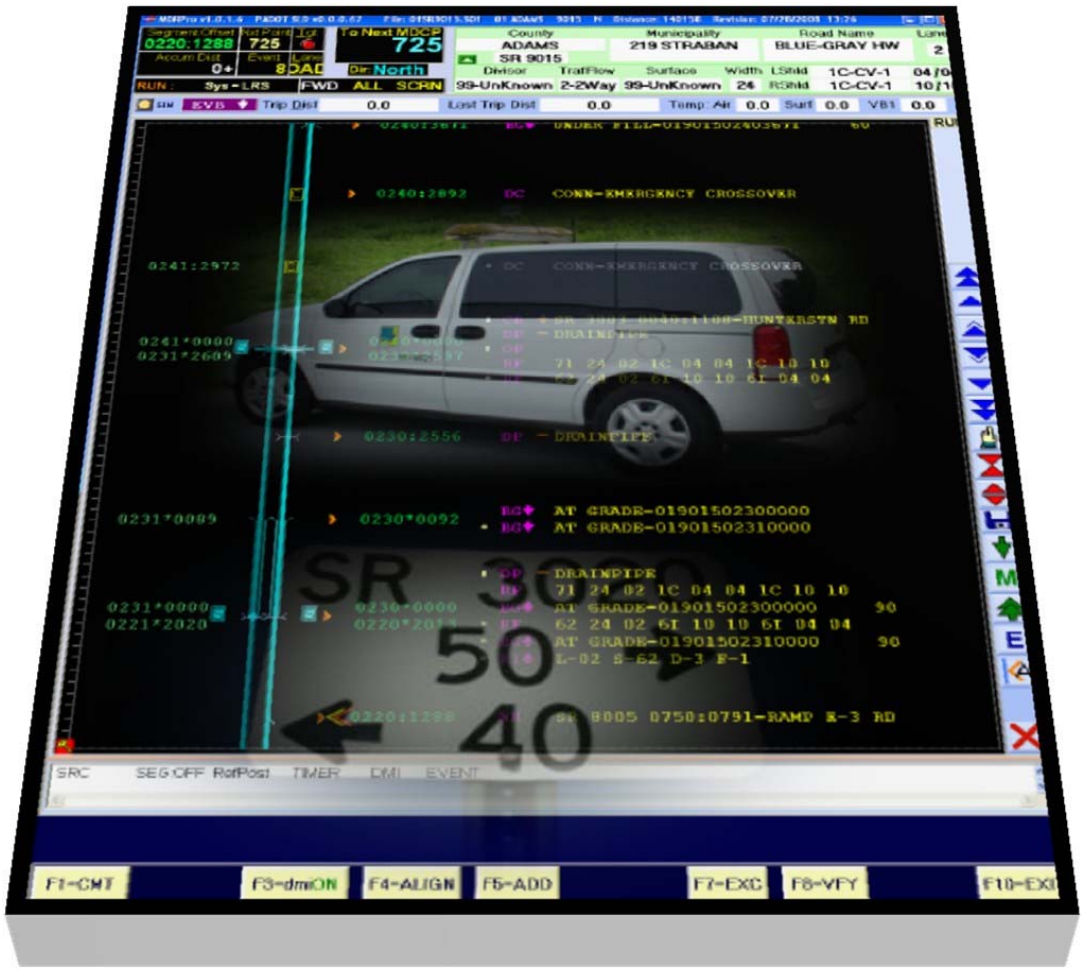
pennsylvania
DEPARTMENT OF TRANSPORTATION

LOCATION REFERENCING SYSTEM
Introduction & Technical Manual
2018 Edition

Roadway Inventory & Testing Unit
Asset Management Division
Pennsylvania Department of Transportation

LOCATION REFERENCING SYSTEM
Introduction & Technical Manual

2018 Edition



Please direct questions or comments regarding this manual, the Location Referencing System, or any other related topic, to:

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1 Introduction

1 Introduction

LRS Overview

PennDOT's Location Referencing System (LRS), implemented in 1987, is the system used to index and designate the State highway network, to define roadway lengths, locations, and route connectivity. The LRS was designed to bring Pennsylvania's State-owned roadway feature data into a verifiable, flexible, and constant engineering standard.

The Roadway Management System (RMS) is PennDOT's means for defining and monitoring the State-owned highway network, maintaining an inventory of the roadway features, conditions, and characteristics, and providing decision-makers with the information that is necessary for funding, business planning, project design, and maintenance programming. The Location Reference System (LRS) provides a framework for which all RMS data can be tied to true roadway locations. Data stored and managed in RMS includes roadway geometry information, traffic information, pavement and shoulder history, maintenance history, municipal and legislative boundaries, intersections, roadside features, structure locations, railroad crossings information, pavement testing, condition survey information (including guide rail and drainage features), and posting/bonding information. One of the primary uses of RMS is the annual allocation of highway maintenance funds.

RMS information is the basis for other PennDOT computer systems and programs. Many other PennDOT computer systems depend on information and data collected by LRS and then stored in RMS. Some of the current users of the LRS and RMS databases are described below.

- ***AHOPS*** ***Automated Highway Occupancy Permit System (e-Permitting)***
- ***APRAS*** ***Automated Permit Routing & Analysis System***
- ***BMS2*** ***Bridge Management System 2***
- ***SAP PM*** ***Plant Maintenance***
- ***CDART*** ***Crash Data Analysis and Retrieval Tool***
- ***ECMS*** ***Engineering & Construction Management System***
- ***GIS*** ***Geographic Information System***
- ***MPMS*** ***Multi-modal Project Management System***
- ***HPMS*** ***Highway Performance Monitoring System***
- ***RCRS*** ***Road Condition Reporting System***
- ***SIMOS*** ***Sign Inventory Management & Ordering System***

With so many users dependent on LRS data, it is vital that the information be as accurate as possible, and that it properly reflects actual field conditions. Accurate segment markers are of obvious significance, since they are the tie between the database and the roadway. When segment marker signs are missing or improperly placed, the information we report may not be tied to the location we think it is. Signing is important to many people within PennDOT, including Pavement Testing and Distress Surveys, Design, Construction, Maintenance, Highway Occupancy Permits, Roadway Posting and Bonding, Tort Liability, Turnbacks, Planning and Programming, Traffic, Municipal Services, Utilities, Right of Way, Crash review and Analysis, and Emergency Management and customers outside PennDOT including the Federal Highway Administration, County 911 programs, State & Local Police, Townships, Local Emergency Management, Consultants, Delivery Services (UPS, Fed Ex, etc.), Fire Departments, Utility Companies.

As with the LR System, the LRS also assigns numbers to all sections of State-owned highways.

However, unlike the old system, the LRS does not utilize a cumulative distance system; instead, each State Route (SR) is divided into specified sections called segments. The LRS identification number, called the LRS key is a unique series of numbers that identify the location of each point or feature along the route. The fourteen-digit number is an integral part of the Roadway Management System (RMS) where roadway data is stored, (the LRS key is explained in further detail in section 2).

LRS History

Prior to the LRS, the system for designating state owned highways was the Legislative Route (LR) system. LR numbers were assigned to sections of highway, which could vary from 2 - 5 digits with no specific order for the numbering within the county. Shown in (Figure 1-1), SR 0419 used to be made of 3 separate LR's, (LR 138, 137 and A-4668) within the town of Cornwall. The LR system used hardcover Straight-Line Diagram (SLD) booklets for referencing roadway data, distances, and roadway feature attribute locations. Distances were referenced by "stations" and were in an accumulative format. Updates or modifications of the old SLD's was not automated and consequently was very time consuming and cumbersome. As a result of this, over time this data became increasingly inaccurate, unreliable and did not reflect actual conditions in the field. The overall integrity of the LR system gradually deteriorated. A need for a more efficient, accurate, and flexible system became evident which resulted in the implementation of the current Location Referencing System (LRS), which replaced LR's with SR's in 1987.

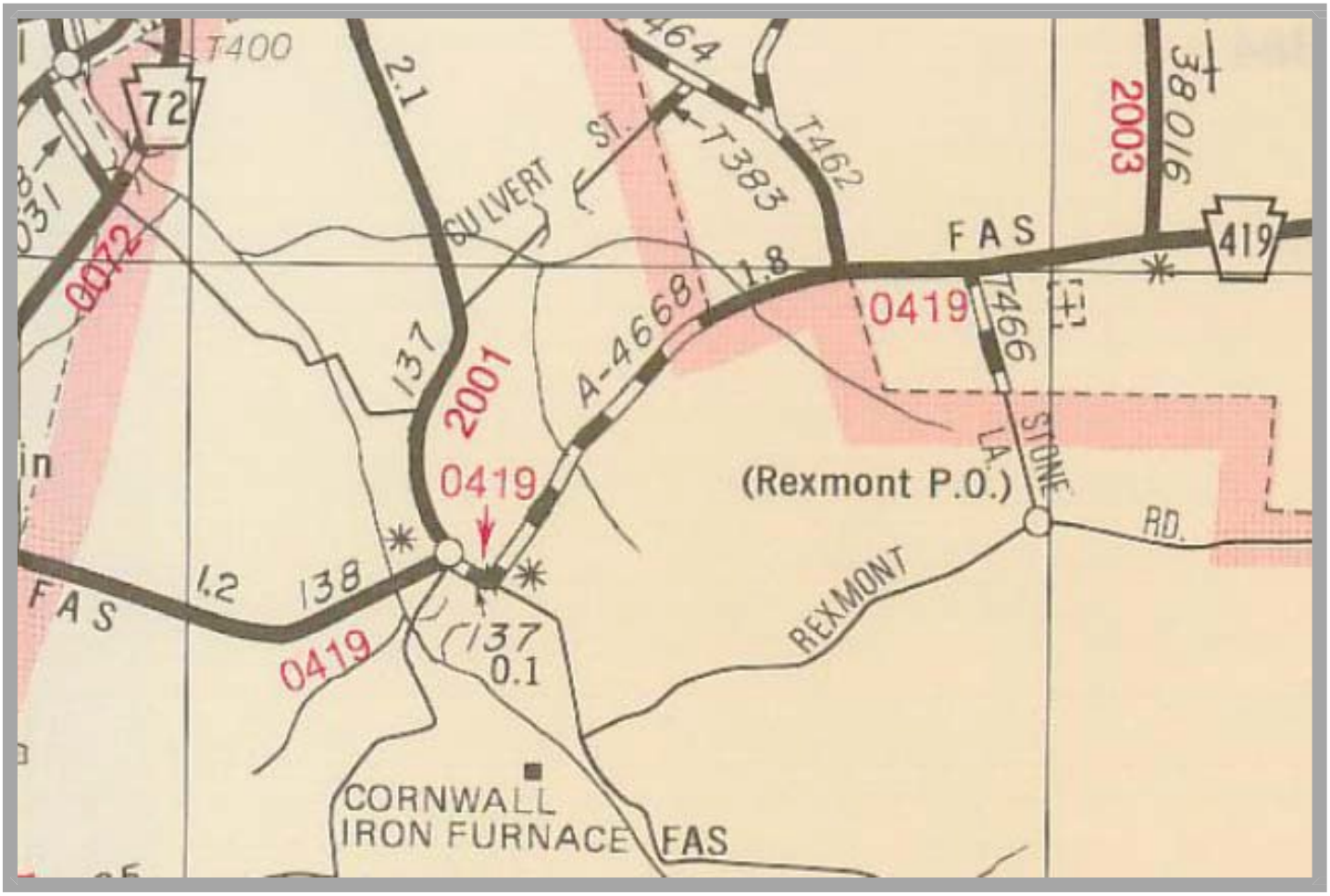


Figure 1-1
LR map with new SR's in Red

LRS SLD's

The LRS also uses an SLD format. However, SLD's are generated and redistributed by the RMS and are more easily updated. The entire LRS database is easily accessible to RMS users and is more efficient and flexible than the old LR system. Information displayed on SLD's can be viewed in the RMS (Figure 1-2) or printed to hardcopy form. Additionally, SLD books and DVDs are refreshed and distributed annually to PennDOT District and County offices, as well as too many external entities. SLD books are available in hardcopy form (Figure1-3), or on CD-ROM (Figure 1-4).

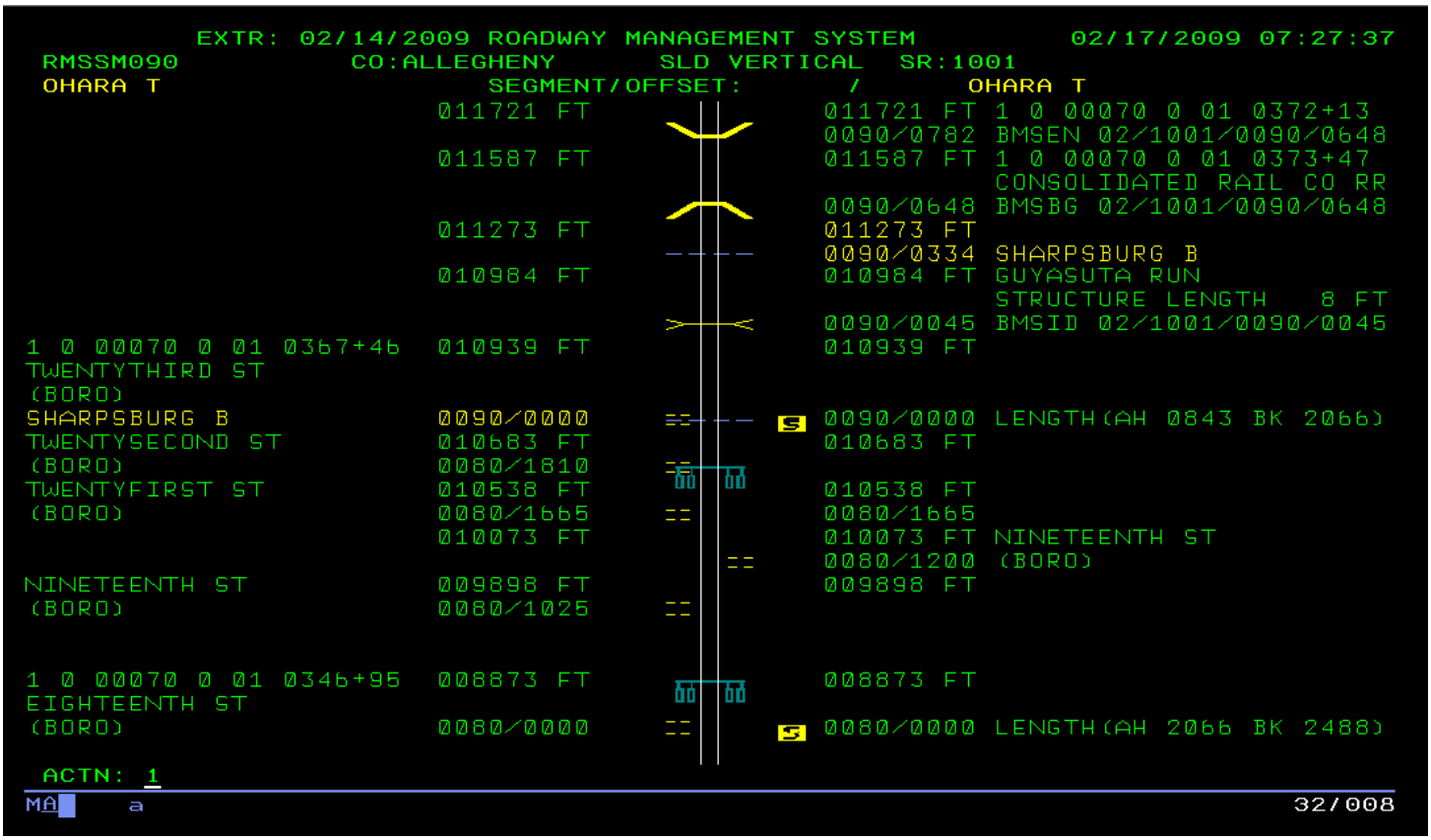


Figure 1-2 RMS SLD

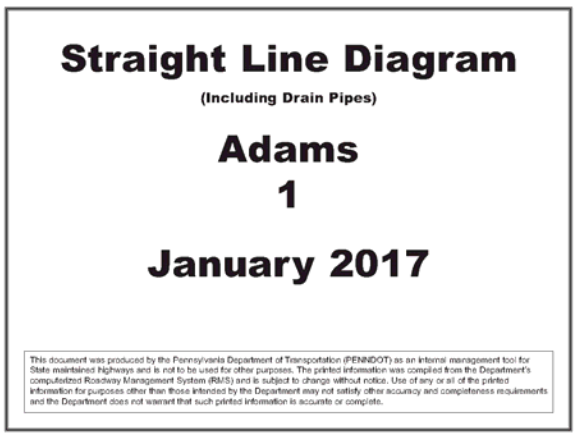


Figure 1-3
Annual SLD Refresh Hardcopy

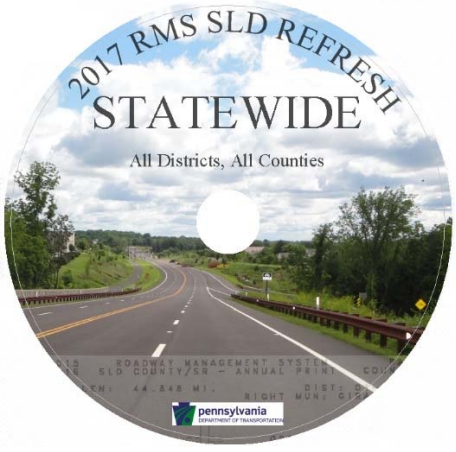


Figure 1-4
Annual SLD Refresh CD-ROM

2 LRS Routing & Segmentation

2 Routing & Segmentation

LRS Key

An LRS key is a unique fourteen-digit number that identifies the location of each specific point or feature along a State route. The first two digits of the key define the County, the next four digits identify the State Route (SR), the next four define the Segment, and the last four identify the Offset.

07/4016/0100/0857 is an example of an LRS key, which identifies:

07	/	4016	/	0100	/	0857
County (CO)		**State Route (SR)**		**Segment (SEG)**		**Offset**

Each of Pennsylvania's sixty-seven counties is identified by a county number, as follows:

County	#
Adams	1
Allegheny	2
Armstrong	3
Beaver	4
Bedford	5
Berks	6
Blair	7
Bradford	8
Bucks	9
Butler	10
Cambria	11
Cameron	12
Carbon	13
Centre	14
Chester	15
Clarion	16
Clearfield	17
Clinton	18
Columbia	19
Crawford	20
Cumberland	21
Dauphin	22
Delaware	23

County	#
Elk	24
Erie	25
Fayette	26
Forest	27
Franklin	28
Fulton	29
Greene	30
Huntingdon	31
Indiana	32
Jefferson	33
Juniata	34
Lackawanna	35
Lancaster	36
Lawrence	37
Lebanon	38
Lehigh	39
Luzerne	40
Lycoming	41
McKean	42
Mercer	43
Mifflin	44
Monroe	45
Montgomery	46

County	#
Montour	47
Northampton	48
Northumberland	49
Perry	50
Pike	51
Potter	52
Schuylkill	53
Snyder	54
Somerset	55
Sullivan	56
Susquehanna	57
Tioga	58
Union	59
Venango	60
Warren	61
Washington	62
Wayne	63
Westmoreland	64
Wyoming	65
York	66
Philadelphia	67

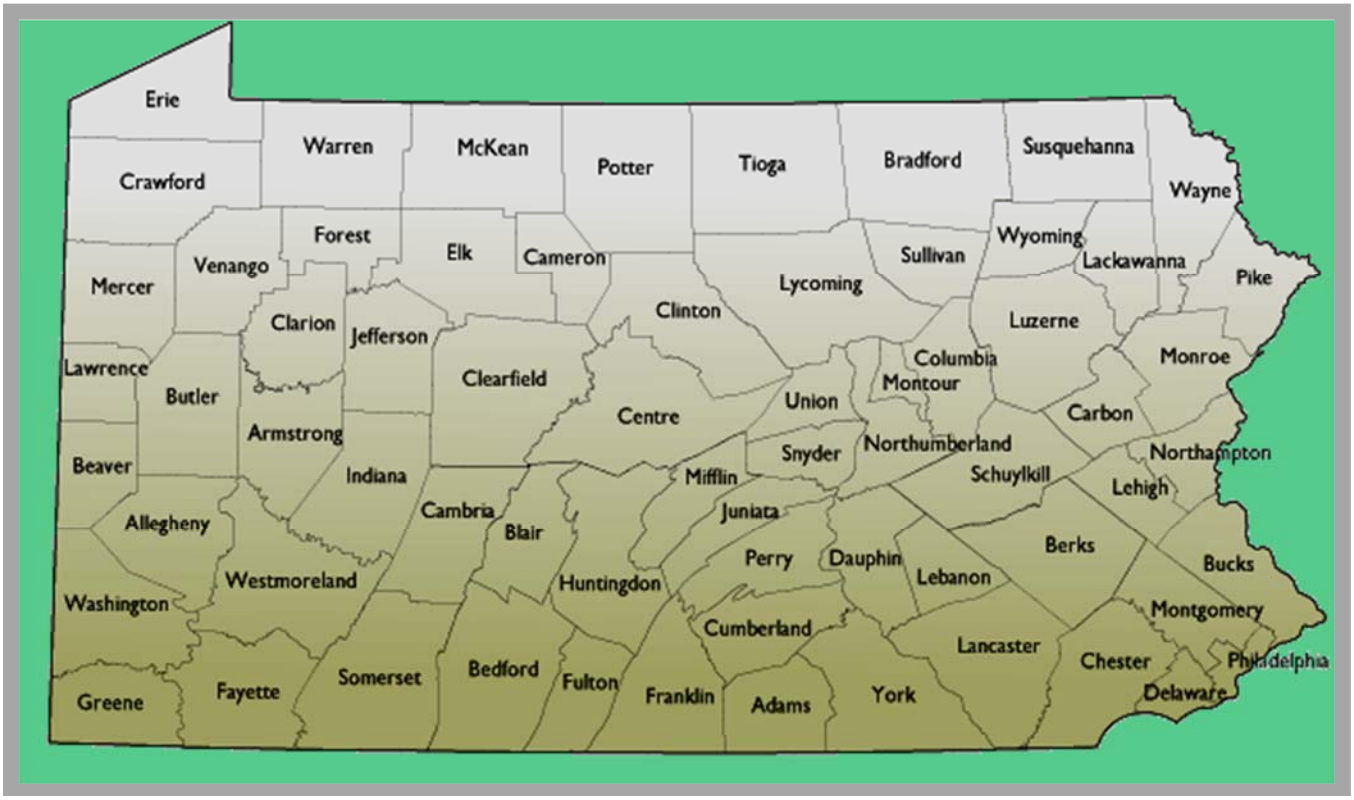


Figure 2-1
Pennsylvania's Counties

State Routes (SR's)

State Routes (SR's) are identified by four-digit numbers. SR numbers are assigned as follows:

1.	Traffic Routes, Interstates, US or PA Routes	0001-0999
2.	Quadrant Routes (Non-Traffic Routes)	1001-4999
3.	Relocated Traffic Routes	6000-6999
4.	Interchanges	8001-8999
5.	Wye's	9101-9199
6.	Rest Areas	9201-9299
7.	Truck Escape Ramps	9301-9399
8.	Others	9401-9499
9.	Park and Rides	9501-9599

Non-tolled Pennsylvania Turnpike Routes

Consists of non-tolled roads owned and maintained by the Pennsylvania Turnpike Commission. These roads are of special interest to the Pennsylvania Department of Transportation and they are assigned a 5000-series number to reference physical and administrative data related to the roadway. While these roads are not stored in the Roadway Management System (RMS), they are tracked internally by both the District and Central Office.

1.	Non-tolled Pennsylvania Turnpike Routes	5001-5999

Figures 2-2 through 2-4 demonstrate SR numbers that are assigned based on Traffic Route numbers.

Figure 2-2
Interstate 81 (SR 0081)

Figure 2-3
U.S. Traffic Route 22 (SR 0022)

Figure 2-4
PA Traffic Route 934 (SR 0934)

LRS Even/Odd Numbering Convention

SR numbers that end with an even number are typically assigned to SR's that flow in the East/West direction, and ones that end in odd numbers are designated to SR's that flow in the North/South direction. This numbering convention applies to Interstate Routes (except those that are Beltways or Spurs), most Traffic Routes and Quadrant Routes (routes greater than 0999).

Route Hierarchy

The following hierarchy was established to accommodate sections of roadway that were shared by multiple Traffic Routes:

1. **Interstates**
2. **U.S. Traffic Routes**
3. **PA Traffic Routes**
4. **Quadrant Routes**

The shared section of roadway must be designated according to the route with the higher hierarchy, (i.e. Figure 2-5, Interstate 83 has a higher ranking than US 322, in this case, the routes would be designated as SR 0083). If both routes are of equal route hierarchy, then the SR is assigned to the route with the lower number (Figures 2-6 through 2-7).

Figure 2-5
Interstate 83 & U.S. 322 Traffic Routes (SR 0083)

Figure 2-6
U.S. Traffic Routes 22 & 322 (SR 0022)

Figure 2-7
U.S. 22 & PA 343 Traffic Routes (SR 0022)

Numbering of Non-Traffic Routes (Quadrant SR's)

Most non traffic route SR's are called "quadrant" routes, the exceptions are 8000 and 9000 SR's, which are mainly ramps or connectors. Counties in general are divided into a four-quadrant layout (as illustrated in Figures 2-8 & 2-9); the quadrant routes are then designated according to their location within each quadrant. For example, quadrant 1 routes are located in the northeastern part of the county and are numbered from 1000 to 1999. Some SR's start in one quadrant and run through another quadrant, when this happens, the SR is numbered according to the quadrant that it began in. Quadrant routes also have a hierarchy with the lower SR number taking precedence over a higher numbered quadrant route.

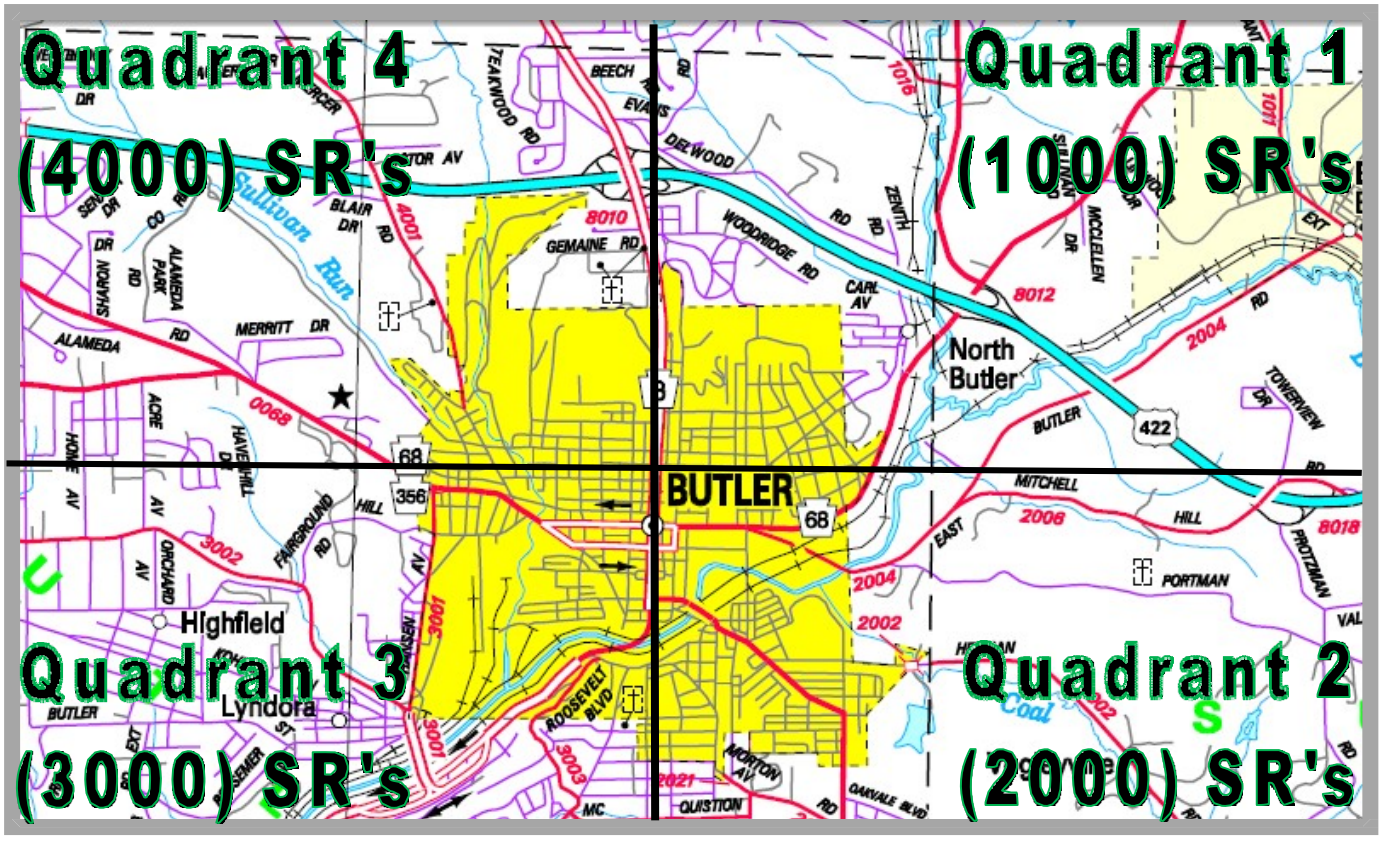


Figure 2-8
Example Quadrant Layout within a County

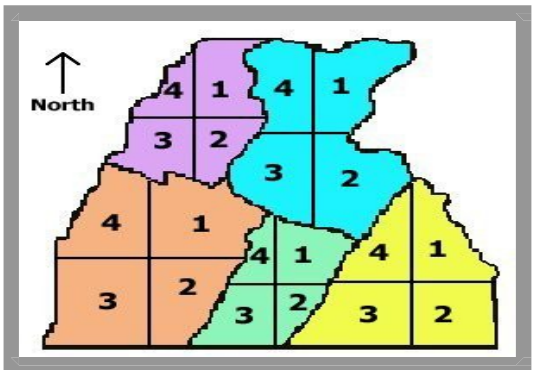


Figure 2-9
Quadrant Layouts for a Group of Counties

Interchanges

An interchange is a road junction that typically uses grade separation, and one or more ramps, to permit traffic on at least one highway to pass through the junction without directly crossing any other traffic stream. It differs from a standard intersection, at which roads cross at grade. Interchanges are almost always used when at least one of the roads is a limited-access divided highway (expressway or freeway), though they may occasionally be used at junctions between two surface streets.

Interchanges are typically numbered sequentially. All ramps within an interchange have the same SR number. Odd numbers are given to interchanges along SR's in the North/South direction; even numbers are given to interchanges along SR's in the East/West direction (Figure 2-10).

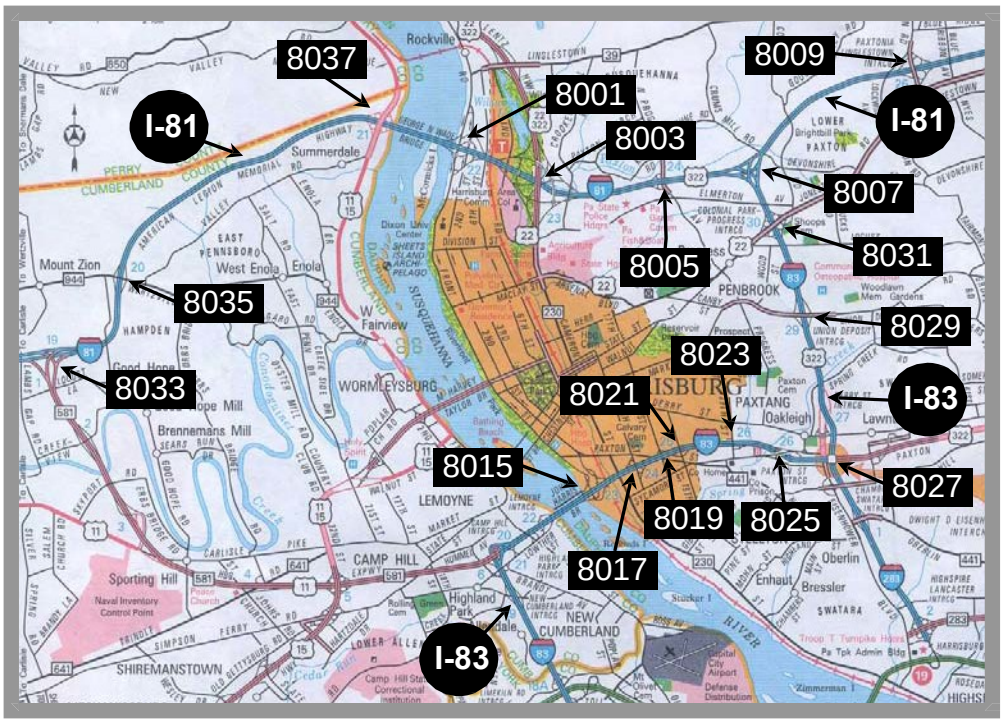


Figure 2-10
Example of Interchange SR Numbering

Note that interchanges along I-81 (which runs North and South), are given sequential odd numbers. The interchanges in Cumberland County are SR's 8033, 8035, and 8037; then numbering restarts in

Dauphin County with SR's 8001, 8003, 8005, 8007, and 8009. Likewise, the interchanges along I-83 (which runs North and South) in Dauphin County are given the sequential odd numbers SR 8015, 8017, 8019, 8021, 8023, 8025, 8027, 8029 and 8031.

Wye's

A wye is a roadway that aids traffic flow at an at-grade intersection (Figure 2-11). A wye is separated from the mainline by some type of median, and must be at least 200 feet in length. If the length is less than 200 feet, then the roadway is to be designated as a connector (also referred to as a "leg").

Separate wye's located at the same at-grade intersection are typically designated with different SR numbers. Wye's are commonly given even SR numbers if the connecting SR is even numbered, or if the wye branches off the Northbound or Eastbound direction of a divided SR. Odd SR numbers are assigned if the connecting SR is odd numbered, or if the wye branches off the Southbound or the Westbound direction of a divided SR.

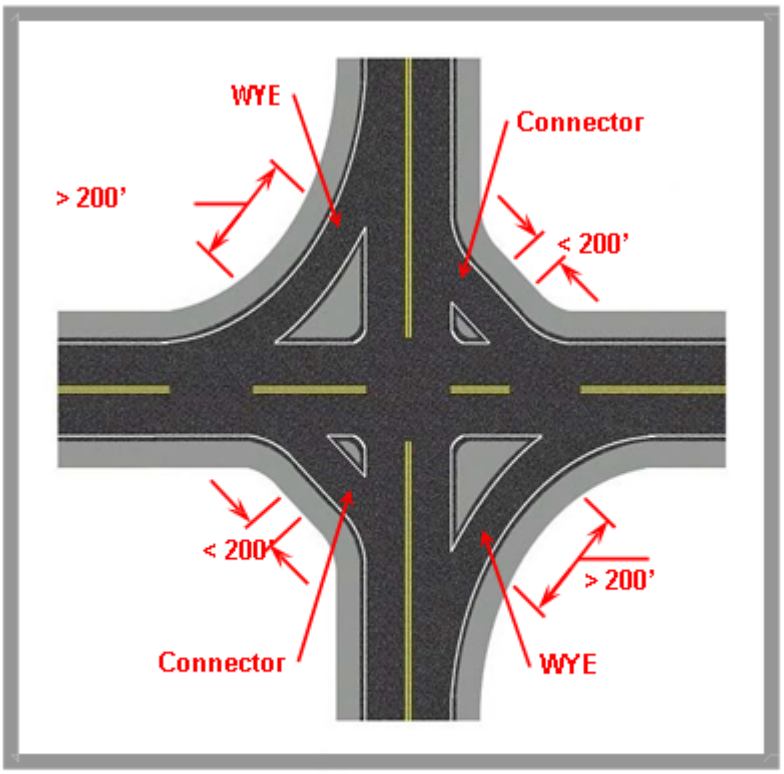


Figure 2-11
Example At-Grade Intersection with Wye's and Connectors

Other SR Numbering Conventions

The last three digits of a relocated Traffic Route are the same as the original Traffic Route, i.e. SR 214 becomes business SR 3214. Rest areas or truck escape ramps are given even numbers if they connect to the Northbound or Eastbound side of an SR, and odd numbers if they connect to the Southbound or Westbound side.

SR Segmentation

Every state route is divided into specified sections of roadway known as segments. Segments can vary in length, but the majority of them are approx. one-half mile in length. Where possible, segments typically start and end at easily identifiable physical features along the roadway such as intersections, bridges, overpasses or railroad tracks.

Since bridge structures are identified by their LRS key, each entire bridge must be contained within a single segment. Therefore, the segment length will equal the length of the bridge in cases where the bridge is longer than one-half mile.

SR's are segmented in the North or East direction, and will normally increase in increments of "tens". Segments are even numbered on undivided roadways, and in the Northbound or Eastbound direction of divided roadways. On the Southbound or Westbound side of divided roadways, there is a corresponding odd numbered segment. Interstate segments are associated with the mile posts.

Segment locations are identified in the field by segment marker signs, which are located according to the segment and offsets found in RMS. On the Southbound or Westbound side of divided roadways, segment markers are placed at the "high end" or "high offset" of the segment that you're going into, because that will correspond to the way you are traveling when you see the signs. Figures 2-12 through 2-14 illustrates segmentation and segment marker location.

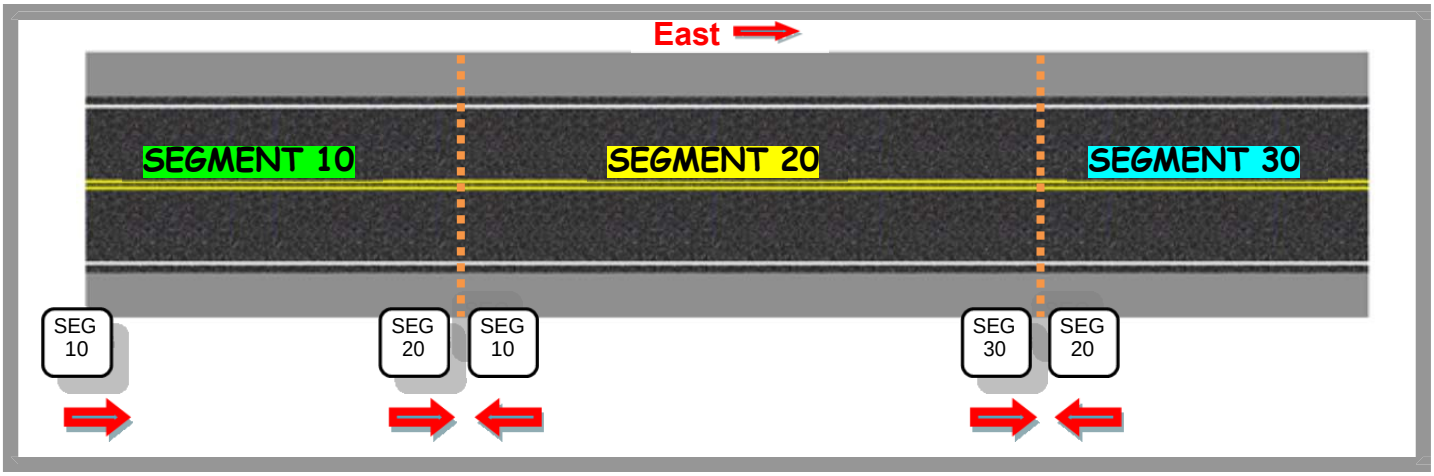


Figure 2-12
Segmentation of an Undivided Roadway

Sequencing of forward and backwards facing signs are shown above in Figure 2-12. The forward signs are shown on the left with their corresponding back facing sign shown to the right. On an undivided roadway, the forward and backward signs are mounted on the same pole and are usually placed on the right side of the road in an Easterly or Northerly direction. In Figure 2-13, you will notice that the westbound signs, that are perpendicular to their corresponding eastbound signs, are signed with the segment you are traveling into, not the one you are leaving.

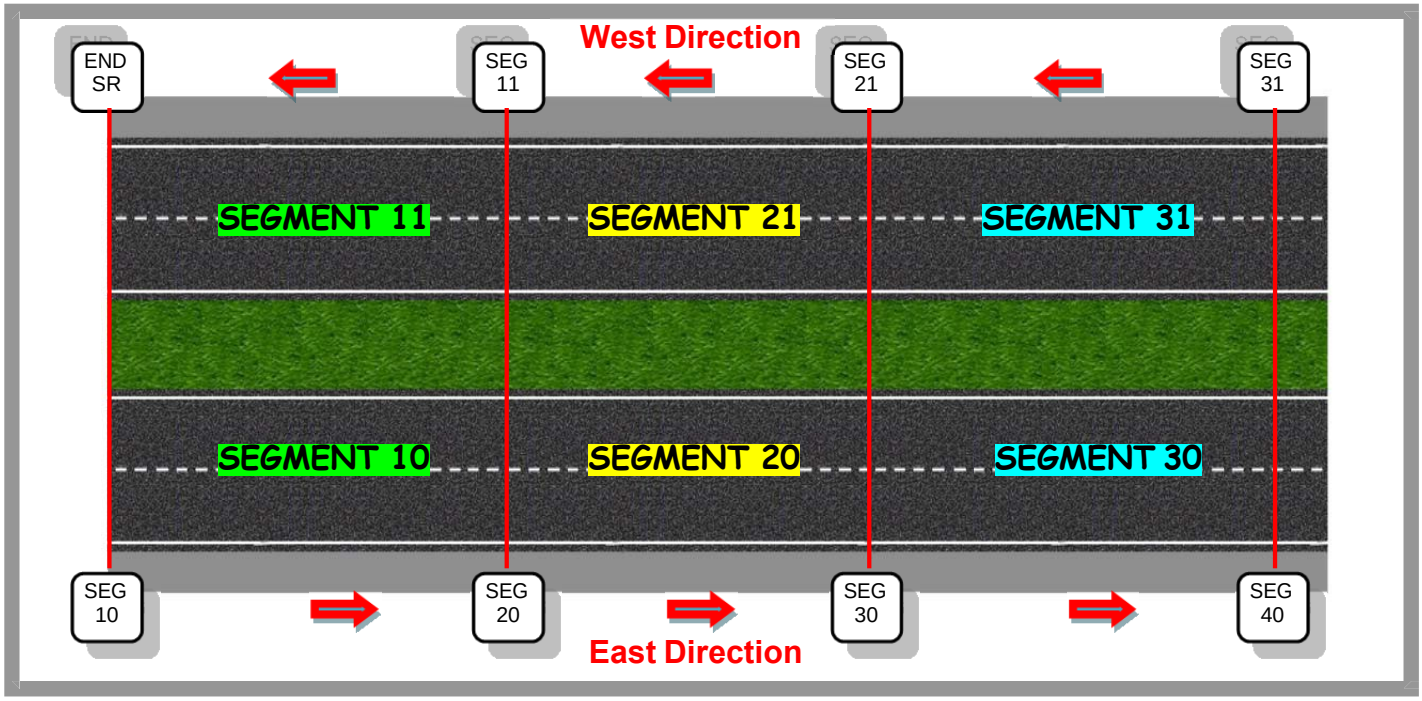


Figure 2-13
Segmentation of a Divided Roadway

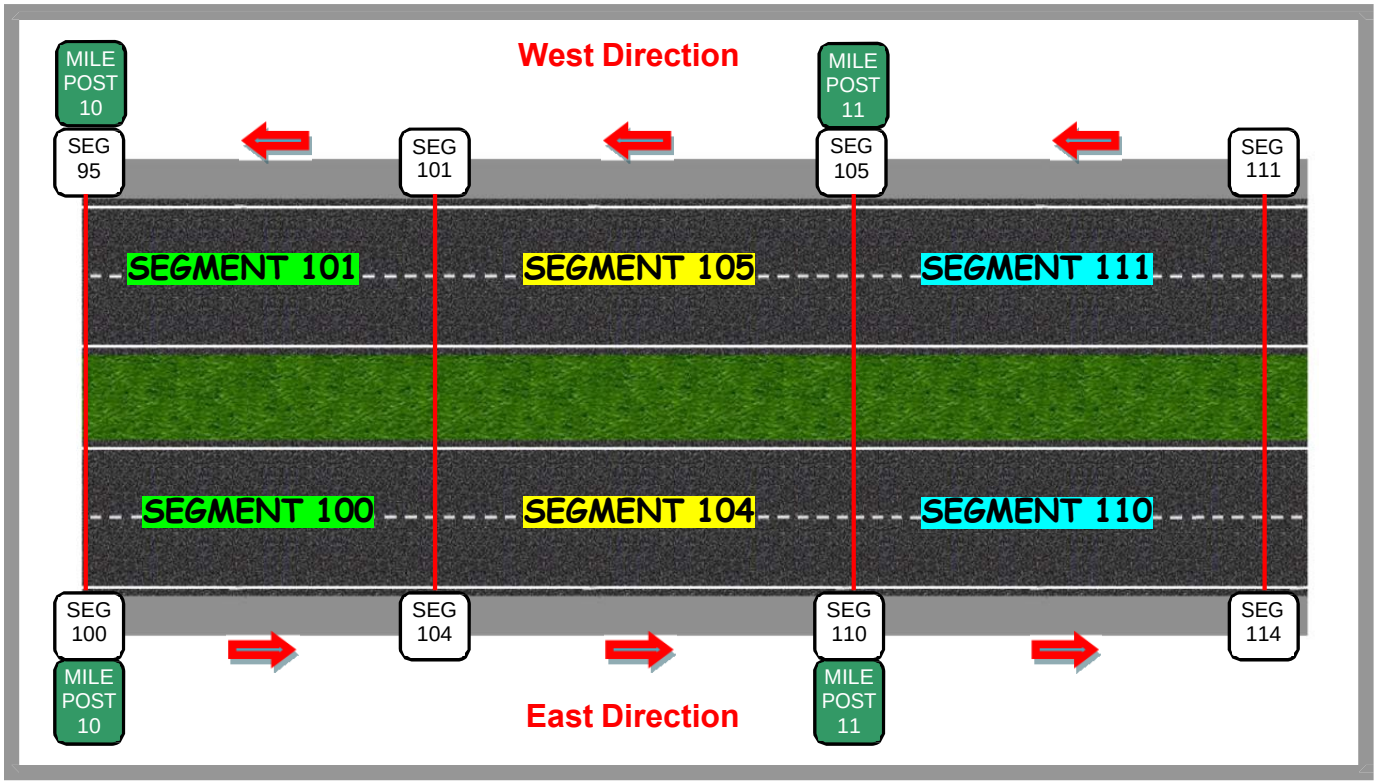


Figure 2-14
Segmentation of an Interstate

Segment Markers

Segment markers allow for easy identification of the LRS segment locations on the state highway system. SR markers indicate the SR and segment numbers at the current location point at which the segment is affixed. Figures 2-15 and 2-16 are photographs of actual segment markers.

Figure 2-15
SR 3012, Segment 140

Figure 2-16
Intersection of SR's 3

Figure 2-17 represents the most common segment marker type. This marker defines the point that SR 1022, segment 0010 begins. This type of marker is found on an undivided highway or in the Northbound or Eastbound direction of a divided highway. Offset 0000 is located at the feature associated with the sign or at the point on the road that is perpendicular to the sign.

Figure 2-18 defines the point that SR 1022, segment 11 is entered. This type of marker is found in the Southbound or Westbound direction of a divided highway. It is also found on a one-way street that runs West or South. Markers for odd numbered segments are located at the "end" of the segment since that is the point that the segment is entered as the route is traveled. Therefore, the ending offset (highest offset value) is located at the feature associated with the sign or at the point on the road that is perpendicular to the sign.

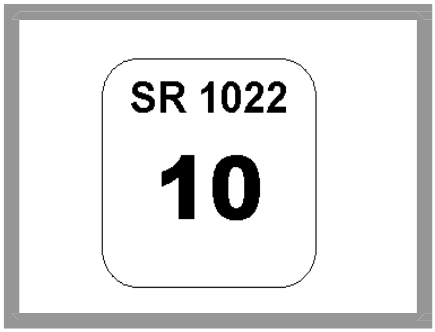


Figure 2-17
SR 1022, Segment 10

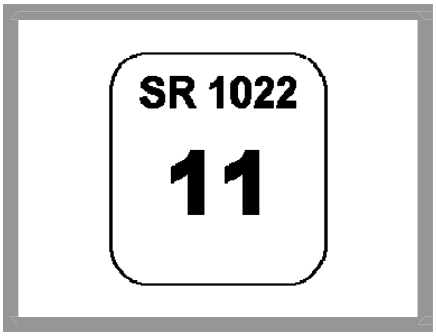


Figure 2-18
SR 1022, Segment 11

Figure 2-19 illustrates the marker type used to identify the ending point of an SR. This type of marker is typically found at the end of an SR that doesn't connect to any other SR or a ramp. The ending offset (highest offset value), is located at the feature associated with the sign or at the point on the road that is perpendicular to the sign.

A segment marker indicating the end of the current segment is depicted in Figure 2-20. This type of marker is most commonly found at the end of a bridge or the point at which a section of an SR has been partially turned back. The ending offset (highest offset value), is located at the feature associated with the sign or at the point on the road that is perpendicular to the sign.

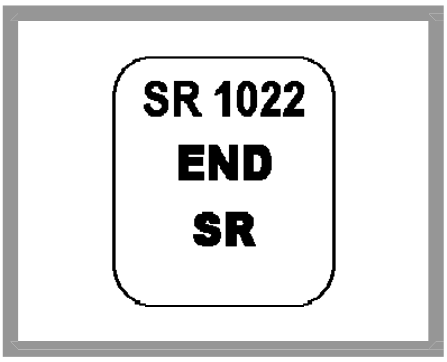


Figure 2-19
End SR 1022

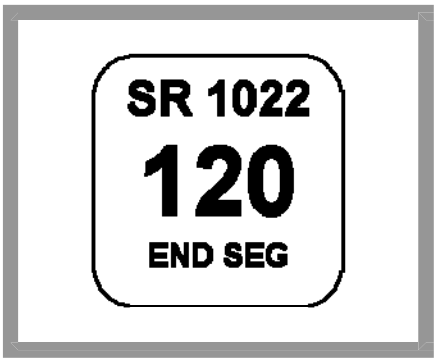


Figure 2-20
End Segment, SR 1022

Ramp segment markers are represented in Figures 2-21 and 2-22. A "begin ramp" segment marker (Figure 2-21) is found at the beginning of any ramp; offset 0000 is located at the gore area associated with the sign. An "end ramp" segment marker (Figure 2-22) locates the ending point of a ramp with the ending offset (highest offset value) located at the gore area associated with the sign.

Figure 2-21
Begin SR 8022, Segment 500

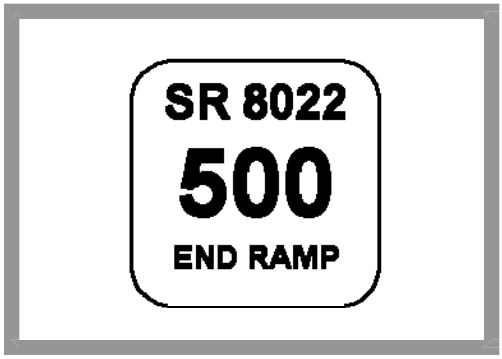


Figure 2-22
End SR 8022, Segment 500

Figures 2-23 through 2-27 depict intersection markers. Figure 2-23 indicates the intersection with SR 1022 and that segment 10 is to the right. Offset 0000 is located at the point where SR 1022 and the traveled SR intersect. This type of marker is found at intersections of at least two divided or undivided SR's.

Figure 2-24 depicts the intersection with SR 1022, where segment 20 is to the right and segment 30 is to the left. Segment 30, offset 0000, and the ending offset (highest offset value) of segment 20 are located at the point where SR 1022 and the traveled SR intersect. This type of marker is found on intersections of at least two undivided SR's.

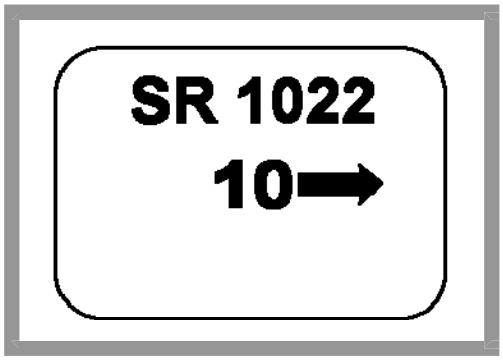


Figure 2-23
Intersection with SR 1022

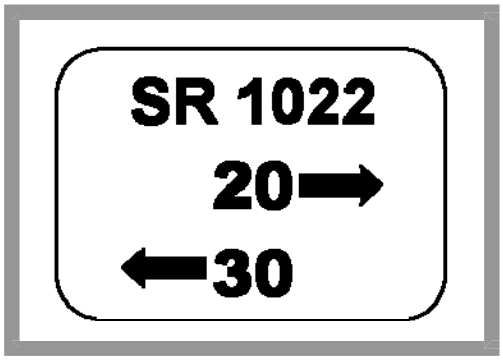


Figure 2-24
Intersection with SR 1022

Figure 2-25 represents the intersection with SR 1022, which is divided with segment 21 to the right and segment 31 to the left. Segment 31, offset 0000, and the ending offset (highest offset value) of segment 21 are located at the point where SR 1022 and the traveled SR intersect. This type of marker is found on intersections with the Southbound or Westbound direction of a divided SR. Figure 2-26 indicates the intersection with divided SR 1022, where segment 30 is to the right and segment 21 is to the left. Segment 30, offset 0000 and the ending offset (highest offset value) of segment 21 are located at the intersection of the traveled SR. This type of marker is found where the intersecting SR is divided on one side, and undivided on the other, of the traveled SR.

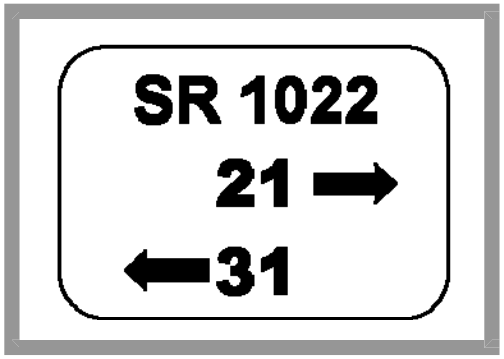


Figure 2-25
Intersection with SR 1022

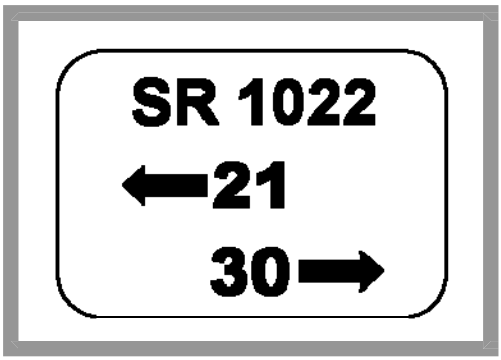


Figure 2-26
Intersection with SR 1022

Figure 2-27 depicts the intersection with SR 1022, where segment 20 continues through the intersection. This type of marker is found on intersections with divided or undivided SR's.

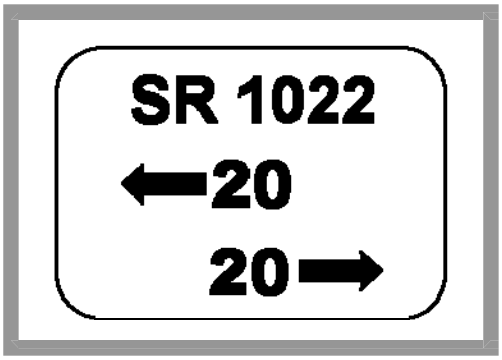


Figure 2-27
SR Intersection with SR 1022

Figures 2-28 and 2-29 depict some other types of segment signs that are non-typical, but very useful. 2-28 is used to help locate a state-owned bridge that is located on a local road; this sign is usually found on an SR that intersects with the local road.

Figure 2-29 is found on the south or west side of a divided SR, this sign shows the total segment length of the segment you are entering. This sign is helpful for determining a starting reference point when there is no SLD available. Detailed information on SR segment marker installations can be found in the last section of this manual.

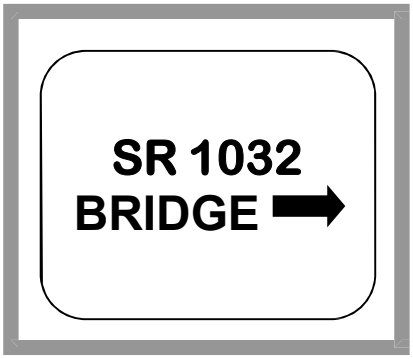


Figure 2-28
Turnback Road with a State-Owned Bridge

Figure 2-29
Total Segment Length of West or South Segment

Null Segments

When multiple SR's share a section of roadway, the SR assignment is based on the previously defined hierarchy. All the other SR's shared by that section have a "Null" section. Nulls are also used when a portion of a route is not State-owned. Since non-State roadways are not defined in the RMS, all null segments are given an arbitrary length of 100 feet. Null segment numbering always begins with a "7" followed by a number that is the next highest even or odd number (whether it's divided or undivided) in sequence to the previous segment prior to the null area. In Figure 2-30, SR 1057 contains null segment "7022" because it shares a section of roadway with SR 0049 before continuing onto segment 30.

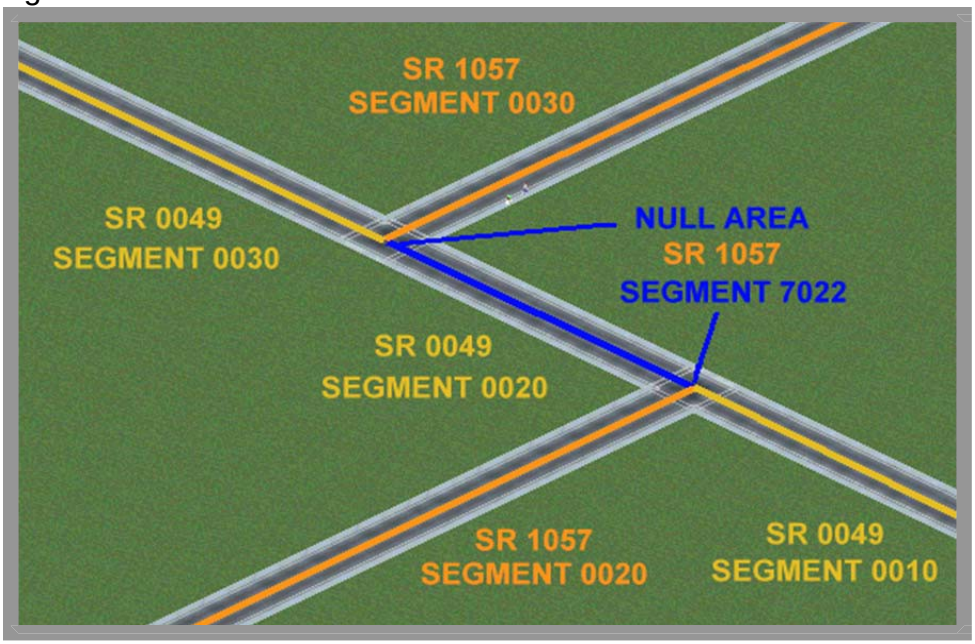


Figure 2-30
Null Section for SR 1057 (Sharing Roadway with SR 0049)

Figures 2-31 & 2-32 demonstrate actual locations of null segments, due to multiple routes designated on the same roadway.

Figure 2-31
Null Section for SR 0322
(Sharing Roadway with SR 0022)

Figure 2-32
Null Section for SR 0322
(Sharing Roadway with SR 0083)

Turnback Segments

Turnback segments are also used when ownership of an SR or a portion of an SR is "turned back" to a Municipality (Township, Borough, City, etc.). These nulls are referred to as Turnbacks. Often only part of an SR is turned back to a municipality while the other sections remain State-owned. For example, the State may continue to maintain ownership of the bridges along a route. Figure 2-33 illustrates a typical Turnback area where the state retains ownership of the bridges and the rest of the road becomes owned by the municipality.

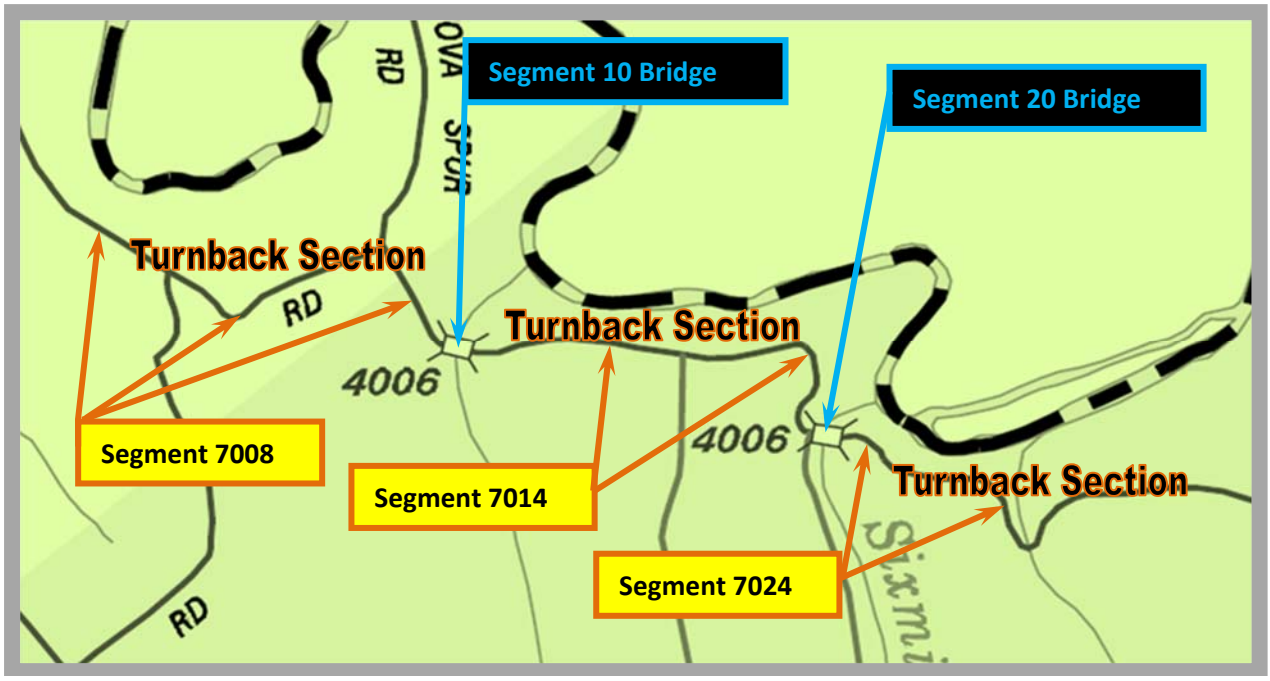


Figure 2-33
Turnback SR with State Owned Bridges

Figures 2-34 & 2-35 demonstrate actual locations of turnback segments. In these examples the roadways were turned back, but the State continues to own and maintain the bridges. Note that there are segment markers at each end of the bridge, indicating that the entire "non-turned back" segment is the bridge and that each bridge must have its own unique segment number.

Figure 2-34
Partial Turnback to Township
with State-Owned Bridge

Figure 2-35
Partial Turnback to Township
with State-Owned Bridge

Interchange Segmentation

The 8000 series SR number assigned to a specific interchange represents all the ramps at that interchange. Ramps within an interchange are segmented according to the mainline SR's involved. The higher priority mainline route (according to the previously defined route hierarchy) will establish the quadrant configuration for the interchange. Quadrants are defined according to the following convention (Figure 2-36):

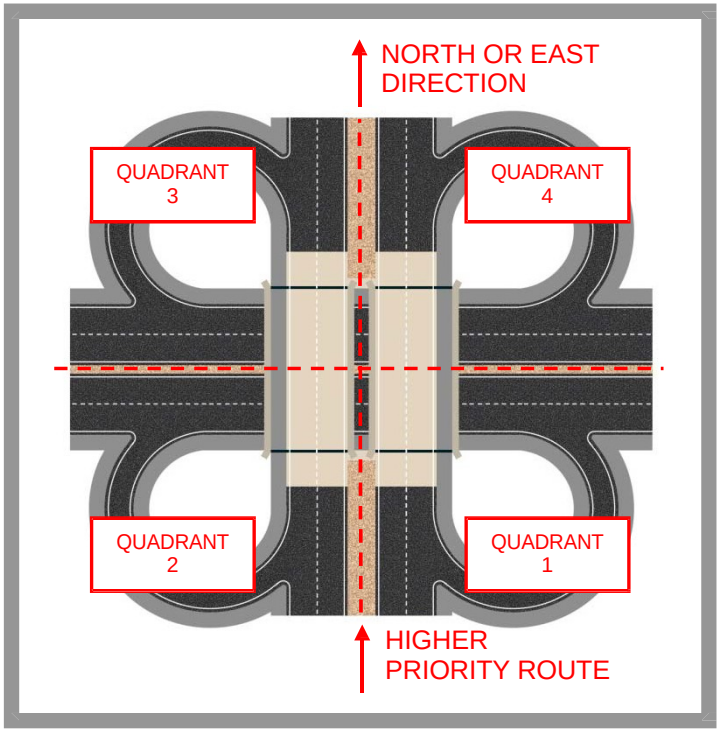


Figure 2-36
Interchange Quadrants

Quadrants are always defined according to this convention, even if there are no ramps in a particular quadrant. Each ramp in a quadrant is assigned a specific segment number, according to the following table. Ramps are always given even segment numbers, preferably in increments of "tens."

Quadrant	Acceptable Segment Numbers	Preferred Segment Number Sequencing
1	0010-0240	0010, 0020, 0030, etc.
2	0250-0490	0250, 0260, 0270, etc.
3	0500-0740	0500, 0510, 0520, etc.
4	0750-0990	0750, 0760, 0770, etc.

Ideally, if there are multiple ramps within the same quadrant, then the most outward ramp is given the lowest segment number, and the others are numbered sequentially inward. Figures 2-37 & 2-38 illustrate typical interchange quadrants and segmentation.

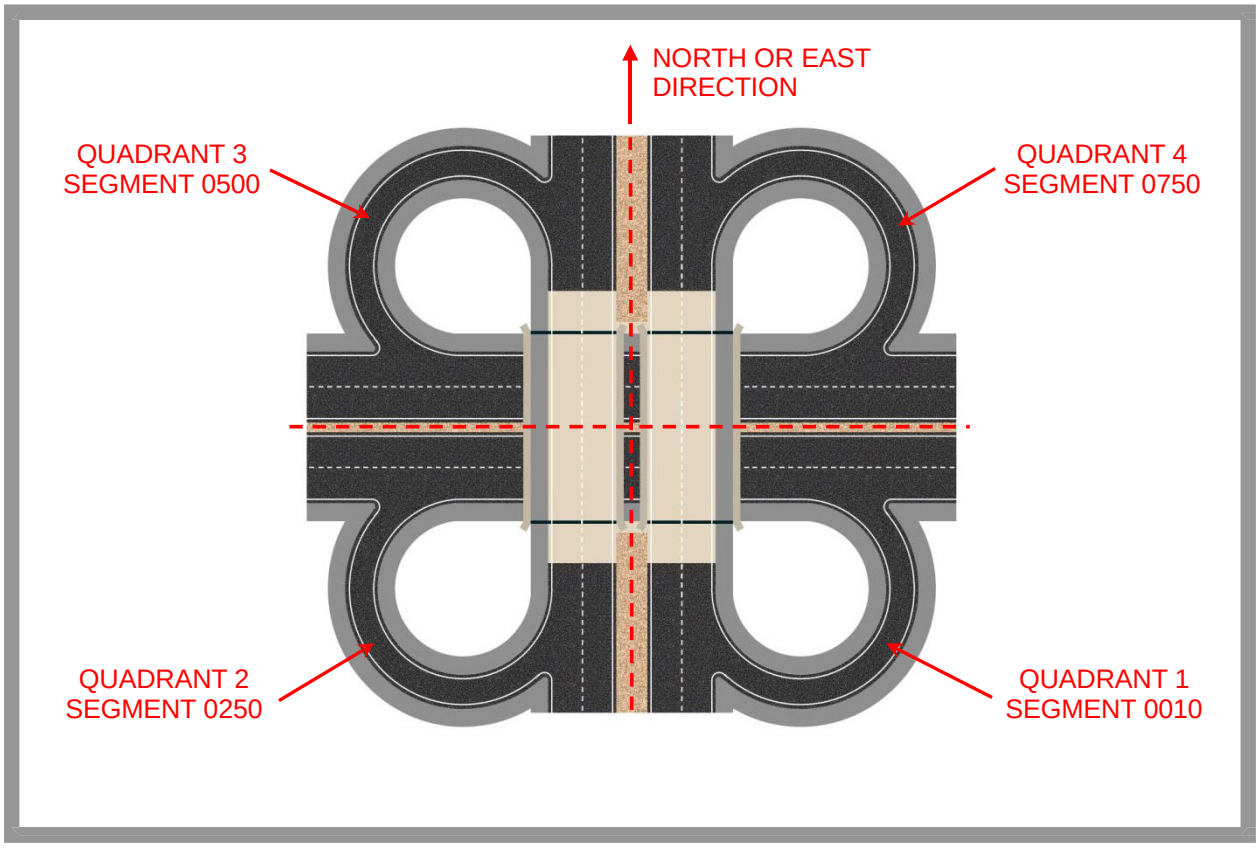


Figure 2-37
Ramp Quadrant Layout & Segmentation

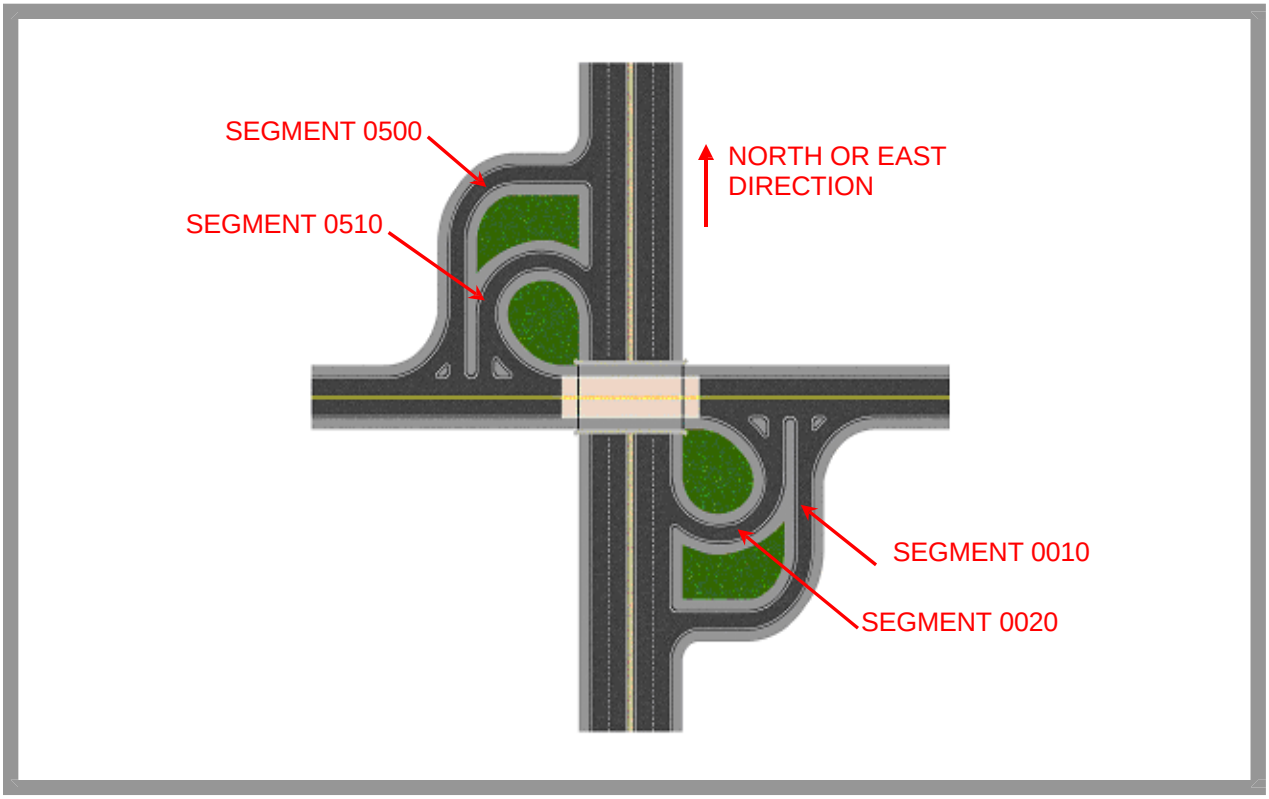


Figure 2-38
Ramp Quadrant Layout & Segmentation

A ramp must be at least 200 feet in length to be given a unique segment number. If the length is less than 200 feet, then the roadway is to be designated as a connector (also referred to as a “leg”).

Ramps should begin or end at intersections perpendicular to connecting roadways if there is a stop sign or traffic light. Additional legs that intersect with the ramp will be considered connectors (<200 feet) or additional segments (>200 feet). In the event there is no stop sign or traffic light, the leg with a yield sign should be the connector (<200 feet) or alternate segment (>200 feet). Figures 2-39 & 2-40 illustrate typical ramps connecting to perpendicular intersections. Figure 2-39 illustrates the correct way to segment this type of ramp. Figure 2-40 illustrates the incorrect way to segment this type of ramp.

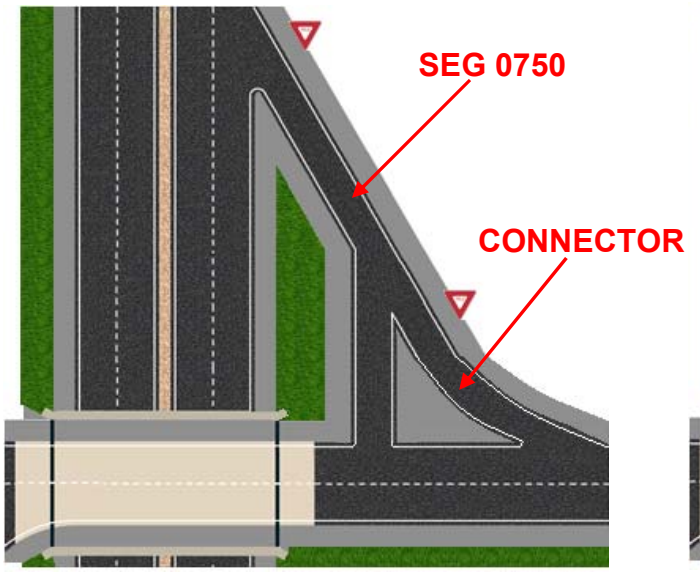


Figure 2-39
Ramp Segment with Connector (Correct)

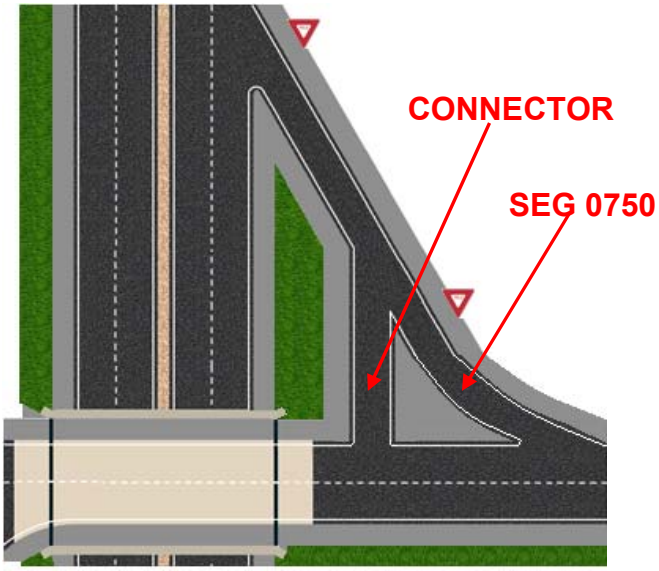


Figure 2-40
Ramp Segment with Connector (Incorrect)

9000 Route Segmentation

Wye's, rest areas, truck escape ramps, and other 9000 routes are always given even segment numbers, preferably in increments of "tens. 9000 routes cannot be bi-directional unless each direction of the route has its own segment (does not apply to park and rides). These routes are generally short in length, however, so segment number 10 is typically assigned to the entire route.

As stated previously, separate wyes located at the same at-grade intersection are typically designated with different SR numbers. However, they may all be given the same SR number, and each designated as unique segments, in the same manner that individual interchange ramps are designated. In these cases, designate segment numbers based on the same quadrant convention defined for interchange ramps.

If there are separated parking areas for cars and trucks within the same rest areas, then the parking area closest to the mainline is designated as segment 10, and the other is designated as segment 20. Figures 2-41 & 2-42 illustrate typical rest area segmentation.

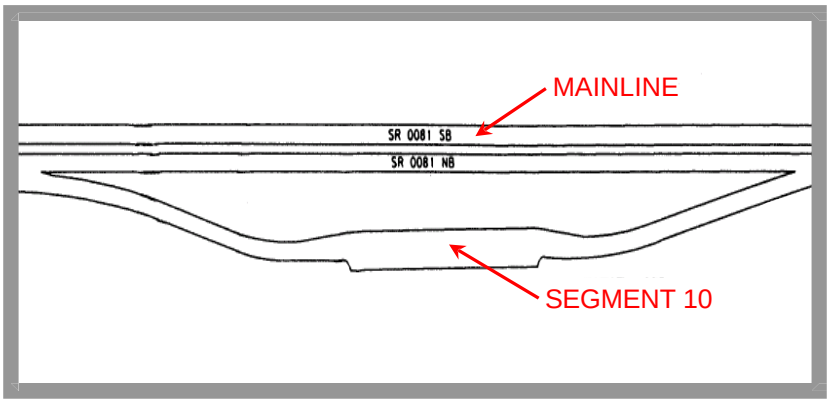


Figure 2-41
Rest Area with One Parking Area

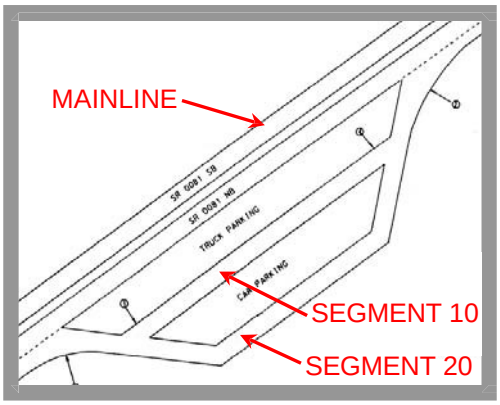


Figure 2-42
Rest Area with Two Parking Areas

Offsets

The location of every roadway feature along a state route is referenced by an offset value, which identifies the distance in feet from the start of the segment to that particular feature. Any feature that exists at the segment start point has an offset value of zero. Offset values always increase in the North or East direction. Therefore, when travelling South or West, the route will decrease in segment and offset (Figure 2-43).

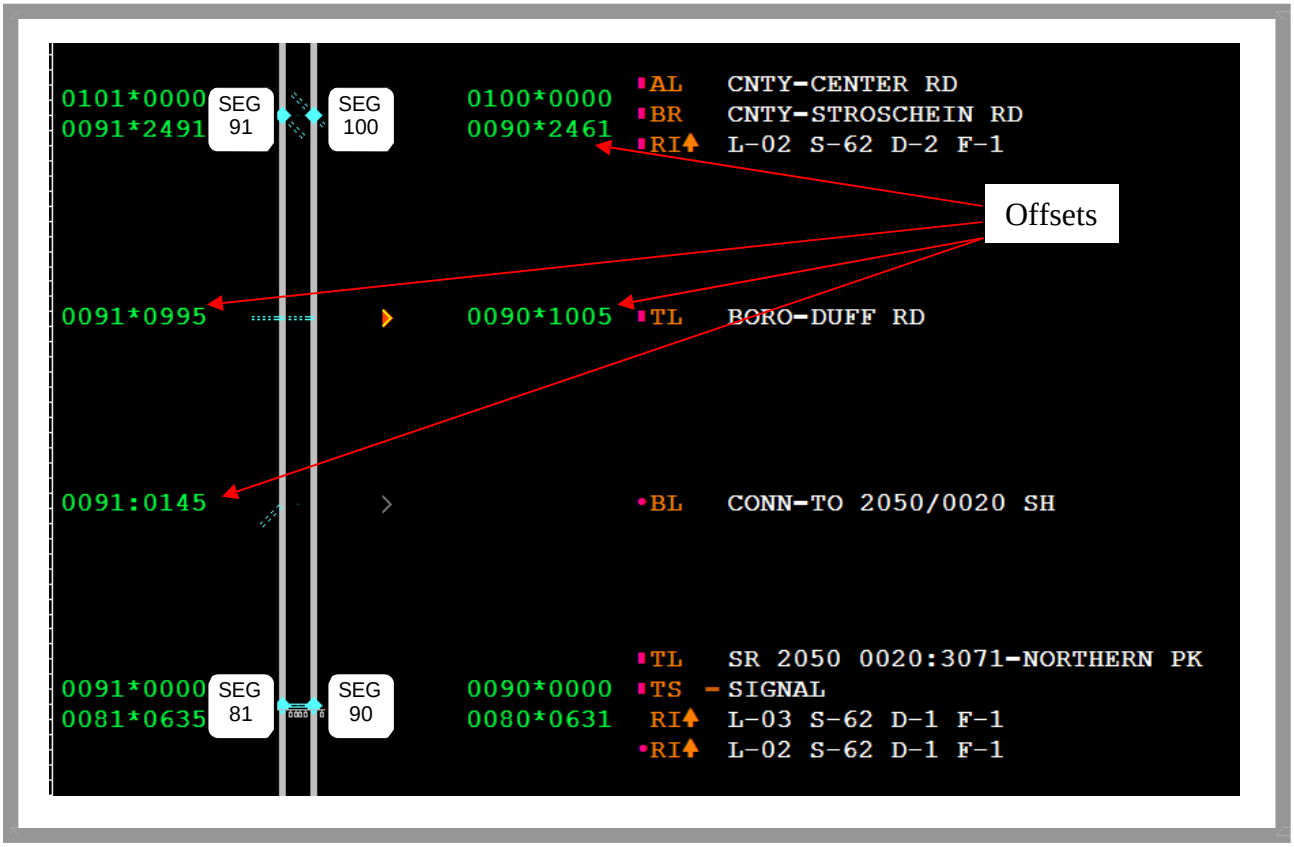


Figure 2-43
Offset of an SR that is Divided

3 LRS/RMS Codes

3 LRS/RMS Codes

LRS Codes

LRS Feature/Intersection Code Table

The following table defines all valid feature codes recognized by the current LRS van software.

