	Unsignalized	Full Movement	Right-in/Right-out
*Sopris+Hendricks	Unsignalized	Signalized	Full Movement	Full Movement
Weant	Unsignalized	Unsignalized	Full Movement	Right-in/Right-out
Snowmass	Unsignalized	Signalized	Full Movement	Full Movement
Roaring Fork	Unsignalized	Unsignalized	Full Movement	Right-in/Right-out
Meadowood Dr.	Unsignalized	Signalized	Full Movement	Full Movement

* Cowen Drive (may be warranted after improvements to the SH 82/SH 133 intersection and if a connection is made to frontage road located within the County to the west of SH 133)

* Delores Way (may be warranted if a future park-n-ride is located here)

* See Discussion on Industrial and Nieslanik Intersection

* Sopris Avenue/Hendrick Road (may be warranted subject to potential intersection realignment)

The installation of traffic signals requires meeting signal warrants in accordance with the *Manual of Uniform Traffic Control Devices* and approval from CDOT. Several of the recommended intersection locations would not require signalization until future traffic growth occurs and the assumed development and/or geometric improvements are completed.

3.2.2 Nieslanik and Industrial Intersection

The Town of Carbondale has identified a desire to provide an additional road connection between SH 133 and Eighth Street for additional access to the eastern part of the Town. There is an existing industrial area east of Eighth Street that would benefit from a more direct access to SH 133. The Town has completed a study (Technical Memorandum, dated September 2002) identifying and evaluating alternatives for the potential extension of Industrial Place and Nieslanik Avenue between SH 133 and Eighth Street. This study also evaluated the Industrial Place and Nieslanik Avenue intersections with SH 133 to determine if more than one signalized full movement intersection would operate at an acceptable level of service for vehicles on SH 133.

Traffic signals located at both Nieslanik Avenue and Industrial Place is not desirable due to the close spacing between intersections (400 feet) and the Industrial Place intersection is not anticipated to meet the peak hour warrant criteria. However, if it is desirable for other reasons, the progression analysis meets the 30% efficiency criteria and both the Industrial Place and Nieslanik Avenue intersections could be signalized. The installation of traffic signals at either and/or both location will require CDOT approval.

3.2.3 Main Street

Main Street is currently a two-lane roadway with left and right turn auxiliary lanes at the SH 133 intersection. Future traffic projections require a proposed five-lane (an exclusive left-turn lane, a shared through and left lane and a shared through and right lane in east and west bound directions) roadway would be adequate to accommodate the traffic and would meet the Right-of-way restrictions on Main Street. A continuous southbound right-turn auxiliary lane was also added from Nieslanik Avenue to Main Street to facilitate traffic operation. A split phasing operation of the intersection control for the eastbound and westbound directions would ensure that the intersection would operate at an acceptable LOS D.

Since the majority of the intersections are unsignalized intersections, a signal warrant analysis was performed. Table 3.5 summarizes the result of the peak hour signal warrant analysis. The warrant analysis indicates that the SH 133 intersections with Village Road., Delores Way., Nieslanik Avenue, Snowmass Drive, and Meadowood Drive satisfied the conditions for a peak hour warrant with only the through and left turning volumes considered. Right turn volumes are generally not considered in signal warrant analysis because these volumes can be easily accommodated without installation of a traffic signal.

Table 3.5
Signal Warrant Analysis
Design Year (2025) Conditions

Peak Hour Warrant Analysis		
Cross Street	(Left Turns+Thrus Only) Warrant Satisfied	(Including Right-turns) Warrant Satisfied
Cowen	No	Yes
Village	Yes	Yes
Delores	Yes	Yes
Industrial	No	Yes
Nieslanik	Yes	Yes
Garfield	No	No
Sopris+Hendricks	No	Yes
Weant	No	No
Snowmass	Yes	Yes
Roaring Fork	No	No
Meadowood	Yes	Yes

Signals are proposed at locations where the peak hour signal warrants were met without inclusion of right-turn volumes. Signals are also proposed at the realigned Sopris and Hendrick intersection and Cowen Drive to provide traffic operational benefits to the Town's local street network and circulation.

A signal is proposed at Cowen Drive if the frontage road is extended to the west of SH 133. It is further recommended that this intersection not be signalized until the improvements have been completed for the connection of SH 133 to SH 82. The improvements could include bridge widening or a grade-separated intersection.

Although Village Road satisfied signal warrants, it was not signalized due to its proximity to the proposed traffic signal at Delores Way and Cowen Drive. Village Road operated at an acceptable LOS D or better as a 3/4 movement (right-turn in/right-turn out/left-turn in). Village Road connects with Cowen Drive providing an alternative means of access to an adjacent full movement intersection.

It is proposed that Sopris Avenue and Hendricks Drive be realigned to form a single intersection in the future. The realigned Sopris and Hendrick intersection was signalized because the crosswalk at the intersection serves a significant number of pedestrians including children crossing for school and to provide additional full-movement access to the Town's local street network. The anticipated volume of pedestrians may allow this intersection to meet warrants for signalization. Traffic from cross streets with restricted left turns was re-distributed to the adjacent signalized intersection through local streets. The final analysis volumes reflect these redistributed vehicles.

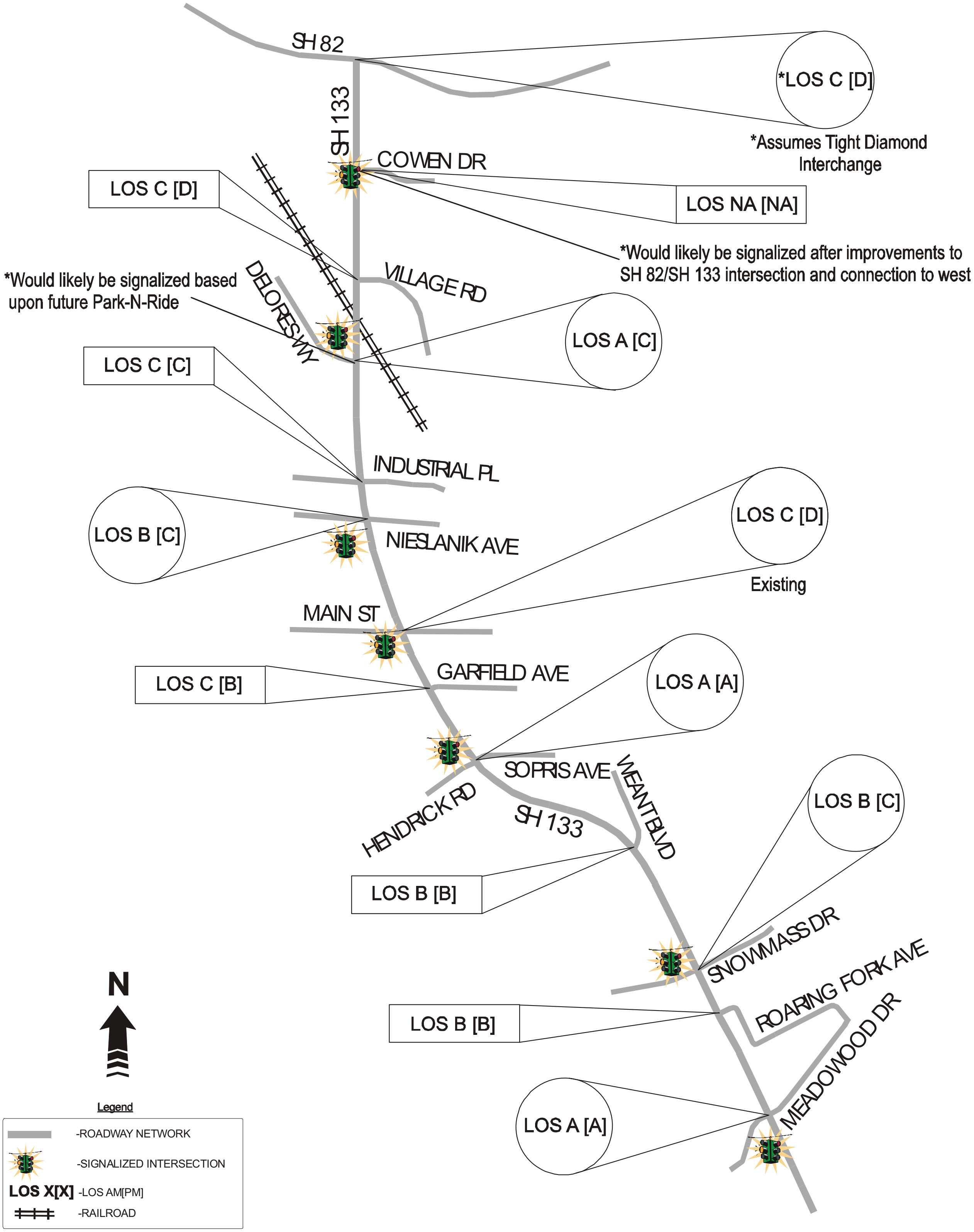
LOS analysis was conducted using the SYNCHRO model based on the 2000 *Highway Capacity Manual* methodology for the proposed future conditions considering the redistributed volumes, reconfigured roadways and controls. LOS was determined for the peak hour within the 7:00 and 9:00 AM and 4:00 and 6:00 PM peak periods. The results from the analyses are illustrated in Figure 3.6 and Table 3.6 summarizes the LOS for all the intersections with their respective delays. The LOS illustrated at the SH 82 and SH133 intersection is obtained from a diamond interchange analysis performed for that location. It can be seen from the results that all the intersections in the study area operate at desirable LOS C or better and at acceptable LOS D or better, which indicates that the SH 133 operates satisfactorily with the proposed future conditions.

Table 3.6
Future Design Year (2025) Conditions with Recommended Improvements

Level Of Service (LOS)				
	AM		PM	
Intersection	LOS	Delay in secs/ veh	LOS	Delay in secs/veh
SH 133 and SH 82	C	20.3	D	29.0
SH 133 and Cowen Drive*	N.A.	N.A.	N.A.	N.A.
SH 133 and Village Road	C	18.1	D	33.0
SH 133 and Delores Way	A	8.9	C	23.5
SH 133 and Industrial Place	C	19.7	C	23.5
SH 133 and Nieslanik Avenue	B	15.1	C	25.1
SH 133 and Main Street	C	28.3	D	46.1
SH 133 and Garfield Avenue	C	15.6	B	13.6
SH 133 and Sopris+Hendrick	A	2.1	A	5.6
SH 133 and Weant Boulevard	B	12.5	B	11.4
SH 133 and Snowmass Drive	B	12.9	C	31.4
SH 133 and Roaring Fork Avenue	B	12.2	B	11.3
SH 133 and Meadowood Drive	A	8.4	A	9.7

- \- All movements are uncontrolled (WBR is free and SBL is uncontrolled)

Figure 3.6
Levels of Service for Future Design Year (2025) with Recommended Improvements



3.3 ACCESS MANAGEMENT ANALYSIS

The alternative development and evaluation of recommended improvements included a review of the accesses along the SH 133 corridor. The corridor feasibility study included the completion of a SH 133 Access Management Plan (see Appendix A). The plan provides the Town of Carbondale and CDOT with a comprehensive roadway access design plan for SH 133 for the purpose of bringing that portion of SH 133 into conformance with its functional needs to the extent feasible given existing conditions. The goal of the plan is to achieve optimal balance between state and local transportation planning objectives, and preserve and support the current and future functional integrity of the highway.

The plan provides guidance for agency review and decisions regarding access permit applications and future access decisions. The SH 133 Access Management Plan evaluates existing and new access points along the highway and recommends appropriate modifications.

3.4 HYDROLOGY & HYDRAULICS

The project will involve construction in close proximity to the Roaring Fork River, a Gold Medal Trout Stream, the Crystal River, and the Rockford and Town Ditches. Protection of these resources should be a primary consideration. Effective erosion control plans for construction activities and post construction conditions should be implemented that minimize water quality impacts.

3.4.1 SH 133 Corridor

The evaluation of proposed improvements and development of programming cost estimates included a review of hydrology and hydraulics considerations. The existing road surface drainage is collected in roadside ditches. There are few existing storm drain facilities present along SH 133. The reconstruction of SH 133 would likely require the construction of a new closed storm drain system. The proposed storm drain would outfall to existing drainage basins, Crystal River and Roaring Fork River.

A RFTA pedestrian underpass is anticipated at the existing railroad crossing between Village Road and Delores Way. The proposed storm drain could either cross underneath this structure and continue north or be extended down the existing railroad Right-of-way. Both options would outfall into the Roaring Fork River. Further analysis regarding elevations and Right-of-way/easement requirements will need to be completed during the preliminary design to determine the desirable solution.

Design storm selection will impact storm drain trunk line size and system costs. Consideration of design storm and development of drainage concepts should be accomplished early in the project design phase. This will ensure that costs, utility relocation, flood history issues and potential detention requirements are addressed.

The *State Highway Access Code* states *“The highway drainage system is for the protection of the state highway right-of-way, structures and appurtenances. It is not designed or intended to serve the drainage requirements of abutting or other properties beyond undeveloped historical flow. Drainage to the state highway right-of-way shall not exceed the undeveloped historical rate of* *flow"*. Presently the storm drainage flows from the SH 133 roadway and is collected in ditches. It is desirable to construct curb, gutter and storm drains.

The Town has stated that there are several local side streets that presently experience storm drainage problems. The Town is interested in improving the drainage on these side streets by possibly discharging this drainage into the new storm drain system that would be constructed for the SH 133 drainage. The Town would be required to pay an equitable apportion of the cost for this additional drainage. This apportionment and cost sharing participation by the Town would be in accordance with current CDOT Procedural Directive 501.2 "Cooperative Storm Drainage System" and will be determined as part of the final design of the drainage system.

3.4.2 SH 133 and SH 82 Intersection

The proposed improvements will likely include a new bridge crossing of the Roaring Fork River. The hydraulic design of this bridge should ensure that an adequate opening is provided to convey flood flows and limit bridge backwater. It shall also ensure that maintenance requirements are minimized, and that the bridge will accommodate recreational objectives. The current regulatory floodplain model shall be acquired and used as the base hydraulic model. This base model would be modified to assess alternative bridge waterway openings, channel improvements, and floodplain impacts.

In addition to hydraulic capacity, the susceptibility of the bridge crossing to scour and stream instability shall be evaluated. Pier shapes and locations would be established to minimize scour potential and debris and ice accumulation, facilitate debris removal and allow for safe passage of recreational boaters. Abutment revetment and scour countermeasures shall be designed to protect the structure and roadway from flood related damage and minimize aesthetic and habitat impacts.

3.5 UTILITIES

The evaluation of the proposed improvements and the development of programming cost estimates included a review of anticipated utility considerations. Conceptual utility mapping is shown in Appendix B. The location and number of utilities should be verified during the preliminary design. The locations shown of the mapping are based on available information. No field locations or surveys were performed to gather or verify this information.

Utilities believed to be within the SH 133 corridor include Town of Carbondale water and sanitary sewer, Town Ditch and Rockford Ditch irrigation companies, Qwest telephone and fiber optic, AT&T Broadband television cable, Public Service Company (Xcel) electric and gas, and Kinder Morgan gas.

3.5.1 Town of Carbondale Water and Sewer

The Town's water line is approximately located; inside and adjacent to the west right-of-way line from Delores Way to Industrial Place, between the east right-of-way and edge of roadway from south of Industrial Place to Sopris Avenue, between the west right-of-way and edge of roadway from Hendrick Street to Seventh Street, between the east right-of-way and edge of roadway from the Carbondale Elementary School to the south project limit. The proposed widening is not anticipated to impact the existing waterlines. There are several existing perpendicular crossing of

SH 133 (Industrial Place, Colorado Avenue, Sopris Avenue, and Seventh Avenue) that could require relocation due to grade changes and/or conflicts with the proposed storm drains. Also, the Town shall be contacted to determine if there is a desire to replace any existing waterlines or construct additional roadway crossings.

The Town's sanitary sewers are located; between the east right-of-way and edge of roadway from the Roaring Fork River to Main Street, and between the west right-of-way and edge of roadway from Main Street to Snowmass Drive. The existing sanitary sewers will likely be underneath the new pavement in several locations due to the proposed widening. The need to relocate the sanitary sewer in these locations will be analyzed and coordinated further during the design phase. Also, there are several existing perpendicular crossing of SH 133 (Cowen Drive, Main Street, Snowmass Drive) that could require relocation due to grade changes and/or conflicts with the proposed storm drains. The Town shall be contacted to determine if there is a desire to replace any existing waterlines or construct additional roadway crossings.

3.5.2 Irrigation Ditches

The Town Ditch and Rockford Ditch are two active irrigation ditches located between Main Street and Meadowood Drive. The Rockford Ditch crosses SH 133 in a 4' x 5' corrugated metal arched pipe south of the Meadowood Drive intersection. The Town Ditch crosses SH 133 in a 24 inch corrugated metal pipe at the Weant Boulevard intersection and in a 3' x 5' corrugated metal arched pipe south of the Meadowood Drive intersection. Also, there is a 36" corrugated metal irrigation pipe crossing at Sopris Avenue and an irrigation pipe located along the east side of SH 133 between Weant Boulevard and Third Street (owners unknown).

As part of the roadway reconstruction and widening it is desirable to replace these pipes where they will be located under the new SH 133 pavement. Additional coordination will be required to determine irrigation company requirements including replacement sizes, maintenance, construction, cost sharing and access requirements.

3.5.3 Private Utilities (Electric, Gas, Telephone, Cable, and Fiber Optic)

Overhead and underground electric, telephone, and cable utilities are present on both sides of SH 133 (generally near the existing right-of-way limits) along a majority of the corridor. There is also an electrical transmission line that parallels the ROW from Red Hill to the Public Service property. It appears that the line is out of the CDOT ROW.

It is unknown at this time if the roadway construction would require the undergrounding of any of these utilities. Undergrounding of the overhead utilities is desirable to improve the views of Mt. Sopris, and the overall scenic value of the corridor. PSCo estimated the cost for undergrounding the existing overhead electric lines along the East side of SH 133 would be approximately $2.0 million. Detailed estimates for the undergrounding were not completed. The cost is included as a line item in the detailed cost estimate located in Appendix F.

Underground gas lines are located; along the east right-of-way line between the Roaring Fork River and Main street, along the west right-of-way line between the Roaring Fork River and Delores Way, along the west right-of-way line from Main Street to 600 feet south of the intersection, along the west right-of-way line from Seventh Street to the south project limit, and along the east right-of-way line from the Carbondale Elementary School to Snowmass Drive. The existing gas lines are located outside the limits of the proposed widening and will not be underneath the new pavement. Locations of existing perpendicular crossings of SH 133 will be investigated during the preparation of construction plans to identify relocations due to grade changes and/or conflicts with the proposed storm drains.

There is an existing Qwest fiber optic line located within the RFTA right-of-way that crosses SH 133. The construction of a grade separated pedestrian underpass at this location will need to consider and minimize disturbance to this facility. Also, there are fiber optic lines crossing SH 133 at Main Street extending east/west and at Weant Boulevard continuing south along the west right-of-way line to the project limit. The design of the storm drainage system will coordinate with the locations of the existing fiber optic lines. The new storm drainage system will coordinate with the location of the fiber optic line crossings.

3.6 BICYCLE AND PEDESTRIAN FACILITIES

The alternative development and evaluation of recommended improvements included an analysis of bicycle and pedestrian facilities. The existing conditions and proposed improvements are described in the following sections. The construction of pedestrian bridges/underpasses is not considered warranted at this time. The construction of raised medians will create safe refuge areas for pedestrian crossings. The construction of grade-separated bike/pedestrian crossing may be considered in the future depending on traffic conditions and development opportunities.

3.6.1 On-Street Bike Lanes

Combination on-street bike lanes and shoulders are proposed along both sides of SH 133 for the length of the corridor. Five feet from the edge of travel lane to lip of gutter pan is the proposed width for a bike lane/shoulder. The on-street bike lane will accommodate regional cyclists who are more experienced destination-focused travelers. The 5-foot width plus the 2-foot gutter pan would also provide a breakdown area for vehicles.

3.6.2 Existing and Proposed Multi-Use Trails

An existing 8-foot wide multi-use recreational trail is located on the east side of SH 133 between Cowen Drive and Snowmass Drive. In areas where the trail is separated from the new road it will be preserved wherever possible. The existing trail would be replaced in areas where it is impacted either horizontally or vertically. Also, the existing trail will be extended south to Meadowood Drive.

On the west side of the road, a new 8-foot wide trail is proposed. The desirable minimum separation from the roadway is 10 feet (5 feet minimum where Right-of-way constraints exist). In locations where auxiliary lanes are located the trail may be connected to the proposed curb and gutter. This separated bike/pedestrian trail will provide for recreational and inexperienced cyclists who would prefer not to travel on the street. The separated trail will also provide greater safety than the on-street bike lane.

3.6.3 Connectivity with the Existing Trails System

Pedestrian crossings across SH 133 will be provided at each signalized intersection. These are anticipated to include Cowen Drive, Delores Way, Nieslanik Avenue (or Industrial Place dependent upon location of the signal), Main Street, Sopris Avenue/Hendrick Road, Snowmass Drive, and Meadowood Drive.

As a part of both SH 133 and SH 82 interchange alternatives, bike lanes and sidewalks would be provided on the bridge over the Roaring Fork River and across SH 82 to access the BLM recreation area. A major point of concern at the first Public Open House was the difficulty for children to safely cross SH 133 to reach schools located on the east side of the road. The proposed crosswalks at Sopris Avenue/Hendrick Road and Snowmass Drive will provide adequate crossings for children to reach Carbondale Middle School, Carbondale Elementary School, and Roaring Fork High School. It will be important to design the proposed sidewalks to minimize mid-block crossings.

The RFTA "Rails to Trails" project plans to construct a bike/pedestrian path along the railroad corridor between Glenwood Springs and Aspen. RFTA representatives have stated that the "Rails to Trails" project anticipates a desire to construct a pedestrian underpass located at SH 133 and the railroad crossing just south of Village Road. This cost would be the responsibility of RFTA and is included as a line item in the detailed cost estimate located in Appendix E. The trails on both sides of SH 133 would be connected to the future RFTA underpass and trail.

3.7 RIGHT-OF-WAY REQUIREMENTS

The evaluation of proposed improvements and the development of programming cost estimates included a review of the Right-of-way considerations. The existing of way information for SH 133 and SH 82 was obtained from CDOT Right-of-way plans and from Garfield County tax records. The existing CDOT Right-of-way along SH 133 within the study area is 120 feet wide. Additional Right-of-way was purchased by CDOT in 1973 for a SH 133 and SH 82 interchange. The Right-of-way acquired was for a proposed diamond interchange with SH 82 going over SH 133.

3.7.1 SH 133 Improvements

Right-of-way would not be required to construct the proposed SH 133 widening improvements. The SH 133 centerline is proposed to be located six-feet west of the center of existing Right-of-way to minimize impacts to the existing trail along the east side of SH 133. The roadway centerline shall be further analyzed during preliminary and final design to determine the optimal location. Locations where the proposed centerline shall be analyzed include the following.

- Main Street - Existing developed properties are located on the west side of the road. The proposed centerline could be shifted to the east to construct the proposed bike/pedestrian trail within the existing Right-of-way along the west side of the road.
- Sopris Avenue/Hendrick Road - Existing developed properties are located on the west side of the road. The proposed centerline could be shifted to the east to construct the proposed bike/pedestrian trail within the existing Right-of-way along the west side of the road.
- Snowmass Drive to Meadowood Drive - The existing curb and gutter on the west side of SH 133 along the River Valley Ranch development shall be matched. This would shift

the roadway from the residential properties on the east side of the roadway along this area.

The Town can require that future developments along the west side of SH 133 donate additional Right-of-way to provide a ten-foot separation to the bike/pedestrian trail. In these areas the proposed six-foot centerline shift to the west would be desirable. It is not anticipated that Right-of-way would be acquired to construct the proposed trail along the west side of SH 133. In locations adjacent to existing developed properties the trail can fit within the existing Right-of-way by reducing the separation between the curb and sidewalk.

3.7.2 CDOT Maintenance Facility

The SH 133 roadway widening will affect the CDOT maintenance facility located between Roaring Fork Avenue and Meadowood Drive and require its relocation to a new location. The maintenance facility services SH 133 between milepost markers 36.0 and 68.9 (SH 82 intersection). The costs to relocate this facility are not included in the overall SH 133 corridor costs.

Table 3.7 summarizes the potential Right-of-way requirements for the proposed SH 133 roadway widening.

Table 3.7
SH 133 Corridor
Potential Right-of-Way Requirements

Improvement	Right-of-Way Required (sf)	Right-of-Way Required (acres)
Cowen Drive extension	7,500	0.2
Sopris/Hendrick Realignment	8,000	0.2
CDOT Maintenance Facility	80,000	1.8
Total	95,500	2.2

The construction of the proposed tight diamond interchange option would require minimal Right-of-way acquisition. The modified trumpet interchange would require additional Right-of-way acquisition on the northwest corner of SH 82 to accommodate the directional loop ramp. Table 3.8 summarizes the potential Right-of-way requirements for the proposed grade-separated interchange at the SH 133 and SH 82 intersection.

Table 3.8
SH 133 and SH 82 Interchange
Potential Right-of-Way Requirements

Interchange	Right-of-Way Required (sf)	Right-of-Way Required (acres)
Alternative A (tight diamond)	5,000	0.1
Alternative B (trumpet type B)	90,000	2.1

3.8 ENVIRONMENTAL CONSIDERATIONS

The environmental overview of proposed improvements was conducted to assess wetland, wildlife, recreational, noise, cultural resource, and environmental justice issues. The environmental considerations along the SH 133 study corridor are shown in Figure 3.7. The overview results demonstrate the proposed improvements should consider environmental effects in six areas:

- Limited encroachment and water quality impacts with the Roaring Fork River, jurisdictional wetlands, and roadside ditches
- Fishing opportunities in the Roaring Fork and Crystal Rivers, as well as, potential bald eagle nesting and roosting areas
- Recreational resources like Hendrick Ranch Park and River Valley Ranch Park
- Single and multi-family homes adjacent to the SH 133 roadway that are potentially sensitive to increases in noise levels
- Cultural resources such as the existing Chamber of Commerce Building
- Disproportionate effects on low income and/or minority populations
- Hazardous materials studies are recommended

The wildlife impacts associated with construction near prime trout waters of the Roaring Fork River could be mitigated by including a well designed stormwater management plan (SWMP) with the construction package. In addition, coordination with the Colorado Division of Wildlife (CDOW) should be initiated to determine if bald eagles nest or roost in the habitat east of the SH 133 corridor along Crystal River. If eagles are found to nest in this area the CDOW and the United States Fish and Wildlife Service (USFWS) may require construction to cease during the spring/summer nesting season, especially if the nest is within 2,600 feet of SH 133.If FHWA funds are involved at any future phase of this project, Section 4(f) implications will certainly warrant review. Section 4(f) states that the Secretary of the US Department of Transportation may approve a project requiring the use of publicly owned land of a public park, recreation area, wildlife/waterfowl refuge, or significant historic site **only if** there are no feasible and prudent alternatives to the taking and the project includes all possible planning to minimize harm to the resource. Hendricks Park, River Valley Ranch, Carbondale Elementary school playground, and the Carbondale Middle School multi-use fields may all be protected under Section 4(f). If impacts to Section 4(f) resources are inevitable, mitigation alternatives must be developed early on in the project and a lengthy review process with FHWA must be initiated as early in the project process as possible. It is likely that the paved multi-use trails adjacent to SH 133 are not protected under Section 4(f). These trails primarily provide a transportation mode rather than a recreation function. Written assurance from the Town of Carbondale that the trails primarily provide a transportation mode may be necessary for a FHWA Section 4(f) eligibility determination. Documentation, coordination, and review times related to Section 4(f) issues often cause delays in project schedules. Avoidance of Section 4(f) resources is usually the best alternative. The other option is to limit project funding to state and local funds. Recreational resources are not protected under Section 4(f) unless federal funds are used in one or multiple phases of the project.

The results of the noise analysis show show that current levels are under CDOT's 66 dBA NAC for Land Use Category B (residential, parks, motels). If this project were advanced to the project development stage, detailed noise analysis would be required. A combination of design year traffic and the addition of a lane in each direction could cause noise impacts to a number of noise sensitive land uses. If noise impacts are predicted, noise abatement measures (noise walls) must be considered.

More research with respect to Environmental Justice (EJ) issues is needed in the project development stage to determine if low-income families live along the corridor, and if disproportionately high impacts are expected on these families as part of the project. Early coordination with FHWA is vital to the schedule of the project, if impacts are expected to low income families.

Hazardous materials studies are recommended in the project development phase to address the identification, evaluation, and potential mitigation of hazardous waste in the project corridor. An Initial Site Assessment (ISA), which includes a records search and visual inspection of the project area, should be conducted. A Preliminary Site Inspection (PSI) is recommended, if the ISA determines there is the potential for hazardous waste within the project corridor. The PSI determines the type and extent of the contamination through soil testing. Gas stations, a vehicle repair shop, a maintenance yard, and a propane gas purchase center all exist along the study corridor and have the potential for hazardous materials on site. Close examination for the potential of contaminated soils adjacent to these properties is recommended. In addition, the bridge over the Roaring Fork River will require inspection to determine if it contains lead based paint. Modifications to the bridge will required a disposal plan, as well as a health and safety plan, if the bridge contains lead based paint.

Impacts to the 100-year floodplain, prime or unique farmlands, air quality, or land use are not expected.

Figure 3.7
Environmental Considerations

Legend

1	Colorado Division of Wildlife Boat Ramp	8	Town of Carbondale Bike Paths
2	Roaring Fork River	11	West Elk Scenic Byway (Mt. Sopris Viewshed)

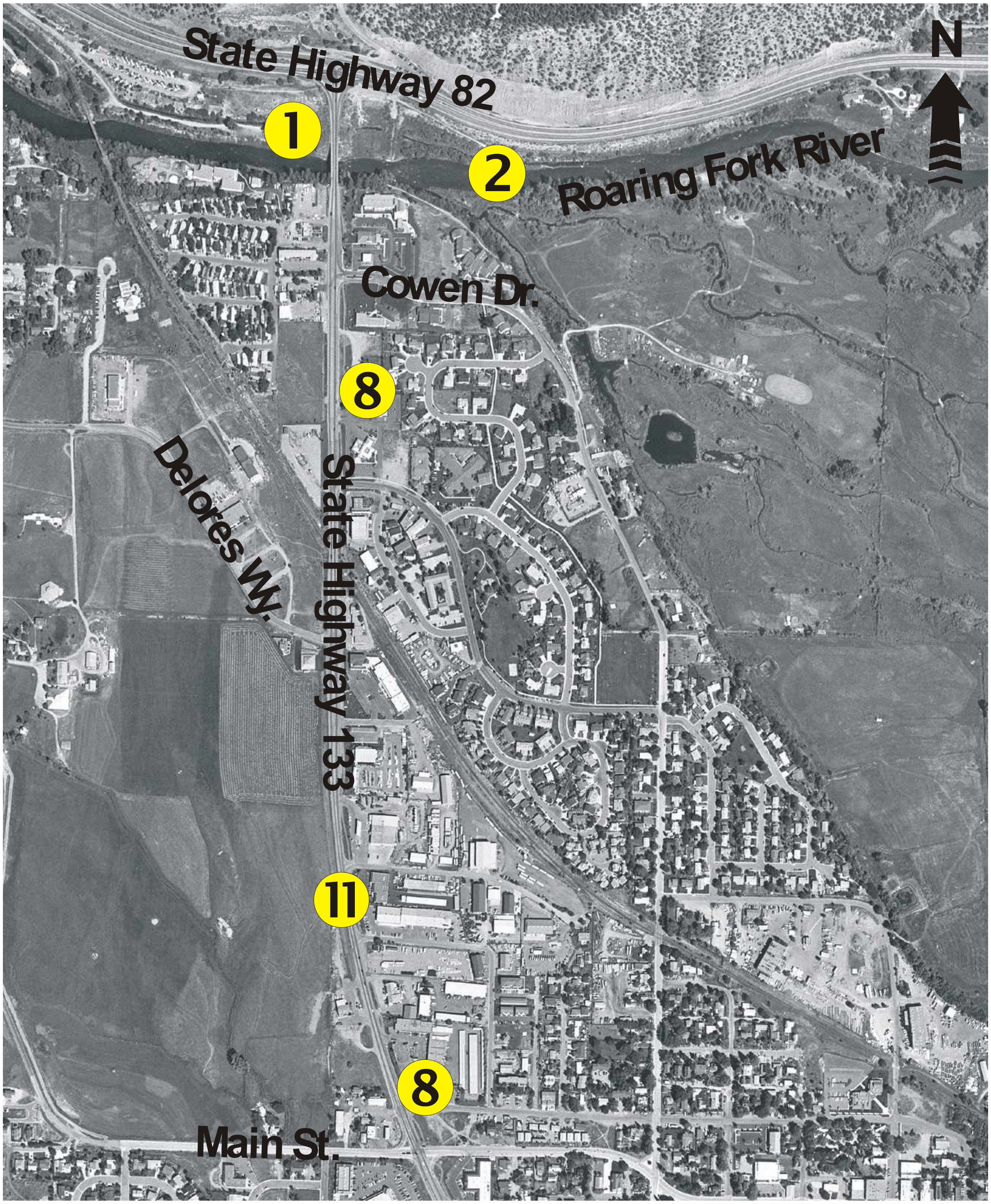
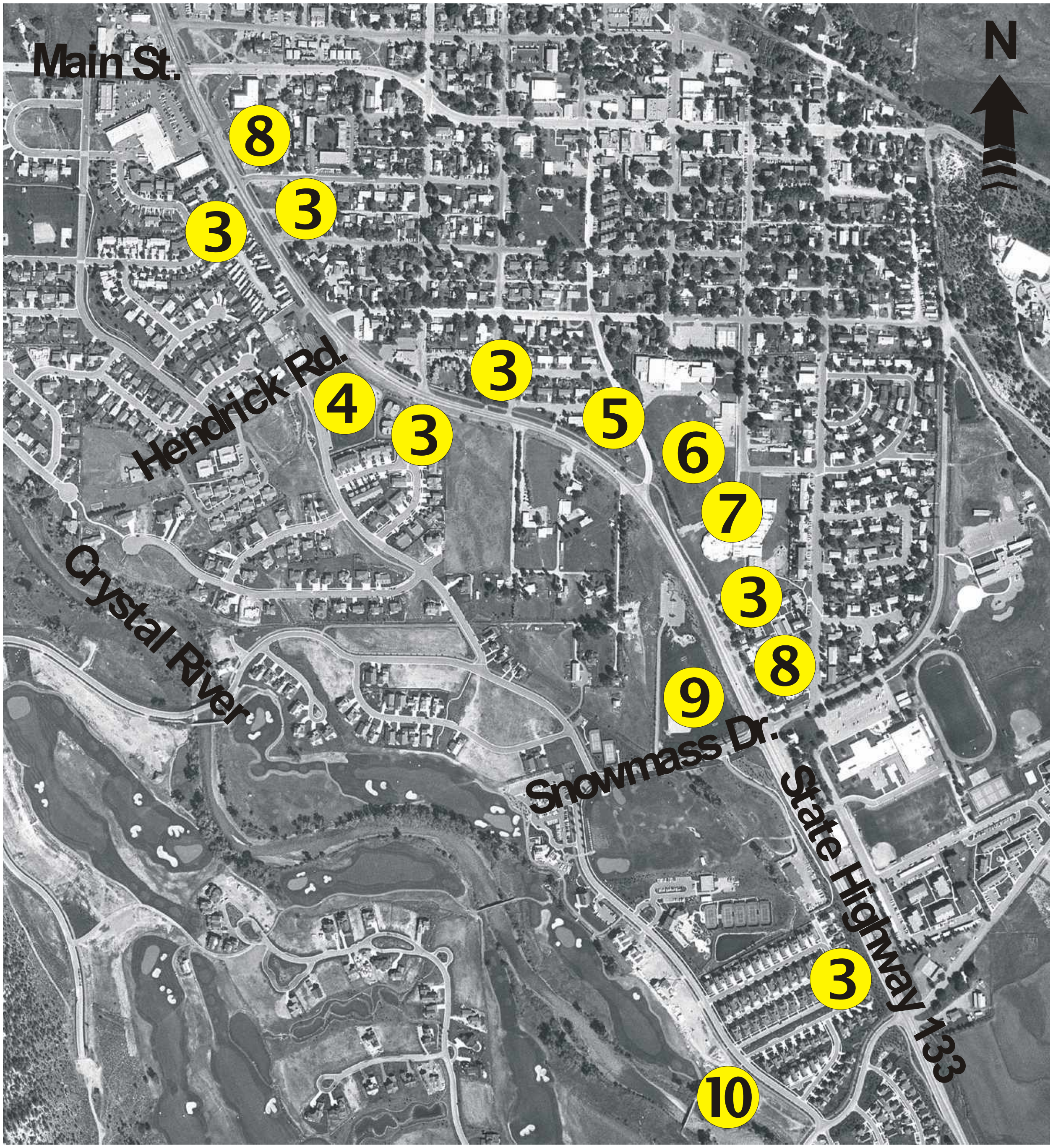


Figure 3.7 (cont.)
Environmental Considerations

Legend

3	Noise Sensitive Area	7	Carbondale Elementary School Playground
4	Hendrick Park	8	Town of Carbondale Bike Paths
5	Local Historic Society/Chamber of Commerce	9	River Valley Ranch Park
6	Carbondale Middle School Ballfields	10	Bald Eagle Nesting Area



3.8.1 NEPA Considerations

The National Environmental Policy Act (NEPA) of 1969 requires any project with a federal action (funding, land transfer, permitting, etc) to demonstrate avoidance, minimization, and mitigation of project related environmental impacts. NEPA requires the responsible agency to prepare an environmental document and involve all relevant agencies (federal, state, and local), public entities, and Tribal governments to participate in the decision making process. It requires the responsible agency to address and comply with more than 40 laws related to social, economic and environmental concerns.

Because some projects are more complex than others, the responsible agency prepares one or more of the following environmental documents: Categorical Exclusion (CE), Environmental Assessment and (EA), Environmental Impact Statement and ROD (EIS), and/or Finding of No Significant Impact (FONSI). Categorical Exclusion's (CE) are completed for projects not expected to affect the environment. Environmental Impact Statements (EIS) are completed when a “significant” impact is expected on the environment. Environmental Assessments (EA) are completed when the extent of impacts are undetermined at the start of the project.

The SH 133 improvements would likely be categorized as a Categorical Exclusion (CE). The project is proposing Right-of-way acquisition only at the certain intersections for right and left turn lane movements. All other improvements are proposed within existing Right-of-way Impacts to Section 4(f), wildlife, wetlands, and cultural resources, and hazardous materials are not expected. In addition, public opposition to the project is not expected. Effects on noise sensitive land uses, environmental justice (EJ) analysis, and recreational land uses will require study. Potential impacts to historic resources depend on the historic eligibility of the Local Historic Society/Chamber of Commerce building. CE’s generally take 3-6 months to complete. If the scope of the project changes significantly and impacts to environmental resources are expected, documentation with an Environmental Assessment (EA) would be required.

The construction of a grade separated interchange at SH 133 and SH 82 would likely be categorized as an EA. The EA will need to clearly demonstrate that the socioeconomic, natural, physical, and cultural environments are not “significantly” impacted. If no significant impacts are documented, a Finding of No Significant Impact (FONSI) will be prepared and a location/design acceptance will be granted by the lead federal agency. EA/FONSI’s generally take 1-2 years to complete.

An EIS is not recommended unless there is a “significant” amount of impact to noise sensitive areas, recreational resources, or National Register of Historic Places (NRHP) eligible sites. “Significance” is determined on a case-by-case basis by the lead federal authority.

3.9 PERMITS REQUIRED

Table 3.9 lists permits that may be required for the project to be advanced to construction:

Table 3.9
Required Permits

Permit	Responsible Agency	Resource
Section 404	US Army Corps of Engineers	Wetlands
NPDES	Colorado Dept. of Public Health and Environment	Stormwater
SB 40	Colorado Division of Wildlife	Threatened & Endangered Species

3.10 PROGRAMMING COST ESTIMATES

Programming cost estimates were prepared based on the evaluation of proposed improvements and the conceptual roadway design plans shown in Appendix B. The cost estimates and quantity information is provided in Appendix F.

3.10.1 SH 133 Corridor

The programming cost estimates were prepared for the reconstruction of SH 133 between Cowen Drive and Meadowood Drive. The roadway will consist of four travel lanes with auxiliary lanes as shown on the conceptual design plans in Appendix B. Roadway elements included excavation, embankment, asphalt pavement, curb and gutter, and sidewalk. Other work elements included erosion control, storm drainage, lighting, traffic signals, signing and striping. Lump sum costs for minor contract revisions, surveying, mobilization, traffic control, design engineering, utilities, force account, construction engineering and contingencies were calculated as a percentage of the total construction elements. A summary of the overall anticipated SH 133 corridor costs are shown in Table 3.10.

Table 3.10
SH 133 Roadway Corridor
(Cowen Drive to Meadowood Drive)
Programming Cost Estimate

Element	Estimated Costs (millions)
Construction Elements	$ 8.9
Engineering	$ 0.8
Right-of-Way	$ 0.2
Utility Relocations	$ 0.6
Construction Engineering	$ 1.2
Contingencies	$ 0.8
Total Programming Cost:	**$12.5**
Potential Additional Project Elements:	
RFTA Trail Underpass	$ 0.3
Undergrounding Overhead Utilities	$ 2.0

3.10.2 SH 133 and SH 82 Grade-Separated Interchange

The programming cost estimate was prepared for a conventional tight diamond interchange with SH 133 going over SH 82. The structure elements anticipate a continuous bridge over the Roaring Fork River and SH 82 (660 lineal feet) and retaining walls along the eastbound SH 82 exit and eastbound SH 82 entrance ramps adjacent to the Roaring Fork River. Roadway elements included excavation, embankment, asphalt pavement, curb and gutter, and sidewalk for the reconstruction of SH 133 to Cowen Drive and SH 82 to remove the existing reverse curve. Lump sum costs for minor contract revisions, surveying, mobilization, traffic control, design engineering, utilities, force account, construction engineering and contingencies were calculated as a percentage of the total construction elements. Other work elements included erosion control, storm drainage, lighting, traffic signals, signing and striping. A summary of the overall anticipated interchange programming costs are shown in Table 3.11.

Table 3.11
SH 133 and SH 82 Conventional Tight Diamond Interchange
Programming Cost Estimate

Interchange	Estimated Costs (millions)
Construction Elements	$17.1
Engineering	$ 1.5
Right-of-Way	$ 0.1
Utility Relocations	$ 0.6
Construction Engineering	$ 2.2
Contingencies	$ 1.5
Total Programming Cost:	**$23.0**

3.10.3 Widen SH 133 Bridge Over Roaring Fork River

The programming cost estimate to widen the existing SH 133 bridge over the Roaring Fork River is shown in Table 3.12.

Table 3.12
SH 133 Bridge Over Roaring Fork River Widening
Programming Cost Estimate

Element	Estimated Costs (millions)
Construction Elements	$ 3.2
Engineering	$ 0.3
Right-of-Way	$ 0.1
Utility Relocations	$ 0.2
Construction Engineering	$ 0.4
Contingencies	$ 0.6
Total Programming Cost:	**$ 4.8**

4.0 RECOMMENDATIONS AND FUNDING PROCESS

4.1 SH 133 RECOMMENDATIONS

Based on the results of the study it is recommended that the highest corridor priority is to widen the existing SH 133 bridge over the Roaring Fork River. The existing bridge is a traffic bottleneck causing significant delay and queing on both SH 133 and SH 82. Without additional traffic lanes across the Roaring Fork River, only minimal benefits will be seen for the congestion on SH 133. Ideally this bridge widening could be planned and designed as the first phase of construction for a grade-separated interchange. The SH 133 roadway corridor would be the next recommended improvement after the SH 133 and SH 82 intersection is improved. The reconstruction of SH 133 between Cowen Drive and Main Street is the second highest priority. The third corridor priority would be the reconstruction of SH 133 between Main Street and Meadowood Drive.

The recommendation made in the SH 133 Access Management Plan (see Appendix B) shall be followed and implemented as private development permits are requested. The access improvements will improve safety and conflicting traffic movements by limiting accesses throughout the corridor.

4.2 TRANSPORTATION DEMAND MANAGEMENT

Transportation Demand Management (TDM) strategies are recommended as a complement to the SH 133 corridor recommendations. TDM strategies are a range of actions that are directed at limiting the use of single occupant vehicles and encouraging the use of alternatives. Elements of potential TDM strategies include the promotion and support of:

- Carpooling/Vanpooling
- Transit
- Bicycling
- Walking
- Variable Work Hours
- Tele-working

Support Strategies include:

- Parking Management
- Rideshare Matching
- Incentives/Subsidies
- Marketing
- Guaranteed Ride Home
- On-site Amenities
- TDM-friendly Site Design Considerations

It is recommended that a location specific detailed TDM program be developed for the SH 133 Corridor. These are some general TDM considerations that should be taken into consideration in the development of a detailed program. It is projected that the vehicle traffic on SH 133 will increase significantly in the future. The creation of a TDM plan would provide opportunities to reduce this traffic growth and/or minimize the traffic during the AM/PM peak periods.

4.3 PROJECT FUNDING PROCESS

One of the goals of the *SH 133 Corridor Feasibility Study* is identify potential funding opportunities for the construction of the proposed improvements. The project is not currently included in any of the statewide transportation plans. The process to obtain funding for transportation projects is a multi-step procedure that is highlighted below and shown in Figure 4.1.

1. Identification of a Project and the Need

The transportation project and the need for the project are identified.

2. Project Sponsorship

Presentation of the need for the project is made to the representative jurisdiction where the project is proposed (Town of Carbondale in this study). The Colorado Department of Transportation (CDOT) sponsors most highway projects. If the Town concurs, CDOT becomes the project sponsor throughout the remainder of the process

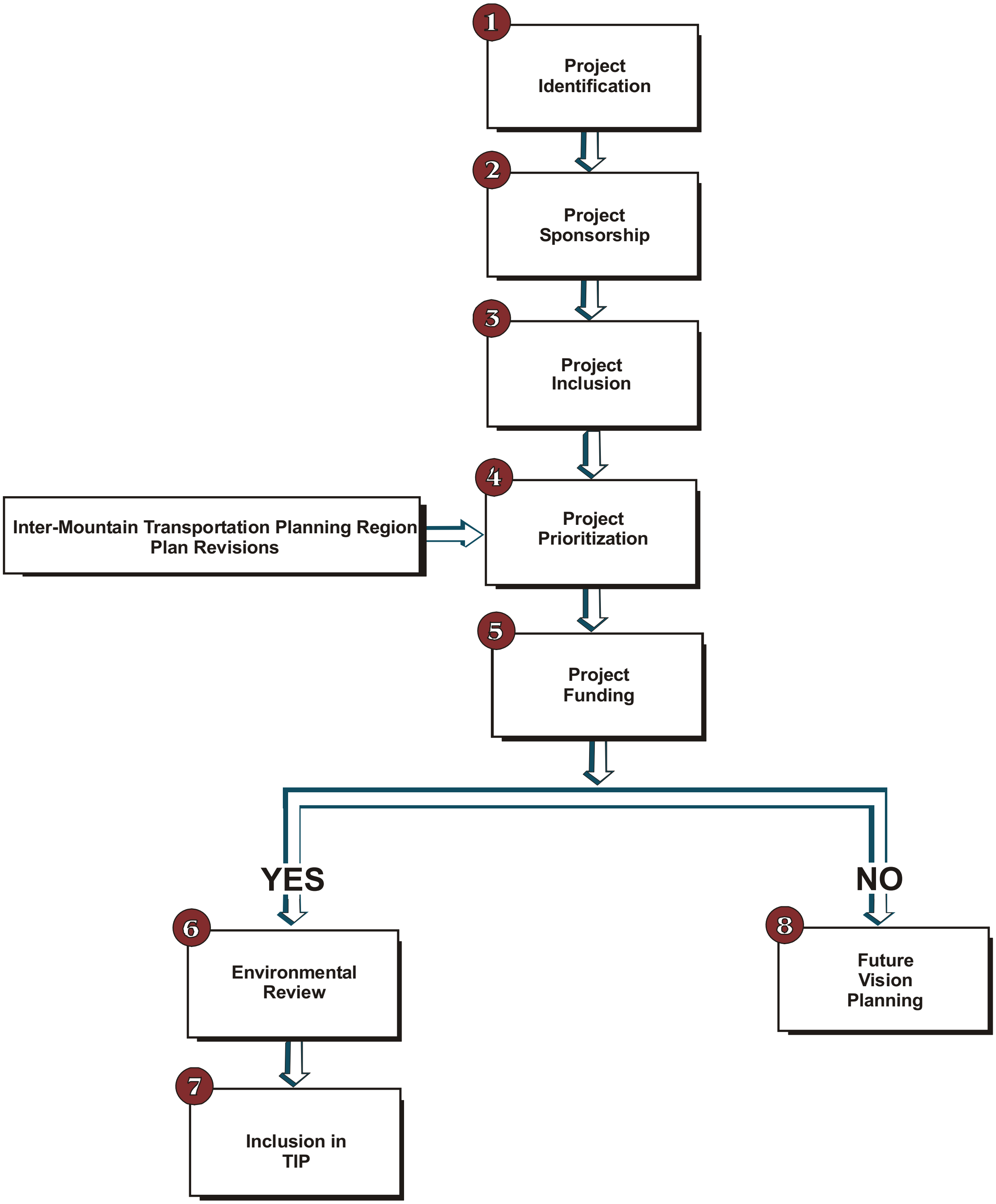
3. Project Inclusion in Transportation Plans

The sponsor will then pursue inclusion of the project in four documents: the regional transportation plan, the statewide transportation plan, the State Transportation Improvement Program (STIP), and the Transportation Improvement Plan (TIP).

> *Regional transportation plans* identify regional needs and priorities and are developed cooperatively between the regional planning commissions and CDOT. Projects range from bicycle/pedestrian upgrades to highway, rail, and transit improvements. All projects from these plans are included in the statewide transportation plan.
>
> The *statewide transportation plan* identifies Colorado's transportation policies, programs, and projects to be implemented over 20 years. The statewide plan includes long-range needs for which funding may not be available during the next 20 years.
>
> The *STIP* identifies priority projects from the statewide transportation plan to be implemented in the first 6 years. Each of the Transportation Planning Regions (TPR's) or Metropolitan Planning Organizations (MPO's) in the state develop a *TIP* within their planning area for projects that will receive Federal funds. The *TIPs* are included in their entirety in the *STIP* adopted by the state.

If the project is eligible for and likely to utilize state or federal funding, the project must be included in the statewide transportation plan. Projects fully funded through local or private dollars are included in regional transportation plans (Inter-Mountain Transportation Planning Region for this study) for air quality conformity or information purposes. Inclusion in the region's transportation plan would occur when the regional transportation plans are revised.

Figure 4.1
Project Funding Process



CARBONDALE ELEMENTARY SCHOOL REDEVELOPMENT
CARBONDALE, COLORADO

TRAFFIC IMPACT ANALYSIS

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9/17/09

FHU Reference No. 08-067
September 2009

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EXECUTIVE SUMMARY

A. Proposed Development

The Roaring Fork School District and the Third Street Center have received approval of a PUD Ordinance to redevelop the original Carbondale Elementary School site as a mixed-use, mixed-income community (CESR). The original Carbondale Elementary School, located at the corner of Capitol Avenue and 3rd Street on the east side of SH 133, was relocated to a new site east of Snowmass Drive in 2007. In addition to the vacant elementary school building, the CESR site also currently includes the Bridges Center, an alternative high school, which will remain in operation in its current location. The remainder of the site is planning to be redeveloped, which is the focus of this traffic impact study. Aside from the Bridges Center, the redevelopment is planned to include single family (approximately 15 units) and multi-family residential units (approximately 65 townhouses and 40 apartments or condominiums), the newly relocated Carbondale Library, and the Third Street Center, a community non-profit center which will occupy the former elementary school building. Traffic impacts for the new Carbondale Library are discussed in more detail in a companion report (Carbondale Library Traffic Impact Analysis, Felsburg Holt & Ullevig, September 2009). The Roaring Fork School District has partnered with the developers of the site to provide affordable housing for school district and other public employees. While some of the residential units will be available at free market rates, the majority (80%) will be affordable housing units with preference given to school district and local employees.

B. Existing and Background Roadway Network and Traffic Operations

The roadway network surrounding the Elementary School site was analyzed in detail. SH 133 is a two-lane major north-south arterial through the Town of Carbondale. It has a 40 mph speed limit and is classified as an NR-B according to the Colorado State Highway Access Code (SHAC). The following nine intersections were analyzed in this study:

- The three unsignalized intersections along SH 133 (SH 133/Hendrick Drive (Sopris Avenue), SH 133/Weant Boulevard, and SH 133/Snowmass Drive) are two-way stop-controlled with SH 133 movements free and side-streets stop-controlled.
- The four unsignalized intersections along Sopris Avenue (Sopris Avenue/Weant Boulevard, Sopris Avenue/4th Street, Sopris Avenue/3rd Street, and Sopris Avenue/2nd Street) are all four-way stop controlled intersections.
- The intersection of Snowmass Drive/2nd Street is a one-way stop controlled intersection with traffic along Snowmass Drive moving freely.

The analysis of existing traffic volumes showed that all movements at all intersections operate at LOS D or better during both peak hours. All of the approaches to local/neighborhood intersections experience LOS A. With one exception, all of the minor street approaches to SH 133 experience LOS B or LOS C. Only the eastbound through-left movement on Snowmass Drive experiences LOS D in the AM peak hour.

Background traffic is the component of traffic volumes on the roadway network that is unrelated to the proposed development. Daily traffic volumes in this area are expected to increase at a rate of 2.2 percent annually. This annual growth rate was used to obtain the short-term and long-term future turning movement volumes.

The analysis of short-term (2011) background traffic volumes determined that all movements at all intersections operate at LOS C or better during both peak hours with the exception of the SH 133/ Snowmass Drive intersection. This intersection is expected to have the westbound approach operate at LOS D in the PM peak hour and an eastbound left-and-through movement at LOS E during the AM peak hour. While this LOS is below the desired LOS D, the projected traffic volumes do not meet MUTCD signal warrants under short-term background conditions.

For the long-term (2029) scenario, SH 133 was widened to a four-lane cross section, based on the SH 133 Corridor Feasibility Study recommendations. Other improvements included in the Feasibility Study include the intersection of Sopris Avenue/Hendrick Drive at SH 133 which will be combined as a single, four-leg, signalized intersection. Other intersections on SH 133 that are anticipated to be signalized include SH 133/Weant Boulevard and SH 133/Snowmass Drive. The signalized intersections at SH 133/Snowmass Drive, SH 133/Weant Boulevard and SH 133/Hendrick Drive (Sopris Avenue) operate at LOS A or B during both peak hours. All movements at all stop-controlled intersections are expected to operate at LOS B or better during both peak hours.

C. Proposed Project Traffic

The number of vehicle-trips generated by the proposed development was estimated based on the equations documented in Trip Generation, by the Institute of Transportation Engineers (ITE), Eighth Edition, 2008. **Table ES-1** presents the estimated daily and peak hour vehicle-trips generated by each land use shown on the CESR Site Plan. As shown, the CESR site has the potential to generate approximately 2,026 vehicle-trips per day, with approximately 145 vehicle-trips during the AM peak hour and 237 vehicle-trips during the PM peak hour.

These trip generation volumes are conservative estimates for several reasons (that is, the estimates probably predict more traffic than will actually occur). First of all, it was mentioned previously that several of the residential units would be reserved for school district and Carbondale employees. As the Carbondale Elementary School, Junior High School, and High School and Carbondale town offices will all be within walking distance, some residents who work at these schools and for the town will likely walk instead of drive. In an effort to be conservative, no pedestrian trip reduction was applied. Secondly, the trip generation estimates for the 3rd Street Center were based on an office building of the same size. The 3rd Street Center is a non-profit center run primarily by volunteers, and these volunteers will likely arrive at various times of day and have varying work schedules. This type of activity will cause traffic to be more spread out through the day, instead of being concentrated in the peak hours as is the case in a typical office building. Thus, the 3rd Street Center trip generation estimates are conservative.

Table ES-1. CESR Trip Generation Summary

Land Use	Approximate Size*	Units	Daily	AM In	AM Out	AM Total	PM In	PM Out	PM Total
Single Family	15	DU	163	3	10	13	10	7	17
Townhome	65	DU	349	4	22	26	20	11	31
Apartment/Condo	40	DU	286	4	18	22	18	9	27
3rd Street Center	45,100	SF	497	62	8	70	11	56	67
Subtotal			1,295	73	58	131	59	83	142
Library (ITE Rate)	13,000	SF	731	10	4	14	46	49	95
Total CESR Traffic			2,026	83	62	145	105	132	237

* The number of residential units in each category may change slightly, but since the total number will likely remain around 120, the total trip generation is not expected to change significantly.

In the month of June 2009, a survey was conducted at the Carbondale Library regarding the mode of transportation people used to travel to/from the library. Based on the results, which surveyed 80 patrons, 35% of people walked or rode a bike to the library. The survey also showed that if the library were to be relocated to the planned location, 7% of people would be more likely to walk or bike. This results in an expected 42% of library patrons either walking to biking to the library. Since the new location would result in increased travel distances for some patrons, it could be assumed that approximately 38% of the visitors would not use vehicles. This could result in significantly lower vehicular trip forecasts for the library – 453 instead of 731 for daily traffic, 9 instead of 14 in the morning, and 59 instead of 95 in the evening. However, this reduction was not applied in our analyses, thus providing a conservative estimate of future traffic conditions.

Much of the traffic accessing CESR will utilize Weant Boulevard and Sopris Avenue to access SH 133. A smaller percentage of site-generated traffic is also expected to use Snowmass Drive (via 2nd Street) to access SH 133. Traffic traveling to/from downtown Carbondale (particularly for the library) is also expected to use 2nd Street, 3rd Street and 4th Street.

D. Recommended Improvements

Based on an analysis of the total traffic volumes (background traffic growth and site-generated traffic) for the CESR development, the following recommended improvements are listed according to the scenario in which they are triggered:

<u>Short-Term Future (2011)</u>

- Background Traffic Conditions
  - No improvements are triggered under short-term background conditions.
- Total Traffic Conditions
  - A southbound left-turn lane is warranted at the intersection of SH 133 and Weant Boulevard.

Long-Term Future (2029)

- Background Traffic Conditions
    - Widen SH 133 to four lanes;
    - Reconstruction and signalization of the SH 133/Hendrick Drive (Sopris Avenue) intersection with lane geometries consistent with recommendations in the SH 133 Corridor Feasibility Study;
    - Signalization of the SH 133/Snowmass Drive intersection, consistent with recommendations in the SH 133 Corridor Feasibility Study;
    - Signalization of the SH 133/Weant Boulevard intersection, consistent with recommendations in the Thompson Park Traffic Impact Study.
- Total Traffic Conditions
    - No additional improvements are triggered under long-term total conditions.

As shown, the redevelopment of the Carbondale Elementary School site will only require the installation of a southbound left-turn lane at the intersection of SH 133 and Weant Boulevard.

The proposed internal street network within CESR will be open to public travel. This will allow more convenient travel for neighbors in the vicinity of 2nd Street and Capitol Avenue to and from SH 133. This travel has been accounted for in our analysis of background traffic. However, traffic calming measures (such as narrow streets, corner neckdowns, on-street parking, etc.) will encourage all traffic to maintain reasonable, slow speeds. It is also recommended that Capitol Avenue revert to a two-way roadway east of 3rd Street to allow for more direct access to the site from the surrounding neighborhoods.

I. INTRODUCTION

The Roaring Fork School District is proposing to redevelop the original Carbondale Elementary School site as a mixed-use, mixed-income community (CESR). The original Carbondale Elementary School, located at the corner of Capitol Avenue and 3rd Street on the east side of SH 133, was relocated to a new site east of Snowmass Drive in 2007. In addition to the vacant elementary school building, the redevelopment site also currently includes the Bridges Center, an alternative high school, which will remain in operation in its current location. The remainder of the site is planning to be redeveloped, which is the focus of this traffic impact study. Aside from the Bridges Center, the redevelopment is planned to include single family and multi-family residential units, the newly relocated Carbondale Library, and the Third Street Center, a community non-profit center which will occupy the former elementary school building. The Roaring Fork School District has partnered with the developers of the site to provide affordable housing for school district employees, Town of Carbondale employees and other Garfield County employees and residents. While some of the residential units will be available at free market rates, the majority of the units (80%) will be affordable housing units with preference given to school district and other public employees. **Figure 1** shows the site location relative to major roadways in the area and the proposed site plan is shown on **Figure 2**. Primary access to the library will be via South 4th Street and Sopris Avenue while the rest of the site will be accessed via Weant Boulevard and South 3rd Street.

It was requested that the Carbondale Library and the Carbondale Elementary School Redevelopment (CESR) be analyzed as two separate developments. Therefore, this report will primarily focus on the CESR but will also include traffic impacts from the library as a part of the background analyses. Traffic impacts for the new Carbondale Library are discussed in more detail in a companion report (Carbondale Library Traffic Impact Analysis, Felsburg Holt & Ullevig, September 2009).

This report was prepared to assess the potential traffic impacts on adjacent roadways due to traffic generated by the CESR and to identify required roadway and traffic control improvements. For the purposes of this study, two future scenarios are considered:

- Short Term Future. This scenario examines the traffic conditions at build-out of the development, estimated to be in 2011 at the earliest but could extend to 2014 in several phases.
- Long Term Future. This scenario examines the traffic conditions associated with long-range forecasted traffic volumes for 2029.

The long-term future scenario roadway improvements assumed in the analysis were based on the general concepts for SH 133 that are outlined in the SH 133 Corridor Feasibility Study (2002). These improvements include the widening of SH 133 to four lanes, the re-alignment of Hendrick Drive creating a four-leg intersection with Sopris Avenue, and the signalization of the SH 133/Hedrick Drive (Sopris Avenue) and SH 133/Snowmass Drive intersections.

This report was prepared as a level three traffic impact study (as defined by CDOT Region 3) in accordance with the guidance of the Colorado State Highway Access Code (SHAC). It also complies with the requirements for a traffic study as defined by the Town of Carbondale's Community Impact Assessment guidelines.

Figure 1
Vicinity Map

NOTE:
Connection and use of proposed frontage road to be coordinated with the Colorado Department of Transportation (CDOT)

NOTE:
Entry landscape, plaza, and parking to be coordinated with The Third Street Center

CARBONDALE
Site Concept
(park along Capitol)

- ⬚ Site Boundary
- Ⓓ Block Label
- 🟦 Civic
- 🟫 Multi-Family Residential
- 🟧 Townhome/Flat Residential
- 🟨 Single-Family Residential
- 🟩 Park
- ▥ Trail/Bikeway

Carbondale, Colorado

May 26, 2009

N W E S 0' 100' 200'

Perry-Rose LLC
Denver, CO

Calthorpe Associates
Berkeley, CA

Figure 2

Site Plan

II. EXISTING CONDITIONS

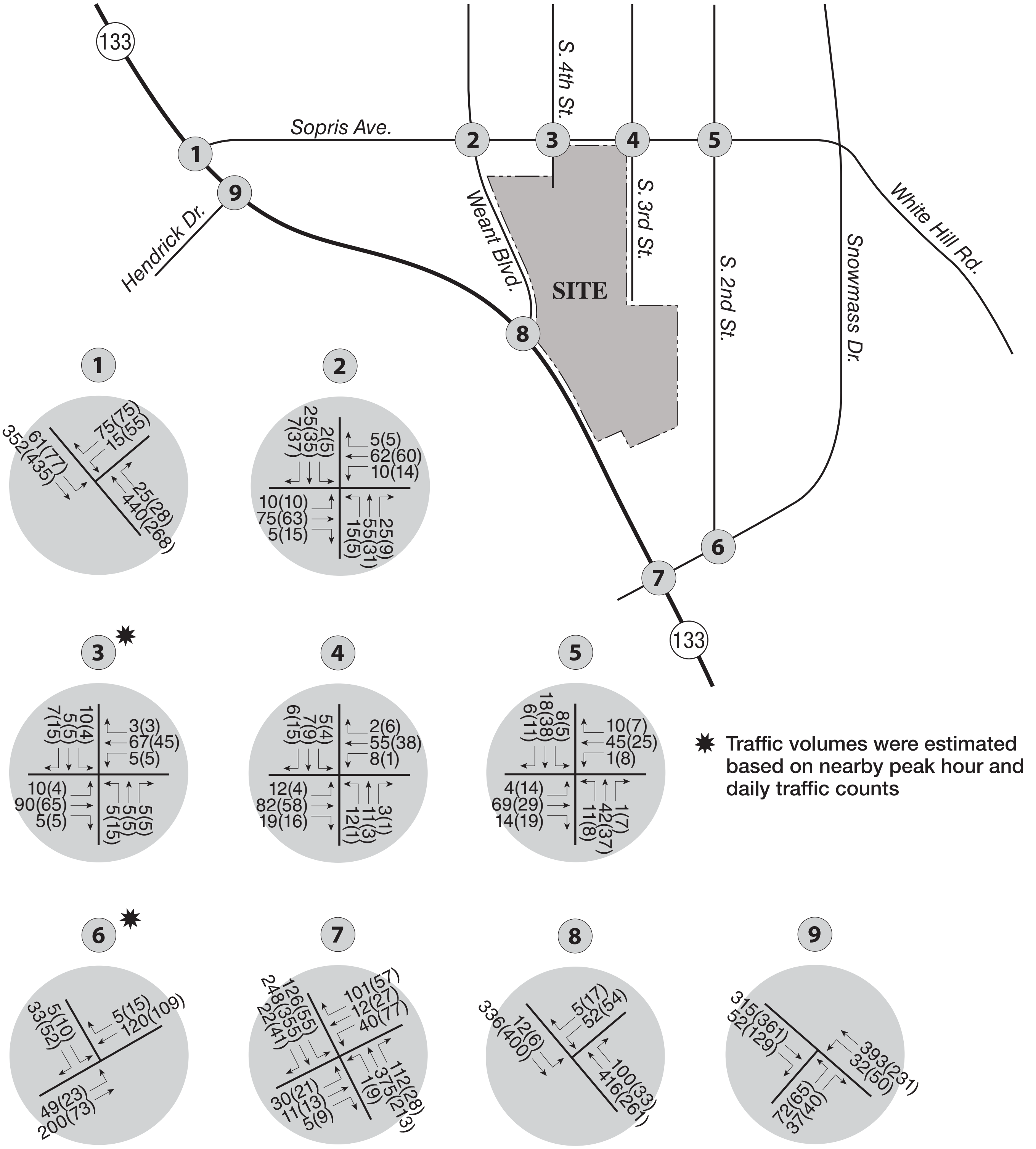
A. Roadway Network

Today, SH 133 is a two-lane major north-south arterial through the Town of Carbondale. It has a 40 mph speed limit and is classified as an NR-B according to the SHAC. The three unsignalized intersections along SH 133 (SH 133/Hendrick Drive (Sopris Avenue), SH 133/Weant Boulevard, and SH 133/Snowmass Drive) are two-way stop-controlled with SH 133 movements free and side-streets stop-controlled. The four unsignalized intersections along Sopris Avenue (Sopris Avenue/Weant Boulevard, Sopris Avenue/4th Street, Sopris Avenue/3rd Street, and Sopris Avenue/2nd Street) are all four-way stop controlled intersections. The intersection of Snowmass Drive/2nd Street is a one-way stop controlled intersection with traffic along Snowmass Drive moving freely.

B. Existing Volumes and Traffic Operations

In April of 2008, AM and PM peak hour turning movement volumes were recorded at the intersections of SH 133/Hendrick Drive, SH 133/Sopris Avenue (Hendrick Drive), SH 133/Weant Boulevard, SH 133/Snowmass Drive, Sopris Avenue/3rd Street and Sopris Avenue/2nd Street. Daily traffic counts were also recorded along Weant Boulevard and 2nd Street. New counts were also collected to verify that traffic patterns in the area had not changed significantly. In July of 2009, additional peak hour turning movement volumes were recorded at the intersections of Sopris Avenue/Weant Boulevard and Sopris Avenue/2nd Street along with daily traffic counts on Weant Boulevard, Sopris Avenue and 2nd Street. Vehicular speeds were also recorded with the 2009 daily traffic counts. The April 2008 and July 2009 counts were compared and it was determined that the April 2008 counts were higher, particularly in the AM peak hour. This can be attributed to the fact that the alternative high school (Bridges Center) and the other nearby schools (new high school, middle school, and new elementary school) were in session at the time of the April counts, but not in July. In an effort to be conservative, the higher traffic volumes collected in April were used in these analyses. The resulting turning movement volumes are shown on **Figure 3**. Raw traffic data for both 2008 and 2009 is presented in **Appendix A**.

Existing traffic operations were evaluated at each intersection according to techniques documented in the Highway Capacity Manual, by the Transportation Research Board (TRB), 2000. The result of such an analysis is a level of service (LOS) rating, which is a qualitative assessment of the traffic flow based on the average stopped delay per vehicle at a controlled intersection. Levels of service are described by a letter designation ranging from “A” to “F”, with LOS A representing essentially uninterrupted flow, and LOS F representing a breakdown of traffic flow with excessive congestion and delay. The signalized intersection capacity analysis results in an overall level of service, representative of all movements through the intersection. The unsignalized intersection capacity analysis produces LOS results for each movement which must yield to conflicting traffic at the intersection. LOS D or better is typically considered acceptable. Existing lane geometries and levels of service are shown on **Figure 4**.



✸ Traffic volumes were estimated based on nearby peak hour and daily traffic counts

LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

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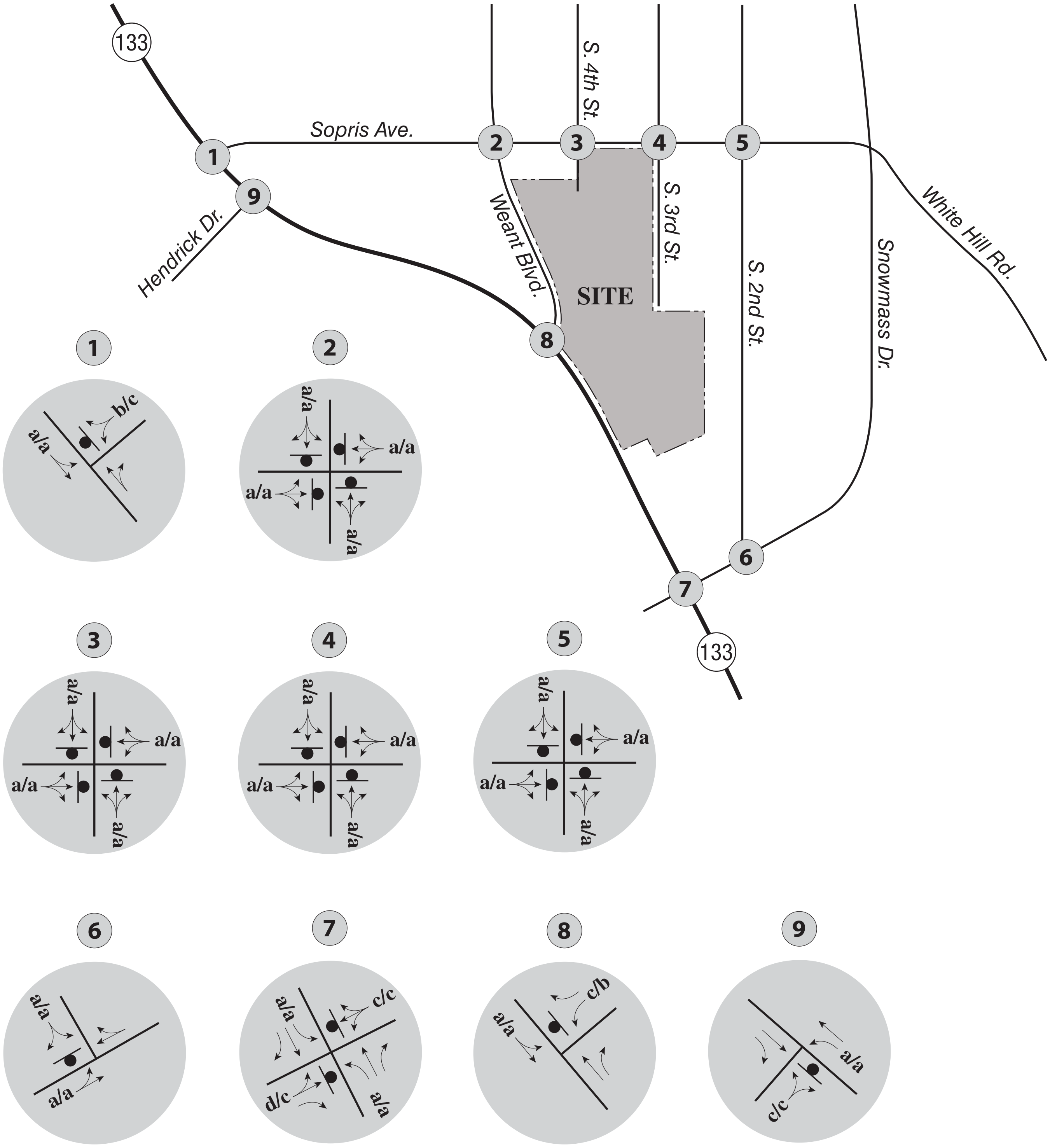
Figure 3

Existing Traffic Volumes

NORTH



LEGEND

x/x = AM/PM Peak Hour Unsignalized Intersection Level of Service

● = Stop Sign

Figure 4

Existing Levels of Service and Lane Geometry

NORTH

FELSBURG HOLT & ULLEVIG

As shown on **Figure 4**, all movements at all intersections operate at LOS D or better during both peak hours. All of the approaches to local/neighborhood intersections experience LOS A. With one exception, all of the minor street approaches to SH 133 experience LOS B or LOS C. Only the eastbound through-left movement on Snowmass Drive experiences LOS D in the AM peak hour. This is traffic from River Valley Ranch and does not involve CESR.

Analysis worksheets are included in **Appendix B**.

III. FUTURE CONDITIONS WITHOUT PROPOSED DEVELOPMENT

Background traffic is the component of traffic volumes on the roadway network that is unrelated to the proposed development. These volumes were derived from recent traffic counts and projections contained in the following:

- SH 133 Corridor Feasibility Study (PBS&J, 2002)
- Traffic Volume Report: Condensed File (CDOT, 2008)
- Thompson Park Traffic Impact Analysis (FHU, 2009)

According to these sources, daily traffic volumes in this area are expected to increase at a rate of 2.2 percent annually. This annual growth rate was used to obtain the short-term and long-term future turning movement volumes.

Estimates of background traffic also included traffic generated by the relocated Carbondale Library (shown on Figure 13 of the Carbondale Library Traffic Impact Study (FHU, 2009)) as well as the Thompson Park development, located on the west side of SH 133 across from the CESR site at Weant Boulevard. As described in the companion report for the new library, the library trips included in the background traffic are conservative in that many patrons (approximately 38%) can be expected to walk or bicycle instead of drive. **Table 1** presents the estimated daily and peak hour vehicle-trips generated by the library. As shown, this development has the potential to generate approximately 731 vehicle-trips per day, with approximately 46 vehicle-trips during the AM peak hour and 95 vehicle-trips during the PM peak hour. The distribution of this traffic is shown on Figure 13 of the companion report for the library.

Table 1. New Library Trip Generation Summary

Land Use	Size	Units	Daily	AM In	AM Out	AM Total	PM In	PM Out	PM Total
Library (ITE Rate)	13,000	SF	731	10	4	14	46	49	95

In addition to estimating background traffic based on growth rates and nearby development, adjustments were also made to account for the planned extension of Grace Avenue between 3rd Street and Weant Boulevard through the CESR site. A portion of traffic currently using 3rd Street and 2nd Street to access Sopris Avenue was reassigned to the intersection of Sopris Avenue and Weant Boulevard as using a new Grace Avenue extension would be a more direct route for some traffic. It is estimated that approximately 300 daily vehicle trips will be added to Grace Avenue due to cut-through traffic, with approximately 30 vph occurring during each peak hour.

A. Short Term Future

Figure 5 presents the short-term (2011) background traffic volumes. Lane geometry and LOS results are shown on **Figure 6**. As was the case under existing traffic conditions, all movements at all intersections operate at LOS C or better during both peak hours with the exception of the SH 133/ Snowmass Drive intersection. This intersection is expected to have the westbound approach operate at LOS D in the PM peak hour and an eastbound left-and-through movement from River Valley Ranch at LOS E during the AM peak hour. While this LOS is below the desired LOS D, the projected traffic volumes do not meet MUTCD signal warrants under short-term background conditions.

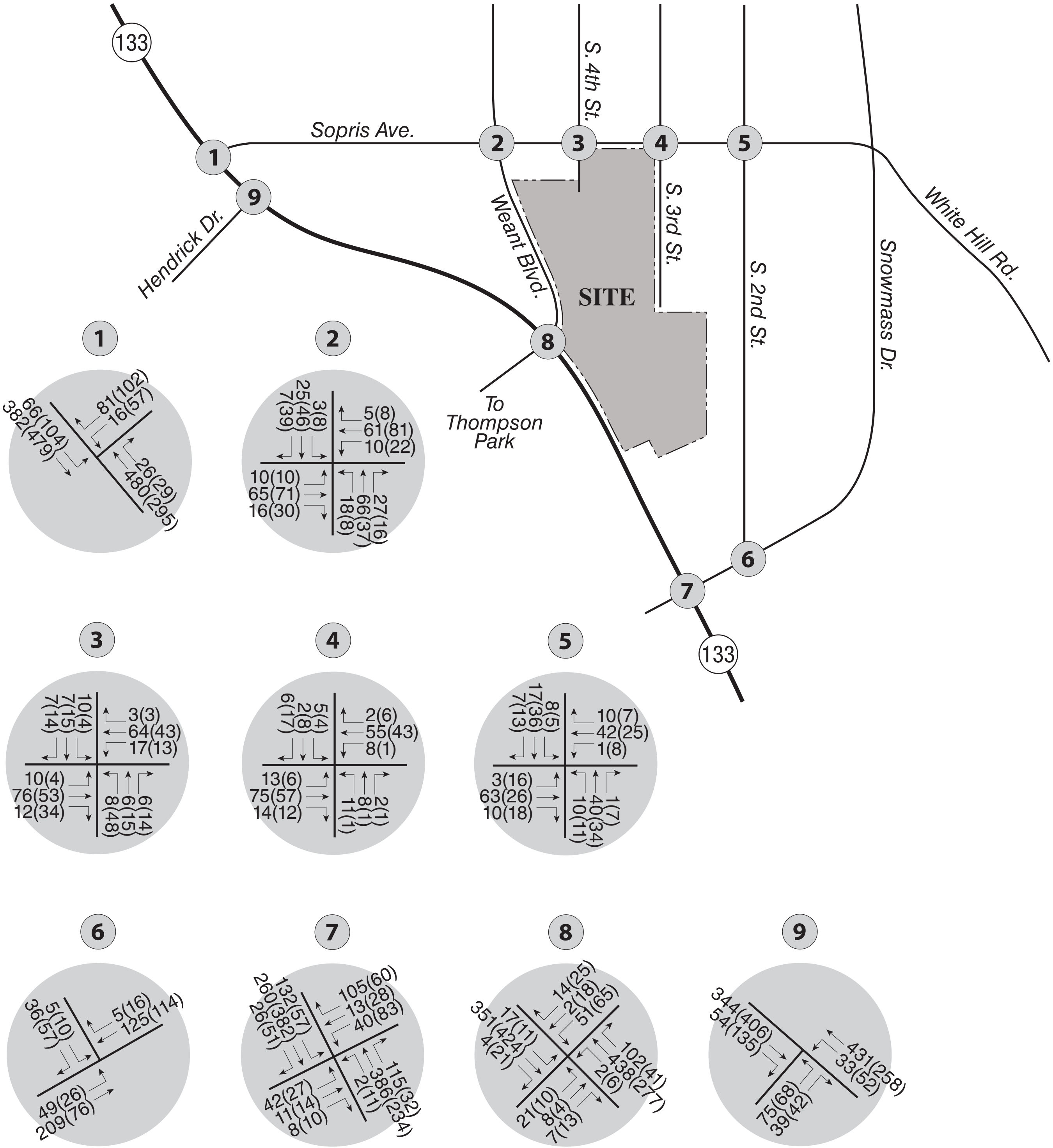
Analysis worksheets are included in **Appendix C**.

B. Long Term Future

Figure 7 presents the background traffic volumes for the long-term (2029) scenario. The LOS results and associated lane geometry for the long-term scenario are shown on **Figure 8**. Based on information in the two reference reports mentioned in the previous section, SH 133 was increased to a four-lane cross section, the intersection of Sopris Avenue/Hendrick Drive at SH 133 was analyzed as a four-leg intersection, and the intersections of SH 133/Hendrick Drive (Sopris Avenue), SH 133/Weant Boulevard and SH 133/Snowmass Drive were analyzed as signalized intersections. Signalization of the SH 133 intersections at Sopris Avenue and Snowmass Drive were based on the SH 133 Corridor Feasibility Study recommendations. Signalization of the SH 133/Weant Boulevard intersection was recommended in the Thompson Park Traffic Impact Study. The recommended lane geometries presented in both reports were also used in this analysis.

The signalized intersections at SH 133/Snowmass Drive, SH 133/Weant Boulevard and SH 133/Hendrick Drive (Sopris Avenue) operate at LOS A or B during both peak hours. All movements at all stop-controlled intersections are expected to operate at LOS B or better during both peak hours.

Analysis worksheets are included in **Appendix D** and signal warrant analysis worksheets are included in **Appendix G**.



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

Figure 5

Short-Term (2011) Background Traffic Volumes

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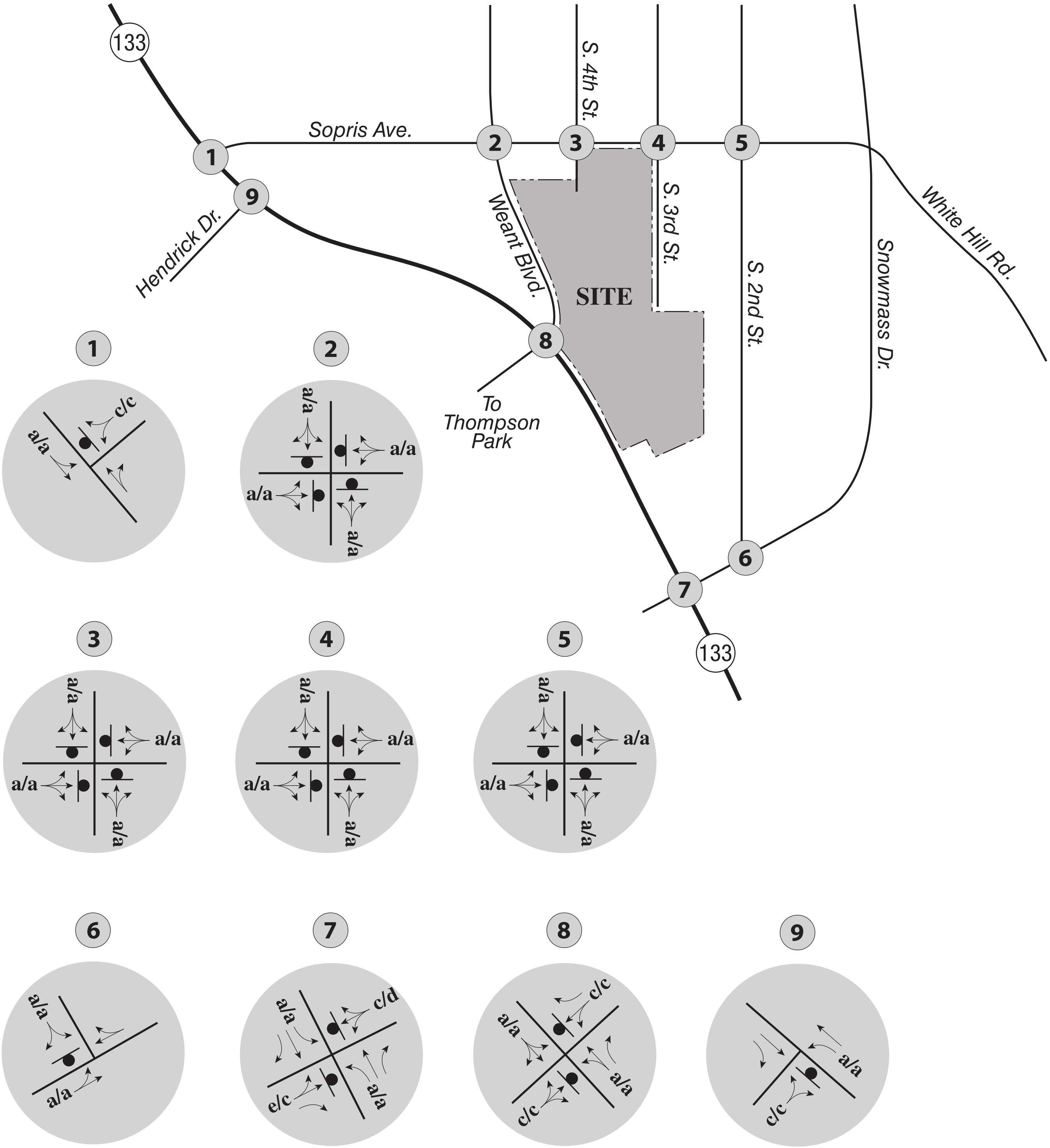
NORTH



LEGEND

x/x = AM/PM Peak Hour Unsignalized Intersection Level of Service

● = Stop Sign

Figure 6

Short-Term (2011) Background
Levels of Service and Lane Geometry

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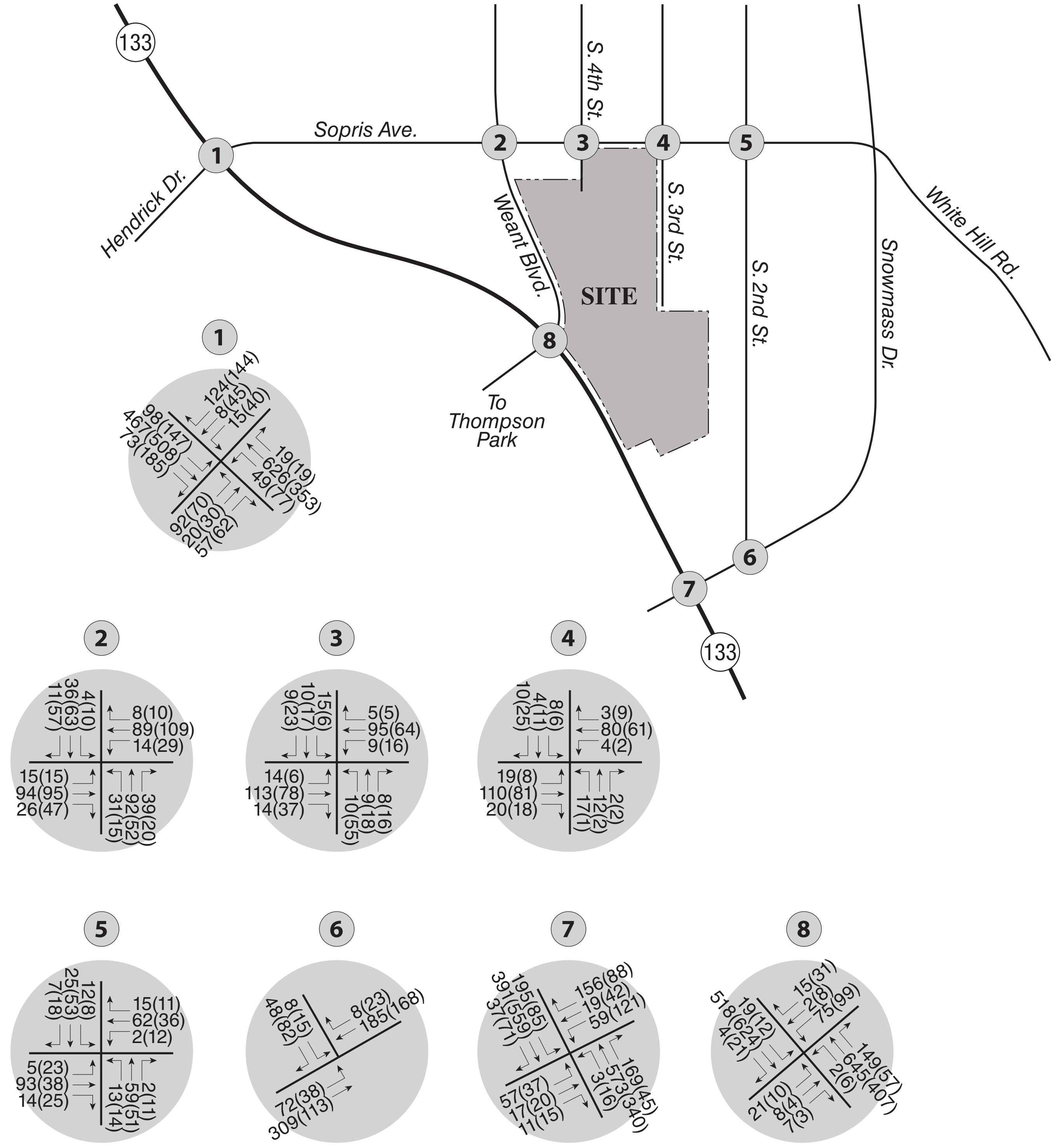
NORTH



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

Figure 7

Long-Term (2029) Background Traffic Volumes

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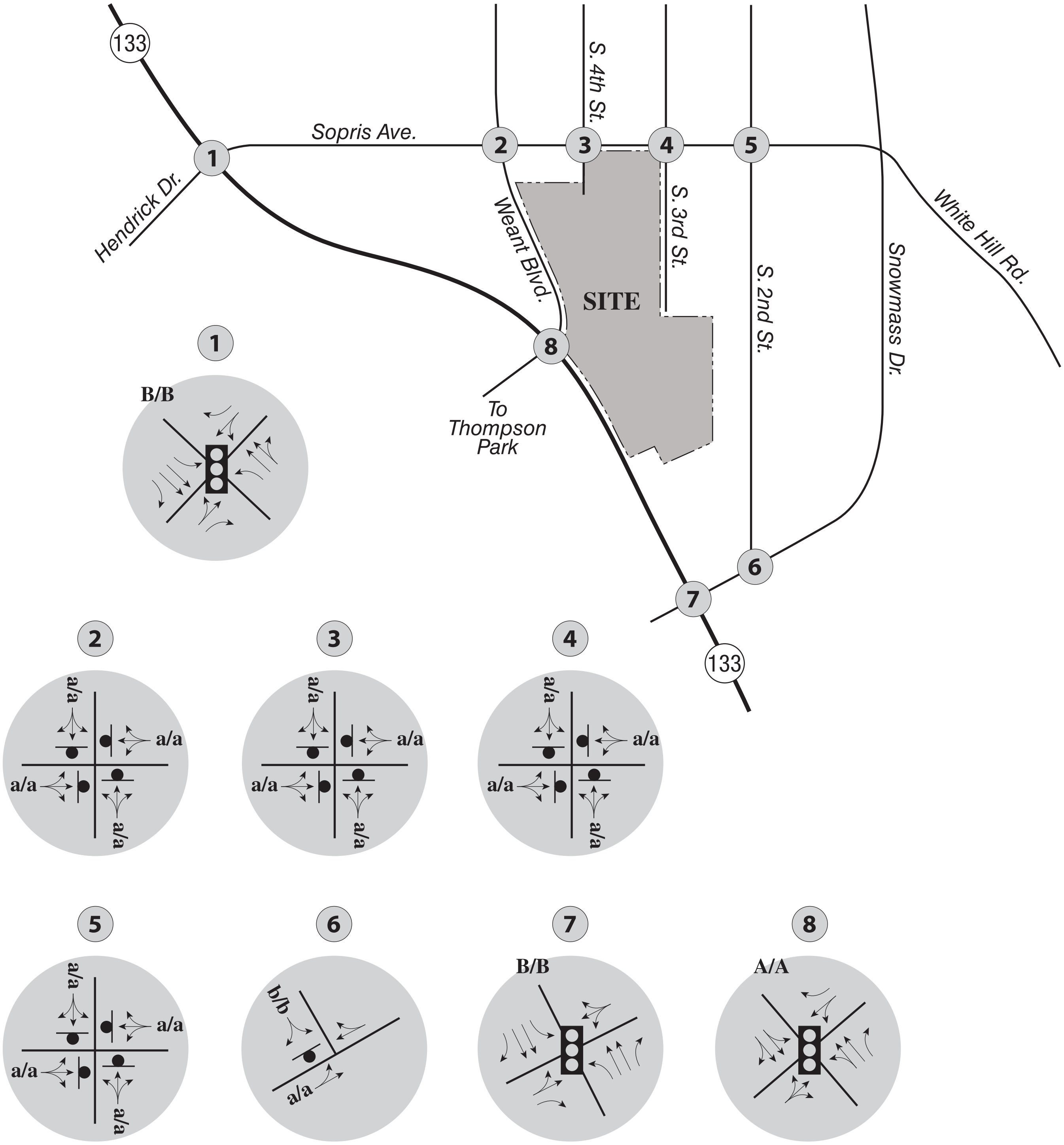
NORTH



LEGEND

X/X = AM/PM Peak Hour Signalized Intersection Level of Service

x/x = AM/PM Peak Hour Unsignalized Intersection Level of Service

● = Stop Sign

🚦 = Traffic Signal

Figure 8

Long-Term (2029) Background
Levels of Service and Lane Geometry

FELSBURG
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NORTH

IV. PROPOSED PROJECT TRAFFIC

A. *Site Trip Generation*

The Carbondale Elementary School Redevelopment is planned to include single family (approximately 15 units) and multi-family residential units (approximately 65 townhouses and 40 apartments), the newly relocated Carbondale Library, and the Third Street Center, a community non-profit center which will occupy the former elementary school building. The number of vehicle-trips generated by the proposed development was estimated based on the equations documented in Trip Generation, by the Institute of Transportation Engineers (ITE), Eighth Edition, 2008. **Table 2** presents the estimated daily and peak hour vehicle-trips generated by each land use shown in the Site Plan (**Figure 2**). As shown, the non-library portion of the CESR site has the potential to generate approximately 1,295 vehicle-trips per day, with approximately 131 vehicle-trips during the AM peak hour and 142 vehicle-trips during the PM peak hour. As mentioned previously, the library traffic is included in the background volumes for this study.

