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Managing Ancillary Pavements: A Survey of Practice and Related Resources

The purpose of this TRS is to serve as a synthesis of pertinent completed research to be used for further study and evaluation by MnDOT. This TRS does not represent the conclusions of either CTC & Associates or MnDOT.

Introduction

MnDOT is interested in learning how other transportation agencies manage ancillary pavements that are not part of the main roadway. Examples of these ancillary pavements include:

- Shoulders.
- Ramps.
- Turn lanes.
- Frontage roads.
- Crossover pavements.
- Rest area pavements.
- Weigh station pavements.

Of specific interest are federal guidelines for managing these pavement assets along with transportation agency practices to inventory and track the condition of ancillary pavements, measures and targets that track agency performance in managing these assets, and how these pavements are addressed in programming and investment decisions.

To support this effort, CTC & Associates conducted a survey of transportation agencies and a literature search to identify management practices associated with ancillary pavements.

Summary of Findings

This Transportation Research Synthesis is divided into two sections:

- Survey of Practice.
- Related Resources.

Survey of Practice

An online survey was distributed to state department of transportation asset management contacts and representatives from transportation agencies in Canada, Norway, Denmark and Finland to gather information about the management of ancillary pavements, including inventory practices, condition tracking and the consideration of ancillary pavements when making programming and investment decisions.

Twenty-one state DOTs and one Canadian transportation agency submitted complete responses to the survey; two additional state DOTs provided information but did not complete the survey. Unlike the examination of publicly available literature conducted for this project, which identified relatively little documentary evidence of transportation agency practices to manage ancillary pavements, survey respondents provided a wealth of information. However, the depth and breadth of responses varied widely. For this reason, there are some gaps in information that could be addressed in follow-up contacts to survey respondents.

The online survey gathered information in seven topic areas:

- Managing ancillary pavements—inventory and condition tracking.
- Use of asset management tracking tools.
- Use of pavement management software programs.
- Measures and targets for ancillary pavements.
- Addressing ancillary pavements in programming and investment decisions.
- Accounting for the cost of ancillary pavement in pavement management systems.
- Related documents.

The following summarizes findings in each topic area.

Managing Ancillary Pavements—Inventory and Condition Tracking

Respondents were asked to identify their practices to inventory and track the condition of the following classes of ancillary pavement:

- Shoulders.
- Ramps.
- Turn lanes.
- Frontage roads.
- Crossover pavements.
- Rest area and weigh station pavements.
- Other ancillary pavements.

Turn lanes were the most commonly managed of the ancillary pavement classes identified above, with 18 agencies reporting practices to inventory, track condition or both. Seventeen agencies provided information about their practices to manage shoulders, and 16 agencies described management practices for ramps. In many cases, agencies manage ramps in the same way they manage shoulders. Fourteen agencies reported on their management practices for frontage roads. If an agency includes a frontage road in its inventory, it is more likely to also track its condition as compared to other ancillary pavement classes.

Only six respondents reported inventorying crossover pavements. All but one of these agencies also gathers condition data for at least some crossover pavements. Rest area and weigh station pavements are treated similarly by many survey respondents. Nine agencies inventory and/or collect condition data on rest area pavements, while seven agencies reported some type of management of weigh station pavements. When asked about management practices for other types of ancillary pavements, two states—Rhode Island and Washington—addressed park-and-ride lots, and Pennsylvania DOT noted that it maintains the same data on truck escape ramps as it maintains for other ramps.

Use of Asset Management Tracking Tools

Twelve respondents use an asset management tracking tool. The most commonly used tool is an in-house system, though a few respondents using an in-house system indicated plans to move to a vendor-supplied solution. Two agencies—Arizona and Alberta—use a pavement management system as their asset management tracking tool, and Georgia DOT uses a vendor system in conjunction with two in-house programs. Only five of the 12 agencies—Alabama, Alberta, Maryland, Pennsylvania and Rhode Island—enter data for ancillary pavements in their asset management tracking tools.

Use of Pavement Management Software Programs

All but one respondent—Missouri DOT—reported the use of a pavement management system. The most commonly used programs among respondents are dTIMS (Deighton Associates Limited) and Pavement Analyst (AgileAssets). Among the 21 agencies using a pavement management system, approximately half—10 agencies—enter condition data for ancillary pavements in the program.

Measures and Targets for Ancillary Pavements

Five state DOTs—Alabama, Arizona, Maryland, Missouri and Texas—have established measures and targets for ancillary pavements. Three of the five limit measurement to specific ancillary pavement classes. The Texas DOT goal of 90 percent of the agency's pavements in good condition includes frontage roads, and Missouri DOT includes outer roads (frontage roads) in its measures and targets. In Maryland, ramps, routes less than 1 mile long and service roads are incorporated into annual performance targets if the agency has historical construction information. Only Arizona DOT reported that its measures and targets are part of an overall system condition assessment.

Addressing Ancillary Pavements in Programming and Investment Decisions

When asked how they address ancillary pavements in programming and investment decisions, the most common practice among respondents is to include one or more of the ancillary pavement classes with mainline pavements or adjacent projects. Four agencies—Florida, Nebraska, North Carolina and Tennessee—do not include ancillary pavements in programming and investment decisions. While Tennessee DOT does not currently address ancillary pavements when making these decisions, the respondent indicated that the agency is moving toward this practice.

Financial Implications

There was little consensus among respondents with regard to how ancillary pavements affect finances when including these pavements in programming and investment decisions. Two agencies have a proactive approach to addressing ancillary pavement improvements. In Washington, a paving model includes the cost of paving ancillary pavements, and Rhode Island DOT includes ancillary pavements as a percentage factor in the agency's pavement management program. Other agencies noted that additional funding is required to treat ancillary pavements, or highlighted funding limitations and the relationship of ancillary pavements to mainline improvements when financing pavement-related projects.

How Decisions are Made

When asked how they decided to include ancillary pavements in programmed pavement projects, respondents were almost evenly split between making these determinations on a case-by-case basis and programming ancillary pavements with mainline or adjacent pavement projects. In Alabama, age, deterioration and distribution are considered when deciding to include ancillary pavements in programmed pavement projects.

Accounting for the Cost of Ancillary Pavement in Pavement Management Systems
Nine state DOTs do not account for the cost of ancillary pavement in their pavement management systems. All but one of the remaining respondents were split between including ancillary pavement costs as part of mainline projects and a more limited inclusion of costs for certain classes of ancillary pavement. Alabama DOT accounts for ancillary pavement costs separately.

Related Documents
A few respondents provided supporting documentation, including a Caltrans report that describes the agency's approach to evaluating some of the ancillary pavements considered in this report. A North Dakota DOT manual discusses pavement investment strategies, and a Tennessee DOT field inspection manual describes how the agency assesses shoulders and ramps.

Related Resources

Unlike the survey, the literature search netted little information about the management of the broader class of ancillary pavement assets. Among the ancillary pavements of interest to MnDOT, only shoulders were referenced in multiple sources.

National Guidance

Two NCHRP reports that provide guidance on collecting and maintaining inventory and condition data for asset management note the challenges associated with gathering data outside the bridge and pavement areas. A 2012 report indicated that among a small group of state DOT interviewees, inventory data was maintained for shoulders, but condition or performance data was less likely to be available, and useful life data was rarely maintained. In a 2009 report, only shoulders are among the ancillary pavements recommended for data collection to measure performance. The data collected for shoulders is not considered part of the core measures state DOTs should be capable of capturing. A 2012 NCHRP synthesis considers both pavements and shoulders to be part of the Road Surface category for management purposes, and a 2007 guide produced in connection with an NCHRP project includes survey results that show that more than 80 percent of the 35 agencies surveyed monitor paved shoulder condition.

State Practices

The most extensive assessment of ancillary pavements appears in two documents produced by Alabama DOT. A manual providing guidance for staff maintaining Alabama DOT's roadway asset inventory includes sections on paved shoulders, paved turn lanes, and asphalt crossover and service roads. A second document provides clarification of condition assessment practices, addressing the collection of condition data for shoulders, paved turnouts and crossovers, and turn lanes.

Other documents that address ancillary pavement management practices in Florida, Louisiana, Mississippi, New Jersey, North Carolina, Pennsylvania and Wisconsin DOTs do so in a more limited manner. Some highlights of these practices follow:

- In Louisiana, a pilot transportation asset management plan indicates that data sets for shoulders and ramps are limited and require either "improvement" or additional cycles of data collection.
- Mississippi DOT's pavement management system appears to include inventory data on turn lanes and shoulders. A data collection manual provides inspection procedures for paved shoulders.
- North Carolina DOT's 2012 Pavement Condition Survey Manual provides direction for staff rating the condition of state-maintained roads, which includes shoulders but not ramps and turn lanes. The manual provides the rating system used to assess shoulders.
- Compass, Wisconsin DOT's statewide maintenance quality assurance program, includes maintenance targets for paved shoulders with regard to drop-off/buildup, cracking and potholes/raveling.

Next Steps

MnDOT might consider the following as it continues its examination of the management of ancillary pavements:

- Prioritizing ancillary pavements to determine which pavement class to inventory first. Consider focusing on ramps and loops as a first priority, followed by shoulders.
- Developing a scope for collecting condition data on ancillary pavements.
    - Consider how the data will be used, how frequently it should be collected, and how much it will cost to gather and maintain the data.
    - Begin with an initial inventory developed by Dan Flatgard, MnDOT Office of Maintenance, and collect condition data for the same data set.
    - Begin data collection with Metro District ancillary pavements given the district's size, assumed pavement condition and past management practices.
- Developing a rating system and performance measures that can be used during the inventory process.
    - Focus on the development of performance measures in the short term, delaying development of targets for ancillary pavements.
    - While ride quality may not be appropriate, consider faulting and cracking when developing performance measures for ancillary pavements.

Detailed Findings

Survey of Practice

Survey Approach

An online survey was distributed to state department of transportation asset management contacts available on the Federal Highway Administration website (see fhwa.dot.gov/infrastructure/asstmgmt/amcontacts.cfm) and representatives from transportation agencies in Canada, Norway, Denmark and Finland. The survey sought information about the management of ancillary pavements, including inventory practices, condition tracking and the consideration of ancillary pavements when making programming and investment decisions.

The survey consisted of the following questions:

1. Please describe how your agency inventories each of the ancillary pavements identified below. Please include in your answers how often you update the inventory for each ancillary pavement asset.
    - Shoulders.
    - Ramps.
    - Turn lanes.
    - Frontage roads.
    - Crossover pavements.
    - Rest area pavements.
    - Weigh station pavements.
    - Other ancillary pavements (please identify).
2. How does your agency track the condition of each of the ancillary pavements identified below? Please include in your answers:
    A. The type of condition data collected.
    B. How often data is collected.
    C. Who is responsible for data collection.
        - Shoulders.
        - Ramps.
        - Turn lanes.
        - Frontage roads.
        - Crossover pavements.
        - Rest area pavements.
        - Weigh station pavements.
        - Other ancillary pavements (please identify).
3. Does your agency use an asset management tracking tool?

3a. What tool do you use?

3b. Do you enter condition data for ancillary pavements in your asset management tracking tool?

4. Does your agency use a pavement management software program?

4a. What software program do you use?

4b. Do you enter condition data for ancillary pavements in your pavement management software?

5. Has your agency established measures and targets for ancillary pavements?
6. How does your agency address ancillary pavements in programming and investment decisions?

6a. Please describe the financial implications of these decisions.

6b. How does your agency decide whether or not to include ancillary pavements in programmed pavement projects?

7. How is the cost of the ancillary pavement accounted for in your pavement management software?
8. Do you have documents, Web pages or other materials you can share that relate to your management of ancillary pavements?
9. Please use this space to provide any additional comments about your answers above.

Twenty-one state DOTs and one Canadian transportation agency—the Alberta Ministry of Transportation—submitted complete responses to the survey. The state DOTs responding to the survey were:

- Alabama.
- Arizona.
- California.
- Colorado.
- Delaware.
- Florida.
- Georgia.
- Iowa.
- Kentucky.
- Maryland.
- Missouri.
- Nebraska.
- New Mexico.
- North Carolina.
- North Dakota.
- Pennsylvania.
- Rhode Island.
- South Dakota.
- Tennessee.
- Texas.
- Washington.

Two state DOTs—Louisiana and Wyoming—provided information but did not complete the survey.

Summary of Survey Results

Survey respondents provided a wealth of information, though the depth and breadth of the respondent feedback varied greatly. Summary tables are used in this report to organize and present much of the information provided in survey responses. These tables lack details in certain areas when a survey respondent provided limited information or opted to focus on other issues.

The online survey gathered information in the following topic areas:

- Managing ancillary pavements—inventory and condition tracking.
- Use of asset management tracking tools.
- Use of pavement management software programs.
- Measures and targets for ancillary pavements.
- Addressing ancillary pavements in programming and investment decisions.
- Accounting for the cost of ancillary pavement in pavement management systems.
- Related documents.

The full text of the survey responses appears in **Appendix A** of this report.

Following is a summary of findings by topic area.

Managing Ancillary Pavements—Inventory and Condition Tracking
Respondents were asked to identify their practices to inventory and track the condition of the following classes of ancillary pavement:

- Shoulders.
- Ramps.
- Turn lanes.
- Frontage roads.
- Crossover pavements.
- Rest area and weigh station pavements.
- Other ancillary pavements.

Turn lanes were the most commonly managed of the ancillary pavement classes identified above, with 18 agencies reporting practices to inventory, track condition or both. Seventeen agencies provided information about their practices to manage shoulders, and 16 agencies described management practices for ramps. Fourteen agencies reported on their management practices for frontage roads, and only six respondents inventory crossover pavements. All but one of these agencies also gathers condition data for at least some crossover pavements. Rest area and weigh station pavements are treated similarly by many survey respondents. Nine agencies inventory and/or collect condition data on rest area pavements, while seven agencies reported some type of management of weigh station pavements.

The following provides details of survey responses in each of these ancillary pavement classes.

Shoulders
Seventeen agencies reported inventorying or tracking the condition of shoulders; some agencies do both. Below are additional details from selected survey responses and respondent feedback that may not appear in the summary table that follows:

- Alabama DOT generates a scorecard with grades ranging from A to F in conjunction with annual condition assessment analyses. See page 36 of this report for information about maintenance of Alabama DOT's roadway asset inventory in RoadMAP (Road Maintenance Accountability Program).
- Colorado DOT derives its inventory from as-builds and maintenance inspections, and updates it very rarely. The agency has determined that not enough shoulders change every year to justify a full inventory effort. Condition data is not collected because shoulders do not "drive" surface treatment dollars.
- Florida DOT inventories shoulders—and all other ancillary pavements—on the state highway system and National Highway System, and those ancillary pavements for which Florida DOT has an agreement with an outside agency of the local government to maintain. Visual condition inspections are performed by district maintenance personnel as part of the agency's Maintenance Rating Program. See page 37 of this report for a citation from the 2015 Florida DOT Maintenance Rating Program Handbook, which describes how to rate flexible and rigid paved shoulders.
- In Louisiana, a one-time data collection effort in 2011 captured shoulder width and surface type to update an old data system. This data is used strictly for inventory purposes and is not included in the agency's pavement management system. The agency has no current plans to include this shoulder data in its asset management system.
- Tennessee DOT uses a Maintenance Rating Index to assess its shoulders. This program is being redesigned to provide five levels of service (A through F) to replace the current pass/fail ratings.

The following table summarizes survey responses.

Inventory and Condition Tracking Practices for Ancillary Pavements: Shoulders

Agency	Inventory			Condition Tracking		
	How Inventory Data is Gathered/Maintained	Pavement Features Inventoried	Inventory Frequency	Type of Data Collected	Frequency of Data Collection	Responsibility for Data Collection
Alabama	Data gathered using asset ID, description, build date (if known), priority, road class, county, route type, route number, begin milepost, end milepost, direction and square yards	N/A	Annual	Condition assessment analysis by random sampling method	Annual	Maintenance personnel or designated consultant
Alberta	Included as part of the paved surface; updated from final construction drawings	N/A	N/A	Cracking	Frequency not determined but expect to have 2- to 3-year cycles	Included in automated pavement distress survey trials
California	N/A	N/A	N/A	For paved shoulders: cracks, alligator cracking, potholes and coarse raveling	Annual	Level of Service team
Florida	Performed at the district level and maintained in the centralized Roadway Characteristics Inventory database	N/A	Annually, if on the NHS, SHS or maintained by FDOT through written agreement	Visual	N/A	District maintenance personnel
Georgia	N/A	Width included in resurfacing information	N/A	Collected by sampling one-tenth of every mile of roadway	Condition assessments for all pavements on the mainline will be captured biennially beginning in 2015	Assessments done at district and area levels and quality checked by the State Maintenance Office
Kentucky	Information stored in Highway Information System database	Seven types: No Shoulders Exist, Paved, Concrete, Stabilized, Combination, Earth and Curbed.	Updated continually when notified of or find on-the-ground changes	Evaluated on good/fair/poor basis	Annually for Interstate and parkways; all other shoulders part of annual random sampling in conjunction with Maintenance Rating	Operations and Pavement Management Branch

Inventory and Condition Tracking Practices for Ancillary Pavements: Shoulders

Agency	Inventory			Condition Tracking		
	How Inventory Data is Gathered/Maintained	Pavement Features Inventoried	Inventory Frequency	Type of Data Collected	Frequency of Data Collection	Responsibility for Data Collection
		Four offsets: Cardinal Right, Non-Cardinal Right, Cardinal Left and Non-Cardinal Left.			Program	
Maryland	Construction activities incorporated with all pavement management construction history upon completion of construction	Inventory shoulder location and width	Annual	Not collected	N/A	N/A
Missouri	Shoulders captured along with lane data	N/A	Change or addition is initiated by completion of a roadway project; occasional statewide reviews	Not collected	N/A	N/A
Nebraska	Data stored in Integrated Highway Inventory database	Shoulder width, thickness and type of surface	Information updated based on construction plans	Rated on a scale of 1 to 10, with 10 being new	Annual visual inspections	Roadway Asset Management section
New Mexico	N/A	Width of left and right shoulders from edge of paint to edge of pavement. Shoulder type (i.e., asphalt, concrete, stabilized, combination, unpaved).	Data collected in 2013	Not collected	N/A	N/A
North Carolina	Derived from current aerial photography, "as-built" project plans, "Let" project plans, Petitions and Municipal Agreements, and other	N/A	After construction projects are completed and documentation from them is provided	Secondary routes: Windshield survey Primary routes: Automated distress collection van	Annual	Pavement Management Unit responsible for data collection; data collection contracted out

Inventory and Condition Tracking Practices for Ancillary Pavements: Shoulders

Agency	Inventory			Condition Tracking		
	How Inventory Data is Gathered/Maintained	Pavement Features Inventoried	Inventory Frequency	Type of Data Collected	Frequency of Data Collection	Responsibility for Data Collection
	engineering documents. Data entered in Attribute for Road Inventory Database.					
North Dakota	Photo inventory only; images taken from mainline roadway	N/A	N/A	Condition not collected; perspective and ROW images	Collected using survey van in a different direction each year	N/A
Pennsylvania	Maintain history; inventoried with condition surveys	Shoulder type, including paved width and total graded width; right and left shoulders inventoried separately	Width and type inventoried with condition surveys	Condition surveys	Annually on NHS routes and 50% per year for two-year cycle of non-NHS routes	N/A
Rhode Island	Inventory linked with linear referencing system	Shoulder widths	N/A	Visual condition assessment only; condition associated with mainline pavement	Annually or after any significant activity that would impact condition within one-tenth of a mile	Planning Division/Asset Management and Asset Information units responsible for data collection; Construction Division supplies data
Tennessee	Inventoried by LiDAR and photolog; dimensions stored in Tennessee Roadway Information Management System	N/A	Annual: Interstates and NHS routes Biennial: Non-NHS state routes	System condition of shoulders, including cracking, drop-off and other distresses	Sampled monthly and maintained in Maintenance Management System for use in budgeting	Maintenance staff
Texas	Data gathered by district staff	N/A	Annual	Maintenance assessments on a limited sample	Annual	Maintenance Division
Washington	Data housed in WSDOT's database, Transportation Information and	N/A	Updated as needed based on contract information	Shoulder images captured from a windshield perspective	Annual	Pavement Management System staff does not rate these images to determine the "due

Inventory and Condition Tracking Practices for Ancillary Pavements: Shoulders							
Agency	Inventory				Condition Tracking		
	How Inventory Data is Gathered/Maintained	Pavement Features Inventoried	Inventory Frequency		Type of Data Collected	Frequency of Data Collection	Responsibility for Data Collection
	Planning System						year" for resurfacing

Ramps

Sixteen agencies provided information about inventory or condition tracking practices for ramps. In many cases, these practices are similar to the data-gathering efforts for shoulders. Below are additional details from selected survey responses and respondent feedback that may not appear in the summary table that follows:

- The Alberta Ministry of Transportation is currently setting up an inventory for ramps.
- Georgia DOT uses two systems—Computerized Pavement Condition Evaluation System (COPACES) and Georgia Asset Management System (GAMS)—to manage its inventory and track condition data. While a separate inventory is not captured for shoulders or turn lanes (these pavement classes are captured as part of the roadway), ramps are captured as a separate asset in COPACES and GAMS.
- The Louisiana Department of Transportation and Development is capturing the same distress data for ramps that the agency gathers for all its pavements. The respondent noted, however, that International Roughness Index data "is almost impossible to capture since the data is almost always faulty due to low speeds on ramps." The second data collection process for ramps is underway using the agency's ongoing long-term contract with Fugro Roadware (Fugro collects right of way videolog, asset inventory and GPS data for all local roads within Louisiana).
- New Mexico DOT inventoried ramps in 2013 but has not yet gathered condition data.
- In South Dakota, distress data on ramps is collected on occasion when time is available in the fall. The agency has not had time for this data collection effort since 2009.

The table below summarizes survey responses.

Inventory and Condition Tracking Practices for Ancillary Pavements: Ramps							
Agency	Inventory				Condition Tracking		
	How Inventory Data is Gathered/Maintained	Pavement Features Inventoried	Inventory Frequency		Type of Data Collected	Frequency of Data Collection	Responsibility for Data Collection
Alabama	Data gathered using asset ID, description,	N/A	Annual		Not collected	N/A	N/A

Inventory and Condition Tracking Practices for Ancillary Pavements: Ramps

Agency	Inventory			Condition Tracking		
	How Inventory Data is Gathered/Maintained	Pavement Features Inventoried	Inventory Frequency	Type of Data Collected	Frequency of Data Collection	Responsibility for Data Collection
	build date (if known), priority, road class, county, route type, route number, begin milepost, end milepost, direction and square yards					
California	N/A	N/A	N/A	Cracks, alligator cracking, potholes, wheel rutting, coarse raveling and bleeding	Annual	Level of Service team
Delaware	Inventoried as for all state-maintained roads	N/A	N/A	Distress data to include cracking, surface defects, raveling and rutting	Every two years	Pavement management section manages a contract for consultant to collect road distress data
Florida	Performed at the district level and maintained in the centralized Roadway Characteristics Inventory database	N/A	Annually, if on the NHS, SHS or maintained by FDOT through written agreement	Visual	N/A	District maintenance personnel
Georgia	Captured as separate asset in COPACES and GAMS; ramp begins at the point of separation from the mainline roadway (commonly the gore area)	N/A	N/A	Collected by sampling one-tenth of every mile of roadway	Condition assessments for all pavements on the mainline will be captured biennially beginning in 2015	Assessments done at district and area levels and quality-checked by state maintenance office
Kentucky	Information stored in Highway Information System database	N/A	Updated whenever a construction project adds, removes or modifies a ramp	Not collected	N/A	N/A

Inventory and Condition Tracking Practices for Ancillary Pavements: Ramps						
Agency	**Inventory**			**Condition Tracking**		
	How Inventory Data is Gathered/Maintained	**Pavement Features Inventoried**	**Inventory Frequency**	**Type of Data Collected**	**Frequency of Data Collection**	**Responsibility for Data Collection**
Maryland	Included with annual inventory collection	N/A	Annual	Pavement condition to include IRI, rutting, cracking and cross slope; also friction data	Three-year cycle for pavement condition; two-year cycle for friction data measured on ramps at least one-quarter mile long	Included with annual inventory collection
Missouri	N/A	Number lanes, lane width, age and surface type	Updates initiated by completion of projects	Not collected	N/A	N/A
Nebraska	Data stored in Integrated Highway Inventory database	Width, thickness and type of surface	Updated based on construction plans	IRI, rutting, faulting and cracking	Interstate ramps every other year; plan to start collecting freeway and expressway ramps	N/A
North Carolina	Derived from current aerial photography, "as-built" project plans, "Let" project plans, Petitions and Municipal Agreements, and other engineering documents. Data entered in Attribute for Road Inventory Database.	N/A	After construction projects are completed and documentation from them is provided	Not collected	N/A	N/A
North Dakota	Photo inventory only; images taken from associated mainline and crossover roadways	N/A	N/A	Condition not collected; photo images and field observation are primary methods of monitoring	Condition data collected in 2009; perspective and right of way images from survey van collected in a different direction each year	N/A
Pennsylvania	Maintain history	Length and width of ramp and configuration	Data updated when maintenance or	Not collected	N/A	N/A

Inventory and Condition Tracking Practices for Ancillary Pavements: Ramps						
Agency	Inventory			Condition Tracking		
	How Inventory Data is Gathered/Maintained	Pavement Features Inventoried	Inventory Frequency	Type of Data Collected	Frequency of Data Collection	Responsibility for Data Collection
		of the interchange	construction is completed			
Rhode Island	Inventory linked with linear referencing system	N/A	N/A	IRI, rutting and cracking	Annually or after any significant activity that would impact condition within one-tenth of a mile	Planning Division/Asset Management and Asset Information units responsible for data collection; Construction Division supplies data
Tennessee	Inventoried by LiDAR and photolog; dimensions stored in Tennessee Roadway Information Management System	N/A	Annual: Interstates and NHS routes Biennial: Non-NHS state routes	Cracking, drop-off and other distresses	Sampled monthly and maintained in Maintenance Management System for use in budgeting	Maintenance staff
Texas	Data gathered by district staff	N/A	Annual	Maintenance assessments on a limited sample	Annual	Maintenance Division
Washington	Data housed in WSDOT's database, Transportation Information and Planning System	N/A	Updated as needed based on contract information	Images captured during the Washington State PMS data collection survey	At the request of the DOT region; only one region out of six requests routine ramp investigations	N/A

Turn Lanes

The most commonly managed class of ancillary pavement is the turn lane. Eighteen agencies reported inventory and/or condition tracking practices. Agencies are more likely to inventory turn lanes than track their condition. Highlighted below is information provided by the states that do not inventory or track the condition of turn lanes:

- In three states—Colorado, Pennsylvania and Tennessee—the turn lane is not treated separately from the through lane or mainline pavement.
- In Delaware, turn lanes are not specifically included in condition ratings. Video is taken of the right-most lane for distress surveys.

The table below summarizes survey responses.

Inventory and Condition Tracking Practices for Ancillary Pavements: Turn Lanes

Agency	Inventory			Condition Tracking		
	How Inventory Data is Gathered/Maintained	Pavement Features Inventoried	Inventory Frequency	Type of Data Collected	Frequency of Data Collection	Responsibility for Data Collection
Alabama	Data gathered using asset ID, description, build date (if known), priority, road class, county, route type, route number, begin milepost, end milepost, direction and square yards	N/A	Annual	Condition assessment analysis by random sampling method	Annual	Maintenance personnel or designated consultant
Alberta	Included as part of the paved surface; updated from final construction drawings	N/A	N/A	Cracking	Frequency not determined but expect to have 2- to 3-year cycles	Included in automated pavement distress survey trials
Arizona	N/A	N/A	N/A	Condition data collected as part of the mainline	IRI and percentage cracking, bleeding and raveling	Annual
Florida	Performed at the district level and maintained in the centralized Roadway Characteristics Inventory database	N/A	Annually, if on the NHS, SHS or maintained by FDOT through written agreement	Visual	N/A	District maintenance personnel
Georgia	Captured during COPACES as part of the roadway	Width	N/A	Collected by sampling one-tenth of every mile of roadway	Condition assessments for all pavements on the mainline will be captured biennially beginning in 2015	Assessments done at district and area levels and quality-checked by the State Maintenance Office
Kentucky	Information stored in Highway Information	Five offsets: CR, NR, CL, NL and Middle for	Updated continually when notified of or find	Evaluated if included in state-owned system	Pavement evaluations cover the entire state in	Operations and Pavement Management Branch

Inventory and Condition Tracking Practices for Ancillary Pavements: Turn Lanes

Agency	Inventory			Condition Tracking		
	How Inventory Data is Gathered/Maintained	Pavement Features Inventoried	Inventory Frequency	Type of Data Collected	Frequency of Data Collection	Responsibility for Data Collection
	System database; multiple turn lanes can be at the same location	two-way left-turn lanes.	on-the-ground changes	with all other pavement evaluations; pavements broken out by contract history and not specific facility type (turn lane, crossover, etc.)	a three-year cycle	perform inspections
Maryland	Included with annual inventory collection	N/A	Annual	Not collected	N/A	N/A
Missouri	Capture turning lanes for all state-owned routes and some off-system routes	N/A	Changes initiated by completion of projects	Do not collect pavement condition data by lane	N/A	N/A
Nebraska	Data stored in Integrated Highway Inventory database	Width, thickness and type of surface	Updated based on construction plans	Not collected	N/A	N/A
New Mexico	N/A	Lane type and pavement type (i.e., bituminous asphalt, concrete, gravel, polymer, unpaved, timber, steel)	Inventoried in 2013	Not collected	N/A	N/A
North Carolina	Derived from current aerial photography, "as-built" project plans, "Let" project plans, Petitions and Municipal Agreements, and other engineering documents. Data entered in Attribute for Road Inventory Database.	N/A	After construction projects are completed and documentation from them is provided	Not collected	N/A	N/A
North Dakota	Photo inventory only;	N/A	N/A	Condition not collected;	Collected using survey	N/A

Inventory and Condition Tracking Practices for Ancillary Pavements: Turn Lanes

Agency	Inventory			Condition Tracking		
	How Inventory Data is Gathered/Maintained	Pavement Features Inventoried	Inventory Frequency	Type of Data Collected	Frequency of Data Collection	Responsibility for Data Collection
	taken from mainline roadway			perspective and ROW images	van in a different direction each year	
Pennsylvania	Maintain a history of the pavement section	Length and width of turn lanes inventoried with mainline lanes; lane configuration maintained longitudinally to the foot.	Data updated when maintenance or construction is completed	Not collected	N/A	N/A
Rhode Island	Inventory linked with linear referencing system	N/A	N/A	IRI, rutting and cracking	Annually or after any significant activity that would impact condition within one-tenth of a mile	Planning Division/Asset Management and Asset Information units responsible for data collection; Construction Division supplies data
South Dakota	N/A	N/A	N/A	Surveyed with mainline	Annual	N/A
Tennessee	Inventoried by LiDAR and photolog; dimensions stored in Tennessee Roadway Information Management System	N/A	Annual: Interstates and NHS routes Biennial: Non-NHS state routes	Not collected	N/A	N/A
Texas	Data gathered by district staff	N/A	Annual	Maintenance assessments	Annually on a limited sample	Maintenance Division
Washington	Data housed in WSDOT's database, Transportation Information and Planning System	N/A	Updated as needed based on contract information	Turn lane images captured from a windshield perspective	Annual	PMS staff does not rate these images to determine the "due year" for resurfacing

Frontage Roads

Fourteen respondents reported inventory and/or condition tracking practices in connection with frontage roads. If an agency includes a frontage road in its inventory, it is more likely to also track its condition as compared to other ancillary pavement classes. Highlighted below is information provided by some of the agencies that do not inventory or track the condition of frontage roads:

- The Alberta Ministry of Transportation is currently setting up an inventory for frontage roads.
- Colorado DOT has no formal inventory at this time. The Maintenance Division oversees these facilities, not pavement management staff. Surface treatment dollars are rarely used on frontage roads.
- In South Dakota, unless a frontage road is designated as a state-numbered highway, distress data is not collected.
- Tennessee DOT does not inventory frontage roads. Preventive maintenance and resurfacing are addressed in conjunction with mainline pavement, if deemed appropriate. Occasionally, projects are let to address frontage roads.

The following table summarizes survey responses.

Inventory and Condition Tracking Practices for Ancillary Pavements: Frontage Roads

Agency	Inventory			Condition Tracking		
	How Inventory Data is Gathered/Maintained	Pavement Features Inventoried	Inventory Frequency	Type of Data Collected	Frequency of Data Collection	Responsibility for Data Collection
Alabama	Data gathered using asset ID, description, build date (if known), priority, road class, county, route type, route number, begin milepost, end milepost, direction and square yards	N/A	Annual	Not collected	N/A	N/A
Delaware	Included in condition rating survey if they have a specified state maintenance number	N/A	Every other year	Distress data to include cracking, surface defects, raveling and rutting	Every two years	Pavement management section manages a contract for consultant to collect road distress data
Florida	Performed at the district level and maintained in the centralized Roadway Characteristics	N/A	Annually, if on the NHS, SHS or maintained by FDOT through written agreement	Visual	N/A	District maintenance personnel

Inventory and Condition Tracking Practices for Ancillary Pavements: Frontage Roads						
Agency	**Inventory**			**Condition Tracking**		
	How Inventory Data is Gathered/Maintained	**Pavement Features Inventoried**	**Inventory Frequency**	**Type of Data Collected**	**Frequency of Data Collection**	**Responsibility for Data Collection**
	Inventory database					
Georgia	Captured as a separate asset	N/A	N/A	Collected by sampling one-tenth of every mile of roadway	Condition assessments for all pavements on the mainline will be captured biennially beginning in 2015	Assessments done at district and area levels and quality-checked by the State Maintenance Office
Kentucky	Information stored in Highway Information System database	N/A	Updated whenever a construction project adds, removes or modifies a frontage road	Evaluated if included in state-owned system with all other pavement evaluations; pavements broken out by contract history and not specific facility type (turn lane, crossover, etc.)	Pavement evaluations cover the entire state in a three-year cycle	Operations and Pavement Management Branch perform inspections
Maryland	Identified as service roads; included with annual inventory collection	N/A	Annual	Pavement condition to include IRI, rutting, cracking and cross slope; also friction data	Three-year cycle for service roads less than 1 mile long; two-year cycle for friction data measured on service roads at least one-quarter mile long but less than 1 mile long. Any service road at least 1 mile long is measured annually.	N/A
Missouri	Added outer roads to inventory about 10 years ago	N/A	N/A	Data collected is same as for any other MoDOT road	N/A	Pavement condition data collected with Automated Road Analyzer van
New Mexico	Frontage roads maintained by the agency are inventoried	Pavement type	Inventoried in 2013	Condition collected in the right-hand driving lane only in the positive	Every other year	N/A

Inventory and Condition Tracking Practices for Ancillary Pavements: Frontage Roads

Agency	Inventory			Condition Tracking		
	How Inventory Data is Gathered/Maintained	Pavement Features Inventoried	Inventory Frequency	Type of Data Collected	Frequency of Data Collection	Responsibility for Data Collection
				direction; collecting pavement roughness, rutting and pavement distress data. IRI and laser crack measurement system for rutting and transverse profiles.		
North Carolina	Treated like secondary roads in terms of inventory practices	N/A	N/A	Data collected according to 2015 NCDOT Pavement Condition Survey Manual	Annual	N/A
North Dakota	Photo inventory only; taken from mainline roadway	N/A	N/A	Condition not collected; perspective and ROW images	Collected using survey van in a different direction each year	N/A
Pennsylvania	Inventoried the same as mainline roads	Lane configuration and width	When maintenance or construction is completed	Pavement and shoulder condition	Annually on the NHS routes and 50% per year for a two-year cycle of non-NHS routes	N/A
Rhode Island	Inventory linked with linear referencing system	N/A	N/A	IRI, rutting and cracking	Annually or after any significant activity that would impact condition within one-tenth of a mile	Planning Division/Asset Management and Asset Information units responsible for data collection; Construction Division supplies data
Texas	Data gathered by district staff	N/A	Annual	Distress data includes rut, ride, cracking, failures and patches	Pavement condition evaluations as a part of pavement management	Service provider for windshield surveys; in-house district staff for rut and ride
Washington	Data housed in	N/A	Updated as needed	N/A	Images are not collected	N/A

Inventory and Condition Tracking Practices for Ancillary Pavements: Frontage Roads						
Agency	Inventory			Condition Tracking		
	How Inventory Data is Gathered/Maintained	Pavement Features Inventoried	Inventory Frequency	Type of Data Collected	Frequency of Data Collection	Responsibility for Data Collection
	WSDOT's database, Transportation Information and Planning System		based on contract information		unless specifically requested by the region	

Crossover Pavements

Only six respondents—Alabama, Florida, Kentucky, North Dakota, Pennsylvania and Washington—reported inventorying crossover pavements. Of these, only North Dakota DOT does not also gather condition data for at least some crossover pavements. South Dakota DOT reported a limited condition data collection practice. Below are highlights of the agencies' practices:

- Alabama DOT maintains the same type of inventory data for crossover pavements as it does for other ancillary pavement classes (build date, priority, road class, etc.). An annual condition assessment analysis that uses the random sampling method generates a scorecard with grades ranging from A to F.
- Florida DOT applies the same inventory practices it uses for other ancillary pavements but only for the portion crossing within the boundaries of FDOT-maintained right of way. Visual inspections of condition are performed by district maintenance staff.
- Kentucky maintains section IDs for crossover pavements in its Highway Information System database, updating that data as construction projects indicate. Only those pavements on the state-owned system are evaluated. Pavement evaluations cover the entire state in a three-year cycle. Pavements are broken out by contract history and not specific facility type (turn lane, crossover, etc). Inspections are performed by the Operations and Pavement Management Branch.
- As the agency does with other classes of ancillary pavement, North Dakota DOT conducts a photo inventory; condition data is not collected.
- Pennsylvania DOT inventories and tracks the condition of crossover pavements that are permanent routes. Data is maintained as for mainline roads, with the inventory updated when maintenance or construction is completed. Pavement and shoulder condition data is collected annually on the National Highway System and 50 percent per year for a two-year cycle of non-NHS pavements.
- In South Dakota, unless a crossover pavement is designated as a state-numbered highway, distress data is not collected.
- Washington State DOT inventories crossover pavements in its Transportation Information and Planning System. Condition data is collected for crossover pavements on the state highway system.

Rest Area and Weigh Station Pavements

Rest area and weigh station pavements are summarized together below given the similarities noted in survey responses. Nine agencies—California, Florida, Kentucky, Maryland, Missouri, North Dakota, Pennsylvania, Rhode Island and Texas—inventory and/or collect condition data on rest area pavements. Seven agencies—Florida, Kentucky, Missouri, Nebraska, North Dakota, Pennsylvania and Rhode Island—inventory and/or track the condition of weigh station pavements. The following highlights agency practices.

Some agencies maintain an inventory only:

- Kentucky Transportation Cabinet stores rest area and weigh station pavement data in the agency's Highway Information System database road centerlines with unique section IDs.
- Maryland DOT includes rest area parking lots, park-and-ride parking lots and state-maintained facility parking lots in its inventory. Inventory features for rest areas include pavement type, location and area. The respondent noted that this inventory was conducted for the first time on a network basis in 2015. It is not clear if or when the inventory will be repeated.
- Missouri DOT began collecting inventory data on rest area and weigh station pavements several years ago and maintains the inventory through project data.
- Nebraska Department of Roads inventories the width, thickness and type of surface of ramps associated with rest area and weigh station pavements. This information is updated based on

construction plans. The respondent noted future plans to collect condition data on rest area and weigh station pavements.

Two agencies evaluate pavement condition for rest area pavements:

- Caltrans evaluates rest area pavement for cracks and potholes. The field evaluations are conducted once a year by the agency's Level of Service team.
- Texas DOT conducts a full evaluation of rest areas three times a year, including a subjective evaluation of the pavement.

Five agencies have similar practices for rest area and weigh station pavements:

- Florida DOT conducts an annual inventory of rest area and weigh station pavements on the state highway system and NHS, and for those pavements covered by a written maintenance agreement between FDOT and an outside agency or local government. Inventories are performed at the district level and maintained in the agency's centralized Roadway Characteristics Inventory database. Condition data is gathered through visual inspections by district maintenance personnel.
- In Georgia, pavements are captured as part of the rest area or weigh station asset where the rest area/weigh station pavement separates from the mainline roadway.
- North Dakota DOT maintains only a photo inventory, with images taken from the mainline roadway. While condition data is not collected, perspective and right of way images from a survey van are collected in a different direction each year.
- Pennsylvania DOT maintains the same inventory data on rest area and weigh station pavements that it maintains on ramps. The inventory is updated when maintenance or construction is completed. Pavement or shoulder condition data on rest area and weigh station pavements is not collected.
- For Rhode Island DOT, rest area and weigh station pavements are inventoried as a single location within the agency's linear referencing system. A visual condition assessment is conducted in conjunction with the mainline pavement. Data is collected annually and after any significant activity that would impact condition. The Planning Division/Asset Management and Asset Information units are responsible for annual data collection, and the Construction Division supplies all of the data.