(AL)	Y-Ahead Left Intersection	(PI)	Point of Interest
(AR)	Y-Ahead Right Intersection	(PB)	Point Back Intersection
(BG↑)	Bridge Begin	(RA)	Reference Ahead
(BG↓)	Bridge End	(RB)	Reference Back
(BL)	Y-Back Left Intersection	(RF)	Reference Point Label
(BR)	Y-Back Right Intersection	(RI↑)	Roadway Information Begin
(CA)	Road Closed Ahead Intersection	(RI↓)	Roadway Information End
(CB↓)	County Name End	(RN)	Entrance Ramp
(CB↑)	County Name Begin	(RO)	Rotary Intersection
(CC)	Canned Comment	(RR)	Railroad Track
(CK)	Road Closed Back Intersection	(RS)	Roadside Rest
(CO)	Comment	(RX)	Exit Ramp
(CR)	Cross Intersection	(SG↑)	Segment Begin
(DC)	Divided Connector	(SG↓)	Segment End
(DP)	Drainpipe	(SL↑)	Sound Wall Left Begin
(EB)	Ramp Entrance Both Directions	(SL↓)	Sound Wall Left End
(ER)	Error or Unknown Feature Type	(SR↑)	Sound Wall Right Begin
(IA)	Intersection Ahead	(SR↓)	Sound Wall Right End
(IB)	Intersection Back	(SS)	Sign Structure
(LN)	T-Left Entrance Ramp	(SX)	Signalized Pedestrian Crossing
(LX)	T-Left Exit Ramp	(TB↑)	Turnback Begin
(MB↓)	Municipality Name End	(TB↓)	Turnback End
(MB↑)	Municipality Name Begin	(TK)	Truck Escape Ramp
(MM)	Memo Comment	(TL)	T-Left Intersection
(MO)	RWIS Monitoring Site	(TR)	T-Right Intersection
(MP)	Milepost	(TS)	Traffic Light or Signal
(NC↑)	Route name Begin	(TU↑)	Tunnel Begin
(NC↓)	Route Name End	(TU↓)	Tunnel End
(N2↑)	Second Route Name Begin	(WR↑)	Retaining Wall Right Begin
(N2↓)	Second Route Name End	(WR↓)	Retaining Wall Right End
(N3↑)	Third Route Name Begin	(WL↑)	Retaining Wall Left Begin
(N3↓)	Third Route Name End	(WL↓)	Retaining Wall Left End
(NL)	Entrance Ramp Left	(XB)	Ramp Exit Both Directions
(NR)	Entrance Ramp Right	(XL)	Exit Ramp Left
(OP)	Overpass	(XR)	Exit Ramp Right
(PA)	Point Ahead Intersection		

Figure 3-1
LRS Code Table

Determining Intersection Types

Intersection feature types in RMS and LRS are based on how many degrees of angle there are between the center of the road that you are traveling on and the center of the road that intersects with that road. The diagram represented in figure 3-2 shows the relationship between the center of the road and the degrees of angle used in determining the feature type. As an example, roads that have an intersection that is between 112.5° to 157.5° (green section) would be considered a Back-Right (BR). When trying to determine intersection types in the field this model should always be used as a guide.

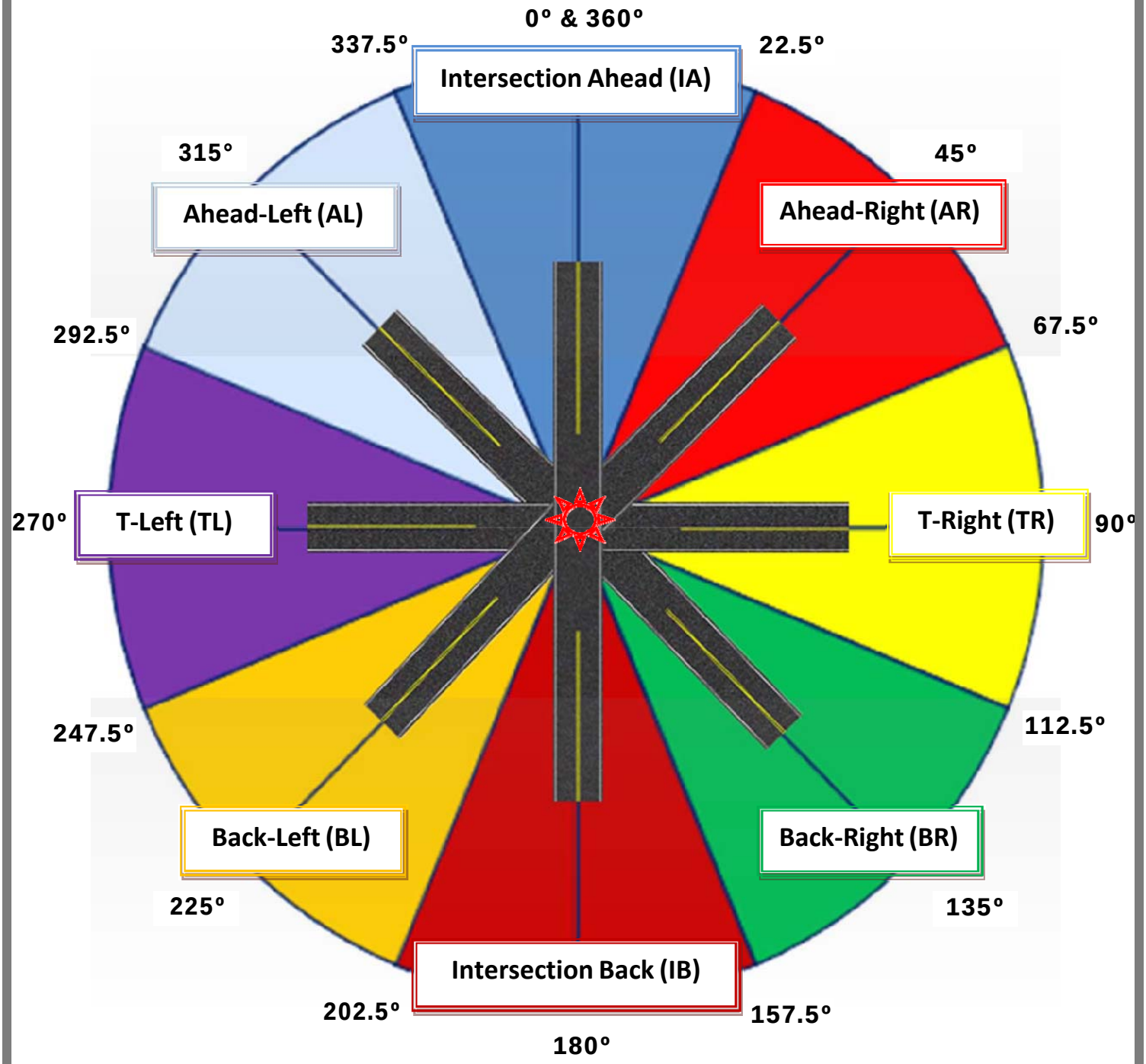


Figure 3-2
Intersection Angles

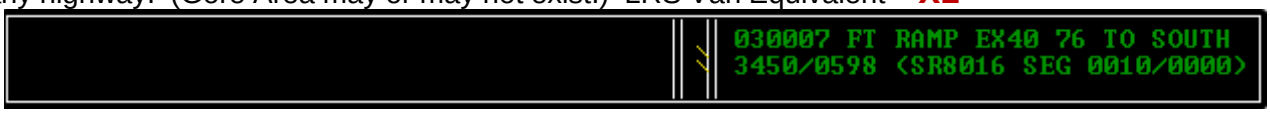
RMS Intersection Coding and LRS Coding Equivalents

- **AHEADL** (Y-Ahead Left Intersection) – Identifies a road which intersects the mainline roadway at approximately a 315 degree angle. LRS Van Equivalent = **AL**

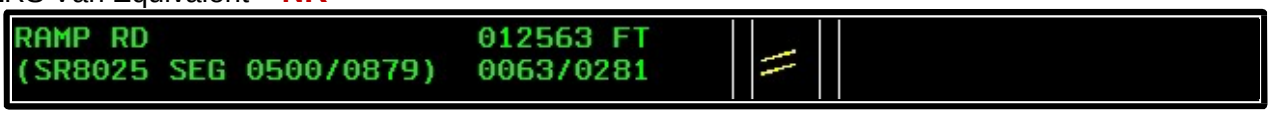
- **AHEADR** (Y-Ahead Right Intersection) – Identifies a road which intersects the mainline roadway at approximately a 45 degree angle. LRS Van Equivalent = **AR**

- **ALENTR** (Ahead Left Enter) – Identifies a ramp entering unto the mainline roadway from the left at approximately a 315 degree angle. Most commonly found on limited access highways in the southbound or westbound direction, but can occur on any highway. (Gore Area may or may not exist.) LRS Van Equivalent **NL**

- **ALEXIT** (Ahead Left Exit) – Identifies a ramp exiting off the mainline roadway to the left at approximately a 315 degree angle. Most commonly found on limited access highways but can occur on any highway. (Gore Area may or may not exist.) LRS Van Equivalent = **XL**

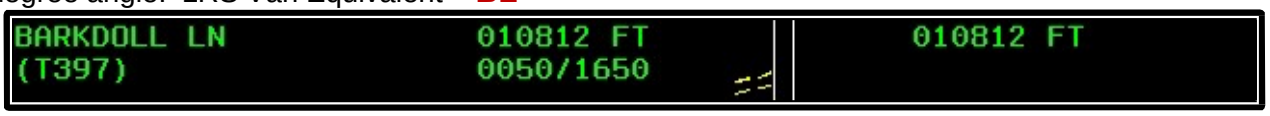


- **ARENTR** (Ahead Right Entrance) – Identifies a ramp entering unto the mainline roadway from the right at approximately a 45 degree angle. Most commonly found on limited access highways in the southbound or westbound direction, but can occur on any highway. (Gore Area may or may not exist.) LRS Van Equivalent = **NR**



- **AREXIT** (Ahead Right Exit) – Identifies a ramp exiting off the mainline roadway to the right at approximately a 45 degree angle. Most commonly found on limited access highways but can occur on any highway. (Gore Area may or may not exist.) LRS Van Equivalent = **XR**

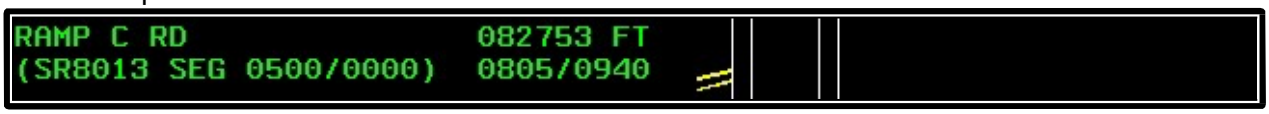
- **BACKL** (Y-Back Left Intersection) –Identifies a road which intersects the mainline roadway at a 225 degree angle. LRS Van Equivalent = **BL**



- **BACKR** (Y-Back Right Intersection) – Identifies a road which intersects the mainline roadway at a 135 angle. LRS Van Equivalent = **BR**

- **BLENTR** (Back Left Entrance) – Identifies a ramp entering onto the mainline roadway from the left approximately a 225 degree angle. Most commonly found on limited access highways but, can occur on any highway. (Gore Area may or may not exist.) LRS Van Equivalent=**NL**

- **BLEXIT** (Back Left Exit) – Identifies a ramp exiting off of the mainline roadway to the left at approximately a 225 degree angle. Most commonly found on limited access highways in the southbound or westbound direction, but can occur on any highway. (Gore Area may or may not exist.) LRS Van Equivalent = **XL**



- **BRENTR** (Back Right Entrance) – Identifies a ramp entering onto the mainline roadway from the right at approximately a 135 degree angle. Most commonly found on limited access highways but, can occur on any highway. (Gore Area may or may not exist.) LRS Van Equivalent = **NR**

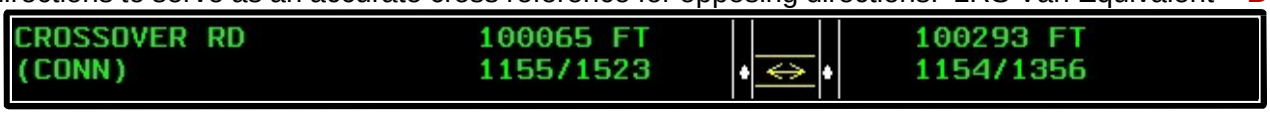
- **BREXIT** (Back Right Exit) – Identifies a ramp exiting off the mainline roadway from the right at approximately a 135 degree angle. Most commonly found on limited access highways in the southbound or westbound direction, but can occur on any highway. (Gore Area may or may not exist.) LRS Van Equivalent = **XR**

- **CLOSEA** (Closed Ahead) – Identifies a section of roadway that is closed permanently to traffic but the right-of-way is State-owned. LRS Van Equivalent = **CA**

- **CLOSEB** (Closed Back) – Identifies a section of roadway that is closed permanently to traffic but the right-of-way is State-owned. LRS Van Equivalent = **CK**

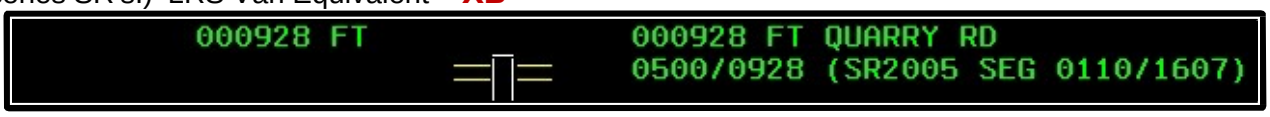
- **CROSS** (Cross Intersection) – Identifies a road which intersects the mainline roadway at a 90 and 270 degree angle. LRS Van Equivalent = **CR**

- **DIVCON** (Divided Connector) – Identifies a roadway or section of roadway which serves as a connection between opposing directions of travel of a SR. This attribute should be located in both directions to serve as an accurate cross reference for opposing directions. LRS Van Equivalent = **DC**



- **ENTRB** (Entrance Both) – Identifies a ramp which is accessible from either direction of the mainline roadway with which it intersects. (This code is exclusively used on 8000 & 9000 series SR's.) LRS Van Equivalent = **EB**

- **EXITB** (Exit Both) – Identifies a ramp which exits onto the mainline roadway and permits access to either direction of roadway with which it intersects. (This code is exclusively used on 8000 & 9000 series SR's.) LRS Van Equivalent = **XB**



- **INTERA** (Intersection Ahead) – A contiguous intersection positioned in front of a SR when another intersection is also present at this location. (At a null or turnback area the INTERA is the actual road being nulled over.) LRS Van Equivalent = **IA**

- **INTERB** (Intersection Back) – A contiguous intersection positioned behind a SR when another intersection is also present at this location. (At a null or turnback area the INTERB is the actual road being nulled over.) LRS Van Equivalent = **IB**

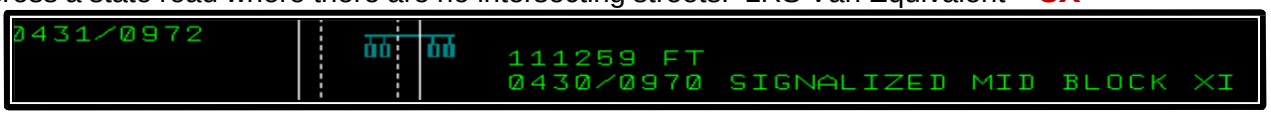
- **POI** (Point of Interest) – Identifies an intersection which is utilized by the Automated Permit Routing/Analysis System (APRAS). LRS Van Equivalent = **PI**

- **REFAHD** (Reference Ahead) – A contiguous intersection positioned in front of a SR when no other intersection exists at this location. (At a null or turnback area the REFAHD is the actual road being nulled over.) LRS Van Equivalent = **RA**

- **REFBAK** (Reference Back) – A contiguous intersection positioned behind a SR when no other intersection exists at this location. (At a null or turnback area the REFBAK is the actual road being nulled over.) LRS Van Equivalent = **RB**

- **ROTARY** (Rotary Intersection) – Identifies a circular intersection which has a center barrier diameter greater than 20 feet. Multiple roads may intersect at various angles. Often referred to as a roundabout, traffic circle or rotary. LRS Van Equivalent = **RO**

- **SPEDX** (Signalized Pedestrian Crossing) – Identifies a traffic signal which is used for pedestrians to cross a state road where there are no intersecting streets. LRS Van Equivalent = **SX**

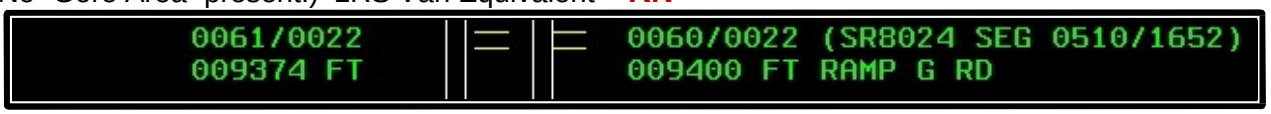


- **TLEFT** (T-Left Intersection) – Identifies a road which intersects a SR at a 270 degree angle. LRS Van Equivalent = **TL**

- **TLENTR** (T-Left Entrance) – Identifies a ramp which enters the main roadway at a 270 degree angle. (No "Gore Area" present.) LRS Van Equivalent = **LN**

- **TLEXIT** (T-Left Exit) – Identifies a ramp which exits the main roadway at a 270 degree angle. (No "Gore Area" present.) LRS Van Equivalent = **LX**

- **TRENTR** (T-Right Entrance) – Identifies a ramp which enters the main roadway at a 90 degree angle. (No "Gore Area" present.) LRS Van Equivalent = **RN**



- **TREXIT** (T-Right Exit) – Identifies a ramp which exits the main roadway at a 90 degree angle. (No "Gore Area" present.) LRS Van Equivalent = **RX**

- **TRIGHT** (T-Right Intersection) – Identifies a road which intersects a SR at a 90 degree angle. LRS Van Equivalent = **TR**

RMS/LRS Intersection Code Conversion Table

Intersection coding in the LRS van software and the RMS is not identical. LRS is limited to a two-character intersection code while RMS utilizes up to a six-character code. The following table displays the intersection code conversion currently being utilized.

RMS CODE	LRS CODE
AHEADL	(AL)
AHEADR	(AR)
ALENTR	(NL)
ALEXIT	(XL)
ARENTR	(NR)
AREXIT	(XR)
BACKL	(BL)
BACKR	(BR)
BLENTR	(NL)
BLEXIT	(XL)
BRENTR	(NR)
BREXIT	(XR)
CLOSEA	(CA)
CLOSEB	(CK)
CROSS	(CR)
DIVCON	(DC)
ENTRB	(EB)
EXITB	(XB)
INTERA	(IA)
INTERB	(IB)
POI	(PI)
REFAHD	(RA)
REFBAK	(RB)
ROTARY	(RO)
SPEDX	(SX)
TLEFT	(TL)
TLENTR	(LN)
TLEXIT	(LX)
TRENTR	(RN)
TREXIT	(RX)
TRIGHT	(TR)

Figure 3-3
RMS to LRS Conversion Codes

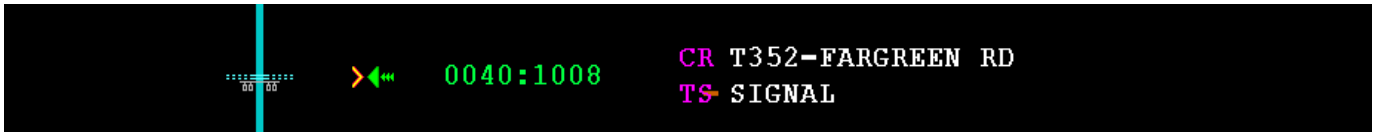
*Note: Other codes that are used for structures in LRS are not shown in Figure 3-3; this table illustrates only codes that are utilized on the RMS Intersection Screen.

RMS Signal Codes

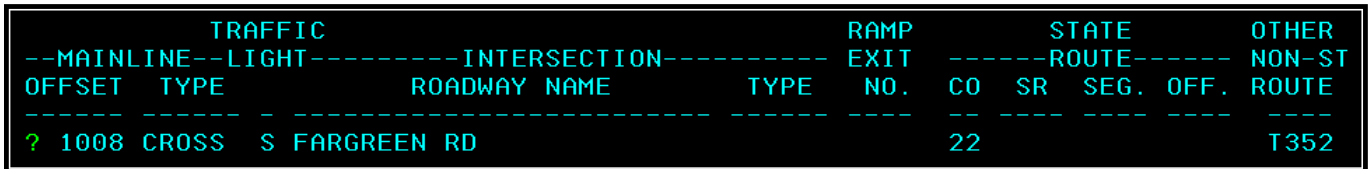
Signalized coding in the LRS van software and the RMS is not identical. RMS utilizes a one letter signal code whereas LRS uses one two 2 letter code with comments describing the type. The codes are entered in the Traffic light column of the intersection screen. The following are examples how RMS displays the signalized codes currently being utilized.

- **Traffic Signal** – Identifies an intersection which utilizes automatically operated colored lights, typically red, amber, and green, for controlling the movement of traffic at road intersections.
  RMS code = **S**

LRS SLD Display

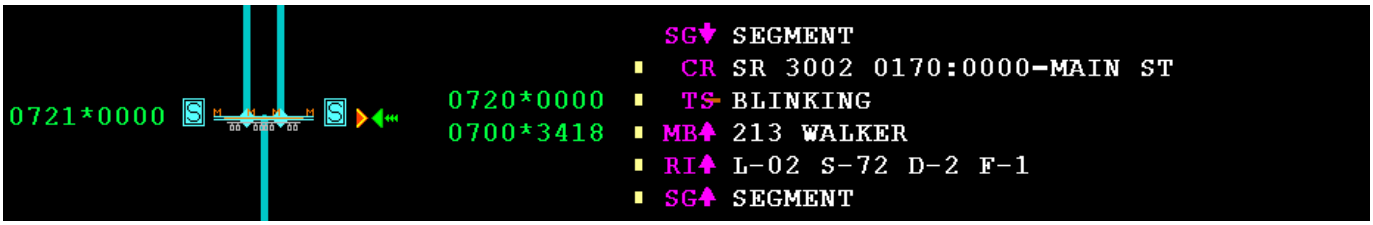


RMS Intersection Display

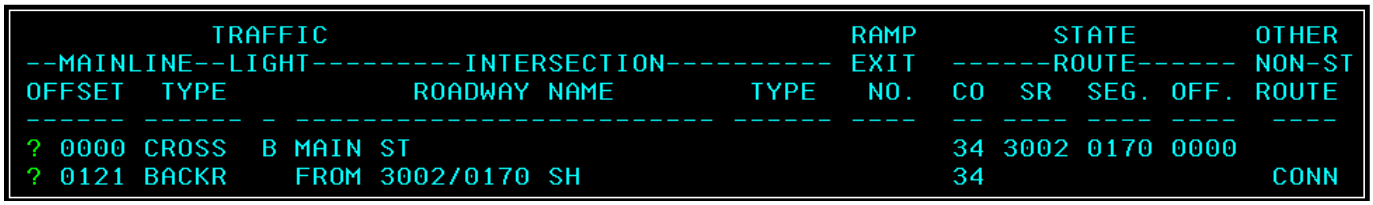


- **Blinking Signal** – Identifies an intersection which utilizes blinking red or amber colored lights at road intersections. RMS code = **B**

LRS SLD Display



RMS Intersection Display



4 Roadway Attribute Location Quick Guide

4 Roadway Attribute Location Quick Guide

Event Point Location Guidelines

Due to the unique nature of each attribute, it is necessary to establish general guidelines which dictate event points for each type of feature. These guidelines will provide consistent statewide verification procedures which in turn will produce a uniform SLD database for the RMS. These event points will establish the location of each feature and dictate the assigned segment/offset value. Although it would be virtually impossible to describe every situation and attribute configuration that may exist in the field, adherence to these guidelines will allow for optimum statewide consistency. The following rules define proper event points for intersections and roadway features.

[1] Note: Some 2 character LRS event codes have a (B) or (E) as a third character, this represents the beginning or end of the particular feature, these type of features are represented on the SLD as an up or down arrow.

[2] Note: Some LRS features like Bridges and Overpasses do not have an RMS code that gets entered into the RMS Intersection Screen. These features are entered on other RMS screens and will be shown on the RMS SLD screen only.

❖ SEGMENTS

Segment start/ends are to be located according to the following criteria:

Feature associated with segment start/end:
Locate feature and segment start/end at same location using the associated feature's appropriate verification point. When measuring distance between two fixed features the measurement should always be taken between the location represented by the feature and not where the segment signs are located in the field. Segment breaks associated with bridges should be located at the bridge begin.

Stand-alone segments (no visible feature associated with segment) start/end:
Segment start/ends are to be located at the point where the roadway centerline and an "imaginary" line drawn perpendicular from the marker to the roadway centerline would meet. If the segment marker is missing then the segment start/end should be located at the appropriate RMS distance. Codes: ST, SE.

❖ INTERSECTIONS

All intersections, regardless of their configuration, are to be located at the point of intersection of the centerline of the intersecting roads. The only exceptions to this rule are ramps, wyes, rest areas, and jug handles, which are located at their gore areas (where pavement meets turf). Codes: AL, AR, BL, BR, CR, IA, IB, RO, TL, TR.

❖ RAMPS

Entrance and exit ramps are to be located by their gore area. Codes: EB, LN, LX, NL, NR, RN, RX, XB, XL, XR.

Where there is no gore area at the ramp intersection, the ramp is located at the intersecting road's edge of pavement. Codes: AL, AR, BL, BR, EB, LN, LX, RN, RX, XB.

❖ BRIDGES

All bridge data is extracted from the Bridge Management System (BMS). Each structure is identified by a unique fifteen digit BMS key, and a 14-digit Bridge ID that contains an LRS key (County number, SR number, Segment, Offset). The length of each structure is dictated by BMS and is to remain

unchanged unless a significant discrepancy is found. Both the start and end of the structure should be located; this will verify bridge lengths. The event points can vary depending on the type of structure and pavement which exists in the field. The location of the expansion dam, edge of parapet walls, or a visible change in surface, in most cases will serve as acceptable event points. Codes: BGB, BGE

❖ OVERPASSES

All overpass data is extracted from the Bridge Management System (BMS). Overpasses are to be located at the intersection of the centerline of the overpass and the centerline of the roadway. Multiple overpasses carrying opposing lanes of the same roadway are to be located separately only if BMS identifies the bridge as two separate structures. If BMS identifies the bridge as a single structure, then it should be represented as a single overpass. Code: OP.

❖ RAILROAD CROSSINGS

Railroad crossings at grade are to be located at the centerline intersection of the centerline of the tracks and the centerline of the roadway. Multiple tracks at grade which are separated by less than 20 feet are to be located at the intersection of the centerline of the multiple tracks and the centerline of the roadway. The number of tracks should be placed in the field 1. Multiple tracks at grade which are separated by more than 20 feet should be located individually. Code: RR.

❖ REST AREAS

Rest areas are to be treated the same as entrance and exit ramps using the "gore area" or centerline location whichever is more appropriate. Code: XR, XL, NR, NL, LN, LX, RN, RX. (RMS Code Equivalents → ALEXIT, AREXIT, ALENTR, ARENTR, BLENTR, BRENTR, BLEXIT, BREXIT, TLENTR, TRENTR, TLEXIT, TREXIT)

❖ TRUCK ESCAPE RAMPS

Truck escape ramps are to be treated the same as exit ramps and should be located using the "gore area". Centerline intersection has been used in the past; however, the centerline point in many cases is "very" ambiguous. The "gore area" hopefully will represent a more defined location. Code: TK. (RMS Code Equivalent → AREXIT, ALEXIT)

❖ TUNNELS

The beginnings and endings of tunnels are to be located at the point where the roadway goes underground and where it re-emerges. Codes: TUB, TUE.

❖ DIVIDED HIGHWAY START/END

The start or end points of a divided highway are located at the points at which the divided roadway cross-section begins. This location is usually indicated by a fixed center barrier or multiple lane separations. These points also indicate the segment start or end points. For help determining if a road should be divided consult the Divided Roadway Flowchart (Appendix A).

❖ DIVIDED HIGHWAY CONNECTORS

Divided highway connectors are to be treated the same as intersections and should be located at the same intersection of the centerlines of the roadways. This attribute should be located in both directions to serve as an accurate cross reference for opposing directions. Code: DC. (RMS Code Equivalent → DIVCON)

❖ MILEPOSTS

Mileposts are to be located at the point where the roadway centerline and an "imaginary" line drawn perpendicular from where the sign and roadway centerline would meet. On Interstates, in most cases

a Segment start/end will also occur at every milepost. Code: MP.

❖ COUNTY & MUNICIPAL BOUNDARIES

County & municipal boundaries are to be located at the point where the roadway centerline and an "imaginary" line drawn perpendicular from the sign to the roadway centerline would meet except for the special case described below.

If a county boundary occurs anywhere on a structure, the entire structure will be shown in the one county claiming maintenance responsibility for the structure. If the county being tested is responsible for the structure, then the entire structure should be included during verification. However, if the county being tested is not responsible for the structure then verification should exclude the bridge. Ignore the county line sign in this case.

Segment begin/end points must occur at a County boundary. Codes: CBB, CBE, MBB, MBE.

❖ COMMON STREET NAME CHANGES

Changes in the common name of a SR are to be located at the point where the signing in the field indicates. Presently, common street name changes occur only at segment begin/end points. Codes: NCB, NCE, N2B, N2E, N3B, N3E.

❖ DRAINAGE PIPES

Drainage Pipes are to be located at the inlet.
Code: DP.

❖ OVERHEAD SIGN STRUCTURES

All overhead sign data is extracted from the Bridge Management System (BMS). Overhead Sign Structures are to be located at the intersection of the centerline of the Sign Structure and the centerline of the roadway. This point will normally occur when positioned directly under the sign.
Code: SS.

❖ RETAINING WALLS AND SOUND WALLS

All walls are to be located at the point where the roadway centerline and an "imaginary" line drawn perpendicular from the wall to the roadway centerline would meet. Walls need to be located on both sides of a highway and elevation (above or below) needs to be identified. Code: SLB, SLE, SRB, SRE, WLB, WLE, WRB, WRE.

❖ MONITORING SITES

RWIS monitoring sites are to be located at the point where the roadway centerline and an "imaginary" line drawn perpendicular from where the monitor and roadway centerline would meet. Code: MO.

❖ SIGNALIZED PEDESTRIAN CROSSING

Signalized crossing are to be located at the point perpendicular to where the crossings meets the centerline of the highway. Code: SX.

❖ Traffic Signals

Traffic signals will be located at the same offset as the intersection that they are utilized for. Code: TS.

❖ Points of Interest

Points of Interest should always be located at the same position as the intersection that they are associated with.

5 Graphical Illustration of Attribute Locations

5 Graphical Illustration of Attribute Locations

Event Point Diagram Legend

The following diagrams define proper event point locations for intersections and roadway features. When event point locations are affected by the Divisor Type, specific Divisor Types are defined on the diagrams. When no Divisor Types are specified, then all Divisor Types apply to the diagram.

LEGEND

Paint Lines	
Divisor Type 1,2,4,5,8*	
Divisor Type 3,7*	
Verified SR Label	Verification for SR 0022
Event Point	
Event Point Location	SR 1001 SEG 0010/0000
Event Point Under Overpass	
Cross Route Label	SR 4006 MAIN ST
Cross Route Event Point	
Cross Route Event Point Location	SR 4006 SEG 0010/0000
Feature Point (within photo's)	
Feature Point Cross Route (within photo's)	
Non State Intersection	T678 CHEERY RD

* Divisor Type Definitions

DIVISOR TYPE CODE	DIVISOR TYPE DESCRIPTION
A	Positive Barrier-Flexible (HPMS)
B	Positive Barrier-Semi Rigid (HPMS)
C	Positive Barrier-Rigid (HPMS)
0	None
1	Paint Divided
2	Fixed Barrier (Man-made)
3	Earth Barrier
4	4' Width or Greater Painted Center
5	Curb
6	City Block
7	Natural Barrier (Trees, Fill, Etc.)
8	Mountable Curb

If the Divisor type is 3 or 7 and is equal to or greater than 20ft, then the verification points for the intersecting roads will be placed at individual separated offsets.

In each figure, an SLD is provided that defines the features illustrated in the drawing. In some cases, a photograph also accompanies the diagram to further define field conditions and/or event point locations. These photographs were not necessarily taken at the same location represented by the diagram or SLD; proper event point locations are represented but all features may not match. The Divided Roadway Flowchart (Appendix A) may be used to help determine when a road should be divided.

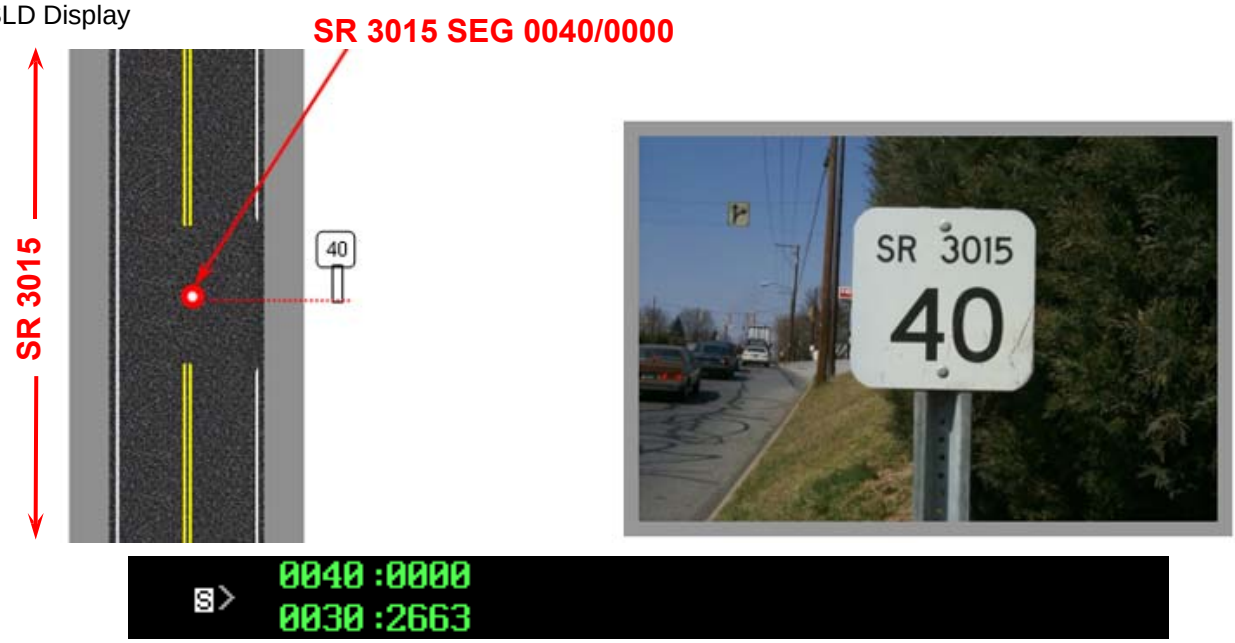
Stand Alone Segments & Segments on Other Signs

5-1: Segments (Without a Fixed Feature), Stand Alone Segment Signs

Note: Accurate sign placement in the field is critical for standalone segment signs; they must be posted in the field at the exact footage specified. They should never be added onto an existing post for another type of sign unless the other sign post is less than 5ft away from the specified segment offset.

Verification for SR 3015

LRS SLD Display



5-2: Municipal and County Boundaries

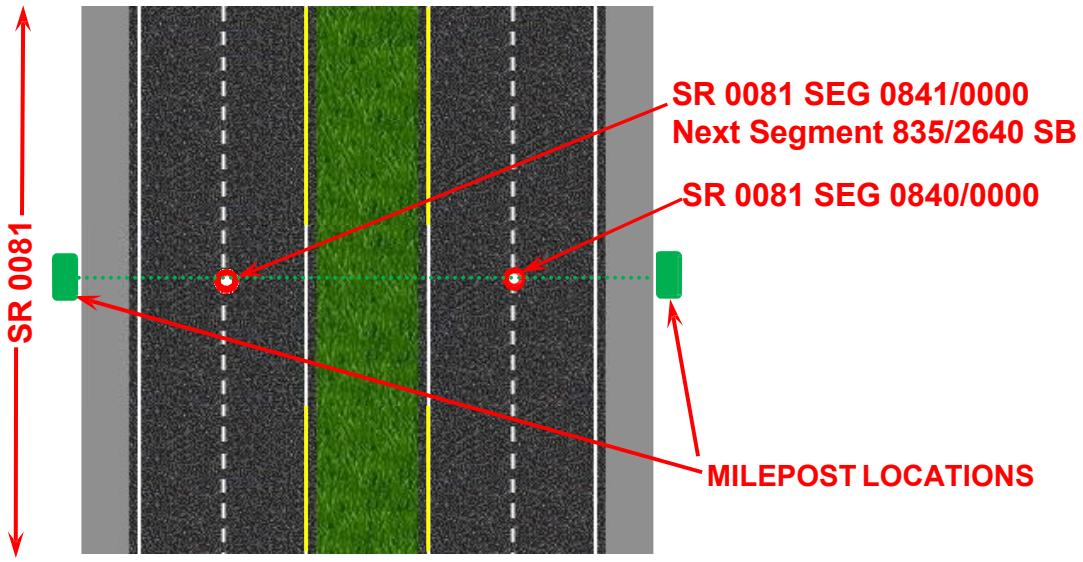
Verification for SR 1001

LRS SLD DISPLAY

5-3: Mileposts

Verification for SR 0081

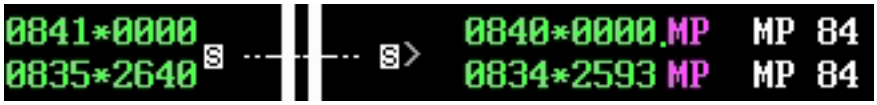
Any Divisor Type



Northbound View

Southbound View

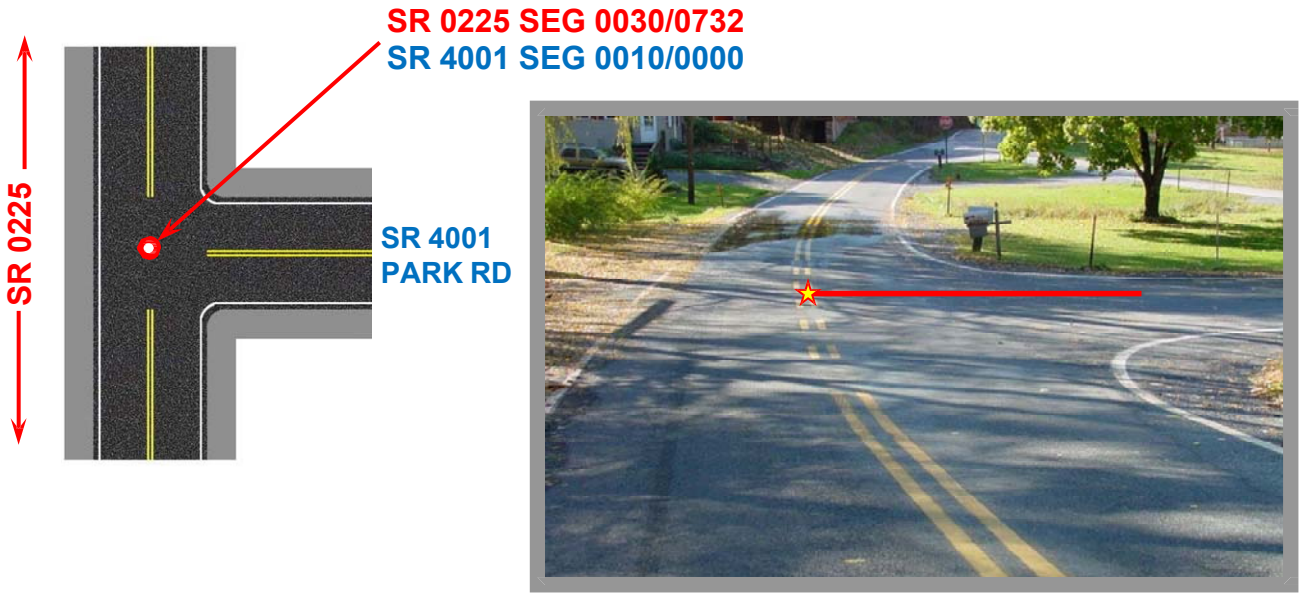
LRS SLD Display



T-Intersections

5-4: T-Intersections - Intersection of 2 Undivided SR's

Verification for SR 0225

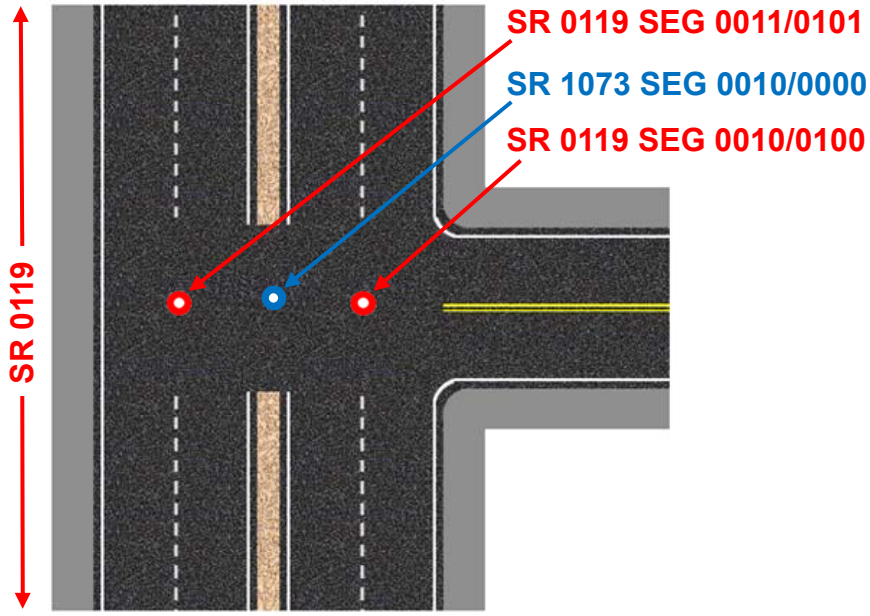


LRS SLD Display

5-5: T-Intersections - Intersection of Divided (CR) and Undivided (TR) SR's

Verification for SR 0119

Divisor (▬) Type 1,2,4,5,8

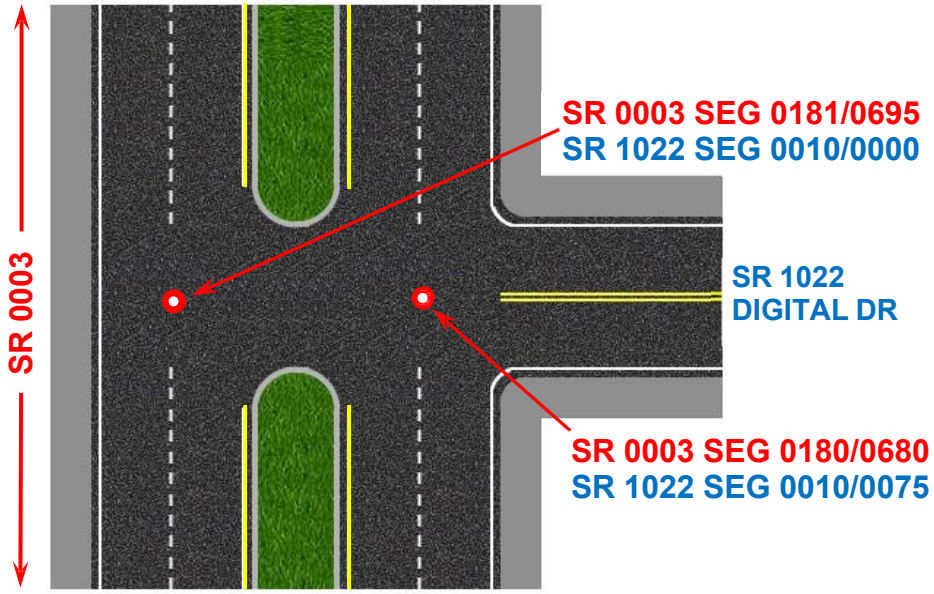


LRS SLD Display

5-6: T-Intersections - Intersection of Divided (CR) ≥ 20 ft and Undivided (TR) SR's

Verification for SR 0003

Divisor (■) Type 3,7

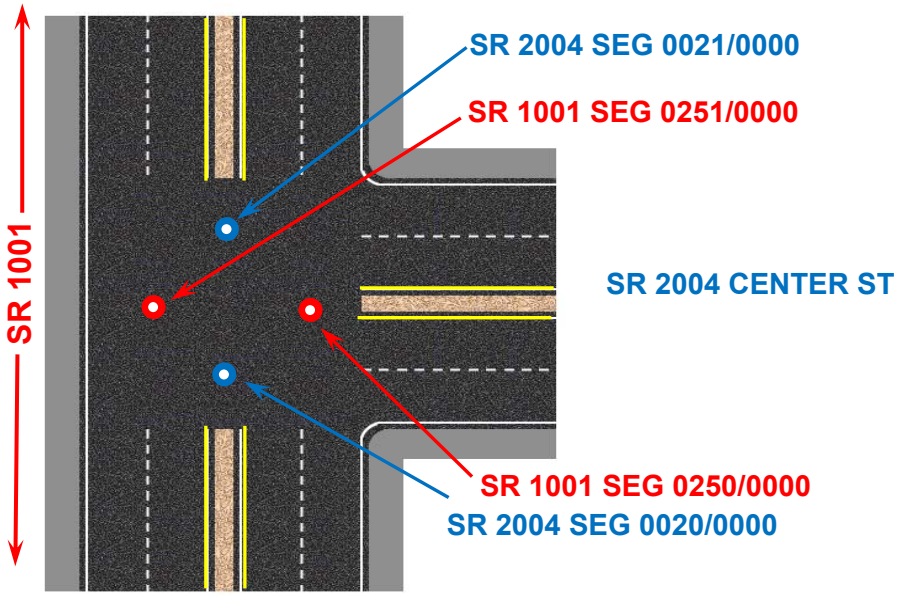


LRS SLD Display

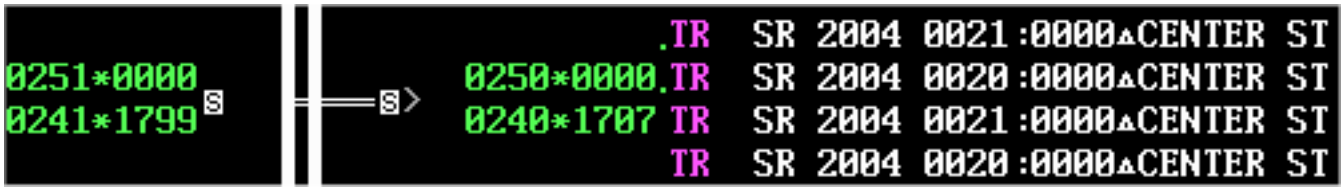
5-7: T-Intersections - Intersection of 2 Divided SR's

Verification for SR 1001

Divisor (▬) Type 1, 2,4,5,8



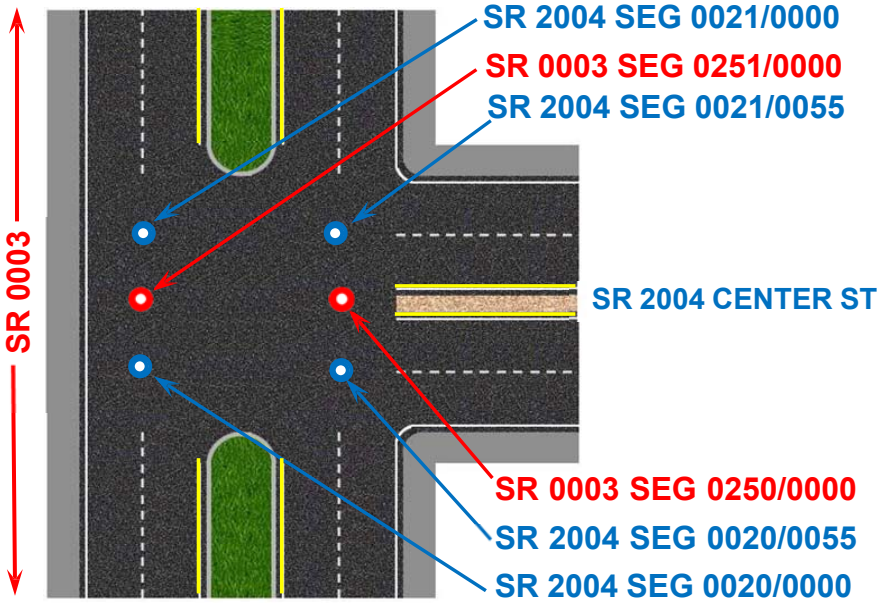
LRS SLD Display



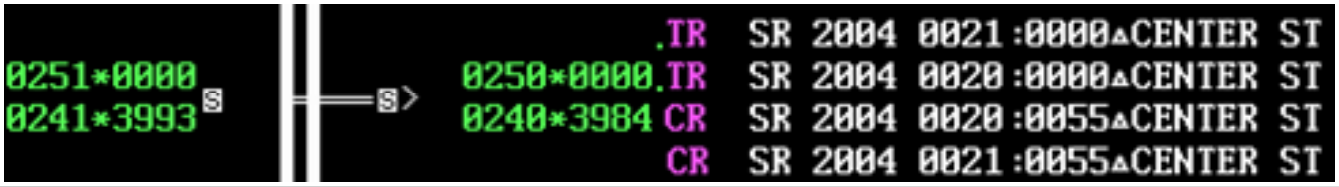
5-8: T-Intersections - Intersection of 2 Divided SR's, one with a ≥ 20 ft barrier (CR)

Verification for SR 0003

Divisor (▪) Type 3, 7
Divisor (▪) Type 1, 2,4,5,8



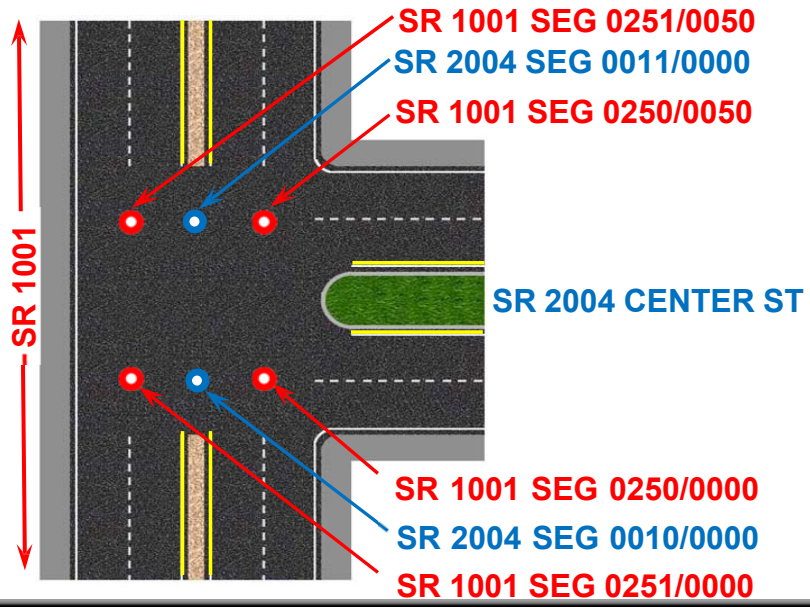
LRS SLD Display



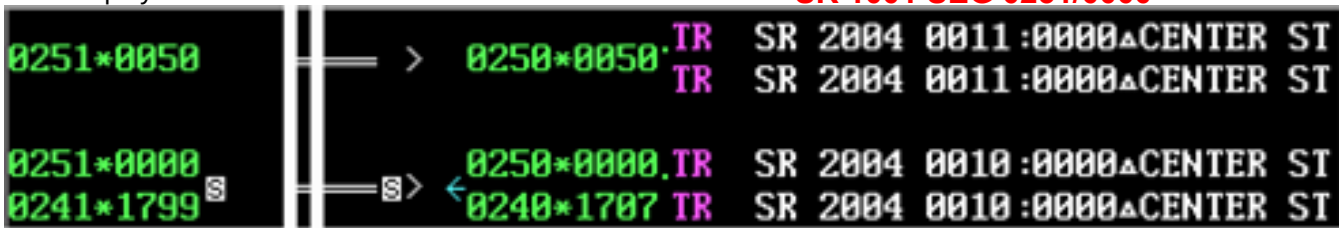
5-9: T-Intersections - Intersection of Divided SR's, (TR) with a ≥ 20 ft barrier

Verification for SR 1001

Divisor (▪) Type 3,7
Divisor (▪) Type 1,2,4,5,8



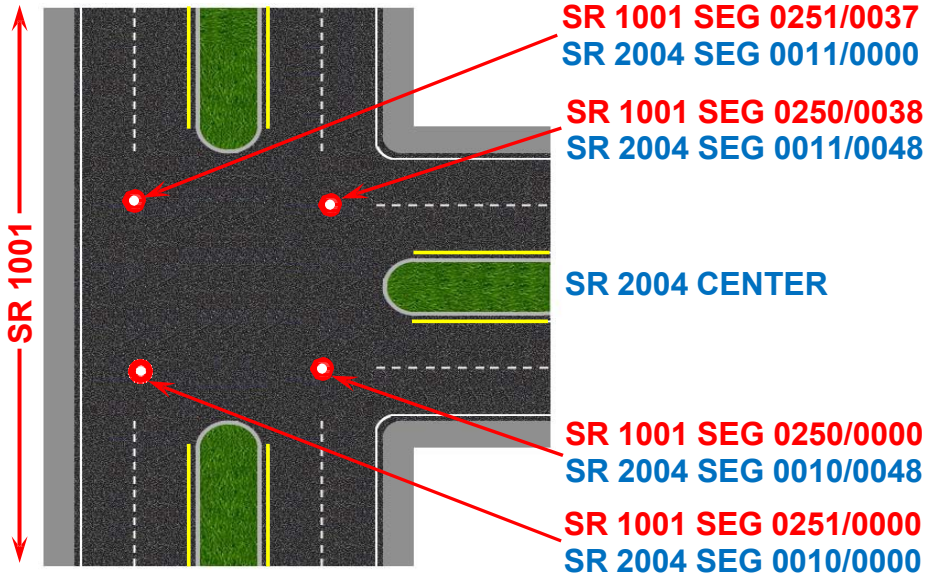
LRS SLD Display



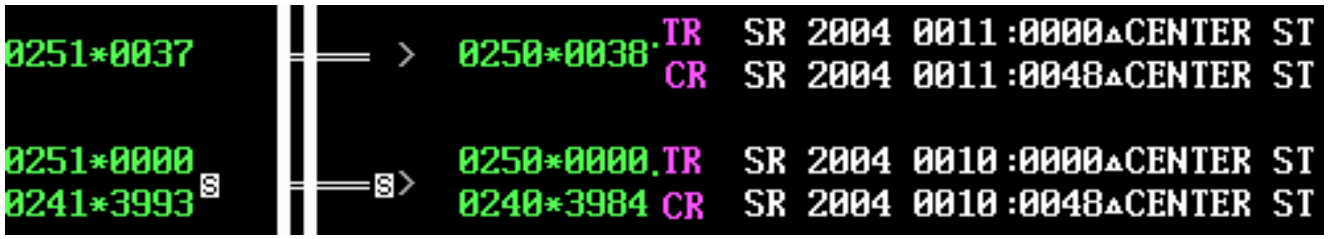
5-10: T-Intersections - Intersection of Divided SR's, both with ≥ 20 ft Barriers

Verification for SR 1001

Divisor (■) Type 3,7

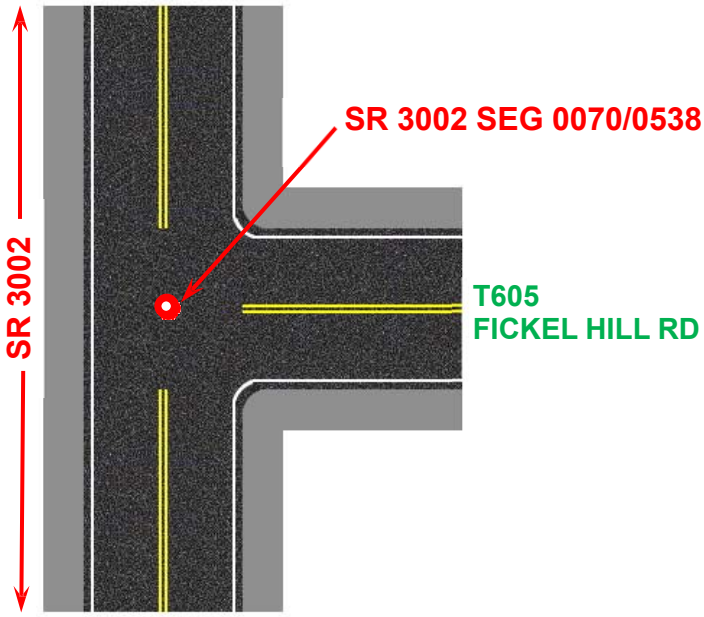


LRS SLD Display



5-11: T-Intersections - Intersection of an Undivided SR (CR) and an Undivided Local Road (TR)

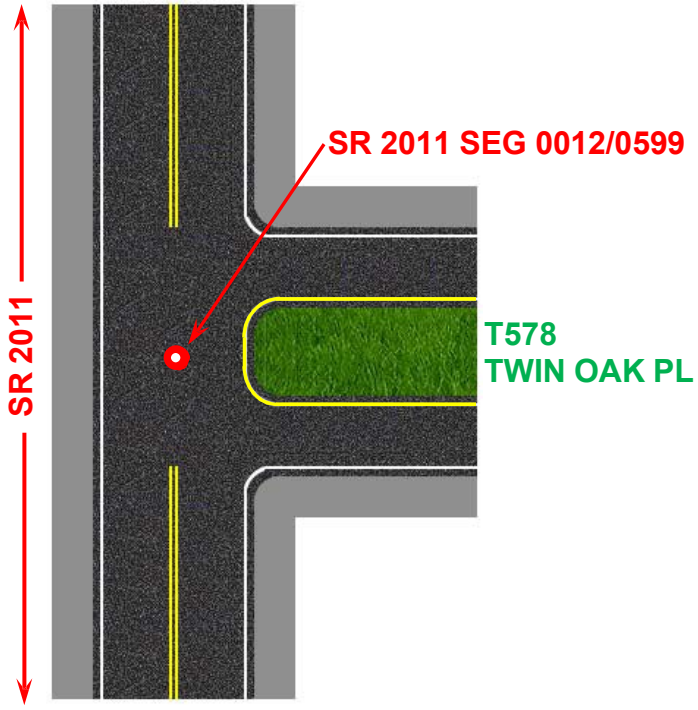
Verification for SR 3002



LRS SLD Display

5-12: T-Intersections - Intersection of an Undivided SR and a Divided Local Road (TR) with a barrier of ≥ 20 ft

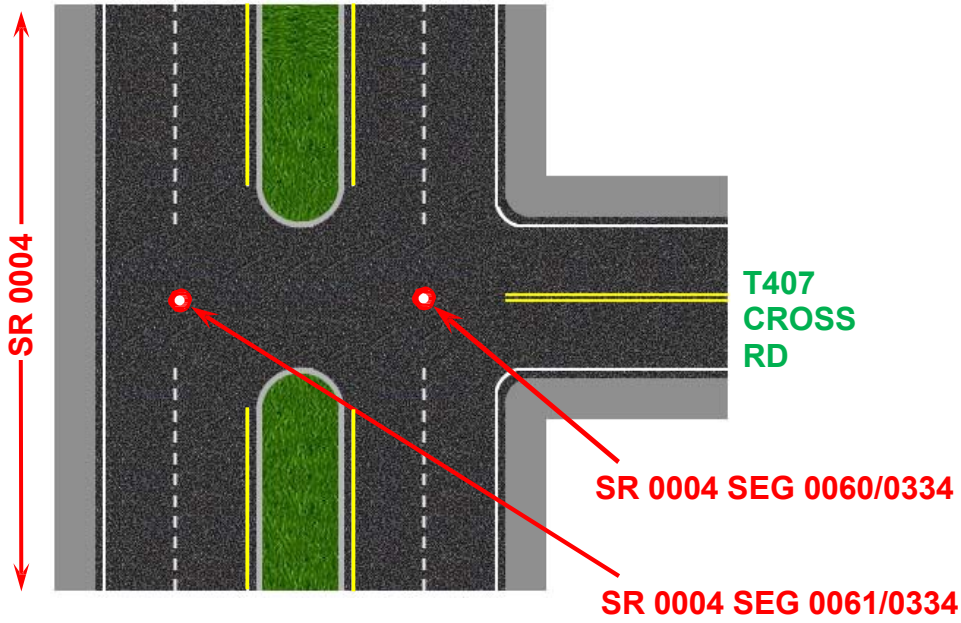
Verification for SR 2011



LRS SLD Display

5-13: T-Intersections - Intersection of a Divided SR with a ≥ 20 ft barrier and an Undivided Local Road (TR)

Verification for SR 0004

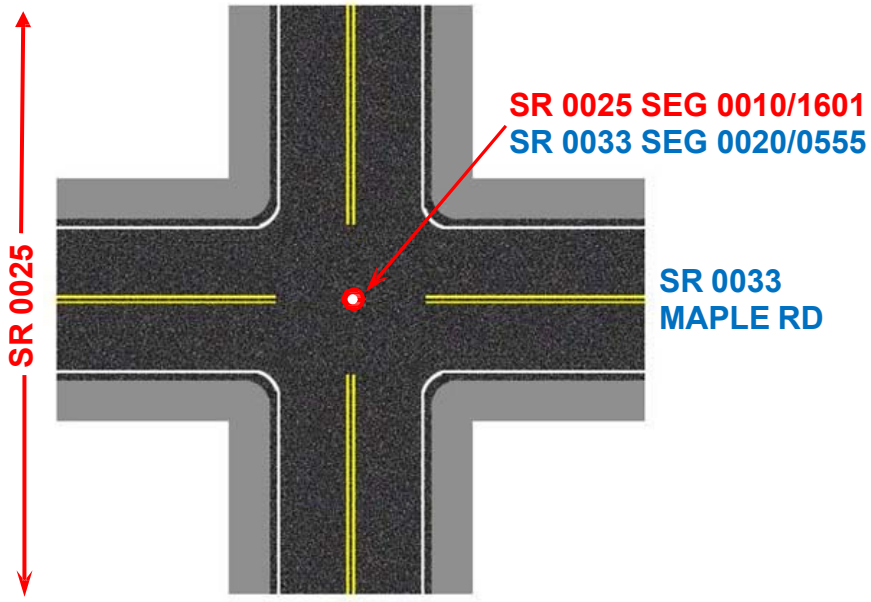


LRS SLD Display

Cross Intersections

5-14: Intersection of Undivided SR's, both (CR's)

Verification for SR 0025

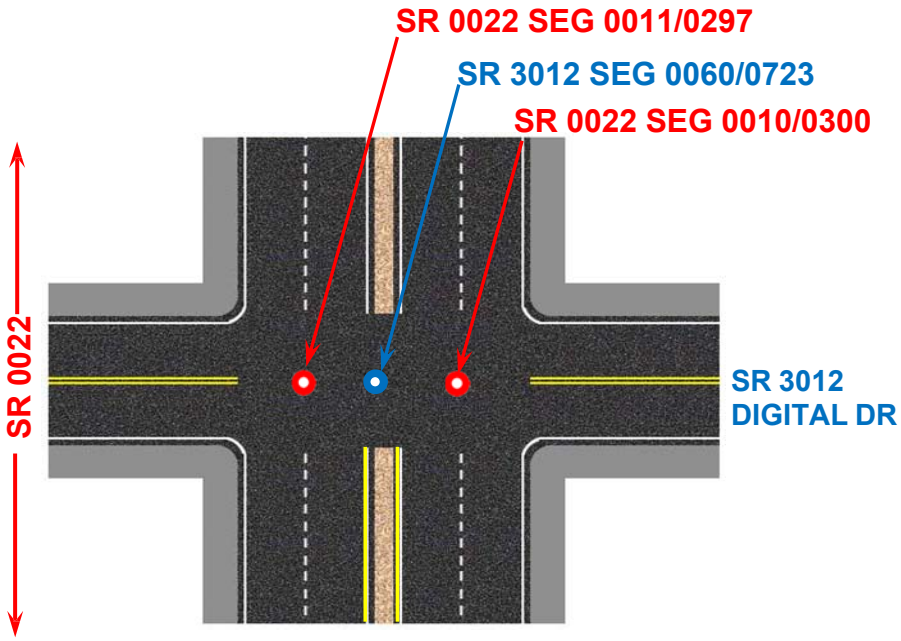


LRS SLD Display

5-15: Intersection of a Divided and Undivided SR's

Verification for SR 0022

Divisor (▬) Type 1,2,4,5,8

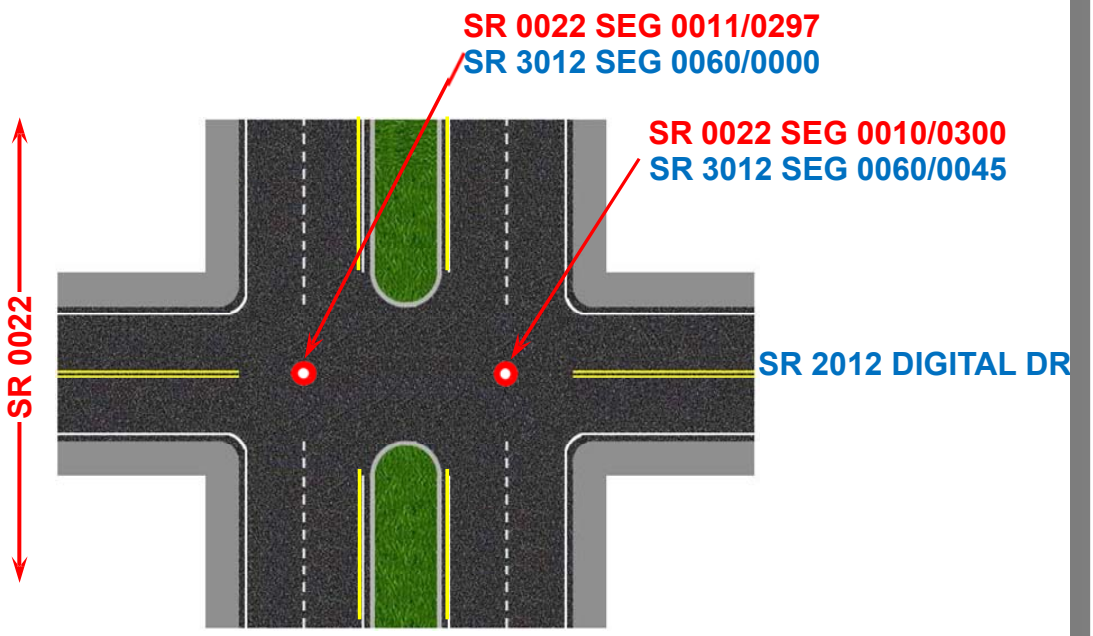


LRS SLD Display

5-16: Intersection of a Divided SR, one with a barrier ≥ 20 ft and an Undivided SR

Verification for SR 0022

Divisor (■) Type 3,7

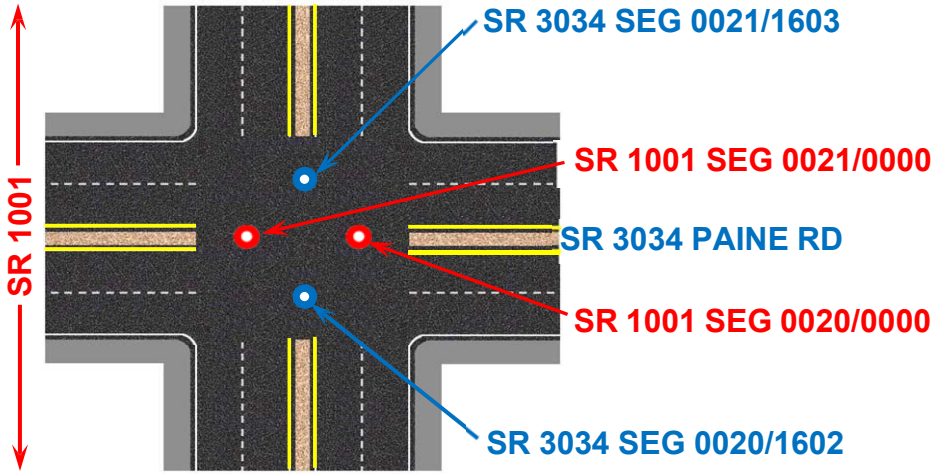


LRS SLD Display

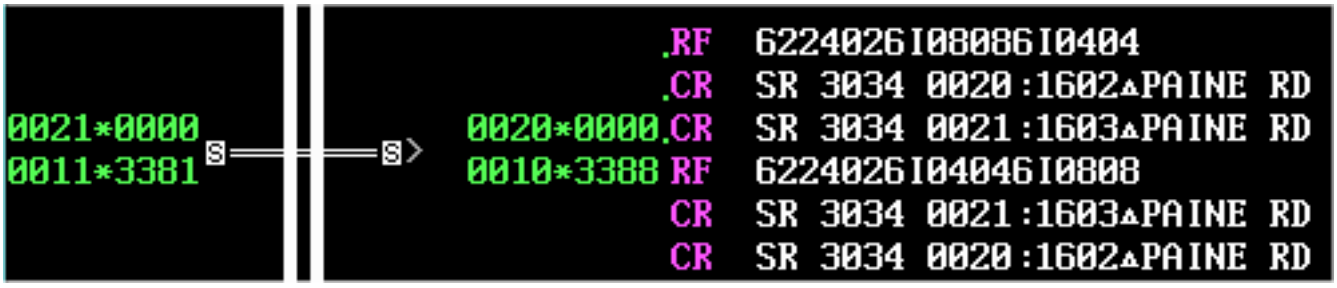
5-17: Intersection of 2 Divided SR's, both (CR's)

Verification for SR 1001

Divisor (▬) Type 1,2,4,5,8



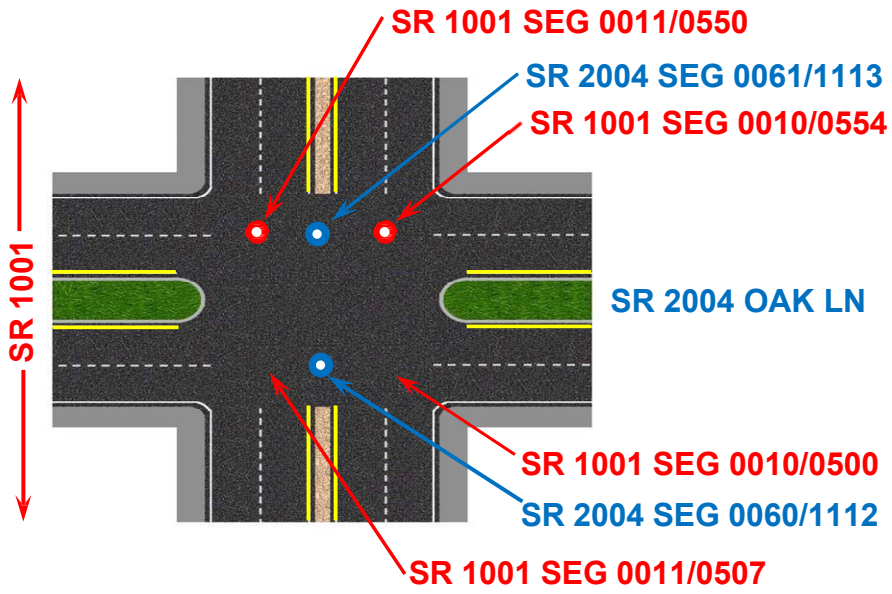
LRS SLD Display



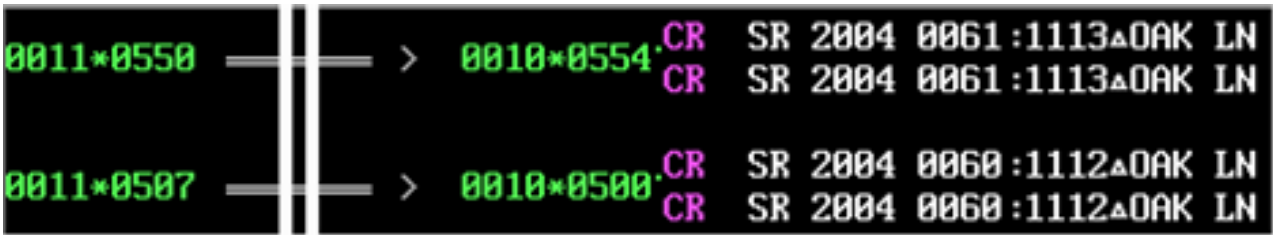
5-18: Intersection of Divided SR's, with the SR being tested having a barrier ≥ 20 ft

Verification for SR 1001

Divisor (■) Type 3,7
Divisor (▬) Type 1,2,4,5,8



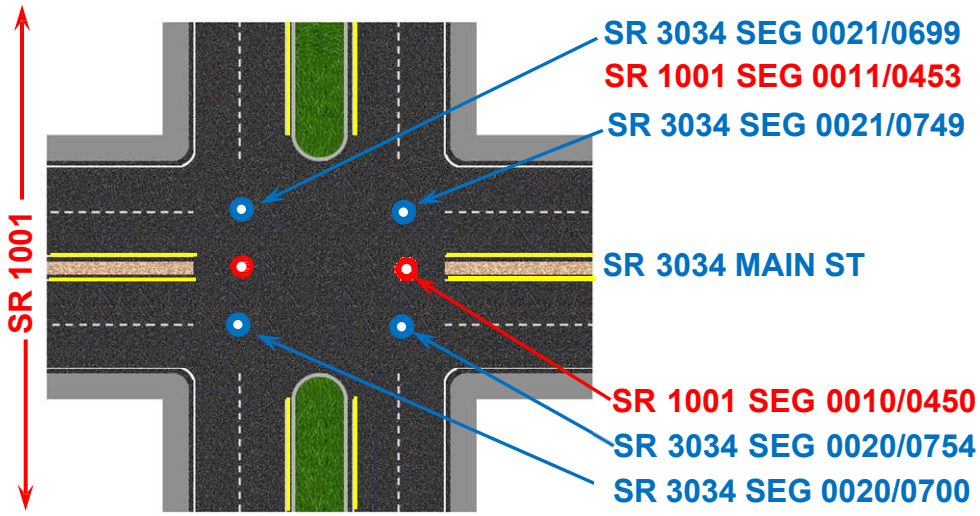
LRS SLD Display



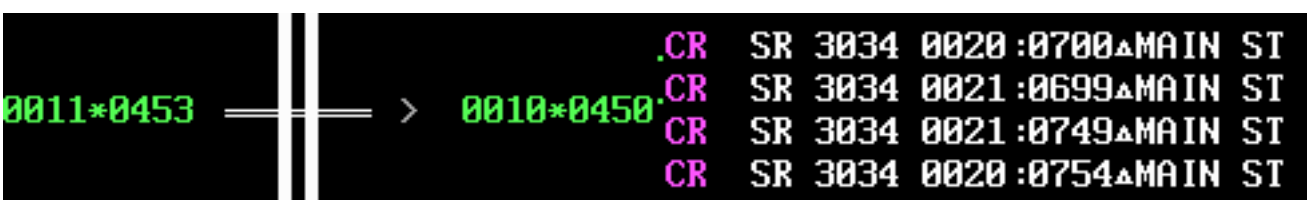
5-19: Intersection of Divided SR's, with the intersecting SR having a barrier ≥ 20 ft

Verification for SR 1001

Divisor (■) Type 3,7
Divisor (▬) Type 1,2,4,5,8



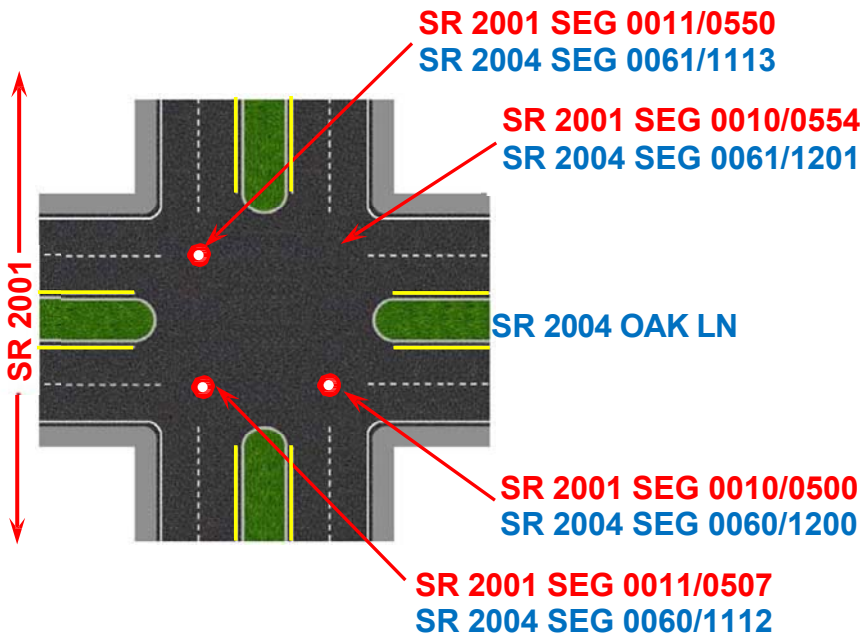
LRS SLD Display



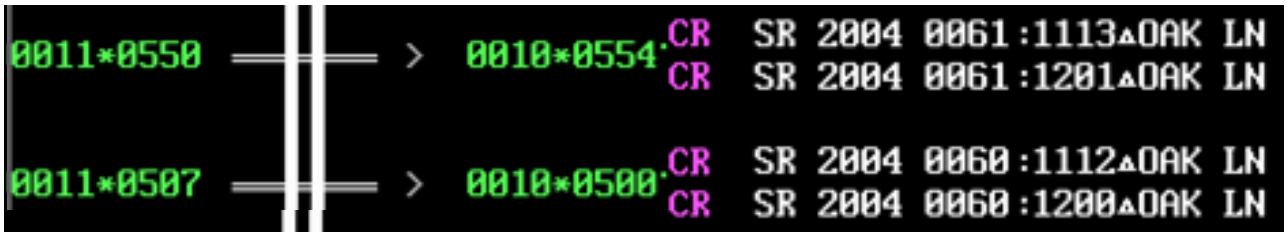
5-20: Intersection of Divided SR's, both having a barrier ≥ 20 ft

Verification for SR 2001

Divisor (■) Type 3,7



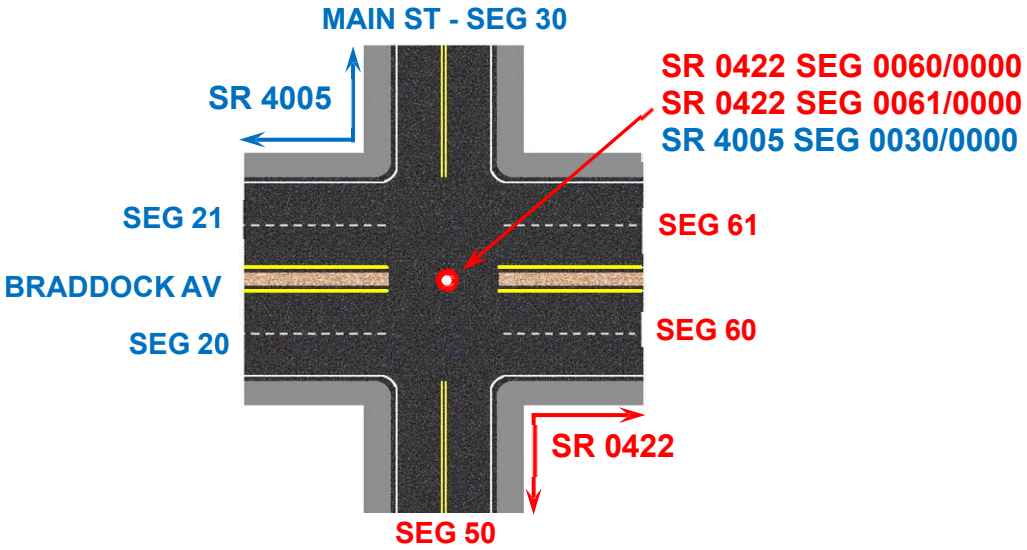
LRS SLD Display



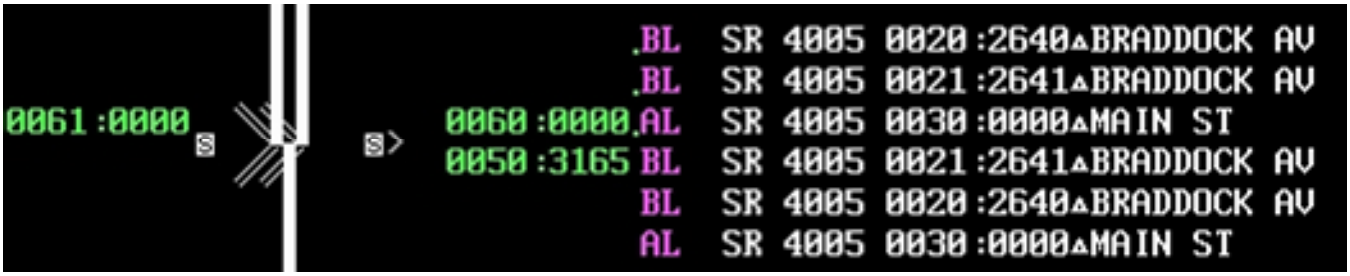
5-21: Intersection of Turning SR's, both transitioning from Divided to Undivided