Table 2. CESR Trip Generation Summary

Land Use	Approximate Size*	Units	Daily	AM In	AM Out	AM Total	PM In	PM Out	PM Total
Single Family	15	DU	163	3	10	13	10	7	17
Townhome	65	DU	349	4	22	26	20	11	31
Apartment/Condo	40	DU	286	4	18	22	18	9	27
3rd Street Center	45,100	SF	497	62	8	70	11	56	67
Subtotal			1,295	73	58	131	59	83	142
Library (included in background traffic)	13,000	SF	731	10	4	14	46	49	95
Total CESR Traffic			2,026	83	62	145	105	132	237

* The number of residential units in each category may change slightly, but since the total number will likely remain around 120, the total trip generation is not expected to change significantly.

The trip generation volumes shown in **Table 2** for the residential units on the CESR site are conservative estimates for several reasons. First of all, it was mentioned previously that several of the residential units would be reserved for school district and other public employees. The work places of these employees will all be within walking distance, some residents who work at these locations will likely walk instead of drive. In an effort to be conservative, no pedestrian trip reduction was applied. Secondly, the trip generation estimates for the 3rd Street Center were based on an office building of the same size. The 3rd Street Center is a non-profit center run primarily by volunteers, and these volunteers will likely arrive at various times of day and have varying work schedules. This type of activity will cause traffic to be more spread out through the day, instead of being concentrated in the peak hours as is the case in a typical office building. Thus, the 3rd Street Center trip generation estimates are conservative. A comparison of these land uses and corresponding trip generation was previously summarized by FHU in a letter provided in **Appendix H**.

In essence, the land uses shown in **Table 2** are replacing the previous Carbondale Elementary School. ITE trip generation estimates for an elementary school (see **Table 3**) show that the daily traffic for CESR is higher than the elementary school by itself. However, the elementary school exhibits much different peaking characteristics with higher volumes in the morning when school starts and lower volumes during the evening peak hour (which is after school normally lets out in mid-afternoon).

Table 3. Elementary School Trip Generation

Land Use	Size	Units	Daily	AM In	AM Out	AM Total	PM In	PM Out	PM Total
Elementary School	45,100	SF	696	143	91	235	25	30	55

When comparing the trip generation for both uses (**Table 2** versus **Table 3**), it can be seen that the proposed land uses would increase daily traffic by approximately 1,300 vpd over that generated by the elementary school. The PM peak hour traffic will increase by approximately 180 vph and the AM peak hour traffic could actually decrease by approximately 90 vph.

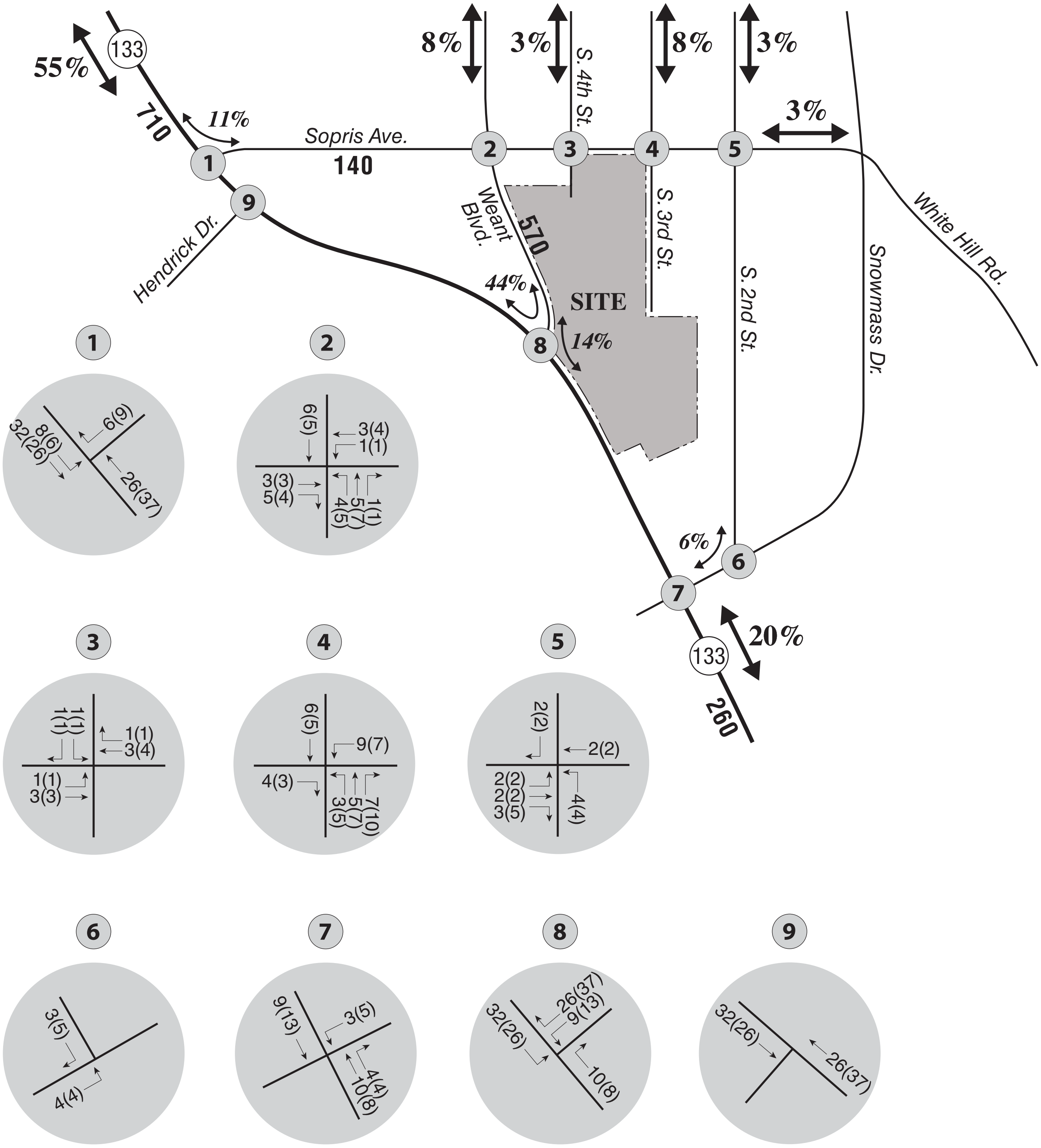
B. Trip Distribution

The site trip distribution estimates, shown on **Figure 9**, are based on the development's location relative to existing developed areas and major roadways. The following distribution percentages were used to assign the vehicle-trips to the external roadway network:

- 55 percent oriented to/from the north via SH 133
- 20 percent oriented to/from the south via SH 133
- 8 percent oriented to/from the north via Weant Boulevard
- 3 percent oriented to/from the north via 4th Street
- 8 percent oriented to/from the north via 3rd Street
- 3 percent oriented to/from the north via 2nd Street
- 3 percent oriented to/from the east via Sopris Avenue

C. Traffic Assignment

The AM and PM peak hour CESR site (non-library) generated trips were assigned to the roadway network as shown on **Figure 9**. These traffic volumes represent the increased demand on the local roadway network as a direct result of the proposed development. On SH 133, this portion of the development would add approximately 75 vehicles per hour (vph) in the AM (78 vph in the PM) north of Sopris Avenue and 26 vph in the AM (30 vph in the PM) south of Snowmass Drive. Weant Boulevard would experience an increase of approximately 77 vph in the AM (84 in the PM) north of SH 133 and Sopris Avenue would experience an increase of approximately 14 vph in the AM (15 vph in the PM).



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

XXXX = Daily Traffic Volumes

XX% = Site Trip Distribution

XX% = Secondary Trip Distribution

Figure 9
Site Generated Traffic
and Trip Distribution

NORTH

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D. Proposed Accesses

The majority of traffic accessing CESR will utilize Weant Boulevard and Sopris Avenue to access SH 133. A smaller percentage of site-generated traffic is also expected to use Snowmass Drive (via 2nd Street) to access SH 133. Traffic traveling to/from downtown Carbondale is also expected to use 2nd Street, 3rd Street and 4th Street.

V. FUTURE CONDITIONS WITH PROPOSED DEVELOPMENT

A. Short Term Future

Site generated traffic volumes from **Figure 9** were added to the corresponding background traffic volumes from **Figure 5** to produce the short-term (2011) total traffic volumes shown on **Figure 10**. **Figure 11** presents the LOS results and associated lane geometry for the short-term future scenario.

Based on the requirements in the SHAC, the southbound left-turn movement at the intersection of SH 133 and Weant Boulevard meets requirements for a left-turn deceleration lane. It is recommended that a left-turn deceleration lane be constructed at this intersection. Additional information regarding lane geometry is included in subsequent sections.

As was the case under short-term background traffic conditions, all movements at all intersections operate at LOS D or better during both peak hours with the exception of the SH 133 / Snowmass Drive intersection. This intersection will have an eastbound left-and-through movement (River Valley Ranch traffic) at LOS E during the AM peak hour. This condition is the same as found for short-term (2011) background traffic, and CESR has not made this condition worse. While this LOS is below the desired LOS D, the projected traffic volumes do not meet MUTCD signal warrants under short-term background conditions.

Analysis worksheets are included in **Appendix E**.

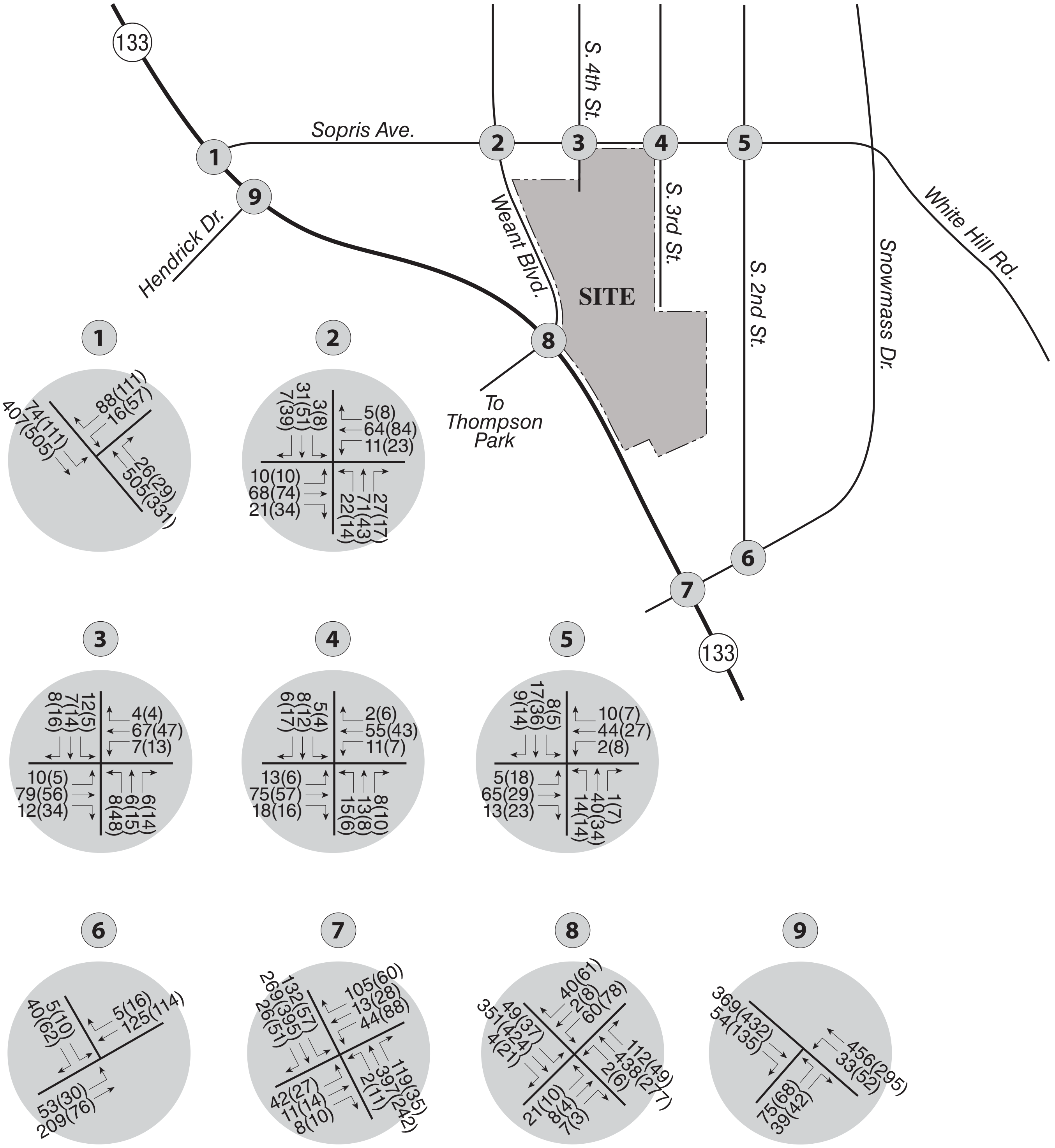
B. Long Term Future

Long-term future (2029) total traffic volumes are shown on **Figure 12**. These volumes are the sum of the site generated traffic volumes (**Figure 9**) and the long-term future background traffic volumes (**Figure 7**). **Figure 13** presents the LOS results and associated lane geometry for the long-term scenario.

It is expected that SH 133 will be widened to a four-lane cross section and that the SH 133/Hendrick Drive (Sopris Avenue) intersection will be re-constructed by 2029.

The three intersections along SH 133 are all planned to be signalized according to the SH 133 Corridor Feasibility Study and the Thompson Park Traffic Impact Study. These three signalized intersections are expected to operate at LOS A or B during both peak hours in the long-term future. All movements at all unsignalized intersections operate at LOS A or B during both peak hours and have the same LOS values as found for background traffic. The future signal at SH 133/Weant Boulevard improved from LOS B to LOS A due to the addition of the southbound left-turn lane.

Analysis worksheets are included in **Appendix F**.



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

Figure 10

Short-Term (2011) Total Traffic Volumes

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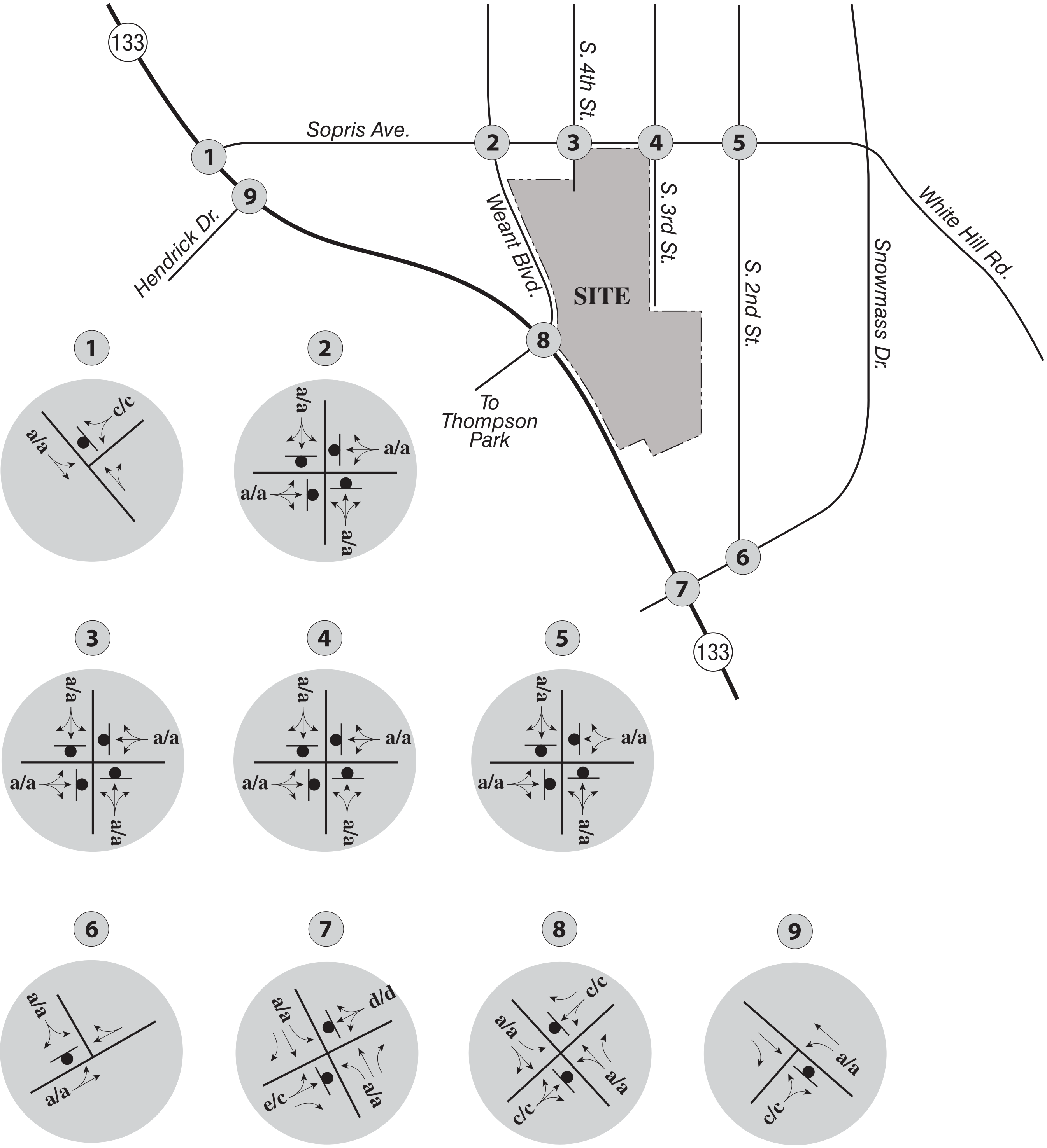
NORTH



LEGEND

x/x = AM/PM Peak Hour Unsignalized Intersection Level of Service

● = Stop Sign

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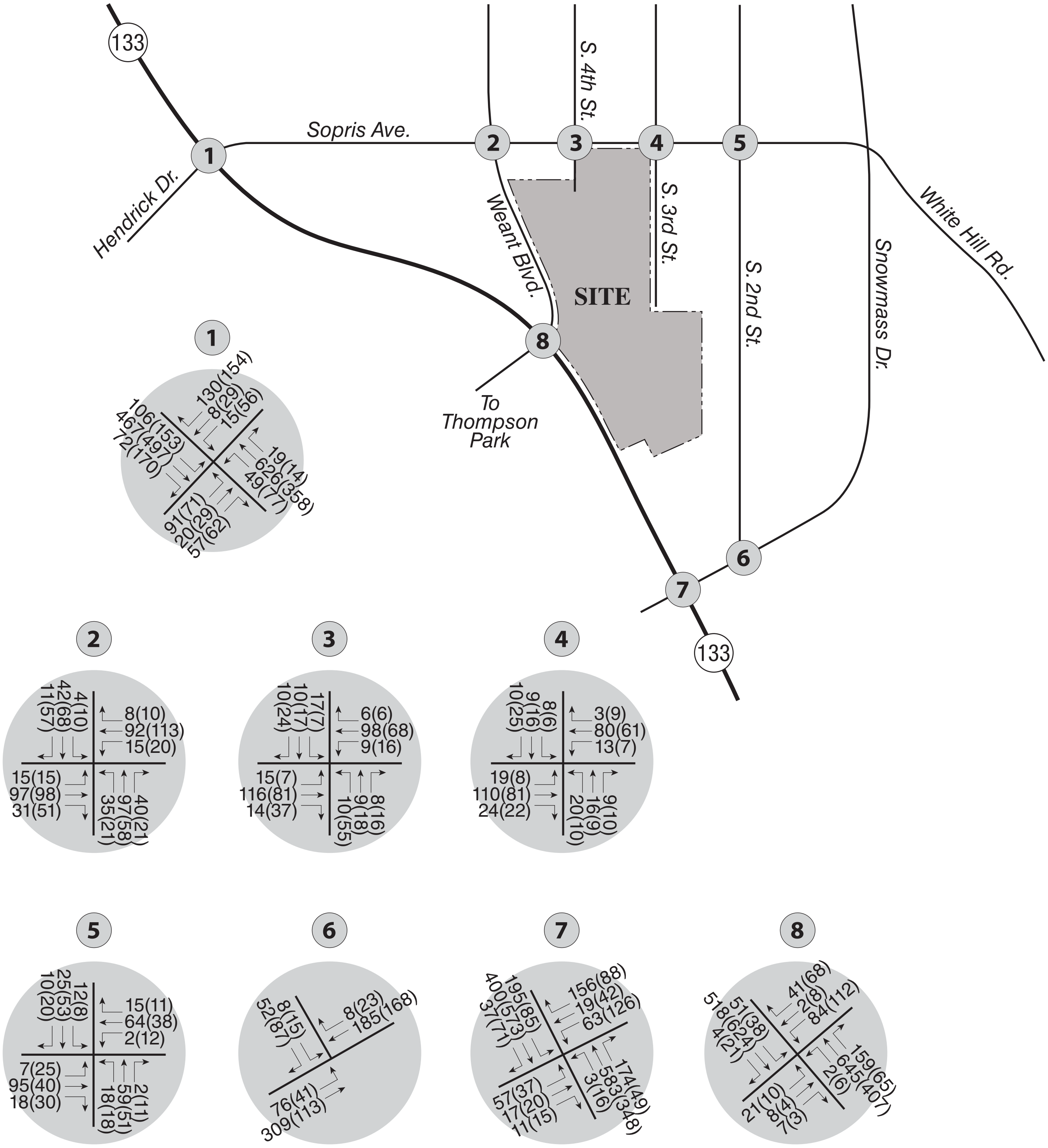
Figure 11

Short-Term (2011) Total Levels of Service and Lane Geometry

NORTH



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

Figure 12

Long-Term (2029) Total Traffic Volumes

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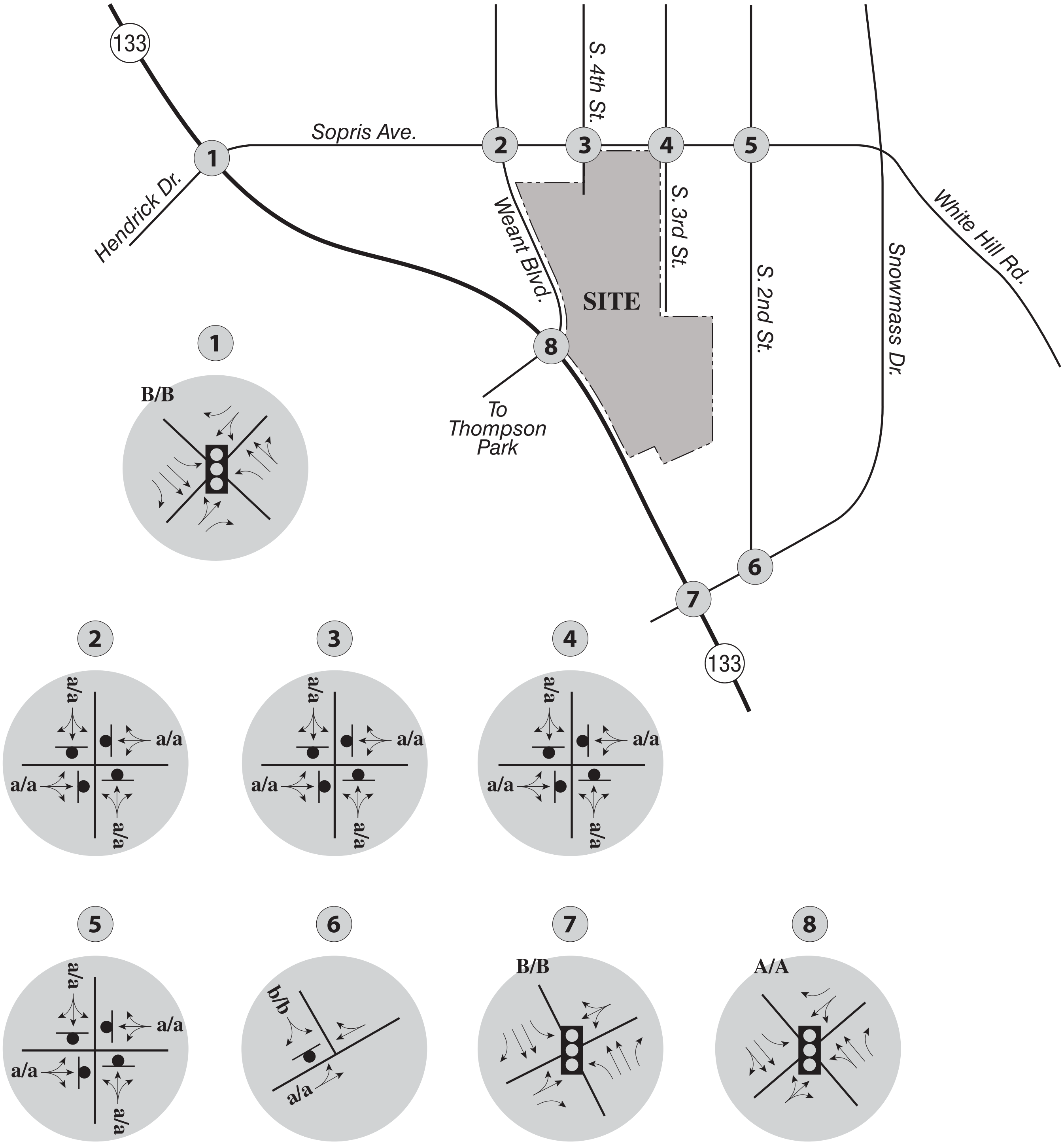
NORTH



LEGEND

X/X = AM/PM Peak Hour Signalized Intersection Level of Service

x/x = AM/PM Peak Hour Unsignalized Intersection Level of Service

● = Stop Sign

🚦 = Traffic Signal

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Figure 13

Long-Term (2029) Total
Levels of Service and Lane Geometry

NORTH

C. Auxiliary Lane Requirements

As described previously, short-term total traffic volumes indicate a need for a southbound left-turn deceleration lane at the intersection of SH 133 and Weant Boulevard based on requirements in the SHAC. Based on a turning movement volume of 51 vph (long-term total AM peak hour volume) and a posted speed limit of 40 mph, it is recommended that the left-turn deceleration lane include 50 feet of storage and 144 feet of taper length (12:1 taper ratio).

D. Bicycle and Pedestrian Considerations

In the future, several facilities are expected to provide adequate access and safety for bicyclists and pedestrians travelling to or from CESR. Currently, both sides of SH 133 have bicycle/pedestrian paths within the study area. As shown in the site plan on **Figure 2**, trails and bicycle paths are also planned along Snowmass Drive, Sopris Avenue and SH 133. Additionally, the future signalization of SH 133/Hendrick Drive (Sopris Avenue), SH 133/Weant Boulevard, and SH 133/Snowmass Drive will provide safe locations for bicyclists and pedestrians to cross SH 133.

E. Traffic Calming

It was requested that speeds along the study roadways be investigated and traffic calming measures be recommended. Based on speed profiles collected in July 2009, the average speed along Sopris Avenue (west of 2nd Street) was 14 mph and the average speed along Weant Boulevard (south of Sopris Avenue) was 16 mph. The 95th percentile speed along both roadways was 23 mph. Based on this information, it seems that the four-way stops along Sopris Avenue and narrow cross-sections along both roadways are adequately slowing traffic in the area. No additional traffic calming measures are recommended for the surrounding neighborhood streets.

The proposed internal street network within CESR will be open to public travel. This will allow more convenient travel for neighbors in the vicinity of 2nd Street and Capitol Avenue to and from SH 133. This travel has been accounted for in our analysis of background traffic (described on page 7). However, traffic calming measures (such as narrow streets, corner neckdowns, on-street parking, etc.) will encourage all traffic to maintain reasonable, slow speeds.

F. Signal Progression

Signal progression analyses were completed along SH 133 to ensure adequate progression of traffic between Snowmass Drive and Hendrick Drive/Sopris Avenue. Both peak hours were analyzed with 90 second cycle lengths and actuated-coordinated signal timing. During the AM peak hour, progression along SH 133 is approximately 32% and the PM peak hour is just over 30%. Both peak hour progression efficiency percentages exceed the SHAC minimum requirement of 30% for NR-B roadways.

VI. SUMMARY AND RECOMMENDATIONS

The redevelopment of the Carbondale Elementary School site is planned to include single-family and multi-family residences, a non-profit community center and the newly relocated Carbondale Library, as well as retaining the existing alternative high school. Roaring Fork School District has partnered with the developers of the site to provide affordable housing for school district and other public employees. While some of the residential units will be available at free market rates, the majority of the units (80%) will be affordable housing units with preference given to school district and other public employees. This development is projected to generate approximately 1,295 vehicle-trips per day, with approximately 131 vehicle-trips during the AM peak hour and 142 vehicle-trips during the PM peak hour. Based on the analysis of the proposed development several improvements are recommended.

The following recommended improvements are listed according to the scenario in which they are triggered:

<u>Short-Term Future (2011)</u>

- Background Traffic Conditions
  - No improvements are triggered under short-term background conditions.
- Total Traffic Conditions
  - A southbound left-turn lane is warranted on SH 133 at its intersection with Weant Boulevard.

<u>Long-Term Future (2029)</u>

- Background Traffic Conditions
  - Widen SH 133 to four lanes;
  - Reconstruction and signalization of the SH 133/Hendrick Drive (Sopris Avenue) intersection with lane geometries consistent with recommendations in the <u>SH 133 Corridor Feasibility Study</u>;
  - Signalization of the SH 133/Snowmass Drive intersection, consistent with recommendations in the <u>SH 133 Corridor Feasibility Study</u>;
  - Signalization of the SH 133/Weant Boulevard intersection, consistent with recommendations in the <u>Thompson Park Traffic Impact Study</u>.
- Total Traffic Conditions
  - No additional improvements are triggered under long-term total conditions.

As shown, the redevelopment of the Carbondale Elementary School site will only require the installation of a southbound left-turn lane at the intersection of SH 133 and Weant Boulevard.

It is also recommended that Capitol Avenue be reverted to a two-way roadway east of 3rd Street to allow for more direct access to the site from the surrounding neighborhoods.

APPENDIX A TRAFFIC COUNTS

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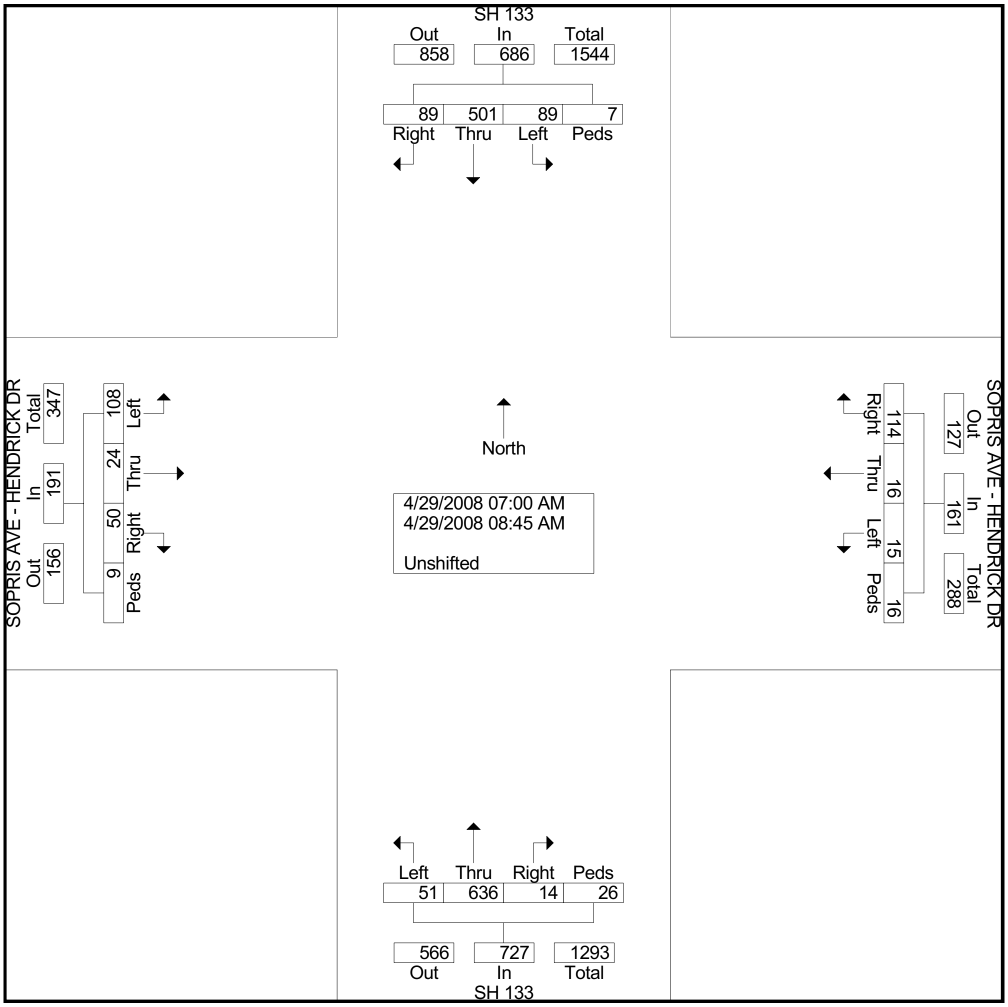
File Name : #3 SH133&SOPRIS_AM
Site Code : 00000000
Start Date : 4/29/2008
Page No : 1

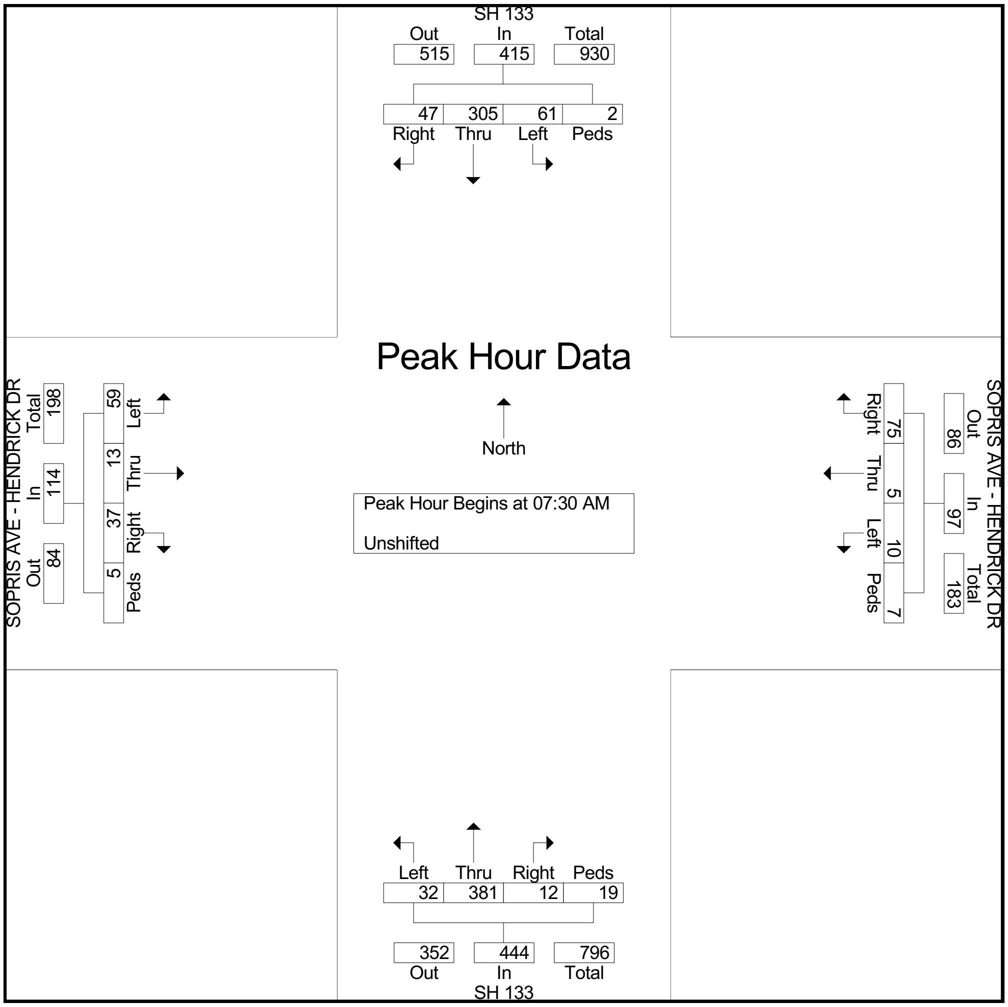
Groups Printed- Unshifted

	SH 133 Southbound				SOPRIS AVE - HENDRICK DR Westbound				SH 133 Northbound				SOPRIS AVE - HENDRICK DR Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	4	44	6	0	0	1	6	3	2	70	0	2	13	0	3	1	155
07:15 AM	12	62	4	2	1	1	15	2	2	69	0	2	10	1	6	2	191
07:30 AM	23	94	19	0	3	2	17	1	6	101	0	12	16	3	9	4	310
07:45 AM	21	120	9	1	5	1	29	3	13	113	3	1	12	4	22	0	357
Total	60	320	38	3	9	5	67	9	23	353	3	17	51	8	40	7	1013
08:00 AM	9	37	8	0	1	1	17	1	4	84	6	2	14	2	5	0	191
08:15 AM	8	54	11	1	1	1	12	2	9	83	3	4	17	4	1	1	212
08:30 AM	8	49	13	3	2	4	8	3	10	64	1	1	14	4	1	1	186
08:45 AM	4	41	19	0	2	5	10	1	5	52	1	2	12	6	3	0	163
Total	29	181	51	4	6	11	47	7	28	283	11	9	57	16	10	2	752
Grand Total	89	501	89	7	15	16	114	16	51	636	14	26	108	24	50	9	1765
Apprch %	13	73	13	1	9.3	9.9	70.8	9.9	7	87.5	1.9	3.6	56.5	12.6	26.2	4.7	
Total %	5	28.4	5	0.4	0.8	0.9	6.5	0.9	2.9	36	0.8	1.5	6.1	1.4	2.8	0.5	



File Name : #3 SH133&SOPRIS_AM
Site Code : 00000000
Start Date : 4/29/2008
Page No : 2

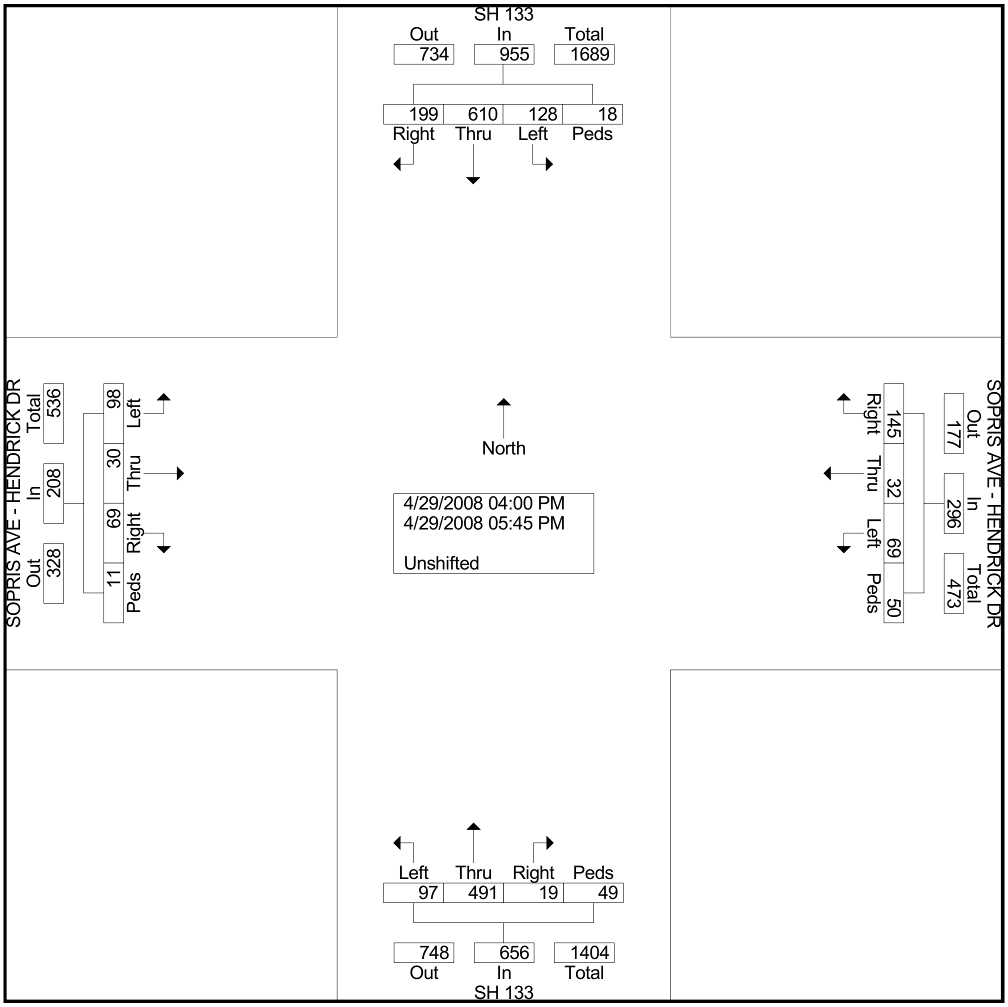
	SH 133 Southbound					**SOPRIS AVE - HENDRICK DR Westbound**					**SH 133 Northbound**					**SOPRIS AVE - HENDRICK DR Eastbound**					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	23	94	19	0	136	3	2	17	1	23	6	101	0	12	119	16	3	9	4	32	310
07:45 AM	21	120	9	1	151	5	1	29	3	38	13	113	3	1	130	12	4	22	0	38	357
08:00 AM	9	37	8	0	54	1	1	17	1	20	4	84	6	2	96	14	2	5	0	21	191
08:15 AM	8	54	11	1	74	1	1	12	2	16	9	83	3	4	99	17	4	1	1	23	212
Total Volume	61	305	47	2	415	10	5	75	7	97	32	381	12	19	444	59	13	37	5	114	1070
% App. Total	14.7	73.5	11.3	0.5		10.3	5.2	77.3	7.2		7.2	85.8	2.7	4.3		51.8	11.4	32.5	4.4		
PHF	.663	.635	.618	.500	.687	.500	.625	.647	.583	.638	.615	.843	.500	.396	.854	.868	.813	.420	.313	.750	.749



File Name : #3 SH133&SOPRIS_PM
Site Code : 00000000
Start Date : 4/29/2008
Page No : 1

Groups Printed- Unshifted

	SH 133 Southbound				SOPRIS AVE - HENDRICK DR Westbound				SH 133 Northbound				SOPRIS AVE - HENDRICK DR Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	9	66	15	8	8	3	17	8	12	72	2	5	17	5	11	2	260
04:15 PM	10	80	21	2	5	1	18	8	14	92	2	8	10	1	8	0	280
04:30 PM	14	62	21	0	8	6	13	13	15	53	1	5	8	3	7	0	229
04:45 PM	18	79	30	3	10	5	22	5	6	56	1	7	13	6	3	0	264
Total	51	287	87	13	31	15	70	34	47	273	6	25	48	15	29	2	1033
05:00 PM	26	75	31	0	9	5	22	4	14	70	4	4	10	7	8	4	293
05:15 PM	21	76	33	2	9	5	19	3	10	46	4	6	15	2	8	0	259
05:30 PM	18	86	25	2	8	4	9	5	11	59	3	4	17	4	13	2	270
05:45 PM	12	86	23	1	12	3	25	4	15	43	2	10	8	2	11	3	260
Total	77	323	112	5	38	17	75	16	50	218	13	24	50	15	40	9	1082
Grand Total	128	610	199	18	69	32	145	50	97	491	19	49	98	30	69	11	2115
Apprch %	13.4	63.9	20.8	1.9	23.3	10.8	49	16.9	14.8	74.8	2.9	7.5	47.1	14.4	33.2	5.3	
Total %	6.1	28.8	9.4	0.9	3.3	1.5	6.9	2.4	4.6	23.2	0.9	2.3	4.6	1.4	3.3	0.5	

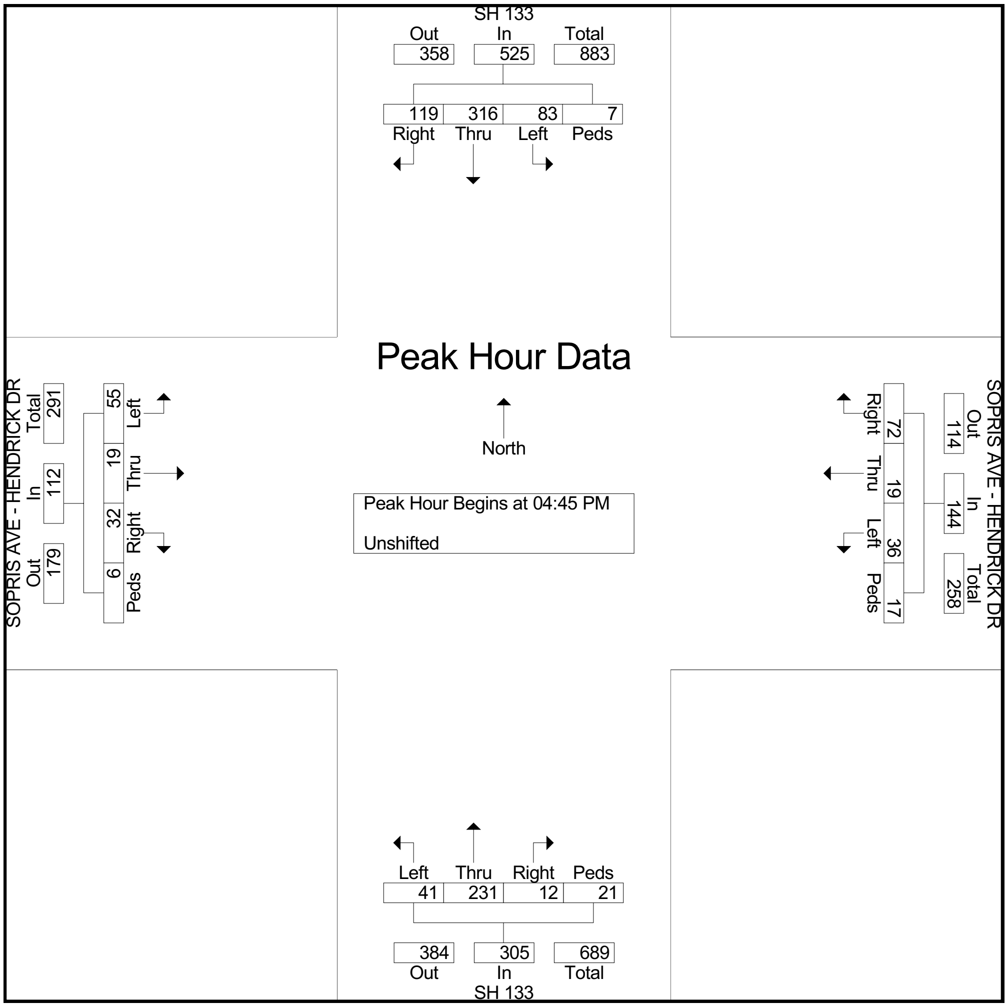


4/29/2008 04:00 PM
4/29/2008 05:45 PM

Unshifted

File Name : #3 SH133&SOPRIS_PM
Site Code : 00000000
Start Date : 4/29/2008
Page No : 2

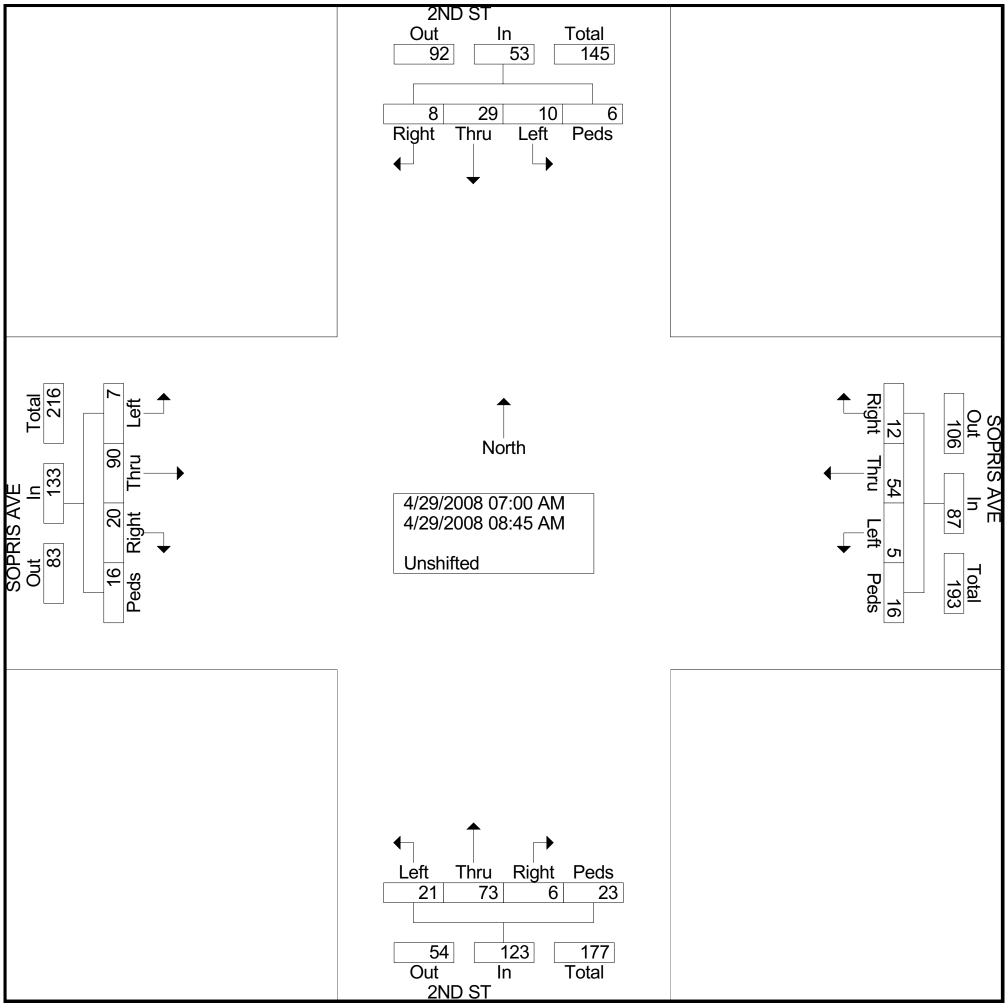
	SH 133 Southbound					SOPRIS AVE - HENDRICK DR Westbound					SH 133 Northbound					SOPRIS AVE - HENDRICK DR Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	18	79	30	3	130	10	5	22	5	42	6	56	1	7	70	13	6	3	0	22	264
05:00 PM	26	75	31	0	132	9	5	22	4	40	14	70	4	4	92	10	7	8	4	29	293
05:15 PM	21	76	33	2	132	9	5	19	3	36	10	46	4	6	66	15	2	8	0	25	259
05:30 PM	18	86	25	2	131	8	4	9	5	26	11	59	3	4	77	17	4	13	2	36	270
Total Volume	83	316	119	7	525	36	19	72	17	144	41	231	12	21	305	55	19	32	6	112	1086
% App. Total	15.8	60.2	22.7	1.3		25	13.2	50	11.8		13.4	75.7	3.9	6.9		49.1	17	28.6	5.4		
PHF	.798	.919	.902	.583	.994	.900	.950	.818	.850	.857	.732	.825	.750	.750	.829	.809	.679	.615	.375	.778	.927



File Name : #4 2ND&SOPRIS AM
Site Code : 00000000
Start Date : 4/29/2008
Page No : 1

Groups Printed- Unshifted

	2ND ST Southbound				**SOPRIS AVE Westbound**				**2ND ST Northbound**				**SOPRIS AVE Eastbound**				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	0	1	1	0	0	2	0	0	2	6	2	0	0	3	0	2	19
07:15 AM	2	1	1	0	3	6	0	1	4	10	1	3	2	9	4	2	49
07:30 AM	3	4	2	4	0	13	5	5	2	6	0	5	0	16	5	2	72
07:45 AM	4	7	3	1	1	19	5	5	5	11	1	1	2	37	5	8	115
Total	9	13	7	5	4	40	10	11	13	33	4	9	4	65	14	14	255
08:00 AM	1	4	1	0	0	9	0	4	3	18	0	1	1	9	3	1	55
08:15 AM	0	3	0	0	0	2	0	0	1	7	0	6	1	7	1	0	28
08:30 AM	0	4	0	0	1	2	1	0	3	9	1	5	1	8	1	1	37
08:45 AM	0	5	0	1	0	1	1	1	1	6	1	2	0	1	1	0	21
Total	1	16	1	1	1	14	2	5	8	40	2	14	3	25	6	2	141
Grand Total	10	29	8	6	5	54	12	16	21	73	6	23	7	90	20	16	396
Apprch %	18.9	54.7	15.1	11.3	5.7	62.1	13.8	18.4	17.1	59.3	4.9	18.7	5.3	67.7	15	12	
Total %	2.5	7.3	2	1.5	1.3	13.6	3	4	5.3	18.4	1.5	5.8	1.8	22.7	5.1	4	

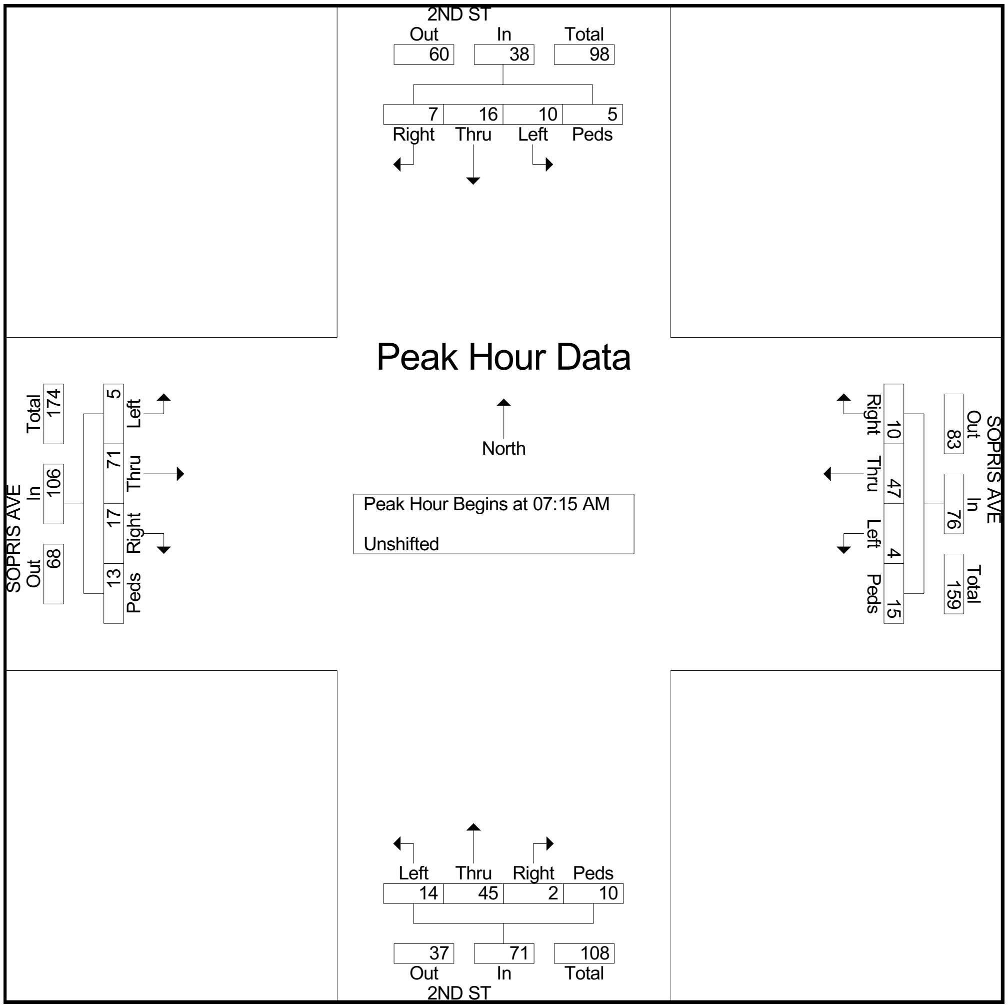


4/29/2008 07:00 AM
4/29/2008 08:45 AM

Unshifted

File Name : #4 2ND&SOPRIS AM
Site Code : 00000000
Start Date : 4/29/2008
Page No : 2

	2ND ST Southbound					SOPRIS AVE Westbound					2ND ST Northbound					SOPRIS AVE Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	2	1	1	0	4	3	6	0	1	10	4	10	1	3	18	2	9	4	2	17	49
07:30 AM	3	4	2	4	13	0	13	5	5	23	2	6	0	5	13	0	16	5	2	23	72
07:45 AM	4	7	3	1	15	1	19	5	5	30	5	11	1	1	18	2	37	5	8	52	115
08:00 AM	1	4	1	0	6	0	9	0	4	13	3	18	0	1	22	1	9	3	1	14	55
Total Volume	10	16	7	5	38	4	47	10	15	76	14	45	2	10	71	5	71	17	13	106	291
% App. Total	26.3	42.1	18.4	13.2		5.3	61.8	13.2	19.7		19.7	63.4	2.8	14.1		4.7	67	16	12.3		
PHF	.625	.571	.583	.313	.633	.333	.618	.500	.750	.633	.700	.625	.500	.500	.807	.625	.480	.850	.406	.510	.633



File Name : #4 2ND&SOPRIS PM
Site Code : 00000000
Start Date : 4/28/2008
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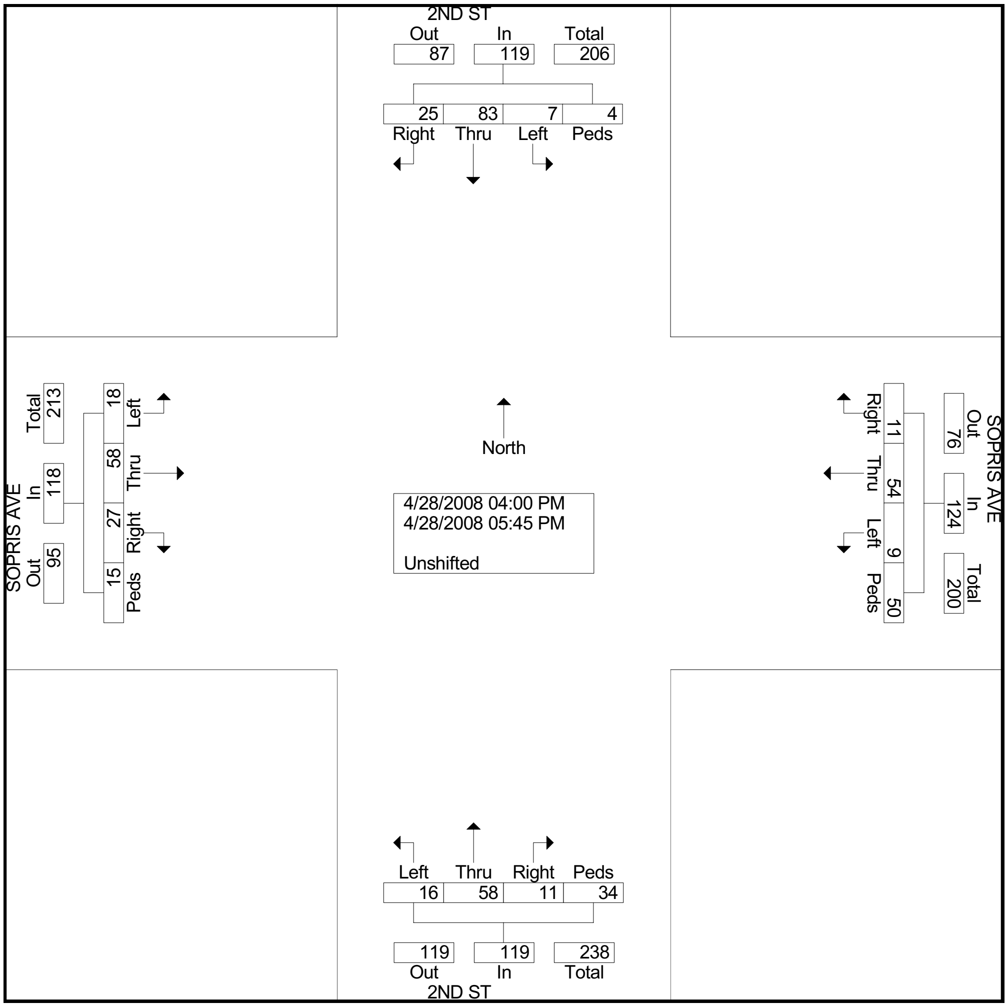
Groups Printed- Unshifted

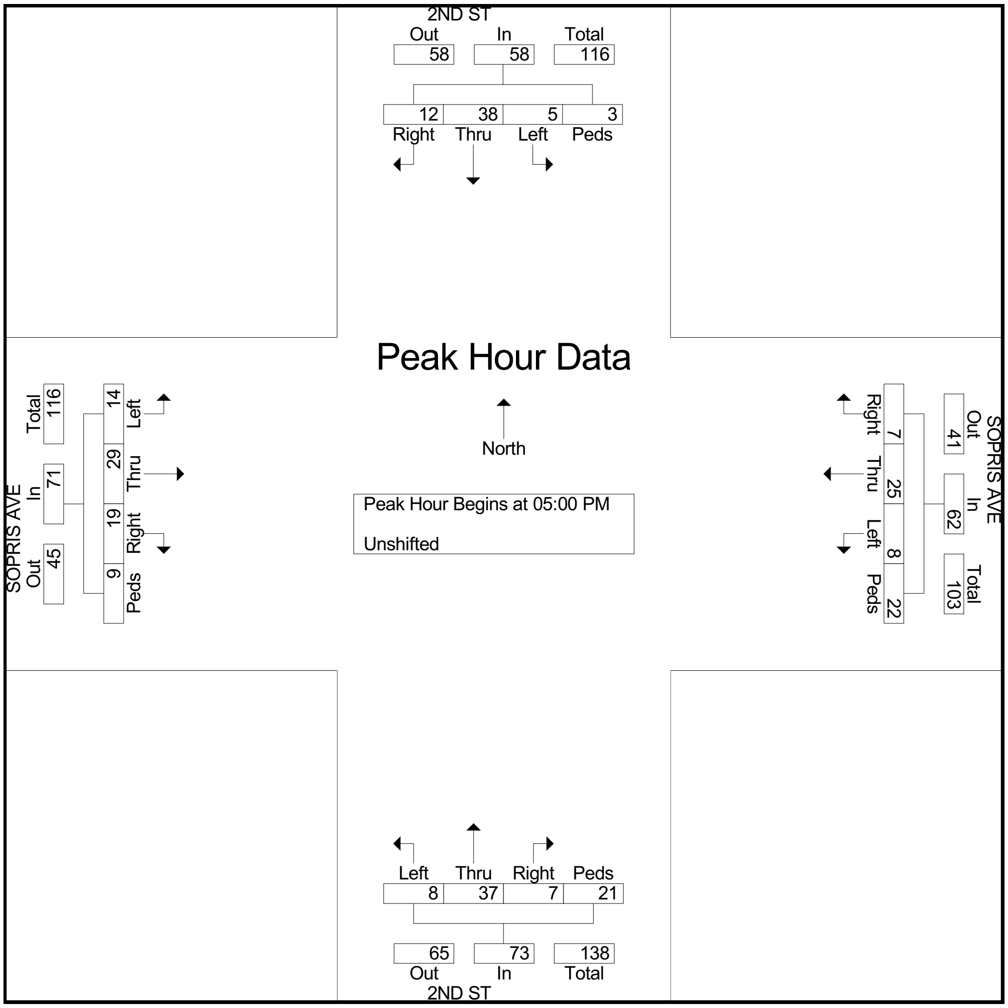
	2ND ST Southbound				SOPRIS AVE Westbound				2ND ST Northbound				SOPRIS AVE Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	0	8	3	0	1	9	0	4	1	6	1	4	0	9	2	1	49
04:15 PM	1	12	4	1	0	7	0	13	2	5	0	6	1	7	1	3	63
04:30 PM	0	12	1	0	0	4	3	8	4	3	3	3	2	6	1	1	51
04:45 PM	1	13	5	0	0	9	1	3	1	7	0	0	1	7	4	1	53
Total	2	45	13	1	1	29	4	28	8	21	4	13	4	29	8	6	216
05:00 PM	2	6	2	1	1	4	1	9	2	5	1	6	3	8	4	2	57
05:15 PM	0	14	1	2	4	7	2	1	3	9	1	1	3	8	3	5	64
05:30 PM	1	9	4	0	1	4	2	4	1	11	4	7	5	5	8	2	68
05:45 PM	2	9	5	0	2	10	2	8	2	12	1	7	3	8	4	0	75
Total	5	38	12	3	8	25	7	22	8	37	7	21	14	29	19	9	264
Grand Total	7	83	25	4	9	54	11	50	16	58	11	34	18	58	27	15	480
Apprch %	5.9	69.7	21	3.4	7.3	43.5	8.9	40.3	13.4	48.7	9.2	28.6	15.3	49.2	22.9	12.7	
Total %	1.5	17.3	5.2	0.8	1.9	11.2	2.3	10.4	3.3	12.1	2.3	7.1	3.8	12.1	5.6	3.1	



All Traffic Data Services Inc.

File Name : #4 2ND&SOPRIS PM
Site Code : 00000000
Start Date : 4/28/2008
Page No : 2

	2ND ST Southbound					SOPRIS AVE Westbound					2ND ST Northbound					SOPRIS AVE Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	2	6	2	1	11	1	4	1	9	15	2	5	1	6	14	3	8	4	2	17	57
05:15 PM	0	14	1	2	17	4	7	2	1	14	3	9	1	1	14	3	8	3	5	19	64
05:30 PM	1	9	4	0	14	1	4	2	4	11	1	11	4	7	23	5	5	8	2	20	68
05:45 PM	2	9	5	0	16	2	10	2	8	22	2	12	1	7	22	3	8	4	0	15	75
Total Volume	5	38	12	3	58	8	25	7	22	62	8	37	7	21	73	14	29	19	9	71	264
% App. Total	8.6	65.5	20.7	5.2		12.9	40.3	11.3	35.5		11	50.7	9.6	28.8		19.7	40.8	26.8	12.7		
PHF	.625	.679	.600	.375	.853	.500	.625	.875	.611	.705	.667	.771	.438	.750	.793	.700	.906	.594	.450	.888	.880



File Name : #5 3RD&SOPRIS_AM
Site Code : 00000000
Start Date : 4/29/2008
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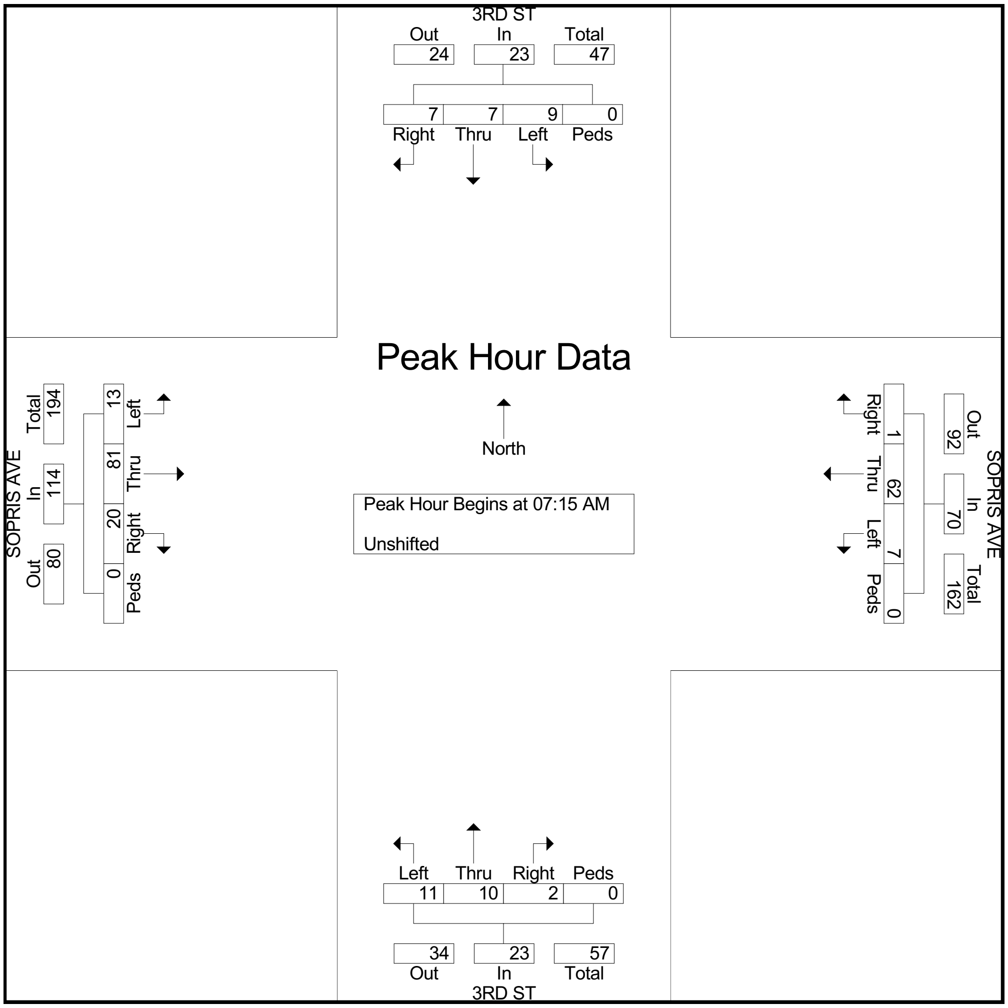
Groups Printed- Unshifted

	3RD ST Southbound				**SOPRIS AVE Westbound**				**3RD ST Northbound**				**SOPRIS AVE Eastbound**				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	0	0	0	0	0	6	0	0	1	0	0	0	0	6	2	0	15
07:15 AM	4	1	2	0	0	11	0	0	1	2	0	0	2	7	2	0	32
07:30 AM	2	1	2	0	0	11	1	0	0	1	1	0	6	16	3	0	44
07:45 AM	2	2	1	0	4	26	0	0	5	5	1	0	3	42	11	0	102
Total	8	4	5	0	4	54	1	0	7	8	2	0	11	71	18	0	193
08:00 AM	1	3	2	0	3	14	0	0	5	2	0	0	2	16	4	0	52
08:15 AM	0	1	1	0	1	4	1	0	2	3	1	0	1	8	1	0	24
08:30 AM	1	1	1	0	0	5	0	0	2	4	0	0	0	7	6	0	27
08:45 AM	0	0	4	0	0	2	0	0	2	1	0	0	1	5	1	0	16
Total	2	5	8	0	4	25	1	0	11	10	1	0	4	36	12	0	119
Grand Total	10	9	13	0	8	79	2	0	18	18	3	0	15	107	30	0	312
Apprch %	31.2	28.1	40.6	0	9	88.8	2.2	0	46.2	46.2	7.7	0	9.9	70.4	19.7	0	
Total %	3.2	2.9	4.2	0	2.6	25.3	0.6	0	5.8	5.8	1	0	4.8	34.3	9.6	0	

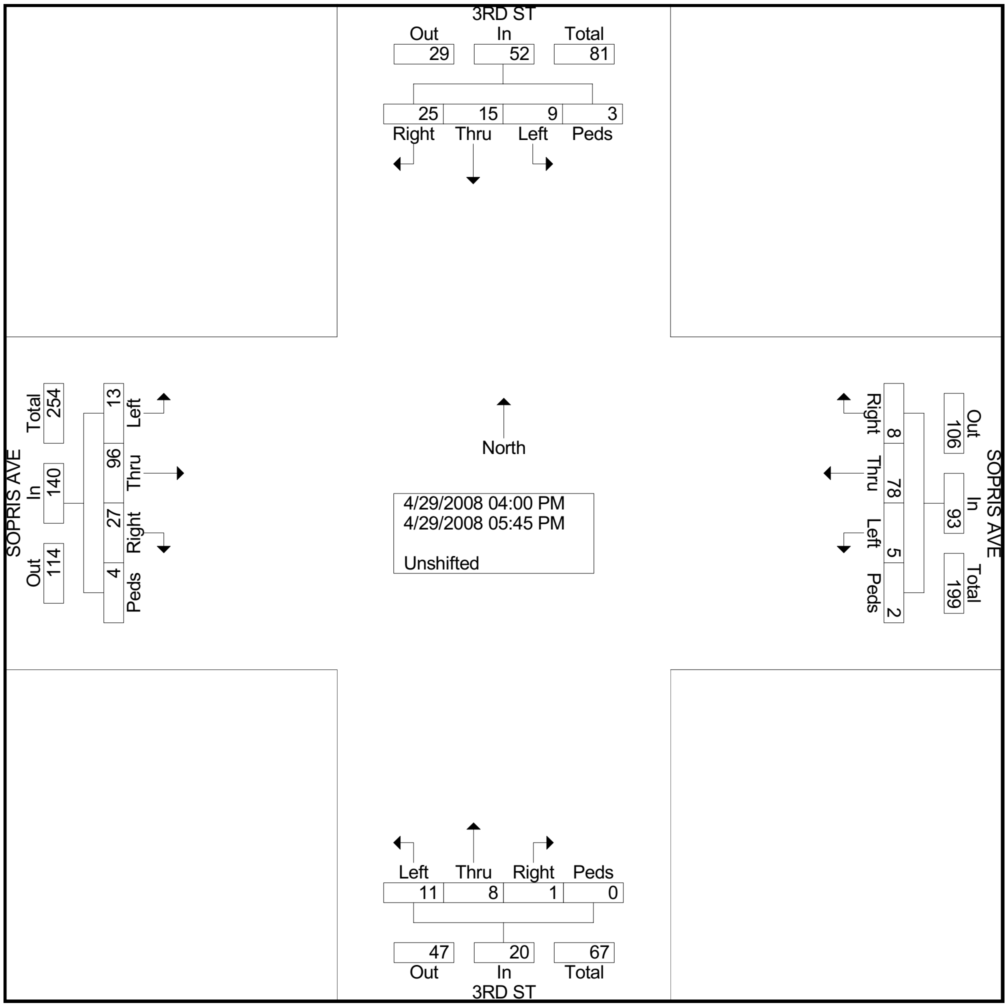
	3RD ST Southbound					SOPRIS AVE Westbound					3RD ST Northbound					SOPRIS AVE Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	4	1	2	0	7	0	11	0	0	11	1	2	0	0	3	2	7	2	0	11	32
07:30 AM	2	1	2	0	5	0	11	1	0	12	0	1	1	0	2	6	16	3	0	25	44
07:45 AM	2	2	1	0	5	4	26	0	0	30	5	5	1	0	11	3	42	11	0	56	102
08:00 AM	1	3	2	0	6	3	14	0	0	17	5	2	0	0	7	2	16	4	0	22	52
Total Volume	9	7	7	0	23	7	62	1	0	70	11	10	2	0	23	13	81	20	0	114	230
% App. Total	39.1	30.4	30.4	0		10	88.6	1.4	0		47.8	43.5	8.7	0		11.4	71.1	17.5	0		
PHF	.563	.583	.875	.000	.821	.438	.596	.250	.000	.583	.550	.500	.500	.000	.523	.542	.482	.455	.000	.509	.564



File Name : #5 3RD&SOPRIS_PM
Site Code : 00000000
Start Date : 4/29/2008
Page No : 1

Groups Printed- Unshifted

	3RD ST Southbound				SOPRIS AVE Westbound				3RD ST Northbound				SOPRIS AVE Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	2	2	2	1	2	7	1	1	4	1	0	0	2	11	3	0	39
04:15 PM	1	0	2	0	1	11	0	0	1	1	0	0	3	9	5	0	34
04:30 PM	2	1	4	0	0	11	0	0	1	0	0	0	2	7	1	1	30
04:45 PM	0	3	2	0	1	11	1	0	4	3	1	0	2	11	2	1	42
Total	5	6	10	1	4	40	2	1	10	5	1	0	9	38	11	2	145
05:00 PM	2	1	4	0	0	10	2	1	0	1	0	0	1	11	4	0	37
05:15 PM	1	1	6	2	0	9	0	0	0	1	0	0	1	15	5	1	42
05:30 PM	1	3	4	0	1	7	2	0	0	1	0	0	2	15	4	1	41
05:45 PM	0	4	1	0	0	12	2	0	1	0	0	0	0	17	3	0	40
Total	4	9	15	2	1	38	6	1	1	3	0	0	4	58	16	2	160
Grand Total	9	15	25	3	5	78	8	2	11	8	1	0	13	96	27	4	305
Apprch %	17.3	28.8	48.1	5.8	5.4	83.9	8.6	2.2	55	40	5	0	9.3	68.6	19.3	2.9	
Total %	3	4.9	8.2	1	1.6	25.6	2.6	0.7	3.6	2.6	0.3	0	4.3	31.5	8.9	1.3	



File Name : #5 3RD&SOPRIS_PM
Site Code : 00000000
Start Date : 4/29/2008
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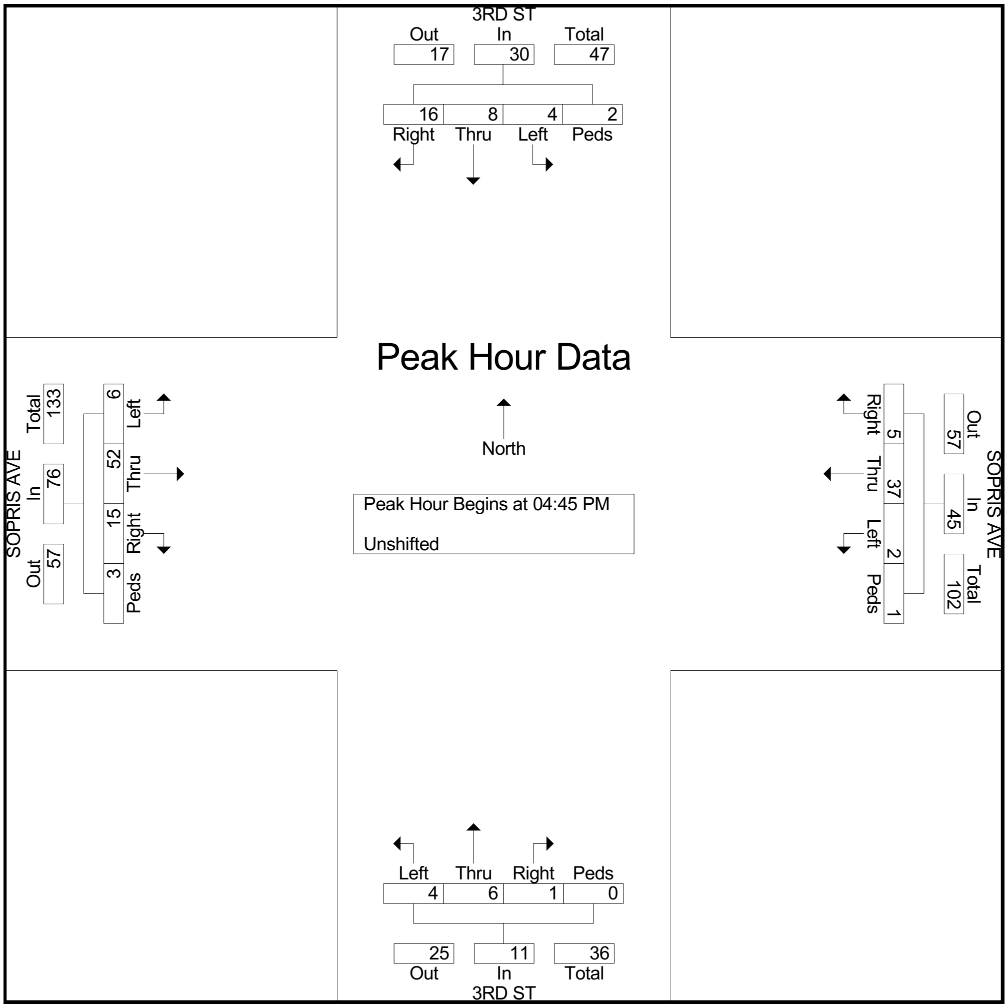
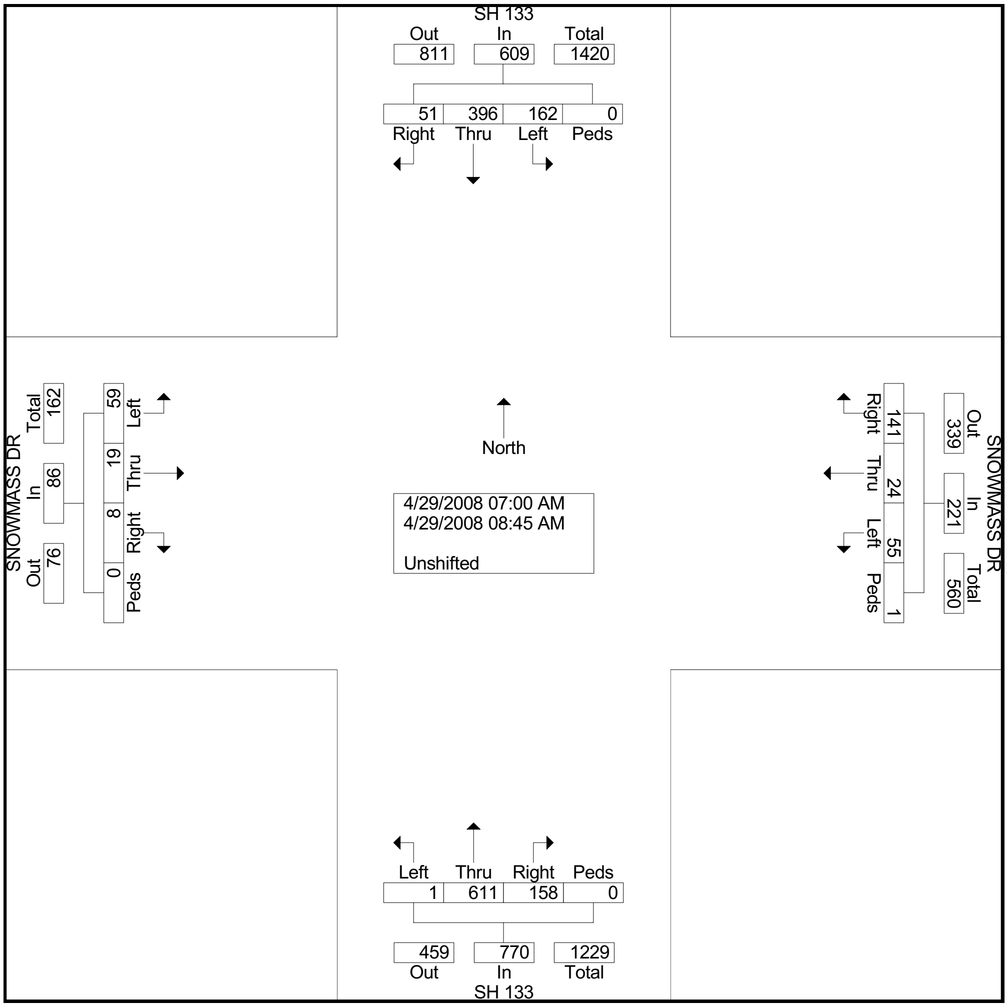
	3RD ST Southbound					SOPRIS AVE Westbound					3RD ST Northbound					SOPRIS AVE Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	3	2	0	5	1	11	1	0	13	4	3	1	0	8	2	11	2	1	16	42
05:00 PM	2	1	4	0	7	0	10	2	1	13	0	1	0	0	1	1	11	4	0	16	37
05:15 PM	1	1	6	2	10	0	9	0	0	9	0	1	0	0	1	1	15	5	1	22	42
05:30 PM	1	3	4	0	8	1	7	2	0	10	0	1	0	0	1	2	15	4	1	22	41
Total Volume	4	8	16	2	30	2	37	5	1	45	4	6	1	0	11	6	52	15	3	76	162
% App. Total	13.3	26.7	53.3	6.7		4.4	82.2	11.1	2.2		36.4	54.5	9.1	0		7.9	68.4	19.7	3.9		
PHF	.500	.667	.667	.250	.750	.500	.841	.625	.250	.865	.250	.500	.250	.000	.344	.750	.867	.750	.750	.864	.964



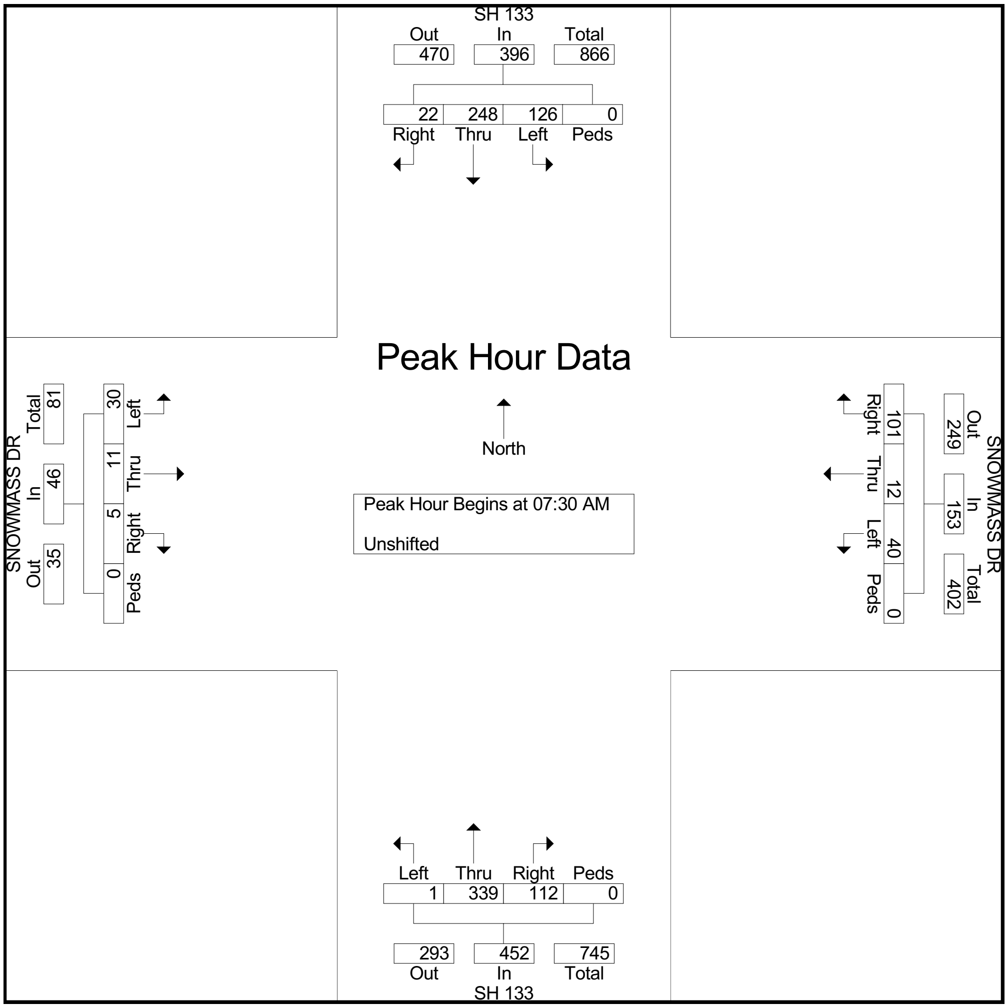
File Name : #2 SH133&SNOWMASS_AM
Site Code : 00000000
Start Date : 4/29/2008
Page No : 1

Groups Printed- Unshifted

	SH 133 Southbound				SNOWMASS DR Westbound				SH 133 Northbound				SNOWMASS DR Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	11	34	6	0	2	1	4	0	0	60	10	0	5	1	1	0	135
07:15 AM	15	26	1	0	3	4	10	1	0	78	23	0	4	3	0	0	168
07:30 AM	37	42	7	0	9	3	21	0	0	55	18	0	6	4	0	0	202
07:45 AM	43	88	4	0	8	0	28	0	0	101	39	0	7	1	3	0	322
Total	106	190	18	0	22	8	63	1	0	294	90	0	22	9	4	0	827
08:00 AM	35	84	4	0	16	6	39	0	1	102	40	0	8	3	2	0	340
08:15 AM	11	34	7	0	7	3	13	0	0	81	15	0	9	3	0	0	183
08:30 AM	3	47	6	0	5	2	17	0	0	73	7	0	12	2	1	0	175
08:45 AM	7	41	16	0	5	5	9	0	0	61	6	0	8	2	1	0	161
Total	56	206	33	0	33	16	78	0	1	317	68	0	37	10	4	0	859
Grand Total	162	396	51	0	55	24	141	1	1	611	158	0	59	19	8	0	1686
Apprch %	26.6	65	8.4	0	24.9	10.9	63.8	0.5	0.1	79.4	20.5	0	68.6	22.1	9.3	0	
Total %	9.6	23.5	3	0	3.3	1.4	8.4	0.1	0.1	36.2	9.4	0	3.5	1.1	0.5	0	