Managing Other Ancillary Pavements

Four respondents offered information about their practices in managing ancillary pavement classes not specifically addressed in the survey questions:

- Two states—Rhode Island and Washington—addressed park-and-ride lots.
  - In Rhode Island, bus and rail park-and-ride lots are inventoried as a single location within the agency's linear referencing system. A visual condition assessment is conducted in conjunction with the mainline pavement. Data is collected annually or after any significant activity that would impact condition by the Planning Division and Asset Management and Asset Information units.
  - Washington State DOT has no recorded inventory of pavement data for park-and-ride lots, and these pavements are not addressed during the annual pavement management data collection. Instead, an investigation is performed when requested by the Maintenance Division or local transit agency.
- Pennsylvania DOT maintains the same data on truck escape ramps as it maintains for other ramps. The agency's inventory is updated when maintenance or construction is completed.
- Maryland DOT provided information about the agency's management practices for short routes. As the respondent indicates, "Maryland is slowly building a database with historic[al] construction activity on ramps and other routes less than 1 mile long. This effort started in 2012 and is approximately 10 percent

complete. The remaining network has a robust database. Construction activity on all lanes and shoulders treated on projects [is] now tracked when construction inspectors provide feedback to pavement management at project completion."

Use of Asset Management Tracking Tools

Twelve respondents use an asset management tracking tool. The most commonly used tool is an in-house system, though a few respondents using an in-house system indicated plans to move to a vendor-supplied solution. Two agencies—Arizona and Alberta—use a pavement management system as their asset management tracking tool, and Georgia DOT uses a vendor system in conjunction with in-house programs.

The table below summarizes survey responses.

Use of Asset Management Tracking Tools

Program	Vendor or Program/ Website	Agency	Comment
dTIMS	Deighton Associates Limited http://www.deighton.com/dtims	Colorado	None
Pavement Analyst	AgileAssets Inc. http://www.agileassets.com/products/pavement-analyst/	Georgia	GAMS includes this AgileAssets product and COPACES/Georgia Pavement Management System (GPAMS)
Pavement management system	N/A	Arizona, Alberta	*Arizona*. Pavement management system, highway log, feature inventory system
VUEWorks	Data Transfer Solutions LLC http://www.vueworks.com/	Rhode Island	None
In-house program	Maintenance Management System	Alabama	LiDAR scanning with videolog is in development
	COPACES/GPAMS http://www.dot.ga.gov/AboutGeorgia/Documents/Asset%20Management/TAM.pdf	Georgia	In-house tools used in conjunction with an AgileAssets product
	Transcend Spatial Solutions Road Analyzer http://www.transcendspatial.com	Iowa	Currently using in-house tools; soon to use Road Analyzer (an interactive Web module used in conjunction with Mobile Asset Verification and Road Inventory Collection)
	N/A	Maryland	Pavement data warehouse for construction history. Asset data warehouse for parking lots.
	N/A	Missouri	In-house mapping tool

Use of Asset Management Tracking Tools			
Program	**Vendor or Program/ Website**	**Agency**	**Comment**
	Esri Roads and Highways http://www.esri.com/software/arcgis/extensions/roads-and-highways	North Carolina	Currently using Attribute for Road Inventory Database in-house system; moving to Esri Roads and Highways
	Roadway Management System http://www.penndot.gov/ProjectAndPrograms/ResearchandTesting/RoadwayManagementandTesting/Pages/Road-Management-System.aspx	Pennsylvania	The Roadway Management System is a mainframe system
	N/A	South Dakota	None

Five agencies—Alabama, Alberta, Maryland, Pennsylvania and Rhode Island—enter data for ancillary pavements in their asset management tracking tools.

Use of Pavement Management Software Programs
A pavement management system is more commonly used by respondents than an asset management tracking tool. Only Missouri DOT does not use a pavement management software program. The most commonly used programs among respondents are dTIMS (Deighton Associates Limited) and Pavement Analyst (AgileAssets Inc.).

The table below reflects the programs used by respondents.

Use of Pavement Management Software Programs			
Program	**Vendor or Program/ Website**	**Agency**	**Comment**
dTIMS	Deighton Associates Limited http://www.deighton.com/dtims	Colorado, Iowa, North Dakota, Pennsylvania, Rhode Island, South Dakota	*South Dakota*. Uses dTIMS CT.
Highway Pavement Management Application	Stantec Inc. http://www.stantec.com/default.htm	Arizona, Tennessee, Alberta	*Arizona*. Currently acquiring a different software program.
Pavement Analyst	AgileAssets Inc. http://www.agileassets.com/products/pavement-analyst/	California, Delaware, Kentucky, New Mexico, North Carolina, Texas	*Texas*. Currently updating legacy mainframe application to AgileAssets.
RoadCare	Applied Research Associates, Inc.	Maryland	Uses tool to develop annual budget distribution and

Use of Pavement Management Software Programs			
Program	**Vendor or Program/ Website**	**Agency**	**Comment**
	http://www.ara.com/Projects/p_roadcare.htm		performance improvement targets.
In-house program	N/A	Alabama	Unspecified program used by agency's Materials and Test Bureau
	N/A	Florida	SAS software
	COPACES/GPAMS http://www.dot.ga.gov/AboutGeorgia/Documents/Asset%20Management/TAM.pdf	Georgia	COPACES/GPAMS
	Pavement Optimization Program http://www.transportation.nebraska.gov/mat-n-tests/pdfs-docs/popmanual.pdf	Nebraska	None
	Washington State Pavement Management System http://www.wsdot.wa.gov/NR/rdonlyres/D5B9567C-38B0-42A1-8E81-DC9A52639687/0/WebWSPMSGeneralOverview2011.pdf	Washington	None

The following 10 agencies enter condition data for ancillary pavements in their pavement management software:

- Arizona and Alberta (HPMA).
- Alabama, Georgia and Nebraska (in-house).
- Maryland (RoadCare).
- North Carolina and Texas (Pavement Analyst).
- Pennsylvania and Rhode Island (dTIMS).

Measures and Targets for Ancillary Pavements

Five state DOTs—Alabama, Arizona, Maryland, Missouri and Texas—have established measures and targets for ancillary pavements.

- Measures and targets associated with Alabama DOT's pavement management program interact with the agency's transportation asset management plan.
- In Arizona, the measures and targets are part of an overall system condition assessment.
- In Maryland, ramps, routes less than 1 mile long and service roads are incorporated into annual performance targets to the extent that the agency has historical construction information. Only about 10 percent of these roads are ultimately considered for treatment.

- Missouri DOT includes outer roads (frontage roads) in its measures and targets.
- The Texas DOT goal of 90 percent of the agency's pavements in good condition includes frontage roads but not other ancillary pavements.

Addressing Ancillary Pavements in Programming and Investment Decisions
Four agencies—Florida, Nebraska, North Carolina and Tennessee—do not include ancillary pavements in programming and investment decisions. While Tennessee DOT does not currently address ancillary pavements when making these decisions, the respondent indicated that the agency is moving toward that practice. California and Georgia DOTs did not respond to this question, and while indicating that ancillary pavements are addressed in programming and investment decisions, the Texas DOT respondent did not provide specifics as to the agency's practices.

The remaining respondents provided varying levels of detail with regard to which ancillary pavements are addressed in programming and investment analyses and how those analyses are made. The most common practice among respondents is to include one or more of the ancillary pavement classes with mainline pavements or adjacent projects when making programming and investment decisions.

The table below summarizes survey responses.

Practices for Including Ancillary Pavements in Programming and Investment Decisions

Practice	Agency	Comment
Ancillary pavements (all or some) addressed with mainline pavement or adjacent project	Iowa, Kentucky, Maryland, Missouri, New Mexico, North Dakota, Pennsylvania, South Dakota, Washington, Alberta	*Iowa*. Programmed as part of broader scoped work. Shoulders may be programmed with Highway Safety Improvement Program funds. *Kentucky*. Ramps are included in adjacent projects. *Maryland*. Rest areas and park-and-ride lots are incorporated into construction projects adjacent to the entrances. *Missouri*. Turning lanes are completed along with the mainline. Ramps are usually addressed every other time a mainline project is completed. *New Mexico*. Ancillary pavements are generally included in projects on the mainline. Weigh station and rest area pavements are addressed during improvements to these types of facilities. *South Dakota*. Ancillary pavements are included when working on adjacent mainline projects when deemed necessary in on-site inspections. *Washington*. At the network level, average project costs include ancillary paving. At the project level, ancillary pavements are included based on engineers' assessment of condition. *Alberta*. Shoulders and turning lanes are included as part of the pavement. Others are handled as additional areas at the project level by the regions/districts.
As needed	Alabama	Bottom-up approach allows district managers to design budgets based on need; Maintenance Bureau reviews and

Practices for Including Ancillary Pavements in Programming and Investment Decisions		
Practice	**Agency**	**Comment**
		approves requests.
	Arizona	On an as-needed basis.
	Delaware	Locations will be reviewed based on information from maintenance districts and complaints from the public to determine if the agency can reasonably accommodate improvements.
Other practice	Colorado	Most ancillary pavements are taken care of by maintenance.
	Rhode Island	Programmed similarly to other ancillary items such as guardrails and signs (these investments will not impact the agency's target setting).

Financial Implications

Nine state DOTs—Alabama, California, Iowa, Kentucky, Missouri, Nebraska, Pennsylvania, South Dakota and Texas—either did not respond or did not provide specific information when asked about the financial implications of deciding to include ancillary pavements in programming and investment decisions. There was little consensus among the remaining respondents.

Two agencies indicated a proactive approach to considering the financial implications of programming ancillary pavement improvements. In Washington, a paving model includes the cost of paving ancillary pavements, and Rhode Island DOT includes ancillary pavements as a percentage factor in the agency's pavement management program. Other agencies noted that additional funding is required to treat ancillary pavements, or identified funding limitations and the relationship of ancillary pavements to mainline improvements when financing pavement-related projects.

The table below summarizes survey responses.

Financial Implications of Programming Ancillary Pavement Improvements		
Issue	**Agency**	**Comment**
Additional funding required	North Carolina	If a review of ancillary pavements along the mainline pavement indicates a need for rehab/preservation, approximately 20% (varies depending on condition and surface area) additional funds are programmed to address the needs.
	Alberta	With the exception of shoulder and turn lanes, other additional areas could increase the project cost by 14% to 20%, up to a certain dollar amount. In these cases, the additional area(s) becomes a separate project.
Competing needs	Maryland	Shoulder treatments do not provide credit for the state's engineering districts to meet performance benefit targets (targets are limited to travel lane miles). If a district is having difficulty meeting lane-mile/year targets, shoulder

Financial Implications of Programming Ancillary Pavement Improvements		
Issue	**Agency**	**Comment**
		treatments may be reduced to allow for more funding for travel lanes.
Factored into pavement management program	Rhode Island	These pavements are included as a factor in the agency's pavement management program. It is understood that a percentage of ancillary pavement each year will go toward the agency's target.
Funding limitations	Arizona	Federal funds cannot be used on frontage roads, forcing the agency to use state funds for frontage roads.
	Delaware	With a set budget every year, maintaining ancillary pavements can impact how many major roads the agency is able to rehabilitate.
	Florida	Each district's annual lane mile allocation for resurfacing will be stretched thinner for ancillary pavements. Each district must budget for its future needs.
	New Mexico	Most ancillary pavements are not considered in allocating funding, which may tend to result in these pavements being in far worse condition before they are addressed.
Limited data	Maryland	Ramps and short routes often lack good historical information. As a result, other routes are suggested for strategic treatment, and short routes and ramps can remain forgotten, possibly requiring more expensive treatments in the future.
Paving model estimates costs	Washington	The agency's paving model is based on parametric estimates that include the cost of paving ancillary pavements.
Relationship to mainline improvements	Georgia	Improvements are included in decisions for the mainline.
	North Dakota	Projects are scoped into broad categories. More expensive mainline fixes allow for ancillary pavement improvements.
Sampling	Tennessee	The agency hopes to use its sampled segments to assist in determining appropriate funding levels for future general maintenance.

How Decisions are Made

Respondents were asked how decisions are made to include ancillary pavements in programmed pavement projects. Respondents were almost evenly split between making these determinations on a case-by-case basis and programming ancillary pavements with mainline or adjacent pavement projects.

How Decisions are Made to Include Ancillary Pavements in Programmed Pavement Projects		
Practice	**Agency**	**Comment**
Case-by-case decision	Delaware	Suggested by maintenance districts when there are a lot of complaints about an ancillary pavement; the decision to include a project in the program is made on a case-by-case basis
	Georgia	Based on the condition of the ancillary pavement and funding
	Iowa	At the discretion of the design team unless a programmed safety improvement
	Maryland	Case-by-case evaluations, depending on available funds, current conditions and future plans
	North Carolina	At the discretion of the division maintenance engineer and county maintenance engineer
	Pennsylvania	On a case-by-case basis, depending on condition observed in the field during design field review
	Tennessee	Determined in the field when a project is programmed for maintenance
Programmed with mainline or adjacent pavement	Alberta	Included with a regular paving project depending on the needs, cost and budget
	Arizona	Ramps and auxiliary lanes are included in the programming of the mainline. Rest areas are handled through a public-private partnership contract.
	Colorado	Surface treatment projects are always driven by mainline highway conditions. Occasionally, a large surface treatment project may have enough clout to rehabilitate adjacent ramps and frontage roads.
	Missouri	Look at the shoulders and ramps during project planning to determine if they need to be addressed; in general, ancillary pavements are treated every other time
	Nebraska	Address all pavements within the project footprint, if needed
	New Mexico	Crossovers, turn lanes, shoulders and ramps are generally included in programmed pavement projects. Frontage roads are generally stand-alone projects.
	North Dakota	Decisions made by management in the preliminary engineering of associated mainline projects
	Rhode Island	When pavements adjacent to or connected to ancillary pavements are being programmed; only if the ancillary pavement is in good to excellent condition will the agency not include that pavement.

How Decisions are Made to Include Ancillary Pavements in Programmed Pavement Projects		
Practice	**Agency**	**Comment**
	Washington	If there is an adjacent paving project, the region materials engineer reviews the ancillary pavements to determine if they need rehabilitation.
Other practices	Alabama	Determined by age, deterioration and distribution
	Florida	If an existing agreement to maintain the facility is in place

Accounting for the Cost of Ancillary Pavement in Pavement Management Systems
The following table summarizes the responses from those agencies that address ancillary pavement costs in their pavement management systems. Respondents were split between including ancillary pavement costs as part of mainline projects and the selective inclusion of ancillary pavement costs.

Accounting for Ancillary Pavement Cost in Pavement Management Systems		
Practice	**Agency**	**Comment**
Ancillary pavement cost included as part of mainline projects	Arizona, Georgia, Iowa, North Dakota, Rhode Island	*Iowa*. Ancillary pavements incorporated into a per-mile unit cost for mainline and shoulders
		North Dakota. Costs tracked in broad investment categories (major rehab, minor rehab, structural improvement, preventive maintenance)
		Rhode Island. Ancillary pavements included as a percentage in the average cost of all pavement projects
Selective inclusion of ancillary pavement costs	Maryland	Only account for ramps and service (frontage) roads
	Missouri	Cost assumptions include treating shoulders and ramps every other time
	Pennsylvania	Only account for a frontage road or a crossover with an assigned permanent route number
	Texas	Only account for frontage roads
	Alberta	Only account for shoulders and turning lanes
Ancillary pavement costs accounted for separately	Alabama	N/A

Maryland DOT provided additional information about the agency's practices in accounting for the cost of ancillary pavement. Since 1998, the agency has tracked project costs by lane miles of through, turn and auxiliary lanes; shoulder areas have not been incorporated into historical costs. The agency assumes that the historical volume of shoulders treated within a given engineering district will be incorporated into future paving work. Future cost estimations consider only the lane miles of all travel lanes (through, turn and auxiliary) based on past costs per lane mile of the same treatment in the same district.

Nine states—Delaware, Colorado, Florida, Nebraska, New Mexico, North Carolina, South Dakota, Tennessee and Washington—do not account for the cost of ancillary pavement in their pavement management systems. Three states offered additional details:

- In Florida, each district must budget from its resurfacing allocation to cover ancillary pavement.
- North Carolina DOT's pavement management system accounts for only mainline treatments based on the pavement width excluding paved shoulders.
- Washington State DOT's pavement management system does not estimate or include project-level costs in the software. The agency's paving model incorporates an allocation to cover the average ancillary preservation work over a 10-year period.

Related Documents

California

A Caltrans Innovative Approach to Maintenance Evaluation, Executive Summary: FY 2014 Maintenance Level of Service Statewide Report, Division of Maintenance, California Department of Transportation, 2014.
See **Appendix B**.
Excerpt from the Introduction:

> The Maintenance Level of Service (LOS) program was developed to evaluate and report how well the Division of Maintenance is able to maintain the State's highways according to guidelines established in the Maintenance Manual.
>
> LOS evaluations are conducted once a year and represent a snapshot of the roadway condition at the time the evaluations were conducted. LOS scores presented at the District level are not adjusted for Average Daily Traffic (ADT), terrain, or climate; the reader should consider these characteristics when comparing LOS scores for each District. LOS scores are primarily used as a tool by the Division of Maintenance to assess how well policies established in the Maintenance Manual are implemented statewide.
>
> **Level of Service Sampling**
> The LOS evaluation segments are randomly selected each year and therefore LOS score fluctuations of +5 or -5 points from year to year are considered stable. The scope of the State's sampling effort was established by dividing the State's highway inventory into one-mile segments. LOS evaluations were performed in each District on a random 20 percent of the segments with the exception of District 12. A larger sampling size of 40% was selected because of the small highway inventory in District 12.

Maryland

Park and Ride: Pavement Survey, State Highway Administration, Maryland Department of Transportation, undated.
See **Appendix C**.
The survey respondent describes this pavement survey form used for park-and ride lots:

> We have recent forms which were used for parking lot evaluations. Quality Engineering Solutions was the consultant which conducted the evaluations. A protocol was developed to allow for fast evaluation which provides quantities for developing rough project cost estimates (SY [square yard] of Asphalt Pavement, SY of Asphalt Full Depth Patching Needed, SY of Concrete Pavement, etc.).

North Dakota

Section 1-06—Design Philosophy, Investment Strategy, and Guides, Design Manual, North Dakota Department of Transportation. March 2014.
http://www.dot.nd.gov/manuals/design/designmanual/chapter1/DM-1-06_tag.pdf
This section of North Dakota DOT's Design Manual addresses the agency's investment strategies.

Tennessee

Field Inspection Manual, Maintenance Rating Program, Maintenance Division, Tennessee Department of Transportation, June 2014.
See **Appendix D**.
The survey respondent indicated that this manual "details how the shoulders and ramps should be assessed." From the abstract:

> This manual is designed to assist personnel responsible for conducting field ratings for the Maintenance Rating Program (MRP). The MRP is a method of conducting ratings of all maintenance assets on randomly selected roadway segments to determine the overall condition of the roadway network. The information obtained from these ratings should be used to schedule and prioritize routine or contracted maintenance activities in order to provide a uniform level of service across the state and to meet established departmental policies.

Tennessee Roadway Information System, State and Local Data Integration, Office of Safety, Roadway Safety Data Program, Federal Highway Administration, June 2014.
http://safety.fhwa.dot.gov/rsdp/downloads/tncasestudy.pdf
Excerpt from the introduction:

> The Tennessee Department of Transportation (TDOT) implemented TRIMS as a mainframe database in 1972 and moved to a client server Oracle database in 1996. TDOT has had a great track record of success with TRIMS achieved by developing a tool that the State DOT and local agencies (as well as contractors) could all use. The local roadway data collection effort (conducted as a 5-year project that began in 2007) resulted in a product that includes the same information on local roads as is collected for State roads.

Washington

State Highway Log, Planning Report, Washington State Department of Transportation, 2014.
http://www.wsdot.wa.gov/mapsdata/roadway/pdf/HwyLog2014Statewide.pdf
Excerpt from the introduction:

> The STATE HIGHWAY LOG, which is published annually from TRIPS, contains roadway data and mileage statistics for all State Highways. This information is representative of data collected through the previous year. It is designed to provide a record of current highway system information and a source for computing distances between major points. Detailed explanations of all fields are included starting on page "I-1", titled "State Highway Log Reference."
>
> The Roadway Geometrics Section is responsible for updating and maintaining the roadway portion of the TRIPS system. The information TRIPS contains is provided by numerous WSDOT Regional, Headquarters and other sources.

Related Resources

Unlike the survey of transportation agencies addressed in the previous section of this report, the literature search netted little information about the management of ancillary pavement assets. Among the ancillary pavements of interest to MnDOT, only shoulders were referenced in multiple sources. National guidance highlights the challenges associated with gathering a comprehensive set of asset inventory data. The most extensive assessment

of ancillary pavements appears in two documents produced by Alabama DOT. Other documents that address the management of ancillary pavements in Florida, Louisiana, Mississippi, New Jersey, North Carolina, Pennsylvania and Wisconsin DOTs do so in a more limited manner, focusing on shoulders.

National Guidance

NCHRP Report 736: Resource Allocation Logic Framework to Meet Highway Asset Preservation, John Wiegmann and Balaji Yelchuru, 2012.
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_736.pdf
This report highlights the state of the practice in collecting and maintaining asset inventory data. From page 15 of the report (page 24 of the PDF):

> The data overview indicates the challenge practitioners face in implementing data-driven resource allocation logic that reflects needs. Outside the bridge/pavement area, condition and performance data is usually limited to estimation based on sample inspection programs. This can be acceptable for the purpose intended but is nevertheless costly to manage and perform. The need for consistent inspection protocols and sufficient frequency of inspection rounds to support the business cycles drives the cost of this kind of effort.

The authors note that most of the nine state DOTs interviewed for this project (Florida, Maryland, Michigan, Minnesota, Nevada, Oregon, Utah, Washington and Wyoming) "spend significant effort to collect and maintain asset inventory data. Most DOTs interviewed have good bridge and pavement information. As shown in the Table 2-1, according to interviews conducted with nine state DOT agencies, information needed for data-driven resource allocation is typically much more limited for other asset types."

Table 2-1, Asset data overview, which is on page 16 of the report (page 25 of the PDF), describes the data collected, estimated or maintained for six asset groups (bridges, pavements, drainage, safety, roadside and others) by the nine state DOTs interviewed for this project, including:

Shoulders (included in the Roadside category):

- All maintain useful inventory data.
- Some maintain useful condition/performance data.
- Useful life data is rarely maintained.

Rest areas and weigh stations (included in the Others category):

- All maintain useful inventory data.
- Few maintain useful condition/performance data.
- Useful life data is rarely maintained.

NCHRP Synthesis 426: Performance-Based Highway Maintenance and Operations Management, Michael J. Markow, 2012.
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_426.pdf
This synthesis used a literature review, a survey of state DOTs and follow-up interviews with four state DOTs to develop case studies of highway maintenance and operations performance management. When researchers asked survey respondents to identify the assets included in their management programs, the Road Surface category considered by respondents included pavements and shoulders. The other ancillary pavements of interest to MnDOT are not addressed in this synthesis.

NCHRP Report 632: An Asset-Management Framework for the Interstate Highway System, Cambridge Systematics, Inc., 2009.
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_632.pdf
Chapter 5, Performance Measures, identifies core and comprehensive performance measures for managing Interstate Highway System assets. Core measures are "performance measures that any IHS owner agency should,

in theory, be capable of capturing and should appear in any Interstate Asset Management Plan. It is recommended that IHS owners collect the additional 'comprehensive' measures described here, pending time and resource limitations."

Shoulders are included in the list of comprehensive measures—not the core measures—with the measure "Percent Functioning as Intended." Rest areas and weigh stations are also included in the comprehensive list of measures, but it is unclear if the performance measure will assess pavement condition or other aspects of these sites.

A Model Guide for Condition Assessment Systems, Kathryn A. Zimmerman and Marshall Stivers, NCHRP Project 20-07, Task 206, October 2007.
http://maintenance.transportation.org/Documents/Final%20Report%2020-07%20Task%20206-2.pdf
Researchers conducted a survey of state practice to evaluate the use of maintenance condition assessment systems. The survey grouped condition attributes into asset categories and types. The Pavement category includes three asset types: paved shoulders, unpaved shoulders and paved surfaces. Page 39 of the report (page 48 of the PDF) describes survey results with regard to paved shoulders:

> **Paved Shoulders**. The survey shows that 28 of 35 agencies monitor the paved shoulder condition. The distribution of the responses (see figure 19) indicate the drop-off (24 SHAs) and a structural distress (20 SHAs) as the most important attributes for the evaluation of the paved shoulders condition. They are followed by the travelway/shoulder separation (12 SHAs) and a functional distress (9 SHAs). One SHA mentions functioning of a rumble strip as one of the condition attributes for the paved shoulders. Three responses are entered in the "other" category.

State Practices

Alabama

Asset Management Manual, Maintenance Bureau, Alabama Department of Transportation, January 2012.
http://www.dot.state.al.us/maweb/frm/RoadMAP_AssetMgmtManual_20120125.pdf
This manual provides guidance to staff maintaining Alabama DOT's roadway asset inventory in RoadMAP (Road Maintenance Accountability Program). Each RoadMAP asset category is addressed with a description of the asset type, the information required for recording the asset and a description—with screen shots—of the data fields storing the information. The manual addresses many of the ancillary pavement assets of interest to MnDOT, including paved shoulders, paved turn lanes, and asphalt crossover and service roads. The manual does not address rest area or weigh station pavements.

Related Resource:

> **ALDOT Condition Assessment FAQs**, Volume 2, Alabama Department of Transportation, November 2013.
> http://www.dot.state.al.us/maweb/frm/ALDOT%20Condition%20Assessment%20FAQs.pdf
> This document provides clarification of the condition assessment process. Items related to ancillary pavements include:
>
> > *In the case of a roadway section having both a paved and non-paved shoulder, do we inventory both and collect condition data on them?*
> >
> > Both paved and unpaved should be inventoried and assessed within the roadway sample segment. A total of 1056 feet of unpaved shoulder and 1056 feet of paved shoulder is possible for inventory. Condition data should be collected on each type of shoulder separately.
> >
> > *Do we collect condition data on paved turnouts and crossovers?*
> >
> > Yes. Because turnouts and crossovers represent a small percentage of the total pavement area, condition data can be collected on these items and treated as part of the pavement without statistically impacting the LOS calculations.

Do we consider a two-way turn lane as a lane or a median?

Two-way turn lanes should be evaluated as an undivided roadway sample segment and evaluated from [right of way] to [right of way].

The item below appears to be in conflict with the January 2012 manual cited above with regard to the inclusion of service roads in the inventory process:

Are ramps and service roads to be inventoried or evaluated?

No. Evaluations and sample segments are limited to mainline highways and do not include ramps or service roads. If ramps fall within a sample segment, move forward or backward as needed or just evaluate the sample segment as if the ramps were not present.

Florida

Maintenance Rating Program Handbook, Data Collection for Maintenance Rating Program, Florida Department of Transportation, 2015.
http://www.dot.state.fl.us/statemaintenanceoffice/RDW/MRP/MRPHandbook2015.pdf
Page 21 of the manual (page 25 of the PDF) describes how to rate flexible paved shoulders/turnouts; page 32 of the manual (page 36 of the PDF) addresses rigid paved shoulders/turnouts.

Louisiana

Initial Transportation Asset Management Plan (Pilot Version), Louisiana Department of Transportation and Development, February 2015.
http://www.tamptemplate.org/wp-content/uploads/tamps/027_louisianadotd.pdf
This pilot transportation asset management plan noted that LADOTD has a partial data set for shoulders, but the data set will "require significant improvement to allow for addition into the TAMP." With regard to ramps, the report notes that "LADOTD currently has only one data collection cycle for Interstate ramps and will need two more cycles of data to provide predictive modeling for treatments."

Mississippi

Pavement Management at MDOT, Mississippi Department of Transportation, undated.
http://mdot.ms.gov/documents/research/Reports/Interim%20and%20Final%20Reports/Pavement%20Management%20At%20MDOT.pdf
This document describes the types of data included in Mississippi DOT's pavement management system. Inventory data appears to include information about turn lanes and shoulders.

Data Collection Manual, AAMO: Accountability in MDOT Maintenance Operations, Mississippi Department of Transportation, August 2007.
http://www.wistrans.org/mrutc/files/Data-Collection-Manual.doc
Pages A-11 and A-12 of the manual provide inspection procedures for paved shoulders.

New Jersey

Asset Management Decision Support System Model, William Robert, Dmitry Gurenich and Jocelyn Hoffman, New Jersey Department of Transportation, 2010.
http://www.state.nj.us/transportation/about/asset/pdf/final_dsm.pdf
This report describes the development of an asset management decision support model to aid New Jersey DOT in using asset management data to support resource allocation decisions. Page 11 of the report (page 16 of the PDF) describes the establishment of a target level of performance for shoulders and rest areas:

Maintenance budgeting is used to establish a target level of performance for a DOT's maintainable assets, such as paved surfaces, shoulders, roadside assets, and rest areas. Generally, the conditions of these assets are characterized using a level of service (LOS) description (often expressed using letter grades), and the approach results in a prediction of the level of funding required to maintain a specified LOS. To support the approach, the agency typically collects sample data on existing LOS, such as through conditions at some number of randomly selected sites on an annual basis. Maintenance budgeting has been used by a number of states to help establish an appropriate level of funding for maintenance, but is not intended to support analysis of capital projects.

It is not clear if the rest area performance data includes an evaluation of pavements in those locations.

North Carolina

Pavement Condition Survey Manual, North Carolina Department of Transportation, 2012.
https://connect.ncdot.gov/resources/Asset-Management/AssetManagementDocs/2012%20Asphalt%20Pavement%20Survey%20Manual.pdf
This manual provides direction to North Carolina DOT staff conducting condition surveys of the paved road network in North Carolina. All state-maintained roads on the primary and secondary systems are included in the survey. Instructions for rating multilane sections include the following:

- Interchange ramps are not to be rated.
- If paved shoulders are on the outside lane, then record the paved shoulder width only. Do not include any width for the unpaved shoulder, even though it is present.
- Rate through lanes together as one section. Do not rate turn lane.

Staff members conducting the survey are advised on how to complete the survey form. Included in the form is an assessment of paved shoulder condition, which is to be rated as follows:

L: Overall good condition; edge intact with no cracking.
M: Acceptable condition; some cracking up to ½ inch wide, less than ½-inch rutting. Edge may be breaking away in spots.
S: Unacceptable condition; cracking more than ¼ inch, rutting more than ½ inch, edge breaking away over large part of section.

Related Resource:

Summary Sheet for Pavements: Key Performance Indicators for Pavements, North Carolina Department of Transportation, January 2010.
https://connect.ncdot.gov/resources/Asset-Management/Documents/Pavement.pdf
Page 5 of the PDF provides performance data for paved shoulders using a condition indicator of Paved Shoulder Widths less than Paved Shoulder Policy.

Pennsylvania

Shoulder and Guard Rail Condition Survey Field Manual, Pennsylvania Department of Transportation, April 2015.
http://www.dot.state.pa.us/public/PubsForms/Publications/PUB%2033.pdf
While the focus of this manual appears to be on the collection of data related to guardrails, the manual does address the recoding of shoulder type, width and condition.

Wisconsin

"Lessons Learned in Developing a Highway Condition Assessment and Maintenance Quality Assurance Program," Emil Juni and Teresa M. Adams, *Proceedings of the 2007 Mid-Continent Transportation Research Symposium*, August 2007.
http://www.ctre.iastate.edu/pubs/midcon2007/JuniQuality.pdf
Compass is Wisconsin DOT's statewide maintenance quality assurance program. As the authors note, "Compass reports the condition of pavements, signs, bridges, drainage, roadsides, and winter operations. The agency has inventory data to assess bridges, pavement, routine maintenance of signs, and winter maintenance. For other features, Compass assesses maintenance condition based upon sampled data." Data on shoulder condition is gathered through field review of cracking and potholes, with the first field sampling occurring in 2002.

Related Resource:

> **CY 2015 Non-Winter Highway Maintenance Targets**, Wisconsin Department of Transportation, 2015.
> http://wisconsindot.gov/Documents/doing-bus/local-gov/hwy-mnt/programs/compass/docs/2015-final-targets.pdf
> This spreadsheet provides maintenance targets for paved shoulders with regard to drop-off/buildup, cracking and potholes/raveling.

Appendix A

Managing Ancillary Pavements: Survey Results

The full text of survey responses is provided below. For reference, an abbreviated version of each question is included before the response. Where applicable, questions have been omitted that are not relevant based on a previous negative response provided by the respondent. The full question text appears on page 6 of this report.

Domestic Responses

Alabama

Contact: Tracy Fletcher, Maintenance Bureau/RoadMAP Manager, Alabama Department of Transportation, fletchert@dot.state.al.us, 334-242-6765.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: Asset ID, description, build date (if known), priority, road class, county, route type, route number, begin milepost, end milepost, direction, square yards. Collected once a year.

   Ramps: Asset ID, description, build date (if known), priority, road class, county, route type, route number, begin milepost, end milepost, direction, square yards. Collected once a year.

   Turn lanes: Asset ID, description, build date (if known), priority, road class, county, route type, route number, begin milepost, end milepost, direction, square yards. Collected once a year.

   Frontage roads: Asset ID, description, build date (if known), priority, road class, county, route type, route number, begin milepost, end milepost, direction, square yards. Collected once a year.

   Crossover pavements: Asset ID, description, build date (if known), priority, road class, county, route type, route number, begin milepost, end milepost, direction, square yards. Collected once a year.

   Rest area pavements: We only capture rest area locations.

   Weigh station pavements: We only capture weigh station locations.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: Condition assessment analysis by random sampling method. Generates a scorecard with grades ranging from A-F. Collected yearly by either Maintenance personnel or by designated consultant.

   Ramps: Not included in the condition assessment.

   Turn lanes: Condition assessment analysis by random sampling method. Generates a scorecard with grades ranging from A-F. Collected yearly by either Maintenance personnel or by designated consultant.

   Frontage roads: Not included in the condition assessment.

   Crossover pavements: Condition assessment analysis by random sampling method. Generates a scorecard with grades ranging from A-F. Collected yearly by either Maintenance personnel or by

designated consultant.

Rest area pavements: Not included in the condition assessment.

Weigh station pavements: Not included in the condition assessment.

3. **Use an asset management tracking tool?** Yes.

3a. **What tool?** Currently use our Maintenance Management System. In development: LiDAR scanning with videolog.

3b. **Enter condition data in the tool?** Yes.

4. **Use a pavement management software program?** [No response.]

4a **What software program?** Program used by the Materials and Test Bureau.

4b. **Enter condition data in the software?** Yes.

5. **Established measures and targets?** Yes. Program used by the Materials and Test Bureau and is tied into our TAMP [transportation asset management plan].

6. **Addressing ancillary pavements in programming and investment decisions:** We have a bottom-up approach that allows our District Managers to design their budgets based on their needs. Then after they are submitted, the Maintenance Bureau reviews and approves their requests.

6a. **Financial implications of decisions:** It shares the responsibility among different entities responsible for maintaining our highways.

6b. **Include ancillary pavements in programmed pavement projects?** Determined by age, deterioration and distribution.

7. **Accounting for ancillary pavement cost in pavement management software:** It is kept separately.

8. **Documents or other materials to share?** No.

9. **Additional comments:** [No response.]

Arizona

Contact: Marwan Aouad, Maintenance Group/Assistant State Maintenance Engineer, Arizona Department of Transportation, maouad@azdot.gov, 602-712-7949.

1. **Inventory ancillary pavements—how and how often:**

Shoulders: 7,825 Maintenance Lane Miles (MLM). A MLM is equivalent to a 12-ft wide lane.

Ramps: 1,257 MLM.

Turn lanes: 1,050 MLM (this is a combination of turn lanes and pass lanes).

Frontage roads: 975 MLM.

Crossover pavements: Not inventoried.

Rest area pavements: This is under our Facilities Program and not under Maintenance. We have a [public-private partnership (P3)] contract that takes care of our rest areas.

Weigh station pavements: This is under a different division called "Enforcement and Compliance Division, ECD."

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility**

for data collection:

Shoulders: As part of the mainline but not done on shoulders; condition data is collected annually and it includes [International Roughness Index], and percentage cracking, bleeding and raveling.

Ramps: As part of the mainline but not done on ramps; condition data is collected annually and it includes IRI, and percentage cracking, bleeding and raveling.

Turn lanes: As part of the mainline; condition data is collected annually and it includes IRI and percentage cracking, bleeding and raveling.

Frontage roads: No condition data is collected on frontage roads.

Crossover pavements: [No response.]

Rest area pavements: [No response.]

Weigh station pavements: [No response.]

3. **Use an asset management tracking tool?** Yes.

3a. **What tool?** Pavement Management System, Highway Log, Feature Inventory System.

3b. **Enter condition data in the tool?** No.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** [Stantec's Highway Pavement Management Application]. We are in the process of acquiring a different software program.

4b. **Enter condition data in the software?** Yes.

5. **Established measures and targets?** Yes. As part of the overall system condition assessment.

6. **Addressing ancillary pavements in programming and investment decisions:** On as-needed basis.

6a. **Financial implications of decisions:** Federal funds cannot be used on frontage roads which forces us to use state funds for frontage roads.

6b. **Include ancillary pavements in programmed pavement projects?** Ramps and auxiliary lanes are included in the programming of the mainline. As described above, rest areas are handled through a P3 contract ($3M annual budget for all assets at the rest areas).

7. **Accounting for ancillary pavement cost in pavement management software:** We do not separate this from the main line. We spend about $18M annually for Surface Treatment Projects ($11M in federal funds and $7M in state funds). Major pavement projects such as thick overlays are handled through our 5-year construction program.

8. **Documents or other materials to share?** Our links are not available externally but I can connect you with the people who manage the Pavement Management System and the Feature Inventory System for additional information.

9. **Additional comments:** [No response.]

California

Contact: Robert Moore, Maintenance, California Department of Transportation, bob.moore@dot.ca.gov, 916-274-6057.

1. **Inventory ancillary pavements—how and how often:**

Shoulders: The following pavement attributes are evaluated for paved shoulders: cracks, alligator cracking, potholes and coarse raveling. The field evaluations are conducted once a year

by the Level of Service (LOS) team.

Ramps: The following pavement attributes are evaluated for ramps: cracks, alligator cracking, potholes, wheel rutting, coarse raveling and bleeding. The field evaluations are conducted once a year by the LOS team.

Turn lanes: Not applicable.

Frontage roads: Not applicable.

Crossover pavements: Not applicable.

Rest area pavements: The following pavement attributes are evaluated for rest area pavement: cracks and potholes. The field evaluations are conducted once a year by the LOS team.

Weigh station pavements: Not applicable.

Other ancillary pavements (please identify): Not applicable.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: See response above. Tong Yang Statewide LOS Coordinator California Department of Transportation Division of Maintenance (916) 263-4988.

   Ramps: See response above. Tong Yang Statewide LOS Coordinator California Department of Transportation Division of Maintenance (916) 263-4988.

   Turn lanes: Not applicable.

   Frontage roads: Not applicable.

   Crossover pavements: Not applicable.

   Rest area pavements: See response above. Tong Yang Statewide LOS Coordinator California Department of Transportation Division of Maintenance (916) 263-4988.

   Weigh station pavements: Not applicable.

   Other ancillary pavements (please identify): Not applicable.

3. **Use an asset management tracking tool?** No.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** PaveM; AgileAssets.

4b. **Enter condition data in the software?** No.

5. **Established measures and targets?** No.

6. **Addressing ancillary pavements in programming and investment decisions:** [No response.]

6a. **Financial implications of decisions:** [No response.]

6b. **Include ancillary pavements in programmed pavement projects?** [No response.]

7. **Accounting for ancillary pavement cost in pavement management software:** [No response.]

8. **Documents or other materials to share?** Sent to Chris Kline.

9. **Additional comments:** [No response.]

Colorado

Contact: Stephen Henry, Pavement Management, Colorado Department of Transportation, stephen.henry@state.co.us, 303-398-6579.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: As-builds and maintenance inspections for inventory. Updated very rarely. From a strategic perspective not enough shoulders change every year to justify a full inventory effort.

   Ramps: No formal inventory at this time. Maintenance takes care of these facilities, not Pavement Management.

   Turn lanes: Turn lanes are not inventoried separately from the rest of the through lanes.

   Frontage roads: No formal inventory at this time. Maintenance takes care of these facilities, not Pavement Management.

   Crossover pavements: No formal inventory at this time. Maintenance takes care of these facilities, not Pavement Management.

   Rest area pavements: No formal inventory at this time. Maintenance takes care of these facilities, not Pavement Management.

   Weigh station pavements: No formal inventory at this time. Maintenance takes care of these facilities, not Pavement Management.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: No condition collected on shoulders because shoulders do not drive surface treatment dollars. Maintenance does annual random inspections of shoulders.

   Ramps: No condition collected on ramps because we do not use surface treatment dollars on ramps.

   Turn lanes: The condition of a turn lane is assumed to be similar to the through lane upon which surface condition data is collected.

   Frontage roads: No condition collected on ramps [sic] because we rarely use surface treatment dollars on frontage roads.

   Crossover pavements: [No response.]

   Rest area pavements: No condition collected on ramps [sic] because we do not use surface treatment dollars on rest areas.

   Weigh station pavements: No condition collected on ramps [sic] because we do not use surface treatment dollars on weigh stations.

3. **Use an asset management tracking tool?** Yes.

3a. **What tool?** dTIMS.

3b. **Enter condition data in the tool?** No.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** dTIMS.

4b. **Enter condition data in the software?** No.

5. **Established measures and targets?** No.

6. **Addressing ancillary pavements in programming and investment decisions:** Most ancillary pavements are taken care of by maintenance.

6a. **Financial implications of decisions:** Frontage roads and ramps get no love from surface treatment, unless a large project runs through the area. Ramps and frontage roads deteriorate to worse condition than the state highways because maintenance can only utilize thinner treatments.

6b. **Include ancillary pavements in programmed pavement projects?** Surface treatment projects are always driven by mainline highway conditions. Occasionally, a large surface treatment project may have enough clout to rehabilitate adjacent ramps and frontage roads.