Verification for SR 0422

Divisor (▬) Type 1,2,4,5,8



LRS SLD Display

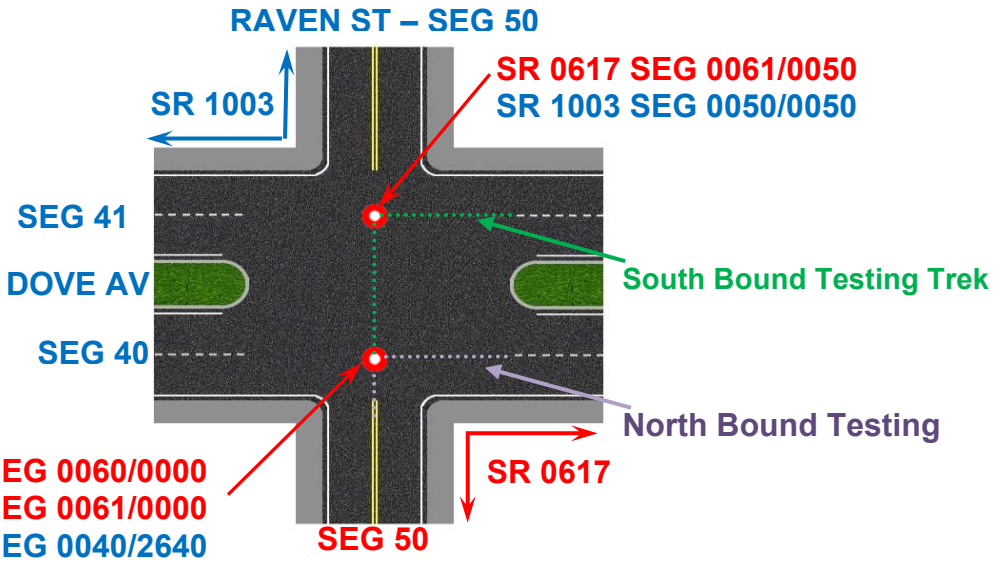


5-22: Intersection of Turning SR's, with both transitioning from Undivided to Divided, with one SR having a barrier ≥ 20 ft

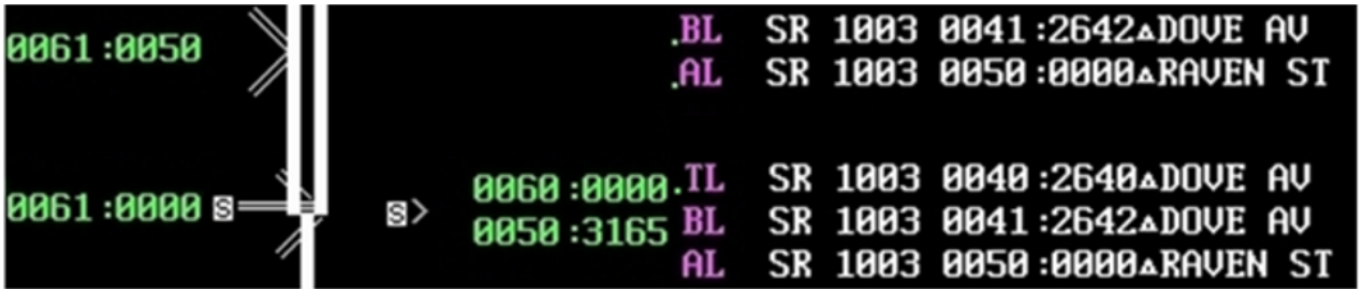
Verification for SR 0491

Divisor (■) Type 3,7

Note: For this type of intersection, there should be a null on SR 1003 from the end of segment 40 to the start of segment 50



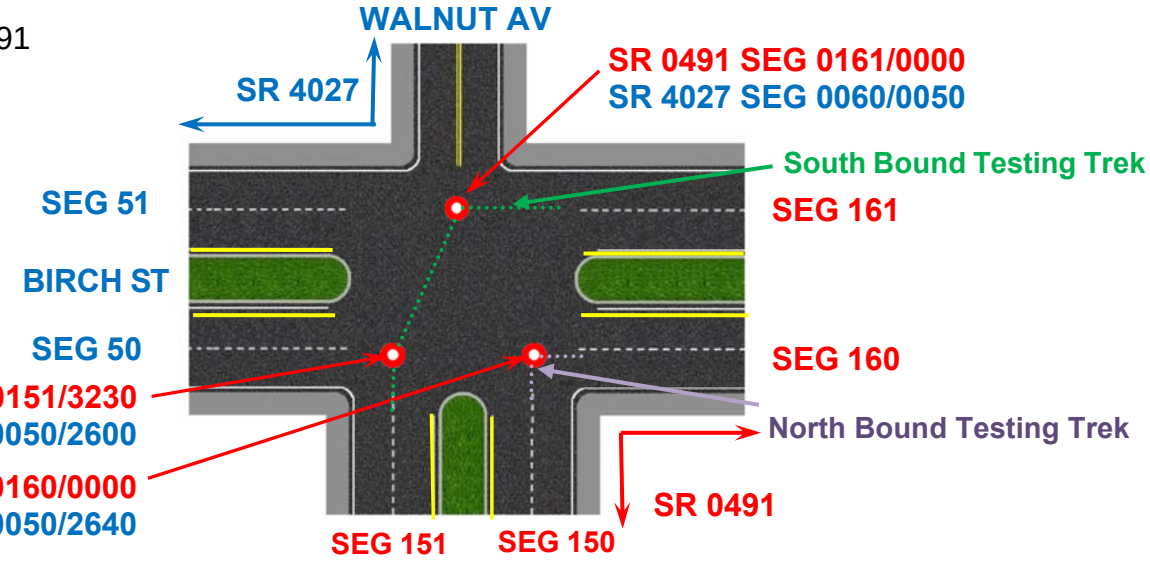
LRS SLD Display



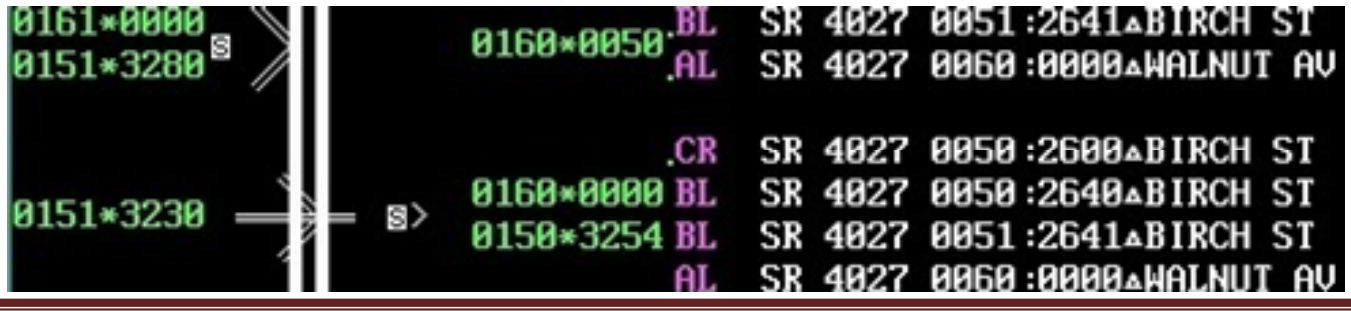
5-23 : Intersection of Turning SR's, with 3 of the intersection having a ≥ 20 ft barrier

Verification for SR 0491

Divisor (■) Type 3,7



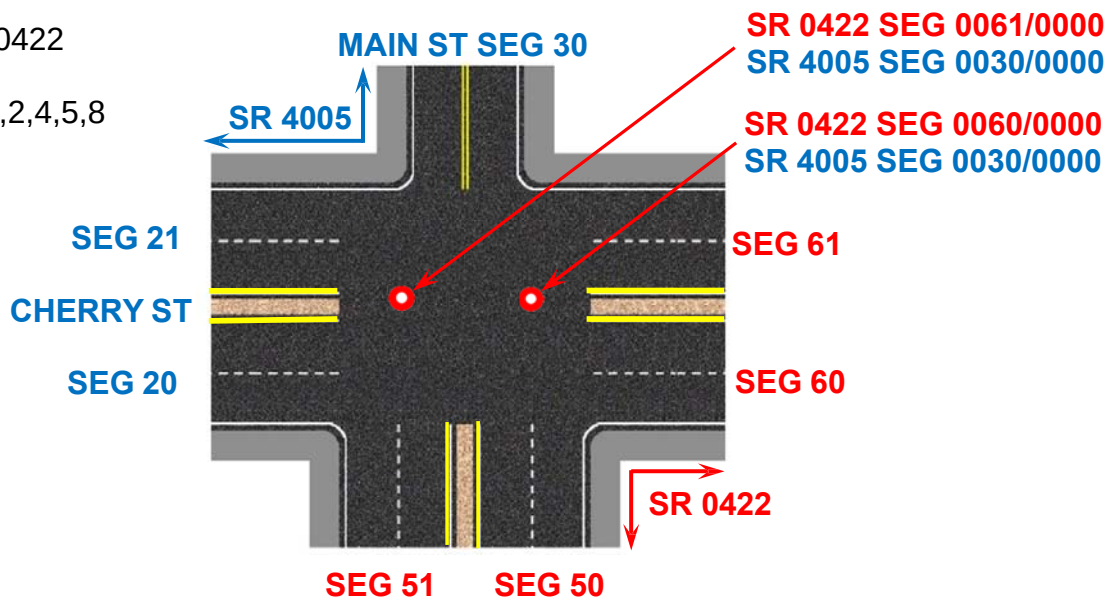
LRS SLD Display



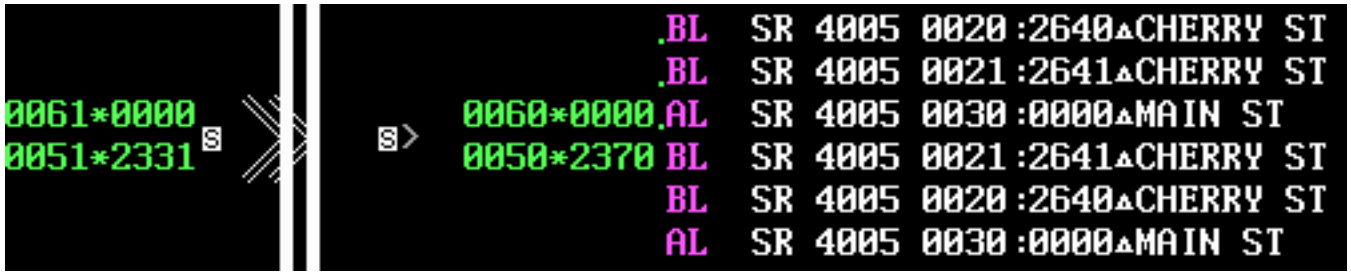
5-24: Intersection of Turning SR's

Verification for SR 0422

Divisor (▬) Type 1,2,4,5,8

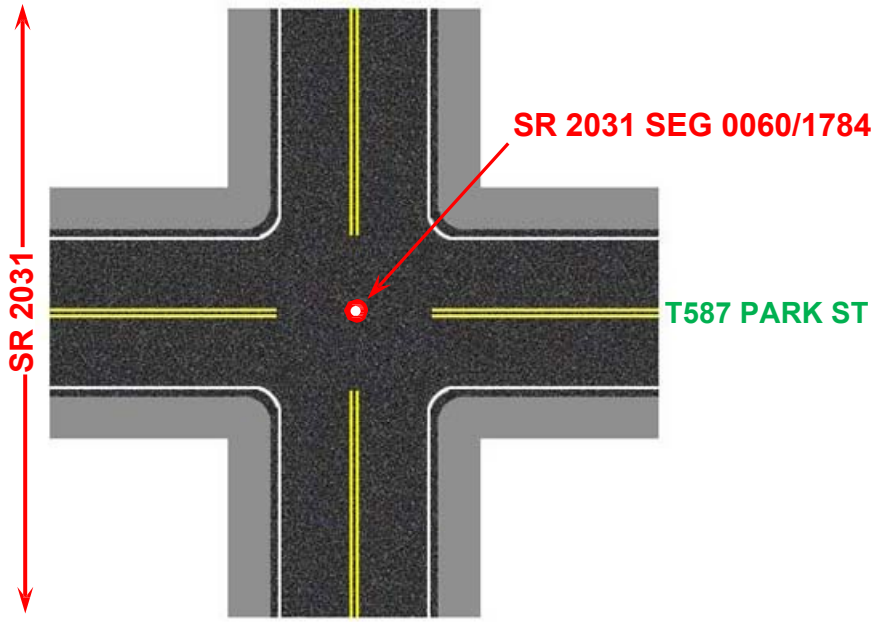


LRS SLD Display



5-25: Intersection of an Undivided SR and Undivided Local Road

Verification for SR 2031

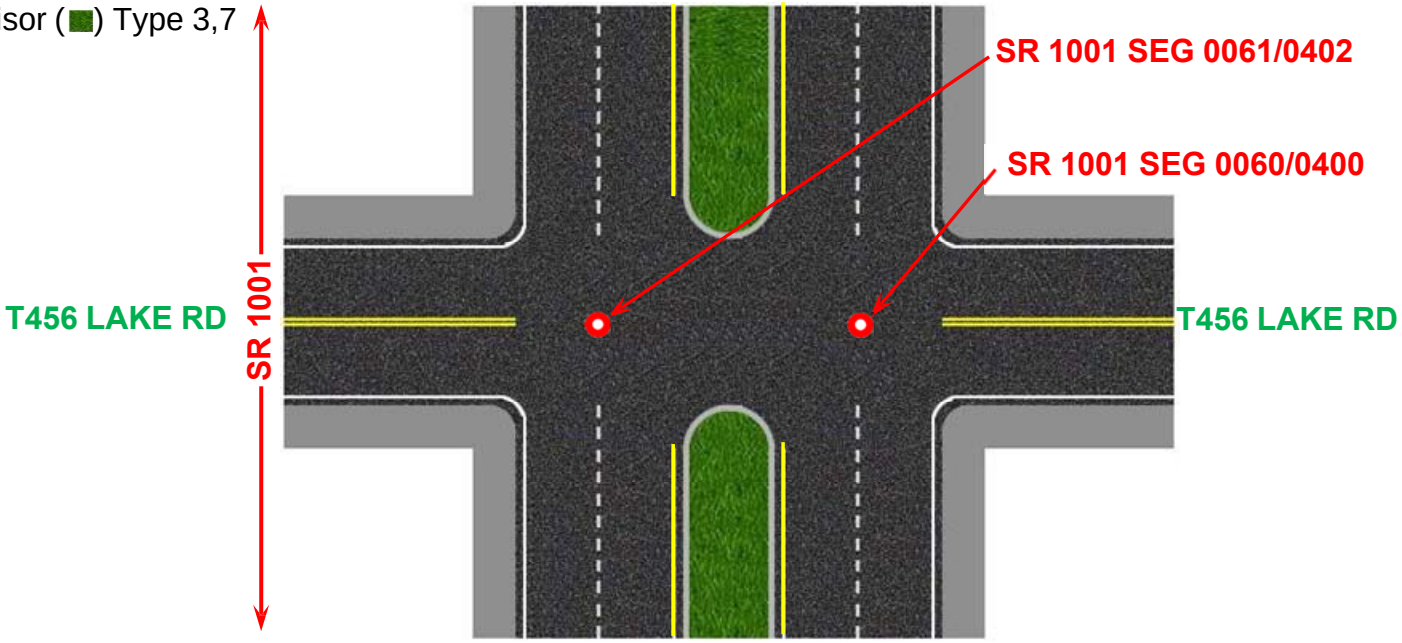


LRS SLD Display

5-26 : Intersection of a Divided SR having a ≥ 20 ft barrier and an Undivided Local Road

Verification for SR 1001

Divisor (■) Type 3,7

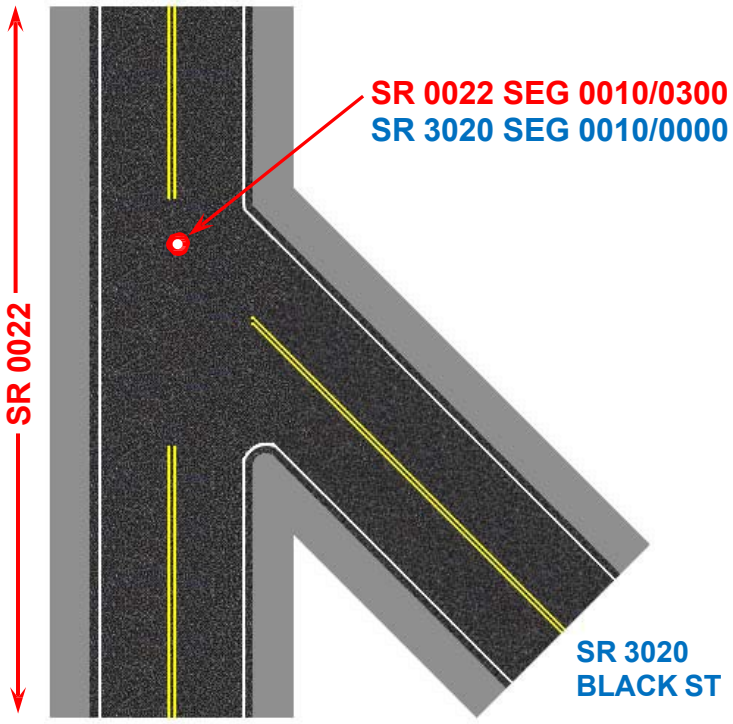


LRS SLD Display

Y-Intersections

5-27 : Intersection of Undivided SR's

Verification for SR 0022

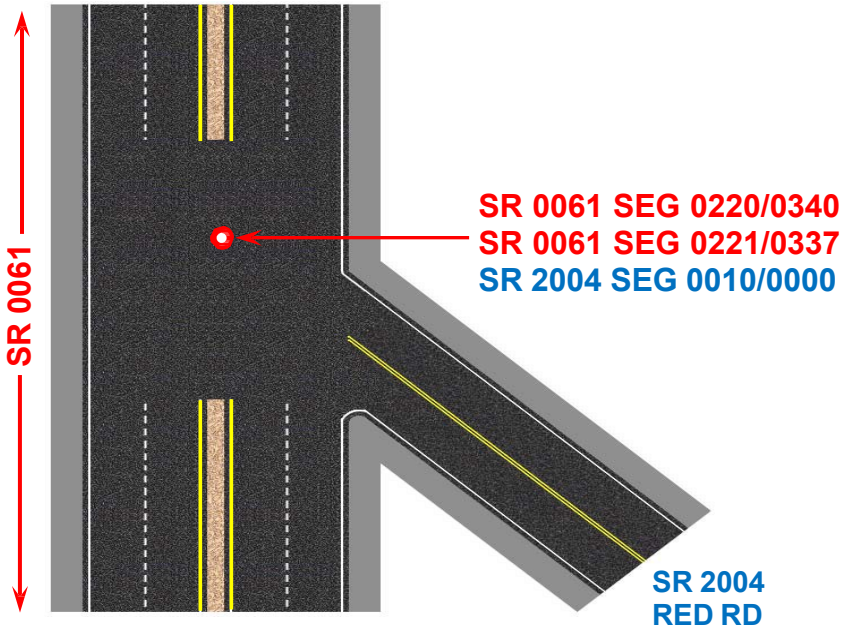


LRS SLD Display

5-28 : Intersection of Divided and Undivided SR's

Verification for SR 0061

Divisor ( ) Type 1,2,4,5,8

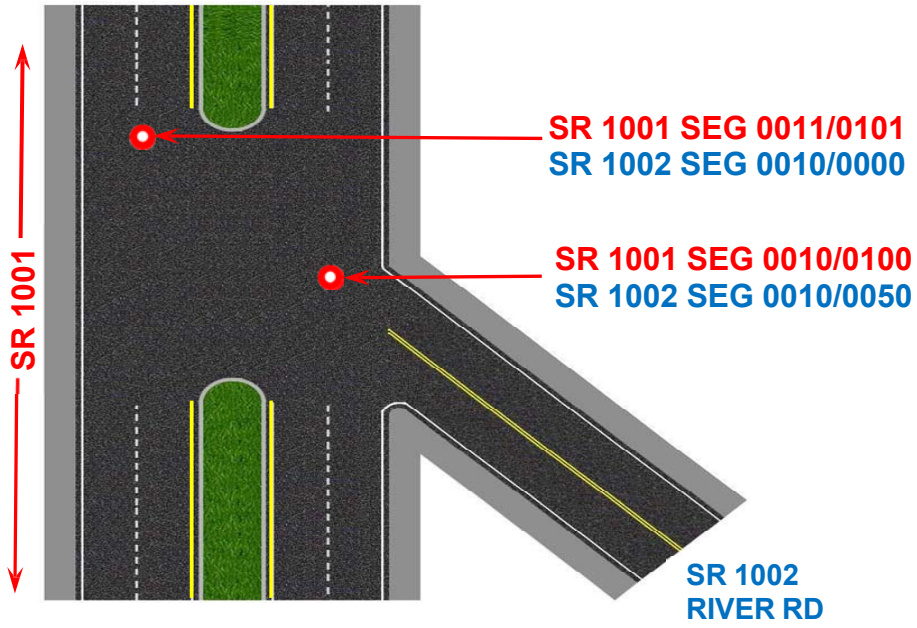


LRS SLD Display

5-29 : Intersection of a Divided SR having a ≥ 20 ft barrier and Undivided SR's

Verification for SR 1001

Divisor ( ) Type 3,7

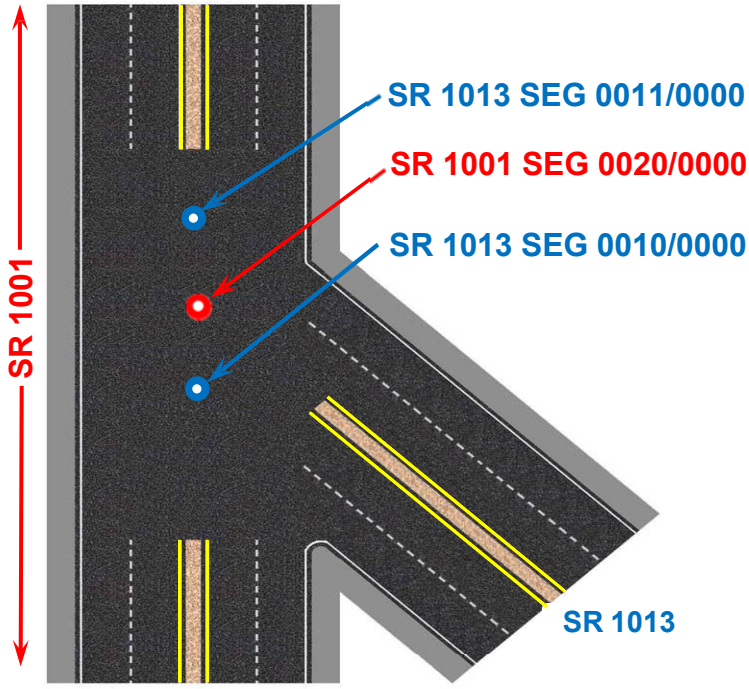


LRS SLD Display

5-30 : Intersection of Divided SR's

Verification for SR 1001

Divisor ( ) Type 1,2,4,5,8

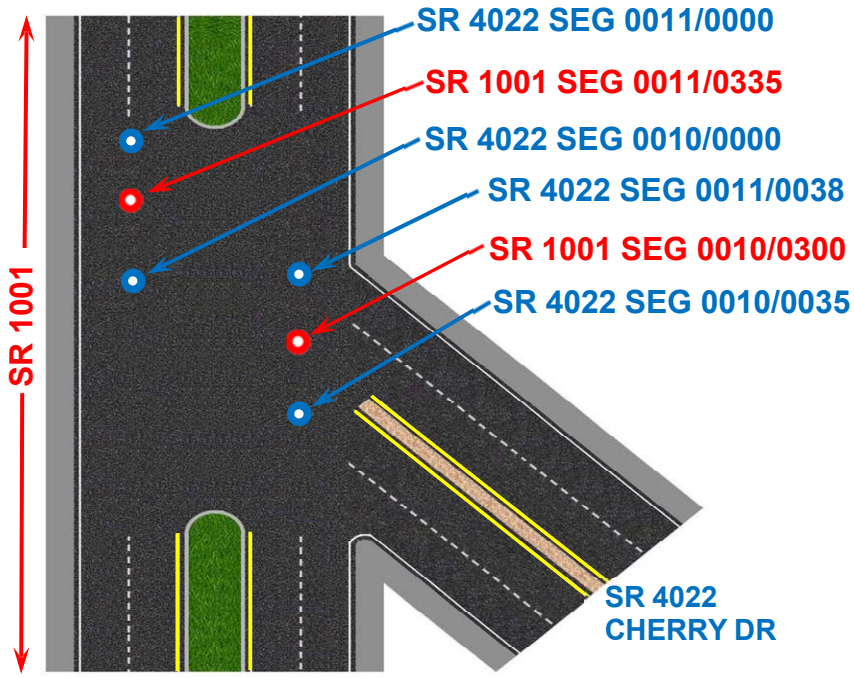


LRS SLD Display

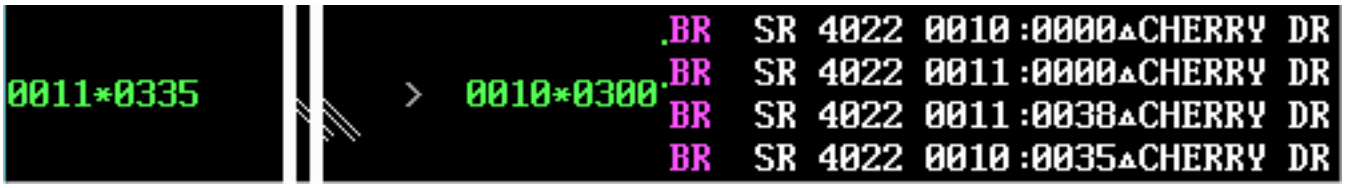
5-31 : Intersection of Divided SR's with the SR being verified having a ≥ 20 ft barrier

Verification for SR 1001

Divisor ( ) Type 3,7
Divisor ( ) Type 1,2,4,5,8



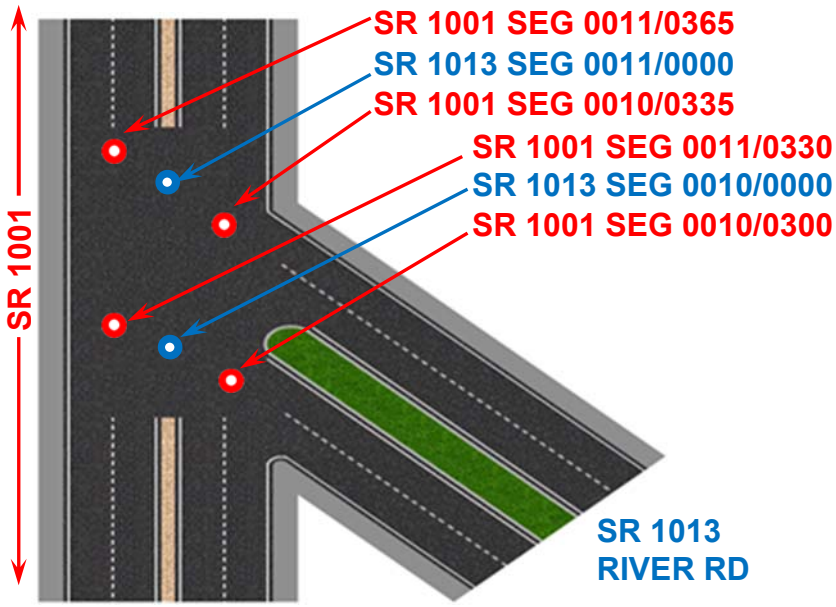
LRS SLD Display



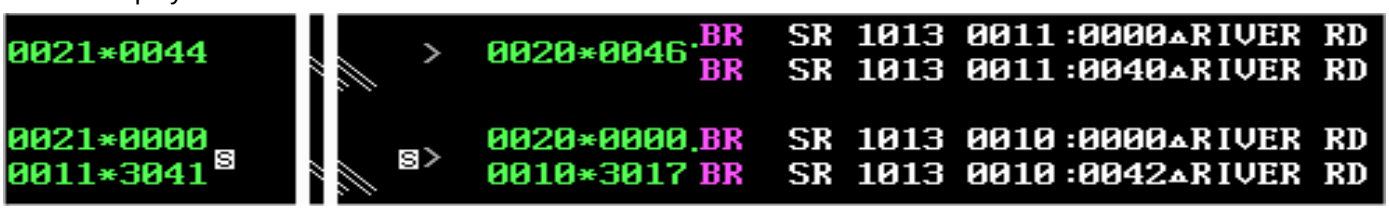
5-32 : Intersection of Divided SR's with the intersecting SR having a ≥ 20 ft barrier

Verification for SR 1001

Divisor ( ) Type 3,7



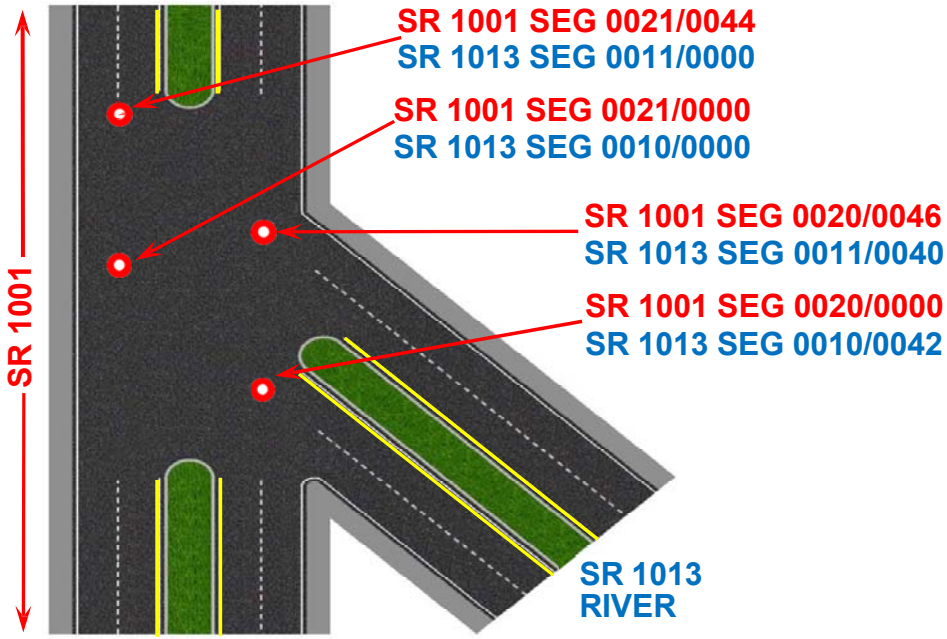
LRS SLD Display



5-33 : Intersection of Divided SR's with both SR's having a ≥ 20 ft barrier

Verification for SR 1001

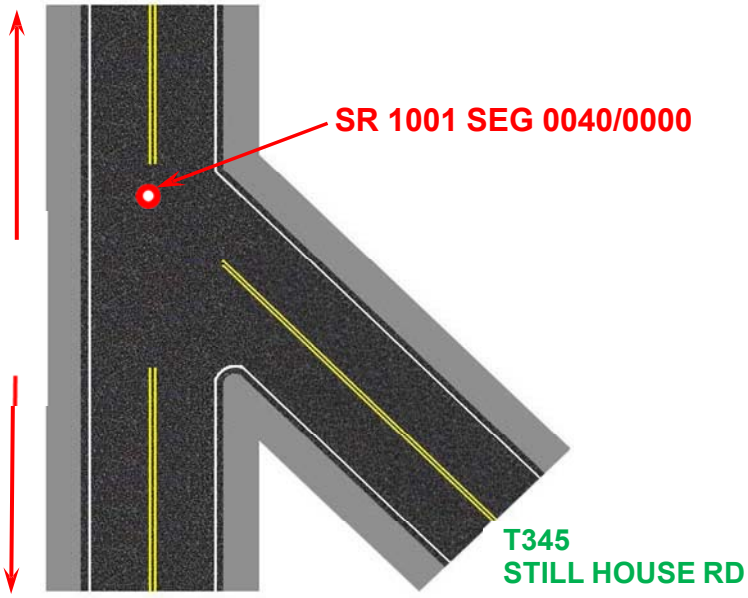
Divisor ( ) Type 3,7



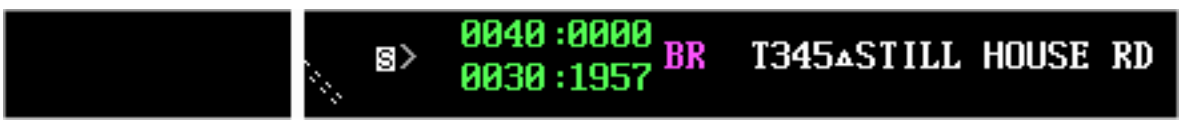
LRS SLD Display

5-34 : Intersection of Undivided SR and Undivided Local Road

Verification for SR 1001



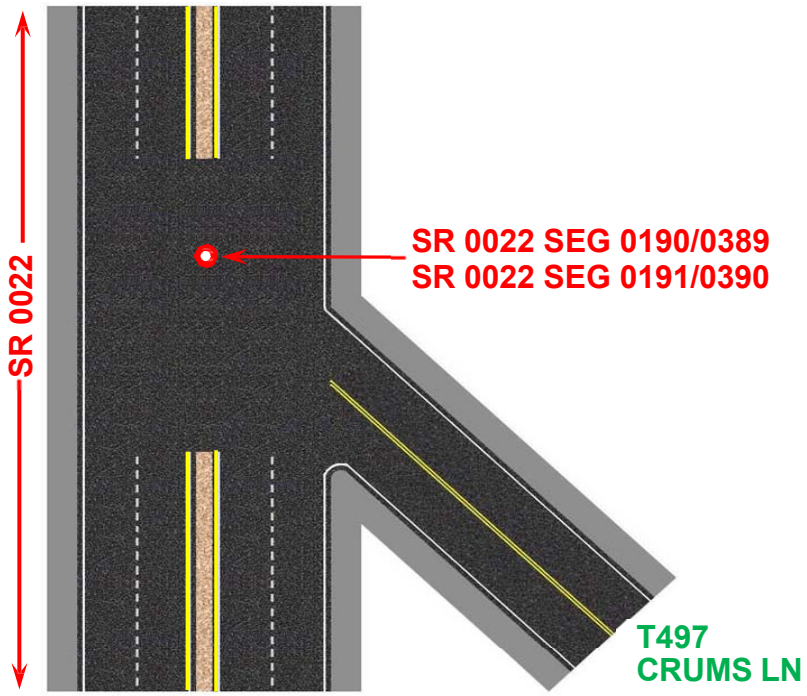
LRS SLD Display



5-35 : Intersection of Divided SR and an Undivided Local Road

Verification for SR 0022

Divisor ( ) Type 1,2,4,5,8

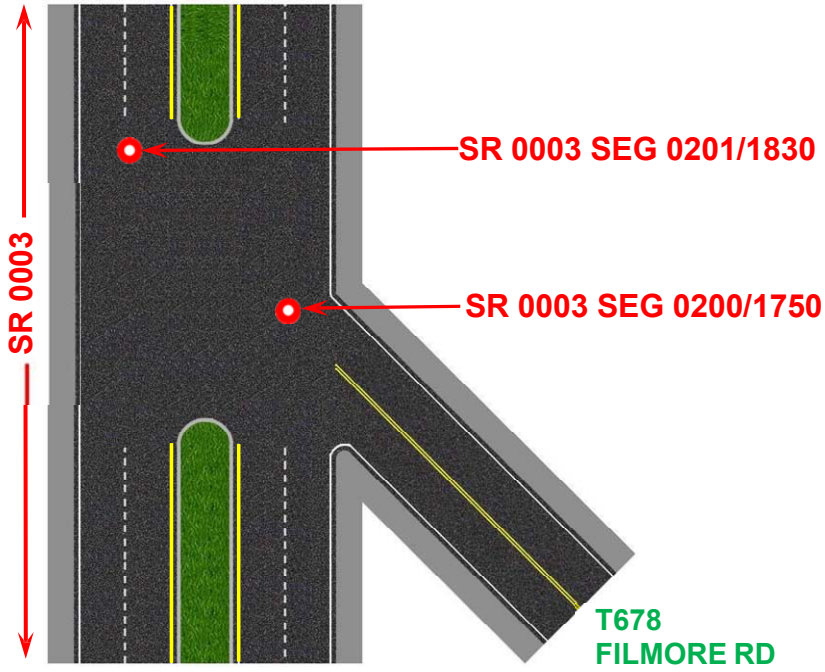


LRS SLD Display

5-36 : Intersection of a Divided SR having a ≥ 20 ft barrier and Undivided Local Road

Verification for SR 0003

Divisor ( ) Type 3,7



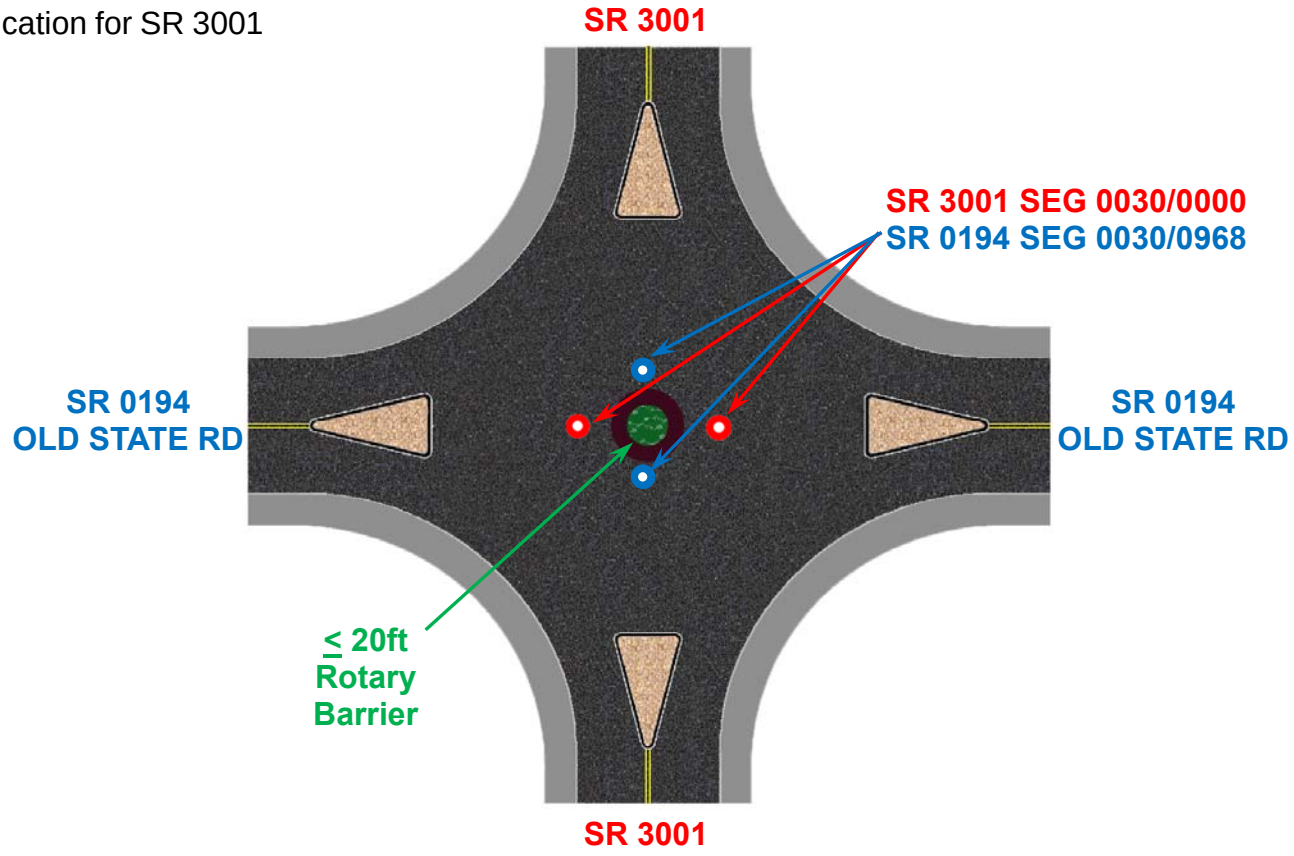
LRS SLD Display

Modern Roundabouts and Nontraditional Intersections

5-37 : Rotary or Traffic Slowing Intersections with a ≤ 20ft Rotary Barrier

All intersecting roads in this type of rotary should be treated as if the rotary did not exist. The verifications points around the rotary should all be treated as if they were the same segments and offsets. The rotary intersection code (RO) should be used and the RO should be labeled as a TWP, BORO, CITY or PRDR type of intersection. The actual type of intersecting roads should also be added as if the rotary did not exist, (i.e. On SR 3001, the SR 0194 intersection would be a CR, and a BORO Rotary type of intersection would be added to that node).

Verification for SR 3001



	TRAFFIC			RAMP	STATE				OTHER
--MAINLINE--	LIGHT	---------INTERSECTION----------		EXIT	------ROUTE------				NON-ST
OFFSET	TYPE	ROADWAY NAME	TYPE	NO.	CO	SR	SEG.	OFF.	ROUTE
? 0000	CROSS	OLD STATE RD			66	0194	0030	0968	
? 0000	ROTARY	ABBOTTSTOWN - MAIN ST			66				BORO

5-38: Modern Roundabout Intersections with a >20ft Rotary Barrier

Whenever the diameter of the center barrier exceeds 20ft, the roundabout intersection should be treated as a divided section of roadway. Figures 5-38.1 and 5-38.2 show three state routes intersecting in the roundabout. The primary route is determined by route hierarchy. In this example, SR 116 is the primary route and will have Eastbound and Westbound segments that extend around the roundabout. Other routes that travel through the roundabout will have null segments. Intersecting routes with a raised barrier will also have divided segments.

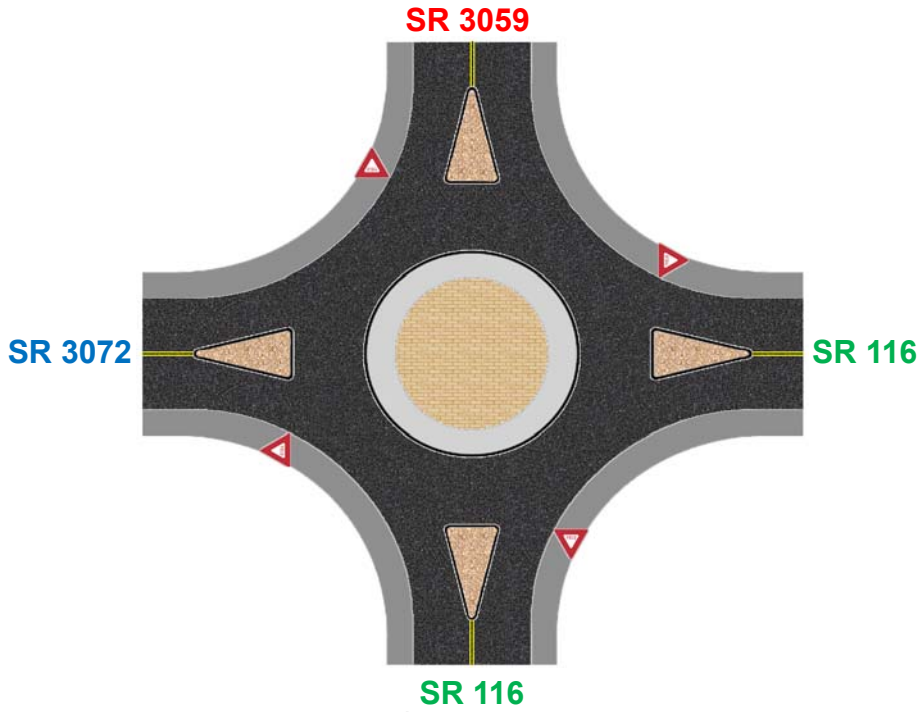


Figure 5-38.1
Intersecting Routes

Note: The roundabout on SR 116 creates SEG 0262 & 0263

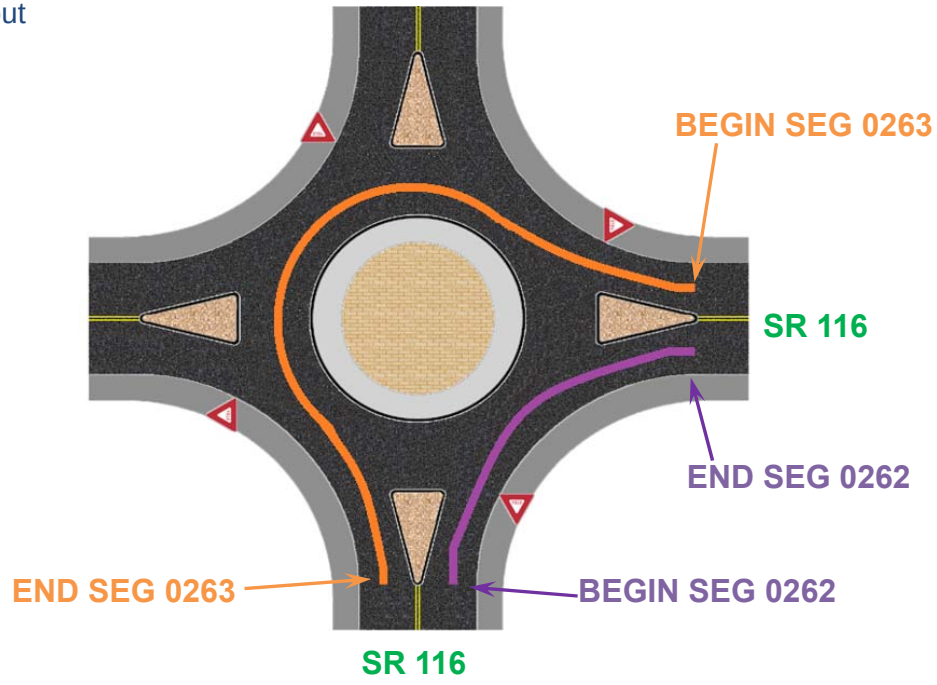


Figure 5-38.2
Divided barriers before and after the roundabout are included

All verification points within the roundabout should be treated as separate intersections, as if the roundabout did not exist (Figure 5-38.3). In addition to the typical intersection information, a rotary code (RO) should also be used at each intersection. The RO codes are entered to include offset, rotary code, municipality, street name, county number, and the TWP, BORO, CITY or PRDR representing the location of the intersection (Figure 5-38.4).

Note: Add ROTARY (RO) codes to all intersecting roads in the circle of the roundabout.

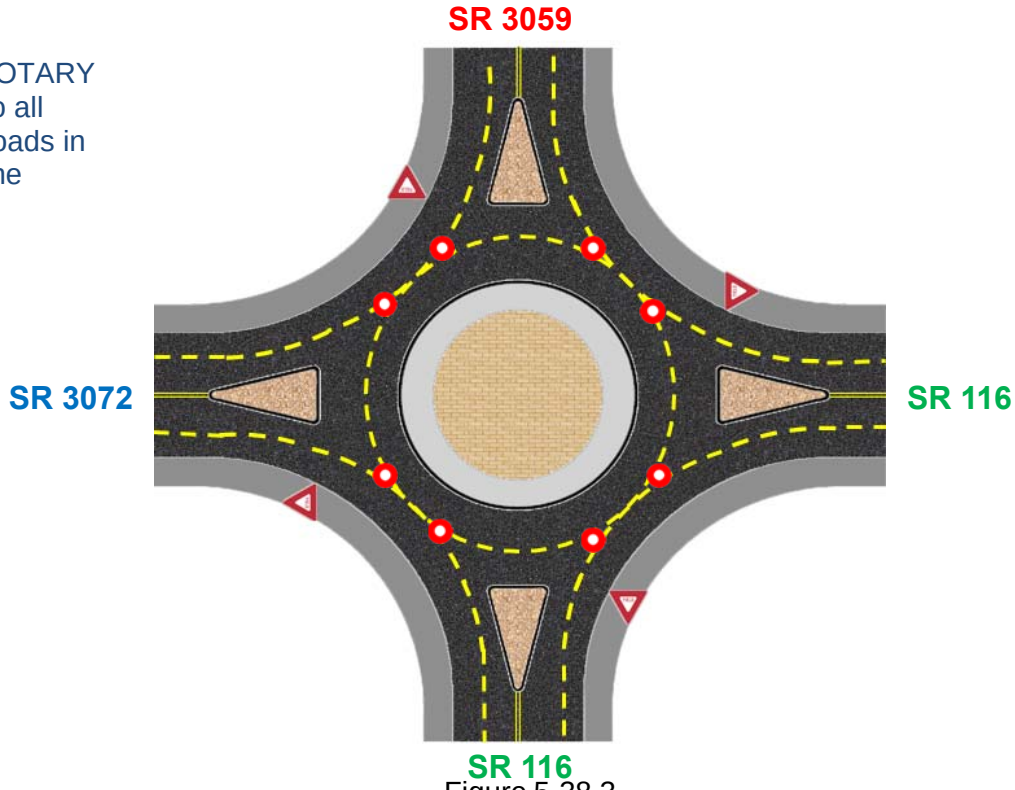


Figure 5-38.3
Locations requiring Rotary (RO) codes

```
RMSRT494            ROADWAY MANAGEMENT INFORMATION SYSTEM  11/27/2017 13:48:16
LTERM: CMCCLEN          INTERSECTION DATA (AT GRADE)

 COUNTY NO/NAME: 66 / YORK              STREET NAME1: MAIN ST
 STATE ROUTE...: 0116                   SEGMENT LENGTH.....: 0609
 SEGMENT.......: 0262   DIRECTION: E    NO. OF INTERSECTIONS: 04  &  LIGHTS: 00

           TRAFFIC                                      RAMP        STATE       OTHER
--MAINLINE--LIGHT---------INTERSECTION---------- EXIT  ------ROUTE------ NON-ST
OFFSET  TYPE           ROADWAY NAME        TYPE   NO.  CO  SR  SEG. OFF. ROUTE
------ ------ - ---------------------- ------ ----  -- ---- ---- ----  ----
? 0302 BACKL    CONN FOR SR 116W TO 116E              66                CONN
? 0302 ROTARY   SPRING GROVE - MAIN ST                66                BORO
? 0406 AHEADL   CONN FOR SR 116E TO 116W              66                CONN
? 0406 ROTARY   SPRING GROVE - MAIN ST                66                BORO
```

Figure 5-38.4
SR 116 segment 262 has two intersections inside the roundabout

Connectors are required to allow PennDOT's Automated Permit Routing Analysis System (APRAS) to function properly. Connections should be added to the primary roadway traveling through the roundabout. In the example shown in figure 5-38.5 the blue line represents the location of the connectors required to connect SR 116 westbound to SR 116 eastbound. The red line identifies the locations of the connectors for SR 116 eastbound to SR 116 westbound. Figure 5-38.6 illustrates how the connectors for segment 262 & 263 (blue lines) are entered into RMS.

Note: Add connectors to connect the East and Westbound segments of the primary route

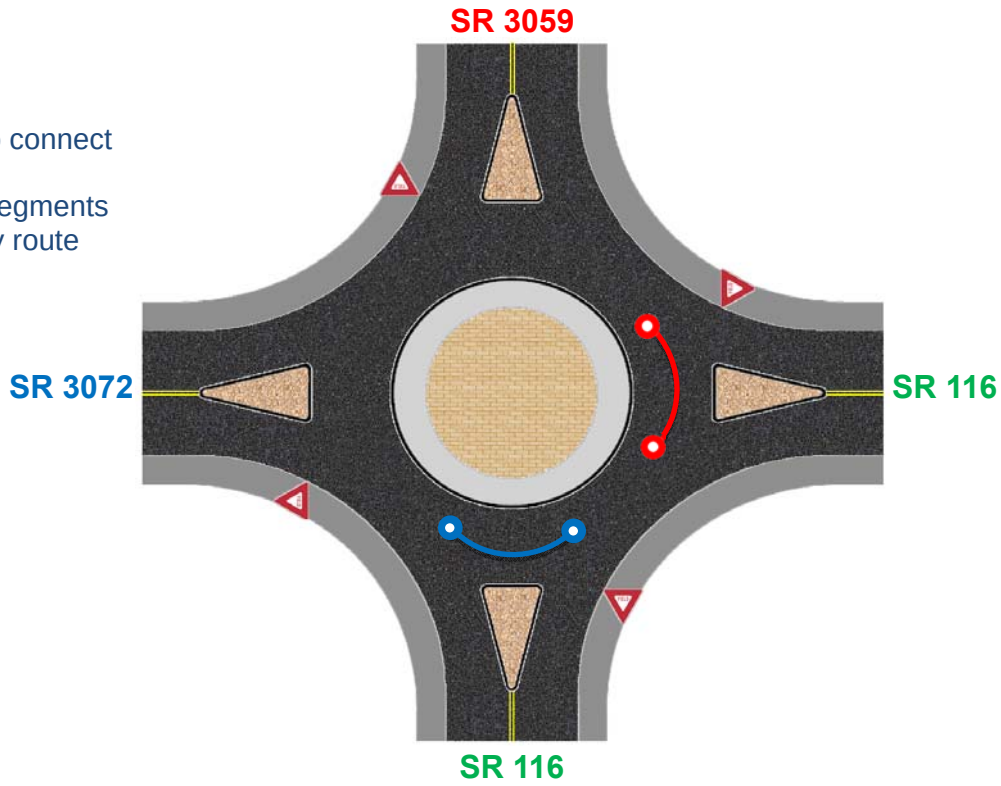


Figure 5-38.5
Four connectors are required on SR 116 in segments 262 & 263

```
COUNTY NO/NAME: 66 / YORK              STREET NAME1:
STATE ROUTE...: 0116                   SEGMENT LENGTH......: 0609
SEGMENT.......: 0262   DIRECTION: E    NO. OF INTERSECTIONS: 04  &  LIGHTS: 00

          TRAFFIC                                      RAMP        STATE       OTHER
--MAINLINE--LIGHT---------INTERSECTION---------- EXIT  ------ROUTE------ NON-ST
OFFSET  TYPE           ROADWAY NAME        TYPE   NO.  CO  SR  SEG. OFF. ROUTE
------ ------ - ------------------------ ------ ----  -- ---- ---- ----  ----
? 0302 BACKL    CONN FOR SR 116W TO 116E              66                 CONN
```

```
COUNTY NO/NAME: 66 / YORK              STREET NAME1: MAIN ST
STATE ROUTE...: 0116                   SEGMENT LENGTH......: 0718
SEGMENT.......: 0263   DIRECTION: W    NO. OF INTERSECTIONS: 12  &  LIGHTS: 00

          TRAFFIC                                      RAMP        STATE       OTHER
--MAINLINE--LIGHT---------INTERSECTION---------- EXIT  ------ROUTE------ NON-ST
OFFSET  TYPE           ROADWAY NAME        TYPE   NO.  CO  SR  SEG. OFF. ROUTE
------ ------ - ------------------------ ------ ----  -- ---- ---- ----  ----
? 0227 BACKR    CONN FOR SR 116W TO 116E              66                 CONN
```

Figure 5-38.6
Connectors are entered EXACTLY as the corresponding connector in the adjacent segment

SR 116 has multiple intersections. Add all of the intersections at the correct offsets, including connectors. As mentioned previously, rotary codes are then added to every intersection and connector. Figure 5-38.7 shows how segment 263 appears in RMS. The RO symbol will display at all connections inside the roundabout (Figure 5-38.8).

```
 COUNTY NO/NAME: 66 / YORK              STREET NAME1:
 STATE ROUTE...: 0116                   SEGMENT LENGTH.....: 0718
 SEGMENT.....: 0263   DIRECTION: W      NO. OF INTERSECTIONS: 12  &  LIGHTS: 00

          TRAFFIC                                    RAMP        STATE       OTHER
--MAINLINE--LIGHT---------INTERSECTION---------- EXIT  ------ROUTE------ NON-ST
OFFSET  TYPE           ROADWAY NAME        TYPE   NO.  CO  SR  SEG. OFF. ROUTE
------ ------ - ------------------------ ------ ----  -- ---- ---- ----  ----
? 0227 AHEADR   CONN FOR SR 116W TO 116E              66                 CONN
? 0227 ROTARY   SPRING GROVE - MAIN ST                66                 BORO
? 0279 AHEADL   W HANOVER ST                          66 3072 0160 0070
? 0279 ROTARY   SPRING GROVE - MAIN ST                66                 BORO
? 0331 BACKL    W HANOVER ST                          66 3072 0161 0070
? 0331 ROTARY   SPRING GROVE - MAIN ST                66                 BORO
? 0392 AHEADL   ROTHS CHURCH RD                       66 3059 0005 0000
? 0392 ROTARY   SPRING GROVE - MAIN ST                66                 BORO
? 0475 ROTARY   SPRING GROVE - MAIN ST                66                 BORO
? 0475 BACKL    ROTHS CHURCH RD                       66 3059 0004 0000
? 0529 AHEADR   CONN FOR SR 116E TO 116W              66                 CONN
? 0529 ROTARY   SPRING GROVE - MAIN ST                66                 BORO
```

Figure 5-38.7
Segment 263 shown in RMS with RO codes at each intersection in the roundabout

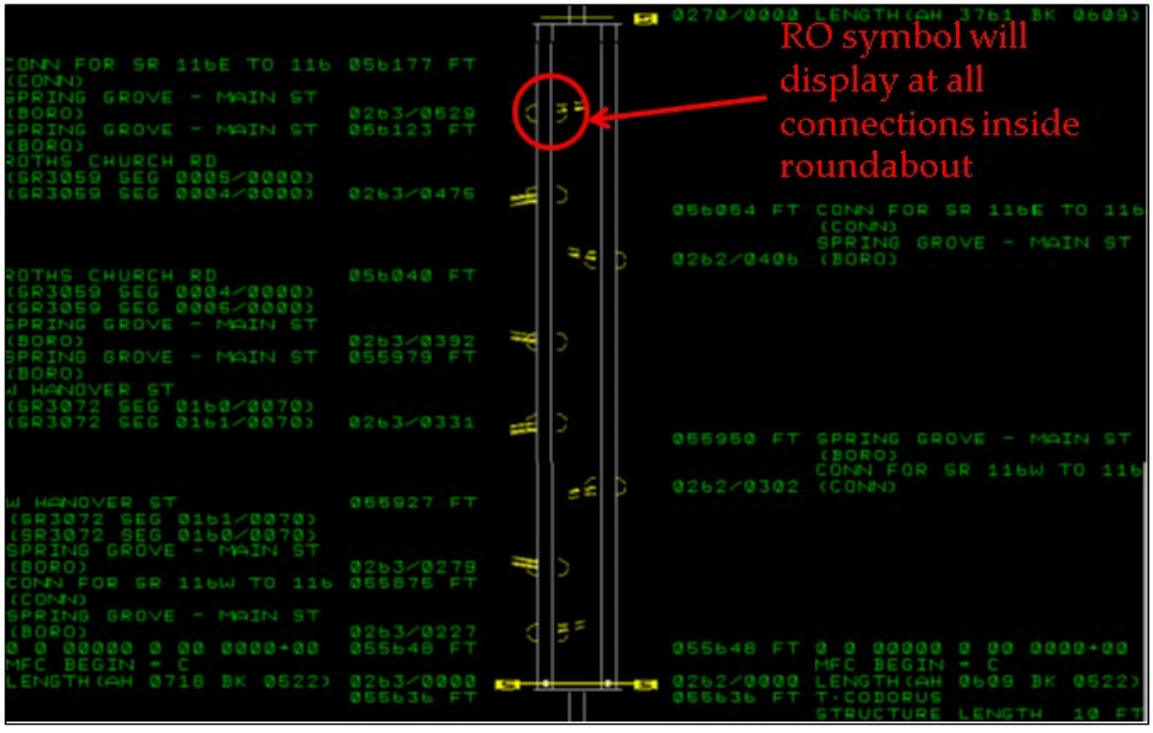


Figure 5-38.8
SLD for SR 116 as it appears in RMS

Create divided segments for all other intersecting routes entering the roundabout with a raised barrier. In this example, SR 3059 and 3072 both have raised barriers requiring the dividing segments (Figure 5-38.9 through 5-38.11).

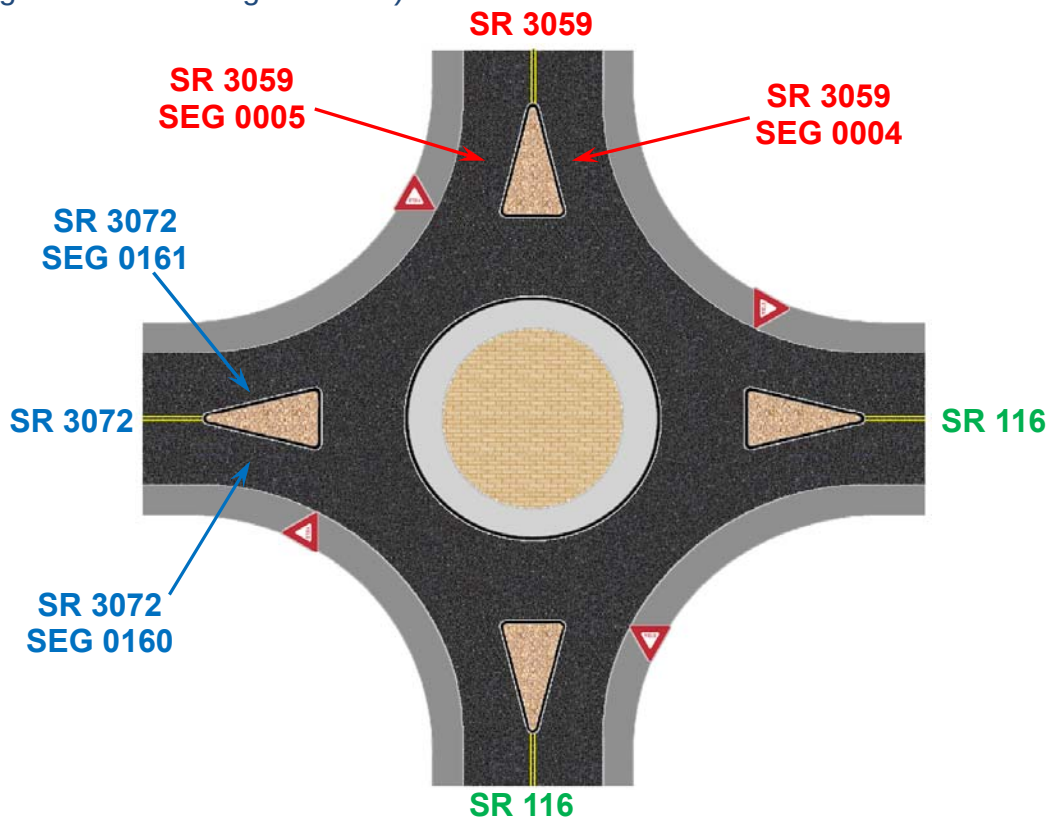


Figure 5-38.9
Create divided segments for intersecting SR's

```
 COUNTY NO/NAME: 66 / YORK              STREET NAME1:
 STATE ROUTE...: 3059                   SEGMENT LENGTH......: 0072
 SEGMENT.......: 0004   DIRECTION: N    NO. OF INTERSECTIONS: 03  &  LIGHTS: 00

           TRAFFIC                                    RAMP        STATE       OTHER
--MAINLINE--LIGHT---------INTERSECTION---------- EXIT  ------ROUTE------ NON-ST
OFFSET  TYPE           ROADWAY NAME        TYPE   NO.  CO  SR  SEG. OFF. ROUTE
------ ------ - ------------------------ ------ ----  -- ---- ---- ----  ----
? 0000 INTERB   MAIN ST                                66 0116 0263 0475
? 0000 ROTARY   SPRING GROVE - MAIN ST                 66                BORO
? 0000 AHEADL   MAIN ST                                66 0116 0263 0475
```

```
 COUNTY NO/NAME: 66 / YORK              STREET NAME1:
 STATE ROUTE...: 3059                   SEGMENT LENGTH......: 0072
 SEGMENT.......: 0005   DIRECTION: S    NO. OF INTERSECTIONS: 03  &  LIGHTS: 00

           TRAFFIC                                    RAMP        STATE       OTHER
--MAINLINE--LIGHT---------INTERSECTION---------- EXIT  ------ROUTE------ NON-ST
OFFSET  TYPE           ROADWAY NAME        TYPE   NO.  CO  SR  SEG. OFF. ROUTE
------ ------ - ------------------------ ------ ----  -- ---- ---- ----  ----
? 0000 INTERB   MAIN ST                                66 0116 0263 0392
? 0000 ROTARY   SPRING GROVE - MAIN ST                 66                BORO
? 0000 AHEADR   MAIN ST                                66 0116 0263 0392
```

Figure 5-38.10
SR 3059 as shown in RMS

```
 COUNTY NO/NAME: 66 / YORK              STREET NAME1:
 STATE ROUTE...: 3072                   SEGMENT LENGTH.....: 0070
 SEGMENT.......: 0160   DIRECTION: E    NO. OF INTERSECTIONS: 03  &  LIGHTS: 00

           TRAFFIC                                    RAMP        STATE       OTHER
--MAINLINE--LIGHT---------INTERSECTION---------- EXIT  ------ROUTE------ NON-ST
OFFSET  TYPE           ROADWAY NAME        TYPE   NO.  CO  SR  SEG. OFF. ROUTE
------ ------ - ------------------------ ------ ----  -- ---- ---- ----  ----
? 0070 BACKL    SR 0116                                66 0116 0263 0279
? 0070 ROTARY   SPRING GROVE - MAIN ST                 66                BORO
? 0070 AHEADR   SR 0116                                66 0116 0263 0279
```

```
 COUNTY NO/NAME: 66 / YORK              STREET NAME1:
 STATE ROUTE...: 3072                   SEGMENT LENGTH.....: 0070
 SEGMENT.......: 0161   DIRECTION: W    NO. OF INTERSECTIONS: 03  &  LIGHTS: 00

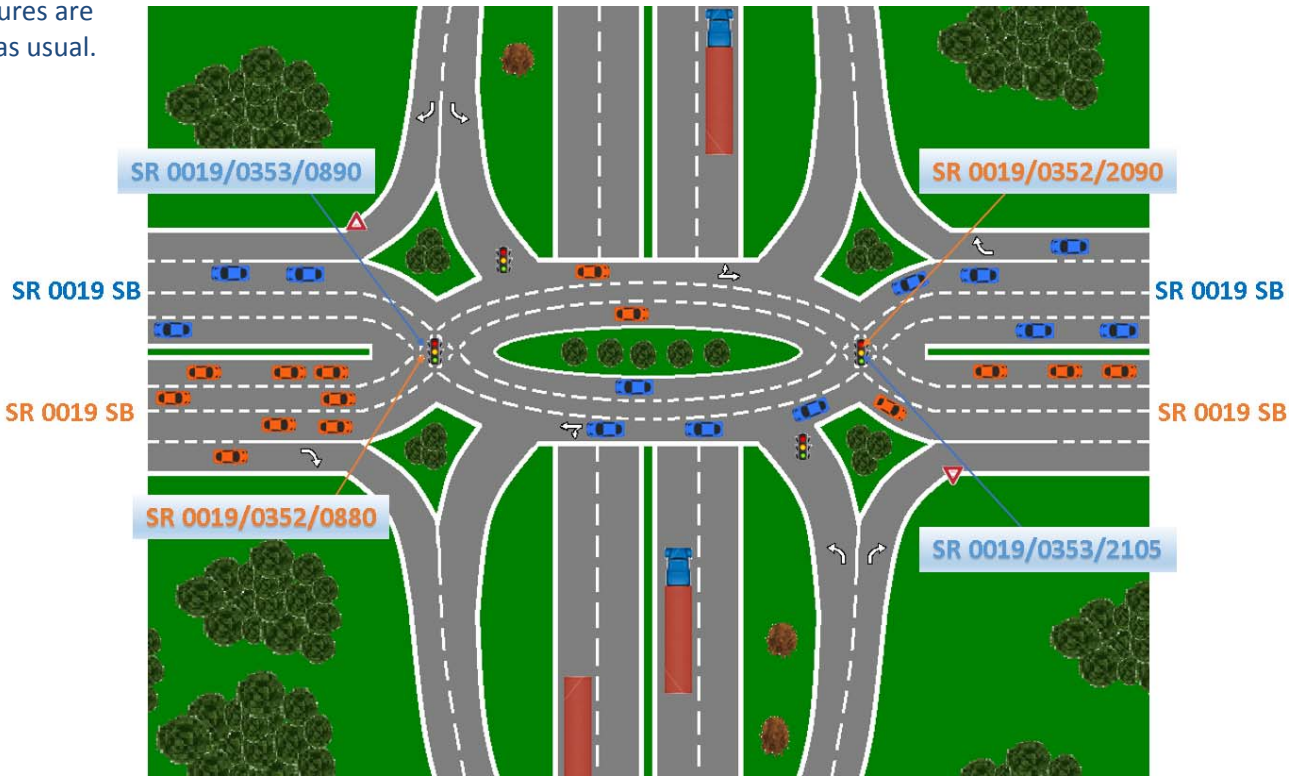
           TRAFFIC                                    RAMP        STATE       OTHER
--MAINLINE--LIGHT---------INTERSECTION---------- EXIT  ------ROUTE------ NON-ST
OFFSET  TYPE           ROADWAY NAME        TYPE   NO.  CO  SR  SEG. OFF. ROUTE
------ ------ - ------------------------ ------ ----  -- ---- ---- ----  ----
? 0070 BACKR    MAIN ST                                66 0116 0263 0331
? 0070 INTERA   MAIN ST                                66 0116 0263 0331
? 0070 ROTARY   SPRING GROVE - MAIN ST                 66                BORO
```

Figure 5-38.11
SR 3072 as shown in RMS

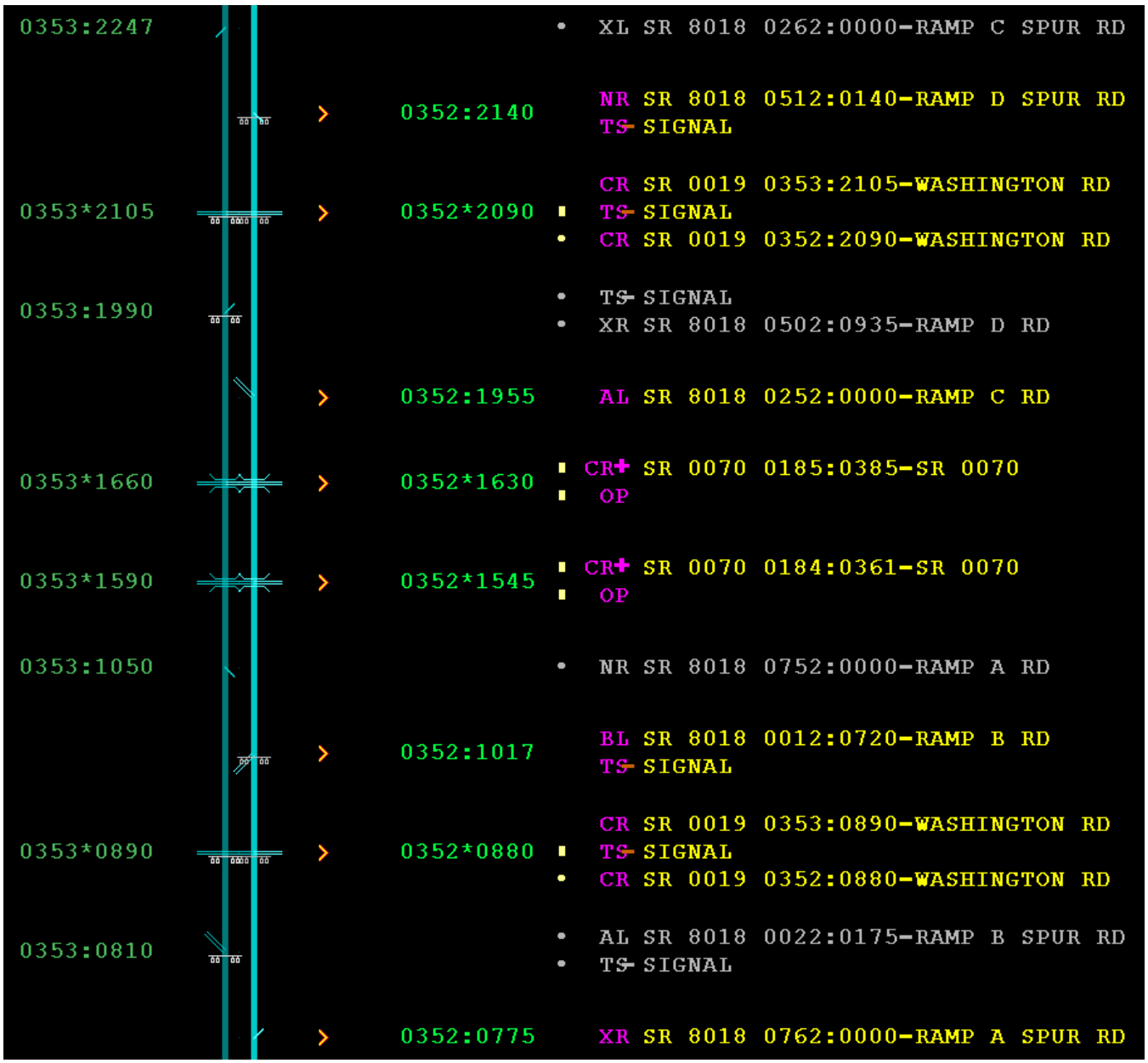
5-39: Diverging Diamond Interchange (DDI)

Verification for SR 0019 Crossovers

All other intersections and features are verified as usual.



LRS SLD Display

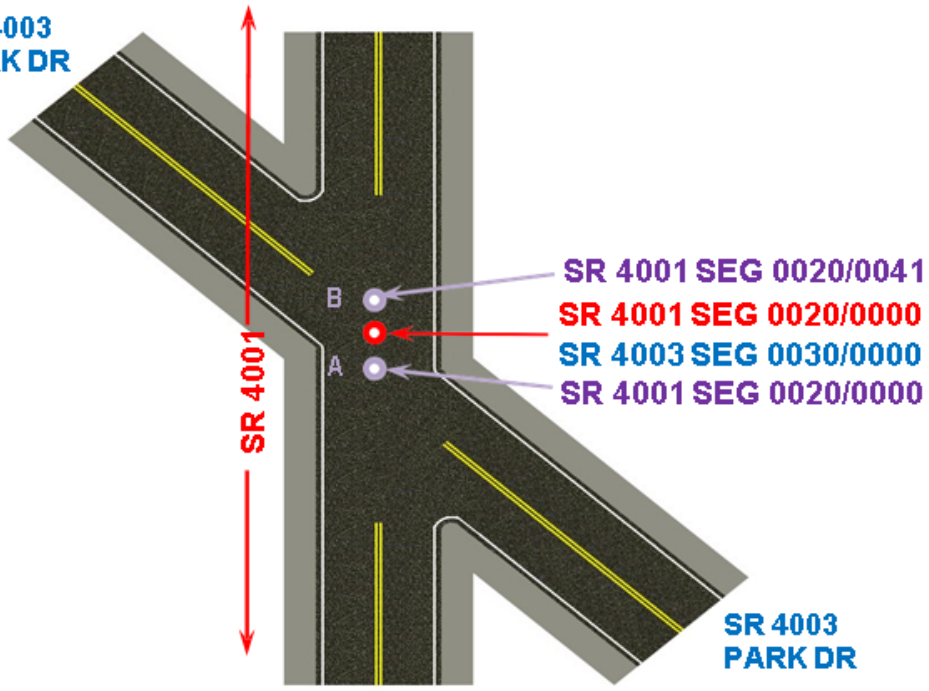


Ramps and Other Intersection Types

5-40: Intersection of 2 SR's that are in Close Proximity to Each Other

Verification for SR 4001

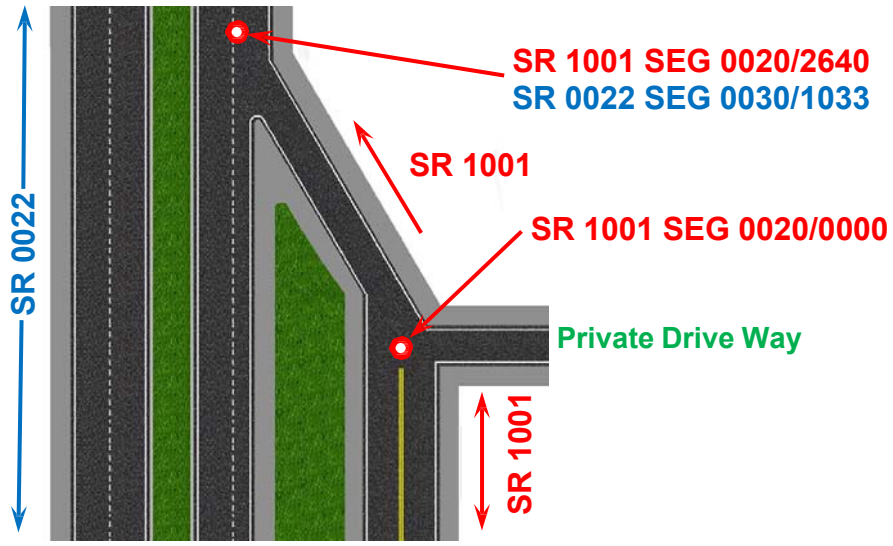
Note: Whenever intersecting SR's intersect at a distance of less than 40ft, they should be treated as one common intersection, if the distance between the 2 intersecting SR's, (**points A and B**) is 40ft or greater, then the intersections should be located at different offsets.