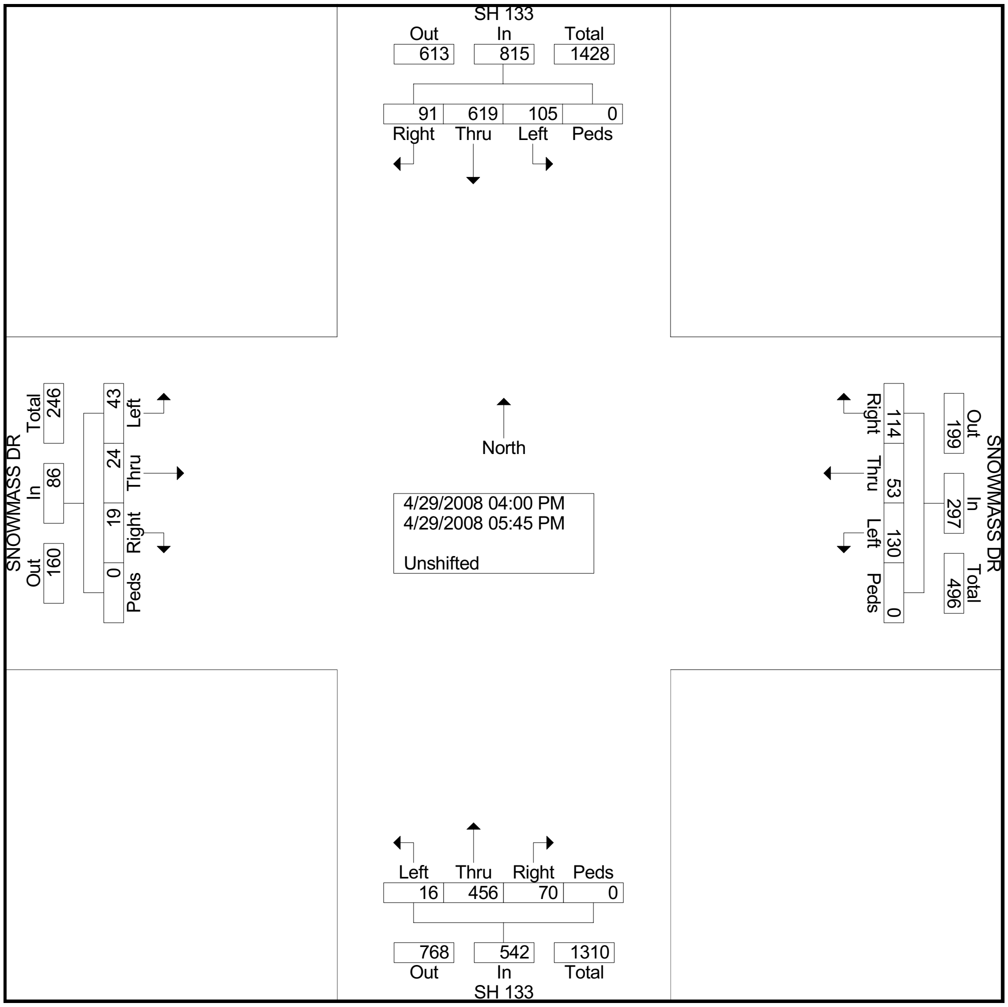
	SH 133 Southbound					SNOWMASS DR Westbound					SH 133 Northbound					SNOWMASS DR Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	37	42	7	0	86	9	3	21	0	33	0	55	18	0	73	6	4	0	0	10	202
07:45 AM	43	88	4	0	135	8	0	28	0	36	0	101	39	0	140	7	1	3	0	11	322
08:00 AM	35	84	4	0	123	16	6	39	0	61	1	102	40	0	143	8	3	2	0	13	340
08:15 AM	11	34	7	0	52	7	3	13	0	23	0	81	15	0	96	9	3	0	0	12	183
Total Volume	126	248	22	0	396	40	12	101	0	153	1	339	112	0	452	30	11	5	0	46	1047
% App. Total	31.8	62.6	5.6	0		26.1	7.8	66	0		0.2	75	24.8	0		65.2	23.9	10.9	0		
PHF	.733	.705	.786	.000	.733	.625	.500	.647	.000	.627	.250	.831	.700	.000	.790	.833	.688	.417	.000	.885	.770



File Name : #2 SH133&SNOWMASS_PM
Site Code : 00000000
Start Date : 4/29/2008
Page No : 1

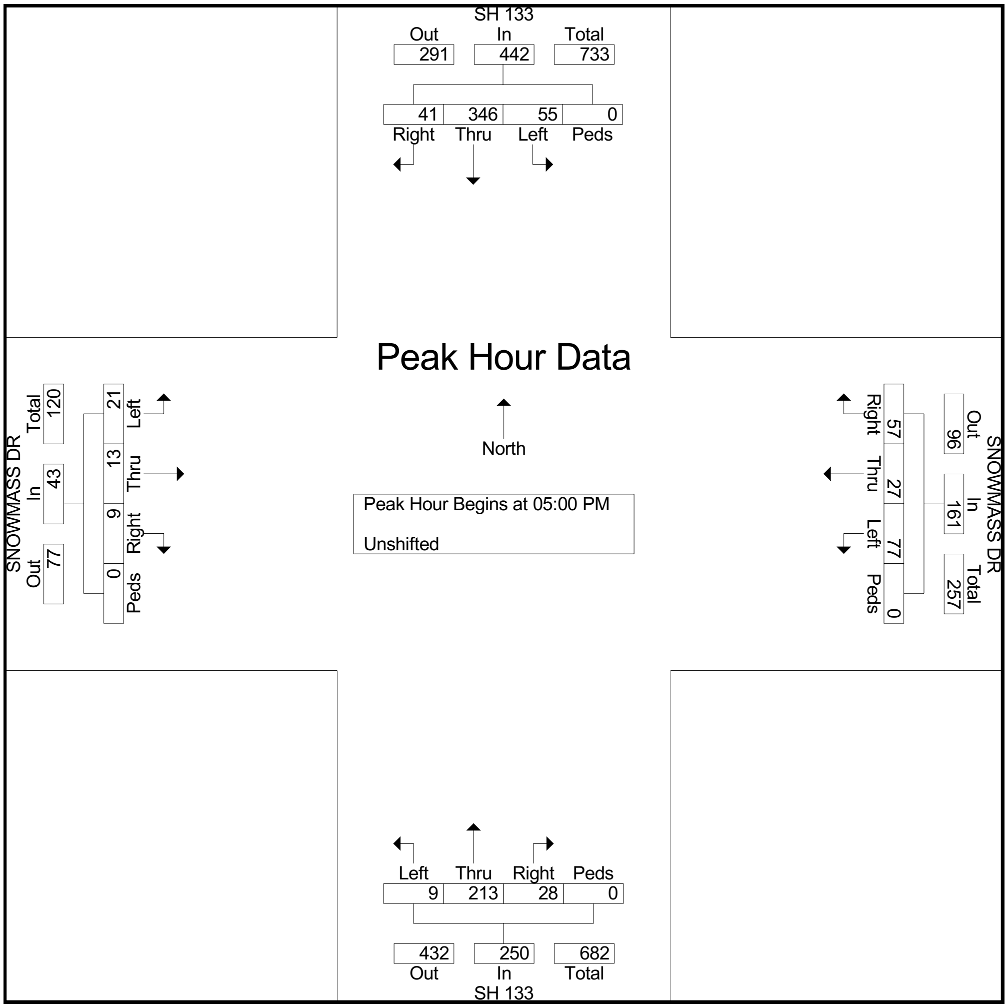
Groups Printed- Unshifted

	SH 133 Southbound				SNOWMASS DR Westbound				SH 133 Northbound				SNOWMASS DR Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	19	60	8	0	12	6	10	0	3	61	11	0	8	0	3	0	201
04:15 PM	9	83	12	0	11	6	20	0	4	74	12	0	4	4	5	0	244
04:30 PM	9	61	16	0	11	7	18	0	0	59	10	0	6	5	0	0	202
04:45 PM	13	69	14	0	19	7	9	0	0	49	9	0	4	2	2	0	197
Total	50	273	50	0	53	26	57	0	7	243	42	0	22	11	10	0	844
05:00 PM	10	85	12	0	18	4	18	0	3	55	4	0	6	2	0	0	217
05:15 PM	12	77	10	0	20	9	11	0	3	57	3	0	6	3	3	0	214
05:30 PM	14	99	7	0	18	6	17	0	1	43	11	0	8	6	2	0	232
05:45 PM	19	85	12	0	21	8	11	0	2	58	10	0	1	2	4	0	233
Total	55	346	41	0	77	27	57	0	9	213	28	0	21	13	9	0	896
Grand Total	105	619	91	0	130	53	114	0	16	456	70	0	43	24	19	0	1740
Apprch %	12.9	76	11.2	0	43.8	17.8	38.4	0	3	84.1	12.9	0	50	27.9	22.1	0	
Total %	6	35.6	5.2	0	7.5	3	6.6	0	0.9	26.2	4	0	2.5	1.4	1.1	0	



File Name : #2 SH133&SNOWMASS_PM
Site Code : 00000000
Start Date : 4/29/2008
Page No : 2

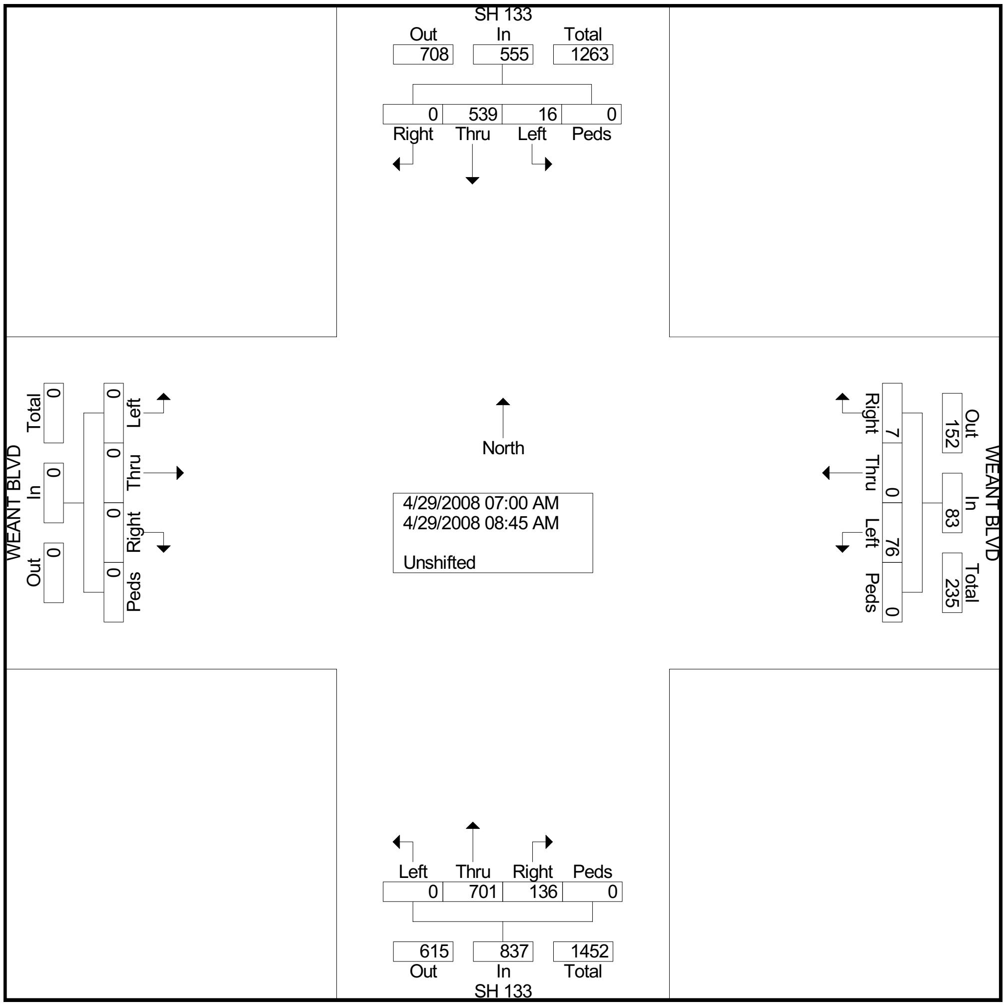
	SH 133 Southbound					SNOWMASS DR Westbound					SH 133 Northbound					SNOWMASS DR Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	10	85	12	0	107	18	4	18	0	40	3	55	4	0	62	6	2	0	0	8	217
05:15 PM	12	77	10	0	99	20	9	11	0	40	3	57	3	0	63	6	3	3	0	12	214
05:30 PM	14	99	7	0	120	18	6	17	0	41	1	43	11	0	55	8	6	2	0	16	232
05:45 PM	19	85	12	0	116	21	8	11	0	40	2	58	10	0	70	1	2	4	0	7	233
Total Volume	55	346	41	0	442	77	27	57	0	161	9	213	28	0	250	21	13	9	0	43	896
% App. Total	12.4	78.3	9.3	0		47.8	16.8	35.4	0		3.6	85.2	11.2	0		48.8	30.2	20.9	0		
PHF	.724	.874	.854	.000	.921	.917	.750	.792	.000	.982	.750	.918	.636	.000	.893	.656	.542	.563	.000	.672	.961



File Name : #1 SH133&WEANT_AM
Site Code : 00000000
Start Date : 4/29/2008
Page No : 1

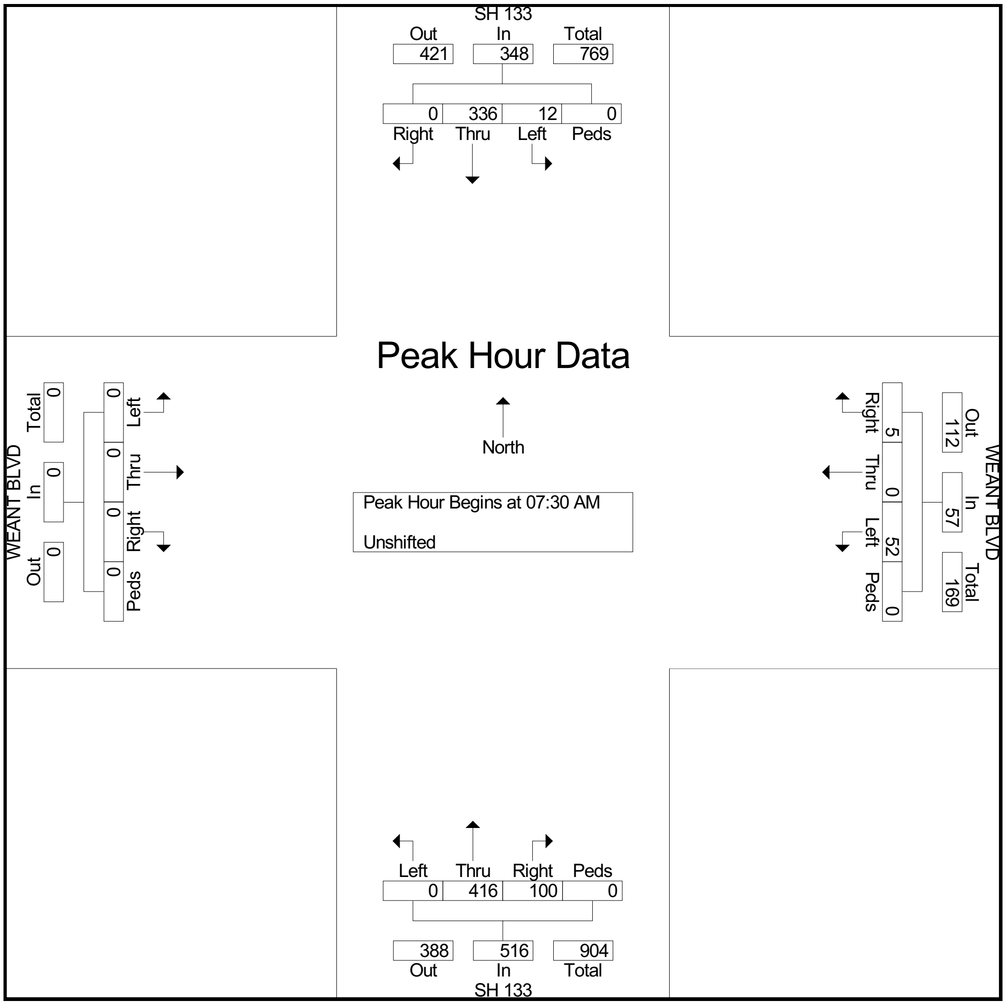
Groups Printed- Unshifted

	SH 133 Southbound				WEANT BLVD Westbound				SH 133 Northbound				WEANT BLVD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	0	45	0	0	2	0	0	0	0	73	6	0	0	0	0	0	126
07:15 AM	2	56	0	0	6	0	0	0	0	74	12	0	0	0	0	0	150
07:30 AM	2	88	0	0	9	0	0	0	0	100	15	0	0	0	0	0	214
07:45 AM	8	157	0	0	23	0	3	0	0	108	33	0	0	0	0	0	332
Total	12	346	0	0	40	0	3	0	0	355	66	0	0	0	0	0	822
08:00 AM	1	43	0	0	13	0	1	0	0	126	25	0	0	0	0	0	209
08:15 AM	1	48	0	0	7	0	1	0	0	82	27	0	0	0	0	0	166
08:30 AM	1	48	0	0	7	0	2	0	0	82	11	0	0	0	0	0	151
08:45 AM	1	54	0	0	9	0	0	0	0	56	7	0	0	0	0	0	127
Total	4	193	0	0	36	0	4	0	0	346	70	0	0	0	0	0	653
Grand Total	16	539	0	0	76	0	7	0	0	701	136	0	0	0	0	0	1475
Apprch %	2.9	97.1	0	0	91.6	0	8.4	0	0	83.8	16.2	0	0	0	0	0	
Total %	1.1	36.5	0	0	5.2	0	0.5	0	0	47.5	9.2	0	0	0	0	0	



File Name : #1 SH133&WEANT_AM
Site Code : 00000000
Start Date : 4/29/2008
Page No : 2

	SH 133 Southbound					WEANT BLVD Westbound					SH 133 Northbound					WEANT BLVD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	2	88	0	0	90	9	0	0	0	9	0	100	15	0	115	0	0	0	0	0	214
07:45 AM	8	157	0	0	165	23	0	3	0	26	0	108	33	0	141	0	0	0	0	0	332
08:00 AM	1	43	0	0	44	13	0	1	0	14	0	126	25	0	151	0	0	0	0	0	209
08:15 AM	1	48	0	0	49	7	0	1	0	8	0	82	27	0	109	0	0	0	0	0	166
Total Volume	12	336	0	0	348	52	0	5	0	57	0	416	100	0	516	0	0	0	0	0	921
% App. Total	3.4	96.6	0	0		91.2	0	8.8	0		0	80.6	19.4	0		0	0	0	0		
PHF	.375	.535	.000	.000	.527	.565	.000	.417	.000	.548	.000	.825	.758	.000	.854	.000	.000	.000	.000	.000	.694

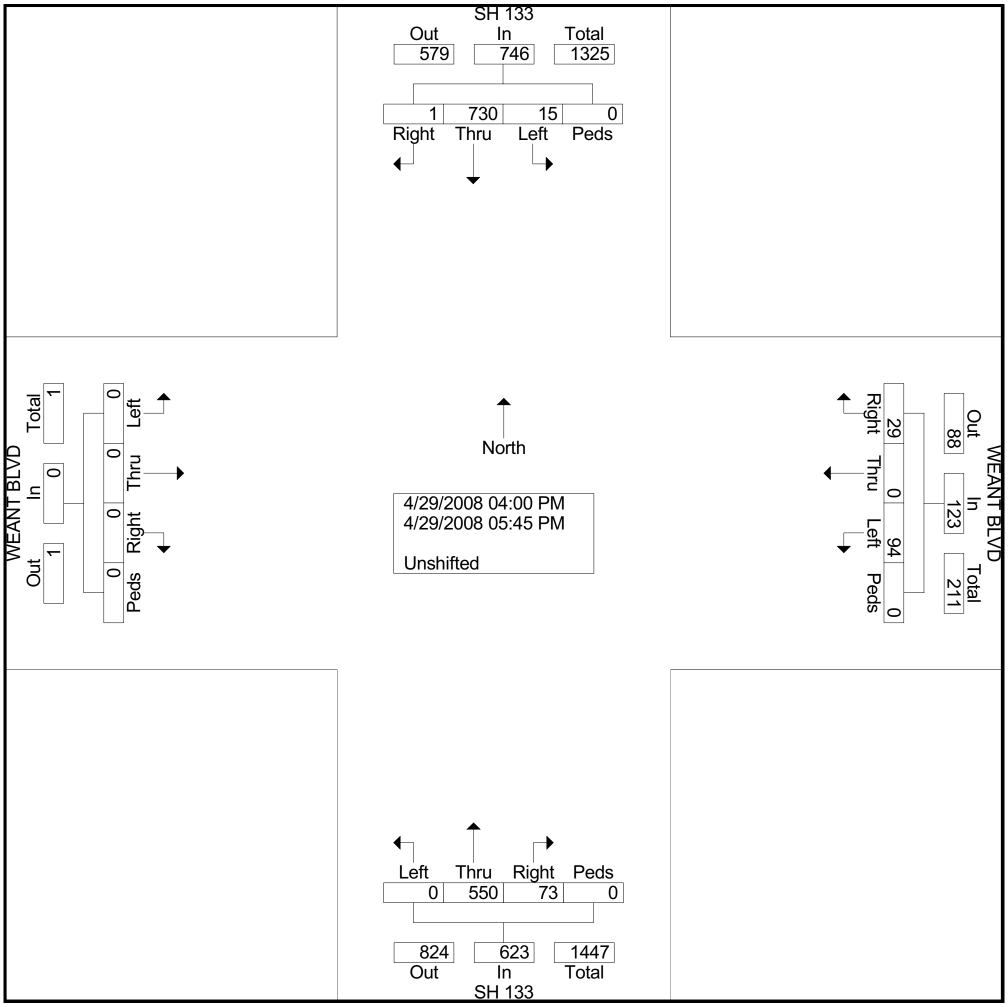


All Traffic Data
Services Inc.

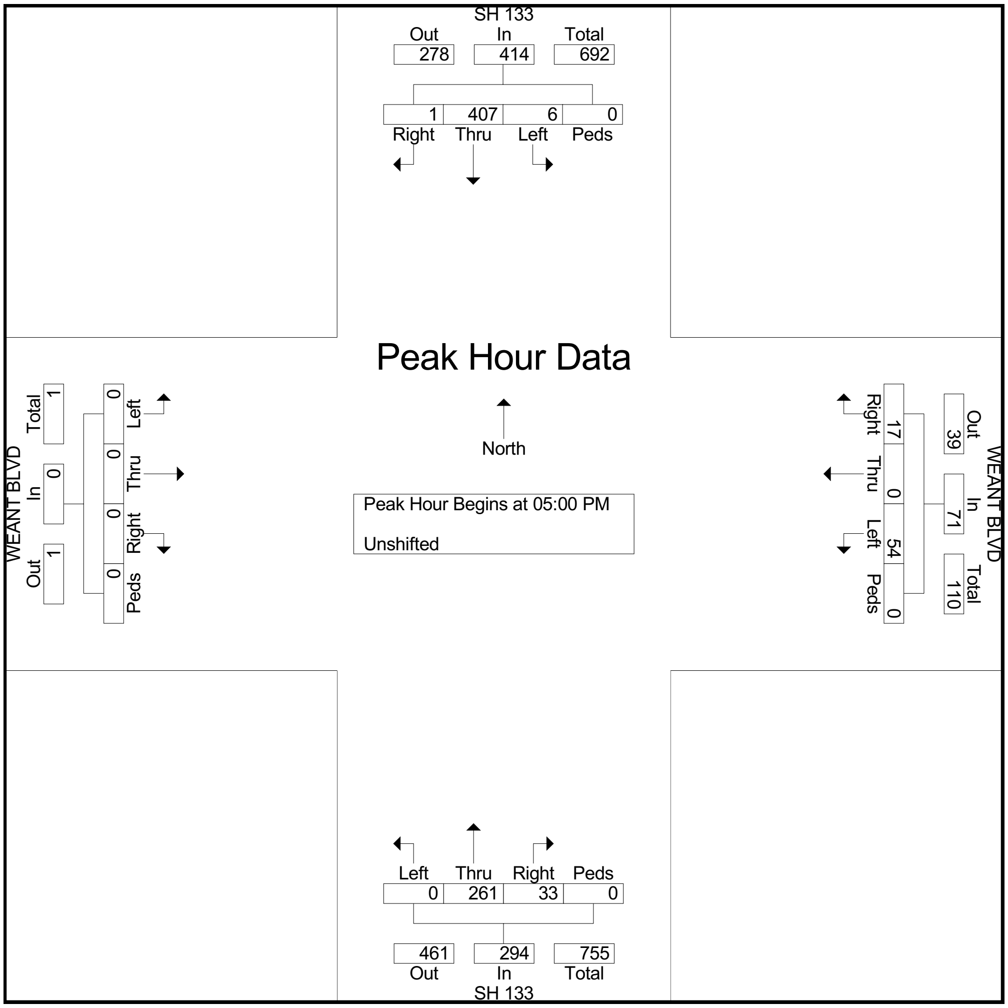
File Name : #1 SH133&WEANT_PM
Site Code : 00000000
Start Date : 4/29/2008
Page No : 1

Groups Printed- Unshifted

	SH 133 Southbound				WEANT BLVD Westbound				SH 133 Northbound				WEANT BLVD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	3	71	0	0	8	0	5	0	0	67	18	0	0	0	0	0	172
04:15 PM	2	91	0	0	16	0	2	0	0	101	11	0	0	0	0	0	223
04:30 PM	4	77	0	0	5	0	4	0	0	68	7	0	0	0	0	0	165
04:45 PM	0	84	0	0	11	0	1	0	0	53	4	0	0	0	0	0	153
Total	9	323	0	0	40	0	12	0	0	289	40	0	0	0	0	0	713
05:00 PM	3	99	1	0	15	0	6	0	0	80	9	0	0	0	0	0	213
05:15 PM	0	88	0	0	17	0	6	0	0	57	9	0	0	0	0	0	177
05:30 PM	2	117	0	0	12	0	3	0	0	63	9	0	0	0	0	0	206
05:45 PM	1	103	0	0	10	0	2	0	0	61	6	0	0	0	0	0	183
Total	6	407	1	0	54	0	17	0	0	261	33	0	0	0	0	0	779
Grand Total	15	730	1	0	94	0	29	0	0	550	73	0	0	0	0	0	1492
Apprch %	2	97.9	0.1	0	76.4	0	23.6	0	0	88.3	11.7	0	0	0	0	0	
Total %	1	48.9	0.1	0	6.3	0	1.9	0	0	36.9	4.9	0	0	0	0	0	



	SH 133 Southbound					WEANT BLVD Westbound					SH 133 Northbound					WEANT BLVD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	3	99	1	0	103	15	0	6	0	21	0	80	9	0	89	0	0	0	0	0	213
05:15 PM	0	88	0	0	88	17	0	6	0	23	0	57	9	0	66	0	0	0	0	0	177
05:30 PM	2	117	0	0	119	12	0	3	0	15	0	63	9	0	72	0	0	0	0	0	206
05:45 PM	1	103	0	0	104	10	0	2	0	12	0	61	6	0	67	0	0	0	0	0	183
Total Volume	6	407	1	0	414	54	0	17	0	71	0	261	33	0	294	0	0	0	0	0	779
% App. Total	1.4	98.3	0.2	0		76.1	0	23.9	0		0	88.8	11.2	0		0	0	0	0		
PHF	.500	.870	.250	.000	.870	.794	.000	.708	.000	.772	.000	.816	.917	.000	.826	.000	.000	.000	.000	.000	.914



Site Code: 6
Station ID: 6
2ND ST N/O SNOWMASS DR

Start Time	29-Apr-08 Tue	NB	SB	Total
12:00 AM		3	2	5
01:00		4	1	5
02:00		0	0	0
03:00		0	0	0
04:00		1	0	1
05:00		6	7	13
06:00		21	29	50
07:00		32	**63**	**95**
08:00		34	42	76
09:00		18	24	42
10:00		19	25	44
[redacted]	[redacted]	36	36	72
12:00 PM		30	29	59
01:00		26	33	59
02:00		34	29	63
03:00		33	51	84
04:00		43	54	97
05:00		69	59	128
06:00		52	65	117
07:00		50	51	101
08:00		29	36	65
09:00		23	16	39
10:00		12	9	21
11:00		5	5	10
Total		580	666	1246
Percent		46.5%	53.5%	
AM Peak		11:00	07:00	07:00
Vol.		36	63	95
PM Peak		17:00	18:00	17:00
Vol.		69	65	128
Grand Total		580	666	1246
Percent		46.5%	53.5%	
ADT		Not Calculated		

Site Code: 7
Station ID: 7
4TH ST N/O SOPRIS AVE

Start Time	29-Apr-08 Tue	NB	SB	Total
12:00 AM		0	0	0
01:00		0	0	0
02:00		0	0	0
03:00		0	0	0
04:00		0	0	0
05:00		4	3	7
06:00		4	3	7
07:00		28	**49**	**77**
08:00		32	44	76
09:00		21	42	63
10:00		23	38	61
11:00		37	32	69
12:00 PM		33	27	60
01:00		32	29	61
02:00		30	27	57
03:00		44	50	94
04:00		22	49	71
05:00		25	51	76
06:00		19	30	49
07:00		11	40	51
08:00		12	34	46
09:00		1	4	5
10:00		3	8	11
11:00		0	4	4
Total		381	564	945
Percent		40.3%	59.7%	
AM Peak		11:00	07:00	07:00
Vol.		37	49	77
PM Peak		15:00	17:00	15:00
Vol.		44	51	94
Grand Total		381	564	945
Percent		40.3%	59.7%	
ADT		Not Calculated		

Site Code: 8
Station ID: 8
WEANT BLVD S/O SOPRIS AVE

Start Time	29-Apr-08 Tue	NB	SB	Total
12:00 AM		0	0	0
01:00		1	0	1
02:00		0	0	0
03:00		0	0	0
04:00		0	0	0
05:00		5	0	5
06:00		27	4	31
07:00		61	37	98
08:00		**79**	**39**	**118**
09:00		61	31	92
10:00		32	26	58
11:00		44	29	73
12:00 PM		46	34	80
01:00		43	26	69
02:00		33	34	67
03:00		63	48	111
04:00		51	57	108
05:00		37	76	113
06:00		47	49	96
07:00		33	37	70
08:00		21	17	38
09:00		6	7	13
10:00		4	7	11
11:00		3	3	6
Total		697	561	1258
Percent		55.4%	44.6%	
AM Peak		08:00	08:00	08:00
Vol.		79	39	118
PM Peak		15:00	17:00	17:00
Vol.		63	76	113
Grand Total		697	561	1258
Percent		55.4%	44.6%	
ADT		Not Calculated		

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APPENDIX B EXISTING LEVEL OF SERVICE WORKSHEETS

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HCM Unsignalized Intersection Capacity Analysis
1: Hendrick Drive & SH 133

9/16/2009

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y		↰	↑	↑	↱
Volume (veh/h)	72	37	32	393	315	52
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	78	40	35	427	342	57
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	839	342	399			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	839	342	399			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	76	94	97			
cM capacity (veh/h)	326	700	1160			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	118	35	427	342	57
Volume Left	78	35	0	0	0
Volume Right	40	0	0	0	57
cSH	398	1160	1700	1700	1700
Volume to Capacity	0.30	0.03	0.25	0.20	0.03
Queue Length 95th (ft)	31	2	0	0	0
Control Delay (s)	17.8	8.2	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	17.8	0.6		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	36.2%	ICU Level of Service	A
Analysis Period (min)	15		

2: Sopris Avenue & SH 133

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	15	75	440	25	61	352
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	82	478	27	66	383
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1007	492			505	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1007	492			505	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	86			94	
cM capacity (veh/h)	250	577			1059	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	98	505	449
Volume Left	16	0	66
Volume Right	82	27	0
cSH	474	1700	1059
Volume to Capacity	0.21	0.30	0.06
Queue Length 95th (ft)	19	0	5
Control Delay (s)	14.6	0.0	1.9
Lane LOS	B		A
Approach Delay (s)	14.6	0.0	1.9
Approach LOS	B		

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Sopris Avenue & Weant Boulevard

9/16/2009

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	75	5	10	62	5	15	55	25	2	25	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	82	5	11	67	5	16	60	27	2	27	8

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	98	84	103	37
Volume Left (vph)	11	11	16	2
Volume Right (vph)	5	5	27	8
Hadj (s)	0.02	0.02	-0.09	-0.08
Departure Headway (s)	4.3	4.3	4.3	4.4
Degree Utilization, x	0.12	0.10	0.12	0.04
Capacity (veh/h)	799	786	804	776
Control Delay (s)	7.9	7.8	7.9	7.6
Approach Delay (s)	7.9	7.8	7.9	7.6
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.8		
HCM Level of Service	A		
Intersection Capacity Utilization	22.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Sopris Avenue & 4th Street

9/16/2009

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	90	5	5	67	3	5	5	5	10	5	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	98	5	5	73	3	5	5	5	11	5	8

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	114	82	16	24
Volume Left (vph)	11	5	5	11
Volume Right (vph)	5	3	5	8
Hadj (s)	0.02	0.02	-0.10	-0.07
Departure Headway (s)	4.1	4.1	4.2	4.3
Degree Utilization, x	0.13	0.09	0.02	0.03
Capacity (veh/h)	863	857	800	801
Control Delay (s)	7.7	7.5	7.3	7.4
Approach Delay (s)	7.7	7.5	7.3	7.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.6		
HCM Level of Service	A		
Intersection Capacity Utilization	18.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: Sopris Avenue & 3rd Street

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	12	82	19	8	55	2	12	11	3	5	7	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	89	21	9	60	2	13	12	3	5	8	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	123	71	28	20
Volume Left (vph)	13	9	13	5
Volume Right (vph)	21	2	3	7
Hadj (s)	-0.05	0.04	0.06	-0.11
Departure Headway (s)	4.0	4.2	4.4	4.2
Degree Utilization, x	0.14	0.08	0.03	0.02
Capacity (veh/h)	875	846	776	807
Control Delay (s)	7.7	7.5	7.5	7.3
Approach Delay (s)	7.7	7.5	7.5	7.3
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.6		
HCM Level of Service	A		
Intersection Capacity Utilization	17.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	4	69	14	1	45	10	11	42	1	8	18	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	75	15	1	49	11	12	46	1	9	20	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	95	61	59	35
Volume Left (vph)	4	1	12	9
Volume Right (vph)	15	11	1	7
Hadj (s)	-0.05	-0.07	0.06	-0.03
Departure Headway (s)	4.1	4.1	4.3	4.3
Degree Utilization, x	0.11	0.07	0.07	0.04
Capacity (veh/h)	849	844	792	806
Control Delay (s)	7.6	7.4	7.7	7.5
Approach Delay (s)	7.6	7.4	7.7	7.5
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.6		
HCM Level of Service	A		
Intersection Capacity Utilization	17.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: Weant Boulevard & SH 133

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑	↱		↰
Volume (veh/h)	52	5	416	100	12	336
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	57	5	452	109	13	365
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		4				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	843	452			561	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	843	452			561	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	83	99			99	
cM capacity (veh/h)	330	607			1010	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	62	452	109	378
Volume Left	57	0	0	13
Volume Right	5	0	109	0
cSH	361	1700	1700	1010
Volume to Capacity	0.17	0.27	0.06	0.01
Queue Length 95th (ft)	15	0	0	1
Control Delay (s)	17.5	0.0	0.0	0.4
Lane LOS	C			A
Approach Delay (s)	17.5	0.0		0.4
Approach LOS	C			

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	37.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
8: Snowmass Drive & SH 133

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰	↑	↱	↰	↑	↱
Volume (veh/h)	30	11	5	40	12	101	1	375	112	126	248	22
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	12	5	43	13	110	1	408	122	137	270	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			4									
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1070	1075	270	962	977	408	293			529		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1070	1075	270	962	977	408	293			529		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	77	94	99	78	94	83	100			87		
cM capacity (veh/h)	142	190	769	200	217	644	1268			1038		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	50	166	1	408	122	137	270	24
Volume Left	33	43	1	0	0	137	0	0
Volume Right	5	110	0	0	122	0	0	24
cSH	174	371	1268	1700	1700	1038	1700	1700
Volume to Capacity	0.29	0.45	0.00	0.24	0.07	0.13	0.16	0.01
Queue Length 95th (ft)	28	56	0	0	0	11	0	0
Control Delay (s)	34.4	22.3	7.8	0.0	0.0	9.0	0.0	0.0
Lane LOS	D	C	A			A		
Approach Delay (s)	34.4	22.3	0.0			2.9		
Approach LOS	D	C						

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Snowmass Drive & 2nd Street

9/16/2009

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	49	200	120	5	5	33
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	53	217	130	5	5	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	136				457	133
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	136				457	133
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				99	96
cM capacity (veh/h)	1448				541	916

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	271	136	41
Volume Left	53	0	5
Volume Right	0	5	36
cSH	1448	1700	839
Volume to Capacity	0.04	0.08	0.05
Queue Length 95th (ft)	3	0	4
Control Delay (s)	1.7	0.0	9.5
Lane LOS	A		A
Approach Delay (s)	1.7	0.0	9.5
Approach LOS			A

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Hendrick Drive & SH 133

9/16/2009

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y		↰	↑	↑	↱
Volume (veh/h)	65	40	50	231	361	129
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	71	43	54	251	392	140
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	752	392	533			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	752	392	533			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	80	93	95			
cM capacity (veh/h)	358	656	1035			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	114	54	251	392	140
Volume Left	71	54	0	0	0
Volume Right	43	0	0	0	140
cSH	433	1035	1700	1700	1700
Volume to Capacity	0.26	0.05	0.15	0.23	0.08
Queue Length 95th (ft)	26	4	0	0	0
Control Delay (s)	16.3	8.7	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	16.3	1.5		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	38.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
2: Sopris Avenue & SH 133

9/16/2009

	↙	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Volume (veh/h)	55	75	268	28	77	435
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	60	82	291	30	84	473
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	947	307			322	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	947	307			322	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	78	89			93	
cM capacity (veh/h)	270	733			1238	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	141	322	557
Volume Left	60	0	84
Volume Right	82	30	0
cSH	425	1700	1238
Volume to Capacity	0.33	0.19	0.07
Queue Length 95th (ft)	36	0	5
Control Delay (s)	17.6	0.0	1.9
Lane LOS	C		A
Approach Delay (s)	17.6	0.0	1.9
Approach LOS	C		

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Sopris Avenue & Weant Boulevard

9/16/2009

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	63	15	14	60	5	5	31	9	5	35	37
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	68	16	15	65	5	5	34	10	5	38	40

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	96	86	49	84
Volume Left (vph)	11	15	5	5
Volume Right (vph)	16	5	10	40
Hadj (s)	-0.05	0.03	-0.06	-0.24
Departure Headway (s)	4.2	4.3	4.3	4.1
Degree Utilization, x	0.11	0.10	0.06	0.10
Capacity (veh/h)	817	801	786	833
Control Delay (s)	7.8	7.8	7.6	7.6
Approach Delay (s)	7.8	7.8	7.6	7.6
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.7		
HCM Level of Service	A		
Intersection Capacity Utilization	18.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Sopris Avenue & 4th Street

9/16/2009

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	4	65	5	5	45	3	15	5	5	4	5	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	71	5	5	49	3	16	5	5	4	5	16

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	80	58	27	26
Volume Left (vph)	4	5	16	4
Volume Right (vph)	5	3	5	16
Hadj (s)	0.00	0.02	0.03	-0.31
Departure Headway (s)	4.1	4.1	4.3	3.9
Degree Utilization, x	0.09	0.07	0.03	0.03
Capacity (veh/h)	865	857	809	882
Control Delay (s)	7.5	7.4	7.4	7.0
Approach Delay (s)	7.5	7.4	7.4	7.0
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.4		
HCM Level of Service	A		
Intersection Capacity Utilization	15.2%	ICU Level of Service	A
Analysis Period (min)	15		

5: Sopris Avenue & 3rd Street

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	4	58	16	1	38	6	1	3	0	4	9	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	63	17	1	41	7	1	3	0	4	10	16

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	85	49	4	30
Volume Left (vph)	4	1	1	4
Volume Right (vph)	17	7	0	16
Hadj (s)	-0.08	-0.04	0.08	-0.26
Departure Headway (s)	3.9	4.0	4.3	3.9
Degree Utilization, x	0.09	0.05	0.01	0.03
Capacity (veh/h)	898	882	802	884
Control Delay (s)	7.3	7.2	7.3	7.1
Approach Delay (s)	7.3	7.2	7.3	7.1
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.3		
HCM Level of Service	A		
Intersection Capacity Utilization	16.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
6: Sopris Avenue & 2nd Street

9/16/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	14	29	19	8	25	7	8	37	7	5	38	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	32	21	9	27	8	9	40	8	5	41	13

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	67	43	57	60
Volume Left (vph)	15	9	9	5
Volume Right (vph)	21	8	8	13
Hadj (s)	-0.10	-0.03	-0.02	-0.08
Departure Headway (s)	4.1	4.2	4.2	4.1
Degree Utilization, x	0.08	0.05	0.07	0.07
Capacity (veh/h)	850	830	827	846
Control Delay (s)	7.4	7.4	7.5	7.4
Approach Delay (s)	7.4	7.4	7.5	7.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.4		
HCM Level of Service	A		
Intersection Capacity Utilization	15.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: Weant Boulevard & SH 133

9/16/2009

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑	↱		↰↑
Volume (veh/h)	54	17	261	33	6	400
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	59	18	284	36	7	435
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		4				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	732	284			320	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	732	284			320	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	85	98			99	
cM capacity (veh/h)	387	755			1240	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	77	284	36	441
Volume Left	59	0	0	7
Volume Right	18	0	36	0
cSH	508	1700	1700	1240
Volume to Capacity	0.15	0.17	0.02	0.01
Queue Length 95th (ft)	13	0	0	0
Control Delay (s)	14.5	0.0	0.0	0.2
Lane LOS	B			A
Approach Delay (s)	14.5	0.0		0.2
Approach LOS	B			

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
8: Snowmass Drive & SH 133

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱		↰	↑	↱	↰	↑	↱
Volume (veh/h)	21	13	9	77	27	57	9	213	28	55	355	41
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	14	10	84	29	62	10	232	30	60	386	45
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			4									
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	833	787	386	768	801	232	430			262		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	833	787	386	768	801	232	430			262		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	90	95	99	71	90	92	99			95		
cM capacity (veh/h)	236	306	662	290	300	808	1129			1302		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	47	175	10	232	30	60	386	45
Volume Left	23	84	10	0	0	60	0	0
Volume Right	10	62	0	0	30	0	0	45
cSH	332	378	1129	1700	1700	1302	1700	1700
Volume to Capacity	0.14	0.46	0.01	0.14	0.02	0.05	0.23	0.03
Queue Length 95th (ft)	12	59	1	0	0	4	0	0
Control Delay (s)	18.7	22.5	8.2	0.0	0.0	7.9	0.0	0.0
Lane LOS	C	C	A			A		
Approach Delay (s)	18.7	22.5	0.3			1.0		
Approach LOS	C	C						

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	47.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Snowmass Drive & 2nd Street

9/16/2009

	↗	→	←	↖	↘	↙
Movement	**EBL**	**EBT**	**WBT**	**WBR**	**SBL**	**SBR**
Lane Configurations		↰	↱		Y	
Volume (veh/h)	23	73	109	15	10	52
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	79	118	16	11	57
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	135				256	127
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	135				256	127
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				98	94
cM capacity (veh/h)	1450				720	924

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	104	135	67
Volume Left	25	0	11
Volume Right	0	16	57
cSH	1450	1700	883
Volume to Capacity	0.02	0.08	0.08
Queue Length 95th (ft)	1	0	6
Control Delay (s)	1.9	0.0	9.4
Lane LOS	A		A
Approach Delay (s)	1.9	0.0	9.4
Approach LOS			A

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	25.5%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX C SHORT-TERM (2011) BACKGROUND LEVEL OF SERVICE WORKSHEETS

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1: Sopris Avenue & SH 133

2011 Background AM

	↙	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↑↱			↰↑
Volume (veh/h)	16	81	480	26	66	382
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	88	522	28	72	415
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1095	536			550	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1095	536			550	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	84			93	
cM capacity (veh/h)	220	545			1020	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	105	550	487
Volume Left	17	0	72
Volume Right	88	28	0
cSH	438	1700	1020
Volume to Capacity	0.24	0.32	0.07
Queue Length 95th (ft)	23	0	6
Control Delay (s)	15.8	0.0	2.0
Lane LOS	C		A
Approach Delay (s)	15.8	0.0	2.0
Approach LOS	C		

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		

2: Sopris Avenue & Weant Boulevard

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	65	16	10	61	5	18	66	27	3	25	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	71	17	11	66	5	20	72	29	3	27	8

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	99	83	121	38
Volume Left (vph)	11	11	20	3
Volume Right (vph)	17	5	29	8
Hadj (s)	-0.05	0.02	-0.08	-0.07
Departure Headway (s)	4.3	4.4	4.3	4.4
Degree Utilization, x	0.12	0.10	0.14	0.05
Capacity (veh/h)	801	776	802	771
Control Delay (s)	7.9	7.9	8.0	7.6
Approach Delay (s)	7.9	7.9	8.0	7.6
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.9		
HCM Level of Service	A		
Intersection Capacity Utilization	23.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	76	12	17	64	3	8	6	6	10	7	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	83	13	18	70	3	9	7	7	11	8	8

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	107	91	22	26
Volume Left (vph)	11	18	9	11
Volume Right (vph)	13	3	7	8
Hadj (s)	-0.02	0.05	-0.07	-0.06
Departure Headway (s)	4.1	4.2	4.3	4.3
Degree Utilization, x	0.12	0.11	0.03	0.03
Capacity (veh/h)	864	847	792	797
Control Delay (s)	7.6	7.7	7.4	7.4
Approach Delay (s)	7.6	7.7	7.4	7.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.6		
HCM Level of Service	A		
Intersection Capacity Utilization	17.7%	ICU Level of Service	A
Analysis Period (min)	15		

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	13	75	14	8	55	2	11	8	2	5	2	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	82	15	9	60	2	12	9	2	5	2	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	111	71	23	14
Volume Left (vph)	14	9	12	5
Volume Right (vph)	15	2	2	7
Hadj (s)	-0.02	0.04	0.08	-0.17
Departure Headway (s)	4.0	4.1	4.4	4.1
Degree Utilization, x	0.12	0.08	0.03	0.02
Capacity (veh/h)	878	856	779	826
Control Delay (s)	7.6	7.5	7.5	7.2
Approach Delay (s)	7.6	7.5	7.5	7.2
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.5		
HCM Level of Service	A		
Intersection Capacity Utilization	17.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: Sopris Avenue & 2nd Street

Carbondale Elementary School
2011 Background AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	3	63	10	1	42	10	10	40	1	8	17	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	68	11	1	46	11	11	43	1	9	18	8

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	83	58	55	35
Volume Left (vph)	3	1	11	9
Volume Right (vph)	11	11	1	8
Hadj (s)	-0.04	-0.08	0.06	-0.05
Departure Headway (s)	4.1	4.1	4.3	4.2
Degree Utilization, x	0.09	0.07	0.07	0.04
Capacity (veh/h)	848	850	802	820
Control Delay (s)	7.6	7.4	7.6	7.4
Approach Delay (s)	7.6	7.4	7.6	7.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.5		
HCM Level of Service	A		
Intersection Capacity Utilization	15.6%	ICU Level of Service	A
Analysis Period (min)	15		

6: Snowmass Drive & 2nd Street

	↗	→	←	↖	↘	↙
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⅄	
Volume (veh/h)	49	209	125	5	5	36
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	53	227	136	5	5	39
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	141				472	139
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	141				472	139
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				99	96
cM capacity (veh/h)	1442				530	910

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	280	141	45
Volume Left	53	0	5
Volume Right	0	5	39
cSH	1442	1700	837
Volume to Capacity	0.04	0.08	0.05
Queue Length 95th (ft)	3	0	4
Control Delay (s)	1.7	0.0	9.5
Lane LOS	A		A
Approach Delay (s)	1.7	0.0	9.5
Approach LOS			A

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		

7: Snowmass Drive & SH 133

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱		↰	↑	↱	↰	↑	↱
Volume (veh/h)	42	11	8	40	13	105	2	386	115	132	260	26
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	12	9	43	14	114	2	420	125	143	283	28
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			4									
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1115	1118	283	1004	1022	420	311			545		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1115	1118	283	1004	1022	420	311			545		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	64	93	99	76	93	82	100			86		
cM capacity (veh/h)	128	178	756	185	203	634	1250			1024		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	66	172	2	420	125	143	283	28
Volume Left	46	43	2	0	0	143	0	0
Volume Right	9	114	0	0	125	0	0	28
cSH	160	354	1250	1700	1700	1024	1700	1700
Volume to Capacity	0.42	0.49	0.00	0.25	0.07	0.14	0.17	0.02
Queue Length 95th (ft)	46	64	0	0	0	12	0	0
Control Delay (s)	43.3	24.4	7.9	0.0	0.0	9.1	0.0	0.0
Lane LOS	E	C	A			A		
Approach Delay (s)	43.3	24.4	0.0			2.9		
Approach LOS	E	C						

Intersection Summary			
Average Delay	6.8		
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		

8: Weant Boulevard & SH 133

2011 Background AM

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱		↰	↱		✥	
Volume (veh/h)	21	8	7	51	2	14	2	438	102	17	351	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	9	8	55	2	15	2	476	111	18	382	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)						4						
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	910	1012	384	913	903	476	386			587		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	910	1012	384	913	903	476	386			587		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	91	96	99	77	99	97	100			98		
cM capacity (veh/h)	244	234	664	240	271	589	1173			988		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total	39	73	478	111	404
Volume Left	23	55	2	0	18
Volume Right	8	15	0	111	4
cSH	275	305	1173	1700	988
Volume to Capacity	0.14	0.24	0.00	0.07	0.02
Queue Length 95th (ft)	12	23	0	0	1
Control Delay (s)	20.3	21.7	0.1	0.0	0.6
Lane LOS	C	C	A		A
Approach Delay (s)	20.3	21.7	0.0		0.6
Approach LOS	C	C			

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	47.9%	ICU Level of Service	A
Analysis Period (min)	15		

9: Hendrick Drive & SH 133

2011 Background AM

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y		↰	↑	↑	↱
Volume (veh/h)	75	39	33	431	344	54
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	82	42	36	468	374	59
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	914	374	433			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	914	374	433			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	72	94	97			
cM capacity (veh/h)	293	672	1127			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	124	36	468	374	59
Volume Left	82	36	0	0	0
Volume Right	42	0	0	0	59
cSH	364	1127	1700	1700	1700
Volume to Capacity	0.34	0.03	0.28	0.22	0.03
Queue Length 95th (ft)	37	2	0	0	0
Control Delay (s)	19.9	8.3	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	19.9	0.6		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	38.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Sopris Avenue & SH 133

Carbondale Elementary School
2011 Background PM

	↙	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	57	102	295	29	104	479
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	62	111	321	32	113	521
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1083	336			352	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1083	336			352	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	72	84			91	
cM capacity (veh/h)	218	706			1207	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	173	352	634
Volume Left	62	0	113
Volume Right	111	32	0
cSH	391	1700	1207
Volume to Capacity	0.44	0.21	0.09
Queue Length 95th (ft)	55	0	8
Control Delay (s)	21.3	0.0	2.4
Lane LOS	C		A
Approach Delay (s)	21.3	0.0	2.4
Approach LOS	C		

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	67.7%	ICU Level of Service	C
Analysis Period (min)	15		

2: Sopris Avenue & Weant Boulevard

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	71	30	22	81	8	8	37	16	8	46	39
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	77	33	24	88	9	9	40	17	9	50	42

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	121	121	66	101
Volume Left (vph)	11	24	9	9
Volume Right (vph)	33	9	17	42
Hadj (s)	-0.11	0.03	-0.10	-0.20
Departure Headway (s)	4.3	4.5	4.5	4.3
Degree Utilization, x	0.14	0.15	0.08	0.12
Capacity (veh/h)	797	766	753	776
Control Delay (s)	8.0	8.2	7.9	7.9
Approach Delay (s)	8.0	8.2	7.9	7.9
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.0		
HCM Level of Service	A		
Intersection Capacity Utilization	23.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Sopris Avenue & 4th Street

Carbondale Elementary School
2011 Background PM

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	4	53	34	13	43	3	48	15	14	4	15	14
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	58	37	14	47	3	52	16	15	4	16	15

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	99	64	84	36
Volume Left (vph)	4	14	52	4
Volume Right (vph)	37	3	15	15
Hadj (s)	-0.18	0.05	0.05	-0.20
Departure Headway (s)	4.1	4.3	4.3	4.1
Degree Utilization, x	0.11	0.08	0.10	0.04
Capacity (veh/h)	857	794	791	826
Control Delay (s)	7.6	7.7	7.8	7.3
Approach Delay (s)	7.6	7.7	7.8	7.3
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.6		
HCM Level of Service	A		
Intersection Capacity Utilization	25.6%	ICU Level of Service	A
Analysis Period (min)	15		

4: Sopris Avenue & 3rd Street

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	6	57	12	1	43	6	1	1	1	4	8	17
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	62	13	1	47	7	1	1	1	4	9	18

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	82	54	3	32
Volume Left (vph)	7	1	1	4
Volume Right (vph)	13	7	1	18
Hadj (s)	-0.05	-0.03	-0.10	-0.29
Departure Headway (s)	4.0	4.0	4.1	3.9
Degree Utilization, x	0.09	0.06	0.00	0.03
Capacity (veh/h)	890	882	835	889
Control Delay (s)	7.4	7.3	7.1	7.0
Approach Delay (s)	7.4	7.3	7.1	7.0
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.3		
HCM Level of Service	A		
Intersection Capacity Utilization	17.0%	ICU Level of Service	A
Analysis Period (min)	15		

5: Sopris Avenue & 2nd Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	16	26	18	8	25	7	11	34	7	5	36	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	28	20	9	27	8	12	37	8	5	39	14

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	65	43	57	59
Volume Left (vph)	17	9	12	5
Volume Right (vph)	20	8	8	14
Hadj (s)	-0.09	-0.03	0.00	-0.09
Departure Headway (s)	4.1	4.2	4.2	4.1
Degree Utilization, x	0.07	0.05	0.07	0.07
Capacity (veh/h)	848	831	826	850
Control Delay (s)	7.4	7.4	7.5	7.4
Approach Delay (s)	7.4	7.4	7.5	7.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.4		
HCM Level of Service	A		
Intersection Capacity Utilization	16.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	26	76	114	16	10	57
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	83	124	17	11	62
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	141				272	133
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	141				272	133
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				98	93
cM capacity (veh/h)	1442				704	917

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	111	141	73
Volume Left	28	0	11
Volume Right	0	17	62
cSH	1442	1700	877
Volume to Capacity	0.02	0.08	0.08
Queue Length 95th (ft)	1	0	7
Control Delay (s)	2.0	0.0	9.5
Lane LOS	A		A
Approach Delay (s)	2.0	0.0	9.5
Approach LOS			A

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	26.5%	ICU Level of Service	A
Analysis Period (min)	15		

7: Snowmass Drive & SH 133

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		✥		↰	↑	↱	↰	↑	↱
Volume (veh/h)	27	14	10	83	28	60	11	234	32	57	382	51
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	29	15	11	90	30	65	12	254	35	62	415	55
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			4									
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	898	852	415	830	873	254	471			289		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	898	852	415	830	873	254	471			289		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	86	95	98	65	89	92	99			95		
cM capacity (veh/h)	209	279	637	260	272	784	1091			1273		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	55	186	12	254	35	62	415	55
Volume Left	29	90	12	0	0	62	0	0
Volume Right	11	65	0	0	35	0	0	55
cSH	289	343	1091	1700	1700	1273	1700	1700
Volume to Capacity	0.19	0.54	0.01	0.15	0.02	0.05	0.24	0.03
Queue Length 95th (ft)	17	77	1	0	0	4	0	0
Control Delay (s)	21.5	27.3	8.3	0.0	0.0	8.0	0.0	0.0
Lane LOS	C	D	A			A		
Approach Delay (s)	21.5	27.3	0.3			0.9		
Approach LOS	C	D						

Intersection Summary			
Average Delay	6.4		
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
8: Weant Boulevard & SH 133

Carbondale Elementary School
2011 Background PM

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱			↰↑	↱		↰↑	↱		↰↑↱	
Volume (veh/h)	10	4	13	65	18	25	6	277	41	11	424	21
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	4	14	71	20	27	7	301	45	12	461	23
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)						4						
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	834	855	472	827	822	301	484			346		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	834	855	472	827	822	301	484			346		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	99	98	75	94	96	99			99		
cM capacity (veh/h)	260	291	592	277	304	739	1079			1213		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total	29	117	308	45	496
Volume Left	11	71	7	0	12
Volume Right	14	27	0	45	23
cSH	364	368	1079	1700	1213
Volume to Capacity	0.08	0.32	0.01	0.03	0.01
Queue Length 95th (ft)	7	34	0	0	1
Control Delay (s)	15.7	20.4	0.2	0.0	0.3
Lane LOS	C	C	A		A
Approach Delay (s)	15.7	20.4	0.2		0.3
Approach LOS	C	C			

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	47.9%	ICU Level of Service	A
Analysis Period (min)	15		

9: Hendrick Drive & SH 133

	↗	↘	↖	↑	↓	↙
Movement	**EBL**	**EBR**	**NBL**	**NBT**	**SBT**	**SBR**
Lane Configurations	Y		↰	↑	↑	↱
Volume (veh/h)	68	42	52	258	406	135
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	46	57	280	441	147
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	835	441	588			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	835	441	588			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	77	93	94			
cM capacity (veh/h)	318	616	987			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	120	57	280	441	147
Volume Left	74	57	0	0	0
Volume Right	46	0	0	0	147
cSH	390	987	1700	1700	1700
Volume to Capacity	0.31	0.06	0.16	0.26	0.09
Queue Length 95th (ft)	32	5	0	0	0
Control Delay (s)	18.2	8.9	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	18.2	1.5		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	41.0%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX D LONG-TERM (2029) BACKGROUND LEVEL OF SERVICE WORKSHEETS

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1: Hendrick Drive & SH 133

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑	↱	↰	↑↱		↰	↑↑	↱
Volume (vph)	92	20	57	15	8	124	49	626	19	98	467	73
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1789	1583		1805	1583	1770	3523		1770	3539	1583
Flt Permitted		0.75	1.00		0.82	1.00	0.42	1.00		0.39	1.00	1.00
Satd. Flow (perm)		1392	1583		1521	1583	782	3523		717	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	100	22	62	16	9	135	53	680	21	107	508	79
RTOR Reduction (vph)	0	0	53	0	0	103	0	1	0	0	0	26
Lane Group Flow (vph)	0	122	9	0	25	32	53	700	0	107	508	53
Turn Type	Perm		Perm	Perm		pm+ov	pm+pt			pm+pt		Perm
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)		13.0	13.0		13.0	21.1	56.9	56.9		60.7	60.7	60.7
Effective Green, g (s)		13.0	13.0		13.0	21.1	56.9	56.9		60.7	60.7	60.7
Actuated g/C Ratio		0.14	0.14		0.14	0.23	0.63	0.63		0.67	0.67	0.67
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		201	229		220	441	542	2227		578	2387	1068
v/s Ratio Prot						0.01	0.00	c0.20		0.02	c0.14	
v/s Ratio Perm		c0.09	0.01		0.02	0.01	0.06			0.11		0.03
v/c Ratio		0.61	0.04		0.11	0.07	0.10	0.31		0.19	0.21	0.05
Uniform Delay, d1		36.1	33.1		33.5	26.8	6.4	7.6		5.6	5.6	4.9
Progression Factor		1.00	1.00		1.00	1.00	0.71	0.72		1.00	1.00	1.00
Incremental Delay, d2		5.1	0.1		0.2	0.1	0.1	0.4		0.2	0.2	0.1
Delay (s)		41.2	33.2		33.7	26.9	4.7	5.8		5.8	5.8	5.0
Level of Service		D	C		C	C	A	A		A	A	A
Approach Delay (s)		38.5			28.0			5.7			5.7	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	46.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

2: Sopris Avenue & Weant Boulevard

2029 Background AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	15	94	26	14	89	8	31	92	39	4	36	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	102	28	15	97	9	34	100	42	4	39	12

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	147	121	176	55
Volume Left (vph)	16	15	34	4
Volume Right (vph)	28	9	42	12
Hadj (s)	-0.06	0.02	-0.07	-0.08
Departure Headway (s)	4.5	4.7	4.5	4.7
Degree Utilization, x	0.19	0.16	0.22	0.07
Capacity (veh/h)	740	725	749	709
Control Delay (s)	8.6	8.5	8.8	8.0
Approach Delay (s)	8.6	8.5	8.8	8.0
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.6		
HCM Level of Service	A		
Intersection Capacity Utilization	31.7%	ICU Level of Service	A
Analysis Period (min)	15		

3: Sopris Avenue & 4th Street

2029 Background AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	14	113	14	9	95	5	10	9	8	15	10	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	123	15	10	103	5	11	10	9	16	11	10

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	153	118	29	37
Volume Left (vph)	15	10	11	16
Volume Right (vph)	15	5	9	10
Hadj (s)	-0.01	0.02	-0.07	-0.04
Departure Headway (s)	4.2	4.2	4.5	4.5
Degree Utilization, x	0.18	0.14	0.04	0.05
Capacity (veh/h)	843	830	750	742
Control Delay (s)	8.1	7.9	7.6	7.7
Approach Delay (s)	8.1	7.9	7.6	7.7
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.9		
HCM Level of Service	A		
Intersection Capacity Utilization	20.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	19	110	20	4	80	3	17	12	2	8	4	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	120	22	4	87	3	18	13	2	9	4	11

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	162	95	34	24
Volume Left (vph)	21	4	18	9
Volume Right (vph)	22	3	2	11
Hadj (s)	-0.02	0.02	0.10	-0.17
Departure Headway (s)	4.1	4.2	4.6	4.3
Degree Utilization, x	0.18	0.11	0.04	0.03
Capacity (veh/h)	857	834	735	770
Control Delay (s)	8.0	7.7	7.8	7.5
Approach Delay (s)	8.0	7.7	7.8	7.5
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.9		
HCM Level of Service	A		
Intersection Capacity Utilization	24.4%	ICU Level of Service	A
Analysis Period (min)	15		

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	93	14	2	62	15	13	59	2	12	25	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	101	15	2	67	16	14	64	2	13	27	8

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	122	86	80	48
Volume Left (vph)	5	2	14	13
Volume Right (vph)	15	16	2	8
Hadj (s)	-0.03	-0.07	0.05	-0.01
Departure Headway (s)	4.3	4.3	4.5	4.5
Degree Utilization, x	0.14	0.10	0.10	0.06
Capacity (veh/h)	815	813	762	757
Control Delay (s)	8.0	7.7	8.0	7.7
Approach Delay (s)	8.0	7.7	8.0	7.7
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.9		
HCM Level of Service	A		
Intersection Capacity Utilization	19.5%	ICU Level of Service	A
Analysis Period (min)	15		

6: Snowmass Drive & 2nd Street

Movement	EBL	EBT	WBT	WBR	SBL	SBR
	↗	→	←	↖	↘	↙
Lane Configurations		↰	↱		Y	
Volume (veh/h)	72	309	185	8	8	48
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	78	336	201	9	9	52
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		255				
pX, platoon unblocked					0.96	
vC, conflicting volume	210				698	205
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	210				665	205
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				98	94
cM capacity (veh/h)	1361				385	835

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	414	210	61
Volume Left	78	0	9
Volume Right	0	9	52
cSH	1361	1700	716
Volume to Capacity	0.06	0.12	0.09
Queue Length 95th (ft)	5	0	7
Control Delay (s)	1.9	0.0	10.5
Lane LOS	A		B
Approach Delay (s)	1.9	0.0	10.5
Approach LOS			B

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	43.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	57	17	11	59	19	156	3	573	169	195	391	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00		0.99		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1793	1583		1674		1770	3539	1583	1770	3539	1583
Flt Permitted		0.70	1.00		0.79		0.46	1.00	1.00	0.42	1.00	1.00
Satd. Flow (perm)		1312	1583		1340		848	3539	1583	774	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	62	18	12	64	21	170	3	623	184	212	425	40
RTOR Reduction (vph)	0	0	11	0	94	0	0	0	71	0	0	15
Lane Group Flow (vph)	0	80	1	0	161	0	3	623	113	212	425	25
Turn Type	pm+pt		Perm	pm+pt			pm+pt		pm+ov	pm+pt		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases	4		4	8			2		2	6		6
Actuated Green, G (s)		9.8	9.8		19.7		49.5	49.5	55.4	57.1	57.1	57.1
Effective Green, g (s)		9.8	9.8		19.7		49.5	49.5	55.4	57.1	57.1	57.1
Actuated g/C Ratio		0.11	0.11		0.22		0.55	0.55	0.62	0.63	0.63	0.63
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		143	172		315		479	1946	974	588	2245	1004
v/s Ratio Prot					c0.03		0.00	c0.18	0.01	c0.04	0.12	
v/s Ratio Perm		0.06	0.00		c0.08		0.00		0.06	c0.19		0.02
v/c Ratio		0.56	0.01		0.51		0.01	0.32	0.12	0.36	0.19	0.03
Uniform Delay, d1		38.1	35.8		30.9		9.2	11.1	7.2	8.3	6.8	6.1
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	0.71	0.70	0.45
Incremental Delay, d2		4.7	0.0		1.4		0.0	0.4	0.1	0.4	0.2	0.0
Delay (s)		42.7	35.8		32.3		9.3	11.5	7.2	6.3	5.0	2.8
Level of Service		D	D		C		A	B	A	A	A	A
Approach Delay (s)		41.8			32.3			10.5			5.3	
Approach LOS		D			C			B			A	

Intersection Summary			
HCM Average Control Delay	13.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱			↰↑	↱		↰↑↑	↱		↰↑↑↱	
Volume (vph)	21	8	7	75	2	15	2	645	149	19	518	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0		4.0	
Lane Util. Factor		1.00			1.00	1.00		0.95	1.00		0.95	
Frt		0.97			1.00	0.85		1.00	0.85		1.00	
Flt Protected		0.97			0.95	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		1762			1776	1583		3539	1583		3529	
Flt Permitted		0.78			0.69	1.00		0.95	1.00		0.92	
Satd. Flow (perm)		1405			1281	1583		3377	1583		3258	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	23	9	8	82	2	16	2	701	162	21	563	4
RTOR Reduction (vph)	0	8	0	0	0	13	0	0	31	0	0	0
Lane Group Flow (vph)	0	32	0	0	84	3	0	703	131	0	588	0
Turn Type	Perm			pm+pt		Perm	pm+pt		pm+ov	Perm		
Protected Phases		4		3	8		5	2	3		6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		5.2			15.5	15.5		66.5	72.8		66.5	
Effective Green, g (s)		5.2			15.5	15.5		66.5	72.8		66.5	
Actuated g/C Ratio		0.06			0.17	0.17		0.74	0.81		0.74	
Clearance Time (s)		4.0			4.0	4.0		4.0	4.0		4.0	
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0		3.0	
Lane Grp Cap (vph)		81			255	273		2495	1351		2407	
v/s Ratio Prot					c0.02				0.01			
v/s Ratio Perm		0.02			c0.03	0.00		c0.21	0.08		0.18	
v/c Ratio		0.40			0.33	0.01		0.28	0.10		0.24	
Uniform Delay, d1		40.9			32.7	30.9		3.9	1.8		3.7	
Progression Factor		1.00			1.00	1.00		0.54	0.02		0.38	
Incremental Delay, d2		3.2			0.8	0.0		0.1	0.0		0.2	
Delay (s)		44.1			33.5	30.9		2.1	0.1		1.7	
Level of Service		D			C	C		A	A		A	
Approach Delay (s)		44.1			33.0			1.8			1.7	
Approach LOS		D			C			A			A	

Intersection Summary

HCM Average Control Delay	4.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑	↱	↰	↑↑↱		↰	↑↑	↱
Volume (vph)	70	30	62	40	45	144	77	353	19	147	508	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected		0.97	1.00		0.98	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1800	1583		1820	1583	1770	3512		1770	3539	1583
Flt Permitted		0.70	1.00		0.77	1.00	0.43	1.00		0.51	1.00	1.00
Satd. Flow (perm)		1297	1583		1440	1583	806	3512		947	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	33	67	43	49	157	84	384	21	160	552	201
RTOR Reduction (vph)	0	0	58	0	0	121	0	2	0	0	0	61
Lane Group Flow (vph)	0	109	9	0	92	36	84	403	0	160	552	140
Turn Type	Perm		Perm	Perm		pm+ov	pm+pt			pm+pt		Perm
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)		13.0	13.0		13.0	23.1	70.4	64.9		79.0	69.5	69.5
Effective Green, g (s)		13.0	13.0		13.0	23.1	70.4	64.9		79.0	69.5	69.5
Actuated g/C Ratio		0.13	0.13		0.13	0.23	0.70	0.65		0.79	0.70	0.70
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		169	206		187	429	620	2279		831	2460	1100
v/s Ratio Prot						0.01	0.01	0.11		c0.02	c0.16	
v/s Ratio Perm		c0.08	0.01		0.06	0.01	0.09			0.13		0.09
v/c Ratio		0.64	0.04		0.49	0.08	0.14	0.18		0.19	0.22	0.13
Uniform Delay, d1		41.3	38.1		40.4	30.2	5.5	7.0		2.8	5.5	5.1
Progression Factor		1.00	1.00		1.00	1.00	0.22	0.36		1.00	1.00	1.00
Incremental Delay, d2		8.2	0.1		2.0	0.1	0.1	0.2		0.1	0.2	0.2
Delay (s)		49.5	38.1		42.5	30.2	1.3	2.7		2.9	5.7	5.3
Level of Service		D	D		D	C	A	A		A	A	A
Approach Delay (s)		45.2			34.8			2.4			5.2	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM Average Control Delay	12.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	40.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	15	95	47	29	109	10	15	52	20	10	63	57
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	103	51	32	118	11	16	57	22	11	68	62

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	171	161	95	141
Volume Left (vph)	16	32	16	11
Volume Right (vph)	51	11	22	62
Hadj (s)	-0.13	0.03	-0.07	-0.21
Departure Headway (s)	4.6	4.7	4.8	4.6
Degree Utilization, x	0.22	0.21	0.13	0.18
Capacity (veh/h)	738	715	690	721
Control Delay (s)	8.8	9.0	8.5	8.6
Approach Delay (s)	8.8	9.0	8.5	8.6
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.8		
HCM Level of Service	A		
Intersection Capacity Utilization	28.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Sopris Avenue & 4th Street

Carbondale Elementary School
2029 Background PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	6	78	37	16	64	5	55	18	16	6	17	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	85	40	17	70	5	60	20	17	7	18	25

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	132	92	97	50
Volume Left (vph)	7	17	60	7
Volume Right (vph)	40	5	17	25
Hadj (s)	-0.14	0.04	0.05	-0.24
Departure Headway (s)	4.2	4.4	4.5	4.3
Degree Utilization, x	0.15	0.11	0.12	0.06
Capacity (veh/h)	822	772	754	782
Control Delay (s)	8.0	8.0	8.1	7.5
Approach Delay (s)	8.0	8.0	8.1	7.5
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.0		
HCM Level of Service	A		
Intersection Capacity Utilization	28.2%	ICU Level of Service	A
Analysis Period (min)	15		

4: Sopris Avenue & 3rd Street

2029 Background PM

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	8	81	18	2	61	9	1	2	2	6	11	25
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	88	20	2	66	10	1	2	2	7	12	27

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	116	78	5	46
Volume Left (vph)	9	2	1	7
Volume Right (vph)	20	10	2	27
Hadj (s)	-0.05	-0.04	-0.17	-0.29
Departure Headway (s)	4.0	4.1	4.2	4.0
Degree Utilization, x	0.13	0.09	0.01	0.05
Capacity (veh/h)	874	863	808	850
Control Delay (s)	7.6	7.5	7.2	7.2
Approach Delay (s)	7.6	7.5	7.2	7.2
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.5		
HCM Level of Service	A		
Intersection Capacity Utilization	19.2%	ICU Level of Service	A
Analysis Period (min)	15		

5: Sopris Avenue & 2nd Street

2029 Background PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	23	38	25	12	36	11	14	51	11	8	53	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	41	27	13	39	12	15	55	12	9	58	20

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	93	64	83	86
Volume Left (vph)	25	13	15	9
Volume Right (vph)	27	12	12	20
Hadj (s)	-0.09	-0.04	-0.02	-0.08
Departure Headway (s)	4.3	4.3	4.3	4.3
Degree Utilization, x	0.11	0.08	0.10	0.10
Capacity (veh/h)	807	781	791	808
Control Delay (s)	7.8	7.7	7.8	7.7
Approach Delay (s)	7.8	7.7	7.8	7.7
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.8		
HCM Level of Service	A		
Intersection Capacity Utilization	20.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Volume (veh/h)	38	113	168	23	15	82
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	123	183	25	16	89
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		255				
pX, platoon unblocked						
vC, conflicting volume	208				401	195
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	208				401	195
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				97	89
cM capacity (veh/h)	1363				587	846

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	164	208	105
Volume Left	41	0	16
Volume Right	0	25	89
cSH	1363	1700	792
Volume to Capacity	0.03	0.12	0.13
Queue Length 95th (ft)	2	0	11
Control Delay (s)	2.1	0.0	10.2
Lane LOS	A		B
Approach Delay (s)	2.1	0.0	10.2
Approach LOS			B

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	34.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

Carbondale Elementary School

7: Snowmass Drive & SH 133

2029 Background PM

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✣		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	37	20	15	121	42	88	16	340	45	85	559	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1805	1583		1733		1770	3539	1583	1770	3539	1583
Flt Permitted		0.73	1.00		0.64		0.39	1.00	1.00	0.52	1.00	1.00
Satd. Flow (perm)		1360	1583		1134		729	3539	1583	969	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	22	16	132	46	96	17	370	49	92	608	77
RTOR Reduction (vph)	0	0	14	0	25	0	0	0	19	0	0	26
Lane Group Flow (vph)	0	62	2	0	249	0	17	370	30	92	608	51
Turn Type	pm+pt		Perm	pm+pt			pm+pt		pm+ov	pm+pt		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases	4		4	8			2		2	6		6
Actuated Green, G (s)		14.5	14.5		23.1		58.8	56.5	61.1	68.9	62.6	62.6
Effective Green, g (s)		14.5	14.5		23.1		58.8	56.5	61.1	68.9	62.6	62.6
Actuated g/C Ratio		0.14	0.14		0.23		0.59	0.56	0.61	0.69	0.63	0.63
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		197	230		290		453	2000	967	735	2215	991
v/s Ratio Prot					c0.04		0.00	0.10	0.00	c0.01	c0.17	
v/s Ratio Perm		0.05	0.00		c0.16		0.02		0.02	0.08		0.03
v/c Ratio		0.31	0.01		0.86		0.04	0.18	0.03	0.13	0.27	0.05
Uniform Delay, d1		38.3	36.6		36.9		10.5	10.6	7.7	5.8	8.4	7.2
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	0.88	0.67	0.66
Incremental Delay, d2		0.9	0.0		21.3		0.0	0.2	0.0	0.1	0.3	0.1
Delay (s)		39.2	36.6		58.2		10.5	10.8	7.7	5.2	5.9	4.9
Level of Service		D	D		E		B	B	A	A	A	A
Approach Delay (s)		38.7			58.2			10.4			5.7	
Approach LOS		D			E			B			A	

Intersection Summary			
HCM Average Control Delay	17.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱			↰↑	↱		↰↑↑	↱		↰↑↑↱	
Volume (vph)	10	4	3	99	8	31	6	407	57	12	624	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0		4.0	
Lane Util. Factor		1.00			1.00	1.00		0.95	1.00		0.95	
Frt		0.98			1.00	0.85		1.00	0.85		1.00	
Flt Protected		0.97			0.96	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		1767			1781	1583		3536	1583		3519	
Flt Permitted		0.75			0.73	1.00		0.95	1.00		0.95	
Satd. Flow (perm)		1358			1364	1583		3348	1583		3330	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	4	3	108	9	34	7	442	62	13	678	23
RTOR Reduction (vph)	0	3	0	0	0	28	0	0	11	0	1	0
Lane Group Flow (vph)	0	15	0	0	117	6	0	449	51	0	713	0
Turn Type	Perm			pm+pt		Perm	pm+pt		pm+ov	Perm		
Protected Phases		4		3	8		5	2	3		6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		5.0			16.2	16.2		75.8	83.0		75.8	
Effective Green, g (s)		5.0			16.2	16.2		75.8	83.0		75.8	
Actuated g/C Ratio		0.05			0.16	0.16		0.76	0.83		0.76	
Clearance Time (s)		4.0			4.0	4.0		4.0	4.0		4.0	
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0		3.0	
Lane Grp Cap (vph)		68			251	256		2538	1377		2524	
v/s Ratio Prot					c0.03				0.00			
v/s Ratio Perm		0.01			c0.04	0.00		0.13	0.03		c0.21	
v/c Ratio		0.22			0.47	0.02		0.18	0.04		0.28	
Uniform Delay, d1		45.6			38.0	35.2		3.4	1.5		3.7	
Progression Factor		1.00			1.00	1.00		0.98	1.19		0.92	
Incremental Delay, d2		1.7			1.4	0.0		0.0	0.0		0.3	
Delay (s)		47.3			39.3	35.3		3.3	1.8		3.7	
Level of Service		D			D	D		A	A		A	
Approach Delay (s)		47.3			38.4			3.1			3.7	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	7.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	41.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX E SHORT-TERM (2011) TOTAL LEVEL OF SERVICE WORKSHEETS

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	↙	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Volume (veh/h)	16	88	505	26	74	407
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	96	549	28	80	442
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1166	563			577	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1166	563			577	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	82			92	
cM capacity (veh/h)	197	526			996	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	113	577	523
Volume Left	17	0	80
Volume Right	96	28	0
cSH	418	1700	996
Volume to Capacity	0.27	0.34	0.08
Queue Length 95th (ft)	27	0	7
Control Delay (s)	16.8	0.0	2.2
Lane LOS	C		A
Approach Delay (s)	16.8	0.0	2.2
Approach LOS	C		

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	70.0%	ICU Level of Service	C
Analysis Period (min)	15		

2: Sopris Avenue & Weant Boulevard

	⤴	→	⤵	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	68	21	11	64	5	22	71	27	3	31	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	74	23	12	70	5	24	77	29	3	34	8

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	108	87	130	45
Volume Left (vph)	11	12	24	3
Volume Right (vph)	23	5	29	8
Hadj (s)	-0.07	0.02	-0.06	-0.05
Departure Headway (s)	4.3	4.4	4.3	4.4
Degree Utilization, x	0.13	0.11	0.16	0.05
Capacity (veh/h)	794	764	790	758
Control Delay (s)	8.0	8.0	8.1	7.7
Approach Delay (s)	8.0	8.0	8.1	7.7
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.0		
HCM Level of Service	A		
Intersection Capacity Utilization	25.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Sopris Avenue & 4th Street

Carbondale Elementary School
2011 Total AM

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	79	12	7	67	4	8	6	6	12	7	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	86	13	8	73	4	9	7	7	13	8	9

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	110	85	22	29
Volume Left (vph)	11	8	9	13
Volume Right (vph)	13	4	7	9
Hadj (s)	-0.02	0.02	-0.07	-0.05
Departure Headway (s)	4.1	4.1	4.3	4.3
Degree Utilization, x	0.12	0.10	0.03	0.03
Capacity (veh/h)	863	851	794	798
Control Delay (s)	7.7	7.6	7.4	7.4
Approach Delay (s)	7.7	7.6	7.4	7.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.6		
HCM Level of Service	A		
Intersection Capacity Utilization	17.4%	ICU Level of Service	A
Analysis Period (min)	15		

4: Sopris Avenue & 3rd Street

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	13	75	18	11	55	2	15	13	8	5	8	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	82	20	12	60	2	16	14	9	5	9	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	115	74	39	21
Volume Left (vph)	14	12	16	5
Volume Right (vph)	20	2	9	7
Hadj (s)	-0.04	0.05	-0.02	-0.10
Departure Headway (s)	4.1	4.2	4.3	4.2
Degree Utilization, x	0.13	0.09	0.05	0.02
Capacity (veh/h)	866	838	791	805
Control Delay (s)	7.7	7.6	7.5	7.4
Approach Delay (s)	7.7	7.6	7.5	7.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.6		
HCM Level of Service	A		
Intersection Capacity Utilization	17.2%	ICU Level of Service	A
Analysis Period (min)	15		

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	65	13	2	44	10	14	40	1	8	17	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	71	14	2	48	11	15	43	1	9	18	10

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	90	61	60	37
Volume Left (vph)	5	2	15	9
Volume Right (vph)	14	11	1	10
Hadj (s)	-0.05	-0.07	0.07	-0.08
Departure Headway (s)	4.1	4.1	4.3	4.2
Degree Utilization, x	0.10	0.07	0.07	0.04
Capacity (veh/h)	845	842	793	817
Control Delay (s)	7.6	7.5	7.7	7.4
Approach Delay (s)	7.6	7.5	7.7	7.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.6		
HCM Level of Service	A		
Intersection Capacity Utilization	17.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
6: Snowmass Drive & 2nd Street

Carbondale Elementary School
2011 Total AM

	↗	→	←	↖	↘	↙
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⋎	
Volume (veh/h)	53	209	125	5	5	40
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	58	227	136	5	5	43
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	141				481	139
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	141				481	139
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				99	95
cM capacity (veh/h)	1442				522	910

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	285	141	49
Volume Left	58	0	5
Volume Right	0	5	43
cSH	1442	1700	840
Volume to Capacity	0.04	0.08	0.06
Queue Length 95th (ft)	3	0	5
Control Delay (s)	1.8	0.0	9.5
Lane LOS	A		A
Approach Delay (s)	1.8	0.0	9.5
Approach LOS			A

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	34.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: Snowmass Drive & SH 133

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰	↑	↱	↰	↑	↱
Volume (veh/h)	42	11	8	44	13	105	2	397	119	132	269	26
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	12	9	48	14	114	2	432	129	143	292	28
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			4									
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1136	1145	292	1026	1043	432	321			561		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1136	1145	292	1026	1043	432	321			561		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	63	93	99	73	93	82	100			86		
cM capacity (veh/h)	123	171	747	178	196	624	1239			1010		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	66	176	2	432	129	143	292	28
Volume Left	46	48	2	0	0	143	0	0
Volume Right	9	114	0	0	129	0	0	28
cSH	153	336	1239	1700	1700	1010	1700	1700
Volume to Capacity	0.43	0.52	0.00	0.25	0.08	0.14	0.17	0.02
Queue Length 95th (ft)	49	72	0	0	0	12	0	0
Control Delay (s)	45.8	26.9	7.9	0.0	0.0	9.2	0.0	0.0
Lane LOS	E	D	A			A		
Approach Delay (s)	45.8	26.9	0.0			2.8		
Approach LOS	E	D						

Intersection Summary			
Average Delay	7.2		
Intersection Capacity Utilization	54.4%	ICU Level of Service	A
Analysis Period (min)	15		

8: Weant Boulevard & SH 133

2011 Total AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱		↰	↱	↰	↱	
Volume (veh/h)	21	8	7	60	2	40	2	438	112	49	351	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	9	8	65	2	43	2	476	122	53	382	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)						4						
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	993	1092	384	980	973	476	386			598		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	993	1092	384	980	973	476	386			598		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	88	96	99	69	99	93	100			95		
cM capacity (veh/h)	197	202	664	209	238	589	1173			979		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	39	111	478	122	53	386
Volume Left	23	65	2	0	53	0
Volume Right	8	43	0	122	0	4
cSH	230	346	1173	1700	979	1700
Volume to Capacity	0.17	0.32	0.00	0.07	0.05	0.23
Queue Length 95th (ft)	15	34	0	0	4	0
Control Delay (s)	23.8	22.8	0.1	0.0	8.9	0.0
Lane LOS	C	C	A		A	
Approach Delay (s)	23.8	22.8	0.0		1.1	
Approach LOS	C	C				

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		

9: Hendrick Drive & SH 133

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y		↰	↑	↑	↱
Volume (veh/h)	75	39	33	456	369	54
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	82	42	36	496	401	59
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	968	401	460			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	968	401	460			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	70	93	97			
cM capacity (veh/h)	272	649	1101			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	124	36	496	401	59
Volume Left	82	36	0	0	0
Volume Right	42	0	0	0	59
cSH	340	1101	1700	1700	1700
Volume to Capacity	0.36	0.03	0.29	0.24	0.03
Queue Length 95th (ft)	41	3	0	0	0
Control Delay (s)	21.6	8.4	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	21.6	0.6		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	39.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	57	111	331	29	111	505
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	62	121	360	32	121	549
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1166	376			391	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1166	376			391	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	68	82			90	
cM capacity (veh/h)	192	671			1167	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	183	391	670
Volume Left	62	0	121
Volume Right	121	32	0
cSH	364	1700	1167
Volume to Capacity	0.50	0.23	0.10
Queue Length 95th (ft)	68	0	9
Control Delay (s)	24.5	0.0	2.6
Lane LOS	C		A
Approach Delay (s)	24.5	0.0	2.6
Approach LOS	C		

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
2: Sopris Avenue & Weant Boulevard

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	74	34	23	84	8	14	43	17	8	51	39
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	80	37	25	91	9	15	47	18	9	55	42

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	128	125	80	107
Volume Left (vph)	11	25	15	9
Volume Right (vph)	37	9	18	42
Hadj (s)	-0.12	0.03	-0.07	-0.19
Departure Headway (s)	4.4	4.5	4.5	4.4
Degree Utilization, x	0.16	0.16	0.10	0.13
Capacity (veh/h)	785	752	740	762
Control Delay (s)	8.2	8.4	8.1	8.1
Approach Delay (s)	8.2	8.4	8.1	8.1
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.2		
HCM Level of Service	A		
Intersection Capacity Utilization	25.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Sopris Avenue & 4th Street

Carbondale Elementary School
2011 Total PM

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	56	34	13	47	4	48	15	14	5	14	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	61	37	14	51	4	52	16	15	5	15	17

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	103	70	84	38
Volume Left (vph)	5	14	52	5
Volume Right (vph)	37	4	15	17
Hadj (s)	-0.17	0.04	0.05	-0.21
Departure Headway (s)	4.1	4.3	4.4	4.2
Degree Utilization, x	0.12	0.08	0.10	0.04
Capacity (veh/h)	851	803	785	822
Control Delay (s)	7.6	7.7	7.9	7.4
Approach Delay (s)	7.6	7.7	7.9	7.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.7		
HCM Level of Service	A		
Intersection Capacity Utilization	25.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Sopris Avenue & 3rd Street

Carbondale Elementary School
2011 Total PM

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	6	57	16	7	43	6	6	8	10	4	12	17
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	62	17	8	47	7	7	9	11	4	13	18

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	86	61	26	36
Volume Left (vph)	7	8	7	4
Volume Right (vph)	17	7	11	18
Hadj (s)	-0.07	-0.01	-0.17	-0.25
Departure Headway (s)	4.0	4.1	4.1	4.0
Degree Utilization, x	0.10	0.07	0.03	0.04
Capacity (veh/h)	875	856	841	865
Control Delay (s)	7.4	7.4	7.2	7.2
Approach Delay (s)	7.4	7.4	7.2	7.2
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.4		
HCM Level of Service	A		
Intersection Capacity Utilization	15.1%	ICU Level of Service	A
Analysis Period (min)	15		

5: Sopris Avenue & 2nd Street

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	18	29	23	8	27	7	14	34	7	5	36	14
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	32	25	9	29	8	15	37	8	5	39	15

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	76	46	60	60
Volume Left (vph)	20	9	15	5
Volume Right (vph)	25	8	8	15
Hadj (s)	-0.11	-0.03	0.01	-0.10
Departure Headway (s)	4.1	4.2	4.2	4.1
Degree Utilization, x	0.09	0.05	0.07	0.07
Capacity (veh/h)	849	825	816	842
Control Delay (s)	7.5	7.4	7.6	7.4
Approach Delay (s)	7.5	7.4	7.6	7.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.5		
HCM Level of Service	A		
Intersection Capacity Utilization	18.7%	ICU Level of Service	A
Analysis Period (min)	15		

6: Snowmass Drive & 2nd Street

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	30	76	114	16	10	62
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	83	124	17	11	67
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	141				280	133
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	141				280	133
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				98	93
cM capacity (veh/h)	1442				693	917

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	115	141	78
Volume Left	33	0	11
Volume Right	0	17	67
cSH	1442	1700	877
Volume to Capacity	0.02	0.08	0.09
Queue Length 95th (ft)	2	0	7
Control Delay (s)	2.3	0.0	9.5
Lane LOS	A		A
Approach Delay (s)	2.3	0.0	9.5
Approach LOS			A

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	27.0%	ICU Level of Service	A
Analysis Period (min)	15		

7: Snowmass Drive & SH 133

2011 Total PM

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		✣		↰	↑	↱	↰	↑	↱
Volume (veh/h)	27	14	10	88	28	60	11	242	35	57	395	51
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	29	15	11	96	30	65	12	263	38	62	429	55
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			4									
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	921	878	429	853	896	263	485			301		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	921	878	429	853	896	263	485			301		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	85	94	98	62	88	92	99			95		
cM capacity (veh/h)	200	269	626	250	263	776	1078			1260		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	55	191	12	263	38	62	429	55
Volume Left	29	96	12	0	0	62	0	0
Volume Right	11	65	0	0	38	0	0	55
cSH	279	329	1078	1700	1700	1260	1700	1700
Volume to Capacity	0.20	0.58	0.01	0.15	0.02	0.05	0.25	0.03
Queue Length 95th (ft)	18	87	1	0	0	4	0	0
Control Delay (s)	22.3	30.1	8.4	0.0	0.0	8.0	0.0	0.0
Lane LOS	C	D	A			A		
Approach Delay (s)	22.3	30.1	0.3			0.9		
Approach LOS	C	D						