7. **Accounting for ancillary pavement cost in pavement management software:** It is not accounted for. However, we are having discussions about these assets.

8. **Documents or other materials to share?** [No response.]

9. **Additional comments:** [No response.]

Delaware

Contact: Sarah McDougall, Pavement Management Engineer, Delaware Department of Transportation, sarah.mcdougall@state.de.us, 302-760-2695.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: We do not include shoulders as part of our condition ratings. Video is taken of the right-most lane for distress surveys.

   Ramps: Ramps are included in our condition ratings which occur every two years. Ramps have their own state maintenance number and are collected the same as all state-maintained roads.

   Turn lanes: Turn lanes are not specifically included in our condition ratings. Video is taken of the right-most lane for distress surveys.

   Frontage roads: Frontage roads would be included in our condition rating survey if they have a specified state maintenance number. Condition surveys are collected every other year.

   Crossover pavements: Crossover pavements are not specifically included in our condition ratings. Video is taken of the right most lane for distress surveys.

   Rest area pavements: Rest area pavements are not specifically included in our condition ratings. I believe they may be maintained by a different division within DelDOT, but they are not included in Pavement Management[’s] survey unless they have a specified state maintenance number.

   Weigh station pavements: Weigh station pavements are not specifically included in our condition ratings.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: N/A.

   Ramps: Distress data is collected (cracking, surface defects, ravelings, rutting, etc.) every two years; pavement management section manages a contract for a consultant to collect road distress data.

   Turn lanes: N/A.

   Frontage roads: Distress data is collected (cracking, surface defects, ravelings, rutting, etc.) every two years; pavement management section manages a contract for a consultant to collect

road distress data.

Crossover pavements: N/A.

Rest area pavements: N/A.

Weigh station pavements: N/A.

3. **Use an asset management tracking tool?** No.
4. **Use a pavement management software program?** Yes.

4a. **What software program?** AgileAssets.

4b. **Enter condition data in the software?** No.

5. **Established measures and targets?** No.
6. **Addressing ancillary pavements in programming and investment decisions:** Based on information that comes in from both the maintenance districts and complaints from the public, locations will be reviewed to see if we can reasonably accommodate improvements.

6a. **Financial implications of decisions:** We have a set budget every year and doing ancillary pavements can impact how many major roads we are able to rehabilitate.

6b. **Include ancillary pavements in programmed pavement projects?** During scoping trips to determine remedies the decision would be made. We also take suggestions and information from maintenance districts if there are a lot of complaints about an ancillary pavement and it would be looked at to determine if we need to include it in the program.

7. **Accounting for ancillary pavement cost in pavement management software:** It is not accounted for.
8. **Documents or other materials to share?** No.
9. **Additional comments:** [No response.]

Florida

Contact: Rhonda Taylor, State Pavement Design Engineer, Florida Department of Transportation, rhonda.taylor@dot.state.fl.us, 850-414-4371.

1. **Inventory ancillary pavements—how and how often:**

Shoulders: FDOT inventories all ancillary pavements on the [state highway system (SHS)] and/or maintained by FDOT annually. If it's not a state-maintained facility, unless there is a written agreement with an outside agency or local government to maintain, we do not inventory other agency ancillary pavements. Only pavements on the SHS, [National Highway System], or with an agreement are inventoried. Inventories are performed at the district level and maintained in the centralized Roadway Characteristics Inventory (RCI) database.

Ramps: Same.

Turn lanes: Same.

Frontage roads: Same.

Crossover pavements: Same, but only the portion crossing within the boundaries of FDOT-maintained [right of way].

Rest area pavements: Same.

Weigh station pavements: Same.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: Visual, performed by district maintenance personnel as part of the MSRP program [Maintenance Rating Program].

   Ramps: Visual, performed by district maintenance personnel as part of the MSRP program.

   Turn lanes: Visual, performed by district maintenance personnel as part of the MSRP program.

   Frontage roads: Visual, performed by district maintenance personnel as part of the MSRP program.

   Crossover pavements: Visual, performed by district maintenance personnel as part of the MSRP program.

   Rest area pavements: Visual, performed by district maintenance personnel as part of the MSRP program.

   Weigh station pavements: Visual, performed by district maintenance personnel as part of the MSRP program.

3. **Use an asset management tracking tool?** No.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** In-house written system (SAS software).

4b. **Enter condition data in the software?** No.

5. **Established measures and targets?** No.

6. **Addressing ancillary pavements in programming and investment decisions:** We don't for pavement management purposes. If ancillary pavement is not accounted for as a state-owned facility in our RCI database, then its condition does not count for or against the Department in performance measures.

6a. **Financial implications of decisions:** The lane mile allocation for resurfacing given to the district each year will be stretched thinner for ancillary pavements. It's up to the district to budget for their future needs.

6b. **Include ancillary pavements in programmed pavement projects?** If an existing agreement to maintain the facility is in place.

7. **Accounting for ancillary pavement cost in pavement management software:** It is not. It's up to the individual district to budget from their resurfacing allocation to cover ancillary pavement.

8. **Documents or other materials to share?** No.

9. **Additional comments:** If frontage roads become too costly for a district to "absorb" in their normal districts resurfacing allocation, the road should be assigned a Roadway ID, tracked in RCI, and the official pavement condition survey performed annually.

Georgia

Contact: Melany Reynolds, Organizational Performance Management/Program Manager, Georgia Department of Transportation, mreynolds@dot.ga.gov, 404-631-1058.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: No separate inventory is captured. This item is captured as part of the roadway assets during [Computerized Pavement Condition Evaluation System (COPACES)] activities. The

width of the shoulders is included in the COPACES/resurfacing information.

Ramps: Ramps are captured as a separate asset in COPACES and [Georgia Asset Management System (GAMS)]. The ramp begins at the point of separation from the mainline roadway (commonly the gore area).

Turn lanes: Captured during COPACES as part of the roadway. The turn lane width is noted in GAMS and COPACES.

Frontage roads: Captured as a separate asset.

Crossover pavements: Captured as part of the mainline. Width and length are noted.

Rest area pavements: Think it is captured as part of the rest area asset where the rest area pavement separates from the mainline roadway.

Weigh station pavements: I think this is handled like the rest areas.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

Shoulders: Condition assessments for all pavements on the mainline will be captured biennially beginning in 2015 (not sure about rest Areas and weigh stations). The data is collected by sampling 1/10 of every mile of roadway. The assessments are done at the district and area level and quality checked by the State Maintenance Office. I assume we are talking about paved shoulders.

Ramps: Condition assessments for all pavements on the mainline will be captured biennially beginning in 2015 (not sure about rest areas and weigh stations). The data is collected by sampling 1/10 of every mile of roadway. The assessments are done at the district and area level and quality checked by the State Maintenance Office. I assume we are talking about paved shoulders [sic].

Turn lanes: Condition assessments for all pavements on the mainline will be captured biennially beginning in 2015 (not sure about rest Areas and weigh stations). The data is collected by sampling 1/10 of every mile of roadway. The assessments are done at the district and area level and quality checked by the State Maintenance Office. I assume we are talking about paved shoulders [sic].

Frontage roads: Condition assessments for all pavements on the mainline will be captured biennially beginning in 2015 (not sure about rest Areas and weigh stations). The data is collected by sampling 1/10 of every mile of roadway. The assessments are done at the district and area level and quality checked by the State Maintenance Office. I assume we are talking about paved shoulders [sic].

Crossover pavements: Condition assessments for all pavements on the mainline will be captured biennially beginning in 2015 (not sure about rest Areas and weigh stations). The data is collected by sampling 1/10 of every mile of roadway. The assessments are done at the district and area level and quality checked by the State Maintenance Office. I assume we are talking about paved shoulders [sic].

Rest area pavements: [No response.]

Weigh station pavements: [No response.]

3. **Use an asset management tracking tool?** No. [It appears that this question was answered in error. The response to Question 3a appears to indicate that this response should be "Yes."]

3a. **What tool?** Georgia Asset Management System (GAMS): AgileAssets product and COPACES/ [Georgia Pavement Management System (GPAMS)].

3b. **Enter condition data in the tool?** No.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** COPACES/GPAMS.

4b. **Enter condition data in the software?** Yes.

5. **Established measures and targets?** No.

6. **Addressing ancillary pavements in programming and investment decisions:** [No response.]

6a. **Financial implications of decisions:** Included in decisions for the mainline.

6b. **Include ancillary pavements in programmed pavement projects?** Based on the condition of the ancillary pavement and funding.

7. **Accounting for ancillary pavement cost in pavement management software:** Accounted for with the mainline pavement. No separate consideration is given.

8. **Documents or other materials to share?** No.

9. **Additional comments:** [No response.]

Iowa

Contact: Scott Schram, Pavement Management Engineer, Iowa Department of Transportation, scott.schram@dot.iowa.gov, 515-239-1604.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: Type width.

   Ramps: Location count.

   Turn lanes: N/A.

   Frontage roads: N/A.

   Crossover pavements: N/A.

   Rest area pavements: Location.

   Weigh station pavements: Location.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: N/A.

   Ramps: N/A.

   Turn lanes: N/A.

   Frontage roads: N/A.

   Crossover pavements: N/A.

   Rest area pavements: Annual field review.

   Weigh station pavements: N/A.

3. **Use an asset management tracking tool?** Yes.

3a. **What tool?** In-house tools. Soon to use Road Analyzer.

3b. **Enter condition data in the tool?** No.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** dTIMS.

4b. **Enter condition data in the software?** No.

5. **Established measures and targets?** No.

6. **Addressing ancillary pavements in programming and investment decisions:** They are programmed as part of broader scoped work. Shoulders may be programmed with [Highway Safety Improvement Program] funds.

6a. **Financial implications of decisions:** [No response.]

6b. **Include ancillary pavements in programmed pavement projects?** Unless it's a programmed safety improvement, it's at the discretion of the design team.

7. **Accounting for ancillary pavement cost in pavement management software:** It's incorporated into a per-mile unit cost for mainline and shoulders.

8. **Documents or other materials to share?** No.

9. **Additional comments:** [No response.]

Kentucky

Contact: Tracy Nowaczyk, Manager, Operations and Pavement Management Branch, Kentucky Transportation Cabinet, tracy.nowaczyk@ky.gov, 502-782-5595.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: Shoulder information is stored as an asset inside the [Highway Information System (HIS)] database. We collect seven different types of shoulders: No Shoulders Exist, Paved, Concrete, Stabilized, Combination, Earth and Curbed. We also use four offsets, depending on what side of the road shoulders exist: Cardinal Right (CR), Non-Cardinal Right (NR), Cardinal Left (CL) and Non-Cardinal Left (NL). Two-way roads will have continual CR & NR shoulder records. CL & NL must exist where divided medians are present and one-way roads can have CR & CL or NR & NL shoulders. Shoulder information is updated continually when we are notified of or find on-the-ground changes.

   Ramps: Ramps are stored in the HIS database road centerlines with a different "Section ID" that makes them unique from the other routes. We update ramps whenever there is a construction project that adds, removes or modifies them.

   Turn lanes: Turn lanes are stored as an attribute inside the "Auxiliary Lane" asset inside the HIS database. Turn lanes have five offsets: CR, NR, CL, NL and Middle (M) for [two-way left-turn lanes]. Multiple turn lanes can be at the same location. Turn lane information is updated continually when we are notified of or find on-the-ground changes.

   Frontage roads: Frontage roads are stored in the HIS database road centerlines with a different "Section ID" that makes them unique from the other routes in our centerline. We update frontage roads whenever there is a construction project that adds, removes or modifies them.

   Crossover pavements: Crossovers are stored in the HIS database road centerlines with a different "Section ID" that makes them unique from the other routes in our centerline. We update crossovers whenever there is a construction project that adds, removes or modifies them.

   Rest area pavements: Rest areas are stored in the HIS database road centerlines with a different "Section ID" that makes them unique from the other routes in our centerline. We update rest areas when notified that one has been opened or closed.

Weigh station pavements: Weigh stations are stored in the HIS database road centerlines with a different "Section ID" that makes them unique from the other routes in our centerline. We update weigh stations when notified that one has been opened or closed.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: Shoulders are evaluated on good/fair/poor basis with Interstate and parkway evaluations on an annual basis. All other shoulders are evaluated as part of a Maintenance Rating Program, which is a random sampling method done annually. Both inspections are done by the Operations and Pavement Management Branch.

   Ramps: These are not specifically evaluated.

   Turn lanes: These types of pavements are evaluated if they are included in the state-owned system with all other pavement evaluations. Pavement evaluations cover the entire state in a three-year cycle. Pavements are broken by contract history and not specific facility type (turn lane, crossover, etc.). Inspections are performed by the Operations and Pavement Management Branch.

   Frontage roads: These types of pavements are evaluated if [they] are included in the state-owned system with all other pavement evaluations. Pavement evaluations cover the entire state in a three-year cycle. Pavements are broken by contract history and not specific facility type (turn lane, crossover, etc.). Inspections are performed by the Operations and Pavement Management Branch.

   Crossover pavements: These types of pavements are evaluated if [they] are included in the state-owned system with all other pavement evaluations. Pavement evaluations cover the entire state in a three-year cycle. Pavements are broken by contract history and not specific facility type (turn lane, crossover, etc.). Inspections are performed by the Operations and Pavement Management Branch.

   Rest area pavements: These are not specifically evaluated.

   Weigh station pavements: These are not specifically evaluated.

3. **Use an asset management tracking tool?** No.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** AgileAssets.

4b. **Enter condition data in the software?** No.

5. **Established measures and targets?** No.

6. **Addressing ancillary pavements in programming and investment decisions:** Ramps are included in adjacent projects.

6a. **Financial implications of decisions:** [No response.]

6b. **Include ancillary pavements in programmed pavement projects?** [No response.]

7. **Accounting for ancillary pavement cost in pavement management software:** [No response.]

8. **Documents or other materials to share?** [No response.]

9. **Additional comments:** [No response.]

Louisiana

Contact: Mark Suarez, Asset Management Engineer, Louisiana Department of Transportation and Development, mark.suarez@la.gov, 225-379-1159.

The respondent provided the following in his initial response to the survey questions:

> "We are in the process of capturing data for ramps for the first time using our ongoing long-term contract with Fugro. Other than having some line work in our GIS, we do not have any real usable data for the remainder of the items you have requested."

The following summarizes information gathered in follow-up contacts with the respondent:

Ramps

The same distress data is being gathered for ramps as is gathered for all of the agency's pavements. The respondent noted that gathering International Roughness Index data "is almost impossible to capture since the data is almost always faulty due to low speeds on ramps." The data collection cycle for ramps is on the same annual data collection cycle as National Highway System pavements, as the vast majority of ramps are on NHS pavements.

LA DOTD is still determining how the ramp data will be used. In proposed FHWA rules, NHS ramps must be included in an asset management plan, but no definition was provided to indicate the FHWA definition of what type of NHS ramps must be included—at-grade, elevated or both. In some cases, elevated ramps are currently considered bridges in Louisiana. If the final rule requires it, the agency will include ramps in its asset management plan and its dTIMS pavement management system.

Shoulders

A one-time data collection effort in 2011 captured shoulder width and surface type to update an old data system. This data is used strictly for inventory purposes and is not included in the agency's pavement management system. The agency has no current plans to include this shoulder data in its asset management system.

Other Pavement Assets

The respondent noted that it will be time-consuming and costly to automate pavement data collection for those pavement assets not currently required under federal rules to be included in a transportation asset management plan. At this time, the agency has no plans to include other assets that are not federally mandated for inclusion in its transportation asset management plan.

Maryland

Contact: Nathan Moore, Pavement Management Engineer, Maryland State Highway Administration, nmoore@sha.state.md.us, 443-572-5073.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: Shoulder inventory location and width is updated annually. Construction activities are incorporated with all pavement management construction history documentation upon completion of construction. No condition data has been collected.

   Ramps: Included with annual inventory collection.

   Turn lanes: Included with annual inventory collection.

   Frontage roads: (Identified as Service Roads in Maryland.) Included with annual inventory collection.

Crossover pavements: Crossover pavement locations are identified, but the area is not included in annual roadway inventory.

Rest area pavements: Pavement type, location and area of rest area parking lots, park-and-ride parking lots, and SHA-maintained facility parking lots were measured for the first time on a network basis in 2015. It is not clear if/when this measurement will be repeated in the future.

Weigh station pavements: Inventory data is not measured.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: Pavement condition is not measured on shoulders.

   Ramps: Pavement condition on ramps (IRI, rutting, cracking, cross slope) data is measured on a 3-year cycle. Friction data (ASTM E 274 FN40R) is measured on ramps which are at least 0.25 miles long on a 2-year cycle.

   Turn lanes: Condition information is not measured on turn lanes.

   Frontage roads: Pavement condition on service roads which are less than 1 mile long (IRI, rutting, cracking, cross slope) data is measured on a 3-year cycle. Friction data (ASTM E 274 FN40R) is measured on service roads which are at least 0.25 miles long but less than 1 mile long on a 2-year cycle. Any service road at least 1 mile long is measured annually.

   Crossover pavements: Condition is not measured.

   Rest area pavements: Pavement condition of rest area parking lots, park-and-ride parking lots, and SHA-maintained facility parking lots was measured for the first time on a network basis in 2015. It is not clear if/when this condition assessment will be repeated in the future.

   Weigh station pavements: Condition data is not measured.

   Other ancillary pavements (please identify): Routes which are less than 1 mile long have condition measured on a 3-year cycle in the slow lane of each direction with an ARAN vehicle. Routes (including ramps and other mainline routes) less than 1 mile long, but at least 0.25 miles long have friction measurements on a 2-year cycle in each direction.

3. **Use an asset management tracking tool?** Yes.

3a. **What tool?** Several tools: 1) In-House Pavement Data Warehouse for Construction History. 2) In-House Asset Data Warehouse for Parking Lots.

3b. **Enter condition data in the tool?** Yes.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** RoadCare (by ARA) to develop annual budget distribution and performance improvement targets.

4b. **Enter condition data in the software?** Yes.

5. **Established measures and targets?** Yes. Ramps, routes less than 1 mile long, and service roads are incorporated into the annual performance targets, only to the extent that we have historic construction information. So, only about 10% of these roads end up being considered for treatment.

6. **Addressing ancillary pavements in programming and investment decisions:** Parking lots are a matter of discussion currently. Public facilities (like rest areas and park-and-ride lots) take considerable priority over facility parking lots. As a rule, rest areas and park-and-ride lots are incorporated into construction projects adjacent to the entrances. SHA facility parking lots simply do not have much current or future funding, except perhaps some overhead money which may be used for crack sealing or patching.

6a. **Financial implications of decisions:** Shoulder treatments do not provide credit for Engineering Districts to meet performance benefit targets, since such targets are limited to travel lane miles. So, if a district is having difficulty meeting lane-mile-year targets, then shoulder treatments may diminish to some extent, to put more money into travel lanes. Also, good asset management practices are limited on ramps and short routes which do not have good historical information. As a result, other routes end up being suggested for strategic treatment, and these short routes and ramps can remain forgotten, until they can be incorporated into the optimization by having construction history information available. Such routes can be treated, with the benefit quantified after construction, but they have the risk of requiring expensive treatments in the future if they are not treated in a strategic manner.

6b. **Include ancillary pavements in programmed pavement projects?** Evaluations are done on a case-by-case basis, depending on available funds, current conditions, and future plans.

7. **Accounting for ancillary pavement cost in pavement management software:** Only the cost of ramps and service roads are accounted for in the pavement management software. Historic project costs have been tracked since 1998, by lane miles (of through, turn and auxiliary lanes). Shoulder areas have not been incorporated into historic costs. We are simply assuming that the same magnitude of shoulders in a given engineering district which were treated in the past will also be incorporated into future paving work. So, future cost estimations only consider the lane miles of all travel lanes (through, turn and auxiliary), based on past costs per lane mile of the same treatment in the same district.

8. **Documents or other materials to share?** We have recent forms which were used for parking lot evaluations. Quality Engineering Solutions was the consultant which conducted the evaluations. A protocol was developed to allow for fast evaluation which provides quantities for developing rough project cost estimates ([square yard (SY)] of Asphalt Pavement, SY of Asphalt Full Depth Patching Needed, SY of Concrete Pavement, etc.).

9. **Additional comments:** Maryland is slowly building a database with historic construction activity on ramps and other routes less than 1 mile long. This effort started in 2012, and is approximately 10% complete. The remaining network has a robust database. Construction activity on all lanes and shoulders treated on projects are now tracked when construction inspectors provide feedback to pavement management at project completion.

Missouri

Contact: Brian Reagan, Transportation Planning, Missouri Department of Transportation, brian.reagan@modot.mo.gov, 573-526-2675.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: Shoulders are captured along with our lane data. Usually a change or addition is initiated by the completion of a roadway project. Occasionally we have tried to complete statewide reviews. This would usually be done for certain types of roads.

   Ramps: Ramps are included in our inventory. We track number lanes, lane width, age, surface type, etc. Changes to these are initiated by the completion of projects.

   Turn lanes: We capture turning lanes for all the state-owned routes, and some of the off-system routes. Changes to these are initiated by the completion of projects.

   Frontage roads: We have lane data for all roads owned by MoDOT.

   Crossover pavements: We have crossovers in order to provide connectivity from side roads to both directions of travel (when applicable).

   Rest area pavements: We inventory the pavements for rest areas. We made an effort to collect

these several years ago. We now maintain them through project data.

Weigh station pavements: We inventory the pavements for weight stations. We made an effort to collect these several years ago. We now maintain them through project data.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: We do not collect condition data for shoulders.

   Ramps: We do not collect condition data for ramps.

   Turn lanes: We do not collect pavement condition data by lane. We would assume the whole facility (including turn lanes) would be in the same condition as the through lane that was measured.

   Frontage roads: We added outer roads to our inventory about ten years ago. We treat them the same as any other MoDOT road. We collection the pavement condition with an ARAN van.

   Crossover pavements: We do not collect pavement condition data on crossovers.

   Rest area pavements: We do not collect pavement condition data on rest areas.

   Weigh station pavements: We do not collect pavement condition data on [weigh stations].

3. **Use an asset management tracking tool?** Yes.

3a. **What tool?** In-house mapping tool.

3b. **Enter condition data in the tool?** No.

4. **Use a pavement management software program?** No.

5. **Established measures and targets?** Yes. Outer roads are included in our measures and targets.

6. **Addressing ancillary pavements in programming and investment decisions:** Districts are expected to maintain outer roads as they would any other road. Turning lanes are completed along with the mainline. Ramps are usually addressed every other time a mainline project is completed.

6a. **Financial implications of decisions:** You need to have an accurate inventory of your system to project cost.

6b. **Include ancillary pavements in programmed pavement projects?** When a project is being planned, we look at the shoulders and ramps to determine if they need to be addressed this time. In general these items are treated every other time.

7. **Accounting for ancillary pavement cost in pavement management software:** When developing the cost for treatments, we assume we will treat shoulders and ramps every other time.

8. **Documents or other materials to share?** No.

9. **Additional comments:** [No response.]

Nebraska

Contact: Mark Osborn, Materials & Research/Roadway Asset Management, Nebraska Department of Roads, mark.osborn@nebraska.gov, 402-479-4443.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: Shoulder width, thickness and type of surface are stored in our Integrated Highway Inventory (IHI) database. The information is updated based on construction plans.

   Ramps: Width, thickness and type of surface are stored in our IHI database. The information is

updated based on construction plans.

Turn lanes: Width, thickness and type of surface are stored in our IHI database. The information is updated based on construction plans.

Frontage roads: Not inventoried.

Crossover pavements: Not inventoried.

Rest area pavements: Ramps only: width, thickness and type of surface are stored in our IHI database. The information is updated based on construction plans.

Weigh station pavements: Ramps only; width, thickness and type of surface are stored in our IHI database. The information is updated based on construction plans.

Other ancillary pavements (please identify): None.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: Shoulders are visually rated on a scale of 1-10 with 10 being new. The ratings are done yearly by the Roadway Asset Management (RAM) section.

   Ramps: Interstate ramps are profiled every other year by RAM, collecting IRI, rutting, faulting and cracking. We plan to start collecting freeway and expressway ramps in the future.

   Turn lanes: No condition is collected.

   Frontage roads: No condition is collected.

   Crossover pavements: No condition is collected.

   Rest area pavements: We plan to start collecting rest area ramps in the future.

   Weigh station pavements: We plan to start collecting weigh station ramps in the future.

   Other ancillary pavements (please identify): None.

3. **Use an asset management tracking tool?** No.
4. **Use a pavement management software program?** Yes.

4a. **What software program?** Pavement Optimization Program (POP). In-house software.

4b. **Enter condition data in the software?** Yes.

5. **Established measures and targets?** No.
6. **Addressing ancillary pavements in programming and investment decisions:** They are not addressed.

6a. **Financial implications of decisions:** Unknown.

6b. **Include ancillary pavements in programmed pavement projects?** All pavements within the project footprint are addressed if needed.

7. **Accounting for ancillary pavement cost in pavement management software:** They are not accounted for.
8. **Documents or other materials to share?** No.
9. **Additional comments:** [No response.]

New Mexico

Contact: Tamara P. Haas, Asset Management & Planning Division, New Mexico Department of Transportation, tamarap.haas@state.nm.us, 505-795-2126.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: The NMDOT collected a shoulder inventory in 2013 to identify the width of the left and right shoulders from the edge of paint to edge of pavement, and also identified the type (i.e., asphalt, concrete, stabilized, combination, unpaved).

   Ramps: Ramps and collector roads were inventoried in 2013.

   Turn lanes: The lane type was inventoried in 2013, which included designation of pavement type, i.e., bituminous asphalt, concrete, gravel, polymer, unpaved, timber, steel.

   Frontage roads: Frontage roads maintained by NMDOT were inventoried in 2013, which also included pavement type. Pavement condition to include distress and IRI is collected every other year.

   Crossover pavements: We have not inventoried crossover pavements.

   Rest area pavements: We have not inventoried rest area pavements.

   Weigh station pavements: We have not inventoried weigh station pavements.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: Condition not collected.

   Ramps: Condition not collected.

   Turn lanes: Condition not collected.

   Frontage roads: Condition collected in the right-hand driving lane only in the positive direction. Pavement roughness, rutting and pavement distress data. IRI and laser crack measurement system for rutting and transverse profiles.

   Crossover pavements: No condition data collected.

   Rest area pavements: No condition data collected.

   Weigh station pavements: No condition data collected.

3. **Use an asset management tracking tool?** No.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** AgileAssets Pavement Management System.

4b. **Enter condition data in the software?** No.

5. **Established measures and targets?** No.

6. **Addressing ancillary pavements in programming and investment decisions:** Ancillary pavements are generally included in projects on the mainline. Weigh station and rest area pavements are addressed during improvements to these types of facilities.

6a. **Financial implications of decisions:** Most ancillary pavements are not being considered in allocating funding, which may tend to have these pavements be in far worse condition before they are addressed.

6b. **Include ancillary pavements in programmed pavement projects?** Frontage roads are generally

stand-alone projects. Crossovers, turn lanes, shoulders and ramps are generally included in programmed pavement projects.

7. **Accounting for ancillary pavement cost in pavement management software:** Not currently addressed.
8. **Documents or other materials to share?** No.
9. **Additional comments:** [No response.]

North Carolina

Contact: Randy Finger, Pavement Management Systems Engineer, North Carolina Department of Transportation, afinger@ncdot.gov, 919-835-8209.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: Inventory information is derived from current aerial photography, 'as-built' project plans, 'Let' project plans, petitions and municipal agreements, and/or other engineering documentation and then entered through our ARID (Attribute for Road Inventory Database) tool once construction projects are completed and documentation from them is provided. Information entered into the ARID database is transformed into the Road Characteristics layer, a geospatial layer of North Carolina Department of Transportation's LRS network with road inventory and other business attributes. It represents a subset of road characteristic attributes of the NCDOT state road system. The Road Characteristics layer is published quarterly on the NCDOT website. For specific rules and procedures on entering this data item, please refer to the ARID_DataManual_V4_2014_04_23 document beginning on Page 2-43.

   Ramps: Inventory information is derived from current aerial photography, 'as-built' project plans, 'Let' project plans, and/or other engineering documentation. The LRS segments used to represent ramps are created by the Data Conversion Group in our GIS unit. Currently, only number of through lanes and facility type are collected on ramps and entered through our ARID (Attribute for Road Inventory Database) tool once construction projects are completed and documentation from them is provided. Information entered into the ARID database is transformed into the Road Characteristics layer, a geospatial layer of North Carolina Department of Transportation's LRS network with road inventory and other business attributes. It represents a subset of road characteristic attributes of the NCDOT state road system. The Road Characteristics layer is published quarterly on the NCDOT website. For specific rules and procedures on entering this data item, please refer to the ARID_DataManual_V4_2014_04_23 document beginning on Page 7-2.

   Turn lanes: Inventory information is derived from current aerial photography, 'as-built' project plans, 'Let' project plans, petitions and municipal agreements, and/or other engineering documentation and then entered through our ARID (Attribute for Road Inventory Database) tool once construction projects are completed and documentation from them is provided. Information entered into the ARID database is transformed into the Road Characteristics layer, a geospatial layer of North Carolina Department of Transportation's LRS network with road inventory and other business attributes. It represents a subset of road characteristic attributes of the NCDOT state road system. The Road Characteristics layer is published quarterly on the NCDOT website. For specific rules and procedures on entering this data item, please refer to the ARID_DataManual_V4_2014_04_23 document beginning on Page 2-67.

   Frontage roads: Frontage roads are treated like secondary roads on our roadway network. They are not inventoried any differently and therefore the roadway attributes associated with them are not treated any differently.

   Crossover pavements: N/A.

Rest area pavements: N/A.

Weigh station pavements: N/A.

Other ancillary pavements (please identify): N/A.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: Shoulder data on secondary routes are collected annually by a windshield survey. The Pavement Management Unit is responsible for the data collection. The data collection itself is contracted out. See page 4 of the 2015 NCDOT Pavement Condition Survey Manual. Primary Routes are collected annually by an automated distress collection van. The Pavement Management Unit is responsible for the data collection. The data collection itself is contracted out. See NCDOT 2014 Shoulder Business Rules 1.4 manual.

   Ramps: N/A.

   Turn lanes: N/A.

   Frontage roads: Frontage roads are treated like secondary roads on our roadway network. Condition is collected annually according to our 2015 NCDOT Pavement Condition Survey Manual.

   Crossover pavements: N/A.

   Rest area pavements: N/A.

   Weigh station pavements: N/A.

   Other ancillary pavements (please identify): N/A.

3. **Use an asset management tracking tool?** Yes.

3a. **What tool?** Currently ARID. Moving to ESRI Roads and Highways.

3b. **Enter condition data in the tool?** No.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** AgileAssets Pavement Analyst [pavement management system (PMS)].

4b. **Enter condition data in the software?** Yes.

5. **Established measures and targets?** No.

6. **Addressing ancillary pavements in programming and investment decisions:** Ancillary pavements are not included in programming or needs analysis from the PMS for our contract resurfacing or pavement preservation funds.

6a. **Financial implications of decisions:** If review of the ancillary pavements along the mainline pavement indicates a need for rehab/preservation, approximately 20% (varies depending on condition and surface area) additional funds are programmed to address the needs.

6b. **Include ancillary pavements in programmed pavement projects?** Including these is at the discretion of the Division Maintenance Engineer and County Maintenance Engineer.

7. **Accounting for ancillary pavement cost in pavement management software:** These costs are not in our PMS. The PMS only accounts for mainline treatments based on the pavement width excluding paved shoulders.

8. **Documents or other materials to share?** Will email all related documents. [At the time of publication of this report, these documents had not been provided.]

9. **Additional comments:** [No response.]

North Dakota

Contact: Jack Smith, Assistant Planning/Asset Management Engineer, North Dakota Department of Transportation, jasmith@nd.gov, 701-328-2016.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: Photo inventory only. Images taken from associated mainline roadway.

   Ramps: Photo inventory only. Images taken from associated mainline and crossover roadways.

   Turn lanes: Photo inventory only, taken from mainline roadway.

   Frontage roads: Photo inventory only, taken from mainline roadway.

   Crossover pavements: Photo inventory only, taken from mainline roadway.

   Rest area pavements: Photo inventory only, taken from mainline roadway.

   Weigh station pavements: Photo inventory only, taken from mainline roadway.

   Other ancillary pavements (please identify): N/A.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: Condition not collected; perspective and [right of way (ROW)] images from survey van are collected in a different direction each year.

   Ramps: Condition not collected; perspective and ROW images from survey van are collected in a different direction each year.

   Turn lanes: Condition not collected; perspective and ROW images from survey van are collected in a different direction each year.

   Frontage roads: Condition not collected; perspective and ROW images from survey van are collected in a different direction each year.

   Crossover pavements: Condition not collected; perspective and ROW images from survey van are collected in a different direction each year.

   Rest area pavements: Condition not collected; perspective and ROW images from survey van are collected in a different direction each year.

   Weigh station pavements: Condition not collected; perspective and ROW images from survey van are collected in a different direction each year.

3. **Use an asset management tracking tool?** No.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** dTIMS.

4b. **Enter condition data in the software?** No.

5. **Established measures and targets?** No.

6. **Addressing ancillary pavements in programming and investment decisions:** Ancillary pavements are currently addressed at the same time as nearby mainline pavements. Maintenance is performed as needed by field observation by field crews.

6a. **Financial implications of decisions:** Projects are scoped into broad categories. More expensive mainline fixes allow for ancillary pavement improvements.

6b. **Include ancillary pavements in programmed pavement projects?** Decisions are made by management in the preliminary engineering of associated mainline projects.

7. **Accounting for ancillary pavement cost in pavement management software:** Costs in the pavement management software are tracked in the broad investment categories (ex: Major Rehab, Minor Rehab, Structural Improvement, Preventive Maintenance.)

8. **Documents or other materials to share?** http://www.dot.nd.gov/manuals/design/designmanual/chapter1/DM-1-06_tag.pdf (link to NDDOT Design Manual section on investment strategies).

9. **Additional comments:** Condition data was collected for ramps in 2009, but maintaining minimum speed for data collection from the survey van is difficult on ancillary pavements. Photo images and field observation are primary methods of monitoring those pavements.

Pennsylvania

Contact: Janice Arellano, Bureau of Maintenance & Operations/Roadway Inventory and Testing Unit, Pennsylvania Department of Transportation, jarellano@pa.gov, 717-787-7294.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: We maintain a history of shoulder type, including paved width and total graded width; right and left shoulders inventoried separately. Width and type are inventoried with our condition surveys (see #2 below).

   Ramps: We maintain a history of the pavement section, including length and width, of all ramps, and the configuration of the interchange. Data are updated when maintenance or construction is completed.

   Turn lanes: We maintain a history of the pavement section, including length and width, of turn lanes with the mainline lanes. Lane configuration is maintained longitudinally to the foot. Inventory is updated when maintenance or construction is completed.

   Frontage roads: Frontage roads are inventoried and the data maintained the same as our mainline roads — pavement history is maintained; lane configuration and width is inventoried when maintenance or construction is completed.

   Crossover pavements: If the crossover is a permanent route, we maintain data the same as frontage roads, which is the same as mainline roads. Inventory is updated when maintenance or construction is completed.

   Rest area pavements: We maintain data on rest area pavements the same as on ramps. Inventory is updated when maintenance or construction is completed.

   Weigh station pavements: We maintain data on weigh station pavements the same as on ramps. Inventory is updated when maintenance or construction is completed.

   Other ancillary pavements (please identify): Truck escape ramps: We maintain data on these the same as on other ramps. Inventory is updated when maintenance or construction is completed.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: We collect condition data on shoulders annually on the NHS routes and 50% per year for a two-year cycle of non-NHS routes.

   Ramps: We do not collect pavement or shoulder condition data on ramps.

   Turn lanes: We do not collect pavement condition data separately for turn lanes; mainline data is assumed to be representative of turn lane. Mainline data is collected annually on NHS routes and 50% per year for a two year cycle on non-NHS.

Frontage roads: Pavement and shoulder conditions are collected annually on the NHS and 50% per year for a two year cycle of non-NHS.

Crossover pavements: If the crossover is a permanent route, pavement and shoulder conditions are collected annually on the NHS and 50% per year for a two year cycle of non-NHS.

Rest area pavements: We do not collect pavement or shoulder condition data on rest areas.

Weigh station pavements: Like ramps, we do not collect pavement or shoulder condition data on weigh station areas.

Other ancillary pavements (please identify): Truck escape ramps: We do not collect pavement or shoulder condition data on truck escape ramps.

3. **Use an asset management tracking tool?** Yes.

3a. **What tool?** Mainframe; Roadway Management System.

3b. **Enter condition data in the tool?** Yes.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** dTIMS.

4b. **Enter condition data in the software?** Yes.

5. **Established measures and targets?** No.

6. **Addressing ancillary pavements in programming and investment decisions:** Ancillary pavements are addressed when the mainline pavement is addressed.

6a. **Financial implications of decisions:** [No response.]

6b. **Include ancillary pavements in programmed pavement projects?** On a case-by-case basis, depending on condition observed in the field during design field view.

7. **Accounting for ancillary pavement cost in pavement management software:** Unless a frontage road or a crossover with an assigned permanent route number, ancillary pavement cost is not accounted for.

8. **Documents or other materials to share?** No.

9. **Additional comments:** [No response.]

Rhode Island

Contact: John Preiss, Asset Management/Asset Manager, Rhode Island Department of Transportation, john.preiss@dot.ri.gov, 401-222-3260, ext. 4058.

1. **Inventory ancillary pavements—how and how often:**

Shoulders: Shoulder widths are inventoried for each pavement section and are linked with linear referencing system (LRS).

Ramps: Ramps are inventoried within the LRS. They have their own baseline for referencing purposes.

Turn lanes: Turn lanes are inventoried within the LRS. They have their own baselines for referencing purposes.

Frontage roads: Frontage roads are inventoried within the LRS. They have their own baselines [for] referencing purposes.

Crossover pavements: Crossover pavements are not inventoried.

Rest area pavements: Rest area pavements are inventoried as a single location within the LRS.

Weigh station pavements: Weigh station pavements are inventoried as a single location within the LRS.

Other ancillary pavements (please identify): Park-and-ride (bus and rail) are inventoried as a single location within the LRS.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

Shoulders: 1. Visual condition assessment only. Condition associated with mainline pavement. 2. Data is collected annually and after any significant activity that would impact condition within a 10th of a mile stretch. 3. The planning division/asset management & asset information units are responsible for annual collections, and the construction division supplies all of the data.

Ramps: 1. IRI, rutting and cracking. 2. Data is collected annually and after any significant activity that would impact the condition within a 10th of a mile stretch. 3. The planning division/asset management & information management units are responsible for the annual collections, and the construction division supplies all other data.

Turn lanes: 1. IRI, rutting and cracking. 2. Data is collected annually and after any significant activity that would impact the condition within a 10th of a mile stretch. 3. The planning division/asset management & information management units are responsible for the annual collections, and the construction division supplies all other data.

Frontage roads: 1. IRI, rutting and cracking. 2. Data is collected annually and after any significant activity that would impact the condition within a 10th of a mile stretch. 3. The planning division/asset management & information management units are responsible for the annual collections, and the construction division supplies all other data.

Crossover pavements: 1. Visual condition assessment only. Condition associated with mainline pavement. 2. Data is collected annually and after any significant activity that would impact condition. 3. The planning division/asset management & asset information units are responsible for annual collections, and the construction division supplies all of the data.

Rest area pavements: 1. Visual condition assessment only. Condition associated with mainline pavement. 2. Data is collected annually and after any significant activity that would impact condition. 3. The planning division/asset management & asset information units are responsible for annual collections, and the construction division supplies all of the data.

Weigh station pavements: 1. Visual condition assessment only. Condition associated with mainline pavement. 2. Data is collected annually and after any significant activity that would impact condition. 3. The planning division/asset management & asset information units are responsible for annual collections, and the construction division supplies all of the data.

Other ancillary pavements (please identify): Park-and-ride lots 1. Visual condition assessment only. Condition associated with mainline pavement. 2. Data is collected annually and after any significant activity that would impact condition. 3. The planning division/asset management & asset information units are responsible for annual collections, and the construction division supplies all of the data.

3. **Use an asset management tracking tool?** Yes.

3a. **What tool?** VueWorks.

3b. **Enter condition data in the tool?** Yes.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** dTIMs.

4b. **Enter condition data in the software?** Yes.

5. **Established measures and targets?** No.

6. **Addressing ancillary pavements in programming and investment decisions:** They are programmed and similar to other ancillary items such as guardrails and signs, with the understanding that these investments will not impact our target setting.

6a. **Financial implications of decisions:** These pavements are included as a factor in our pavement management program. It is understood that a percentage of pavement each year will go towards our target.

6b. **Include ancillary pavements in programmed pavement projects?** Ancillary pavements [are] programmed in when the pavements adjacent to or connected to are being programmed. Only if the ancillary pavement is in good to excellent condition will [w]e not include that pavement.

7. **Accounting for ancillary pavement cost in pavement management software:** Ancillary pavements are included as a percentage in the average costs of all our pavement projects.

8. **Documents or other materials to share?** No.

9. **Additional comments:** To clarify on question 8. We do not have any official documentation on the decision as to how we manage these ancillary pavements. If you have any additional questions please feel free to contact me.

South Dakota

Contact: Blair Lunde, Pavement Management Engineer, South Dakota Department of Transportation, blair.lunde@state.sd.us, 605-773-3119.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: Information on ancillary pavements is inventoried upon construction.

   Ramps: [No response.]

   Turn lanes: [No response.]

   Frontage roads: [No response.]

   Crossover pavements: [No response.]

   Rest area pavements: [No response.]

   Weigh station pavements: [No response.]