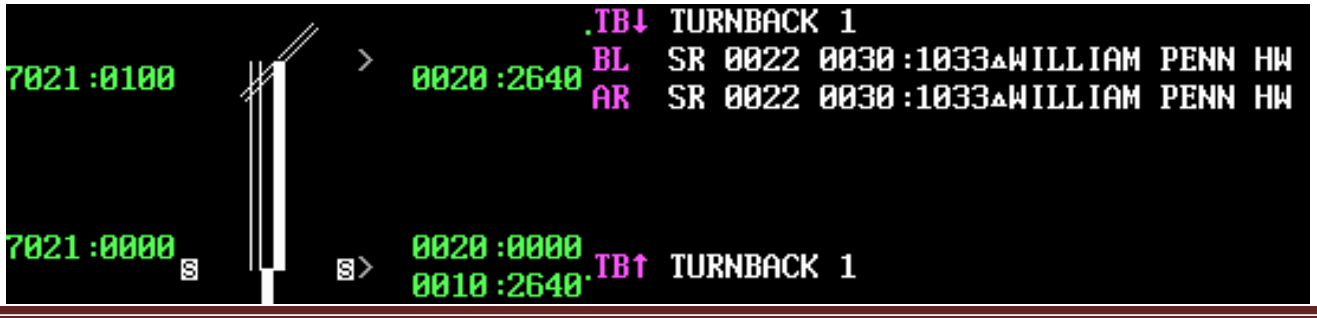
LRS SLD Display

5-41: Intersection of an Undivided SR with a partial One-way Section and a Divided SR

Verification for SR 1001

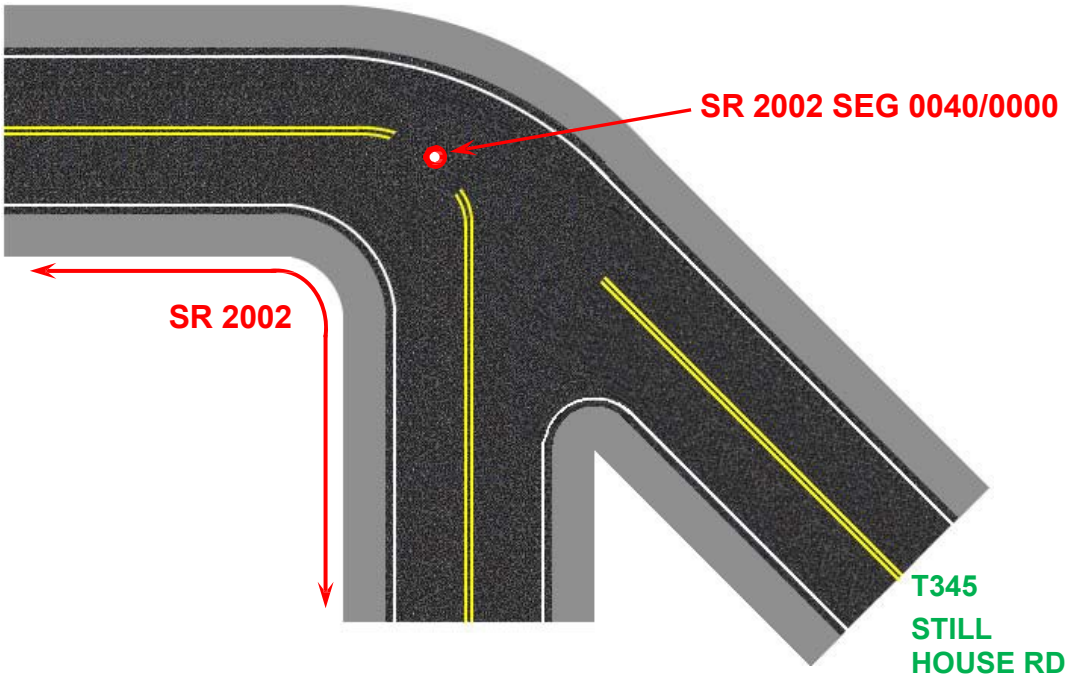


LRS SLD Display

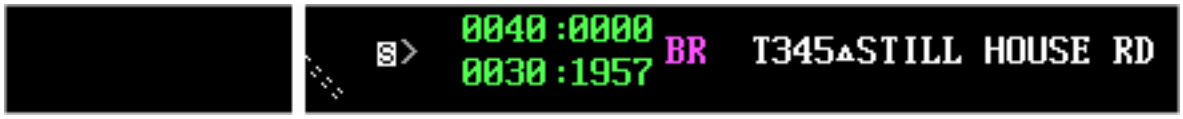


5-42 : Intersection of Undivided SR and Undivided Local Road that is on a Curve

Verification for SR 2002



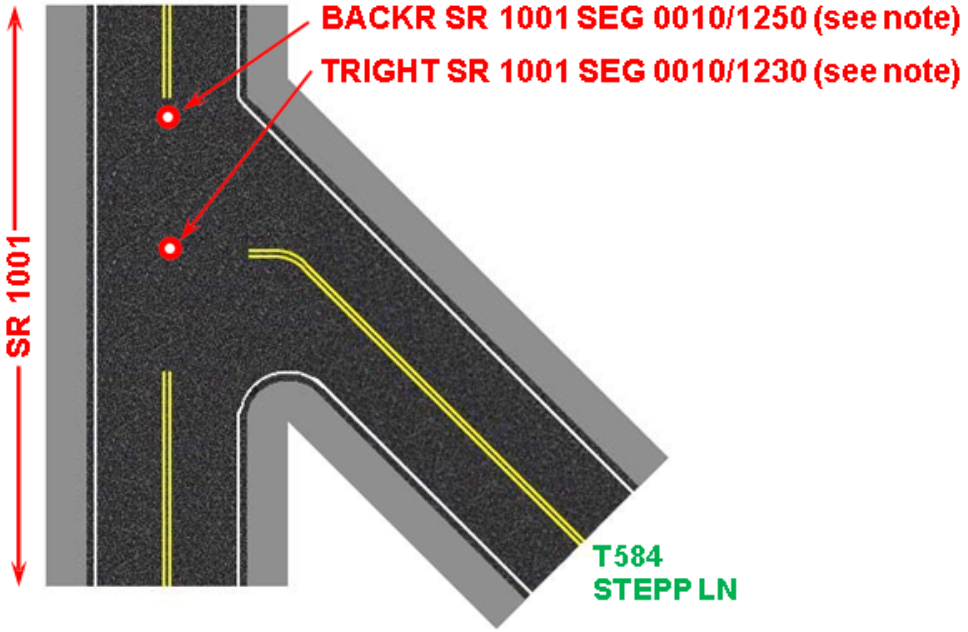
LRS SLD Display



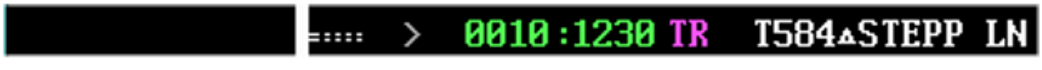
5-43: Intersection of Undivided SR and a Skewed Undivided Local Road that is Paint Lined at a 90 Degree Angle

Verification for SR 1001

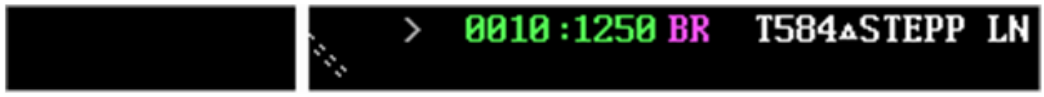
Note: Event point, (BACKR) or (TRIGHT), is acceptable. However, the event code and location must correspond to the code used.



LRS SLD Display



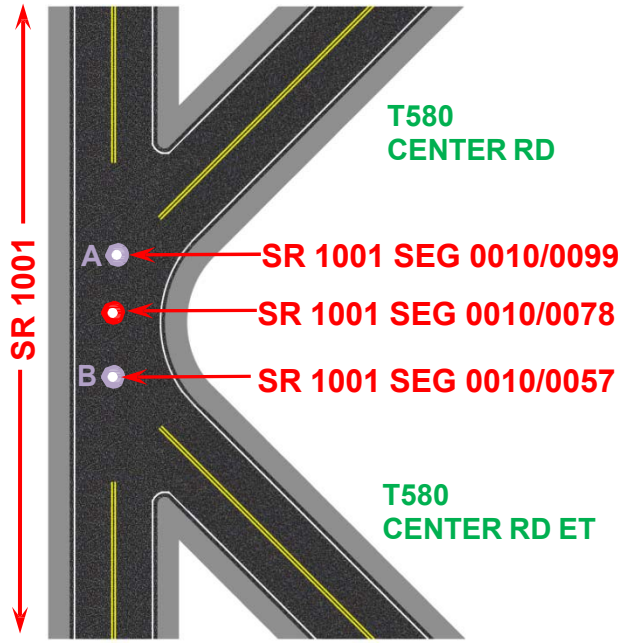
or



5-44: Intersection of an Undivided SR and Local Roads that intersect in a V Formation

Verification for SR 1001

Note: This intersection should be treated as one "COMMON" intersection if the distance between the 2 intersecting roads **(A and B)** is less than 40ft., if they are greater than 40ft apart then they should be verified separately.

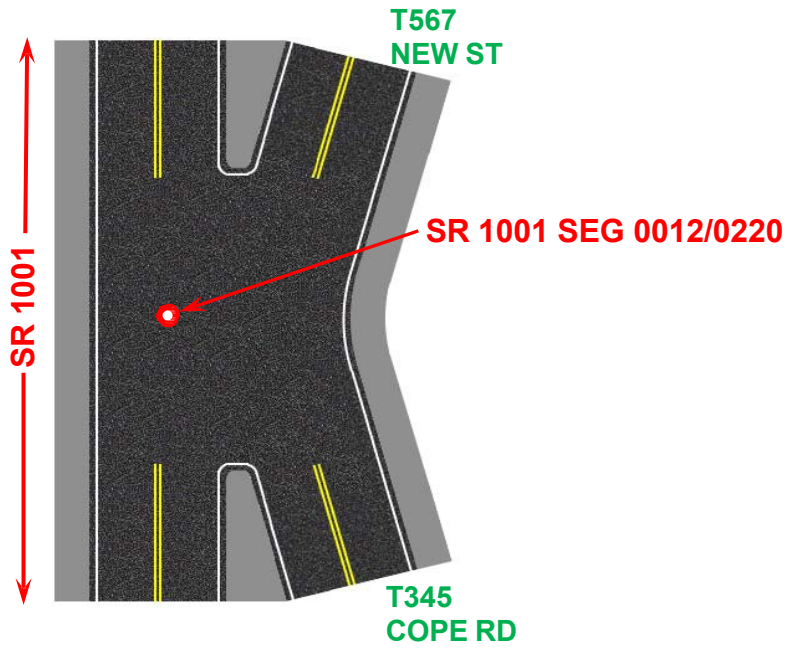


LRS SLD Display

5-45: Intersection of Undivided SR and Skewed Undivided Local Roads

Verification for SR 1001

Note: This intersection should be treated as one "common" intersection and the event point should be located at the center of this "common" intersection.

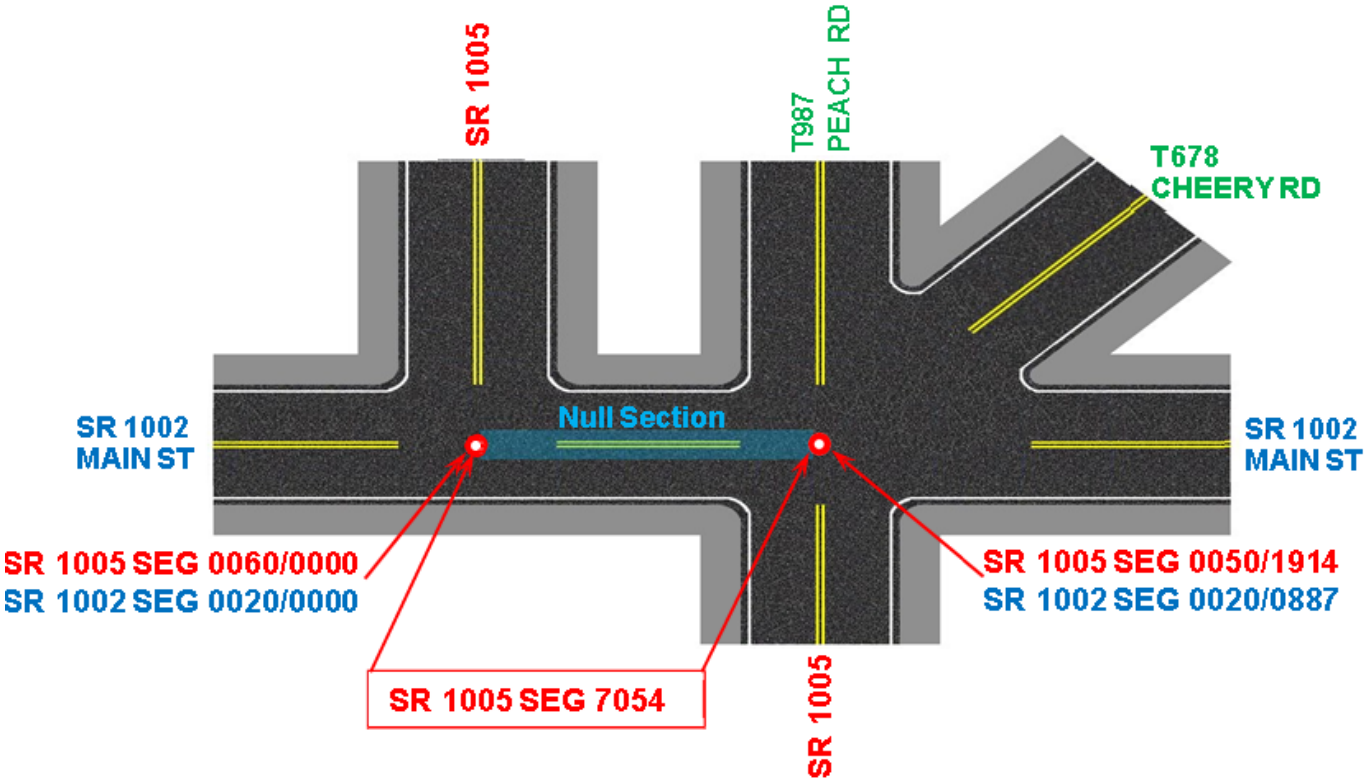


LRS SLD Display

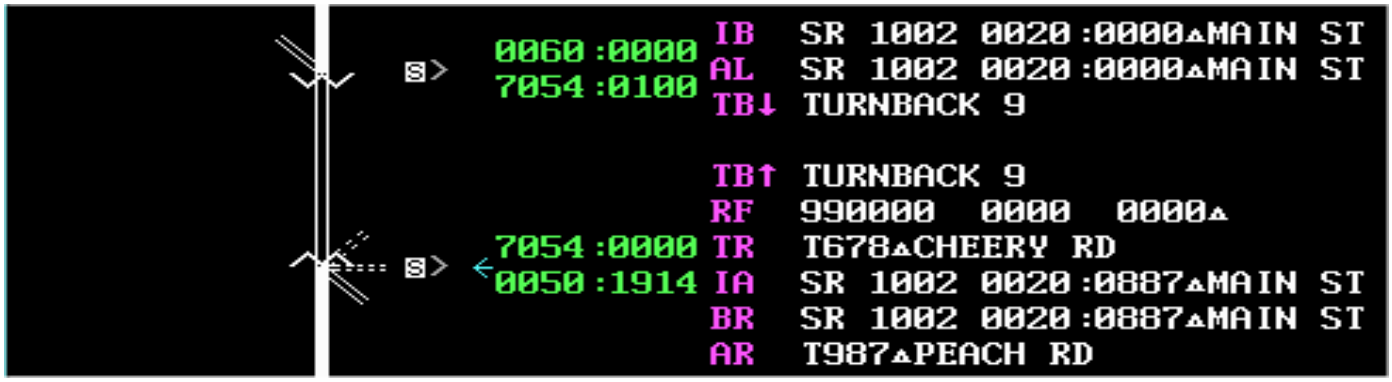
5-46: Intersection of Two Undivided SR's where Each SR Overlaps the Other (Nulls Over)

Verification for SR 1005

Note: SR 1005 contains a 7054 segment that accounts for the portion that runs concurrently over SR 1002. The 7054 segment is known as a turnback or null segment.

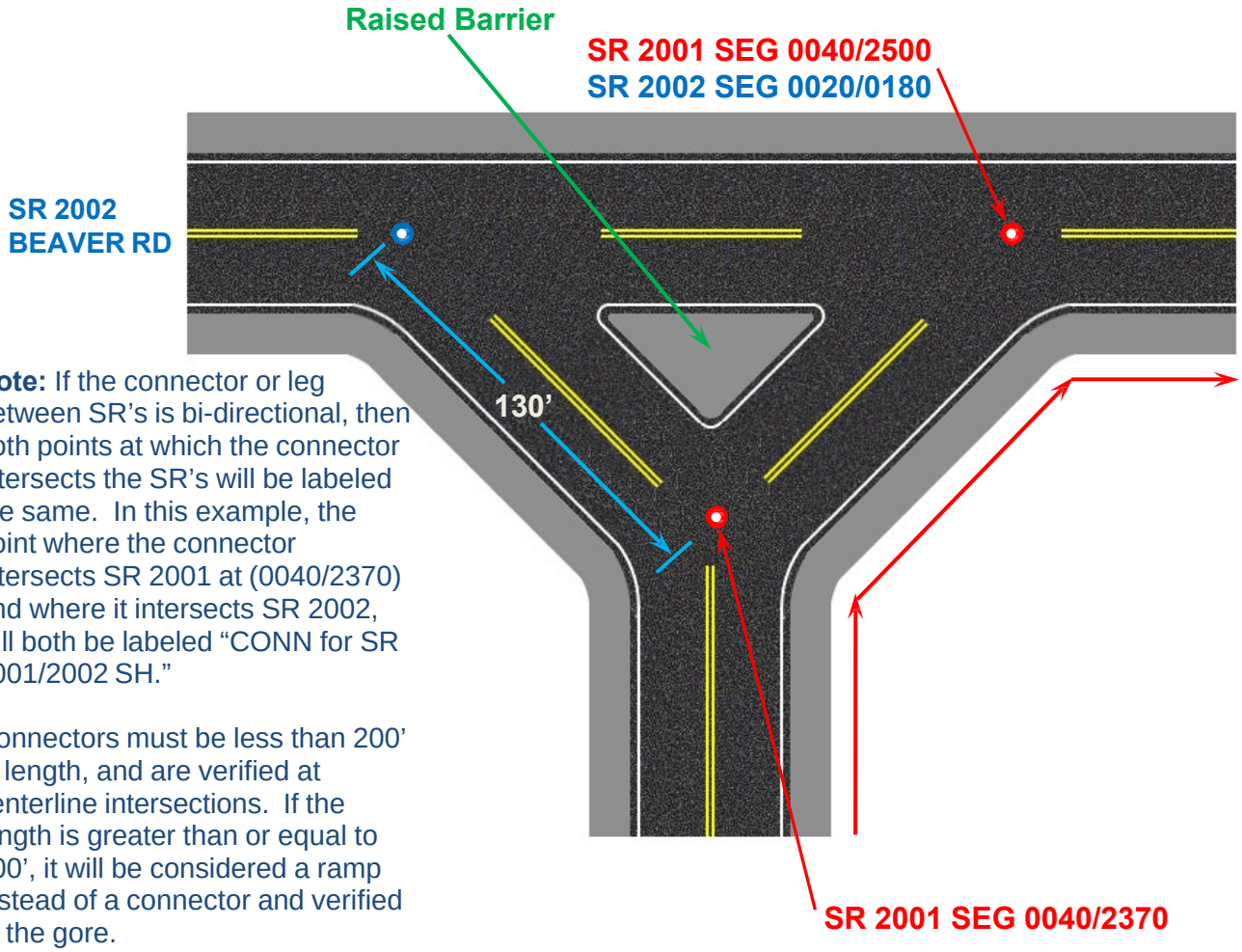


LRS SLD Display



5-47: Intersection of Two Undivided SR's with one of the SR's having a Bidirectional Connector

Verification for SR 2001



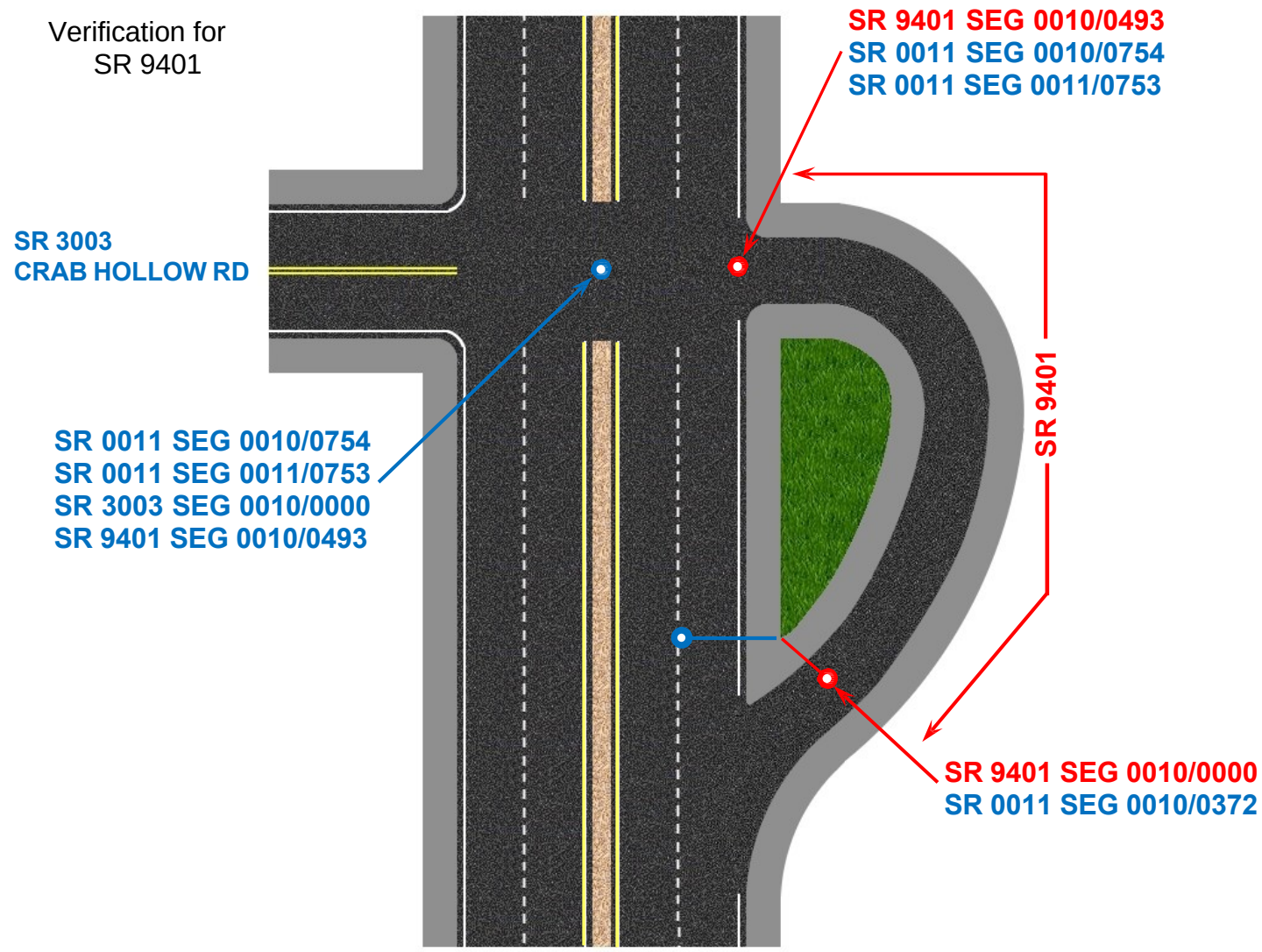
Note: If the connector or leg between SR's is bi-directional, then both points at which the connector intersects the SR's will be labeled the same. In this example, the point where the connector intersects SR 2001 at (0040/2370) and where it intersects SR 2002, will both be labeled "CONN for SR 2001/2002 SH."

Connectors must be less than 200' in length, and are verified at centerline intersections. If the length is greater than or equal to 200', it will be considered a ramp instead of a connector and verified at the gore.

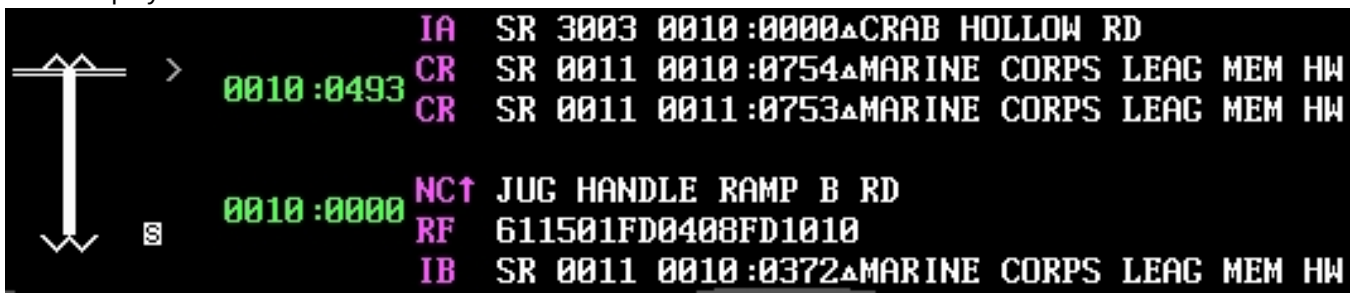
LRS SLD Display

5-48: Intersection of a Divided SR, Undivided SR and a Jughandle

Verification for
SR 9401



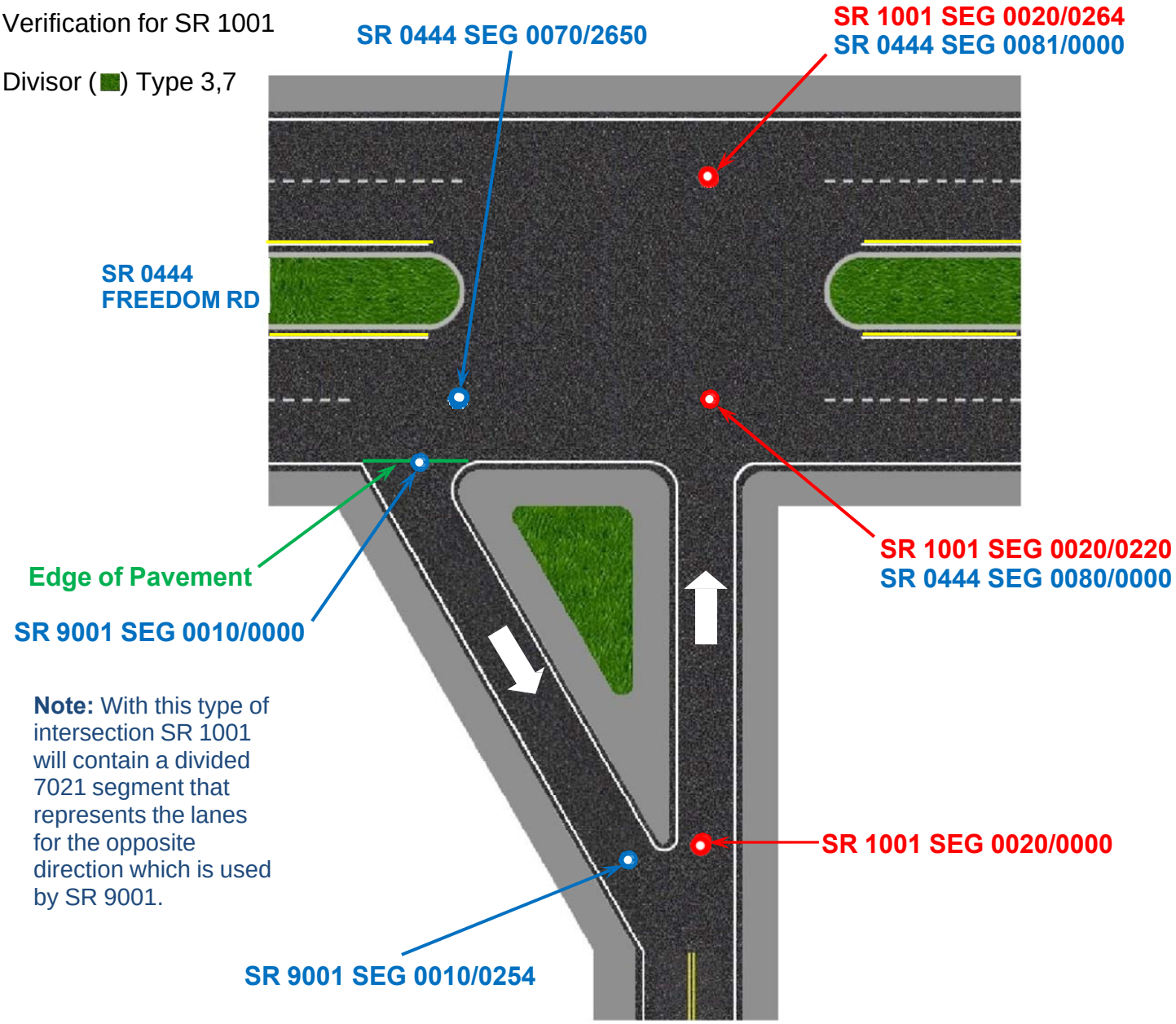
LRS SLD Display



5-49: Intersection of an Undivided SR with a Wye and a Divided SR having a ≥ 20 ft barrier

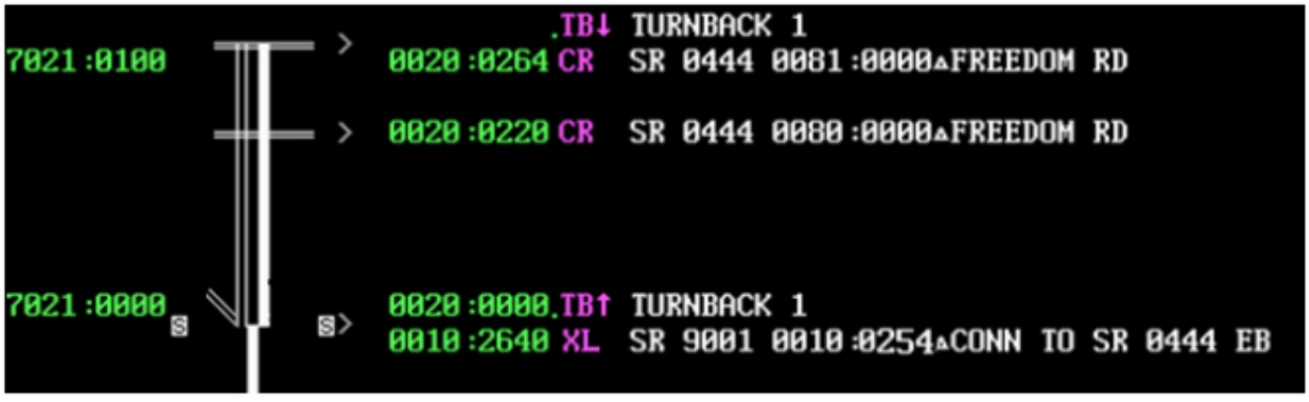
Verification for SR 1001

Divisor (■) Type 3,7



Note: With this type of intersection SR 1001 will contain a divided 7021 segment that represents the lanes for the opposite direction which is used by SR 9001.

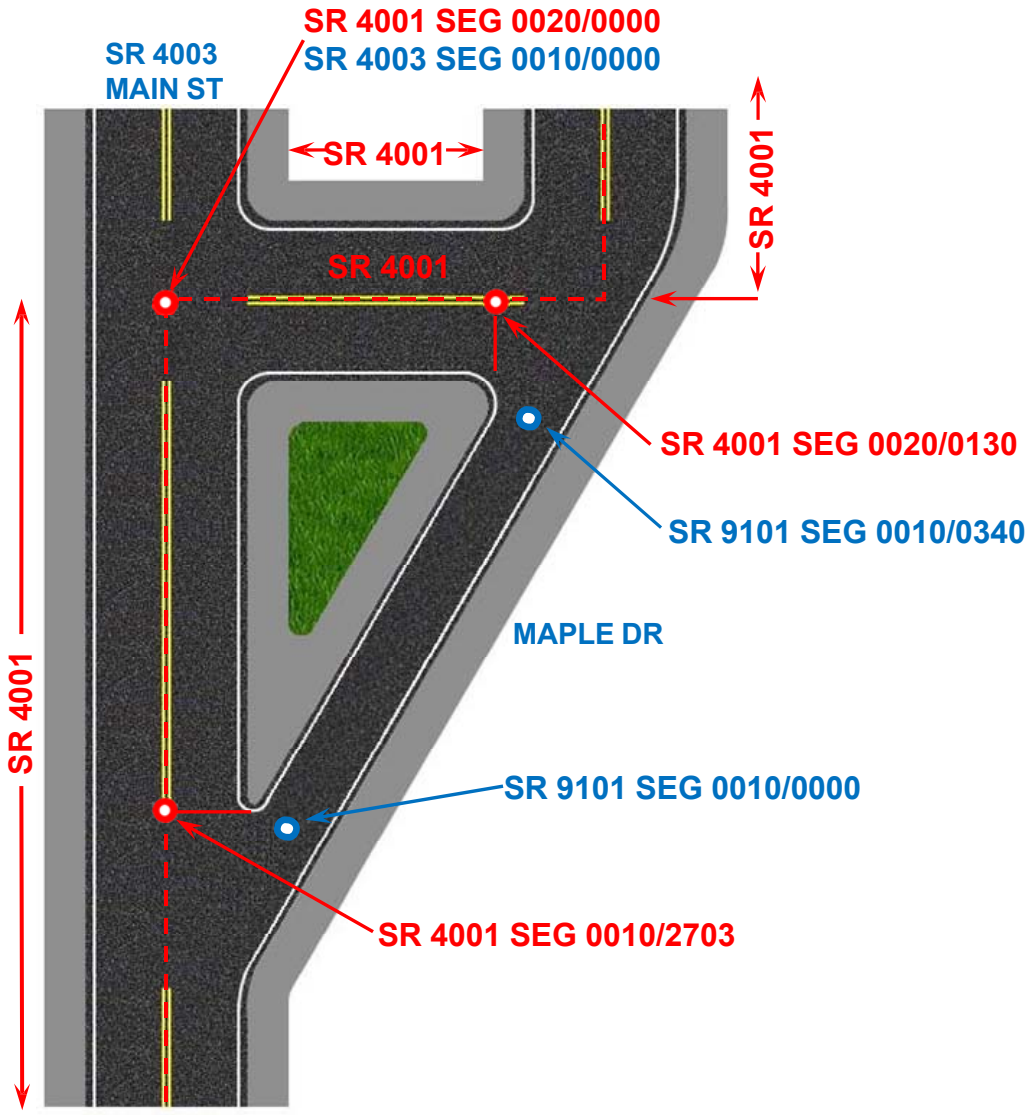
LRS SLD Display



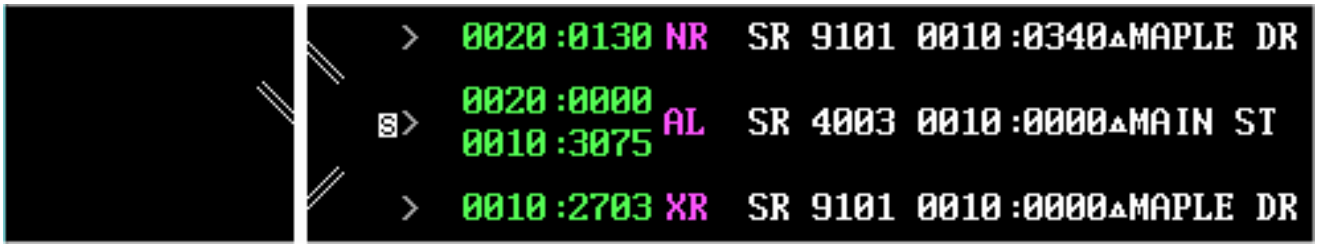
5-50: Intersection of Two Undivided SR's that Meet in a Wye Formation

Verification for SR 4001

Note: All SR's that are constructed in this formation should contain a 9000 SR for the portion of roadway that is one way and considered a leg. If the total length of the leg or connector is less than 200ft it should be treated as a connection



LRS SLD Display

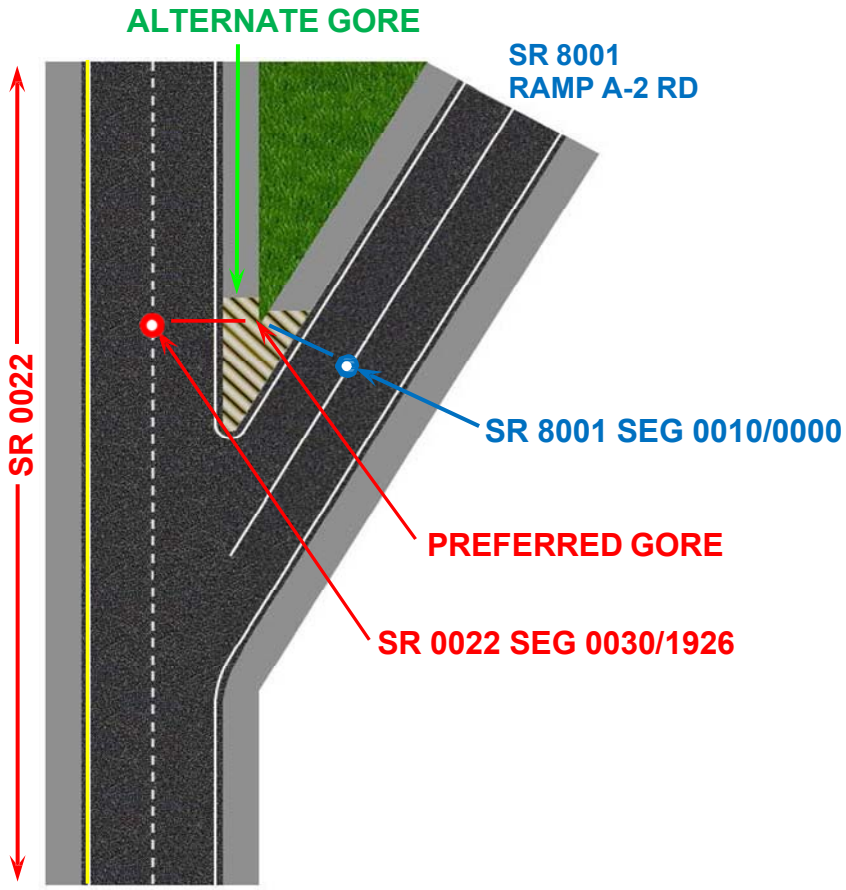


5-51: Intersection of Mainline and an Exit Ramp

Verification for SR 0022

Note: The preferred gore area is where the improved surface meets the “unimproved” surface (grass, earth, loose aggregate, etc.). If this point is not clearly defined, an alternate gore area (such as the start of shoulder as shown) may be used.

In some cases, there is no “unimproved” area. In these cases, the preferred gore area is where there is a distinct change in material (such as from concrete to bituminous).



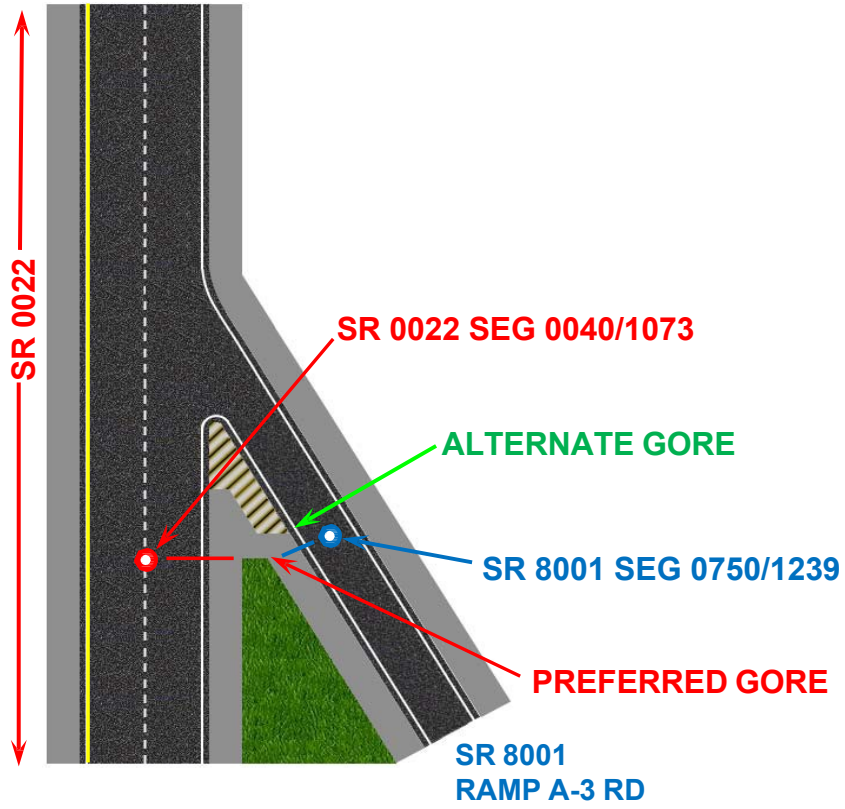
LRS SLD Display

5-52: Intersection of Mainline and an Entrance Ramp

Verification for SR 0022

Note: The preferred gore area is where the improved surface meets the "unimproved" surface (grass, earth, loose aggregate, etc.). If this point is not clearly defined, an alternate gore area may be used.

In some cases, there is no "unimproved" area, in these cases, the preferred gore area is where there is a distinct change in material (such as from concrete to bituminous).



LRS SLD Display

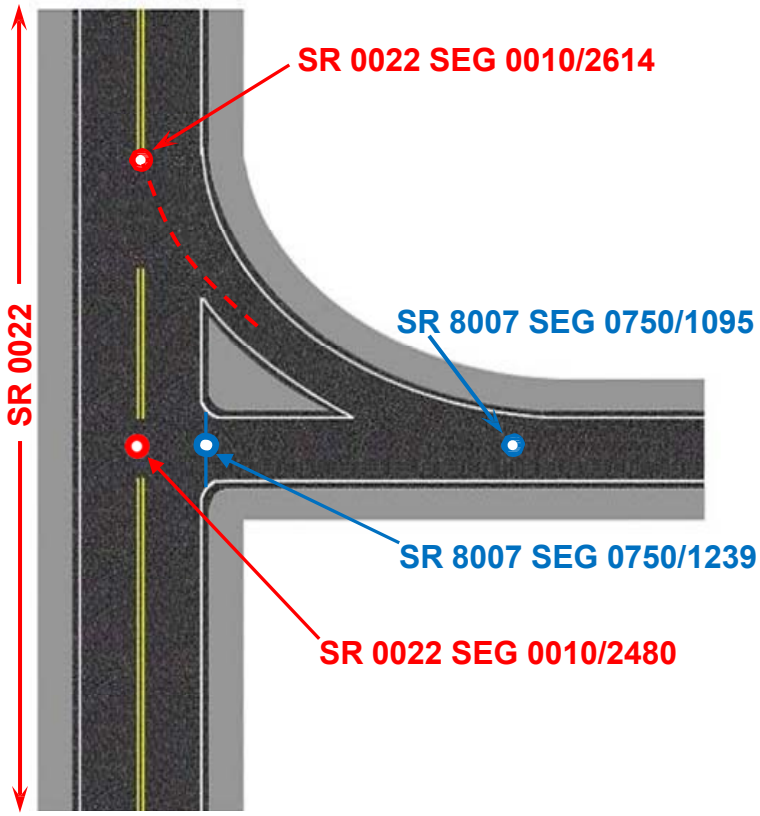
5-53: Intersection of Cross-Route and a Ramp with a Connector

Verification for SR 0022
Divisor (▬) Type 1,2,4,5,8

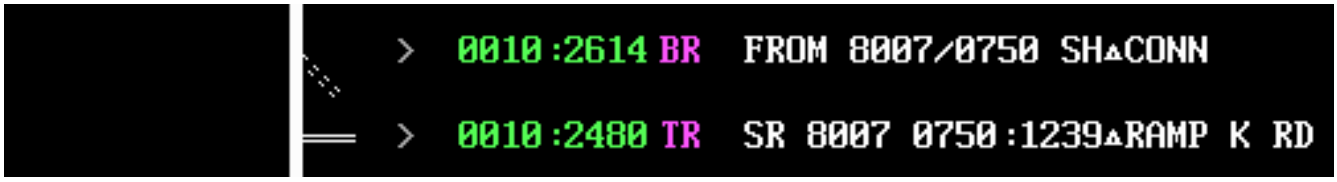
Note: Ramps shall begin or end at intersections perpendicular to connecting roadways when a stop sign or a traffic signal is present.

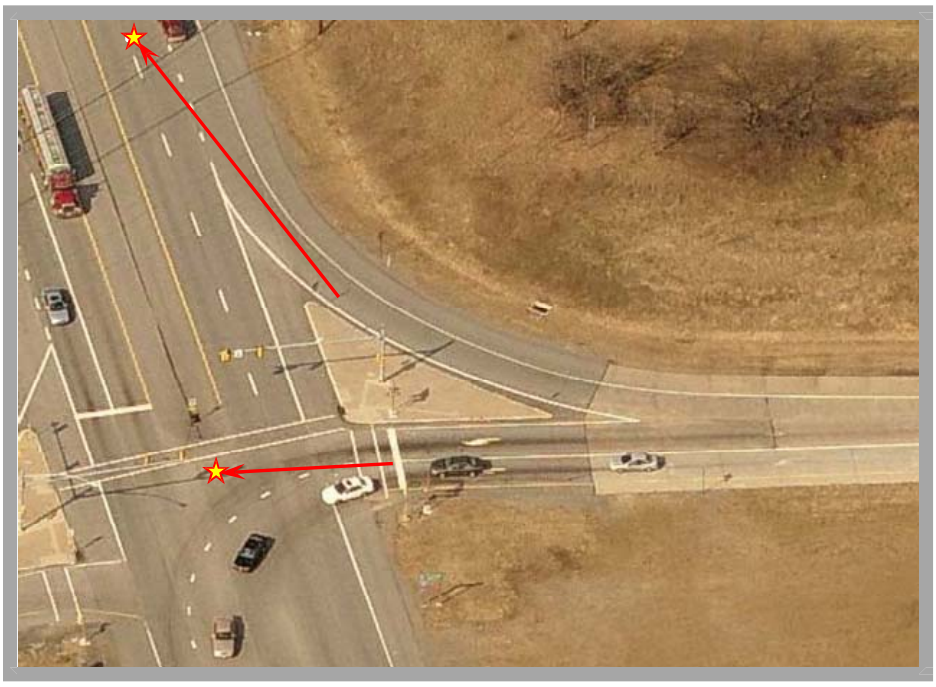
If a stop sign or traffic signal is not present, the connector shall be assigned to the leg containing a yield sign.

Although this is the preferred method, ramp segments must be consistent within the interchange.



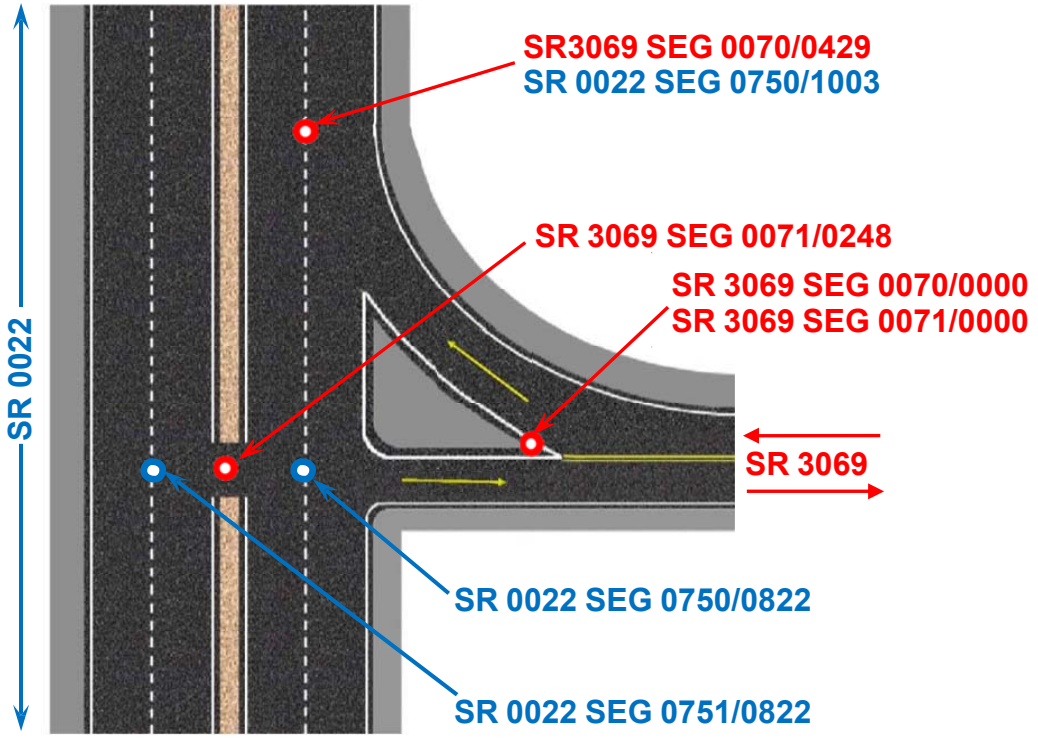
LRS SLD Display



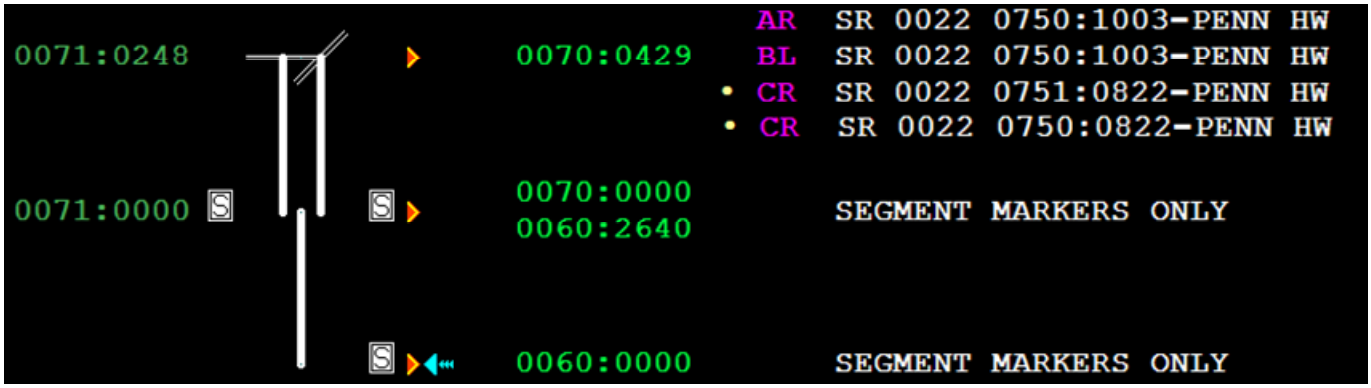


5-54: Intersection of a Split SR and a Divided SR

Verification for SR 3069
Divisor (▬) Type 1,2,4,5,8

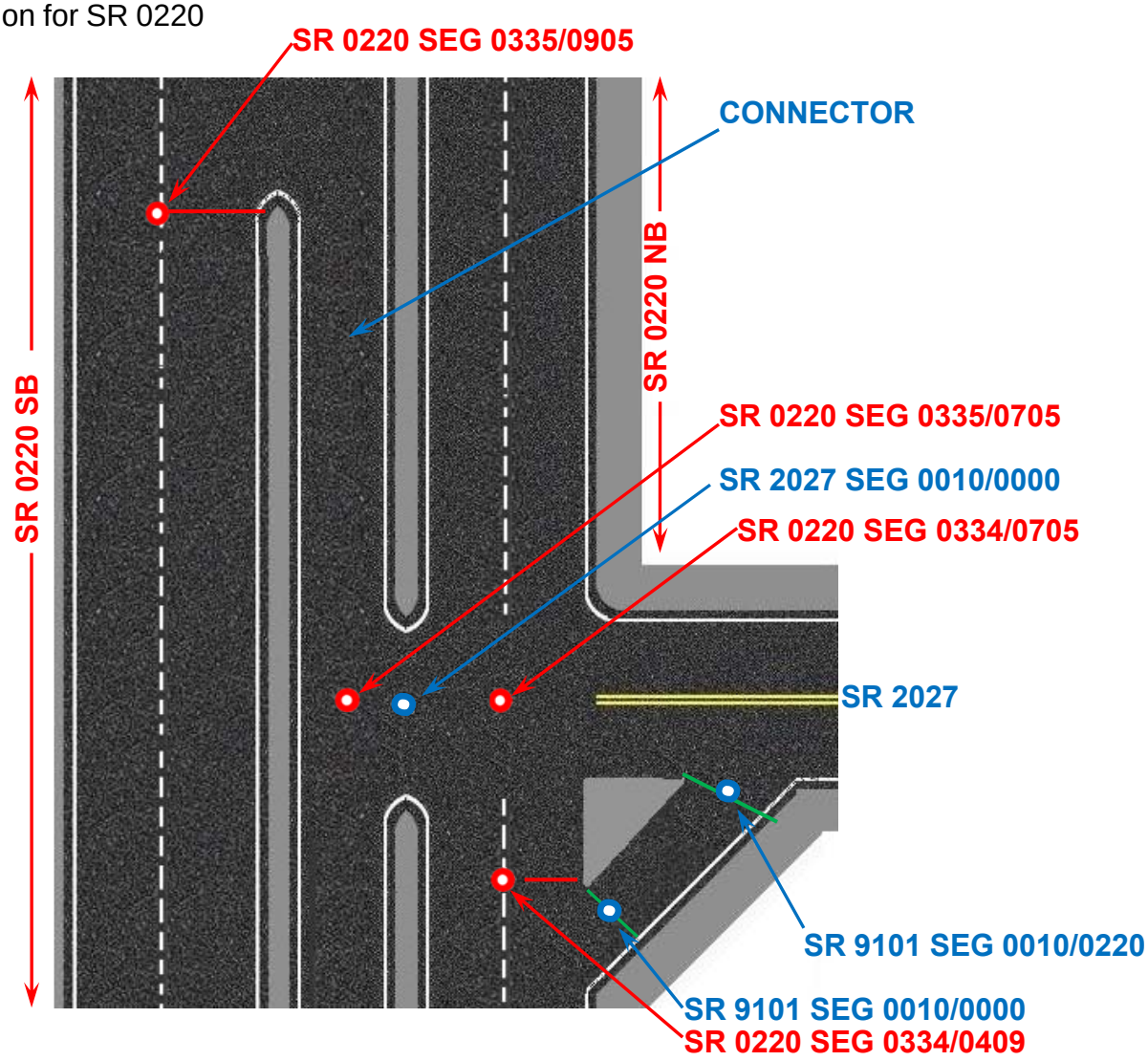


LRS SLD Display

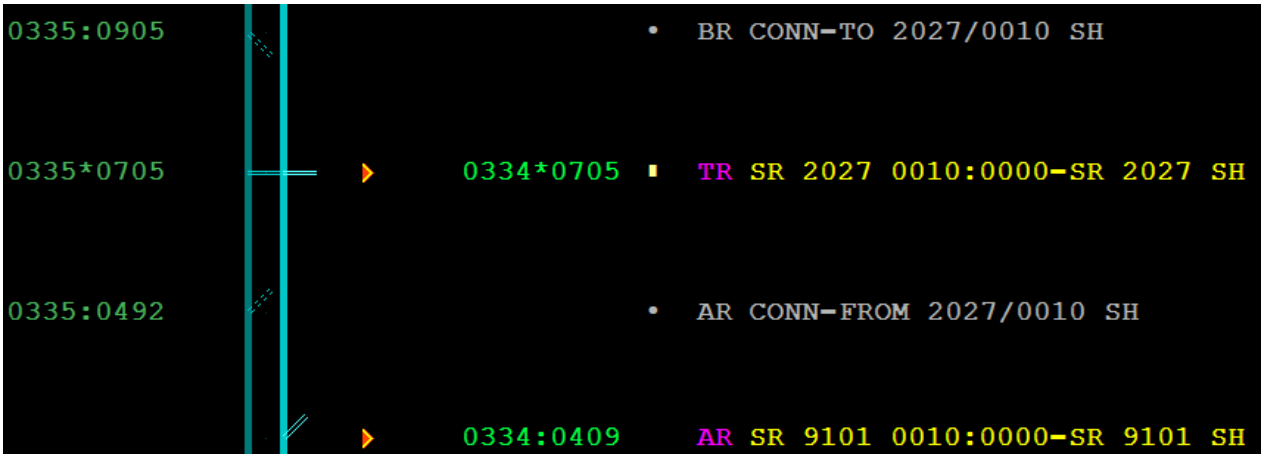


5-55: Intersection of a Divided SR with a Restricted Turning Lane

Verification for SR 0220

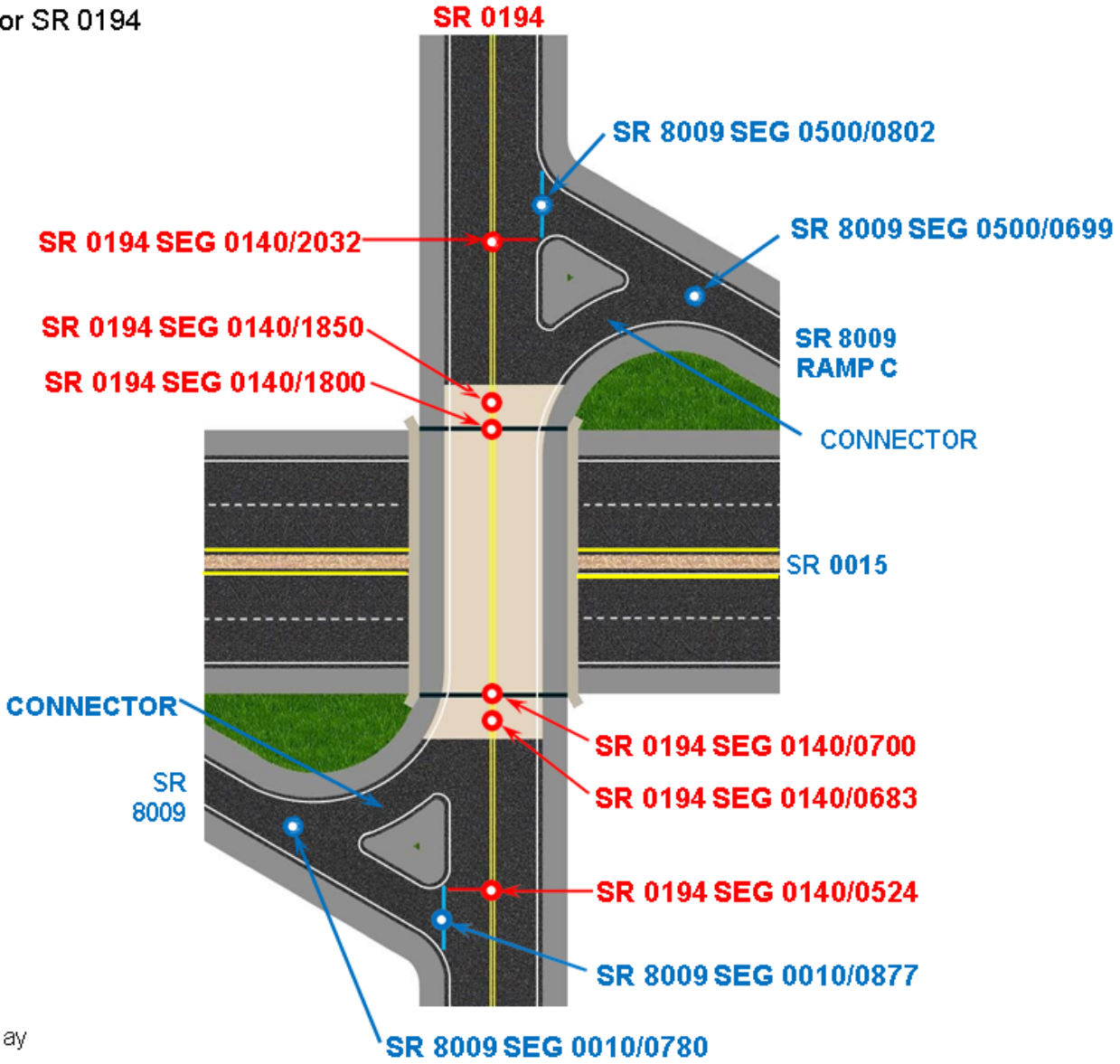


LRS SLD Display

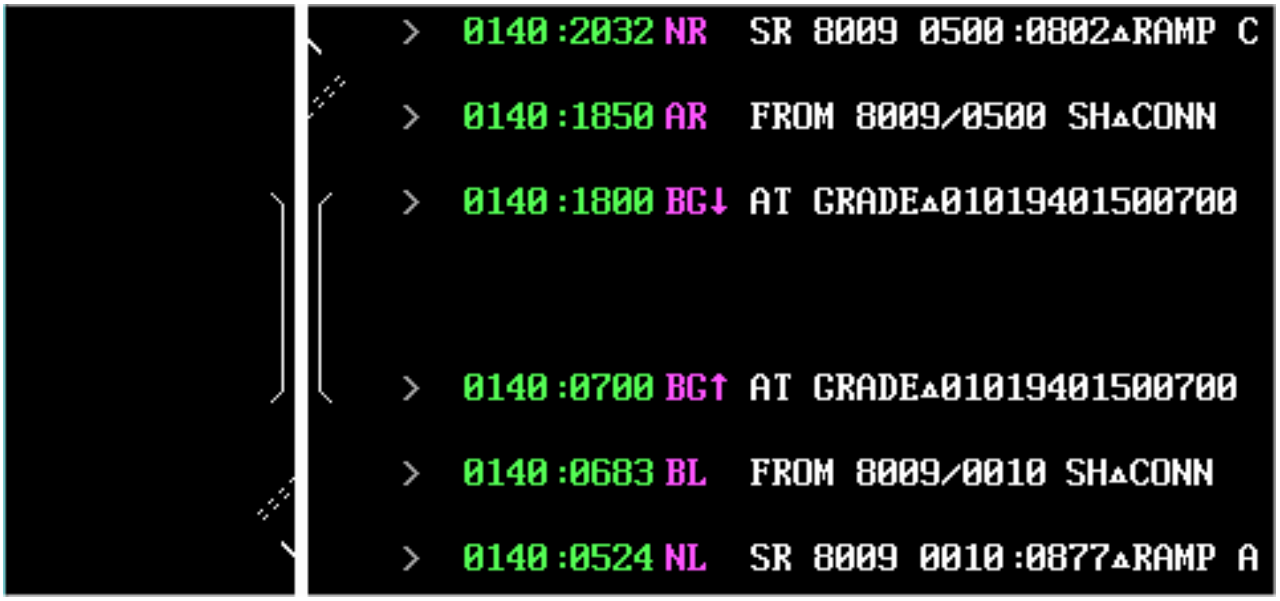


5-56: Intersection of Cross-Route and Ramps with Connectors

Verification for SR 0194



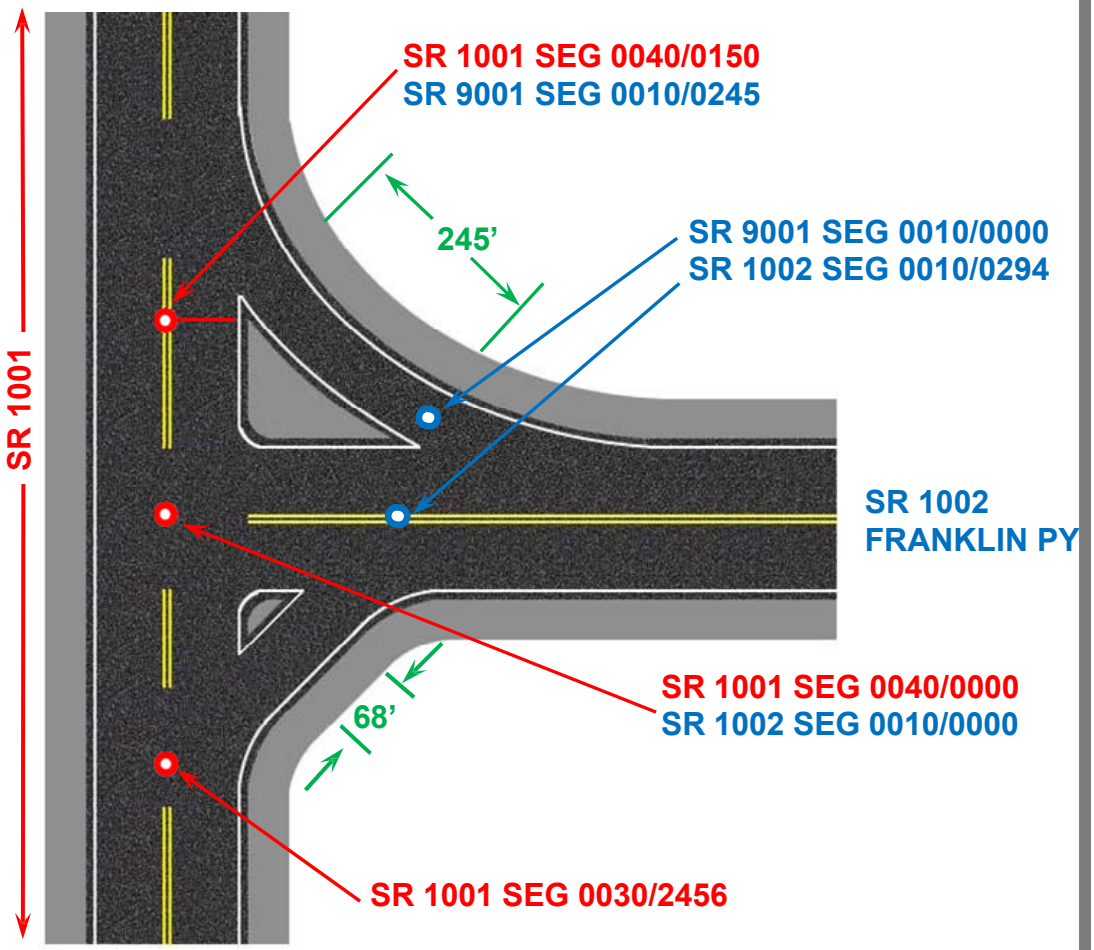
LRS SLD Display



5-57: Intersection of Two Undivided SR's with a Ramp and a Connector

Verification for SR 1001

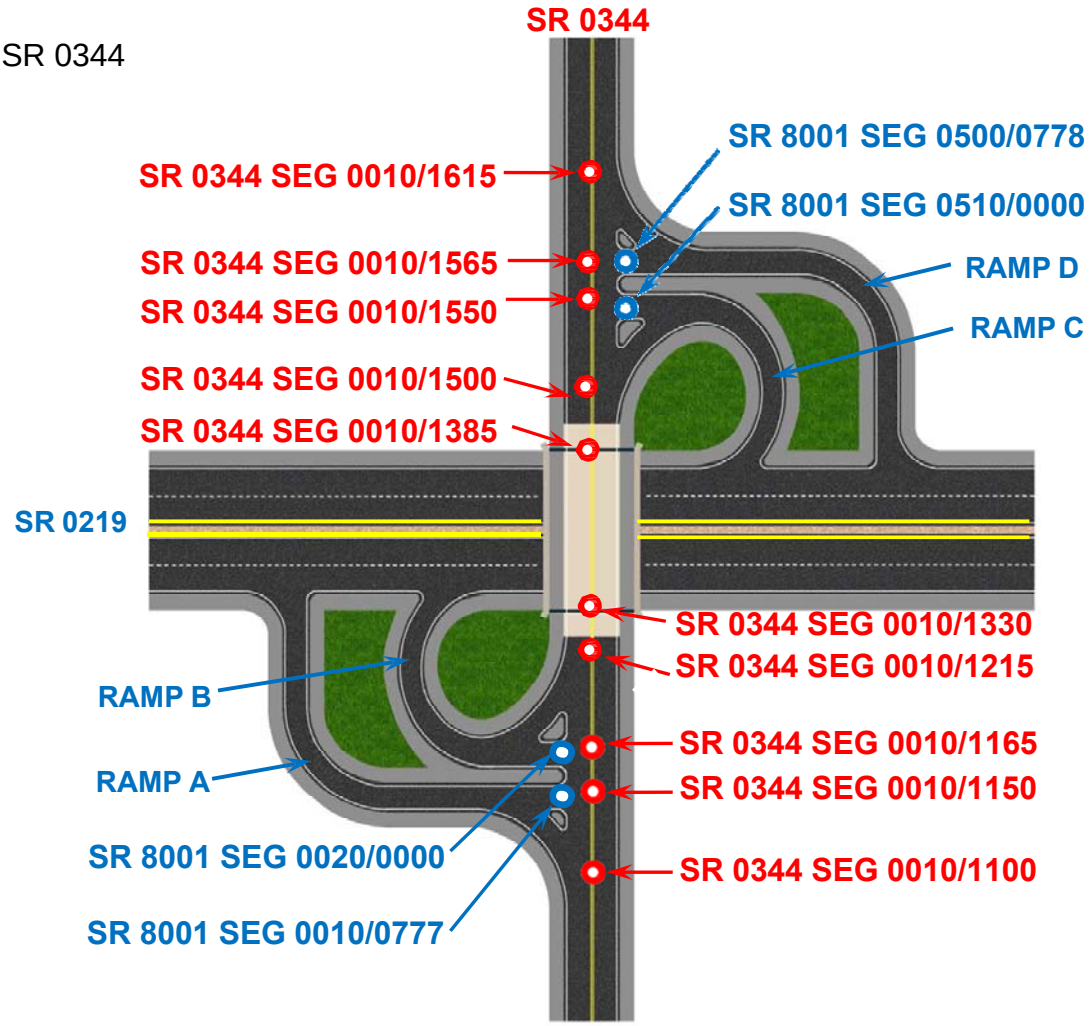
Note: Connectors must be less than 200' in length, and are verified at centerline intersections. If the length is greater than or equal to 200', it will be considered a ramp and verified at the gore.



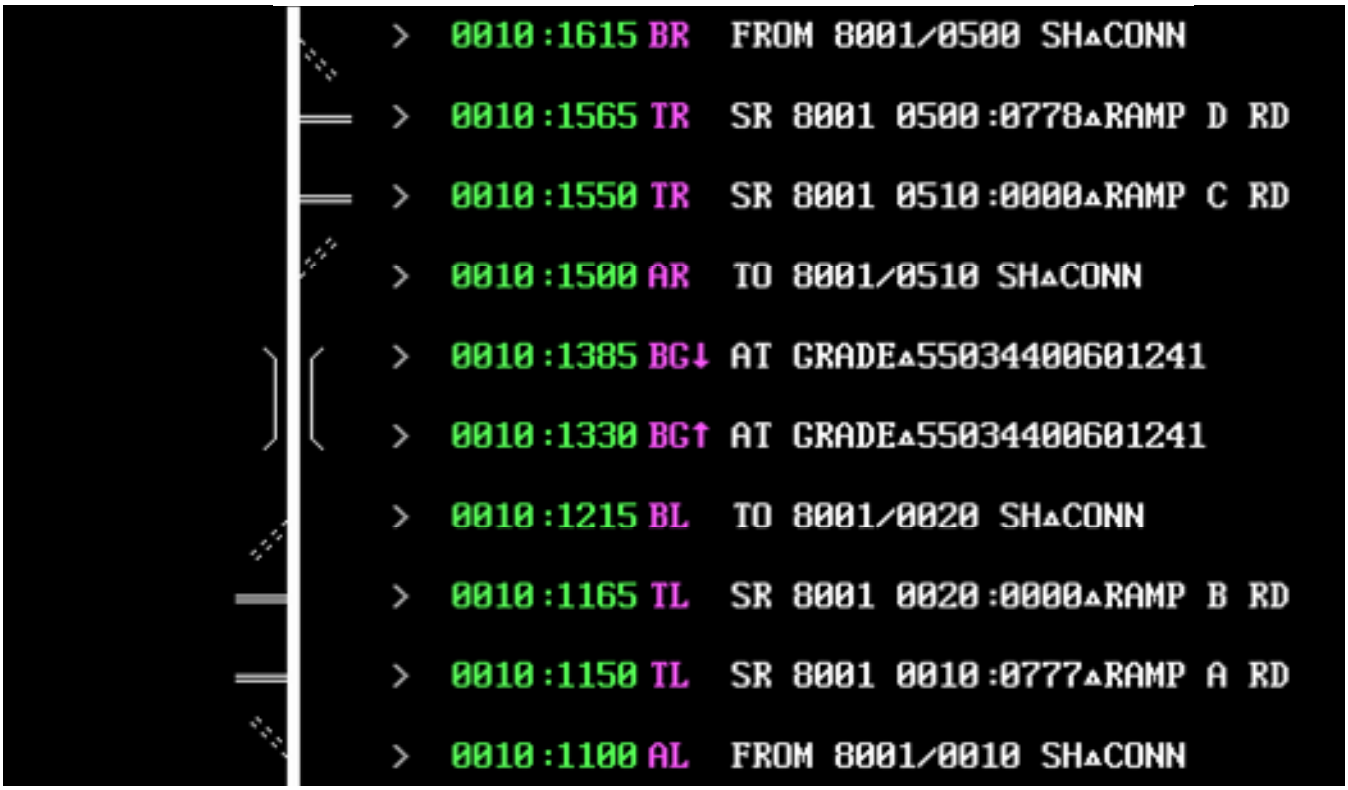
LRS SLD Display

5-58: Intersection of a Cross-Route and Ramps with Connectors

Verification for SR 0344



LRS SLD Display

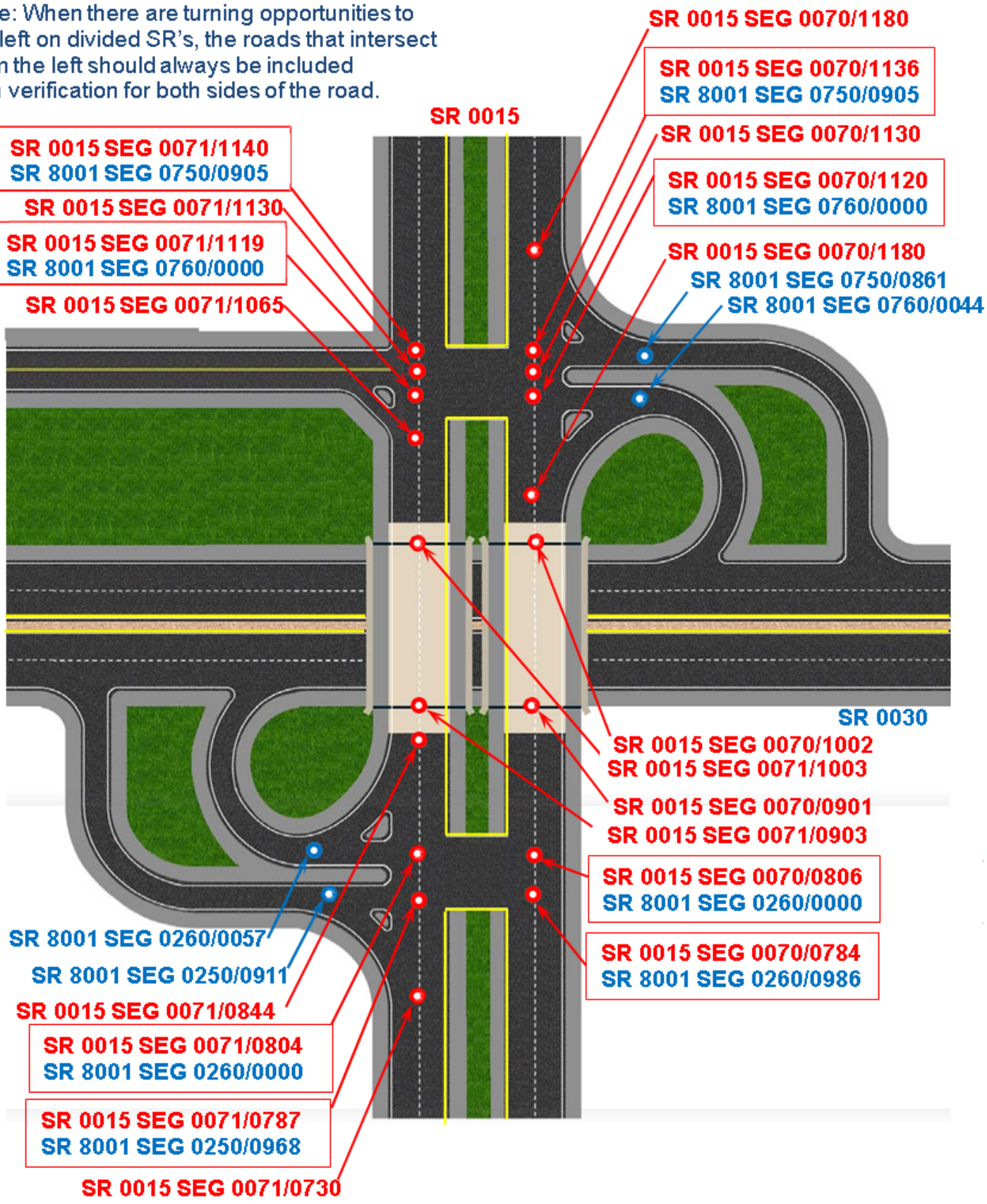


5-59: Intersection of 2 Divided Cross-Routes and Ramps within an Interchange

Verification for SR 0015

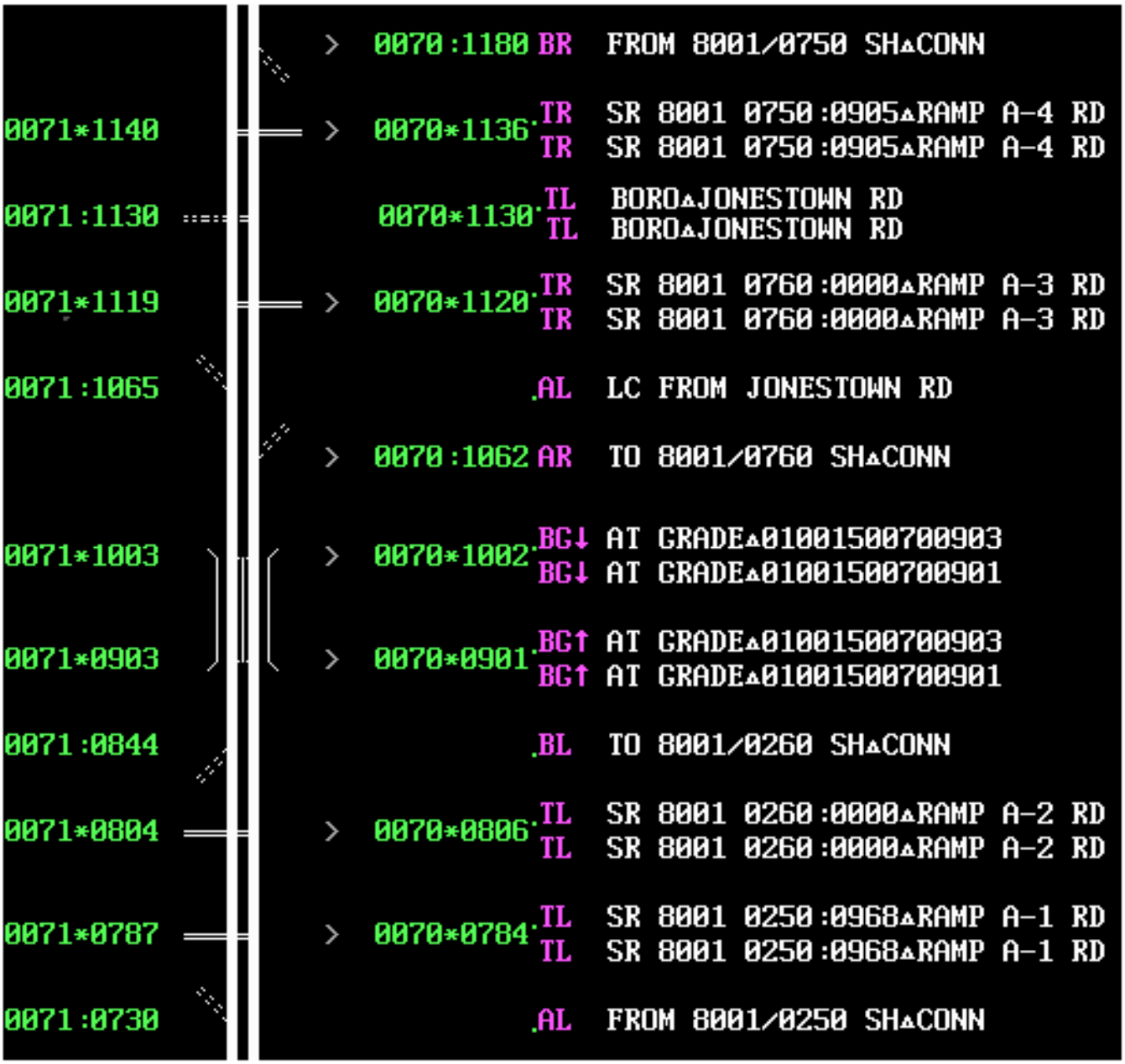
Divisor (■) Type 3,7

Note: When there are turning opportunities to the left on divided SR's, the roads that intersect from the left should always be included with verification for both sides of the road.