Intersection Summary			
Average Delay	6.9		
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱		↰	↱	↰	↳	
Volume (veh/h)	10	4	3	78	8	61	6	277	49	37	424	21
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	4	3	85	9	66	7	301	53	40	461	23
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)						4						
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	904	920	472	861	878	301	484			354		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	904	920	472	861	878	301	484			354		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	98	99	68	97	91	99			97		
cM capacity (veh/h)	222	260	592	263	275	739	1079			1204		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	18	160	308	53	40	484
Volume Left	11	85	7	0	40	0
Volume Right	3	66	0	53	0	23
cSH	260	451	1079	1700	1204	1700
Volume to Capacity	0.07	0.35	0.01	0.03	0.03	0.28
Queue Length 95th (ft)	6	39	0	0	3	0
Control Delay (s)	19.9	19.5	0.2	0.0	8.1	0.0
Lane LOS	C	C	A		A	
Approach Delay (s)	19.9	19.5	0.2		0.6	
Approach LOS	C	C				

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	45.0%	ICU Level of Service	A
Analysis Period (min)	15		

9: Hendrick Drive & SH 133

	↗	↘	↖	↑	↓	↙
Movement	**EBL**	**EBR**	**NBL**	**NBT**	**SBT**	**SBR**
Lane Configurations	Y		↰	↑	↑	↱
Volume (veh/h)	68	42	52	295	432	135
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	46	57	321	470	147
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	903	470	616			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	903	470	616			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	74	92	94			
cM capacity (veh/h)	290	594	964			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	120	57	321	470	147
Volume Left	74	57	0	0	0
Volume Right	46	0	0	0	147
cSH	360	964	1700	1700	1700
Volume to Capacity	0.33	0.06	0.19	0.28	0.09
Queue Length 95th (ft)	36	5	0	0	0
Control Delay (s)	19.9	9.0	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	19.9	1.3		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	42.4%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX F LONG-TERM (2029) TOTAL LEVEL OF SERVICE WORKSHEETS

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱	↰	↑↱		↰	↑↑	↱
Volume (vph)	91	20	57	15	8	130	49	626	19	106	467	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1790	1583		1805	1583	1770	3523		1770	3539	1583
Flt Permitted		0.75	1.00		0.82	1.00	0.42	1.00		0.39	1.00	1.00
Satd. Flow (perm)		1393	1583		1521	1583	782	3523		717	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	99	22	62	16	9	141	53	680	21	115	508	78
RTOR Reduction (vph)	0	0	53	0	0	108	0	1	0	0	0	25
Lane Group Flow (vph)	0	121	9	0	25	33	53	700	0	115	508	53
Turn Type	Perm		Perm	Perm		pm+ov	pm+pt			pm+pt		Perm
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)		13.0	13.0		13.0	21.2	56.8	56.8		60.7	60.7	60.7
Effective Green, g (s)		13.0	13.0		13.0	21.2	56.8	56.8		60.7	60.7	60.7
Actuated g/C Ratio		0.14	0.14		0.14	0.24	0.63	0.63		0.67	0.67	0.67
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		201	229		220	443	541	2223		580	2387	1068
v/s Ratio Prot						0.01	0.00	c0.20		0.02	c0.14	
v/s Ratio Perm		c0.09	0.01		0.02	0.01	0.06			0.12		0.03
v/c Ratio		0.60	0.04		0.11	0.07	0.10	0.31		0.20	0.21	0.05
Uniform Delay, d1		36.1	33.1		33.5	26.8	6.5	7.6		5.7	5.6	4.9
Progression Factor		1.00	1.00		1.00	1.00	0.71	0.71		1.00	1.00	1.00
Incremental Delay, d2		5.0	0.1		0.2	0.1	0.1	0.4		0.2	0.2	0.1
Delay (s)		41.1	33.2		33.7	26.8	4.6	5.8		5.8	5.8	5.0
Level of Service		D	C		C	C	A	A		A	A	A
Approach Delay (s)		38.4			27.9			5.7			5.7	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Sopris Avenue & Weant Boulevard

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	15	97	31	15	92	8	35	97	40	4	42	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	105	34	16	100	9	38	105	43	4	46	12

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	155	125	187	62
Volume Left (vph)	16	16	38	4
Volume Right (vph)	34	9	43	12
Hadj (s)	-0.08	0.02	-0.06	-0.07
Departure Headway (s)	4.6	4.7	4.6	4.7
Degree Utilization, x	0.20	0.16	0.24	0.08
Capacity (veh/h)	732	713	739	697
Control Delay (s)	8.7	8.6	9.0	8.2
Approach Delay (s)	8.7	8.6	9.0	8.2
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.7		
HCM Level of Service	A		
Intersection Capacity Utilization	32.7%	ICU Level of Service	A
Analysis Period (min)	15		

3: Sopris Avenue & 4th Street

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	15	116	14	9	98	6	10	9	8	17	10	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	126	15	10	107	7	11	10	9	18	11	11

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	158	123	29	40
Volume Left (vph)	16	10	11	18
Volume Right (vph)	15	7	9	11
Hadj (s)	0.00	0.02	-0.07	-0.04
Departure Headway (s)	4.2	4.2	4.5	4.5
Degree Utilization, x	0.18	0.14	0.04	0.05
Capacity (veh/h)	839	828	745	738
Control Delay (s)	8.1	8.0	7.7	7.8
Approach Delay (s)	8.1	8.0	7.7	7.8
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.0		
HCM Level of Service	A		
Intersection Capacity Utilization	21.0%	ICU Level of Service	A
Analysis Period (min)	15		

4: Sopris Avenue & 3rd Street

2029 Total AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	19	110	24	13	80	3	20	16	9	8	9	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	120	26	14	87	3	22	17	10	9	10	11

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	166	104	49	29
Volume Left (vph)	21	14	22	9
Volume Right (vph)	26	3	10	11
Hadj (s)	-0.04	0.04	0.00	-0.13
Departure Headway (s)	4.2	4.3	4.5	4.4
Degree Utilization, x	0.19	0.12	0.06	0.04
Capacity (veh/h)	844	815	742	751
Control Delay (s)	8.1	7.9	7.8	7.6
Approach Delay (s)	8.1	7.9	7.8	7.6
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.0		
HCM Level of Service	A		
Intersection Capacity Utilization	21.4%	ICU Level of Service	A
Analysis Period (min)	15		

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	7	95	18	2	64	15	18	59	2	12	25	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	103	20	2	70	16	20	64	2	13	27	11

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	130	88	86	51
Volume Left (vph)	8	2	20	13
Volume Right (vph)	20	16	2	11
Hadj (s)	-0.04	-0.07	0.06	-0.04
Departure Headway (s)	4.3	4.3	4.5	4.5
Degree Utilization, x	0.15	0.10	0.11	0.06
Capacity (veh/h)	811	795	754	755
Control Delay (s)	8.1	7.8	8.1	7.8
Approach Delay (s)	8.1	7.8	8.1	7.8
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.9		
HCM Level of Service	A		
Intersection Capacity Utilization	21.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
6: Snowmass Drive & 2nd Street

Carbondale Elementary School
2029 Total AM

Movement	EBL	EBT	WBT	WBR	SBL	SBR
	↗	→	←	↖	↘	↙
Lane Configurations		↰	↱		Y	
Volume (veh/h)	76	309	185	8	8	52
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	83	336	201	9	9	57
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		255				
pX, platoon unblocked					0.96	
vC, conflicting volume	210				707	205
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	210				674	205
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				98	93
cM capacity (veh/h)	1361				379	835

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	418	210	65
Volume Left	83	0	9
Volume Right	0	9	57
cSH	1361	1700	720
Volume to Capacity	0.06	0.12	0.09
Queue Length 95th (ft)	5	0	7
Control Delay (s)	2.0	0.0	10.5
Lane LOS	A		B
Approach Delay (s)	2.0	0.0	10.5
Approach LOS			B

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
7: Snowmass Drive & SH 133

Carbondale Elementary School
2029 Total AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	57	17	11	63	19	156	3	583	174	195	400	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00		0.99		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1793	1583		1676		1770	3539	1583	1770	3539	1583
Flt Permitted		0.70	1.00		0.77		0.45	1.00	1.00	0.41	1.00	1.00
Satd. Flow (perm)		1305	1583		1307		837	3539	1583	765	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	62	18	12	68	21	170	3	634	189	212	435	40
RTOR Reduction (vph)	0	0	11	0	90	0	0	0	73	0	0	15
Lane Group Flow (vph)	0	80	1	0	169	0	3	634	116	212	435	25
Turn Type	pm+pt		Perm	pm+pt			pm+pt		pm+ov	pm+pt		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases	4		4	8			2		2	6		6
Actuated Green, G (s)		9.8	9.8		19.8		49.3	49.3	55.3	57.0	57.0	57.0
Effective Green, g (s)		9.8	9.8		19.8		49.3	49.3	55.3	57.0	57.0	57.0
Actuated g/C Ratio		0.11	0.11		0.22		0.55	0.55	0.61	0.63	0.63	0.63
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		142	172		312		471	1939	973	584	2241	1003
v/s Ratio Prot					c0.04		0.00	c0.18	0.01	c0.04	0.12	
v/s Ratio Perm		0.06	0.00		c0.08		0.00		0.07	c0.19		0.02
v/c Ratio		0.56	0.01		0.54		0.01	0.33	0.12	0.36	0.19	0.03
Uniform Delay, d1		38.1	35.8		31.1		9.3	11.2	7.2	8.4	6.9	6.1
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	0.74	0.71	0.46
Incremental Delay, d2		5.0	0.0		1.9		0.0	0.5	0.1	0.4	0.2	0.0
Delay (s)		43.1	35.8		33.0		9.4	11.7	7.3	6.6	5.1	2.9
Level of Service		D	D		C		A	B	A	A	A	A
Approach Delay (s)		42.2			33.0			10.6			5.4	
Approach LOS		D			C			B			A	

Intersection Summary			
HCM Average Control Delay	13.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: Weant Boulevard & SH 133

Carbondale Elementary School
2029 Total AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	21	8	7	84	2	41	2	645	159	51	518	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00		0.95	1.00	1.00	0.95	
Frt		0.97			1.00	0.85		1.00	0.85	1.00	1.00	
Flt Protected		0.97			0.95	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1762			1776	1583		3539	1583	1770	3535	
Flt Permitted		0.77			0.69	1.00		0.95	1.00	0.37	1.00	
Satd. Flow (perm)		1396			1278	1583		3377	1583	693	3535	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	23	9	8	91	2	45	2	701	173	55	563	4
RTOR Reduction (vph)	0	8	0	0	0	37	0	0	33	0	0	0
Lane Group Flow (vph)	0	32	0	0	93	8	0	703	140	55	567	0
Turn Type	Perm			pm+pt		Perm	pm+pt		pm+ov	Perm		
Protected Phases		4		3	8		5	2	3		6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		5.2			15.7	15.7		66.3	72.8	66.3	66.3	
Effective Green, g (s)		5.2			15.7	15.7		66.3	72.8	66.3	66.3	
Actuated g/C Ratio		0.06			0.17	0.17		0.74	0.81	0.74	0.74	
Clearance Time (s)		4.0			4.0	4.0		4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		81			259	276		2488	1351	511	2604	
v/s Ratio Prot					c0.03				0.01		0.16	
v/s Ratio Perm		0.02			c0.04	0.00		c0.21	0.08	0.08		
v/c Ratio		0.40			0.36	0.03		0.28	0.10	0.11	0.22	
Uniform Delay, d1		40.9			32.7	30.8		3.9	1.8	3.4	3.7	
Progression Factor		1.00			1.00	1.00		0.54	0.02	0.33	0.39	
Incremental Delay, d2		3.2			0.9	0.0		0.1	0.0	0.4	0.2	
Delay (s)		44.1			33.6	30.9		2.2	0.1	1.5	1.6	
Level of Service		D			C	C		A	A	A	A	
Approach Delay (s)		44.1			32.7			1.8			1.6	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM Average Control Delay	5.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱	↰	↑↱		↰	↑↑	↱
Volume (vph)	71	29	62	56	29	154	77	358	14	183	497	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected		0.97	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1799	1583		1804	1583	1770	3520		1770	3539	1583
Flt Permitted		0.71	1.00		0.66	1.00	0.45	1.00		0.48	1.00	1.00
Satd. Flow (perm)		1324	1583		1232	1583	840	3520		895	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	77	32	67	61	32	167	84	389	15	199	540	185
RTOR Reduction (vph)	0	0	59	0	0	132	0	2	0	0	0	39
Lane Group Flow (vph)	0	109	8	0	93	35	84	402	0	199	540	146
Turn Type	Perm		Perm	Perm		pm+ov	Perm			pm+pt		Perm
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)		10.8	10.8		10.8	19.0	59.0	59.0		71.2	71.2	71.2
Effective Green, g (s)		10.8	10.8		10.8	19.0	59.0	59.0		71.2	71.2	71.2
Actuated g/C Ratio		0.12	0.12		0.12	0.21	0.66	0.66		0.79	0.79	0.79
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		159	190		148	405	551	2308		788	2800	1252
v/s Ratio Prot						0.01		0.11		c0.02	0.15	
v/s Ratio Perm		c0.08	0.01		0.08	0.01	0.10			c0.18		0.09
v/c Ratio		0.69	0.04		0.63	0.09	0.15	0.17		0.25	0.19	0.12
Uniform Delay, d1		38.0	35.0		37.7	28.5	5.9	6.0		2.3	2.3	2.2
Progression Factor		1.00	1.00		1.00	1.00	0.49	0.51		1.00	1.00	1.00
Incremental Delay, d2		11.6	0.1		8.1	0.1	0.6	0.2		0.2	0.2	0.2
Delay (s)		49.6	35.1		45.8	28.6	3.5	3.2		2.5	2.5	2.4
Level of Service		D	D		D	C	A	A		A	A	A
Approach Delay (s)		44.1			34.8			3.3			2.5	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	42.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Sopris Avenue & Weant Boulevard

Carbondale Elementary School
2029 Total PM

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	15	98	51	30	113	10	21	58	21	10	68	57
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	107	55	33	123	11	23	63	23	11	74	62

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	178	166	109	147
Volume Left (vph)	16	33	23	11
Volume Right (vph)	55	11	23	62
Hadj (s)	-0.13	0.03	-0.05	-0.20
Departure Headway (s)	4.6	4.8	4.9	4.7
Degree Utilization, x	0.23	0.22	0.15	0.19
Capacity (veh/h)	727	702	677	708
Control Delay (s)	9.0	9.1	8.7	8.8
Approach Delay (s)	9.0	9.1	8.7	8.8
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.9		
HCM Level of Service	A		
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Sopris Avenue & 4th Street

Carbondale Elementary School
2029 Total PM

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	7	81	37	16	68	6	55	18	16	7	17	24
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	88	40	17	74	7	60	20	17	8	18	26

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	136	98	97	52
Volume Left (vph)	8	17	60	8
Volume Right (vph)	40	7	17	26
Hadj (s)	-0.13	0.03	0.05	-0.24
Departure Headway (s)	4.2	4.4	4.5	4.3
Degree Utilization, x	0.16	0.12	0.12	0.06
Capacity (veh/h)	818	771	749	776
Control Delay (s)	8.0	8.0	8.2	7.6
Approach Delay (s)	8.0	8.0	8.2	7.6
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.0		
HCM Level of Service	A		
Intersection Capacity Utilization	28.0%	ICU Level of Service	A
Analysis Period (min)	15		

4: Sopris Avenue & 3rd Street

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	8	81	22	7	61	9	6	9	10	6	16	25
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	88	24	8	66	10	7	10	11	7	17	27

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	121	84	27	51
Volume Left (vph)	9	8	7	7
Volume Right (vph)	24	10	11	27
Hadj (s)	-0.07	-0.02	-0.16	-0.26
Departure Headway (s)	4.1	4.2	4.2	4.1
Degree Utilization, x	0.14	0.10	0.03	0.06
Capacity (veh/h)	858	840	799	830
Control Delay (s)	7.7	7.6	7.4	7.4
Approach Delay (s)	7.7	7.6	7.4	7.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.6		
HCM Level of Service	A		
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	25	40	30	12	38	11	18	51	11	8	53	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	43	33	13	41	12	20	55	12	9	58	22

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	103	66	87	88
Volume Left (vph)	27	13	20	9
Volume Right (vph)	33	12	12	22
Hadj (s)	-0.10	-0.03	0.00	-0.09
Departure Headway (s)	4.3	4.4	4.4	4.3
Degree Utilization, x	0.12	0.08	0.11	0.10
Capacity (veh/h)	805	774	782	792
Control Delay (s)	7.9	7.8	7.9	7.8
Approach Delay (s)	7.9	7.8	7.9	7.8
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.8		
HCM Level of Service	A		
Intersection Capacity Utilization	22.7%	ICU Level of Service	A
Analysis Period (min)	15		

6: Snowmass Drive & 2nd Street

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Volume (veh/h)	41	113	168	23	15	87
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	45	123	183	25	16	95
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		255				
pX, platoon unblocked						
vC, conflicting volume	208				407	195
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	208				407	195
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				97	89
cM capacity (veh/h)	1363				581	846

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	167	208	111
Volume Left	45	0	16
Volume Right	0	25	95
cSH	1363	1700	793
Volume to Capacity	0.03	0.12	0.14
Queue Length 95th (ft)	3	0	12
Control Delay (s)	2.3	0.0	10.3
Lane LOS	A		B
Approach Delay (s)	2.3	0.0	10.3
Approach LOS			B

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	34.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	37	20	15	126	42	88	16	348	49	85	573	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1805	1583		1734		1770	3539	1583	1770	3539	1583
Flt Permitted		0.73	1.00		0.81		0.38	1.00	1.00	0.52	1.00	1.00
Satd. Flow (perm)		1362	1583		1443		708	3539	1583	969	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	22	16	137	46	96	17	378	53	92	623	77
RTOR Reduction (vph)	0	0	12	0	23	0	0	0	20	0	0	29
Lane Group Flow (vph)	0	62	4	0	256	0	17	378	33	92	623	48
Turn Type	Perm		Perm	Perm			Perm		custom	Perm		custom
Protected Phases		4			8			2	3		6	7
Permitted Phases	4		4	8			2		2	6		6
Actuated Green, G (s)		22.7	22.7		21.6		52.0	52.0	55.3	52.0	52.0	56.4
Effective Green, g (s)		22.7	22.7		21.6		52.0	52.0	55.3	52.0	52.0	56.4
Actuated g/C Ratio		0.25	0.25		0.24		0.58	0.58	0.61	0.58	0.58	0.63
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		344	399		346		409	2045	1043	560	2045	1062
v/s Ratio Prot								0.11	0.00		c0.18	c0.00
v/s Ratio Perm		0.05	0.00		c0.18		0.02		0.02	0.09		0.03
v/c Ratio		0.18	0.01		0.74		0.04	0.18	0.03	0.16	0.30	0.05
Uniform Delay, d1		26.4	25.2		31.6		8.2	9.0	6.8	8.9	9.7	6.5
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.04	1.01	1.09
Incremental Delay, d2		0.3	0.0		8.3		0.2	0.2	0.0	0.6	0.4	0.0
Delay (s)		26.6	25.2		39.9		8.4	9.2	6.8	9.9	10.2	7.1
Level of Service		C	C		D		A	A	A	A	B	A
Approach Delay (s)		26.3			39.9			8.9			9.8	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: Weant Boulevard & SH 133

Carbondale Elementary School
2029 Total PM

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			↰	↱		↰↑	↱	↰	↑↱	
Volume (vph)	10	4	3	112	8	68	6	407	65	38	624	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00		0.95	1.00	1.00	0.95	
Frt		0.98			1.00	0.85		1.00	0.85	1.00	1.00	
Flt Protected		0.97			0.96	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1767			1780	1583		3536	1583	1770	3522	
Flt Permitted		0.70			0.73	1.00		0.95	1.00	0.49	1.00	
Satd. Flow (perm)		1275			1355	1583		3350	1583	917	3522	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	4	3	122	9	74	7	442	71	41	678	23
RTOR Reduction (vph)	0	3	0	0	0	61	0	0	13	0	2	0
Lane Group Flow (vph)	0	15	0	0	131	13	0	449	58	41	699	0
Turn Type	Perm			Perm		Perm	Perm		custom	Perm		
Protected Phases		4			8			2	3		6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		4.6			16.4	16.4		65.6	73.4	65.6	65.6	
Effective Green, g (s)		4.6			16.4	16.4		65.6	73.4	65.6	65.6	
Actuated g/C Ratio		0.05			0.18	0.18		0.73	0.82	0.73	0.73	
Clearance Time (s)		4.0			4.0	4.0		4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		65			247	288		2442	1361	668	2567	
v/s Ratio Prot									0.00		c0.20	
v/s Ratio Perm		0.01			c0.10	0.01		0.13	0.03	0.04		
v/c Ratio		0.23			0.53	0.05		0.18	0.04	0.06	0.27	
Uniform Delay, d1		41.0			33.3	30.4		3.8	1.6	3.5	4.1	
Progression Factor		1.00			1.00	1.00		1.08	1.24	0.87	0.87	
Incremental Delay, d2		1.8			2.2	0.1		0.2	0.0	0.2	0.3	
Delay (s)		42.8			35.5	30.4		4.3	2.0	3.2	3.8	
Level of Service		D			D	C		A	A	A	A	
Approach Delay (s)		42.8			33.7			4.0			3.8	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM Average Control Delay	8.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX G SIGNAL WARRANT WORKSHEETS

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MUTCD Volume-based Warrant Evaluation - 2029 Background
SH 133 at Sopris Avenue

***Warrants for Signalization ARE met**

Major Street: SH 133 — Critical Approach Speed: 40 MPH
Minor Street: Sopris Avenue — Critical Approach Speed: 25 MPH

Classified as Rural Intersection (R)

WARRANT 1 - Condition A, Minimum Vehicular Volume

100 % Satisfied	YES	[✓ NO]
80% Satisfied	YES	[✓ NO]

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)				Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
	~~U~~	R	~~U~~	R								
APPROACH LANES	1		2 or more									
Both Apprchs. Major Street	~~500 (400)~~	~~350 (280)~~	~~600 (480)~~	420 (336)	1332	1250	1169	1087	1005	924	842	761
Highest Apprch. Minor Street	~~150 (120)~~	105 (84)	~~200 (160)~~	~~140 (112)~~	112	105	98	91	85	78	71	64

WARRANT 1, Condition B - Interruption of Continuous Traffic

100 % Satisfied	YES	[✓ NO]
80% Satisfied	[✓ YES]	NO

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)				Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
	~~U~~	R	~~U~~	R								
APPROACH LANES	1		2 or more									
Both Apprchs. Major Street	~~750 (600)~~	~~525 (420)~~	~~900 (720)~~	630 (504)	1332	1250	1169	1087	1005	924	842	761
Highest Apprch. Minor Street	~~75 (60)~~	53 (42)	~~100 (80)~~	~~70 (56)~~	112	105	98	91	85	78	71	64

WARRANT 2 - Four Hour Volume

100 % Satisfied	[✓ YES]	NO

	Peak Hour	2nd Highest	3rd Highest	4th Highest
Both Apprchs. Major Street	1332	1250	1169	1087
Highest Apprch. Minor Street	112	105	98	91

MUTCD Volume-based Warrant Evaluation - 2029 Background
SH 133 at Weant Boulevard

***Warrants for Signalization ARE met**

Major Street: SH 133 Critical Approach Speed: 40 MPH
Minor Street: Weant Blvd Critical Approach Speed: 25 MPH

Classified as Rural Intersection (R)

WARRANT 1 - Condition A, Minimum Vehicular Volume

100 % Satisfied	YES	[✓ NO]
80% Satisfied	YES	[✓ NO]

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)				Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
	~~U~~	R	~~U~~	R								
APPROACH LANES	1		2 or more									
Both Apprchs. Major Street	~~500 (400)~~	~~350 (280)~~	~~600 (480)~~	420 (336)	1070	1004	939	873	808	742	677	611
Highest Apprch. Minor Street	~~150 (120)~~	105 (84)	~~200 (160)~~	~~140 (112)~~	107	100	94	87	81	74	68	61

WARRANT 1, Condition B - Interruption of Continuous Traffic

100 % Satisfied	YES	[✓ NO]
80% Satisfied	[✓ YES]	NO

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)				Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
	~~U~~	R	~~U~~	R								
APPROACH LANES	1		2 or more									
Both Apprchs. Major Street	~~750 (600)~~	~~525 (420)~~	~~900 (720)~~	630 (504)	1070	1004	939	873	808	742	677	611
Highest Apprch. Minor Street	~~75 (60)~~	53 (42)	~~100 (80)~~	~~70 (56)~~	107	100	94	87	81	74	68	61

WARRANT 2 - Four Hour Volume

100 % Satisfied	[✓ YES]	NO

	Peak Hour	2nd Highest	3rd Highest	4th Highest
Both Apprchs. Major Street	1070	1004	939	873
Highest Apprch. Minor Street	107	100	94	87

MUTCD Volume-based Warrant Evaluation - 2029 Background
SH 133 at Snowmass Drive

***Warrants for Signalization ARE met**

Major Street: SH 133 Critical Approach Speed: 40 MPH
Minor Street: Snowmass Drive Critical Approach Speed: 25 MPH

Classified as Rural Intersection (R)

WARRANT 1 - Condition A, Minimum Vehicular Volume

100 % Satisfied	YES	NO
80% Satisfied	YES	NO

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)				Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
	~~U~~	R	~~U~~	R								
APPROACH LANES	1		2 or more									
Both Apprchs. Major Street	~~500 (400)~~	~~350 (280)~~	~~600 (480)~~	420 (336)	1162	1091	1020	948	877	806	735	664
Highest Apprch. Minor Street	~~150 (120)~~	105 (84)	~~200 (160)~~	~~140 (112)~~	234	220	205	191	177	162	148	134

WARRANT 1, Condition B - Interruption of Continuous Traffic

100 % Satisfied	YES	NO
80% Satisfied	YES	NO

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)				Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
	~~U~~	R	~~U~~	R								
APPROACH LANES	1		2 or more									
Both Apprchs. Major Street	~~750 (600)~~	~~525 (420)~~	~~900 (720)~~	630 (504)	1162	1091	1020	948	877	806	735	664
Highest Apprch. Minor Street	~~75 (60)~~	53 (42)	~~100 (80)~~	~~70 (56)~~	234	220	205	191	177	162	148	134

WARRANT 2 - Four Hour Volume

100 % Satisfied	YES	NO

	Peak Hour	2nd Highest	3rd Highest	4th Highest
Both Apprchs. Major Street	1162	1091	1020	948
Highest Apprch. Minor Street	234	220	205	191

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APPENDIX H 3RD STREET CENTER TRIP GENERATION ANALYSIS

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FELSBURG
HOLT &
ULLEVIG
25 years of engineering paths to transportation solutions

March 3, 2009

Mr. Yancy Nichol, P.E.
Sopris Engineering, LLC
502 Main Street, Suite A3
Carbondale, Colorado 81623

Subject: Trip Generation Analysis for Third Street Center
FHU Reference No. 04-073

Dear Mr. Nichol:

The Third Street Center is a proposed redevelopment that will utilize the existing Carbondale Elementary School building as a community non-profit center. The elementary school is located south of the intersection of Third Street and Capitol Avenue in Carbondale, Colorado. The size of the main floor of the building is 45,100 square feet. Felsburg Holt & Ullevig was asked to prepare an analysis of the traffic that would be generated by the proposed office use as compared to the previous use as an elementary school.

Table 1 provides a comparison of the trip generation rates for the two uses. This information was taken from Trip Generation, Eight Edition, Institute of Transportation Engineers, 2008. This publication has trip rate data based on surveys of different land uses on a national basis over a number of years. **Table 1** shows that rates for elementary school uses (ITE Code #520) are higher for daily traffic and for morning peak hour traffic. Office uses (ITE Code #710) are higher in the evening peak hour (generally between 4:00pm and 6:00pm) because schools typically let out in the late afternoon before the normal rush hour.

Table 1. Trip Generation Rates

Land Use	ITE Land Use Code	Units	Daily	AM Peak Hour	PM Peak Hour
Elementary School	520	1,000 S.F.	15.4	5.2	1.21
Offices	710	1,000 S.F.	11.01	1.55	1.49
Comparison			-29%	-70%	+23%

Table 2 provides a comparison of the traffic volumes generated by these uses during the three time periods. These traffic volume forecasts show the same pattern as described for Table 1. The increase in evening peak hour traffic volumes are relatively minor compared to the decrease in daily and morning peak hour volumes.

Table 2. Traffic Volume Comparison

Land Use	ITE Land Use Code	Size	Daily	AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
Elementary School	520	45,100 S.F.	696	143	91	235	25	30	55
Office	710	45,100 S,F.	497	62	8	70	11	56	67
Comparison			-199 (-29%)	-81 (-57%)	-82 (-91%)	-165 (-70%)	-14 (-56%)	+26 (+87%)	+12 (+23%)

CONCLUSIONS

The conversion of Carbondale Elementary School to the non-profit office uses proposed for the Third Street Center would generally result in a decrease in traffic volumes using Third Street and Capitol Avenue. While there is an increase in evening peak hour traffic volumes, this increased is relatively minor compared to the decrease in daily and morning peak hour volumes. Daily traffic would decrease by almost 200 vehicles per day (29%).

Please call if you have any questions or need additional information.

Sincerely,

FELSBURG HOLT & ULLEVIG

David E. Hattan

David E. Hattan, P.E., PTOE
Associate

Attachments

S.0 EXECUTIVE SUMMARY

S.1 STUDY PURPOSE

The purpose of the *State Highway* (*SH) 133 Corridor Feasibility Study* is to review the current and projected conditions, make corridor improvement recommendations and develop programming cost estimates. The study area included the SH 133 corridor through the Town of Carbondale from SH 82 to Meadowood Drive (milepost 68.82 to 66.46), approximately 2.3 miles long. The study included both the SH 133 corridor from the existing bridge over the Roaring Fork River to Meadowood Drive and the SH 133 and SH 82 intersection including the existing bridge over the Roaring Fork River.

S.2 PROJECT BACKGROUND

The *State Highway 133 Citizen's Task Force Report,* completed in 1998, was used as a point of reference for this study. The corridor feasibility study included various resource inventories and engineering studies to develop a clear understanding of the existing issues. These included a traffic and safety analysis for existing and future traffic volumes, a determination of future land use, a local circulation study, and an environmental overview.

Two Public Open Houses were held as part of the study. An initial public open house was held on December 12, 2001, to obtain information regarding the public's opinion on the existing deficiencies and needs of the SH 133 corridor. A final open house was held on May 8, 2002 to present the conclusions and initial recommendations. Comments received at the two open houses were incorporated into the final recommended improvements. Summaries of the public comments received are included in Appendix C.

An SH 133 Access Management Plan (see Appendix A) was completed in conjunction with the SH 133 corridor study. Individual meetings with property owners were conducted during the preparation of the plan.

A review of the existing SH 133 corridor indicates the following issues:

- Poor level of service (LOS) at the intersections
- Uncontrolled accesses throughout the corridor
- Nonfunctional geometry at SH 133 and SH 82 intersection
- Lack of pedestrian/bike crossings
- No pedestrian trail along the west side of SH 133
- Lack of adequate transit facilities
- Insufficient number of traffic lanes

S.3 FUTURE (2025) TRAFFIC ANALYSIS

The SH 133 corridor study included an analysis of future (2025) traffic conditions. For future (2025) projected traffic volumes, without improvements to the SH 82/SH 133 intersection, traffic would queue from the SH 82 intersection past Main Street. Therefore the analysis of the future (2025) traffic operations was completed for the SH 133 corridor excluding the SH 82 intersection. Recommendations for the corridor were based on the assumption of an improved SH 82 intersection that could include bridge widening or a grade-separated interchange.

Access improvements were anticipated in accordance with the SH 133 Access Management Plan included in Appendix A. Traffic signals for the future (2025) anticipated traffic conditions are recommended at the following intersections:

- Cowen Drive (may be warranted after improvements to the SH 82/SH 133 intersection and if a connection is made to frontage road located within the County to the west of SH 133)
- Delores Way (may be warranted if a future park-n-ride is located here)
- Nieslanik Avenue and/or Industrial Place
- Main Street
- Sopris Avenue/Hendrick Road (may be warranted subject to potential intersection realignment)
- Snowmass Drive
- Meadowood Drive

The installation of traffic signals requires meeting signal warrants in accordance with the *Manual of Uniform Traffic Control Devices* and approval from CDOT. Several of the recommended intersection locations would not require signalization until future traffic growth occurs and the assumed development and/or geometric improvements are completed.

S.4 ACCIDENT ANALYSIS

SH 133 corridor accident data for the three-year period 1998 to 2000 indicates that the frequency of accidents is 2.78 per million vehicle miles traveled (MVMT). This is greater than the State Average accident rate of 2.25 per MVMT for the year 1999. SH 133 and SH 82 intersection accident data for the three-year period 1998 to 2000 indicates that the frequency of accidents is 2.45 per MVMT. This is greater than the state average accident rate of 1.25 per MVMT for the year 1999. The accident summary reports are included in Appendix E.

S.5 RECOMMENDED SH 133 CORRIDOR IMPROVEMENTS

Based on the identified deficiencies the SH 133 corridor recommendations are as follows.

- Widen SH 133 to four through travel lanes with outside shoulder/bike lanes.
- Construct a raised median to control access.
- Left and right turn acceleration and deceleration lanes will be located where required for operational purposes to achieve acceptable traffic operations.
- Construct new multi-use bike/pedestrian path along the west side of SH 133.
- Replace existing multi-use bike/pedestrian path along the east side of SH 133 where it is impacted by construction. Extend existing path south to Meadowood Drive.

- Construct a one-way northbound frontage road along the east side of SH 133 between Roaring Fork Avenue and Weant Boulevard.
- Construct a new roadway opposite Cowen Drive to connect with a county road along the back of the properties.
- Realign Sopris Avenue with Hendrick Road to improve pedestrian mobility and safety and improve traffic operations.

S.6 SH 133 AND SH 82 INTERSECTION ANALYSIS

The existing SH 133 and SH 82 intersection operates at LOS C during the AM peak and LOS E in the PM peak. The traffic analysis determined that within approximately ten years a signalized intersection would not be able to achieve an acceptable LOS for the projected traffic volumes. Therefore, a grade-separated interchange is recommended. Three grade-separated interchange options will be carried forward for further evaluation. They include the conventional tight diamond, trumpet type B, and directional 3-level flyover. (The directional 3-level flyover would have higher construction costs and more complicated constructability. However, this interchange form could provide some phasing advantages and shall also be analyzed in greater detail.)

S.7 PROJECT PRIORITIZATION

Based on the results of the corridor study it is recommended that the highest corridor improvement priority is widening the existing SH 133 bridge over the Roaring Fork River. The existing bridge is a traffic bottleneck causing significant delay and queuing on both SH 133 and SH 82. Ideally this bridge widening could be planned and designed as the first phase of construction for a grade-separated interchange. The SH 133 roadway corridor would be the next recommended improvement after the SH 133 and SH 82 intersection is improved. The reconstruction of SH 133 between Cowen Drive and Main Street is the second highest priority. The third corridor priority would be the reconstruction of SH 133 between Main Street and Meadowood Drive.

S.8 ENVIRONMENTAL RESOURCES

The environmental overview demonstrated the proposed improvements should consider environmental effects in five areas:

- Limited encroachment with the Roaring Fork River, jurisdictional wetlands, and roadside ditches
- Fishing opportunities in the Roaring Fork and Crystal Rivers, as well as, potential bald eagle nesting and roosting areas
- Recreational resources like Hendrick Ranch Park and River Valley Ranch Park
- Single and multi family homes adjacent to the SH 133 roadway that are potentially sensitive to increases in noise levels
- Cultural resources such as the existing Chamber of Commerce Building
- Disproportionate effects on low income and/or minority populations

The SH 133 improvements would likely be categorized as a Categorical Exclusion (CE). The project is proposing Right-of-Way acquisition only at the certain intersections for right and left-turn lane movements. All other improvements are proposed within existing Right-of-Way Impacts to Section 4(f), wildlife, wetlands, and cultural resources, and hazardous materials are not expected. In addition, public opposition to the project is not expected. Effects on noise sensitive land uses, environmental justice (EJ) analysis, and recreational land uses will require study. Potential impacts to historic resources depend on the historic eligibility of the Local Historic Society/Chamber of Commerce building. CE's generally take 3-6 months to complete. If the scope of the project changes significantly and impacts to environmental resources are expected, documentation with an Environmental Assessment (EA) would be required.

The construction of a grade separated interchange at SH 133 and SH 82 would likely be categorized as an EA. The EA will need to clearly demonstrate that the socioeconomic, natural, physical, and cultural environments are not "significantly" impacted. If no significant impacts are documented, a Finding of No Significant Impact (FONSI) will be prepared and a location/design acceptance will be granted by the lead federal agency. EA/FONSI's generally take 1-2 years to complete.

S.9 PROGRAMMING COST ESTIMATES

Programming cost estimates were prepared based on the conceptual roadway design plans. The conceptual roadway design plans are shown in Appendix B. The cost estimates and quantity information is provided in Appendix F. A summary of the overall anticipated corridor costs is shown in Tables S.1 and S.2.

Table S.1
SH 133 Roadway Corridor
(Cowen Drive to Meadowood Drive)
Programming Cost Estimate

Roadway Corridor	Estimated Costs (millions)
Construction Elements	$ 8.9
Engineering	$ 0.8
Right-of-Way	$ 0.2
Utility Relocations	$ 0.6
Construction Engineering	$ 1.2
Contingencies	$ 0.8
Total Project Cost:	**$12.5**
Potential Additional Project Elements:	
RFTA Trail Underpass	$ 0.3
Undergrounding Overhead Utilities	$ 2.0

Table S.2
SH 133 and SH 82 Conventional Tight Diamond Interchange Programming Cost Estimate

Interchange	Estimated Costs (millions)
Construction Elements	$17.1
Engineering	$ 1.5
Right-of-Way	$ 0.1
Utility Relocations	$ 0.6
Construction Engineering	$ 2.2
Contingencies	$ 1.5
Total Project Cost:	**$23.0**

The programming cost estimate to widen the existing SH 133 bridge over the Roaring Fork River is shown in Table S.3.

Table S.3
SH 133 Bridge Over Roaring Fork River Widening Programming Cost Estimate

Element	Estimated Costs (millions)
Construction Elements	$ 3.2
Engineering	$ 0.3
Right-of-Way	$ 0.1
Utility Relocations	$ 0.2
Construction Engineering	$ 0.4
Contingencies	$ 0.6
Total Programming Cost:	**$ 4.8**

S.10 NEXT STEPS

To achieve the goals of the *SH 133 Corridor Feasibility Study*, the following next steps shall be completed.

- Use the SH 133 Access Management Plan to coordinate improvements by private developments.
- Pursue inclusion of the project in the regional transportation plan, the statewide transportation plan, the State Transportation Improvement Program (STIP), and the Transportation Improvement Plan (TIP).
- Complete a detailed interchange feasibility study at SH 133 and SH 82 to determine a recommended configuration, and phasing plan for construction.
- Develop a Transportation Demand Management (TDM) program to identify opportunities to reduce traffic growth.
- Pursue funding initiatives to widen the existing bridge over the Roaring Fork River as an early action project.
- Once project funding is identified and available complete the appropriate National Environmental Policy Act (NEPA).
- Environmental documentation and prepare construction plans. The construction plans would then be bid and the recommended improvements constructed.

Table of Contents

1.0 INTRODUCTION

The Town of Carbondale in partnership with the Colorado Department of Transportation (CDOT) is preparing a corridor feasibility study for State Highway (SH) 133 between SH 82 and Meadowood Drive (milepost 68.45 to 66.46), approximately 2.0 miles. The overall purpose of the feasibility study is to review the current and projected traffic conditions and make corridor improvement recommendations. This document is the Access Management Plan and corresponds to the improvements outlined in the *SH 133 Corridor Feasibility Study*. The SH 133 intersection with SH 82 was included in the feasibility study, but is not included in the Access Management Plan because it is proposed to be grade separated in the future. A separate interchange management plan would be required for a new interchange. The project area is shown on Figure 1.

The SH 133 Access Management Plan was developed in accordance with the *State of Colorado State Highway Access Code,* effective August 31, 1998. The plan provides the Town of Carbondale and CDOT with a comprehensive roadway access design plan for SH 133 with the purpose of bringing that portion of SH 133 into conformance with its functional need to the extent feasible given existing conditions. The goals of the plan are to achieve optimal balance between state and local transportation planning objectives and preserve and support the current and future functional integrity of the highway.

The plan provides guidance for agency review and decisions regarding access permit applications and future access decisions. This plan evaluates existing and proposed access points along the highway and recommends appropriate modifications. The purpose of the plan is to:

- Improve traffic flow
- Improve traffic safety
- Reduce traffic conflicts
- Provide appropriate access to adjacent land uses

Figure 1
Vicinity Map

2.0 ACCESS MANAGEMENT ANALYSIS

Currently, several accesses along the SH 133 Corridor do not meet *State Highway Access Code* requirements. There are numerous private accesses along the corridor that are not controlled (stop sign or traffic signal) creating both operation and safety concerns for vehicles entering SH 133. Wide driveways currently exist due to the absence of curb and gutter creating unsafe operational conditions. The SH 133 Access Management Plan reduces the number of traffic conflicts, improves traffic flow and safety, and brings SH 133 into compliance with the *State Highway Access Code*, to the extent feasible given existing conditions.

State roadways are classified in accordance with the *State Highway Access Category Assignment Schedule*, January 18, 2001. SH 133 is classified as a Non-Rural Arterial (NR-B) category from 1,257 feet north of Roaring fork Drive to 32 feet north of Village Drive. From 517 feet south of Meadowood Drive to 1,257 feet north of Roaring fork Drive SH 133 is classified as a Non-Rural Principle Highway (NR-A). The access classification limits are shown on Figure 1. CDOT and the Town of Carbondale have agreed to these access classifications.

2.1 COLORADO DEPARTMENT OF TRANSPORTATION PROCESS

The SH 133 Access Management Plan is being written in accordance with the *State Highway Access Code*. Access to properties on SH 133 may be provided from the local adjacent street network if feasible. CDOT does have the ability to modify existing accesses for safety and operational reasons and the recommended access may be restricted to something less than currently exists. Change of access is covered by the *State Highway Access Code*, Volume 2 Code of Colorado Regulations 601-1 Section 2.6 “Changes in Land Use and Access Use.” Paragraph (7):

> *The Department or issuing authority may, when necessary for the improved safety and operation of the roadway, rebuild, modify, remove, or relocate any access, or redesign the highway including any auxiliary lane and allowable turning movement. The permittee and or current property owner will be notified of the change. Changes in roadway median design that may affect turning movements normally will not require a license modification hearing as an access permit confers no private rights to the permittee regarding the control of highway design or traffic operation even when that design affects access turning movements.*

2.2 ACCESS MANAGEMENT CRITERIA AND GUIDELINES

2.2.1 State Highway Access Code Criteria

The access category NR-A was used to classify the section of SH 133 from Meadowood Drive to Weant Boulevard. The access granting requirements for NR-A roadway categories are as follows:

- One access shall be granted per parcel if reasonable access cannot be obtained from the local street or road system.

- The desirable spacing for all intersecting public ways and other accesses that will be full movement, or have the potential for signalization, is one-half mile intervals. Exceptions to this one-half mile standard may be permitted when there is no other reasonable alternative.
- Left turns in (3/4 movement) may be allowed at accesses if the addition of left turns will improve operation at an adjacent full-movement intersection, and meet appropriate design criteria, and significant operational or safety problems would not occur.
- Additional right turn only access shall be allowed where required acceleration and deceleration lanes can be provided, would relieve an identified congestion condition on the local street or road system, would not be detrimental to the safety and operation of the highway, and the additional access would not knowingly cause a hardship to an adjacent property or interfere with the location, planning, and operation of the general street system.

The access category NR-A, auxiliary lane requirements are as follows:

- The posted speed is 40 miles per hour (mph) and a design speed of 40 mph was used.
- Left-turn deceleration lanes are equivalent to the deceleration length plus the storage length. The deceleration length for the 40 mph design speed is 370 feet long. The taper length (13.5:1 ratio) is included within this length.
- Right-turn deceleration lanes are equivalent to the deceleration length required. The deceleration length for the 40 mph design speed is 370 feet long. The taper length (13.5:1 ratio) is included within this length.
- Acceleration lanes are equivalent to the acceleration length required. The acceleration length for the 40 mph design speed is 380 feet long. The taper length (13.5:1 ratio) is included within this length.

The access category NR-B was used to classify the section of SH 133 from Weant Boulevard to Village Drive. The access granting requirements for NR-B roadway categories are as follows:

- One access shall be granted per parcel if it does not create safety or operational problems. The access will provide, as a minimum, for right turns only. The access may have left turns in (3/4 movement) if the addition of left turns will improve operation at an adjacent full-movement intersection and meet appropriate design standards, unless significant operational or safety problems would occur.
- Where it is shown that the location will be able to meet appropriate design criteria, full-movement access shall be granted at one-half mile spacing, or where a signal progression analysis indicates good progression of 30 percent efficiency or better, or does not degrade the existing signal progression.
- Additional right turn only access shall be allowed where required auxiliary lanes can be provided. Additional right turn only access may be allowed when it would relieve an identified congestion condition on the local street or road system which cannot be

improved, and the parcel size or trip generation potential requires additional access to maintain good highway traffic and land use design. An additional access must show that it would not knowingly cause a hardship to an adjacent property or interfere with the location, planning, and operation of the general street system.

The access category NR-B, auxiliary lane requirements are as follows:

- The posted speed is 35 mph and a design speed of 35 mph was used.
- Left and right turn deceleration lanes are equivalent to the storage length plus the taper length (10:1 ratio).
- Acceleration lanes are equivalent to the acceleration length required. The acceleration length for the 35 mph design speed is 270 feet long. The taper length (10:1 ratio) is included within this length.

2.2.2 General Guidelines

In addition to the State Highway Access Code criteria general design guidelines were developed as follows:

- Where two accesses are close together (acceleration lane overlaps with deceleration lane) a continuous auxiliary lane was used between the accesses to improve roadway consistency, safety, and to maintain curb and gutter continuity.
- Single resident accesses were designed to allow right-in and right-out turning movements.
- Future developments were considered when determining future improvements.
- The turning radius of each access was designed to accommodate the largest vehicle using the access on a daily basis; in most cases that vehicle was a semi-truck and trailer.
- A U-turn was typically provided within approximately 0.5 mile of the accesses limited to right-in/right-out. This ensures that no more than 1 mile of out-of-direction travel occurs.
- School buses and trucks would not be able to make U-turns because of geometric constraints. These vehicles would have to turn around on one of the roads intersecting SH 133.

2.3 PUBLIC INVOLVEMENT

The SH 133 Access Management Plan follows the same process as that for a control plan. The *State Highway Access Code* requires that at least one advertised public meeting be held during the development phase of an access control plan.

This plan has been developed based on input from CDOT, the Town of Carbondale, and the public. Letters outlining the corridor feasibility and access management studies were sent to each property owner to solicit input. Individual meetings with the property owners were held on

December 12, 2001. A total of twelve property owners attended the meetings. Appendix C includes the letter, mailing list, and meeting contact reports.

In addition to the individual meetings a Public Open House was advertised and held on the evening of December 12, 2001. A second Public Open House was held on May 8, 2002 to present the study conclusions and recommendations. The comments received at the two open houses were incorporated into the final recommended improvements. The Access Management Plans are shown in Figure 3 and the conceptual roadway design plans are in Appendix B.

2.4 RECOMMENDED ACCESS MANAGEMENT PLAN

The SH 133 Access Management Plan was completed concurrently with the SH 133 conceptual roadway design. The existing accesses and proposed accesses are shown in Table 1 and illustrated in the access management plans shown in Figure 3. Table 1 shows the business or street name of the access and the owner of the access if applicable, the address of the access, the existing access configuration, and the proposed access configuration. The proposed access configuration is based on the traffic analysis completed for the corridor feasibility study.

2.4.1 Proposed Improvements

The recommended roadway improvements include complete reconstruction and widening to add one general-purpose lane to SH 133 in each direction. Curb and gutter would be installed on both sides of the road for the entire length of the project. A raised curbed median is recommended along the project corridor for access control. The Town of Carbondale Planning Department and Citizens Task Force requested that the raised median be eliminated south of Main Street to Meadowood Drive.

It is recommended that the Sopris Avenue/Hendrick Road intersection be modified to align the roadway approaches with each other. The realignment will improve pedestrian mobility and safety while improving vehicular operation. The construction will require the acquisition of some right of way from the northwest corner of the intersection.

It is recommended that a frontage road connection be completed to the west of SH 133 opposite the Cowen Drive intersection. The completion of this roadway will allow for access to several properties off of a frontage road along the back of the parcels and eliminates six full movement accesses along SH 133. Right-in/right-out access may continue to be allowed at certain locations.

There are several residential properties in close proximity to the existing roadway along the east side of SH 133 between Weant Boulevard and Roaring Fork Avenue. A one-way frontage road is proposed in this location. The frontage road will reduce the number of direct accesses from SH 133. Another potential improvement is the extension of Roaring Fork Avenue to connect with Snowmass Drive. This extension will provide an alternative access to the rear of four residential properties in this area.

Traffic signals are proposed at the following locations:

- Cowen Drive - Potential signalized intersection if frontage road connection is constructed on west side of SH 133.

- Delores Way
- Nieslanik Avenue and/or Industrial Place
- Main Street
- Sopris Avenue/Hendrick Road - Proposed intersection realignment to be opposite each other.
- Snowmass Drive
- Meadowood Drive

The installation of traffic signals requires meeting signal warrants in accordance with the *Manual of Uniform Traffic Control Devices* and approval from CDOT. Several of the recommended intersection locations would not require signalization until future traffic growth occurs and the assumed development and/or geometric improvements are completed.

2.4.2 Progression Analysis

Progression along SH 133 was analyzed using the SYNCHRO software. The quality of progression was used as a measure of effectiveness. The *State Highway Access Code* states for a NR-B classification that full-movement access shall be granted at one-half mile spacing or where signal progression analysis indicates good progression of 30 percent efficiency or better or does not degrade the existing signal progression.

The SYNCHRO software optimized the corridor progression for the peak vehicle direction of travel. The southbound travel direction is optimized for the greatest benefit during the PM peak period. The northbound travel direction is optimized for the greatest benefit during the AM peak period. The signal progression efficiency for the SH 133 corridor is shown in Table 1. The time space diagrams are included in Appendix D.

Table 1
SH 133 Signal Progression Efficiency
(Meadowood Dr. to SH 82)

	Period	Cycle Length	NB Band	SB Band	Efficiency	
					NB	SB
Signal at Nieslanik Ave.	PM	130 sec.	29 sec.	48 sec.	22%	37%
	AM	110 sec.	36 sec.	29 sec.	33%	22%
Signal at Industry Place	PM	130 sec.	21 sec.	45 sec.	16%	35%
	AM	110 sec.	36 sec.	23 sec.	33%	21%

Based on the quality of progression along the corridor, it is concluded that the signalization of Neislanik Avenue or Industrial Place does not have significant differences to the operations along the SH 133 corridor.

2.4.3 Access Recommendations

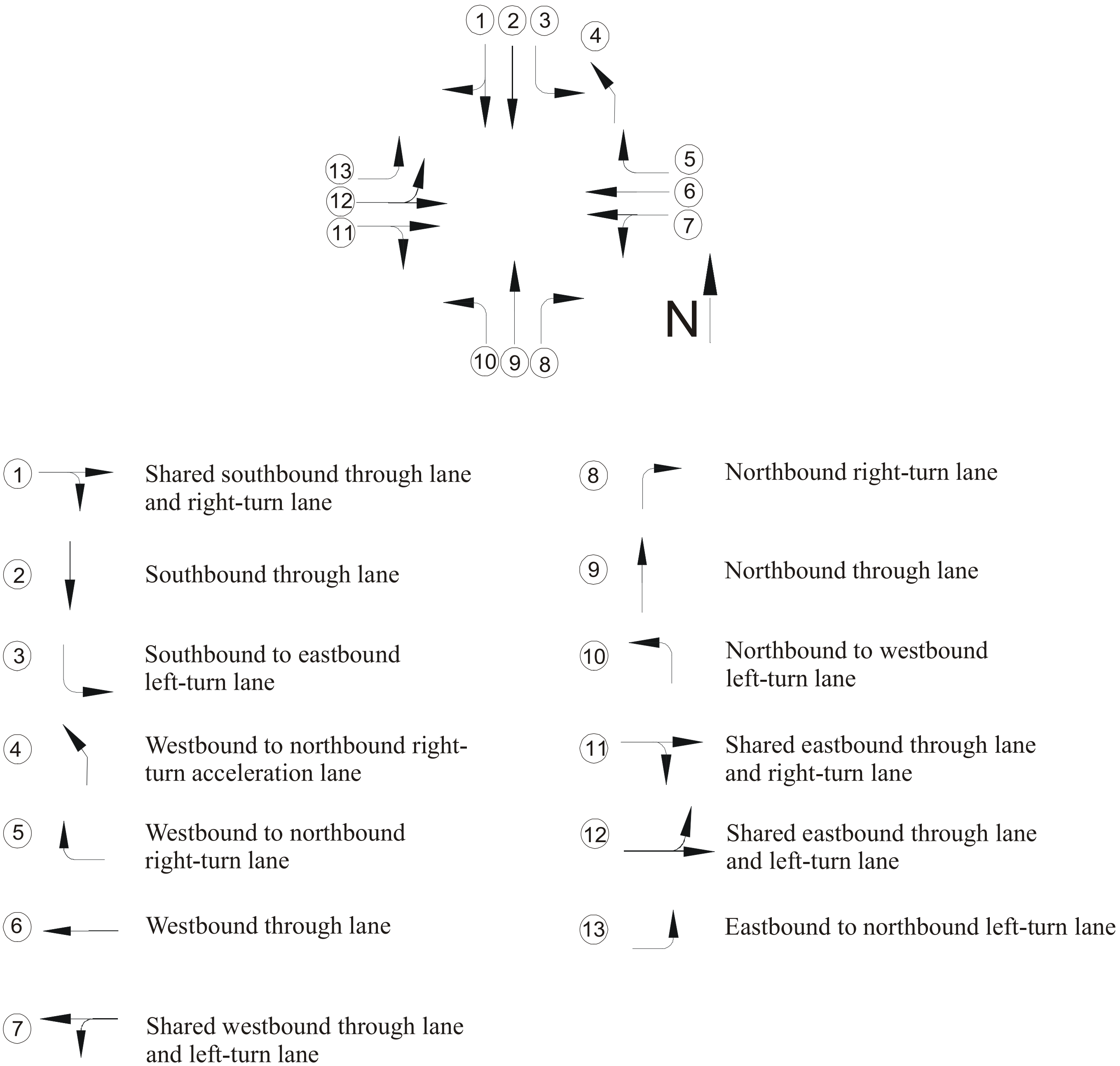
Variations of full, three-quarter, and right-in/right-out movements were used for the SH 133 Access Management Plan. Figure 2 illustrates the configuration used for each access. The vertical arrows represent SH 133 and the horizontal arrows represent the cross streets and corresponding accesses.

Full-movement access refers to the configuration where all directions of traffic are permitted to turn into and out of the access or roadway. Full-movement accesses are usually provided at public roads. A three-quarter-movement access at a tee-intersection permits all movements except the left-turn movement out of the access. A right-in/right-out access only permits right turns from the major roadway into the access and right turns out of the access, no left turns are provided.

2.5 FUTURE IMPLEMENTATION

The Town of Carbondale and CDOT will use the SH 133 Access Management Plan to provide guidance for agency review and decisions regarding access permit applications and future access decisions. It is anticipated that the recommended improvements identified in the *SH 133 Corridor Feasibility Study* will be completed as part of a future CDOT or Local Agency Highway Construction Project. During the course of these highway improvements, CDOT will initiate the appropriate procedures, permits, and agreements to achieve the access improvements recommended by this plan. Additional public involvement and design analysis would be completed as part of the preliminary design of the recommended roadway improvements.

Figure 2
SH 133 Access Configuration Legend



1	Shared southbound through lane and right-turn lane
2	Southbound through lane
3	Southbound to eastbound left-turn lane
4	Westbound to northbound right-turn acceleration lane
5	Westbound to northbound right-turn lane
6	Westbound through lane
7	Shared westbound through lane and left-turn lane
8	Northbound right-turn lane
9	Northbound through lane
10	Northbound to westbound left-turn lane
11	Shared eastbound through lane and right-turn lane
12	Shared eastbound through lane and left-turn lane
13	Eastbound to northbound left-turn lane

TO: CHRIS LEHRMAN

Vickie Walton

From: Matt Gardner
Sent: Tuesday, December 07, 2010 20:53
To: Vickie Walton
Subject: accidents

Vickie,

I checked thru 77 accidents in New World and 359 accidents in NETRMS for accidents in those locations. Here is what I found.

Hwy 133 @ Snowmass	4
Hwy 133 @ River Valley Ranch Dr.	2
Hwy 133 @ Roaring Fork Ave	2
Hwy 133 @ Hendricks Dr	3

I searched from 01-01-05 until 12-07-2010.

I included 133 and RF Ave because they are close to Snowmass and I also included RVR Dr and 133 because it is essentially 133 and Snowmass

Matt.

PS

It took about 2 hours to do this if they are wondering.

Southbound SH133 @ Snowmass Dr. (PM Peak)

Westbound Snowmass Drive @ SH 133 (PM Peak)

Westbound Snowmass Drive @ SH 133 (AM Peak)

Northbound SH133 @ Snowmass Dr. (PM Peak)

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Traffic & Safety Section

222 South 6th Street, Room 100
Grand Junction, Colorado 81501
(970) 683-6287 Fax: 970-683-6290

Date: October 12, 2010
To: City/County Transportation Officials
From: Alisa Babler
Permit Unit Engineer
Subject: CDOT Region 3 Intersection Analysis and Prioritization Request for Applications

CDOT Region 3 Traffic and Safety (CDOT) has commissioned Fehr and Peers to complete the Intersection Analysis and Prioritization Study. The intent of this study is to update the study done in 2007, develop a methodology, and prioritize intersection improvements for the use of the TPR and CDOT in a multi-year funding program. Up to three intersections per county will be analyzed in-depth and ranked, to assist in developing priorities for CDOT and the TPR. The study will analyze the intersections, identifying long and short term improvements to address deficiencies, and recommend prioritization for future funding.

At this time we are requesting intersection applications for the study. Intersections for consideration should have safety or operational issues and be located on the state highway system. We are requesting that counties submit up to three intersections for inclusion in the study. Additionally, please provide the application packet to cities within your respective county for additional submittals by the city if desired. All intersections submitted will be compiled and an initial evaluation done to establish the top three intersections in the county for an in-depth analysis and inclusion in the study. Intersections not included in the in-depth analysis will be provided as a list in the appendix for future reference.

Any supporting data and documentation available, as it relates to the intersection, will be useful in determining applicable improvements and the final priority of the intersection. The application should include as many specifics as possible regarding deficiencies of the intersection, time of day, impacts of weather, geometric constraints, right of way constraints, crash history, and any other site specific information available.

Please provide your applications no later than **December 15, 2010.** Completed applications should be sent to:

Emily Gloeckner, P.E.
Fehr & Peers Transportation Consultants
621 17th Street, Ste. 2301
Denver, CO 80293
E.Gloeckner@fehrandpeers.com

Phone: 303-296-4300
Fax: 303-296-4302

Thank you for assisting us in the development of this program. Should you have any questions, please feel free to contact the CDOT project manager, Alisa Babler at 970-683-6271 or the Fehr & Peers project manager, Emily Gloeckner, at 303-296-4300.

Region 3 Intersection Analysis and Prioritization Intersection Application

Requesting Agency

Agency Name	Town of Carbondale
Contact Person	Larry Ballenger
Title	Public Works Director
Email	larryb@sopris.net
Phone Number	970-963-1307
Mailing Address	511 Colorado AvenueCarbondale, CO 81623

Intersection Location			
Highway (example, US 50)	SHW 133		
Highway Milepost	67.50		
Local Cross Street name	Hendrick Drive		

Is the Cross Street (check one) [✓ Public ROW] Private Drive Other

Intersection Information

Type of Intersection (check one)	Signal	[✓ Minor St Stop]	All Way Stop	Other:
Nearby Driveways	[✓ Yes:] Distance between intersections: Approximately 175' to Sopris Ave. (to the North), and 400' to South 8th St. (to the South).			No
Traffic Mix (check all that apply)	[✓ Trucks]	[✓ Pedestrians]	[✓ Bicycles]	Other:
Intersection Issues	Please describe the types of safety or operational issues at the intersection.			
Safety Issues:	Please refer to Sections 4 and 5 of the attached Pedestrian Crosswalk Traffic Control Assessment prepared for this intersection by TurnKey Consulting, LLC in November of 2007. TurnKey performed a pedestrian gap assessment of the HW133 and Hendrick Drive during peak morning and evening hours on two separate dates during this school year. As you can see in the report, TurnKey concluded that a School Crossing Signal was warranted based on the requirements in Section 4C.06 of the MUTCD CDOT has previously reviewed this intersection and determined that intersection improvements (including a traffic signal) were warranted consistent with the recommendations set forth in the SH 133 Corridor Feasibility Study (PBS&J, 2002). Additionally, there have been three traffic accidents reported to the Carbondale Police Department in the last 5 years (see attached data report).			
Operational Issues:	Please refer to Section 7 of the aforementioned Pedestrian Crosswalk Traffic Control Assessment. TurnKey concludes that there “are not sufficient gaps in the existing SH-133 travel stream to allow the high number of pedestrians to cross”. The existing crossing location currently employs warning signs and flashers, temporary reduced speed zones as well was school crossing guards in an attempt to improve pedestrian safety. As you can see, these measures are insufficient and a comprehensive intersection improvement consistent with the Corridor Feasibility Study (PBS&J, 2002)and the attached CDOT Construction Bid Plans. (Federal Aid Project No C133A-036) is required to improve pedestrian safety.			

Intersection Deficiencies

Please provide a brief description of the existing intersection deficiencies and associated safety concerns, including time of the concerns (day of the week/hour(s)/seasons/time/weekday/weekend/holiday/etc):

As previously mentioned within this application, CDOT has formally investigated the HW 133 and Hendrick/Sopris intersection and determined that warrants for signal had installation had been met. The attached Pedestrian Crosswalk Traffic Control Assessment provides the background information regarding insufficient traffic gap lengths for safe pedestrian crossing. While TurnKey observed the peak pedestrian traffic between the hours of 5 and 6 pm, the counts were taken during the months of September and October of 2007. Statements from the crossing guards employed to assist with safe pedestrian crossings yield that pedestrian and bicycle traffic increases in the spring time, as the temperatures begin to become more pleasant. Specifically, the crossing guards have witnessed and increase in school related pedestrian activity in the spring during the morning and afternoon peak hours (7-8 am and 3-4 pm respectively).

The Corridor Fesibilty Study (PBS&J, 2002) recommends Hendricks Drive and Sopris Avenue be realigned to form a single intersection in the future.
The realigned Sopris and Hendrick intersection was recommended to be signalized because the crosswalk at the intersection serves a significant number of pedestrians including children crossing for school and to provide additional full-movement access to the Town’s local street network. While the current CDOT plans attached are for signalization of Hendrick Drive only, the Town feels that realignment of Sopris Avenue may be warranted to satisfy the recommendations of the Feasibility Study.

Mitigation

Please provide a brief description of possible mitigations, improvements, and/or projects to mitigate the safety concerns at the intersection:

The proposed mitigation solution to improve pedestrian safety for the SH 133 and Hendrick Drive intersection is to implement and install the traffic signal and associated intersection improvements recommended by the attached Corridor Feasibility Study. Specific designs for these improvements can be found within the attached CDOT Construction Bid Plans for the HW 133 and Hendrick Dr. intersection, dated 5/7/2009.

Are there any existing plans for improvements for this intersection? [✓ Yes]/No. If yes, please explain:

Please refer to the attached CDOT Construction Bid Plans for this intersection Construction Project Code No. 16847

Are any additional funding sources available for this project: [✓ Yes]/No. If yes, please explain:

The Town of Carbondale would like to treat this project as a Local Agency project. Associated matching fund requirements can be met

Does this intersection have impacts to adjacent intersections, roadways, etc? If yes, please explain:

None

Additional Information

To assist in analyzing the intersection please attach the following information if available/applicable:

- Accident data, including police reports if available
- Traffic Volumes, such as AADT/ADT, peak hour volumes, peak hour turning movement counts
- Traffic Studies
- Pedestrian Counts
- Bicycle Counts
- Existing signal timing or Synchro files
- Existing construction plans
- Survey data
- Aerial photos
- Photographs of the intersection
- Right of Way maps
- Any other data/documentation to assist in analyzing the intersection

List of Attachments:

*Pedestrian Traffic Control Assessment; TurnKey Consulting, LLC; 2007
*CDOT Highway Construction Bid Plans; CDOT 2009
*Construction Cost Estimate SH133/Hendrick Signal Installation; CDOT, 2009
*Email containing vehicle accident counts from Carbondale Police Department

Pedestrian Crosswalk
Traffic Control Assessment

Prepared For:

Carbondale Crosswalk

SH-133 @ Mile Post 67.50
Near Hendrick Drive

Carbondale, Colorado

COLORADO REGISTERED PROFESSIONAL ENGINEER
BARRIE L. HUDSON, JR.
35278
11-19-07

November 19, 2007

587½ Grand Cascade Way
Grand Junction, CO 81501
970-985-4001

TurnKey
Consulting, LLC

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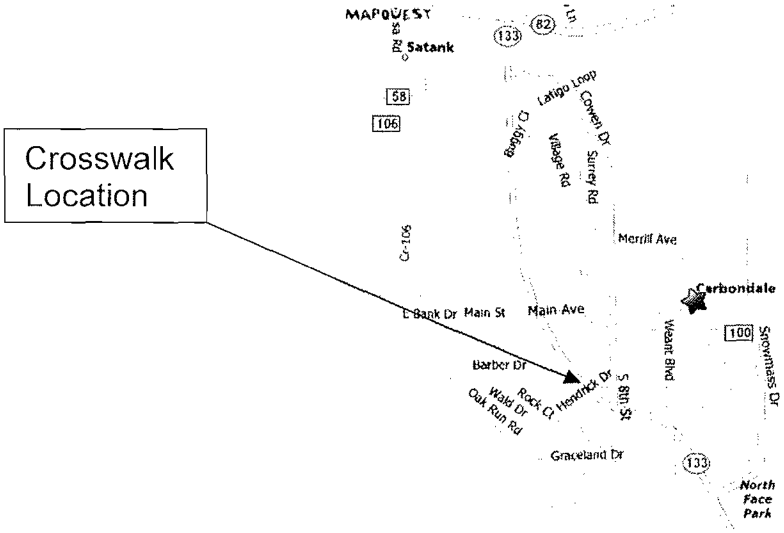
1 Introduction & Executive Summary

This report summarizes the results of a traffic control assessment associated with the existing unsignalized pedestrian crosswalk in Carbondale, CO. The crosswalk is located in Carbondale on SH-133 near Hendrick Drive (milepost 67.50). Due to the high volume of traffic on SH-133, and the high volume of pedestrians at this location, the Town of Carbondale requested an evaluation of different traffic control options. TurnKey Consulting collected appropriate traffic data and evaluated warrants for different types of crosswalk traffic control.

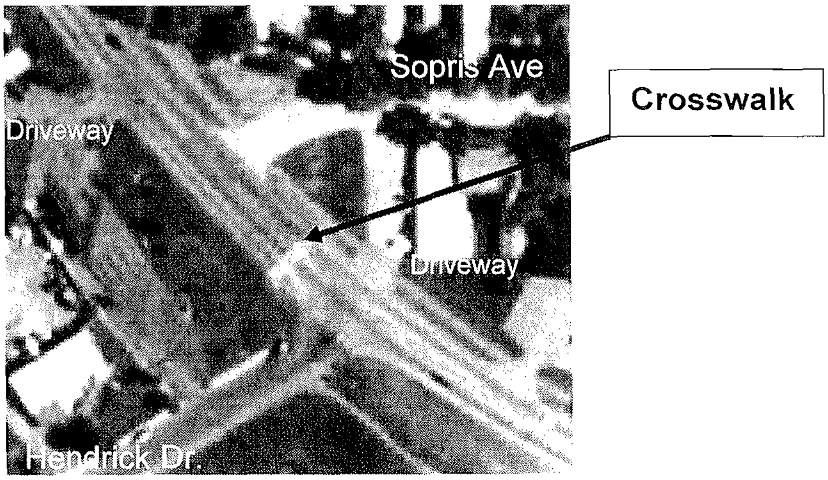
2 Existing Crosswalk Characteristics

The existing crosswalk is located between Sopris Avenue and Hendrick Drive

Vicinity Map



Aerial View



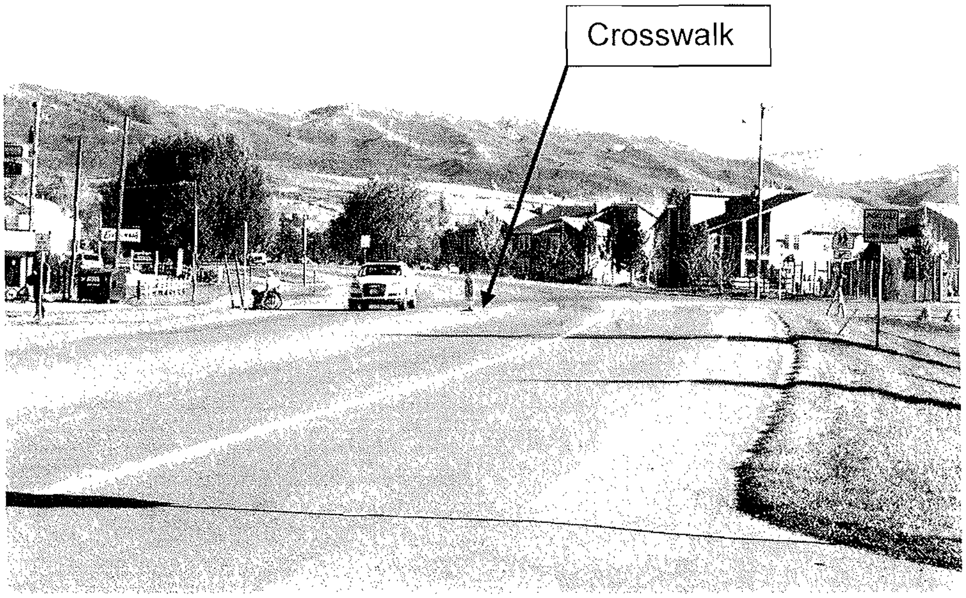
SH-133 Information at Crosswalk

- Functional Classification: Other Principal Arterial – Urban
- Speed limit = 35 mph
- Southbound Lanes: 1 through & 1 right-turn deceleration lane (to Hendrick Dr.)
- Northbound lanes: 1 through
- Median: 8-ft wide painted
- Shoulders: 4-ft wide paved
- Superelevation approximately 3% across all lanes
- 2006 AADT: 11,000 vehicles per day
- Estimated Peak Hour volume, two-way: 990 vehicles per hour (9% factor)

Crosswalk & Pedestrian Information

- Crosswalk Length: 60-ft
- Pavement markings: Yes (standard)
- Signing: Yes (standard)
- Advance speed reduction: Yes, school walking periods only, 25 mph
- Sidewalk connectivity: Yes – both sides
- Weekday Crossing Volumes (two-way):
  - AM Peak = 49 pedestrians (1 count)
  - Noon Peak = 43 pedestrians (1 count)
  - PM Peak (5-6 pm) = 60 pedestrians (ave of 2 counts)
- Type of crossing groups: predominately single row

SH-133 at Crosswalk – Looking South



3 Data Collection

TurnKey Consulting and Newland Project Resources collected traffic and pedestrian data on two separate occasions. In addition, the appendix contains statement from the current crossing guard.

The first pedestrian count was conducted on 9/12/07. It included three separate two-hour counts to cover all possible peak periods (7-9am, 11am-1pm, and 4-6pm). The Counts included all pedestrians crossing SH-133 between Euclid Avenue (575-ft north of marked crosswalk) and 8th Street (450-ft south of marked crosswalk). The majority of crossings occurred at the marked crosswalk. This series of counts identified the peak hour as the period between 5pm and 6pm, in which 76 pedestrians crossed SH-133.

The second pedestrian count was conducted on 10/25/07 during the period between 4pm and 6pm. The second count was done for the same limits as the first count. The second count identified the peak hour as the period between 5pm and 6pm, in which 44 pedestrians crossed SH-133. Once again, the majority of crossings occurred at the marked crosswalk. The advanced warning flashing beacon and speed reduction ended at 4:30pm.

TurnKey Consulting obtained other important field data on 10/25/07.

- Distance measurements and photographs
- Observed pedestrian and vehicle behavior in and around the crosswalk
- Video documentation of time gaps between vehicles
- Measured crossing times
    - 34 crossing groups
    - Average crossing times = 13 seconds
    - Average crossing speed = 4.6 feet per second

4 Crossing Calculations

This section includes the calculations necessary to evaluate crossing treatment warrants.

Minimum Acceptable Gap (G)

Equation: $G = W/S + (N-1)H + R$

Where: G = Minimum safe gap (seconds)
W = Width of crossing distance = 60 feet
S = Walking speed = 4.6 fps
N = predominant number of rows in crossing groups = 1
H = time headway between rows (seconds) = 2 seconds
R = pedestrian startup time = 3 seconds

The Minimum acceptable gap (G) = 16 seconds

Number of Adequate Gaps

The following table shows the number of adequate gaps in the actual vehicle travel stream, based on observation of video documentation taken during the PM peak hour (5-6pm).

Gap (Seconds)	Number of Gaps
16	1
17	4
18	4
19	2
20	2
21	1
22	1
23	1
Total =	**16**

5 School Crossing Signal Warrant Assessment

The MUTCD Section 4C.06 “Warrant 5, School Crossing” states:

> *The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of school children at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the children are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 students during the highest crossing hour.*
>
> *The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 90 m (300 ft), unless the proposed traffic control signal will not restrict the progressive movement of traffic.*

Conditions at the Crosswalk - PM Peak Hour

- Number of adequate gaps = 16
- Number of minutes in period = 60
- Number of pedestrians crossing = 60 (average of two counts)
- Distance to nearest signal = greater than 300 feet

The crossing signal warrant is met, since 16 gaps are less than 60 minutes, and 60 pedestrians are more than 20, and there are not any signals within 300 feet.

6 Traffic Control Options

The MUTCD Section 4C.06 "Warrant 5, School Crossing" states:

> *Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.*

The crossing location already has warning signs and flashers, temporary reduced speed zones, and school crossing guards. Grade separation is not feasible to the density of adjacent land development and the closely spaced side roads and driveways. The pedestrian crossing users include students and non-student walkers. The peak hour of crossing is actually well after school hours (5-6 pm). This means that the majority of crosswalk users do not get the benefit of the temporary reduced speed limits, flashing beacons, or crossing guards. These safety features end at 4:30 pm. It is not recommended that the existing warning lights and speed reductions be made into full-time measures. The effectiveness of this approach would diminish over time, as drivers became accustomed to their constant presence. Therefore, it is necessary to identify a full-time traffic control measure that would be effective and safe.

6.1 Option 1 – Midblock Pedestrian Signal

The midblock signal would indicate green to traffic on SH-133, and would turn red upon pedestrian detection (push button). This option could have five different methods of signal operation.

Standard Operations (G-Y-R)
This approach would cycle through the standard green-yellow-red signal indications. It provides a controlled crossing. It would also removes conflicts with turning vehicles by providing a crossing location that is not associated with an intersection.

Flashing Red Operations (G-FR-R)
This approach would have a flashing red phase instead of a yellow phase. In addition to the benefits of the standard operation, the flashing red operations minimize the interruption of traffic progression (in a coordinated system). The crosswalk location would be an isolated signal and would not be part of a coordinated system.

Pedestrian Light Controlled (Pelican) Operations
Similar to the flashing red operations, this approach uses a flashing yellow instead of a flashing red indication. Drivers can proceed across the crosswalk during the flashing yellow if pedestrians are not present.

Pedestrian User Friendly Intelligent (Puffin) Operations
Similar to the Pelican operations, this approach uses electronic in-crosswalk detectors to identify when the crosswalk is occupied or not. Drivers can proceed across the crosswalk during the flashing yellow if pedestrians are not present.

Two Can Cross (Toucan) Operations
Similar to the Pelican or Puffin operations, this approach is used when there is an even mix of pedestrian and bicycle volumes.

6.2 Option 2 – Intersection Signal with Pedestrian Features

This type of signal could be located at the intersection of SH-133 & Hendrick Drive, which is located within 50 feet of the existing crosswalk location. TurnKey Consulting observed conflicts between vehicles and vehicles/pedestrians. Drivers on Hendrick Drive were more focused on gaps in the SH-133 travel stream than on possible pedestrians in the nearby crosswalk. Some vehicles started a left turn movement towards the crosswalk and then had to stop when they saw the pedestrian. Other drivers thought they had an adequate gap to make the left turn out of Hendrick Drive, but did not realize that the oncoming vehicles would quickly slow during the flashing reduced speed operation. The intersection signal option would resolve this conflict by controlling all traffic movements within the operation sphere of the crosswalk. This option would also help most of the pedestrians who use SH-133 crosswalk, since most of them also use the unsignalized crosswalk on Hendrick Drive.

This Study did not obtain the data necessary to conduct a full signal warrant study. However, it is possible that this intersection could meet additional signal warrants beyond just the School Crossing Warrant. TurnKey Consulting observed vehicles delays on Hendrick Drive in excess of 60 seconds during the PM Peak Hour. The queue on Hendrick Drive was usually 2-5 vehicles. This delay was caused by the lack of adequate gaps in the SH-133 travel stream. A detailed signal warrant study is recommended in order to fully investigate the intersection signal option.

If the intersection signal is considered, the project should include the closure of the existing driveway that creates a 4-leg intersection at Hendrick Drive. This driveway could be closed and the small commercial site would still have good access directly to Sopris Avenue, and then SH-133. The recommended 3-leg intersection would be less expensive than the 4-leg alternative, and it would provide better traffic operations and safety.

7 Conclusion

Alternate gaps and blockades are inherent in the traffic stream and are different at each crossing location. For safety, pedestrians need to wait for a gap in traffic that is of sufficient duration to permit reasonably safe crossing. When the delay between the occurrences of adequate gaps becomes excessive, pedestrians might become impatient and endanger themselves by attempting to cross the street during an inadequate gap.

This study had documented that there are not sufficient gaps in the existing SH-133 travel stream to allow the high number of pedestrians to cross. The amount of adequate gaps will only become fewer as time goes on and traffic volumes increase. In addition, the existing crosswalk is located in a confusing and conflicting traffic area. It is located between four closely spaced side roads and driveways with many turning movements.

It is clear that the existing traffic control treatments are not adequate for this crossing location. The Town of Carbondale and CDOT now have adequate information to consider some type of signalized pedestrian crossing. The signalized crossing could be a mid-block location or an intersection location. A traffic signal warrant study would be necessary in order to further consider the intersection signal option.

References:

1. Manual of Transportation Engineering Studies, 2000, ITE
2. Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), 2003 Edition, FHWA, ITE, AASHTO, ATSSA
3. Alternative Treatments for At-Grade Pedestrian Crossings, and informational report, 2001, Nazir Lalani & the ITE Pedestrian and Bicycle Task Force, ITE

Statements from Crossing Guard

Skip Hudson

From: Tom Newland [tomn@sopris.net]
Sent: Wednesday, November 14, 2007 4:33 PM
To: 'cody owen'
Cc: 'Skip Hudson'
Subject: RE: Hendricks/SH133 Crossing

Cody:

Thank, Cody. I am forwarding this email to my consultant, Turnkey Consulting, for use in the report.

Thanks again,

- Tom

From: cody owen [mailto:codyowen@sopris.net]
Sent: Wednesday, November 14, 2007 2:11 PM
To: 'Tom Newland'
Cc: spirit@sopris.net
Subject: RE: Hendricks/SH133 Crossing

#1

Tom,
From my observations, there are between 30 and 50 people crossing during the times that I am there, both morning and night for crossing guard. They are both pedestrians and bicyclists.

Since this is one of the heaviest used crosswalks in town I suspect that the total numbers for every day are easily 3 times that number. People are crossing here from the residential neighborhoods on the West side of SH 133 to go shopping at City Market and generally into town. They cross here since the sidewalk is only paved on the East side of SH 133. Senior housing is just 1 ½ blocks away which has 65 units and will be expanding in 2008. Many of these residents are users since they don't have a car. I also know of users who cross here from the East side of SH133 in order to take their dog to the dog park (of which I frequent) just 1 block away from the corner of Hendrick Drive and SH133.

Thanks again for your assistance,
Cody

From: Tom Newland [mailto:tomn@sopris.net]
Sent: Wednesday, November 14, 2007 11:46 AM
To: codyowen@sopris.net
Subject: Hendricks/SH133 Crossing

Cody:

This is to follow up with you on the pedestrian crossing at SH 133 and Hendricks Road.

My consultant, Skip Hudson, is preparing his report and it looks very favorable for a stop light. He would like to include your observations on the amount and frequency of people using the crosswalk.

Could you respond to this email with your thoughts and observations? Skip will be producing a draft by the end of the week and was hoping to include the information from your email in it.

From: Tom Newland [tomn@sopris.net]
Sent: Thursday, November 15, 2007 1:20 PM
To: 'Skip Hudson'
Subject: FW: SH 133 - Numbers for report

Skip:

Here's that info on school children

\- Tom

-----Original Message-----
From: spirit@sopris.net [mailto:spirit@sopris.net]
Sent: Thursday, November 15, 2007 10:12 AM
To: tomn@sopris.net
Cc: codyowen@sopris.net
Subject: SH 133 - Numbers for report

#2

Tom,
Cody has asked that I respond directly to you reguarding your inquiry of the number of CHILDREN that us the crosswalk durint the school year.

The number varies from day to day, mostly depending on the weather and the activities of each child for that day.

Generally, I feel confident that you can figure 25 children use the crosswalk each day in the morning and afternoon - during the cold weather months and 35 use it in the warm weather months. Suffice to say that we really notice a pick up in the numbers in the spring when more kids are walking and biking to school.

The number that Cody gave you before included other user (parents who escort their children on bicycles and ather adult users, etc.) As you can see, during the time that Cody is working as crossing guard, the numbers represented are mostly for the children.

If you have any questions, please don't hesitate to contact me again.

Jean

Jean Owen
Creative Consulting - Proposals and Reports
151 Quent Lane
Carbondale, CO 81623
(970)963-5664 home/work (970)355-9610 cell

Public Schools

Carbondale Community Charter School
1505 Satank Road
Carbondale, CO 81623
Roaring Fork Re-1 School District

Carbondale Elementary School
600 South 3Rd
Carbondale, CO 81623
Roaring Fork Re-1 School District

Carbondale Middle School
455 South 3Rd
Carbondale, CO 81623
Roaring Fork Re-1 School District

Crystal River Elementary School
160 Snowmass Drive
Carbondale, CO 81623
Roaring Fork Re-1 School District

Roaring Fork High School
180 Snowmass Drive
Carbondale, CO 81623
Roaring Fork Re-1 School District

Name: Carbondale Ped Crossing Study
Date: 9/12/2007
limits of counts Terri Newland 970-927-4645

Pedestrian Crossing Movements - Field Data

AM

Morning								
Time	Eastbound	Westbound	Time	Eastbound	Westbound	Time	Eastbound	Westbound
7:00 - 7:15 7	2	5	8:00 - 8:15 16	12	4			
7:15 - 7:30 6	1	5	8:15 - 8:30 5	4	1			
7:30 - 7:45 10	8	2	8:30 - 8:45 10	3	7			
7:45 - 8:00 18	14	4	8:45 - 9:00 2	2	0			

Peak = 7:45 - 8:45
Vol = 49

Name: Carbondale Ped Crossing Study
Date: 9/12/2007
limits of counts Terri Newland 970-927-4645

Pedestrian Crossing Movements - Field Data

Noon

Noon			Noon					
Time	Eastbound	Westbound	Time	Eastbound	Westbound	Time	Eastbound	Westbound
11:00-11:15 10	5	5	12:00 - 12:15 14	9	5			
11:15 - 11:30 4	1	3	12:15 - 12:30 8	5	3			
11:30 - 11:45 14	3	11	12:30 - 12:45 11	6	5			
11:45 - 12:00 7	3	4	12:45 - 1:00 6	0	6			

Peak = 11:30 - 12:30

Vol = 43

Name: Carbondale Ped Crossing Study
Date: 9/12/2007
limits of counts Tom Newland 927-4645

Pedestrian Crossing Movements - Field Data

PM

Afternoon			Afternoon					
Time	Eastbound	Westbound	Time	Eastbound	Westbound	Time	Eastbound	Westbound
			4:00 -4:15 9	1	8	5:00 - 5:15 19	2	17
			25 4:15 - 4:30 28	16	12	5:15-5:30 9	3	6
			4:30 - 4:45 10	4	6	5:30-5:45 30	16	14
			4:45 - 5:00 18	8	10	5:45 - 6:00 6	4	2

Peak = 4:45 - 5:45
Vol = 76

Name: Carbondale Ped Crossing Study
Date: 10/25/07
limits of counts

Pedestrian Crossing Movements - Field Data

↑ ↓

<table>
<tr><th colspan="3">Morning</th><th colspan="3">Noon</th><th colspan="3">Afternoon</th></tr>
<tr><th>Time</th><th>Eastbound</th><th>Westbound</th><th>Time</th><th>Eastbound</th><th>Westbound</th><th>Time</th><th>Eastbound</th><th>Westbound</th></tr>
<tr><td>7:00 - 7:15</td><td></td><td></td><td>11:00 - 11:15</td><td></td><td></td><td>4:00 - 4:15</td><td>||| ||
3 2</td><td>||| ||| ||||</td></tr>
<tr><td>7:15 - 7:30</td><td></td><td></td><td>11:15 - 11:30</td><td></td><td></td><td>4:15 - 4:30</td><td>||</td><td>||</td></tr>
<tr><td>7:30 - 7:45</td><td></td><td></td><td>11:30 - 11:45</td><td></td><td></td><td>4:30 - 4:45</td><td>卌
5</td><td>卌 |
6</td></tr>
<tr><td>7:45 - 8:00</td><td></td><td></td><td>11:45 - 12:00</td><td></td><td></td><td>4:45 - 5:00</td><td>|| |||| |
2</td><td>|| || |</td></tr>
</table>

Pedestrian Crossing Movements - Field Data

10/25/07

↑ ↓

Morning			Noon			Afternoon			
Time	Eastbound	Westbound	Time	Eastbound	Westbound	Time	Eastbound	Westbound	
8:00 - 8:15			12:00 - 12:15			5:00 - 5:15	ǀǀ ǀǀǀ ǀ	ǀ ǀǀǀ	10
8:15 - 8:30			12:15 - 12:30			5:15 - 5:30	ǀǀǀǀ	ǀ ǀǀ	7
8:30 - 8:45			12:30 - 12:45			5:30 - 5:45	𝍸	ǀǀǀǀ ǀǀ	11
8:45 - 9:00			12:45 - 1:00			5:45 - 6:00	ǀ 𝍸 ǀǀǀ	ǀǀ ǀǀǀ ǀǀ	16
									44

$$Ave = \frac{44 + 26}{2} =$$

Pedestrian
Row
DaTS

Pedestrian Crossing
Time Data

N

6.5 R
10.5
3.5 R
9.2
8.1
8.8
9.9
5.6 R
5.8 R
5.2

Av = 9.3 sec

$\frac{34 ft}{9.3 sec} \times \frac{3600 sec}{hr} \times \frac{1 mile}{5280 ft}$

2.5 mph

3.67 fps

M

ped 14.0 16.1
10.0 14.2
11.7
11.4 15.4
12.1 15.4
11.5 16.3
10.1 16.3
~~9.8~~ R 16.[illegible]
11.1 16.[illegible]
12.5 16.[illegible]
10.8
12.5
13.4
12.8
10.1
10.7
10.8
11.3
11.8

Converted from N+S

$\frac{3[illegible]}{27}$ = 12.95

say 13 sec

4.6 fps

Flashing Reduced Speed ends 4:30 P

25 mph → 35 mph

S

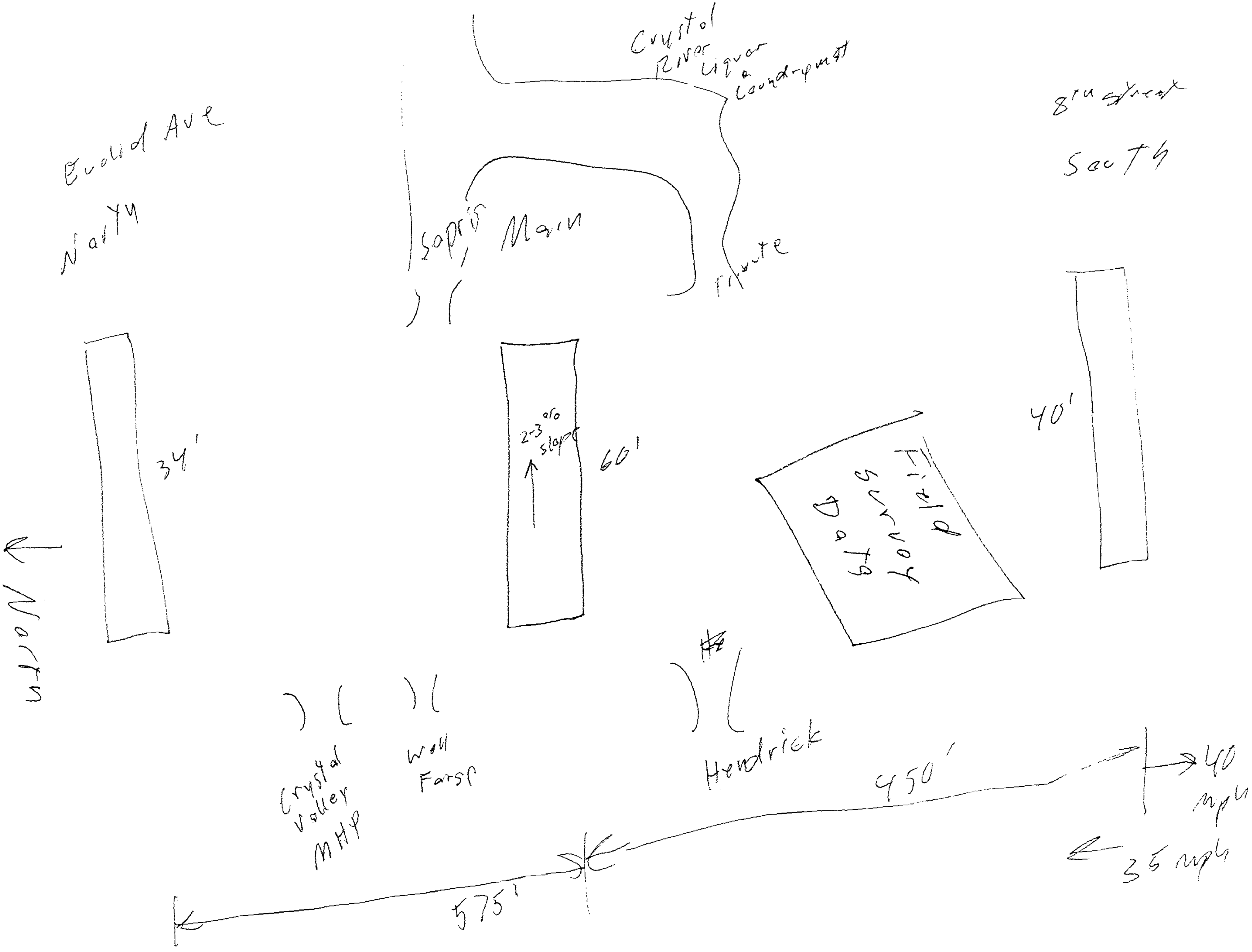
4.5 R
4.5 R
9.6
11.0

Av = 10.3

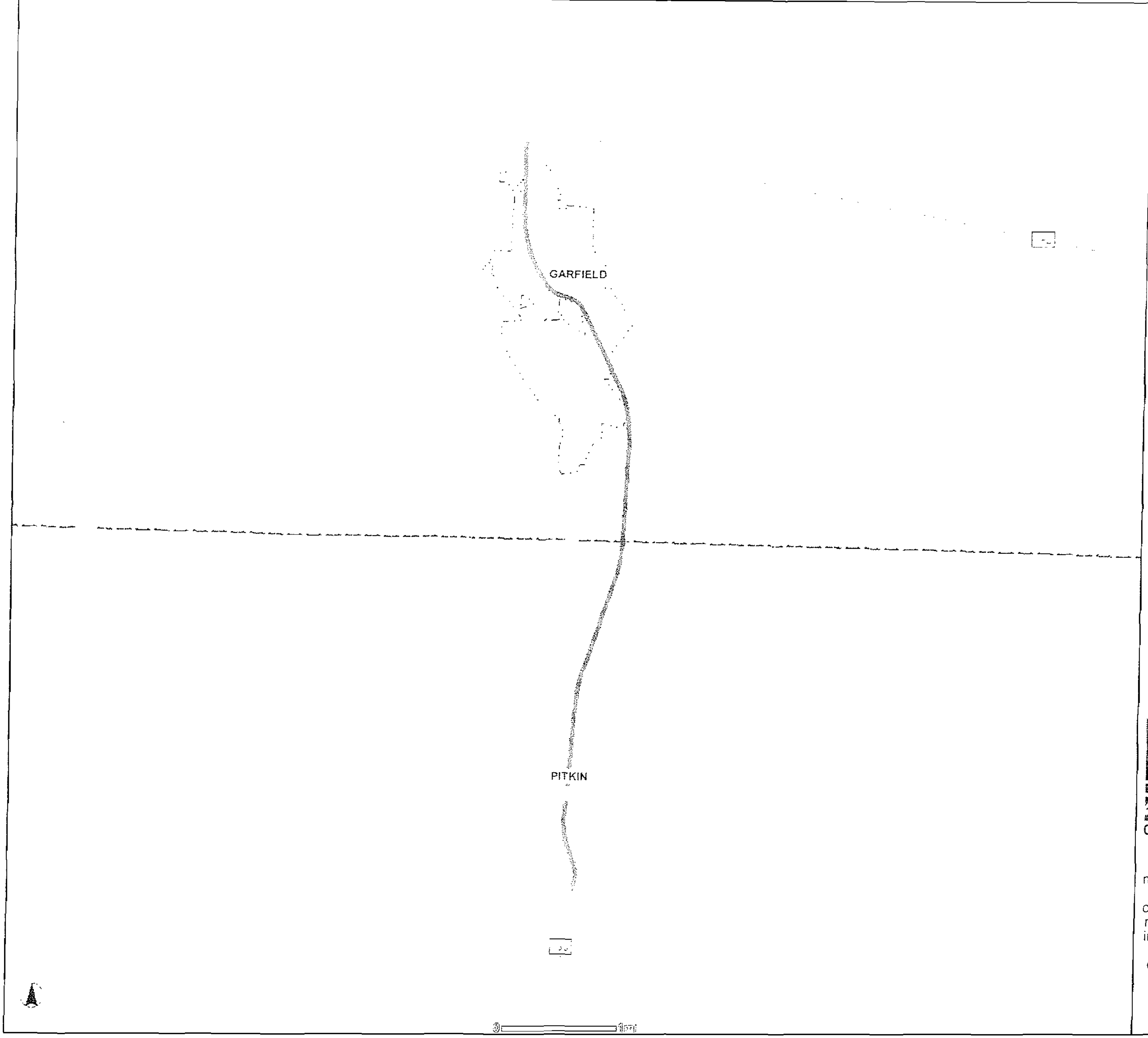
$\frac{40 ft}{10.3 sec} \times \frac{3600}{5280} = 2.65 mph$

[illegible]

Ped Crossing Time Data


Crystal River Liquor & Laundromat
Euclid Ave
North
8th Street
South
Sopris
Main
Route
34'
2-3% slope
60'
40'
Field survey Data
North
Crystal Valley MHP
Wall Farst
Hendrick
450'
575'
40 mph
35 mph

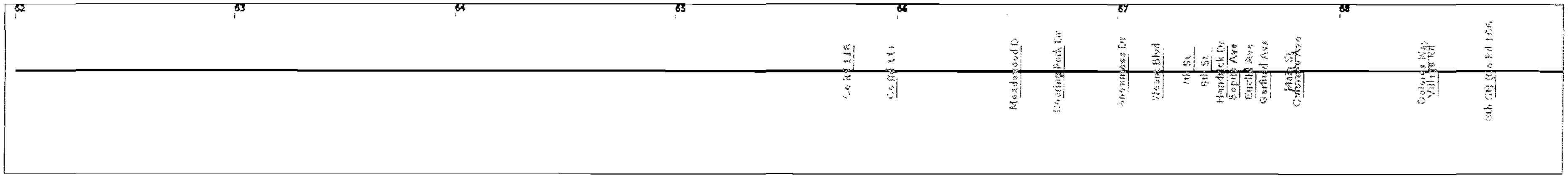
133A From 62 To 69



Colorado Department of Transportation

Map Created:
Wed Nov 14 10:09:05 2007

133A
From 62 To 69



Ramps

Overpass

Underpass

CLASSIFICATION

Functional Class	6 Minor Art-Rural	14 Other Pri Art-Urban	6		

GEOMETRICS

Through Lane Quantity	2				

SAFETY

Speed Limit	55	45	35		

TRAFFIC

AADT	3300	4200	7400	11000	18600
AADT Year	2006				
Peak Truck Percentage	2.2	1.5	.8	2	3.1
Year 20 Factor	1.47	1.48	1.54	1.58	
DHV	9				

It may appear that information is missing from the straight line diagram. If so, reduce the number of miles/page (Step 3) and re-submit the request.