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: We do not collect distress data on shoulders.

   Ramps: Distress data on ramps is collected on occasion when time is available in the Fall, we have not had time in the Fall to collect since 2009.

   Turn lanes: Turn lanes are surveyed with mainline each year.

   Frontage roads: Unless it is designated as a state-numbered highway, distress data is not collected on frontage roads.

   Crossover pavements: Unless it is designated as a state-numbered highway, distress data is not collected on crossover pavements.

   Rest area pavements: Not collected.

Weigh station pavements: Not collected.

Other ancillary pavements (please identify): Not collected.

3. **Use an asset management tracking tool?** Yes.

3a. **What tool?** Internally developed.

3b. **Enter condition data in the tool?** No.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** Deighton Associates, Limited; dTIMS CT.

4b. **Enter condition data in the software?** No.

5. **Established measures and targets?** No.

6. **Addressing ancillary pavements in programming and investment decisions:** When working on adjacent mainline projects, ancillary pavements are included when deemed necessary in on-site inspections.

6a. **Financial implications of decisions:** [No response.]

6b. **Include ancillary pavements in programmed pavement projects?** [No response.]

7. **Accounting for ancillary pavement cost in pavement management software:** It isn't.

8. **Documents or other materials to share?** No.

9. **Additional comments:** [No response.]

Tennessee

Contact: James Maxwell, Maintenance/Assistant Director, Tennessee Department of Transportation, james.maxwell@tn.gov, 615-253-0012.

1. **Inventory ancillary pavements—how and how often:**

Shoulders: Shoulders are inventoried by LiDAR and photolog and dimensions are stored in our Tennessee Roadway Information Management System (TRIMS). Interstates and NHS routes are inventoried annually and non-NHS state routes are inventoried biennially. System condition of shoulders is sampled monthly as part of our Maintenance Management System. Preventive maintenance and resurfacing are addressed in conjunction with that of the mainline pavement.

Ramps: Ramps are inventoried by LiDAR and photolog and dimensions are soon to be stored in our Tennessee Roadway Information Management System (TRIMS). Interstates and NHS routes are inventoried annually and non-NHS state routes are inventoried biennially. System condition of shoulders [sic] is sampled monthly as part of our Maintenance Management System. Preventive maintenance and resurfacing are addressed in conjunction with that of the mainline pavement.

Turn lanes: Turn lanes are inventoried by LiDAR and photolog and dimensions are stored in our Tennessee Roadway Information Management System (TRIMS). NHS routes are inventoried annually and non-NHS state routes are inventoried biennially. Preventive maintenance and resurfacing are addressed in conjunction with that of the mainline pavement.

Frontage roads: Frontage roads are not inventoried. Preventive maintenance and resurfacing are addressed in conjunction with that of the mainline pavement, if deemed appropriate. Occasionally, projects are let to address frontage roads.

Crossover pavements: Crossover pavements are not inventoried. Preventive maintenance and

resurfacing are addressed in conjunction with that of the mainline pavement, if deemed appropriate.

Rest area pavements: Rest area pavements are not inventoried. Occasionally we are called upon to provide preventive maintenance or resurfacing for a rest area when contacted by the rest area or other staff.

Weigh station pavements: Weigh station pavements are not inventoried by LiDAR or photolog. Occasionally we are called upon to provide preventive maintenance or resurfacing for a weigh station when contacted by the weigh station or other staff.

Other ancillary pavements (please identify): None.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: These pavements are sampled by maintenance staff on a monthly basis. We detail cracking, drop-off and other distresses. This data is maintained in our Maintenance Management System for possible future use in budgeting.

   Ramps: These pavements are sampled by maintenance staff on a monthly basis. We detail cracking, drop-off and other distresses. This data is maintained in our Maintenance Management System for possible future use in budgeting.

   Turn lanes: Data on these pavements are not collected separately but are considered with the whole of the mainline pavement.

   Frontage roads: We do not normally collect condition data on frontage roads unless a special need is brought to our attention.

   Crossover pavements: Crossover pavements are considered part of the mainline pavement and addressed as such when there is a preventive maintenance or resurfacing project.

   Rest area pavements: No condition data collected.

   Weigh station pavements: No condition data collected.

   Other ancillary pavements (please identify): None.

3. **Use an asset management tracking tool?** No.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** Highway Pavement Management Application by Stantec.

4b. **Enter condition data in the software?** No.

5. **Established measures and targets?** No.

6. **Addressing ancillary pavements in programming and investment decisions:** Currently we do not address them but we are moving in that direction.

6a. **Financial implications of decisions:** We hope to be able to use our sampled segments to assist in determining appropriate funding levels for general maintenance in the future.

6b. **Include ancillary pavements in programmed pavement projects?** This is determined in the field when a project is programmed for maintenance.

7. **Accounting for ancillary pavement cost in pavement management software:** It is not.

8. **Documents or other materials to share?** We have a Maintenance Rating Index (MRI) manual that details how the shoulders and ramps should be assessed. I will send a pdf to your email.

9. **Additional comments:** The MRI program is being redesigned to provide 5 Levels of Service (A-F) instead of current Pass/Fail.

Texas

Contact: Magdy Mikhail, Director, Pavement Preservation Branch, Maintenance Division, Texas Department of Transportation, magdy.mikhail@txdot.gov, 512-832-7210.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: Yearly, district staff.

   Ramps: Yearly, district staff.

   Turn lanes: Yearly, district staff.

   Frontage roads: Yearly, district staff.

   Rest area pavements: Safety rest area inspection team, which is part of the maintenance division.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: Maintenance assessments; yearly on a limited sample; Maintenance Division.

   Ramps: Maintenance assessments; yearly on a limited sample; Maintenance Division.

   Turn lanes: Maintenance assessments, yearly on a limited sample; Maintenance Division.

   Frontage roads: Pavement condition evaluations as a part of pavement management, distress data rut, ride, cracking, failures, patches, etc. Service provider for windshield surveys and in-house district staff for rut & ride.

   Crossover pavements: N/A.

   Rest area pavements: Three times a year a full evaluation of the rest areas including a subjective evaluation of the pavement.

   Weigh station pavements: N/A.

3. **Use an asset management tracking tool?** No.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** In the process of updating legacy mainframe application to AgileAssets.

4b. **Enter condition data in the software?** Yes.

5. **Established measures and targets?** Yes. Goal of 90% of our pavements in good condition includes frontage roads, but not other ancillary pavements.

6. **Addressing ancillary pavements in programming and investment decisions:** Yes.

6a. **Financial implications of decisions:** [No response.]

6b. **Include ancillary pavements in programmed pavement projects?** Yes.

7. **Accounting for ancillary pavement cost in pavement management software:** Only account for frontage roads.

8. **Documents or other materials to share?** No.

9. **Additional comments:** [No response.]

Washington

Contact: Patrick Morin, Manager of Operations & Asset Management, Capital Program Development & Management Washington State Department of Transportation, morinp@wsdot.wa.gov, 360-705-7141.

1. **Inventory ancillary pavements—how and how often:**

   Shoulders: Inventoried in WSDOT's database entitled "Transportation Information and Planning System (TRIPS)." Updated as needed based on contract information. Info available @ http://www.wsdot.wa.gov/mapsdata/roadway/pdf/HwyLog2014Statewide.pdf.

   Ramps: Inventoried in WSDOT's database entitled "Transportation Information and Planning System (TRIPS)." Updated as needed based on contract information. Info available @ http://www.wsdot.wa.gov/mapsdata/roadway/pdf/HwyLog2014Statewide.pdf.

   Turn lanes: Inventoried in WSDOT's database entitled "Transportation Information and Planning System (TRIPS)." Updated as needed based on contract information. Info available @ http://www.wsdot.wa.gov/mapsdata/roadway/pdf/HwyLog2014Statewide.pdf.

   Frontage roads: Inventoried in WSDOT's database entitled "Transportation Information and Planning System (TRIPS)." Updated as needed based on contract information. Info available @ http://www.wsdot.wa.gov/mapsdata/roadway/pdf/HwyLog2014Statewide.pdf.

   Crossover pavements: Inventoried in WSDOT's database entitled "Transportation Information and Planning System (TRIPS)." Updated as needed based on contract information. Info available @ http://www.wsdot.wa.gov/mapsdata/roadway/pdf/HwyLog2014Statewide.pdf.

   Rest area pavements: No recorded inventory of pavement data.

   Weigh station pavements: No recorded inventory of pavement data.

   Other ancillary pavements (please identify): Park and ride lots. No recorded inventory of pavement data.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: From a windshield perspective, shoulder images are captured during the annual Washington State Pavement Management System data collection survey. WSDOT PMS staff does not rate these images to determine the Due Year for resurfacing.

   Ramps: Ramp images are captured during the Washington State Pavement Management System data collection survey at the request of the DOT Region. Only one Region out of six request routine ramp investigations.

   Turn lanes: From a windshield perspective, turn lane images are captured during the annual Washington State Pavement Management System data collection survey. WSDOT PMS staff does not rate these images to determine the Due Year for resurfacing.

   Frontage roads: Images are not collected unless specifically requested by the Region.

   Crossover pavements: Data is collected as long as the cross over is a state highway.

   Rest area pavements: Data is not collected during the annual Washington State Pavement Management data collection. Maintenance generally requests an investigation when the pavement condition develops significant wear.

   Weigh station pavements: Data is not collected during the annual Washington State Pavement Management data collection. Maintenance or the Washington State Patrol Weigh Enforcement Office requests an investigation when the pavement condition develops significant wear.

Other ancillary pavements (please identify): Park and ride lots. Data is not collected during the annual Washington State Pavement Management data collection. An investigation is performed when requested by Maintenance or the local transit agency.

3. **Use an asset management tracking tool?** No.
4. **Use a pavement management software program?** Yes.

4a. **What software program?** Washington State Pavement Management System.

4b. **Enter condition data in the software?** No.

5. **Established measures and targets?** No.
6. **Addressing ancillary pavements in programming and investment decisions:** At the network level, average project costs include ancillary paving. At the project level, ancillary pavement[s] are included based on engineers assessment of condition.

6a. **Financial implications of decisions:** WSDOT's Paving Model is based on parametric estimates that include the cost of paving these ancillary pavements.

6b. **Include ancillary pavements in programmed pavement projects?** If there is an adjacent paving project, the Region Materials Engineer reviews the ancillary pavements to determine if they need rehabilitation.

7. **Accounting for ancillary pavement cost in pavement management software:** WSPMS does not estimate or include project level costs in the software. The Paving Model incorporates an allocation to cover the average ancillary preservation work over a 10-year period.
8. **Documents or other materials to share?** No.
9. **Additional comments:** WSDOT regularly reviews its processes to determine if they are providing the information necessary to make wise investment decisions.

Wyoming

Contact: Martin Kidner, Asset Manager, Wyoming Department of Transportation, martin.kidner@wyo.gov, 307-777-4766.

The respondent provided the following in response to the survey questions:

> "Just to close the loop, your e-mail specifies 'If you have experience...' which Wyoming does not. We have a group of roads, nearly identical to yours that we term as pavements not managed."

International Responses

Alberta

Contact: Wei He, SPE/Pavement Management Specialist, Alberta Ministry of Transportation, wei.he@gov.ab.ca, 780-415-6567.

1. **Inventory ancillary pavements—how and how often:**

Shoulders: Included as part of the paved surface, updated from final construction drawings.

Ramps: We are in the process of setting up an inventory for ramps and frontage roads.

Turn lanes: Included as part of the paved surface, updated from final construction drawings.

Frontage roads: We are in the process of setting up an inventory for ramps and frontage roads.

Crossover pavements: Not tracked at the network level.

Rest area pavements: Not tracked at the network level.

Weigh station pavements: Not tracked at the network level.

2. **Track condition of ancillary pavements—type of data collected, frequency of and responsibility for data collection:**

   Shoulders: Cracking, included in automated pavement distress survey trials. Frequency not determined at this point but envisioned to have 2-3 year cycles.

   Ramps: Generally not tracked at the network level.

   Turn lanes: Cracking, included in automated pavement distress survey trials. Frequency not determined at this point but envisioned to have 2-3 year cycles.

   Frontage roads: Generally not tracked at the network level.

   Crossover pavements: Not tracked at the network level.

   Rest area pavements: Not tracked at the network level.

   Weigh station pavements: Not tracked at the network level.

   Other ancillary pavements (please identify): N/A.

3. **Use an asset management tracking tool?** Yes.

3a. **What tool?** Pavement Management System.

3b. **Enter condition data in the tool?** Yes.

4. **Use a pavement management software program?** Yes.

4a. **What software program?** HPMA (developed by Stantec Consulting Inc.).

4b. **Enter condition data in the software?** Yes.

5. **Established measures and targets?** No.

6. **Addressing ancillary pavements in programming and investment decisions:** Shoulders and turning lanes are included as part of the pavement. Others are handled as additional areas at the project level by the Regions/Districts.

6a. **Financial implications of decisions:** With the exception of shoulder and turn lanes, other additional areas could increase the project cost by 14-20%, up to a certain dollar amount, by which the additional area(s) becomes a separate project.

6b. **Include ancillary pavements in programmed pavement projects?** Decided case by case. They may or may not be included with a regular paving project depending on the needs, cost and budget.

7. **Accounting for ancillary pavement cost in pavement management software:** Shoulders and turning lanes are counted as part of the pavement, others are not accounted for.

8. **Documents or other materials to share?** No.

9. **Additional comments:** We are also curious about the practice from other DOTs. Hope the survey results can be shared.

Appendix B

FY 2014 Maintenance Level of Service Statewide Report Executive Summary

A Caltrans Innovative Approach to Maintenance Evaluation

Division of Maintenance

Tony Tavares - Division Chief

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Introduction

Level of Service Application and Disclaimer

The Maintenance Level of Service (LOS) program was developed to evaluate and report how well the Division of Maintenance is able to maintain the State's highways according to guidelines established in the Maintenance Manual.

LOS evaluations are conducted once a year and represent a snapshot of the roadway condition at the time the evaluations were conducted. LOS scores presented at the District level are not adjusted for Average Daily Traffic (ADT), terrain, or climate; the reader should consider these characteristics when comparing LOS scores for each District. LOS scores are primarily used as a tool by the Division of Maintenance to assess how well policies established in the Maintenance Manual are implemented statewide.

Level of Service Sampling

The LOS evaluation segments are randomly selected each year and therefore LOS score fluctuations of +5 or -5 points from year to year are considered stable. The scope of the State's sampling effort was established by dividing the State's highway inventory into one-mile segments. LOS evaluations were performed in each District on a random 20 percent of the segments with the exception of District 12. A larger sampling size of 40% was selected because of the small highway inventory in District 12.

Table 1, *FY 2014 District LOS Sampling Statistics,* summarizes the number of segments evaluated in each District and the percentage of each District's total centerline miles that were evaluated. The number of Landscaping segments, Rest Areas, Vista Points, and Park and Ride lots that were evaluated in each District are also listed.

Table 2, *District LOS Coordinator,* identifies the LOS coordinators responsible for the LOS evaluations in each District.

Table 1: FY 2014 District LOS Sampling Statistics

Dist.	Roadway		Landscape	Rest Areas	Vista Points	Park & Ride
	Segments Evaluated	% Evaluated	Segments Evaluated	Segments Evaluated	Segments Evaluated	Segments Evaluated
1	195	20%	0	5	14	6
2	357	20%	42	19	10	10
3	322	20%	50	11	9	26
4	313	20%	50	4	13	43
5	261	20%	50	5	7	10
6	378	20%	50	7	3	11
7	249	20%	61	2	1	45
8	387	20%	50	10	6	17
9	214	20%	1	5	17	1
10	285	20%	43	6	23	2
11	213	20%	50	7	4	58
12	123	40%	49	0	0	3
Total	**3,297**		**496**	**81**	**107**	**232**

Table 2: District LOS Coordinator

District	LOS Coordinator	Contact No.
1	Bill Wolf	(707) 441-5863
2	Tim Croom	(530) 225-3550
3	Mike Monaghan	(530) 740-4945
4	Olie Ealy	(510) 715-6688
5	Carol Salas	(805) 549-3834
6	David Macias	(559) 978-7965
7	Roger Castillo	(213) 620-6318
8	Eric Hedberg	(909) 888-1264
9	Tim Walsh	(760) 872-1371
10	Jon Bevan	(209) 948-7530
11	Terry Kloepfer	(619) 688-3329
12	Darla Duncan	(714) 288-4073

Reporting of Level of Service

The programs in the Division of Maintenance responsible for the LOS data presented in this report are summarized in Table 3, *Evaluation Responsibility*.

Table 3: Evaluation Responsibility

Program	Family	Elements	Evaluation Responsibility
HM-1	A	Flexible Pavement	LOS
HM-1	B	Rigid Pavement	LOS
HM-2	C	Slopes, Drainage	LOS
HM-2	D	Roadside Litter and Debris	LOS
HM-2	E	Landscaping	LOS
HM-2	G	Roadside Rests, Vista Points and Park and Ride Lots	LOS
HM-3	H	Bridge	HM-3 Structure
HM-4	K	Electrical	HM-4 Electrical
HM-4	M	Traffic Guidance	LOS
HM-2	C & E	Annual Tree Inspection	HM-2 Landscaping

Evaluation Period

This report contains the results of the LOS evaluations that were conducted between March, 2014 and September, 2014. LOS evaluations are performed annually and represent a snapshot of the condition of the highway segments or facilities at the time the evaluations were conducted.

Electrical LOS, Bridge LOS and the Annual Tree Inspection (ATI) evaluation periods are discussed on pages 24, 27 and 28 respectively.

Quality Assurance

The Quality Assurance (QA) process involves Headquarter staff conducting independent LOS evaluations in each District. An additional QA review is conducted if the discrepancy between the District's evaluation and the QA team's initial evaluation exceeds 10 percent. This process is repeated until the discrepancy is less than 10 percent.

The QA team conducts random field evaluations in the Districts throughout the LOS evaluation period. Every District is evaluated by the QA team at least once.

Intranet Web Site and Contact

For additional information about the LOS program or for LOS data from a prior year, contact the Statewide LOS Coordinator Tong Yang at e-mail Tong_Yang@dot.ca.gov or by phone at (916) 263-4988 or visit the Maintenance LOS intranet website at http://onramp.dot.ca.gov/hq/maint/roadway/los/index.shtml.

The Mile Marker Performance Measures

Litter and Debris Level of Service

The Mile Marker performance measures are statewide goals and do not apply to individual Districts. One of the performance measures for Maintenance is to achieve a Litter and Debris Level of Service (LOS) score of 80. The LOS evaluation criteria for Litter and Debris are as follows: The amount of litter and debris is offensive;

- Pass (LOS 100): no deficiency
- Need 1 (LOS 50): one small area
- Need 2 (LOS 0): more than one area

Pass: LOS = 100

Need 2: LOS = 0

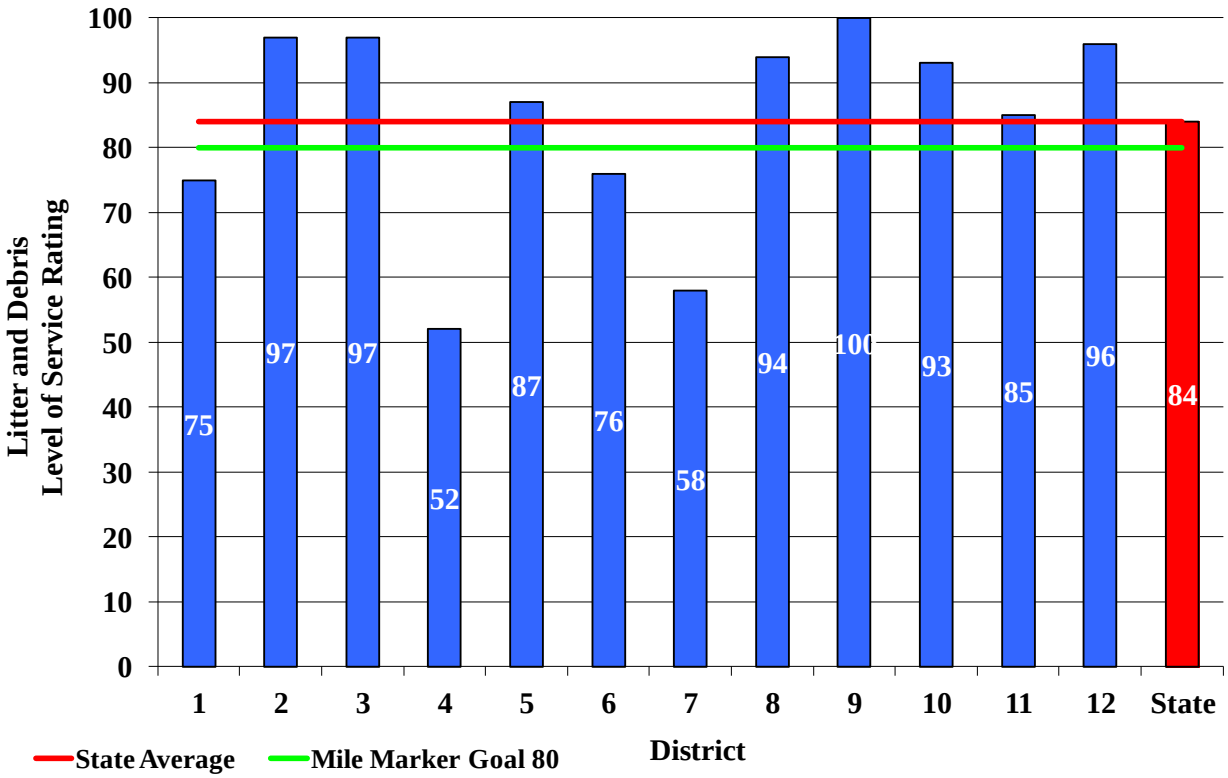
In Fiscal Year (FY) 2014, the State evaluated 3,297 highway segments for Litter and Debris. The results of this evaluation are as follows:

- 2,645 segments were rated as *Pass*
- 242 segments were rated as *Need 1*
- 410 segments were rated as *Need 2*.

Calculated based on those conditions, the LOS score for Litter and Debris is 84. The Division of Maintenance met the Mile Marker performance goal of achieving an LOS score of 80 for Litter and Debris. The statewide Litter and Debris expenditure as reported in the Integrated Maintenance Management System (IMMS) for FY 2014 was $43.7 million, an increase of approximately $6.5 million from the prior year. Expenditures associated with the litter abatement program (D4 Family) were approximately $22.5 million or 52% of the statewide Litter and Debris effort.

The Sweeping expenditure (D30050 and F20051) accounted for $18.5 million or 42% of the total Litter and Debris expenditure. The Road Patrol Inspection and Investigation Activities (D2 Family) accounted $2.7 million or 6% of the statewide Litter and Debris effort. Additional Litter and Debris expenditure data is available on the Maintenance intranet website under the IMMS dashboard link. The Litter and Debris LOS score did not change from previous year's score of 84 and decreased 1 point as compared to two years ago. Refer to Exhibit State-1, *FY 2014 Litter and Debris Level of Service Distribution*, for the Litter and Debris LOS distribution.

Exhibit State-1: FY 2014 Litter and Debris Level of Service Distribution



Striping Level of Service

The Mile Marker performance measure for Striping is to achieve a statewide LOS score of 95. The LOS evaluation criteria for striping are as follows: No night inspection conducted, striping needs replacement;

- Pass (LOS 100): no deficiency
- Need 1 (LOS 50): no night inspection documentation
- Need 2 (LOS 0): no actions taken on problems identified in the night inspections and deficiency exceeds the threshold

Pass: LOS = 100

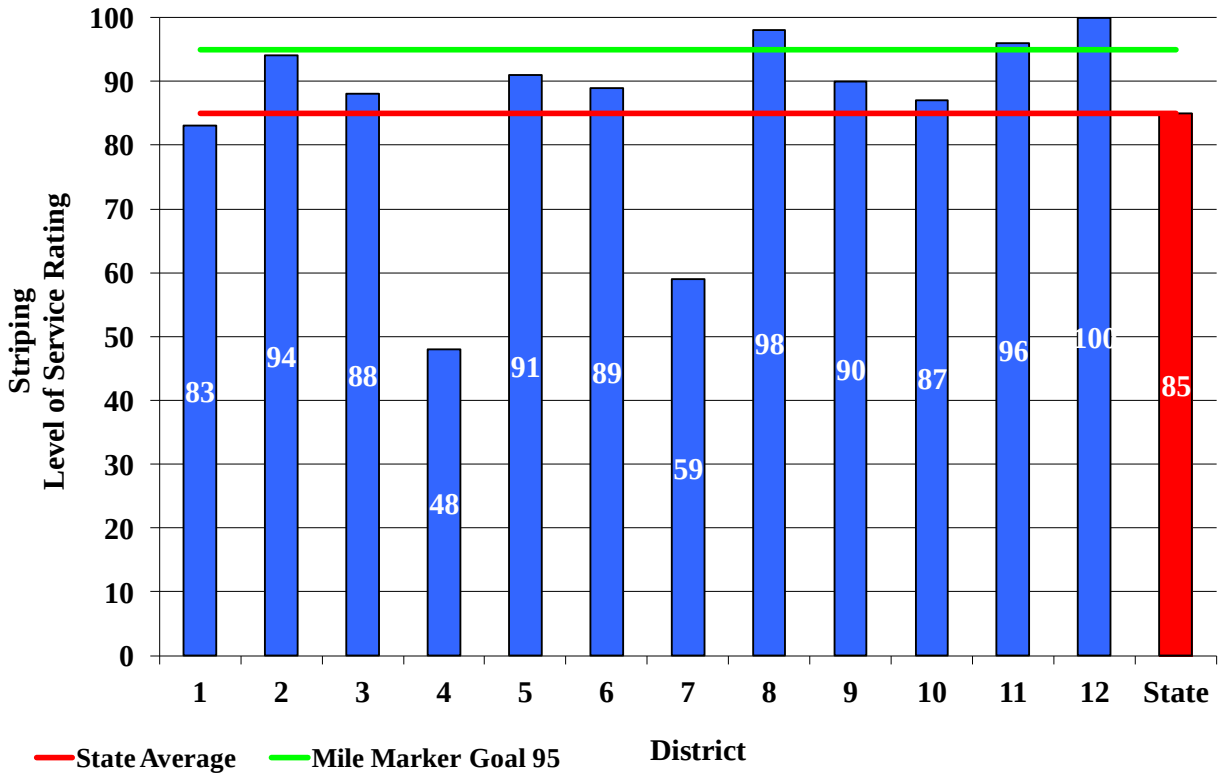
Need 2: LOS = 0

In FY 2014, the State evaluated 3,297 highway segments for Striping. The results of this evaluation are as follows:

- 2,798 segments were rated as *Pass;*
- 13 segments were rated as *Need 1*;
- 486 segments were rated as *Need 2*.

Calculated based on those conditions, the LOS score for Striping is 85. The Division of Maintenance did not meet the Mile Marker performance measure of achieving an LOS score of 95 for Striping. The statewide Striping expenditure as reported in IMMS for FY 2014 was $10.6 million, an increase of $1.3 million from the prior year. Additional Striping expenditure data is available on the Maintenance intranet website under the IMMS dashboard link. The Striping LOS score decreased 2 points from the previous year and decreased 5 points as compared to two years ago. Refer to Exhibit State-2, *FY 2014 Striping Level of Service Distribution*, for the Striping LOS distribution.

Exhibit State-2: FY 2014 Striping Level of Service Distribution



Guardrail Level of Service

The Mile Marker performance measure for Guardrail is to achieve a statewide LOS score of 95. The LOS evaluation criteria for Guardrail are as follows: Posts not securely in place or guardrail damaged or deteriorated;

- Pass (LOS 100): no deficiency
- Need 2 (LOS 0): any deficiency

Pass: LOS = 100

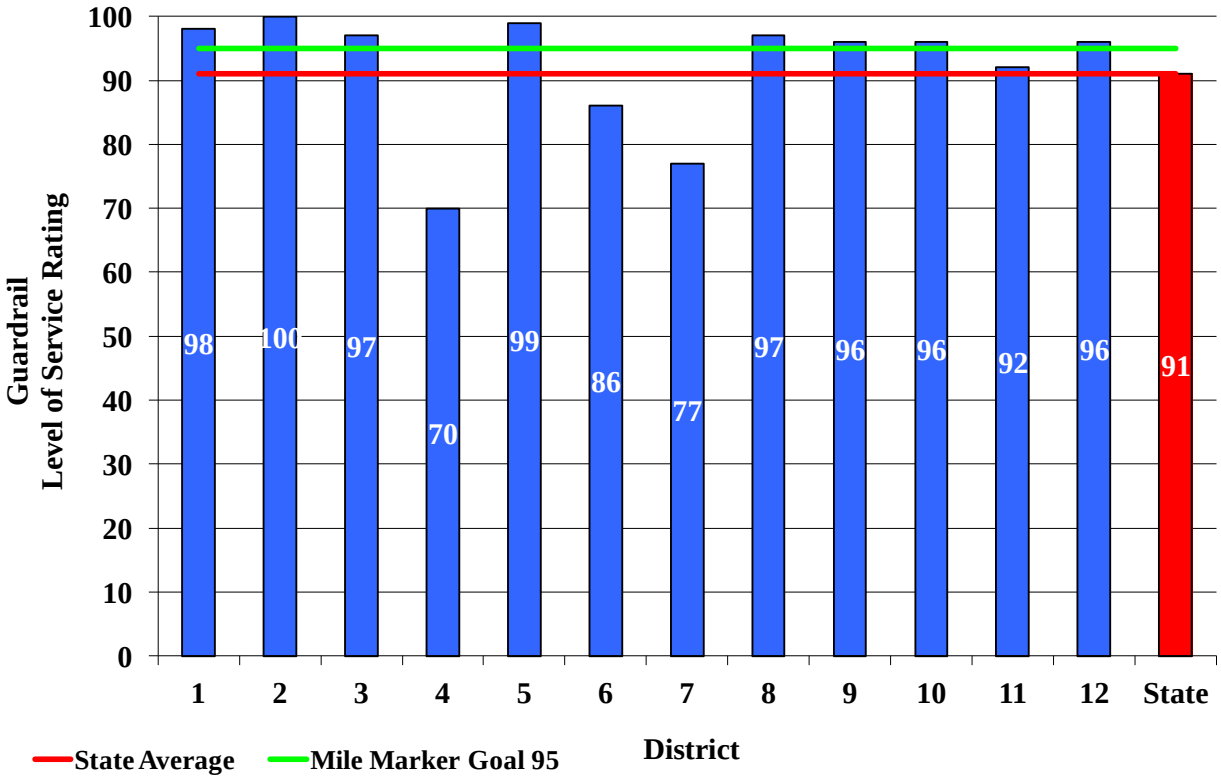
Need 2: LOS = 0

In FY 2014, the State evaluated 1,824 highway segments for Guardrail. The results of this evaluation are as follows:

- 1,652 segments were rated as *Pass;*
- 172 segments were rated as *Need 2*.

Calculated based on those conditions, the LOS score for Guardrail is 91. The Division of Maintenance did not meet the Mile Marker performance measure of achieving an LOS score of 95 for Guardrail. The statewide Guardrail expenditure as reported in IMMS for FY 2014 was $10.2 million, an increase of approximately $1.0 million from the prior year. The Guardrail LOS score decreased 1 point from previous year and did not change as compared to two years ago. Refer to Exhibit State-3, *FY 2014 Guardrail Level of Service Distribution*, for the Guardrail LOS distribution.

Exhibit State-3: FY 2014 Guardrail Level of Service Distribution



Roadway (A, B, C, D and M Families)

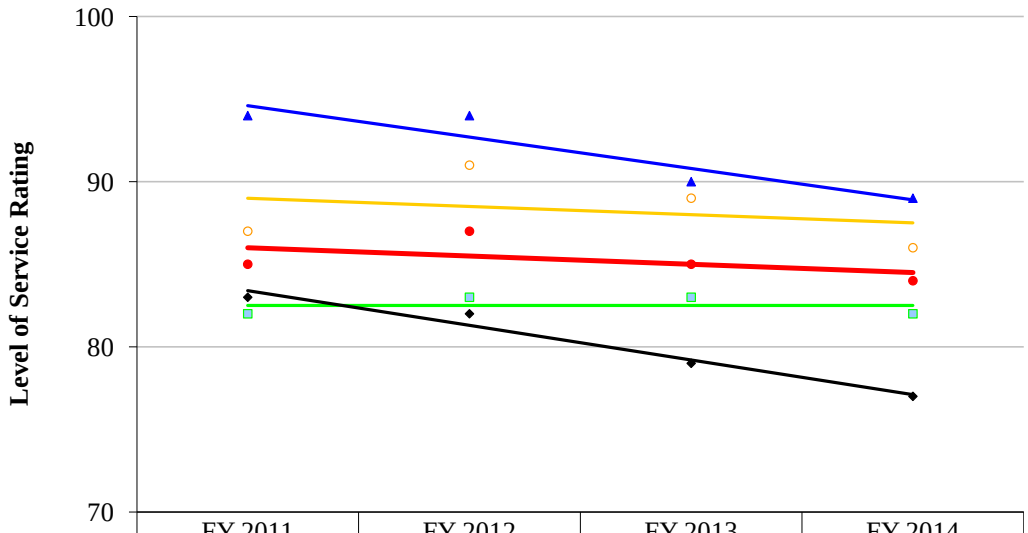
Overall Roadway Level of Service Trends

The Overall Roadway LOS score is a measure of the maintenance needs of the entire highway and is calculated based upon a weighted average of the following elements:

- Travelway (40%)
- Drainage (15%)
- Roadside (15%)
- Traffic Guidance (30%)

The FY 2014 Overall Roadway LOS score is 84. The Division of Maintenance did not meet the Mile Marker performance measure of achieving an LOS score of 87 for Overall Roadway. The Overall Roadway LOS score decreased 1 point from the previous year and decreased 3 points as compared to two years ago, indicating that the Level of Service of the State's highways has remained stable during this period. LOS scores have a tolerance of +5 or -5 points due to the random sampling of the evaluation segments. Therefore LOS score fluctuations of +5 or -5 points from year to year are considered a stable LOS trend. See Exhibit State-4, *Roadway Level of Service Trends*, for the Roadway LOS trends and Exhibit State-5, *Roadway Attribute Summary*, for the Roadway attribute summary.

Exhibit State-4: Roadway Level of Service Trends



	FY 2011	FY 2012	FY 2013	FY 2014
Travelway	82	83	83	82
Drainage	94	94	90	89
Roadside	83	82	79	77
Traffic Guidance	87	91	89	86
Overall Roadway	85	87	85	84

Exhibit State-5: Roadway Attribute Summary

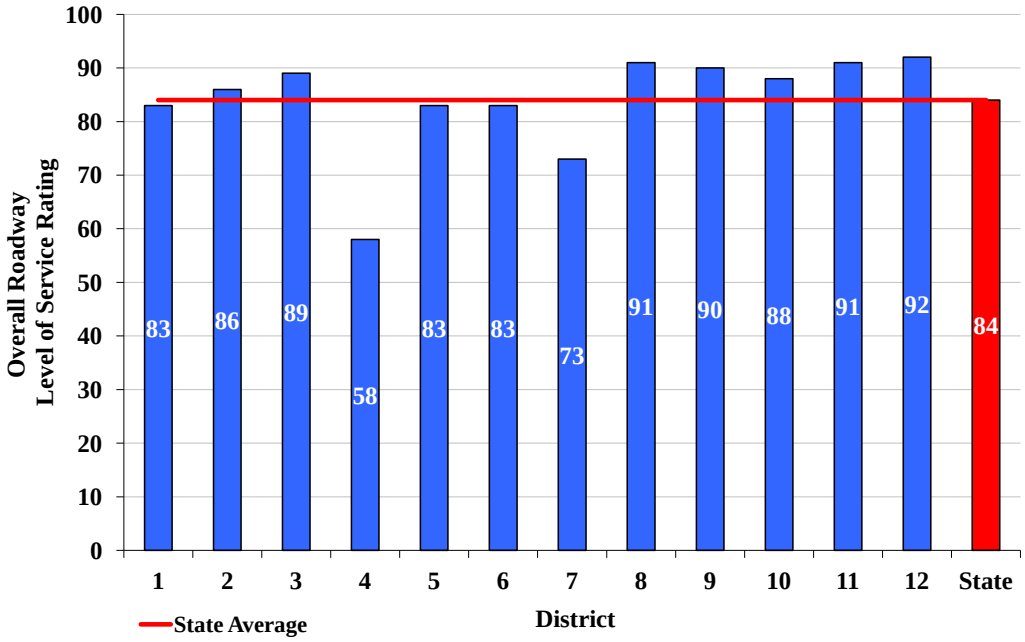
FY 2014					
Maintenance Attribute	**Pass**	**Need 1**	**Need 2**	**Applicable**	**LOS Score**
Flexible Travelway (40%)	**Travelway LOS = 82**				
Rideability	2518	219	145	2882	91
Cracks	1349	130	1403	2882	49
Alligator Cracking	2141	66	675	2882	75
Potholes	2527	150	205	2882	90
Wheel Rutting	2729	53	100	2882	96
Coarse Raveling	2608	69	205	2882	92
Bleeding	2778	28	76	2882	97
Paved Shoulders	917	124	566	1607	61
Ramps	176	58	191	425	48
Rigid Travelway (40%)					
Joint Separation	331	30	110	471	73
Slab Failure	394	26	51	471	86
Cracks	219	55	197	471	52
Spalls	249	63	159	471	60
Paved Shoulders	251	47	161	459	60
Ramps	160	46	107	313	58
Drainage (15%)	**Drainage LOS = 89**				
Surface Drains	2878	136	283	3297	89
Cross Drains	2459		325	2784	88
Ditches	2511		497	3008	83
Slope	2950	46	104	3100	96
Ramps	558	46	110	714	81
Roadside (15%)	**Roadside LOS = 77**				
Roadside Vegetation	1974	301	1022	3297	64
Fences	937	87	211	1235	79
Tree/Brush Encroachment	2240		1057	3297	68
Litter/Debris *	2645	242	410	3297	84
Graffiti	2851	249	197	3297	90
Ramps	302	93	326	721	48
Traffic Guidance (30%)	**Traffic Guidance LOS = 86**				
Striping *	2798	13	486	3297	85
Pavement Marking	1529	77	428	2034	77
Raised Markers	2332	43	399	2774	85
Guide Markers	2591	105	316	3012	88
Signs	2707	77	324	3108	88
Guardrail *	1652		172	1824	91
Barriers	720		64	784	92
Attenuators	263		18	281	94
Ramps	374	71	244	689	59

*Performance Measure

Overall Roadway Level of Service

The FY 2014 statewide Overall Roadway LOS score is 84. The Overall Roadway LOS scores varied from a low of 58 in District 4 to a high of 92 in District 12. The low Overall Roadway LOS score in District 4 is due to low scores for Roadside (LOS 45) and Traffic Guidance (LOS 49). District 12 led the State in Overall Roadway LOS for the 8th year in a row. Refer to Exhibit State-6, *FY 2014 Overall Roadway Level of Service Distribution*, for the Overall Roadway LOS distribution. For additional LOS scores by District, please refer to the District LOS reports, which are available on the Maintenance intranet website: http://onramp.dot.ca.gov/hq/maint/roadway/los/index.shtml

Exhibit State-6: FY 2014 Overall Roadway Level of Service Distribution



Travelway Level of Service (A and B Families)

The Travelway element was divided into two categories, flexible and rigid. The Flexible Travelway (AC) consists of the following 9 attributes;

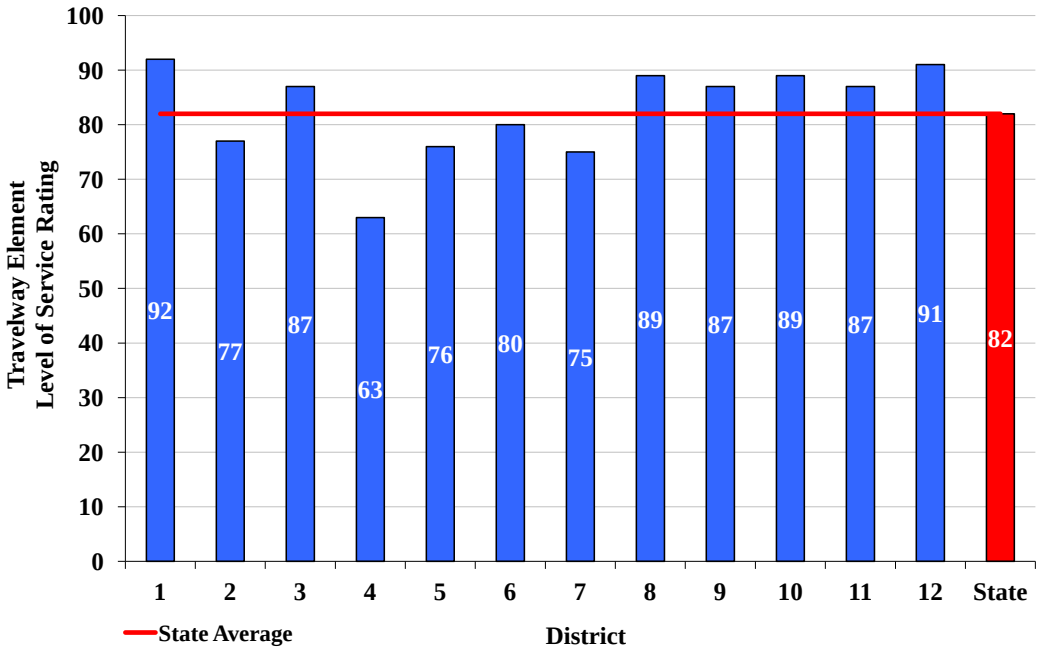
- Rideability, cracks, alligator cracking, potholes, wheel rutting, coarse raveling, bleeding, paved shoulders, and ramps

The Rigid Travelway (PCC) consists of the following 6 attributes;

- Joint separation, slab failure, cracks, spalls, paved shoulders, and ramps

Calculated as a weighted average of those attributes, the FY 2014 LOS score for Travelway is 82. The Travelway LOS score decreased 1 point from the prior year and decreased 1 point as compared to two years ago. The LOS scores for Travelway varied from a low of 63 in District 4 to a high of 92 in District 1. The low Travelway score for District 4 is due to low LOS scores for Cracks (LOS 38), Paved Shoulders (LOS 46) and Alligator Cracking (LOS 56). Refer to Exhibit State-7, *FY 2014 Travelway Level of Service Distribution*, for the Travelway LOS distribution.