5-59: Continued

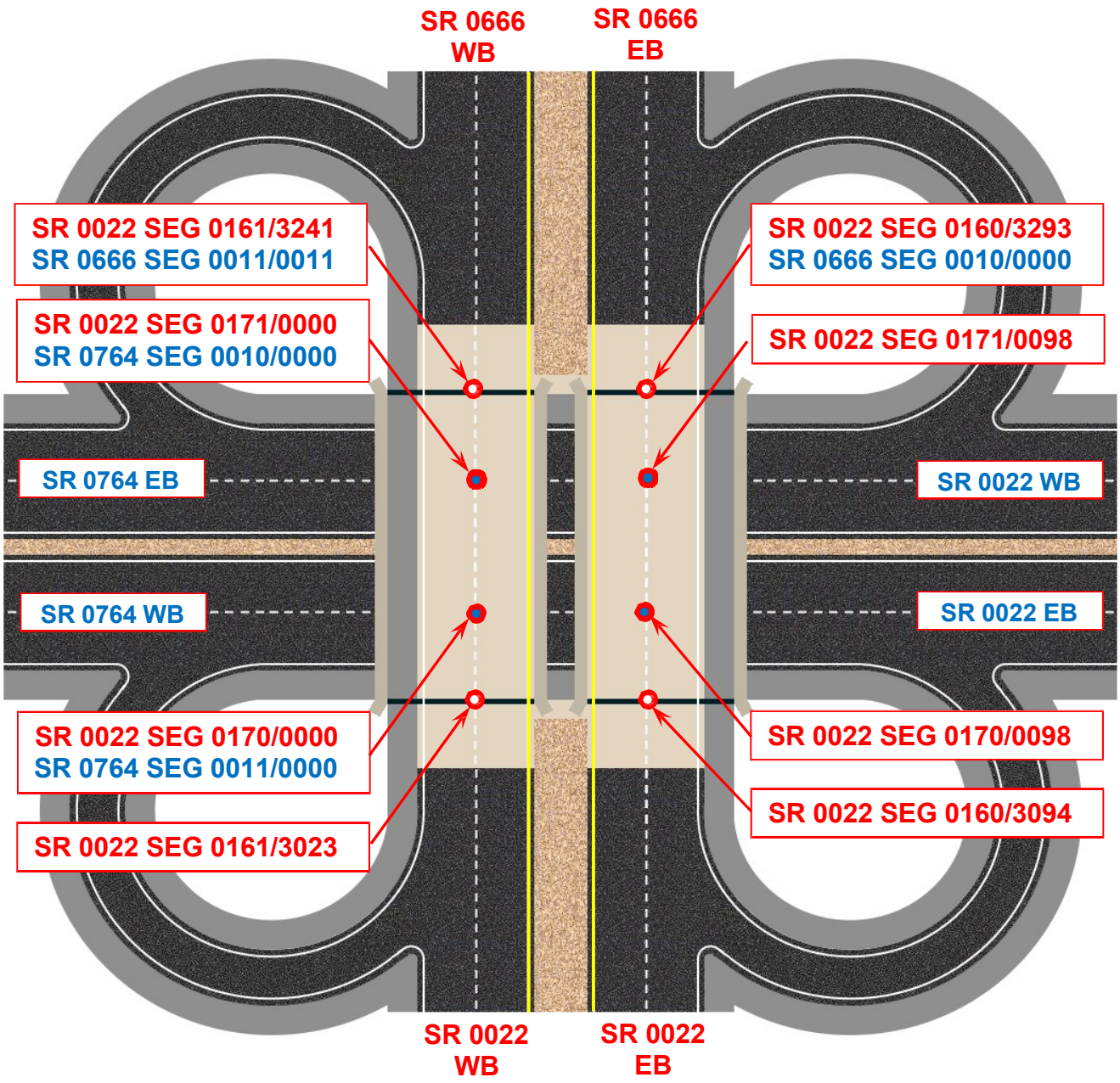
LRS SLD Display



5-60: Intersection of Two SR's within a Cloverleaf Interchange

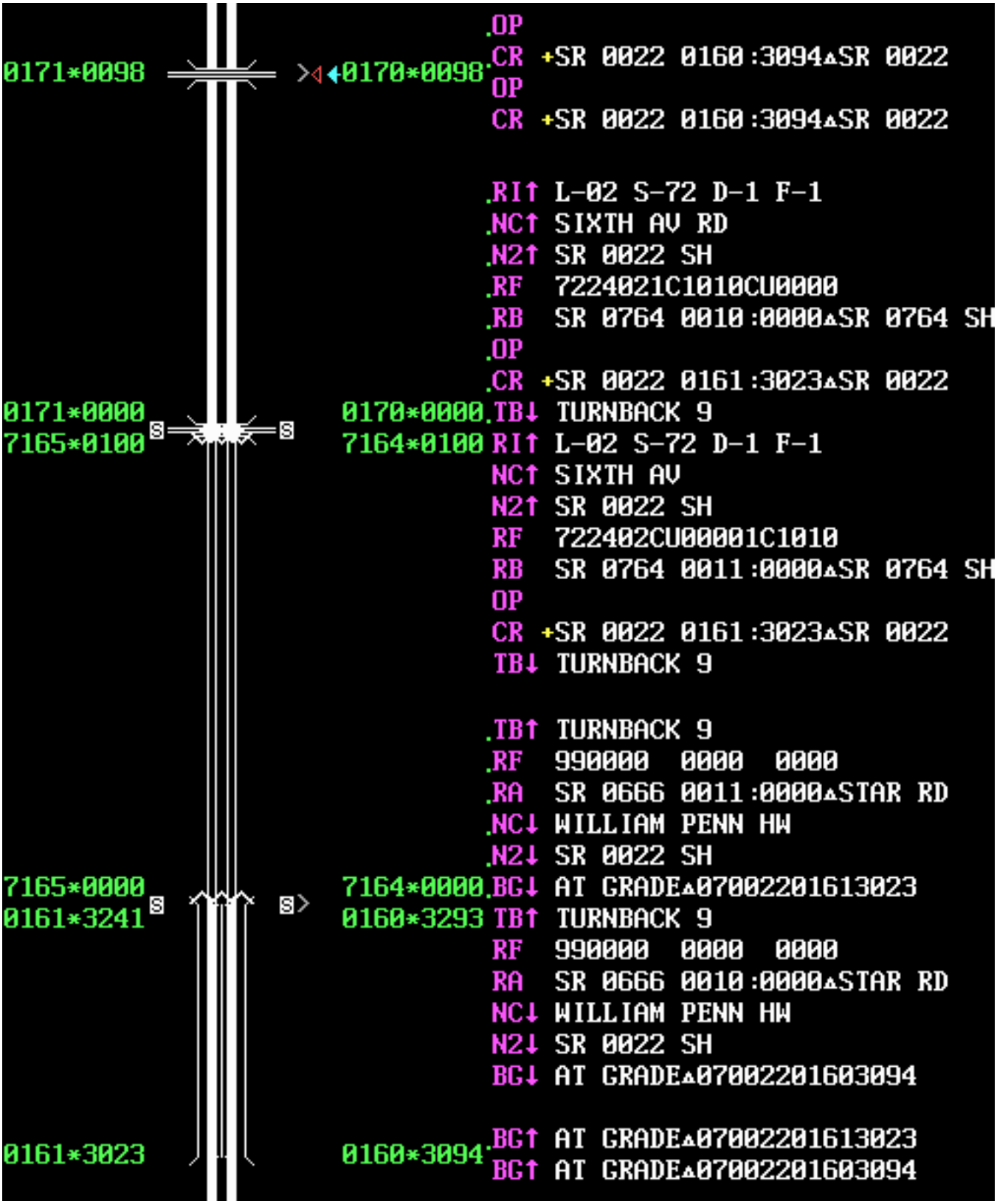
Verification for SR 0022

Divisor ( ) Type 1,2,4,5,8



5-60: Continued

LRS SLD Display



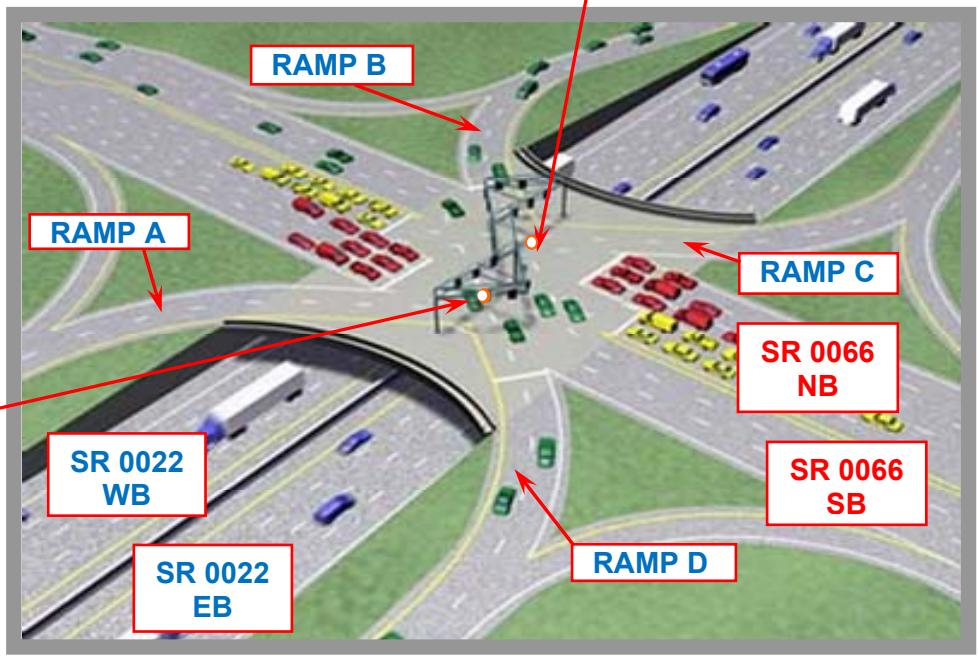
5-61: Intersection of Two SR's within a SPUI Interchange

Verification for SR 0066

Divisor (■) Type 3,7

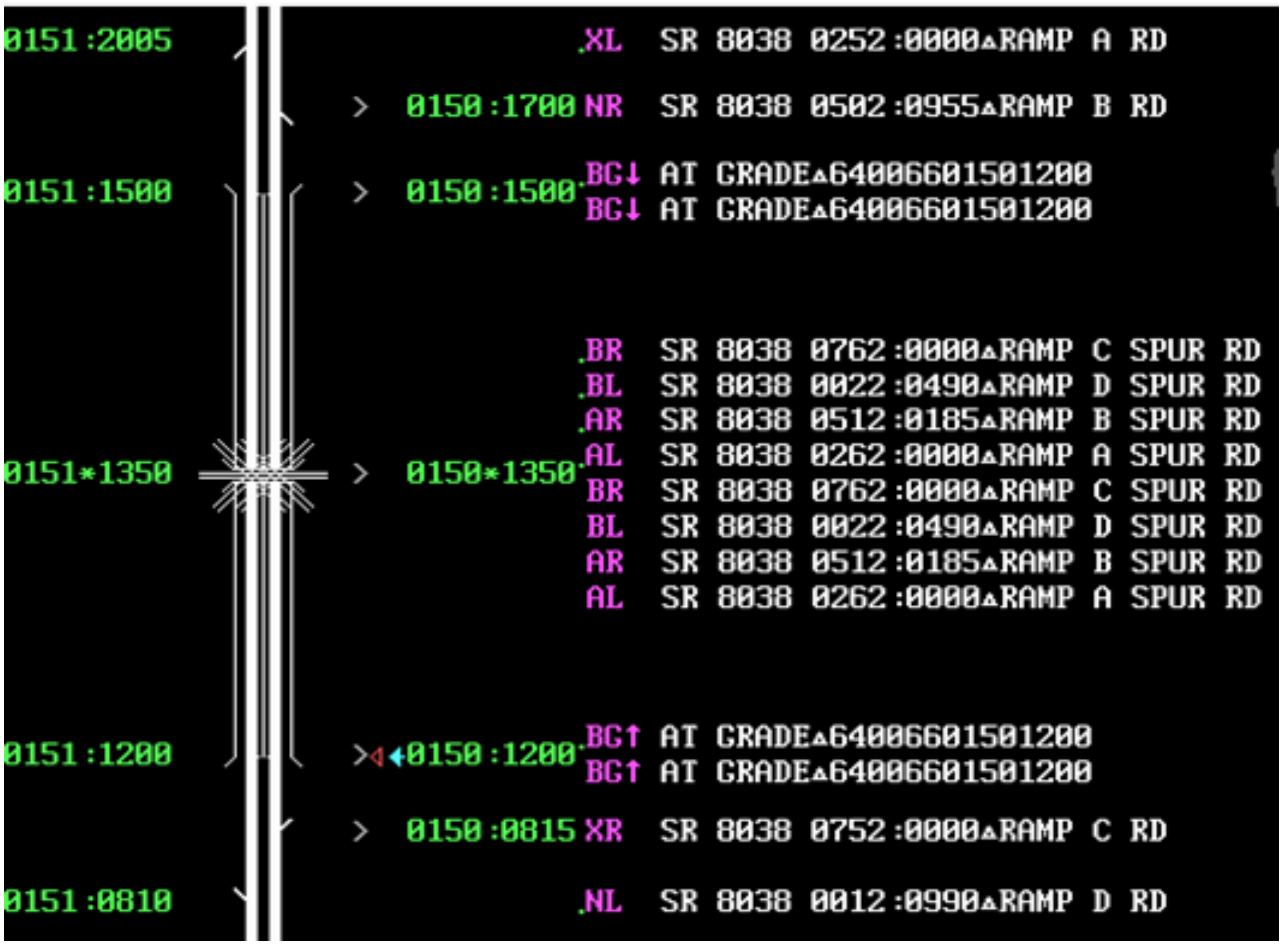
Note: Verification points for other entrance/exit ramps, bridge begin and end points, are to be located in the same manner as other interchange types.

SR 0066 SEG 0150/1350
SR 8038 SEG 0022/0490
SR 8038 SEG 0262/0000
SR 8038 SEG 0512/0185
SR 8038 SEG 0762/0000



SR 0066 SEG 0151/1350
SR 8038 SEG 0022/0490
SR 8038 SEG 0262/0000
SR 8038 SEG 0512/0185
SR 8038 SEG 0762/0000

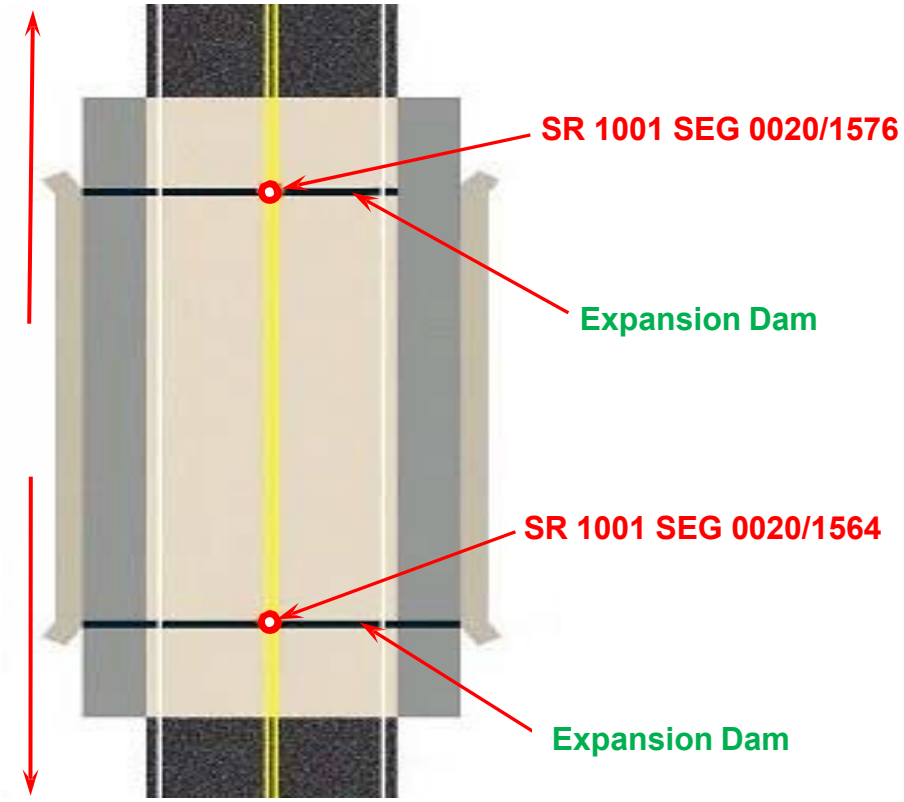
LRS SLD Display



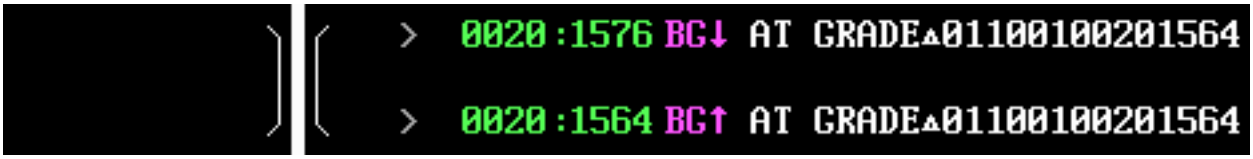
5-62: At-Grade Bridge

Verification for SR 1001

Note: Segment breaks which fall on at-grade bridges should be located at the bridge begin.



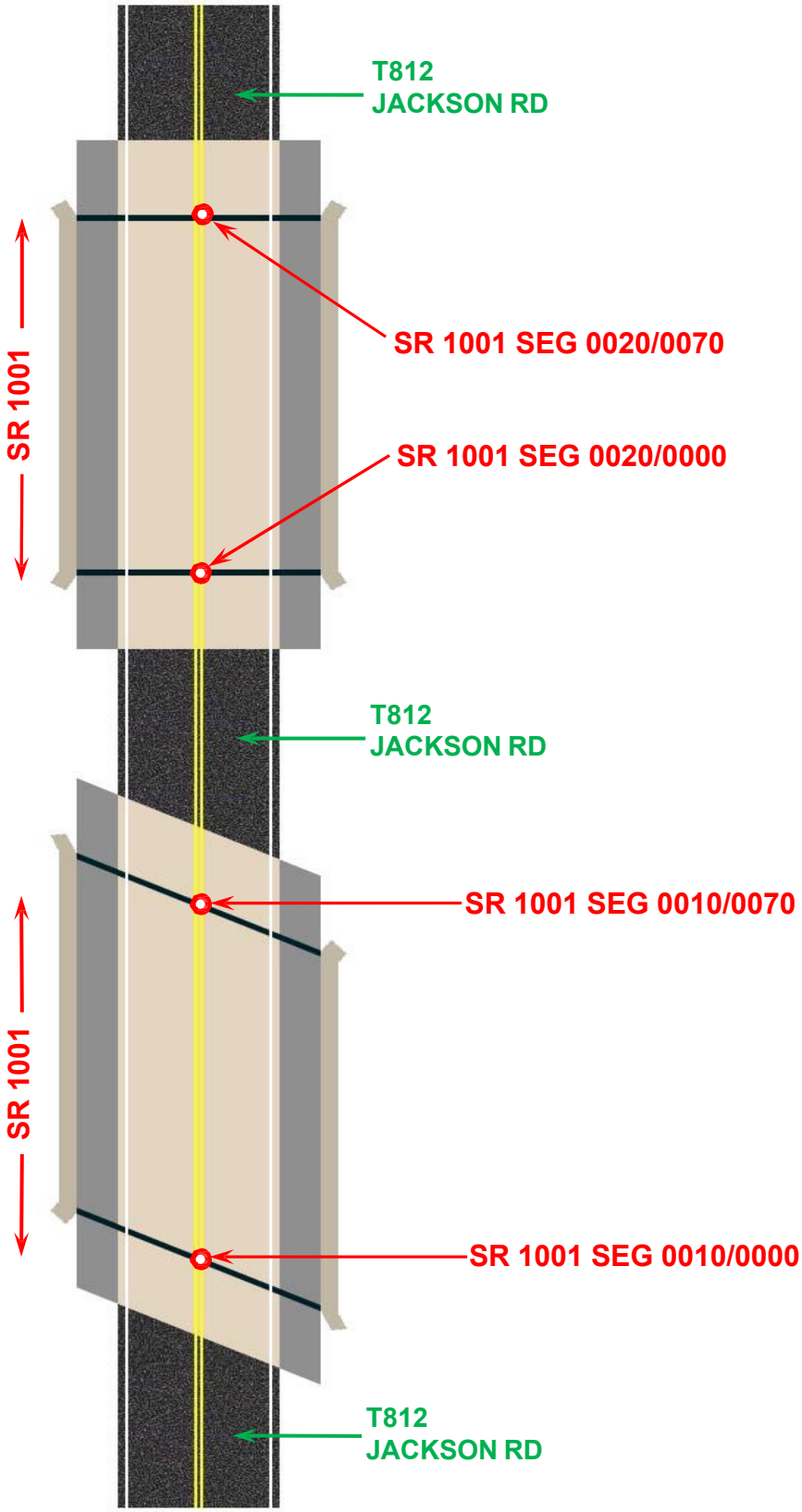
LRS SLD Display



5-63: State Owned Bridge and a Turnback Road

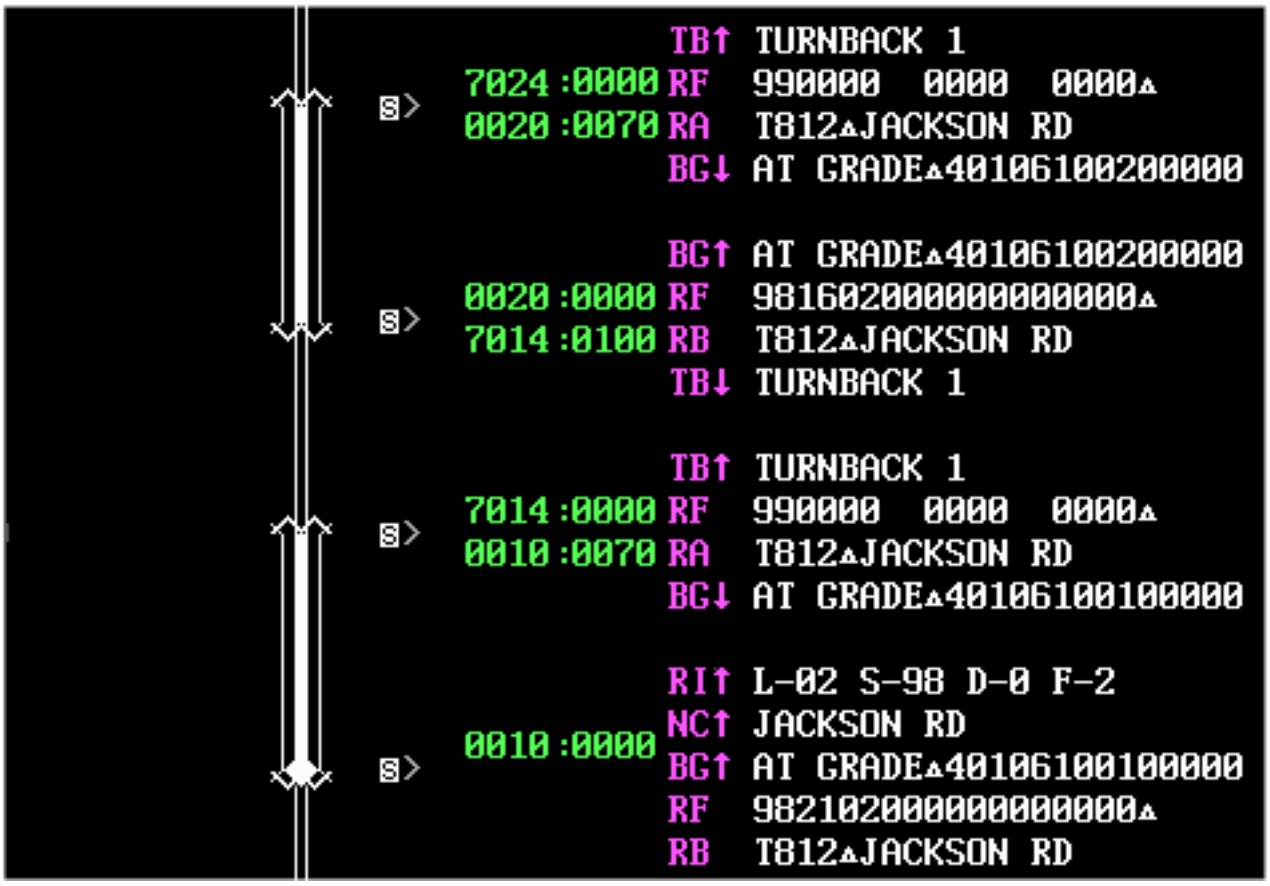
Verification for SR 1001

Note: Intersection features should still be shown on the bridge begin and end offsets.

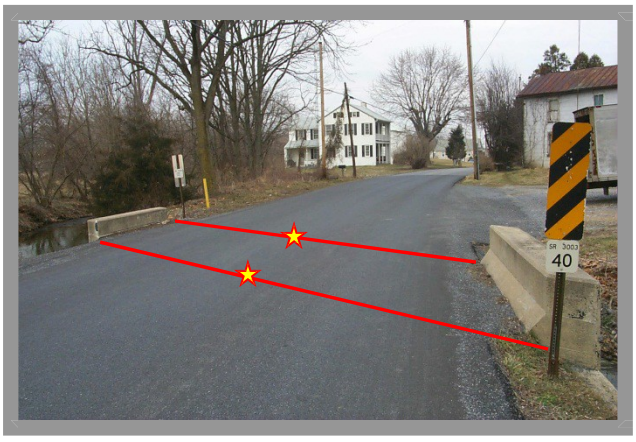


5-63: Continued

LRS SLD Display

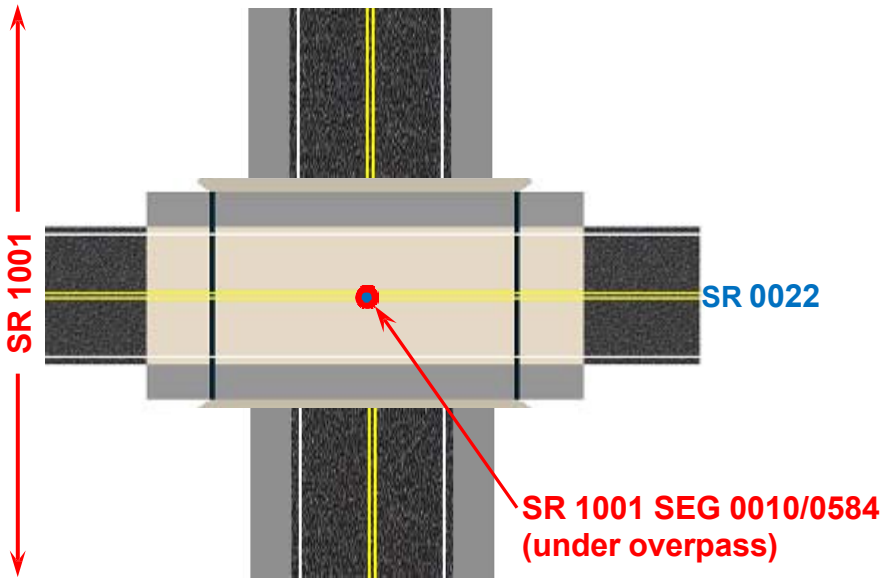


Note: All turnback areas are shown as nulls. All nulls are given an arbitrary length of 100', regardless of their actual length. Segment markers will be placed at both ends of each bridge shown. A segment that is predominantly bridge or structure will have a surface type of 98, reference data in the null area will always be "990000 0000 0000".



5-64: Overpasses

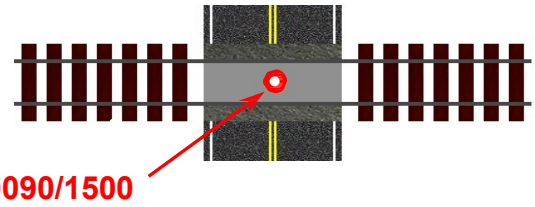
Verification for SR 1001

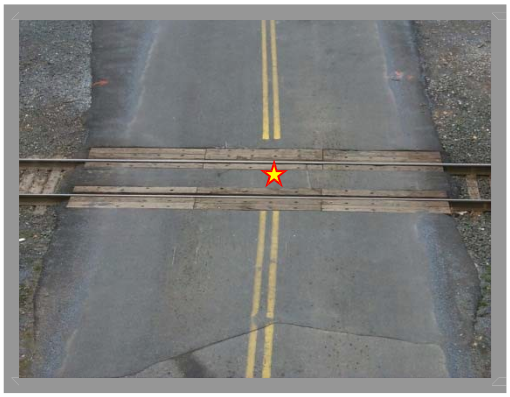


LRS SLD Display

5-65: Single Track Railroad Crossing

Verification for SR 1001

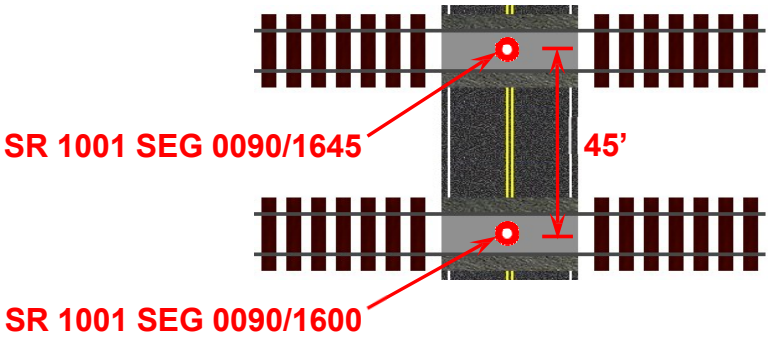


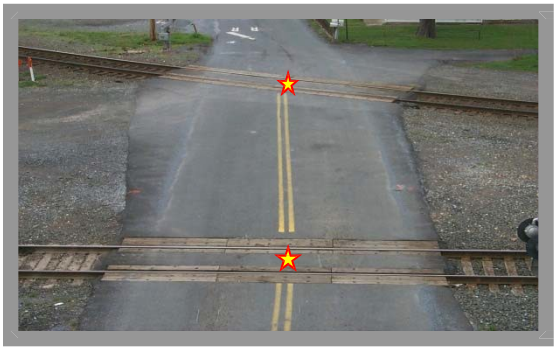


LRS SLD Display

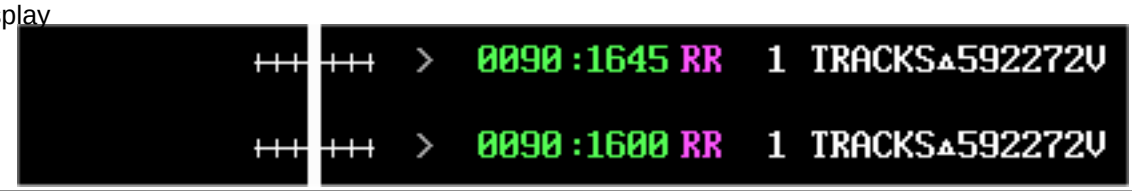
5-66: Multiple Railroad Tracks Separated by 20ft or more

Verification for SR 1001



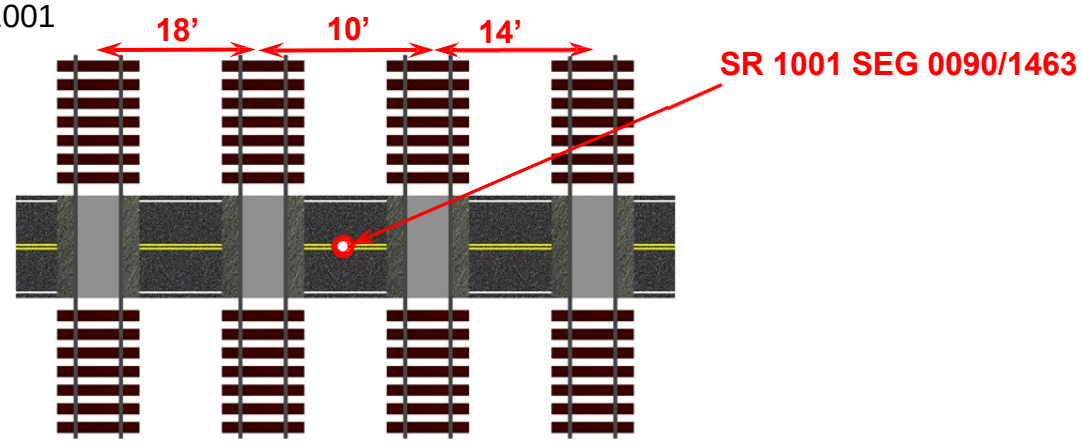


LRS SLD Display

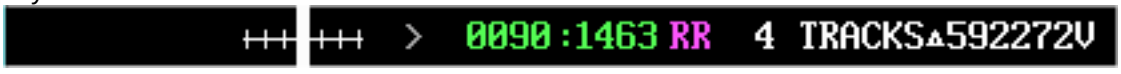


5-67: Multiple Railroad Tracks Separated by Less Than 20ft

Verification for SR 1001

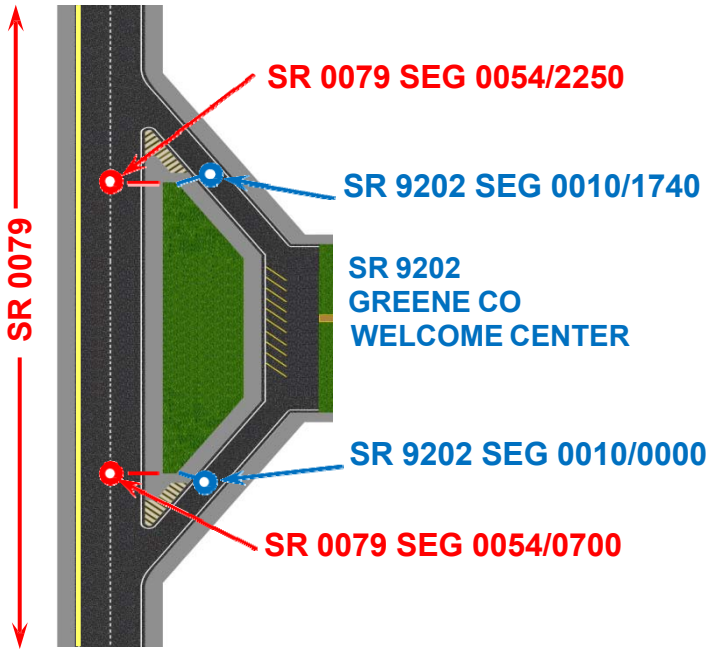


LRS SLD Display



5-68: Rest Area's

Verification for SR 0079



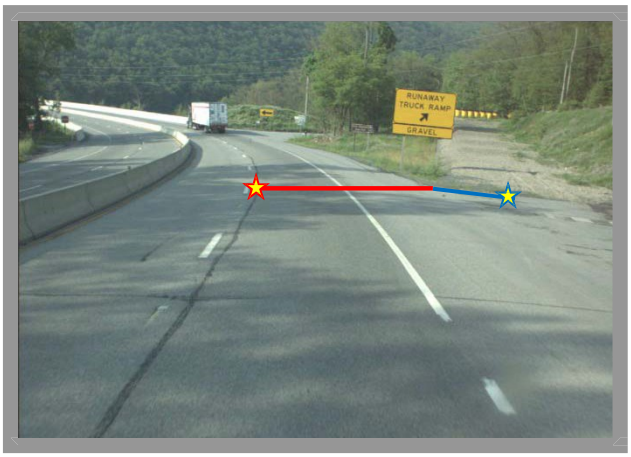
LRS SLD Display

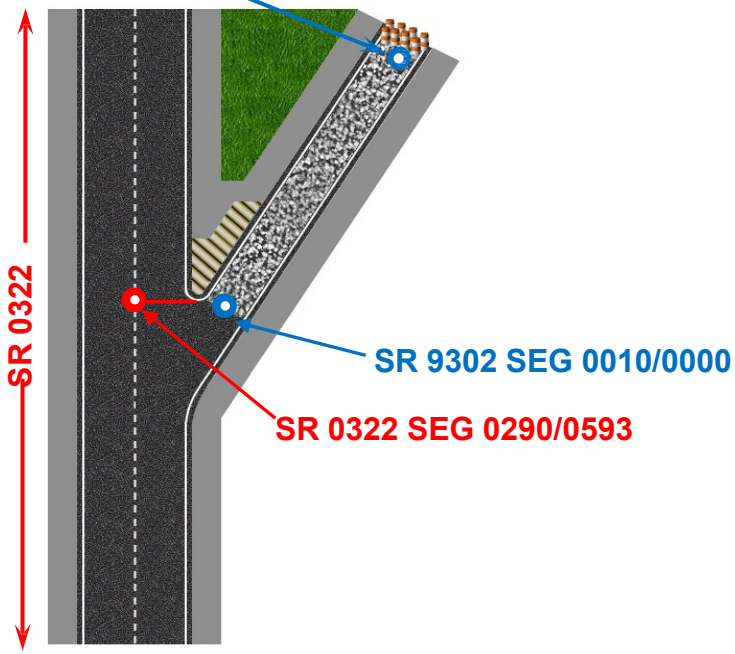
```
>  0054:2250 NR  SR 9202 0010:1740▲GREENE CO WELCOME CENTER

>  0054:0700 XR  SR 9202 0010:0000▲GREENE CO WELCOME CENTER
```

5-69: Truck Escape Ramps

Verification for SR 0322





LRS SLD Display

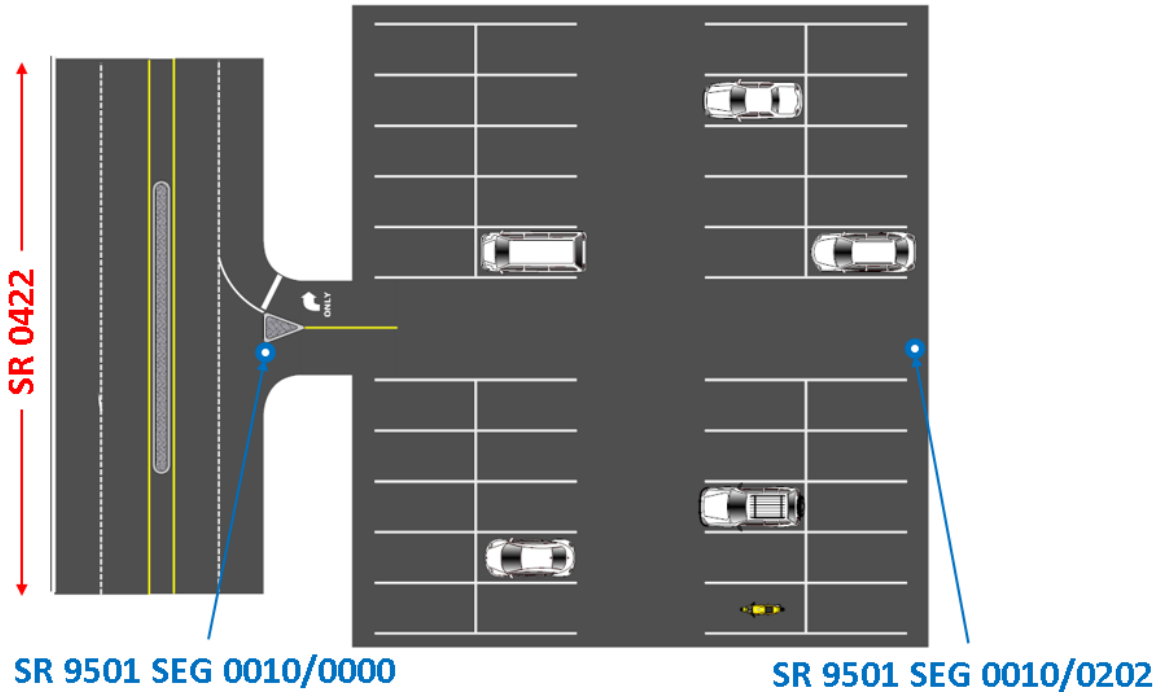
```
>  0044:1215 XR  SR 9301 0010:0000▲TRUCK ESCAPE RAMP RD
```

5-70: Park and Rides

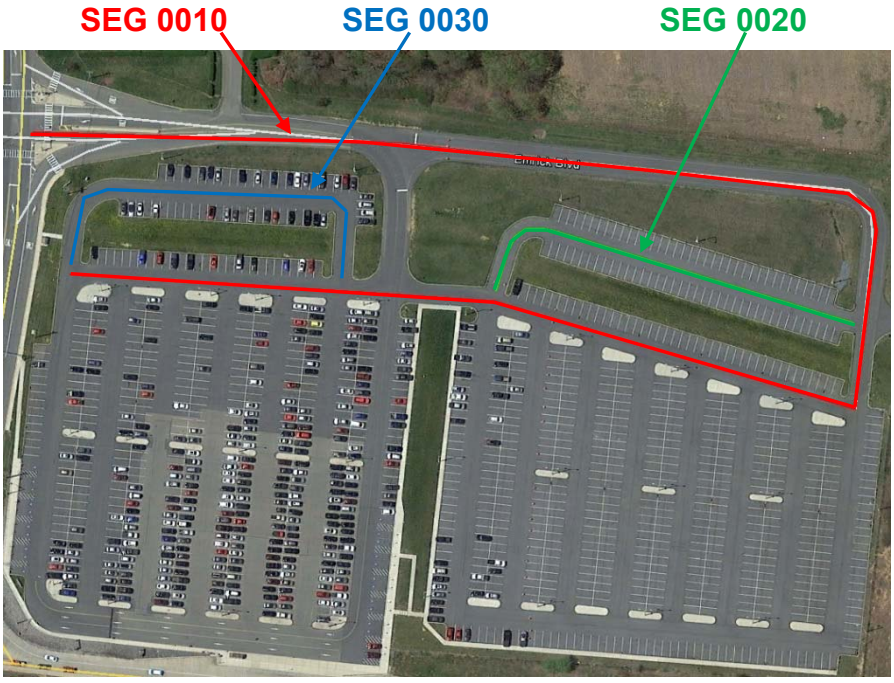
Verification for SR 9501

Note: Park and Rides shall be measured from the gore (or edge of pavement) of the parking lot entrance continuing (straight) to the edge of pavement at the opposite side of the parking lot. Pavement width will fluctuate based on the actual width of the pavement.

Unlike other 9000 SRs, Park and Rides use typical “SR to SR” intersection codes in lieu of “ramp intersection codes”.



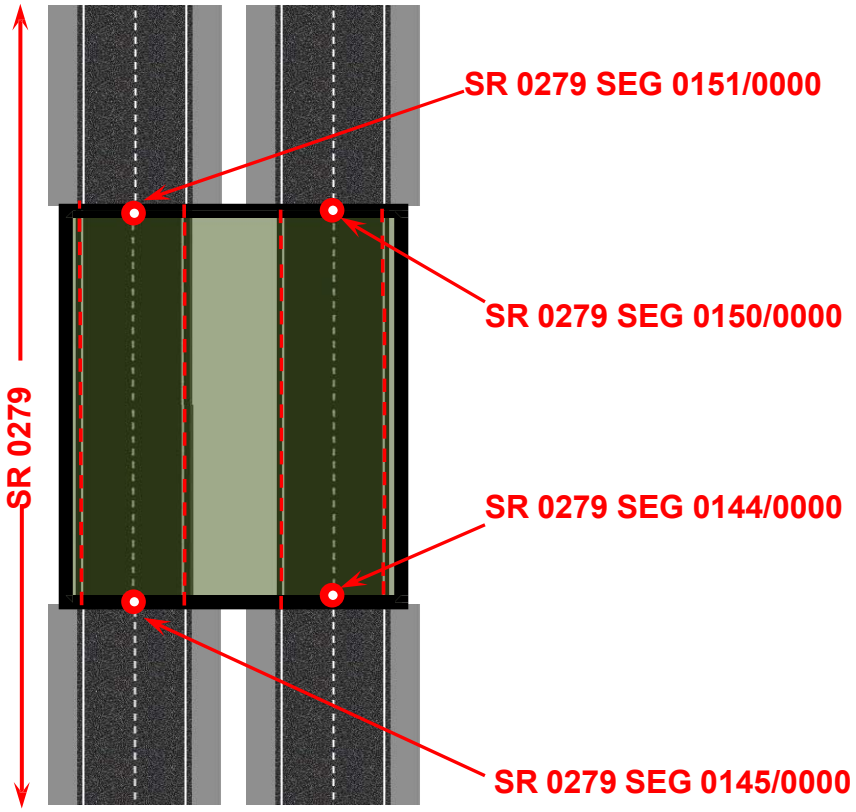
Note: Irregularly shaped Park and Rides shall be measured from the entrance to the exit following the most direct path.



5-71: Tunnels

Verification for SR 0279

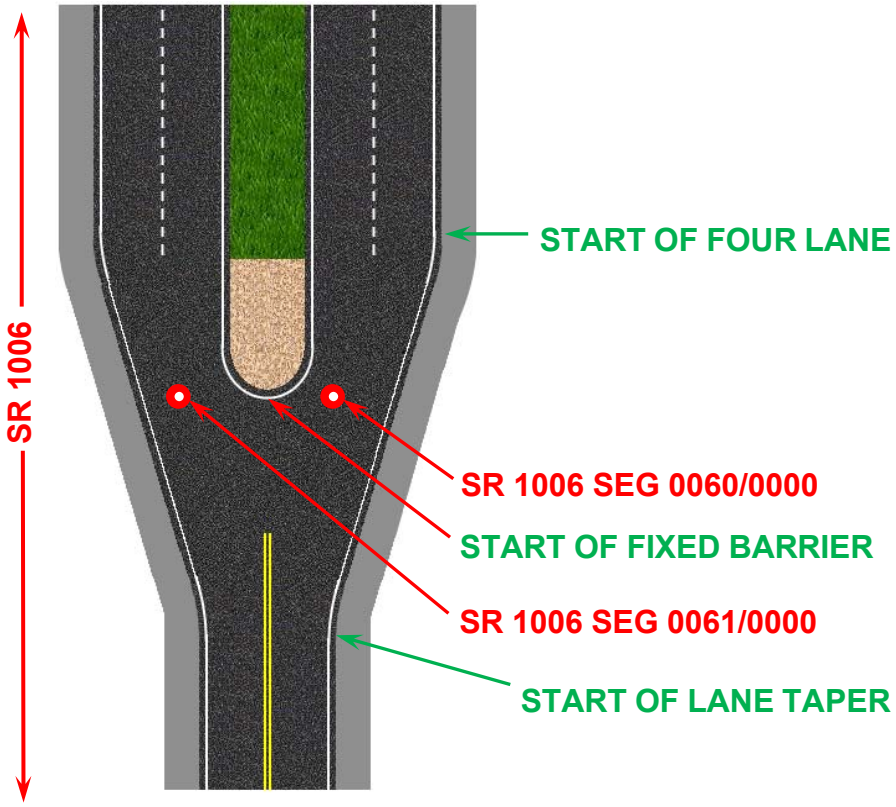
Any Divisor Type



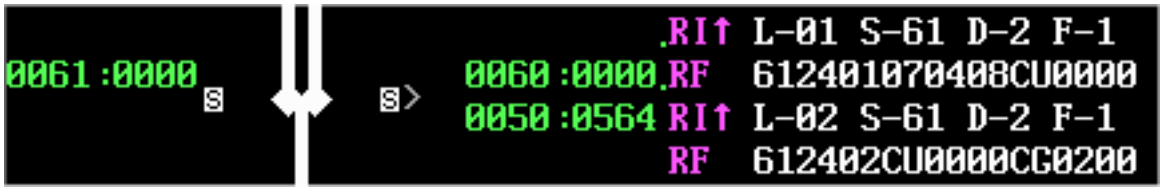
LRS SLD Display

5-72: Divided Highway Start/End

Verification for SR 1006



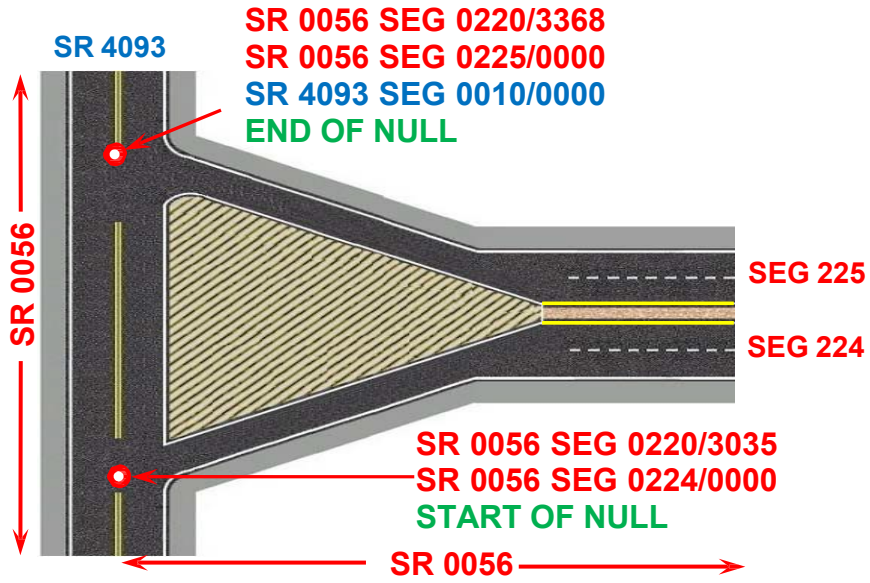
LRS SLD Display



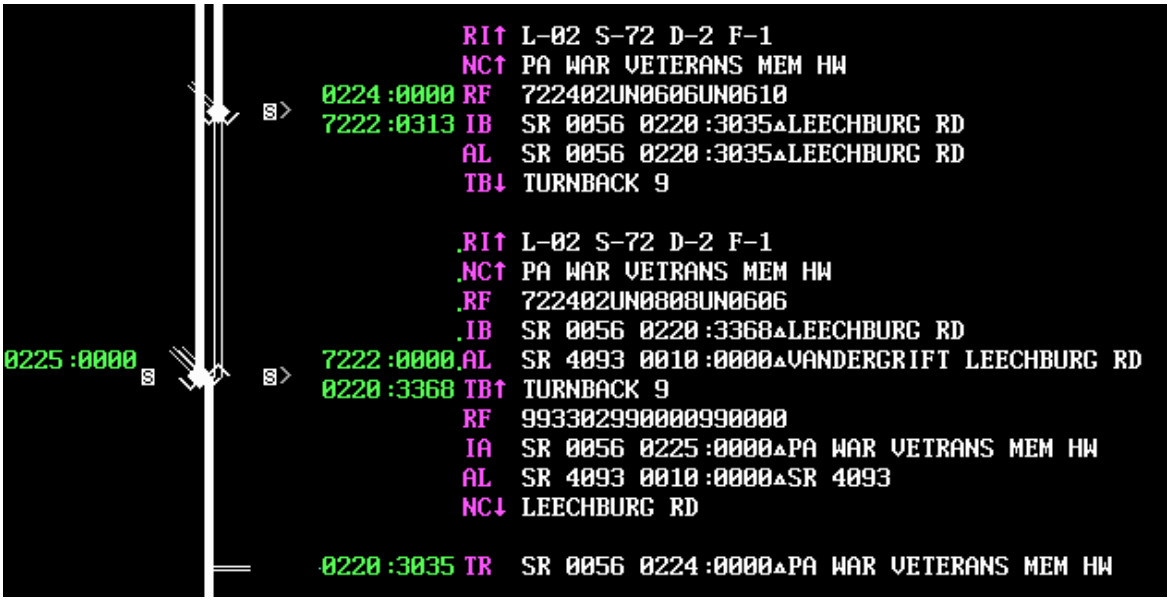
5-73: V-Type Divided Highway Start/End

Verification for SR 0056

Note: Segment 220/3035 to 220/3368 will need to have a null inserted because it contains bi-directional traffic and a divided section that starts or ends at 2 different physical locations.



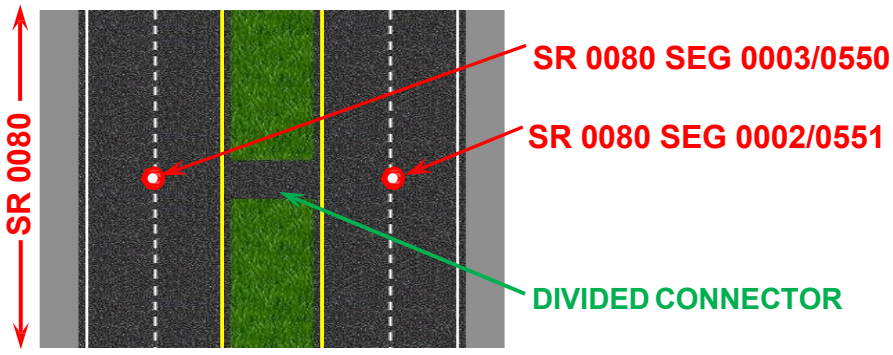
LRS SLD Display



5-74: Divided Highway Connector's and Emergency Turnarounds

Verification for SR 0080

Any Divisor Type

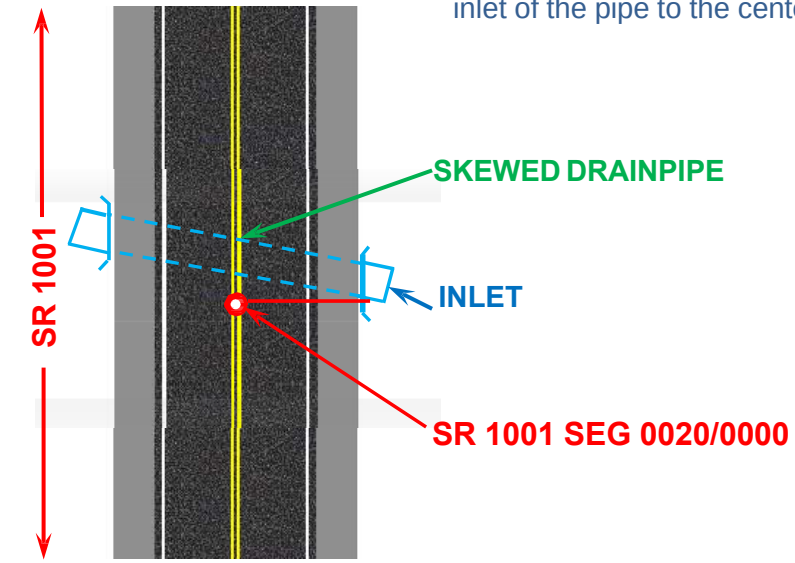


LRS SLD Display

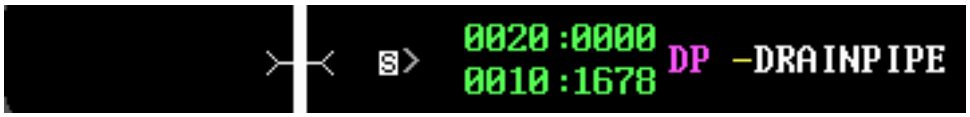
5-75: Drain Pipes

Verification for SR 1001
Note

Note: The verification point for skewed pipes will be at a perpendicular line drawn from the inlet of the pipe to the centerline of the road.

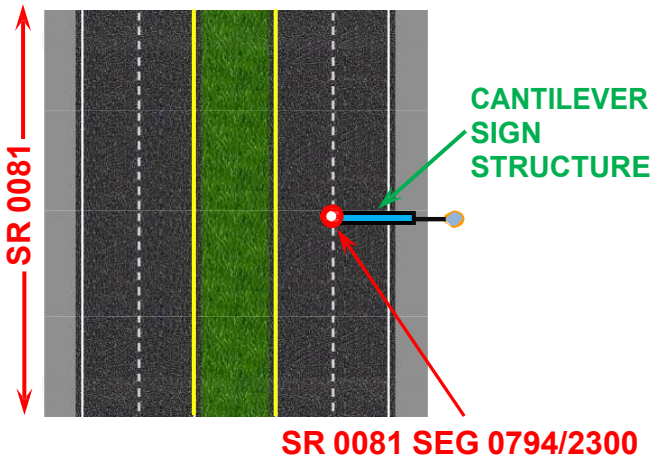


LRS SLD Display



5-76: Overhead Sign Structure (Cantilever)

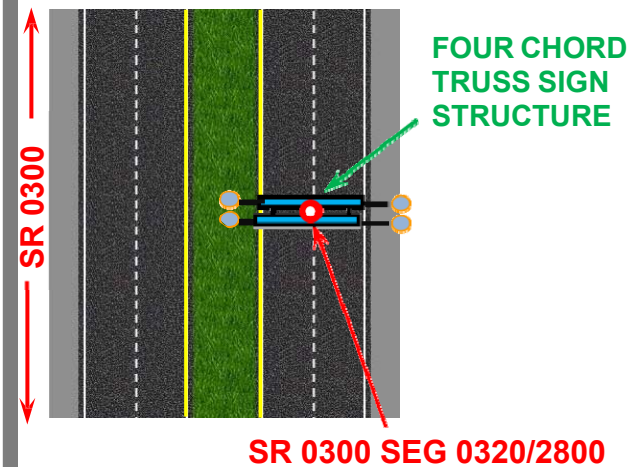
Verification for SR 0081



LRS SLD Display

5-77: Overhead Sign Structure (Chord & Truss)

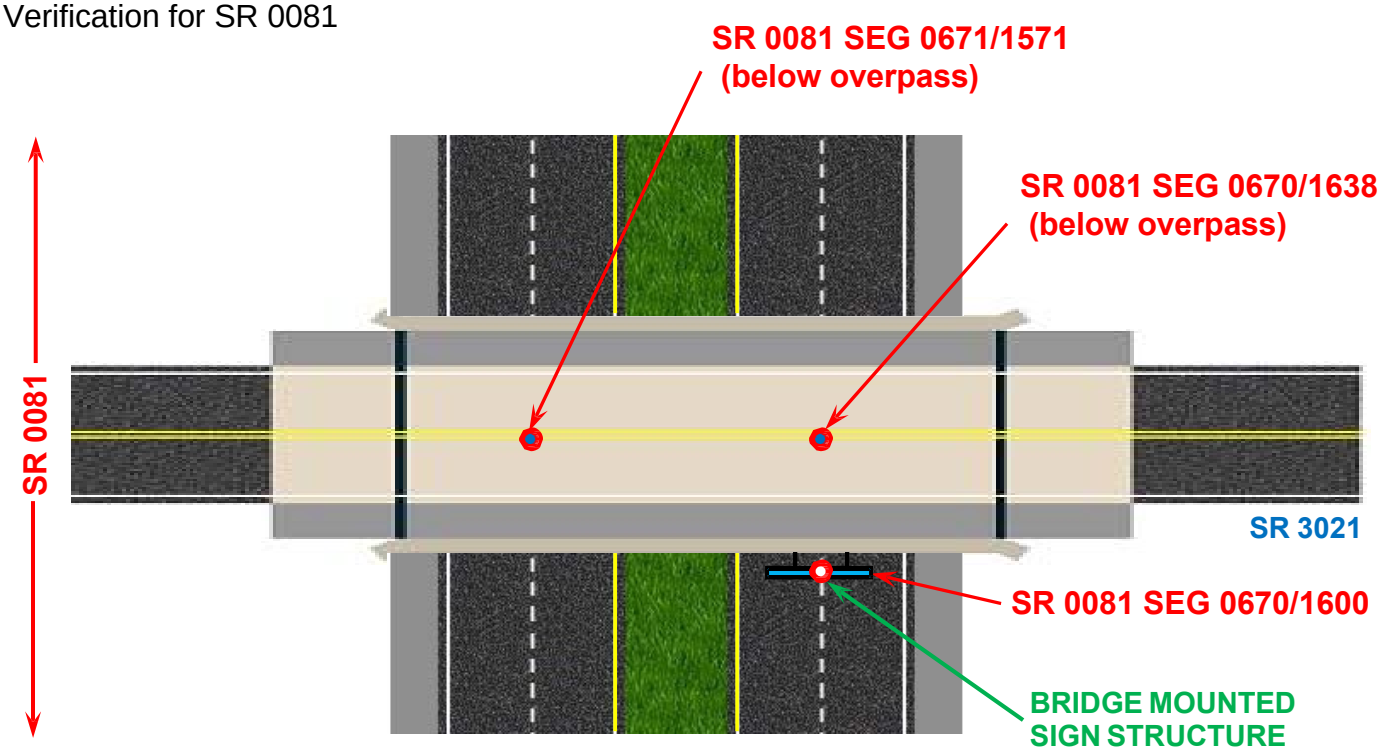
Verification for SR 0300



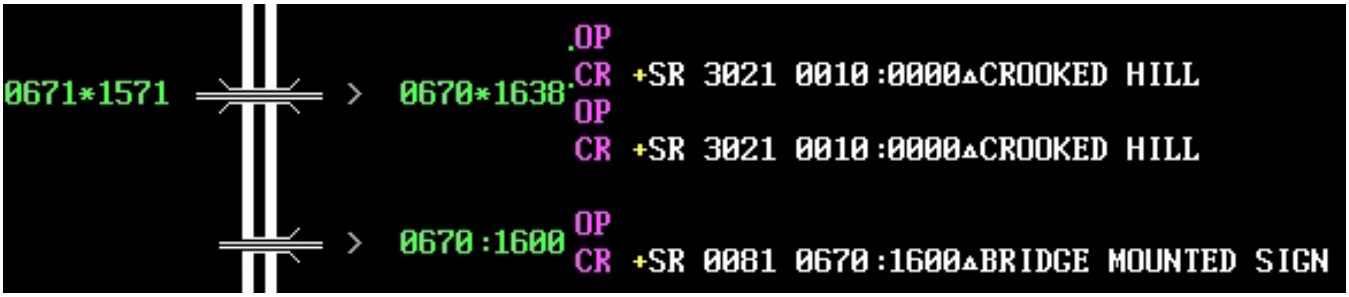
LRS SLD Display

5-78: Bridge Mounted Sign Structure

Verification for SR 0081



LRS SLD Display



5-79: Points of Interest (POI)

Verification for SR 0147

A POI is a point defined in RMS that locates a private driveway entrance or other intersection not defined by other feature codes.

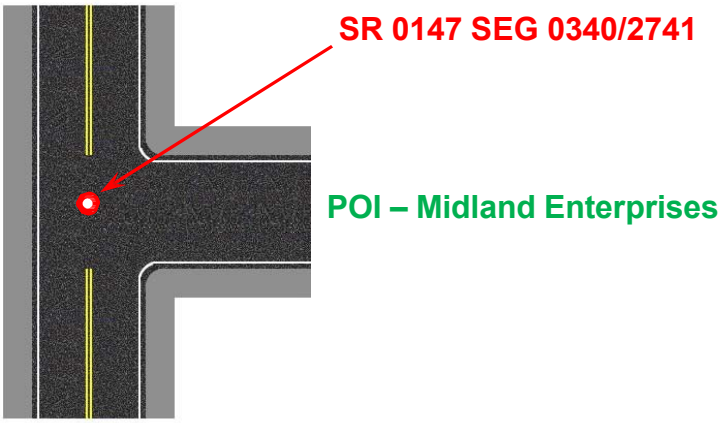
POI records have been added to the RMS database as the result of the implementation of the Automated Permit Routing Analysis System (APRAS). APRAS was designed to automate and expedite the permit issuance of oversized and/or overweight vehicles. APRAS computes the correct route as well as the mileage, cost, etc. for the permit. For APRAS to operate correctly, the exact location that an oversized/overweight vehicle begins and ends on State-owned highways must be defined, even if the beginning or ending point is not at an intersection of State or local roads.

POI records are included on the intersection screen of the RMS database; in most cases they establish where a private driveway intersects a State-owned highway. POI records are to be located at the appropriate segment/offset on the SR that corresponds to their actual location. If POI is not directly located on an SR then it should be located with the appropriate intersection that would normally provide access to that point. If 2 or more POI's are needed at the same location, then the POI's need to be labeled with one common name for both POI's. Shown below are illustrate example POI records on the RMS Intersection screen:

```
 COUNTY NO/NAME: 22 / DAUPHIN          STREET NAME1: MARKET ST
 STATE ROUTE...: 0147                  SEGMENT LENGTH.....: 3100
 SEGMENT.....: 0340   DIRECTION: B    NO. OF INTERSECTIONS: 04  &  LIGHTS: 00

          LIGHT                                        RAMP        STATE       OTHER
--MAINLINE---  |  ----------INTERSECTION----------    EXIT  ------ROUTE------ NON-ST
OFFSET  TYPE   |        ROADWAY NAME          TYPE     NO.  CO  SR  SEG. OFF. ROUTE
------ ------  |  ------------------------- ------  ----  -- ---- ---- ----  ----
? 0000 TLEFT   |  BOWMAN ST                                 22                 BORO
? 0438 TRIGHT  |  SHIPPEN DAM RD                            22 4002 0010 0000
? 2741 TRIGHT  |  MIDLAND DR                                22                 PRDR
? 2741 POI     |  MIDLAND ENTERPRISES INC                   22                 APRA
```

Note: POI records should always be added with a private intersection showing the correct intersection feature type.



LRS SLD Display

```
                  078054 FT                    077786 FT (APRA) MIDLAND ENTERPRI
                                                        MIDLAND DR
                                               0340/2741 (PRDR)
                  078043 FT                    077775 FT
                                               0340/2730 024 "DIA CAST IRON
```

6 RMS/LRS Connectors & Coding

6 RMS/LRS Connectors and Coding

RMS/LRS Intersection Connectors

The following examples define how connectors are coded in the RMS. The data should be coded the same way in LRS pertaining to the Roadway Name Field and the other Non-State Route Field. These two fields correspond to Field 1 and Field 2 data in the LRS software. It is critical that connectors in interchanges contain names using the TO/FROM format in order for the Automated Permit Routing and Analysis System (APRAS) to connect the SR's properly.

Connectors must be less than 200' in length, and are verified at centerline intersections. If the length is greater than or equal to 200', it will be considered a ramp and verified at the gore.

Name all connectors in the Roadway Name field to reflect whether it is connecting from a route or to a route by including "**TO**" or "**FROM**," as well as the **4 digit SR number**, **(/)** and a **4-digit segment**. This information is to be entered for the mainline intersections and at intersections on the ramps.

If the connector between SR's is bi-directional, then both points at which the connector intersects the SR's should be labeled the same, i.e. **CONN FOR SR 0989 and 2002** with the lower number SR first.

For any intersection with a "CONN" code in the Other Non-State Route field, the Roadway Name field should always start with either "**TO**" or "**FROM**," as well as the SR number and segment. The exceptions to this rule are connections to local, borough, township, city, or any other non-state road; in these cases, the field should start with "**LC**," for Local Connector.

If a connector leads to or from a ramp and a divided SR, and turning is permitted either onto or from that SR, code the intersecting segment number for the side of the divided SR that the connector intersects.

Example 1: Conn to a divided SR (3015, Figure 6-1) from a ramp (8005, segment 10, Figure 6-2)

```
RMSRT494            ROADWAY MANAGEMENT INFORMATION SYSTEM  09/22/2009 11:20:43
LTERM: IRVIN           INTERSECTION DATA (AT GRADE)

 COUNTY NO/NAME: 22 / DAUPHIN          STREET NAME1: RAMP E RD
 STATE ROUTE...: 8005                  SEGMENT LENGTH......: 1211
 SEGMENT.......: 0010   DIRECTION: E   NO. OF INTERSECTIONS: 05  &  LIGHTS: 01

          TRAFFIC                                  RAMP        STATE       OTHER
--MAINLINE--LIGHT---------INTERSECTION---------- EXIT  ------ROUTE------ NON-ST
OFFSET  TYPE           ROADWAY NAME        TYPE   NO.  CO  SR  SEG. OFF. ROUTE
------ ------ - ------------------------ ------ ----  -- ---- ---- ----  ----
? 0000 INTERB   AMERICAN LEGION MEM HW            69  22 0081 0684 0363
? 0974 AHEADR   TO 3015/0091 SH                   22                    CONN
? 1211 EXITB  S PROGRESS AV                     69  22 3015 0091 1040
? 1211 EXITB  S PROGRESS AV                       22 3015 0090 1028
? 1211 INTERA S VALLEY RD                         22                    T431
```

Figure - 6-1

```
RMSRT494            ROADWAY MANAGEMENT INFORMATION SYSTEM  09/22/2009 11:26:39
LTERM: IRVIN           INTERSECTION DATA (AT GRADE)

 COUNTY NO/NAME: 22 / DAUPHIN          STREET NAME1: N PROGRESS AV
 STATE ROUTE...: 3015                  SEGMENT LENGTH......: 1966
 SEGMENT.......: 0091   DIRECTION: S   NO. OF INTERSECTIONS: 07  &  LIGHTS: 01

          TRAFFIC                                    RAMP        STATE       OTHER
--MAINLINE--LIGHT---------INTERSECTION---------- EXIT  ------ROUTE------ NON-ST
OFFSET  TYPE           ROADWAY NAME        TYPE   NO.  CO  SR  SEG. OFF. ROUTE
------ ------ - ------------------------ ------ ----  -- ---- ---- ----  ----
? 0361 TLEFT    GOOSE VALLEY RD                       22                 TWP
? 0908 AHEADL   FROM 8005/0010 RD                     22                 CONN
? 1040 TLENTR S RAMP E RD                             22 8005 0010 1211
? 1040 TRIGHT S VALLEY RD                             22                 T431
? 1040 TLEFT  S TO 8005/0020 SH                       22                 CONN
? 1161 BLEXIT   RAMP F RD                             22 8005 0020 0000
? 1895 AHEADL   FROM 8005/0500 SH                     22                 CONN
```

Figure – 6-2

Example 3: Connection to a Local Road

```
RMSRT494            ROADWAY MANAGEMENT INFORMATION SYSTEM  10/02/2009 10:56:02
LTERM: IRVIN           INTERSECTION DATA (AT GRADE)

 COUNTY NO/NAME: 36 / LANCASTER        STREET NAME1: OREGON PK
 STATE ROUTE...: 0272                  SEGMENT LENGTH......: 3008
 SEGMENT.......: 0530   DIRECTION: B   NO. OF INTERSECTIONS: 06  &  LIGHTS: 00

          TRAFFIC                                    RAMP        STATE       OTHER
--MAINLINE--LIGHT---------INTERSECTION---------- EXIT  ------ROUTE------ NON-ST
OFFSET  TYPE           ROADWAY NAME        TYPE   NO.  CO  SR  SEG. OFF. ROUTE
------ ------ - ------------------------ ------ ----  -- ---- ---- ----  ----
? 0000 TRIGHT   LANDIS VALLEY RD                      36                 TWP
? 0000 TLEFT    VALLEY RD                             36 1014 0030 3651
? 0898 TRIGHT   WHITEMARSH DR                         36                 TWP
? 2364 TLEFT    LC TO VALLEY RD                       36                 CONN
? 2513 BACKL    VALLEY RD                             36                 TWP
? 2590 TRIGHT   HUNSICKER RD                          36                 TWP
```

Figure 6-3

Example 4: Bi-directional connection between 2 SR's

```
RMSRT494            ROADWAY MANAGEMENT INFORMATION SYSTEM  10/02/2009 11:05:26
LTERM: IRVIN           INTERSECTION DATA (AT GRADE)

 COUNTY NO/NAME: 66 / YORK             STREET NAME1: FISSELS CHURCH RD
 STATE ROUTE...: 3011                  SEGMENT LENGTH......: 2392
 SEGMENT.......: 0100   DIRECTION: B   NO. OF INTERSECTIONS: 04  &  LIGHTS: 00

          TRAFFIC                                    RAMP        STATE       OTHER
--MAINLINE--LIGHT---------INTERSECTION---------- EXIT  ------ROUTE------ NON-ST
OFFSET  TYPE           ROADWAY NAME        TYPE   NO.  CO  SR  SEG. OFF. ROUTE
------ ------ - ------------------------ ------ ----  -- ---- ---- ----  ----
? 0269 BACKL    LC TO UNKNOWN RD                      66                 TWP
? 2243 AHEADR   CONN FOR SR 0616 AND 3011             66                 CONN
? 2392 AHEADL   PLEASANT VALLEY RD                    66 0616 0050 0000
? 2392 BACKR    PLEASANT VALLEY RD                    66 0616 0050 0000
```

Figure – 6-4

RMS/LRS Attribute Definitions

Roadway Information (RI) Record

The roadway information (RI) record displayed on the SLD (Figure 6-5) indicates various roadway characteristics.

Figure 6-5

The **RI** record breaks down into 4 individual parts:

1. (**L**) = Number of Lanes
2. (**S**) = Surface type
3. (**D**) = Divisor type
4. (**F**) = Facility type (Directional flow of traffic)

1. Lanes (L) (Figure 6-6)**:** Undivided Roadways – Total number of travel lanes for roadway. Divided Roadways – Total number of travel lanes in direction of travel.

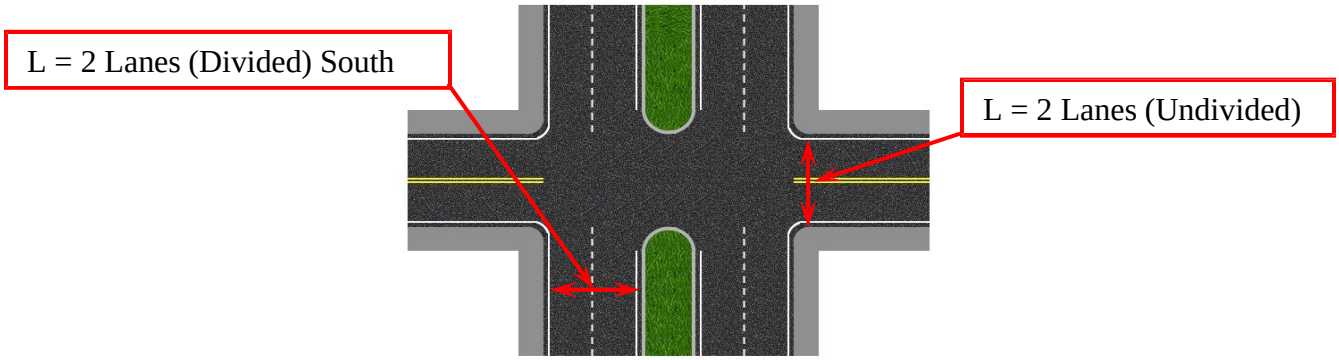


Figure 6-6

2. **Surface Type (S):** Predominant pavement surface type.

SURFACE TYPE CODE	SURFACE TYPE DESCRIPTION
20	Earth – Unimproved
30	Earth – Graded/Drained
40	Stabilized (Soil, Gravel Or Stone)
51	Bituminous Surface Treatment
52	Bituminous – Intermediate Type
61	Bituminous – High Type
62	Bituminous On PCC Base
71	Plain Portland Cement Concrete
72	Reinforced Portland Cement Concrete
73	Continuously Reinforced/Prestressed
74	Concrete Over Concrete - Bonded
75	Concrete Over Concrete – Unbonded
76	Concrete Over Bituminous
80	Brick/Block
98	Bridge Decks
99	** Undefined Surface Type **

3. **Divisor Type (D):** Type of divisor or barrier that separates travel lanes. Figures 6-7 through 6-14 illustrate the various divisor types.

DIVISOR TYPE CODE	DIVISOR TYPE DESCRIPTION
0	None
1	Paint Divided
2	Fixed Barrier (Man-made)
3	Earth Barrier
4	4’ Width or Greater Painted Center
5	Curb
6	City Block
7	Natural Barrier (Trees, Fill, Etc.)
8	Mountable Curb

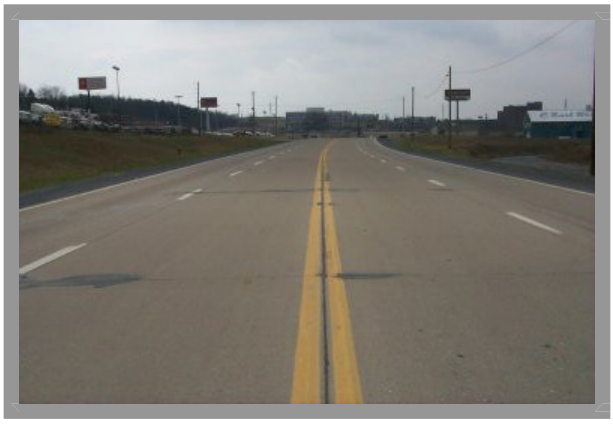


Figure 6-7 Type 1: Paint Divisor

Figure 6-8 Type 2: Fixed Barrier

Figure 6-9
Type 3: Earth Divisor

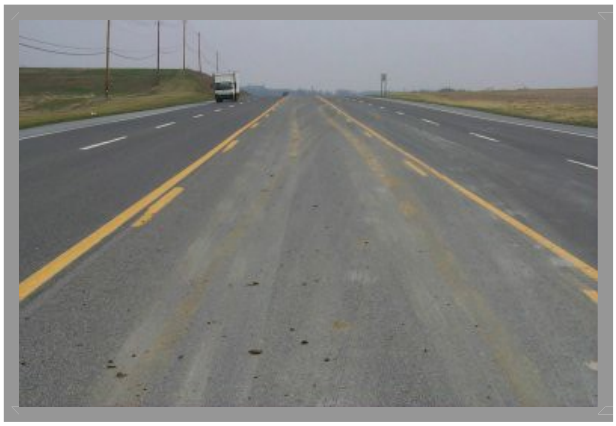


Figure 6-10
Type 4: 4' Width or Greater Paint Divisor

Figure 6-11
Type 7: Natural Barrier

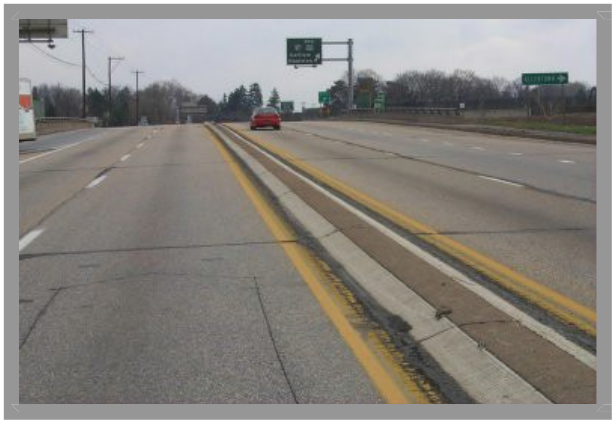


Figure 6-12
Type 8: Mountable Curb

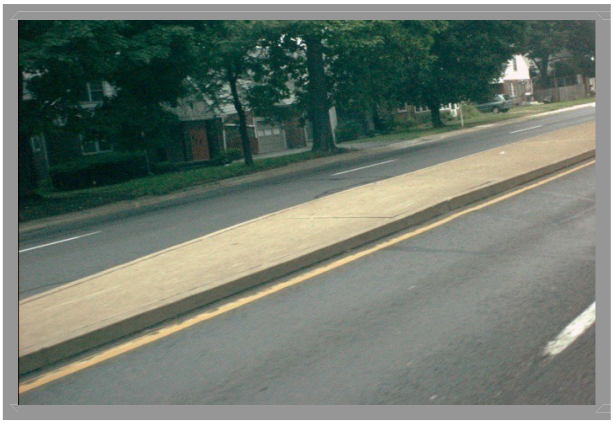


Figure 6-13
Type 5: Curb

Figure 6-14
Type 6: City Block

4. Facility Type (F): Permissible traffic flow for roadway.

Type 1 – One direction of travel (Divided roadway, One-way Street).
Type 2 – Two directions of travel (Undivided roadway).
Type 3 – Two directions of travel (State-owned right side only).
Type 4 – Two directions of travel (State-owned left side only).

Reference Code (RF) Record

Roadway geometry data can be displayed in LRS files in the form of an 18-digit Reference Code (RF) record. This data is segment specific, describes the predominate data for each segment, and appears only at the start of each segment. This data is always displayed in the North/East perspective. Below is a breakdown of a sample (RF) code.

POSITION	DESCRIPTION
1,2	Surface Type (S)
3,4	Roadway Width
5,6	Total Number of Lanes (L)
7,8	Left Shoulder Type
9,10	Left Shoulder Paved Width
11,12	Left Shoulder Total Width
13,14	Right Shoulder Type
15,16	Right Shoulder Paved Width
17,18	Right Shoulder Total Width

Surface type and number of lanes will be the same as the data contained in the (RI) record.

612402060408060408 is an example RF record, defined as follows:

- **Surface = 61**
- **Roadway width = 24'**
- **Total number of lanes = 02,**
- **Left shoulder type = 06, Left shoulder paved width = 04, Left shoulder total width = 08**
- **Right shoulder type = 06, Right shoulder paved width = 04, Right shoulder total width =**
- **08**

The following illustration (Figure 6-15) shows how the measurements contained in the RF record are to be determined.

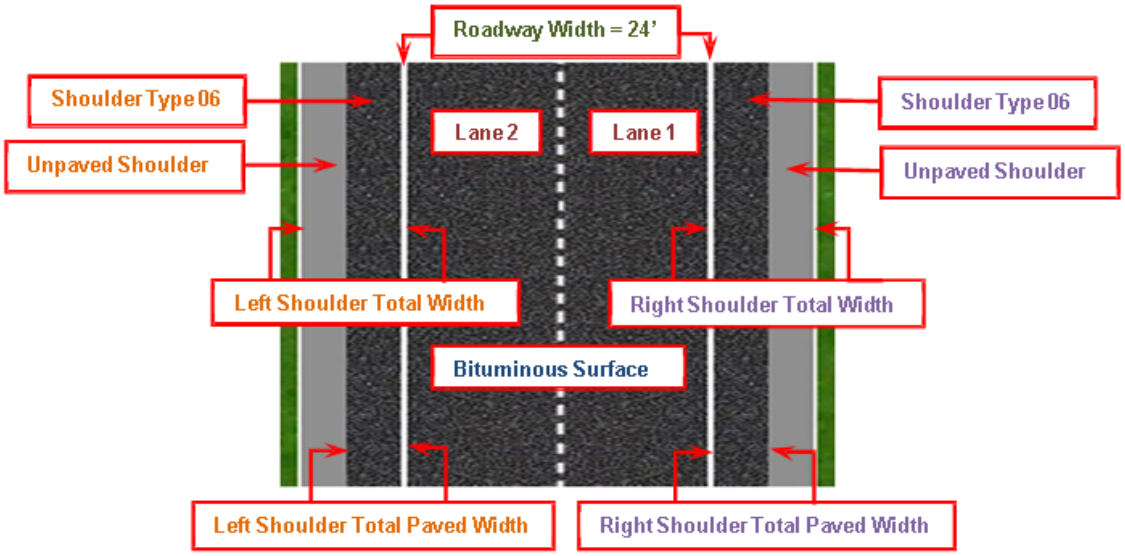


Figure 6-15
RF Codes

Shoulder Types

Predominant shoulder type:

CODE	SHOULDER TYPE
BS	BCBC SHOULDER
BW	BITUMINOUS WEDGE
CG	CURBED GUTTER
CU	CURB
D1	PLASTIC PIPE EDGE DRAIN
D2	POROUS CONC. PIPE EDGE DRAIN
D3	PVC PIPE EDGE DRAIN
D4	ABS PIPE EDGE DRAIN
D5	PERF. PLASTIC PIPE EDGE DRN
D6	CORR. STEEL COATED EDGE DR.
D7	CORR. ALUM. PIPE EDGE DR
D8	PRE-FAB EDGE DRAIN
FD	FULL DEPTH ROAD CONSTRUCTION
GR	GRAVEL SHOULDER
NO	NONE
PG	PAVED GUTTER
RB	RECYCLED PAVED SHOULDER
RC	ROLLER COMPACTED CONCRETE
RG	RUBBLE GUTTER
R3	R3 ROCK
SP	PAVED SHOULDERS, TYPE 1-SP
ST	STABILIZED SHOULDER
TS	TURF SHOULDER
UN	UNKNOWN PAVED SHOULDER
01	PAVED SHOULDERS, TYPE 1
03	PAVED SHOULDERS, TYPE 3
04	PAVED SHOULDERS, TYPE 4
06	PAVED SHOULDERS, TYPE 6
07	PAVED SHOULDERS, TYPE 7
1C	CONCRETE SHOULDERS, TYPE 1
1F	PAVED SHOULDERS, TYPE 1-F
1I	PAVED SHOULDERS, TYPE 1-I
1S	PAVED SHOULDERS, TYPE 1-S
2C	CONCRETE SHOULDERS, TYPE 2
6F	PAVED SHOULDERS, TYPE 6-F
6I	PAVED SHOULDERS, TYPE 6-I
6P	PAVED SHOULDERS, TYPE 6-SP
6S	PAVED SHOULDERS, TYPE 6-S
99	** STARTUP INITIAL VALUE **

RMS/LRS Allowable Name Abbreviations

To standardize naming conventions, and ensure consistency, the following table establishes abbreviations to be used for the ending portion of road names in RMS as well as LRS.