Section 1A.09 Engineering Study and Engineering Judgment Standard:

This Manual describes the application of traffic control devices, but shall not be a legal requirement for their installation.

Guidance:
The decision to use a particular device at a particular location should be made on the basis of either an engineering study or the application of engineering judgment. Thus, while this Manual provides Standards, Guidance, and Options for design and application of traffic control devices, this Manual should not be considered a substitute for engineering judgment.

Engineering judgment should be exercised in the selection and application of traffic control devices, as well as in the location and design of the roads and streets that the devices complement. Jurisdictions with responsibility for traffic control that do not have engineers on their staffs should seek engineering assistance from others, such as the State transportation agency, their County, a nearby large City, or a traffic engineering consultant.

Section 4C.06 Warrant 5, School Crossing

Support:
The School Crossing signal warrant is intended for application where the fact that school children cross the major street is the principal reason to consider installing a traffic control signal.

Standard:
The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of school children at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the children are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 students during the highest crossing hour.
Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.
The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 90 m (300 ft), unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Guidance:

If this warrant is met and a traffic control signal is justified by an engineering study, then:

A. If at an intersection, the traffic control signal should be traffic-actuated and should include pedestrian detectors.

B. If at a nonintersecting crossing, the traffic control signal should be pedestrian-actuated, parking and other sight obstructions should be prohibited for at least 30 m (100 ft) in advance of and at least 6.1 m (20 ft) beyond the crosswalk, and the installation should include suitable standard signs and pavement markings.

C. Furthermore, if installed within a signal system, the traffic control signal should be coordinated.

Section 7A.03 School Crossing Control Criteria

Support:
Alternate gaps and blockades are inherent in the traffic stream and are different at each crossing location. For safety, students need to wait for a gap in traffic that is of sufficient duration to permit reasonably safe crossing. When the delay between the occurrence of adequate gaps becomes excessive, students might become impatient and endanger themselves by attempting to cross the street during an inadequate gap.

A recommended method for determining the frequency and adequacy of gaps in the traffic stream is given in the Institute of Transportation Engineers' publication, "School Trip Safety Program Guidelines" (see Section 1A.11).

Section 4K.03 Warning Beacon

Support:

Typical applications of Warning Beacons include the following:

A. At obstructions in or immediately adjacent to the roadway;
B. As supplemental emphasis to warning signs;
C. As emphasis for midblock crosswalks;
D. On approaches to intersections where additional warning is required, or where special conditions exist; and
E. As supplemental emphasis to regulatory signs, except STOP, YIELD, DO NOT ENTER, and SPEED LIMIT signs.

Standard:

A Warning Beacon shall consist of one or more signal sections of a standard traffic signal face with a flashing CIRCULAR YELLOW signal indication in each signal section.

A Warning Beacon shall be used only to supplement an appropriate warning or regulatory sign or marker. The beacon shall not be included within the border of the sign except for SCHOOL SPEED LIMIT sign beacons.

Warning Beacons, if used at intersections, shall not face conflicting vehicular approaches.

If a Warning Beacon is suspended over the roadway, the clearance above the pavement shall be at least 4.6 m (15 ft) but not more than 5.8 m (19 ft).

Guidance:

The condition or regulation justifying Warning Beacons should largely govern their location with respect to the roadway.

If an obstruction is in or adjacent to the roadway, illumination of the lower portion or the beginning of the obstruction or a sign on or in front of the obstruction, in addition to the beacon, should be considered.

Warning Beacons should be operated only during those hours when the condition or regulation exists.

Option:

If Warning Beacons have more than one signal section, they may be flashed either alternately or simultaneously.

A flashing yellow beacon interconnected with a traffic signal controller assembly may be used with a traffic signal warning sign (see Section 2C.29).

Section 4K.03 Warning Beacon

Support:

Typical applications of Warning Beacons include the following:

A. At obstructions in or immediately adjacent to the roadway;

B. As supplemental emphasis to warning signs;

C. As emphasis for midblock crosswalks;

D. On approaches to intersections where additional warning is required, or where special conditions exist; and

E. As supplemental emphasis to regulatory signs, except STOP, YIELD, DO NOT ENTER, and SPEED LIMIT signs.

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A Warning Beacon shall consist of one or more signal sections of a standard traffic signal face with a flashing CIRCULAR YELLOW signal indication in each signal section.

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Warning Beacons should be operated only during those hours when the condition or regulation exists.

Option:

If Warning Beacons have more than one signal section, they may be flashed either alternately or simultaneously.

A flashing yellow beacon interconnected with a traffic signal controller assembly may be used with a traffic signal warning sign (see Section 2C.29).

7. Signal-Controlled Crossings for Pedestrians

This section summarizes the use of signals that are installed for pedestrian crossings. One of the applications is at intersections, such as in Canada where the pedestrian crossing is signalized but the intersection side street approaches are controlled by STOP signs. Most of the applications in the USA, Canada, Australia, and the UK are at midblock locations. These treatments have been placed in a separate section because they are generally not located at intersections and their operations are significantly different from pedestrian crossings at signalized intersections.

7.1. MIDBLOCK SIGNAL-CONTROLLED CROSSINGS WITH FLASHING RED

Description: Traffic signals are used to control traffic at midblock crosswalks. During the WALK interval, a steady red signal indication is displayed to drivers approaching the crosswalk. During the flashing DON'T WALK interval, drivers see a flashing red indication and, after stopping, they may proceed through the crosswalk area in front of them if it is not occupied by pedestrians. After the pedestrian clearance interval ends, the signal turns green to allow drivers to proceed. The flashing red minimizes the interruption to traffic progression. Vehicles must remain stopped during the 4- to 7-second WALK interval but are not required to wait the full 12 to 20 seconds that would be necessary if a steady red indication were displayed during the completion of the DON'T WALK clearance interval.

Objective: To provide pedestrians a signal-protected opportunity to cross midblock at a controlled crosswalk.

Cost: Ranges from $50,000 to $75,000, depending on the width of the street and the length of the mast-arm poles.

Applications: Currently, this treatment is in use at 105 locations in the downtown and other retail areas of Los Angeles at midblock locations. It provides pedestrians an opportunity to cross midblock at a controlled crosswalk. The City uses the pedestrian warrant contained in the California *Traffic Manual* to convert midblock crosswalks on multilane roadways to pedestrian signals. Signal controls at midblock crosswalks are also required based on intense retail activity, high pedestrian volumes, midblock crossing demand, the presence of existing signals at the end of the subject block, and block length greater than 180 m.

Advantages: Provides a controlled crossing while minimizing disruption to traffic flow. This treatment also removes conflict with turning vehicles by providing a crossing location that is not associated with an intersection.

Disadvantages: Cost of installation is significant. Because there may not be traffic surges to give an audible cue about crossing intervals, accessible pedestrian signals (APSs) with locator tone must be provided to inform visually impaired persons that actuation of a signal is required to cross the major street and to indicate onset of the WALK interval; this increases the cost.

Studies: None found. The City of Los Angeles decided over 20 years ago that this approach had advantages over providing uncontrolled midblock crosswalks with yellow beacons. Development patterns using long "super blocks" created the need for midblock crossings.

Figure 7-1A. Midblock signal-controlled crossing on Sunset Boulevard in Los Angeles, California, USA. (Source: Nazir Lalani, County of Ventura, CA, USA.)

Figure 7-1B. Midblock signal-controlled crossing in downtown Los Angeles, California, USA. (Source: Nazir Lalani, County of Ventura, CA, USA.)

Sites: Figures 7-1A and 7-1B show midblock signal-controlled crossings in and near downtown Los Angeles at locations where pedestrian travel patterns dictate the need to provide such midblock crossings.

7.2. MIDBLOCK SIGNAL-CONTROLLED PEDESTRIAN CROSSINGS

Description: Traffic signals are used to control traffic at midblock crosswalks. During the WALK interval, a steady red signal indication is displayed to drivers approaching the crosswalk. During the flashing DON'T WALK interval, drivers continue to see a steady red indication. Drivers may not proceed through the crosswalk area in front of them until the signal turns green. Signals remain green for drivers until a pedestrian reactivates the push button.

Objective: To provide pedestrians an opportunity to cross midblock at a controlled crosswalk.

Cost: Ranges from $50,000 to $75,000, depending on the width of the street and the length of the mast-arm poles.

Applications: This treatment is currently used at some midblock locations in urban areas of Ontario, Canada, and some parts of the USA. It provides pedestrians an opportunity to cross midblock at a controlled crosswalk. The Ontario *Manual on Uniform Traffic Control Devices*[12] provides a specific warrant for midblock pedestrian signals. Under free-flow conditions, the warrant requires an average of 120 pedestrian crossings per hour over the heaviest 8 hours of the day and an average of 290 vehicles per hour entering the crossing over the same 8 hours. Under restricted-flow conditions, the warrant values are 240 pedestrians per hour and 575 vehicles per hour. The vehicular volume thresholds are increased by 25 percent for streets with more than one lane per direction.

At midblock signalized pedestrian crossings in Tucson, Arizona, USA, the pedestrian crosses the street in two stages, first to a median island and then along the median to a second signalized crossing point a short distance away. The pedestrian then activates a second crossing button, and another crossing signal changes to red for the traffic, giving the pedestrian a WALK signal. The two crossings operate independently of each other and delay the pedestrian minimally while allowing the signal operation to fit into the major street traffic progression, thus reducing the potential for stops, delays, accidents, and environmental air-quality issues.

Advantages: Provides a controlled crossing. Also removes conflict with turning vehicles by providing a crossing location that is not associated with an intersection.

Disadvantages: Cost of installation is significant. There is some disruption to traffic flow, which can be minimized if the midblock signal is part of the coordinated system. Because there may not be traffic surges to give an audible cue about crossing intervals, APSs with locator tone must be provided to inform visually impaired persons that actuation of a signal is required to cross the major street and to indicate onset of the WALK interval; this increases the cost. The concern that the signal may be disregarded by drivers because it rests in green for substantial lengths of time has not been borne out by observations made at such crossings in the City of Tucson, Arizona, USA.[59]

Studies: Glock et al.,[59] for the City of Tucson, reported drivers' compliance at the midblock crossings seems as good as that at other traditional traffic signals. However, some driver violations have been reported. The device is effective overall in providing a safe crossing for pedestrians at midblock locations.

Sites: Figure 7–2A shows a midblock signal installation in Toronto, Ontario, Canada. Figure 7–2B shows a midblock signalized pedestrian crossing in Tucson, Arizona, USA.

Figure 7–2A. Midblock signal-controlled crossing in Toronto, Ontario, Canada. (Source: Douglas Allingham, Whitby, ON, Canada.)

Figure 7–2B. Midblock signalized pedestrian crossing in Tucson, Arizona, USA. This treatment includes a staggered pedestrian refuge. Each half of the crossing is actuated independently of the other half. (Source: Nazir Lalani, County of Ventura, CA, USA.)

7.3. INTERSECTION PEDESTRIAN SIGNALS

Description: Signals installed at intersections control traffic at crosswalks on the major street. These intersection pedestrian signals are sometimes referred to as "half signals." The side street is controlled by STOP signs. No signal indications are provided for the minor street traffic.

Objective: To provide a pedestrian crossing for the major street that is protected by signals while minimizing delay to major street traffic by retaining STOP sign control on the minor street.

Cost: Ranges from $50,000 to $75,000, depending on the width of the street and the length of the mast-arm poles.

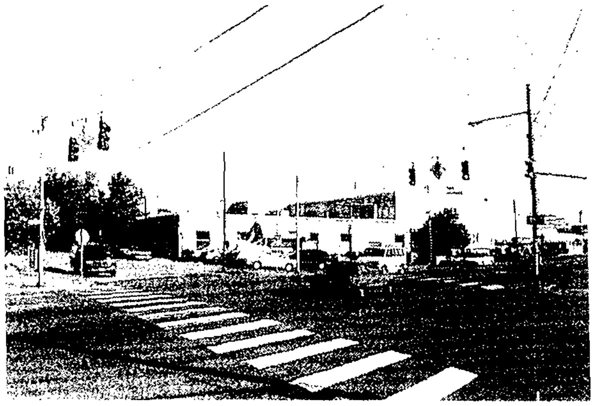
Applications: At locations where there is heavy pedestrian demand to cross the major street but the side street traffic on the minor approach is light. Section 2.2 of this report provides the methodology used in British Columbia, Canada, to determine where such signals are to be installed.

Advantages: Provides a controlled crossing while minimizing disruption to traffic flow but does not include side street signal control. This lack of control on the side street does not attract more traffic to the street as conventional intersection signals would.

Disadvantages: Cost of installation is significant. Drivers on side streets may be confused on right-of-

Figure 7–3A. Intersection pedestrian signal in Vancouver, British Columbia, Canada. (Source: Don Henderson, City of Vancouver, Canada.)

Portland, Oregon



Seattle, Washington

Figure 7–3B. Intersection pedestrian signals in Portland, Oregon, and the Puget Sound area. (Source: top: William C. Kloos; bottom, Randy S. McCourt, Portland, OR, USA.)

way assignment. If understood, the right-of-way relies on gaps in main street traffic to enter or cross the main street. Because there may not be traffic surges to give an audible cue about crossing intervals, APSs with locator tone must be provided to inform visually impaired persons that actuation of a signal is required to cross the major street and to indicate onset of the WALK interval; this increases the cost.

Studies: This application has been tested in Portland, Oregon. The staff reported that a review of collision data indicated that the frequency of broadside collisions involving side street traffic is no greater than at intersections where the side street is controlled by signals. However, red light violations are higher because the signals dwell on green for much longer periods of time.

Sites: Figure 7–3A shows this type of treatment in operation at an intersection in the greater Vancouver area of British Columbia, Canada. Figure 7–3B shows examples of this treatment being used in Portland, Oregon, and Seattle, Washington, USA.

7.4. PELICAN CROSSINGS

Description: First introduced in the UK in the 1970s, Pelican (**Pe**destrian **li**ght **con**trolled) crossings are traffic signals used to control traffic at midblock crosswalks. During the pedestrian WALK interval, drivers approaching the crosswalk must stop at a steady red signal. The pedestrian signal display, on the far side of the crossing, consists of a steady green walking figure, which normally lasts for 4–9 seconds. This period is followed by a flashing green walking figure for the pedestrian clearance interval. During the pedestrian clearance interval, a flashing amber indication lasting 6–18 seconds is displayed to drivers. During this flashing amber period, drivers may proceed through the crosswalk area if it is not occupied by pedestrians.

The flashing green walking figure interval is followed by an additional brief pedestrian clearance interval, during which a steady red standing figure is displayed to pedestrians for up to 2 seconds before the flashing amber vehicle signal indication turns green for vehicular traffic. The green for vehicular traffic can be set from 20 to 60 seconds for fixed-time operation or from 6 to 60 seconds if vehicle detection is provided to detect gaps in traffic. The sequence of indications is shown in Table 7–1.

Objective: To provide pedestrians an opportunity to cross midblock at a controlled crosswalk. The flashing amber minimizes the interruption to traffic platoons.

Cost: Ranges from $50,000 to $75,000, depending on the width of the street, the length of mast-arm poles, and whether or not center island and landscaping are installed. Operation costs are estimated to be $4,000 per year. In the UK and Australia where these types of crossing are used extensively without mast arms, the cost range for installation is $30,000 to $60,000.

Applications: Currently, this treatment is used in the UK, Australia, and other countries with strong links to the UK's approach to traffic engineering. The warrants and guidelines according to which this treatment is used in the UK and Australia are provided in Sections 2.3 and 2.5 of this report, respectively.

Advantages: Provides a controlled crossing. This treatment also removes conflict with turning vehicles by providing a crossing location that is not associated with an intersection.

Table 7–1. Pedestrian and Vehicle Signal Indication Sequence at Pelican Crossings

Period	Pedestrian Indication	Vehicular Indication	Timing (Seconds)
1	Red	Green	20–60 (fixed) 6–60 (variable)
2	Red	Amber	3 (mandatory)
3	Red	Red	1–3 (fixed)
4	Green	Red	4–9 (fixed)
5 (optional)	Flashing green	Red	0 or 2
6	Flashing green	Flashing amber	6–18
7	Red	Flashing amber	1 or 2

Source: James Landles, London, UK.

Disadvantages: Cost of installation is significant. There is some disruption to traffic flow, which can be minimized if the midblock signal is part of the coordinated system. Because there may not be traffic surges to give an audible cue about crossing intervals, APSs with locator tone must be provided to inform visually impaired persons that actuation of a signal is required to cross the major street and to indicate onset of the WALK interval; this increases the cost.

Studies: Lalani[29] conducted studies of Pelican crossings in the 1970s on behalf of the Greater London Council (GLC) and found that they can reduce pedestrian-related collisions, but only if their use is associated with additional treatment. The study found that pedestrian-related collisions decreased at the crossing but increased in the areas on either side of the crossing. However, at locations where Pelican crossings were provided with additional treatments, such as anti-skid surface treatment and pedestrian railings that channelized pedestrians to the controlled crossing, pedestrian-related collisions decreased significantly after Pelican crossings were installed.

Research done by the Australian Road Research Board for VicRoads showed a 40 percent reduction in delays for drivers with no adverse effects on pedestrians compared to traditional signalized midblock pedestrian crossings. Audible and tactile treatments at Pelican crossings are described in Traffic Advisory Leaflet 4/91,[60] published by the Department of Environment, Transport and the Regions in the UK.

Sites: Figure 7–4A shows a Pelican crossing in Australia. Figure 7–4B shows a Pelican crossing with additional treatments in the UK.

Figure 7-4A. Pelican crossing in Victoria, Australia. (Source: Bill Saggers, Melbourne, Australia.)

Figure 7–4B. Pelican crossing with zigzag markings and anti-skid surfacing in the UK. For information on zigzag marking, see Section 4.5. (Source: Michael F. Talbot, London, UK.)

7.5. PUFFIN CROSSINGS

Description: Puffin (Pedestrian user friendly intelligent)[61] crossings are similar in construction to Pelican crossings but have different operations and timing requirements. They provide more flexibility in how much time is provided for pedestrians to cross. Puffins operate in a manner somewhat similar to Pelicans with some important differences. Puffins

Table 7–2. Pedestrian and Vehicle Signal Indication Sequence at Puffin Crossings

Period	Pedestrian Indication	Vehicular Indication	Timing (Seconds)
1	Red	Green	20–60 (fixed) 6–60 (variable)
2	Red	Amber	3 (mandatory)
3	Red	Red	1–3
4	Green	Red	4–9
5	Red	Red	1–5 (fixed period)
6 (variable period)	Red	Red	0–22 (pedestrian extendable period)
7 (or 8)	Red	Red	0–3 (appears only on a maximum change if pedestrians are still being detected)
8	Red	Red	0–3 (appears only if there is a gap change)
9	Red	Red/Amber	2

Source: James Landles, London, UK.

use nearside pedestrian signal heads as opposed to farside. They provide an extendable all-red crossing period using microwave, infrared, and other types of overhead detection. The call is initiated by a push button accompanied by an infrared pedestrian detector demand. Puffins are equipped with two forms of detection. These are:

- Curbside infrared detectors: These cancel pedestrian actuations when no longer required.
- On-crossing overhead detector such as microwave or infrared: These extend the all-red time.

Vehicles must stop at a red signal when pedestrians begin crossing (the pedestrian signal display consists of a steady green walking figure). The length of the steady green pedestrian indication period is normally 4–9 seconds at the crossing, depending on the level of pedestrian demand. This is followed by a period of 1–5 seconds of all-red, which can be extended up to 22 seconds by the on-crossing pedestrian detectors. During the all-red, the pedestrian sees a red standing figure on the nearside pedestrian signal indication and the vehicle indication remains red. The red standing figure can be displayed for up to 3 additional seconds if pedestrians are still detected in the crosswalk at the end of the 22-second interval or if there is a gap change. The vehicular indication then turns green after displaying the starting amber indication that follows the vehicular red indication (a practice that is used in some European countries). The green for vehicular traffic can be set from 20 to 60 seconds for fixed time operation or from 6 to 60 seconds if vehicle detection is provided to detect gaps in traffic. The sequence of indications is shown in Table 7–2.

Objective: To provide pedestrians an opportunity to cross midblock at a controlled crosswalk. The intent of the Puffin crossing is to minimize the interruption to traffic platoons while affording pedestrians the full protection of a red signal indication while in the crosswalk. This is accomplished by using pedestrian detectors to control the length of the pedestrian clearance interval.

Cost: Ranges from $50,000 to $75,000, depending on the width of the street, the length of mast-arm poles, and whether or not center island and landscaping are installed. Operation costs are about $4,000 per year. In the UK and Australia where these types of crossing are used extensively without mast arms, the cost range for installation is $30,000 to $60,000.

Applications: Currently, this treatment is used in the UK, Australia, and other countries with strong links to the UK's approach to traffic engineering. The warrants and guidelines according to which this treatment is used in the UK and Australia are provided in Sections 2.3 and 2.5 of this report, respectively. The Puffin crossing was the result of joint European research (part of the DRIVE Initiative) that looked at ways to provide an efficient crossing for drivers and pedestrians, especially those who are more vulnerable.

Figure 7-5. Puffin crossing in Victoria, Australia. (Source: Bill Saggers, Melbourne, Australia.)

Advantages: Provides a controlled crossing. This treatment also removes conflict with turning vehicles by providing a crossing location that is not associated with an intersection. The nearside signal has advantages for partially sighted pedestrians. The crossing gives the correct crossing time for pedestrians with varying walking speeds. It cancels unnecessary halts to vehicles if the pedestrian has been detected leaving the sidewalk by using gaps in traffic flow.

Disadvantages: Cost of installation is significant. There is some disruption to traffic flow that can be minimized if the midblock signal is part of the coordinated system. Because there may not be traffic surges to give an audible cue about crossing intervals, APSs with locator tone must be provided to inform visually impaired persons that actuation of a signal is required to cross the major street and to indicate onset of the WALK interval; this increases the cost.

Studies: The study by Lalani[29] for the GLC recommended that Pelican crossings be installed with anti-skid surface treatments, pedestrian railings, or other associated treatments. These recommendations are generally accepted for Puffin installations as well.

Research done by the Australian Road Research Board[29a] for VicRoads has shown a 40 percent reduction in delays for drivers with no adverse effects on pedestrians compared to traditional signalized midblock pedestrian crossings.

Sites: Figure 7-5 shows a Puffin crossing in Australia. Note the microwave sensor at the top of the signal pole.

7.6. TOUCAN CROSSINGS

Description: Toucan crossings (Two can cross) have the same form of vehicular detection as the Pelican and Puffin crossings and normally the same form of pedestrian on-crossing detector as the Puffin crossing. This facility is intended to allow both bicyclists and pedestrians to share an unsegregated road space when crossing the road. For farside signals, a steady green bicycle symbol is displayed along with the steady green walking figure. The method of operation is different from the Pelican and Puffin crossings because the pedestrian signal goes dark instead of displaying a flashing green walking figure. Nearside signal operation is planned in the future to give a Puffin-type operation.

Vehicles must stop when pedestrians begin crossing (pedestrian and bicycle signal display consists of a steady green walking figure and bicycle). The length of the pedestrian and bicycle steady green indication (invitation to cross) is normally 4–7 seconds at the crossing, depending on the level of pedestrian demand. This is followed by an initial period of 3 seconds during which the pedestrian and bicyclist see a dark pedestrian signal indication and the vehicle indication remains red. The dark pedestrian and bicyclist signal indication can be extended for up to an additional 22 seconds if pedestrians are detected in the crosswalk. The dark pedestrian and bicyclist signal indication can be displayed for 3 additional seconds before the vehicle indication turns green if pedestrians and bicyclists are still detected in the crosswalk at the end of the preceding 22 seconds. The green for vehicular traffic can be set from 20 to 60 seconds for fixed-time operation or 6 to 60 seconds if vehicle detection is provided to detect gaps in traffic. The sequence of indications is shown in Table 7–3.

In Tucson, Arizona, the crossing provides the typical pedestrian indication with 4- to 7-second intervals for pedestrians to begin crossing the street and a pedestrian clearance interval that is based on walking speeds and the length of the crossing. A separate indication displays a red bicycle symbol while the vehicular indications are green for the street the bicyclist is waiting to cross. The bicycle symbol turns green when the vehicular indication turns red to stop vehicular traffic and remains green until the onset of the bicycle clearance interval of 4–6 seconds (which is much shorter than the pedestrian clearance interval), when the bicycle symbol turns yellow. Therefore, during a portion of the clearance interval for pedestrians, the bicycle symbol remains green for a period of time until the onset of the shorter yellow clearance interval for bicyclists. Video detection is provided for vehicles on the major thoroughfare as well as bicyclists approaching the crossing on the minor street.

Objective: To provide a signal-controlled crossing that can be used by both pedestrians and bicyclists

Table 7–3. Pedestrian, Bicycle, and Vehicle Indication Sequence at Toucan Crossings

Period	Pedestrian and Bicyclist Indication	Vehicular Indication	Timing (Seconds)
1	Red	Green	20–60 (fixed) 6–60 (variable)
2	Red	Amber	3 (mandatory)
3	Red	Red	1–3
4	Green	Red	4–7
5	Dark	Red	3 (fixed period)
6	Dark	Red	0–22 (pedestrian extendable period)
7	Dark	Red	0–3 (appears only on a maximum change if pedestrians and bicyclists are still being detected)
8	Red	Red	1–3
9	Red	Red with amber	2

Source: James Landles, London, UK.

on a shared basis by providing indications for both bicycles and pedestrians.

Cost: Ranges from $75,000 to $100,000, depending on the width of the street and the length of the mast-arm poles. Operation costs are estimated to be $4,000 per year. In the UK and Australia, where these types of crossing are used extensively without mast arms, the cost range for installation is $40,000 to $75,000.

Applications: Currently, this treatment is used in the UK and in Tucson, Arizona, USA. The guidelines according to which this treatment is used in the UK are provided in Section 2.3 of this report. A study performed for the City of Tucson[59] established warrants for the use of this treatment.

Advantages: Provides a controlled crossing for both pedestrians and bicyclists. In the UK, the original crossings for both pedestrians and bicyclists had two crossing points in parallel. The current version uses a combined crossing point, reducing the signal clutter and cost. In the Tucson application, a Toucan crossing was preferred over the installation of a traditional full signal. A full signal controlling all vehicle approaches to the intersection would not allow for good signal synchronization, creating excess stops, accidents, delays, and air-quality concerns. A traditional full signal would encourage additional traffic to cut through or along the residential street, thus negatively impacting the "liveability" of the street, whereas a Toucan signal avoids such impacts.

Disadvantages: Cost of installation is significant. There is some disruption to traffic flow, but this is minimized by on-crossing detectors. Delay to drivers can further be minimized if the midblock signal is part of the coordinated system. However, caution has to be exercised since delays are likely to increase for pedestrians and bicyclists. Because there may not be traffic surges to give an audible cue about crossing intervals, APSs with locator tone must be pro-

Figure 7–6A. Toucan crossing in the UK. (Source: Michael F. Talbot, London, UK.)

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Traffic & Safety Section
222 South 6th Street, Room 100
Grand Junction, Colorado 81501
(970) 248-7230

Dear Applicant,

Thank you for your inquiry about properly obtaining access to the State Highway System. Through this process, CDOT is aiming to improve the safety and operational efficiency of our state highways. Access management is one of the means to achieve this. Please read this letter carefully and follow its instructions to ensure the most efficient processing of your application for access.

Applications for access shall include a **completed** access permit application (CDOT Form No. 137) and any required attachments reasonably necessary to review and assess the application or complete the permit. Copies of forms, the State Highway Access Code, and other helpful information are also available at our internet site, www.dot.state.co.us/AccessPermits/index.htm.

Necessary attachments to the application shall include the following, although additional information may be required:

- ✓ Deed of Property
- ✓ Power of Attorney for signature authority (if other than owner)
- ✓ Location Map AND Surrounding Ownership Map (may be combined into one)
- ✓ Site Plan (If there will be more than 100 trips per day (50 cars per day), plans need to be stamped by a P.E.)
- ✓ Stake at Centerline of Proposed Access with Owners Name.
- Do not send any money at this time.

If any of the above items are missing, your application will be rejected. The Department will promptly transmit written notice to the applicant if the application is not complete and sufficient for review. The notice will include any outstanding items, issues, or concerns.

Send completed applications to: Access Unit Manager
222 S 6th St., Room 100
Grand Junction, CO 81501
(970) 683-6284

Once a field review has been conducted by CDOT, your application will be forwarded to the appropriate local jurisdiction, if applicable. The local authorities of the Town of Crested Butte, Town and County of Eagle, Town of Oak Creek, Town of Olathe, and Pitkin County have retained access permit issuing authority; your application will be forwarded to them for review and processing. If the access is in the Town of Avon, City of Delta, Town of Fraser, City of Montrose, or in unincorporated areas of Delta, Grand, Gunnison, Hinsdale, Jackson, or Montrose County we will forward your application to them for comment once we determine that it is complete.

Construction may not begin until a Permit and a Notice to Proceed have been approved. Additional information may be required before a Notice to Proceed is issued. Two items that are always required are a certificate of insurance naming CDOT as an insured party and a traffic control plan. Please allow 45 days for processing this application.

If there are any further questions, please feel free to contact this office at the above referenced address and number.

Attachments: Application Form (CDOT Form No. 137)
Examples of Site Plan and Surrounding Ownership Map

COLORADO DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ACCESS PERMIT APPLICATION

Issuing authority application acceptance date:

Instructions:

Please print or type

- Contact the Colorado Department of Transportation (CDOT) or your local government to determine your issuing authority.
- Contact the issuing authority to determine what plans and other documents are required to be submitted with your application.
- Complete this form (some questions may not apply to you) and attach all necessary documents and Submit it to the issuing authority.
- Submit an application for each access affected.
- If you have any questions contact the issuing authority.
- For additional information see CDOT's Access Management website at **http://www.dot.state.co.us/AccessPermits/index.htm**

1) Property owner (Permittee)		2) Agent for permittee (if different from property owner)	
Street address		Mailing address	
City, state & zip	Phone #	City, state & zip	Phone # (required)
E-mail address		E-mail address if available	

3) Address of property to be served by permit (required)

4) Legal description of property: If within jurisdictional limits of Municipality, city and/or County, which one?

county	subdivision	block	lot	section	township	range

5) What State Highway are you requesting access from?

6) What side of the highway? ☐N ☐S ☐E ☐W

7) How many feet is the proposed access from the nearest mile post?

____________ feet (☐N ☐S ☐E ☐W) from:____________

How many feet is the proposed access from the nearest cross street?

____________ feet (☐N ☐S ☐E ☐W) from:____________

8) What is the approximate date you intend to begin construction?

9) Check here if you are requesting a:

☐ new access ☐ temporary access (duration anticipated:) ☐ improvement to existing access

☐ change in access use ☐ removal of access ☐ relocation of an existing access (provide detail)

10) Provide existing property use

11) Do you have knowledge of any State Highway access permits serving this property, or adjacent properties in which you have a property interest?

☐ no ☐ yes, if yes - what are the permit number(s) and provide copies: and/or, permit date:

12) Does the property owner own or have any interests in any adjacent property?

☐ no ☐ yes, if yes - please describe:

13) Are there other existing or dedicated public streets, roads, highways or access easements bordering or within the property?

☐ no ☐ yes, if yes - list them on your plans and indicate the proposed and existing access points.

14) If you are requesting agricultural field access - how many acres will the access serve?

15) If you are requesting commercial or industrial access please indicate the types and number of businesses and provide the floor area square footage of each.

business/land use	square footage	business	square footage

16) If you are requesting residential developement access, what is the type (single family, apartment, townhouse) and number of units?

type	number of units	type	number of units

17) Provide the following vehicle count estimates for vehicles that will use the access. Leaving the property then returning is two counts.

Indicate if your counts are ☐ peak hour volumes or ☐ average daily volumes.	# of passenger cars and light trucks at peak hour volumes	# of multi unit trucks at peak hour volumes
# of single unit vehicles in excess of 30 ft.	# of farm vehicles (field equipment)	**Total count of all vehicles** 0

18) Check with the issuing authority to determine which of the following documents are required to complete the review of your application.

- a) Property map indicating other access, bordering roads and streets.
- b) Highway and driveway plan profile.
- c) Drainage plan showing impact to the highway right-of-way.
- d) Map and letters detailing utility locations before and after development in and along the right-of-way.
- e) Subdivision, zoning, or development plan.
- f) Proposed access design.
- g) Parcel and ownership maps including easements.
- h) Traffic studies.
- i) Proof of ownership.

1- It is the applicant's responsibility to contact appropriate agencies and obtain all environmental clearances that apply to their activities. Such clearances may include Corps of Engineers 404 Permits or Colorado Discharge Permit System permits, or ecological, archeological, historical or cultural resource clearances. The CDOT Environmental Clearances Information Summary presents contact information for agencies administering certain clearances, information about prohibited discharges, and may be obtained from Regional CDOT Utility/Special Use Permit offices or accessed via the CDOT Planning/Construction-Environmental-Guidance webpage **http://www.dot.state.co.us/environmental/Forms.asp**.

2- All workers within the State Highway right of way shall comply with their employer's safety and health policies/ procedures, and all applicable U.S. Occupational Safety and Health Administration (OSHA) regulations - including, but not limited to the applicable sections of 29 CFR Part 1910 - Occupational Safety and Health Standards and 29 CFR Part 1926 - Safety and Health Regulations for Construction.

Personal protective equipment (e.g. head protection, footwear, high visibility apparel, safety glasses, hearing protection, respirators, gloves, etc.) shall be worn as appropriate for the work being performed, and as specified in regulation. At a minimum, all workers in the State Highway right of way, except when in their vehicles, shall wear the following personal protective equipment: High visibility apparel as specified in the Traffic Control provisions of the documentation accompanying the Notice to Proceed related to this permit (at a minimum, ANSI/ISEA 107-1999, class 2); head protection that complies with the ANSI Z89.1-1997 standard; and at all construction sites or whenever there is danger of injury to feet, workers shall comply with OSHA's PPE requirements for foot protection per 29 CFR 1910.136, 1926.95, and 1926.96. If required, such footwear shall meet the requirements of ANSI Z41-1999.

Where any of the above-referenced ANSI standards have been revised, the most recent version of the standard shall apply.

3- The Permittee is responsible for complying with the Revised Guidelines that have been adopted by the Access Board under the American Disabilities Act (ADA). These guidelines define traversable slope requirements and prescribe the use of a defined pattern of truncated domes as detectable warnings at street crossings. The new Standards Plans and can be found on the Design and Construction Project Support web page at: **<http://www.dot.state.co.us/DesignSupport/>**, then click on *Design Bulletins*.

If an access permit is issued to you, it will state the terms and conditions for its use. Any changes in the use of the permitted access not consistent with the terms and conditions listed on the permit may be considered a violation of the permit.

The applicant declares under penalty of perjury in the second degree, and any other applicable state or federal laws, that all information provided on this form and submitted attachments are to the best of their knowledge true and complete.

I understand receipt of an access permit does not constitute permission to start access construction work.

Applicant's signature	Print name	Date

If the applicant is not the owner of the property, we require this application also to be signed by the property owner or their legally authorized representative (or other acceptable written evidence). This signature shall constitute agreement with this application by all owners-of-interest unless stated in writing. If a permit is issued, the property owner, in most cases, will be listed as the permittee.

Property owner signature	Print name	Date

Previous editions are obsolete and may not be used

Checklist Notes

GENERAL NOTES SHEET REQUIREMENTS (Sheet 3 of the plan set)

1. "All materials, equipment, installation and construction within the State Highway ROW shall be in accordance with the latest edition of the following standard references as applicable:
   - A. CDOT Materials Manual
   - B. CDOT Construction Manual
   - C. CDOT Standard Specifications for Road and Bridge Construction, latest edition
   - D. CDOT Standard Special Provisions, as applicable to project
   - E. CDOT Standard Plans (M&S Standards)
     FHWA Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways and the Colorado Supplement thereto
   - F. AASHTO Roadside Design Guide

   Please note that some of the reference materials listed above may be purchased from:

   Colorado Department of Transportation
   Bid Plans Room
   4201 East Arkansas Avenue
   Denver, CO 80222-3400
   (303) 757-9313"

2. "Access construction within highway ROW and all highway improvements shall comply with the Access Permit and Notice to Proceed (NTP). A copy of the Permit and NTP shall be available on the construction site at all times."

3. "Permittee shall designate a certified Traffic Control Supervisor (TCS) to manage construction signage and safety of operations during activities within CDOT right of way. The TCS shall be available whenever work is in progress."
4. "No vehicles are allowed to park in CDOT Right of Way."
5. "The Engineer of Record is responsible for all erosion control elements."
6. "The Permittee shall complete all work in the CDOT right of way within 45 calendar days and within a single construction season."
7. "It is the responsibility of the Permittee to determine which environmental clearances and/or regulations apply to the project, and to obtain any clearances that are required directly from the appropriate agency prior to commencing work. Please refer to or request a copy of the "CDOT Environmental Clearance Information Summary" (ECIS) for details. The ECIS may be obtained from CDOT Permitting Offices or may be accessed via the CDOT Planning/Construction-Environmental Guidance webpage at: http://www.dot.state.co.us/AccessPermits/PDF/EnvironmentalClearancesInformationSummary.pdf

FAILURE TO COMPLY WITH REGULATORY REQUIREMENTS MAY RESULT IN SUSPENSION OR REVOCATION OF YOUR CDOT PERMIT, OR ENFORCEMENT ACTIONS BY OTHER AGENCIES.

ALL discharges are subject to the provisions of the Colorado Water Quality Act and the Colorado Discharge Permit Regulations. Prohibited discharges include substances such as: wash water, paint, automotive fluids, solvents, oils or soaps.

Unless otherwise identified by CDOT or the Colorado Department of Public Health and Environmental (CDPHE) Water Quality Control Division (WQCD) as significant sources of pollutants to the waters of the State, the following discharges to storm water systems are allowed without a Colorado Discharge Permit System Permit: landscape irrigation, diverted stream flows, uncontaminated ground water infiltration to separate storm sewers, discharges from potable water sources, foundation drains, air condition condensation, irrigation water, springs, footing drains, water line flushing, flows from riparian habitats and wetlands, and flow from fire fighting activities.

ANY OTHER DISCHARGES, including storm water discharges from industrial facility or construction sites, may require Colorado Discharge Permit System permits from CDPHE before work begins. For additional information and forms, go to the CDPHE website at: http://www.cdphe.state.co.us/wq/PermitsUnit/index.html

TYPICAL SECTION NOTES (Include on typical section plan sheets)

1. “CDOT must approve the asphalt mix design prior to construction. The Permittee’s Engineer of Record shall coordinate with the CDOT Permit Unit contact person (970-683-6286) to obtain approval”.
2. “Break point on slopes and in bottoms of ditches shall be rounded during construction.”
3. “At the locations where new asphalt is to abut existing asphalt, saw cut the existing pavement 1 foot back from the existing edge and remove pavement. From the saw cut line, mill existing pavement back 2 feet to a depth of 2 inches. Tack exposed vertical asphalt edge prior to paving. The saw cutting will not be paid for separately, but shall be included in the removal of the asphalt item.”
4. “Prior to overlay, the existing pavement at the overlay tie-ins shall be milled to a depth of 2” and tapered to 0” over a distance of 50 feet from the tie-in to provide a smooth transition from the overlay to the existing pavement.”

TRAFFIC SIGNAL PLAN NOTES (Include on signal sheets)

1. "Contractor shall notify CDOT at least two weeks prior to signal being placed in flash mode to coordinate signal activization."
2. "CDOT must be notified 48 hours prior to signal being turned on for full operation."

SIGNING & MARKING PLAN NOTES (Include on Signing & Marking Plans)

1. "In CDOT Region 3 all sign posts shall be galvanized tubular steel."
2. "Full-Compliance" temporary pavement markings shall be applied per CDOT specifications at the end of each construction day.
3. "The contractor shall contact CDOT project manager and engineer of record, at least two weeks prior to scheduled striping. The permittee will be responsible for any corrections required upon final inspection of the access."
4. "Unless an asphalt overlay is required, grinding of existing pavement markings shall be required by CDOT. The pavement markings shall be removed to the extent that they will not be visible under day or night conditions and in a manner that will not affect traffic flow."

TRAFFIC CONTROL PLAN NOTES (Include on Construction Traffic Control Plans)

1. "Prior to beginning of work in the CDOT ROW, the Permittee shall create a site specific and detailed construction traffic control plan which covers all phases and day/night signage conditions of work, including final signing and striping."
2. "Permittee shall designate a Traffic Control Supervisor (TCS) as described in the General Notes. The TCS must be available 24 hours throughout construction."
3. "Permittee shall only use the traffic control plans stamped with "Notice to Proceed Plans – Exhibit A"; CDOT shall concur with all other traffic control plans prior to them being used on the highway."
4. "Permittee shall remove all traffic control devices at the end of the day's construction activities, on weekends and holidays, unless otherwise directed by CDOT."

RIGHT OF WAY

FED. ROAD DIST. NO.	DIST.	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	S0108(1)	5	

Rev. 9-11-75 Rev. Par. 7 & 9. J.B.

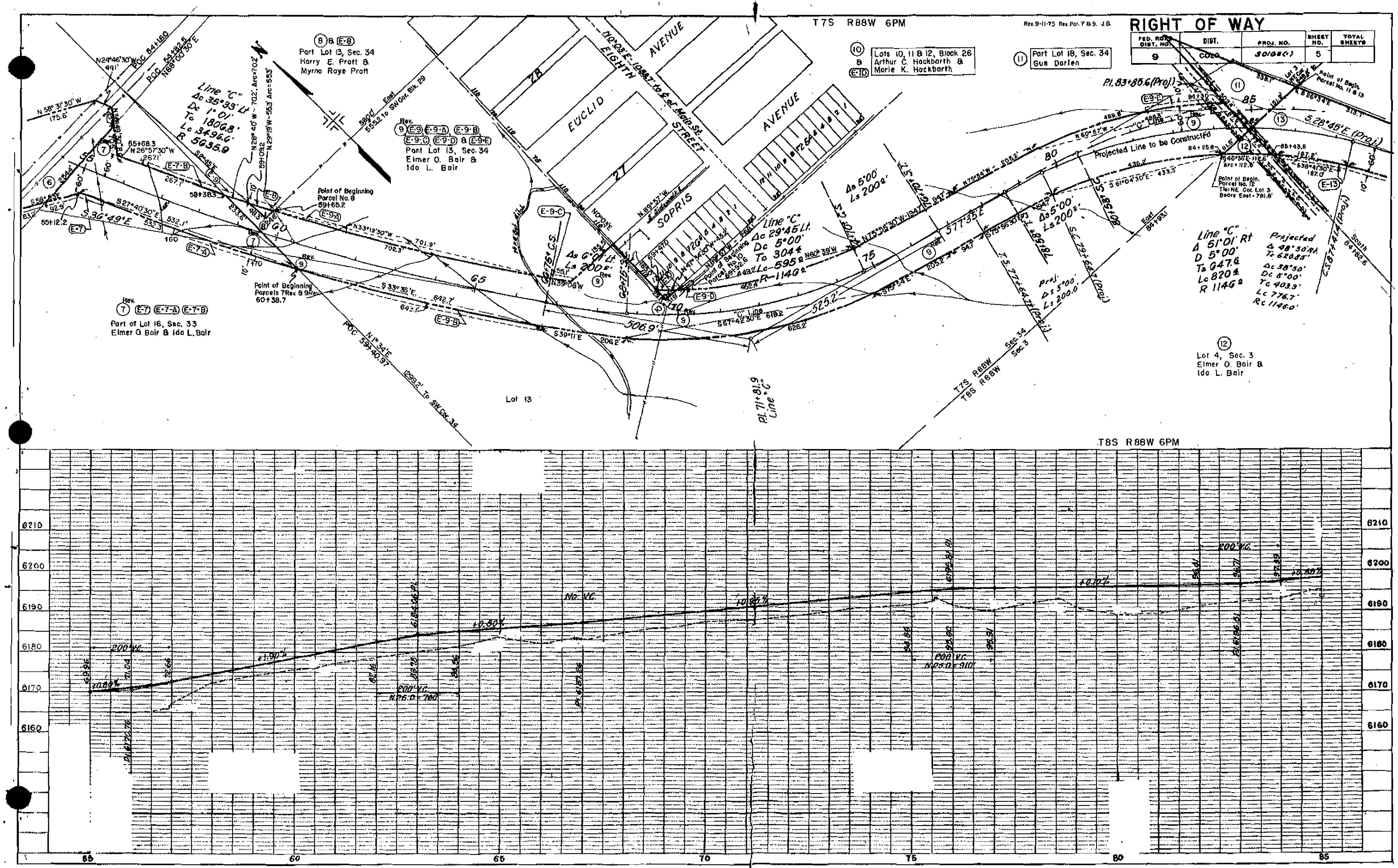


PLATE 3 — PLAN-PROFILE O. P. R. R. & S. STANDARD
KEUFFEL & ESSER CO., NEW YORK.
K & E Co. No. 346-10

July 1, 2009	SH133/HENDRICK SIGNAL INSTALLATION				
CONTRACT			PROJECT	UNIT	EXTENDED
ITEM NO.		UNIT	TOTALS:	PRICE	PRICE
202-00220	REMOVAL OF ASPHALT MAT	SY	260	$ 10.00	$ 2,600.00
202-00250	REMOVAL OF PAVEMENT MARKING	SF	400	$ 2.00	$ 800.00
202-00710	REMOVAL OF POWER POLE	EACH	1	$ 750.00	$ 750.00
202-00810	REMOVAL OF GROUND SIGN	EACH	4	$ 75.00	$ 300.00
202-00821	REMOVAL OF SIGN PANEL	EACH	1	$ 50.00	$ 50.00
203-00010	UNCLASSIFIED EXCAVATION (CIP)	CY	13	$ 25.00	$ 325.00
203-01597	POTHOLING	HOUR	10	$ 210.00	$ 2,100.00
207-00205	TOP SOIL	CY	5	$ 50.00	$ 250.00
208-00020	SILT FENCE	LF	300	$ 2.00	$ 600.00
208-00045	CONCRETE WASHOUT STRUCTURE (TEMPORARY)	EACH	1	$ 800.00	$ 800.00
208-00205	EROSION CONTROL SUPERVISOR	HOUR	40	$ 65.00	$ 2,600.00
210-00810	RESET GROUND SIGN	EACH	1	$ 200.00	$ 200.00
212-00006	SEEDING (NATIVE) (SEE NOTE #5)	ACRE	0.1	$ 1,000.00	$ 100.00
213-00002	MULCHING (WEED FREE HAY) (SEE NOTE #5)	ACRE	0.1	$ 1,000.00	$ 100.00
213-00061	MULCH TACKIFIER (SEE NOTE #5)	LB	0.15	$ 25.00	$ 3.75
304-06000	AGGREGATE BASE COURSE (CLASS 6)	TON	26	$ 50.00	$ 1,300.00
403-00720	HMA (PATCHING) (ASPHALT)	TON	29	$ 200.00	$ 5,800.00
503-00018	DRILLED CAISSON (18 INCH)	LF	4	$ 300.00	$ 1,200.00
503-00036	DRILLED CAISSON (36 INCH)	LF	57	$ 250.00	$ 14,250.00
608-00010	CONCRETE CURB RAMP	SY	26.5	$ 100.00	$ 2,650.00
613-00200	2 INCH ELECTRICAL CONDUIT (PLASTIC)	LF	650	$ 20.00	$ 13,000.00
613-00300	3 INCH ELECTRICAL CONDUIT (PLASTIC)	LF	550	$ 20.00	$ 11,000.00
613-10000	WIRING	LS	1	$ 10,000.00	$ 10,000.00
613-07000	PULL BOX SPECIAL	EACH	3	$ 1,200.00	$ 3,600.00
613-07029	PULL BOX (24"x24"x12")	EACH	3	$ 1,200.00	$ 3,600.00
613-07034	PULL BOX (24"x36"x18")	EACH	5	$ 1,000.00	$ 5,000.00
613-32400	LIGHT STANDARD STEEL (40 FOOT)	EACH	1	$ 3,100.00	$ 3,100.00
613-70250	LUMINAIRE HIGH PRESSURE SODIUM (250 WATT)	EACH	4	$ 500.00	$ 2,000.00
614-00011	SIGN PANEL (CLASS 1)	SF	21	$ 20.00	$ 420.00
614-01512	STEEL SIGN SUPPORT (2 INCH ROUND) (POST)	LF	7	$ 20.00	$ 140.00
614-70118	PEDESTRIAN SIGNAL FACE (18) (LED)	EACH	4	$ 650.00	$ 2,600.00
614-70336	TRAFFIC SIGNAL FACE (12-12-12) (LED)	EACH	9	$ 800.00	$ 7,200.00
614-72855	TRAFFIC SIGNAL CONTROLLER CABINET	EACH	1	$ 11,250.00	$ 11,250.00
614-72860	PEDESTRIAN PUSH BUTTON	EACH	4	$ 205.00	$ 820.00
614-72875	LOOP DETECTOR WIRE	LF	400	$ 6.00	$ 2,400.00
614-81120	TRAFFIC SIGNAL-LIGHT POLE STEEL (1-20FT MAST ARM)	EACH	1	$ 15,500.00	$ 15,500.00
614-81130	TRAFFIC SIGNAL-LIGHT POLE STEEL (1-30FT MAST ARM)	EACH	1	$ 15,500.00	$ 15,500.00

July 1, 2009

SH133/HENDRICK SIGNAL INSTALLATION

CONTRACT ITEM NO.		UNIT	PROJECT TOTALS:	UNIT PRICE	EXTENDED PRICE
614-81140	TRAFFIC SIGNAL-LIGHT POLE STEEL (1-40FT MAST ARM)	EACH	1	$ 15,500.00	$ 15,500.00
614-84000	TRAFFIC SIGNAL PEDESTAL POLE STEEL	EACH	1	$ 2,000.00	$ 2,000.00
614-86245	TRAFFIC SIGNAL CONTROLLER	EACH	1	$ 12,000.00	$ 12,000.00
620-00020	SANITARY FACILITY	EACH	1	$ 300.00	$ 300.00
625-00000	CONSTRUCTION SURVEYING	LS	1	$ 6,000.00	$ 6,000.00
626-00000	MOBILIZATION	LS	1	$ 60,000.00	$ 60,000.00
627-00005	EPOXY PAVEMENT MARKING PAINT	GAL	11	$ 160.00	$ 1,760.00
627-30405	PREFORMED THERMOPLASTIC PAVEMENT MARKING (WORD-SYMBOL)	SF	194	$ 20.00	$ 3,880.00
627-30410	PREFORMED THERMOPLASTIC PAVEMENT MARKING (XWALK-STOP LINE)	SF	492	$ 13.00	$ 6,396.00
630-00000	FLAGGING	HOUR	200	$ 25.00	$ 5,000.00
630-00007	TRAFFIC CONTROL INSPECTION	DAY	12	$ 40.00	$ 480.00
630-00012	TRAFFIC CONTROL MANAGEMENT	DAY	33	$ 650.00	$ 21,450.00
630-80341	CONSTRUCTION TRAFFIC SIGN (PANEL SIZE A)	EACH	18	$ 65.00	$ 1,170.00
630-80355	PORTABLE MESSAGE SIGN PANEL	EACH	2	$ 2,500.00	$ 5,000.00
630-80360	DRUM CHANNELIZING DEVICE	EACH	15	$ 35.00	$ 525.00
630-80380	TRAFFIC CONE	EACH	50	$ 10.00	$ 500.00
F/A 01	EROSION CONTROL	FA	1		$ 1,000.00
F/A 02	MINOR CONTRACT REVISIONS	FA	1		$ 15,000.00
	TOTAL				$ 301,869.75

ESTIMATE IS BASED ON REVIEW OF ARCHIVED UNIT PRICES FROM CDOT COST DATA BASE (2008 AND 2009). CDOT COST ESTIMATOR FOR R3 DID REVIEW THIS COST ESTIMATE AND INDICATED ESTIMATE WAS 3 TO 5% LOW BASED ON CURRENT BIDDING ENVIRONMENT. MOBILIZATION FOR CONTRACTOR OUTSIDE OF CARBONDALE IS BIGGEST LINE ITEM AND SUBJECT TO FLUCTUATION. THIS ESTIMATE IS FOR CONSTRUCTION COSTS ONLY AND DOESN'T INCLUDE CONTRACT ADMINISTRATION. THIS ESTIMATE IS SUBJECT TO COST FLUCTUATIONS WITH STEEL, CONCRETE, ASPHALT, AND FUEL PRICES. THIS COST ESTIMATE DOESN'T INCLUDE UTILITY COSTS OF UNDERGROUNDING POWER OR PROVIDING SERVICE TO SIGNAL. COST OF INSTALLING CONDUIT TO UNDERGROUND ELECTRIC POWER IS INCLUDED IN THIS ESTIMATE.

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From: "Curtis, Michael" <Michael.Curtis@DOT.STATE.CO.US>
SpamShield Pro Actions...
To: "'larryb@sopris.net'" <larryb@sopris.net>, "Drayton, Devin"<Devin.Drayton@DOT.STATE.CO.US>
Cc: "Yeates, Sean" <Sean.Yeates@dot.state.co.us>
Subject: 16487_SH133_HENDRICK_COST_ESTIMATE.xls
Date: Wed 08/05/2009 09:03 AM

Attachments

Name
Part 1.1
Part 1.2
16487_SH133_HENDRICK_COST_ESTIMATE.x

Larry,

I have prepared a construction cost estimate for the signal installation at SH133 and Hendrick per the plans prepared b
review the disclaimer at the bottom of the spreadsheet. I do know the bidding environment is favorable currently with l
construction projects. The biggest line item for this project is mobilization. An out of town contractor will have to cover
travel costs, as well as bonds, mobilization of equipment, etc. I did have the cost estimate reviewed by an estimator a
was 3 to 5 percent low.

I would inflate the estimate some just so you are covered if costs go up between now and when you construct this bas
funds.

If you have any questions on the access permit that will be needed please contact Devin Drayton at 970-683-6286.

Please feel free to contact me if you have any questions regarding this estimate.

Mike
Project Manager/Engineer
Region 3 Traffic & Safety
Colorado Department of Transportation
Phone: (970) 683-6277
Fax: (970) 683-6290
Email: michael.curtis@dot.state.co.us

Attachment: Save View
Name: 16487_SH133_HENDRICK_COST_ESTIMATE.xls
Type: application/vnd.ms-excel

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OPERATIONS COMMENTS

Project: SH 133 / Hendricks

For the electronic copy of these comments go to: \\r3ntb\Traffic\Common\OpsCommon\PlansReview

Reviewer	Date	Sheet No.	Comment
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Bill Crawford	5/22/2009	17	The "RIGHT LANE MUST TURN RIGHT" sign should be placed at the beginning of the full width right turn lane.
Bill Crawford	5/22/2009		
Eric Kimball	5/26/2009	13	adjust quantities for comments below
Eric Kimball	5/26/2009	14	Move valveboxes to 50' from stopbar on White solid between turn and thru lanes, all approaches
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Eric Kimball	5/26/2009	14	1- 6 x 40' quad loop starting 2' ahead of stopbar for 133 Left turn lane
Eric Kimball	5/26/2009	14	Install 2- 6 x 30' quad loop in front of cross walk on south leg.
Eric Kimball	5/26/2009	14	Replace signal pole on SW corner with light standard and mount signal signal equipment on light standard.
Eric Kimball	5/26/2009	14	Remove Mast arm signal head (#12) for right turn only lane. Replace With right turn only arrow Lane designation sign.
Eric Kimball	5/26/2009	14	Install left turn only arrow lane designation signs on mast arm next to left turn head.
Eric Kimball	5/26/2009	17	Install Stop here on Red sign at stop - bar on south leg.

COLORADO DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS
SH 133 AT HENDRICK DRIVE
TRAFFIC SIGNAL

The *Colorado Department of Transportation's Standard Specifications for Road and Bridge Construction*, dated 2005, controls construction of this project. The following Special Provisions supplement or modify the Standard Specifications and take precedence over the Standard Specifications and Plans. When Specifications or Special Provisions contain both English units and SI units, the English units apply and are the Specification requirement.

PROJECT SPECIAL PROVISIONS

COLORADO DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS
SH 133 AT HENDRICK DRIVE
TRAFFIC SIGNAL

STANDARD SPECIAL PROVISIONS

		No. of Pages
Revision of Section 101 – Falsework, Formwork, and Shoring	(Nov. 30, 2006)	1
Revision of Section 101 – Safety Critical Work	(Nov. 30, 2006)	1
Revision of Section 101,107 and 108 – Water Quality Control (Without CDPS-SCP)	(January 29, 2009)	7
Revision of Section 103 – Colorado Resident Bid Preference	(August 1, 2005)	1
Revision of Section 104 – Value Engineering Change Proposals	(August 1, 2005)	5
Revision of Section 105 – Disputes and Claims for Contract Adjustments	(January 17, 2008)	30
Revision of Section 105 – Failure to Maintain Roadway or Structure	(August 2, 2007)	1
Revision of Section 105 – Violation of Working Time Limitation	(August 1, 2005)	1
Revision of Section 106 – Certificates of Compliance and Certified Test Reports	(June 29, 2006)	1
Revision of Sections 106 and 601 – Concrete Sampling and Pumping	(April 30, 2009)	2
Revision of Section 107 – Project Safety Planning	(April 30, 2009)	3
Revision of Section 107 – Responsibility for Damage Claims, Insurance Types and Coverage Limits	(August 1, 2005)	2
Revision of Section 107 – Ton-Mile Taxes	(April 12, 2007)	1
Revision of Section 108 – Liquidated Damages	(October 25, 2007)	1
Revision of Section 108 – Payment Schedule	(October 11, 2006)	1
Revision of Section 108 – Progress Schedule	(November 3, 2008)	1
Revision of Section 109 – Compensation of Compensable Delays	(January 17, 2008)	1
Revision of Section 109 – Fuel Cost Adjustment	(Nov. 30, 2006)	2
Revision of Section 212 – Seeding Seasons	(April 12, 2007)	1
Revision of Section 401 – Compaction of Hot Mix Asphalt	(October 25, 2007)	1
Revision of Section 401 – Processing of Asphalt Mix Design	(January 17, 2008)	1
Revision of Sections 601, 606, 608, 609 and 618 – Concrete Finishing	(April 12, 2007)	1
Revision of Sections 613 and 715 – Lighting	(June 29, 2006)	14
Revision of Sections 614 and 630 – Retroreflective Sign Sheeting	(Sept. 2, 2005)	1
Revision of Section 627– Pavement Marking	(April 12, 2007)	2
Revision of Sections 627 and 713–Preformed Plastic Pavement Marking	(Oct. 13, 2005)	3
Revision of Section 630 – Construction Zone Traffic Control	(November 3, 2008)	1
Revision of Section 630 – NCHRP 350 Requirements	(August 2, 2007)	1
Revision of Section 630 – Payment for Construction Traffic Control Devices	(June 7, 2007)	1
Revision of Section 630 – Portable Sign Storage	(August 1, 2005)	1
Revision of Section 702 – Bituminous Materials	(January 17, 2008)	10
Revision of Section 712 – Hydrated Lime	(January 17, 2008)	1
Affirmative Action Requirements –Equal Employment Opportunity	(August 1, 2005)	10
Emerging Small Business Program	(October 13, 2005)	8

COMMENCEMENT AND COMPLETION OF WORK

The Contractor shall complete all work within XX calendar days in accordance with the "Notice to Proceed".

Section 108 of the Standard Specifications is hereby revised for this project as follows:

Subsection 108.03 shall include the following:

The Contractor's progress schedule may be a Bar Chart Schedule.

Salient features to be shown on the Contractor's Progress Schedule are:

1. Notice to Proceed
2. Mobilization(s)
3. Erosion Control
4. Traffic Signal
5. Concrete Flatwork/HMA work
6. Signing and Striping

REVISION OF SECTION 101
DEFINITION OF TERMS

Technical Specifications related to construction materials and methods for the work embraced under this Contract shall consist of the *State Department of Highways, Division of Highways, State of Colorado, Standard Specifications for Road and Bridge Construction* dated 2005.

Certain terms utilized in the Specifications referred to in the paragraph above shall be interpreted to have different meaning within the scope of this Contract. A summary of redefinitions follows:

Subsection 101.27	"Department" shall mean the Town of Carbondale, Colorado.
Subsection 101.28	"Chief Engineer" shall mean the Director of Public Works, Carbondale, Colorado, or designated representative.
Subsection 101.36	"Laboratory" shall mean Town of Carbondale, Colorado or their designated representative.
Subsection 101.47	"Project Engineer" or "Project Manager" shall mean the Director of Public Works, Carbondale, Colorado, or designated representative.
Subsection 101.70	"State" shall mean Carbondale, Colorado (where applicable).

REVISION OF SECTION 107
PERMITS, LICENSES AND TAXES

Section 107 of the Standard Specifications is hereby revised for this project as follows:

Subsection 107.02 shall include the following:

> Unless otherwise specified, the Contractor shall procure all permits and licenses; pay all charges, fees, and taxes, including permits procured for this project by others; and give all notices necessary and incidental to the due and lawful prosecution of the work. The costs of these permits will not be paid for separately, but shall be included in the work.
>
> The Contractor shall be responsible for obtaining a Colorado Department of Public Health & Environment Storm Water Discharge permit and any other permits required for this project.

REVISION OF SECTION 209
WATERING & DUST PALLIATIVES

Section 209 of the Standard Specifications is hereby revised for this project as follows:

In Subsection 209.07, delete the first paragraph and replace with the following:

> Water will not be measured, but shall be included in the work.

In Subsection 209.08, delete the third paragraph and replace with the following:

> Water required for all items of work, including landscaping and dust control, will not be paid for separately, but shall be included in the work.

REVISION OF SECTION 608
CONCRETE CURB RAMP

Section 608 of the Standard Specifications is hereby revised for this project as follows:

Subsection 608.01 shall include the following:

This work consists of construction of concrete curb ramp, including the installation of detectable warnings, in accordance with these specifications and in conformity with the plans.

Subsection 608.02 shall include the following:

Detectable warnings on curb ramps shall be Armor-Tile Tactile Systems, cast-in-place type, brick red in color or approved equal.

Alternate materials may be used, if pre-approved by the Engineer. The Contractor shall submit a sample of the product, the name of the selected supplier, and documentation that the product meets all contrast requirements and will be fully compatible with the curb ramp surface to the Engineer for approval prior to the start of work.

Subsection 608.03 shall include the following:

Detectable warnings on curb ramps shall be installed in strict accordance with the manufacturer's recommendations.

Subsection 608.05 shall include the following:

Detectable warnings on curb ramps, including all work and materials necessary for fabrication, transport and installation will not be measured and paid for separately, but shall be included in the work.

Subsection 608.06 shall include the following:

Pay Item	**Pay Unit**
Concrete Curb Ramp	Square Yard

The price per square yard of Concrete Curb Ramp shall be full compensation for furnishing and placing all materials, including detectable warnings, necessary to complete the work.

FORCE ACCOUNT ITEMS

DESCRIPTION

This Special Provision contains the Town's estimate for Force Account Items included in the Contract. The estimated amounts marked with an asterisk will be added to the total bid to determine the amount of the performance and payment bonds. Force Account work shall be performed as directed by the Engineer.

BASIS OF PAYMENT

Payment will be made in accordance with Subsection 109.04. Payment will constitute full compensation for all work necessary to complete the item.

Force Account work valued at $5,000 or less that must be performed by a licensed journeyman in order to comply with federal, state, or local codes, may be paid for after receipt of an itemized statement endorsed by the Contractor.

Item No.	Force Account Item	Quantity	Estimated Amount
F/A 01	Erosion Control	F/A	$ 5,000
F/A 02	Minor Contract Revisions	F/A	$ 10,000

Force Account descriptions include:

F/A 01	Erosion Control – This work is for unforeseen erosion control measures not included in the contract drawings.
F/A 02	Minor Contract Revisions – This work consists of minor work authorized and approved by the Engineer which is not included in the Contract drawings or specifications, and is necessary to accomplish the Scope of Work of this Contract.

TRAFFIC CONTROL PLAN - GENERAL

The Contractor shall submit a Traffic Control Plan (TCP) to the Town of Carbondale for approval prior to beginning any construction. The key elements of the Contractor's Method of Handling Traffic (MHT) are outlined in Subsection 630.09.

All work zone traffic control shall be in accordance with the latest edition of the Manual on Uniform Traffic Control Device (MUTCD).

The components of the TCP for this project are included in the following:

1. Subsection 104.04 and Section 630 of the Standard Specifications and Special Provisions.
2. Latest revised Standard Plan S-630-1(03/15/2007), Traffic Controls for Highway Construction and Standard Plan S-630-2.
3. Tabulation of Traffic Control Devices (included in the General Notes for this project).

Special Traffic Control Plan requirements for this project are as follows:

1. During the construction of this project, traffic shall use the present traveled roadway.

2. Work that interferes with traffic will only be permitted during the following hours:

    - Monday through Friday only one lane may be closed in each direction during daytime work. Weekday Schedule, 9:00AM to 3:30PM. Night closures from 7:00 PM to 5:30 AM may be allowed if requested by the Contractor and approved by the Engineer.
    - No work on Holidays
    - Contractor shall not close lanes during special events.
    - Contractor shall coordinate lane closures with adjacent projects.
    - Contractor shall maintain business access during business hours.

3. The Contractor shall submit a Construction Phasing Plan to the Engineer for approval, one week prior to the start of any construction.

4. All construction signing shall be in conformance with the MUTCD. Traffic control devices and barricades must be kept clean and in good working order at all times. All flaggers and traffic control supervisors shall be certified per Specification 630.10.

5. The existing path shall be maintained throughout the project or adequate detours provided.

-2-

TRAFFIC CONTROL PLAN - GENERAL

The Contractor shall conduct weekly meetings, with representatives of the aforementioned agencies and organizations, in order to review traffic control operations for the upcoming week. Also, similar meetings shall be conducted on a monthly basis to review the general construction activities and schedule for the upcoming month.

The Contractor shall install construction traffic control devices where they do not block or impede other existing traffic control devices, or sidewalks for pedestrians, disabled persons, bicyclists.

All construction vehicle ingress/egress to the limits of the project shall be along approved routes. Prior to construction, the Contractor shall submit site access plans for approval to the Engineer.

The Contractor and Contractor's subcontractors shall equip their construction vehicles with flashing amber lights. Equipment to be used at night shall also be equipped with flashing amber lights. Flashing amber lights on vehicles and equipment shall be visible from all directions.

All work shall be completed Monday through Friday 7 AM to 7 PM unless otherwise stated herein or if otherwise approved by the Engineer.

The Contractor shall maintain all existing access to private property at all times unless approved by the Engineer.

The Contractor shall maintain existing access to all roadways, side streets, walkways, alleyways, driveways and hike/bikepaths at all times unless otherwise directed by the Engineer.

All access shall be maintained on surfaces equal to or better than those existing at the time the access is first disturbed.

The Contractor shall maintain continuous access through the project for pedestrians, bicyclists, and disabled persons. When the existing access route is disturbed by construction, a temporary all-weather access shall be provided. All temporary access shall be a minimum of 5 feet wide and meet Americans with Disabilities Act (ADA) and MUTCD requirements. Temporary all-weather access/path will not be measured and paid for separately but shall be included in the work. Temporary access shall be delineated by temporary fence and paid for in accordance with Section 607. Acceptable all weather surfacing shall be concrete or asphalt surface, or as approved by the Engineer.

-3-

TRAFFIC CONTROL PLAN - GENERAL

During non-construction periods (evenings, weekends, holidays, etc.) all work shall be adequately protected to insure the safety of vehicular and pedestrian traffic, as detailed in the Contractor's MHT. Excavations or holes shall be filled in and surfaced with temporary asphalt or fenced when unattended.

The Contractor shall not have construction equipment or materials in the lanes open to traffic at any time unless directed by the Engineer.

All personal vehicles and construction equipment parking is to be prohibited where it conflicts with safety, access, or the flow of traffic. Landscaped areas and roadway shoulders shall be kept clear of all parking.

All costs incidental to the foregoing requirements shall be included in the original Contract prices for the project, including any additional traffic control items required for haul routes into the project, except as otherwise noted.

It is the sole responsibility of the Contractor to determine the appropriate construction phasing for this project.

UTILITIES

The known utilities within the limits of this project are:

UTILITY	CONTACT/EMAIL	PHONE/FAX
Xcel Energy-Electric	Josh Wilson Josh.Wilson@xcelenergy.com	970-433-3470

The work described in these plans and specifications requires full cooperation between the Contractor and the utility owners in accordance with Subsection 105.10 in conducting their respective operations, to complete the utility work with minimum delay to the project.

PART 1 - CONTRACTOR SHALL PERFORM THE WORK LISTED BELOW:

Coordinate project construction with the performance by the utility owner of each utility work element listed in Part 2 below. Perform preparatory work specified in Part 2 for each utility work element. Provide an accurate construction schedule that includes all utility work elements to the owner of each impacted utility. Provide each utility owner with periodic updates to the schedule. Conduct necessary utility coordination meetings, and provide other necessary accommodations as directed by the Engineer. Notify each utility owner in writing, with a copy to the Engineer, prior to the time each utility work element is to be performed by the utility owner. Provide the notice for the number of days specified in Part 2 immediately prior to the time the utility work must be begun to meet the project schedule.

Provide traffic control, as directed by the Engineer, for any utility work by the utility owner expected to be coordinated with construction. However, traffic control for utility work outside of typical project work hours shall be the responsibility of the utility owner.

Perform each utility work element for every utility owner listed here in Part 1. Notify each utility owner in advance of any work being done by the Contractor to its facility, so that the utility owner can coordinate its inspections for final acceptance of the work with the Engineer.

XCEL ENERGY – STREET LIGHTING & ELECTRIC DISTRIBUTION

Coordinate all required work including the removal of pole, undergrounding of electric line and power source for traffic signal with Xcel Energy – Electric Distribution forces.

The Town's Contractor shall provide the utility owner written notice 5 days immediately prior to requiring undergrounding of electric line.

-2-
UTILITIES

PART 2 - UTILITY OWNERS SHALL PERFORM THE WORK LISTED BELOW:

Although the Town's Contractor shall provide traffic control for utility work expected to be coordinated with construction, traffic control for utility work outside of typical project work hours shall be the responsibility of the utility owner. The utility owner shall prepare and submit to the Town's Engineer a Method of Handling Traffic for utility work to be performed outside typical project work hours. The utility owner shall obtain acceptance of the Method of Handling traffic from the Town's Engineer prior to beginning the utility work to be performed outside typical project work hours.

XCEL ENERGY – STREET LIGHTING & ELECTRIC DISTRIBUTION

Remove pole and underground electric line.

Provide power source for traffic signal.

The Town's Contractor shall provide the utility owner written notice 5 days immediately prior to needing pole removed and electric line buried and power source for traffic signal.

GENERAL:

The Contractor shall comply with Article 1.5 of Title 9, CRS ("Excavation Requirements") when excavating or grading is planned in the area of underground utility facilities. The Contractor shall notify all affected utilities at least two (2) business days, not including the actual day of notice, prior to commencing such operations. The Contractor shall contact the Utility Notification Center of Colorado (UNCC) at phone no. 1-800-922-1987, to have locations of UNCC registered lines marked by member companies. All other underground facilities shall be located by contacting the respective owner. Utility service laterals shall also be located prior to beginning excavation or grading.

The location of utility facilities as shown on the plan and profile sheets, and herein described, were obtained from the best available information.

All costs incidental to the foregoing requirements will not be paid for separately but shall be included in the work.

OPERATIONS COMMENTS

Project: SH 133 / Hendricks

For the electronic copy of these comments go to: \\r3ntb\Traffic\Common\OpsCommon\PlansReview

Reviewer	Date	Sheet No.	Comment	Addressed?
Bill Crawford	5/22/2009	16	At approximately station 24+25 Left the plan sheet shows a stop sign that appears to be for the trail instead of Sopris Street because of the way it is facing, it should be faced that traffic stops perpendicular to Hwy 133.	
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COLORADO DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS
SH 133 AT HENDRICK DRIVE
TRAFFIC SIGNAL

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COLORADO DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS
SH 133 AT HENDRICK DRIVE
TRAFFIC SIGNAL

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Revision of Section 101 – Falsework, Formwork, and Shoring	(Nov. 30, 2006)	1
Revision of Section 101 – Safety Critical Work	(Nov. 30, 2006)	1
Revision of Section 101,107 and 108 – Water Quality Control (Without CDPS-SCP)	(January 29, 2009)	7
Revision of Section 103 – Colorado Resident Bid Preference	(August 1, 2005)	1
Revision of Section 104 – Value Engineering Change Proposals	(August 1, 2005)	5
Revision of Section 105 – Disputes and Claims for Contract Adjustments	(January 17, 2008)	30
Revision of Section 105 – Failure to Maintain Roadway or Structure	(August 2, 2007)	1
Revision of Section 105 – Violation of Working Time Limitation	(August 1, 2005)	1
Revision of Section 106 – Certificates of Compliance and Certified Test Reports	(June 29, 2006)	1
Revision of Sections 106 and 601 – Concrete Sampling and Pumping	(April 30, 2009)	2
Revision of Section 107 – Project Safety Planning	(April 30, 2009)	3
Revision of Section 107 – Responsibility for Damage Claims, Insurance Types and Coverage Limits	(August 1, 2005)	2
Revision of Section 107 – Ton-Mile Taxes	(April 12, 2007)	1
Revision of Section 108 – Liquidated Damages	(October 25, 2007)	1
Revision of Section 108 – Payment Schedule	(October 11, 2006)	1
Revision of Section 108 – Progress Schedule	(November 3, 2008)	1
Revision of Section 109 – Compensation of Compensable Delays	(January 17, 2008)	1
Revision of Section 109 – Fuel Cost Adjustment	(Nov. 30, 2006)	2
Revision of Section 212 – Seeding Seasons	(April 12, 2007)	1
Revision of Section 401 – Compaction of Hot Mix Asphalt	(October 25, 2007)	1
Revision of Section 401 – Processing of Asphalt Mix Design	(January 17, 2008)	1
Revision of Sections 601, 606, 608, 609 and 618 – Concrete Finishing	(April 12, 2007)	1
Revision of Sections 613 and 715 – Lighting	(June 29, 2006)	14
Revision of Sections 614 and 630 – Retroreflective Sign Sheeting	(Sept. 2, 2005)	1
Revision of Section 627– Pavement Marking	(April 12, 2007)	2
Revision of Sections 627 and 713–Preformed Plastic Pavement Marking	(Oct. 13, 2005)	3
Revision of Section 630 – Construction Zone Traffic Control	(November 3, 2008)	1
Revision of Section 630 – NCHRP 350 Requirements	(August 2, 2007)	1
Revision of Section 630 – Payment for Construction Traffic Control Devices	(June 7, 2007)	1
Revision of Section 630 – Portable Sign Storage	(August 1, 2005)	1
Revision of Section 702 – Bituminous Materials	(January 17, 2008)	10
Revision of Section 712 – Hydrated Lime	(January 17, 2008)	1
Affirmative Action Requirements –Equal Employment Opportunity	(August 1, 2005)	10
Emerging Small Business Program	(October 13, 2005)	8

COMMENCEMENT AND COMPLETION OF WORK

The Contractor shall complete all work within XX calendar days in accordance with the "Notice to Proceed".

Section 108 of the Standard Specifications is hereby revised for this project as follows:

Subsection 108.03 shall include the following:

The Contractor's progress schedule may be a Bar Chart Schedule.

Salient features to be shown on the Contractor's Progress Schedule are:

1. Notice to Proceed
2. Mobilization(s)
3. Erosion Control
4. Traffic Signal
5. Concrete Flatwork/HMA work
6. Signing and Striping

REVISION OF SECTION 101
DEFINITION OF TERMS

Technical Specifications related to construction materials and methods for the work embraced under this Contract shall consist of the *State Department of Highways, Division of Highways, State of Colorado, Standard Specifications for Road and Bridge Construction* dated 2005.

Certain terms utilized in the Specifications referred to in the paragraph above shall be interpreted to have different meaning within the scope of this Contract. A summary of redefinitions follows:

Subsection 101.27	"Department" shall mean the Town of Carbondale, Colorado.
Subsection 101.28	"Chief Engineer" shall mean the Director of Public Works, Carbondale, Colorado, or designated representative.
Subsection 101.36	"Laboratory" shall mean Town of Carbondale, Colorado or their designated representative.
Subsection 101.47	"Project Engineer" or "Project Manager" shall mean the Director of Public Works, Carbondale, Colorado, or designated representative.
Subsection 101.70	"State" shall mean Carbondale, Colorado (where applicable).

REVISION OF SECTION 107
PERMITS, LICENSES AND TAXES

Section 107 of the Standard Specifications is hereby revised for this project as follows:

Subsection 107.02 shall include the following:

> Unless otherwise specified, the Contractor shall procure all permits and licenses; pay all charges, fees, and taxes, including permits procured for this project by others; and give all notices necessary and incidental to the due and lawful prosecution of the work. The costs of these permits will not be paid for separately, but shall be included in the work.
>
> The Contractor shall be responsible for obtaining a Colorado Department of Public Health & Environment Storm Water Discharge permit and any other permits required for this project.

REVISION OF SECTION 209
WATERING & DUST PALLIATIVES

Section 209 of the Standard Specifications is hereby revised for this project as follows:

In Subsection 209.07, delete the first paragraph and replace with the following:

Water will not be measured, but shall be included in the work.

In Subsection 209.08, delete the third paragraph and replace with the following:

Water required for all items of work, including landscaping and dust control, will not be paid for separately, but shall be included in the work.

REVISION OF SECTION 608
CONCRETE CURB RAMP

Section 608 of the Standard Specifications is hereby revised for this project as follows:

Subsection 608.01 shall include the following:

This work consists of construction of concrete curb ramp, including the installation of detectable warnings, in accordance with these specifications and in conformity with the plans.

Subsection 608.02 shall include the following:

Detectable warnings on curb ramps shall be Armor-Tile Tactile Systems, cast-in-place type, brick red in color or approved equal.

Alternate materials may be used, if pre-approved by the Engineer. The Contractor shall submit a sample of the product, the name of the selected supplier, and documentation that the product meets all contrast requirements and will be fully compatible with the curb ramp surface to the Engineer for approval prior to the start of work.

Subsection 608.03 shall include the following:

Detectable warnings on curb ramps shall be installed in strict accordance with the manufacturer's recommendations.

Subsection 608.05 shall include the following:

Detectable warnings on curb ramps, including all work and materials necessary for fabrication, transport and installation will not be measured and paid for separately, but shall be included in the work.

Subsection 608.06 shall include the following:

Pay Item	**Pay Unit**
Concrete Curb Ramp	Square Yard

The price per square yard of Concrete Curb Ramp shall be full compensation for furnishing and placing all materials, including detectable warnings, necessary to complete the work.

FORCE ACCOUNT ITEMS

DESCRIPTION

This Special Provision contains the Town's estimate for Force Account Items included in the Contract. The estimated amounts marked with an asterisk will be added to the total bid to determine the amount of the performance and payment bonds. Force Account work shall be performed as directed by the Engineer.

BASIS OF PAYMENT

Payment will be made in accordance with Subsection 109.04. Payment will constitute full compensation for all work necessary to complete the item.

Force Account work valued at $5,000 or less that must be performed by a licensed journeyman in order to comply with federal, state, or local codes, may be paid for after receipt of an itemized statement endorsed by the Contractor.

Item No.	Force Account Item	Quantity	Estimated Amount
F/A 01	Erosion Control	F/A	$ 5,000
F/A 02	Minor Contract Revisions	F/A	$ 10,000

Force Account descriptions include:

F/A 01	Erosion Control – This work is for unforeseen erosion control measures not included in the contract drawings.
F/A 02	Minor Contract Revisions – This work consists of minor work authorized and approved by the Engineer which is not included in the Contract drawings or specifications, and is necessary to accomplish the Scope of Work of this Contract.

TRAFFIC CONTROL PLAN - GENERAL

The Contractor shall submit a Traffic Control Plan (TCP) to the Town of Carbondale for approval prior to beginning any construction. The key elements of the Contractor's Method of Handling Traffic (MHT) are outlined in Subsection 630.09.

All work zone traffic control shall be in accordance with the latest edition of the Manual on Uniform Traffic Control Device (MUTCD).

The components of the TCP for this project are included in the following:

1. Subsection 104.04 and Section 630 of the Standard Specifications and Special Provisions.
2. Latest revised Standard Plan S-630-1(03/15/2007), Traffic Controls for Highway Construction and Standard Plan S-630-2.
3. Tabulation of Traffic Control Devices (included in the General Notes for this project).

Special Traffic Control Plan requirements for this project are as follows:

1. During the construction of this project, traffic shall use the present traveled roadway.

2. Work that interferes with traffic will only be permitted during the following hours:

   - Monday through Friday only one lane may be closed in each direction during daytime work. Weekday Schedule, 9:00AM to 3:30PM. Night closures from 7:00 PM to 5:30 AM may be allowed if requested by the Contractor and approved by the Engineer.
   - No work on Holidays
   - Contractor shall not close lanes during special events.
   - Contractor shall coordinate lane closures with adjacent projects.
   - Contractor shall maintain business access during business hours.

3. The Contractor shall submit a Construction Phasing Plan to the Engineer for approval, one week prior to the start of any construction.

4. All construction signing shall be in conformance with the MUTCD. Traffic control devices and barricades must be kept clean and in good working order at all times. All flaggers and traffic control supervisors shall be certified per Specification 630.10.

5. The existing path shall be maintained throughout the project or adequate detours provided.

-2-

TRAFFIC CONTROL PLAN - GENERAL

The Contractor shall conduct weekly meetings, with representatives of the aforementioned agencies and organizations, in order to review traffic control operations for the upcoming week. Also, similar meetings shall be conducted on a monthly basis to review the general construction activities and schedule for the upcoming month.

The Contractor shall install construction traffic control devices where they do not block or impede other existing traffic control devices, or sidewalks for pedestrians, disabled persons, bicyclists.

All construction vehicle ingress/egress to the limits of the project shall be along approved routes. Prior to construction, the Contractor shall submit site access plans for approval to the Engineer.

The Contractor and Contractor's subcontractors shall equip their construction vehicles with flashing amber lights. Equipment to be used at night shall also be equipped with flashing amber lights. Flashing amber lights on vehicles and equipment shall be visible from all directions.

All work shall be completed Monday through Friday 7 AM to 7 PM unless otherwise stated herein or if otherwise approved by the Engineer.

The Contractor shall maintain all existing access to private property at all times unless approved by the Engineer.

The Contractor shall maintain existing access to all roadways, side streets, walkways, alleyways, driveways and hike/bikepaths at all times unless otherwise directed by the Engineer.

All access shall be maintained on surfaces equal to or better than those existing at the time the access is first disturbed.

The Contractor shall maintain continuous access through the project for pedestrians, bicyclists, and disabled persons. When the existing access route is disturbed by construction, a temporary all-weather access shall be provided. All temporary access shall be a minimum of 5 feet wide and meet Americans with Disabilities Act (ADA) and MUTCD requirements. Temporary all-weather access/path will not be measured and paid for separately but shall be included in the work. Temporary access shall be delineated by temporary fence and paid for in accordance with Section 607. Acceptable all weather surfacing shall be concrete or asphalt surface, or as approved by the Engineer.

-3-

TRAFFIC CONTROL PLAN - GENERAL

During non-construction periods (evenings, weekends, holidays, etc.) all work shall be adequately protected to insure the safety of vehicular and pedestrian traffic, as detailed in the Contractor's MHT. Excavations or holes shall be filled in and surfaced with temporary asphalt or fenced when unattended.

The Contractor shall not have construction equipment or materials in the lanes open to traffic at any time unless directed by the Engineer.

All personal vehicles and construction equipment parking is to be prohibited where it conflicts with safety, access, or the flow of traffic. Landscaped areas and roadway shoulders shall be kept clear of all parking.

All costs incidental to the foregoing requirements shall be included in the original Contract prices for the project, including any additional traffic control items required for haul routes into the project, except as otherwise noted.

It is the sole responsibility of the Contractor to determine the appropriate construction phasing for this project.

UTILITIES

The known utilities within the limits of this project are:

UTILITY	CONTACT/EMAIL	PHONE/FAX
Xcel Energy-Electric	Josh Wilson Josh.Wilson@xcelenergy.com	970-433-3470

The work described in these plans and specifications requires full cooperation between the Contractor and the utility owners in accordance with Subsection 105.10 in conducting their respective operations, to complete the utility work with minimum delay to the project.

PART 1 - CONTRACTOR SHALL PERFORM THE WORK LISTED BELOW:

Coordinate project construction with the performance by the utility owner of each utility work element listed in Part 2 below. Perform preparatory work specified in Part 2 for each utility work element. Provide an accurate construction schedule that includes all utility work elements to the owner of each impacted utility. Provide each utility owner with periodic updates to the schedule. Conduct necessary utility coordination meetings, and provide other necessary accommodations as directed by the Engineer. Notify each utility owner in writing, with a copy to the Engineer, prior to the time each utility work element is to be performed by the utility owner. Provide the notice for the number of days specified in Part 2 immediately prior to the time the utility work must be begun to meet the project schedule.

Provide traffic control, as directed by the Engineer, for any utility work by the utility owner expected to be coordinated with construction. However, traffic control for utility work outside of typical project work hours shall be the responsibility of the utility owner.

