

# Nuggets & Nibbles

From the Cornell Local Roads Program

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**Nuggets & Nibbles is available online!**

[www.clrp.cornell.edu/nuggets\\_and\\_nibbles](http://www.clrp.cornell.edu/nuggets_and_nibbles)

## Spring 2010 Workshop Schedule

This coming Spring we are offering 18 workshops throughout New York State. The flyers are enclosed in this issue. There is also a Spring 2010 workshop map on the back cover. Complete information is available on our website: [www.clrp.cornell.edu](http://www.clrp.cornell.edu)

### Spring 2010 Workshop Schedule

#### Asphalt Paving Principles:

- March 23 - Putnam County
- March 24 - Washington County
- March 25 - Schoharie County

*Who should attend:* This workshop is intended for highway and public works officials who select paving alternatives, evaluate options, and analyze cost.

#### Basics of a Good Road:

- April 6 - Niagara County
- April 7 - Ontario County
- April 8 - Broome County
- April 13 - St. Lawrence County
- April 14 - Saratoga County
- April 15 - Sullivan County

*Who should attend:* Newly-elected or newly-appointed town, county, city, and village highway officials, street foremen, construction supervisors, and others interested in learning about the fundamental concepts of road building are encouraged to attend. Bring your mayor, town board supervisor, or highway committee to this session!



#### Powers and Duties of Local Highway Officials:

- April 27 - Suffolk County
- April 28 - Ulster County
- April 29 - Schenectady County
- May 18 - Tioga County
- May 19 - Wayne County
- May 20 - Genesee County

*Who should attend:* Town, county, city and village highway, public works and municipal officials who have responsibility for or are interested in the legal responsibilities of the operations and management of highway departments in New York State.

#### Small Highway Department Management:

- May 11 - Erie County
- May 12 - Monroe County
- May 13 - Onondaga County

*Who should attend:* This course is intended for recently-elected or appointed town or village highway and public works officials who supervise a staff of fewer than 25 employees. Experienced highway officials from small departments, mayors, and supervisors are welcome to attend if they feel that the course content will be of interest.

# Preserving Municipal Roads: What Are Your Options?



David Orr, P.E., Senior Engineer

Fracking wells, windmill farms, biodiesel facilities; there are lots of new businesses that may increase the traffic on local highways. Forest loggers, coal haulers, a new shopping plaza; there are also lots of existing businesses that may, or already have, increased the traffic on local highways. The fundamental question for a highway agency dealing with a possible increase in traffic is **What are my options?**

Highways form the backbone of moving goods, services, and people from one point to another. Local municipalities in New York State maintain eighty-six percent of all the centerline miles. We rely on these highways on a daily basis to get from here to there. If the road surface is too rough, it will cost more to travel on the highway. Local municipalities have to balance the need for access with the effects of increased traffic. One person's improved economy is another person's environmental damage.

Much discussion is currently underway on this last issue because of the Marcellus Shale natural gas exploration and drilling taking place in the Southern Tier and Western Catskills. The drilling process may require over a million gallons of water per well. One estimate of the number of truck trips for a single well site ranges from nearly 900 to over 1,300, with most occurring during a very short period when the wellhead is set up for the first time (figures taken from the New York State Department of Environmental Conservation's [NYSDEC] draft Generic Environmental Impact Statement [GEIS]).

There are some who think the draft GEIS does not do enough to regulate the gas industry. There are many highway agencies in New York State that would not think of the NYSDEC as an agency that is too lenient, but there are always differences of opinion on controversial issues such as this one.

The draft GEIS is over 500 pages long, NOT including the glossary, bibliography, and other appendices. Comments on the draft GEIS are due at the end of 2009. If you do not have time to read the entire document, the following three chapters are a quick starting point to at least get the basics:

- Chapter 1 - Introduction, 5 Pages
- Chapter 8 - Permit Process and Regulatory Coordination, 10 pages
- Chapter 9 - Alternative Actions, 11 Pages

In upcoming issues of *Nuggets & Nibbles*, we will examine in more depth the various options available for local agencies when dealing with increased traffic due to ANY development, not just the Marcellus Shale drilling. We may look at truck access laws, access and hauling fees, highway permits, weight restrictions, and evaluation of existing roads along with other possible options for local agencies. Let's first take a look at why the Marcellus Shale is being explored and the need to have an inventory of your highway system.

## Marcellus Shale Drilling

Natural gas shale is a valuable source of energy. Unfortunately, shale is an impervious rock and it can be very difficult to extract any gas held within it. To get gas from the rock, vertical shafts are first drilled down to the layer of shale (typically several thousand feet deep in most of New York State). Directional drilling then creates horizontal shafts inside the shale layer. However, this process alone does not release enough gas to make it economically feasible.