NAME	ABBREVIATION
Alley	AL
Avenue	AV
Boulevard	BL
By-Pass	BP
Bridge	BR
Circle	CR
Court	CT
Drive	DR
Extension	ET
Expressway	EX
Highway	HW
Lane	LN
Lot	LT
Public Institute	PI
Pike	PK
Place	PL
Park System	PS
Plot	PT
Park	PR
Parkway	PY
Plaza	PZ
Road	RD
Railroad	RR
Township Road (No Name)	RT
Row	RO
State Highway (No Name)	SH
Square	SQ
Street	ST
Terrace	TE
Tunnel	TN
Turnpike	TP
Trail	TR
Way	WY
Wye	YE

Numbered Street Names

All numbered street names should be spelled out in RMS. In most cases, directional prefixes are not to be included in the roadway name. The exception to this is when two separate (non-contiguous) roads with the same name need to be differentiated. The following examples established standard naming conventions for numbered street names.

NUMBERED NAME	STREET NAME
1ST	FIRST ST
2ND	SECOND ST
3RD	THIRD ST
4TH	FOURTH ST
4 and ½	FOUR AND HALF ST
5TH	FIFTH ST
6TH	SIXTH ST
7TH	SEVENTH ST
8TH	EIGHTH ST
9TH	NINTH ST
10TH	TENTH ST
11TH	ELEVENTH ST
12TH	TWELFTH ST
13TH	THIRTEENTH ST
14TH	FOURTEENTH ST
15TH	FIFTEENTH ST
16TH	SIXTEENTH ST
17TH	SEVENTEENTH ST
18TH	EIGHTEENTH ST
19TH	NINETEENTH ST
20TH	TWENTIETH ST
21ST	TWENTYFIRST ST
22ND	TWENTYSECOND ST
23RD	TWENTYTHIRD ST
24TH	TWENTYFOURTH ST
25TH	TWENTYFIFTH ST
26TH	TWENTYSIXTH ST
27TH	TWENTYSEVENTH ST
28TH	TWNETYEIGHTH ST
29TH	TWENTYNINTH ST
30TH	THIRTIETH ST
31ST	THIRTYFIRST ST
32ND	THIRTYSECOND ST
40TH	FORTIETH ST
41ST	FORTYFIRST ST
42ND	FORTYSECOND ST
50TH	FIFTIETH ST
60TH	SIXTIETH ST
70TH	SEVENTIETH ST
80TH	EIGHTIETH ST
90TH	NINETIETH ST
100TH	ONE HUNDREDTH ST
101ST	ONE HUNDRED AND FIRST ST
102ND	ONE HUNDRED AND SECOND ST
200TH	TWO HUNDREDTH ST
201ST	TWO HUNDRED AND FIRST ST

7 LRS VEHICLE OVERVIEW

7 LRS VEHICLE OVERVIEW

LRS Van Description

Specialized testing vans (Figure 7-1) are used to perform LRS verification, Quality Assurance, and Quality Commitment Testing. PennDOT currently maintains six LRS vans; four in the Bureau of Maintenance and Operations (BOMO), and one each in Engineering Districts 2-0, and 12-0.

Figure 7-1
LRS Testing Van

The electronic systems consist of an integrated combination of hardware and software that is designed to be installed and operated in a vehicle environment. The major system hardware consists of a backplane computer system, LCD monitor, compact computer keyboard, mouse, event keyboards, printer, GPS unit, data communication control box and appropriate interfaces. A Data Measurement Subsystem that is interfaced to a wheel mounted sensor detects movement of the vehicle and report the distances to the application software.

Figure 7-2
LRS Van view from Rear

Figure 7-3
LRS Van Operators view

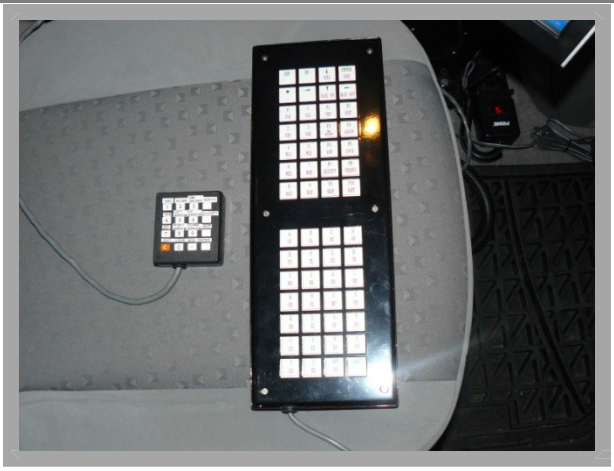


Figure 7-4
Large and Small Input Event Boards

Figure 7-5
Color Laser Printer

Figure 7-6
Power and Control Switches

Figure 7-7
LCD Monitor for Driver

The system accepts a downloaded RMS file containing all roadway information as an input database for verification and outputs an RMS file containing all feature information, segment and offset values, as well as any comments made during verification. Vehicle location and roadway features are displayed on the computer monitor in a Straight Line Diagram (SLD) format, and the software accepts operator inputs verifying or modifying roadway feature locations. Collection and display is in real time including on-board analysis and instant recall of previously verified features. Routes can be tested in increasing or decreasing segment order, and may begin on a segment beginning, ending, or any permanent landmark feature.

During testing activities, the system will track and display the location of the test vehicle, and display upcoming pertinent roadway feature data for the current roadway section. During verification activities, the data will be displayed in SLD graphical format on the monitor.

The system will accept interactive operator inputs to support verification and modification of roadway feature data and locations as the test vehicle transverses over the actual roadway (Figure 7-8). The system is capable of performing verification at vehicle speeds of up to 60 mph, but usually testing protocols demand speeds of less than 15 mph to ensure accuracy. On board analysis and instant recall of previously verified features data is available at the completion of verification activities. Shown on the SLD screen are various informational fields that are used by the operator to help navigate and control the application software.

Figure 7-8
SLD in Testing Mode

Input Event Board Commands

The Event Keyboard (Figure 7-9) is the primary operator interface, along with the mouse, used during roadway feature verification activities. The event keyboard is interfaced to the computer through the distance measuring system and is equipped with the necessary keys associated with the verification process, as follows:

EVENTING KEYS:

(F1)	[CMT]	Add a Comment
(F2)	[Edit]	Go into Edit mode
(F3)	[DMI on/off]	Start/Stop distance count
(F4)	[Align]	Align to starting point
(F5)	[Add]	Add a node
(F6)	[Lock]	Lock onto next feature
(F7)	[Except]	Problem needs corrected
(F8)	[Verify]	Features are correct
(F9)	[Skip]	Leave features at current offset
(F10)	[Exit]	Exit the current screen

SPECIFIC ADD KEYS:

(SLB)	Sound Wall Begin Left
(SLE)	Sound wall End left
(SRS)	Name Change End
(SRE)	Name Change Begin
(WLS)	Retaining Wall Start on Left
(WLE)	Retaining wall End on Left
(WRS)	Retaining Wall Start on Right
(WRE)	Retaining wall End on Right
(BGS)	Bridge Start
(BGE)	Bridge End
(SS)	Over Head Sign Structure
(AL)	Ahead Left Intersection
(DC)	Divided Highway Connector
(AR)	Ahead Right Intersection
(TS)	Traffic Signal
(TL)	T-Left Intersection
(CR)	Cross Intersection
(TR)	T-Right Intersection
(MO)	Monitoring Sight
(BL)	Back Left Intersection
(RO)	Rotary Intersection
(BR)	Back Right Intersection
(EB)	Entrance Both; Enter a Ramp from Both Directions
(NL)	Entrance Ramp on Left
(MP)	Mileposts
(NR)	Entrance Ramp on Right
(XB)	Exit Both, Exit from a Ramp to Both Directions
(XL)	Exit Ramp Left
(OP)	Overpass
(XR)	Exit Ramp Right
(LN)	T-Left Entrance Ramp
(LX)	T-Left Exit Ramp
(DP)	Drainage Pipe
(CO)	Comment
(RN)	T-Right Entrance Ramp
(RX)	T-Right Exit Ramp
(RR)	Railroad Crossing

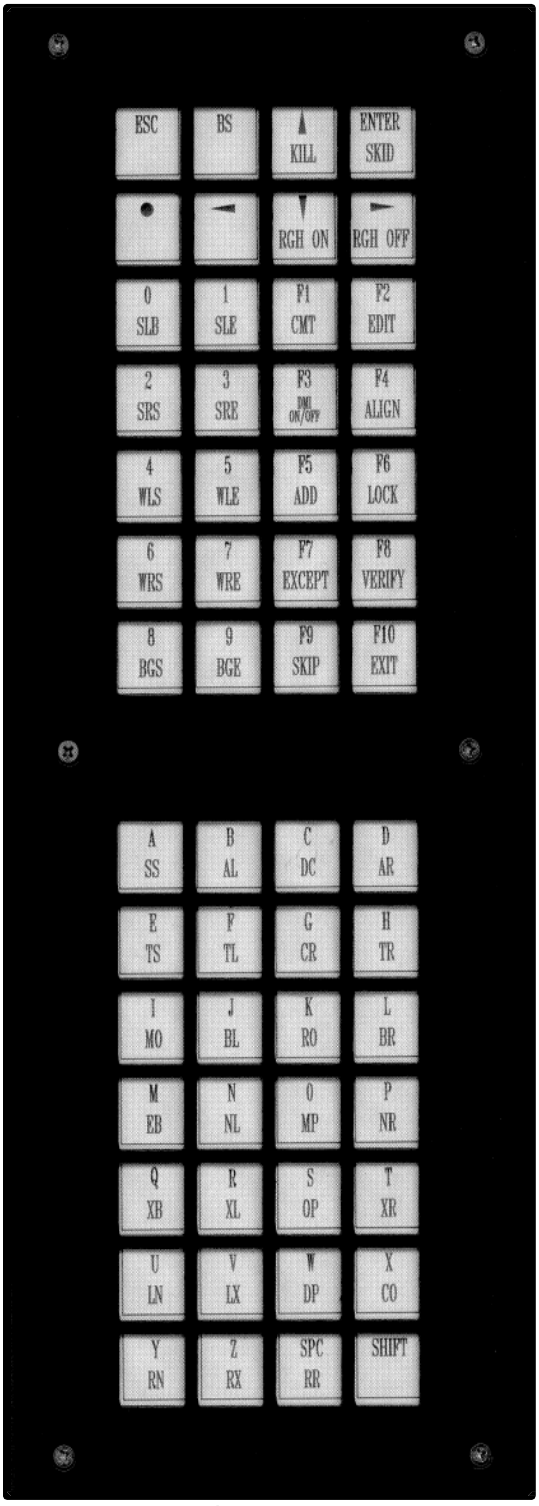


Figure 7-9
Input Event Board

MISCELLANEOUS KEYS: Alphabetic, Numeric and Navigation Keys.

Correcting and Editing an SLD

When performing LRS field testing, necessary corrections are done to the SLD in the edit mode screen of the LRS software, using numbered comment lines. It is recommended to note inconsistencies on a hardcopy SLD, as exemplified in Figure 7-10.

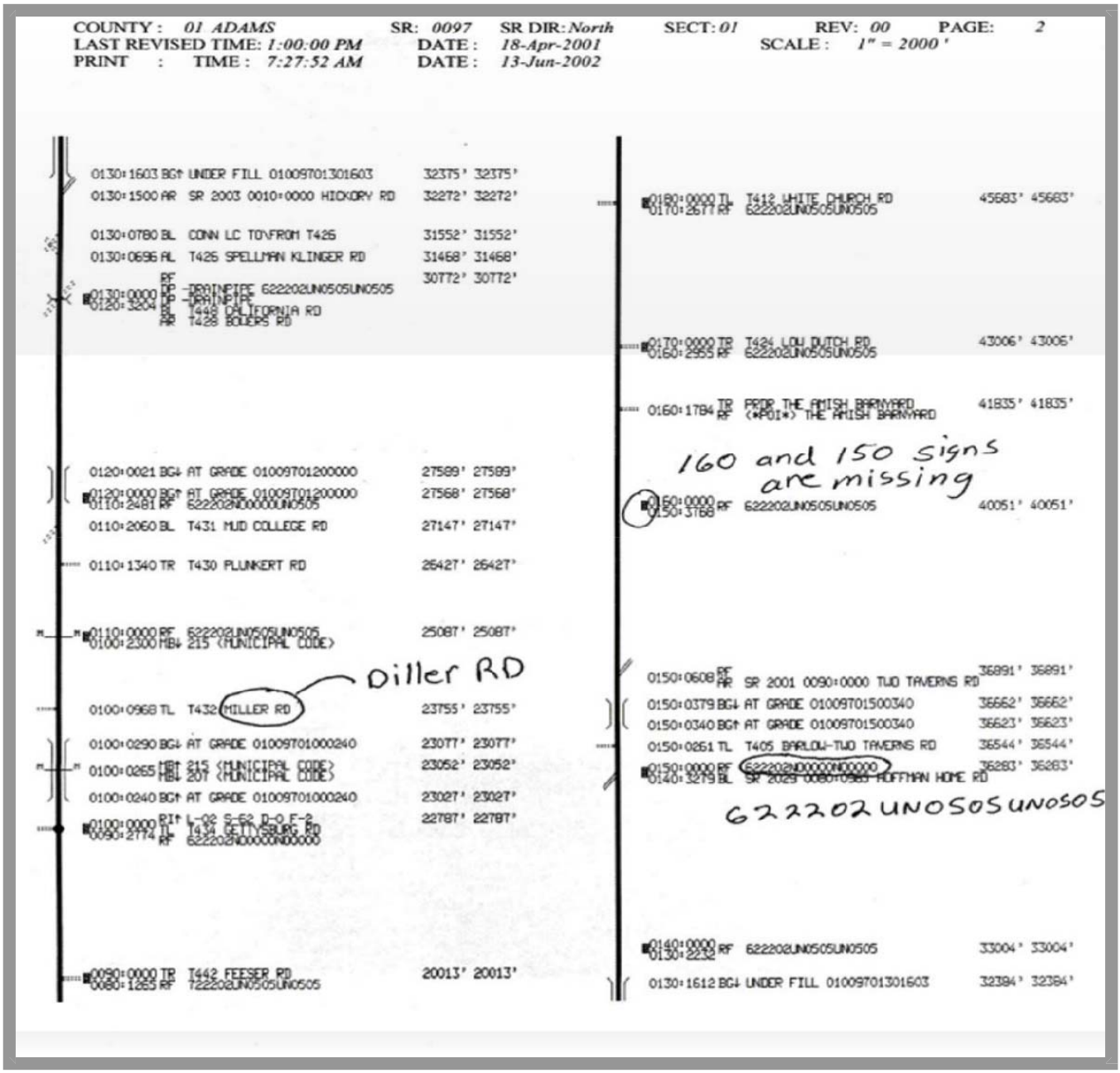
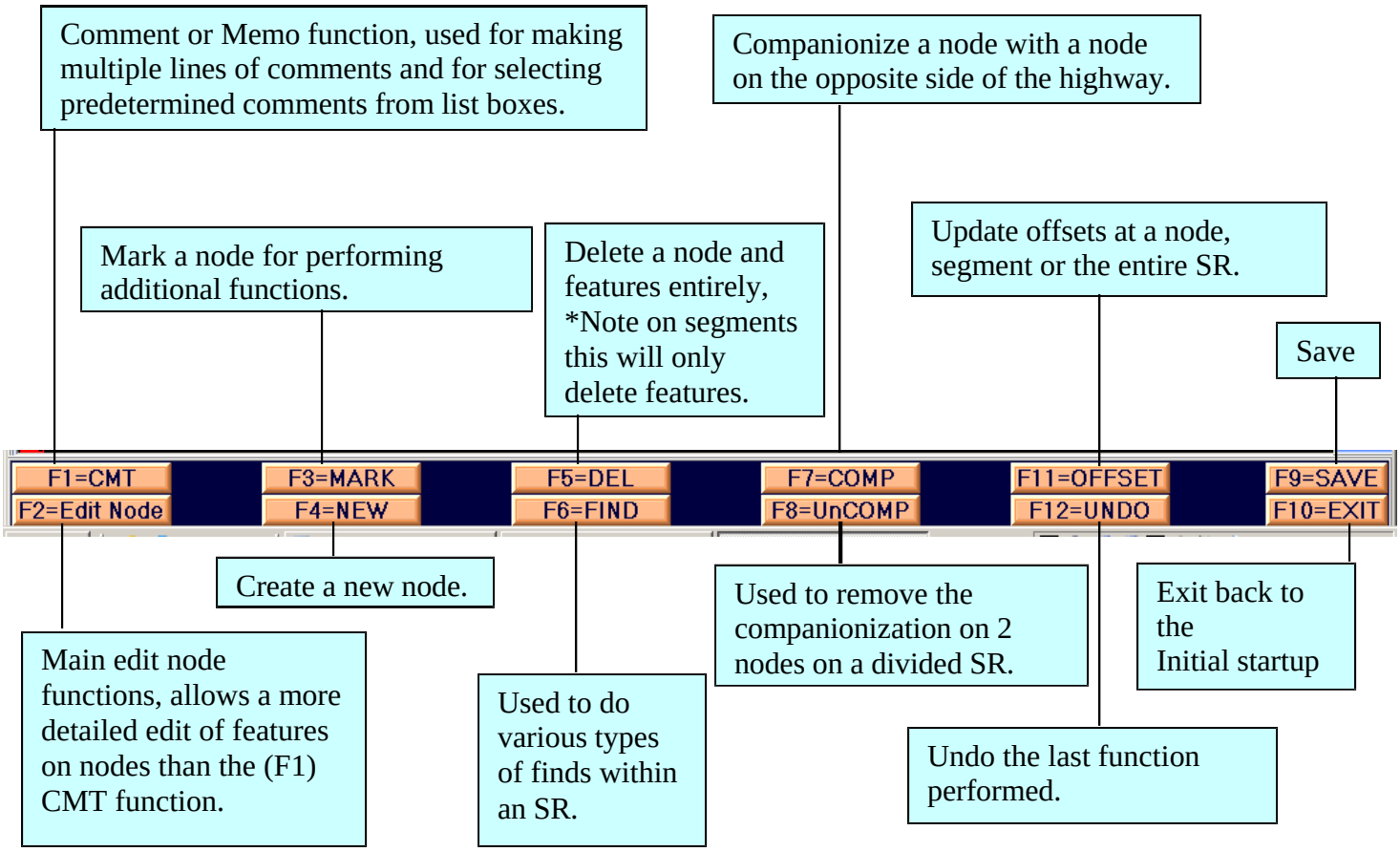


Figure 7-10
Inconsistencies are noted on SLD

After testing is completed, the notes made on the hardcopy SLD are to be transferred to the software's Edit Node screen. This is referred to as "Edit Mode." All corrections are made on comment lines (CO), memo lines (MM) or canned comment lines (CC). Multiple comment lines per node can be added.

Function Key Description in the Edit Mode



The Memo Function (F1)

Whenever the F1 key is used either during testing or in Edit mode, the screen shown below (Figure 7-11) comes up. In the Enter Comment Statement area, comments can be added in the form of sentences or paragraph, just like you would type with a word processing program. The area in the middle and the right contains predefined comment statements called (CC) comments. Any of the CC comments can be selected, and they will then be added on as a new line for the current node.

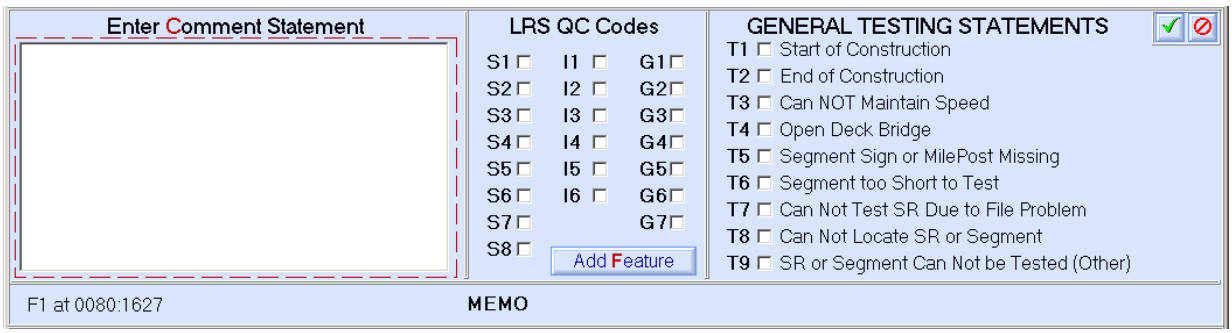


Figure 7-11
Comment Statement Window

The Node Editor

By double clicking on a node or by hitting enter when you're at a particular node the Edit box shown below will come up (Figure 7-12). The primary purpose for the Node Editor is to manipulate features found at individual nodes. The Node Editor function commands are shown at the bottom of the Node Editor box and can be used to perform various modifications. In addition to using the function commands many commands can be performed by right clicking on the mouse at an individual feature.

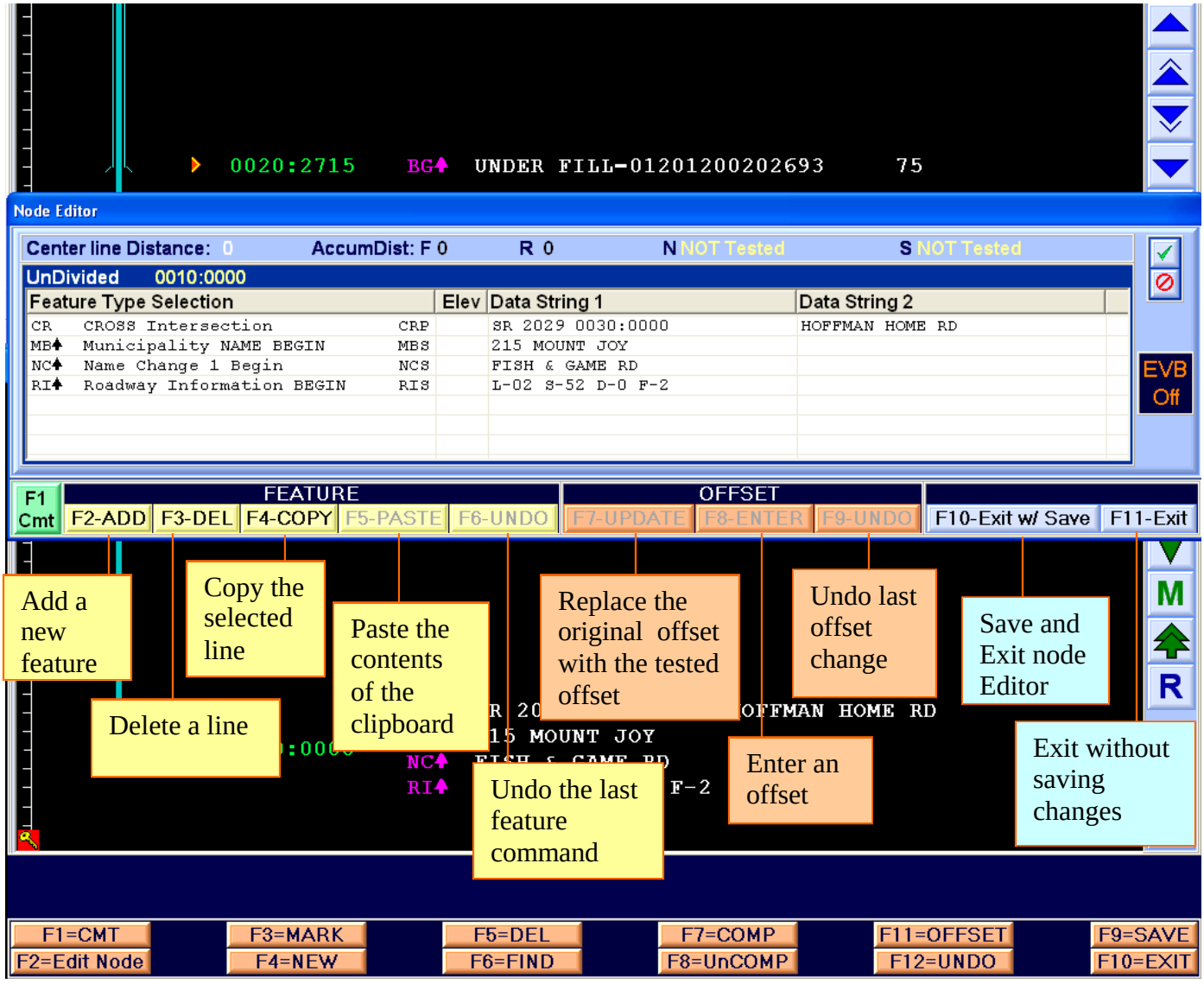


Figure 7-12
Node Editor Functions

When corrections to the SR have been completed, the data should is saved. Each time the SLD extract file is saved, the file extension for the SR is increased by 1; for example:

Original file: 01SR0097.S01
First edit: 01SR0097.S02
Second edit: 01SR0097.S03

If more testing or corrections are necessary, the file with the greatest extension number is used to produce the final version containing a complete and corrected SR.

8 Quality Control and Assurance Reports

8 Quality Control and Assurance Reports

LRS Quality Commitment & Quality Assurance Programs

The Bureau of Maintenance and Operations, Roadway Inventory & Testing Unit performs Quality Commitment (QC) verification on all State-owned routes. The QC program begins in April of each year and concludes in November.

Five percent of each county's mileage is tested each year. Typically, half of the SR's selected for QC testing are Traffic routes and the other half are Quadrant routes, but the SR's are selected randomly within those categories.

The information that is verified, rated, and/or modified as part of the QC program is broken down into four categories.

SR LENGTH: The total length of a State Route measured in feet by summing the segment lengths of all undivided highways and both sides of divided highways.

SEGMENT LENGTH: The total length of a segment in feet from the beginning offset to the ending offset.

INTERSECTING FEATURE: The County, SR, Segment, and Offset value of the at-grade intersection, or the BMS structure key for bridges, and the intersection type code.

SEGMENT MARKER: The SR-Segment sign marking the beginning of a segment. For undivided roads, this includes both the ahead and back signs.

UNITS AND ACCURACY GOALS: The test unit and acceptable variance for each of the four categories is defined as follows:

QC Category	Test Unit	Acceptable Variance
SR Length	Feet	(0.44%+80')
Segment Length	Feet	40'
Intersecting Feature	Off/Type	40'/None
Segment Marker	Each	None

Each County is given an annual QC rating, based on a composite of all SR's tested in the County. Four categories are evaluated for each SR. An overall rating, in the form of a percentage based on a maximum total of 100 points, is determined by weighting the percentage for each of the four evaluation categories as follows:

- SR LENGTH
- SEGMENT LENGTH
- INTERSECTING FEATURES
- SEGMENT MARKERS

QC Ratings

A breakdown of each QC category and result follows:

* **SR LENGTH:** The total length of a State Route measured in feet by summing the segment lengths of all undivided highways and the longest side of divided highways.

* **SEGMENT LENGTH:** The total length of a segment measured in feet.

* **INTERSECTING FEATURE:** The County, SR, Segment and Offset value of the at-grade intersection, or the BMS structure key for bridges, and the intersection type code.

* **SEGMENT MARKER:** The SR-Segment sign marking the beginning of a segment. For undivided roadways this includes both the ahead and back signs.

Each county is given an annual QC rating, based on a composite of all of the SR's tested in that county. The overall rating is determined by weighting the score for each of the four categories as follows:

	0.30	x	SR LENGTH
+	0.25	x	SEGMENT LENGTH
+	0.25	x	INTERSECTING FEATURE
+	0.20	x	SEGMENT MARKER

An overall rating is then determined for each Engineering District, by accumulating the scores for all SR's in all counties in that District. Acceptance for a county or Engineering District is based on the following criteria:

Unsatisfactory		Satisfactory
Deficient	Needs Improvement	Meets Standard
< 80%	80% - 92%	> 92%

QC Reporting

An annual LRS QA/QC Program Final Report is produced and distributed to PennDOT Executive staff and the Engineering Districts. This report analyzes each Engineering District's results as well as trends and supporting information.

Annual letters are sent to each District Engineer/District Administrator defining QC ratings and acceptance levels for each county, as well as the Engineering District overall.

Along with a copy of this letter, detailed QC reports for each tested SR are sent to each District RMS Coordinator, who is responsible for making necessary data adjustments by March 31st of the following year. Hardcopies of SLD's for the tested SR's, with corrections noted, are also provided.

A sample detailed QC report follows:

District QC Report

Cover Letter: District & County Scores

OS-600 (12-15)

pennsylvania
DEPARTMENT OF TRANSPORTATION

MEMO

DATE: July 11, 2017

SUBJECT: 2017 LRS Quality Commitment (QC) Program

TO: Joseph P. Dubovi, III, P.E., District Executive
Engineering District 10-0

FROM: Richard N. Roman, P.E., Director \s\
Bureau of Maintenance and Operations

Each year, we evaluate the accuracy of PennDOT's Location Referencing System (LRS) by testing a random 5% sample of State Routes in each county. The goal is to maintain greater than 92% accuracy between the data in the Roadway Management System (RMS) and actual locations in the field. The evaluation program, LRS-QC, tests the accuracy of four types of LRS data (SR Length, Segment Length, Feature, and Segment Marker), and the summary ratings for 2017 are as follows:

Armstrong	98.8%	Meets Standards
Butler	96.9%	Meets Standards
Clarion	99.2%	Meets Standards
Indiana	98.8%	Meets Standards
Jefferson	97.9%	Meets Standards

The overall rating for District 10-0 is 98.3% indicating RMS data meets standards.

2017 detail reports for your District are sent to your RMS Coordinator. These reports list deficiencies which should be corrected, preferably within 90 days. Please notify Janice Arellano, P.E., RMS Administrator, in writing when they have been corrected so we can close-out this year's review.

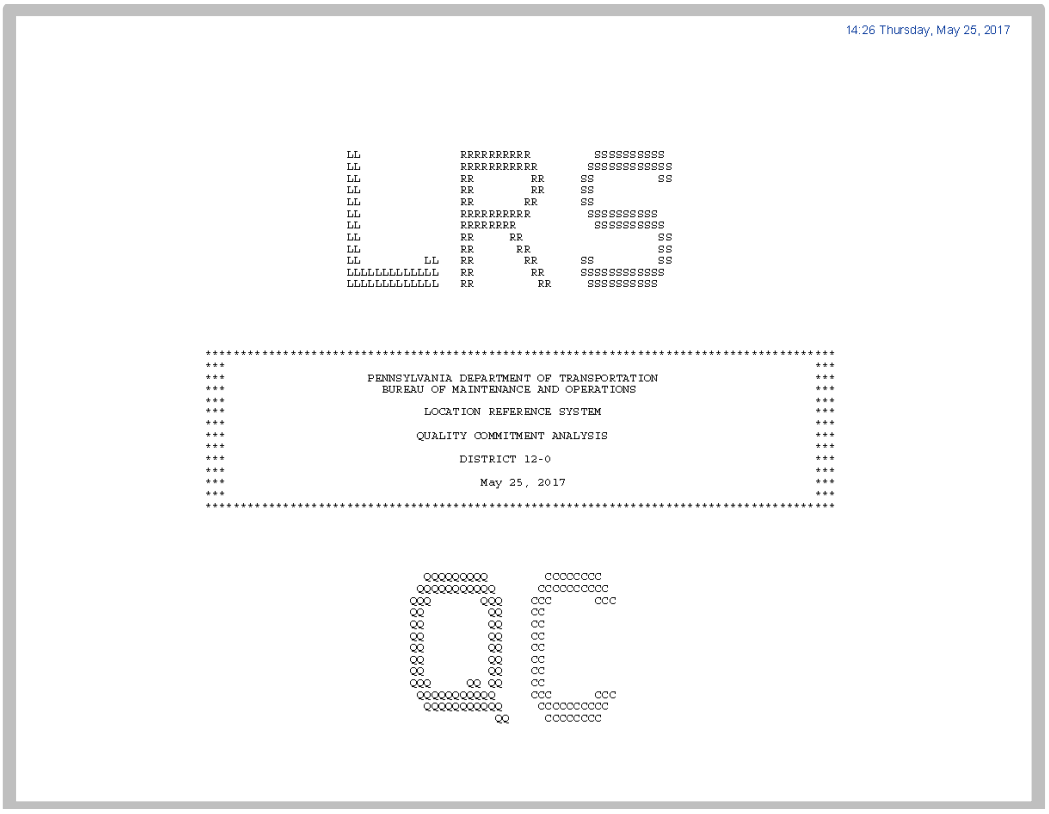
Attachment

4950/JLA/jla

cc: J. Michael Long, P.E., Chief, Asset Management Division, BOMO
Steven L. Koser, P.E., Chief, Pav't Testing & Asset Management Section, BOMO
Janice L. Arellano, P.E., Chief, Roadway Inventory and Testing Unit, BOMO
Colin R. McClenahen, Roadway Programs Manager 1, BOMO
Rodney L. Irvin, Roadway Programs Manager 1, BOMO
Craig E. Alexander, Roadway Programs Technician Supervisor, BOMO
Brian P. McClenahen, Roadway Programs Specialist, BOMO
(w/attachments) Kathy L. Renosky, Roadway Programs Tech 1, District 10-0

Bureau of Maintenance and Operations
400 North Street | Harrisburg, PA 17120 | 717-787-6899 | www.penndot.gov

QC Cover



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PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
BUREAU OF MAINTENANCE AND OPERATIONS

LOCATION REFERENCE SYSTEM

QUALITY COMMITMENT ANALYSIS

DISTRICT 12-0

May 25, 2017

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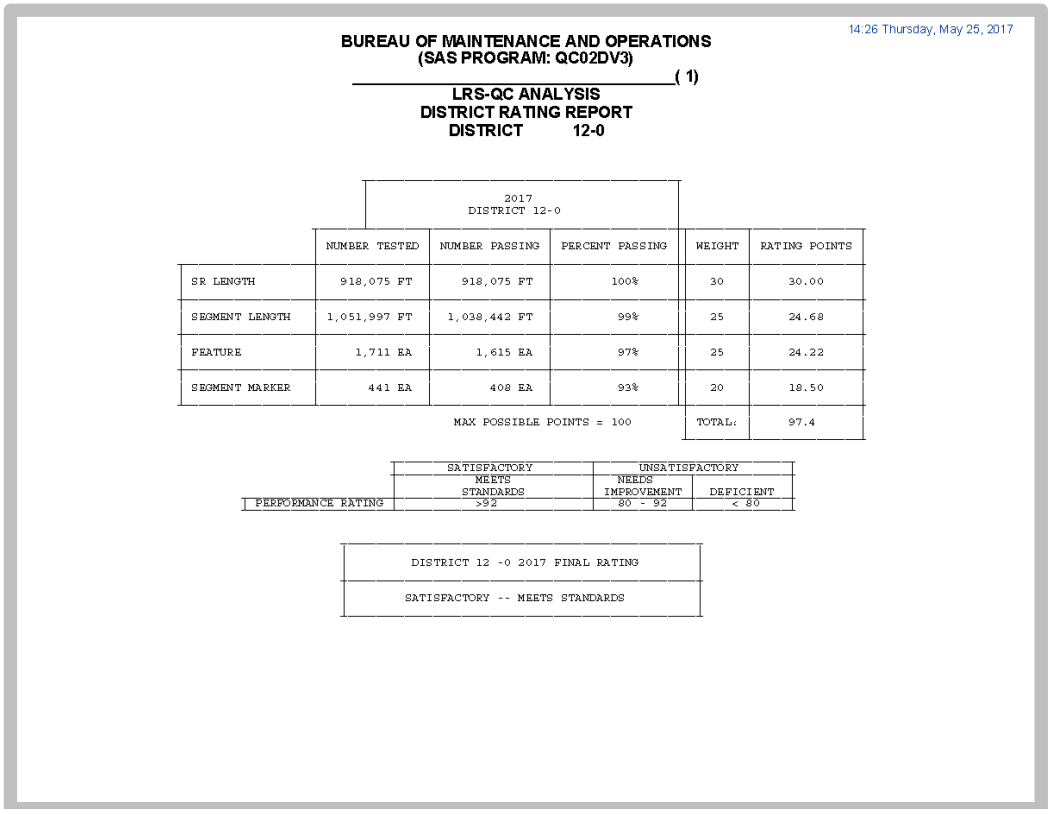
District Section 1: Rating Statistics



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BUREAU OF MAINTENANCE AND OPERATIONS
(SAS PROGRAM: QC02DV3)
(1)

LRS-QC ANALYSIS
DISTRICT RATING REPORT
DISTRICT 12-0

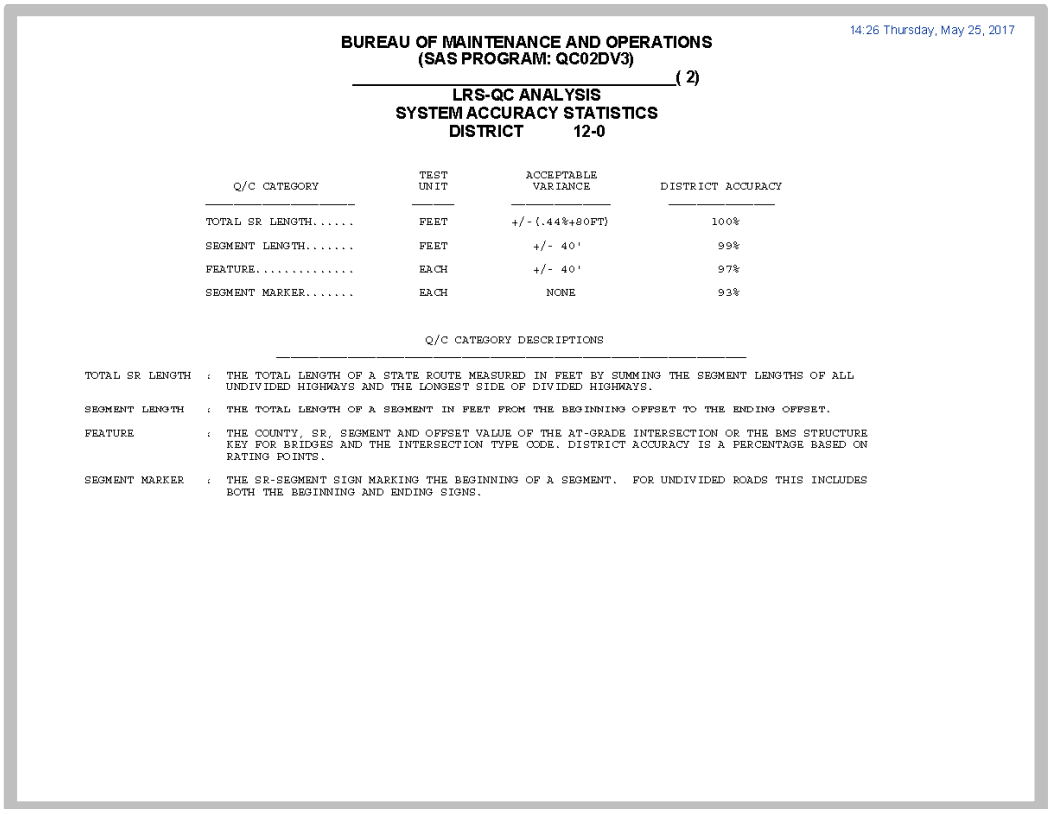
	2017 DISTRICT 12-0				
	NUMBER TESTED	NUMBER PASSING	PERCENT PASSING	WEIGHT	RATING POINTS
SR LENGTH	918,075 FT	918,075 FT	100%	30	30.00
SEGMENT LENGTH	1,051,997 FT	1,038,442 FT	99%	25	24.68
FEATURE	1,711 EA	1,615 EA	97%	25	24.22
SEGMENT MARKER	441 EA	408 EA	93%	20	18.50
	MAX POSSIBLE POINTS = 100			TOTAL:	97.4

	SATISFACTORY	UNSATISFACTORY	
	MEETS STANDARDS	NEEDS IMPROVEMENT	DEFICIENT
PERFORMANCE RATING	>92	80 - 92	< 80

DISTRICT 12 -0 2017 FINAL RATING

SATISFACTORY -- MEETS STANDARDS

District Section 2: Accuracy Statistics



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BUREAU OF MAINTENANCE AND OPERATIONS
(SAS PROGRAM: QC02DV3)
(2)

LRS-QC ANALYSIS
SYSTEM ACCURACY STATISTICS
DISTRICT 12-0

Q/C CATEGORY	TEST UNIT	ACCEPTABLE VARIANCE	DISTRICT ACCURACY
TOTAL SR LENGTH.....	FEET	+/-(.44%+80FT)	100%
SEGMENT LENGTH.....	FEET	+/- 40'	99%
FEATURE.....	EACH	+/- 40'	97%
SEGMENT MARKER.....	EACH	NONE	93%

Q/C CATEGORY DESCRIPTIONS

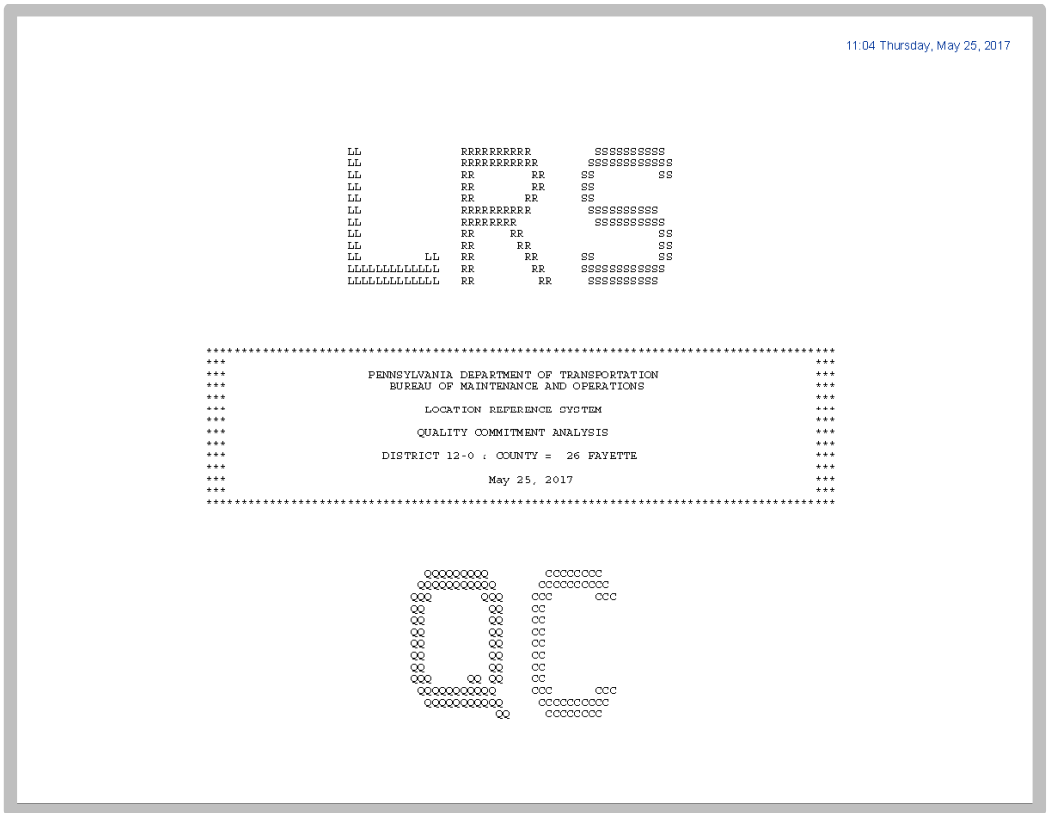
TOTAL SR LENGTH : THE TOTAL LENGTH OF A STATE ROUTE MEASURED IN FEET BY SUMMING THE SEGMENT LENGTHS OF ALL UNDIVIDED HIGHWAYS AND THE LONGEST SIDE OF DIVIDED HIGHWAYS.

SEGMENT LENGTH : THE TOTAL LENGTH OF A SEGMENT IN FEET FROM THE BEGINNING OFFSET TO THE ENDING OFFSET.

FEATURE : THE COUNTY, SR, SEGMENT AND OFFSET VALUE OF THE AT-GRADE INTERSECTION OR THE BMS STRUCTURE KEY FOR BRIDGES AND THE INTERSECTION TYPE CODE. DISTRICT ACCURACY IS A PERCENTAGE BASED ON RATING POINTS.

SEGMENT MARKER : THE SR-SEGMENT SIGN MARKING THE BEGINNING OF A SEGMENT. FOR UNDIVIDED ROADS THIS INCLUDES BOTH THE BEGINNING AND ENDING SIGNS.

Individual County QC Report Cover



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PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
BUREAU OF MAINTENANCE AND OPERATIONS

LOCATION REFERENCE SYSTEM

QUALITY COMMITMENT ANALYSIS

DISTRICT 12-0 : COUNTY = 26 FAYETTE

May 25, 2017

County QC Index

11:04 Thursday, May 25, 2017

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***          SECTION #1 ........... COUNTY RATING REPORT                                  ***
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***          SECTION #2 ........... RATINGS BY SR                                         ***
***                                                                                       ***
***          SECTION #3 ........... SYSTEM ACCURACY STATISTICS                            ***
***                                                                                       ***
***          SECTION #4 ........... TOTAL SR LENGTH STATISTICS                            ***
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***          SECTION #5 ........... SEGMENTS WITH LENGTH DIFFERENCES OVER 40 FEET         ***
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***          SECTION #6 ........... LISTING OF FEATURE DIFFERENCES                        ***
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***          SECTION #7 ........... SEGMENTS WITH MARKER PROBLEMS                         ***
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***          SECTION #8 ........... SEGMENT LENGTH FREQUENCY TABLES                       ***
***                                                                                       ***
***          SECTION #9 ........... FREQUENCY TABLE OF OFFSET DIFFERENCES                 ***
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***          SECTION #10 .......... COMMENT LISTING                                       ***
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County Section 1: Rating Statistics

11:04 Thursday, May 25, 2017

BUREAU OF MAINTENANCE AND OPERATIONS
(SAS PROGRAM: QC02VER8) **(1)**

LRS-QC ANALYSIS
COUNTY RATING REPORT

FAYETTE COUNTY

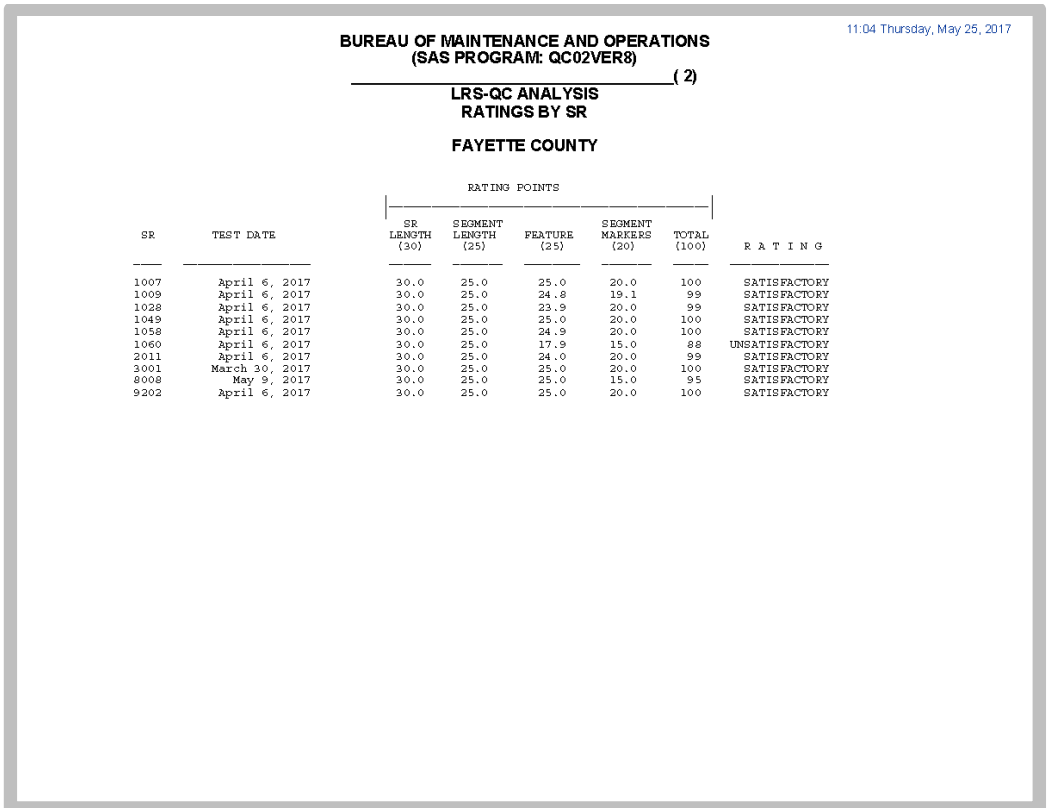
	2017 FAYETTE COUNTY DISTRICT 12				
	NUMBER TESTED	NUMBER PASSING	PERCENT PASSING	WEIGHT	RATING POINTS
SR LENGTH	217,586 FT	217,586 FT	100%	30	30.00
SEGMENT LENGTH	217,784 FT	217,784 FT	100%	25	25.00
FEATURE	224 EA	207 EA	97%	25	24.29
SEGMENT MARKER	89 EA	86 EA	97%	20	19.33
		MAX POSSIBLE POINTS = 100		TOTAL:	98.6

NOTE: FEATURE NUMBER PASSED FIELD IS APPROXIMATE DUE TO ROUNDING

	SATISFACTORY	UNSATISFACTORY	
	MEETS STANDARDS	NEEDS IMPROVEMENT	DEFICIENT
PERFORMANCE RATING	>92	80 - 92	< 80

FAYETTE COUNTY 2017 FINAL RATING
SATISFACTORY -- MEETS STANDARDS

County Section 2: QC Rating by SR



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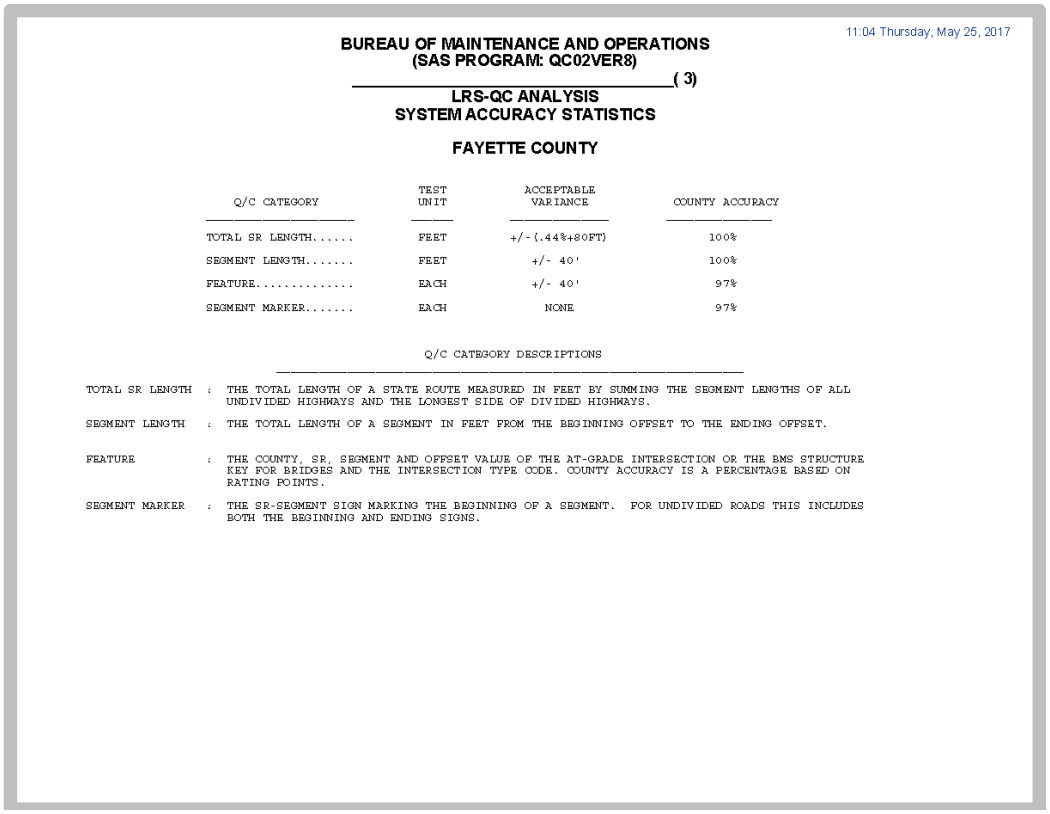
BUREAU OF MAINTENANCE AND OPERATIONS
(SAS PROGRAM: QC02VER8)
(2)

LRS-QC ANALYSIS
RATINGS BY SR

FAYETTE COUNTY

SR	TEST DATE	RATING POINTS: SR LENGTH (30)	SEGMENT LENGTH (25)	FEATURE (25)	SEGMENT MARKERS (20)	TOTAL (100)	RATING
1007	April 6, 2017	30.0	25.0	25.0	20.0	100	SATISFACTORY
1009	April 6, 2017	30.0	25.0	24.8	19.1	99	SATISFACTORY
1028	April 6, 2017	30.0	25.0	23.9	20.0	99	SATISFACTORY
1049	April 6, 2017	30.0	25.0	25.0	20.0	100	SATISFACTORY
1058	April 6, 2017	30.0	25.0	24.9	20.0	100	SATISFACTORY
1060	April 6, 2017	30.0	25.0	17.9	15.0	88	UNSATISFACTORY
2011	April 6, 2017	30.0	25.0	24.0	20.0	99	SATISFACTORY
3001	March 30, 2017	30.0	25.0	25.0	20.0	100	SATISFACTORY
8008	May 9, 2017	30.0	25.0	25.0	15.0	95	SATISFACTORY
9202	April 6, 2017	30.0	25.0	25.0	20.0	100	SATISFACTORY

County Section 3: Accuracy Statistics



11:04 Thursday, May 25, 2017

BUREAU OF MAINTENANCE AND OPERATIONS
(SAS PROGRAM: QC02VER8)
(3)

LRS-QC ANALYSIS
SYSTEM ACCURACY STATISTICS

FAYETTE COUNTY

Q/C CATEGORY	TEST UNIT	ACCEPTABLE VARIANCE	COUNTY ACCURACY
TOTAL SR LENGTH.....	FEET	+/-(.44%+80FT)	100%
SEGMENT LENGTH.....	FEET	+/- 40'	100%
FEATURE.....	EACH	+/- 40'	97%
SEGMENT MARKER.....	EACH	NONE	97%

Q/C CATEGORY DESCRIPTIONS

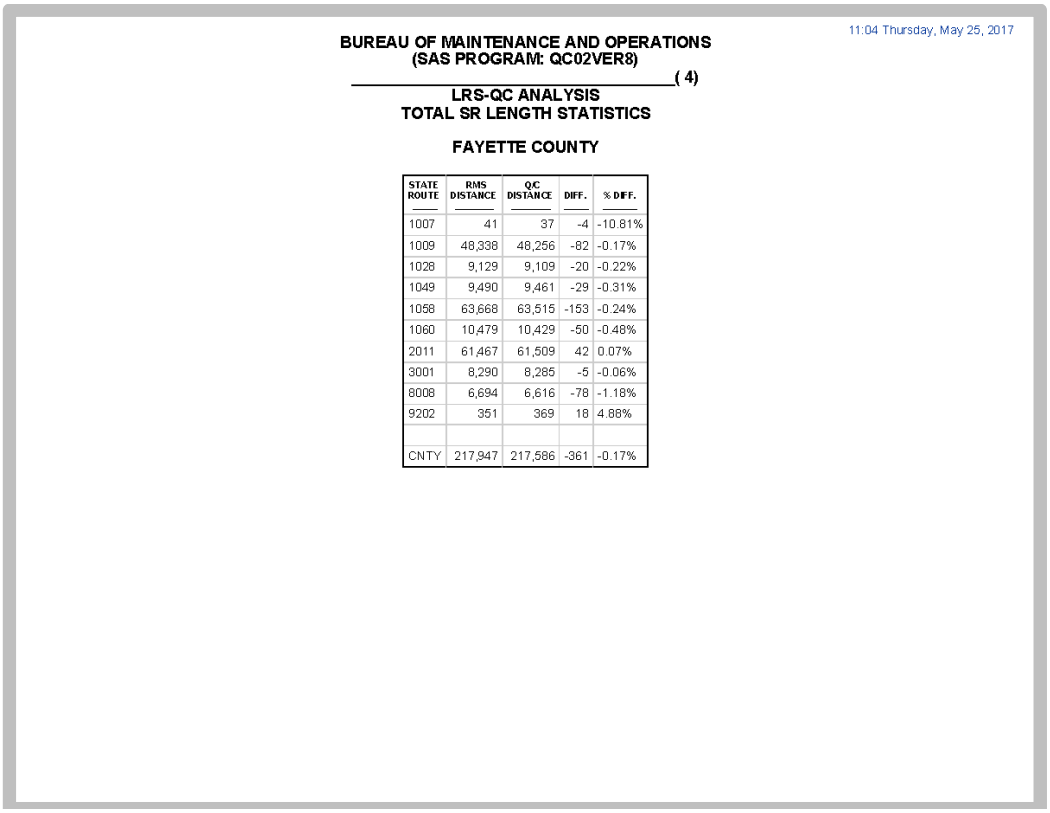
TOTAL SR LENGTH : THE TOTAL LENGTH OF A STATE ROUTE MEASURED IN FEET BY SUMMING THE SEGMENT LENGTHS OF ALL UNDIVIDED HIGHWAYS AND THE LONGEST SIDE OF DIVIDED HIGHWAYS.

SEGMENT LENGTH : THE TOTAL LENGTH OF A SEGMENT IN FEET FROM THE BEGINNING OFFSET TO THE ENDING OFFSET.

FEATURE : THE COUNTY, SR, SEGMENT AND OFFSET VALUE OF THE AT-GRADE INTERSECTION OR THE BMS STRUCTURE KEY FOR BRIDGES AND THE INTERSECTION TYPE CODE. COUNTY ACCURACY IS A PERCENTAGE BASED ON RATING POINTS.

SEGMENT MARKER : THE SR-SEGMENT SIGN MARKING THE BEGINNING OF A SEGMENT. FOR UNDIVIDED ROADS THIS INCLUDES BOTH THE BEGINNING AND ENDING SIGNS.

County Section 4: Total SR Length Statistics



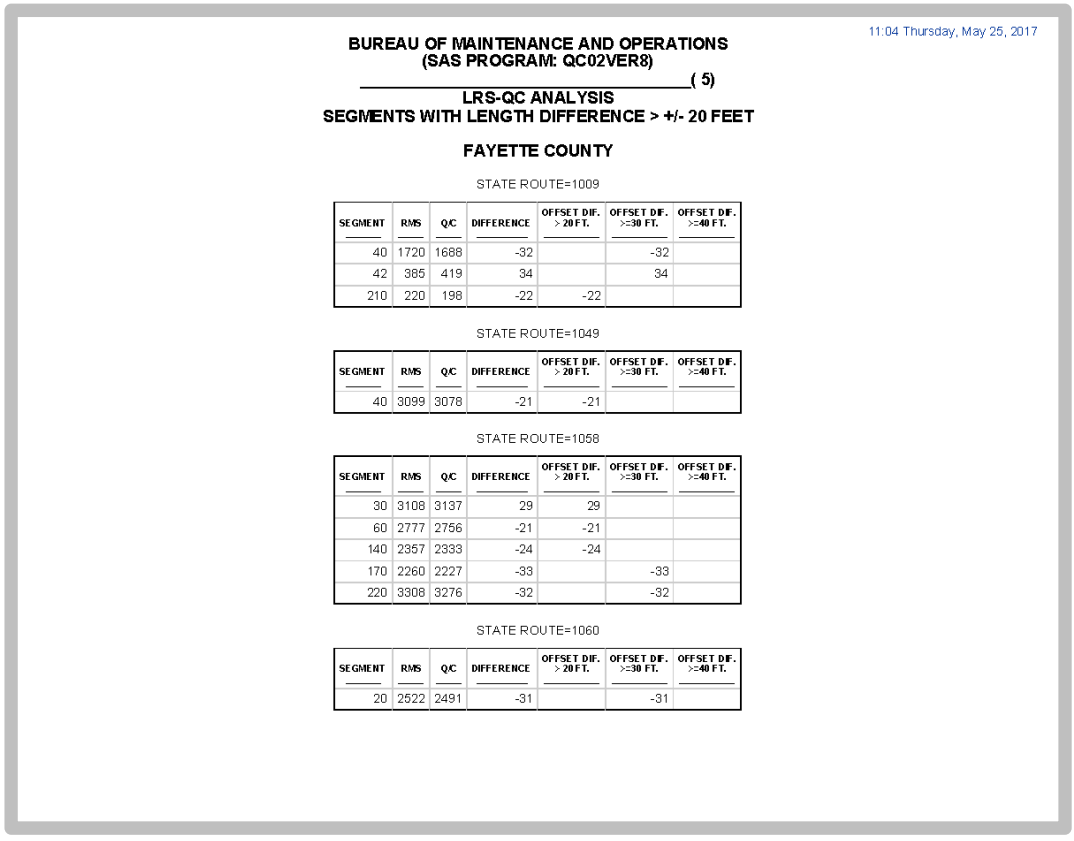
11:04 Thursday, May 25, 2017

BUREAU OF MAINTENANCE AND OPERATIONS
(SAS PROGRAM: QC02VER8)
(4)
LRS-QC ANALYSIS
TOTAL SR LENGTH STATISTICS

FAYETTE COUNTY

STATE ROUTE	RMS DISTANCE	QC DISTANCE	DIFF.	% DIFF.
1007	41	37	-4	-10.81%
1009	48,338	48,256	-82	-0.17%
1028	9,129	9,109	-20	-0.22%
1049	9,490	9,461	-29	-0.31%
1058	63,668	63,515	-153	-0.24%
1060	10,479	10,429	-50	-0.48%
2011	61,467	61,509	42	0.07%
3001	8,290	8,285	-5	-0.06%
8008	6,694	6,616	-78	-1.18%
9202	351	369	18	4.88%
CNTY	217,947	217,586	-361	-0.17%

County Section 5: Segments with Length Problems



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BUREAU OF MAINTENANCE AND OPERATIONS
(SAS PROGRAM: QC02VER8)
(5)
LRS-QC ANALYSIS
SEGMENTS WITH LENGTH DIFFERENCE > +/- 20 FEET

FAYETTE COUNTY

STATE ROUTE=1009

SEGMENT	RMS	QC	DIFFERENCE	OFFSET DIF. > 20 FT.	OFFSET DIF. >=30 FT.	OFFSET DIF. >=40 FT.
40	1720	1688	-32		-32	
42	385	419	34		34	
210	220	198	-22	-22		

STATE ROUTE=1049

SEGMENT	RMS	QC	DIFFERENCE	OFFSET DIF. > 20 FT.	OFFSET DIF. >=30 FT.	OFFSET DIF. >=40 FT.
40	3099	3078	-21	-21		

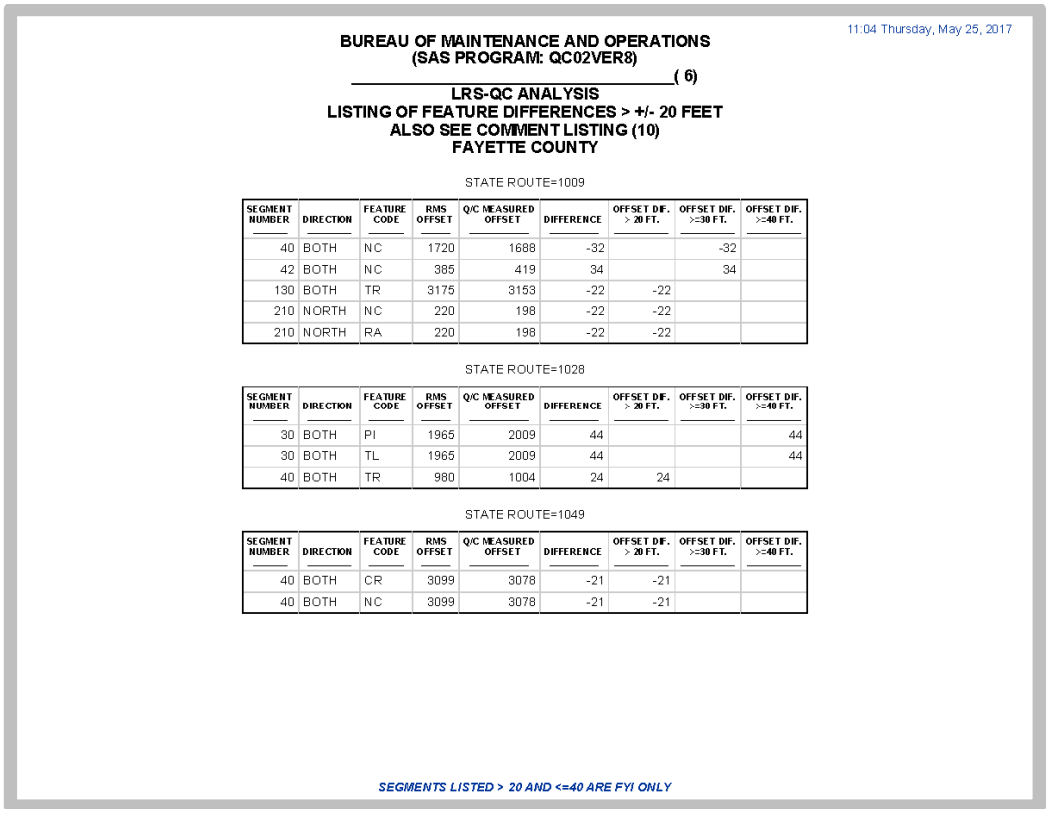
STATE ROUTE=1058

SEGMENT	RMS	QC	DIFFERENCE	OFFSET DIF. > 20 FT.	OFFSET DIF. >=30 FT.	OFFSET DIF. >=40 FT.
30	3108	3137	29	29		
60	2777	2756	-21	-21		
140	2357	2333	-24	-24		
170	2260	2227	-33		-33	
220	3308	3276	-32		-32	

STATE ROUTE=1060

SEGMENT	RMS	QC	DIFFERENCE	OFFSET DIF. > 20 FT.	OFFSET DIF. >=30 FT.	OFFSET DIF. >=40 FT.
20	2522	2491	-31		-31	

County Section 6: Comparison of LRS and RMS Feature Offsets



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BUREAU OF MAINTENANCE AND OPERATIONS
(SAS PROGRAM: QC02VER8)
(6)
LRS-QC ANALYSIS
LISTING OF FEATURE DIFFERENCES > +/- 20 FEET
ALSO SEE COMMENT LISTING (10)
FAYETTE COUNTY

STATE ROUTE=1009

SEGMENT NUMBER	DIRECTION	FEATURE CODE	RMS OFFSET	Q/C MEASURED OFFSET	DIFFERENCE	OFFSET DIF. > 20 FT.	OFFSET DIF. >=30 FT.	OFFSET DIF. >=40 FT.
40	BOTH	NC	1720	1688	-32		-32	
42	BOTH	NC	385	419	34		34	
130	BOTH	TR	3175	3153	-22	-22		
210	NORTH	NC	220	198	-22	-22		
210	NORTH	RA	220	198	-22	-22		

STATE ROUTE=1028

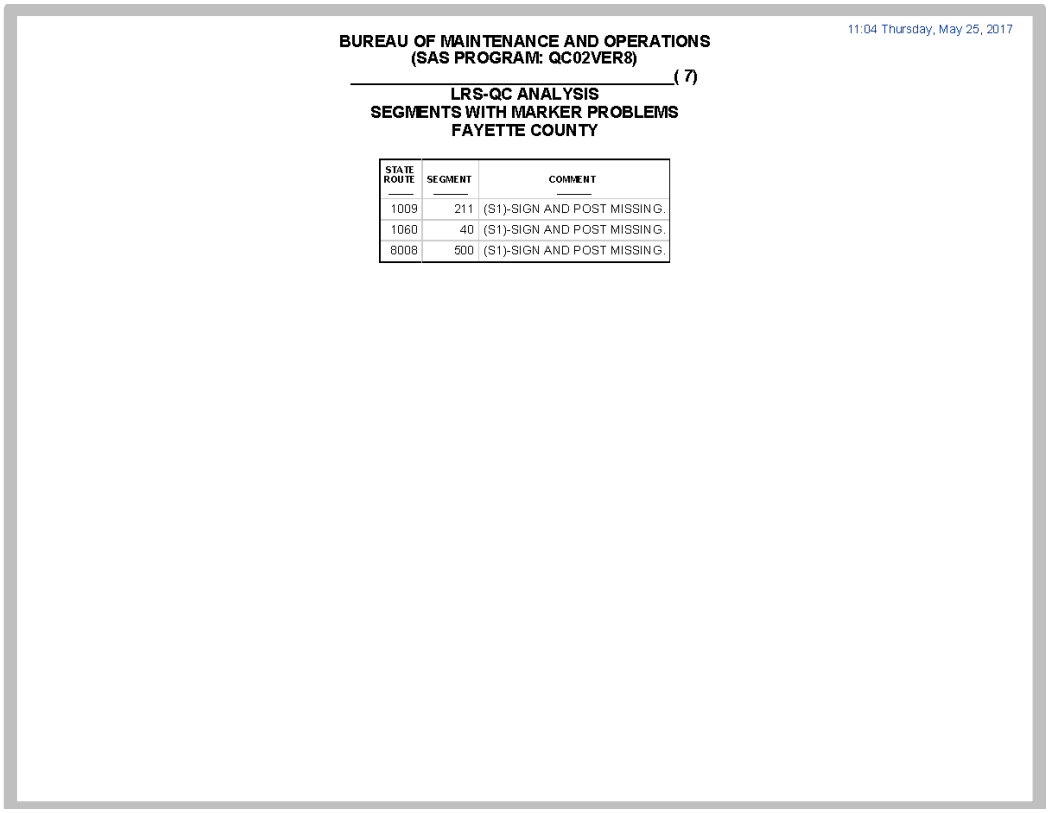
SEGMENT NUMBER	DIRECTION	FEATURE CODE	RMS OFFSET	Q/C MEASURED OFFSET	DIFFERENCE	OFFSET DIF. > 20 FT.	OFFSET DIF. >=30 FT.	OFFSET DIF. >=40 FT.
30	BOTH	PI	1965	2009	44			44
30	BOTH	TL	1965	2009	44			44
40	BOTH	TR	980	1004	24	24		

STATE ROUTE=1049

SEGMENT NUMBER	DIRECTION	FEATURE CODE	RMS OFFSET	Q/C MEASURED OFFSET	DIFFERENCE	OFFSET DIF. > 20 FT.	OFFSET DIF. >=30 FT.	OFFSET DIF. >=40 FT.
40	BOTH	CR	3099	3078	-21	-21		
40	BOTH	NC	3099	3078	-21	-21		

SEGMENTS LISTED > 20 AND <=40 ARE FYI ONLY

County Section 7: Segments with Signing Problems



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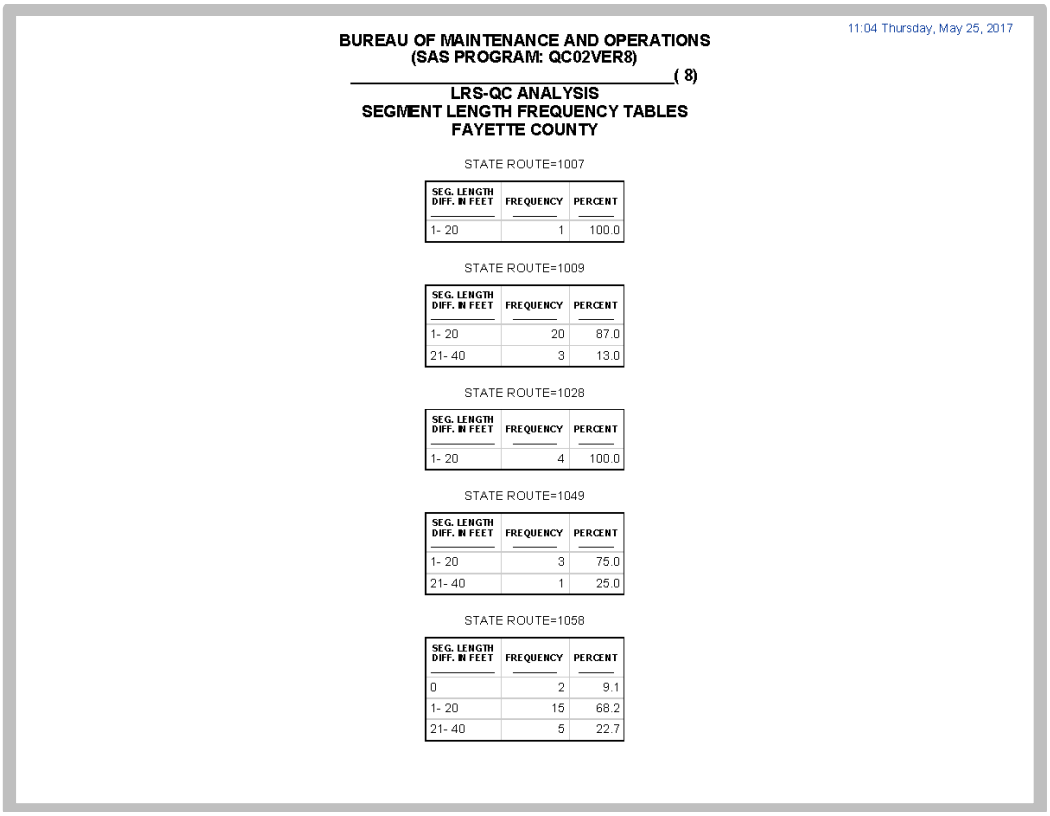
BUREAU OF MAINTENANCE AND OPERATIONS
(SAS PROGRAM: QC02VER8)
(7)
LRS-QC ANALYSIS
SEGMENTS WITH MARKER PROBLEMS
FAYETTE COUNTY

STATE ROUTE	SEGMENT	COMMENT
1009	211	(S1)-SIGN AND POST MISSING.
1060	40	(S1)-SIGN AND POST MISSING.
8008	500	(S1)-SIGN AND POST MISSING.

County Section 8: Average Segments Accuracy Statistics



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BUREAU OF MAINTENANCE AND OPERATIONS
(SAS PROGRAM: QC02VER8)
(8)
LRS-QC ANALYSIS
SEGMENT LENGTH FREQUENCY TABLES
FAYETTE COUNTY

STATE ROUTE=1007

SEG. LENGTH DIFF. IN FEET	FREQUENCY	PERCENT
1- 20	1	100.0

STATE ROUTE=1009

SEG. LENGTH DIFF. IN FEET	FREQUENCY	PERCENT
1- 20	20	87.0
21- 40	3	13.0

STATE ROUTE=1028

SEG. LENGTH DIFF. IN FEET	FREQUENCY	PERCENT
1- 20	4	100.0

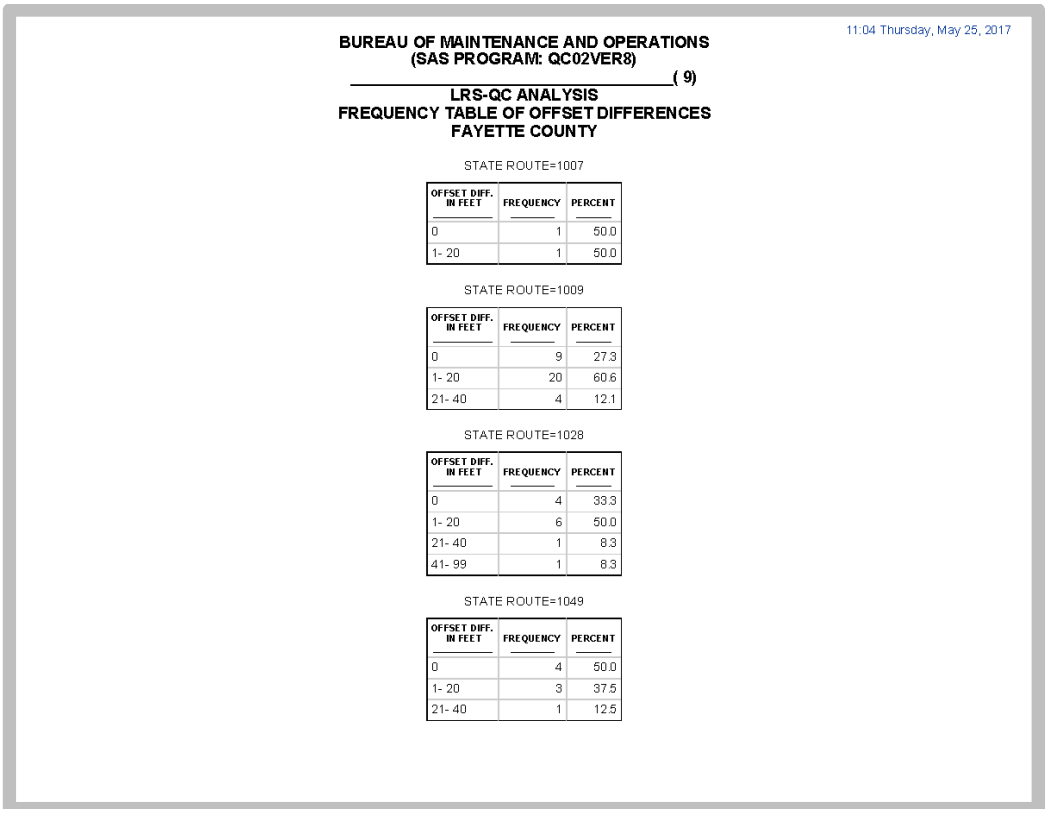
STATE ROUTE=1049

SEG. LENGTH DIFF. IN FEET	FREQUENCY	PERCENT
1- 20	3	75.0
21- 40	1	25.0

STATE ROUTE=1058

SEG. LENGTH DIFF. IN FEET	FREQUENCY	PERCENT
0	2	9.1
1- 20	15	68.2
21- 40	5	22.7

County Section 9: Average Feature Accuracy Statistics



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BUREAU OF MAINTENANCE AND OPERATIONS
(SAS PROGRAM: QC02VER8)
(9)
LRS-QC ANALYSIS
FREQUENCY TABLE OF OFFSET DIFFERENCES
FAYETTE COUNTY

STATE ROUTE=1007

OFFSET DIFF. IN FEET	FREQUENCY	PERCENT
0	1	50.0
1- 20	1	50.0

STATE ROUTE=1009

OFFSET DIFF. IN FEET	FREQUENCY	PERCENT
0	9	27.3
1- 20	20	60.6
21- 40	4	12.1

STATE ROUTE=1028

OFFSET DIFF. IN FEET	FREQUENCY	PERCENT
0	4	33.3
1- 20	6	50.0
21- 40	1	8.3
41- 99	1	8.3

STATE ROUTE=1049

OFFSET DIFF. IN FEET	FREQUENCY	PERCENT
0	4	50.0
1- 20	3	37.5
21- 40	1	12.5

County Section 10: County Comments Listing by SR

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BUREAU OF MAINTENANCE AND OPERATIONS
(SAS PROGRAM: QC02VER8)
(10)

LRS-QC ANALYSIS
FEATURE LISTING
COMMENT LISTING
FAYETTE COUNTY

STATE ROUTE=1009

SEG. NUM.	RMS OFF.	Q/C OFF.	OFF. DIFF.	COMMENT
10	0	0	0	CHANGE NCB=POPLAR RUN RD
42	0	0	0	PAINTED AND VERIFIED AT
42	0	0	0	THE INTERSECTION IN
42	0	0	0	FIELD.
50	0	0	0	PAINTED AND VERIFIED AT
50	0	0	0	THE INTERSECTION IN
50	0	0	0	FIELD.
70	1085	1084	1	I2-FIELD 2 DATA INCORRECT
70	1085	1084	1	CHANGE BACKL=CONN-
70	1085	1084	1	LC FOR MURPHY LN
130	865	856	9	I2-FIELD 2 DATA INCORRECT
130	865	856	9	CHANGE TRIGHT=
130	865	856	9	PRDR-WINDY RIDGE RD
150	2300	2295	5	T1-COULD NOT LOCATE BRIDGE
150	2300	2295	5	OR PIPE
210	0	0	0	VERIFIED AT GRASS MEDIAN
210	0	0	0	IN FIELD.
211	215	222	-7	S1-SIGN AND POST MISSING
211	215	222	-7	SEG 211 SIGN AND POST
211	215	222	-7	ARE MISSING.

Codes Used for LRS QC testing

When performing LRS QC testing, a standard set of fixed codes are used to label problems found while doing the testing. The codes can be seen on the final LRS SLD and in the comments section of the QC report. The codes are as follows:

S – Sign Error Codes

S1	Sign And Post Missing
S2	Post Present, Segment Paddle Missing
S3	Sign Not In Reasonable Proximity Of Feature
S4	Signs Are Reversed
S5	Sign Is On Wrong Feature
S6	Sign # Does Not Match Segment
S7	Sign In Field But No Corresponding Segment In RMS
S8	Sign Pointed Wrong Direction

I – Intersection Error Codes

I1	Field 1 Data Incorrect
I2	Field 2 Data Incorrect
I3	Incorrect Intersection/Feature Code
I4	Intersection/Feature Needs Added To RMS
I5	Intersection/Feature Needs Removed From RMS
I6	Intersection/Feature Needs Relocated

G – Other Error Codes

G1	Entire SR Not Signed
G2	Incorrect Divided Area Start Or End
G3	Divided Area Only 2 Travel Lanes
G4	Divided Area Needs Added
G5	Divided Area Needs Removed
G6	Null Needs Added, Deleted, Or Relocated
G7	One-Way Street Problem

LRS Quality Assurance (QA) Program

In addition to the Quality Commitment (QC) program, the Bureau of Maintenance and Operations, Asset Management Division, Roadway Inventory & Testing Unit (RITU) performs Quality Assurance (QA) verification on State-owned routes, except those in Engineering Districts 2-0, and 12-0, who perform their own QA testing. Regardless of who does the field testing, each Engineering District is responsible for its own LRS completeness and maintenance with respect to the RMS.