Perform each utility work element for every utility owner listed here in Part 1. Notify each utility owner in advance of any work being done by the Contractor to its facility, so that the utility owner can coordinate its inspections for final acceptance of the work with the Engineer.

XCEL ENERGY – STREET LIGHTING & ELECTRIC DISTRIBUTION

Coordinate all required work including the removal of pole, undergrounding of electric line and power source for traffic signal with Xcel Energy – Electric Distribution forces.

The Town's Contractor shall provide the utility owner written notice 5 days immediately prior to requiring undergrounding of electric line.

-2-
UTILITIES

PART 2 - UTILITY OWNERS SHALL PERFORM THE WORK LISTED BELOW:

Although the Town's Contractor shall provide traffic control for utility work expected to be coordinated with construction, traffic control for utility work outside of typical project work hours shall be the responsibility of the utility owner. The utility owner shall prepare and submit to the Town's Engineer a Method of Handling Traffic for utility work to be performed outside typical project work hours. The utility owner shall obtain acceptance of the Method of Handling traffic from the Town's Engineer prior to beginning the utility work to be performed outside typical project work hours.

XCEL ENERGY – STREET LIGHTING & ELECTRIC DISTRIBUTION

Remove pole and underground electric line.

Provide power source for traffic signal.

The Town's Contractor shall provide the utility owner written notice 5 days immediately prior to needing pole removed and electric line buried and power source for traffic signal.

GENERAL:

The Contractor shall comply with Article 1.5 of Title 9, CRS ("Excavation Requirements") when excavating or grading is planned in the area of underground utility facilities. The Contractor shall notify all affected utilities at least two (2) business days, not including the actual day of notice, prior to commencing such operations. The Contractor shall contact the Utility Notification Center of Colorado (UNCC) at phone no. 1-800-922-1987, to have locations of UNCC registered lines marked by member companies. All other underground facilities shall be located by contacting the respective owner. Utility service laterals shall also be located prior to beginning excavation or grading.

The location of utility facilities as shown on the plan and profile sheets, and herein described, were obtained from the best available information.

All costs incidental to the foregoing requirements will not be paid for separately but shall be included in the work.

COLORADO DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS
SH 133 AT HENDRICK DRIVE
TRAFFIC SIGNAL

The *Colorado Department of Transportation's Standard Specifications for Road and Bridge Construction*, dated 2005, controls construction of this project. The following Special Provisions supplement or modify the Standard Specifications and take precedence over the Standard Specifications and Plans. When Specifications or Special Provisions contain both English units and SI units, the English units apply and are the Specification requirement.

PROJECT SPECIAL PROVISIONS

COLORADO DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS
SH 133 AT HENDRICK DRIVE TRAFFIC SIGNAL

STANDARD SPECIAL PROVISIONS

COMMENCEMENT AND COMPLETION OF WORK

The Contractor shall complete all work within XX calendar days in accordance with the X "Notice to Proceed".

Section 108 of the Standard Specifications is hereby revised for this project as follows:

Subsection 108.03 shall include the following:

The Contractor's progress schedule may be a Bar Chart Schedule.

Salient features to be shown on the Contractor's Progress Schedule are:

1. Notice to Proceed
2. Mobilization(s)
3. Erosion Control
4. Traffic Signal
5. Concrete Flatwork/HMA work
6. Signing and Striping
7. Landscape

REVISION OF SECTION 107
PERMITS, LICENSES AND TAXES

Section 107 of the Standard Specifications is hereby revised for this project as follows:

Subsection 107.02 shall include the following:

Unless otherwise specified, the Contractor shall procure all permits and licenses; pay all charges, fees, and taxes, including permits procured for this project by others; and give all notices necessary and incidental to the due and lawful prosecution of the work. The costs of these permits will not be paid for separately, but shall be included in the work.

The Contractor shall be responsible for obtaining a Colorado Department of Public Health & Environment Storm Water Discharge permit and any other permits required for this project.

The Contractor will be required to obtain a __________ grading and right-of-way permit prior to construction. These permits will be at no cost to the Contractor.

REVISION OF SECTION 209
WATERING & DUST PALLIATIVES

Section 209 of the Standard Specifications is hereby revised for this project as follows:

In Subsection 209.07, delete the first paragraph and replace with the following:

Water will not be measured, but shall be included in the work.

In Subsection 209.08, delete the third paragraph and replace with the following:

Water required for all items of work, including landscaping and dust control, will not be paid for separately, but shall be included in the work.

REVISION OF SECTION 608
CONCRETE CURB RAMP

Section 608 of the Standard Specifications is hereby revised for this project as follows:

Subsection 608.01 shall include the following:

This work consists of construction of concrete curb ramp, including the installation of detectable warnings, in accordance with these specifications and in conformity with the plans.

Subsection 608.02 shall include the following:

Detectable warnings on curb ramps shall be Armor-Tile Tactile Systems, cast-in-place type, brick red in color or approved equal.

Alternate materials may be used, if pre-approved by the Engineer. The Contractor shall submit a sample of the product, the name of the selected supplier, and documentation that the product meets all contrast requirements and will be fully compatible with the curb ramp surface to the Engineer for approval prior to the start of work.

Subsection 608.03 shall include the following:

Detectable warnings on curb ramps shall be installed in strict accordance with the manufacturer's recommendations.

Subsection 608.05 shall include the following:

Detectable warnings on curb ramps, including all work and materials necessary for fabrication, transport and installation will not be measured and paid for separately, but shall be included in the work.

Subsection 608.06 shall include the following:

Pay Item	**Pay Unit**
Concrete Curb Ramp	Square Yard

The price per square yard of Concrete Curb Ramp shall be full compensation for furnishing and placing all materials, including detectable warnings, necessary to complete the work.

FORCE ACCOUNT ITEMS

DESCRIPTION

This Special Provision contains the City's estimate for Force Account Items included in the Contract. The estimated amounts marked with an asterisk will be added to the total bid to determine the amount of the performance and payment bonds. Force Account work shall be performed as directed by the Engineer.

BASIS OF PAYMENT

Payment will be made in accordance with Subsection 109.04. Payment will constitute full compensation for all work necessary to complete the item.

Force Account work valued at $5,000 or less that must be performed by a licensed journeyman in order to comply with federal, state, or local codes, may be paid for after receipt of an itemized statement endorsed by the Contractor.

Item No.	Force Account Item	Quantity	Estimated Amount
F/A 01	Erosion Control	F/A	$ 5,000
F/A 02	Minor Contract Revisions	F/A	$ 10,000

Force Account descriptions include:

F/A 01	Erosion Control – This work is for unforeseen erosion control measures not included in the contract drawings.
F/A 02	Minor Contract Revisions – This work consists of minor work authorized and approved by the Engineer which is not included in the Contract drawings or specifications, and is necessary to accomplish the Scope of Work of this Contract.

TRAFFIC CONTROL PLAN - GENERAL

The Contractor shall submit a Traffic Control Plan (TCP) to the City of Englewood for approval prior to beginning any construction. The key elements of the Contractor's Method of Handling Traffic (MHT) are outlined in Subsection 630.09.

All work zone traffic control shall be in accordance with the latest edition of the Manual on Uniform Traffic Control Device (MUTCD).

The components of the TCP for this project are included in the following:

1. Subsection 104.04 and Section 630 of the Standard Specifications and Special Provisions.
2. Standard Plan 630-2 "Barricades, Drums, Concrete Barriers (Temp.) & Vertical Panels.
3. Tabulation of Traffic Control Devices (included in the plans for this project).
4. Construction Traffic Control details (included in the plans for this project).

Special Traffic Control Plan requirements for this project are as follows:

- The Contractor shall submit a Construction Phasing Plan to the Engineer for approval, one week prior to the start of any construction.

- All construction signing shall be in conformance with the MUTCD. Traffic control devices and barricades must be kept clean and in good working order at all times. All flaggers and traffic control supervisors shall be certified per Specification 630.10.

- The existing trails shall be maintained throughout the project or adequate detours provided.

- A minimum of one eleven foot through lane in each direction on Platte River Drive South and Platte River Drive West shall be maintained.

The Contractor shall conduct weekly meetings, with representatives of the aforementioned agencies and organizations, in order to review traffic control operations for the upcoming week. Also, similar meetings shall be conducted on a monthly basis to review the general construction activities and schedule for the upcoming month.

The Contractor shall install construction traffic control devices where they do not block or impede other existing traffic control devices, or sidewalks for pedestrians, disabled persons, bicyclists.

All construction vehicle ingress/egress to the limits of the project shall be along approved routes. Prior to construction, the Contractor shall submit site access plans for approval to the Engineer.

-2-

TRAFFIC CONTROL PLAN - GENERAL

The Contractor and Contractor's subcontractors shall equip their construction vehicles with flashing amber lights. Equipment to be used at night shall also be equipped with flashing amber lights. Flashing amber lights on vehicles and equipment shall be visible from all directions.

All work shall be completed Monday through Friday 7 AM to 7 PM unless otherwise stated herein or if otherwise approved by the Engineer.

The Contractor shall maintain all existing access to private property at all times unless approved by the Engineer.

The Contractor shall maintain existing access to all roadways, side streets, walkways, alleyways, driveways and hike/bikepaths at all times unless otherwise directed by the Engineer.

All access shall be maintained on surfaces equal to or better than those existing at the time the access is first disturbed.

The Contractor shall maintain continuous access through the project for pedestrians, bicyclists, and disabled persons. When the existing access route is disturbed by construction, a temporary all-weather access shall be provided. All temporary access shall be a minimum of 5 feet wide and meet Americans with Disabilities Act (ADA) and MUTCD requirements. Temporary all-weather access/path will not be measured and paid for separately but shall be included in the work. Temporary access shall be delineated by temporary fence and paid for in accordance with Section 607. Acceptable all weather surfacing shall be concrete or asphalt surface, or as approved by the Engineer.

During non-construction periods (evenings, weekends, holidays, etc.) all work shall be adequately protected to insure the safety of vehicular and pedestrian traffic, as detailed in the Contractor's MHT. Excavations or holes shall be filled in and surfaced with temporary asphalt or fenced when unattended.

The Contractor shall not have construction equipment or materials in the lanes open to traffic at any time unless directed by the Engineer.

All personal vehicles and construction equipment parking is to be prohibited where it conflicts with safety, access, or the flow of traffic. Landscaped areas and roadway shoulders shall be kept clear of all parking.

-3-

TRAFFIC CONTROL PLAN - GENERAL

All costs incidental to the foregoing requirements shall be included in the original Contract prices for the project, including any additional traffic control items required for haul routes into the project, except as otherwise noted.

It is the sole responsibility of the Contractor to determine the appropriate construction phasing for this project.

UTILITIES

The known utilities within the limits of this project are:

UTILITY	CONTACT/EMAIL	PHONE/FAX
Xcel Energy-Electric 10001 W. Hampden Avenue Lakewood, CO 80227	Mark Supancic Mark.supancic@xcelenergy.com	303-716-2003 303-716-2046
Qwest Communications 9750 E. Costilla Ave., Room 201 Englewood, CO 80112	Kathy Bryant Kathy.Bryant@qwest.com	303-792-6203 303-792-6236
Comcast Cable 10312 W. Hampden Ave. Frontage Road South Lakewood, CO 80227	Scott Moore scott_moore@cable.comcast.net	303-603-2932 303-603-2970
City of Englewood 1000 Englewood Parkway Englewood, CO 80110	Tom Brennen	303-762-2654
Metro Wastewater 6450 York Street Denver, CO 80229	Marc Flatt MFlatt@mwrd.dst.co.us	303-286-3203
Denver Water Department 1600 W. 12th Avenue Denver, CO 80204	Lou Vullo Lou.Vullo@denverwater.org	303-628-6671

The work described in these plans and specifications requires full cooperation between the Contractor and the utility owners in accordance with Subsection 105.10 in conducting their respective operations, to complete the utility work with minimum delay to the project.

PART 1 - CONTRACTOR SHALL PERFORM THE WORK LISTED BELOW:

Coordinate project construction with the performance by the utility owner of each utility work element listed in Part 2 below. Perform preparatory work specified in Part 2 for each utility work element. Provide an accurate construction schedule that includes all utility work elements to the owner of each impacted utility. Provide each utility owner with periodic updates to the schedule. Conduct necessary utility coordination meetings, and provide other necessary accommodations as directed by the Engineer. Notify each utility owner in writing, with a copy to the Engineer, prior to the time each utility work element is to be performed by the utility owner. Provide the notice the number of days specified in Part 2 immediately prior to the time the utility work must be begun to meet the project schedule.

-2-
UTILITIES

Provide traffic control, as directed by the Engineer, for any utility work by the utility owner expected to be coordinated with construction. However, traffic control for utility work outside of typical project work hours shall be the responsibility of the utility owner.

Perform each utility work element for every utility owner listed here in Part 1. Notify each utility owner in advance of any work being done by the Contractor to its facility, so that the utility owner can coordinate its inspections for final acceptance of the work with the Engineer.

XCEL ENERGY – STREET LIGHTING & ELECTRIC DISTRIBUTION
No impacts are anticipated.

QWEST COMMUNICATIONS – TELEPHONE
No impacts are anticipated.

COMCAST COMMUNICATIONS – TELEPHONE
No impacts are anticipated.

METRO WASTEWATER – SANITARY SEWER
No impacts are anticipated.

DENVER WATER DEPARTMENT – WATER
No impacts are anticipated.

PART 2 - UTILITY OWNERS SHALL PERFORM THE WORK LISTED BELOW:

Although the City's Contractor shall provide traffic control for utility work expected to be coordinated with construction, traffic control for utility work outside of typical project work hours shall be the responsibility of the utility owner. The utility owner shall prepare and submit to the City's Engineer a Method of Handling Traffic for utility work to be performed outside typical project work hours. The utility owner shall obtain acceptance of the Method of Handling traffic from the City's Engineer prior to beginning the utility work to be performed outside typical project work hours.

-3-

UTILITIES

GENERAL:

The Contractor shall comply with Article 1.5 of Title 9, CRS ("Excavation Requirements") when excavating or grading is planned in the area of underground utility facilities. The Contractor shall notify all affected utilities at least two (2) business days, not including the actual day of notice, prior to commencing such operations. The Contractor shall contact the Utility Notification Center of Colorado (UNCC) at phone no. 1-800-922-1987, to have locations of UNCC registered lines marked by member companies. All other underground facilities shall be located by contacting the respective owner. Utility service laterals shall also be located prior to beginning excavation or grading.

The location of utility facilities as shown on the plan and profile sheets, and herein described, were obtained from the best available information.

All costs incidental to the foregoing requirements will not be paid for separately but shall be included in the work.

Oversight / NHS	
FHWA REGION VIII OVERSIGHT?	☒ NO ☐ YES
NATIONAL HIGHWAY SYSTEM?	☐ NO ☐ YES

DEPARTMENT OF TRANSPORTATION
STATE OF COLORADO

HIGHWAY CONSTRUCTION BID PLANS OF PROPOSED
FEDERAL AID PROJECT NO. C 133A-036
STATE HIGHWAY NO. 133
GARFIELD COUNTY
CONSTRUCTION PROJECT CODE NO. 16847
PERMIT # ________

Related Projects:
P.E. UNDER PROJECT:
Project Number C133A-036
Project Code: 16847

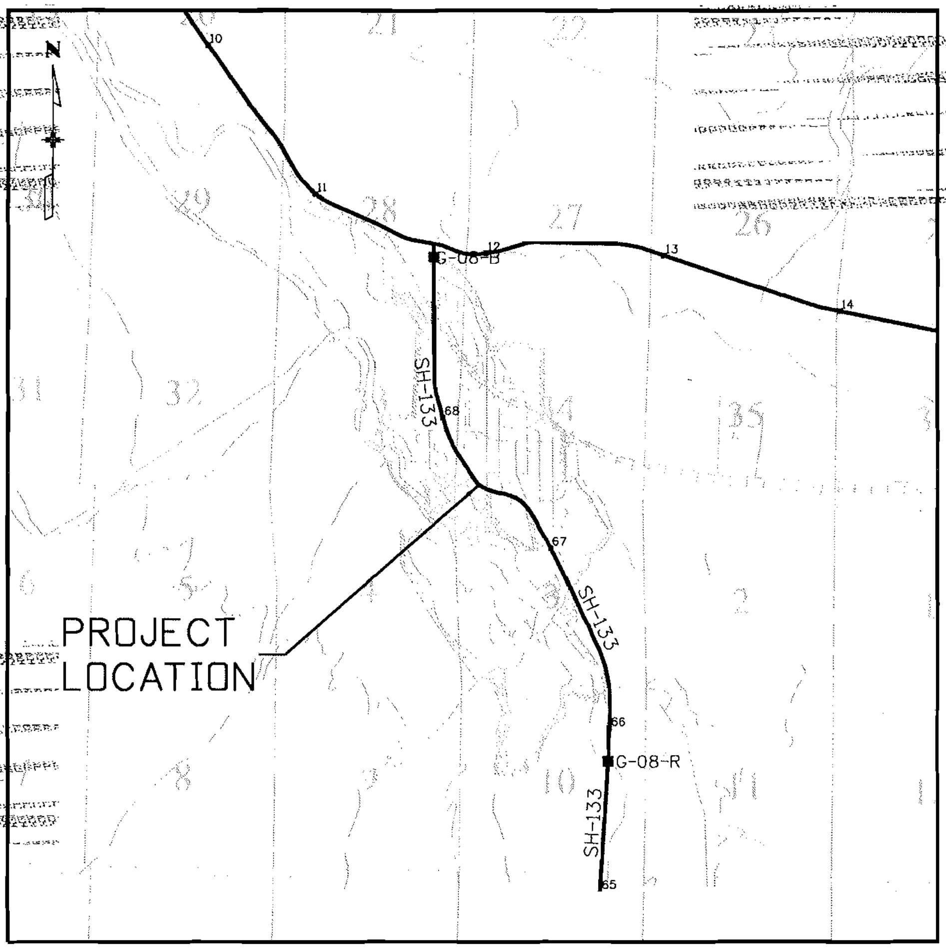
R.D.W. Projects:
R.D.W. Project Description
XXXXXXXXXXXXXXX

TABULATION OF LENGTH & DESIGN DATA

STATION	FEET ROADWAY SH 133	MILE POST LIMIT
BEGIN 16847 =		
STA. 23+76.50		67.53
	530.5	
END 16847 =		
STA. 29+07.03		67.44
TOTAL	530.5	
SUMMARY OF PROJECT LENGTH	FEET	
MAJOR STRUCTURE		
PROJECT GROSS LENGTH	530.5	

DESIGN DATA	S.H. 133
MAXIMUM RADIUS OF CURVE	NA
MAXIMUM GRADE	NA
MINIMUM S.S.D. HORIZONTAL	NA
MINIMUM S.S.D. VERTICAL	NA
MAXIMUM DESIGN SPEED	NA
20XX DESIGN TRAFFIC	DHV = 1650 ADT = 18300
DHV TRUCK %	3%
CONSTRUCTION CLEAR ZONE (MIN 18')	18 FT

SHEET NO.	INDEX OF SHEETS
1	TITLE SHEET
2	STANDARD PLANS LIST SHEET
3	GENERAL NOTES
4	SUMMARY OF APPROXIMATE QUANTITIES
5	TABULATION OF QUANTITIES
6	TYPICAL SECTION
7-9	STORM WATER MANAGEMENT PLAN SHEETS
10	GEOMETRIC LAYOUT
11	SITE PLAN
12	PLAN AND PROFILE
13	SIGNAL NOTES AND QUANTITIES
14	SIGNAL PLAN
15	TABULATION OF PAVEMENT MARKING QUANTITIES
16-17	SIGNING AND STRIPING PLAN
18	CROSS SECTIONS



PROJECT LOCATION MAP

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Colorado Department of Transportation
222 South 6th Street, Room 100
Grand Junction, CO 81501
Phone: 970-248-7230 FAX: 970-248-7294
Region 3 SHY

As Constructed
No Revisions:
Revised:
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Contract Information	
Contractor:	
Resident Engineer:	SEAN YEATES
Project Engineer:	MICHAEL CURTIS
PROJECT STARTED: 9/29/08	ACCEPTED: / /
Comments:	

Project No./Code	
C 133A-036	
16847	
Sheet Number	1

PLAN NUMBER	NEW OR REVISED	M STANDARD TITLE	PAGE NUMBER
■ M-100-1		STANDARD SYMBOLS (3 SHEETS)	1-3
■ M-203-1		APPROACH ROADS	4
■ M-203-2		DITCH TYPES	5
☐ M-203-11		SUPERELEVATION CROWNED AND DIVIDED HIGHWAYS (3 SHEETS)	6-8
☐ M-203-12		SUPERELEVATION STREETS (2 SHEETS)	9-10
☐ M-206-1		EXCAVATION AND BACKFILL FOR STRUCTURES (2 SHEETS)	11-12
☐ M-206-2		EXCAVATION AND BACKFILL FOR BRIDGES (2 SHEETS)	13-14
☐ M-208-1		TEMPORARY EROSION CONTROL (7 SHEETS)	15-21
☐ M-210-1		MAILBOX SUPPORTS (2 SHEETS)	22-23
☐ M-214-1		PLANTING DETAILS	24
☐ M-412-1		CONCRETE PAVEMENT JOINTS (5 SHEETS)	25-29
☐ M-510-1		STRUCTURAL PLATE PIPE H-20 LOADING	30
☐ M-601-1		SINGLE CONCRETE BOX CULVERT (2 SHEETS)	31-32
☐ M-601-2		DOUBLE CONCRETE BOX CULVERT (2 SHEETS)	33-34
☐ M-601-3		TRIPLE CONCRETE BOX CULVERT (2 SHEETS)	35-36
☐ M-601-10		HEADWALL FOR PIPES	37
☐ M-601-11		TYPE "S" SADDLE HEADWALLS FOR PIPE	38
☐ M-601-12		HEADWALLS AND PIPE OUTLET PAVING	39
☐ M-601-20		WINGWALLS FOR PIPE OR BOX CULVERTS	40
■ M-603-1		METAL AND PLASTIC PIPE (2 SHEETS)	41-42
☐ M-603-2		REINFORCED CONCRETE PIPE	43
☐ M-603-3		PRECAST CONCRETE BOX CULVERT	44
☐ M-603-10		CONCRETE AND METAL END SECTIONS (2 SHEETS)	45-46
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☐ M-604-11		INLET, TYPE D	48
☐ M-604-12		CURB INLET TYPE R (2 SHEETS)	49-50
☐ M-604-13		CONCRETE INLET TYPE 13	51
☐ M-604-20		MANHOLES (3 SHEETS)	52-54
☐ M-604-25		VANE GRATE INLET (5 SHEETS)	55-59
☐ M-605-1		SUBSURFACE DRAINS	60
☐ M-606-1		GUARDRAIL TYPE 3 W-BEAM (16 SHEETS)	61-76
☐ M-606-13		GUARDRAIL TYPE 7 F-SHAPE BARRIER (4 SHEETS)	77-80
☐ M-606-14		PRECAST TYPE 7 CONCRETE BARRIER (3 SHEETS)	81-83

PLAN NUMBER	NEW OR REVISED	M STANDARD TITLE	PAGE NUMBER
☐ M-607-1		WIRE FENCES AND GATES (3 SHEETS)	84-86
☐ M-607-2		CHAIN LINK FENCE (3 SHEETS)	87-89
☐ M-607-3		BARRIER FENCE	90
☐ M-607-4		DEER FENCE AND GATES (2 SHEETS)	91-92
☐ M-607-10		PICKET SNOW FENCE	93
☐ M-607-15		ROAD CLOSURE GATE (9 SHEETS)	94-102
■ M-608-1		CURB RAMPS (4 SHEETS)	103-106
☐ M-609-1		CURBS, GUTTERS, AND SIDEWALKS (3 SHEETS)	107-109
☐ M-611-1		CATTLE GUARD (2 SHEETS)	110-111
☐ M-613-1		ROADWAY LIGHTING (4 SHEETS)	112-115
☐ M-614-1		RUMBLE STRIPS (3 SHEETS)	116-118
☐ M-614-2		SAND BARREL ARRAYS (2 SHEETS)	119-120
☐ M-615-1		EMBANKMENT PROTECTOR TYPE 3	121
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☐ M-616-1		INVERTED SIPHON	123
☐ M-620-1		FIELD LABORATORY CLASS 1	124
☐ M-620-2		FIELD LABORATORY CLASS 2	125
☐ M-620-11		FIELD OFFICE CLASS 1	126
☐ M-620-12		FIELD OFFICE CLASS 2	127
☐ M-629-1		SURVEY MONUMENTS (2 SHEETS)	128-129

PLAN NUMBER	NEW OR REVISED	S STANDARD TITLE	PAGE NUMBER
☐ S-612-1		DELINEATOR INSTALLATIONS (5 SHEETS)	131-135
☐ S-614-1		GROUND SIGN PLACEMENT (2 SHEETS)	136-137
■ S-614-2		CLASS I SIGNS	138
☐ S-614-3		CLASS II SIGNS	139
☐ S-614-4		CLASS III SIGNS (3 SHEETS)	140-142
■ S-614-5		BREAK-AWAY SIGN SUPPORT DETAILS FOR GROUND SIGNS (2 SHEETS)	143-144
☐ S-614-6		CONCRETE FOOTINGS AND SIGN ISLANDS FOR CLASS III SIGNS (2 SHEETS)	145-146
■ S-614-8		TUBULAR STEEL SIGN SUPPORT DETAILS (5 SHEETS)	147-151
☐ S-614-10		MARKER ASSEMBLY INSTALLATIONS	152
☐ S-614-12		STRUCTURE NUMBER INSTALLATION	153
☐ S-614-14		FLASHING BEACON AND SIGN INSTALLATIONS (3 SHEETS)	154-156
☐ S-614-20		TYPICAL POLE MOUNT SIGN INSTALLATIONS	157
☐ S-614-21		CONCRETE BARRIER SIGN POST INSTALLATIONS	158
☐ S-614-22		TYPICAL MULTI-SIGN INSTALLATIONS	159
■ S-614-40		TYPICAL TRAFFIC SIGNAL INSTALLATION DETAILS (7 SHEETS)	160-166
■ S-614-40A		ALTERNATIVE TRAFFIC SIGNAL INSTALLATION DETAILS (5 SHEETS)	167-171
☐ S-614-50		MONOTUBE OVERHEAD SIGNS (14 SHEETS)	172-185
■ S-627-1		PAVEMENT MARKINGS (5 SHEETS)	186-190
■ S-630-1	■	TRAFFIC CONTROLS FOR HIGHWAY CONSTRUCTION (12 SHEETS) **(REVISED SHEET 11 ON 07/31/08)**	191-202
■ S-630-2		BARRICADES, DRUMS, CONCRETE BARRIERS (TEMP.) AND VERTICAL PANELS	203
☐ S-630-3		FLASHING BEACON (PORTABLE) DETAILS	204

THE STANDARD PLAN SHEETS INDICATED HEREON BY A MARKED BOX ARE TO BE USED TO CONSTRUCT THIS PROJECT.

ALL OF THE M&S STANDARD PLANS, AS SUPPLEMENTED AND REVISED, APPLY TO THIS PROJECT WHEN USED BY DESIGNATED PAY ITEM OR SUBSIDIARY ITEM.

THE NEW OR REVISED M&S STANDARD PLANS SHEETS ARE ATTACHED AFTER THE LAST SHEET LISTED ON THE INDEX OF SHEETS.

COLORADO
DEPARTMENT OF TRANSPORTATION

STANDARD PLANS LIST
M&S STANDARDS
July 04, 2006

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STANDARD PLANS LIST
Designer: D. SMITH
Detailer: D. SMITH
Sheet Subset: TRAFFIC
Structure Numbers -
-
Subset Sheets: 1 of 1

Project No./Code
C 133A-036
16847
Sheet Number 2

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GENERAL NOTES

ALL WORK IN CDOT RIGHT OF WAY SHALL BE IN ACCORDANCE WITH CDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION, AND ITS SUPPLEMENTS.

ALL DETAILED WORK IN CDOT RIGHT OF WAY SHALL BE IN ACCORDANCE WITH THE CDOT LATEST EDITION OF THE STANDARD PLANS (M&S STANDARDS), AND THE APPROVED PLANS AND SPECIFICATIONS.

ALL WORK ZONE TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), LATEST EDITION, THE CURRENT COLORADO SUPPLEMENTS, AND THE APPROVED PLANS AND SPECIFICATIONS.

FOR PRELIMINARY PLAN QUANTITIES OF PAVEMENT MATERIALS, THE FOLLOWING RATES OF APPLICATION WERE USED:

BITUMINOUS PAVEMENT [PATCHING]....................@ 110 LBS./SQ. YD./INCH
AGGREGATE BASE COURSE CLASS [6]....................@ 133 LBS./CU. FT.

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ANY LAYER OF BITUMINOUS PAVEMENT THAT IS TO HAVE A SUCCEEDING LAYER PLACED THEREON SHALL BE COMPLETED FULL WIDTH BEFORE SUCCEEDING LAYER IS PLACED.

ASPHALT JOINTS SHALL FALL ON LINES, SHOULDERS LINES OR MEDIAN LINES, EXCEPT WHERE STATED IN THE PLANS.

THE CONTRACTOR SHALL NOT PARK ANY VEHICLES OR EQUIPMENT IN, OR DISTURB ANY AREAS NOT APPROVED BY THE ENGINEER.

MOISTURE-DENSITY CONTROL WILL BE REQUIRED FOR THE FULL DEPTH OF THOSE EMBANKMENTS ON THIS PROJECT.

DEPTH OF MOISTURE-DENSITY CONTROL FOR THIS PROJECT SHALL BE AS FOLLOWS:

BASES OF CUTS AND FILLS 0.5 FEET.

EXCAVATION REQUIRED FOR COMPACTION OF BASES OF CUTS AND FILLS WILL BE CONSIDERED AS SUBSIDIARY TO THAT OPERATION AND WILL NOT BE PAID FOR SEPARATELY.

TYPE OF COMPACTION FOR THIS PROJECT WILL BE AASHTO T-99

IT IS ESTIMATED THAT 11 GALLONS OF PAVEMENT MARKING PAINT WILL BE REQUIRED ON THIS PROJECT AS FOLLOWS:

WHITE....................6 GALLONS
YELLOW...................5 GALLONS

\YS, ASSUMING LEAD TIME FOR
. BE REQUIRED ON THIS
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IT IS ESTIMATED THAT THE CONSTRUCTION TIME FOR THE PROJECT IS 45 DAYS, ASSUMING LEAD TIME FOR DELIVERY OF MATERIALS IS NOT INCLUDED IN THIS CONSTRUCTION TIME.

IT IS ESTIMATED THAT [illegible] DAYS OF TRAFFIC CONTROL MANAGEMENT WILL BE REQUIRED ON THIS PROJECT.

IT IS ESTIMATED THAT [illegible] DAYS OF TRAFFIC CONTROL INSPECTION WILL BE REQUIRED ON THIS PROJECT.

IT IS ESTIMATED THAT 18 EACH OF CONSTRUCTION TRAFFIC SIGN (PANEL SIZE A) WILL BE REQUIRED ON THIS PROJECT. THIS ESTIMATE IS BASED ON CDOT STANDARD TRAFFIC CONTROLS FOR HIGHWAY CONSTRUCTION, CASES 18 AND 19 AND TYPICAL PATH DETOUR SIGNAGE

IT IS ESTIMATED THAT 15 EACH DRUM CHANNELIZING DEVICES WILL BE REQUIRED ON THIS PROJECT.

IT IS ESTIMATED THAT 50 EACH TRAFFIC CONES WILL BE REQUIRED ON THIS PROJECT.

IT IS ESTIMATED THAT 200 HOURS OF FLAGGING WILL BE REQUIRED ON THIS PROJECT.

IT IS ESTIMATED THAT 1 SANITARY FACILITY WILL BE REQUIRED ON THIS PROJECT.

IT IS ESTIMATED THAT 10 HOURS WILL BE REQUIRED FOR POT[illegible] SHALL BE RESPONSIBLE FOR CONTACTING AND COORDINATING W[illegible] UTILITY REPRESENTATIVES TO BE ONSITE DURING POTHOLING A[illegible] RESPONSIBLE FOR DETERMINING THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAYBE NECESSARY TO AVOID DAMAGE THERETO. THE CONTRACTOR SHALL REFER TO THE UTILITY SPECIFICATION FOR ADDITIONAL REQUIREMENTS.

NO RIGHT-OF-WAY ACQUISITION WILL BE NEEDED FOR THIS PROJECT. ALL WORK WILL BE COMPLETED ENTIRELY WITHIN THE EXISTING RIGHT-OF-WAY.

WHERE NEW PAVEMENT IS TO ABUT EXISTING PAVEMENT, THE EXISTING PAVEMENT SHALL BE REMOVED TO A NEAT VERTICAL LINE USING A CUTTING SAW OR OTHER METHOD AS APPROVED BY THE ENGINEER. SAW CUTTING ASPHALT WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE COST OF REMOVAL OF ASPHALT MAT.

ALL SURVEYING NECESSARY TO COMPLETE THE PROJECT WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE WORK.

THE CONTRACTOR SHALL PROTECT ALL EXISTING SURVEY MONUMENTATION DESIGNATED TO REMAIN FROM DAMAGE DURING CONSTRUCTION OPERATIONS. ANY MONUMENTS DISTURBED BY THE CONTRACTOR THAT ARE NOT DESIGNATED FOR RELOCATION, SHALL BE RESET AT THE CONTRACTOR'S EXPENSE. THE CONTRACTOR AND ENGINEER SHALL NOTE THOSE MONUMENTS IN THE FIELD PRIOR TO CONSTRUCTION. SEE TABULATION OF SURVEY.

TRAFFIC CONTROL PLAN NOTES:

1. PRIOR TO BEGINNING OF WORK IN THE CDOT ROW, THE PERMITTEE SHALL CREATE A SITE SPECIFIC AND DETAILED CONSTRUCTION TRAFFIC CONTROL PLAN WHICH COVERS ALL PHASES AND DAY/NIGHT SIGNAGE CONDITIONS OF WORK, INCLUDING FINAL SIGNING AND STRIPING.
2. PERMITTEE SHALL DESIGNATE A TRAFFIC CONTROL SUPERVI[illegible] IN THE FIELD. THIS PERSON MUST BE AVAILABLE 24 [illegible] CONSTRUCTION.
3. PERMITTEE SHALL ONLY USE THE TRAFFIC CONTROL PLANS STAMPED WITH "NOTICE TO PROCEED PLANS - EXHIBIT A"; CDOT SHALL CONCUR WITH ALL OTHER TRAFFIC CONTROL PLANS PRIOR TO THEM BEING USED ON THE HIGHWAY.
4. PERMITTEE SHALL REMOVE ALL TRAFFIC CONTROL DEVICES AT THE END OF THE DAY'S CONSTRUCTION ACTIVITIES, ON WEEKENDS AND HOLIDAYS, UNLESS OTHERWISE DIRECTED BY CDOT.

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GENERAL NOTES

Designer:	D. SMITH	Structure Numbers	
Detailer:	D. SMITH		
Sheet Subset:	NOTES	Subset Sheets:	1 of 1

Project No./Code
C133A-036
16847
Sheet Number 3

INDEX			CONTRACT ITEM NO.		UNIT	ROADWAY						PROJECT TOTALS:	AS CONST. PROJECT TOTALS
BOOK	PAGE	SHEET				PLAN	AS CONST.						
			202-00220	REMOVAL OF ASPHALT MAT	SY	260						260	
			202-00250	REMOVAL OF PAVEMENT MARKING	SF	400						400	
			202-00710	REMOVAL OF POWER POLE	EACH	1						1	
			202-00810	REMOVAL OF GROUND SIGN	EACH	4						4	
			202-00821	REMOVAL OF SIGN PANEL	EACH	1						1	
			203-00010	UNCLASSIFIED EXCAVATION (CIP)	CY	13						13	
			203-01597	POTHOLING	HOUR	10						10	
			207-00205	TOP SOIL	CY	5						5	
			208-00020	SILT FENCE	LF	300						300	
			208-00045	CONCRETE WASHOUT STRUCTURE (TEMPORARY)	EACH	1						1	
			208-00205	EROSION CONTROL SUPERVISOR	HOUR	40						40	
			210-00810	RESET GROUND SIGN	EACH	1						1	
			212-00006	SEEDING (NATIVE) (SEE NOTE #5)	ACRE	0.1						0.1	
			213-00002	MULCHING (WEED FREE HAY) (SEE NOTE #5)	ACRE	0.1						0.1	
			213-00061	MULCH TACKIFIER (SEE NOTE #5)	LB	0.15						0.15	
			304-06000	AGGREGATE BASE COURSE (CLASS 6)	TON	26						26	
			403-00720	HMA (PATCHING)(ASPHALT)	TON	29						29	
			503-00018	DRILLED CAISSON (18 INCH)	LF	4						4	
			503-00036	DRILLED CAISSON (36 INCH)	LF	57						57	
			608-00010	CONCRETE CURB RAMP	SY	26.5						26.5	
			613-00200	2 INCH ELECTRICAL CONDUIT (PLASTIC)	LF	650						650	
			613-00300	3 INCH ELECTRICAL CONDUIT (PLASTIC)	LF	550						550	
			613-10000	WIRING	LS	1						1	
			613-07000	PULL BOX SPECIAL	EACH	3						3	
			613-07029	PULL BOX (24"x24"x12")	EACH	3						3	
			613-07034	PULL BOX (24"x36"x18")	EACH	5						5	
			613-32400	LIGHT STANDARD STEEL (40 FOOT)	EACH	1						1	
			613-70250	LUMINAIRE HIGH PRESSURE SODIUM (250 WATT)	EACH	4						4	
			614-00011	SIGN PANEL (CLASS 1)	SF	21						21	
			614-01512	STEEL SIGN SUPPORT (2 INCH ROUND)(POST)	LF	7						7	
			614-70118	PEDESTRIAN SIGNAL FACE (18)(LED)	EACH	4						4	
			614-70336	TRAFFIC SIGNAL FACE (12-12-12)(LED)	EACH	9						9	
			614-72855	TRAFFIC SIGNAL CONTROLLER CABINET	EACH	1						1	
			614-72860	PEDESTRIAN PUSH BUTTON	EACH	4						4	
			614-72875	LOOP DETECTOR WIRE	LF	400						400	
			614-81000	TRAFFIC SIGNAL LIGHT POLE STEEL	EACH	1						1	
			614-81120	TRAFFIC SIGNAL-LIGHT POLE STEEL (1-20FT MAST ARM)	EACH	1						1	
			614-81130	TRAFFIC SIGNAL-LIGHT POLE STEEL (1-30FT MAST ARM)	EACH	1						1	
			614-81140	TRAFFIC SIGNAL-LIGHT POLE STEEL (1-40FT MAST ARM)	EACH	1						1	
			614-84000	TRAFFIC SIGNAL PEDESTAL POLE STEEL	EACH	1						1	
			614-86245	TRAFFIC SIGNAL CONTROLLER	EACH	1						1	
			620-00020	SANITARY FACILITY	EACH	1						1	
			627-00005	EPOXY PAVEMENT MARKING PAINT	GAL	11						11	
			627-30405	PREFORMED THERMOPLASTIC PAVEMENT MARKING (WORD-SYMBOL)	SF	194						194	
			627-30410	PREFORMED THERMOPLASTIC PAVEMENT MARKING (XWALK-STOP LINE)	SF	492						492	
			630-00000	FLAGGING	HOUR	200						200	
			630-00007	TRAFFIC CONTROL INSPECTION	DAY	12						12	
			630-00012	TRAFFIC CONTROL MANAGEMENT	DAY	33						33	
			630-80341	CONSTRUCTION TRAFFIC SIGN (PANEL SIZE A)	EACH	18						18	
			630-80355	PORTABLE MESSAGE SIGN PANEL	EACH	2						2	
			630-80360	DRUM CHANNELIZING DEVICE	EACH	15						15	
			630-80380	TRAFFIC CONE	EACH	50						50	
			F/A 01	EROSION CONTROL	FA	1						1	
			F/A 02	MINOR CONTRACT REVISIONS	FA	1						1	

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SUMMARY OF APPROXIMATE QUANTITIES

Designer: D. SMITH
Detailer: D. SMITH
Sheet Subset: QUANTITY
Structure Numbers -
-
Subset Sheets: 1 of 1

Project No./Code
C 133A-036
16847
Sheet Number 4

TABULATION OF QUANTITIES

REMOVAL OF ASPHALT MAT

FROM:	TO:	HCL	SY
25+30.46, 15.13' LT.	26+77.39, 20.01' LT.	SH 133 SHOULDER	231
25+60.55, 52.74' LT.	25+88.85, 83.14' RT.	SH 133 SHOULDER	29
TOTAL:			260

REMOVAL OF PAVEMENT MARKING

FROM:	TO:	HCL	SF
23+76.50, 0.0' RT.	29+07.00, 0.0' RT.	SH 133 SHOULDER	400
TOTAL:			400

REMOVAL OF POWER POLE

FROM:	HCL	DESCRIPTION	EACH
26+68.25, 63.58' RT.	SH 133 SHOULDER		1
TOTAL:			1

REMOVAL OF GROUND SIGN

FROM:	HCL	DESCRIPTION	EACH
25+59.51, 8.87' LT.	SH 133 SHOULDER	STOP SIGN (R1-1)	1
26+50.83, 25.91' LT.	SH 133 SHOULDER	YIELD SIGN (R1-2)	1
26+01+05, 13.92' LT.	SH 133 SHOULDER	YIELD SIGN (R1-2)	1
25+56.22, 59.67' RT.	SH 133 SHOULDER	CROSSWALK (W16-7P)	1
TOTAL:			4

RESET GROUND SIGN

FROM:	HCL	DESCRIPTION	EACH
25+79.71, 10.03' LT.	SH 133 SHOULDER	CROSSWALK (S1-1)	1
25+55.58, 59.44'RT.	SH 133 SHOULDER	CROSSWALK (S1-1)	1
25+55.58, 59.44'RT.	SH 133 SHOULDER	ARROW(W16-7PL)	1
TOTAL:			3

AGGREGATE BASE COURSE (CLASS 6)

FROM:	TO:	HCL	TON
5+38.36, 0.00' RT.	6+86.52, 0.00' RT.	PATH	26.3
TOTAL:			26.3

HMA (PATCHING) (ASPHALT)

FROM:	TO:	HCL	TON
5+38.36, 0.00' RT.	6+86.52, 0.00' RT.	PATH	29.0
TOTAL:			29.0

CONCRETE CURB RAMP

FROM:	HCL	DESCRIPTION	SY
25+99.25, 5.58' LT.	SH 133 SHOULDER	TYPE 2A (MODIFIED)	16.0
25+96.24, 74.09' RT.	SH 133 SHOULDER	TYPE 2A (MODIFIED)	10.5
TOTAL:			26.5

TABULATION OF EARTHWORK QUANTITIES

	PROJECT TOTALS (CU. YD.)	
	PLAN	AS CONSTRUCTED
UNCLASSIFIED EXCAVATION FROM		
FROM: PATH CROSS SECTIONS	13.1	
TOTAL FOR PAY QUANTITY UNCLASSIFIED EXCAVATION (C.I.P.)	13.1	

	PROJECT TOTALS (CU. YD.)	
FOR INFORMATION ONLY	PLAN	AS CONSTRUCTED
EMBANKMENT MATERIAL (C.I.P.): PATH CROSS SECTIONS	3.6	
NET TOTAL:	3.6	
EMBANKMENT x 1.25 (FACTOR)	4.5	
EXCESS EXCAVATION	8.6	
UNCLASSIFIED EXCAVATION	13.1	

COMPACTION (AASHTO T-99) (CU. YD.)		
EMBANKMENT (NET)	3.6	
BASE OF CUTS AND FILLS (6")	29	
TOTAL	32.6	
WETTING (M. GALLON) FOR COMPACTION (40 GAL. PER CU. YD.)	1.3	

NOTE:
1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSAL OF EXCESS MATERIAL.

SIGN PANEL (CLASS 1)

SIGN NO.	SIGN CODE	LEGEND	NOTE	DIMENSION	STEEL SIGN SUPPORT (2-INCH ROUND) (LF)	PANEL SIZE (SF)	BACKGROUND COLOR
S-1	R3-5L	LEFT TURN ONLY	MOUNT ON MAST ARM	30"X36"	0	7.5	WHITE
S-2	R3-5R	RIGHT TURN ONLY	MOUNT ON MAST ARM	30"X36"	0	7.5	WHITE
S-3	R10-6	STOP HERE ON RED		24"X36"	7.0	6.0	WHITE
TOTAL					7.0	21	

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Print Date: 6/30/2009
File Name: 16847DES_Tabulation.dgn
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Sheet Revisions

Date:	Comments	Init.

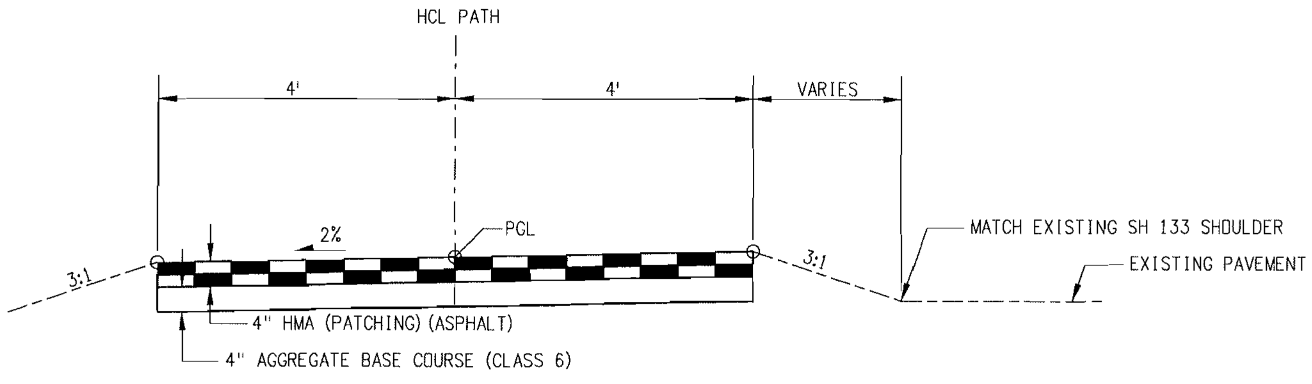
Colorado Department of Transportation
222 South 6th Street, Room 100
Grand Junction, CO 81501
Phone: 970-248-7230 FAX: 970-248-7294
Region 3 SHY

As Constructed
No Revisions:
Revised:
Void:

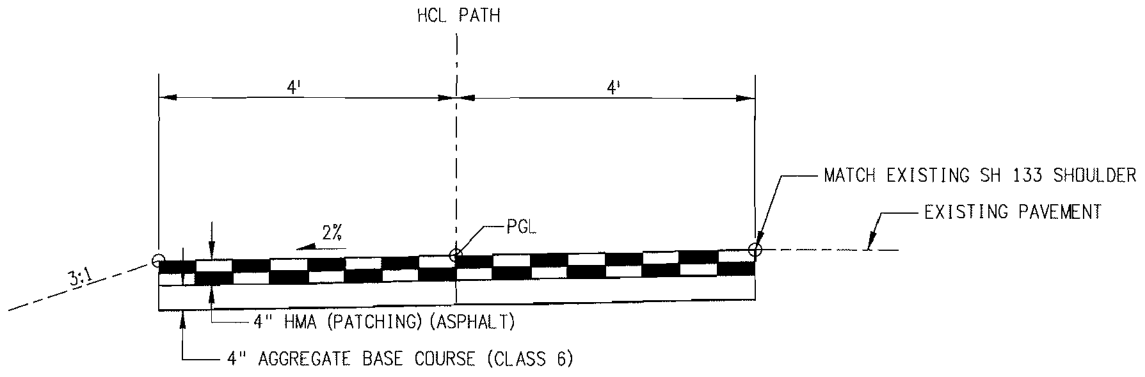
TABULATION OF QUANTITIES

Designer:	D. SMITH	Structure Numbers	-
Detailer:	D. SMITH		-
Sheet Subset:	TABS	Subset Sheets:	1 of 1

Project No./Code
C133A-036
16847
Sheet Number 5



PATH TYPICAL
5+38.36 TO 5+98.65
6+06.65 TO 6+86.52



PATH TYPICAL
5+98.65 TO 6+06.65

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TYPICAL SECTION
Designer: D. SMITH
Detailer: M. GAWELKO
Sheet Subset: TYPICAL
Structure Numbers - -
Subset Sheets: 1 of 1

Project No./Code
C133A-036
16847
Sheet Number 6

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GENERAL NOTES:

ALL DETAILED WORK SHALL BE IN ACCORDANCE WITH THE LATEST REVISIONS TO CDOT STANDARD PLANS (M&S STANDARDS), CDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, AND THE APPROVED PLANS AND SPECIFICATIONS.

1. SITE DESCRIPTION

FOR PROJECT INFORMATION:

A. PROJECT SITE DESCRIPTION

THE PROJECT INCLUDES THE SIGNAL CONSTRUCTION AT SH 133 AND HENDRICK DRIVE THAT INCLUDES THE REALIGNMENT OF A PATH DUE TO THE SIGNAL POLE LOCATIONS AND UPGRADES TO THE STRIPING, SIGNING AND PEDESTRIAN CROSSINGS.

B. PROPOSED SEQUENCING FOR MAJOR ACTIVITIES:

GENERAL SEQUENCE OF EVENTS FOR THE PROJECT WILL BE PLACING THE SIGNAL, GRADING AND PAVING THE RELOCATED PATH, SIGNING AND STRIPING AND FINAL GRADING, SEEDING AND MULCHING ACTIVITIES.

C. ACRES OF DISTURBANCE:

TOTAL AREA OF CONSTRUCTION SITE:	0.90 ACRES
TOTAL AREA OF DISTURBANCE:	0.50 ACRES
ACREAGE OF SEEDING:	0.10 ACRES

D. EXISTING SOIL DATA:

E. EXISTING VEGETATION, INCLUDING PERCENT COVER:

NATIVE GRASSES - 50% VEGATATION COVER

DATE OF SURVEY:

F. POTENTIAL POLLUTANTS SOURCES:

SEE FIRST CONSTRUCTION ACTIVITIES UNDER POTENTIAL POLLUTANT SOURCES. THE ECS SHALL PREPARE A LIST OF ALL POTENTIAL POLLUTANTS AND THEIR LOCATIONS IN ACCORDANCE WITH SUBSECTION 107.25.

G. RECEIVING WATER:

1. OUTFALL LOCATIONS:
   NO CHANGE TO EXISTING CONDITIONS.
2. NAMES OF RECEIVING WATER(S) ON SITE AND THE ULTIMATE RECEIVING WATER:
3. DISTANCE ULTIMATE RECEIVING WATER IS FROM PROJECT:
4. DOES THE RECEIVING WATER HAVE AN APPROVED TMDL?

H. ALLOWABLE NON-STORMWATER DISCHARGES:

1. GROUNDWATER AND STORMWATER DEWATERING: DISCHARGE TO THE GROUND OF WATER FROM CONSTRUCTION DEWATERING ACTIVITIES MAY BE AUTHORIZED PROVIDED THAT:
   A. THE SOURCE IS GROUNDWATER AND/OR GROUNDWATER COMBINED WITH STORMWATER THAT DOES NOT CONTAIN POLLUTANTS.
   B. THE SOURCE AND BMP's ARE IDENTIFIED IN THE SWMP.
   C. DISCHARGES DO NOT LEAVE THE SITE AS SURFACE RUNOFF OR TO SURFACE WATERS.
2. IF DISCHARGES DO NOT MEET THE ABOVE CRITERIA, A SEPARATE PERMIT FROM THE DEPARTMENT OF HEALTH WILL BE REQUIRED. CONTAMINATED GROUNDWATER REQUIRING COVERAGE UNDER A SEPARATE PERMIT MAY INCLUDE GROUNDWATER CONTAMINATED WITH POLLUTANTS FROM A LANDFILL, MINING ACTIVITIES, INDUSTRIAL POLLUTANT PLUMES, UNDERGROUND STORAGE TANK, ETC.

I. ENVIRONMENTAL IMPACTS:

1. WETLAND IMPACTS:	NO
2. STREAM IMPACTS:	NO
3. THREATENED AND ENDANGERED SPECIES:	NO IMPACT ON ANY FEDERALLY LISTED SPECIES

2. SITE MAP COMPONENTS:

PRE-CONSTRUCTION - THE FOLLOWING COMPONENTS ARE SHOWN ON THE SWM SITE PLAN IF APPLICABLE.

A. CONSTRUCTION SITE BOUNDARIES

B. ALL AREAS OF GROUND SURFACE DISTURBANCE

C. AREAS OF CUT AND FILL

D. LOCATION OF ALL STRUCTURAL BMP's IDENTIFIED IN THE SWMP

E. LOCATION OF NON-STRUCTURAL BMP's AS APPLICABLE IN THE SWMP

F. SPRINGS, STREAMS, WETLANDS AND OTHER SURFACE WATER

G. PROTECTION OF TREES, SHRUBS, CULTURAL RESOURCES AND MATURE VEGETATION

3. SWMP ADMINISTRATOR FOR DESIGN:

4. STORMWATER MANAGEMENT CONTROLS FIRST CONSTRUCTION ACTIVITIES

THE CONTRACTOR SHALL PERFORM THE FOLLOWING:

A. DESIGNATE A SWMP ADMINISTRATOR/EROSION CONTROL SUPERVISOR

(TO BE FILLED OUT AT TIME OF CONSTRUCTION;
DESIGNATE THE INDIVIDUAL(S) RESPONSIBLE FOR IMPLEMENTING, MAINTAINING AND REVISING SWMP, INCLUDING THE TITLE AND CONTACT INFORMATION. THE ACTIVITIES AND RESPONSIBILITIES OF THE ADMINISTRATOR SHALL ADDRESS ALL ASPECTS OF THE PROJECT'S SWMP.)

B. POTENTIAL POLLUTANT SOURCES

EVALUATE, IDENTIFY AND DESCRIBE ALL POTENTIAL SOURCES OF POLLUTANTS AT THE SITE IN ACCORDANCE WITH SUBSECTION 107.25 AND PLACE IN THE SWMP NOTEBOOK. ALL BMP's RELATED TO POTENTIAL POLLUNTANTS SHALL BE SHOWN ON THE SWMP SITE MAP BY THE CONTRACTOR'S ECS.

C. BEST MANAGEMENT PRACTICES (BMPS) FOR STORMWATER POLLUTION PREVENTION

PHASED BMP IMPLEMENTATION

DURING DESIGN: FIELDS ARE MARKED WHEN USED IN THE SWMP. DURING CONSTRUCTION: THE ECS SHALL UPDATE THE CHECKED BOXES TO MATCH SITE CONDITIONS.

STRUCTURAL BMP PRACTICES FOR EROSION AND SEDIMENT CONTROL;

PRACTICES MAY INCLUDE, BUT ARE NOT LIMITED TO:

BMP	TYPE OF CONTROL	BMP AS DESIGNED	IN USE ON SITE	FIRST CONSTRUCTION ACTIVITIES	DURING CONSTRUCTION	INTERIM/FINAL STABILIZATION
CHECK DAMS	SEDIMENT					
SILT FENCE	SEDIMENT	X				
EROSION LOGS	SEDIMENT					
TEMPORARY SEDIMENT TRAP/BASIN	SEDIMENT					
PERMANENT SEDIMENT TRAP/BASIN	SEDIMENT					
EMBANKMENT PROTECTOR	EROSION					
INLET PROTECTION	EROSION					
OUTLET PROTECTION	EROSION					
CONCRETE WASHOUTS	CONSTRUCTION	X				
STABILIZED CONSTRUCTION ENTRANCE	CONSTRUCTION					
DEWATERING	SEDIMENT					
TEMPORARY STREAM CROSSING	EROSION					
OTHER						

- SILT FENCE - TO BE PLACED AT THE TOE OF ALL SLOPES IDENTIFIED ON THE SWMP SITE MAP AND IS TO BE USED AS PERIMETER CONTROL TO CAPTURE SEDIMENT LADEN RUN-OFF FROM EMBANKMENT AREAS.

- CONCRETE WASHOUTS - TO BE USED TO CONTAIN ALL WASH WATER FROM TOOLS OR CONCRETE TRUCK CHUTES. THEY SHALL BE USED IN LOCATIONS WHERE CONCRETE WILL BE USED.

- STABILIZED CONSTRUCTION ENTRANCE - STABILIZED CONSTRUCTION ENTRANCE IS USED TO PREVENT AND MINIMIZE SEDIMENT FROM BEING TRACKED ONTO THE PAVED SURFACES. ONE STABILIZED CONSTRUCTION ENTRANCE SHALL BE USED FOR THE CONSTRUCTION STAGING YARD. IF THE YARD IS PAVED, THE ENGINEER MAY WAIVE THE ENTRANCE REQUIREMENT.

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STORM WATER
MANAGMENT PLAN

Designer: D.SMITH
Detailer: D.SMITH
Sheet Subset: SWMP
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NON-STRUCTURAL BMP PRACTICES FOR EROSION AND SEDIMENT CONTROL:
PRACTICES MAY INCLUDE, BUT ARE NOT LIMITED TO:

BMP	TYPE OF CONTROL	BMP AS DESIGNED	IN USE ON SITE	FIRST CONSTRUCTION ACTIVITIES	DURING CONSTRUCTION	INTERIM/FINAL STABILIZATION
SURFACE ROUGHENING/GRADING TECHNIQUES	EROSION	X				
SEEDING PERMANENT	EROSION	X				
SEEDING TEMPORARY	EROSION					
MULCH/MULCH TACKIFIER	EROSION	X				
SOIL BINDER	EROSION					
SOIL RETENTION BLANKET	EROSION					
VEGETATIVE BUFFER STRIPS	EROSION					
PROTECTION OF TREES	EROSION	X				
PRESERVATION OF MATURE VEGETATION	EROSION	X				
OTHER						

EROSION CONTROL DEVICES ARE USED TO LIMIT THE AMOUNT OF EROSION ON SITE.

SEDIMENT CONTROL DEVICES ARE DESIGNED TO CAPTURE SEDIMENT ON THE PROJECT SITE.

CONSTRUCTION CONTROL ARE BMP's RELATED TO CONSTRUCTION ACCESS AND STAGING.

- SURFACE ROUGHENING/GRADING TECHNIQUES - USED TO TEMPORARILY STABILIZE DISTURBED AREAS AND PROTECT FROM WIND AND WATER EROSION. TO BE USED AS A TEMPORARY PRACTICE DURING CONSTRUCTION.

- SEEDING PERMANENT - USED TO PROMOTE GROWTH OF VEGETATION. TO BE DONE AS SOON AS FINAL GRADE IS FINISHED.

- MULCH/MULCH TACKIFIER - USED TO PROTECT THE GROUND AND KEEP SEEDING IN PLACE. TO BE USED AS SOON AS SEEDING IS COMPLETED.

- PROTECTION OF TREES AND MATURE VEGETATION - ANY AREAS AND TREES THAT ARE TO BE PROTECTED SHALL HAVE ORANGE CONSTRUCTION FENCE PLACED AROUND THEM AND SHOWN ON THE SITE MAP SO THAT CONSTRUCTION TRAFFIC WILL NOT DISTURB THEM.

D. OFFSITE DRAINAGE (RUN ON WATER)
1. DESCRIBE AND RECORD BMP's ON THE SWMP SITE MAP THAT HAVE BEEN IMPLEMENTED TO ADDRESS RUN-ON WATER IN ACCORDANCE WITH SUBSECTION 208.03.

E. STABILIZED CONSTRUCTION ENTRANCE/VEHICLE TRACKING CONTROL
1. BMP's SHALL BE IMPLEMENTED IN ACCORDANCE WITH SUBSECTION 208.04.

F. PERIMETER CONTROL
1. PERIMETER CONTROL SHALL BE ESTABLISHED AS THE FIRST ITEM ON THE SWMP TO PREVENT THE POTENTIAL FOR POLLUTANTS LEAVING THE CONSTRUCTION SITE BOUNDARIES, ENTERING THE STORMWATER DRAINAGE SYSTEM, OR DISCHARGING TO STATE WATERS.

2. PERIMETER CONTROL MAY CONSIST OF VEGETATION BUFFERS, BERMS, SILT FENCE, EROSION LOGS, EXISTING LANDFORMS, OR OTHER BMP's AS APPROVED.

3. PERIMETER CONTROL SHALL BE IN ACCORDANCE WITH SUBSECTION 208.04.

5. DURING CONSTRUCTION

RESPONSIBILITIES OF THE SWMP ADMINISTRATOR/EROSION CONTROL SUPERVISOR DURING CONSTRUCTION

THE SWMP SHOULD BE CONSIDERED A "LIVING DOCUMENT" THAT IS CONTINUOUSLY REVIEWED AND MODIFIED. DURING CONSTRUCTION, THE FOLLOWING ITEMS SHALL BE ADDED, UPDATED, OR AMENDED AS NEEDED BY THE SWMP ADMINISTRATION/EROSION CONTROL SUPERVISOR (ECS) IN ACCORDANCE WITH SECTION 208.

A. MATERIALS HANDLING AND SPILL PREVENTION

B. STOCKPILE MANAGEMENT

C. GRADING AND SLOPE STABILIZATION

D. SURFACE ROUGHENING

E. VEHICLE TRACKING

F. TEMPORARY STABILIZATION

G. CONCRETE WASHOUT
1. CONCRETE WASH OUT WATER OR WASTE FROM FIELD LABORATORIES AND PAVING EQUIPMENT SHALL BE CONTAINED IN ACCORDANCE WITH SUBSECTION 208.05.

H. SAW CUTTING

I. NEW INLET/CULVERT PROTECTION

J. STREET CLEANING

6. INSPECTIONS

A. INSPECTIONS SHALL BE IN ACCORDANCE WITH SUBSECTION 208.03 (C).

7. BMP MAINTENANCE

A. MAINTENANCE SHALL BE IN ACCORDANCE WITH SUBSECTION 208.04 (E).

8. RECORD KEEPING

A. RECORDS SHALL BE KEPT IN ACCORDANCE WITH SUBSECTION 208.03 (C).

9. INTERIM AND FINAL STABILIZATON

A. SEEDING PLAN

SOIL PREPARATION, SOIL CONDITIONING OR TOPSOIL, SEEDING (NATIVE), MULCHING (WEED FREE HAY), AND MULCH TACKIFIER WILL BE REQUIRED FOR AN ESTIMATED 0.50 ACRES OF DISTURBED AREA WITHIN THE RIGHT-OF-WAY LIMITS WHICH ARE NOT SURFACED. THE FOLLOWING TYPES AND RATES SHALL BE USED.

COMMON NAME	BOTANICAL NAME		APPLICATION RATE Pounds pls/Acre
Western wheatgrass	*Pascopyrum smithii* "Arriba"		8.0
Sideoats grama	*Bouteloua curtipendula* "Vaughn"		3.0
Thickspike wheatgrass	*Elymus lanceolatus ssp. dasystachyum* "Critan		[illegible]
Buffalograss	*Buchloe dactyloides* "Texoka"		[illegible]
Blue grama	*Bouteloua gracilis* "Hachita"		1.0
Little bluestem	*Schizachyrium scoparium* "Pastura"		2.0
Prairie junegrass	*Koeleria cristata*		0.3
Saltgrass	*Distichlis spicata*		1.0
Green needlegrass	*Stipa viridula* "Lodorm"		1.0
Purple prairie clover	*Petalostemum purpurea*		0.5
Gaillardia	*Gaillardia aristata*		1.0
Blue flax	*Linum lewisii*		0.5
**Oats	Avena sativa		3.0
		Total	35.0

** in the event of fall seeding, substitute Oats with
*Winter Wheat / Triticum aestivum var. Pastu
sativum at the same rate.

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STORM WATER
MANAGMENT PLAN

Designer: D.SMITH
Detailer: D.SMITH
Sheet Subset: SWMP
Structure Numbers
Subset Sheets: 2 of 3

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B. SEEDING APPLICATION:

DRILL SEED 0.25 INCH TO 0.5 INCH INTO THE SOIL. IN SMALL AREAS NOT ACCESSIBLE TO A DRILL, HAND BROADCAST AT DOUBLE THE RATE AND RAKE 0.25 INCH TO 0.5 INCH INTO SOIL.

C. MULCHING APPLICATION:

APPLY 1½ TONS OF CERTIFIED WEED FREE HAY PER ACRE MECHANICALLY CRIMPED INTO THE SOIL IN COMBINATION WITH AN ORGANIC MULCH TACKIFIER.

D. SPECIAL REQUIREMENTS:

DUE TO HIGH FAILURE RATES, HYDROMULCHING AND/OR HYDROSEEDING WILL NOT BE ALLOWED.

E. SOIL CONDITIONING AND FERTILIZER REQUIREMENTS:

1. FERTILIZER WILL NOT BE REQUIRED ON THE PROJECT.

F. BLANKET APPLICATION:

ON SLOPES AND DITCHES REQUIRING A BLANKET, THE BLANKET SHALL BE PLACED IN LIEU OF MULCH AND MULCH TACKIFIER. SEE SWMP FOR BLANKET LOCATIONS.

G. RESEEDING OPERATIONS/CORRECTIVE STABILIZATION

PRIOR TO FINAL ACCEPTANCE.

1. SEEDED AREAS SHALL BE REVIEWED DURING THE 14 DAY INSPECTIONS BY THE EROSION CONTROL SUPERVISOR FOR BARE SOILS CAUSED BY SURFACE OR WIND EROSION. BARE AREAS CAUSED BY SURFACE OR GULLY EROSION, BLOWN AWAY MULCH, ETC. SHALL BE REGRADED, SEEDED, MULCHED AND HAVE MULCH TACKIFIER (OR BLANKET) APPLIED AS NECESSARY.

2. AREAS WHERE SEED HAS NOT GERMINATED AFTER ONE SEASON SHALL BE EVALUATED BY THE ENGINEER AND CDOT LANDSCAPE ARCHITECT. AREAS THAT HAVE NOT GERMINATED SHALL HAVE SEED, MULCH AND MULCH TACKIFIER (OR BLANKET) REAPPLIED. WORK SHALL BE PAID FOR BY THE APPROPRIATE BID ITEM.

3. THE CONTRACTOR SHALL MAINTAIN SEEDING/MULCH/TACKIFIER, MOW TO CONTROL WEEDS OR APPLY HERBICIDE TO CONTROL WEEDS IN THE SEEDED AREAS UNTIL FINAL ACCEPTANCE.

10. PRIOR TO FINAL ACCEPTANCE

A. FINAL ACCEPTANCE SHALL BE IN ACCORDANCE WITH SUBSECTION 208.061.

11. TABULATION OF STORMWATER QUANTITIES

PAY ITEM	DESCRIPTION	UNIT	QUANTITY
207	TOP SOIL	CY	5
208	SILT FENCE	LF	300
208	CONCRETE WASHOUT STRUCTURE (TEMPORARY)	EACH	1
208	EROSION CONTROL SUPERVISOR	HOUR	40
212	SEEDING (NATIVE) (SEE NOTE #5)	ACRE	0.10
213	MULCHING (WEED FREE HAY) (SEE NOTE #5)	ACRE	0.10
213	MULCH TACKIFIER (SEE NOTE #5)	LB	0.15
F/A	EROSION CONTROL	FA	1

1. BMP MAINTENANCE SHALL NOT BE PAID FOR SEPERATELY BUT SHALL BE INCLUDED IN THE PRICE OF THE WORK.

2. IT IS ESTIMATED THAT ONE (1) CONCRETE WASHOUT STRUCTURE (TEMPORARY) WILL BE REQUIRED ON THE PROJECT. TEMPORARY STRUCTURE DETAILS AND LOCATION SHALL BE SUBMITTED FOR APPROVAL PRIOR TO USE.

3. IT IS ESTIMATED THAT ZERO (0) STABILIZED CONSTRUCTION ENTRANCE(S) WILL BE REQUIRED AS DIRECTED TO MINIMIZE VEHICLE TRACKING CONTROL. ALL SITES HAVE PAVED ENTRANCES.

4. MAINTENANCE OF SEEDED AREAS SHALL NOT BE PAID FOR SEPERATELY BUT SHALL BE INCLUDED IN THE PRICE OF THE WORK.

5. TOPSOIL, SEEDING (NATIVE), MULCHING (WEED-FREE HAY), AND MULCH TACKIFIER QUANTITIES INCLUDE QUANTITIES FOR INCIDENTAL DISTURBANCE TO THE CONSTRUCTION SITE.

6. SEEDING (NATIVE), MULCHING (WEED-FREE HAY), AND MULCH TACKIFIER QUANTITIES INCLUDE INITIAL APPLICATION AS WELL AS QUANTITIES FOR MULTIPLE SEEDING APPLICATIONS THROUGHOUT THE DURATION OF THE PROJECT.

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STORM WATER
MANAGMENT PLAN

Designer: D.SMITH
Detailer: D.SMITH
Sheet Subset: SWMP
Structure Numbers –
–
Subset Sheets: 3 of 3

Project No./Code
Project Number
Code
Sheet Number 9

HCL PATH

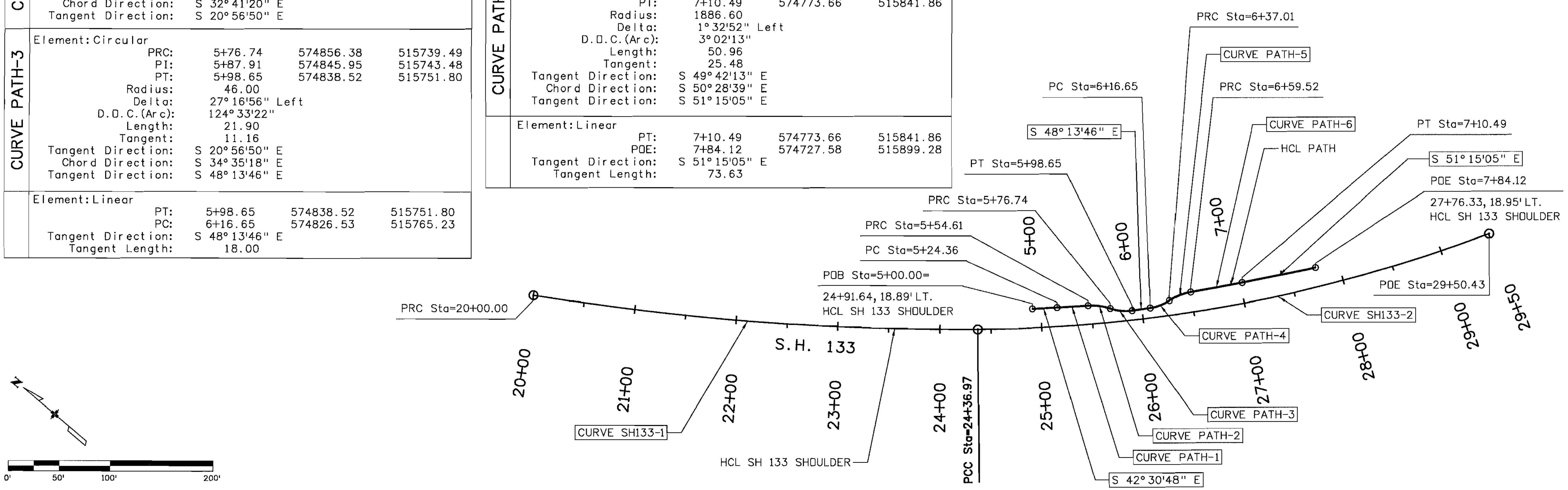
		STATION	NORTHING	EASTING
	Element: Linear			
	POB:	5+00.00	574914.79	515690.34
	PC:	5+24.36	574896.83	515706.81
	Tangent Direction:	S 42° 30'48" E		
	Tangent Length:	24.36		
CURVE PATH-1	Element: Circular			
	PC:	5+24.36	574896.83	515706.81
	PI:	5+39.49	574885.68	515717.03
	RC:	5+54.61	574874.88	515727.62
	Radius:	904.00		
	Delta:	1° 55'02" Left		
	D.O.C.(Arc):	6° 20'17"		
	Length:	30.25		
	Tangent:	15.13		
	Tangent Direction:	S 42° 30'48" E		
	Chord Direction:	S 43° 28'19" E		
	Tangent Direction:	S 44° 25'50" E		
CURVE PATH-2	Element: Circular			
	PRC:	5+54.61	574874.88	515727.62
	PI:	5+65.83	574866.86	515735.47
	PRC:	5+76.74	574856.38	515739.49
	Radius:	54.00		
	Delta:	23° 28'59" Right		
	D.O.C.(Arc):	106° 06'12"		
	Length:	22.13		
	Tangent:	11.22		
	Tangent Direction:	S 44° 25'50" E		
	Chord Direction:	S 32° 41'20" E		
	Tangent Direction:	S 20° 56'50" E		
CURVE PATH-3	Element: Circular			
	PRC:	5+76.74	574856.38	515739.49
	PI:	5+87.91	574845.95	515743.48
	PT:	5+98.65	574838.52	515751.80
	Radius:	46.00		
	Delta:	27° 16'56" Left		
	D.O.C.(Arc):	124° 33'22"		
	Length:	21.90		
	Tangent:	11.16		
	Tangent Direction:	S 20° 56'50" E		
	Chord Direction:	S 34° 35'18" E		
	Tangent Direction:	S 48° 13'46" E		
	Element: Linear			
	PT:	5+98.65	574838.52	515751.80
	PC:	6+16.65	574826.53	515765.23
	Tangent Direction:	S 48° 13'46" E		
	Tangent Length:	18.00		

HCL PATH (CONTINUED)

		STATION	NORTHING	EASTING
CURVE PATH-4	Element: Circular			
	PC:	6+16.65	574826.53	515765.23
	PI:	6+27.00	574819.63	515772.95
	PRC:	6+37.01	574816.71	515782.88
	Radius:	46.00		
	Delta:	25° 21'44" Left		
	D.O.C.(Arc):	124° 33'22"		
	Length:	20.36		
	Tangent:	10.35		
	Tangent Direction:	S 48° 13'46" E		
	Chord Direction:	S 60° 54'38" E		
	Tangent Direction:	S 73° 35'30" E		
CURVE PATH-5	Element: Circular			
	PRC:	6+37.01	574816.71	515782.88
	PI:	6+48.43	574813.48	515793.83
	PRC:	6+59.52	574806.09	515802.55
	Radius:	54.00		
	Delta:	23° 53'17" Right		
	D.O.C.(Arc):	106° 06'12"		
	Length:	22.51		
	Tangent:	11.42		
	Tangent Direction:	S 73° 35'30" E		
	Chord Direction:	S 61° 38'52" E		
	Tangent Direction:	S 49° 42'13" E		
CURVE PATH-6	Element: Circular			
	PRC:	6+59.52	574806.09	515802.55
	PI:	6+85.01	574789.61	515821.98
	PT:	7+10.49	574773.66	515841.86
	Radius:	1886.60		
	Delta:	1° 32'52" Left		
	D.O.C.(Arc):	3° 02'13"		
	Length:	50.96		
	Tangent:	25.48		
	Tangent Direction:	S 49° 42'13" E		
	Chord Direction:	S 50° 28'39" E		
	Tangent Direction:	S 51° 15'05" E		
	Element: Linear			
	PT:	7+10.49	574773.66	515841.86
	POE:	7+84.12	574727.58	515899.28
	Tangent Direction:	S 51° 15'05" E		
	Tangent Length:	73.63		

HCL SH 133 SHOULDER

		STATION	NORTHING	EASTING
CURVE SH133-1	Element: Circular			
	PC:	20+00.00	575297.74	515385.95
	PI:	22+18.99	575109.82	515498.39
	PCC:	24+36.97	574942.99	515640.24
	Radius:	2641.00		
	Delta:	9° 28'47.9" Left		
	D.O.C.(Arc):	2° 10'10.1"		
	Length:	436.97		
	Tangent:	218.99		
	Tangent Direction:	S 30° 53'38.2" E		
	Chord Direction:	S 35° 38'02.1" E		
	Tangent Direction:	S 40° 22'26.1" E		
CURVE SH133-2	Element: Circular			
	PCC:	24+36.97	574942.99	515640.24
	PI:	26+96.40	574745.35	515808.29
	PT:	29+50.43	574617.92	516034.26
	Radius:	1456.00		
	Delta:	20° 12'19.5" Left		
	D.O.C.(Arc):	3° 56'06.5"		
	Length:	513.46		
	Tangent:	259.42		
	Tangent Direction:	S 40° 22'26.1" E		
	Chord Direction:	S 50° 28'35.8" E		
	Tangent Direction:	S 60° 34'45.6" E		



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File Name: 16847ALG_Plan01.dgn	
Horiz. Scale: 1:100	Vert. Scale: As Noted
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Colorado Department of Transportation

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Region 3
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GEOMETRY PLAN

Designer:	D. SMITH	Structure Numbers	–
Detailer:	D. SMITH		–
Sheet Subset: GEOMETRY		Subset Sheets:	1 of 1

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C 133A-036

16847

Sheet Number 10

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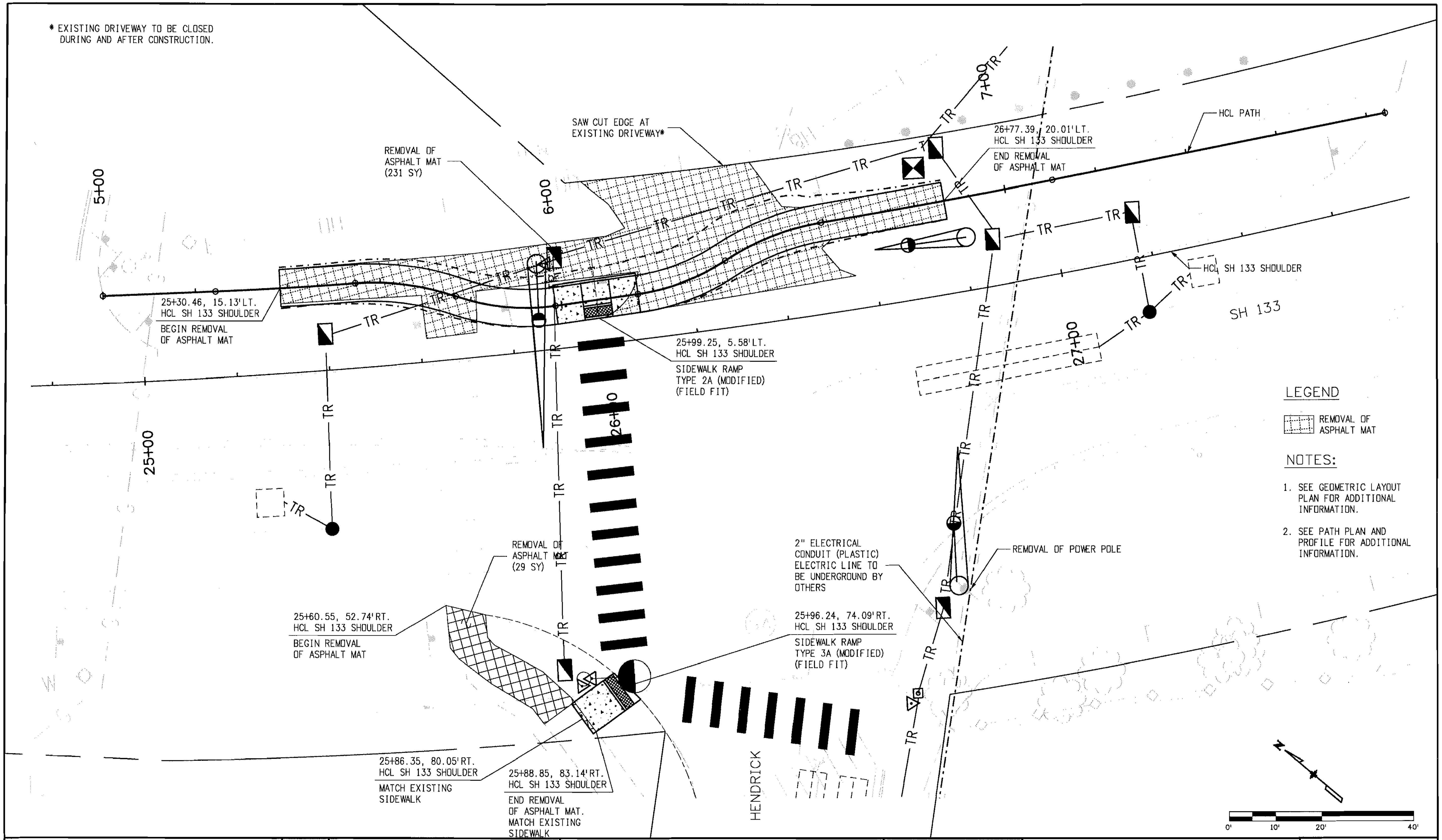
16847ALG_Plan01.dgn 6/30/2009 2:11:27 PM

* EXISTING DRIVEWAY TO BE CLOSED
DURING AND AFTER CONSTRUCTION.



LEGEND

▦ REMOVAL OF ASPHALT MAT

NOTES:

1. SEE GEOMETRIC LAYOUT PLAN FOR ADDITIONAL INFORMATION.
2. SEE PATH PLAN AND PROFILE FOR ADDITIONAL INFORMATION.

Print Date: 6/30/2009
File Name: 16847DES_Plan05.dgn
Horiz. Scale: 1:20 Vert. Scale: As Noted
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Void:

SITE PLAN

Designer: D. SMITH
Detailer: D. SMITH
Sheet Subset: TRAFFIC
Structure Numbers -
Subset Sheets: 1 of 1

Project No./Code
C 133A-036
16847
Sheet Number 11

dsmith 2:12:01 PM P:\CDOT\Region 3\Region 3 Traffic NPS 2008\SH 133 Hendrick\16847\Design\Drawings\16847DES_Plan05.dgn

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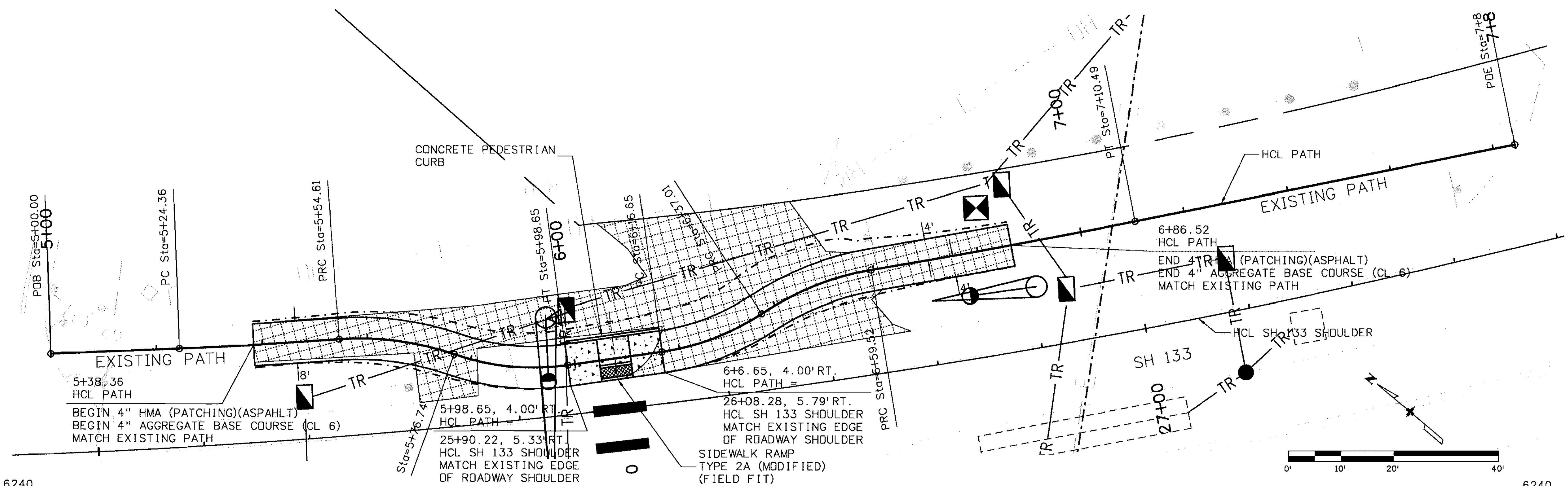

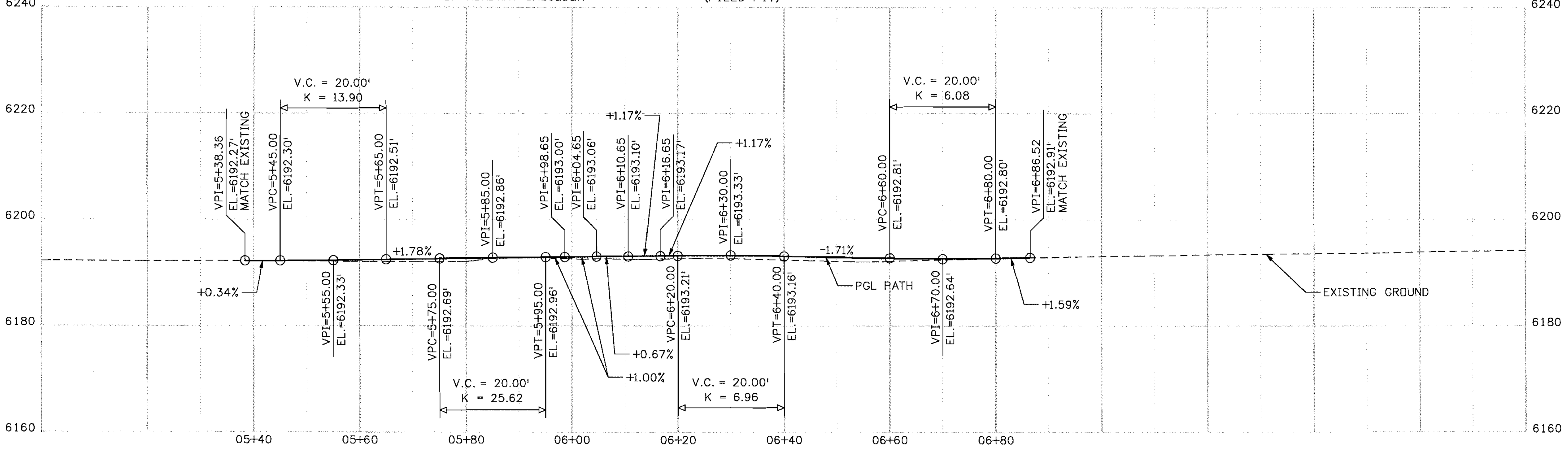

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Unit Information Unit Leader Initials

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Sheet Revisions		
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PLAN AND PROFILE
Designer: D. SMITH
Detailer: M. GAWELKO
Sheet Subset: PLAN
Structure Numbers -
-
Subset Sheets: 1 of 1

Project No./Code
C133A-036
16847
Sheet Number 12

dsmith 2:12:34 PM P:\CDOT\Region 3\Region 3 Traffic NPS 2008\SH 133 Hendrick\16847\Design\Drawings\16847DES_Plan04.dgn

SUMMARY OF APPROXIMATE QUANTITIES-TRAFFIC SIGNALS

CDOT ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY
503-00018	DRILLED CAISSON (18 INCH)	LF	4
503-00036	DRILLED CAISSON (36 INCH)	LF	57
613-00200	2 INCH ELECTRICAL CONDUIT (PLASTIC)	LF	650
613-00300	3 INCH ELECTRICAL CONDUIT (PLASTIC)	LF	550
613-07029	PULL BOX (24"x24"x12")	EACH	3
613-07034	PULL BOX (24"x36"x18")	EACH	5
613-07000	PULL BOX (SPECIAL)	EACH	3
613-10000	WIRING	LS	1
613-32400	LIGHT STANDARD STEEL (40 FOOT)	EACH	1
613-70250	LUMINARE HIGH PRESSURE SODIUM (250 WATT)	EACH	4
614-01512	STEEL SIGN SUPPORT (2-INCH ROUND) (POST)	LF	7
614-70118	PEDESTRIAN SIGNAL FACE (18) (LED)	EACH	4
614-70336	TRAFFIC SIGNAL FACE (12-12-12) (LED)	EACH	9
614-86245	TRAFFIC SIGNAL CONTROLLER	EACH	1
614-72855	TRAFFIC SIGNAL CONTROLLER CABINET	EACH	1
614-72860	PEDESTRIAN PUSH BUTTON	EACH	4
614-72875	LOOP DETECTOR WIRE	LF	400
614-81120	TRAFFIC SIGNAL-LIGHT POLE STEEL (1-20 FT MAST ARM)	EACH	1
614-81130	TRAFFIC SIGNAL-LIGHT POLE STEEL (1- 30FT MAST ARM)	EACH	1
614-81140	TRAFFIC SIGNAL-LIGHT POLE STEEL (1-40 FT MAST ARM)	EACH	1
614-84000	TRAFFIC SIGNAL PEDESTAL POLE STEEL	EACH	1

dsmith 2:39:11 PM P:\CDOT\Region 3\Region 3 Traffic NPS 2008\SH 133 Hendrick\16847\Design\Drawings\16847DES_SignalSummary.dgn

Print Date: 6/30/2009
File Name: 16847DES_SignalSummary.dgn
Horiz. Scale: 1:30 Vert. Scale: As Noted
Unit Information MC

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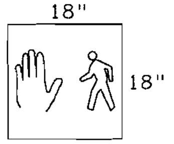
TABULATION OF QUANTITIES
SIGNALS

Designer: D. SMITH
Detailer: D. SMITH
Sheet Subset: TRAFFIC
Structure Numbers - -
Subset Sheets: 1 of 1

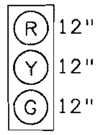
Project No./Code
C 133A-036
16847
Sheet Number 13

NOTES:

1. REFER TO SIGNING & STRIPING PLANS FOR ADDITIONAL SIGNING AND STRIPING REQUIREMENTS.
2. CONTRACTOR SHALL CONFIRM POLE LOCATIONS WITH CDOT PRIOR TO DRILLING CAISSONS.
3. CONTRACTOR SHALL NOTIFY CDOT AT LEAST TWO WEEKS PRIOR TO SIGNAL BEING PLACED IN FLASH MODE TO COORDINATE SIGNAL ACTIVATION.
4. CDOT MUST BE NOTIFIED 48 HOURS PRIOR TO SIGNAL BEIGN TURNED ON FOR FULL OPERATION.