Exhibit State-7: FY 2014 Travelway Level of Service Distribution



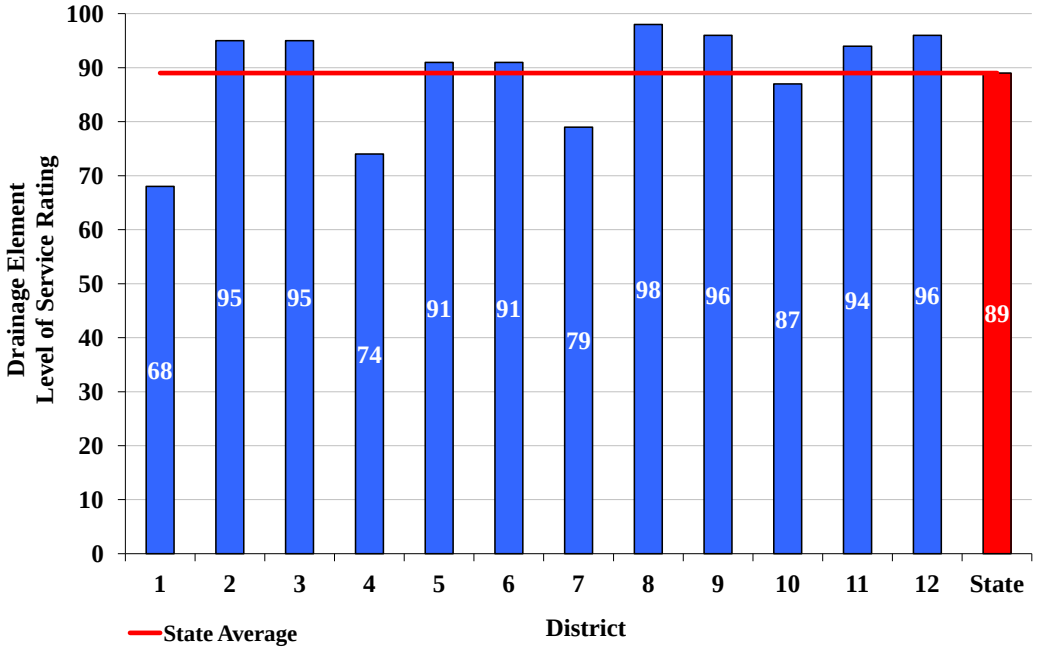
Drainage Level of Service (C Family)

The Drainage element consists of the following 5 attributes;

- Surface drain, cross drains, ditches, slopes, and ramps

Calculated as a weighted average of those attributes, the FY 2014 LOS score for Drainage is 89. The Drainage LOS score decreased 1 point from the prior year and decreased 5 points as compared to two years ago. The LOS scores for Drainage varied from a low of 68 in District 1 to a high of 98 in Districts 8. The low Drainage score for District 1 is due to low LOS scores for Ditches (LOS 31) and Surface Drains (LOS 51). Refer to Exhibit State-8, *FY 2014 Drainage Level of Service Distribution*, for the Drainage LOS distribution.

Exhibit State-8: FY 2014 Drainage Level of Service Distribution



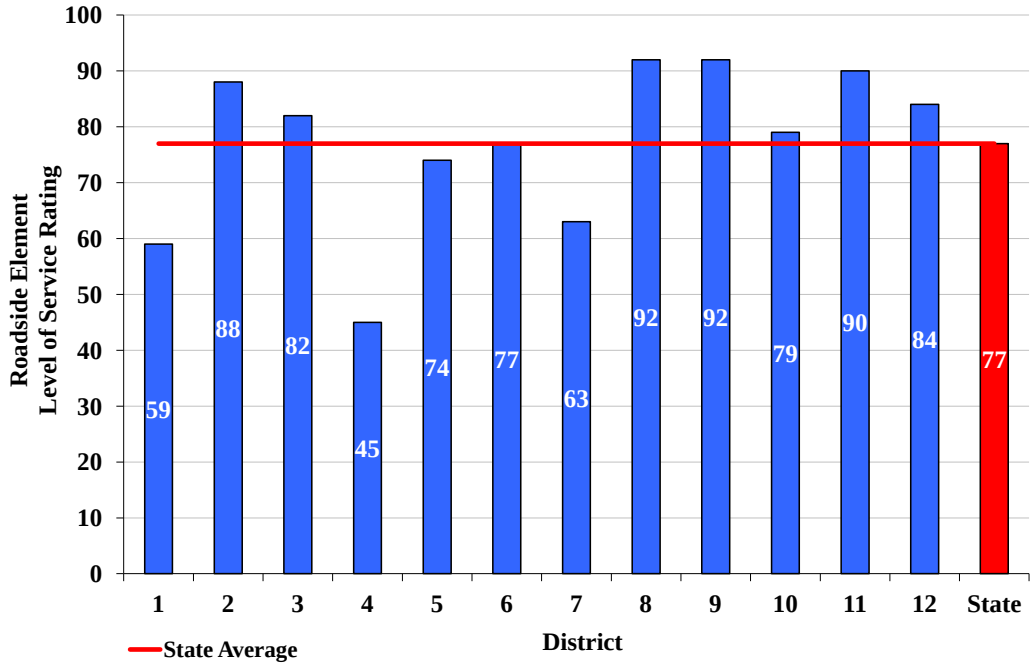
Roadside Level of Service (C and D Families)

The Roadside element consists of 6 attributes;

- Vegetation, fences, tree/brush encroachment, litter and debris, graffiti, and ramps

Calculated as a weighted average of those attributes, the FY 2014 LOS score for Roadside is 77. The Roadside LOS score decreased 2 points from the prior year and decreased 5 points as compared to two years ago. The LOS score for Roadside varied from a low of 45 in District 4 to a high of 92 in Districts 8 and 9. The low Roadside score for District 4 is due to low LOS scores for Tree/Brush Encroachment (LOS 30), Roadside Vegetation (LOS 38), and Litter and Debris (LOS 52). Refer to Exhibit State-9, *FY 2014 Roadside Level of Service Distribution*, for the Roadside LOS distribution.

Exhibit State-9: FY 2014 Roadside Level of Service Distribution



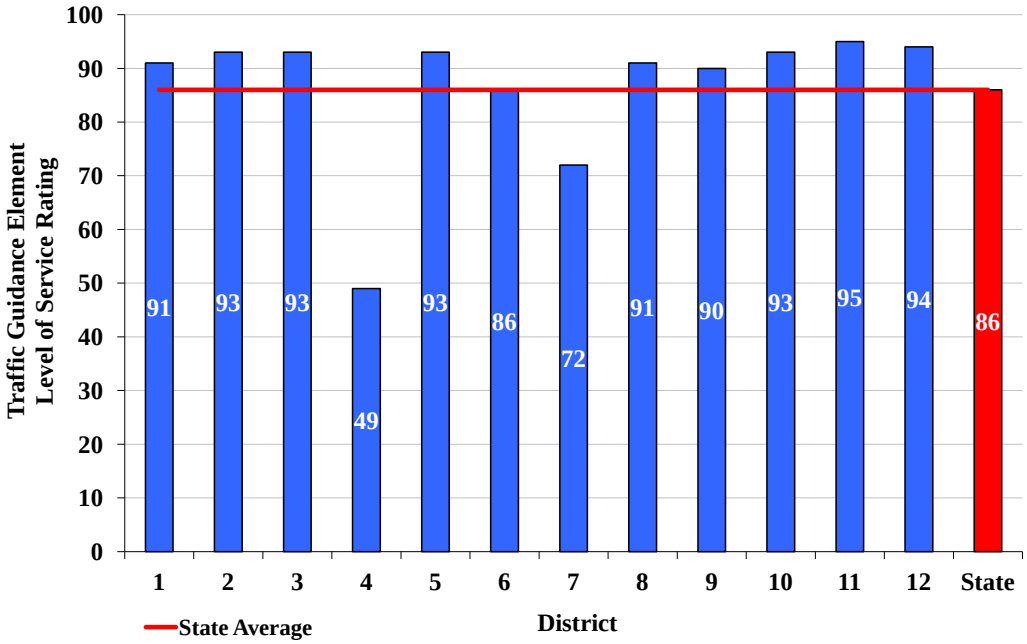
Traffic Guidance Level of Service (M Family)

The Traffic Guidance element consists of 9 attributes;

- Striping, pavement markings, raised markers, guide markers, signs, guardrails, barriers, attenuators, and ramps

Calculated as a weighted average of those attributes, the FY 2014 LOS score for Traffic Guidance is 86. The Traffic Guidance LOS score decreased 3 points from the prior year and decreased 5 points as compared to two years ago. The LOS scores for Traffic Guidance varied from a low of 49 in District 4 to a high of 95 in District 11. The low District 4 Traffic Guidance LOS score is due to low scores for Guide Markers (LOS 27), Signs (LOS 31) and Pavement Markings (LOS 43). Refer to Exhibit State-10, *FY 2014 Traffic Guidance Level of Service Distribution*, for the Traffic Guidance LOS distribution.

Exhibit State-10: FY 2014 Traffic Guidance Level of Service Distribution



E & G Family

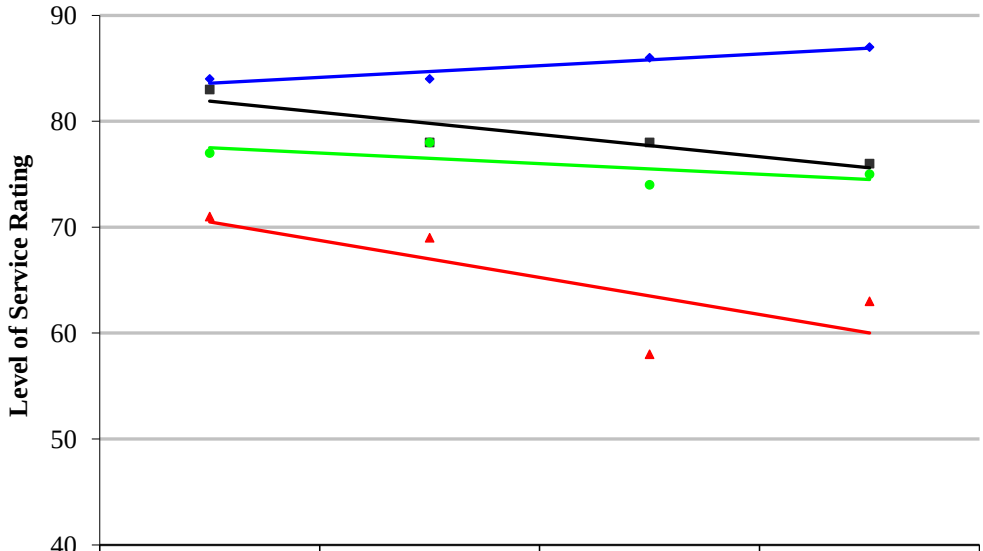
E & G Family Level of Service Trends

The E & G Maintenance Families consists of the following elements:

- Landscaping, Rest Areas, Vista Points, Park and Ride Lots

Comparing the FY2014 LOS scores of the E & G family elements with scores from previous years; Landscaping and Vista Points shows a negative trend with declining LOS scores. The LOS trends for Rest Areas and Park and Ride Lots are stable. LOS scores have a tolerance of +5 or -5 points due to the random sampling of the evaluation segments. Therefore LOS score fluctuations of +5 or -5 points from year to year are considered a stable LOS trend. See Exhibit State-11, *E & G Family Level of Service Trends*, for the E & G family LOS trends and Exhibit State-12, *E & G Family Attribute Summary*, for the E & G family attribute summary. For additional LOS scores by District, please refer to the District LOS reports, which are available on the Maintenance intranet website: http://onramp.dot.ca.gov/hq/maint/roadway/los/index.shtml

Exhibit State-11: E & G Family Level of Service Trends



	FY 2011	FY 2012	FY 2013	FY 2014
Landscaping	71	69	58	63
Rest Areas	84	84	86	87
Vista Points	83	78	78	76
Park & Ride Lots	77	78	74	75

FY 2014 Maintenance LOS Statewide Report

Exhibit State-12: E & G Family Attribute Summary

FY 2014	Pass	Need 1	Need 2	Applicable	LOS Score
Landscaping	**Landscaping LOS = 63**				
Weed control	170	99	227	496	44
Volunteer plants	218	139	139	496	58
Mulch	186	36	45	267	76
Tree/shrub/vine encroachment	301		194	495	61
Tree/shrub/vine health	257	124	111	492	65
Tree/shrub/vine prune	236	118	135	489	60
Ground cover	201	49	73	323	70
Irrigation system	292		89	381	77
Litter	336	83	77	496	76
Roadside Rest Area	**Rest Area LOS = 87**				
Structure	72	6	3	81	93
Restroom interior	59	11	11	81	80
Paint	71	7	3	81	92
Plumbing fixtures	61	11	9	81	82
Janitorial level	77	3	1	81	97
Infomation display case	69	3	7	79	89
Phones, fountains	70		9	79	89
Walkways	71		9	80	89
Grounds	74	3	4	81	93
Tables/benches	74	4	2	80	95
Signs	65	6	10	81	84
Parking lot pavement cracks	38	4	39	81	49
Parking lot potholes	67	6	6	79	89
Drainage	78	1	2	81	97
Irrigation system	55		6	61	90
Striping/marking	59	2	19	80	75
Graffiti	47	15	19	81	67
Lighting	71	2	5	78	92
Litter	75	5	1	81	96
Vista Points	**Vista Points LOS = 76**				
Vegetation control	63	18	24	105	69
Pavement	47	15	42	104	52
Litter	87	9	11	107	86
Graffiti	70	12	25	107	71
Drainage	92	12	3	107	92
Signs	85	3	9	97	89
Striping/marking	44	10	21	75	65
Lighting	9	1	0	10	95
Park and Ride Lots	**Park & Ride Lots LOS = 75**				
Pavement	91	45	96	232	49
Litter	156	37	39	232	75
Graffiti	183	25	24	232	84
Drainage	203	11	7	221	94
Signs	179	16	36	231	81
Striping/marking	124	22	84	230	59
Irrigation	81		32	113	72
Vegetation control	140		89	229	61
Landscaping	99	14	10	123	86
Lighting	187	2	1	190	99

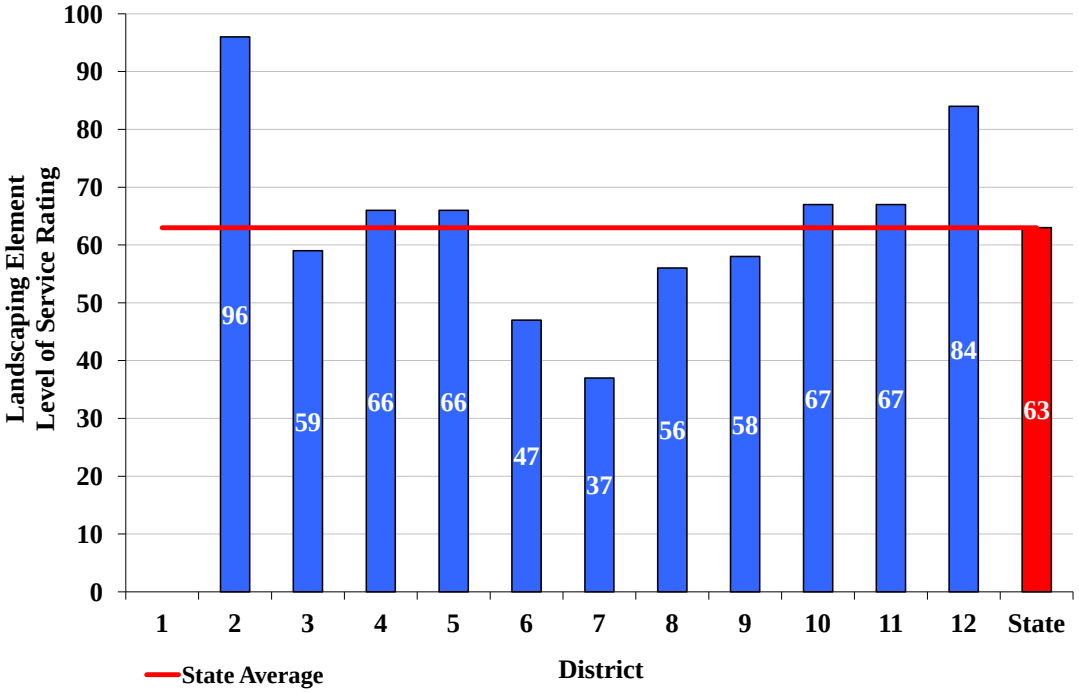
Landscaping Level of Service (E Family)

The Landscaping element consists of 9 attributes;

- Weed control, volunteer plants, mulch, tree/shrub/vine encroachment, tree/shrub/vine health, tree/shrub/vine prune, ground cover, irrigation system and litter

Calculated as a weighted average of those attributes, the FY 2014 LOS score for Landscaping is 63. The LOS scores for Landscaping varied from a low of 37 in District 7 to a high of 96 in District 2. The low Landscaping score for District 7 is due to low scores for Weed Control (LOS 20), Litter (LOS 29), Tree/Shrub Encroachment (LOS 36) and Tree/Shrub Health (LOS 37). No Landscaping segments were evaluated in District 1. Refer to Exhibit State-13, *FY 2014 Landscaping Level of Service Distribution*, for the Landscaping LOS distribution.

Exhibit State-13: FY 2014 Landscaping Level of Service Distribution



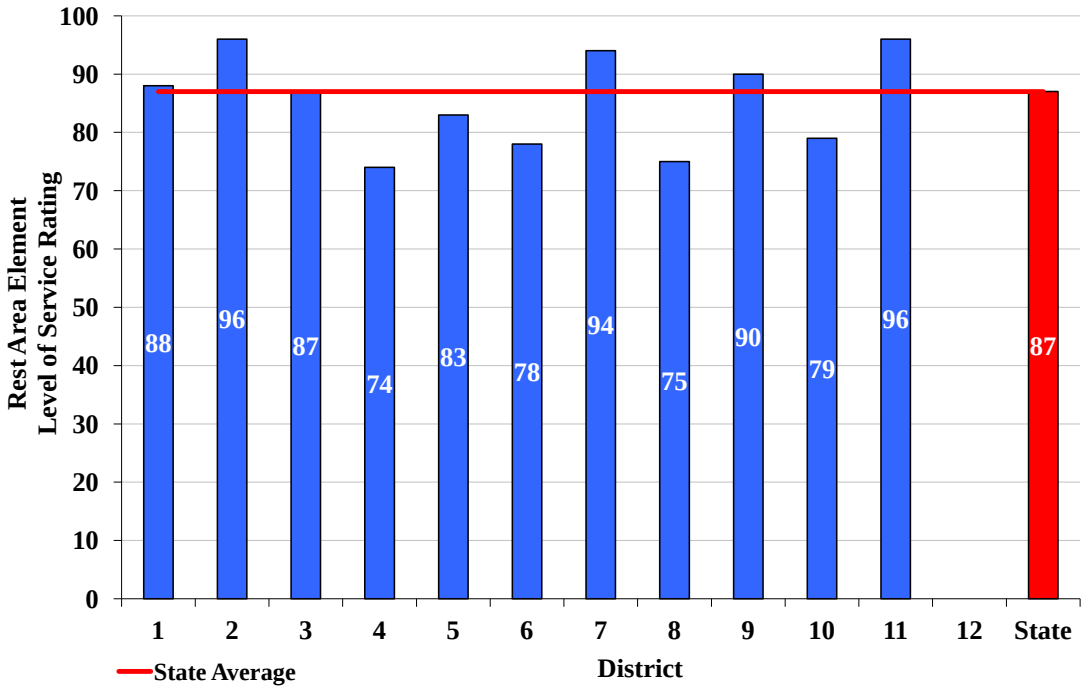
Rest Area Level of Service (G Family)

The Rest Area element consists of 19 attributes;

- Structure, rest room interior, paint, plumbing fixtures, janitorial level, information display cases, phones and fountains, walkways, grounds, tables and benches, signs, parking lot pavement cracks, parking lot potholes, drainage, irrigation, striping and marking, graffiti, lighting and litter

Calculated as a weighted average of those attributes, the FY 2014 LOS score for Rest Area is 87. The LOS scores for Rest Area varied from a low of 74 in District 4 to a high of 96 in Districts 2 and 11. The low Rest Area score for District 4 is due to low scores for Graffiti (LOS 13), Restroom Interior (LOS 50), and Pavement Cracks (LOS 63). There are no Rest Areas in District 12. Refer to Exhibit State-14, *FY 2014 Rest Area Level of Service Distribution*, for the Rest Area LOS distribution.

Exhibit State-14: FY 2014 Rest Area Level of Service Distribution



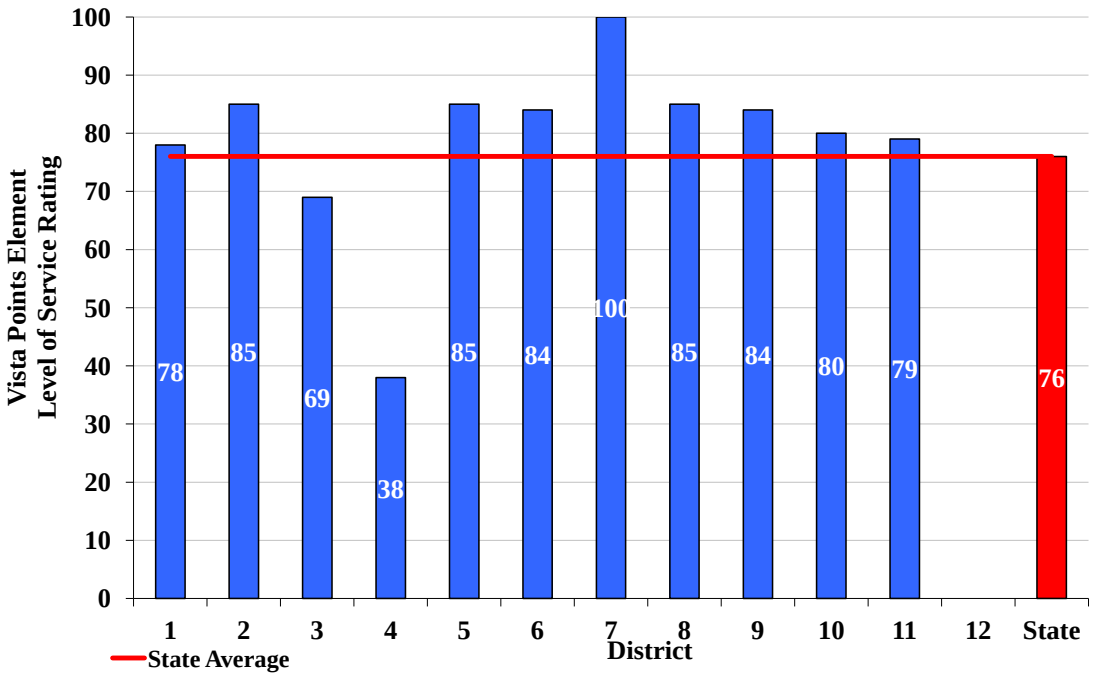
Vista Points Level of Service (G Family)

The Vista Points element consists of 8 attributes;

- Vegetation control, pavement, litter, graffiti, drainage, signs, striping and marking, and lighting

Calculated as a weighted average of those attributes, the FY 2014 LOS score for Vista Points is 76. The LOS score for Vista Points varied from a low of 38 in District 4 to a high of 100 in District 7. District 7 evaluated only one Vista Point. The low Vista Points score for District 4 is due to low scores for Striping/Marking (LOS 8), Pavement (LOS 15) and Graffiti (LOS 15). There are no Vista Points in District 12. Refer to Exhibit State-15, *FY 2014 Vista Points Level of Service Distribution*, for the Vista Points LOS distribution.

Exhibit State-15: FY 2014 Vista Points Level of Service Distribution



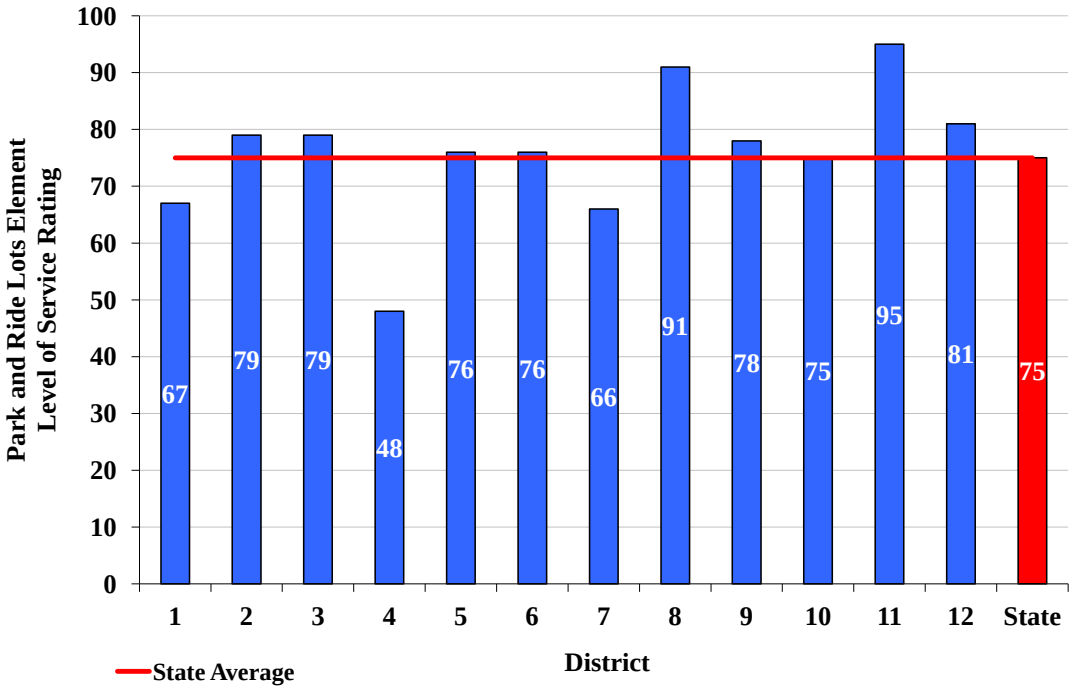
Park and Ride Lots Level of Service (G Family)

The Park and Ride Lots element consists of 10 attributes;

- Pavement, litter, graffiti, drainage, signs, striping and marking, irrigation, vegetation control, landscaping, and lighting

Calculated as a weighted average of those attributes, the FY 2014 LOS score for Park and Ride Lots is 75. The LOS score for Park and Ride Lots varied from a low of 48 in District 4 to a high of 95 in District 11. The low Park and Ride Lots score for District 4 is due to low scores for Irrigation (LOS 14), Pavement (LOS 17), and Striping/Marking (LOS 23). Refer to Exhibit State-16, *FY 2014 Park and Ride Lot Level of Service Distribution*, for the Park and Ride Lots LOS distribution.

Exhibit State-16: FY 2014 Park and Ride Lots Level of Service Distribution



Electrical (K Family)

Electrical Level of Service

The FY 2014 Electrical Maintenance (K Family) LOS scores are based on reports from the IMMS system during the periods of July 1, 2013 through June 30, 2014. These scores are calculated by evaluating the adherence to preventative maintenance (PM) schedules on Traffic Signals, Flashing Beacons, Ramp Meters, Changeable Message Signs (CMS), and Closed Circuit Televisions (CCTV). It also includes the percentage of functional highway lighting fixtures and overhead directional sign lighting fixtures. The methodology for calculating the LOS scores for K family assets are as follows:

Highway Lighting Assets: The LOS score is the percentage of light fixtures that are found to be functional during the monthly night light inspection. This category includes scores on highway lighting and overhead sign lighting. The statewide LOS score for highway lighting was 99.

Traffic Signal Assets: The LOS score is the percentage of preventative maintenance checks. This category includes scores for both Traffic Signal and Flashing Beacon assets. The statewide LOS score for traffic signal was 64.

Traffic Management Systems (TMS): The LOS score is the percentage of preventative maintenance checks completed on schedule. This category includes Ramp Meter, CMS, and CCTV assets. The statewide LOS score for traffic management systems was 41.

Refer to Exhibit State-17, 18, and 19 for the Highway Lighting, Traffic Signal, and TMS LOS distributions.

Exhibit State-17: FY 2014 Highway Lighting (K Family)
Level of Service Distribution

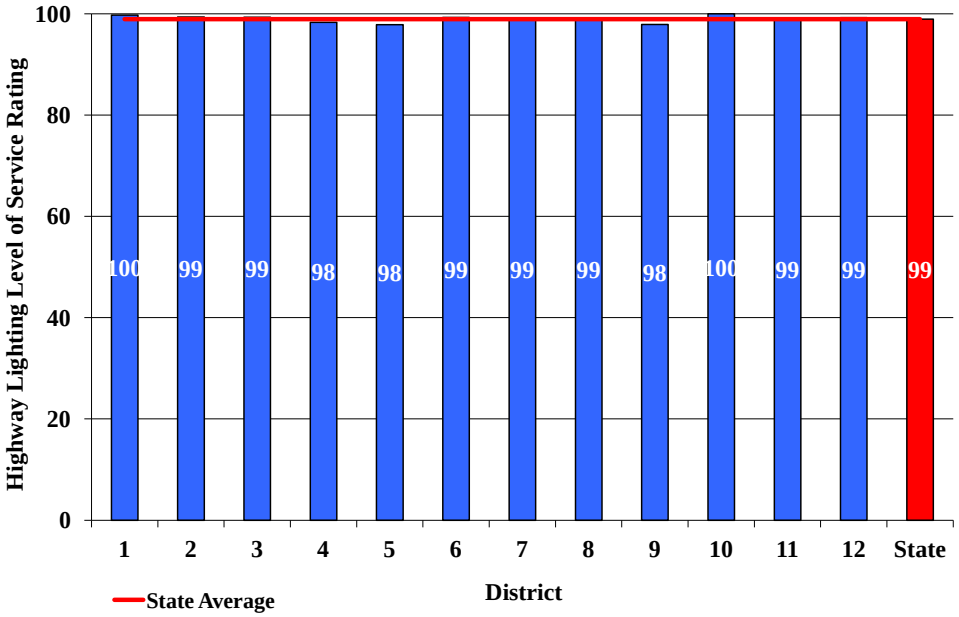


Exhibit State-18: FY 2014 Traffic Signals (K Family)
Level of Service Distribution

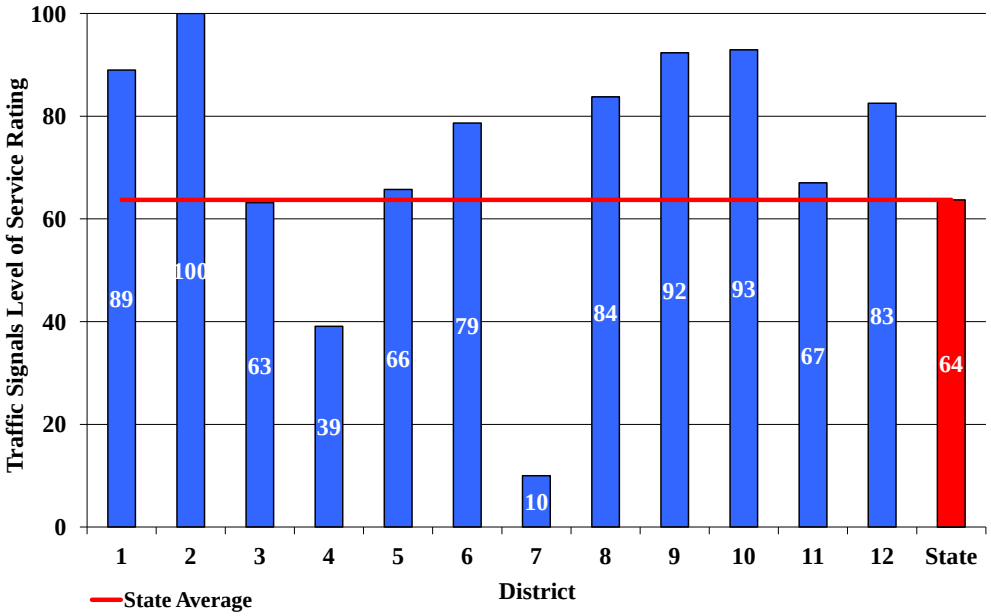
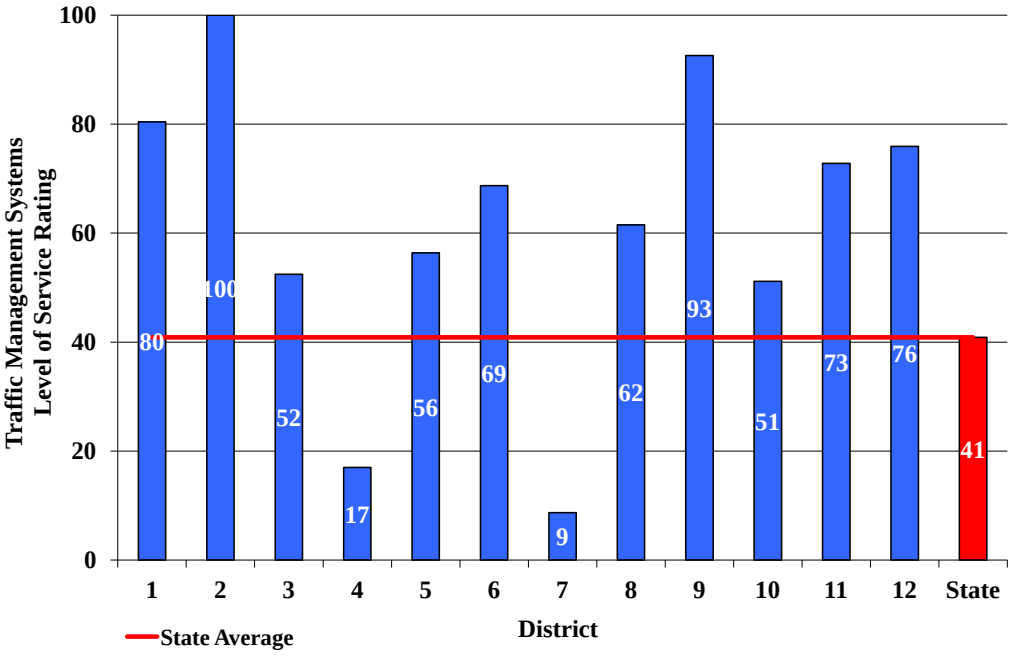


Exhibit State-19: FY 2014 Traffic Management Systems (K Family)
Level of Service Distribution



Bridge (H Family)

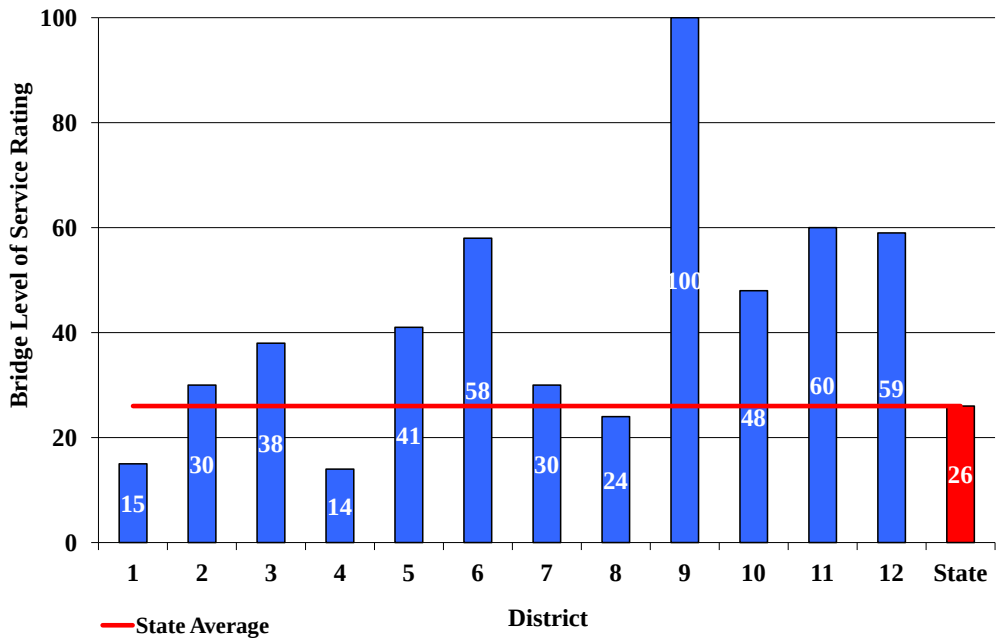
Bridge Level of Service (BLOS)

The Bridge Level of Service (BLOS) measures the district crew's ability to complete bridgework identified through the bridge inspection program within a reasonable time period (2 years). The BLOS score was calculated by summing up the total dollar value of all crew work identified in each district that is past due (backlogged) and dividing that dollar amount by the total amount of all identified crew work. This ratio of "old work" to "all work" is then converted into a BLOS score as shown in the example below.

EXAMPLE: District 1 has $100,000 of outstanding bridge crew work. $25,000 of the outstanding work is more than 2 years old (backlogged). Ratio of backlogged work to total outstanding work is $25,000/$100,000 = 0.25. The BLOS equals (1 - 0.25) X 100 = 75.

The statewide BLOS score for FY 2014 is 26. Refer to Exhibit State-20 for the Bridge LOS distribution.

Exhibit State-20: FY 2014 Bridge Level of Service Distribution



Annual Tree Inspection

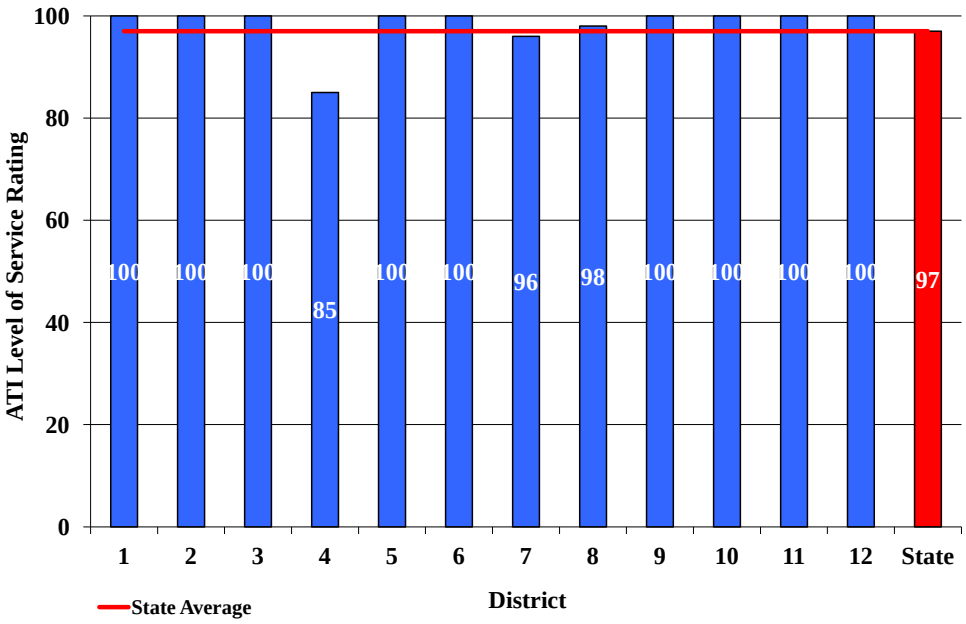
Annual Tree Inspection (ATI)

The Annual Tree Inspection (ATI) Level of Service tracking and reporting are provided in compliance with Maintenance Policy Directive (MPD) 1003, issued on November 27, 2010. The FY 2014 ATI LOS scores are based on completed work orders generated in the IMMS system during the periods of July 1, 2013 through June 23, 2014. ATI LOS scores are calculated by taking the total number of routes and dividing by the number of work orders that have been completed for those routes during the fiscal year. Each individual work order covers an entire route.

EXAMPLE: District 6 has 50 routes. A total of 30 completed work orders would result in an LOS score of 60. This is achieved by taking the completed work orders and dividing by the number of routes in the District. ATI LOS score (30 / 50) x 100 = 60.

The FY 2014 LOS score for ATI was 97 (see Exhibit State-21). This is the fourth year of tracking and reporting ATI LOS scores. The ATI LOS score increased 8 points as compared to the prior year. The LOS scores for ATI varied from a low of 85 in District 4 to a high of 100 in Districts 1, 2, 3, 5, 6, 9, 10, 11 & 12. Additional ATI data for each District is available in IMMS.