Unlike the QC program, counties are not given ratings based on the results of the QA testing. Furthermore, all of the QC categories are not evaluated as part of the QA program; SR's are verified for these three items:

FEATURE OFFSETS: The RMS offset values of features are compared to the field measured offset values.

SEGMENT AND SR LENGTHS: The total length of segments and SR's in RMS are compared to the field measured values.

FIELD 1 AND FIELD 2 DATA: The data contained in Field 1 and Field 2 of the LRS extract file is compared to the data obtained in the field. These fields contain Roadway Information (RI) data, Reference Code (RF) data, intersection data, common street names, township data, railroad crossing data, and bridge data.

QA TESTING:

Twenty percent of each county's mileage is tested each year. (SR's that are verified via the QC program are also considered in the QA program.) SR's to be tested are determined by the test teams, but it is recommended that half of the SR's tested are Traffic Routes and the other half are Quadrant Routes.

For the Engineering Districts in which RITU performs QA testing, one testing team is sent to one county, of one Engineering District for two weeks, and then rotated to another County in another Engineering District, etc. Therefore, a team visits each of the nine Engineering Districts involved in our QA program for two weeks once every four months, approximately. This schedule may vary based on the availability of testing personnel.

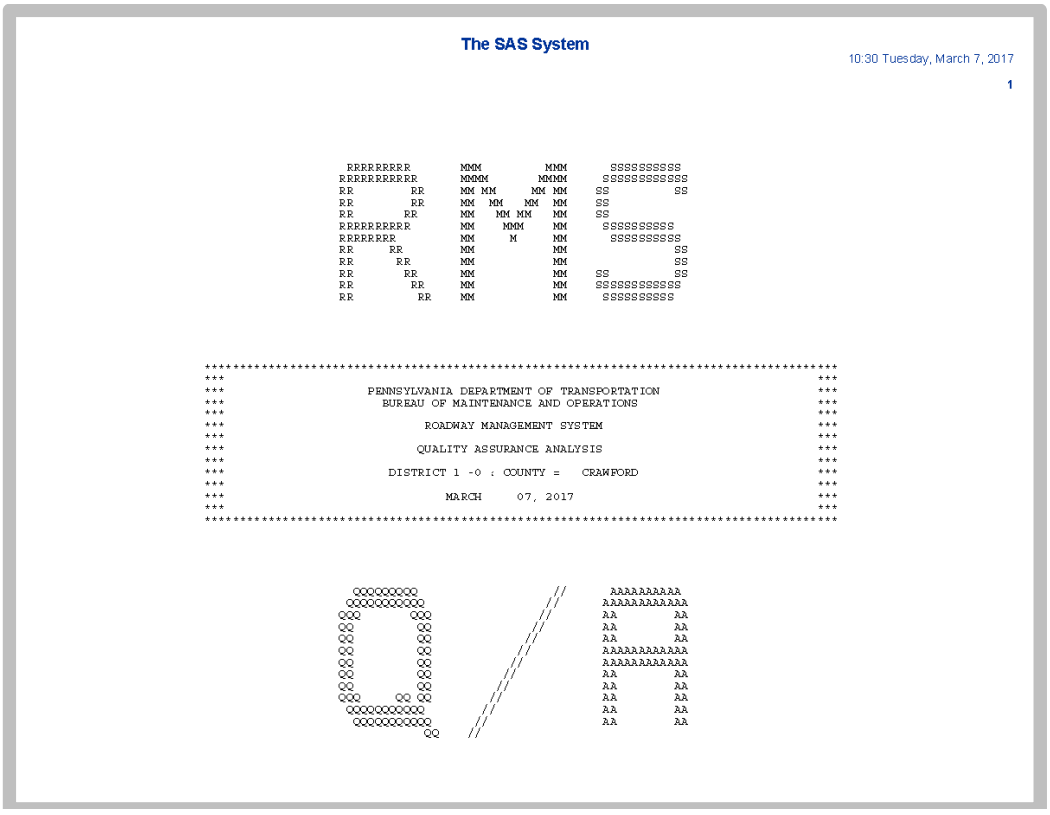
The order that counties will be selected for testing will be determined randomly, unless RITU is informed by a District RMS Coordinator that a particular county is preferred to be done first. When RITU testing crews are in a particular District, they will also be available, by request, to perform additional LRS testing on any new or problem routes. If additional routes or special request routes are required to be tested, an LRS Testing Request Form should be completed and sent to RITU.

LRS QA REPORTING

Whether the QA field testing is performed centrally or by Engineering District personnel, the results are sent to and analyzed by RITU. The analysis programs monitor the productivity of the testing, as well as the inconsistencies determined by the field testing. Reports defining these inconsistencies, along with hardcopy SLD's noting the corrections, are sent to each District RMS Coordinator, who is responsible for correcting all data in the RMS within three months from the time the reports and SLD's are delivered. RITU maintains a "dates file" to track all LRS related activities for each SR, from SLD file extract request date, through testing, reporting and correcting inconsistencies, and completion.

A sample detailed QA report that is sent to a District RMS Coordinator follows:

LRS QA Report Cover



The SAS System

10:30 Tuesday, March 7, 2017

1

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
BUREAU OF MAINTENANCE AND OPERATIONS