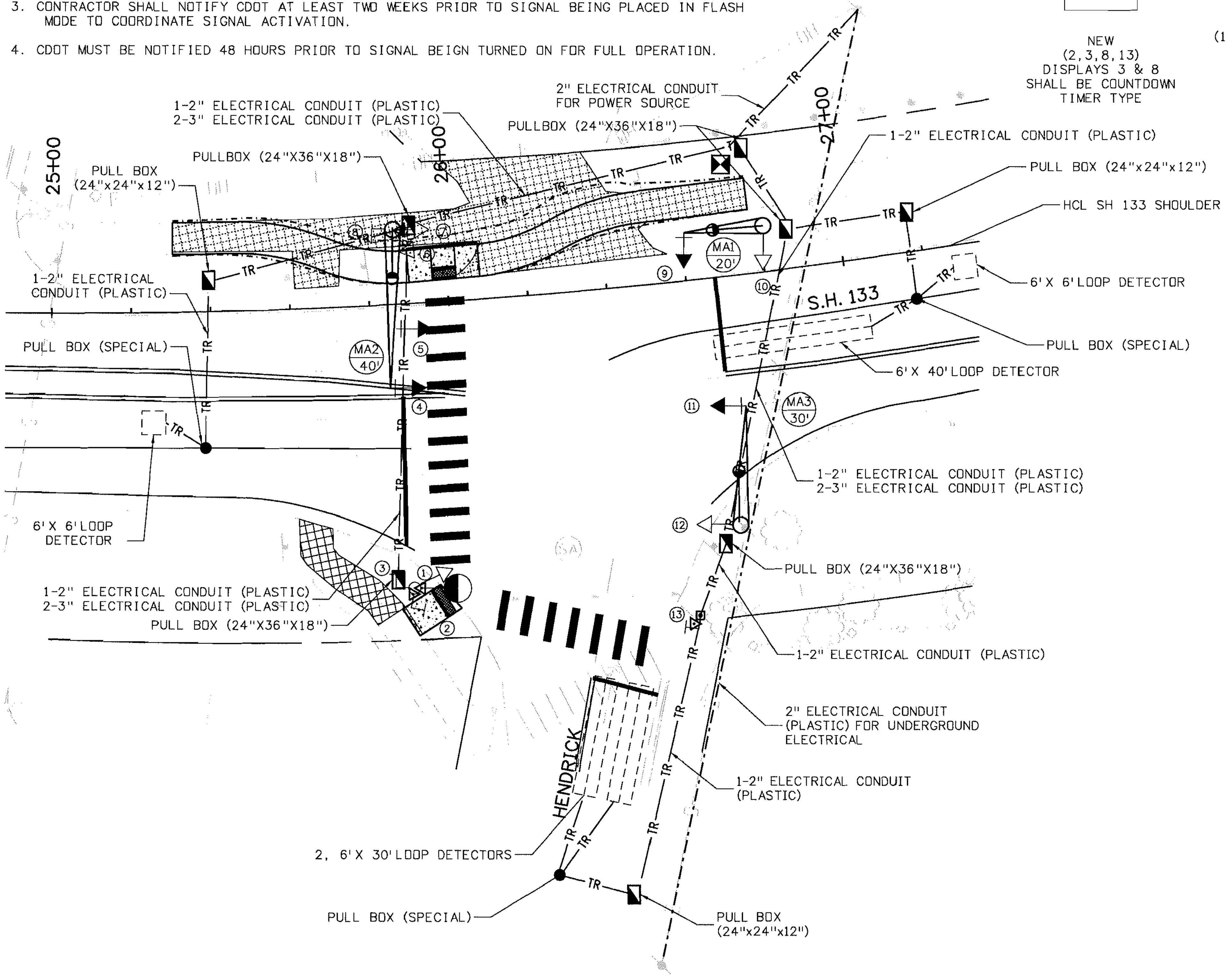
NEW
(2,3,8,13)
DISPLAYS 3 & 8
SHALL BE COUNTDOWN
TIMER TYPE



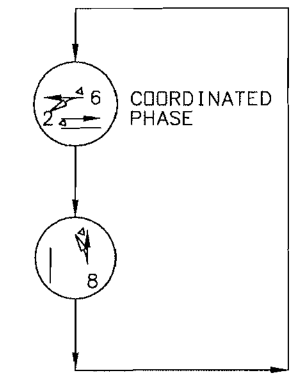
NEW
(1,4,5,6,7,9,
10,11,12)

LEGEND:

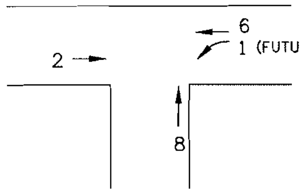
Ⓧ ◄┤ OVERHEAD MOUNTED SIGNAL FACE WITH BACKPLATE
Ⓧ ◁— POLE MOUNTED SIGNAL FACE
PEDESTRIAN SIGNAL FACE
△ PUSH BUTTON, AND SIGN
—— PROPOSED CONDUIT-SCHEDULE 80 PVC
PULL BOX
● PULL BOX (SPECIAL)
☒ TRAFFIC SIGNAL CONTROLLER & CABINET
MA1 65' MAST ARM SIGNAL POLE WITH LUMINAIRE, EXCEPT AS NOTED
⊡ PEDESTAL POLE
○—◐ LIGHT STANDARD
——◐ LUMINAIRE

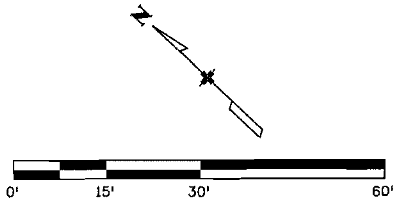


PHASING PLAN DIAGRAM



PHASING PLAN LAYOUT





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File Name: 16847DES_Plan01.dgn
Horiz. Scale: 1:30 Vert. Scale: As Noted
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Sheet Revisions		
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SIGNAL PLAN

Designer: S. MARKOVETZ
Detailer: D. SMITH
Sheet Subset: TRAFFIC
Structure Numbers -
Subset Sheets: 1 of 1

Project No./Code
C 133A-036
16847
Sheet Number 14

dsmith 2:40:53 PM P:\CDOT\Region 3\Region 3 Traffic NPS 2008\SH 133 Hendrick\16847\Design\Drawings\16847DES_Plan01.dgn

TABULATION OF PAVEMENT MARKINGS

LOCATION	STATION/ MP	to	STATION/ MP	DESCRIPTION	EPOXY PAVEMENT MARKING (LF)											PREFORMED THERMO-PLASTIC PAVEMENT MARKING (SF)		PREFORMED PLASTIC PAVEMENT MARKING (SF)	
					LANE						EDGE		CHANNELIZING		LANE DROP				
					YELLOW SOLID	DOUBLE YELLOW SOLID	YELLOW BROKEN	YELLOW SOLID BROKEN	WHITE BROKEN	WHITE BROKEN	WHITE SOLID	YELLOW SOLID	WHITE SOLID	YELLOW SOLID	WHITE BROKEN	WORD - SYMBOL	XWALK - STOPLINE	WORD - SYMBOL	XWALK - STOPLINE
					4 INCH	4 INCH	4 INCH	4 INCH	4 INCH	8 INCH	4 INCH	4 INCH	8 INCH	8 INCH	8 INCH				
	22+54		23+32								78								
	23+78		25+88								220								
	25+19		25+88										107						
	26+38		27+68										131						
	26+60		29+12								266								
	25+12		29+12								400								
	21+75		23+30			155													
	23+76		24+53			154													
	24+84		26+02			121													
	24+84		25+97			115													
	26+70		29+12			249													
	27+67		29+12			146													
	25+88		26+43																
	25+88																86		
	26+57																46		
	26+00																220		
	26+23		26+57														140		
	25+63															54			
	26+77															54			
	27+18															32			
	27+58															54			
				TOTAL (LF)	0	940	0	0	0	0	964	0	238	0	0				
				TOTAL (SF)												194.00	492.00	0.00	0.00
				TOTAL (GAL)	0.00	5.97	0.00	0.00	0.00	0.00	3.06	0.00	1.51	0.00	0.00				

NOTES: 105 SF/GAL USED FOR EPOXY PAINT

FOR DETAILS OF PAVEMENT MARKING LINES AND LINE PLACEMENT, SEE STANDARD S-627-1

(NOTE TO DESIGNER, ONLY USE NOTES SPECIFIC TO THIS PAGE, ALL OTHER NOTES ON TRAFFIC GENERAL NOTES PAGE)

NOTES:

1. IN CDOT REGION 3 ALL SIGN POSTS SHALL BE GALVANIZED TUBULAR STEEL.
2. FULL-COMPLIANCE TEMPORARY PAVEMENT MARKINGS SHALL BE APPLIED PER CDOT SPECIFICATIONS AT THE END OF EACH CONSTRUCTION DAY.
3. THE CONTRACTOR SHALL CONTACT CDOT PROJECT MANAGER AND ENGINEER OF RECORD, AT LEAST TWO WEEKS PRIOR TO SCHEDULED STRIPING. THE PERMITTEE WILL BE RESPONSIBLE FOR ANY CORRECTIONS REQUIRED UPON FINAL INSPECTION OF THE ACCESS.
4. UNLESS AN ASPHALT OVERLAY IS REQUIRED, GRINDING OF EXISTING PAVEMENT MARKINGS SHALL BE REQUIRED BY CDOT. THE PAVEMENT MARKINGS SHALL BE REMOVED TO THE EXTENT THAT THEY WILL NOT BE VISIBLE UNDER DAY OR NIGHT CONDITIONS AND IN A MANNER THAT WILL NOT AFFECT TRAFFIC FLOW.

SUMMARY OF PAVEMENT MARKING QUANTITIES

COLOR	EPOXY PAVEMENT MARKING (GAL)		PREFORMED THERMOPLASTIC PAVEMENT MARKING (SF)		PREFORMED PLASTIC PAVEMENT MARKING (SF)	
	YELLOW	WHITE	WORD - SYMBOL	XWALK - STOPLINE	WORD - SYMBOL	XWALK - STOPLINE
	5.97	4.57				
PROJECT TOTALS	10.54		194.00	492.00	0.00	0.00

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File Name: 16847DES_TrfcSummary.dgn
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TABULATION OF PAVEMENT MARKING QUANTITIES

Designer: D. SMITH
Detailer: D. SMITH
Sheet Subset: TRAFFIC
Structure Numbers - -
Subset Sheets: 1 of 1

Project No./Code
C 133A-036
16847
Sheet Number 15

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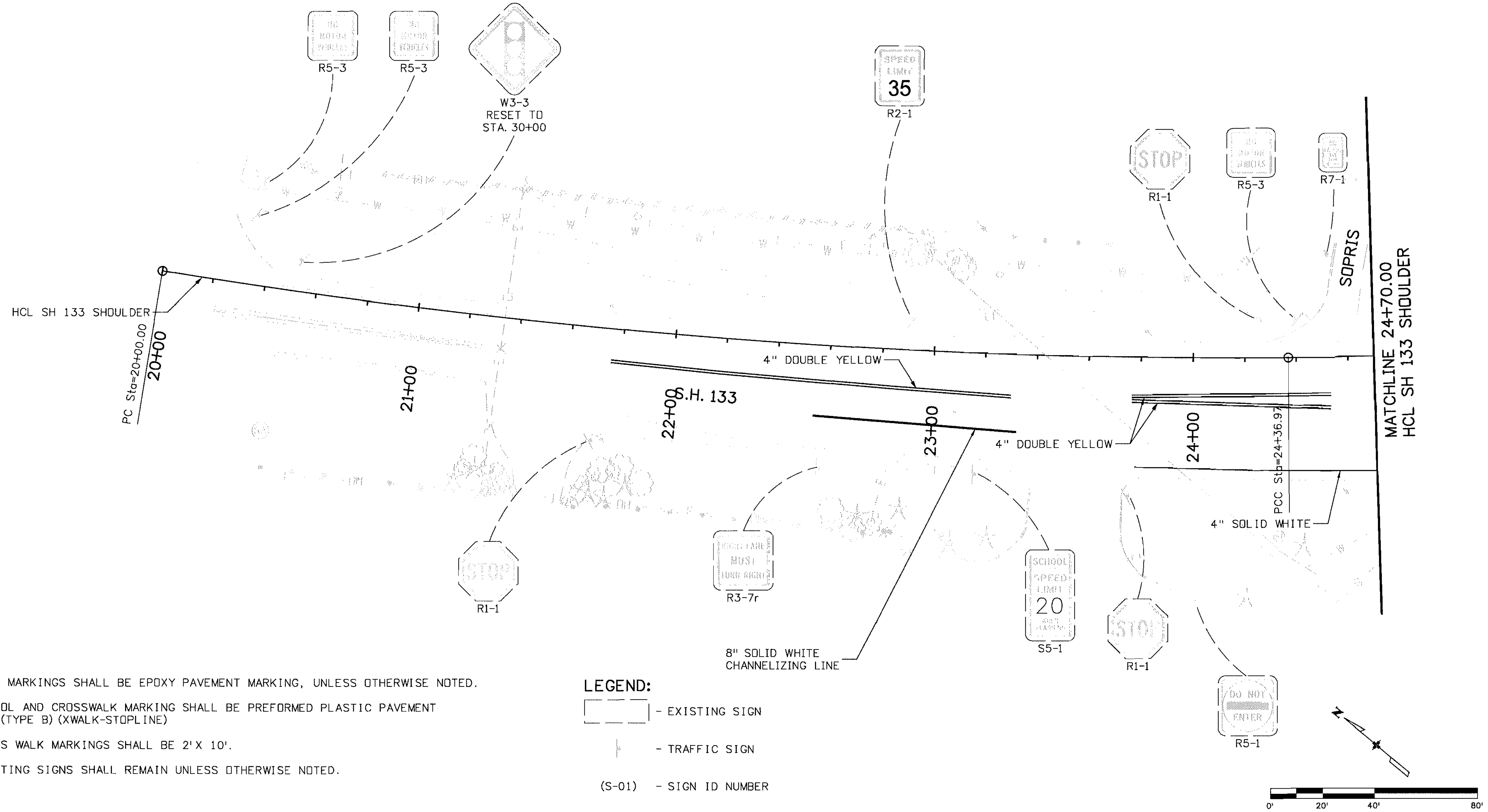

NOTE:

1. PAVEMENT MARKINGS SHALL BE EPOXY PAVEMENT MARKING, UNLESS OTHERWISE NOTED.
2. ALL SYMBOL AND CROSSWALK MARKING SHALL BE PREFORMED PLASTIC PAVEMENT MARKING (TYPE B) (XWALK-STOPLINE)
3. ALL CROSS WALK MARKINGS SHALL BE 2'X 10'.
4. ALL EXISTING SIGNS SHALL REMAIN UNLESS OTHERWISE NOTED.

LEGEND:

- EXISTING SIGN
- TRAFFIC SIGN

(S-01) - SIGN ID NUMBER

Print Date: 6/30/2009
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Horiz. Scale: 1:40 Vert. Scale: As Noted
Unit Information MC

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SIGNING AND STRIPING PLAN
Designer: S. MARKOVETZ
Detailer: D. DYER
Sheet Subset: TRAFFIC
Structure Numbers -
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Subset Sheets: 1 of 2

Project No./Code
C 133A-036
16847
Sheet Number 16

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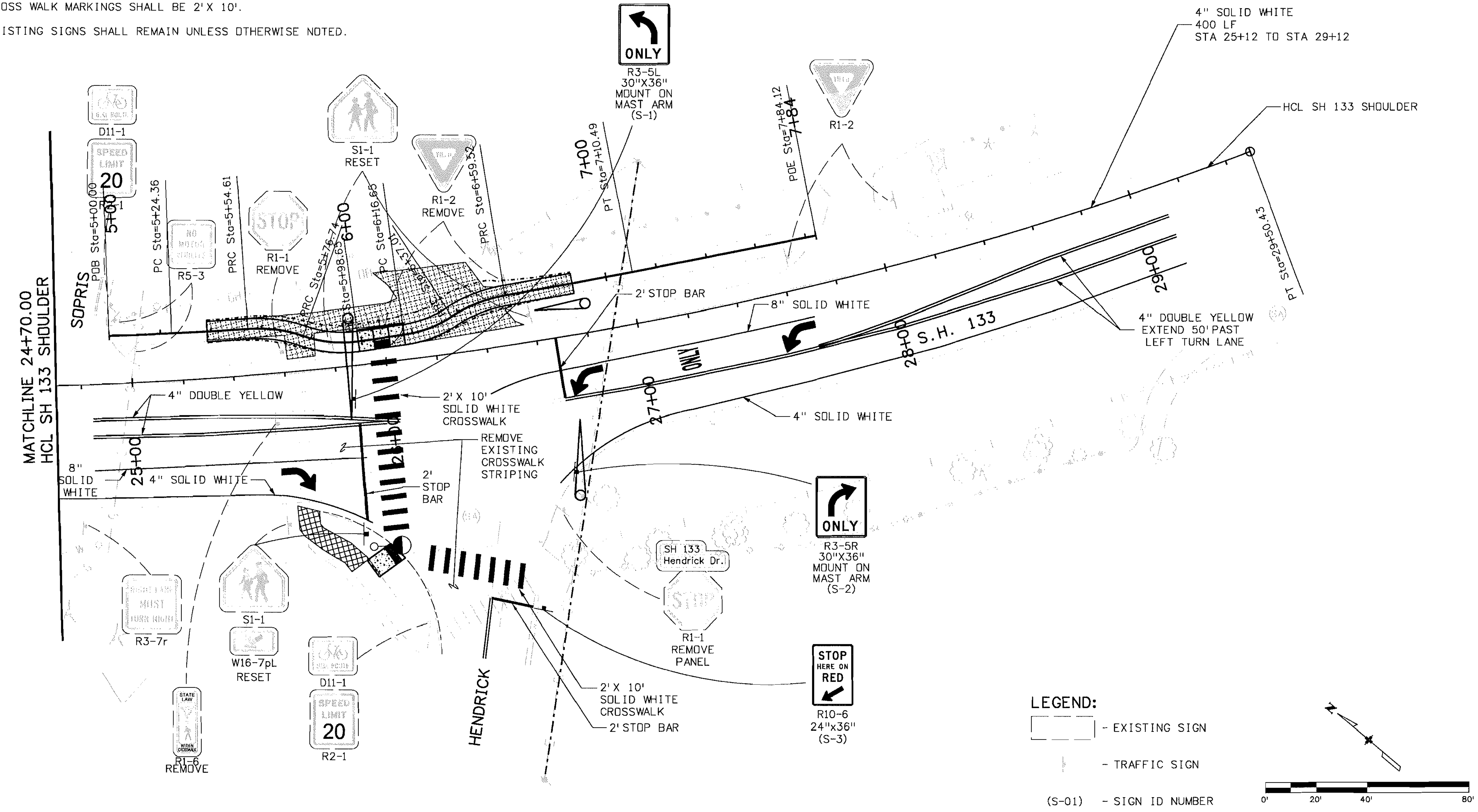
NOTE:

1. PAVEMENT MARKINGS SHALL BE EPOXY PAVEMENT MARKING, UNLESS OTHERWISE NOTED.
2. ALL SYMBOL AND CROSSWALK MARKING SHALL BE PREFORMED PLASTIC PAVEMENT MARKING (TYPE B) (XWALK-STOPLINE)
3. ALL CROSS WALK MARKINGS SHALL BE 2'X 10'.
4. ALL EXISTING SIGNS SHALL REMAIN UNLESS OTHERWISE NOTED.



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Unit Information	MC

R-X

Sheet Revisions

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SIGNING AND STRIPING PLAN

Designer: S. MARKOVETZ	Structure Numbers	-	
Detailer: D. DYER		-	
Sheet Subset: TRAFFIC	Subset Sheets:	2 of 2	

Project No./Code
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16847
Sheet Number 17

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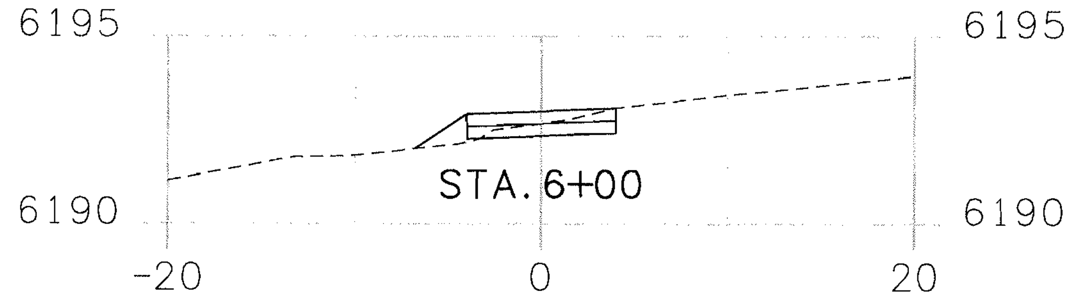

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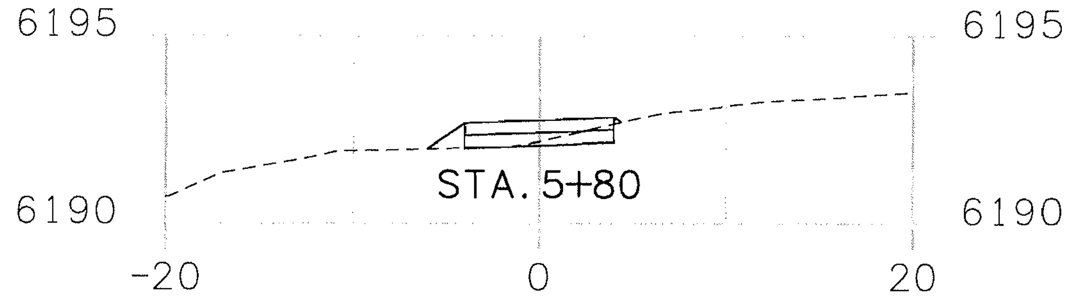

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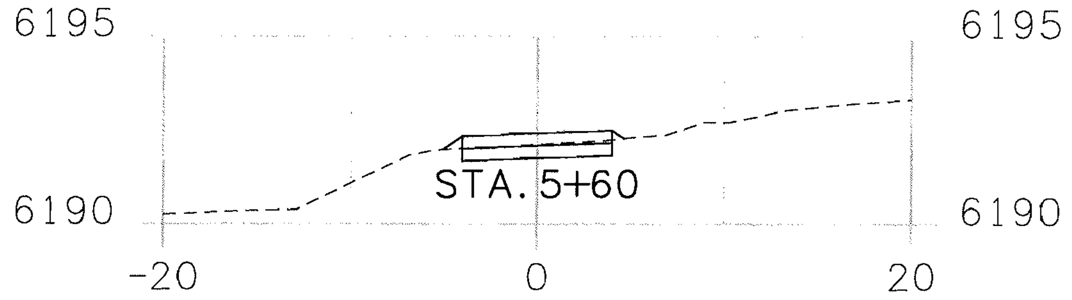

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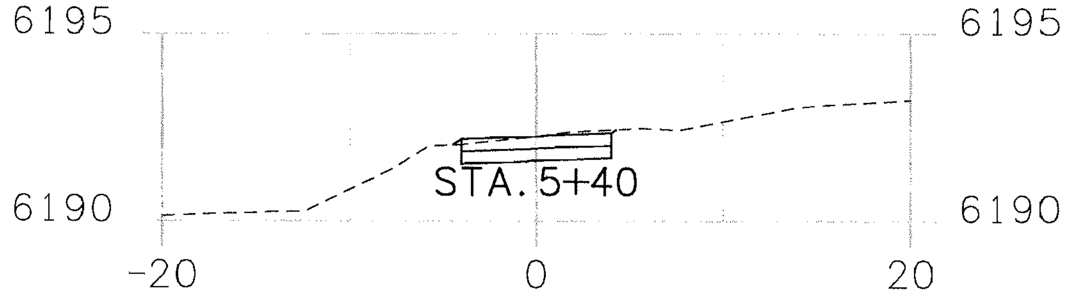

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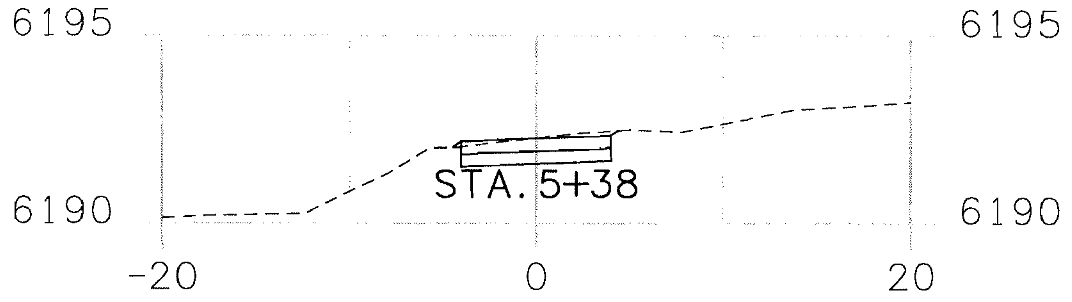

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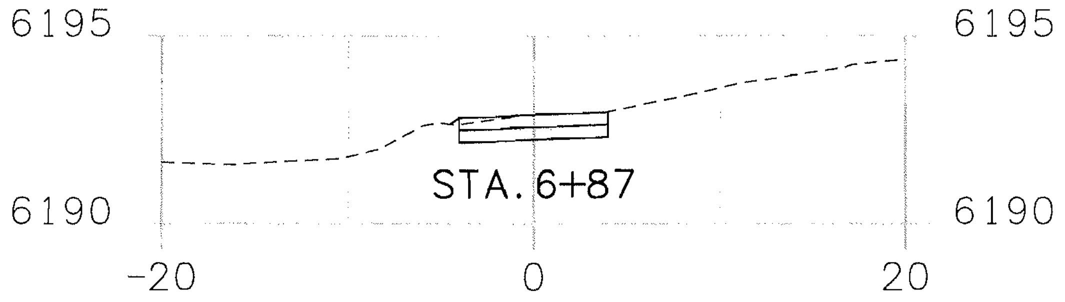
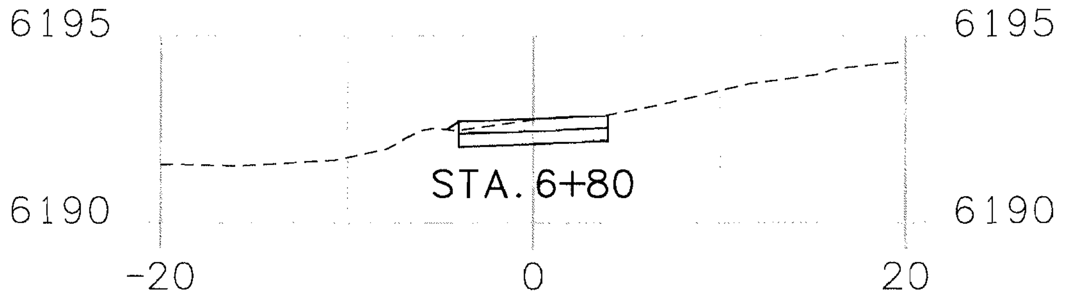


STA. 6+87



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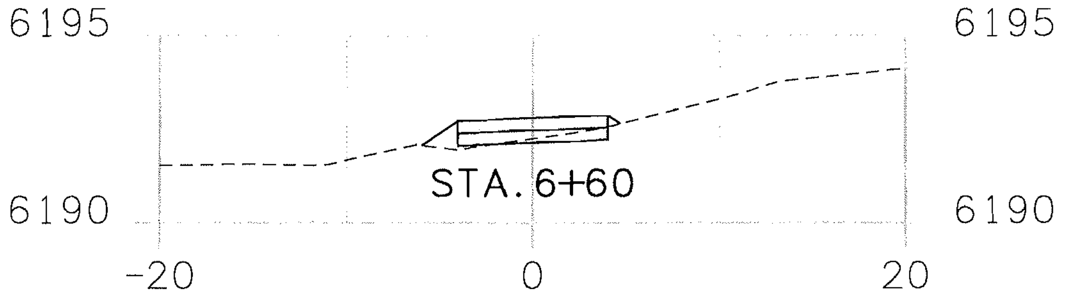

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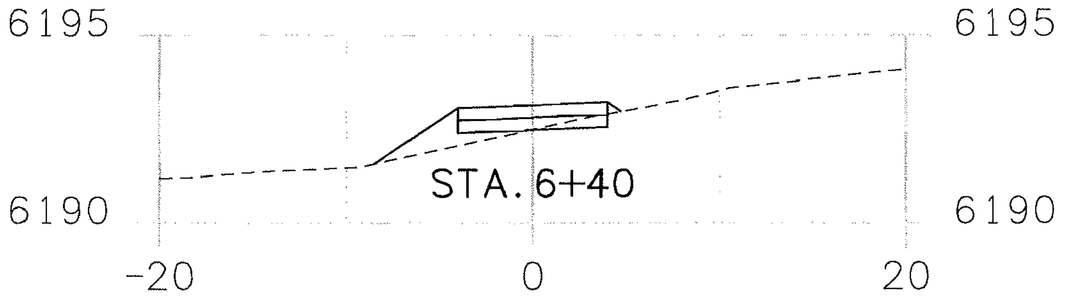

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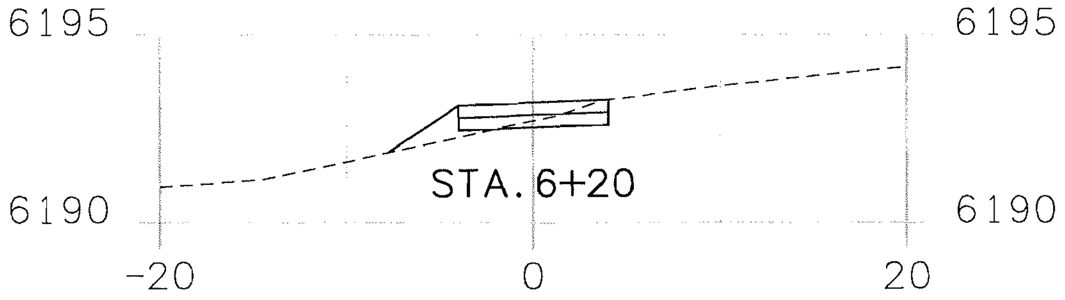

STA. 6+20

Print Date: 6/30/2009
File Name: 16847DES_CrossSections01.dgn
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CROSS SECTIONS
Designer: D. SMITH
Detailer: D. SMITH
Sheet Subset: SECTIONS
Structure Numbers -
-
Subset Sheets: 1 of 1

Project No./Code
C133A-036
16847
Sheet Number 18

dsmith 2:13:41 PM P:\CDOT\Region 3\Region 3 Traffic NPS 2008\SH 133 Hendrick\16847\Design\Drawings\16847DES_CrossSections01.dgn

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Pedestrian Crosswalk Traffic Control Assessment

Prepared For:

Carbondale Crosswalk

SH-133 @ Mile Post 67.50
Near Hendrick Drive

Carbondale, Colorado

COLORADO REGISTERED PROFESSIONAL ENGINEER
BARRIE L. HUDSON, JR.
35278
11-19-07

November 19, 2007

587½ Grand Cascade Way
Grand Junction, CO 81501
970-985-4001

TurnKey
Consulting, LLC

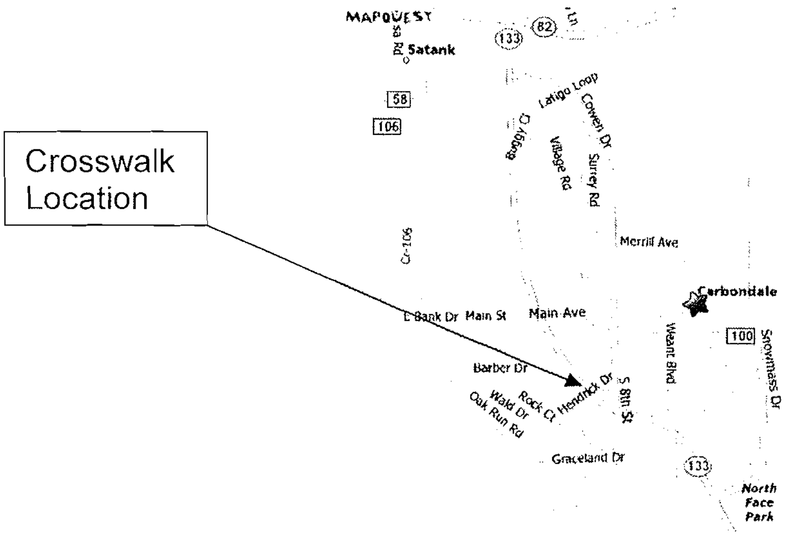
1 Introduction & Executive Summary

This report summarizes the results of a traffic control assessment associated with the existing unsignalized pedestrian crosswalk in Carbondale, CO. The crosswalk is located in Carbondale on SH-133 near Hendrick Drive (milepost 67.50). Due to the high volume of traffic on SH-133, and the high volume of pedestrians at this location, the Town of Carbondale requested an evaluation of different traffic control options. TurnKey Consulting collected appropriate traffic data and evaluated warrants for different types of crosswalk traffic control.

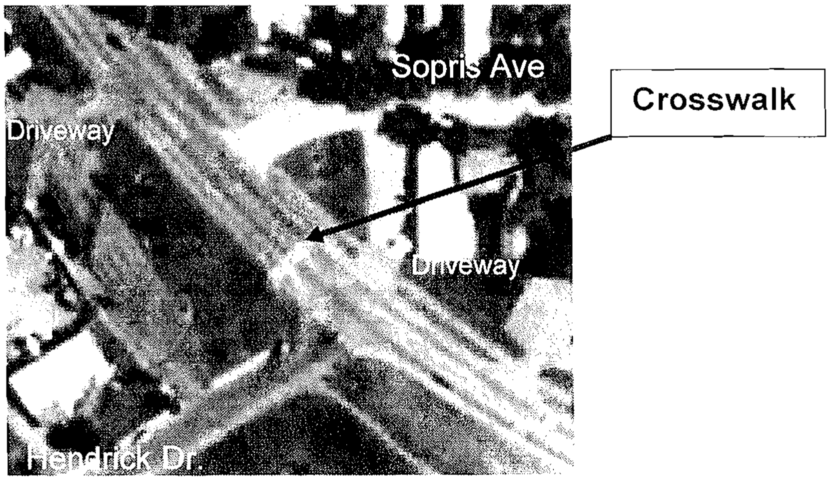
2 Existing Crosswalk Characteristics

The existing crosswalk is located between Sopris Avenue and Hendrick Drive

Vicinity Map



Aerial View



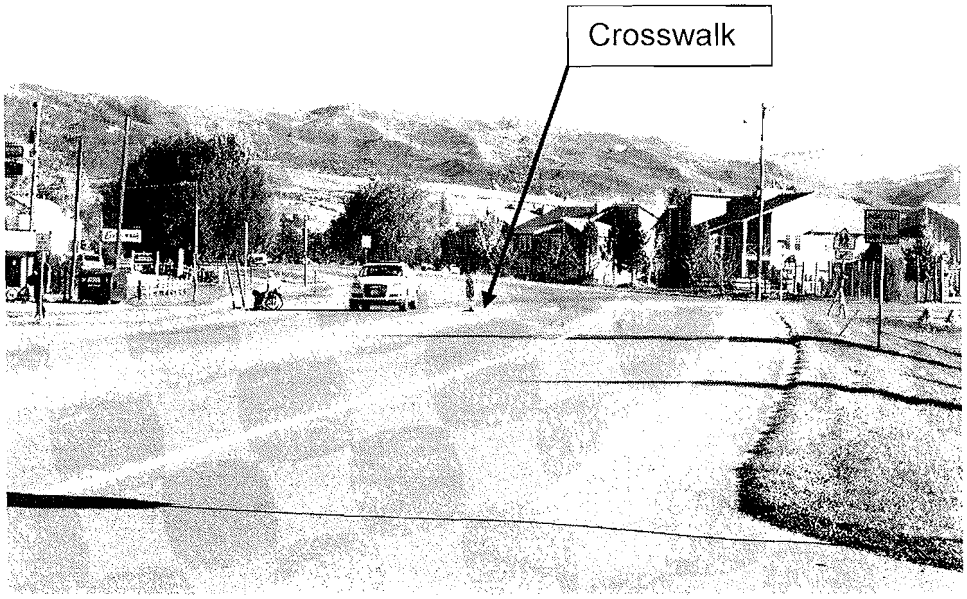
SH-133 Information at Crosswalk

- Functional Classification: Other Principal Arterial – Urban
- Speed limit = 35 mph
- Southbound Lanes: 1 through & 1 right-turn deceleration lane (to Hendrick Dr.)
- Northbound lanes: 1 through
- Median: 8-ft wide painted
- Shoulders: 4-ft wide paved
- Superelevation approximately 3% across all lanes
- 2006 AADT: 11,000 vehicles per day
- Estimated Peak Hour volume, two-way: 990 vehicles per hour (9% factor)

Crosswalk & Pedestrian Information

- Crosswalk Length: 60-ft
- Pavement markings: Yes (standard)
- Signing: Yes (standard)
- Advance speed reduction: Yes, school walking periods only, 25 mph
- Sidewalk connectivity: Yes – both sides
- Weekday Crossing Volumes (two-way):
  - AM Peak = 49 pedestrians (1 count)
  - Noon Peak = 43 pedestrians (1 count)
  - PM Peak (5-6 pm) = 60 pedestrians (ave of 2 counts)
- Type of crossing groups: predominately single row

SH-133 at Crosswalk – Looking South



3 Data Collection

TurnKey Consulting and Newland Project Resources collected traffic and pedestrian data on two separate occasions. In addition, the appendix contains statement from the current crossing guard.

The first pedestrian count was conducted on 9/12/07. It included three separate two-hour counts to cover all possible peak periods (7-9am, 11am-1pm, and 4-6pm). The Counts included all pedestrians crossing SH-133 between Euclid Avenue (575-ft north of marked crosswalk) and 8th Street (450-ft south of marked crosswalk). The majority of crossings occurred at the marked crosswalk. This series of counts identified the peak hour as the period between 5pm and 6pm, in which 76 pedestrians crossed SH-133.

The second pedestrian count was conducted on 10/25/07 during the period between 4pm and 6pm. The second count was done for the same limits as the first count. The second count identified the peak hour as the period between 5pm and 6pm, in which 44 pedestrians crossed SH-133. Once again, the majority of crossings occurred at the marked crosswalk. The advanced warning flashing beacon and speed reduction ended at 4:30pm.

TurnKey Consulting obtained other important field data on 10/25/07.

- Distance measurements and photographs
- Observed pedestrian and vehicle behavior in and around the crosswalk
- Video documentation of time gaps between vehicles
- Measured crossing times
    - 34 crossing groups
    - Average crossing times = 13 seconds
    - Average crossing speed = 4.6 feet per second

4 Crossing Calculations

This section includes the calculations necessary to evaluate crossing treatment warrants.

Minimum Acceptable Gap (G)

Equation: $G = W/S + (N-1)H + R$

Where: G = Minimum safe gap (seconds)
W = Width of crossing distance = 60 feet
S = Walking speed = 4.6 fps
N = predominant number of rows in crossing groups = 1
H = time headway between rows (seconds) = 2 seconds
R = pedestrian startup time = 3 seconds

The Minimum acceptable gap (G) = 16 seconds

Number of Adequate Gaps

The following table shows the number of adequate gaps in the actual vehicle travel stream, based on observation of video documentation taken during the PM peak hour (5-6pm).

Gap (Seconds)	Number of Gaps
16	1
17	4
18	4
19	2
20	2
21	1
22	1
23	1
Total =	**16**

5 School Crossing Signal Warrant Assessment

The MUTCD Section 4C.06 "Warrant 5, School Crossing" states:

> *The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of school children at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the children are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 students during the highest crossing hour.*
>
> *The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 90 m (300 ft), unless the proposed traffic control signal will not restrict the progressive movement of traffic.*

Conditions at the Crosswalk - PM Peak Hour

- Number of adequate gaps = 16
- Number of minutes in period = 60
- Number of pedestrians crossing = 60 (average of two counts)
- Distance to nearest signal = greater than 300 feet

The crossing signal warrant is met, since 16 gaps are less than 60 minutes, and 60 pedestrians are more than 20, and there are not any signals within 300 feet.

6 Traffic Control Options

The MUTCD Section 4C.06 "Warrant 5, School Crossing" states:

> *Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.*

The crossing location already has warning signs and flashers, temporary reduced speed zones, and school crossing guards. Grade separation is not feasible to the density of adjacent land development and the closely spaced side roads and driveways. The pedestrian crossing users include students and non-student walkers. The peak hour of crossing is actually well after school hours (5-6 pm). This means that the majority of crosswalk users do not get the benefit of the temporary reduced speed limits, flashing beacons, or crossing guards. These safety features end at 4:30 pm. It is not recommended that the existing warning lights and speed reductions be made into full-time measures. The effectiveness of this approach would diminish over time, as drivers became accustomed to their constant presence. Therefore, it is necessary to identify a full-time traffic control measure that would be effective and safe.

6.1 Option 1 – Midblock Pedestrian Signal

The midblock signal would indicate green to traffic on SH-133, and would turn red upon pedestrian detection (push button). This option could have five different methods of signal operation.

Standard Operations (G-Y-R)
This approach would cycle through the standard green-yellow-red signal indications. It provides a controlled crossing. It would also removes conflicts with turning vehicles by providing a crossing location that is not associated with an intersection.

Flashing Red Operations (G-FR-R)
This approach would have a flashing red phase instead of a yellow phase. In addition to the benefits of the standard operation, the flashing red operations minimize the interruption of traffic progression (in a coordinated system). The crosswalk location would be an isolated signal and would not be part of a coordinated system.

Pedestrian Light Controlled (Pelican) Operations
Similar to the flashing red operations, this approach uses a flashing yellow instead of a flashing red indication. Drivers can proceed across the crosswalk during the flashing yellow if pedestrians are not present.

Pedestrian User Friendly Intelligent (Puffin) Operations
Similar to the Pelican operations, this approach uses electronic in-crosswalk detectors to identify when the crosswalk is occupied or not. Drivers can proceed across the crosswalk during the flashing yellow if pedestrians are not present.

Two Can Cross (Toucan) Operations

Similar to the Pelican or Puffin operations, this approach is used when there is an even mix of pedestrian and bicycle volumes.

6.2 Option 2 – Intersection Signal with Pedestrian Features

This type of signal could be located at the intersection of SH-133 & Hendrick Drive, which is located within 50 feet of the existing crosswalk location. TurnKey Consulting observed conflicts between vehicles and vehicles/pedestrians. Drivers on Hendrick Drive were more focused on gaps in the SH-133 travel stream than on possible pedestrians in the nearby crosswalk. Some vehicles started a left turn movement towards the crosswalk and then had to stop when they saw the pedestrian. Other drivers thought they had an adequate gap to make the left turn out of Hendrick Drive, but did not realize that the oncoming vehicles would quickly slow during the flashing reduced speed operation. The intersection signal option would resolve this conflict by controlling all traffic movements within the operation sphere of the crosswalk. This option would also help most of the pedestrians who use SH-133 crosswalk, since most of them also use the unsignalized crosswalk on Hendrick Drive.

This Study did not obtain the data necessary to conduct a full signal warrant study. However, it is possible that this intersection could meet additional signal warrants beyond just the School Crossing Warrant. TurnKey Consulting observed vehicles delays on Hendrick Drive in excess of 60 seconds during the PM Peak Hour. The queue on Hendrick Drive was usually 2-5 vehicles. This delay was caused by the lack of adequate gaps in the SH-133 travel stream. A detailed signal warrant study is recommended in order to fully investigate the intersection signal option.

If the intersection signal is considered, the project should include the closure of the existing driveway that creates a 4-leg intersection at Hendrick Drive. This driveway could be closed and the small commercial site would still have good access directly to Sopris Avenue, and then SH-133. The recommended 3-leg intersection would be less expensive than the 4-leg alternative, and it would provide better traffic operations and safety.

7 Conclusion

Alternate gaps and blockades are inherent in the traffic stream and are different at each crossing location. For safety, pedestrians need to wait for a gap in traffic that is of sufficient duration to permit reasonably safe crossing. When the delay between the occurrences of adequate gaps becomes excessive, pedestrians might become impatient and endanger themselves by attempting to cross the street during an inadequate gap.

This study had documented that there are not sufficient gaps in the existing SH-133 travel stream to allow the high number of pedestrians to cross. The amount of adequate gaps will only become fewer as time goes on and traffic volumes increase. In addition, the existing crosswalk is located in a confusing and conflicting traffic area. It is located between four closely spaced side roads and driveways with many turning movements.

It is clear that the existing traffic control treatments are not adequate for this crossing location. The Town of Carbondale and CDOT now have adequate information to consider some type of signalized pedestrian crossing. The signalized crossing could be a mid-block location or an intersection location. A traffic signal warrant study would be necessary in order to further consider the intersection signal option.

References:

1. Manual of Transportation Engineering Studies, 2000, ITE
2. Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), 2003 Edition, FHWA, ITE, AASHTO, ATSSA
3. Alternative Treatments for At-Grade Pedestrian Crossings, and informational report, 2001, Nazir Lalani & the ITE Pedestrian and Bicycle Task Force, ITE

Statements from Crossing Guard

Skip Hudson

From: Tom Newland [tomn@sopris.net]
Sent: Wednesday, November 14, 2007 4:33 PM
To: 'cody owen'
Cc: 'Skip Hudson'
Subject: RE: Hendricks/SH133 Crossing

Cody:

Thank, Cody. I am forwarding this email to my consultant, Turnkey Consulting, for use in the report.

Thanks again,

- Tom

From: cody owen [mailto:codyowen@sopris.net]
Sent: Wednesday, November 14, 2007 2:11 PM
To: 'Tom Newland'
Cc: spirit@sopris.net
Subject: RE: Hendricks/SH133 Crossing

#1

Tom,
From my observations, there are between 30 and 50 people crossing during the times that I am there, both morning and night for crossing guard. They are both pedestrians and bicyclists.

Since this is one of the heaviest used crosswalks in town I suspect that the total numbers for every day are easily 3 times that number. People are crossing here from the residential neighborhoods on the West side of SH 133 to go shopping at City Market and generally into town. They cross here since the sidewalk is only paved on the East side of SH 133. Senior housing is just 1 ½ blocks away which has 65 units and will be expanding in 2008. Many of these residents are users since they don't have a car. I also know of users who cross here from the East side of SH133 in order to take their dog to the dog park (of which I frequent) just 1 block away from the corner of Hendrick Drive and SH133.

Thanks again for your assistance,
Cody

From: Tom Newland [mailto:tomn@sopris.net]
Sent: Wednesday, November 14, 2007 11:46 AM
To: codyowen@sopris.net
Subject: Hendricks/SH133 Crossing

Cody:

This is to follow up with you on the pedestrian crossing at SH 133 and Hendricks Road.

My consultant, Skip Hudson, is preparing his report and it looks very favorable for a stop light. He would like to include your observations on the amount and frequency of people using the crosswalk.

Could you respond to this email with your thoughts and observations? Skip will be producing a draft by the end of the week and was hoping to include the information from your email in it.

Skip Hudson

From: Tom Newland [tomn@sopris.net]
Sent: Thursday, November 15, 2007 1:20 PM
To: 'Skip Hudson'
Subject: FW: SH 133 - Numbers for report

Skip:

Here's that info on school children

- Tom

-----Original Message-----
From: spirit@sopris.net [mailto:spirit@sopris.net]
Sent: Thursday, November 15, 2007 10:12 AM
To: tomn@sopris.net
Cc: codyowen@sopris.net
Subject: SH 133 - Numbers for report

#2

Tom,
Cody has asked that I respond directly to you reguarding your inquiry of the number of CHILDREN that us the crosswalk durint the school year.

The number varies from day to day, mostly depending on the weather and the activities of each child for that day.

Generally, I feel confident that you can figure 25 children use the crosswalk each day in the morning and afternoon - during the cold weather months and 35 use it in the warm weather months. Suffice to say that we really notice a pick up in the numbers in the spring when more kids are walking and biking to school.

The number that Cody gave you before included other user (parents who escort their children on bicycles and ather adult users, etc.) As you can see, during the time that Cody is working as crossing guard, the numbers represented are mostly for the children.

If you have any questions, please don't hesitate to contact me again.

Jean

Jean Owen
Creative Consulting - Proposals and Reports
151 Quent Lane
Carbondale, CO 81623
(970)963-5664 home/work (970)355-9610 cell

Public Schools

Carbondale Community Charter School
1505 Satank Road
Carbondale, CO 81623
Roaring Fork Re-1 School District

Carbondale Elementary School
600 South 3Rd
Carbondale, CO 81623
Roaring Fork Re-1 School District

Carbondale Middle School
455 South 3Rd
Carbondale, CO 81623
Roaring Fork Re-1 School District

Crystal River Elementary School
160 Snowmass Drive
Carbondale, CO 81623
Roaring Fork Re-1 School District

Roaring Fork High School
180 Snowmass Drive
Carbondale, CO 81623
Roaring Fork Re-1 School District

Name: Carbondale Ped Crossing Study
Date: 9/12/2007
limits of counts Terri Newland 970-927-4645

Pedestrian Crossing Movements - Field Data

AM

Morning								
Time	Eastbound	Westbound	Time	Eastbound	Westbound	Time	Eastbound	Westbound
7:00 - 7:15 7	2	5	8:00 - 8:15 16	12	4			
7:15 - 7:30 6	1	5	8:15 - 8:30 5	4	1			
7:30 - 7:45 10	8	2	8:30 - 8:45 10	3	7			
7:45 - 8:00 18	14	4	8:45 - 9:00 2	2	0			

Peak = 7:45 - 8:45

Vol = 49

Name: Carbondale Ped Crossing Study
Date: 9/12/2007
limits of counts Terri Newland 970-927-4645

Pedestrian Crossing Movements - Field Data

Noon

Noon			Noon					
Time	Eastbound	Westbound	Time	Eastbound	Westbound	Time	Eastbound	Westbound
11:00-11:15 10	5	5	12:00 - 12:15 ⑭	9	5			
11:15 - 11:30 4	1	3	12:15 - 12:30 ⑧	5	3			
11:30 - 11:45 ⑭	3	11	12:30 - 12:45 11	6	5			
11:45 - 12:00 ⑦	3	4	12:45 - 1:00 6	0	6			

Peak = 11:30 - 12:30

Val = 43

Name: Carbondale Ped Crossing Study
Date: 9/12/2007
limits of counts Tom Newland 927-4645

Pedestrian Crossing Movements - Field Data

PM

Afternoon			Afternoon					
Time	Eastbound	Westbound	Time	Eastbound	Westbound	Time	Eastbound	Westbound
			4:00 -4:15 9	1	8	5:00 - 5:15 19	2	17
			25 4:15 - 4:30 28	16	12	5:15-5:30 9	3	6
			4:30 - 4:45 10	4	6	5:30-5:45 30	16	14
			4:45 - 5:00 18	8	10	5:45 - 6:00 6	4	2

Peak = 4:45 - 5:45
Vol = 76

Name: Carbondale Ped Crossing Study
Date: 10/25/07
limits of counts

Pedestrian Crossing Movements - Field Data

↑ ↓

Morning			Noon			Afternoon		
Time	Eastbound	Westbound	Time	Eastbound	Westbound	Time	Eastbound	Westbound
7:00 - 7:15			11:00 - 11:15			4:00 - 4:15	𝍷𝍷𝍷 𝍷𝍷 3 2	𝍷𝍷𝍷 𝍷𝍷𝍷 𝍷𝍷𝍷𝍷
7:15 - 7:30			11:15 - 11:30			4:15 - 4:30	𝍷𝍷	𝍷𝍷𝍷
7:30 - 7:45			11:30 - 11:45			4:30 - 4:45	𝍸 5	𝍸𝍷 6
7:45 - 8:00			11:45 - 12:00			4:45 - 5:00	𝍷𝍷 𝍷𝍷𝍷𝍷 𝍷 2	𝍷𝍷 𝍷𝍷 𝍷

Pedestrian Crossing Movements - Field Data

10/25/07

↑ ↓

Morning			Noon			Afternoon			
Time	Eastbound	Westbound	Time	Eastbound	Westbound	Time	Eastbound	Westbound	
8:00 - 8:15			12:00 - 12:15			5:00 - 5:15	𝍷𝍷 𝍷𝍷𝍷 𝍷	𝍷 𝍷𝍷𝍷	10
8:15 - 8:30			12:15 - 12:30			5:15 - 5:30	𝍷𝍷𝍷𝍷	𝍷 𝍷𝍷	7
8:30 - 8:45			12:30 - 12:45			5:30 - 5:45	𝍸	𝍷𝍷𝍷𝍷 𝍷𝍷	11
8:45 - 9:00			12:45 - 1:00			5:45 - 6:00	𝍷 𝍸 𝍷𝍷𝍷	𝍷𝍷 𝍷𝍷𝍷 𝍷𝍷	16
									44

$$Ave = \frac{44 + 26}{2} =$$

Pedes
Row
Dat

Pedestrian Crossing Time Data

N	M		S
6.5 R	14.0	16.1	4.5 R
10.5	10.0	14.2	4.5 R
3.5 R	11.7		9.6
9.2	11.4	15.4	11.0
8.1	12.1	15.4	
8.8	11.0	16.3	
9.9	10.1	16.3	
	~~9.8~~ R	16.	
5.6 R	11.1	16.	
5.8 R	12.5	16.	
5.2	10.8		
	12.5		
	13.4		
	12.8		
	10.1		
	10.7		
	10.8		
	11.3		
	11.8		

Converted from No 3

Avg 9.3 sec

$\frac{34 ft}{9.3 sec} \times \frac{3600 sec}{hr} \times \frac{1 mile}{5280 ft}$

2.5 mph

3.67 fps

$\frac{3[illegible]}{27} = 12.95$

say 13 sec

4.6 fps

Avg 10.3

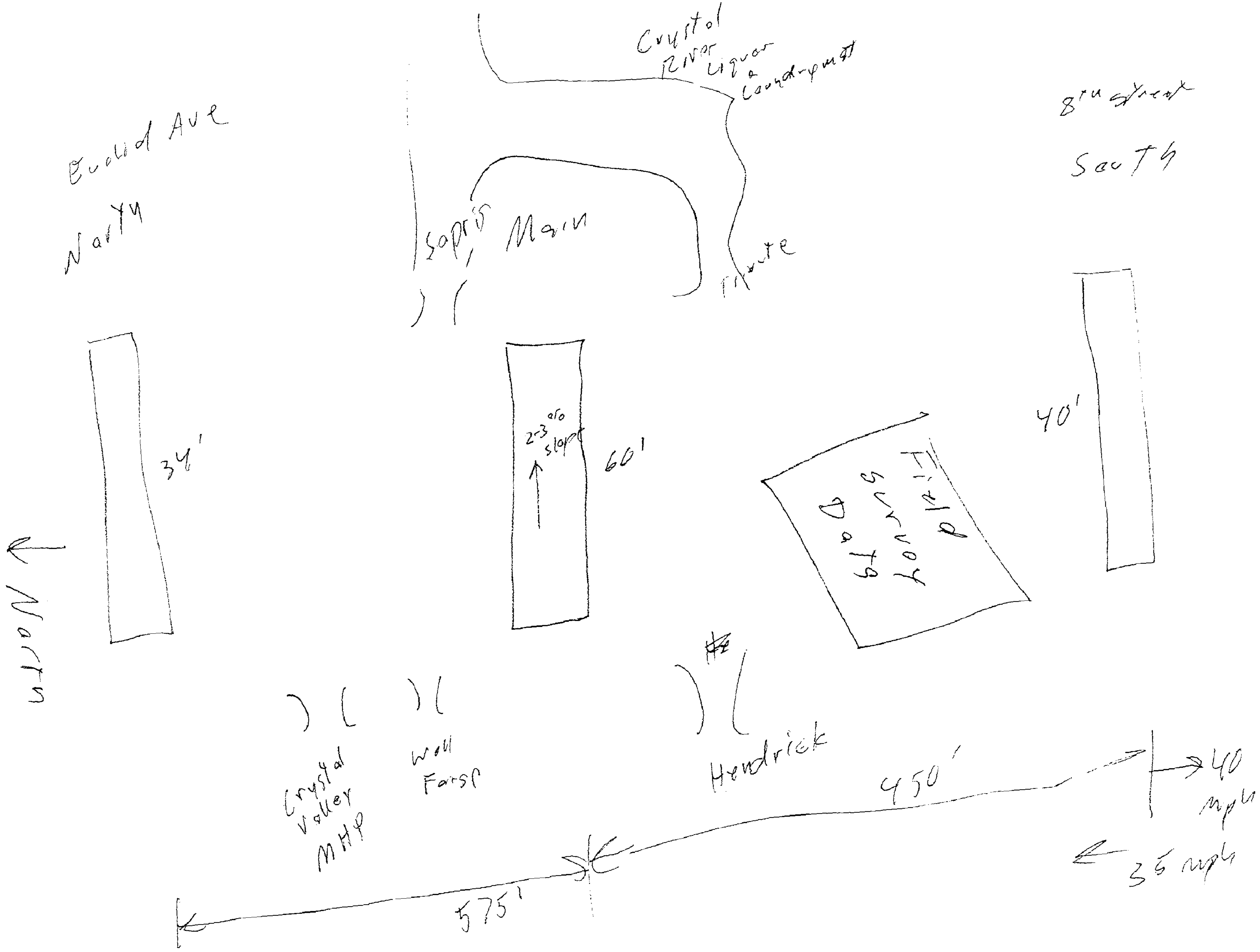
$\frac{40 ft}{10.3 sec} \times \frac{3600}{5280} = 2.65$ mph

[illegible]

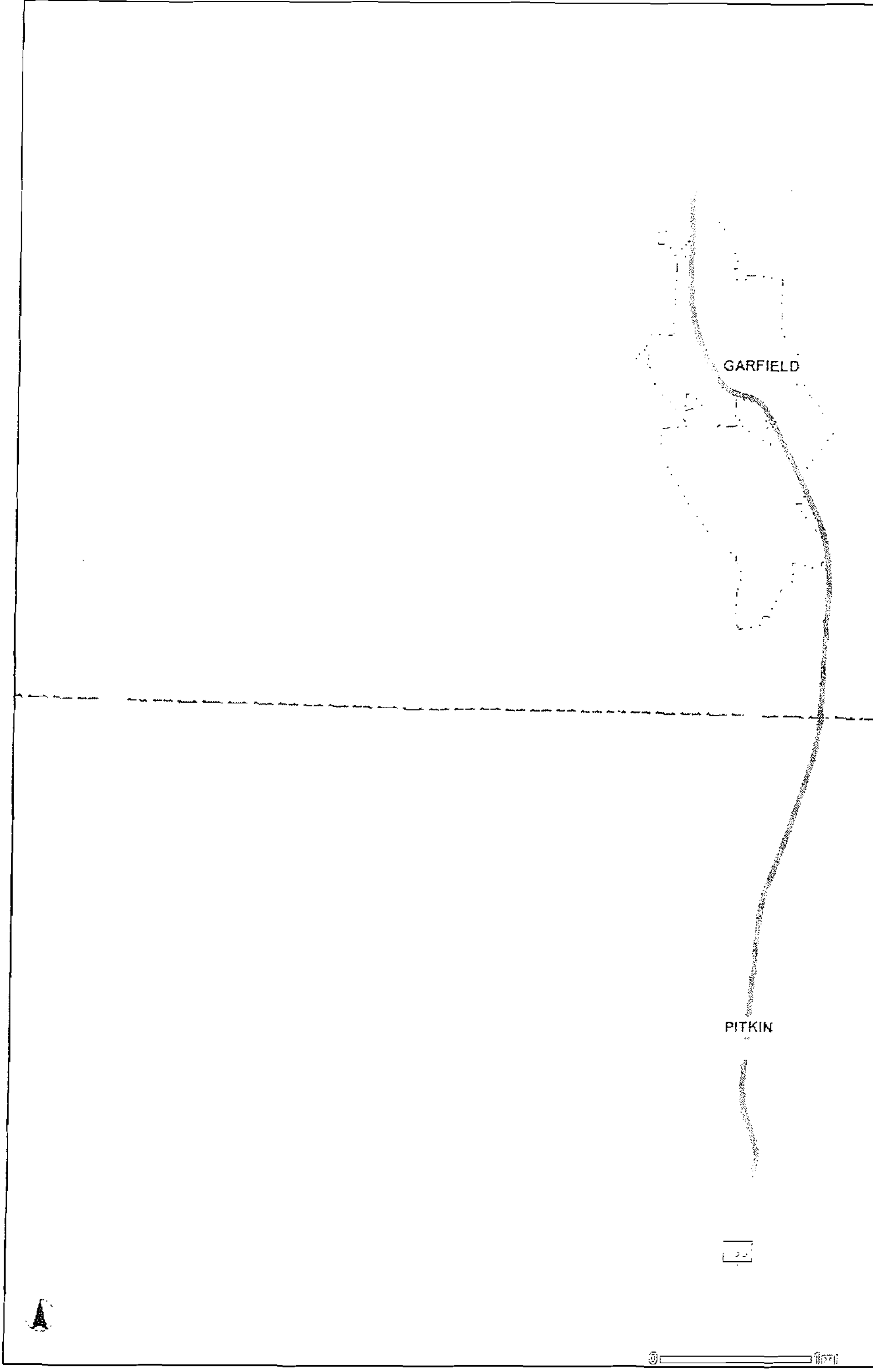
Flashing Reduced Speed ends 41.30 E

25 mph → 35 mph

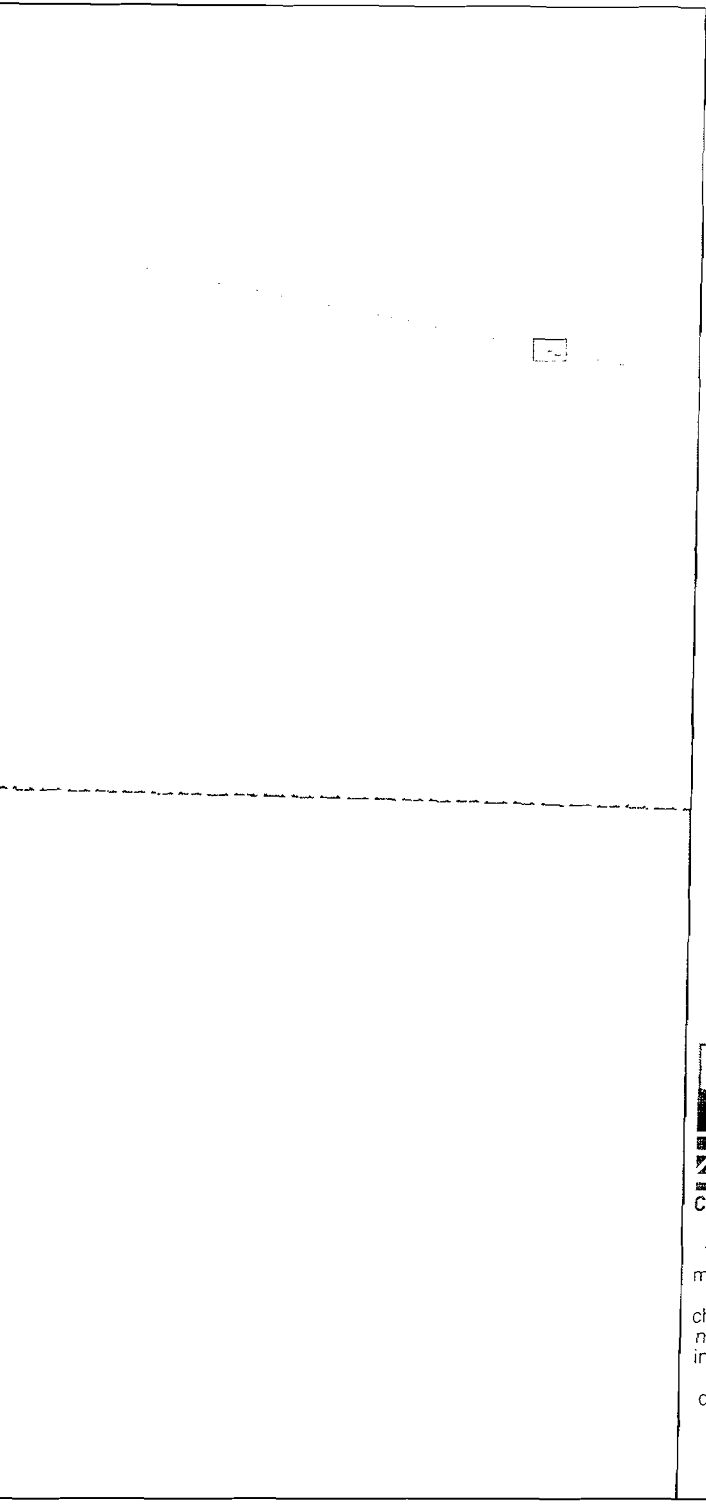
Ped Crossing Time Data


Euclid Ave
North
Sopris
Main
Crystal River Liquor & Laundromat
Route
8th Street
South
34'
2-3 % slope
60'
Field survey Data
40'
North
#2
Crystal Valley MHP
Woll Forsr
Hendrick
450'
575'
40 mph
35 mph

133A



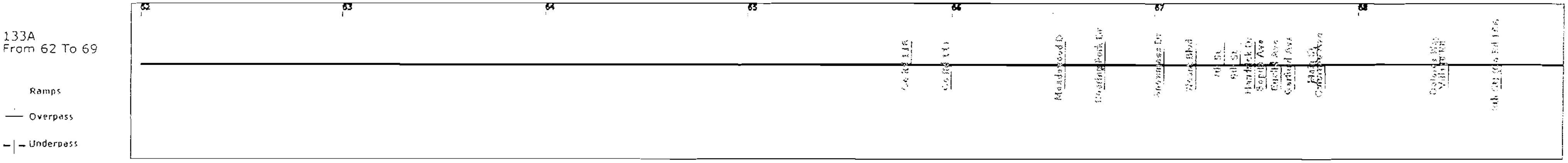
From 62 To 69



Colorado Department of Transportation

Map Created:
Wed Nov 14 10:09:05 2007

133A
From 62 To 69



CLASSIFICATION

Functional Class	6 Minor Art-Rural	14 Other Pri Art-Urban	6

GEOMETRICS

Through Lane Quantity	2

SAFETY

Speed Limit	55	45	35

TRAFFIC

AADT	3300	4200	7400	11000	18600
AADT Year	2006				
Peak Truck Percentage	2.2	1.5	.8	2	3.1
Year 20 Factor	1.47	1.48	1.54	1.58	
DHV	9				

It may appear that information is missing from the straight line diagram. If so, reduce the number of miles/page (Step 3) and re-submit the request.

Section 1A.09 Engineering Study and Engineering Judgment Standard:

This Manual describes the application of traffic control devices, but shall not be a legal requirement for their installation.

Guidance:
The decision to use a particular device at a particular location should be made on the basis of either an engineering study or the application of engineering judgment. Thus, while this Manual provides Standards, Guidance, and Options for design and application of traffic control devices, this Manual should not be considered a substitute for engineering judgment.

Engineering judgment should be exercised in the selection and application of traffic control devices, as well as in the location and design of the roads and streets that the devices complement. Jurisdictions with responsibility for traffic control that do not have engineers on their staffs should seek engineering assistance from others, such as the State transportation agency, their County, a nearby large City, or a traffic engineering consultant.

Section 4C.06 Warrant 5, School Crossing

Support:
The School Crossing signal warrant is intended for application where the fact that school children cross the major street is the principal reason to consider installing a traffic control signal.

Standard:
The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of school children at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the children are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 students during the highest crossing hour.
Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.
The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 90 m (300 ft), unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Guidance:
If this warrant is met and a traffic control signal is justified by an engineering study, then:
A. If at an intersection, the traffic control signal should be traffic-actuated and should include pedestrian detectors.
B. If at a nonintersecting crossing, the traffic control signal should be pedestrian-actuated, parking and other sight obstructions should be prohibited for at least 30 m (100 ft) in advance of and at least 6.1 m (20 ft) beyond the crosswalk, and the installation should include suitable standard signs and pavement markings.
C. Furthermore, if installed within a signal system, the traffic control signal should be coordinated.

Section 7A.03 School Crossing Control Criteria

Support:
Alternate gaps and blockades are inherent in the traffic stream and are different at each crossing location. For safety, students need to wait for a gap in traffic that is of sufficient duration to permit reasonably safe crossing. When the delay between the occurrence of adequate gaps becomes excessive, students might become impatient and endanger themselves by attempting to cross the street during an inadequate gap.

A recommended method for determining the frequency and adequacy of gaps in the traffic stream is given in the Institute of Transportation Engineers' publication, "School Trip Safety Program Guidelines" (see Section 1A.11).

Section 4K.03 Warning Beacon

Support:

Typical applications of Warning Beacons include the following:

A. At obstructions in or immediately adjacent to the roadway;

B. As supplemental emphasis to warning signs;

C. As emphasis for midblock crosswalks;

D. On approaches to intersections where additional warning is required, or where special conditions exist; and

E. As supplemental emphasis to regulatory signs, except STOP, YIELD, DO NOT ENTER, and SPEED LIMIT signs.

Standard:

A Warning Beacon shall consist of one or more signal sections of a standard traffic signal face with a flashing CIRCULAR YELLOW signal indication in each signal section.

A Warning Beacon shall be used only to supplement an appropriate warning or regulatory sign or marker. The beacon shall not be included within the border of the sign except for SCHOOL SPEED LIMIT sign beacons.

Warning Beacons, if used at intersections, shall not face conflicting vehicular approaches.

If a Warning Beacon is suspended over the roadway, the clearance above the pavement shall be at least 4.6 m (15 ft) but not more than 5.8 m (19 ft).

Guidance:

The condition or regulation justifying Warning Beacons should largely govern their location with respect to the roadway.

If an obstruction is in or adjacent to the roadway, illumination of the lower portion or the beginning of the obstruction or a sign on or in front of the obstruction, in addition to the beacon, should be considered.

Warning Beacons should be operated only during those hours when the condition or regulation exists.

Option:

If Warning Beacons have more than one signal section, they may be flashed either alternately or simultaneously.

A flashing yellow beacon interconnected with a traffic signal controller assembly may be used with a traffic signal warning sign (see Section 2C.29).

Section 4K.03 Warning Beacon

Support:

Typical applications of Warning Beacons include the following:

A. At obstructions in or immediately adjacent to the roadway;

B. As supplemental emphasis to warning signs;

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Option:

If Warning Beacons have more than one signal section, they may be flashed either alternately or simultaneously.

A flashing yellow beacon interconnected with a traffic signal controller assembly may be used with a traffic signal warning sign (see Section 2C.29).

7. Signal-Controlled Crossings for Pedestrians

This section summarizes the use of signals that are installed for pedestrian crossings. One of the applications is at intersections, such as in Canada where the pedestrian crossing is signalized but the intersection side street approaches are controlled by STOP signs. Most of the applications in the USA, Canada, Australia, and the UK are at midblock locations. These treatments have been placed in a separate section because they are generally not located at intersections and their operations are significantly different from pedestrian crossings at signalized intersections.

7.1. MIDBLOCK SIGNAL-CONTROLLED CROSSINGS WITH FLASHING RED

Description: Traffic signals are used to control traffic at midblock crosswalks. During the WALK interval, a steady red signal indication is displayed to drivers approaching the crosswalk. During the flashing DON'T WALK interval, drivers see a flashing red indication and, after stopping, they may proceed through the crosswalk area in front of them if it is not occupied by pedestrians. After the pedestrian clearance interval ends, the signal turns green to allow drivers to proceed. The flashing red minimizes the interruption to traffic progression. Vehicles must remain stopped during the 4- to 7-second WALK interval but are not required to wait the full 12 to 20 seconds that would be necessary if a steady red indication were displayed during the completion of the DON'T WALK clearance interval.

Objective: To provide pedestrians a signal-protected opportunity to cross midblock at a controlled crosswalk.

Cost: Ranges from $50,000 to $75,000, depending on the width of the street and the length of the mast-arm poles.

Applications: Currently, this treatment is in use at 105 locations in the downtown and other retail areas of Los Angeles at midblock locations. It provides pedestrians an opportunity to cross midblock at a controlled crosswalk. The City uses the pedestrian warrant contained in the California *Traffic Manual* to convert midblock crosswalks on multilane roadways to pedestrian signals. Signal controls at midblock crosswalks are also required based on intense retail activity, high pedestrian volumes, midblock crossing demand, the presence of existing signals at the end of the subject block, and block length greater than 180 m.

Advantages: Provides a controlled crossing while minimizing disruption to traffic flow. This treatment also removes conflict with turning vehicles by providing a crossing location that is not associated with an intersection.

Disadvantages: Cost of installation is significant. Because there may not be traffic surges to give an audible cue about crossing intervals, accessible pedestrian signals (APSs) with locator tone must be provided to inform visually impaired persons that actuation of a signal is required to cross the major street and to indicate onset of the WALK interval; this increases the cost.

Studies: None found. The City of Los Angeles decided over 20 years ago that this approach had advantages over providing uncontrolled midblock crosswalks with yellow beacons. Development patterns using long "super blocks" created the need for midblock crossings.

Figure 7–1A. Midblock signal-controlled crossing on Sunset Boulevard in Los Angeles, California, USA. (Source: Nazir Lalani, County of Ventura, CA, USA.)

Figure 7–1B. Midblock signal-controlled crossing in downtown Los Angeles, California, USA. (Source: Nazir Lalani, County of Ventura, CA, USA.)

Sites: Figures 7–1A and 7–1B show midblock signal-controlled crossings in and near downtown Los Angeles at locations where pedestrian travel patterns dictate the need to provide such midblock crossings.

7.2. MIDBLOCK SIGNAL-CONTROLLED PEDESTRIAN CROSSINGS

Description: Traffic signals are used to control traffic at midblock crosswalks. During the WALK interval, a steady red signal indication is displayed to drivers approaching the crosswalk. During the flashing DON'T WALK interval, drivers continue to see a steady red indication. Drivers may not proceed through the crosswalk area in front of them until the signal turns green. Signals remain green for drivers until a pedestrian reactivates the push button.

Objective: To provide pedestrians an opportunity to cross midblock at a controlled crosswalk.

Cost: Ranges from $50,000 to $75,000, depending on the width of the street and the length of the mast-arm poles.

Applications: This treatment is currently used at some midblock locations in urban areas of Ontario, Canada, and some parts of the USA. It provides pedestrians an opportunity to cross midblock at a controlled crosswalk. The Ontario *Manual on Uniform Traffic Control Devices*[12] provides a specific warrant for midblock pedestrian signals. Under free-flow conditions, the warrant requires an average of 120 pedestrian crossings per hour over the heaviest 8 hours of the day and an average of 290 vehicles per hour entering the crossing over the same 8 hours. Under restricted-flow conditions, the warrant values are 240 pedestrians per hour and 575 vehicles per hour. The vehicular volume thresholds are increased by 25 percent for streets with more than one lane per direction.

At midblock signalized pedestrian crossings in Tucson, Arizona, USA, the pedestrian crosses the street in two stages, first to a median island and then along the median to a second signalized crossing point a short distance away. The pedestrian then activates a second crossing button, and another crossing signal changes to red for the traffic, giving the pedestrian a WALK signal. The two crossings operate independently of each other and delay the pedestrian minimally while allowing the signal operation to fit into the major street traffic progression, thus reducing the potential for stops, delays, accidents, and environmental air-quality issues.

Advantages: Provides a controlled crossing. Also removes conflict with turning vehicles by providing a crossing location that is not associated with an intersection.

Disadvantages: Cost of installation is significant. There is some disruption to traffic flow, which can be minimized if the midblock signal is part of the coordinated system. Because there may not be traffic surges to give an audible cue about crossing intervals, APSs with locator tone must be provided to inform visually impaired persons that actuation of a signal is required to cross the major street and to indicate onset of the WALK interval; this increases the cost. The concern that the signal may be disregarded by drivers because it rests in green for substantial lengths of time has not been borne out by observations made at such crossings in the City of Tucson, Arizona, USA.[59]

Studies: Glock et al.,[59] for the City of Tucson, reported drivers' compliance at the midblock crossings seems as good as that at other traditional traffic signals. However, some driver violations have been reported. The device is effective overall in providing a safe crossing for pedestrians at midblock locations.

Sites: Figure 7–2A shows a midblock signal installation in Toronto, Ontario, Canada. Figure 7–2B shows a midblock signalized pedestrian crossing in Tucson, Arizona, USA.

Figure 7–2A. Midblock signal-controlled crossing in Toronto, Ontario, Canada. (Source: Douglas Allingham, Whitby, ON, Canada.)

Figure 7–2B. Midblock signalized pedestrian crossing in Tucson, Arizona, USA. This treatment includes a staggered pedestrian refuge. Each half of the crossing is actuated independently of the other half. (Source: Nazir Lalani, County of Ventura, CA, USA.)

7.3. INTERSECTION PEDESTRIAN SIGNALS

Description: Signals installed at intersections control traffic at crosswalks on the major street. These intersection pedestrian signals are sometimes referred to as "half signals." The side street is controlled by STOP signs. No signal indications are provided for the minor street traffic.

Objective: To provide a pedestrian crossing for the major street that is protected by signals while minimizing delay to major street traffic by retaining STOP sign control on the minor street.

Cost: Ranges from $50,000 to $75,000, depending on the width of the street and the length of the mast-arm poles.

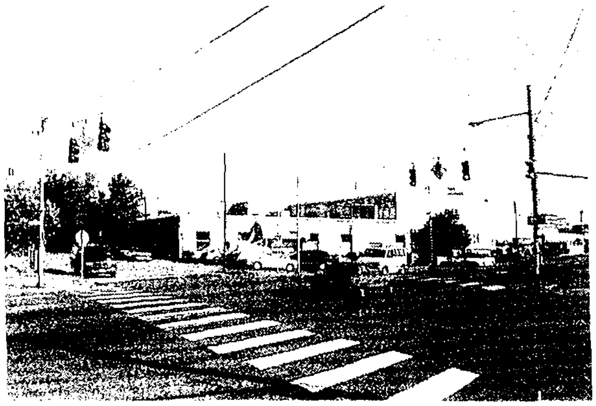
Applications: At locations where there is heavy pedestrian demand to cross the major street but the side street traffic on the minor approach is light. Section 2.2 of this report provides the methodology used in British Columbia, Canada, to determine where such signals are to be installed.

Advantages: Provides a controlled crossing while minimizing disruption to traffic flow but does not include side street signal control. This lack of control on the side street does not attract more traffic to the street as conventional intersection signals would.

Disadvantages: Cost of installation is significant. Drivers on side streets may be confused on right-of-

Figure 7–3A. Intersection pedestrian signal in Vancouver, British Columbia, Canada. (Source: Don Henderson, City of Vancouver, Canada.)

Portland, Oregon



Seattle, Washington

Figure 7–3B. Intersection pedestrian signals in Portland, Oregon, and the Puget Sound area. (Source: top: William C. Kloos; bottom, Randy S. McCourt, Portland, OR, USA.)

way assignment. If understood, the right-of-way relies on gaps in main street traffic to enter or cross the main street. Because there may not be traffic surges to give an audible cue about crossing intervals, APSs with locator tone must be provided to inform visually impaired persons that actuation of a signal is required to cross the major street and to indicate onset of the WALK interval; this increases the cost.

Studies: This application has been tested in Portland, Oregon. The staff reported that a review of collision data indicated that the frequency of broadside collisions involving side street traffic is no greater than at intersections where the side street is controlled by signals. However, red light violations are higher because the signals dwell on green for much longer periods of time.

Sites: Figure 7–3A shows this type of treatment in operation at an intersection in the greater Vancouver area of British Columbia, Canada. Figure 7–3B shows examples of this treatment being used in Portland, Oregon, and Seattle, Washington, USA.

7.4. PELICAN CROSSINGS

Description: First introduced in the UK in the 1970s, Pelican (**P**edestrian **li**ght **con**trolled) crossings are traffic signals used to control traffic at midblock crosswalks. During the pedestrian WALK interval, drivers approaching the crosswalk must stop at a steady red signal. The pedestrian signal display, on the far side of the crossing, consists of a steady green walking figure, which normally lasts for 4–9 seconds. This period is followed by a flashing green walking figure for the pedestrian clearance interval. During the pedestrian clearance interval, a flashing amber indication lasting 6–18 seconds is displayed to drivers. During this flashing amber period, drivers may proceed through the crosswalk area if it is not occupied by pedestrians.

The flashing green walking figure interval is followed by an additional brief pedestrian clearance interval, during which a steady red standing figure is displayed to pedestrians for up to 2 seconds before the flashing amber vehicle signal indication turns green for vehicular traffic. The green for vehicular traffic can be set from 20 to 60 seconds for fixed-time operation or from 6 to 60 seconds if vehicle detection is provided to detect gaps in traffic. The sequence of indications is shown in Table 7–1.

Objective: To provide pedestrians an opportunity to cross midblock at a controlled crosswalk. The flashing amber minimizes the interruption to traffic platoons.

Cost: Ranges from $50,000 to $75,000, depending on the width of the street, the length of mast-arm poles, and whether or not center island and landscaping are installed. Operation costs are estimated to be $4,000 per year. In the UK and Australia where these types of crossing are used extensively without mast arms, the cost range for installation is $30,000 to $60,000.

Applications: Currently, this treatment is used in the UK, Australia, and other countries with strong links to the UK's approach to traffic engineering. The warrants and guidelines according to which this treatment is used in the UK and Australia are provided in Sections 2.3 and 2.5 of this report, respectively.

Advantages: Provides a controlled crossing. This treatment also removes conflict with turning vehicles by providing a crossing location that is not associated with an intersection.

Table 7–1. Pedestrian and Vehicle Signal Indication Sequence at Pelican Crossings

Period	Pedestrian Indication	Vehicular Indication	Timing (Seconds)
1	Red	Green	20–60 (fixed) 6–60 (variable)
2	Red	Amber	3 (mandatory)
3	Red	Red	1–3 (fixed)
4	Green	Red	4–9 (fixed)
5 (optional)	Flashing green	Red	0 or 2
6	Flashing green	Flashing amber	6–18
7	Red	Flashing amber	1 or 2

Source: James Landles, London, UK.

Disadvantages: Cost of installation is significant. There is some disruption to traffic flow, which can be minimized if the midblock signal is part of the coordinated system. Because there may not be traffic surges to give an audible cue about crossing intervals, APSs with locator tone must be provided to inform visually impaired persons that actuation of a signal is required to cross the major street and to indicate onset of the WALK interval; this increases the cost.

Studies: Lalani[29] conducted studies of Pelican crossings in the 1970s on behalf of the Greater London Council (GLC) and found that they can reduce pedestrian-related collisions, but only if their use is associated with additional treatment. The study found that pedestrian-related collisions decreased at the crossing but increased in the areas on either side of the crossing. However, at locations where Pelican crossings were provided with additional treatments, such as anti-skid surface treatment and pedestrian railings that channelized pedestrians to the controlled crossing, pedestrian-related collisions decreased significantly after Pelican crossings were installed.

Research done by the Australian Road Research Board for VicRoads showed a 40 percent reduction in delays for drivers with no adverse effects on pedestrians compared to traditional signalized midblock pedestrian crossings. Audible and tactile treatments at Pelican crossings are described in Traffic Advisory Leaflet 4/91,[60] published by the Department of Environment, Transport and the Regions in the UK.

Sites: Figure 7–4A shows a Pelican crossing in Australia. Figure 7–4B shows a Pelican crossing with additional treatments in the UK.

Figure 7-4A. Pelican crossing in Victoria, Australia. (Source: Bill Saggers, Melbourne, Australia.)

Figure 7–4B. Pelican crossing with zigzag markings and anti-skid surfacing in the UK. For information on zigzag marking, see Section 4.5. (Source: Michael F. Talbot, London, UK.)

7.5. PUFFIN CROSSINGS

Description: Puffin (Pedestrian user friendly intelligent)[61] crossings are similar in construction to Pelican crossings but have different operations and timing requirements. They provide more flexibility in how much time is provided for pedestrians to cross. Puffins operate in a manner somewhat similar to Pelicans with some important differences. Puffins

Table 7–2. Pedestrian and Vehicle Signal Indication Sequence at Puffin Crossings

Period	Pedestrian Indication	Vehicular Indication	Timing (Seconds)
1	Red	Green	20–60 (fixed) 6–60 (variable)
2	Red	Amber	3 (mandatory)
3	Red	Red	1–3
4	Green	Red	4–9
5	Red	Red	1–5 (fixed period)
6 (variable period)	Red	Red	0–22 (pedestrian extendable period)
7 (or 8)	Red	Red	0–3 (appears only on a maximum change if pedestrians are still being detected)
8	Red	Red	0–3 (appears only if there is a gap change)
9	Red	Red/Amber	2

Source: James Landles, London, UK.

use nearside pedestrian signal heads as opposed to farside. They provide an extendable all-red crossing period using microwave, infrared, and other types of overhead detection. The call is initiated by a push button accompanied by an infrared pedestrian detector demand. Puffins are equipped with two forms of detection. These are:

- Curbside infrared detectors: These cancel pedestrian actuations when no longer required.
- On-crossing overhead detector such as microwave or infrared: These extend the all-red time.

Vehicles must stop at a red signal when pedestrians begin crossing (the pedestrian signal display consists of a steady green walking figure). The length of the steady green pedestrian indication period is normally 4–9 seconds at the crossing, depending on the level of pedestrian demand. This is followed by a period of 1–5 seconds of all-red, which can be extended up to 22 seconds by the on-crossing pedestrian detectors. During the all-red, the pedestrian sees a red standing figure on the nearside pedestrian signal indication and the vehicle indication remains red. The red standing figure can be displayed for up to 3 additional seconds if pedestrians are still detected in the crosswalk at the end of the 22-second interval or if there is a gap change. The vehicular indication then turns green after displaying the starting amber indication that follows the vehicular red indication (a practice that is used in some European countries). The green for vehicular traffic can be set from 20 to 60 seconds for fixed time operation or from 6 to 60 seconds if vehicle detection is provided to detect gaps in traffic. The sequence of indications is shown in Table 7–2.

Objective: To provide pedestrians an opportunity to cross midblock at a controlled crosswalk. The intent of the Puffin crossing is to minimize the interruption to traffic platoons while affording pedestrians the full protection of a red signal indication while in the crosswalk. This is accomplished by using pedestrian detectors to control the length of the pedestrian clearance interval.

Cost: Ranges from $50,000 to $75,000, depending on the width of the street, the length of mast-arm poles, and whether or not center island and landscaping are installed. Operation costs are about $4,000 per year. In the UK and Australia where these types of crossing are used extensively without mast arms, the cost range for installation is $30,000 to $60,000.

Applications: Currently, this treatment is used in the UK, Australia, and other countries with strong links to the UK's approach to traffic engineering. The warrants and guidelines according to which this treatment is used in the UK and Australia are provided in Sections 2.3 and 2.5 of this report, respectively. The Puffin crossing was the result of joint European research (part of the DRIVE Initiative) that looked at ways to provide an efficient crossing for drivers and pedestrians, especially those who are more vulnerable.

Figure 7-5. Puffin crossing in Victoria, Australia. (Source: Bill Saggers, Melbourne, Australia.)

Advantages: Provides a controlled crossing. This treatment also removes conflict with turning vehicles by providing a crossing location that is not associated with an intersection. The nearside signal has advantages for partially sighted pedestrians. The crossing gives the correct crossing time for pedestrians with varying walking speeds. It cancels unnecessary halts to vehicles if the pedestrian has been detected leaving the sidewalk by using gaps in traffic flow.

Disadvantages: Cost of installation is significant. There is some disruption to traffic flow that can be minimized if the midblock signal is part of the coordinated system. Because there may not be traffic surges to give an audible cue about crossing intervals, APSs with locator tone must be provided to inform visually impaired persons that actuation of a signal is required to cross the major street and to indicate onset of the WALK interval; this increases the cost.

Studies: The study by Lalani[29] for the GLC recommended that Pelican crossings be installed with anti-skid surface treatments, pedestrian railings, or other associated treatments. These recommendations are generally accepted for Puffin installations as well.

Research done by the Australian Road Research Board[29a] for VicRoads has shown a 40 percent reduction in delays for drivers with no adverse effects on pedestrians compared to traditional signalized midblock pedestrian crossings.

Sites: Figure 7-5 shows a Puffin crossing in Australia. Note the microwave sensor at the top of the signal pole.

7.6. TOUCAN CROSSINGS

Description: Toucan crossings (Two can cross) have the same form of vehicular detection as the Pelican and Puffin crossings and normally the same form of pedestrian on-crossing detector as the Puffin crossing. This facility is intended to allow both bicyclists and pedestrians to share an unsegregated road space when crossing the road. For farside signals, a steady green bicycle symbol is displayed along with the steady green walking figure. The method of operation is different from the Pelican and Puffin crossings because the pedestrian signal goes dark instead of displaying a flashing green walking figure. Nearside signal operation is planned in the future to give a Puffin-type operation.

Vehicles must stop when pedestrians begin crossing (pedestrian and bicycle signal display consists of a steady green walking figure and bicycle). The length of the pedestrian and bicycle steady green indication (invitation to cross) is normally 4–7 seconds at the crossing, depending on the level of pedestrian demand. This is followed by an initial period of 3 seconds during which the pedestrian and bicyclist see a dark pedestrian signal indication and the vehicle indication remains red. The dark pedestrian and bicyclist signal indication can be extended for up to an additional 22 seconds if pedestrians are detected in the crosswalk. The dark pedestrian and bicyclist signal indication can be displayed for 3 additional seconds before the vehicle indication turns green if pedestrians and bicyclists are still detected in the crosswalk at the end of the preceding 22 seconds. The green for vehicular traffic can be set from 20 to 60 seconds for fixed-time operation or 6 to 60 seconds if vehicle detection is provided to detect gaps in traffic. The sequence of indications is shown in Table 7–3.

In Tucson, Arizona, the crossing provides the typical pedestrian indication with 4- to 7-second intervals for pedestrians to begin crossing the street and a pedestrian clearance interval that is based on walking speeds and the length of the crossing. A separate indication displays a red bicycle symbol while the vehicular indications are green for the street the bicyclist is waiting to cross. The bicycle symbol turns green when the vehicular indication turns red to stop vehicular traffic and remains green until the onset of the bicycle clearance interval of 4–6 seconds (which is much shorter than the pedestrian clearance interval), when the bicycle symbol turns yellow. Therefore, during a portion of the clearance interval for pedestrians, the bicycle symbol remains green for a period of time until the onset of the shorter yellow clearance interval for bicyclists. Video detection is provided for vehicles on the major thoroughfare as well as bicyclists approaching the crossing on the minor street.

Objective: To provide a signal-controlled crossing that can be used by both pedestrians and bicyclists

Table 7–3. Pedestrian, Bicycle, and Vehicle Indication Sequence at Toucan Crossings

Period	Pedestrian and Bicyclist Indication	Vehicular Indication	Timing (Seconds)
1	Red	Green	20–60 (fixed) 6–60 (variable)
2	Red	Amber	3 (mandatory)
3	Red	Red	1–3
4	Green	Red	4–7
5	Dark	Red	3 (fixed period)
6	Dark	Red	0–22 (pedestrian extendable period)
7	Dark	Red	0–3 (appears only on a maximum change if pedestrians and bicyclists are still being detected)
8	Red	Red	1–3
9	Red	Red with amber	2

Source: James Landles, London, UK.

on a shared basis by providing indications for both bicycles and pedestrians.

Cost: Ranges from $75,000 to $100,000, depending on the width of the street and the length of the mast-arm poles. Operation costs are estimated to be $4,000 per year. In the UK and Australia, where these types of crossing are used extensively without mast arms, the cost range for installation is $40,000 to $75,000.

Applications: Currently, this treatment is used in the UK and in Tucson, Arizona, USA. The guidelines according to which this treatment is used in the UK are provided in Section 2.3 of this report. A study performed for the City of Tucson[50] established warrants for the use of this treatment.

Advantages: Provides a controlled crossing for both pedestrians and bicyclists. In the UK, the original crossings for both pedestrians and bicyclists had two crossing points in parallel. The current version uses a combined crossing point, reducing the signal clutter and cost. In the Tucson application, a Toucan crossing was preferred over the installation of a traditional full signal. A full signal controlling all vehicle approaches to the intersection would not allow for good signal synchronization, creating excess stops, accidents, delays, and air-quality concerns. A traditional full signal would encourage additional traffic to cut through or along the residential street, thus negatively impacting the "liveability" of the street, whereas a Toucan signal avoids such impacts.