Exhibit State-21: FY 2014 Annual Tree Inspection Level of Service Distribution



Appendix C

Park and Ride:
Pavement Survey

General Information:

Rater :

Date :

Site Name / Location:

Details:

Asphalt Surface Area (SY):

Concrete Surface Area (SY):

Overall Asphalt Condition :

Overall Concrete Condition :

**Condition Evaluation:
Good = Minimal cracking, No rutting or depressions, Tight minimal cracks on concrete
Fair = Some cracking, Minimal rutting or depressions, Some spalling on concrete
Poor = Significant cracking/rutting, Surface raveling, Maintenance patching required

Asphalt Color (see key) :

**Asphalt Color Key: 1 2 3 4

Total Asphalt Cracking (SY):

Total Concrete Cracking (% Slabs Cracked):

Asphalt Patching Needed (SY):

Concrete Patching Needed (SY):

% Curb/Gutter:

Reveal (inches):

**Patch in kind with same material. Asphalt patches shall be at least 6' wide to allow for proper compaction. Concrete patches shall be at least one foot wide.

**Patch severe distress, such as in the following pictures or worse:

Drainage Issues:

Recommended Repair :

**Grinding is needed if the surface is raveling off, or if extremely bumpy.

Appendix D

TENNESSEE
DEPARTMENT OF TRANSPORTATION
MAINTENANCE RATING PROGRAM

FIELD INSPECTION MANUAL

Prepared by

Headquarters Maintenance Division

Budget & Policy Section

June 2014

Additional copies of this manual may be obtained from:

TDOT Maintenance Division Budget & Policy Section 505 Deaderick Street Suite 400 James K. Polk Bldg. Nashville, TN 37243 Phone: (615) 741-2027	Online: http://www.tn.gov/tdot/maintenance/docs/MRI-Training-Manual.pdf Revision 1.3 August 8, 2014

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C MRI CONFLICT RESOLUTION FLOWCHART

ABSTRACT

This manual is designed to assist personnel responsible for conducting field ratings for the Maintenance Rating Program (MRP). The MRP is a method of conducting ratings of all maintenance assets on randomly selected roadway segments to determine the overall condition of the roadway network. The information obtained from these ratings should be used to schedule and prioritize routine or contracted maintenance activities in order to provide a uniform level of service across the state and to meet established departmental policies.

In addition to using these results to assist in the planning of future maintenance activities, the MRP will provide information on the condition of roadway assets to the Governmental Accounting Standards Board (GASB) on a regular 3-year cycle. GASB has established recommendations for state transportation agencies to ensure the appropriate funding has been established to maintain its infrastructure. In 2012, the U.S. Congress passed the Moving Ahead for Progress in the 21st Century (MAP-21) transportation bill, which requires state highway agencies to apply risk analysis and asset management principles to ensure that federal-aid highways are maintained at an acceptable level. In order to comply with both GASB and MAP-21 requirements, TDOT will report on the condition of its roadway and bridge assets through the use of several asset management systems. Data from the MRP ratings will be used by TDOT management, the Tennessee General Assembly, and GASB and must therefore be collected accurately and completely to maintain the credibility of the MRP.

The MRP will provide a portion of the condition assessment for roadway assets. This will be in the form of what is referred to as the Maintenance Rating Index, or MRI. Each roadway segment measures 0.10 mile (528 feet) and is randomly selected each month through the Maintenance Management System (MMS). The MRI is a numerical score on a 100-point scale, 100 being the highest score, but does not necessarily indicate a perfect roadway. The target cumulative score has been set to an average of 85 throughout the state. This score is generated from assessments that are performed each month by District personnel to determine the present condition of each roadway segment. The MRI will be part of the performance evaluation for all supervisors and managers in the Operations Bureau.

Annual training is strongly recommended for all TDOT District Operations Supervisors in Maintenance (or their designee) and Quality Assurance (QA) personnel involved in conducting the condition assessment ratings. TDOT District Operations Supervisors in Maintenance (or their designee) will be responsible for training additional TDOT personnel who will be conducting the condition assessment ratings within their respective district. It is also highly recommended that each region and/or district assign a trained supervisor or manager to perform quality checks on the inspections performed in their area to ensure the accuracy of the ratings.

Condition assessment ratings are conducted on all types of state highway facilities. The type of maintenance required for each roadway segment determines the classification of a particular system type. The current system type classifications are:

1. **Interstates**
2. **State Routes**
3. **Other (not currently used but reserved for future use)**

Each system type is divided into five (5) maintenance element classifications:

1. **Traveled Pavement**
2. **Shoulder**
3. **Roadside**
4. **Drainage**
5. **Traffic Services**

Each of the five (5) maintenance elements listed above is further subdivided into characteristics. For example, the "Roadside" maintenance element consists of the following characteristics:

- **Grass Height**
- **Landscaping / Wildflowers**
- **Litter Pickup**
- **Access Control Fence**
- **Travel Pavement/Shoulder Sweeping**
- **Graffiti**
- **Vegetation / Brush Removal**
- **Slopes / Erosion Control**

The Maintenance Rating Form lists each characteristic that is to be evaluated in the condition assessment rating. A sample rating form is included in **Appendix A** of this manual.

TERMINOLOGY

REGION – The Region where the segment is located.

DISTRICT – The District within the Region where the segment is located.

SEGMENT ID – The number that uniquely identifies the roadway segment that is to be rated.

INSPECTOR – The name should be clearly printed of the inspector performing the condition assessment rating.

SYSTEM TYPE – Classification of the roadway based upon the type of maintenance that is applied to the roadway segment.

INSPECTION PERIOD – The month and year within which the rating must be performed.

DATE OF INSPECTION – The month/day/year that the segment was rated.

COUNTY – Identifies the county in which the segment to be rated is located.

ROUTE – Identifies the State Route or Interstate on which the segment is located. Interstates begin with the letter "I" and state routes begin with the letters "SR". The last three digits are the route number.

SPECIAL CASE – The special case for the route selected. The special case is a single digit number from 0 to 9, and is described in more detail on page 14.

COUNTY SEQUENCE – The county sequence for the roadway segment to be rated. The county sequence is a single digit number that identifies whether the segment falls on a portion of a route that leaves the county and then re-enters the county (see pages 15-16 for more detail).

BEGIN LM – Beginning point of the segment to be rated.

END LM – Ending point of the segment to be rated.

MAINTENANCE ELEMENT – A part of the highway system that requires maintenance (i.e. Traveled Pavement, Shoulder, Roadside, Drainage, Traffic Services).

CHARACTERISTIC – Part of a maintenance element that, combined with other characteristics, composes the maintenance element. Each characteristic has a performance threshold that determines the "Pass" or "Fail" status. Not all characteristics may be present on a roadway segment. For example, under the Traffic Services Element, characteristics may include warning/regulatory signs, pavement markings and guardrail/guardrail terminals. The characteristics not present may be guide signs, raised pavement markers, barrier walls, and attenuators.

SEGMENT PREVIOUSLY MARKED – Indicates whether the segment has previously been identified.

SECTION RATING INDEX – The rating score given to a roadway segment that is based upon the condition assessment information contained in the Maintenance Rating Form (ranges from 0 to 100).

MAINTENANCE RATING INDEX (MRI) – Overall average rating score given to the entire roadway network in a specified county, district, region, or statewide (ranges from 0 to 100).

CONSTRUCTION WORK ZONE – A part of the roadway that is under construction and is defined as follows: from the "Work Begins 500 ft. Ahead" or "Road Work Next X miles" sign to the "End Work Zone" sign. construction zones are considered active until all construction signs and construction barrels have been removed.

RATING SAMPLE SELECTION

The MRI is generated using the Maintenance Management System (MMS). Each month, a current inventory of state-maintained road segments is extracted from the Tennessee Roadway Information Management System (TRIMS) and broken into 0.10 mile (528 feet) segments. Sample segments containing a bridge that exceed 250 feet in length along the roadway centerline or roadway segments that do not measure at least 528 feet in length are excluded from selection. If a specific roadway segment is expected to be under construction for an extended period of time, it may also be excluded from selection upon request by the District Operations Supervisor/Manager/Engineer by notifying the HQ Maintenance Budget & Policy Office. The remaining segments are then classified by facility type and a sample of the population is selected at random by the MMS system.

MMS preprints the Maintenance Rating Forms with the location information for each roadway segment. The preprinted rating forms may be printed monthly by each District to be completed and entered into the MRI module inside the MMS. Each District Operations Supervisor in Maintenance is responsible for making sure that the rating forms are completed and entered into MMS by the last working day of each month. All calculations are then performed by the database, and the results may be printed for review from within the MRI module in MMS.

At the time when random sample segments are selected, 10% of the segments are flagged for quality assurance (QA). These segments are preprinted and distributed to other consultants who conduct the same rating that is performed by the TDOT personnel. The QA segments are required by GASB and the Tennessee General Assembly and are used to verify the accuracy of the information being provided by TDOT personnel. QA segment ratings are performed during the middle week of each month in order to minimize the amount of time between the QA rating and the TDOT rating.

Should there be significant differences between the TDOT and QA condition assessment rating results, the MRI Conflict Resolution Flowchart should be used to resolve these issues. The MRI Conflict Resolution Flowchart is located in Appendix C of this manual.

DATA COLLECTION

CREW ORGANIZATION AND RESPONSIBILITIES

The MRP team will be selected by the District Operations Supervisor in Maintenance. Individuals that conduct the condition assessments should be knowledgeable in all highway maintenance activities and must have completed the MRI condition assessment training. Each District will be responsible for implementing the MRP.

It is mandatory that MRP personnel's first priority be the safety of the pedestrian and motoring public and themselves. On occasions, it may be necessary to schedule the rating of samples with high traffic volume during low-traffic periods in order to ensure safety. When necessary, appropriate traffic control procedures should be arranged during MRP ratings. Personnel should conduct all condition assessments while facing traffic to ensure the safety of the inspector.

Maintenance Rating Forms must be complete, clear, legible and accurate. Personnel should print all information rather than using cursive handwriting to make it easier to read the information. The rating forms should be completed using only a pencil and eraser so that mistakes may be corrected without making confusing stray marks on the rating form.

LOCATING, MARKING, AND MEASURING SEGMENTS

In order to provide consistency throughout the state and QA condition assessment ratings, segments should be located using the Department's electronic version of TRIMS – E-TRIMS. Conduct a desktop review of E-TRIMS by collecting distances from nearby cross streets in order to pin-point the exact location and direction of the segment to be rated. It is recommended that either district or regional offices use qualified staff trained on locating MRI segments to go out at the beginning of the month to locate, measure, and mark the segments for the inspector.

Once a segment is properly field located, it should be clearly marked with **white** spray paint from the beginning log mile to the ending log mile **in the direction of traffic on the same side of the roadway as the increasing log mile**, so that it may be located for quality assurance. When marking interstates and divided highways, markings should be present on both sides of the roadway. The **beginning** and **ending** points should be marked appropriately, at the edge of pavement, to designate the boundaries of the rating. The roadway segment should be clearly identified by including the Segment ID Number and directional arrows indicating the direction the rating is to be conducted. See Figures 1, 2 and 3 for more details. If upon arrival to the selected segment the inspector finds previously painted MRI markings, then the inspector should circle YES on the corresponding item on the Maintenance Rating Form. The inspector should indicate whether the previously marked segment is greater than or equal to (≥) 500 feet in length; if less than (<) 500 feet in length, enter the actual length in the appropriate box on the Maintenance Rating Form. An example of the Maintenance Rating Form is provided in Appendix A.

FIGURE 1: SEGMENT MARKING FOR A TWO-LANE ROADWAY

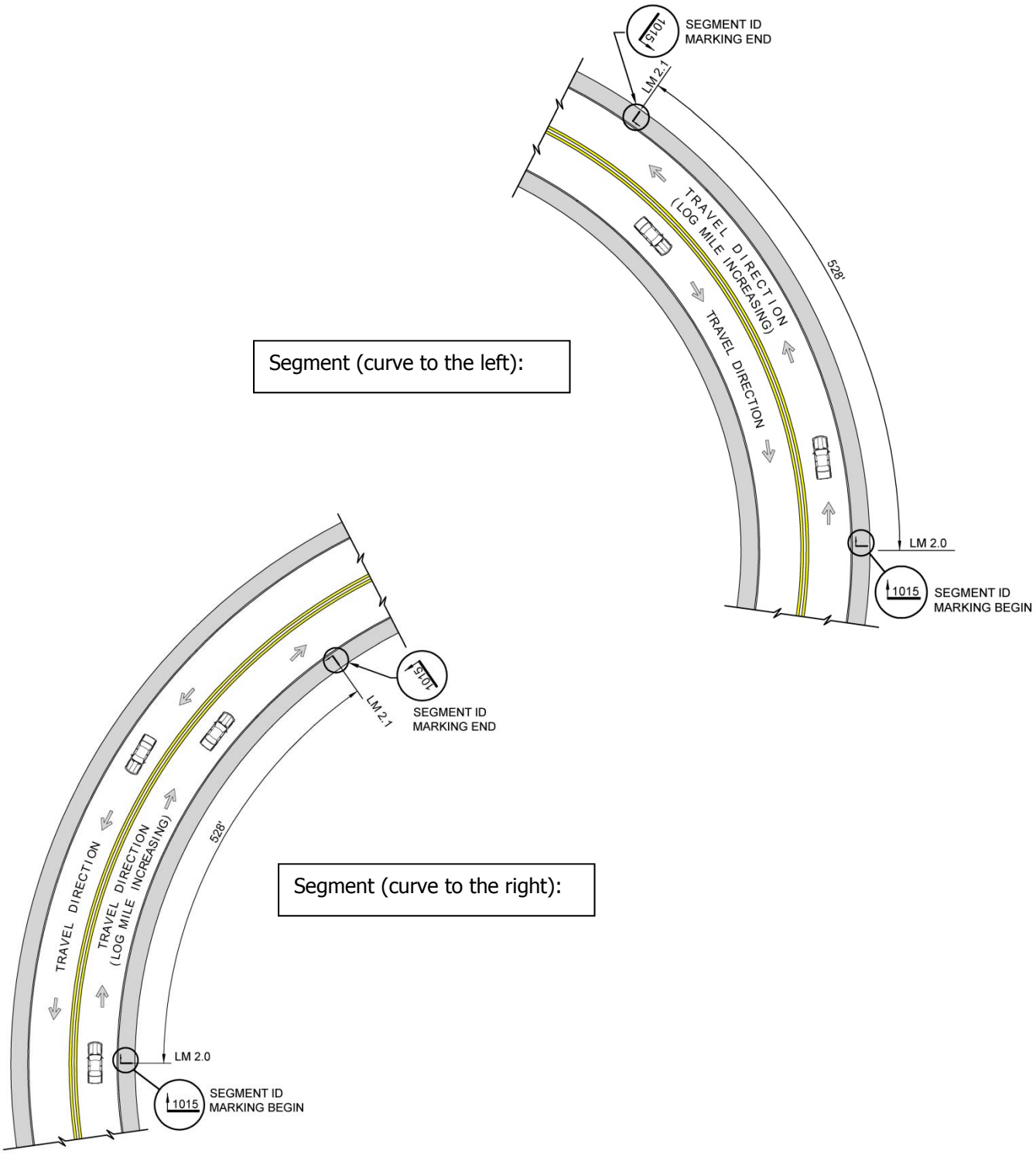
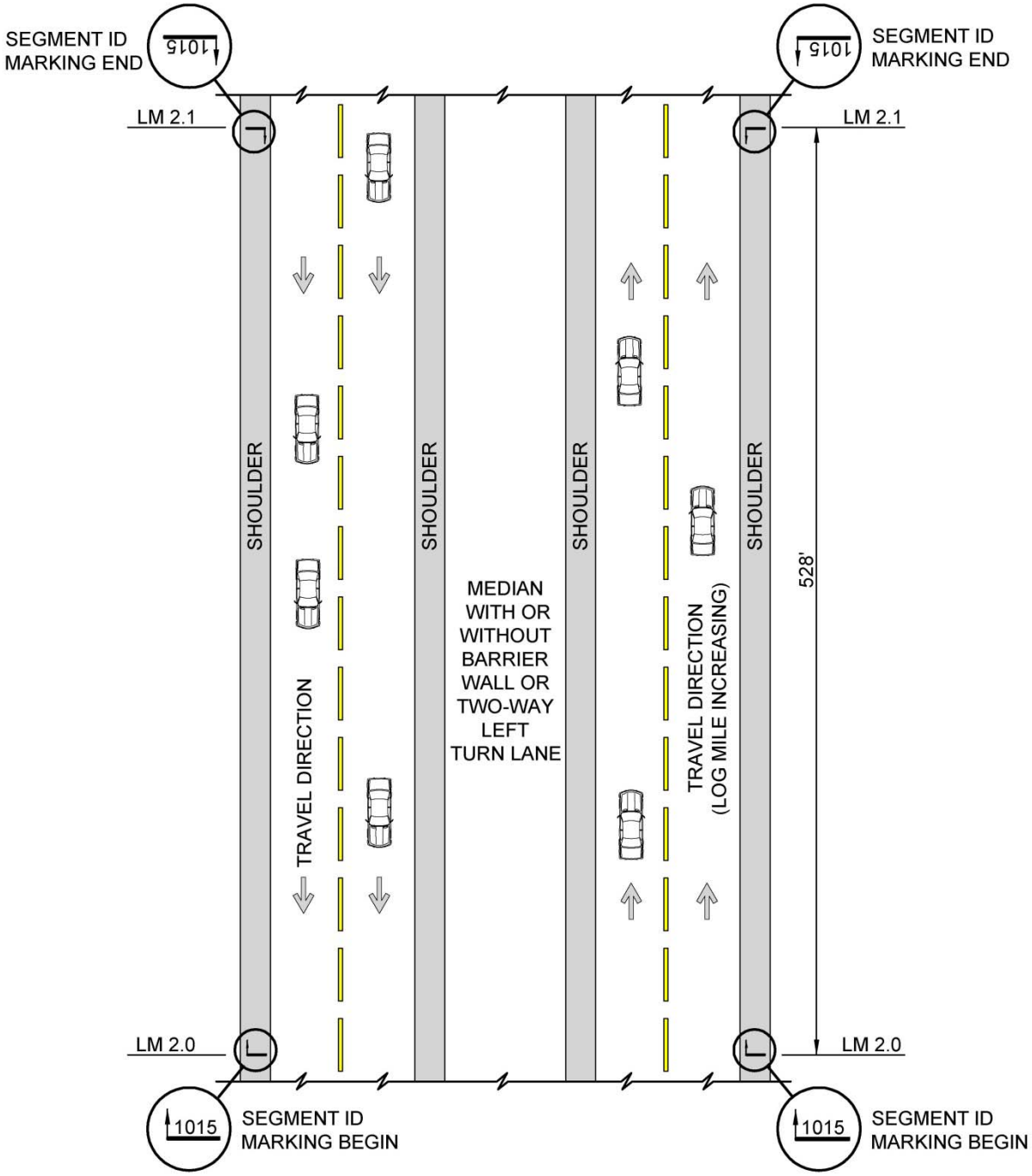


FIGURE 2: SEGMENT MARKING FOR A MULTI-LANE HIGHWAY WITHOUT RAMPS



Once a segment has been clearly marked in white spray paint along the roadway with appropriate directional arrows, the segment is to be measured 0.10 mile (528 feet) with the use of a measuring wheel or with a vehicle installed Distance Measuring Instrument (DMI). Vehicle odometers **SHOULD NOT** be used as they do not provide sufficient accuracy to ensure the segment has been measured properly. Once the ending point of the segment is reached, it should be marked in the same manner as the beginning point.

If a segment has been previously identified that month by TDOT or the QA consultant, the person who arrives last and finds existing markings within the proper designated segment location will perform his/her condition assessment within the existing markings. If the previously rated segment is not located at the proper

designated segment location, then the individual should properly locate, mark, and rate the correct segment. They should then notify TDOT Maintenance Headquarters (via email) providing the following information: segment ID, county, route, begin/end log miles, and improper location of previously rated segment.

Additionally, if the segment has been previously rated and is marked at a length other than 528 feet, the following steps should be taken:

1. Circle YES on the Maintenance Rating Form to indicate that, upon arrival, there are previously painted MRI markings

2. If the previously marked segment measures at least 500 feet in length, circle YES on the Maintenance Rating Form to indicate so, then use the previously painted markings and rate the same marked segment. No additional steps are required.

3. If the previously marked segment measures less than (<) 500 feet in length, then perform the following steps:

    a. Spray paint the correct beginning and ending locations on the edge of pavement and inspect the segment in its entirety (528 feet).
    b. Record the actual length of the previously marked segment on the Maintenance Rating Form, and take a photo depicting the corrected segment length.
    c. Notify TDOT Maintenance Headquarters (via email) providing the following: segment ID, county, route, begin/end log miles, and the incorrect field recorded length. Attach the photo(s) to the email.

In turn, TDOT Maintenance Headquarters will contact either the QA Consultant or the TDOT District office to inform them of the discrepancy. The individual in error will then conduct a re-assessment of the segment and submit a revised Maintenance Rating Form. If additional resolution is needed, then the MRI Conflict Resolution Flowchart should be used to resolve these issues. The MRI Conflict Resolution Flowchart is provided in Appendix C of this manual.

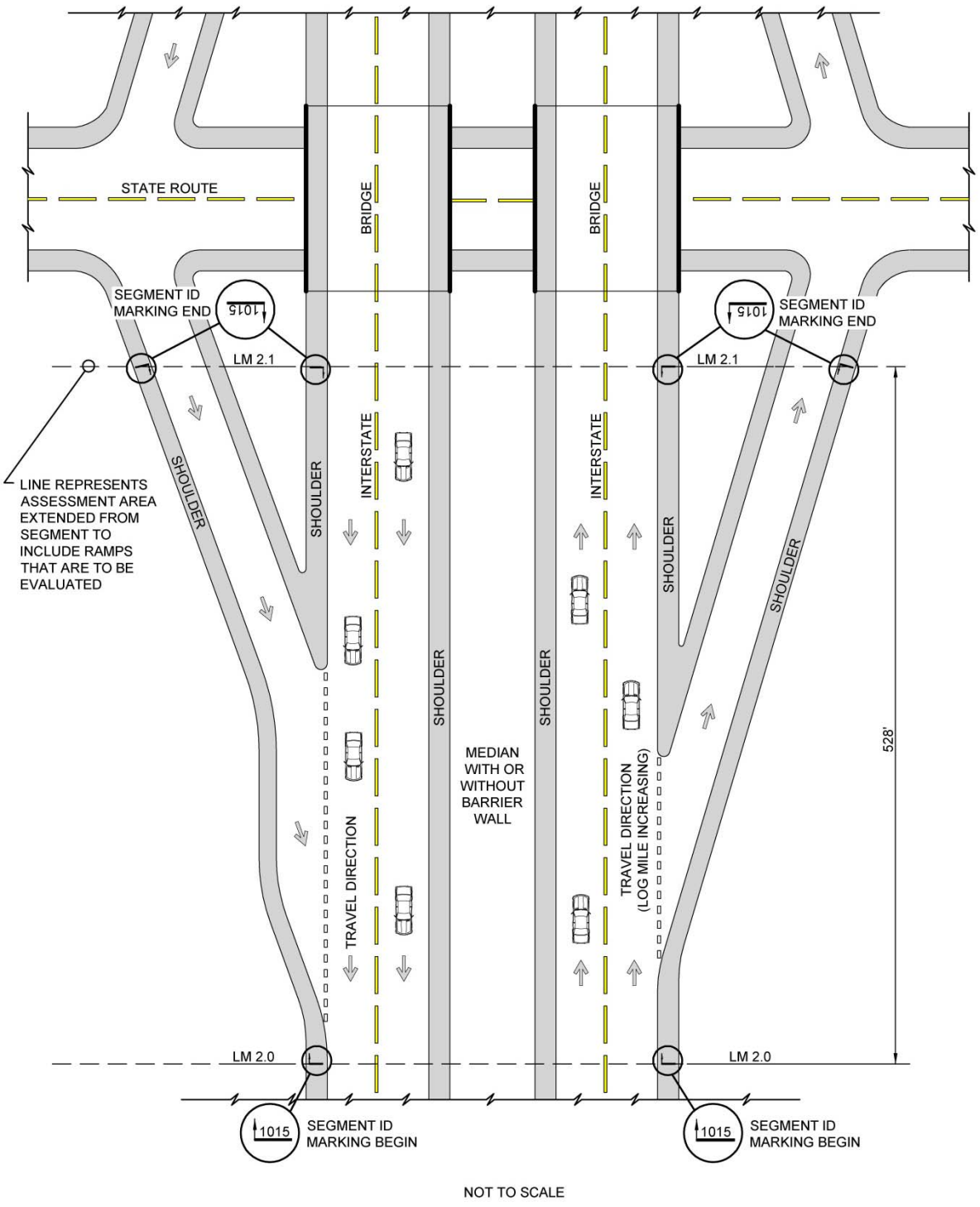
If portions of an interchange ramp fall within the selected segment, the rated segment must include a rating of the ramp(s) along with the mainline. The inspector must indicate whether ramps were included in the roadway segment inspection by circling YES or NO on the Maintenance Rating Form.

When evaluating ramps that fall within the segment, the individual must determine if the ramps are associated with the Segment ID Number and Route on the Maintenance Rating Form. Determining if a ramp is governed by the listed Segment ID Number and Route on the Maintenance Rating Form is dependent upon the following criteria:

1. When two State Routes intersect and include ramps, the State Route that is access controlled will govern the ramps. For example, in Region 1, SR-115 (Alcoa Highway) and SR-1 (Kingston Pike) intersect and have interchange ramps. The ramps would be governed by SR-115 since it is controlled access. In Region 2, SR-153 and SR-58 intersect and have interchange ramps. The ramps would be governed by SR-153 since it is controlled access. In Region 3, SR-840 and SR-246 intersect and have interchange ramps. The ramps would be governed by SR-840 since it is controlled access. In Region 4, SR-385 (Bill Morris Parkway) and SR-86 (US-72) intersect and have interchange ramps. The ramps would be governed by SR-385 since it is controlled access. If both State Routes are controlled access routes, then the lower numbered State Route will govern the ramps.

2. When a State Route interchanges with an Interstate. The Interstate **ALWAYS** governs over the ramps. For example, I-440 has an interchange with SR-106. I-440 would govern the ramps within the interchange.
3. When two Interstates intersect and include ramps, the lower numbered Interstate will govern the ramps. For example, I-40 and I-640 intersect and have interchange ramps. The ramps would be governed by I-40 since it is the lowered numbered Interstate.

FIGURE 3: SEGMENT MARKING FOR A MULTI-LANE HIGHWAY WITH RAMPS



EQUIPMENT AND SUPPLIES

The following equipment and supplies may be required and/or recommended for the efficient and safe collection of the survey data:

- DOT-approved vests (required)
- DOT-approved hard hat (required)
- Flashing amber lights for vehicle roof or strobes in vehicle lights (required)
- Segment measuring device (required):
  - Vehicle installed Distance Measuring Instrument (DMI) or
  - Distance measuring wheel
- Maintenance Rating Form for each segment to be inspected (required)
- Copy of Maintenance Rating Program Training Manual (required)
- Clipboard
- Measuring tape (at least 100 feet long – suggested)
- Pencils
- Eraser
- Small measuring ruler (6" or 12") or small measuring tape (3' to 12') (required)
- 4-foot carpenter's level (required)
- White marking paint (required)
- Flashlight (recommended)
- Pocket calculator (recommended)
- 15-foot rod or pole (required)
- Digital camera (required)

General Notes:

1. If the selected segment falls on or within:
   a. A bridge section (box culverts less than (<) 20 feet in length are okay), or
   b. A construction zone (construction zone is defined as from the "Work Begins 500 feet Ahead" or "Road Work Next X miles" sign to the "End Work Zone" sign). Construction zones are considered active until all construction signs and construction barrels have been removed.

   Then, the inspector must move off the bridge, or out of the construction zone, **in the forward direction** (increasing logmile direction) to the nearest 0.10 mile point which has not been inspected during a prior month of the current fiscal year, and start the condition assessment at that point. If the bridge or construction zone extends to the end of the route within the county, then the inspector must move in the reverse (decreasing logmile) direction to the nearest 0.10 mile point. The person rating the segment must note the new logmile and reason for moving in the inspector comments box of the Maintenance Rating Form.

2. If the selected segment falls on or within National Park boundaries (i.e. Great Smoky Mountains National Park), then the segment will not be rated**.** The inspector should notify TDOT Maintenance Headquarters (via email) providing: segment ID, county, route, begin/end log miles, and indicate that the segment falls within National Park Boundaries. This **DOES NOT** include Tennessee State Park boundaries.

Rate only those assets that are the responsibility of state maintenance personnel within the right-of-way or by a TDOT contractor. If a segment falls within a city that performs the required maintenance under a City Maintenance Contract or Special Agreement, rate the segment in the normal manner. **Do not move the segment inspection outside of the city limits.**

MAINTENANCE RATING FORMS

The Maintenance Rating Form is the official form that should be used to record the condition of each randomly selected roadway segment. Only the official rating form may be used to report condition assessment. Should a replacement form be needed, it may be reprinted from the MRI Module in the MMS. See an authorized MMS user to print the form. A sample Maintenance Rating Form is included in Appendix A of this manual.

All identification information for the roadway segment to be rated is shown at the top of the rating form. Each rating form is preprinted with the appropriate identification information for the selected roadway segment. Roadway segments are identified, as they are in TRIMS/E-TRIMS, by County, Route, Special Case, County Sequence, Beginning Logmile, and Ending Logmile. All interstate routes and some special state routes (such as SR-840) are logged by continuous mile markers. The continuous Beginning Mile Marker and Ending Mile Marker have been used in place of the Beginning and Ending Logmile on these routes.

A unique Segment ID Number has been automatically generated for each segment and appears at the top right hand corner of the rating form. This number should be referenced to identify the roadway segment that is being rated. This number is unique for each fiscal year. The Segment ID Numbers start over each fiscal year (i.e., a segment will not be generated more than once within the fiscal year).

The body of the rating form is used to list the characteristics being rated. For each characteristic there are boxes for Pass, N/A, and Fail. These boxes are used to depict whether each characteristic meets the condition standard requirement. Should a characteristic not be present on the roadway segment being rated, the "N/A" box should be marked. Some characteristics may not be marked "N/A" on the form and have been shaded on the form to indicate this requirement. Condition standards for each characteristic can be found within this manual.

Personnel conducting the condition assessments must use a pencil when marking the rating forms and should use only block type letters and numbers on the rating form rather than cursive, fancy, or rounded type characters. No stray marks should be made on the rating form and all boxes must be clearly marked to minimize confusion over which box is actually marked. A comments box has been provided at the bottom of the rating form to include any important notes pertinent to the assessment.

All condition assessments are subject to review for quality assurance purposes. Personnel should take great care to ensure all ratings are accurate and timely. Should major differences in the original survey and QA review of the roadway segment arise, the Maintenance Budget and Policy Section may request that the segment be re-evaluated, photo documentation be provided from departmental and/or QA personnel, and potentially a new Maintenance Rating Form be submitted. The MRI Conflict Resolution Flowchart, provided in Appendix C of this manual, should be used to resolve any significant discrepancies between segments rated by TDOT and QA consultants.

INSTRUCTIONS FOR COMPLETING MAINTENANCE RATING FORM

Segment ID Number: This is a number that uniquely identifies the roadway segment to be rated. This number should be spray-painted at the edge of the pavement at the starting point and ending point of the roadway segment with white paint. This ensures the roadway segment can be easily identified at a later date for quality assurance purposes. See Figures 1, 2 and 3 for more details.

Inspector: This box should be used to record the name of the individual performing the condition assessment ratings. The name should be clearly printed.

System Type: This box depicts the classification of the roadway being rated. There are two types of systems being surveyed: (1) Interstates and (2) State Routes.

Inspection Period: This box depicts the month and year in which the condition assessment rating should be performed. All Maintenance Rating Forms must be entered into the MRI Module in MMS by the last working day of the month indicated in the Inspection Period box.

County: The county where the segment to be rated is located.

Route: The route where the segment to be rated is located. Interstates begin with the letter "I" and State Routes begin with the letters "SR". The last three digits are the route number. For example, Interstate 40 would be shown as "I0040" and State Route 1 would be shown as "SR001".

Special Case: This box depicts the special case for the route. The special case is a single digit number from 0 to 9. Most routes will have a special case of zero, which corresponds to "NONE". The special cases are as follows:

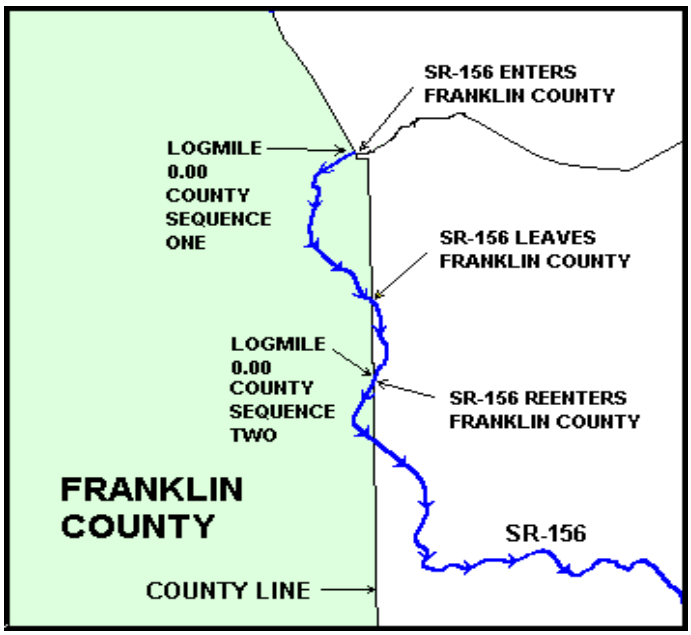
Number	Special Case
0	NONE
1	SPUR ROUTE
2	ALTERNATE ROUTE
3	STATE ROUTE CONNECTOR
4	BY-PASS
5	BUSINESS ROUTE
6	NORTHBOUND
7	SOUTHBOUND
8	EASTBOUND
9	WESTBOUND

County Seq.: This box depicts the county sequence for the roadway segment to be rated. The county sequence is a single digit number that identifies whether the segment falls on a portion of a route that has left the county and then reenters the county again. Each time a route leaves and reenters the county, the logmile starts over at zero and the county sequence number increases by one. This means that it is possible for a route to have two points within a specific

county that have the same logmile, but have a different county sequence number to identify the portion of the route on which it is located.

If the county sequence box depicts the number two (2), then that means that the segment to be rated is located on the portion of the route that has entered the county for the second time. See Figure 4 for an example.

FIGURE 4: COUNTY SEQUENCE EXAMPLE



Begin Logmile: This box depicts the logmile where the roadway segment to be rated begins. This point should be marked on the edge of the pavement with white spray paint and a directional arrow pointing towards the End Logmile. The Segment ID Number should be included to identify the segment so that it may be easily identified in the future. See Figures 1, 2 and 3.

End Logmile: This box depicts the logmile where the roadway segment to be rated ends. This point should be marked on the edge of the pavement with white spray paint and a directional arrow pointing towards the Begin Logmile. The Segment ID Number should be included to identify the segment so that it may be easily identified in the future. See Figures 1, 2 and 3.

The bottom portion of the rating form is where each characteristic on the segment will be rated. Each of the five maintenance element classifications (Traveled Pavement, Shoulder, Roadside, Drainage, and Traffic Services) is listed within this section of the rating form. Each of the Elements has corresponding characteristics that are to be rated.

Beside each characteristic, there are three empty boxes with the headings Pass, N/A, and Fail above them. The inspector will place an "X" in the box that identifies the appropriate condition rating for that characteristic on the rated segment. **ONE AND ONLY ONE BOX MUST BE MARKED FOR EACH CHARACTERISTIC**. No stray marks should be made that could be confusing to someone attempting to enter the data from the rating form.

If the individual performing the condition assessment rating determines that the characteristic **does** meet the condition standard requirement set forth within this manual, then he/she marks the box labeled **"Pass".** If the individual determines that the characteristic **does not** meet the condition standard requirement set forth within this manual, then he/she marks the box labeled **"Fail".** However, not every characteristic for each roadway segment will be applicable for rating. Should a characteristic not be present on the roadway segment that is being rated, then the individual should mark the box labeled **"N/A".** This will ensure that the characteristic neither counts for nor against the rated segment.

NOTE: All characteristics must be clearly marked with one and only one "X" in the appropriate box. DO NOT LEAVE ANY CHARACTERISTIC BLANK.

Ramps Present in Segment: This YES/NO selection allows the inspector to indicate whether the selected segment contains an interchange ramp or intersection ramp that has been included in the inspection. Circle the appropriate response on the Maintenance Rating Form. Enter the selection in the Inspector Comments box when entering the data into the MMS database.

Previously Painted MRI Markings Present: This YES/NO selection allows the inspector to indicate whether the segment being assessed has been previously located with painted markings present upon arrival to the segment. If upon arrival to the selected segment the inspector finds previously painted MRI markings, then the inspector should circle YES on the corresponding item on the Maintenance Rating Form. Enter the selection in the Inspector Comments box when entering the data into the MMS database. This box will be reviewed by TDOT Maintenance as required to verify that the same segment was correctly rated by the QA consultant and Department personnel.

Segment Length ≥500 ft.: This YES/NO selection allows the inspector to indicate whether the previously painted MRI markings found upon arrival are at least 500 feet in length. If greater than or equal to (≥) 500 feet, then circle YES – otherwise circle NO. Enter the selection in the Inspector Comments box when entering the data into the MMS database.

Enter Segment Length: If the length of the previously painted MRI markings is less than (<) 500 feet, then enter the actual length of the previously marked segment. Enter the selection in the Inspector Comments box when entering the data into the MMS database.

Inspector Comments: This box allows the individual conducting the condition assessment rating to record any important comments about the segment. It is located at the bottom of the rating form. Comments should be printed legibly. If additional space is needed to record comments, the back of the rating form may be used; however, the inspector should indicate on the front that additional comments are included on the back of the rating form to avoid those comments being overlooked and omitted from the database during data entry.

Once the Maintenance Rating Form has been completed, it should be checked for accuracy and completeness by a trained individual at either the District or Region office. It should then be entered into the MMS database by a trained individual at either the District or Region office or by HQ for quality assurance (QA) inspections performed by a third party consultant.

CHARACTERISTICS LISTED ON THE MAINTENANCE RATING FORM

Each of the characteristics listed on the rating form will now be discussed within this section. The condition standards, threshold limits, and rating method will be examined.

For each roadway segment, all characteristics present should be rated. This includes all features within the entire right-of-way from the beginning logmile to the ending logmile for the selected segment. Not all characteristics will be present for every roadway segment; however, there are some characteristics that must be rated for **ALL** roadway segments.

TRAVELED PAVEMENT ELEMENT CHARACTERISTICS (Asphalt)

Asphalt Travel Pavement includes asphalt present:

- Within the travel lanes (between the outside pavement striping edge lines and outside the edge lines less than [<] 2 feet in width) of the mainline and (between the outside pavement striping edge lines and outside the edge lines less than [<] 1 foot in width) of the ramps.
- Within two-way left turn (TWLT) lanes.
- Within merge/turn lanes.

See Figure 5 for more details on Traveled Pavement Assessment area. If the selected roadway segment is an asphalt pavement section, then all characteristics that relate to asphalt pavements should be rated as either **"Pass"** or **"Fail"** except for the two characteristics for rutting. **Only one characteristic for rutting should be rated – either Mainline or Intersection – depending on whether an intersection falls within the segment.** A segment should be rated for intersection rutting if the following conditions are met:

1. A stopping condition is present (i.e. three- or four-way stop or traffic signal). An intersecting road that does not cause the mainline road to come to a stop **should not** be considered as an intersection. This should be treated as a turnout and should be rated for normal conditions within the projected right-of-way limits.

2. The intersection should be completely within the designated segment. If only part of the intersection lies within the segment, then it should be treated as a continuation of the mainline.

3. If an intersection does fall completely within the roadway segment, then all pavements within the roadway segment should be rated for **"Intersection Rutting"** and the **"Mainline Rutting"** characteristic should be marked as **"N/A"**.

TRAVELED PAVEMENT ELEMENT CHARACTERISTICS (Concrete)

Concrete Travel Pavement includes concrete pavement:

- Within the travel lanes (between the outside pavement striping edge lines and outside the edge lines less than [<] 2 feet in width) of the mainline and (between the outside pavement striping edge lines and outside the edge lines less than [<] 1 foot in width) of the ramps.
- Within two-way left turn (TWLT) lanes.
- Within merge/turn lanes.

See Figure 5 for more details on Traveled Pavement Assessment area. If the selected roadway segment is a concrete pavement section, then all characteristics that relate to concrete pavements should be rated as either **"Pass"** or **"Fail"**.

SHOULDER ELEMENT CHARACTERISTICS

Shoulder Pavement includes any asphalt or concrete pavement present which:

- Is greater than or equal to (≥) 2 feet in width beyond the outside edge of the traveled pavement striping for the mainline.
- Is greater than or equal to (≥) 1 foot in width beyond the outside edge of lane striping along a ramp.
- Is within a paved driveway or business entrance. These locations should be rated under their applicable shoulder characteristic only to the extent of the existing shoulder width adjacent to the driveway or business entrance as if the roadway shoulder continued through the area. See Figure 8.
- Is located within median cross-overs for divided highways.
- Is around mailbox pull-offs (an area where vehicles use to place or collect mail in a mailbox) should be rated as shoulder (paved if ≥ 2 feet of asphalt). Failures typically seen in these areas are edge drop-offs and potholes).

Unpaved Shoulder includes any stabilized area present which:

- Is greater than or equal to (≥) 2 feet in width beyond the outside the edge of lane striping (or beyond the asphalt/concrete shoulder) with a 4:1 slope or flatter for the mainline.
- Is greater than or equal to (≥) 1 foot in width beyond the outside edge of lane striping (or beyond the asphalt/concrete shoulder) with a 4:1 slope or flatter present along a ramp.
- Is around mailbox pull-offs (an area where vehicles use to place or collect mail within a mailbox) should be rated as shoulder (unpaved if ≥ 2 feet in width). Failures typically seen in these areas are rutting and washouts.