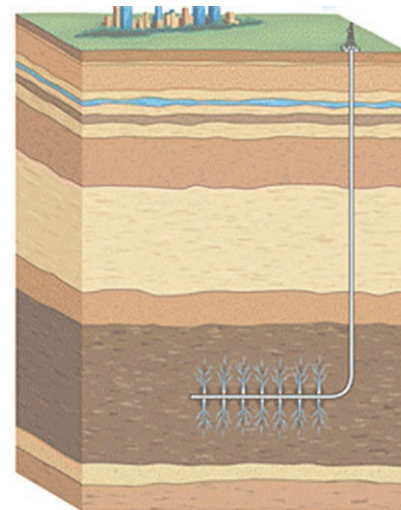
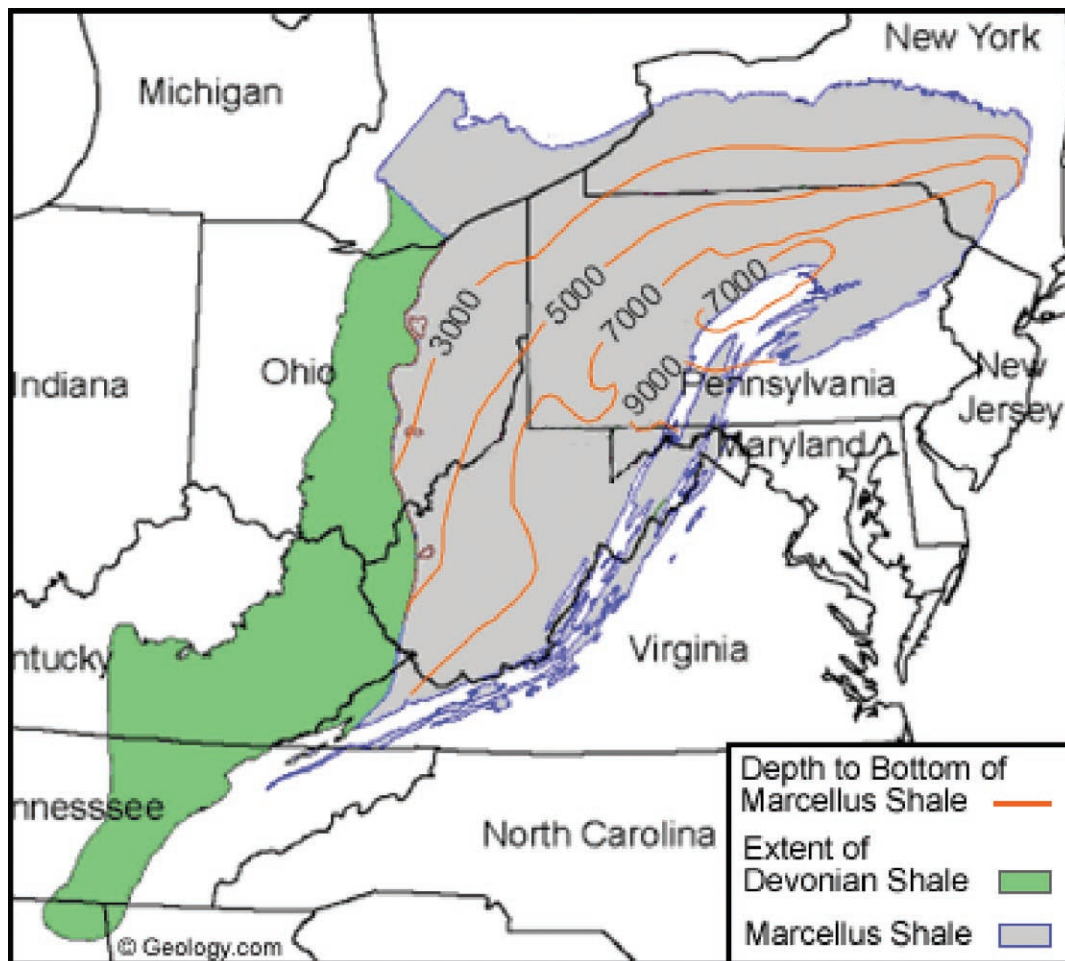


Figure 1 - Simple illustration of fracking from the Museum of the Earth's webpage: <http://www.museumoftheearth.org/outreach.php?page=92387/352042>

To increase the amount of gas released, the shale is fractured using a process of hydraulic fracturing also known as “fracking” (see Figure 1). Fracking uses water, solids such as sand, and some additional additives to create small fissures in the rock which allow the gas to escape. In addition to the natural gas, some of the water used in the process, along with natural water already in the shale zone, comes back up the hole and has to be treated. Treatment is necessary because of the additives added to make the fracking fluid more effective, and also due to extra contaminants picked up from the shale during the drilling process.