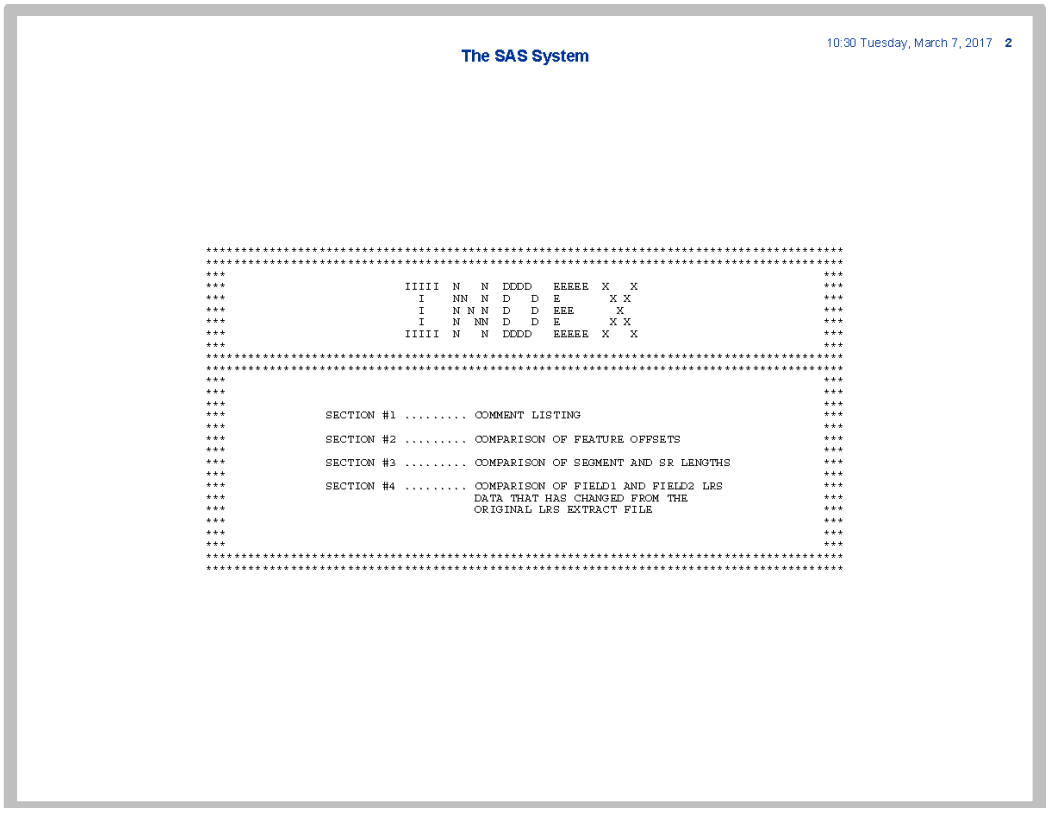
ROADWAY MANAGEMENT SYSTEM

QUALITY ASSURANCE ANALYSIS

DISTRICT 1 -0 : COUNTY = CRAWFORD

MARCH 07, 2017

LRS QA Index



10:30 Tuesday, March 7, 2017 2

The SAS System

```
**********************************************************************************
**********************************************************************************
***                                                                            ***
***                        IIIII  N   N  DDDD   EEEEE  X   X                   ***
***                          I    NN  N  D   D  E       X X                    ***
***                          I    N N N  D   D  EEE      X                     ***
***                          I    N  NN  D   D  E       X X                    ***
***                        IIIII  N   N  DDDD   EEEEE  X   X                   ***
***                                                                            ***
**********************************************************************************
**********************************************************************************
***                                                                            ***
***                                                                            ***
***                                                                            ***
***             SECTION #1 ......... COMMENT LISTING                           ***
***                                                                            ***
***             SECTION #2 ......... COMPARISON OF FEATURE OFFSETS              ***
***                                                                            ***
***             SECTION #3 ......... COMPARISON OF SEGMENT AND SR LENGTHS       ***
***                                                                            ***
***             SECTION #4 ......... COMPARISON OF FIELD1 AND FIELD2 LRS        ***
***                                  DATA THAT HAS CHANGED FROM THE            ***
***                                  ORIGINAL LRS EXTRACT FILE                 ***
***                                                                            ***
***                                                                            ***
***                                                                            ***
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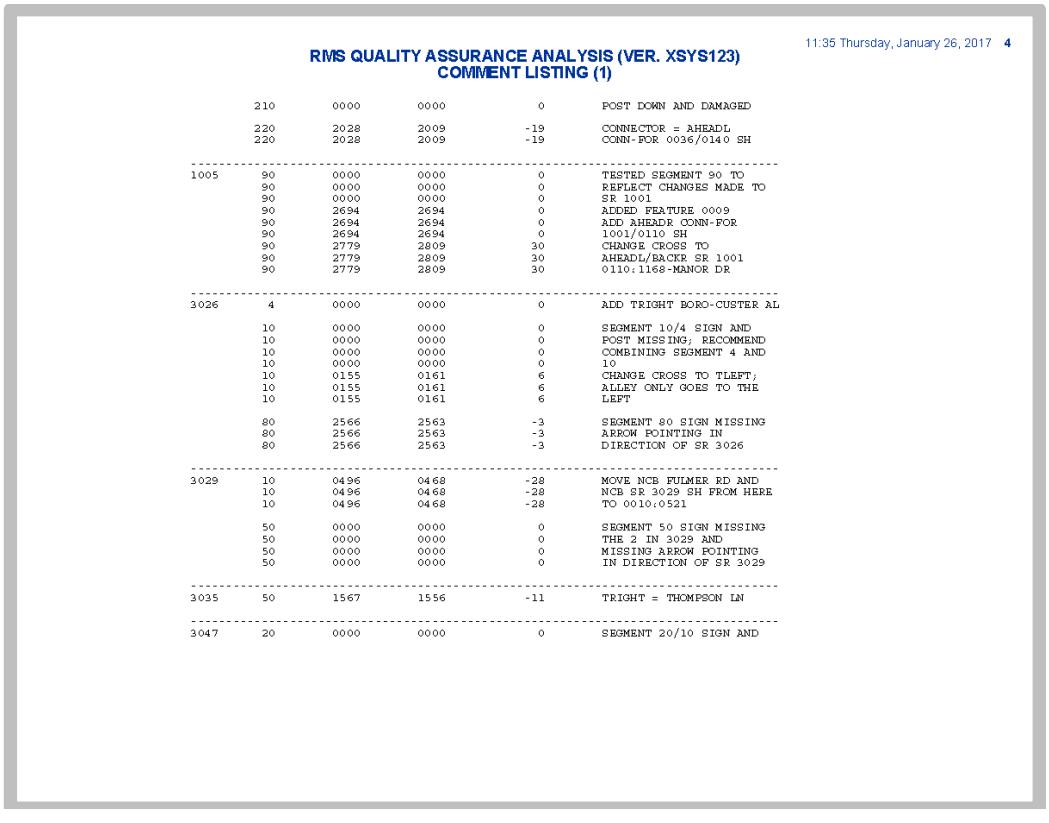
LRS QA Section 1: Comment Listing



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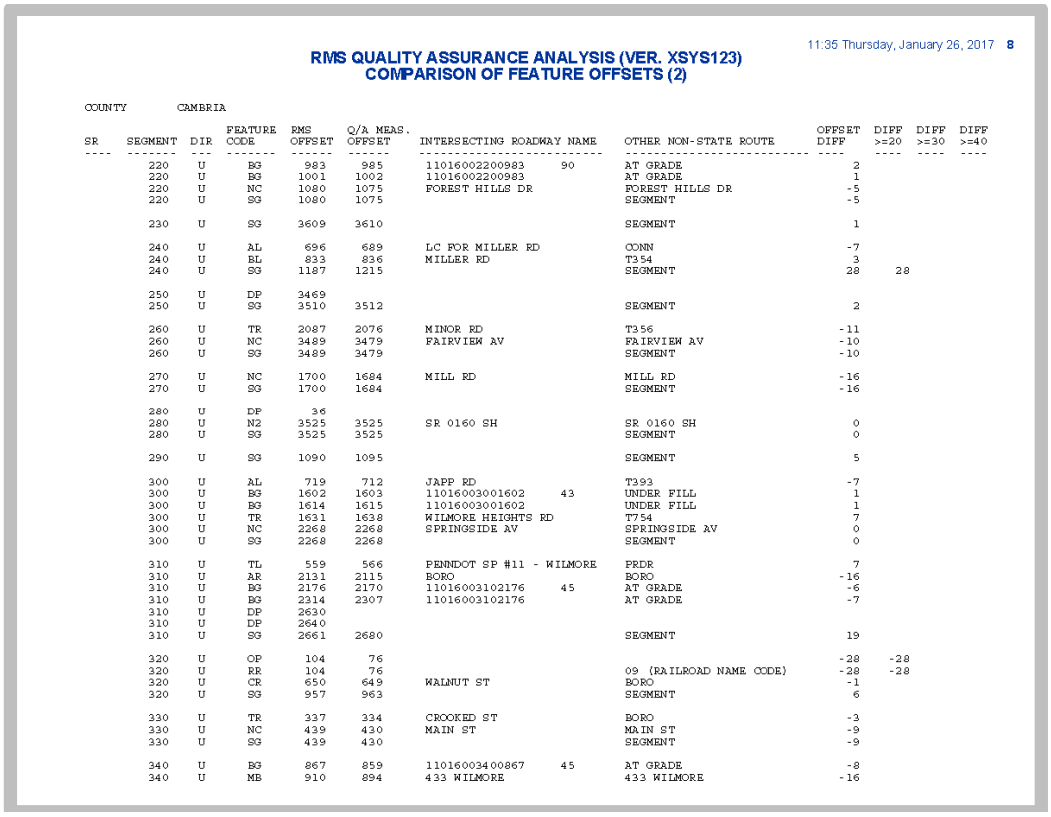
RMS QUALITY ASSURANCE ANALYSIS (VER. XSYS123)
COMMENT LISTING (1)

	210	0000	0000	0	POST DOWN AND DAMAGED
	220	2028	2009	-19	CONNECTOR = AHEADL
	220	2028	2009	-19	CONN-FOR 0036/0140 SH
1005	90	0000	0000	0	TESTED SEGMENT 90 TO
	90	0000	0000	0	REFLECT CHANGES MADE TO
	90	0000	0000	0	SR 1001
	90	2694	2694	0	ADDED FEATURE 0009
	90	2694	2694	0	ADD AHEADR CONN-FOR
	90	2694	2694	0	1001/0110 SH
	90	2779	2809	30	CHANGE CROSS TO
	90	2779	2809	30	AHEADL/BACKR SR 1001
	90	2779	2809	30	0110:1168-MANOR DR
3026	4	0000	0000	0	ADD TRIGHT BORO-CUSTER AL
	10	0000	0000	0	SEGMENT 10/4 SIGN AND
	10	0000	0000	0	POST MISSING; RECOMMEND
	10	0000	0000	0	COMBINING SEGMENT 4 AND
	10	0000	0000	0	10
	10	0155	0161	6	CHANGE CROSS TO TLEFT;
	10	0155	0161	6	ALLEY ONLY GOES TO THE
	10	0155	0161	6	LEFT
	80	2566	2563	-3	SEGMENT 80 SIGN MISSING
	80	2566	2563	-3	ARROW POINTING IN
	80	2566	2563	-3	DIRECTION OF SR 3026
3029	10	0496	0468	-28	MOVE NCB FULMER RD AND
	10	0496	0468	-28	NCB SR 3029 SH FROM HERE
	10	0496	0468	-28	TO 0010:0521
	50	0000	0000	0	SEGMENT 50 SIGN MISSING
	50	0000	0000	0	THE 2 IN 3029 AND
	50	0000	0000	0	MISSING ARROW POINTING
	50	0000	0000	0	IN DIRECTION OF SR 3029
3035	50	1567	1556	-11	TRIGHT = THOMPSON LN
3047	20	0000	0000	0	SEGMENT 20/10 SIGN AND

LRS QA Section 2: Comparison of Feature Offsets



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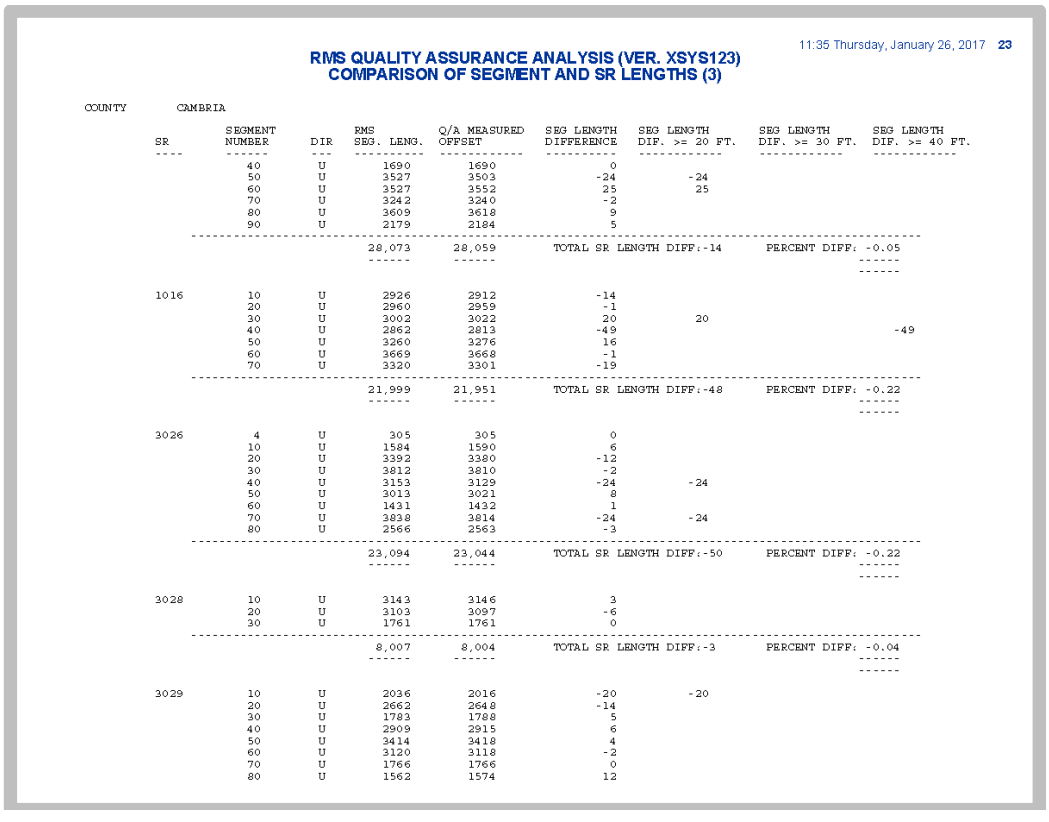
RMS QUALITY ASSURANCE ANALYSIS (VER. XSYS123)
COMPARISON OF FEATURE OFFSETS (2)

COUNTY CAMBRIA

SR	SEGMENT	DIR	FEATURE CODE	RMS OFFSET	Q/A MEAS. OFFSET	INTERSECTING ROADWAY NAME		OTHER NON-STATE ROUTE	OFFSET DIFF	DIFF >=20	DIFF >=30	DIFF >=40
	220	U	BG	983	985	11016002200983	90	AT GRADE	2			
	220	U	BG	1001	1002	11016002200983		AT GRADE	1			
	220	U	NC	1080	1075	FOREST HILLS DR		FOREST HILLS DR	-5			
	220	U	SG	1080	1075			SEGMENT	-5			
	230	U	SG	3609	3610			SEGMENT	1			
	240	U	AL	696	689	LC FOR MILLER RD		CONN	-7			
	240	U	BL	833	836	MILLER RD		T354	3			
	240	U	SG	1187	1215			SEGMENT	28	28		
	250	U	DP	3469								
	250	U	SG	3510	3512			SEGMENT	2			
	260	U	TR	2087	2076	MINOR RD		T356	-11			
	260	U	NC	3489	3479	FAIRVIEW AV		FAIRVIEW AV	-10			
	260	U	SG	3489	3479			SEGMENT	-10			
	270	U	NC	1700	1684	MILL RD		MILL RD	-16			
	270	U	SG	1700	1684			SEGMENT	-16			
	280	U	DP	36								
	280	U	N2	3525	3525	SR 0160 SH		SR 0160 SH	0			
	280	U	SG	3525	3525			SEGMENT	0			
	290	U	SG	1090	1095			SEGMENT	5			
	300	U	AL	719	712	JAPP RD		T393	-7			
	300	U	BG	1602	1603	11016003001602	43	UNDER FILL	1			
	300	U	BG	1614	1615	11016003001602		UNDER FILL	1			
	300	U	TR	1631	1638	WILMORE HEIGHTS RD		T754	7			
	300	U	NC	2268	2268	SPRINGSIDE AV		SPRINGSIDE AV	0			
	300	U	SG	2268	2268			SEGMENT	0			
	310	U	TL	559	566	PENNDOT SP #11 - WILMORE		PRDR	7			
	310	U	AR	2131	2115	BORO		BORO	-16			
	310	U	BG	2176	2170	11016003102176	45	AT GRADE	-6			
	310	U	BG	2314	2307	11016003102176		AT GRADE	-7			
	310	U	DP	2630								
	310	U	DP	2640								
	310	U	SG	2661	2680			SEGMENT	19			
	320	U	OP	104	76				-28	-28		
	320	U	RR	104	76			09 (RAILROAD NAME CODE)	-28	-28		
	320	U	CR	650	649	WALNUT ST		BORO	-1			
	320	U	SG	957	963			SEGMENT	6			
	330	U	TR	337	334	CROOKED ST		BORO	-3			
	330	U	NC	439	430	MAIN ST		MAIN ST	-9			
	330	U	SG	439	430			SEGMENT	-9			
	340	U	BG	867	859	11016003400867	45	AT GRADE	-8			
	340	U	MB	910	894	433 WILMORE		433 WILMORE	-16			

LRS QA Section 3: Comparison of Segments and SR Length



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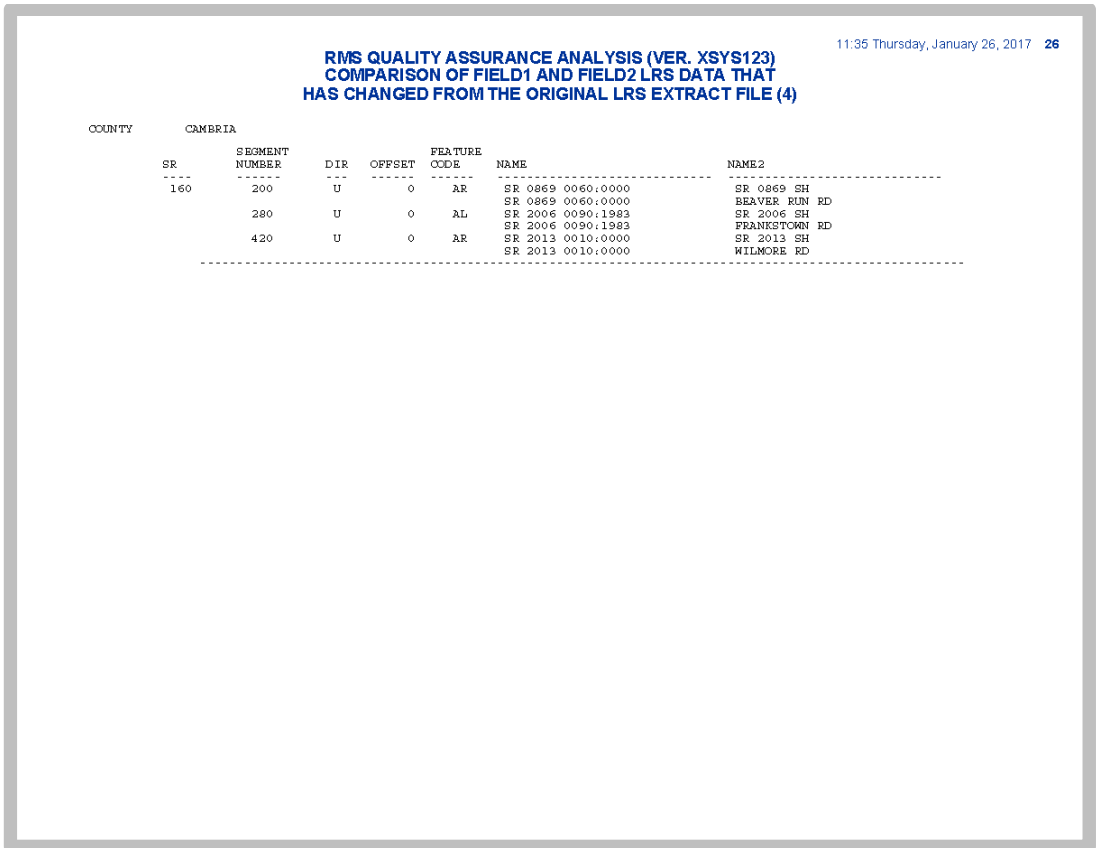
RMS QUALITY ASSURANCE ANALYSIS (VER. XSYS123)
COMPARISON OF SEGMENT AND SR LENGTHS (3)

COUNTY CAMBRIA

SR	SEGMENT NUMBER	DIR	RMS SEG. LENG.	Q/A MEASURED OFFSET	SEG LENGTH DIFFERENCE	SEG LENGTH DIF. >= 20 FT.	SEG LENGTH DIF. >= 30 FT.	SEG LENGTH DIF. >= 40 FT.
	40	U	1690	1690	0			
	50	U	3527	3503	-24	-24		
	60	U	3527	3552	25	25		
	70	U	3242	3240	-2			
	80	U	3609	3618	9			
	90	U	2179	2184	5			
			28,073	28,059	TOTAL SR LENGTH DIFF:-14		PERCENT DIFF: -0.05	
1016	10	U	2926	2912	-14			
	20	U	2960	2959	-1			
	30	U	3002	3022	20	20		
	40	U	2862	2813	-49			-49
	50	U	3260	3276	16			
	60	U	3669	3668	-1			
	70	U	3320	3301	-19			
			21,999	21,951	TOTAL SR LENGTH DIFF:-48		PERCENT DIFF: -0.22	
3026	4	U	305	305	0			
	10	U	1584	1590	6			
	20	U	3392	3380	-12			
	30	U	3812	3810	-2			
	40	U	3153	3129	-24	-24		
	50	U	3013	3021	8			
	60	U	1431	1432	1			
	70	U	3838	3814	-24	-24		
	80	U	2566	2563	-3			
			23,094	23,044	TOTAL SR LENGTH DIFF:-50		PERCENT DIFF: -0.22	
3028	10	U	3143	3146	3			
	20	U	3103	3097	-6			
	30	U	1761	1761	0			
			8,007	8,004	TOTAL SR LENGTH DIFF:-3		PERCENT DIFF: -0.04	
3029	10	U	2036	2016	-20	-20		
	20	U	2662	2648	-14			
	30	U	1783	1788	5			
	40	U	2909	2915	6			
	50	U	3414	3418	4			
	60	U	3120	3118	-2			
	70	U	1766	1766	0			
	80	U	1562	1574	12			



11:35 Thursday, January 26, 2017 26

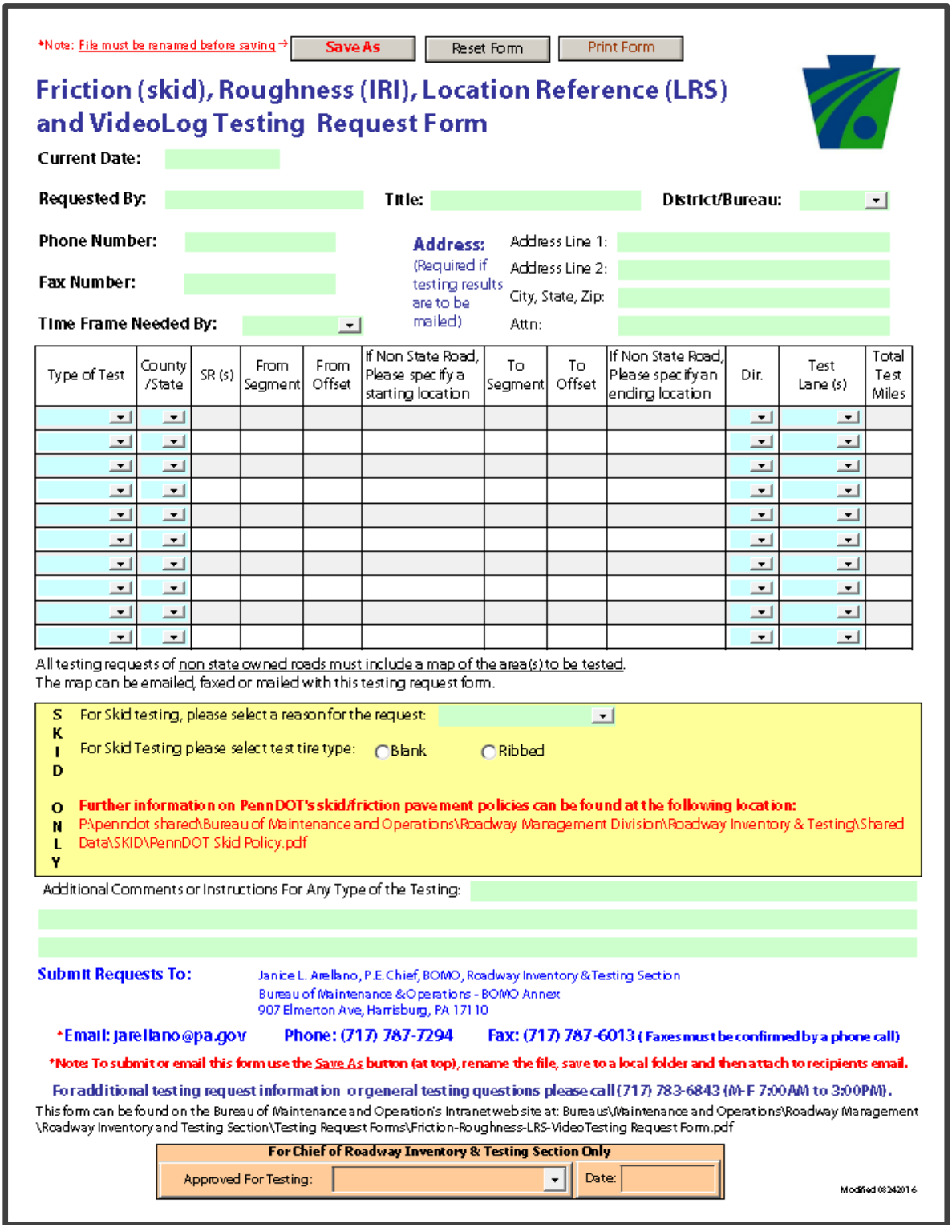
RMS QUALITY ASSURANCE ANALYSIS (VER. XSYS123)
COMPARISON OF FIELD1 AND FIELD2 LRS DATA THAT
HAS CHANGED FROM THE ORIGINAL LRS EXTRACT FILE (4)

COUNTY CAMBRIA

SR	SEGMENT NUMBER	DIR	OFFSET	FEATURE CODE	NAME	NAME2
160	200	U	0	AR	SR 0869 0060:0000	SR 0869 SH
					SR 0869 0060:0000	BEAVER RUN RD
	280	U	0	AL	SR 2006 0090:1983	SR 2006 SH
					SR 2006 0090:1983	FRANKSTOWN RD
	420	U	0	AR	SR 2013 0010:0000	SR 2013 SH
					SR 2013 0010:0000	WILMORE RD

As stated with reference to the QC program, an annual LRS QA/QC Program Final Report is produced and distributed to PennDOT Executive staff and the Engineering Districts. This report analyzes each Engineering District's results as well as trends and supporting information. Regarding the QA program, this report will also identify the number of necessary corrections in each Engineering District, the number of corrections made within three months, the number made later, and the number not made at all. As stated, this report will be distributed to PennDOT Executive staff and the Engineering Districts.

Testing Request Form



*Note: File must be renamed before saving → Save As | Reset Form | Print Form

Friction (skid), Roughness (IRI), Location Reference (LRS) and VideoLog Testing Request Form

Current Date:

Requested By: **Title:** **District/Bureau:**

Phone Number:

Fax Number:

Time Frame Needed By:

Address: (Required if testing results are to be mailed)
Address Line 1:
Address Line 2:
City, State, Zip:
Attn:

Type of Test	County /State	SR (s)	From Segment	From Offset	If Non State Road, Please specify a starting location	To Segment	To Offset	If Non State Road, Please specify an ending location	Dir.	Test Lane (s)	Total Test Miles

All testing requests of non state owned roads must include a map of the area(s) to be tested.
The map can be emailed, faxed or mailed with this testing request form.

SKID ONLY

For Skid testing, please select a reason for the request:

For Skid Testing please select test tire type: ◯ Blank ◯ Ribbed

Further information on PennDOT's skid/friction pavement policies can be found at the following location:
P:\penndot shared\Bureau of Maintenance and Operations\Roadway Management Division\Roadway Inventory & Testing\Shared Data\SKID\PennDOT Skid Policy.pdf

Additional Comments or Instructions For Any Type of the Testing:

Submit Requests To: Janice L. Arellano, P.E. Chief, BOMO, Roadway Inventory &Testing Section
Bureau of Maintenance &Operations - BOMO Annex
907 Elmerton Ave, Harrisburg, PA 17110

*Email: jarellano@pa.gov Phone: (717) 787-7294 Fax: (717) 787-6013 (Faxes must be confirmed by a phone call)

*Note: To submit or email this form use the Save As button (at top), rename the file, save to a local folder and then attach to recipients email.

For additional testing request information or general testing questions please call (717) 783-6843 (M-F 7:00AM to 3:00PM).

This form can be found on the Bureau of Maintenance and Operation's Intranet web site at: Bureaus\Maintenance and Operations\Roadway Management \Roadway Inventory and Testing Section\Testing Request Forms\Friction-Roughness-LRS-VideoTesting Request Form.pdf

For Chief of Roadway Inventory & Testing Section Only
Approved For Testing: Date:

Modified 08242016

This form can be found by using the link on the BOMO/RITU Intranet site and then by using the "Testing Request Forms" button. It can also be found at the following location on the shared drive:

P:\PENNDOT SHARED\BUREAU OF MAINTENANCE AND OPERATIONS\Roadway Management Division\Roadway Inventory & Testing\Forms\Friction-Roughness-LRS-Video Testing Request Form.pdf

9 Updating RMS from LRS

9 Updating RMS from LRS

RMS/LRS Corrections

The procedure to test, determine inconsistencies, and make corrections from LRS QA/QC testing is defined as follows:

1. RITU analyzes field edited SLD extract files and generates a report defining inconsistencies between the RMS and field data.

2. RITU updates all offsets on the SR's and creates electronic copy SLD's with the new offsets.

3. Reports and updated copy of the SLD's are sent via electronic mail to the appropriate District RMS Coordinator.

4. **The District RMS Coordinator makes the necessary corrections to the RMS data. The data that needs to be corrected may include all the following, bridges, intersections, boundaries, pavement variables, road names, traffic lights, railroad crossings, RMS administrative changes or any other inconsistencies stated on the tested SLD, QA/QC reports.**

    - If segment adjustments, deletions, additions, and/or address administrative changes are necessary (i.e. renaming a segment to a new number), the District RMS Coordinator completes and submits the LRS Segment Change Form to RITU for further processing (Figure 9-1).
    - When submitting an LRS Segment Change Form it is required that a copy of the SLD be included along with any additional relevant documents, like maps.
        - **The RMS Coordinator is required to make notifications* and ensure Automated Permit Routing/Analysis System has temporary connectors added, if necessary prior to submitting the LRS Segment Change Form to RITU**.

    *All Districts are responsible for implementing and following a notification process when submitting RMS adjustment forms that meet any of the following criteria. State Route name changes, full or partial route reversals, vacations, abandonments, total turnbacks and any other change that would impact other systems using RMS data not limited to but including APRAS, RCRS, bridge units, local authorities, and property owners affected by the change.

    In addition to the in-house notification procedure, the Districts are responsible for notifying organizations and individuals outside of PennDOT that may be affected by the upcoming SR adjustment. The Districts are responsible for maintaining a notification contact list that includes, but is not limited to, District and County personnel, local municipalities, EMAs, 911 centers, residents, businesses, postal authority, and others the District deems necessary. Notification must be made far enough in advance of the SR adjustments to allow for feedback from those affected by the change. The District shall also determine what method should be used to distribute the notification, such as a press release, electronic correspondence, certified mail or hand delivered flyers. The notification should

explain the change as well as the reason for the change. Contact RITU for guidance and questions.

5. RITU notifies the District RMS Coordinator and other necessary personnel** when adjustments, deletions, additions, and/or address administrative changes are completed through email.

   **RITU is required to notify the Traffic Engineering Division's Signs Standards Specifications & Manufacturing Section and Maintenance Performance Management Division's Maintenance Systems and Reporting Section prior to making any of the above listed adjustments.

   RITU maintains a list of contacts for the circulation letters and requests the RMS Coordinators verify and/or update the circulation contact information every six months or as changes occur.

6. When all LRS corrections are completed, (excluding the noted exceptions on the form), an LRS QA/QA completion form is to be completed by the District RMS Coordinator and submitted to RITU (Figure 9-2).

LRS Tracking

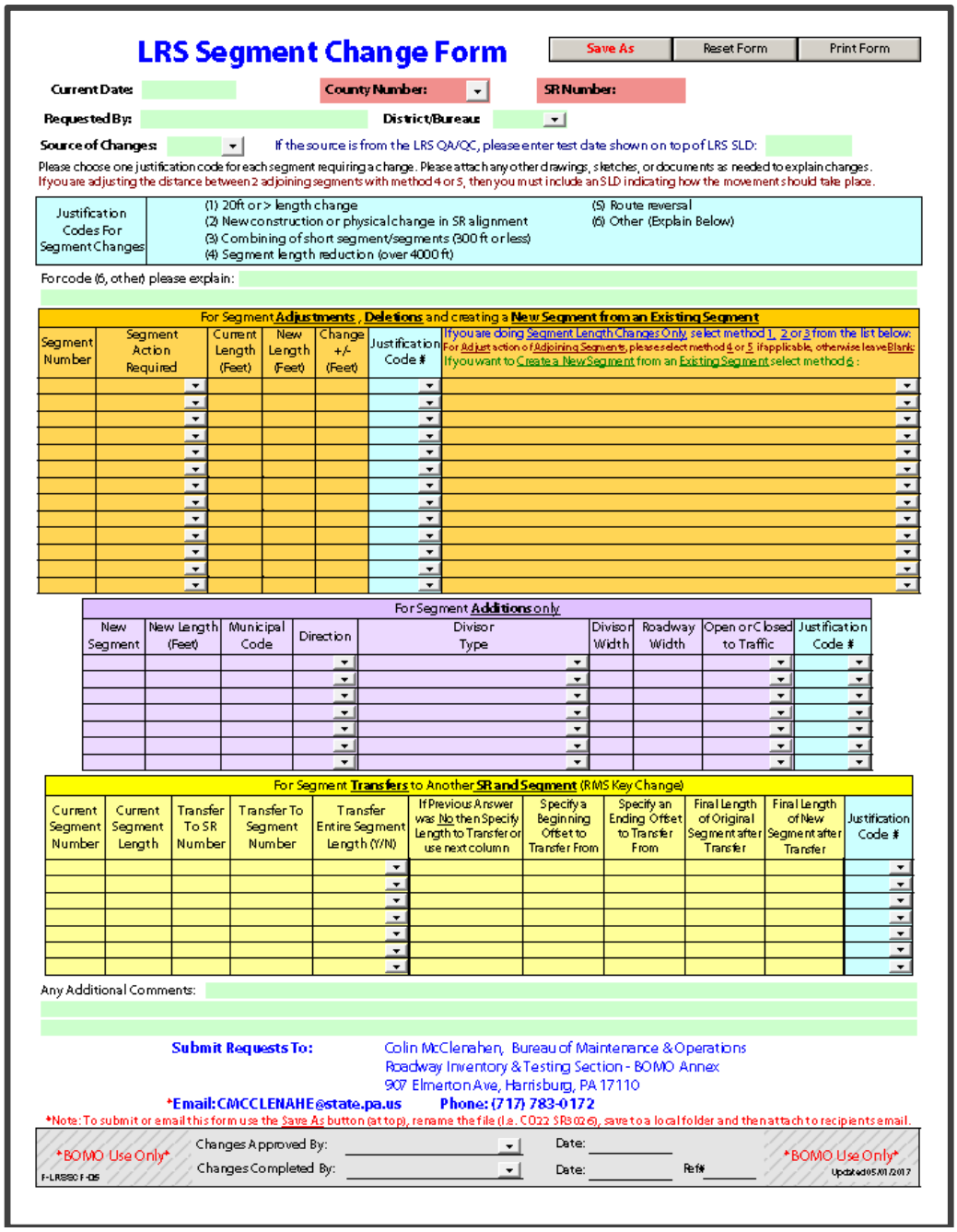
The total number of days needed for the RMS Coordinator to make all necessary changes to RMS, including getting segment adjustments corrected, is tracked in a Crystal Reports database file. The database is used as part of an annual rating system to determine the number of roads that are corrected and signed off as they are completed throughout the year. This report is available for viewing at the following location:

http://pdprodsapbi.penndot.lcl:8080/BOE/CMC

Instructions for logging in and viewing the status of an individual SR can be acquired by contacting BOMO/Roadway Inventory and Testing Unit.

LRS Segment Change Form

Completing the LRS Segment change form for making changes in segment length's, adding, deleting, renaming and moving segments requires some preparation so that the appropriate parts of the segments and all data attached to them get changed or moved without losing data that you may still need.



LRS Segment Change Form

Save As | Reset Form | Print Form

Current Date: | County Number: | SR Number:

Requested By: | District/Bureau:

Source of Changes: | If the source is from the LRS QA/QC, please enter test date shown on top of LRS SLD:

Please choose one justification code for each segment requiring a change. Please attach any other drawings, sketches, or documents as needed to explain changes.
If you are adjusting the distance between 2 adjoining segments with method 4 or 5, then you must include an SLD indicating how the movement should take place.

Justification Codes For Segment Changes		
	(1) 20ft or > length change	(5) Route reversal
	(2) New construction or physical change in SR alignment	(6) Other (Explain Below)
	(3) Combining of short segment/segments (300 ft or less)	
	(4) Segment length reduction (over 4000 ft)	

For code (6, other) please explain:

For Segment **Adjustments**, **Deletions** and creating a **New Segment from an Existing Segment**

Segment Number	Segment Action Required	Current Length (Feet)	New Length (Feet)	Change +/- (Feet)	Justification Code #	If you are doing Segment Length Changes Only, select method 1, 2 or 3 from the list below. For Adjustaction of Adjoining Segments, please select method 4 or 5 if applicable, otherwise leave Blank. If you want to Create a New Segment from an Existing Segment select method 6 :

For Segment **Additions** only

New Segment	New Length (Feet)	Municipal Code	Direction	Divisor Type	Divisor Width	Roadway Width	Open or Closed to Traffic	Justification Code #

For Segment **Transfers** to Another **SR and Segment** (RMS Key Change)

Current Segment Number	Current Segment Length	Transfer To SR Number	Transfer To Segment Number	Transfer Entire Segment Length (Y/N)	If Previous Answer was No then Specify Length to Transfer or use next column	Specify a Beginning Offset to Transfer From	Specify an Ending Offset to Transfer From	Final Length of Original Segment after Transfer	Final Length of New Segment after Transfer	Justification Code #

Any Additional Comments:

Submit Requests To: Colin McClenahen, Bureau of Maintenance & Operations
Roadway Inventory & Testing Section - BOMO Annex
907 Elmerton Ave, Harrisburg, PA 17110
*Email: CMCCLENAHE@state.pa.us **Phone: (717) 783-0172**

*Note: To submit or email this form use the Save As button (at top), rename the file (i.e. C022 SR3026), save to a local folder and then attach to recipients email.

BOMO Use Only | Changes Approved By: | Date: | Changes Completed By: | Date: | Ref# | *BOMO Use Only*
F-LRS80F-05 | Updated 05/01/2017

Figure 9-1
LRS Segment Change Form

This form can be found at the following location:
P:\penndot shared\Bureau of Maintenance and Operations\Roadway Management Division\Roadway Inventory & Testing\Forms\LRS Segment Change Form.pdf

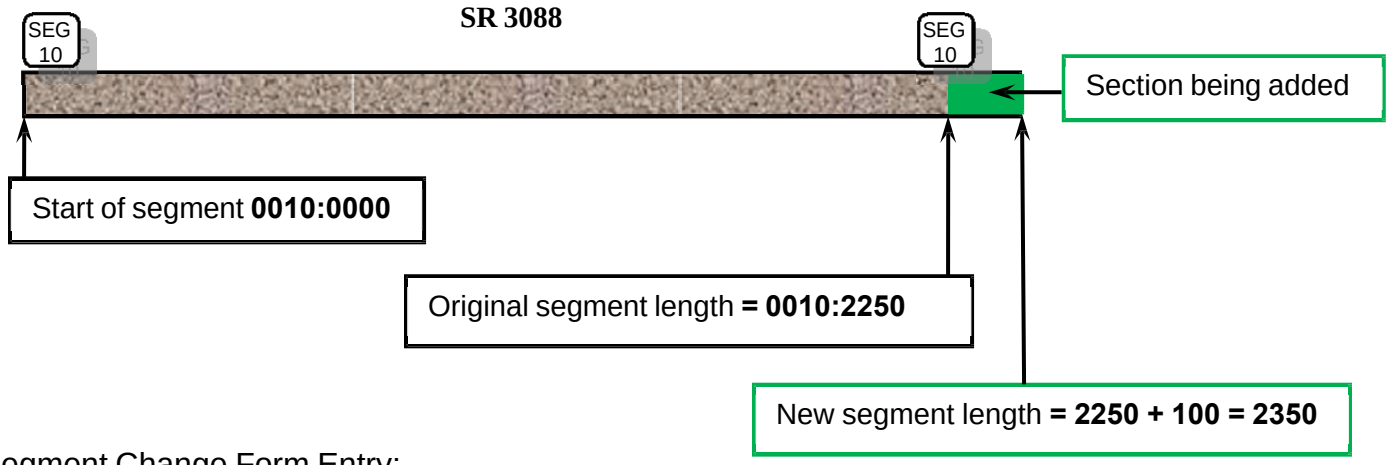
Proper Completion of an LRS Segment Change Form

Choosing the correct segment adjustment method is vital to keeping RMS data attached with existing segments in RMS.

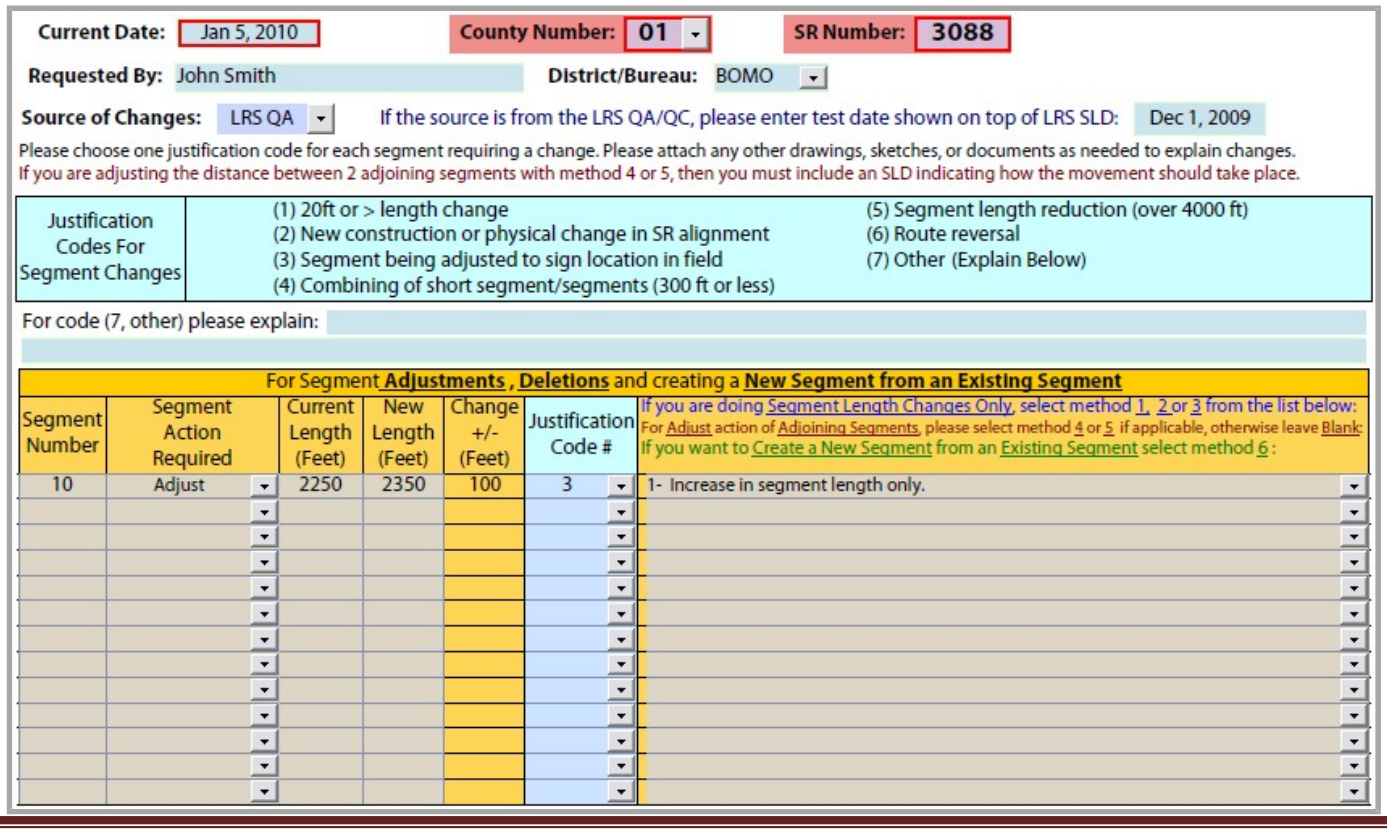
How to properly complete the method of changing or moving footage on the LRS Segment Change Form (located at the right-hand column of the top section):

Option 1: Increase in segment length only, (**i.e. For SR 3088, increase segment 10 by 100ft**).

This option adds footage onto the end of the current segment; it does not affect the distance of the next segment in sequence. A typical reason for using this type of adjustment would be; a segment length has been extended due to new construction, the original configuration of an intersection has changed due to new traffic patterns, or any other condition that would cause the length of a segment to be increased.



Segment Change Form Entry:



Current Date: Jan 5, 2010 | County Number: 01 | SR Number: 3088

Requested By: John Smith | District/Bureau: BOMO

Source of Changes: LRS QA | If the source is from the LRS QA/QC, please enter test date shown on top of LRS SLD: Dec 1, 2009

Please choose one justification code for each segment requiring a change. Please attach any other drawings, sketches, or documents as needed to explain changes.
If you are adjusting the distance between 2 adjoining segments with method 4 or 5, then you must include an SLD indicating how the movement should take place.

Justification Codes For Segment Changes		
	(1) 20ft or > length change	(5) Segment length reduction (over 4000 ft)
	(2) New construction or physical change in SR alignment	(6) Route reversal
	(3) Segment being adjusted to sign location in field	(7) Other (Explain Below)
	(4) Combining of short segment/segments (300 ft or less)	

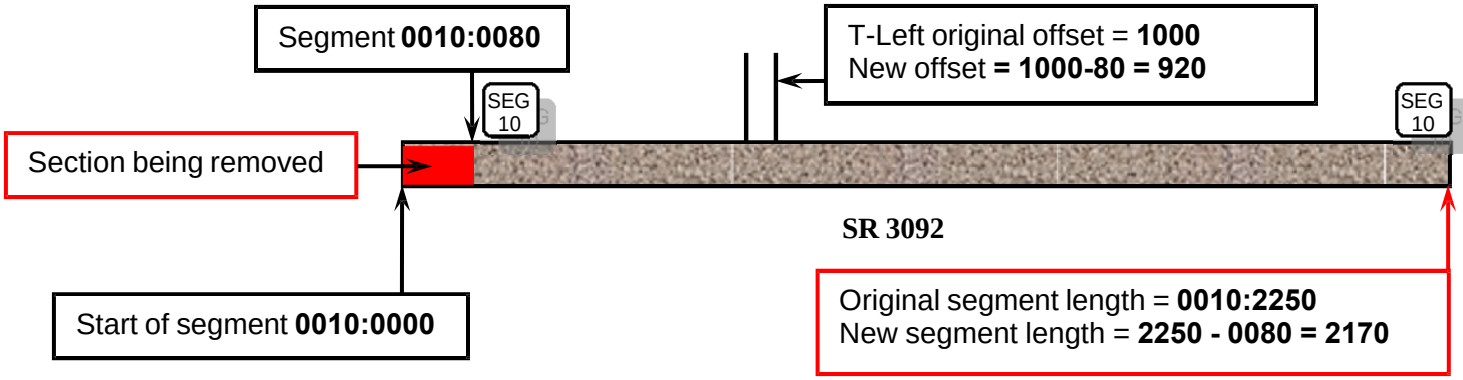
For code (7, other) please explain:

For Segment **Adjustments**, **Deletions** and creating a **New Segment from an Existing Segment**

Segment Number	Segment Action Required	Current Length (Feet)	New Length (Feet)	Change +/- (Feet)	Justification Code #	If you are doing Segment Length Changes Only, select method 1, 2 or 3 from the list below: For Adjust action of Adjoining Segments, please select method 4 or 5 if applicable, otherwise leave Blank: If you want to Create a New Segment from an Existing Segment select method 6 :
10	Adjust	2250	2350	100	3	1- Increase in segment length only.

Option 2: Remove footage from the beginning portion of the segment.

This option will remove distance starting from the beginning of a segment to a specified distance or offset within the segment. A typical reason for using this type of adjustment would be; a segment length has been decreased due to new construction, the original configuration of an intersection has changed due to new traffic patterns, or any other condition that would cause the length of a segment to be decreased. This type of adjustment creates a permanent loss of data that was contained within the affected section. When this option is used, all offsets that are still contained within the segment will be automatically decreased by the value of the deleted portion of the segment, (**i.e. On SR 3092, Remove 80ft from the beginning of segment 0010**).



Segment Change Form Entry:

Current Date: Jan 5, 2010 **County Number:** 01 **SR Number:** 3092

Requested By: John Smith **District/Bureau:** BOMO

Source of Changes: LRS QA If the source is from the LRS QA/QC, please enter test date shown on top of LRS SLD: Dec 1, 2009

Please choose one justification code for each segment requiring a change. Please attach any other drawings, sketches, or documents as needed to explain changes.
If you are adjusting the distance between 2 adjoining segments with method 4 or 5, then you must include an SLD indicating how the movement should take place.

Justification Codes For Segment Changes		
	(1) 20ft or > length change	(5) Segment length reduction (over 4000 ft)
	(2) New construction or physical change in SR alignment	(6) Route reversal
	(3) Segment being adjusted to sign location in field	(7) Other (Explain Below)
	(4) Combining of short segment/segments (300 ft or less)	

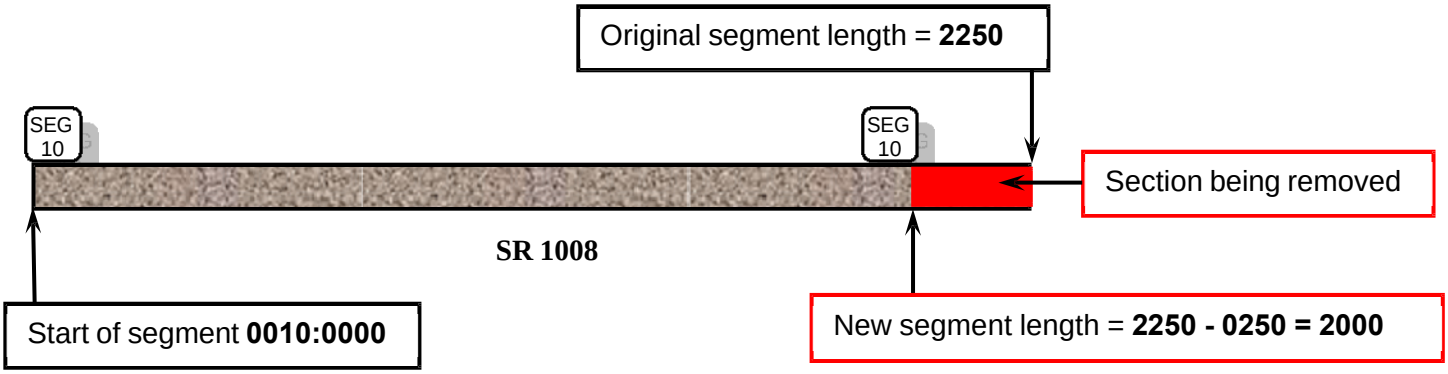
For code (7, other) please explain:

For Segment **Adjustments**, **Deletions** and creating a **New Segment from an Existing Segment**

Segment Number	Segment Action Required	Current Length (Feet)	New Length (Feet)	Change +/- (Feet)	Justification Code #	If you are doing Segment Length Changes Only, select method 1, 2 or 3 from the list below: For Adjust action of Adjoining Segments, please select method 4 or 5 if applicable, otherwise leave Blank: If you want to Create a New Segment from an Existing Segment select method 6 :
10	Adjust	2250	2170	-80	3	2 - Remove footage from beginning portion of the segment.

Option 3: Remove footage from the ending portion of the segment.

This option will remove the footage specified from the ending portion of the segment. A typical reason for using this type of adjustment would be; a segment length has been decreased due to new construction, the original configuration of an intersection has changed due to new traffic patterns, or any other condition that would cause the length of a segment to be decreased. This type of adjustment creates a permanent loss of data that was contained within the affected section. Offsets of features that come before the section being removed are not affected by the change in footage, (**i.e. For SR 1008, remove 250ft from the end of segment 0010**).



Segment Change Form Entry:

Current Date: Jan 5, 2010 **County Number:** 01 **SR Number:** 1008

Requested By: John Smith **District/Bureau:** 9-0

Source of Changes: LRS QC If the source is from the LRS QA/QC, please enter test date shown on top of LRS SLD: Sep 15, 2009

Please choose one justification code for each segment requiring a change. Please attach any other drawings, sketches, or documents as needed to explain changes.
If you are adjusting the distance between 2 adjoining segments with method 4 or 5, then you must include an SLD indicating how the movement should take place.

Justification Codes For Segment Changes		
	(1) 20ft or > length change	(5) Segment length reduction (over 4000 ft)
	(2) New construction or physical change in SR alignment	(6) Route reversal
	(3) Segment being adjusted to sign location in field	(7) Other (Explain Below)
	(4) Combining of short segment/segments (300 ft or less)	

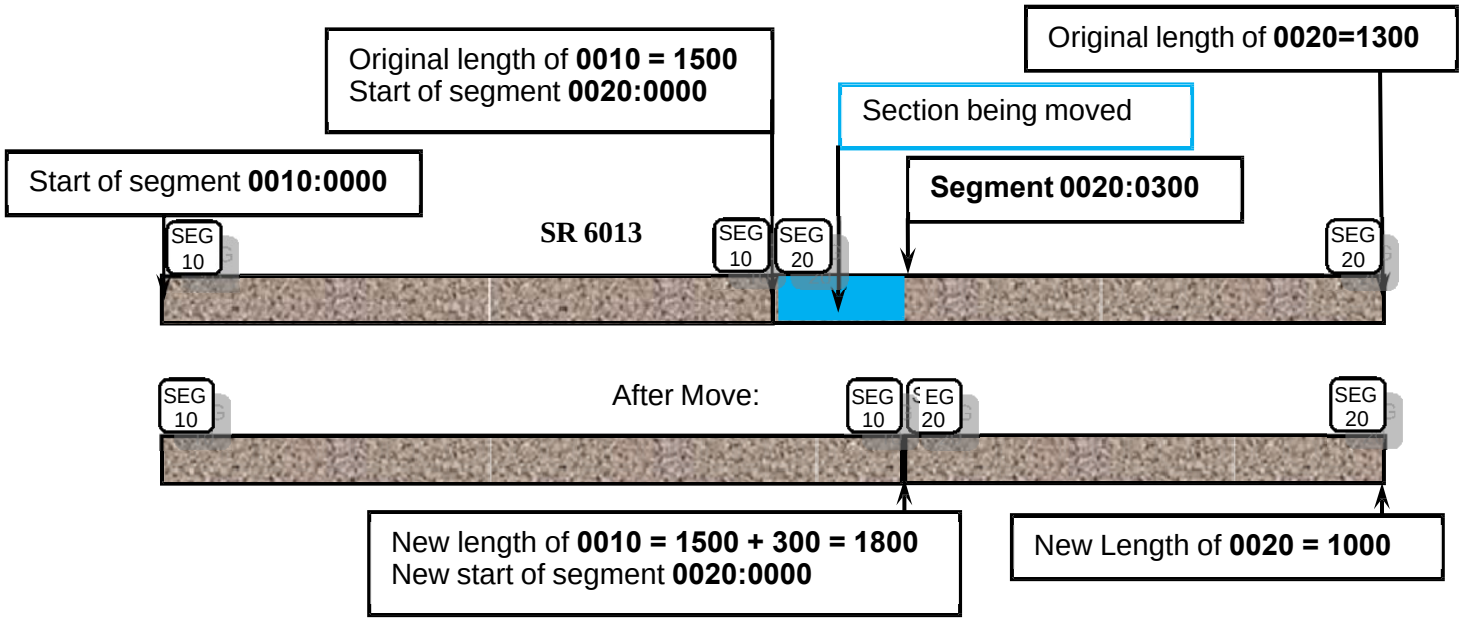
For code (7, other) please explain:

For Segment **Adjustments**, **Deletions** and creating a **New Segment from an Existing Segment**

Segment Number	Segment Action Required	Current Length (Feet)	New Length (Feet)	Change +/- (Feet)	Justification Code #	If you are doing Segment Length Changes Only, select method 1, 2 or 3 from the list below: For Adjust action of Adjoining Segments, please select method 4 or 5 if applicable, otherwise leave Blank: If you want to Create a New Segment from an Existing Segment select method 6 :
10	Adjust	2250	2000	-250	3	3 - Remove footage from ending portion of the segment.

Option 4: Move the Beginning portion of one segment into the End of the prior segment.

This option should always be used when 2 adjoining segments both need to have a change in footage. The reason for 2 adjoining segments to both be adjusted may include any of the following; a standalone segment sign being relocated to a permanent feature, a segment sign on the end of a bridge is getting moved to the beginning of the bridge, a sign may have been placed in the field at an incorrect offset, or any other change that needs to be made without losing the original data contained within the 2 existing segments. Typically, when moving footage between 2 adjoining segments, a decrease in one segment will cause an equal increase in the other segment (**i.e. On SR 6013, Move the beginning 300ft of segment 0020 into the end of segment 0010**).



Segment Change Form Entry:

Current Date: Dec 13, 2017 **County Number:** 67 **SR Number:** 6013

Requested By: Fred Smith **District/Bureau:** 6-0

Source of Changes: Other If the source is from the LRS QA/QC, please enter test date shown on top of LRS SLD: Nov 27, 2017

Please choose one justification code for each segment requiring a change. Please attach any other drawings, sketches, or documents as needed to explain changes.
If you are adjusting the distance between 2 adjoining segments with method 4 or 5, then you must include an SLD indicating how the movement should take place.

Justification Codes For Segment Changes	(1) 20ft or > length change	(5) Route reversal
	(2) New construction or physical change in SR alignment	(6) Other (Explain Below)
	(3) Combining of short segment/segments (300 ft or less)	
	(4) Segment length reduction (over 4000 ft)	

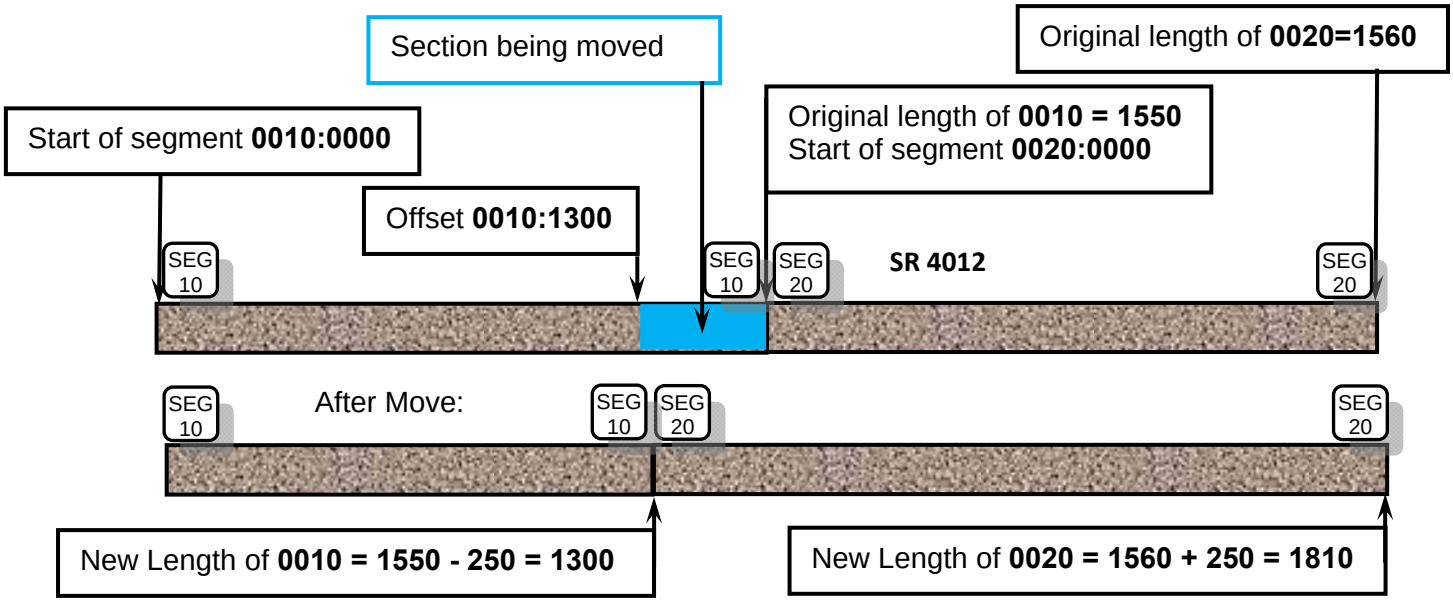
For code (6, other) please explain:

For Segment **Adjustments**, **Deletions** and creating a **New Segment from an Existing Segment**

Segment Number	Segment Action Required	Current Length (Feet)	New Length (Feet)	Change +/- (Feet)	Justification Code #	If you are doing Segment Length Changes Only, select method 1, 2 or 3 from the list below: For Adjust action of Adjoining Segments, please select method 4 or 5 if applicable, otherwise leave Blank: If you want to Create a New Segment from an Existing Segment select method 6 :
10	Adjust	1500	1800	300		
20	Adjust	1300	1000	-300	3	4 - Move Beginning portion of segment into the End of the prior segment.

Option 5: Move Ending portion of segment into the Beginning of the next segment.

This option should always be used when 2 adjoining segments both need to have a change in footage. The reason for 2 adjoining segments to both be adjusted may include any of the following; a standalone segment sign being relocated to a permanent feature, a segment sign on the end of a bridge is getting moved to the beginning of the bridge, a sign may have been placed in the field at an incorrect offset, or any other change that needs to be made without losing the original data contained within the 2 existing segments. Typically, when moving footage between 2 adjoining segments a decrease in one segment will cause an equal increase in the other segment (**i.e. For SR 4012, Move the ending 250ft of segment 0010 into the beginning of segment 0020**).



Segment Change Form Entry:

Current Date: Dec 13, 2017 **County Number:** 67 **SR Number:** 4012

Requested By: Fred Smith **District/Bureau:** 6-0

Source of Changes: LRS QA If the source is from the LRS QA/QC, please enter test date shown on top of LRS SLD: Nov 27, 2017

Please choose one justification code for each segment requiring a change. Please attach any other drawings, sketches, or documents as needed to explain changes.
If you are adjusting the distance between 2 adjoining segments with method 4 or 5, then you must include an SLD indicating how the movement should take place.

Justification Codes For Segment Changes	(1) 20ft or > length change (2) New construction or physical change in SR alignment (3) Combining of short segment/segments (300 ft or less) (4) Segment length reduction (over 4000 ft)	(5) Route reversal (6) Other (Explain Below)

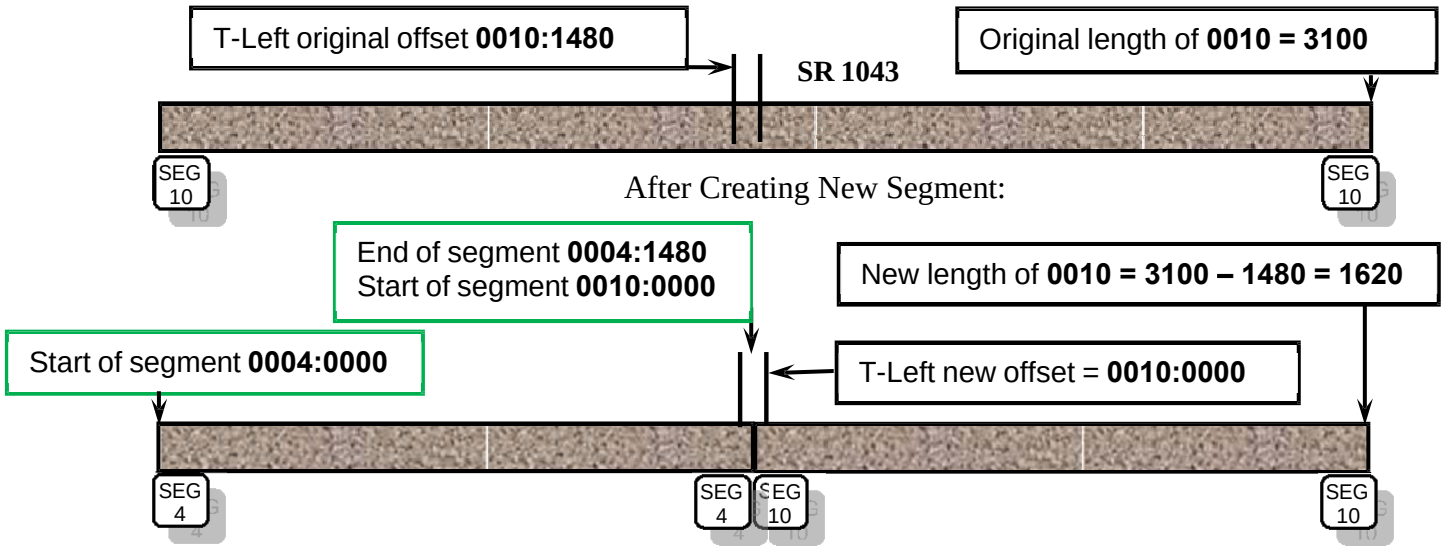
For code (6, other) please explain:

For Segment **Adjustments**, **Deletions** and creating a **New Segment from an Existing Segment**

Segment Number	Segment Action Required	Current Length (Feet)	New Length (Feet)	Change +/- (Feet)	Justification Code #	If you are doing Segment Length Changes Only, select method 1, 2 or 3 from the list below: For Adjust action of Adjoining Segments, please select method 4 or 5 if applicable, otherwise leave Blank: If you want to Create a New Segment from an Existing Segment select method 6 :
10	Adjust	1550	1300	-250	3	5 - Move Ending portion of segment into the Beginning of the next segment.
20	Adjust	1560	1810	250		

Option 6: Create a New segment from an Existing segment.

This option is used whenever you want to take part of one segment and create a totally new segment from that part. Typically, this option is used to reduce the size of a long segment by making it two segments (**i.e. For SR 1043, create a new segment 0004 from existing segment 0010**).



- **For option 6, there are different ways that the Change Form could be completed. Shown below is an example of one way that would be considered acceptable.**
- **For this type of segment addition, the new segment part of the form does not have to be completed because the new segments geometry and other coding information would be the same as the original segment.**

Segment Change Form Entry:

Current Date: Dec 13, 2017 **County Number:** 04 **SR Number:** 1043

Requested By: BobSmith **District/Bureau:** 11-0

Source of Changes: LRS QA If the source is from the LRS QA/QC, please enter test date shown on top of LRS SLD: Nov 27, 2017

Please choose one justification code for each segment requiring a change. Please attach any other drawings, sketches, or documents as needed to explain changes.
If you are adjusting the distance between 2 adjoining segments with method 4 or 5, then you must include an SLD indicating how the movement should take place.

Justification Codes For Segment Changes		
	(1) 20ft or > length change	(5) Route reversal
	(2) New construction or physical change in SR alignment	(6) Other (Explain Below)
	(3) Combining of short segment/segments (300 ft or less)	
	(4) Segment length reduction (over 4000 ft)	

For code (6, other) please explain:

For Segment **Adjustments**, **Deletions** and creating a **New Segment from an Existing Segment**

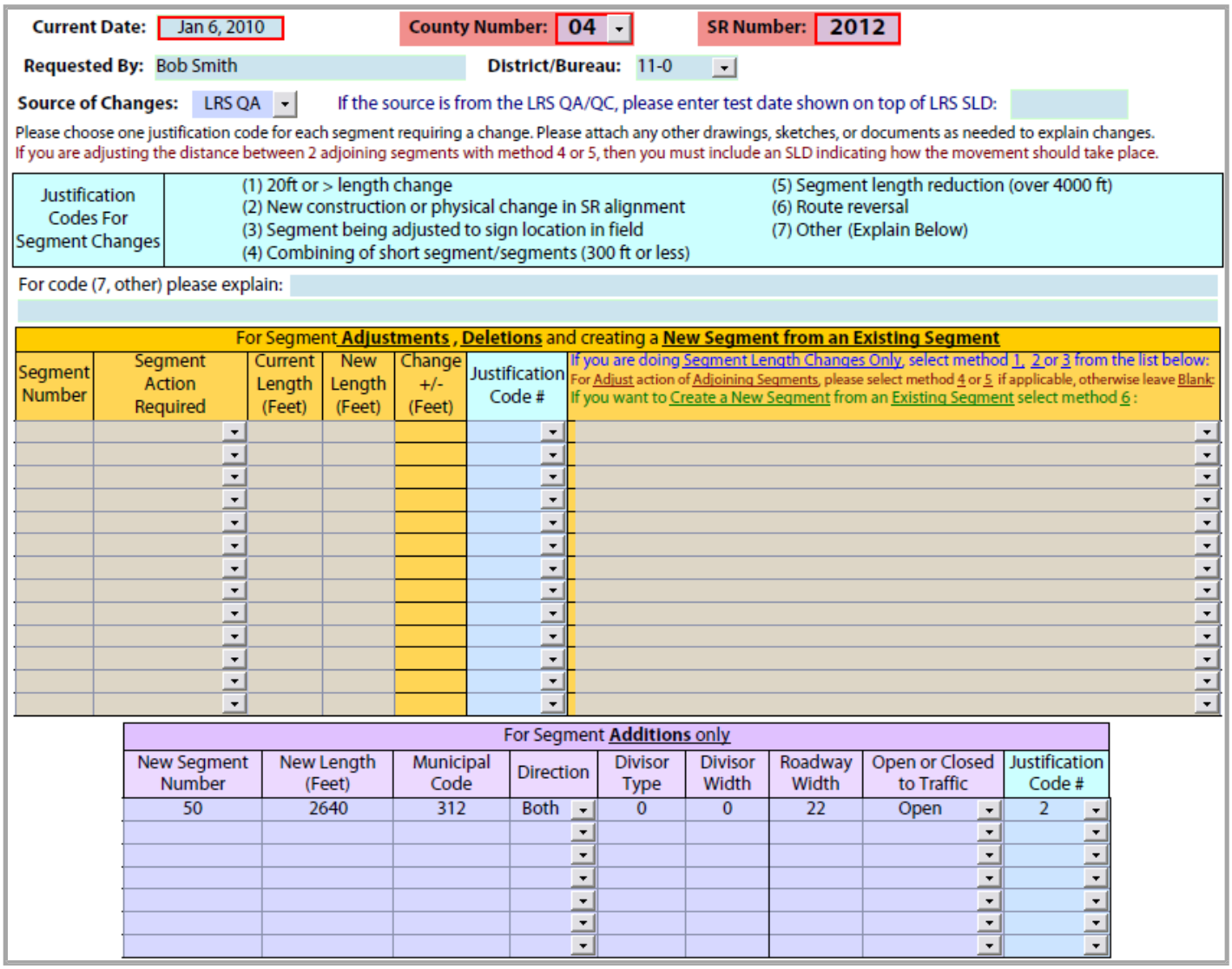
Segment Number	Segment Action Required	Current Length (Feet)	New Length (Feet)	Change +/- (Feet)	Justification Code #	If you are doing Segment Length Changes Only, select method 1, 2 or 3 from the list below: For Adjust action of Adjoining Segments, please select method 4 or 5 if applicable, otherwise leave Blank: If you want to Create a New Segment from an Existing Segment select method 6 :
10		3100	1620	-1480	3	
4	New From Existing	0	1480	1480	3	6 - Create a New segment from an Existing segment.

Adding Segments

Segment Adds are normally needed for newly constructed sections of highway, but they may also be used for less common situations like a reverse turnback of a municipal road, were a local road is given to the state and it becomes a new SR. Segment adds can also be useful to prebuild a section of highway that is currently being constructed and will soon be open to traffic. When prebuilding with segment adds, the entire section of highway can be constructed in RMS and kept closed until the actual time the road is open for travel. By prebuilding an SR, pavement, intersection, and other known data elements can be entered into RMS ahead of time to cut down on the necessity of having to rush to get it in when road is open to traffic. When requesting a Segment Add, it is critical that all indicated fields shown on the Change form for segment Add's, be completed in their entirety to ensure that the add is done without delay. An example of adding a new segment (50) to SR 2012 is shown below:

*Note: For an undivided SR with bidirectional traffic flow, the Direction field should always be entered as **Both.**

Segment Change Form Entry:



Current Date: Jan 6, 2010 **County Number:** 04 **SR Number:** 2012

Requested By: Bob Smith **District/Bureau:** 11-0

Source of Changes: LRS QA If the source is from the LRS QA/QC, please enter test date shown on top of LRS SLD:

Please choose one justification code for each segment requiring a change. Please attach any other drawings, sketches, or documents as needed to explain changes.
If you are adjusting the distance between 2 adjoining segments with method 4 or 5, then you must include an SLD indicating how the movement should take place.

Justification Codes For Segment Changes		
	(1) 20ft or > length change	(5) Segment length reduction (over 4000 ft)
	(2) New construction or physical change in SR alignment	(6) Route reversal
	(3) Segment being adjusted to sign location in field	(7) Other (Explain Below)
	(4) Combining of short segment/segments (300 ft or less)	

For code (7, other) please explain:

For Segment **Adjustments**, **Deletions** and creating a **New Segment from an Existing Segment**

Segment Number	Segment Action Required	Current Length (Feet)	New Length (Feet)	Change +/- (Feet)	Justification Code #	If you are doing Segment Length Changes Only, select method 1, 2 or 3 from the list below: For Adjust action of Adjoining Segments, please select method 4 or 5 if applicable, otherwise leave Blank: If you want to Create a New Segment from an Existing Segment select method 6 :

For Segment **Additions** only

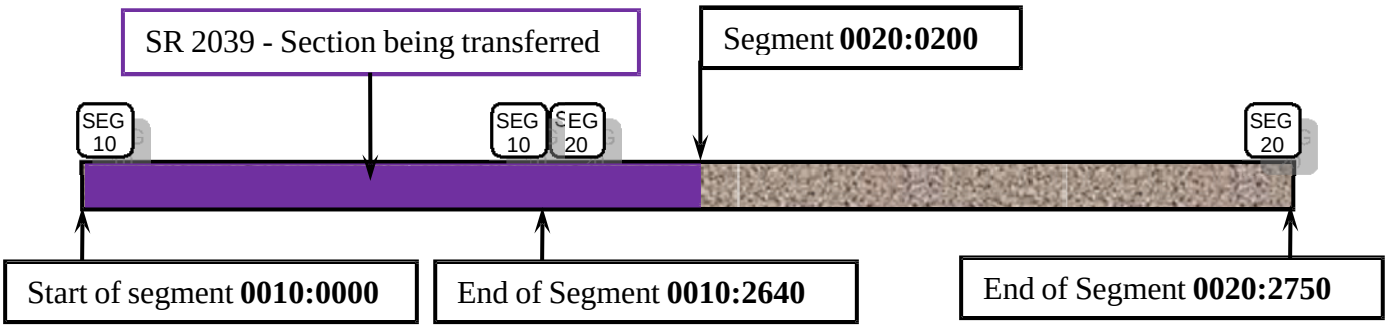
New Segment Number	New Length (Feet)	Municipal Code	Direction	Divisor Type	Divisor Width	Roadway Width	Open or Closed to Traffic	Justification Code #
50	2640	312	Both	0	0	22	Open	2

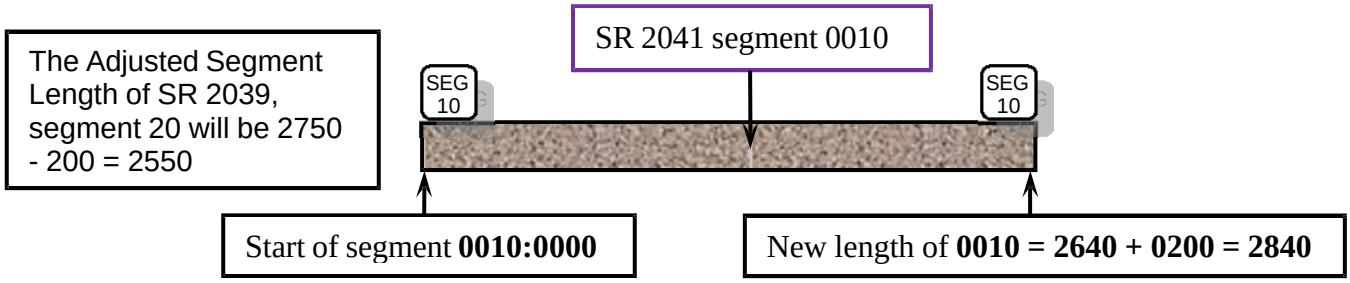
Transferring Segments

Segment transfers are used whenever you have an existing segment that is currently in RMS, but it needs to be renamed or relabeled to a different SR. Some examples of situations when segment transfers would be used are:

- A bypass is built around a town and the original traffic route that went through the town is now getting renamed to a quadrant SR.
- Someone decides to combine two SR's into one.
- A route reversal causes intersecting interchange ramps to be relabeled for a different quadrant.

Segment transfers can be done for an entire segment or for a part of a segment. If doing a partial segment, the (To) and (From) offsets must be specified (**i.e. For SR 2039 transfer all of segment 10 and the first 200 ft of segment 20 to a new segment (0010) on SR (SR 2041).**





Segment Change Form Entry:

Current Date: Dec 13, 2017 **County Number:** 04 **SR Number:** 2039

Requested By: Bob Smith **District/Bureau:** 11-0

Source of Changes: LRS QC If the source is from the LRS QA/QC, please enter test date shown on top of LRS SLD: Nov 27, 2017

Please choose one justification code for each segment requiring a change. Please attach any other drawings, sketches, or documents as needed to explain changes.
If you are adjusting the distance between 2 adjoining segments with method 4 or 5, then you must include an SLD indicating how the movement should take place.

Justification Codes For Segment Changes	(1) 20ft or > length change (2) New construction or physical change in SR alignment (3) Combining of short segment/segments (300 ft or less) (4) Segment length reduction (over 4000 ft)	(5) Route reversal (6) Other (Explain Below)

For Segment **Transfers** to Another **SR and Segment** (RMS Key Change)

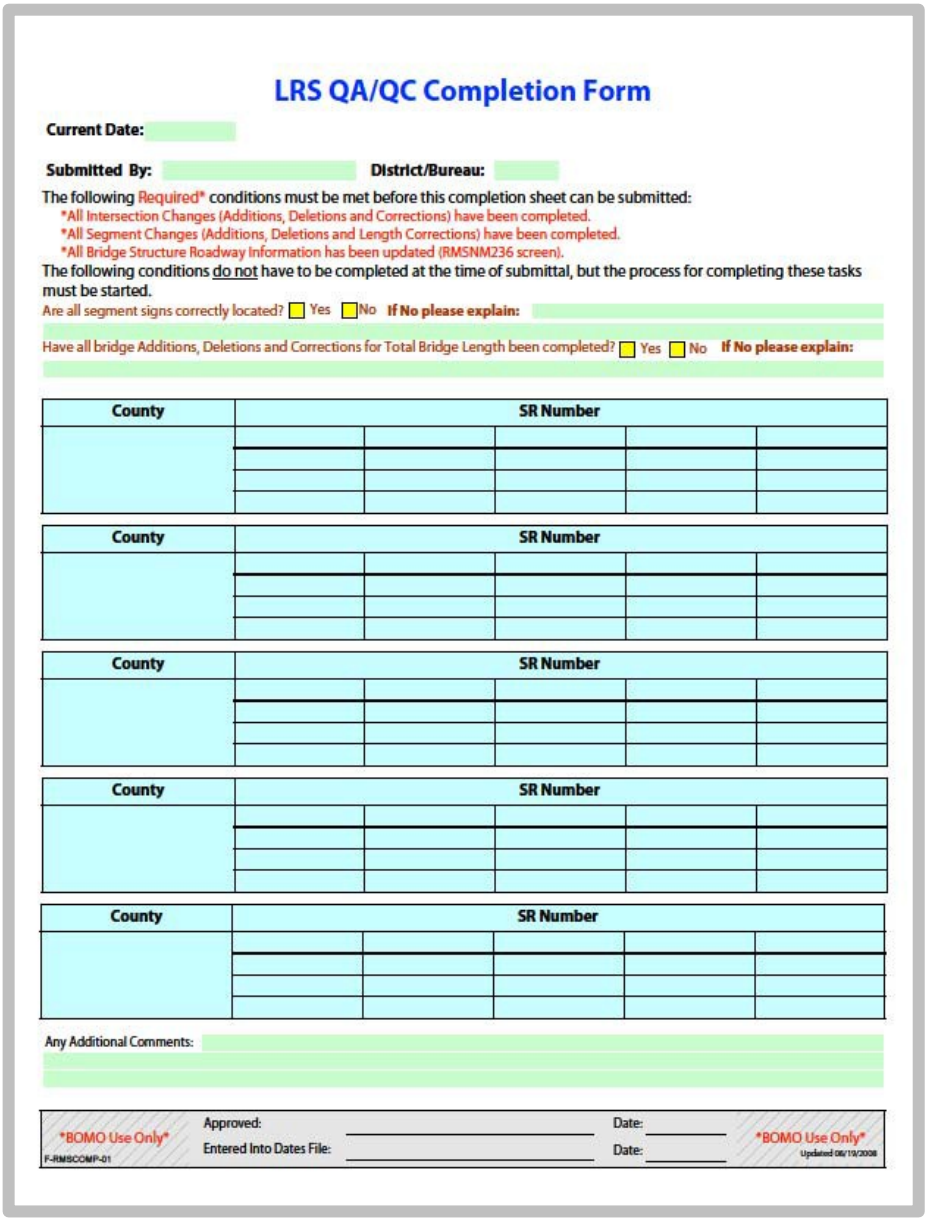
Current Segment Number	Current Segment Length	Transfer To SR Number	Transfer To Segment Number	Transfer Entire Segment Length (Y/N)	If Previous Answer was No then Specify Length to Transfer or use next column	Specify a Beginning Offset to Transfer From	Specify an Ending Offset to Transfer From	Final Length of Original Segment after Transfer	Final Length of New Segment after Transfer	Justification Code #
10	2640	2041	10	Yes				0	2840	3
20	2750	2041	10	No	200	0	200	2550	2840	3

SR Documentation for Segment Changes

Whenever you are working with more than one segment or on a project that will require multiple change forms, it is essential to provide as much detailed documentation as possible. At the very least, there should be a drawing or map showing how the new alignment will look. Often, a construction plan is submitted that is difficult to interpret. It is always preferred that some type of sketch or drawing is submitted with the changes, instead of the construction plans.

LRS QA/QC Completion Form

After all required RMS corrections are completed; the following form should be submitted to finalize the completion process:



LRS QA/QC Completion Form

Current Date:

Submitted By: **District/Bureau:**

The following Required* conditions must be met before this completion sheet can be submitted:
*All Intersection Changes (Additions, Deletions and Corrections) have been completed.
*All Segment Changes (Additions, Deletions and Length Corrections) have been completed.
*All Bridge Structure Roadway Information has been updated (RMSNM236 screen).

The following conditions do not have to be completed at the time of submittal, but the process for completing these tasks must be started.

Are all segment signs correctly located? ☐ Yes ☐ No **If No please explain:**

Have all bridge Additions, Deletions and Corrections for Total Bridge Length been completed? ☐ Yes ☐ No **If No please explain:**

County	SR Number				

County	SR Number				

County	SR Number				

County	SR Number				

County	SR Number				

Any Additional Comments:

BOMO Use Only F-RMSCOMP-01

Approved: _____ Date: _____

Entered Into Dates File: _____ Date: _____

BOMO Use Only Updated 08/19/2008

Figure 9-2
LRS QA/QC Completion Form

This form can be found at the following location:
P:\penndot shared\Bureau of Maintenance and Operations\Roadway Management Division\Roadway Inventory & Testing\Forms\LRS Completion Form.pdf

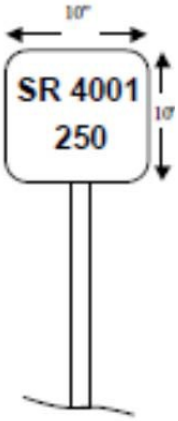
SR Segment Signing

10 SR Signing

10 SR Signing

Segment Sign Introduction

There are 2 different types of signs used to indicate a segment number, a 10 inch X 10 inch sign and a 12 inch X 18 inch sign. Both types of signs have a white back ground with solid black numbering and lettering. The font that should be used is ARIAL. The exact dimensions of the numbering and lettering are shown in figure 10-1 through 10-4. The signs may be made of metal or plastic, although metal is preferred due to problems with the signs breaking in the winter, caused by plowed snow coming off the blade and breaking the brittle plastic signs. All of the specified dimensions, numbering, text, color, material and spacing of the signs should be strictly adhered to, in order to provide uniformity between signs in different counties and districts. A temporary sign that does not meet the exact sign specifications can be used until the permanent sign is ordered and replaced.



Segment Sign Types, Dimensions and Character Spacing

Sign Type 1: 10 x 10 Non-State Intersection and Feature Segment Sign

This type of sign is used to identify the beginning of the segment that you are entering, in the direction you are traveling. Typically, this type of sign will be found at segment changes on all of the following types of features:

Intersections with non-state roads, Ramps, Bridges, Overpasses, Railroad Crossings, Rest Areas, Truck Escape Ramps, Tunnels, Divided Highway Start/End, Divided Highway Connectors, Mileposts, County & Municipal Boundaries, Drainage Pipes, Overhead Sign Structures.

This type of sign is also used at segment change locations without any identifiable feature (stand alone segments), where the segment sign location is determined by footage only.

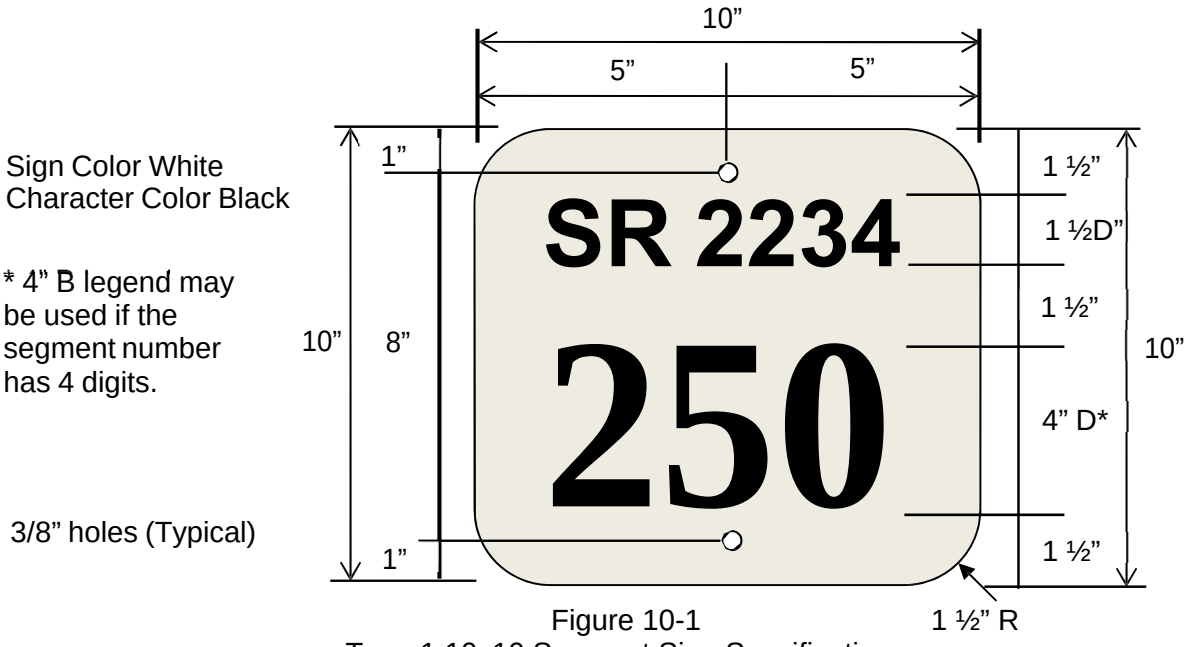
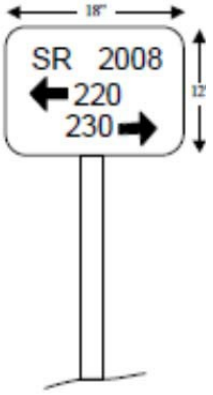


Figure 10-1
Type-1 10x10 Segment Sign Specifications

Sign Type 2: 12 x 18 Intersection Single Segment Sign



Type 2 signs are used primarily at intersection locations where 2 or more state roads meet. Whenever there are two SR's intersecting, there should always be at least two type 2 signs shown at the intersection, usually of the same post. Type 2 signs are also used at special locations like an intersection of a state road and a twp road, where the twp road contains structures still owned by PennDOT (Turnback Bridges). For Turnback Bridges, the segment sign will have the SR number and the letters (BR) and an arrow indicating that there are state owned bridges on the road that the arrow points towards.

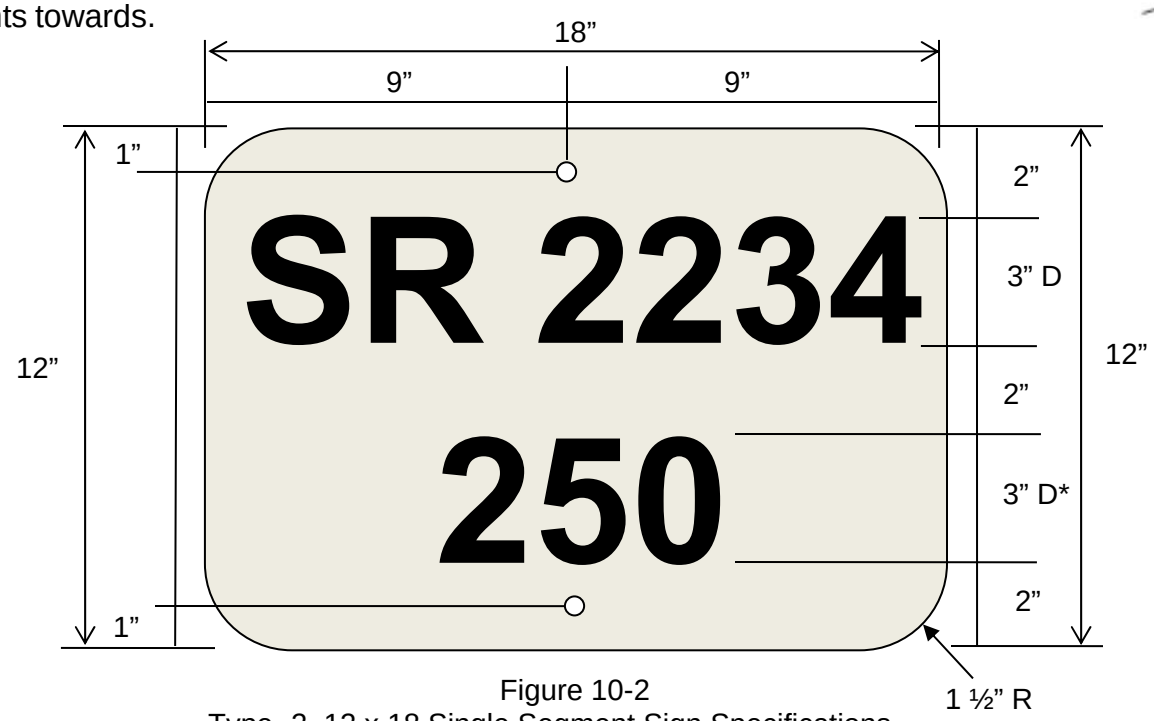


Figure 10-2
Type -2, 12 x 18 Single Segment Sign Specifications

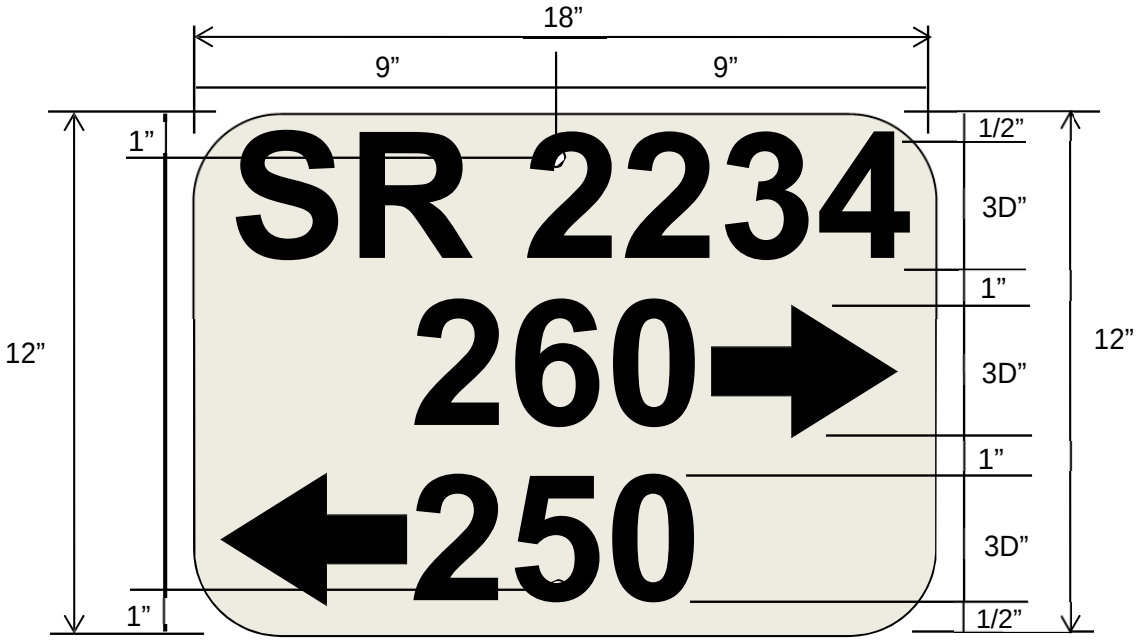


Figure 10-3
Type-2, 12 x 18 Multi Segment Sign Specifications

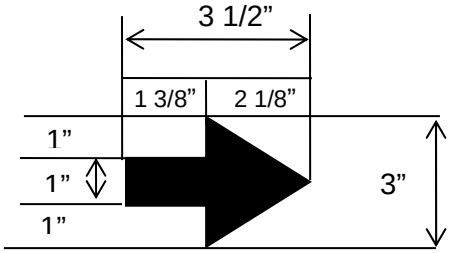


Figure 10-4
Type-2, 12 x 18 Segment Sign Arrow Specifications

Segment Sign Mounting

- Fasten all Type-2 12” x 18” SR Marker and Type-1 10” x 10” Segment Marker signs with anti-theft nuts and bolts.
- Permanently scribe 1 inch numerals on back of all signs indicating the day, month and year of installation.
- Height – Fasten SR Marker and Segment Marker Signs to posts or supports with the top of the marker approximately 4 feet above the ground, except as follows:
    - In business, commercial and residential districts where pedestrian movement is likely, tops of signs should be installed approximately 8 feet above the ground.
    - Markers must be either perpendicular to or centered directly behind the stop sign.
    - Markers are to be installed at least 1 foot below other signs or a minimum of 3 feet above the ground.
    - Markers at bridges should be visible to approaching traffic. Segment Markers may be installed above bridge clearance signs.

Segment Post Installation Requirements

If an existing sign post is not used, follow these guidelines for installation of segment sign posts:

- Use 2.5 lb./ft. breakaway channel bar posts and 5/16” x 2” galvanized, Grade 2 anchor bolts.
- Locate posts in the vicinity of physical features in accordance with this manual.
- Drive anchors with no more than 4 inch exposure above ground elevation.
- Use 4 foot posts, except in business, commercial and residential areas. In these areas where pedestrian movement is likely, 8 foot posts will be required.

Installation of SR Marker Signs

- The Type-1 10” x 10” SR sign should be used at all non-state road intersections and at feature locations (i.e. bridges, overpasses, railroad crossing, boundaries, pipes, etc)
- A Type-2 18” x 12” SR sign, will normally be erected at the beginning and end of all SR’s and at intersections with other State Highways.
- Signs should be visible from within a vehicle on all State Highways that approach another State Highway.
- SR signs should be located to take advantage of existing sign posts or other supports, such as street sign posts.
- Signs should be installed on with existing signs or by themselves, at a point before crossing the centerlines of the intersections for the direction you’re traveling.
- Segment markers installed with regulatory signs such as STOP, YIELD, speed limit, etc., cannot

be mounted facing the same direction as the regulatory sign. They can be mounted on the back or sides. For warning and guide signs, the segment markers can face the same direction. Segment markers need to be 12 inches below the other sign.

- Segment Signs should always be installed on the right side of the highway when traveling in the direction of increasing segment numbers (North or East).
- Segment Signs at physical features should be placed on existing sign supports that are within 20' of the physical feature, e.g. bridge clearance markers, stop signs, municipal boundary name signs.

Nodes in the vicinity of a physical feature should be located at the physical feature point and not at the Segment Marker Sign. However, nodes not defined by a physical feature will be assumed to be at the centerline of the highway, directly opposite the Segment Marker Sign. For Segment Markers not at a physical reference point, measure the distance from last physical feature with a distance measuring instrument (DMI) along the centerline of highway. SR Marker Signs located at the approach to turnback intersections should not be removed if the Department continues to maintain a structure.

Segment Sign Placement

The establishment of segment locations and lengths were determined in accordance with guidelines developed by PennDOT's Bureau of Maintenance and Operations. SR's are typically broken into approximately one-half mile segments. Ideally, segments should not be less than 200 feet or longer than 4000 feet in length.

Signs that are associated with mileposts, boundaries and sign structures should be located directly on the same sign post or sign structure support truss; these include all of the following features:

- Interstate and Traffic Route mile posts
- Interstate and Traffic Route 10th mile posts (usually .5 sign)
- State/County Boundaries
- Municipal Boundaries

Figure 10-5
Mile Post with Segment Sign

Figure 10-6
Boundary with Segment Sign

Since signs cannot be erected at the exact center of intersections, they are to be located cater-corner (*slanted across a polygon on a diagonal line)* from the center point (Point found that represents the crossing of the centerline of both intersections) of all 4 way Intersections (Figure 10-7). Intersection signs should always be placed to the right and before the intersecting road, so that they can be clearly seen in a vehicle before crossing the intersection. The placement of the segment sign should be to an existing intersection sign post if possible.

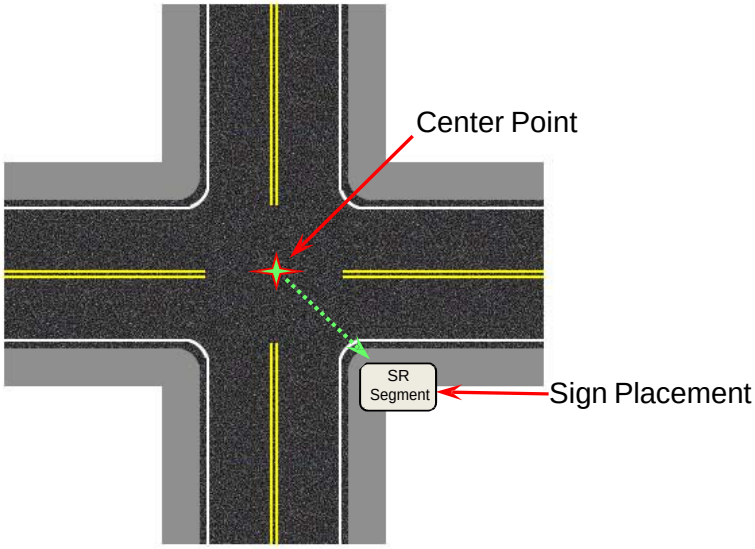


Figure 10-7
4 Way Intersection Segment Sign Placement

Placement of segment signs should be to the right, corresponding to direction, (excepted as *Noted) and perpendicular to the center point (Point representing the crossing of the center of the roadway and the center of the intersecting road or feature) of all of the following features:

Note: When the placement of a sign to the right interferes, or falls on another road on the right, then the sign can be placed on the left side or at an alternate location on the road, perpendicular to the center point of the intersections, (i.e. Back Right Intersection).

- T and Y Intersections
- Bridges
- Overpasses
- Railroad Crossings
- Culverts
- Drainpipes
- Ramp Gores
- Divides Roadway Start/End Barriers or Lanes on divided roadways
- Sign Structures

SR Segmentation

Every state route is divided into specified sections of roadway known as segments. Segments can vary in length, but the majority of them are approximately one-half mile in length. Where possible, segments typically start and end at easily identifiable physical features along the roadway such as intersections, bridges, overpasses or railroad tracks.

Since bridge structures are identified by their LRS key, each entire bridge must be contained within a single segment. Therefore, the segment length will equal the length of the bridge in cases where the bridge is longer than one-half mile.

SR's are segmented in the North or East direction, and will normally increase in increments of ten. Segments are even numbered on undivided roadways, and in the Northbound or Eastbound direction of divided roadways. On the Southbound or Westbound side of divided roadways, there is a

corresponding odd numbered segment. Interstate segments are associated with the mile posts. Segment locations are identified in the field by segment marker signs, which are located according to the segment and offset found in RMS. On the Southbound or Westbound side of divided roadways, segment markers are placed at the "high end" or "high offset" of the segment that you're going into, because that will correspond to the way you are traveling when you see the signs. Figures 10-8 through 10-10 illustrates segmentation and segment marker location.

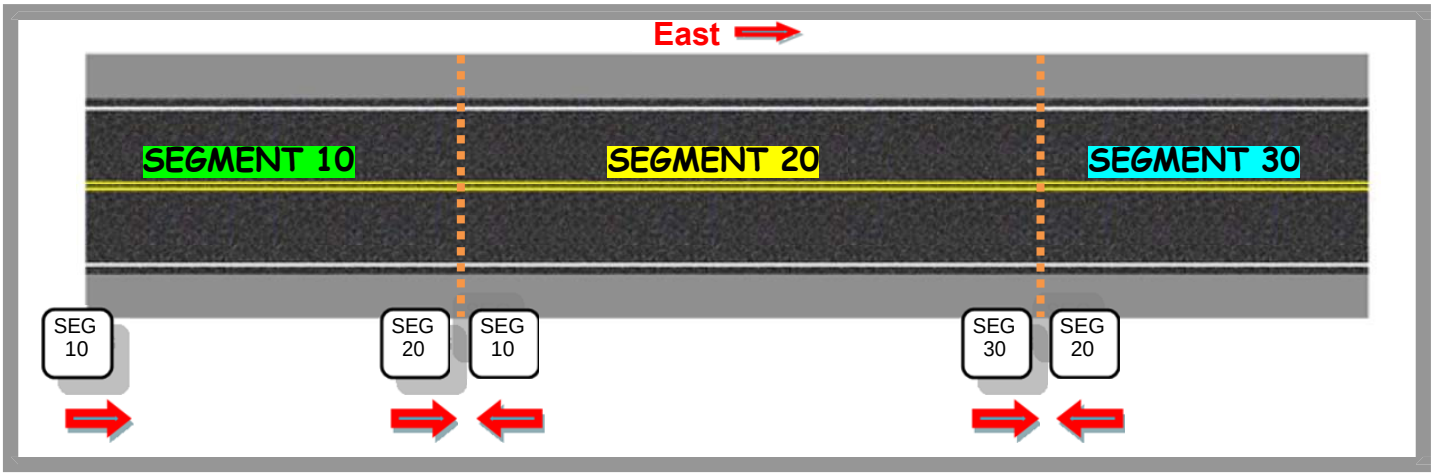


Figure 10-8
Segmentation of an Undivided Roadway

Sequencing of forward and backward facing signs are shown above in Figure 10-8. The forward signs are shown on the left with their corresponding back facing sign shown to the right. On an undivided roadway, the forward and backward signs are mounted on the same pole and are usually placed on the right side of the road in an Easterly or Northerly direction.

In Figure 10-9 you will notice that the westbound signs that are perpendicular to their corresponding eastbound signs, are signed with the segment you are traveling into, not the one you are leaving.

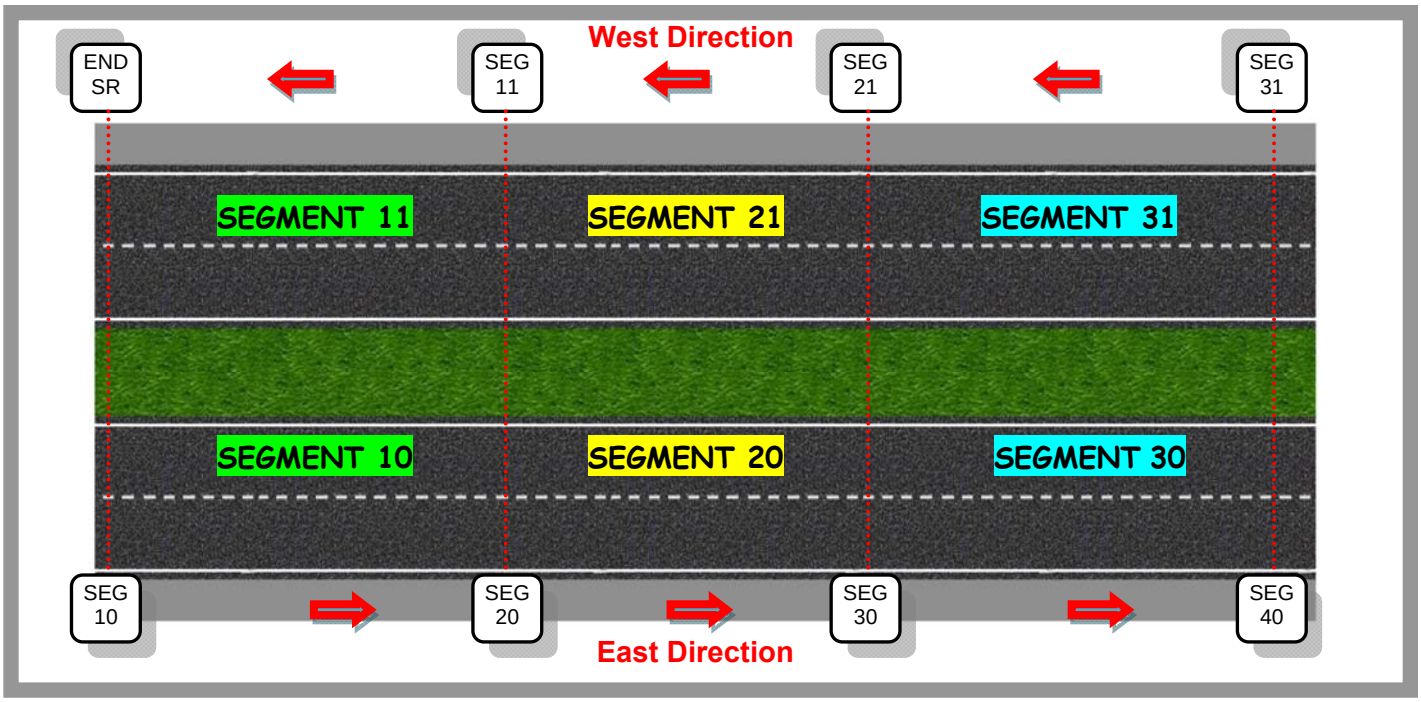


Figure 10-9
Segmentation of a Divided Roadway

Interstate milepost and SR segmentation signing can be complicated. Figure 10-10 illustrates the correct sequence of signing for a particular section of roadway. The westbound segments that are on the milepost will always correspond to the segment that you are entering when driving west.

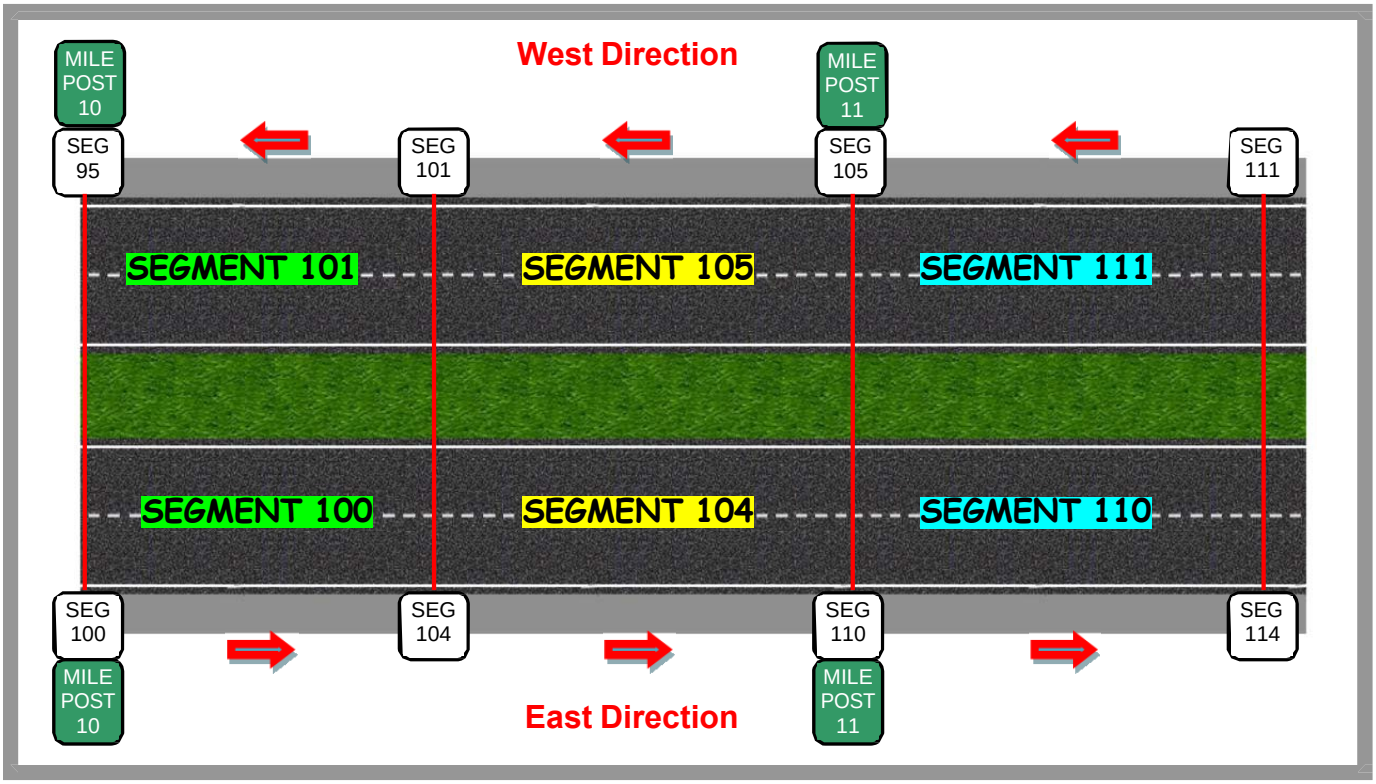


Figure 10-10
Segmentation of an Interstate

On some interstates, there are bridge structures that will have a milepost location on the bridge with an accompanying segment located at the start of the structure, not mounted with the milepost sign. This situation occurs because SR segments cannot change in a structure. They must always occur at the beginning of the structure; therefore, the milepost and segment may not be mounted together.

Whenever an interstate is signed, it is important to keep the milepost exactly one mile apart. It may be necessary in some instance to reference the milepost location by measuring footage from the milepost in the prior state, district, or county to get an accurate placement.

SR Signing at Intersections and on Specific Features

All of the following illustrations represent correct sign placement for the feature or intersection that they are associated with:

Legend

Ideal Sign Placement - SR Segment SR Seg

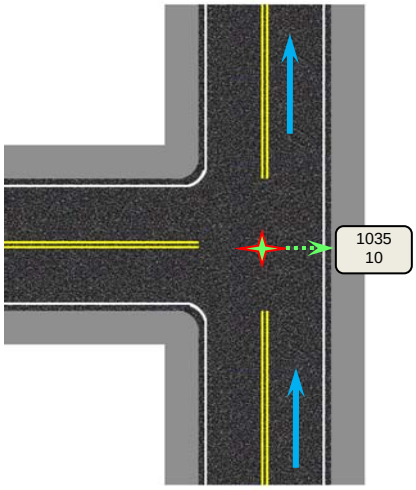
Center Point to Sign Line -

Center Point -

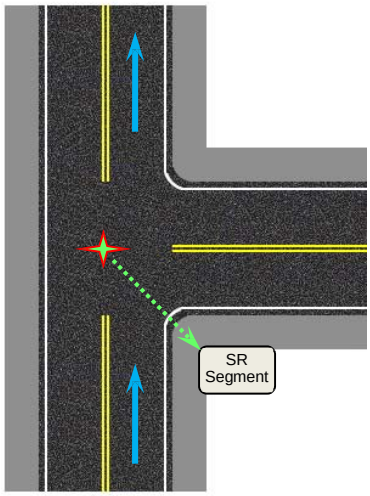
Directional flow of SR being signed -

Acceptable Alternate Sign Placement - SR Segment SR Seg

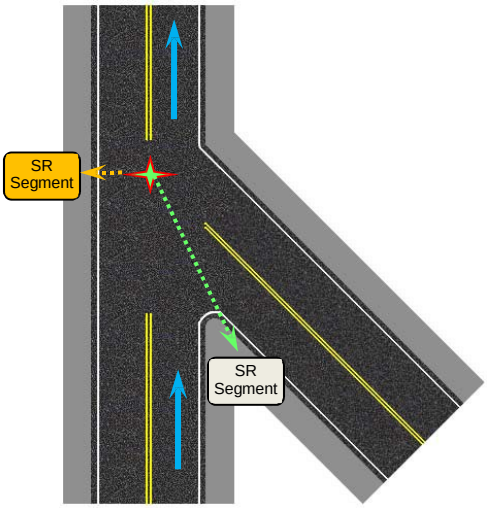
Alternate Center Point to Sign Line -



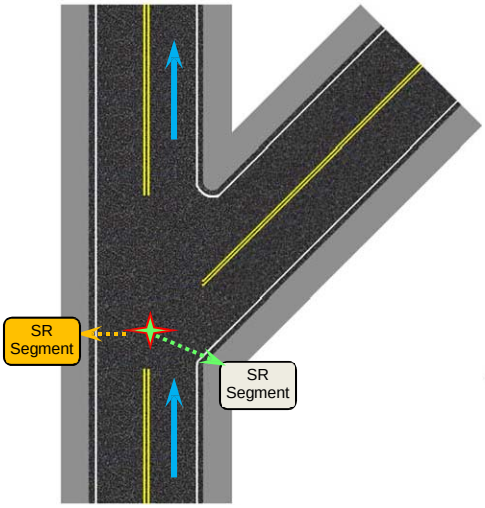
T-Left Intersection



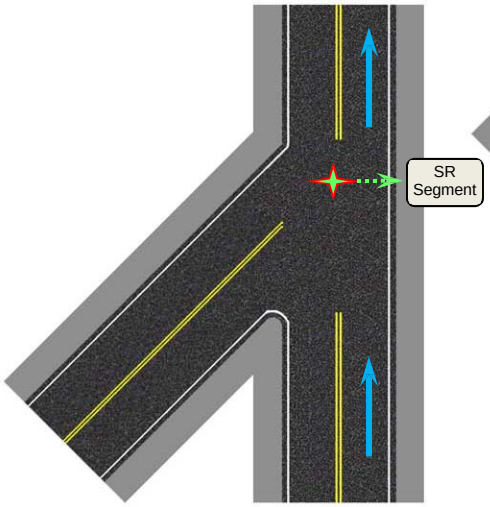
T-Right Intersection



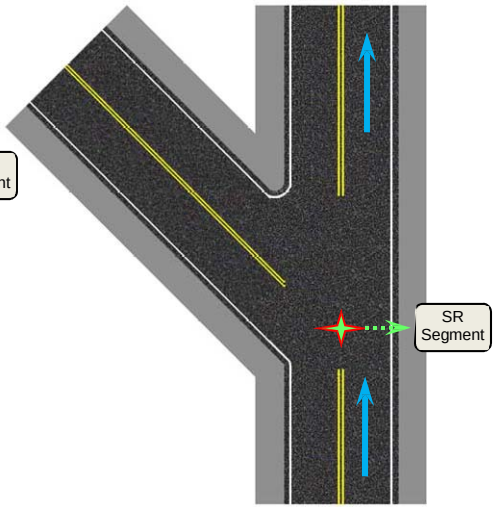
Back Right Intersection



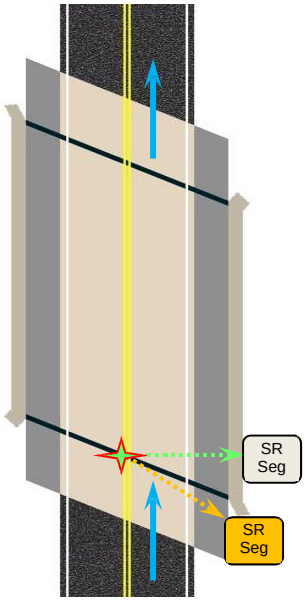
Ahead Right Intersection



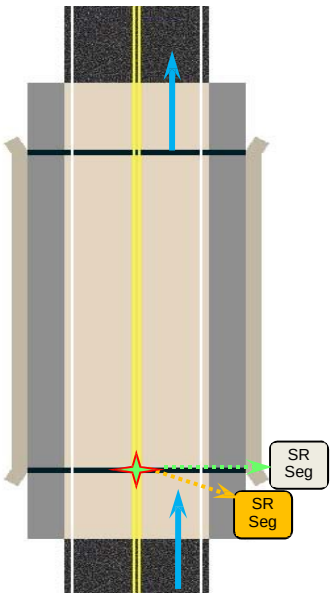
Back Left Intersection



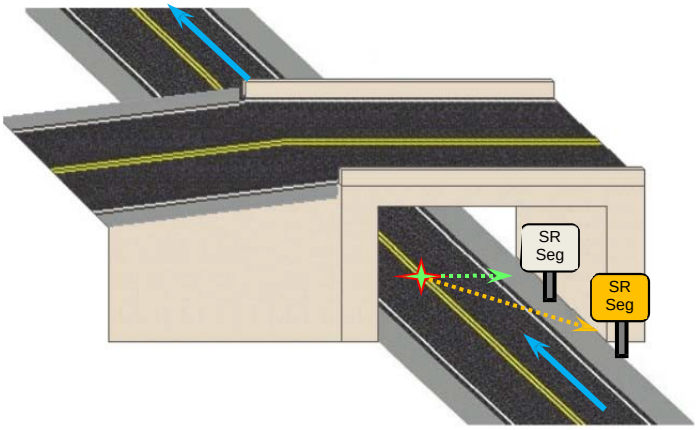
Ahead Left Intersection



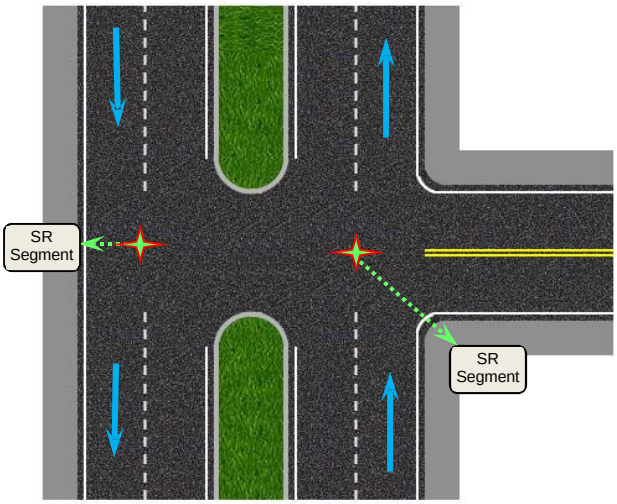
Skewed Bridge



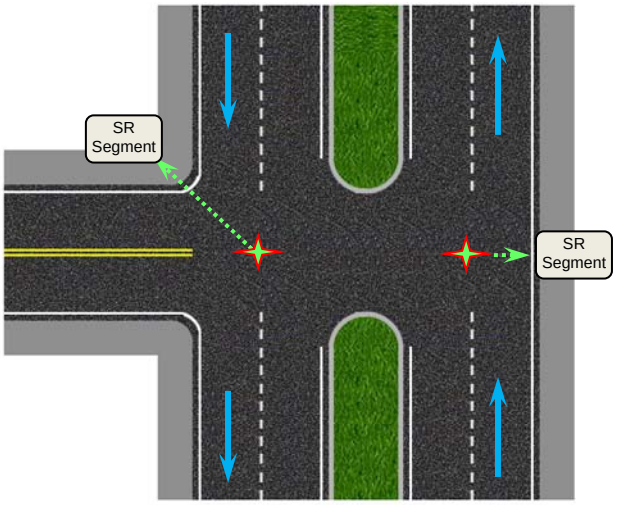
Bridge



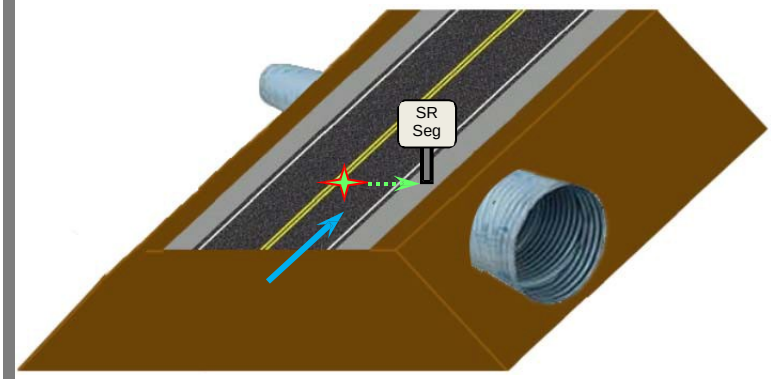
Overpass



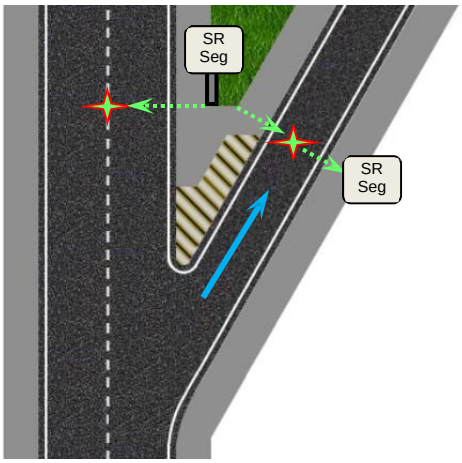
Divided SR with a T-Right Intersection



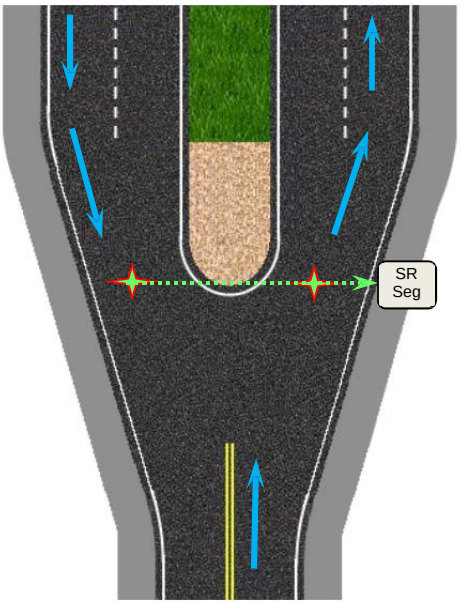
Divided SR with a T-Left Intersection



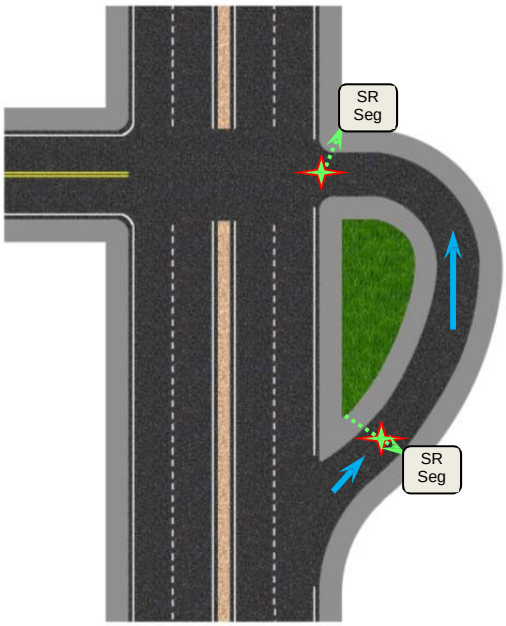
Drainage Pipe and Culverts



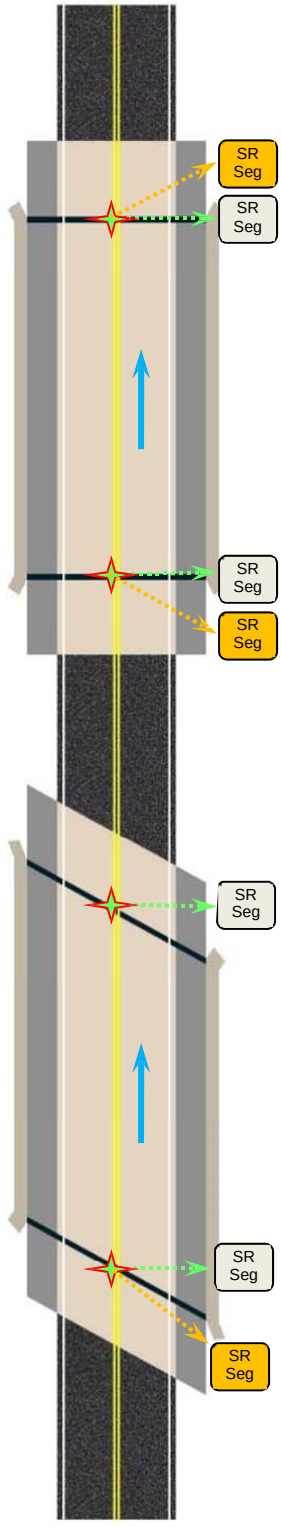
Exit Ramp



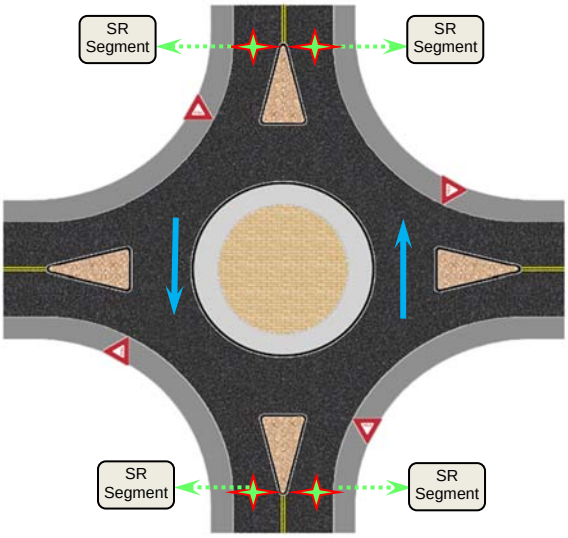
Divided Road Start and End



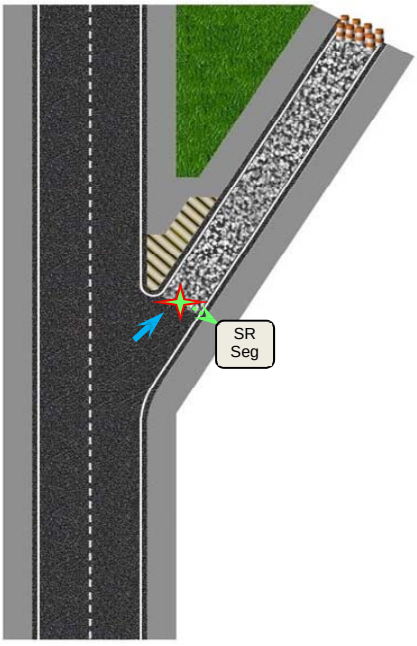
Jug Handle Intersection



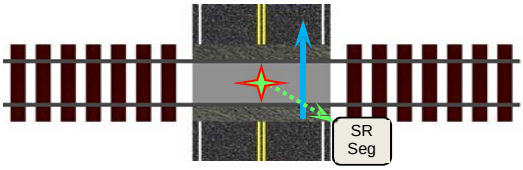
Turnback Bridges



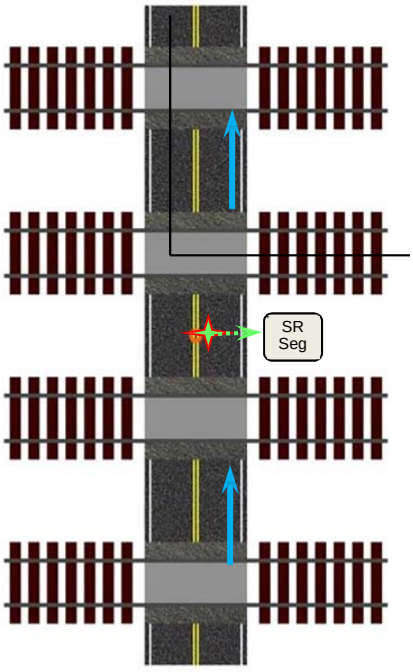
Roundabout or Rotary Intersection



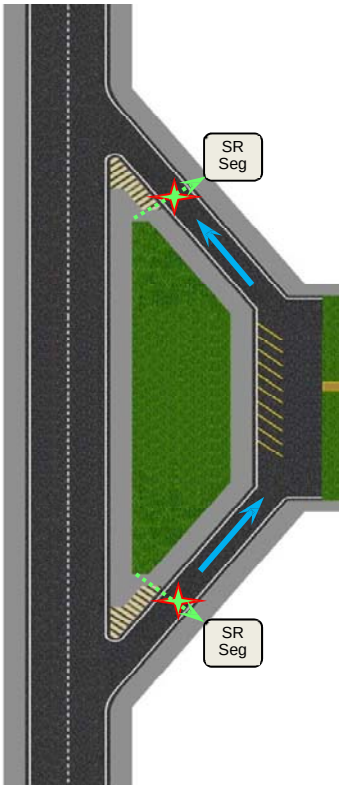
Truck Escape Ramp



Single Railroad Crossing



Multiple Railroad Tracks



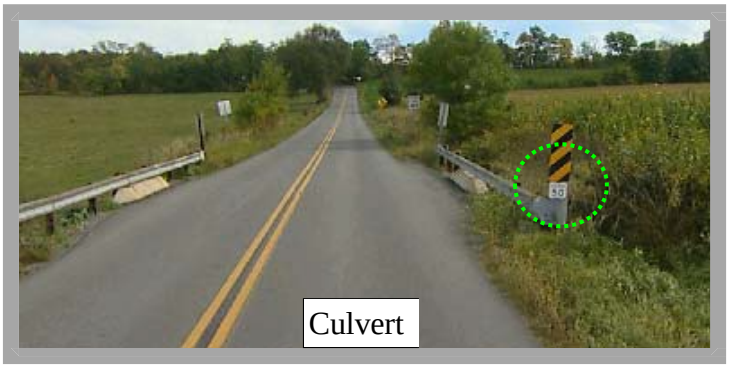
Rest Area Ramps

Real World Sign Placement

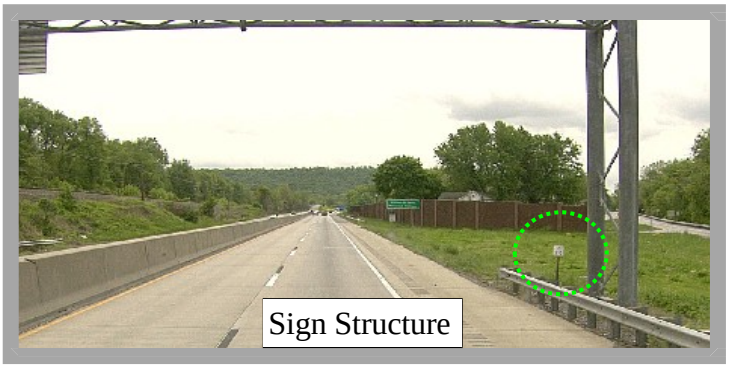
The photographs shown on the next page represent examples of acceptable segment sign placement for different types of intersections and features.

Skewed Overpass

3 Way Intersection

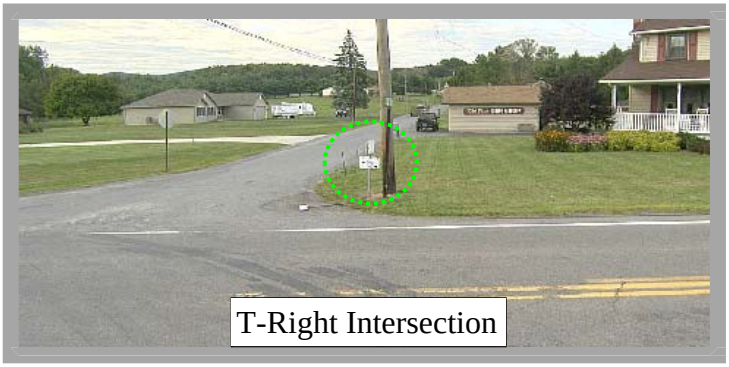


Culvert

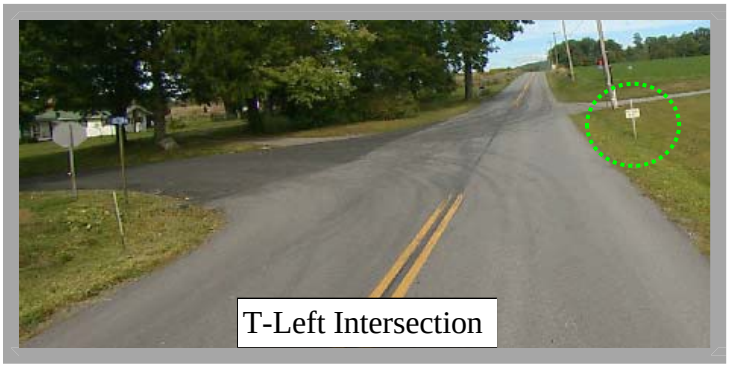


Sign Structure

Skewed Bridge



T-Right Intersection



T-Left Intersection

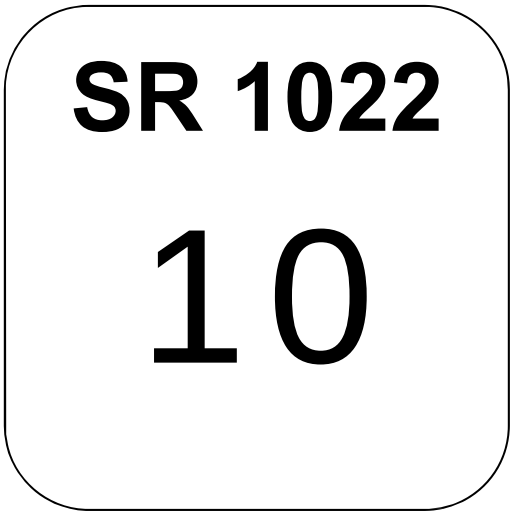
Overpass

Ahead Left/Back Right Intersections

Stand Alone Segment

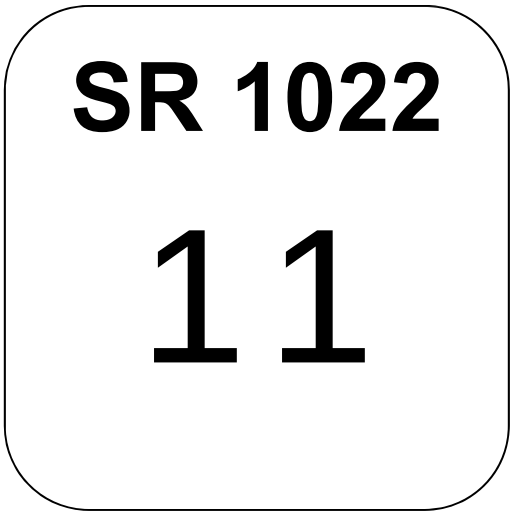
Sign Usage Descriptions

Type-1 Signs

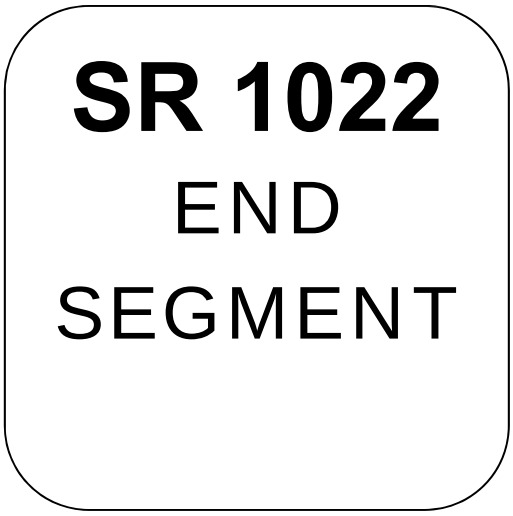


- This sign represents that you are entering segment 10
- Found on an undivided highway or on the EAST or NORTH side of a divided highway
- Offset 0000 will start at the feature associated with the sign or at the point on the road that is perpendicular to the sign

- This sign represents that you are at the ending point of an SR
- Found at the END of any State highway or Ramp
- The ending offset or high offset value will end at the feature associated with the sign or at the point on the road that is perpendicular to the sign



- This sign represents that you are entering segment 11
- Found on the WEST or SOUTH side of a divided highway, can also be found on a one-way street that runs WEST or SOUTH
- The high segment offset will start at the feature associated with the sign or at the point on the road that is perpendicular to the sign

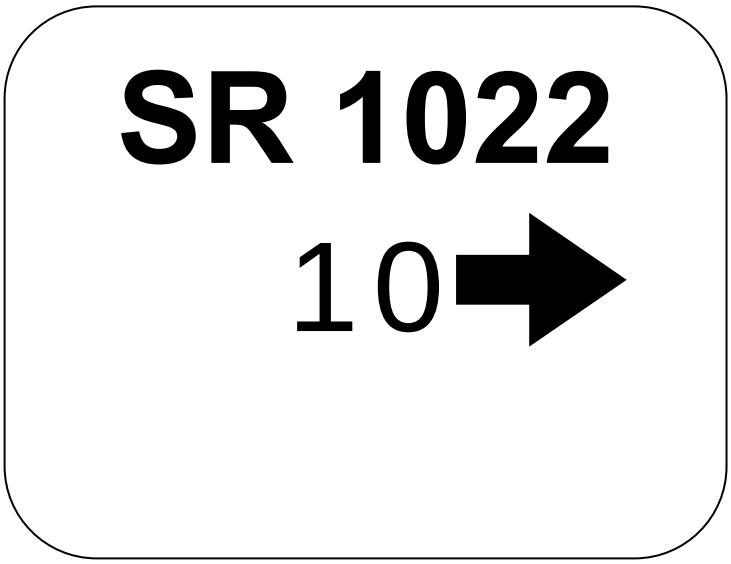


- This sign represents that you are at the end of the current segment of the SR you are on
- Found most commonly at the end of a bridge or municipal line on an SR that has been partially turned back
- The ending offset or high offset value will end at the feature associated with the sign

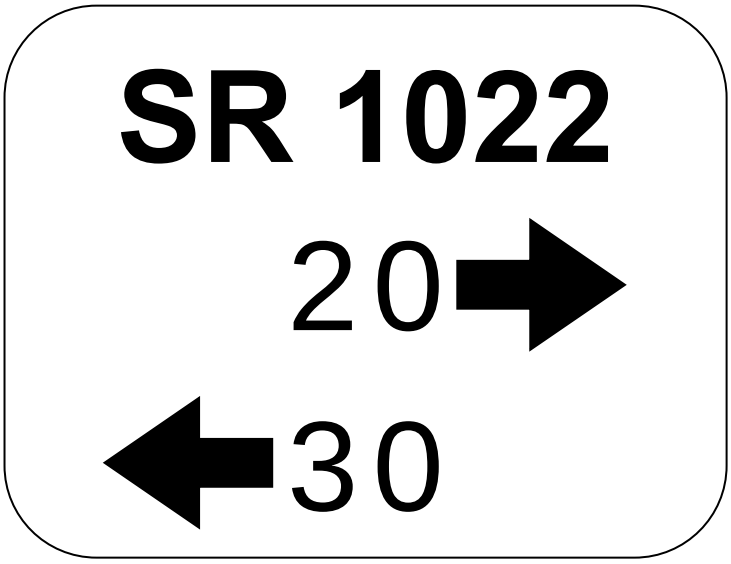
- This sign represents that you are at the beginning point of a ramp
- Offset 0000 will start at the gore area associated with the sign

- This sign represents that you are at the high offset of segment 501
- This type of sign is used strictly on the WEST or SOUTH SIDE of a DIVIDED HIGHWAY
- This sign gives you the high offset of the segment you're entering

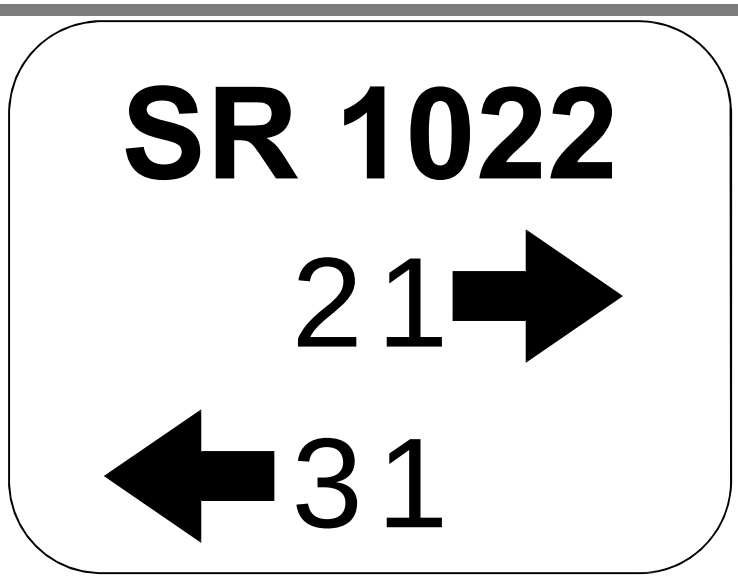
Type-2 Signs



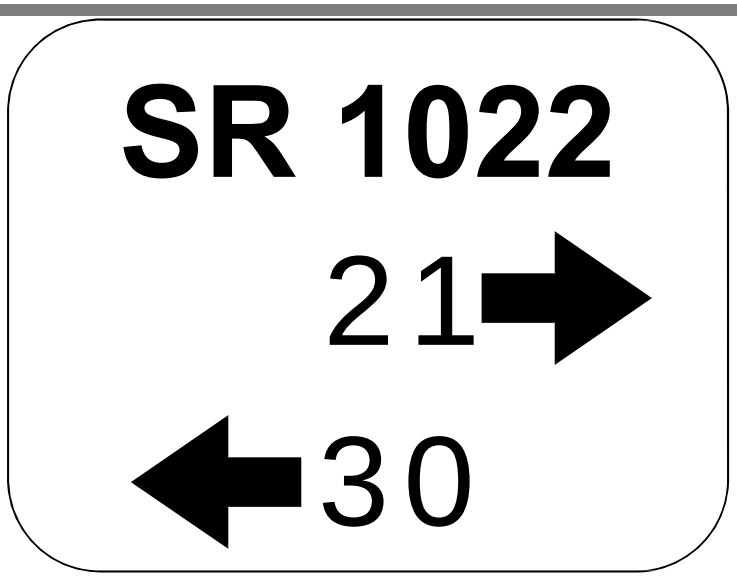
- This sign represents that you are at an intersection and segment 10 is to your right
- Offset 0000 will start at the intersection point of the road you are on and the road to your right
- This type of sign may be found on divided or undivided intersections of at least two SR's



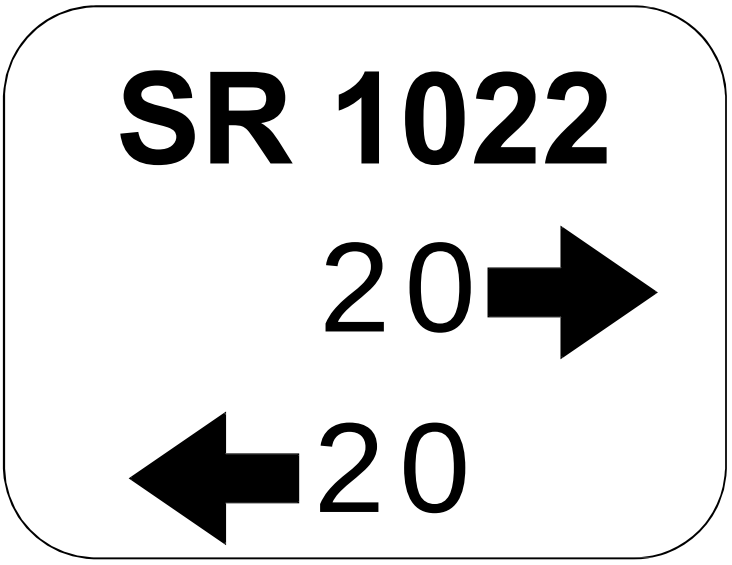
- This sign represents that you are at an intersection and segment 20 is to your right and segment 30 is to your left
- Segment 30 offset 0000 will start at the intersection point of the road you are on and the road to your left
- Segment 20 at its high offset will start at the intersection point of the road you are on and the road to your right
- This type of sign may be found on an undivided intersection of at least 2 SR's



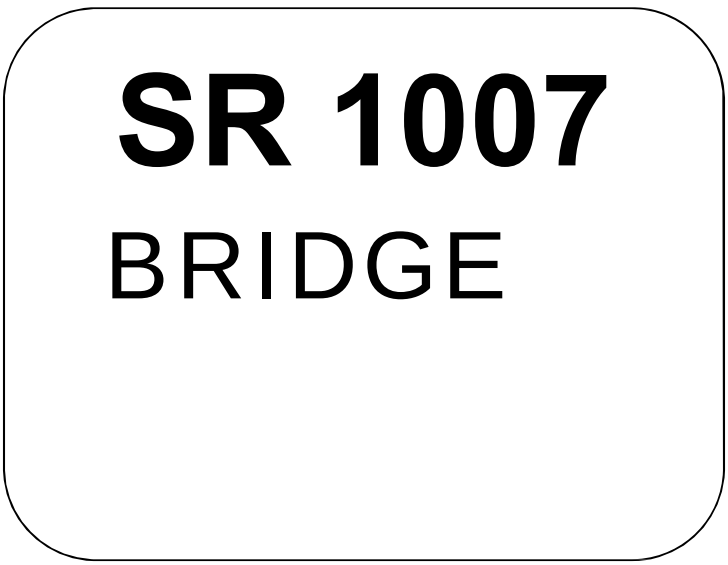
- This sign represents that you are at an intersection of a divided highway and segment 21 is to your right and segment 31 is to your left
- Segment 31 offset 0000 will start at the intersection point of the road you are on and the road to your left
- Segment 21 at its high offset will start at the intersection point of the road you are on and the road to your right
- This type of sign may be found on divided intersections of at least 2 intersecting SR's



- This sign represents that you are at an intersection of a divided highway and segment 30 is to your left and segment 21 is to your right
- Segment 30 offset 0000 will start at the intersection point of the road you are on and the road to your left
- Segment 21 at its high offset will start at the intersection point of the road you are on and the road to your right
- This type of sign may be found on divided intersections of at least 2 intersecting SR's



- This sign represents that you are at an intersection and segment 20 is to your right and left and that segment 20 does not start at the intersection
- This type of sign may be found on a divided or undivided intersections of at least 2 SR's



- This sign represents that you are at an intersection of a state road and a local road
- The bridge indicator means that there is a state-owned bridge on the local road that the arrow is pointing towards
- This type of sign is found on divided or undivided intersections of an SR and a local road

SR Segment Signing Example

An example of how a typical SR (1005) and the SR's that intersect it would be signed.

Legend

Segment Change Point

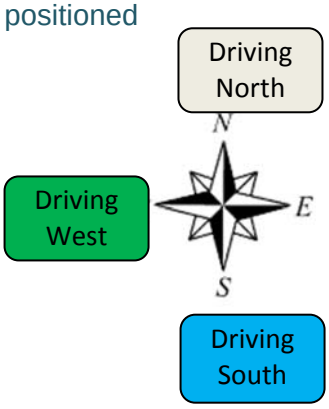
Single Type-2 Sign

Back to Back Type-2 Signs

Single Type-1 Sign

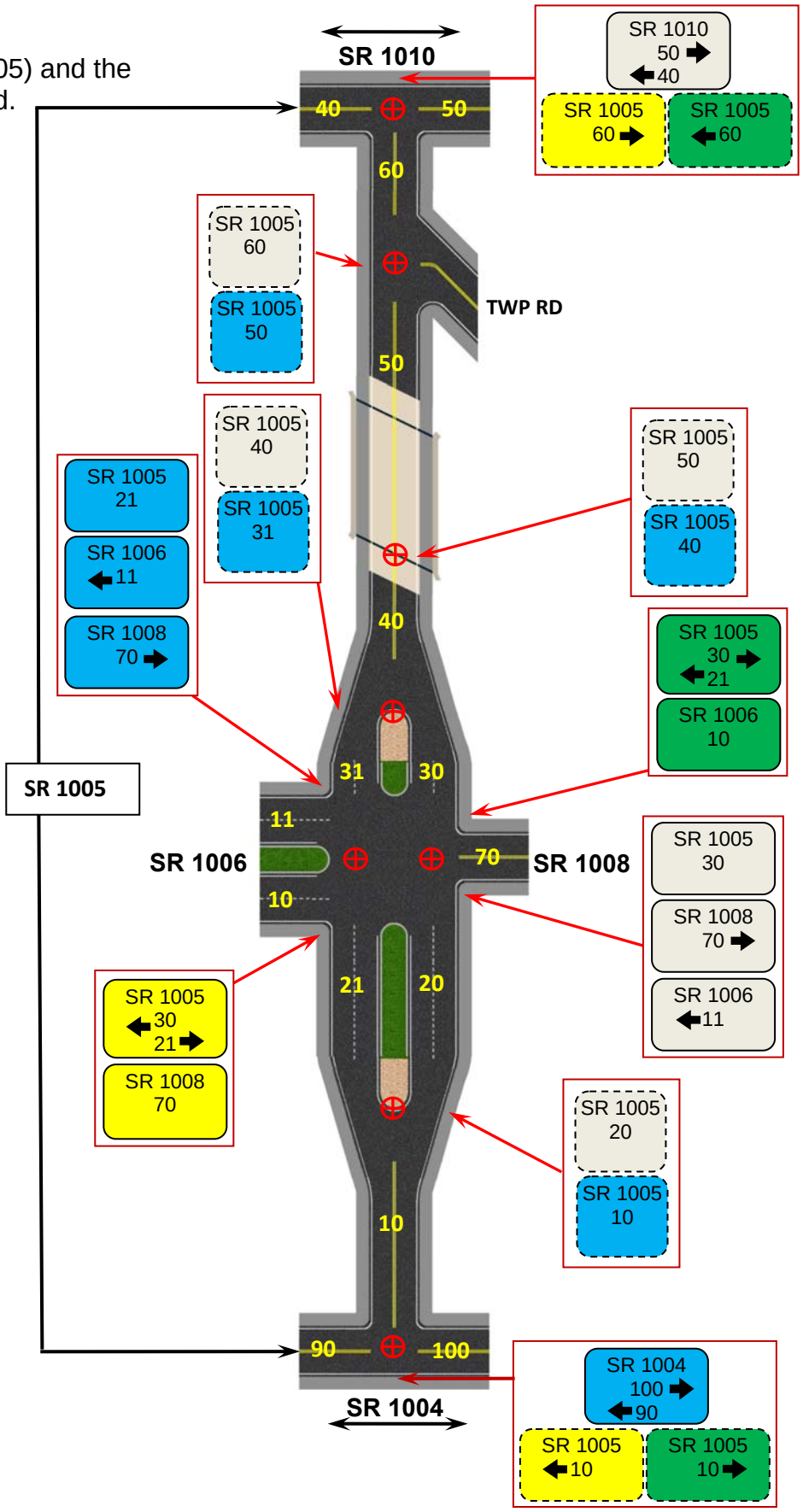
Back to Back Type-1 Signs

Color coded direction that the segment signs are intended to be read or be positioned



Note: *Arrows on the Blue or South signs are shown in a North perspective for illustration purposes.*

Note*: Color is not intended to be taken literally, all signs are white and with black characters*



Ordering SR Signs

Sign Information:

1. Order the required 18” x 12” and 10” x 10” SR\segment signs from current Traffic Sign Contract No. 4600008263 (contract number may change over time).

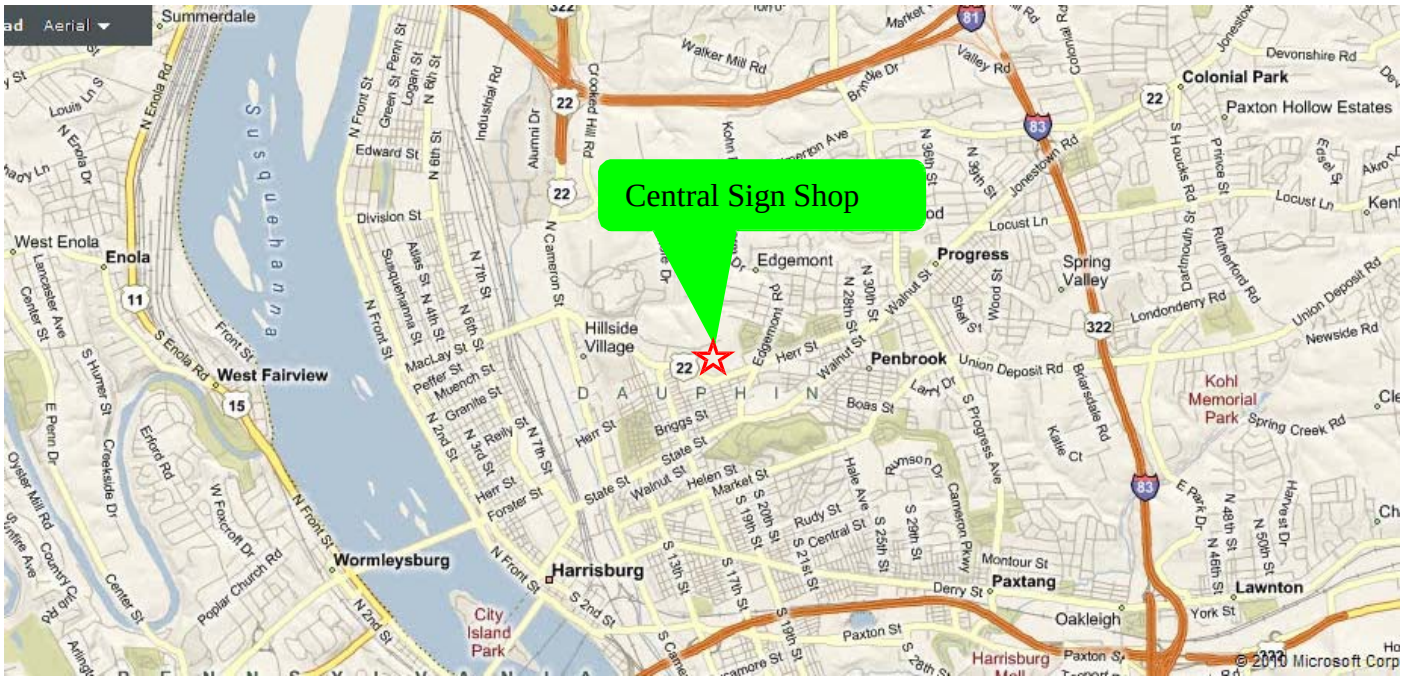
2. Central Sign Shop has blank 18” x 12” and 10” x 10” SR\segment signs available.

   Ordering Specifications:
   - 10x10 - 307942 nomenclature C1-2
   - 18x12 - 307943 nomenclature C2-2

3. Characters on signs can be either stenciled or directly applied with prepositioned letters and numbers. To re-use SR signs, place white non-reflective and pressure- sensitive overlay on the sign then use direct-applied prepositioned letters and numbers.

Contact Information:

Location: PennDOT Sign Shop Distribution Center
21st & Herr Streets, Harrisburg, PA 17033
Phone: (717) 787-6105



The sign shop is currently a destination pickup for PennDOT’s Pony Express delivery trucks.

This manual is produced by the Bureau of Maintenance & Operations, Roadway Information & Testing Unit (RITU). Any information found in this manual that seems to be in error, can be immediately addressed by contacting RITU directly at either of the following numbers:

(717) 783-6843

or

(717) 783-0172

If you would like to see additional information included in future publications of this manual, please use the same contact numbers shown above.

APPENDIX A:

Divided Roadway Flowchart

Divided Roadway Flowchart