If the selected roadway segment has a shoulder, then all applicable characteristics should be marked as either **"Pass"** or **"Fail"** for Asphalt, Concrete, Unpaved, or Curb & Gutter sections of shoulder. All other characteristics that are not applicable should be marked as **"N/A"**. Segments can contain more than one type of shoulder or no shoulder at all. The inspector is to rate all shoulder types that are present within the segment.

ROADSIDE ELEMENT CHARACTERISTICS

Grass Height: Grass Height must be rated for **ALL** roadway segments unless it lies within an urban area where it is not intended for any type of grasses to grow or be present. Only the appropriate characteristic for Grass Height should be marked **"Pass"** or **"Fail".**

Landscaping/Wildflowers: Landscaping and Wildflowers should only be rated if there is a designated landscaping or wildflower bed present within the roadway segment.

Litter/Debris: Litter and Debris should be rated for **ALL** roadway segments. Litter is defined as any foreign item that is larger than 4 inches by 4 inches, or for small items such as cigarette butts which are larger than 4 inches by 4 inches when measured as a single pile. Litter and Debris should be rated by visual inspection while walking along the edge of the pavement. Any litter and debris that may be seen from the edge of the pavement that exceeds the size requirement should be counted as a single piece of litter.

Sweeping: Sweeping should be rated as either **"Pass"** or **"Fail"** for **ALL** roadway segments. This characteristic should **NEVER** be rated as **"N/A"**. Even if no sweeping activity is currently taking place on a roadway segment, it should be rated for debris accumulation.

Graffiti: Graffiti should be rated as either **"Pass"** or **"Fail"** for **ALL** roadway segments. This characteristic should **NEVER** be rated as **"N/A"**. If no graffiti is present on the roadway segment, then the inspector should mark **"Pass"**. If graffiti is found to be present on the roadway segment, then the inspector should mark **"Fail"**.

Vegetation/Brush: Vegetation/Brush should be rated for **ALL** roadway segments unless it lies within a section where there are absolutely no trees or brush within the right-of-way limits. If any vegetation is found within the right-of-way limits, then this characteristic is to be rated as either **"Pass"** or **"Fail"** and should not be marked as **"N/A"**.

Slopes/Erosion Control/ Turf Rutting: This characteristic should be rated for **ALL** roadway segments unless it lies within an area where none of these conditions are possible.

DRAINAGE ELEMENT CHARACTERISTICS

Most roadway segments should have at least one drainage characteristic. Rarely, a segment will not have any drainage items.

TRAFFIC SERVICES ELEMENT CHARACTERISTICS

Pavement Markings: Pavement Markings should be rated for **ALL** roadway segments. This characteristic should **NEVER** be rated as **"N/A"**. On-street parking stall lines should not be inspected.

CONDITION STANDARDS AND HOW TO MEASURE DEFECTS

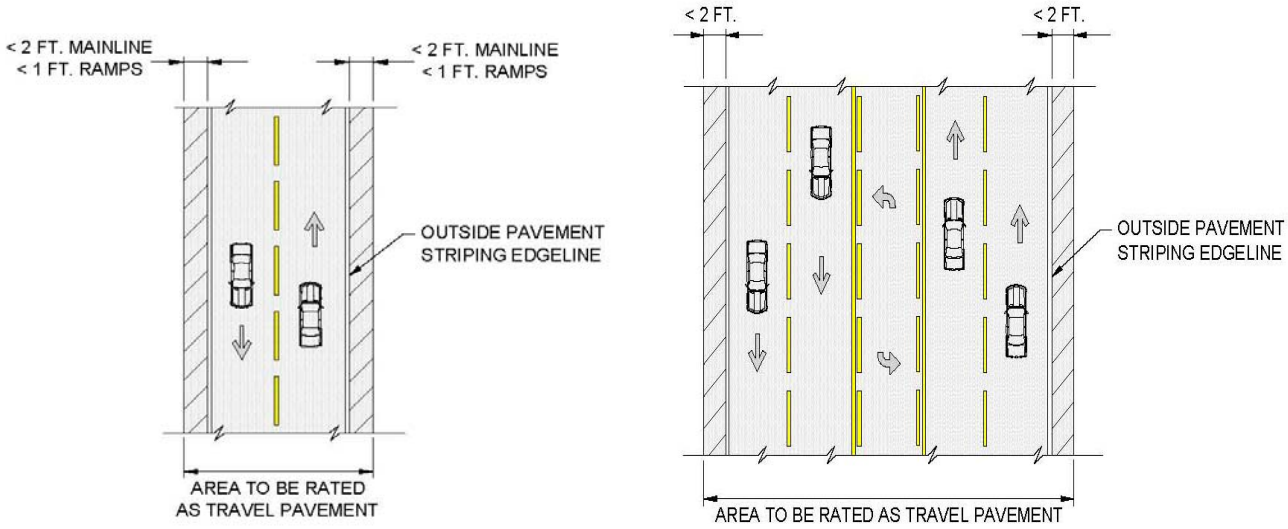
TRAVELED PAVEMENT ELEMENT

ASPHALT TRAVELED PAVEMENT

Definition: Asphalt Traveled Pavement includes asphalt present at the following:

- Within the travel lanes (between the outside pavement striping edge lines and outside the edge lines less than [<] 2 feet in width) of the mainline and (between the outside pavement striping edge lines and outside the edge lines less than [<] 1 foot in width) of the ramps.
- Within two-way left turn (TWLT) lanes.
- Within merge/turn lanes. See Figure 5.

FIGURE 5: TRAVELED PAVEMENT ASSESSMENT AREA



NOTE:
1. Mainline traveled pavement area can extend outside the pavement striping edge line less than (<) 2 feet.
2. Ramp traveled pavement area can extend outside the pavement striping edge line less than (<) 1 foot.

UNSEALED CRACKING:

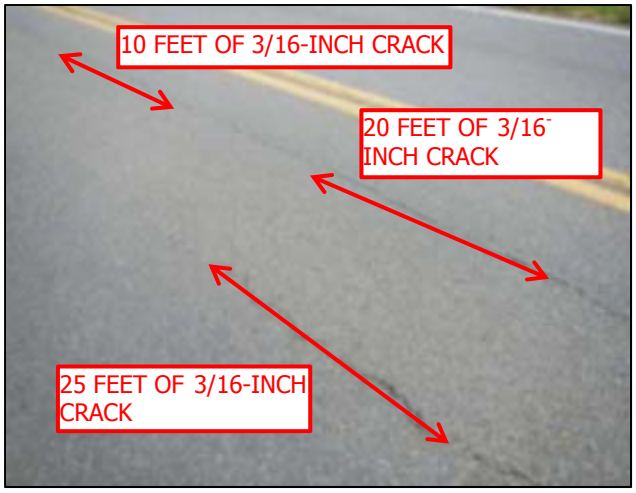
Condition Standard: If cracks have a cumulative length greater than or equal to (≥) 50 feet with a width greater than (>) 3/16 inch, or if any portion of a crack exceeds ½ inch and is unsealed, then the characteristic **"Fails"**.

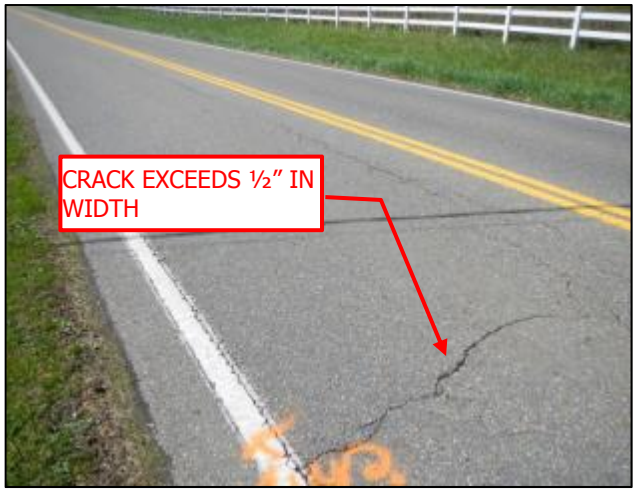
Measurement:

Step 1: Use a hand-held measuring device (tape, ruler, etc.) to measure the width of any existing cracks within the asphalt traveled pavement.

Step 2: Measure the total length of each crack that is greater than (>) 3/16 inch in width located within the segment. If any portion of any crack measured exceeds ½ inch in width, then this characteristic **"Fails"** regardless of the length.

Step 3: Add the individual lengths that contain cracks greater than (>) 3/16 inch to obtain a total cumulative length. A cumulative length greater than or equal to (≥) 50 feet of cracking does not meet the condition standard requirement and therefore **"Fails"**.





POTHOLES:

Condition Standard: No pothole greater than (>) 1 square foot in area and 1½" in depth.

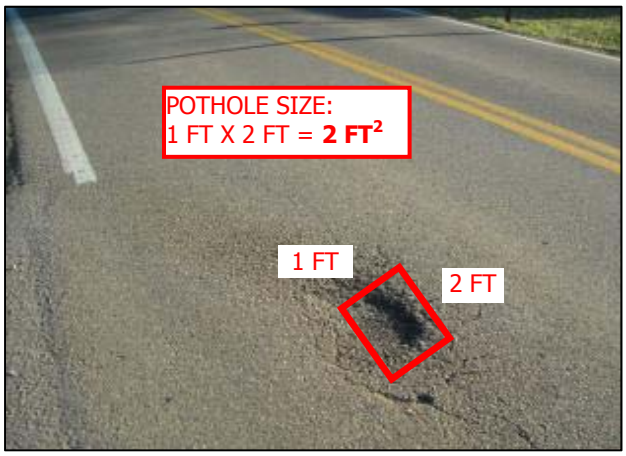
Measurement:

Step 1: Measure with a ruler or tape the width and length of the pothole in feet.

Step 2: Treat the area of the pothole as a rectangle and calculate the square-foot area of the pothole by multiplying the width by the length measured.

Step 3: Place a straightedge across the pothole over the deepest spot. Use a ruler or tape measure to measure the depth from the bottom of the straightedge to the deepest spot inside the pothole.

NOTE: If the area measurement exceeds 1 square foot **and** the depth measurement exceeds (>) 1½", then the characteristic does not meet the condition standard requirement and therefore **"Fails".**



ALLIGATOR/BLOCK CRACKING:

Condition Standard: No alligator/block cracking or base failure areas causing a threat to motorist safety or greater than (>) 100 square feet in area.

Measurement:

Step 1: Use spray paint to lightly mark the area of the alligator cracking.

Step 2: Measure with a tape the width and length of the marked area in feet.

Step 3: Treat the area as a rectangle and calculate the square-foot area by multiplying the width by the length measured.

Step 4: Repeat these steps for all areas of alligator cracking within the roadway segment.

Step 5: Add the calculated area for each alligator cracked location to find the total area for the segment.

NOTE: If the total area exceeds (>) 100 square feet, then this characteristic does not meet the condition standard requirement, and therefore **"Fails".**

Alligator Cracking – small interconnecting pattern of parallel and longitudinal cracking.

Block Cracking – large intersecting cracks that form a rectangular shape.

FLUSHING/CORRUGATIONS/CROSSFALL/SHOVING/UPHEAVAL/RAVELING/SETTLEMENT:

Condition Standard: No flushing, corrugations, settlements, raveling, shoving, heave, or crossfall areas causing a threat to motorist safety or greater than (>) 100 square feet in area.

Measurement:

Step 1: Use spray paint to lightly mark the area that is flushing, corrugating (raised bumps giving a "wash board" effect), crossfall (ensuring proper slope is provided to drain water from pavement), shoving, upheaval, raveling, or settling.

Step 2: Measure with a tape the width and length of the each marked area in feet.

Step 3: Treat the area as a rectangle and calculate each area in square feet by multiplying the width by the length measured.

Step 4: Repeat these steps for all areas identified within the roadway segment.

Step 5: Once all areas have been calculated, add the measurements together.

NOTE: If the total area for all defects exceeds (>) 100 square feet, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

Flushing (bleeding) occurs when asphalt binder fills the aggregate voids during hot weather and then expands onto the pavement surface.

Corrugation occurs when asphalt begins to have a wave pattern or exhibit a "wash board" effect.

Shoving is the sliding or pushing of the asphalt. Common areas located near braking or stopping traffic.

Upheaval is the upward movement in the pavement due to swelling of the subgrade.

Raveling is surface deterioration that occurs when aggregate particles are dislodged or oxidation causes loss of the asphalt binder.

Settlement is depressions within the asphalt typically seen by collecting water or asphalt breaking away due to poor lateral support.

ASPHALT TRAVELED PAVEMENT EDGE DROP-OFF:

Condition Standard: No edge drop-off on the asphalt traveled pavement greater than (>) 2 inches in depth. Asphalt traveled pavement edge drop-off occurs anywhere from within the travel lane to less than (<) 2 feet outside the travel lane striping.

Measurement:

Step 1: Place a straightedge (i.e. level) on the edge of the pavement and hanging over like a springboard.

Step 2: Measure with a ruler or tape the distance from the bottom of the straightedge to the top of the shoulder in inches. **If there is less than (<) 2 feet of pavement outside of the travel lane striping (< 1 foot for ramps), this measurement should be made 2 inches out away from the edge of the pavement. If there is at least 2 feet of pavement outside of the travel lane striping (1 foot for ramps), this measurement should be made at the cold joint between the travel lane and the paved shoulder.**

Step 3: Take measurements at locations where the edge drop-off is greatest on either side of the roadway and on the inside shoulder of a divided highway.

NOTE: If any measurement is greater than (>) 2 inches in depth, then this characteristic does not meet the condition standard requirement, and therefore **"Fails"**. See Figure 6 for more detail.

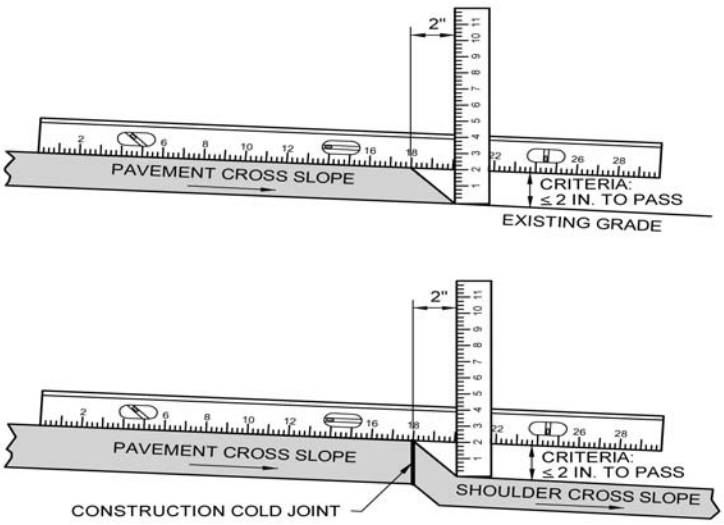
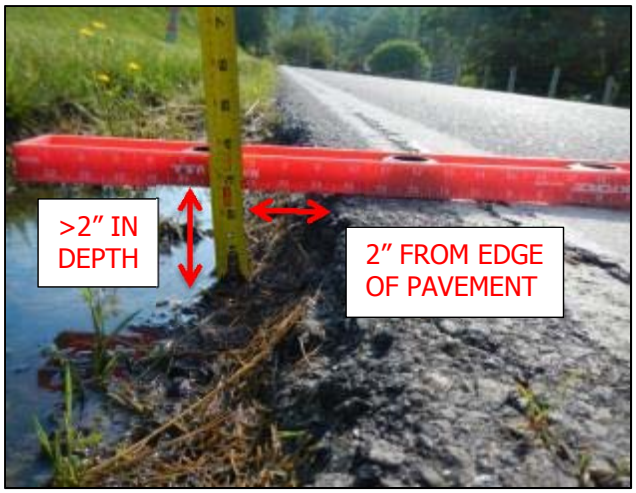


FIGURE 6: PAVEMENT EDGE DROP-OFF



Traveled Pavement Edge Drop-Off – Measurement location with < 2 feet of pavement outside of the painted edge line.

Traveled Pavement Edge Drop-Off – Measurement location with ≥ 2 feet of pavement outside of the painted edge line.

MAINLINE RUTTING

Condition Standard: No mainline ruts greater than (>) 1 inch in depth are permitted.

Measurement:

Step 1: Place a straightedge across the rutted pavement, bridging the rut.

Step 2: Measure with a ruler or tape the distance from the bottom of the straightedge to the bottom of the rut in inches.

If any portion of the rutted pavement is measured to be greater than (>) 1 inch in depth, then this characteristic does not meet the condition standard requirement, and therefore **"Fails"**.

INTERSECTION RUTTING:

Condition Standard: No intersection ruts greater than (>) 2 inches in depth are permitted. An intersection is defined as a section of roadway where the following conditions occur:

1. Two roadways meet to form an intersection.
2. A stopping condition is present that causes the mainline roadway that is being surveyed to stop through use of either a three- or four-way stop sign or a traffic signal.

NOTE: If the conditions above are met and an intersection is indeed present, then the inspector should rate the entire section for intersection rutting rather than for mainline rutting.

Measurement:

Step 1: Place a straightedge across the rutted pavement, bridging the rut.

Step 2: Measure with a ruler or tape the distance from the bottom of the straightedge to the bottom of the rut in inches.

NOTE: If any portion of the rutted pavement is measured to be greater than (>) 2 inches in depth, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

Mainline Rutting

Intersection Rutting

CONCRETE TRAVELED PAVEMENT

Definition: Concrete Traveled Pavement includes concrete present at the following:

- Within the travel lanes (between the outside pavement striping edge lines and outside the edge lines less than [<] 2 feet in width) of the mainline and (between the outside pavement striping edge lines and outside the edge lines less than [<] 1 foot in width) of the ramps.
- Within two-way left turn (TWLT) lanes.
- Within merge/turn lanes. See Figure 5.

UNSEALED JOINTS:

Condition Standard: No unsealed joints between concrete pavement slabs.

Measurement: **Step 1:** Visually inspect all joints between concrete pavement slabs.

NOTE: If any joint is unsealed, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

Unsealed Concrete Joints

UNSEALED CRACKING:

Condition Standard: No unsealed cracks with a cumulative length of 50 feet or more of cracking greater than (>) 3/16 inch in width, or if any portion of a crack exceeds ½ inch and is unsealed within the concrete pavement slab.

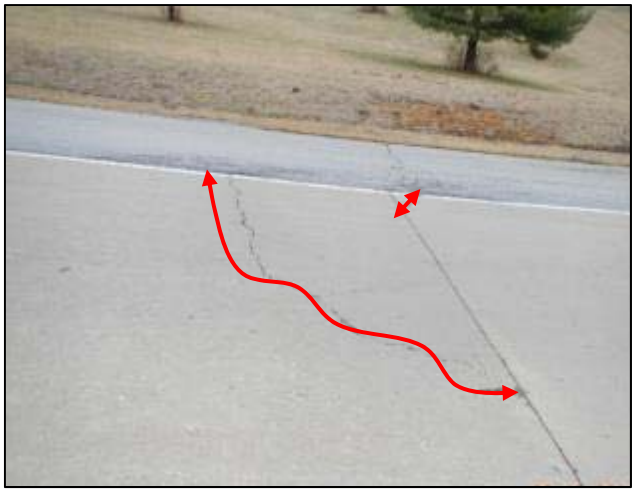
Measurement:

Step 1: Use a hand-held device (tape, ruler, etc.) to measure the width of any existing cracks within the concrete traveled pavement.

Step 2: Measure the total length of each crack greater than (>) 3/16 inch in width present within the segment. If any portion of any crack measured exceeds ½ inch in width, then this characteristic **"Fails"** regardless of the length.

Step 3: Add the individual lengths that contain cracks greater than (>) 3/16 inch to obtain a total cumulative length. A cumulative length greater than or equal to (≥) 50 feet of 3/16 inch cracking does not meet the condition standard requirement and therefore **"Fails"**.

Portion of the crack exceeds ½". Characteristic "Fails".



If > 50 feet of cumulative cracking of 3/16" is present, characteristic "Fails".

POTHOLES/SPALLS:

Condition Standard: No pothole greater than (>) 1 square foot in area and 1½ inch in depth is permitted. No spall greater than (>) 1 square foot in area is permitted.

Measurement Potholes:

Step 1: Use a ruler or tape to measure the width and length of the pothole in feet.

Step 2: Treat the area of the pothole as a rectangle and calculate the square foot area of the pothole by multiplying the width by the length measured.

Step 3: Place a straightedge across the pothole over the deepest spot.

Step 4: Measure with a ruler or tape the depth in inches from the bottom of the straightedge to the deepest spot inside the pothole.

NOTE: If the area measurement exceeds 1 square foot **and** the depth measurement exceeds 1½ inches, then the characteristic does not meet the condition standard requirement and therefore **"Fails"**. **Detail photo representation of measuring a pothole is depicted under Asphalt Traveled Pavement, Potholes section.**

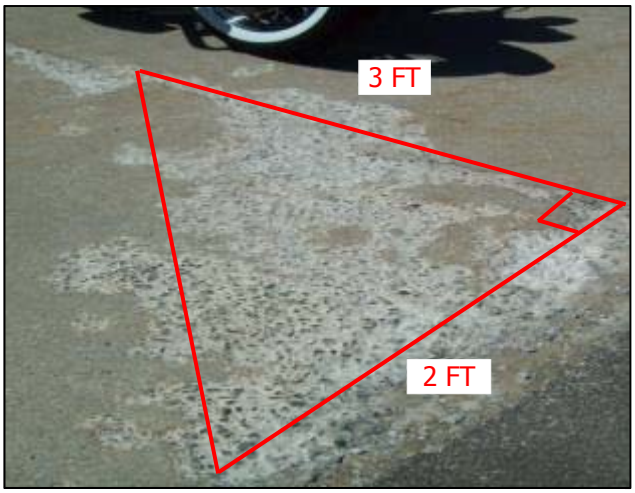
Measurement Spalls:

Step 1: Visually inspect all concrete pavement slabs for spalls in the concrete.

Step 2: Measure with a ruler or tape the width and length of the spall in feet. If the spall occurs on the corner of the slab, it will typically be triangular in shape. If the spall occurs on one edge of the slab, then it will typically be more rectangular in shape.

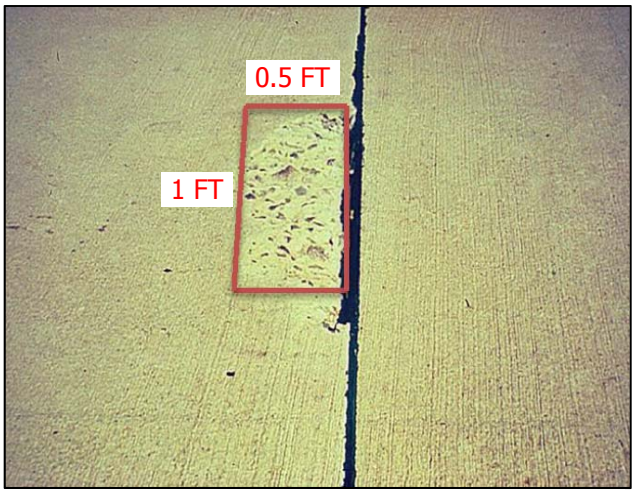
Step 3: Calculate the area of the spall. If the area is triangle-shaped, calculate the area of the spall by multiplying the width by the length measured, and then divide that number by 2. If the area is rectangular-shaped, then calculate the area of the spall by multiplying the width by the length measured.

NOTE: If the area of any spall is calculated to be greater than (>) 1 square foot, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.



Triangular spall that occurs in the corner of the concrete slab:

Area: 3 FT x 2 FT = 6 FT^2 then, 6 FT^2 ÷ 2 = **3 FT^2**
Characteristic would "Fail" for Concrete Spalling



Rectangular spall that occurs on the edge of the concrete slab:

Area: 1 FT x 0.5 FT = **0.5 FT^2**
Characteristic would "Pass" for Concrete Spalling

CONCRETE ASPHALT PAVEMENT EDGE DROP-OFF:

Condition Standard: No edge drop-off on the concrete traveled pavement greater than (>) 2 inches in depth is permitted. Concrete Traveled pavement edge drop-off occurs anywhere from within the travel lane to less than (<) 2 feet outside the travel lane striping.

Measurement:

Step 1: Place a straightedge (i.e. level) on the edge of the concrete pavement and hanging over like a springboard.

Step 2: Measure with a ruler or tape the distance from the bottom of the straightedge to the top of the shoulder in inches. **If there is less than (<) 2 feet of pavement outside of the travel lane striping, this measurement should be made approximately 2 inches out away from the edge of the pavement**. **If there is at least 2 feet of pavement outside of the travel lane striping, this measurement should be made at the cold joint between the travel lane and the paved shoulder.**

Step 3: Take measurements at locations where the edge drop-off is greatest on either side of the roadway and on the inside shoulder of a divided highway.

NOTE: If any measurement is greater than (>) 2 inches in depth, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**. **See Figure 6, depicted under the Asphalt Traveled Pavement Edge Drop-off section, for measuring an edge drop-off.**

SLAB FAULTING:

Condition Standard: No elevation difference between adjacent slabs greater than (>) 1 inch is permitted. No elevation difference within a slab greater than (>) 1 inch is permitted.

Measurement Adjacent Slabs:

Step 1: Place a straightedge (i.e. level) across a joint between two concrete pavement slabs. See Figure 7.

Step 2: Measure with a ruler or tape the distance from the bottom of the straightedge to the top of the adjacent slab in inches.

NOTE: If the distance measured exceeds 1 inch in height, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

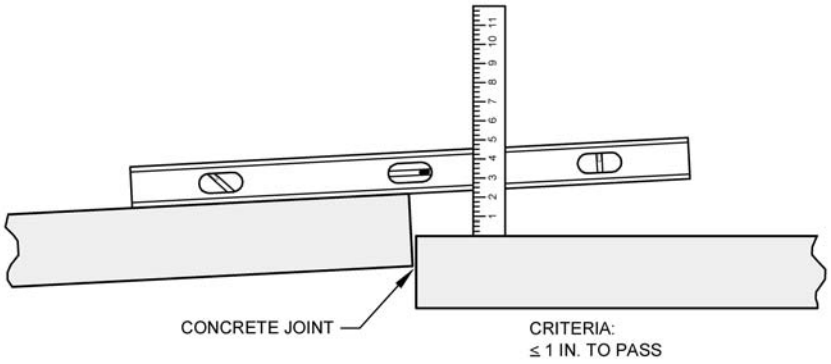
Measurement Within Slab:

Step 1: Place a straightedge (i.e. level) across any existing crack in a concrete pavement slab. See Figure 7.

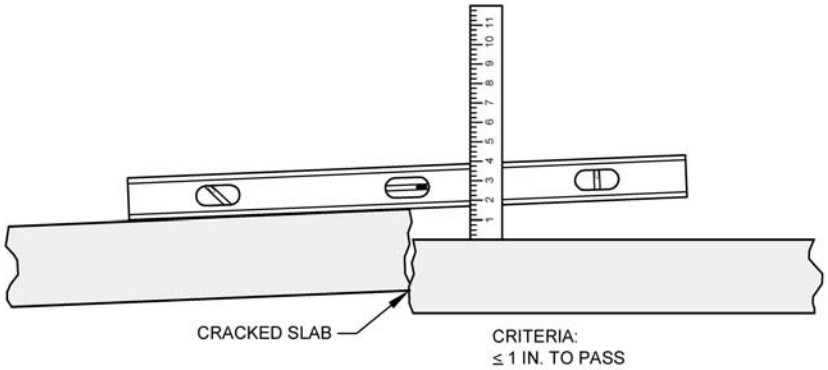
Step 2: Measure with a ruler or tape the distance from the bottom of the straightedge to the top of the lower side of the crack in inches.

NOTE: If the distance measured exceeds 1" in height, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

FIGURE 7: CONCRETE FAULTING



CONCRETE FAULTING (ADJACENT SLABS)



CONCRETE FAULTING (WITHIN SLAB)

CONDITION STANDARDS AND HOW TO MEASURE DEFECTS

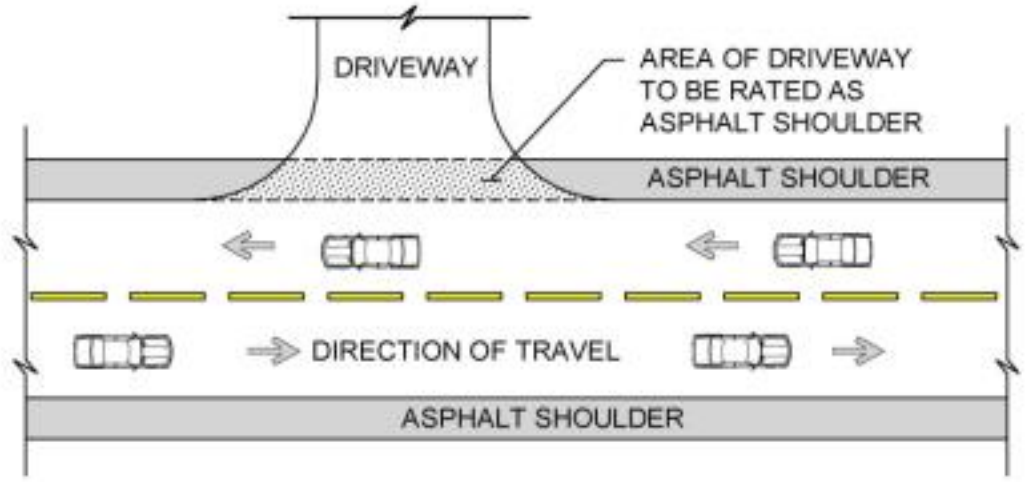
SHOULDER ELEMENT

ASPHALT SHOULDER

Definition: Asphalt Shoulder includes any asphalt pavement present which:

- Is greater than or equal to (≥) 2 feet in width beyond the outside edge of the traveled pavement striping for the mainline.
- Is greater than or equal to (≥) 1 foot in width beyond the outside edge of lane striping along a ramp.
- Is within a paved driveway or business entrance. These locations should be rated under their applicable shoulder characteristic only to the extent of the existing shoulder width adjacent to the driveway or business entrance as if the roadway shoulder continued through the area. See Figure 8.
- Is located within median cross-overs for divided highways.

FIGURE 8: SHOULDERS AT PAVED DRIVEWAYS OR BUSINESS ENTRANCES



NOTE: Driveways and/or Business Entrances are to be rated to the extent of the adjacent shoulder

UNSEALED CRACKING:

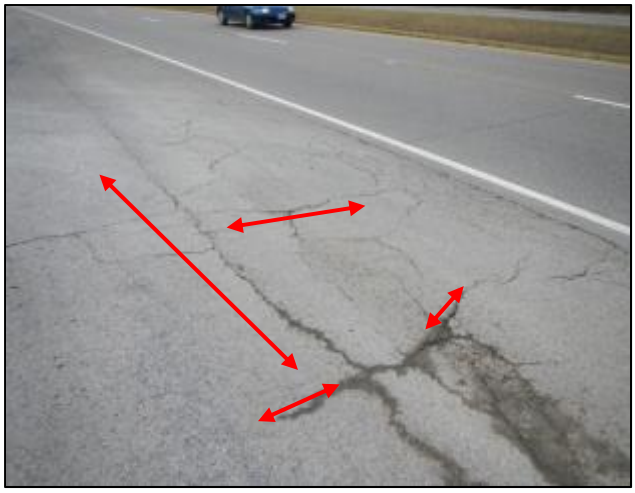
Condition Standard: No unsealed cracks with a cumulative length of 50 feet or more of cracking greater than (>) ½ inch is permitted.

Measurement:

Step 1: Use a hand-held device (tape, ruler, etc.) to measure the width of any existing cracks within the asphalt shoulder.

Step 2: Measure the total length of each crack greater than (>) 1/2 inch in width present within the segment.

Step 3: Add the individual lengths that contain cracks greater than (>) 1/2 inch to obtain a total cumulative length. A cumulative length greater than or equal to (≥) 50 feet of unsealed cracking does not meet the condition standard requirement and therefore **"Fails"**.



If greater than (>) 50 feet of cumulative length of unsealed cracks greater than (>) ½ inch are present then, characteristic **"Fails"**.

UNSEALED LONGITUDINAL JOINTS:

Condition Standard: No unsealed longitudinal joints greater than (>) ½ inch in width is permitted.

Measurement:

Step 1: Use a tape measure or ruler to measure the width of the longitudinal joint.

NOTE: If any portion of the unsealed longitudinal joint measurement exceeds ½ inch in width, then this characteristic does not meet the condition standard requirement and therefore **"Fails".**

Portion of the Longitudinal Joint that exceeds ½ inch. Characteristic "Fails".

POTHOLES:

Condition Standard: No pothole greater than (>) 1 square foot in area and 1½ inches in depth is permitted.

Measurement:

Step 1: Measure with a ruler or tape the width and length of the pothole in feet.

Step 2: Treat the area of the pothole as a rectangle, and calculate the square foot area of the pothole by multiplying the width by the length measured.

Step 3: Place a straightedge across the pothole over the deepest spot. Use a ruler or tape measure to measure the depth from the bottom of the straightedge to the deepest spot inside the pothole.

NOTE: If the area measurement exceeds 1 square foot and the depth measurement exceeds 1½ inches, then the characteristic does not meet the condition standard requirement and therefore **"Fails"**. **Detail photo representation of measuring a pothole is depicted under the Asphalt Traveled Pavement, Potholes section.**

ALLIGATOR/BLOCK CRACKING:

Condition Standard: No alligator/blocked cracking or base failure areas causing a threat to motorist safety or greater than (>) 200 square feet in area are permitted.

Measurement:

Step 1: Use spray paint to lightly mark the area of the alligator/block cracking.

Step 2: Measure with a tape the width and length of the marked area in feet.

Step 3: Treat the area as a rectangle, and calculate the square foot area by multiplying the width by the length measured.

Step 4: Repeat these steps for all areas of alligator/block cracking within the roadway segment.

Step 5: Add the calculated areas for each alligator/block cracked location to find the total area for the segment.

NOTE: If the total area exceeds 200 square feet, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**. **Detail photo representation of alligator/block cracking is depicted under the Asphalt Traveled Pavement, Alligator/Block Cracking section.**

FLUSHING/CROSSFALL/CORRUGATIONS/HEAVE/RAVELING/SETTLEMENT:

Condition Standard: No flushing, corrugations, settlements, raveling, heave, or crossfall areas causing a threat to motorist safety or greater than (>) 200 square feet in area are permitted.

Measurement:

Step 1: Use spray paint to lightly mark the area that is flushing, corrugating (raised bumps giving a "wash board" effect), crossfall (ensuring proper slope is provided to drain water from pavement), shoving, upheaval, raveling, or settling.

Step 2: Measure with a tape the width and length of the each marked area in feet.

Step 3: Treat the area as a rectangle and calculate each area in square feet by multiplying the width by the length measured.

Step 4: Repeat these steps for all areas identified within the roadway segment.

Step 5: Once all areas have been calculated, add them together.

NOTE: If the total area for all defects exceeds 200 square feet, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**. **Detail photo representation of each item is depicted under the Asphalt Traveled Pavement, Flushing/Crossfall/Corrugations/Heave /Raveling/Settlement section.**

ASPHALT SHOULDER EDGE DROP-OFF:

Condition Standard: No edge drop-off at edge of asphalt pavement shoulder greater than (>) 4 inches in depth is permitted.

Measurement:

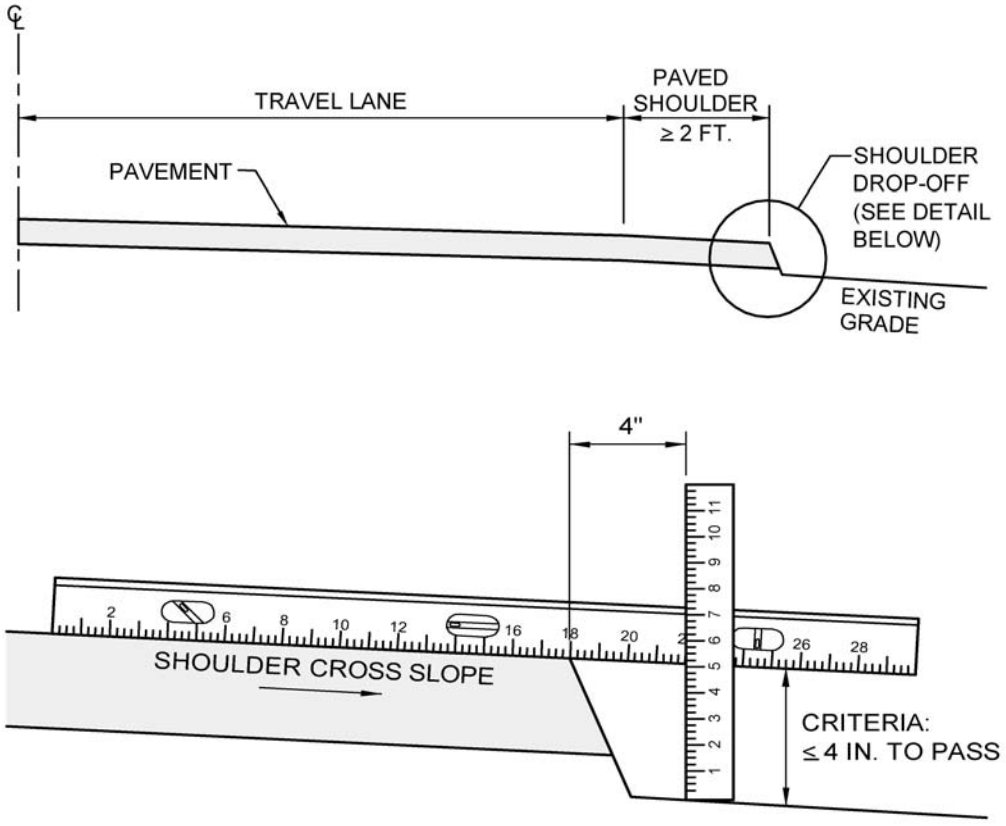
Step 1: Place a straightedge (i.e. level) on the edge of the paved shoulder and hanging over like a springboard.

Step 2: Measure with a ruler or tape the distance from the bottom of the straightedge to the top of the shoulder in inches. This measurement should be made approximately **4 inches out away from the edge of the pavement**.

Step 3: Take measurements at locations where the edge drop-off is greatest on either side of the roadway. If the roadway segment is a divided highway, take measurements on the inside shoulder as well.

NOTE: If any measurement is greater than (>) 4 inches in depth, then this characteristic does not meet the condition standard requirement and therefore **"Fails**". See Figure 9.

FIGURE 9: SHOULDER DROP-OFF



SHOULDER BUILDUPS:

Condition Standard: No shoulder buildups that cause the trapping of water onto the travel lane pavement are permitted.

Measurement: **Step 1:** Visually inspect the paved shoulder within the roadway segment.

NOTE: If any portion of the paved shoulder is built-up such that it could cause water to be trapped onto the traveled pavement, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

Example of Shoulder Buildups

Example of Shoulder Buildup.

CONCRETE SHOULDER

Definition: Concrete Shoulder includes concrete pavement:

- Is greater than or equal to (≥) 2 feet in width beyond the outside edge of the traveled pavement striping for the mainline.
- Is greater than or equal to (≥) 1 foot in width beyond the outside edge of lane striping along a ramp.
- Is within a paved driveway or business entrance. These locations should be rated under their applicable shoulder characteristic only to the extent of the existing shoulder width adjacent to the driveway or business entrance as if the roadway shoulder continued through the area. See Figure 8.
- Is located within median cross-overs for divided highways.

UNSEALED JOINTS:

Condition Standard: No unsealed joints between concrete pavement slabs are permitted.

Measurement: **Step 1:** Visually inspect all joints between concrete pavement slabs.

NOTE: If any joint is unsealed, then this characteristic does not meet the condition standard requirement and therefore **"Fails**". **Detail photo representation of unsealed joints is depicted under the Concrete Traveled Pavement, Unsealed Joints section.**

UNSEALED CRACKING:

Condition Standard: No unsealed cracks with a cumulative length of 50 feet or more of cracking greater than (>) ½ inch.

Measurement:

Step 1: Visually inspect all concrete paved shoulders for any cracks in the slab.

Step 2: Use a hand-held device (tape, ruler, etc.) to measure the width of any existing cracks within the concrete traveled pavement.

NOTE: If any portion of the crack measures greater than (>) ½ inch in width, then this characteristic does not meet the condition standard requirement and therefore **"Fails**". **Detail photo representation of unsealed cracking is depicted under the Asphalt Shoulder, Unsealed Cracking section.**

POTHOLES/SPALLS:

Condition Standard: No pothole greater than (>) 1 square foot in area and 1½ inches in depth is permitted. No spall greater than (>) 1 square foot in area is permitted.

Measurement (Potholes):

Step 1: Visually inspect all concrete shoulder pavement slabs for potholes in the concrete

Step 2: Use a ruler or tape to measure the width and length of the pothole in feet.

Step 3: Treat the area of the pothole as a rectangle, and calculate the square foot area of the pothole by multiplying the width by the length measured.

Step 4: Place a straightedge across the pothole over the deepest spot.

Step 5: Measure with a ruler or tape the depth in inches from the bottom of the straightedge to the deepest spot inside the pothole.

NOTE: If the area measurement exceeds 1 square foot **and** the depth measurement exceeds 1½ inches, then the characteristic does not meet the condition standard requirement and therefore **"Fails"**. **Detail photo representation of a pothole is depicted under the Asphalt Traveled Pavement, Potholes section.**

Measurement (Spalls):

Step 1: Visually inspect all concrete pavement slabs for spalls in the concrete.