Disadvantages: Cost of installation is significant. There is some disruption to traffic flow, but this is minimized by on-crossing detectors. Delay to drivers can further be minimized if the midblock signal is part of the coordinated system. However, caution has to be exercised since delays are likely to increase for pedestrians and bicyclists. Because there may not be traffic surges to give an audible cue about crossing intervals, APSs with locator tone must be pro-

Figure 7–6A. Toucan crossing in the UK. (Source: Michael F. Talbot, London, UK.)

Oversight / NHS	
FHWA REGION VIII OVERSIGHT?	☐ NO ☐ YES
NATIONAL HIGHWAY SYSTEM?	☐ NO ☐ YES

DEPARTMENT OF TRANSPORTATION
STATE OF COLORADO

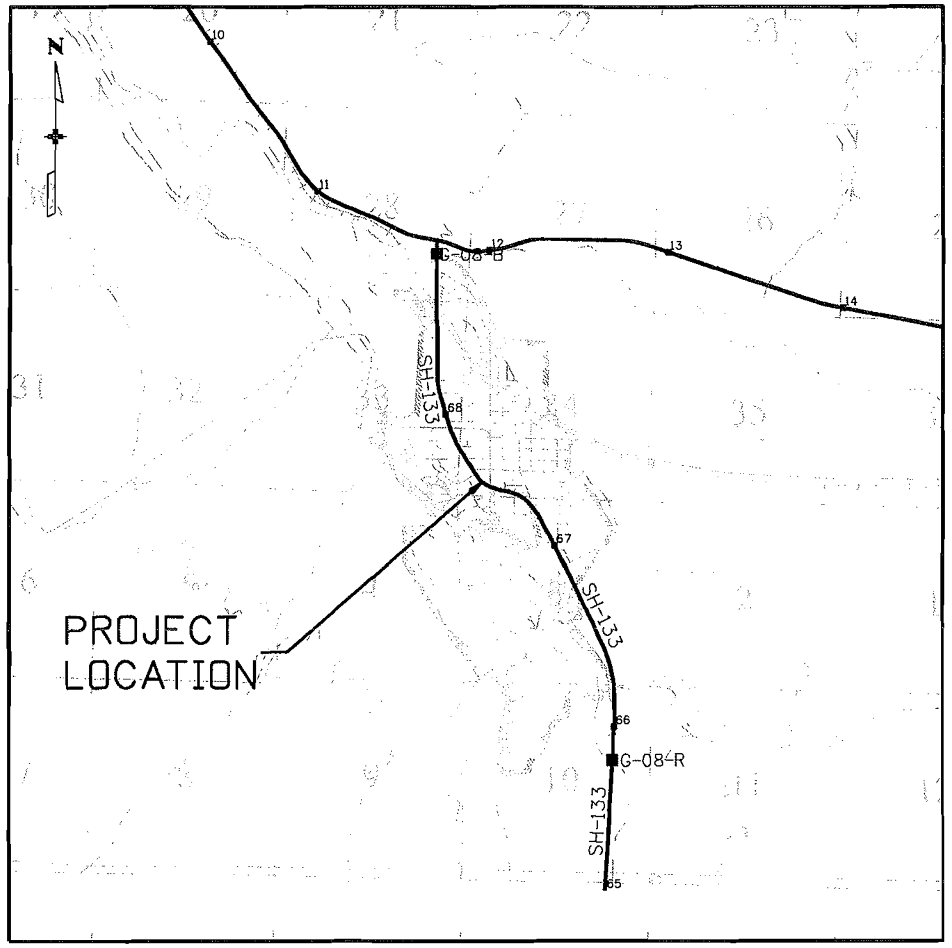
Related Projects:
P. E. UNDER PROJECT:
Project Number XXXXXXXXX
Project Code: XXXXX

R.O.W. Projects:
R.O.W. Project Description
XXXXXXXXXXXXXXX

HIGHWAY CONSTRUCTION BID PLANS OF PROPOSED
FEDERAL AID PROJECT NO. C 133A-036
STATE HIGHWAY NO. 133
GARFIELD COUNTY
CONSTRUCTION PROJECT CODE NO. 16847

TABULATION OF LENGTH & DESIGN DATA	
STATION	FEET ROADWAY SH 133
BEGIN 16847 = STA. 23+76.50 END 16847 = STA. 29+07.03	530.5
TOTAL	530.5
SUMMARY OF PROJECT LENGTH	FEET
MAJOR STRUCTURE	-
PROJECT GROSS LENGTH	530.5

DESIGN DATA	S.H. 133
MAXIMUM RADIUS OF CURVE	NA
MAXIMUM GRADE	NA
MINIMUM S.S.D. HORIZONTAL	NA
MINIMUM S.S.D. VERTICAL	NA
MAXIMUM DESIGN SPEED	NA
20XX DESIGN TRAFFIC	DHV = 1650 ADT = 18300
DHV TRUCK %	3%
CONSTRUCTION CLEAR ZONE (MIN 18')	18 FT.



PROJECT LOCATION MAP

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Print Date: 5/7/2009
File Name: 16847DES_TitleSht.dgn
Horiz. Scale: 1:1 Vert. Scale: As Noted
Unit Information MC

R-X

Sheet Revisions		
Date:	Comments	Init.

Colorado Department of Transportation
222 South 6th Street, Room 100
Grand Junction, CO 81501
Phone: 970-248-7230 FAX: 970-248-7294
Region 3 SHY

As Constructed
No Revisions:
Revised:
Void:

Contract Information
Contractor:
Resident Engineer: SEAN YEATES
Project Engineer: MICHAEL CURTIS
PROJECT STARTED: 9/29/08 ACCEPTED: / /
Comments:

Project No./Code
C 133A-036
16847
Sheet Number 1

PLAN NUMBER	NEW OR REVISED	M STANDARD TITLE	PAGE NUMBER
☐ M-100-1		STANDARD SYMBOLS (3 SHEETS)	1-3
☐ M-203-1		APPROACH ROADS	4
☐ M-203-2		DITCH TYPES	5
☐ M-203-11		SUPERELEVATION CROWNED AND DIVIDED HIGHWAYS (3 SHEETS)	6-8
☐ M-203-12		SUPERELEVATION STREETS (2 SHEETS)	9-10
☐ M-206-1		EXCAVATION AND BACKFILL FOR STRUCTURES (2 SHEETS)	11-12
☐ M-206-2		EXCAVATION AND BACKFILL FOR BRIDGES (2 SHEETS)	13-14
☐ M-208-1		TEMPORARY EROSION CONTROL (7 SHEETS)	15-21
☐ M-210-1		MAILBOX SUPPORTS (2 SHEETS)	22-23
☐ M-214-1		PLANTING DETAILS	24
☐ M-412-1		CONCRETE PAVEMENT JOINTS (5 SHEETS)	25-29
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■ S-614-40		TYPICAL TRAFFIC SIGNAL INSTALLATION DETAILS (7 SHEETS)	160-166
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■ S-630-1	■	TRAFFIC CONTROLS FOR HIGHWAY CONSTRUCTION (12 SHEETS) **(REVISED SHEET 11 ON 07/31/08)**	191-202
■ S-630-2		BARRICADES, DRUMS, CONCRETE BARRIERS (TEMP) AND VERTICAL PANELS	203
☐ S-630-3		FLASHING BEACON (PORTABLE) DETAILS	204

THE STANDARD PLAN SHEETS INDICATED HEREON BY A MARKED BOX ARE TO BE USED TO CONSTRUCT THIS PROJECT.

ALL OF THE M&S STANDARD PLANS, AS SUPPLEMENTED AND REVISED, APPLY TO THIS PROJECT WHEN USED BY DESIGNATED PAY ITEM OR SUBSIDIARY ITEM.

THE NEW OR REVISED M&S STANDARD PLANS SHEETS ARE ATTACHED AFTER THE LAST SHEET LISTED ON THE INDEX OF SHEETS.

COLORADO
DEPARTMENT OF TRANSPORTATION

STANDARD PLANS LIST
M&S STANDARDS
July 04, 2006

Print Date: 5/7/2009	Sheet Revisions			Colorado Department of Transportation	As Constructed	STANDARD PLANS LIST	Project No./Code
File Name: M&S Standard Plans List Index.dgn	Date:	Comments	Init.	222 South 6th Street, Room 100 Grand Junction, CO 81501 Phone: 970-248-7230 FAX: 970-248-7294	No Revisions:		C 133A-036
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Unit Information MC				Region 3 SHY	Void:	Sheet Subset: TRAFFIC	Subset Sheets: 1 of 1	Sheet Number 2

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GENERAL NOTES

ALL WORK IN CDOT RIGHT OF WAY SHALL BE IN ACCORDANCE WITH CDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION, AND ITS SUPPLEMENTS.

ALL DETAILED WORK IN CDOT RIGHT OF WAY SHALL BE IN ACCORDANCE WITH THE CDOT LATEST EDITION OF THE STANDARD PLANS (M&S STANDARDS), AND THE APPROVED PLANS AND SPECIFICATIONS.

ALL WORK ZONE TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), LATEST EDITION, THE CURRENT COLORADO SUPPLEMENTS, AND THE APPROVED PLANS AND SPECIFICATIONS.

FOR PRELIMINARY PLAN QUANTITIES OF PAVEMENT MATERIALS, THE FOLLOWING RATES OF APPLICATION WERE USED:

BITUMINOUS PAVEMENT [PATCHING].........................@ 110 LBS./SQ. YD./INCH
AGGREGATE BASE COURSE CLASS-[6]....................@ 133 LBS./CU. FT.

ANY LAYER OF BITUMINOUS PAVEMENT THAT IS TO HAVE A SUCCEEDING LAYER PLACED THEREON SHALL BE COMPLETED FULL WIDTH BEFORE SUCCEEDING LAYER IS PLACED.

ASPHALT JOINTS SHALL FALL ON LINES, SHOULDERS LINES OR MEDIAN LINES, EXCEPT WHERE STATED IN THE PLANS.

THE CONTRACTOR SHALL NOT PARK ANY VEHICLES OR EQUIPMENT IN, OR DISTURB ANY AREAS NOT APPROVED BY THE ENGINEER.

MOISTURE-DENSITY CONTROL WILL BE REQUIRED FOR THE FULL DEPTH OF THOSE EMBANKMENTS ON THIS PROJECT.

DEPTH OF MOISTURE-DENSITY CONTROL FOR THIS PROJECT SHALL BE AS FOLLOWS:

BASES OF CUTS AND FILLS 0.5 FEET.

EXCAVATION REQUIRED FOR COMPACTION OF BASES OF CUTS AND FILLS WILL BE CONSIDERED AS SUBSIDIARY TO THAT OPERATION AND WILL NOT BE PAID FOR SEPARATELY.

TYPE OF COMPACTION FOR THIS PROJECT WILL BE AASHTO T-99

IT IS ESTIMATED THAT 9 GALLONS OF PAVEMENT MARKING PAINT WILL BE REQUIRED ON THIS PROJECT AS FOLLOWS:
WHITE...................5 GALLONS
YELLOW..................4 GALLONS

IT IS ESTIMATED THAT CONSTRUCTION TIME FOR THE PROJECT IS 45 DAYS, ASSUMING LEAD TIME FOR DELIVERY OF MATERIALS IS NOT INCLUDED IN THIS CONSTRUCTION TIME.

IT IS ESTIMATED THAT 33 DAYS OF TRAFFIC CONTROL MANAGEMENT WILL BE REQUIRED ON THIS PROJECT.

IT IS ESTIMATED THAT 12 DAYS OF TRAFFIC CONTROL INSPECTION WILL BE REQUIRED ON THIS PROJECT.

IT IS ESTIMATED THAT 18 EACH OF CONSTRUCTION TRAFFIC SIGN (PANEL SIZE A) WILL BE REQUIRED ON THIS PROJECT. THIS ESTIMATE IS BASED ON CDOT STANDARD TRAFFIC CONTROLS FOR HIGHWAY CONSTRUCTION, CASES 18 AND 19 AND TYPICAL PATH DETOUR SIGNAGE.

IT IS ESTIMATED THAT 15 EACH DRUM CHANNELIZING DEVICES WILL BE REQUIRED ON THIS PROJECT.

IT IS ESTIMATED THAT 50 EACH TRAFFIC CONES WILL BE REQUIRED ON THIS PROJECT.

IT IS ESTIMATED THAT 200 HOURS OF FLAGGING WILL BE REQUIRED ON THIS PROJECT.

IT IS ESTIMATED THAT 1 SANITARY FACILITY WILL BE REQUIRED ON THIS PROJECT.

IT IS ESTIMATED THAT 10 HOURS WILL BE REQUIRED FOR POTHOLING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING AND COORDINATING WITH THE APPROPRIATE UTILITY REPRESENTATIVES TO BE ONSITE DURING POTHOLING AND SHALL LIKEWISE BE RESPONSIBLE FOR DETERMINING THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAYBE NECESSARY TO AVOID DAMAGE THERETO. THE CONTRACTOR SHALL REFER TO THE UTILITY SPECIFICATION FOR ADDITIONAL REQUIREMENTS.

NO RIGHT-OF-WAY ACQUISITION WILL BE NEEDED FOR THIS PROJECT. ALL WORK WILL BE COMPLETED ENTIRELY WITHIN THE EXISTING RIGHT-OF-WAY.

WHERE NEW PAVEMENT IS TO ABUT EXISTING PAVEMENT, THE EXISTING PAVEMENT SHALL BE REMOVED TO A NEAT VERTICAL LINE USING A CUTTING SAW OR OTHER METHOD AS APPROVED BY THE ENGINEER. SAW CUTTING ASPHALT WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE COST OF REMOVAL OF ASPHALT MAT.

ALL SURVEYING NECESSARY TO COMPLETE THE PROJECT WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE WORK.

THE CONTRACTOR SHALL PROTECT ALL EXISTING SURVEY MONUMENTATION DESIGNATED TO REMAIN FROM DAMAGE DURING CONSTRUCTION OPERATIONS. ANY MONUMENTS DISTURBED BY THE CONTRACTOR THAT ARE NOT DESIGNATED FOR RELOCATION, SHALL BE RESET AT THE CONTRACTOR'S EXPENSE. THE CONTRACTOR AND ENGINEER SHALL NOTE THOSE MONUMENTS IN THE FIELD PRIOR TO CONSTRUCTION. SEE TABULATION OF SURVEY.

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Designer: D. SMITH
Detailer: D. SMITH
Sheet Subset: NOTES
Structure Numbers -
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Project No./Code
C133A-036
16847
Sheet Number 3

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INDEX			CONTRACT ITEM NO.		UNIT	ROADWAY						PROJECT TOTALS:	AS CONST. PROJECT TOTALS
BOOK	PAGE	SHEET				PLAN	AS CONST.						
			202	REMOVAL OF ASPHALT MAT	SY	260						260	
			202	REMOVAL OF PAVEMENT MARKING	SF	400						400	
			202	REMOVAL OF POWER POLE	EACH	1						1	
			202	REMOVAL OF GROUND SIGN	EACH	4						4	
			202	REMOVAL OF SIGN PANEL	EACH	1						1	
			203	UNCLASSIFIED EXCAVATION (CIP)	CY	13						13	
			203	POTHOLING	HOUR	10						10	
			207	TOP SOIL	CY	5						5	
			208	SILT FENCE	LF	300						300	
			208	CONCRETE WASHOUT STRUCTURE (TEMPORARY)	EACH	1						1	
			208	EROSION CONTROL SUPERVISOR	HOUR	40						40	
			210	RESET GROUND SIGN	EACH	3						3	
			212	SEEDING (NATIVE) (SEE NOTE #5)	ACRE	0.1						0.1	
			213	MULCHING (WEED FREE HAY) (SEE NOTE #5)	ACRE	0.1						0.1	
			213	MULCH TACKIFIER (SEE NOTE #5)	LB	0.15						0.15	
			304	AGGREGATE BASE COURSE (CLASS 6)	TON	26						26	
			403	HMA (PATCHING) (ASPHALT)	TON	29						29	
			503	DRILLED CAISSON (36 INCH)	LF	44						44	
			608	CONCRETE CURB RAMP	SY	26.5						26.5	
			613	2 INCH ELECTRICAL CONDUIT (PLASTIC)	LF	500						500	
			613	3 INCH ELECTRICAL CONDUIT (PLASTIC)	LF	550						550	
			613	WIRING	LS	1						1	
			613	PULL BOX	EACH	5						5	
			613	PULL BOX SPECIAL	EACH	3						3	
			613	LUMINAIRE HIGH PRESSURE SODIUM (250 WATT)	EACH	4						4	
			614	PEDESTRIAN SIGNAL FACE (18) (LED)	EACH	4						4	
			614	TRAFFIC SIGNAL FACE (12-12-12) (LED)	EACH	9						9	
			614	TRAFFIC SIGNAL CONTROLLER	EACH	1						1	
			614	TRAFFIC SIGNAL CONTROLLER CABINET	EACH	1						1	
			614	PEDESTRIAN PUSH BUTTON	EACH	4						4	
			614	LOOP DETECTOR WIRE	LF	1600						1600	
			614	TRAFFIC SIGNAL-LIGHT POLE STEEL	EACH	1						1	
			614	TRAFFIC SIGNAL-LIGHT POLE STEEL (1 MAST ARM)	EACH	3						3	
			614	TRAFFIC SIGNAL PEDESTAL POLE STEEL	EACH	1						1	
			620	SANITARY FACILITY	EACH	1						1	
			627	EPOXY PAVEMENT MARKING PAINT	GAL	9						9	
			627	PREFORMED PLASTIC PAVEMENT MARKING (XWALK-STOP LINE)	SF	492						492	
			630	FLAGGING	HOUR	200						200	
			630	TRAFFIC CONTROL INSPECTION	DAY	12						12	
			630	TRAFFIC CONTROL MANAGEMENT	DAY	33						33	
			630	CONSTRUCTION TRAFFIC SIGN (PANEL SIZE A)	EACH	18						18	
			630	DRUM CHANNELIZING DEVICE	EACH	15						15	
			630	PORTABLE MESSAGE SIGN PANEL	EACH	2						2	
			630	TRAFFIC CONE	EACH	50						50	
			F/A 01	EROSION CONTROL	FA	1						1	
			F/A 02	MINOR CONTRACT REVISIONS	FA	1						1	

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SUMMARY OF
APPROXIMATE QUANTITIES

Designer: D. SMITH
Detailer: D. SMITH
Sheet Subset: QUANTITY
Structure Numbers -
-
Subset Sheets: 1 of 1

Project No./Code
C 133A-036
16847
Sheet Number 4

TABULATION OF QUANTITIES

REMOVAL OF ASPHALT MAT

FROM:	TO:	HCL	SY
25+30.46, 15.13' LT. 25+60.55, 52.74' LT.	26+77.39, 20.01' LT. 25+88.85, 83.14' RT.	SH 133 SHOULDER SH 133 SHOULDER	231 29
TOTAL:			260

REMOVAL OF PAVEMENT MARKING

FROM:	TO:	HCL	SF
23+76.50, 0.0' RT.	29+07.00, 0.0' RT.	SH 133 SHOULDER	400
TOTAL:			400

REMOVAL OF POWER POLE

FROM:	HCL	DESCRIPTION	EACH
26+68.25, 63.58' RT.	SH 133 SHOULDER		1
TOTAL:			1

REMOVAL OF GROUND SIGN

FROM:	HCL	DESCRIPTION	EACH
25+59.51, 8.87' LT. 26+50.83, 25.91' LT. 26+01+05, 13.92' LT. 25+56.22, 59.67' RT.	SH 133 SHOULDER SH 133 SHOULDER SH 133 SHOULDER SH 133 SHOULDER	STOP SIGN (R1-1) YIELD SIGN (R1-2) YIELD SIGN (R1-2) CROSSWALK (W16-7P)	1 1 1 1
TOTAL:			4

RESET GROUND SIGN

FROM:	HCL	DESCRIPTION	EACH
25+79.71, 10.03' LT.	SH 133 SHOULDER	CROSSWALK (S1-1)	1
TOTAL:			1

AGGREGATE BASE COURSE (CLASS 6)

FROM:	TO:	HCL	TON
5+38.36, 0.00' RT.	6+86.52, 0.00' RT.	PATH	26.3
TOTAL:			26.3

HMA (PATCHING) (ASPHALT)

FROM:	TO:	HCL	TON
5+38.36, 0.00' RT.	6+86.52, 0.00' RT.	PATH	29.0
TOTAL:			29.0

CONCRETE CURB RAMP

FROM:	HCL	DESCRIPTION	SY
25+99.25, 5.58' LT. 25+96.24, 74.09' RT.	SH 133 SHOULDER SH 133 SHOULDER	TYPE 2A (MODIFIED) TYPE 2A (MODIFIED)	16.0 10.5
TOTAL:			26.5

TABULATION OF EARTHWORK QUANTITIES

	PROJECT TOTALS (CU. YD.)	
	PLAN	AS CONSTRUCTED
UNCLASSIFIED EXCAVATION FROM		
FROM: PATH CROSS SECTIONS	13.1	
TOTAL FOR PAY QUANTITY UNCLASSIFIED EXCAVATION (C.I.P.)	13.1	

FOR INFORMATION ONLY	PROJECT TOTALS (CU. YD.)	
	PLAN	AS CONSTRUCTED
EMBANKMENT MATERIAL (C.I.P.): PATH CROSS SECTIONS	3.6	
NET TOTAL:	3.6	
EMBANKMENT x 1.25 (FACTOR) EXCESS EXCAVATION	4.5 8.6	
UNCLASSIFIED EXCAVATION	13.1	

COMPACTION (AASHTO T-99) (CU. YD.) EMBANKMENT (NET) BASE OF CUTS AND FILLS (6")	 3.6 29	
TOTAL	32.6	
WETTING (M. GALLON) FOR COMPACTION (40 GAL. PER CU. YD.)	1.3	

NOTE:
1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSAL OF EXCESS MATERIAL.

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TABULATION OF QUANTITIES

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Detailer:	D. SMITH		-
Sheet Subset:	TABS	Subset Sheets:	1 of 1

Project No./Code
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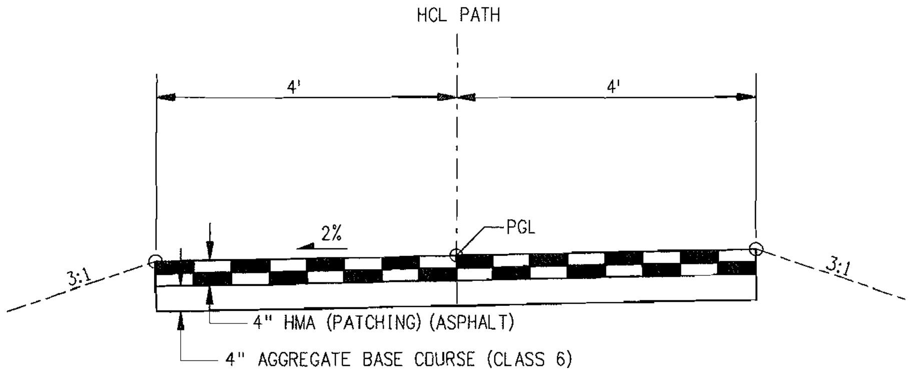

PATH TYPICAL
5+38.36 TO 6+86.52

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TYPICAL SECTION
Designer: D. SMITH
Detailer: M. GAWELKO
Sheet Subset: TYPICAL
Structure Numbers –
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Subset Sheets: 1 of 1

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Sheet Number 6

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GENERAL NOTES:

ALL DETAILED WORK SHALL BE IN ACCORDANCE WITH THE LATEST REVISIONS TO CDOT STANDARD PLANS (M&S STANDARDS), CDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, AND THE APPROVED PLANS AND SPECIFICATIONS.

1. SITE DESCRIPTION

FOR PROJECT INFORMATION:

A. PROJECT SITE DESCRIPTION

THE PROJECT INCLUDES THE SIGNAL CONSTRUCTION AT SH 133 AND HENDRICK DRIVE THAT INCLUDES THE REALIGNMENT OF A PATH DUE TO THE SIGNAL POLE LOCATIONS AND UPGRADES TO THE STRIPING, SIGNING AND PEDESTRIAN CROSSINGS.

B. PROPOSED SEQUENCING FOR MAJOR ACTIVITIES:

GENERAL SEQUENCE OF EVENTS FOR THE PROJECT WILL BE PLACING THE SIGNAL, GRADING AND PAVING THE RELOCATED PATH, SIGNING AND STRIPING AND FINAL GRADING, SEEDING AND MULCHING ACTIVITIES.

C. ACRES OF DISTURBANCE:

TOTAL AREA OF CONSTRUCTION SITE: 0.90 ACRES
TOTAL AREA OF DISTURBANCE: 0.50 ACRES
ACREAGE OF SEEDING: 0.10 ACRES

D. EXISTING SOIL DATA:

E. EXISTING VEGETATION, INCLUDING PERCENT COVER:

NATIVE GRASSES - 50% VEGATATION COVER

DATE OF SURVEY:

F. POTENTIAL POLLUTANTS SOURCES:

SEE FIRST CONSTRUCTION ACTIVITIES UNDER POTENTIAL POLLUTANT SOURCES. THE ECS SHALL PREPARE A LIST OF ALL POTENTIAL POLLUTANTS AND THEIR LOCATIONS IN ACCORDANCE WITH SUBSECTION 107.25.

G. RECEIVING WATER:

1. OUTFALL LOCATIONS:
   NO CHANGE TO EXISTING CONDITIONS.
2. NAMES OF RECEIVING WATER(S) ON SITE AND THE ULTIMATE RECEIVING WATER:
3. DISTANCE ULTIMATE RECEIVING WATER IS FROM PROJECT:
4. DOES THE RECEIVING WATER HAVE AN APPROVED TMDL?

H. ALLOWABLE NON-STORMWATER DISCHARGES:

1. GROUNDWATER AND STORMWATER DEWATERING: DISCHARGE TO THE GROUND OF WATER FROM CONSTRUCTION DEWATERING ACTIVITIES MAY BE AUTHORIZED PROVIDED THAT:
   - A. THE SOURCE IS GROUNDWATER AND/OR GROUNDWATER COMBINED WITH STORMWATER THAT DOES NOT CONTAIN POLLUTANTS.
   - B. THE SOURCE AND BMP's ARE IDENTIFIED IN THE SWMP.
   - C. DISCHARGES DO NOT LEAVE THE SITE AS SURFACE RUNOFF OR TO SURFACE WATERS.
2. IF DISCHARGES DO NOT MEET THE ABOVE CRITERIA, A SEPARATE PERMIT FROM THE DEPARTMENT OF HEALTH WILL BE REQUIRED. CONTAMINATED GROUNDWATER REQUIRING COVERAGE UNDER A SEPARATE PERMIT MAY INCLUDE GROUNDWATER CONTAMINATED WITH POLLUTANTS FROM A LANDFILL, MINING ACTIVITIES, INDUSTRIAL POLLUTANT PLUMES, UNDERGROUND STORAGE TANK, ETC.

I. ENVIRONMENTAL IMPACTS:

1. WETLAND IMPACTS: NO
2. STREAM IMPACTS: NO
3. THREATENED AND ENDANGERED SPECIES: NO IMPACT ON ANY FEDERALLY LISTED SPECIES

2. SITE MAP COMPONENTS:

PRE-CONSTRUCTION - THE FOLLOWING COMPONENTS ARE SHOWN ON THE SWM SITE PLAN IF APPLICABLE.

A. CONSTRUCTION SITE BOUNDARIES

B. ALL AREAS OF GROUND SURFACE DISTURBANCE

C. AREAS OF CUT AND FILL

D. LOCATION OF ALL STRUCTURAL BMP's IDENTIFIED IN THE SWMP

E. LOCATION OF NON-STRUCTURAL BMP's AS APPLICABLE IN THE SWMP

F. SPRINGS, STREAMS, WETLANDS AND OTHER SURFACE WATER

G. PROTECTION OF TREES, SHRUBS, CULTURAL RESOURCES AND MATURE VEGETATION

3. SWMP ADMINISTRATOR FOR DESIGN:

4. STORMWATER MANAGEMENT CONTROLS FIRST CONSTRUCTION ACTIVITIES

THE CONTRACTOR SHALL PERFORM THE FOLLOWING:

A. DESIGNATE A SWMP ADMINISTRATOR/EROSION CONTROL SUPERVISOR

(TO BE FILLED OUT AT TIME OF CONSTRUCTION;
DESIGNATE THE INDIVIDUAL(S) RESPONSIBLE FOR IMPLEMENTING, MAINTAINING AND REVISING SWMP, INCLUDING THE TITLE AND CONTACT INFORMATION. THE ACTIVITIES AND RESPONSIBILITIES OF THE ADMINISTRATOR SHALL ADDRESS ALL ASPECTS OF THE PROJECT'S SWMP.)

B. POTENTIAL POLLUTANT SOURCES

EVALUATE, IDENTIFY AND DESCRIBE ALL POTENTIAL SOURCES OF POLLUTANTS AT THE SITE IN ACCORDANCE WITH SUBSECTION 107.25 AND PLACE IN THE SWMP NOTEBOOK. ALL BMP's RELATED TO POTENTIAL POLLUNTANTS SHALL BE SHOWN ON THE SWMP SITE MAP BY THE CONTRACTOR'S ECS.

C. BEST MANAGEMENT PRACTICES (BMPS) FOR STORMWATER POLLUTION PREVENTION

PHASED BMP IMPLEMENTATION

DURING DESIGN: FIELDS ARE MARKED WHEN USED IN THE SWMP. DURING CONSTRUCTION: THE ECS SHALL UPDATE THE CHECKED BOXES TO MATCH SITE CONDITIONS.

STRUCTURAL BMP PRACTICES FOR EROSION AND SEDIMENT CONTROL;

PRACTICES MAY INCLUDE, BUT ARE NOT LIMITED TO:

BMP	TYPE OF CONTROL	BMP AS DESIGNED	IN USE ON SITE	FIRST CONSTRUCTION ACTIVITIES	DURING CONSTRUCTION	INTERIM/FINAL STABILIZATION
CHECK DAMS	SEDIMENT					
SILT FENCE	SEDIMENT	X				
EROSION LOGS	SEDIMENT					
TEMPORARY SEDIMENT TRAP/BASIN	SEDIMENT					
PERMANENT SEDIMENT TRAP/BASIN	SEDIMENT					
EMBANKMENT PROTECTOR	EROSION					
INLET PROTECTION	EROSION					
OUTLET PROTECTION	EROSION					
CONCRETE WASHOUTS	CONSTRUCTION	X				
STABILIZED CONSTRUCTION ENTRANCE	CONSTRUCTION					
DEWATERING	SEDIMENT					
TEMPORARY STREAM CROSSING	EROSION					
OTHER						

- SILT FENCE - TO BE PLACED AT THE TOE OF ALL SLOPES IDENTIFIED ON THE SWMP SITE MAP AND IS TO BE USED AS PERIMETER CONTROL TO CAPTURE SEDIMENT LADEN RUN-OFF FROM EMBANKMENT AREAS.

- CONCRETE WASHOUTS - TO BE USED TO CONTAIN ALL WASH WATER FROM TOOLS OR CONCRETE TRUCK CHUTES. THEY SHALL BE USED IN LOCATIONS WHERE CONCRETE WILL BE USED.

- STABILIZED CONSTRUCTION ENTRANCE - STABILIZED CONSTRUCTION ENTRANCE IS USED TO PREVENT AND MINIMIZE SEDIMENT FROM BEING TRACKED ONTO THE PAVED SURFACES. ONE STABILIZED CONSTRUCTION ENTRANCE SHALL BE USED FOR THE CONSTRUCTION STAGING YARD. IF THE YARD IS PAVED, THE ENGINEER MAY WAIVE THE ENTRANCE REQUIREMENT.

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STORM WATER
MANAGMENT PLAN

Designer: D.SMITH
Detailer: D.SMITH
Sheet Subset: SWMP
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Project Number
Code
Sheet Number 7

NON-STRUCTURAL BMP PRACTICES FOR EROSION AND SEDIMENT CONTROL;
PRACTICES MAY INCLUDE, BUT ARE NOT LIMITED TO:

BMP	TYPE OF CONTROL	BMP AS DESIGNED	IN USE ON SITE	FIRST CONSTRUCTION ACTIVITIES	DURING CONSTRUCTION	INTERIM/FINAL STABILIZATION
SURFACE ROUGHENING/GRADING TECHNIQUES	EROSION	X				
SEEDING PERMANENT	EROSION	X				
SEEDING TEMPORARY	EROSION					
MULCH/MULCH TACKIFIER	EROSION	X				
SOIL BINDER	EROSION					
SOIL RETENTION BLANKET	EROSION					
VEGETATIVE BUFFER STRIPS	EROSION					
PROTECTION OF TREES	EROSION	X				
PRESERVATION OF MATURE VEGETATION	EROSION	X				
OTHER						

EROSION CONTROL DEVICES ARE USED TO LIMIT THE AMOUNT OF EROSION ON SITE.

SEDIMENT CONTROL DEVICES ARE DESIGNED TO CAPTURE SEDIMENT ON THE PROJECT SITE.

CONSTRUCTION CONTROL ARE BMP's RELATED TO CONSTRUCTION ACCESS AND STAGING.

- SURFACE ROUGHENING/GRADING TECHNIQUES - USED TO TEMPORARILY STABILIZE DISTURBED AREAS AND PROTECT FROM WIND AND WATER EROSION. TO BE USED AS A TEMPORARY PRACTICE DURING CONSTRUCTION.

- SEEDING PERMANENT - USED TO PROMOTE GROWTH OF VEGETATION. TO BE DONE AS SOON AS FINAL GRADE IS FINISHED.

- MULCH/MULCH TACKIFIER - USED TO PROTECT THE GROUND AND KEEP SEEDING IN PLACE. TO BE USED AS SOON AS SEEDING IS COMPLETED.

- PROTECTION OF TREES AND MATURE VEGETATION - ANY AREAS AND TREES THAT ARE TO BE PROTECTED SHALL HAVE ORANGE CONSTRUCTION FENCE PLACED AROUND THEM AND SHOWN ON THE SITE MAP SO THAT CONSTRUCTION TRAFFIC WILL NOT DISTURB THEM.

D. OFFSITE DRAINAGE (RUN ON WATER)
1. DESCRIBE AND RECORD BMP's ON THE SWMP SITE MAP THAT HAVE BEEN IMPLEMENTED TO ADDRESS RUN-ON WATER IN ACCORDANCE WITH SUBSECTION 208.03.

E. STABILIZED CONSTRUCTION ENTRANCE/VEHICLE TRACKING CONTROL
1. BMP's SHALL BE IMPLEMENTED IN ACCORDANCE WITH SUBSECTION 208.04.

F. PERIMETER CONTROL
1. PERIMETER CONTROL SHALL BE ESTABLISHED AS THE FIRST ITEM ON THE SWMP TO PREVENT THE POTENTIAL FOR POLLUTANTS LEAVING THE CONSTRUCTION SITE BOUNDARIES, ENTERING THE STORMWATER DRAINAGE SYSTEM, OR DISCHARGING TO STATE WATERS.

2. PERIMETER CONTROL MAY CONSIST OF VEGETATION BUFFERS, BERMS, SILT FENCE, EROSION LOGS, EXISTING LANDFORMS, OR OTHER BMP's AS APPROVED.

3. PERIMETER CONTROL SHALL BE IN ACCORDANCE WITH SUBSECTION 208.04.

5. DURING CONSTRUCTION

RESPONSIBILITIES OF THE SWMP ADMINISTRATOR/EROSION CONTROL SUPERVISOR DURING CONSTRUCTION

THE SWMP SHOULD BE CONSIDERED A "LIVING DOCUMENT" THAT IS CONTINUOUSLY REVIEWED AND MODIFIED. DURING CONSTRUCTION, THE FOLLOWING ITEMS SHALL BE ADDED, UPDATED, OR AMENDED AS NEEDED BY THE SWMP ADMINISTRATION/EROSION CONTROL SUPERVISOR (ECS) IN ACCORDANCE WITH SECTION 208.

A. MATERIALS HANDLING AND SPILL PREVENTION

B. STOCKPILE MANAGEMENT

C. GRADING AND SLOPE STABILIZATION

D. SURFACE ROUGHENING

E. VEHICLE TRACKING

F. TEMPORARY STABILIZATION

G. CONCRETE WASHOUT
1. CONCRETE WASH OUT WATER OR WASTE FROM FIELD LABORATORIES AND PAVING EQUIPMENT SHALL BE CONTAINED IN ACCORDANCE WITH SUBSECTION 208.05.

H. SAW CUTTING

I. NEW INLET/CULVERT PROTECTION

J. STREET CLEANING

6. INSPECTIONS

A. INSPECTIONS SHALL BE IN ACCORDANCE WITH SUBSECTION 208.03 (C).

7. BMP MAINTENANCE

A. MAINTENANCE SHALL BE IN ACCORDANCE WITH SUBSECTION 208.04 (E).

8. RECORD KEEPING

A. RECORDS SHALL BE KEPT IN ACCORDANCE WITH SUBSECTION 208.03 (C).

9. INTERIM AND FINAL STABILIZATON

A. SEEDING PLAN
SOIL PREPARATION, SOIL CONDITIONING OR TOPSOIL, SEEDING (NATIVE), MULCHING (WEED FREE HAY), AND MULCH TACKIFIER WILL BE REQUIRED FOR AN ESTIMATED 0.50 ACRES OF DISTURBED AREA WITHIN THE RIGHT-OF-WAY LIMITS WHICH ARE NOT SURFACED. THE FOLLOWING TYPES AND RATES SHALL BE USED:

COMMON NAME	**BOTANICAL NAME**	**APPLICATION RATE**
		Pounds pls/Acre
Western wheatgrass	*Pascopyrum smithii* "Arriba"	8.0
Sideoats grama	*Bouteloua curtipendula* "Vaughn"	3.0
Thickspike wheatgrass	*Elymus lanceolatus ssp. dasystachyum* "Critana"	4.0
Buffalograss	*Buchloe dactyloides* "Texoka"	7.0
Blue grama	*Bouteloua gracilis* "Hachita"	1.0
Little bluestem	*Schizachyrium scoparium* "Pastura"	2.0
Prairie junegrass	*Koeleria cristata*	0.3
Saltgrass	*Distichlis spicata*	1.0
Green needlegrass	*Stipa viridula* "Lodorm"	1.0
Purple prairie clover	*Petalostemum purpurea*	0.5
Gaillardia	*Gaillardia aristata*	1.0
Blue flax	*Linum lewisii*	0.5
**Oats	Avena sativa	3.0
	Total	35.0
	** in the event of fall seeding, substitute Oats with *Winter Wheat / Triticum aestivum var. Pastura sativum at the same rate.	

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STORM WATER
MANAGMENT PLAN

Designer: D.SMITH
Detailer: D.SMITH
Sheet Subset: SWMP
Structure Numbers -
-
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Project Number
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B. SEEDING APPLICATION:

DRILL SEED 0.25 INCH TO 0.5 INCH INTO THE SOIL. IN SMALL AREAS NOT ACCESSIBLE TO A DRILL, HAND BROADCAST AT DOUBLE THE RATE AND RAKE 0.25 INCH TO 0.5 INCH INTO SOIL.

C. MULCHING APPLICATION:

APPLY 1½ TONS OF CERTIFIED WEED FREE HAY PER ACRE MECHANICALLY CRIMPED INTO THE SOIL IN COMBINATION WITH AN ORGANIC MULCH TACKIFIER.

D. SPECIAL REQUIREMENTS:

DUE TO HIGH FAILURE RATES, HYDROMULCHING AND/OR HYDROSEEDING WILL NOT BE ALLOWED.

E. SOIL CONDITIONING AND FERTILIZER REQUIREMENTS:

1. FERTILIZER WILL NOT BE REQUIRED ON THE PROJECT.

F. BLANKET APPLICATION:

ON SLOPES AND DITCHES REQUIRING A BLANKET, THE BLANKET SHALL BE PLACED IN LIEU OF MULCH AND MULCH TACKIFIER. SEE SWMP FOR BLANKET LOCATIONS.

G. RESEEDING OPERATIONS/CORRECTIVE STABILIZATION

PRIOR TO FINAL ACCEPTANCE.

1. SEEDED AREAS SHALL BE REVIEWED DURING THE 14 DAY INSPECTIONS BY THE EROSION CONTROL SUPERVISOR FOR BARE SOILS CAUSED BY SURFACE OR WIND EROSION. BARE AREAS CAUSED BY SURFACE OR GULLY EROSION, BLOWN AWAY MULCH, ETC. SHALL BE REGRADED, SEEDED, MULCHED AND HAVE MULCH TACKIFIER (OR BLANKET) APPLIED AS NECESSARY.

2. AREAS WHERE SEED HAS NOT GERMINATED AFTER ONE SEASON SHALL BE EVALUATED BY THE ENGINEER AND CDOT LANDSCAPE ARCHITECT. AREAS THAT HAVE NOT GERMINATED SHALL HAVE SEED, MULCH AND MULCH TACKIFIER (OR BLANKET) REAPPLIED. WORK SHALL BE PAID FOR BY THE APPROPRIATE BID ITEM.

3. THE CONTRACTOR SHALL MAINTAIN SEEDING/MULCH/TACKIFIER, MOW TO CONTROL WEEDS OR APPLY HERBICIDE TO CONTROL WEEDS IN THE SEEDED AREAS UNTIL FINAL ACCEPTANCE.

10. PRIOR TO FINAL ACCEPTANCE

A. FINAL ACCEPTANCE SHALL BE IN ACCORDANCE WITH SUBSECTION 208.061.

11. TABULATION OF STORMWATER QUANTITIES

PAY ITEM	DESCRIPTION	UNIT	QUANTITY
207	TOP SOIL	CY	5
208	SILT FENCE	LF	300
208	CONCRETE WASHOUT STRUCTURE (TEMPORARY)	EACH	1
208	EROSION CONTROL SUPERVISOR	HOUR	40
212	SEEDING (NATIVE) (SEE NOTE #5)	ACRE	0.10
213	MULCHING (WEED FREE HAY) (SEE NOTE #5)	ACRE	0.10
213	MULCH TACKIFIER (SEE NOTE #5)	LB	0.15
F/A	EROSION CONTROL	FA	1

1. BMP MAINTENANCE SHALL NOT BE PAID FOR SEPERATELY BUT SHALL BE INCLUDED IN THE PRICE OF THE WORK.

2. IT IS ESTIMATED THAT ONE (1) CONCRETE WASHOUT STRUCTURE (TEMPORARY) WILL BE REQUIRED ON THE PROJECT. TEMPORARY STRUCTURE DETAILS AND LOCATION SHALL BE SUBMITTED FOR APPROVAL PRIOR TO USE.

3. IT IS ESTIMATED THAT ZERO (0) STABILIZED CONSTRUCTION ENTRANCE(S) WILL BE REQUIRED AS DIRECTED TO MINIMIZE VEHICLE TRACKING CONTROL. ALL SITES HAVE PAVED ENTRANCES.

4. MAINTENANCE OF SEEDED AREAS SHALL NOT BE PAID FOR SEPERATELY BUT SHALL BE INCLUDED IN THE PRICE OF THE WORK.

5. TOPSOIL, SEEDING (NATIVE), MULCHING (WEED-FREE HAY), AND MULCH TACKIFIER QUANTITIES INCLUDE QUANTITIES FOR INCIDENTAL DISTURBANCE TO THE CONSTRUCTION SITE.

6. SEEDING (NATIVE), MULCHING (WEED-FREE HAY), AND MULCH TACKIFIER QUANTITIES INCLUDE INITIAL APPLICATION AS WELL AS QUANTITIES FOR MULTIPLE SEEDING APPLICATIONS THROUGHOUT THE DURATION OF THE PROJECT.

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STORM WATER
MANAGMENT PLAN

Designer: D.SMITH
Detailer: D.SMITH
Structure Numbers - -
Sheet Subset: SWMP
Subset Sheets: 3 of 3

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HCL PATH

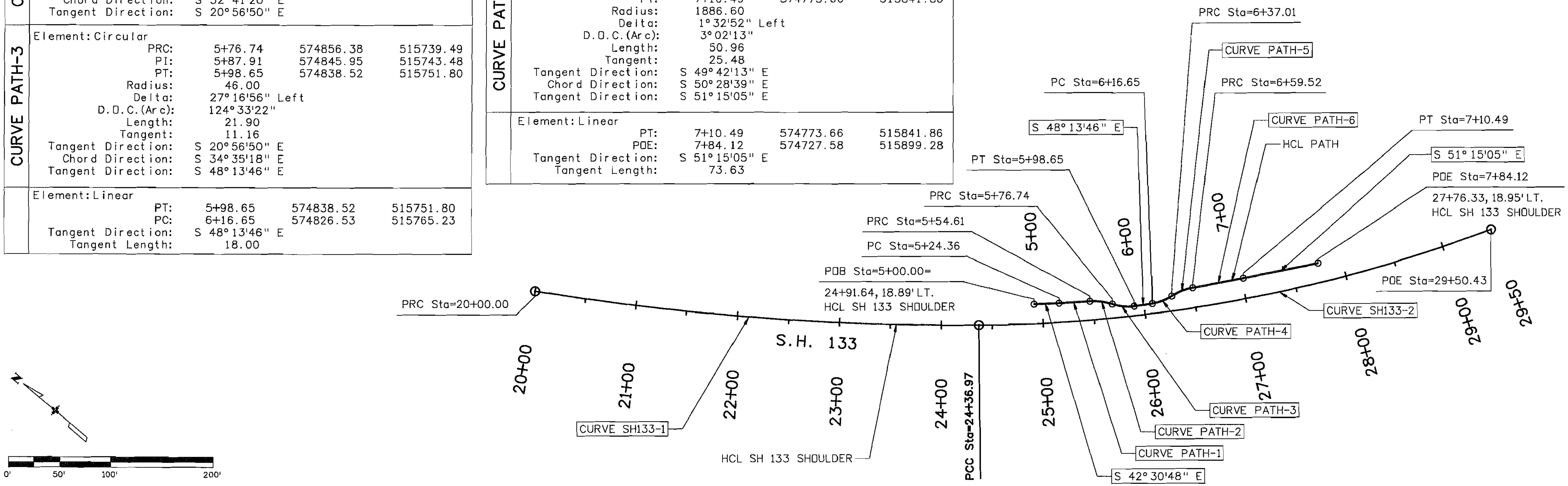
		STATION	NORTHING	EASTING
	Element:Linear			
	POB:	5+00.00	574914.79	515690.34
	PC:	5+24.36	574896.83	515706.81
	Tangent Direction:	S 42° 30'48" E		
	Tangent Length:	24.36		
CURVE PATH-1	Element:Circular			
	PC:	5+24.36	574896.83	515706.81
	PI:	5+39.49	574885.68	515717.03
	RC:	5+54.61	574874.88	515727.62
	Radius:	904.00		
	Delta:	1° 55'02" Left		
	D.O.C.(Arc):	6° 20'17"		
	Length:	30.25		
	Tangent:	15.13		
	Tangent Direction:	S 42° 30'48" E		
	Chord Direction:	S 43° 28'19" E		
	Tangent Direction:	S 44° 25'50" E		
CURVE PATH-2	Element:Circular			
	PRC:	5+54.61	574874.88	515727.62
	PI:	5+65.83	574866.86	515735.47
	PRC:	5+76.74	574856.38	515739.49
	Radius:	54.00		
	Delta:	23° 28'59" Right		
	D.O.C.(Arc):	106° 06'12"		
	Length:	22.13		
	Tangent:	11.22		
	Tangent Direction:	S 44° 25'50" E		
	Chord Direction:	S 32° 41'20" E		
	Tangent Direction:	S 20° 56'50" E		
CURVE PATH-3	Element:Circular			
	PRC:	5+76.74	574856.38	515739.49
	PI:	5+87.91	574845.95	515743.48
	PT:	5+98.65	574838.52	515751.80
	Radius:	46.00		
	Delta:	27° 16'56" Left		
	D.O.C.(Arc):	124° 33'22"		
	Length:	21.90		
	Tangent:	11.16		
	Tangent Direction:	S 20° 56'50" E		
	Chord Direction:	S 34° 35'18" E		
	Tangent Direction:	S 48° 13'46" E		
	Element:Linear			
	PT:	5+98.65	574838.52	515751.80
	PC:	6+16.65	574826.53	515765.23
	Tangent Direction:	S 48° 13'46" E		
	Tangent Length:	18.00		

HCL PATH (CONTINUED)

		STATION	NORTHING	EASTING
CURVE PATH-4	Element:Circular			
	PC:	6+16.65	574826.53	515765.23
	PI:	6+27.00	574819.63	515772.95
	PRC:	6+37.01	574816.71	515782.88
	Radius:	46.00		
	Delta:	25° 21'44" Left		
	D.O.C.(Arc):	124° 33'22"		
	Length:	20.36		
	Tangent:	10.35		
	Tangent Direction:	S 48° 13'46" E		
	Chord Direction:	S 60° 54'38" E		
	Tangent Direction:	S 73° 35'30" E		
CURVE PATH-5	Element:Circular			
	PRC:	6+37.01	574816.71	515782.88
	PI:	6+48.43	574813.48	515793.83
	PRC:	6+59.52	574806.09	515802.55
	Radius:	54.00		
	Delta:	23° 53'17" Right		
	D.O.C.(Arc):	106° 06'12"		
	Length:	22.51		
	Tangent:	11.42		
	Tangent Direction:	S 73° 35'30" E		
	Chord Direction:	S 61° 38'52" E		
	Tangent Direction:	S 49° 42'13" E		
CURVE PATH-6	Element:Circular			
	PRC:	6+59.52	574806.09	515802.55
	PI:	6+85.01	574789.61	515821.98
	PT:	7+10.49	574773.66	515841.86
	Radius:	1886.60		
	Delta:	1° 32'52" Left		
	D.O.C.(Arc):	3° 02'13"		
	Length:	50.96		
	Tangent:	25.48		
	Tangent Direction:	S 49° 42'13" E		
	Chord Direction:	S 50° 28'39" E		
	Tangent Direction:	S 51° 15'05" E		
	Element:Linear			
	PT:	7+10.49	574773.66	515841.86
	POE:	7+84.12	574727.58	515899.28
	Tangent Direction:	S 51° 15'05" E		
	Tangent Length:	73.63		

HCL SH 133 SHOULDER

		STATION	NORTHING	EASTING
CURVE SH133-1	Element:Circular			
	PC:	20+00.00	575297.74	515385.95
	PI:	22+18.99	575109.82	515498.39
	PCC:	24+36.97	574942.99	515640.24
	Radius:	2641.00		
	Delta:	9° 28'47.9" Left		
	D.O.C.(Arc):	2° 10'10.1"		
	Length:	436.97		
	Tangent:	218.99		
	Tangent Direction:	S 30° 53'38.2" E		
	Chord Direction:	S 35° 38'02.1" E		
	Tangent Direction:	S 40° 22'26.1" E		
CURVE SH133-2	Element:Circular			
	PCC:	24+36.97	574942.99	515640.24
	PI:	26+96.40	574745.35	515808.29
	PT:	29+50.43	574617.92	516034.26
	Radius:	1456.00		
	Delta:	20° 12'19.5" Left		
	D.O.C.(Arc):	3° 56'06.5"		
	Length:	513.46		
	Tangent:	259.42		
	Tangent Direction:	S 40° 22'26.1" E		
	Chord Direction:	S 50° 28'35.8" E		
	Tangent Direction:	S 60° 34'45.6" E		



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GEOMETRY PLAN

Designer: D. SMITH
Detailer: D. SMITH
Sheet Subset: GEOMETRY
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Sheet Number 10

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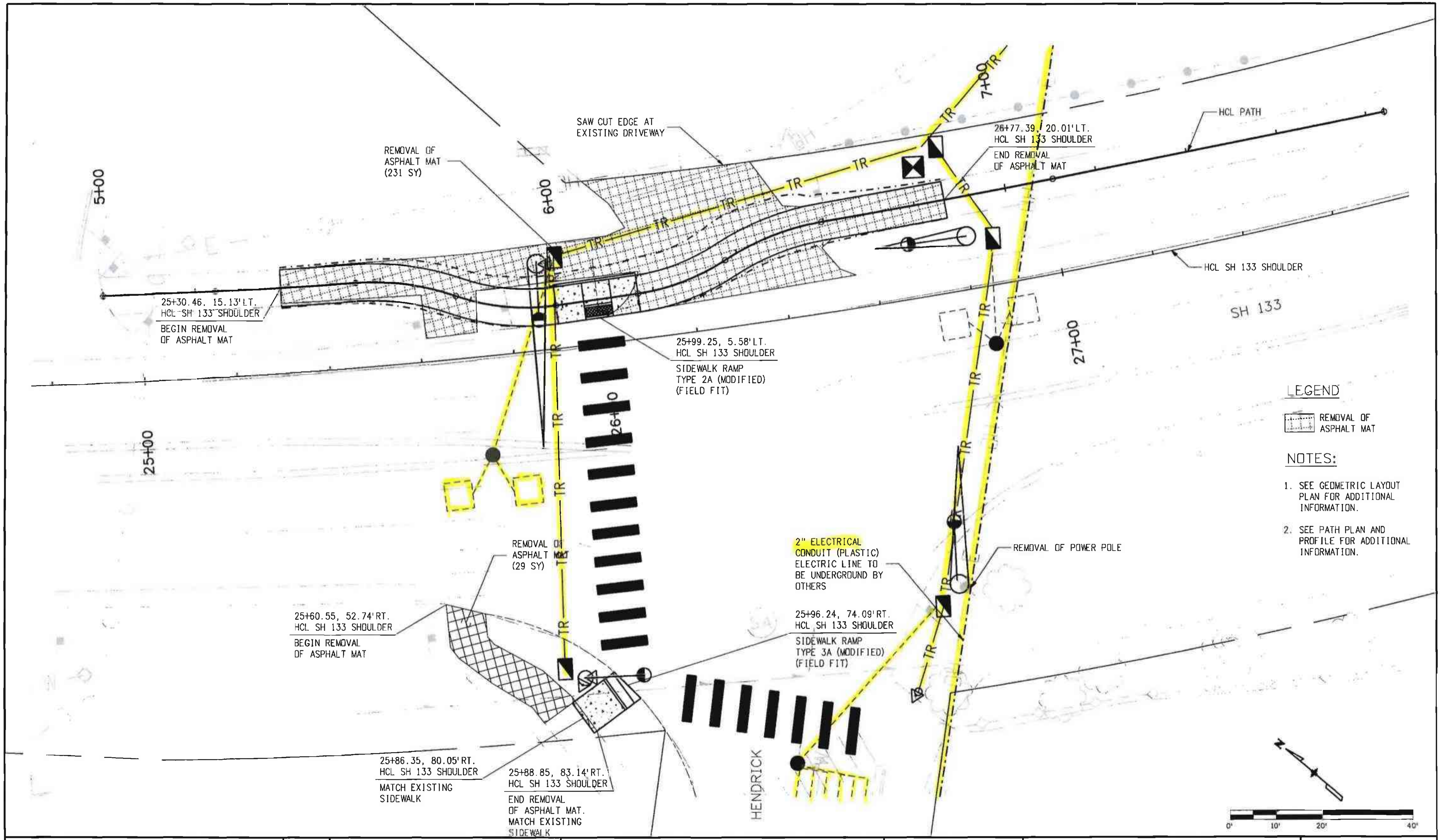

LEGEND

▨ REMOVAL OF ASPHALT MAT

NOTES:

1. SEE GEOMETRIC LAYOUT PLAN FOR ADDITIONAL INFORMATION.
2. SEE PATH PLAN AND PROFILE FOR ADDITIONAL INFORMATION.

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SITE PLAN

Designer: D. SMITH
Detailer: D. SMITH
Sheet Subset: TRAFFIC
Structure Numbers -
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Sheet Number 11

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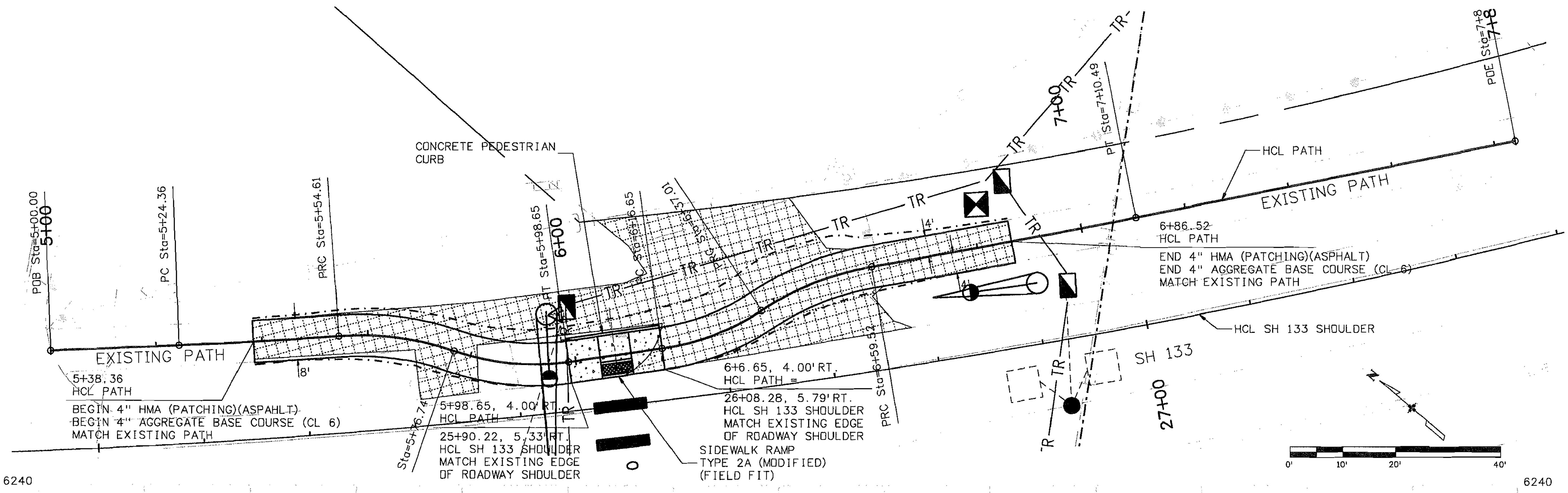

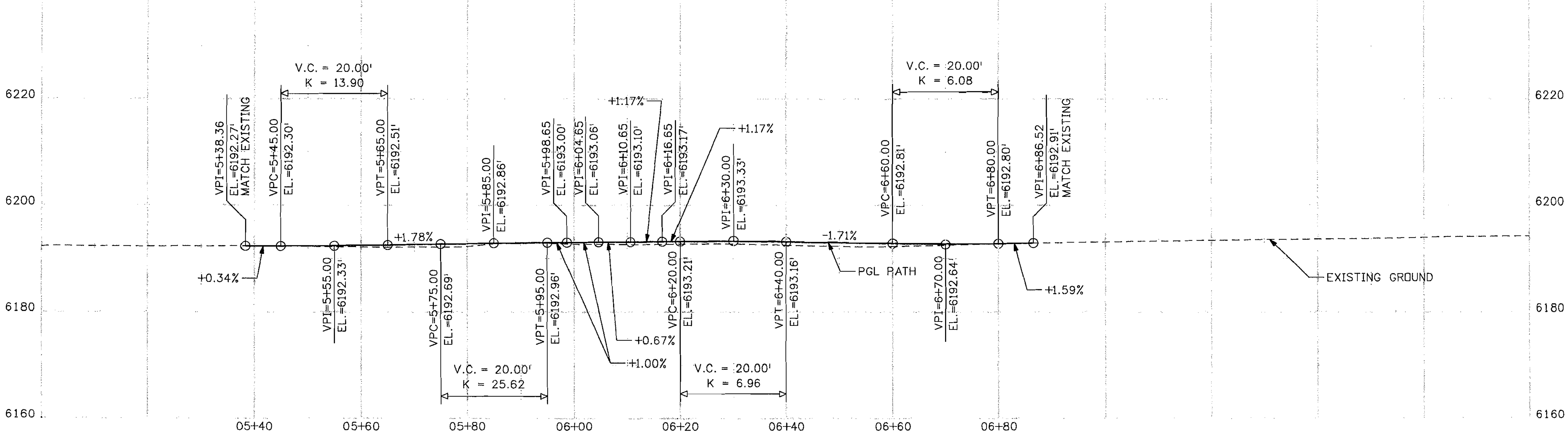

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PLAN AND PROFILE

Designer: D. SMITH
Detailer: M. GAWELKO
Sheet Subset: PLAN
Structure Numbers -
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SUMMARY OF APPROXIMATE QUANTITIES-TRAFFIC SIGNALS

CDOT ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY
503	DRILLED CAISSON (36 INCH)	LF	44
613	2 INCH ELECTRICAL CONDUIT (PLASTIC)	LF	500
613	3 INCH ELECTRICAL CONDUIT (PLASTIC)	LF	550
613	PULL BOX (24"X36"X18")	EACH	5
613	PULL BOX (SPECIAL)	EACH	3
613	WIRING	LS	1
613	LUMINAIRE HIGH PRESSURE SODIUM (250 WATT)	EACH	4
614	PEDESTRIAN SIGNAL FACE (18) (LED)	EACH	4
614	TRAFFIC SIGNAL FACE (12-12-12) (LED)	EACH	9
614	TRAFFIC SIGNAL CONTROLLER	EACH	1
614	TRAFFIC SIGNAL CONTROLLER CABINET	EACH	1
614	PEDESTRIAN PUSH BUTTON	EACH	4
614	LOOP DETECTOR WIRE	LF	1600
614	TRAFFIC SIGNAL-LIGHT POLE STEEL	EACH	1
614	TRAFFIC SIGNAL-LIGHT POLE STEEL (1 MAST ARM)	EACH	3
614	TRAFFIC SIGNAL PEDESTAL POLE STEEL	EACH	1

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TABULATION OF QUANTITIES
SIGNALS
Designer: D. SMITH
Detailer: D. SMITH
Sheet Subset: TRAFFIC
Structure Numbers -
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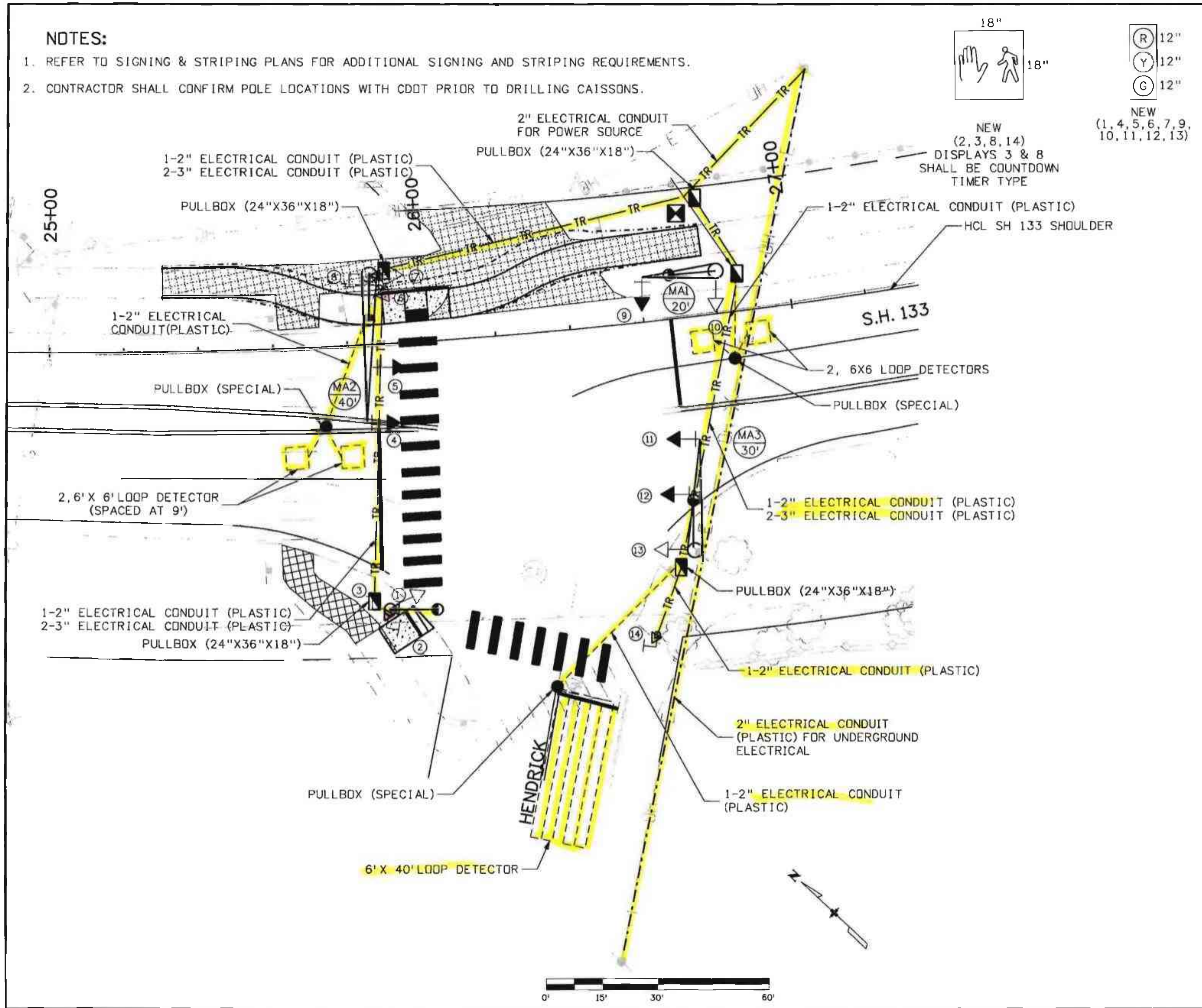
NOTES:

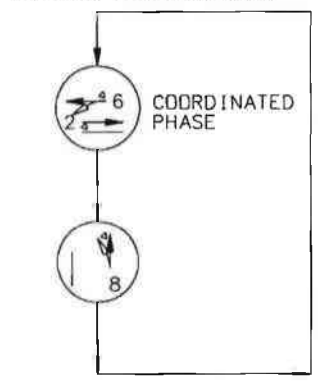
1. REFER TO SIGNING & STRIPING PLANS FOR ADDITIONAL SIGNING AND STRIPING REQUIREMENTS.
2. CONTRACTOR SHALL CONFIRM POLE LOCATIONS WITH CDOT PRIOR TO DRILLING CAISSONS.



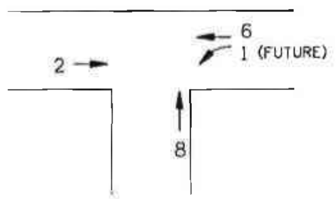
LEGEND:

⊗ ◀─┼	OVERHEAD MOUNTED SIGNAL FACE WITH BACKPLATE
⊗ ◁──	POLE MOUNTED SIGNAL FACE
┘	PEDESTRIAN SIGNAL FACE
△	PUSH BUTTON, AND SIGN
──	PROPOSED CONDUIT-SCHEDULE 80 PVC
◪	PULL BOX (TYPE II)
⧗	TRAFFIC SIGNAL CONTROLLER & CABINET
MA1 65'	MAST ARM SIGNAL POLE WITH LUMINAIRE, EXCEPT AS NOTED
○	PEDESTAL POLE

PHASING PLAN DIAGRAM



PHASING PLAN LAYOUT



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SIGNAL PLAN

Designer: S. MARKOVETZ
Detailer: D. SMITH
Sheet Subset: TRAFFIC
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TABULATION OF PAVEMENT MARKINGS

LOCATION	STATION/ MP	to	STATION/ MP	DESCRIPTION	EPOXY PAVEMENT MARKING (LF)											PREFORMED THERMO-PLASTIC PAVEMENT MARKING (SF)		PREFORMED PLASTIC PAVEMENT MARKING (SF)	
					LANE						EDGE		CHANNELIZING		LANE DROP				
					YELLOW SOLID	DOUBLE YELLOW SOLID	YELLOW BROKEN	YELLOW SOLID BROKEN	WHITE BROKEN	WHITE BROKEN	WHITE SOLID	YELLOW SOLID	WHITE SOLID	YELLOW SOLID	WHITE BROKEN	WORD - SYMBOL	XWALK - STOPLINE	WORD - SYMBOL	XWALK - STOPLINE
					4 INCH	4 INCH	4 INCH	4 INCH	4 INCH	8 INCH	4 INCH	4 INCH	8 INCH	8 INCH	8 INCH				
	22+54		23+32								79								
	23+78		25+88								220								
	25+19		25+88										72						
	26+38		27+68										131						
	26+60		29+12								266								
	25+12		29+12								400								
	21+75		23+30			154													
	23+76		24+53			151													
	24+84		26+02			121													
	24+84		25+97			115													
	26+70		29+12			249													
	27+67		29+12			128													
	25+88		26+43																
	25+88																		86
	26+57																		46
	26+00																		220
	26+23		26+57																140
				TOTAL (LF)	0	918	0	0	0	0	965	0	203	0	0				
				TOTAL (SF)												0.00	0.00	0.00	492.00
				TOTAL (GAL)	0.00	5.83	0.00	0.00	0.00	0.00	3.06	0.00	1.29	0.00	0.00				

NOTES: 105 SF/GAL USED FOR EPOXY PAINT

FOR DETAILS OF PAVEMENT MARKING LINES AND LINE PLACEMENT, SEE STANDARD S-627-1

SUMMARY OF PAVEMENT MARKING QUANTITIES

COLOR	EPOXY PAVEMENT MARKING (GAL)		PREFORMED THERMOPLASTIC PAVEMENT MARKING (TYPE III) (SF)		PREFORMED PLASTIC PAVEMENT MARKING (SF)	
	YELLOW	WHITE	WORD - SYMBOL	XWALK - STOPLINE	WORD - SYMBOL	XWALK - STOPLINE
PROJECT TOTALS	5.83	4.35	0.00	0.00	0.00	492.00
	10.18					

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SIGNAL PLAN

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Detailer: D. SMITH
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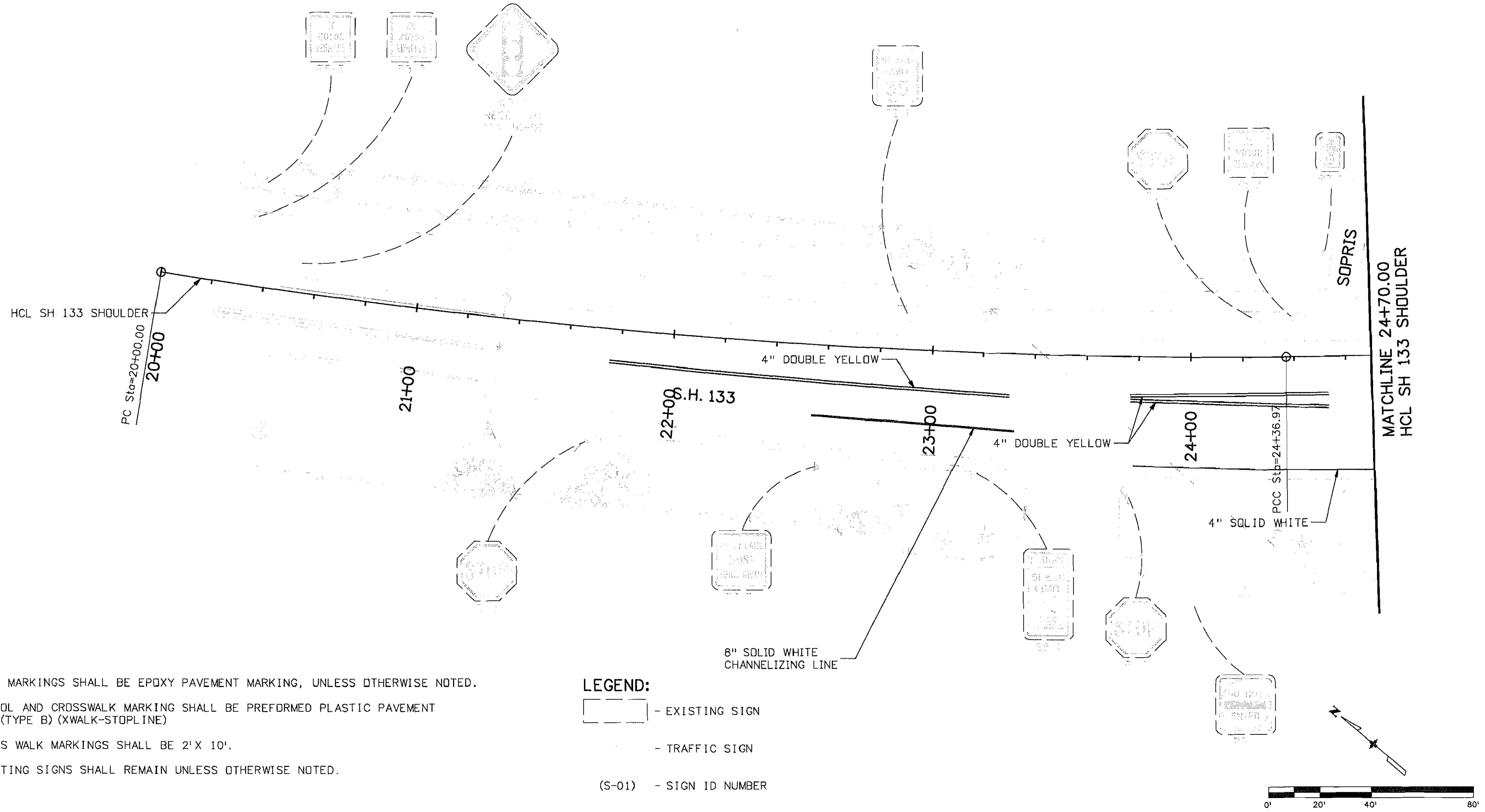
16847
Sheet Number 15



NOTE:

1. PAVEMENT MARKINGS SHALL BE EPOXY PAVEMENT MARKING, UNLESS OTHERWISE NOTED.
2. ALL SYMBOL AND CROSSWALK MARKING SHALL BE PREFORMED PLASTIC PAVEMENT MARKING (TYPE B) (XWALK-STOPLINE)
3. ALL CROSS WALK MARKINGS SHALL BE 2' X 10'.
4. ALL EXISTING SIGNS SHALL REMAIN UNLESS OTHERWISE NOTED.

LEGEND:

- EXISTING SIGN
- TRAFFIC SIGN

(S-01) - SIGN ID NUMBER

Print Date: 5/7/2009
File Name: 16847DES_Plan02.dgn
Horiz. Scale: 1:40 Vert. Scale: As Noted
Unit Information MC

R-X

Sheet Revisions

Date:	Comments	Init.

Colorado Department of Transportation
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DEPARTMENT OF TRANSPORTATION
222 South 6th Street, Room 100
Grand Junction, CO 81501
Phone: 970-248-7230 FAX: 970-248-7294
Region 3 SHY

As Constructed
No Revisions:
Revised:
Void:

SIGNING AND STRIPING PLAN

Designer: S. MARKOVETZ
Detailer: D. DYER
Sheet Subset: TRAFFIC
Structure Numbers -
-
Subset Sheets: 1 of 2

Project No./Code
C 133A-036
16847
Sheet Number 16

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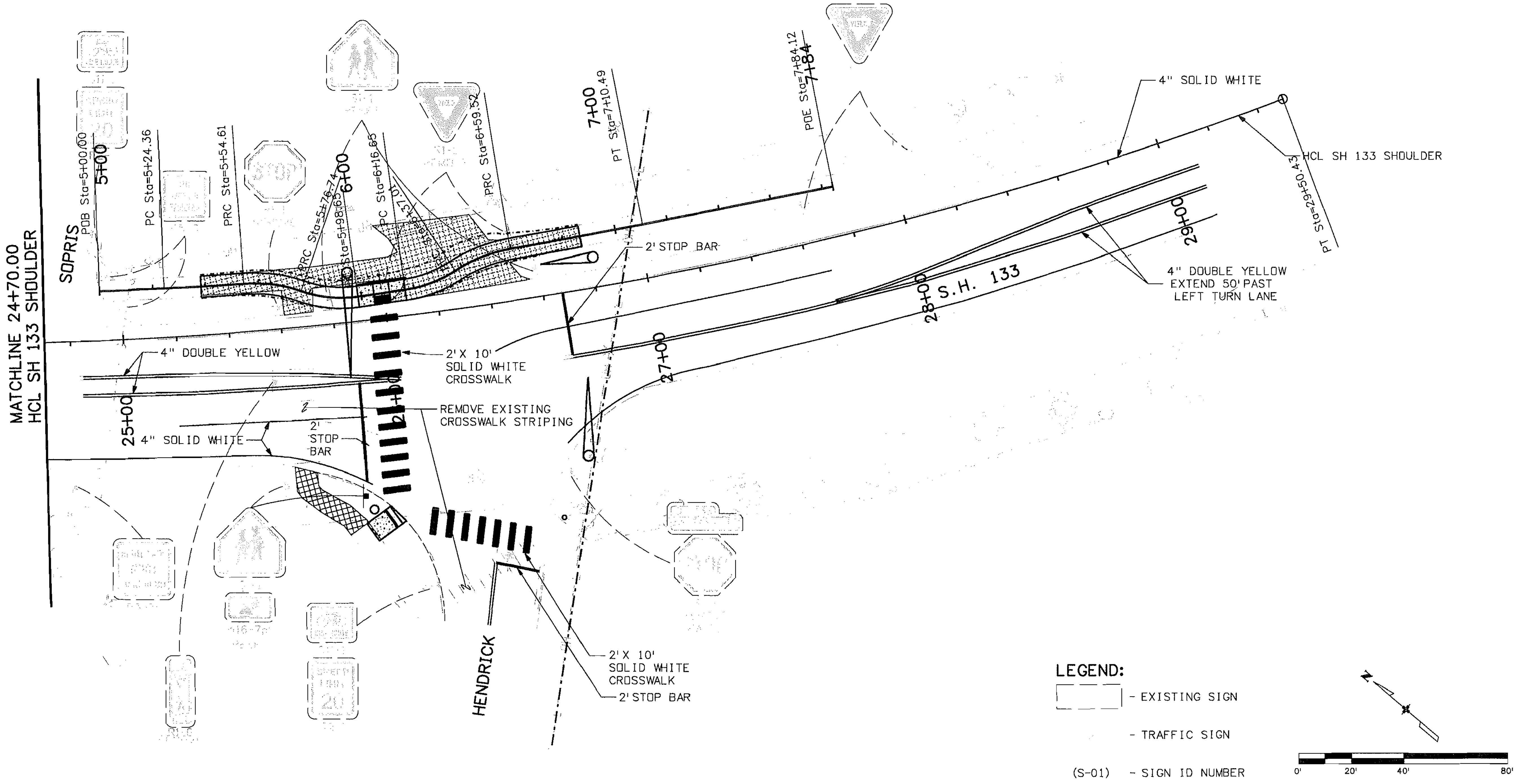
NOTE:

1. PAVEMENT MARKINGS SHALL BE EPOXY PAVEMENT MARKING, UNLESS OTHERWISE NOTED.
2. ALL SYMBOL AND CROSSWALK MARKING SHALL BE PREFORMED PLASTIC PAVEMENT MARKING (TYPE B) (XWALK-STOPLINE)
3. ALL CROSS WALK MARKINGS SHALL BE 2'X 10'.
4. ALL EXISTING SIGNS SHALL REMAIN UNLESS OTHERWISE NOTED.



Print Date: 5/7/2009
File Name: 16847DES_Plan03.dgn
Horiz. Scale: 1:40 Vert. Scale: As Noted
Unit Information MC

R-X

Sheet Revisions		
Date:	Comments	Init.

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Region 3
SHY

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No Revisions:
Revised:
Void:

SIGNING AND STRIPING PLAN
Designer: S. MARKOVETZ
Detailer: D. DYER
Sheet Subset: TRAFFIC
Structure Numbers -
Subset Sheets: 2 of 2

Project No./Code
C 133A-036
16847
Sheet Number 17

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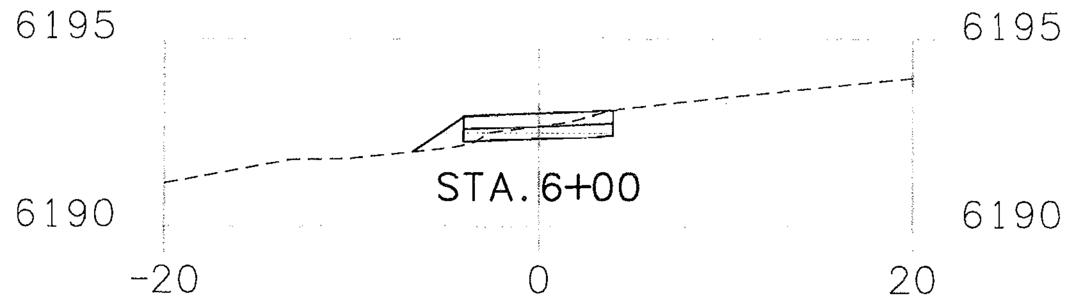

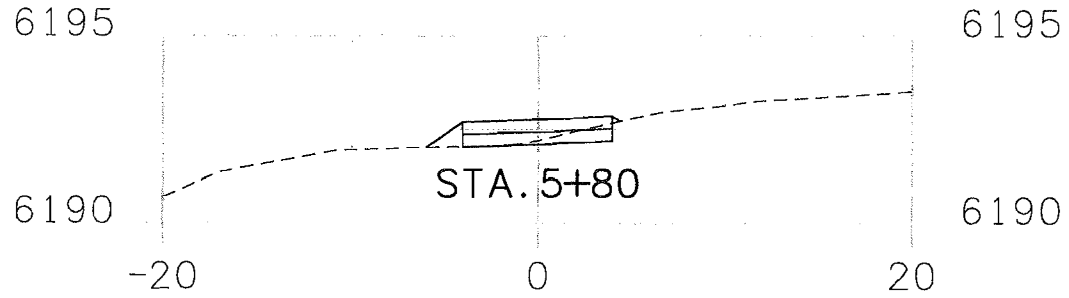

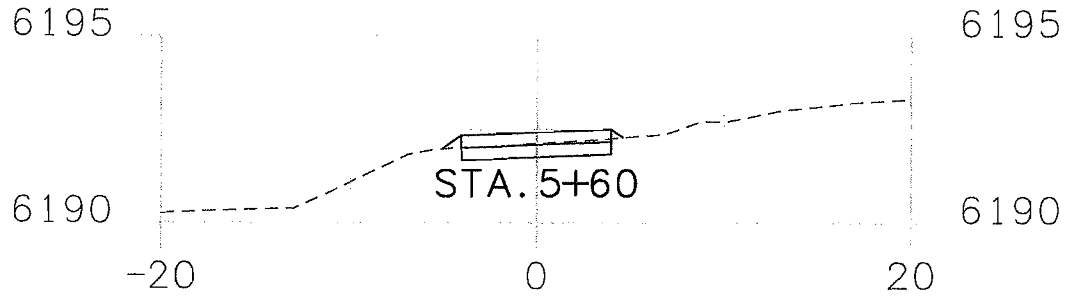

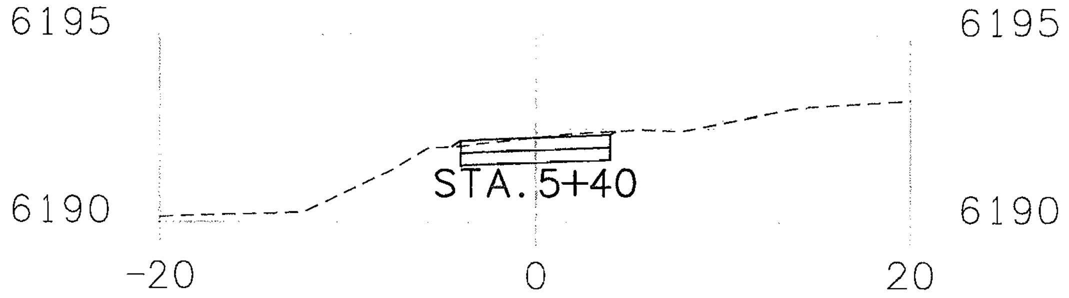

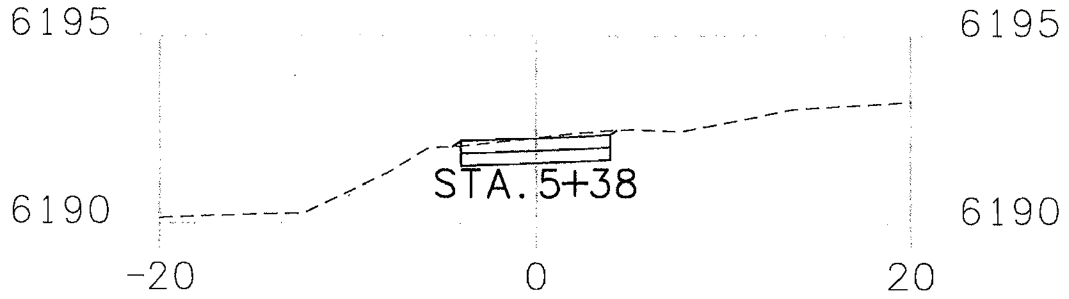

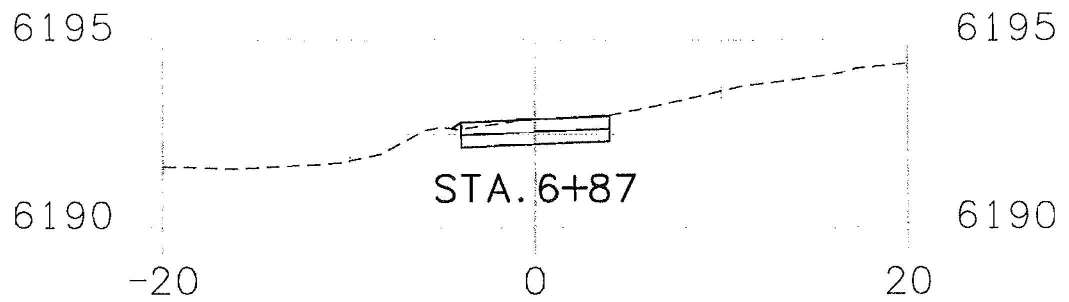

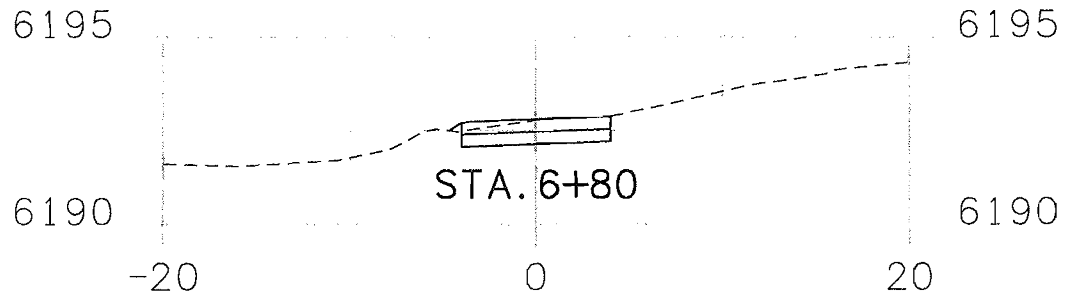

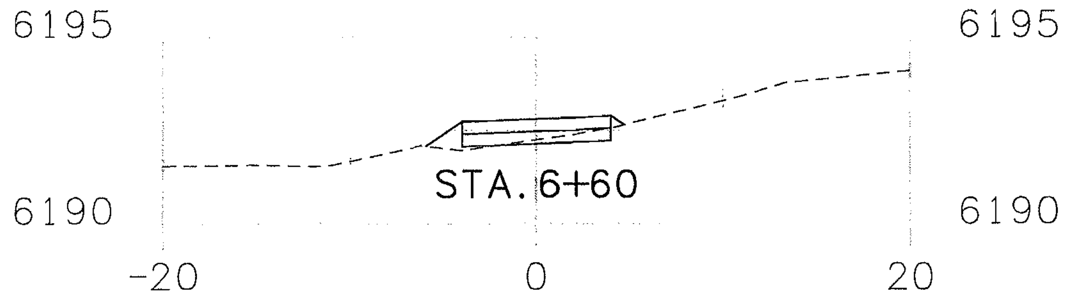

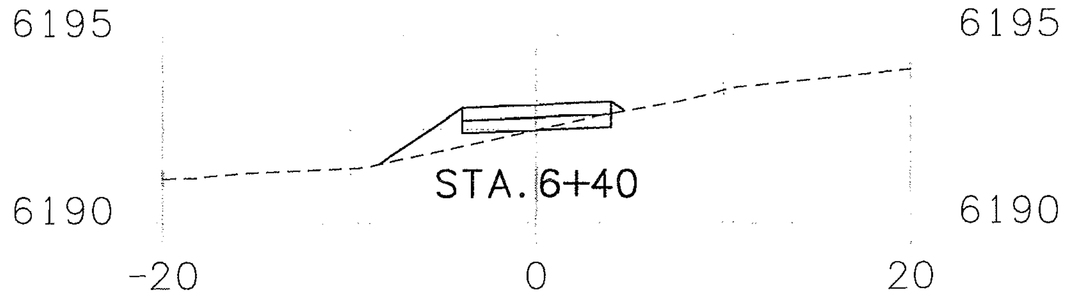

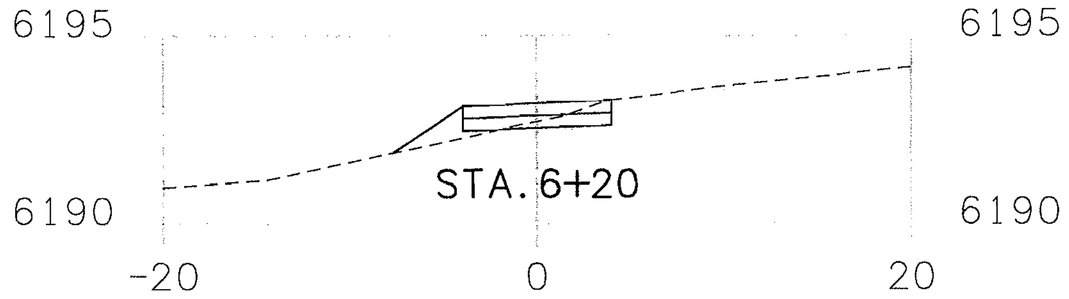

Print Date: 5/7/2009
File Name: 16847DES_CrossSections01.dgn
Horiz. Scale: 1:10 Vert. Scale: As Noted
Unit Information Unit Leader Initials

R-X

Sheet Revisions

Date:	Comments	Init.

Colorado Department of Transportation

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Region 3 SHY

As Constructed
No Revisions:
Revised:
Void:

CROSS SECTIONS

Designer: D. SMITH
Detailer: D. SMITH
Structure Numbers -
Sheet Subset: SECTIONS Subset Sheets: 1 of 1

Project No./Code
C133A-036
16847
Sheet Number 18

TO: CHRIS LEHRMAN

Vickie Walton

From: Matt Gardner
Sent: Tuesday, December 07, 2010 20:53
To: Vickie Walton
Subject: accidents

Vickie,

I checked thru 77 accidents in New World and 359 accidents in NETRMS for accidents in those locations. Here is what I found.

Hwy 133 @ Snowmass	4
Hwy 133 @ River Valley Ranch Dr.	2
Hwy 133 @ Roaring Fork Ave	2
Hwy 133 @ Hendricks Dr	3

I searched from 01-01-05 until 12-07-2010.

I included 133 and RF Ave because they are close to Snowmass and I also included RVR Dr and 133 because it is essentially 133 and Snowmass

Matt.

PS

It took about 2 hours to do this if they are wondering.