Step 2: Measure with a ruler or tape the width and length of the spall in feet. If the spall occurs on the corner of the slab, generally it will be triangular in shape. If the spall occurs on one edge of the slab, usually these spalls will be more rectangular in shape.

Step 3: Calculate the area of the spall. If the area is triangle-shaped, calculate the area of the spall by multiplying the width by the length measured and then divide that number by 2. If the area is rectangular-shaped, calculate the area of the spall by multiplying the width by the length measured.

NOTE: If the area of any spall is calculated to be greater than (>) 1 square foot, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**. **Detail photo representation of a spall is depicted under the Concrete Traveled Pavement, Potholes/Spalls section.**

CONCRETE SHOULDER EDGE DROP-OFF:

Condition Standard: No edge drop-off on the concrete shoulder greater than (>) 4 inches in depth is permitted.

Measurement:

Step 1: Place a straightedge (i.e. level) on the edge of the concrete paved shoulder and hanging over like a springboard.

Step 2: Measure with a ruler or tape the distance from the bottom of the straightedge to the top of the shoulder in inches. This measurement should be made approximately **4 inches out away from the edge of the paved shoulder**.

Step 3: Take measurements at locations where the edge drop-off is greatest on either side of the roadway and on the inside shoulder of a divided highway.

NOTE: If any measurement is greater than (>) 4 inches in depth, then this characteristic does not meet the condition standard requirement, and therefore **"Fails"**. **Figure 9 is a diagram depicting where the shoulder edge drop-off should be measured.**

SLAB FAULTING:

Condition Standard: No elevation difference between adjacent slabs greater than (>) 1 inch nor elevation difference within a slab greater than (>) 1 inch is permitted.

Measurement (Adjacent Slabs):

Step 1: Place a straightedge (i.e. level) across a joint between two concrete shoulder pavement slabs.

Step 2: Measure with a ruler or tape the distance from the bottom of the straightedge to the top of the adjacent slab in inches.

NOTE: If the distance measured exceeds 1" in height, then this characteristic does not meet the condition standard requirement, and therefore **"Fails"**.

Measurement (Within Slab):

Step 1: Place a straightedge (i.e. level) across any existing crack in a concrete shoulder pavement slab.

Step 2: Measure with a ruler or tape the distance from the bottom of the straightedge to the top of the lower side of the crack in inches.

NOTE: If the distance measured exceeds 1" in height, then this characteristic does not meet the condition standard requirement, and therefore **"Fails"**. **Figure 7 depicts how to measure concrete slab faulting.**

SHOULDER BUILDUPS:

Condition Standard: No concrete shoulder buildups that cause the trapping of water onto the travel lane pavement are permitted.

Measurement: **Step 1:** Visually inspect the concrete paved shoulder within the roadway segment.

NOTE: If any portion of the concrete paved shoulder is built-up such that it could cause water to be trapped onto the traveled pavement, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**. **Detail photo representation of a shoulder buildup is depicted under the Asphalt Shoulder, Buildups section.**

UNPAVED SHOULDER

Definition: Unpaved Shoulder includes any stabilized area present which:

- Is greater than or equal (≥) to 2 feet in width beyond the outside the edge of lane striping (or beyond the asphalt/concrete shoulder) with a 4 Horizontal to 1 Vertical (4H:1V) slope or flatter for the mainline.
- Is greater than or equal (≥) to 1 foot in width beyond the outside edge of lane striping (or beyond the asphalt/concrete shoulder) with a 4H:1V slope or flatter present along a ramp.

UNPAVED SHOULDER BUILDUPS:

Condition Standard: No shoulder buildups that cause the trapping of water onto the travel lane pavement is permitted.

Measurement: **Step 1:** Visually inspect the unpaved shoulder within the roadway segment.

NOTE: If any portion of the unpaved shoulder is built-up such that it could cause water to be trapped onto the traveled pavement, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

Unpaved Shoulder Buildups – areas where the unpaved shoulder profile is higher than the adjacent paved surface, potentially trapping water on the pavement.

UNPAVED SHOULDER WASHOUTS:

Condition Standard: No shoulder deviations or washout sections greater than (>) 2 inches in depth and 6 inches in width and greater than (>) 50 linear feet within the roadway segment are permitted.

Measurement:

Step 1: Visually inspect the unpaved shoulder within the roadway segment. Use spray paint to lightly mark the area that has washed out.

Step 2: Use a tape or ruler to measure the width and depth of any areas of the unpaved shoulder that have eroded or washed away.

Step 3: For all areas meeting the minimum width and depth requirements above, measure the longitudinal length of the deviations, depressions or washouts along the roadway parallel to the direction of traffic.

Step 4: Repeat this for the entire unpaved shoulder length within the roadway segment.

Step 5: Add the lengths of all measured shoulder deviation sections.

NOTE: If the total length of shoulder deviations is greater than (>) 50 linear feet, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

Unpaved Shoulder Washout – areas where unpaved shoulder material has been removed due to erosion and/or vehicle wheels.

CURB AND GUTTER:

Condition Standard: No non-functional curb and gutter sections, included within the roadway segment, are permitted.

Measurement:

Step 1: Visually inspect all curb and gutter sections within the roadway segment.

Step 2: Determine if any section is damaged so that it no longer functions as designed (blockage, buildup, where pavement has been overlaid reducing hydraulic capacity, cracked up, misaligned, or damaged such that it no longer channels water into a drain inlet).

Asphalt overlaid on roadway reducing the hydraulic capacity of the curb; therefore, the characteristic "Fails".

Curb and gutter cracked-up and damaged such that it no longer channels water as designed; therefore, the characteristic "Fails".

Curb and gutter blocked with vegetation such that it no longer channels water as designed; therefore, characteristic "Fails".

Curb and gutter built up with debris reducing curb's hydraulic capacity; therefore, characteristic "Fails".

CONDITION STANDARDS AND HOW TO MEASURE DEFECTS

ROADSIDE ELEMENT

GRASS HEIGHT:

Condition Standard: At least 95% of the grass must be kept below 24 inches in height.

Measurement:

Step 1: Using a tape or large ruler, measure the height of the grass within the roadway segment. Measure grass "as-is" as it stands whether it is wind-blown, flopped over, etc. Make sure to take measurements on both sides of the roadway and also within the median. Take measurements at locations where the grass height is greatest.

Step 2: If any area of grass measures greater than (>) 24 inches in height, use a tape measure to find the length and width of the area of grass that exceeds the height restriction.

Step 3: Multiply the length by the width measured to calculate the area. Repeat this step for every section of grass that exceeds the height restriction.

Step 4: Add all of the areas together to get the total area of grass that exceeds the height restriction.

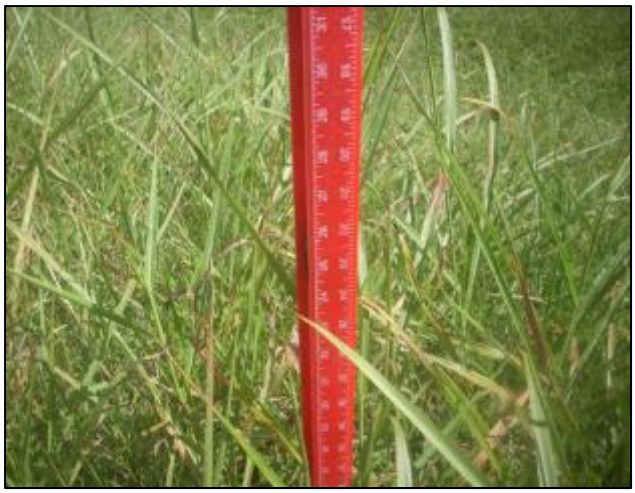
Step 5: Next, measure the length and width of the mowing limits within the roadway segment by placing one end of the tape measure next to the roadway shoulder and the other at the outside edge of the mowing limits. If a median is present, then measure the length and width of the median.

Step 6: Next multiply the length by the width of all measured areas to calculate the total area of both outside mowing limits and the median (if applicable).

Step 7: Finally, divide the total area of grass that exceeds the height restriction by the total area of mowing limits then multiply by 100 to calculate the total percentage of grass that exceeds the height restriction.

NOTE: If the total area of grass that exceeds the height restriction is greater than or equal (≥) 5% of the total area of the mowing limits, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

Example: Calculated area of grass over 24" along State Route = 150 ft^2
Calculated area of mowing limits along State Route = 2,000 ft^2
150 ft^2 ÷ 2,000 ft^2 = 0.075 then 0.075 X 100 = 7.5%, and is > 5%
Therefore, the grass height characteristic would "Fail".



If grass height exceeds 24 inches on more than 5% of the segment's mowing limits, then characteristic "Fails".

LANDSCAPING AND WILDFLOWERS:

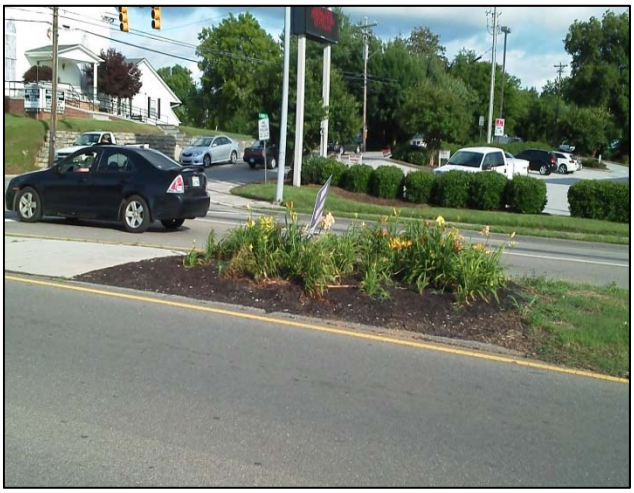
Condition Standard: 95% of landscaping and wildflower beds are maintained to their original constructed condition. Beds should be free of litter, weeds, and other foreign materials. Areas should be properly mulched, irrigated, fertilized, and well maintained.

Measurement

Step 1: Visually inspect any landscaping or wildflower areas within the roadway segment.

Step 2: Determine if less than (<) 95% of the total area of landscaping or wildflower beds are maintained such that they are clean, properly irrigated, free of debris or noxious weeds, and aesthetically pleasing.

NOTE: If this characteristic does not meet the condition standard requirement, then it **"Fails"**.



Example of landscaping within the right-of-way.

LITTER AND DEBRIS:

Condition Standard:

Interstates: No more than 100 pieces of litter or debris are permitted within the roadway segment.

State Routes: No more than 50 pieces of litter or debris are permitted within the roadway segment.

Note: For the purposes of this condition assessment, litter should be defined as:

1. Any foreign object located within the right-of-way limits of the roadway segment that is larger than 4 inches by 4 inches and is visible from the edge of the roadway shoulder.

2. For small items, such as cigarette butts, if there are a large number of items located in the same vicinity, then they should be considered as a single piece of litter if they are collectively larger than 4 inches by 4 inches.

3. Any single piece of litter or debris, such as a large object like a mattress located within the traveled pavement, is considered to be an immediate safety hazard to the motorist.

Measurement

Step 1: Walk along the outside shoulder of the roadway segment and inspect for litter.

Step 2: Repeat Step 1 for both outside and inside shoulders of the roadway segment.

Step 3: Determine whether the total number of pieces of litter and debris counted within the roadway segment exceeds the limited number of pieces of litter defined above.

NOTE: If this characteristic does not meet the condition standard requirement, then it **"Fails"**. In addition, if any single piece of litter or debris is considered to be an immediate safety hazard to the motorist, such as a large object like a mattress located within the traveled pavement, then the characteristic does not meet the condition standard requirement and therefore also **"Fails"**.

FENCE:

Condition Standard:

No damaged or non-functional right-of-way/closed access/state fencing should be located within the roadway segment. Private fencing for landowners and businesses **ARE NOT** to be rated

Measurement:

Step 1: Visually inspect access control fence within the roadway segment.

NOTE: If any section of fence is damaged or non-functional, then this characteristic does not meet the condition standard requirement, and therefore **"Fails"**.

SWEEPING:

Condition Standard: No significant accumulation of small particles of dirt, gravel, sand, rubber, plastic or any other foreign object on the traveled pavement or shoulder of the roadway segment.

Measurement:

Step 1: Visually inspect the traveled pavement and shoulder of the roadway segment for any accumulation of small particles of dirt, gravel, sand, rubber, plastic or any other foreign object.

NOTE: If a significant accumulation of these objects is present within the roadway segment, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**. If there is no sweeping to be done on the roadway segment, **DO NOT MARK "N/A" FOR THIS CHARACTERISTIC**, it should be rated as **"Pass"**.

Accumulation of gravel present along the travel pavement, therefore the Sweeping characteristic "Fails".

GRAFFITI:

Condition Standard: No graffiti should be permitted within the roadway segment.

Measurement:

Step 1: Visually inspect the roadway segment for graffiti.

NOTE: If any graffiti is located within the roadway segment, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**. If there is no graffiti present on the roadway segment, **DO NOT MARK "N/A" FOR THIS CHARACTERISTIC. If no graffiti is present**, then it should be rated as **"Pass"**.

VEGETATION AND BRUSH:

Condition Standard: No vegetation or brush that obstructs the view of the motorist in any way, such as sight distance, blocking a warning/regulatory/guide sign, or falling onto the roadway is permitted within the roadway segment. No vegetation or brush should be permitted that does not allow for at least 15 feet of vertical clearance above the traveled pavement.

Measurement:

Step 1: Determine if any vegetation or brush obstructs sight distance or the motorists' view of any warning, regulatory, or guide sign(s).

Step 2: Using a 15-foot pole or rod, stand at the edge of the traveled pavement and verify that no vegetation or brush intrudes upon the 15-foot vertical clearance above the traveled pavement.

NOTE: If any vegetation or brush obstructs sight distance or the motorists' view of any warning, regulatory, or guide sign(s) then this characteristic does not meet the condition standard requirement, and therefore **"Fails"**. If any vegetation or brush is intruding upon the 15-foot vertical clearance, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

12 feet vertical clearance measured over travel lane, therefore the characteristic "Fails".

Vegetation is obstructing visibility of a warning sign, therefore the characteristic "Fails".

SLOPES/EROSION CONTROL/TURF RUTTING:

Condition Standard:

No erosion areas that endanger slope stability are permitted. No undermining of riprap slopes, paved ditches, slope pavements, and retaining or noise walls. No turf rutting from mechanical vehicles (i.e. tractors, utility trailers, etc.) or for vehicles that have left paved areas and caused rutting in the median, shoulder, etc. off the roadway greater than 6" deep.

Measurement:

Step 1: Visually inspect the roadway segment for areas that contain slopes that have eroded and/or are potentially unstable.

Step 2: Visually inspect the roadway segment for turf rutting greater than (>) 6 inches in depth.

NOTE: If any of these conditions are present within the roadway segment, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

Turf rutting is > 6 inches in depth, therefore, the characteristic "Fails".

Slope erosion that endangers slope stability and reduces hydraulic capacity of roadside ditch. Therefore, the characteristic "Fails".

CONDITION STANDARDS AND HOW TO MEASURE DEFECTS

DRAINAGE ELEMENT

BOX CULVERTS:

Condition Standard: No box culverts that are functioning at less than (<) 90% of designed capacity. If greater than (>) 10% of the cross section area is blocked, then the segment should be rated **"Fail"**. If a box culvert is located parallel to the travel pavement (i.e. under a driveway or business entrance) it should be rated as a "Side Drain".

Measurement

Step 1: Use a tape or ruler to measure the width and height of the opening of the box culvert.

Step 2: Multiply the width by the height to calculate the area of the box culvert.

Step 3: Measure the height and width of the box culvert that is blocked or with filled with solid competent/hard material (i.e. soil and rocks not leaf litter) and multiply them to calculate the area of the box culvert that is blocked.

Step 4: Divide the area that is blocked by the total area of the box culvert to find the percentage of the area that is blocked.

NOTE: If more than 10% of the area of the box culvert is blocked, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

If more than 10% of the box culvert area is blocked, the characteristic "Fails".

CROSSDRAIN PIPES:

Condition Standard: No crossdrain pipes that are functioning at less than (<) 90% of designed capacity are permitted. If greater than (>) 10% of the cross section area is blocked, then the segment should be rated **"Fail"**.

Measurement

Step 1: Use a tape or ruler to measure the inside diameter of the opening of the crossdrain pipe.

Step 2 Determine the maximum depth of blockage indicated in the Maintenance Rating Program Pipe Size chart provided in Appendix B to determine the allowable depth of blockage.

Step 3: Measure the depth of the portion of the pipe that is blocked with solid competent/hard material (i.e. soil and rocks not leaf litter).

Step 4: Compare the depth measured to the maximum depth listed on the chart for the appropriate pipe size.

NOTE: If the depth measured exceeds the maximum depth listed on the chart, then this characteristic does not meet the condition standard requirement and therefore **"Fails".**

Pipe blockage should be measured to solid competent/hard material (beyond the leaf litter). Refer to Appendix B to determine the allowable depth of blockage.

PAVED/UNPAVED DITCHES:

Condition Standard: No paved or unpaved ditches that are functioning at less than (<) 50% of designed capacity. If greater than (>) 50% of the cross section area is blocked, then the segment should be rated **"Fail"**.

Measurement

Step 1: Use a tape or ruler to measure the width and depth of the ditch.

Step 2: Multiply the width by the depth and divide by 2 to calculate the area of the ditch.

Step 3: Measure the width and depth of the part of the ditch that is **most blocked** with solid competent/hard material (i.e. soil and rocks not leaf litter) within the roadway segment and multiply them to calculate the area of the ditch that is blocked.

Step 4: Divide the area of ditch that is blocked by the total area of the ditch to find the percentage of the area that is blocked.

NOTE: If more than 50% of the area of the ditch is blocked, then this characteristic does not meet the condition standard requirement, and therefore **"Fails"**.

Concrete median ditch with > 50% of the cross sectional area blocked, therefore the characteristic "Fails".

Roadside ditch with > 50% of the cross sectional area blocked, therefore the characteristic "Fails".

CATCH BASINS AND AREA DRAIN INLETS:

Condition Standard: No catch basins or area drain inlets that are functioning at less than (<) 90% of designed capacity are permitted. If greater than (>) 10% of the cross section area is blocked, then the segment should be rated **"Fail"**. No damaged or non-functional grates are allowed.

Measurement

Step 1: Use a tape or ruler to measure the length and width of the catch basin or area drain inlet.

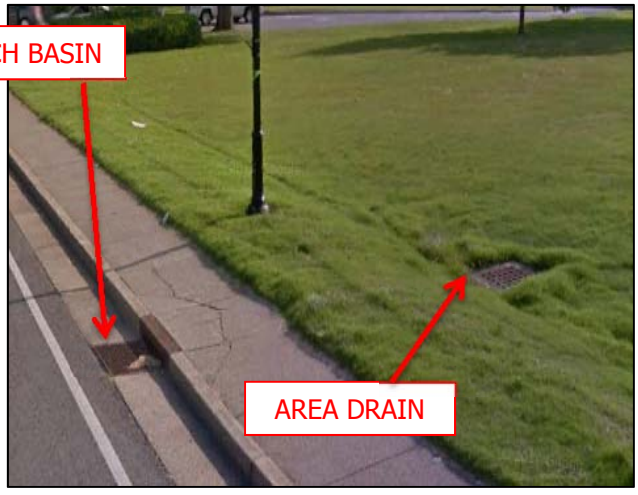
Step 2: Multiply the length by the width to calculate the area of the catch basin or area drain inlet.

Step 3: Measure the length and width of the part of the catch basin or area drain inlet that is blocked and multiply them to calculate the area that is blocked.

Step 4: Divide the area of catch basin or area drain inlet that is blocked by the total area of the catch basin or area drain inlet to find the percentage of the area that is blocked.

Step 5: If more than 10% of the area is blocked, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

NOTE: If there are any damaged or non-functional grates then the characteristic **"Fails"**.



SIDE DRAINS/LATERAL UNDERDRAINS:

Condition Standard:

Side Drains: No side drains functioning at less than (<) 90% of designed capacity are permitted. If greater than (>) 10% of the cross section area is blocked, then the segment should be rated **"Fail"**.

NOTE: Side drains should be defined as pipes that run parallel to the mainline (along the ditch line) under driveways, entrances, median crossovers, and side streets. **Box culverts under driveways, entrances, median crossovers, and side streets should be rated as a side drain.**

Lateral Underdrains: No lateral underdrains functioning at less than (<) 90% of designed capacity are permitted. Only the visible outfall portion of the lateral underdrain is to be evaluated; do not evaluate the portion of the underdrain underneath the shoulder or travel lane that cannot be seen without camera-mounted visual aid.

Measurement

Step 1: Use a tape or ruler to measure the inside diameter of the opening of the side drain or lateral underdrain pipe.

Step 2 Determine the maximum depth of blockage specified in the Maintenance Rating Program Pipe Size chart provided in Appendix B to determine the allowable depth of blockage.

Step 3: Measure the depth of the portion of the pipe that is blocked with solid competent/hard material (i.e. soil and rocks not leaf litter).

Step 4: Compare the depth measured to the maximum depth listed on the chart for the appropriate pipe size.

Step 5: If the depth measured exceeds the maximum depth listed on the chart, then this characteristic does not meet the condition standard requirement, and therefore **"Fails"**.

A side drain under a private driveway which carries storm water drainage parallel to the mainline.

The visible outfall portion of the lateral underdrain is to be evaluated. Do not evaluate the portion of the lateral underdrain underneath the shoulder or travel lane that cannot be seen without camera-mounted visual aid.

ILLICIT DISCHARGE:

Condition Standard: Any visual observation of a discharge onto TDOT right-of-way within a roadway segment that appears to contain a potential illicit discharge of soils, solid materials, chemical pollutants, bacterial contaminants, or other non-storm water discharge should be noted by the inspector by marking **"Fail"** on the rating form. Personnel should notify the Regional Environmental Coordinator for verification and classification.

Measurement

Step 1: Search the drainage area within the roadway segment for possible discharges of storm water onto TDOT right-of-way.

Step 2: Visually inspect all discharges for examples of illicit discharges listed above.

Step 3: If no illicit discharge is observed, mark **"Pass"** on the Maintenance Rating Form.

Step 4: If an illicit discharge is observed, mark **"Fail"** on the Maintenance Rating Form.

Step 5: Contact the Regional Environmental Coordinator to report the possible illicit discharge location.

Example of Illicit Discharge onto right-of-way.

CONDITION STANDARDS AND HOW TO MEASURE DEFECTS

TRAFFIC SERVICES ELEMENT

WARNING/REGULATORY SIGNS:

Condition Standard:

1. No warning or regulatory signs that are missing or non-functional should be present within the right of way limits of the roadway segment.
2. Signs should be clear, reflective, unobstructed, plumb, structurally sound, and free from damage to the sign facing which would affect sign function.
3. A sign should be considered plumb if it is leaning < 1 inch per foot of post length.

NOTE: Warning and Regulatory Signs should be defined as signs that convey a warning message or inform the driver of a road regulation such as speed limits. Some examples of Warning and Regulatory Signs are stop signs, yield signs, speed limit signs, curve ahead signs, chevrons, and school signs.

Warning/Regulatory Sign Examples:

Measurement

Step 1: Visually inspect the sign face to determine whether it is clear, reflective, and free from damage.

NOTE: If the sign facing is damaged or obstructed such that it prevents the motorist from easily reading the sign, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

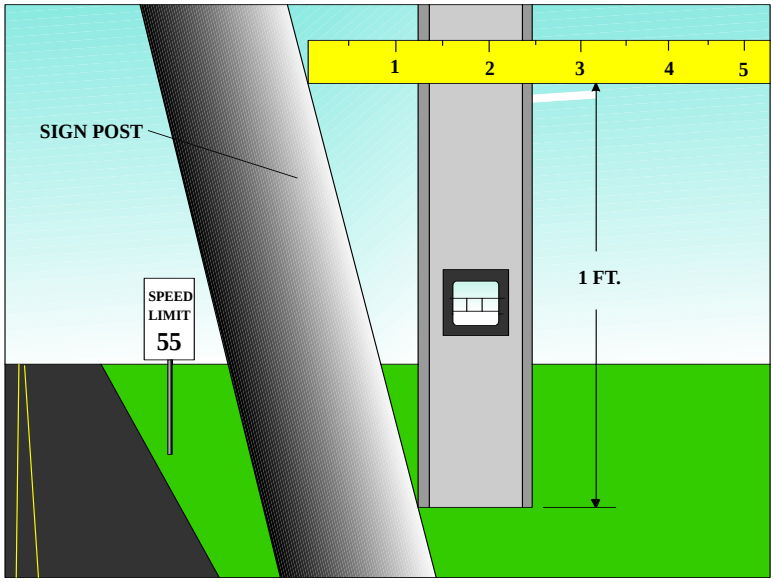
Step 2: Determine if the sign is plumb:

a.) Place the edge of a 4-foot carpenter's level near the bottom of the sign post, making sure that it is vertically level.

b.) Measure 1 foot from the edge of the carpenter's level and use a tape to measure the distance from the side of the post to the side of the carpenter's level, as depicted in Figure 10.

NOTE: If this distance exceeds 1 inch, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

FIGURE 10: MEASURING IF THE SIGN IS PLUMB



GUIDE SIGNS:

Condition Standard:

1. No guide signs that are missing or non-functional should be present within the right of way limits of the roadway segment.
2. Signs should be clear, reflective, unobstructed, plumb, structurally sound, and free from damage to the sign facing that would affect sign function.
3. A sign should be considered plumb if it is leaning less than (<) 1 inch per foot of post length.

NOTE: Guide signs should be defined as signs that guide or direct the motorist to a specific destination. Some examples of guide signs are interstate guide signs (green signs), exit gore signs, mileage signs, and logo signs.

Guide Sign Examples:

Measurement

Step 1: Visually inspect the sign face to determine whether it is clear, reflective, and free from damage.

NOTE: If the sign facing is damaged or obstructed such that it prevents the motorist from easily reading the sign, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

Step 2: To determine if the sign is plumb:

a.) Place the edge of a 4-foot carpenter's level near the bottom of the sign post, making sure that it is vertically level.
b.) Measure 1 foot from the edge of the carpenter's level and use a tape measure to measure the distance from the side of the post to the side of the carpenter's level, as depicted in Figure 10.

PAVEMENT MARKINGS:

Condition Standard: 95% of pavement markings within the roadway segment should be clear and reflective enough to be seen from a distance of at least 200 feet.

Measurement

Step 1: Visually inspect the pavement markings within the roadway segment to determine if they are clear and reflective from at least 200 feet.

Step 2: Measure the length of all sections of pavement markings that are not clear and reflective with a tape measure.

Step 3: Add all of the lengths together to find the total length of pavement markings that are not clear and reflective.

Step 4: Determine the total length of pavement markings within the roadway segment by counting the number of solid lines and dashed lines. If the lines extend throughout the entire segment, then each solid line will be 528 feet in length and each dashed line will be 132 feet in length. Otherwise, measure the length of all lines within the segment.

Step 5: Divide the length of pavement markings that are not clear and reflective by the total length of pavement markings within the roadway segment to find the percentage of bad pavement markings.

Note: If this percentage exceeds 5%, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

Example of Pavement Markings

RAISED PAVEMENT MARKERS/DELINEATORS:

Condition Standard: No more than two (2) raised pavement markers or delineators within the roadway segment may be missing or non-functional. If no pavement markers or delineators are present on a section of Interstate, then the inspector should mark **"Fail"** for this characteristic. For all other routes, if no raised pavement markers or delineators are present, then this characteristic should be marked as **"N/A"**. Delineators used to designate the location of cross drain pipes, box culverts, etc. are not included in this characteristic.

Measurement

Step1: Visually inspect the raised pavement markers and delineators within the roadway segment to determine if they are missing or non-functional.

NOTE: If more than two (2) raised pavement markers or delineators within the roadway segment are missing or non-functional, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**.

Examples of Raised Pavement Markers

Example of Delineators

GUARDRAIL/CABLE RAIL/GUARDRAIL TERMINALS:

Condition Standard:

1. No guardrail/cable rail terminals are missing, damaged, or non-functional.
2. No guardrail/cable rail segments are missing, damaged, or non-functional.
3. No guardrail segments less than (<) 25 inches or greater than (>) 33 inches in vertical height from the cross slope of the traveled pavement or shoulder to the top of the guardrail (i.e., guardrail height must be within a range of 25 to 33 inches to **"Pass"**).
4. If a section of guardrail/cable rail or a guardrail terminal has taken a minor hit but will still function as designed and poses no threat to the motorist, then this characteristic should be marked **"Pass".**
5. If any portion of the Cable Rail is not in full tension, then the characteristic **"Fails"**.

Measurement

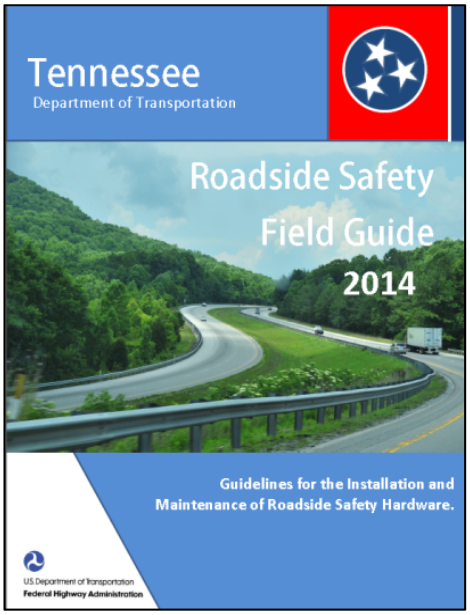
Step 1: Visually inspect all sections of guardrail, cable rail, and guardrail/cable rail terminals within the roadway segment to determine if they are missing, damaged, or non-functional.

Step 2: Measure guardrail to determine if within the allowable height:

a.) Place a straightedge (i.e. level) on the cross slope of the traveled pavement or paved/unpaved shoulder and hanging over like a springboard.

b.) Measure with a ruler or tape the distance from the bottom of the straightedge to the top of the guardrail in inches. See example depicted in Figure 11.

c.) Take measurements at locations where the guardrail is present on either side of the roadway and on the inside shoulder of a divided highway.

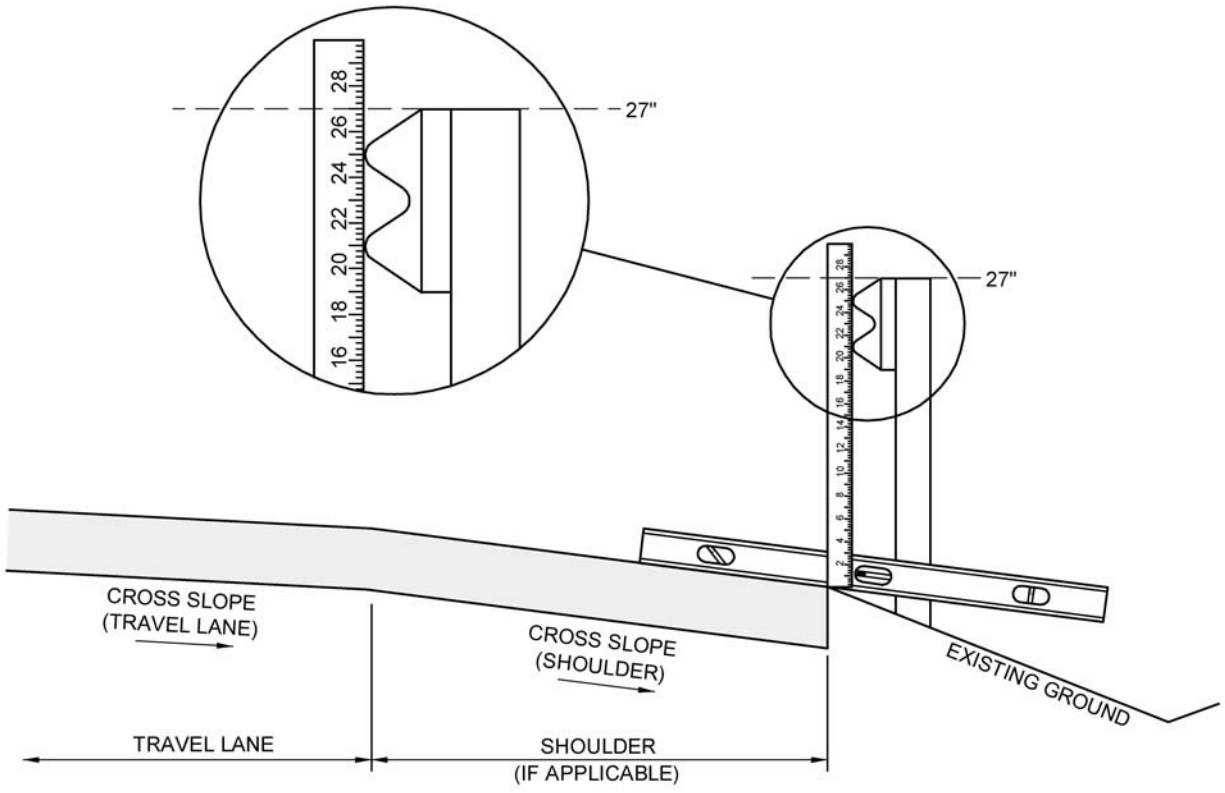


NOTE: If a guardrail segment or terminal has taken a minor hit but will still function as designed and poses no threat to motorists, then it meets the condition standard requirement. If it has been damaged to the point that it no longer functions as designed, then this characteristic does not meet the condition standard requirement and therefore **"Fails"**. Guardrail height will be measured (measured from the top of rail to the cross slope). If any section of the guardrail measures < 25 inches or > 33 inches in vertical height, then the characteristic **"Fails". Refer to the medium priority items in the TDOT Roadside Safety Field Guide for guidance on what constitutes a minor hit and what would necessitate repair. When the characteristic falls under medium to high priority, it should be noted as a "Fail".**

If any portion of the Cable Rail is not in full tension, then the characteristic "Fails".

Example of a guardrail end terminal.

FIGURE 11: GUARDRAIL HEIGHT MEASUREMENT



GUARDRAIL HEIGHT MEASUREMENT

NOTE: The guardrail height should not be measured from the existing ground. The cross slope of the shoulder (if present) or the travel lane should be extended and the height should be measured from the theoretical cross slope to the top of the guardrail.

CONCRETE BARRIER WALLS:

Condition Standard: No barrier wall segments that are missing, damaged, or non-functional are permitted. No barrier wall terminals should be left unprotected. If a section of barrier wall is left unprotected, then this characteristic should be marked **"Fail"**. If a section of barrier wall has taken a minor hit but will still function as designed and poses no threat to the motorist, then this characteristic should be marked **"Pass"**.

Measurement

Step 1: Visually inspect all sections of concrete barrier wall within the roadway segment to determine if they are missing, damaged, or non-functional.

NOTE: If a concrete barrier wall section has taken a minor hit, but will still function as designed and poses no threat to motorists, then it meets the condition standard requirement. If it has been damaged to the point that it no longer functions as designed, then this characteristic does not meet the condition standard requirement, and therefore **"Fails"**. **Refer to the medium priority items in the TDOT Roadside Safety Field Guide for guidance on what constitutes a minor hit and what would necessitate repair. When the characteristic falls under medium to high priority it should be noted as a "Fail".**

Examples of concrete barrier walls.

ATTENUATORS:

Condition Standard: No attenuators that are damaged to the point where it is non-functional and cannot take another hit safely are permitted. If an attenuator has taken a minor hit but will still function as designed if it takes another subsequent hit, then this characteristic should be marked **"Pass"**. If the attenuator is damaged such that it will not take another hit safely, then this characteristic should be marked **"Fail"**.

Measurement

Step 1: Visually inspect all attenuators within the roadway segment to determine if portions are missing, damaged, or non-functional.

NOTE: If an attenuator has taken a minor hit, but will still function as designed and poses no threat to the motorists, then it meets the condition standard requirement. If it has been damaged to the point that it no longer functions as designed, then this characteristic does not meet the condition standard requirement, and therefore **"Fails"**. **Refer to the medium priority items in the TDOT Roadside Safety Field Guide for guidance on what constitutes a minor hit and what would necessitate repair. When the characteristic falls under medium to high priority it should be noted as a "Fail".**

Example of two different types of attenuators.

APPENDIX A

SAMPLE MAINTENANCE RATING FORM

MAINTENANCE RATING FORM

Region: 3 **District:** 38 **Segment ID:** 6542

Inspector:		County:	HICKMAN
		Route:	I0040
		Special Case:	0
System Type:	Interstate	County Seq.:	1
Inspection Period:	6/2014	Begin LM:	158.9
Date of Inspection:		End LM:	159

Maintenance Element		Pass	N/A	Fail
TRAVELED PAVEMENT				
ASPHALT	ASPH CRACKING			
	ASPH POTHOLES			
	ASPH ALLIGATOR CRACKING			
	ASPH FLUSH/HEAVE/RAVEL			
	ASPH EDGE DROPOFF			
RUTTING	MAINLINE RUTTING			
	INTERSECTION RUTTING			
CONCRETE	CONC JOINTS			
	CONC CRACKING			
	CONC POTHOLES			
	CONC EDGE DROPOFF			
	CONC SLAB FAULTING			
SHOULDER				
SH. ASPHALT	ASPH SHLD CRACKING			
	ASPH SHLD/ROADWAY JOINT			
	ASPH SHLD POTHOLES			
	ASPH SHLD ALIGATORCRACK			
	ASPH SHLD FLUSH/HEAVE			
	ASPH SHLD EDGEDROPOFF			
	ASPH SHLD BUILDUPS			
SH. CONCRETE	CONC SHLD JOINTS			
	CONC SHLD CRACKING			
	CONC SHLD POTHOLES			
	CONC SHLD EDGEDROPOFF			
	CONC SHLD SLAB FAULTING			
	CONC SHLD BUILDUPS			
SH. UNPAVED	UNPAVED SHLD BUILDUPS			
	UNPAVED SHLD WASHOUTS			
CURB & GUTTER	CURB + GUTTER			

Maintenance Element	Pass	N/A	Fail
ROADSIDE			
GRASS			
LANDSCAPING + WILDFLOWERS			
LITTER		■	
FENCE			
SWEEPING		■	
GRAFFITI		■	
VEGETATION + BRUSH			
SLOPES/EROSION/TURF RUT			
DRAINAGE			
BOX CULVERTS			
CROSSDRAIN PIPES			
DITCHES			
CATCH BASINS + INLETS			
SIDE DRAINS			
ILLICIT DISCHARGE		■	
TRAFFIC SERVICES			
WARNING/REGULATORY SIGNS			
GUIDE SIGNS			
PAVEMENT MARKINGS		■	
RAISED PVMT MKR/DELINATOR			
GUARDRAIL/CABLE/TERMINALS			
BARRIER WALLS			
ATTENUATORS			

ARE RAMPS PRESENT IN SEGMENT? YES / NO

WERE PREVIOUSLY PAINTED MRI MARKINGS PRESENT UPON ARRIVAL? YES / NO

-WAS SEGMENT LENGTH >= 500 FT? YES / NO

- IF NOT, THEN ENTER SEGMENT LENGTH

Inspector Comments

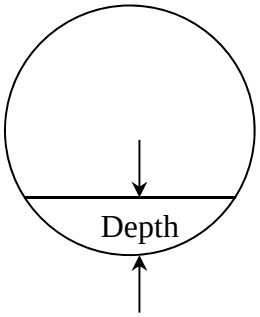
DT-1723

APPENDIX B

MAINTENANCE RATING PROGRAM PIPE SIZE CHART FOR CROSS DRAINS, SIDE DRAINS AND LATERAL UNDERDRAINS

Maintenance Rating Program Pipe Size Chart for Round Cross Drains, Side Drains and Lateral Underdrains

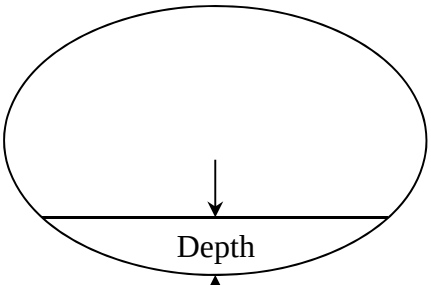
ROUND PIPES



Round Pipe Sizes (Diameter)	Max. Depth of Blockage to Pass (inches)
4″	½″
6″	1″
8″	1 ¼″
12″	2″
15″	2 ¼″
18″	2 ¾″
24″	3 ¾″
30″	4 ½″
36″	5 ½″
42″	6 ½″
48″	7 ½″
54″	8 ½″
60″	9 ½″
66″	10″
72″	11″
78″	12″
84″	13 ¼″

Maintenance Rating Program Pipe Size Chart For Oval Cross Drains and Side Drains

OVAL PIPES



Oval Pipe Sizes	Max. Depth of Blockage to Pass (inches)
23″ x 14″	4″
30″ x 19″	5 ¼″
38″ x 24″	6 ½″
45″ x 29″	8″
49″ x 32″	8 ¾″
53″ x 34″	9 ¼″
60″ x 38″	10 ½″
68″ x 43″	11 ¾″
76″ x 48″	13 ¼″
83″ x 53″	14 ½″
91″ x 58″	16″
98″ x 63″	17 ¼″
106″ x 68″	18 ½″
113″ x 72″	19 ¾″
121″ x 77″	21″
128″ x 82″	22 ½″
136″ x 87″	23 ¾″
143″ x 92″	25″
151″ x 97″	26 ½″
166″ x 106″	29″
180″ x 116″	31 ½″

APPENDIX C

MRI CONFLICT RESOLUTION FLOWCHART

CONFLICT RESOLUTION FLOWCHART