New technological advances, coupled with increased demand and the rising price of natural gas, have made it economically feasible to begin extracting natural gas from so-called ‘tight shales.’ In the case of the Marcellus shale, there is some evidence that the shale may be easier to fracture due to the presence of pyrite (fool’s gold). If so, the amount of gas released may be larger than the typical ten percent of available gas found in most gas shales. If so, this would make the Marcellus shale the largest source of natural gas in the United States. Figure 2 (see below) shows the area and depth of the Marcellus Shale in and around New York State.

*Continued on page 4*



*Figure 2 - Map showing the approximate depth in feet to the base of the Marcellus Shale. Prepared using the map by Robert Milici and Christopher Swezey, adding depth-to-Marcellus contours published by Wallace de Witt and others, 1993, United States Department of Energy Report: The Atlas of Major Appalachian Gas Plays. <http://geology.com/articles/marcellus/marcellus-shale-depth-map.gif>*

For those interested, there is a wealth of information available on the internet discussing the issues involved with drilling of the Marcellus Shale. Cornell Cooperative Extension has developed a website specifically to help provide unbiased information: <http://gasleasing.cce.cornell.edu>

## Creating a Highway System Inventory

A fundamental starting point for any review of your options is to know where you are today. It is like getting directions from one place to another - knowing where you are going is important, but you have to know where you are starting from. In the case of highways, we need to start with an inventory of what we have. The more information we have at our fingertips, the more confident we can be in choosing an option.

A highway inventory is the process of collecting the information necessary to adequately describe the highways in the local network. The amount and type of information gathered can be adjusted to fit the specific needs of an individual community. The objective is to gather what you need without gathering too much. A good rule of thumb to follow in starting an inventory is "DON'T GET CARRIED AWAY!"

An inventory does not require the use of a computer; manual systems can work very well. The inventory may be as simple as a map showing all roads with notations about section length, width, pavement type, and date of construction or last improvement. There are also any number of computer based systems that can be used. Which system you use depends upon your needs.

## Defining Section Boundaries

Before actually starting the inventory, the highway system needs to be divided into manageable sections. Sections are defined so that the critical information about the pavement within their boundaries is consistent in physical characteristics and other factors. It is not necessary that all segments be the same length. Any one of the following would define the boundary between two sections:

- Change in the number of traffic lanes
- Change in pavement type (chip seal to hot-mix, for instance)
- Abrupt change in traffic patterns or volume

- Change in drainage characteristics (such as curb and gutter to a drainage ditch section)
- Change in pavement structure (thickness, material, etc.)
- Boundary between previous construction projects (different projects can reflect differences in design, materials, age, and other factors)

In addition, geographic or man-made features may offer or force section boundaries. Examples include:

- Rivers or streams
- City or town limits
- County lines
- Railroad grade crossings
- Road intersections

Urban streets can be divided easily into sections using intersections or blocks. One important consideration is how to count the area within the intersection. The intersection areas should be carefully defined to avoid duplication. Two common alternatives are to either always include the intersection with the major road or to make the intersection its own segment. If your agency would work on an intersection as a separate project, the last method makes the most sense.

## Essential Information

The inventory process can be completed over time, but should be as simple as possible while still collecting the required information. Listed below are types of information that should be considered for collection:

- **Section Description** - The description includes the name or route number of the road.
- **Functional and Administrative Classification** - The functional classification of the street or road (arterial, collector and residential) and special designations such as school bus routes should be recorded if this information will be used in priority-setting by your agency.
- **Pavement Structure** - This includes pavement thickness, type, and materials. In the case of truck traffic, this information can be very useful.
- **Roadway Geometry** - Geometry refers to the visible features of a road, and includes pavement width, number of lanes, median width, shoulder width and type, and parking locations.
- **History** - The date of construction, dates and type of successive maintenance such as surface treatments or reconstruction should be recorded if available.

- **Traffic** - This should include both Average Daily Traffic (ADT) and percent (%) of trucks. See the sidebar in the righthand column of this page for a simple way to estimate daily traffic.
- **Drainage Characteristics** - This should describe the drainage system for the section, such as storm sewers, side ditches, curb and gutter, and all subsurface drainage.

A complete physical inventory can be very costly and the most time consuming portion of road management plan. Any data not directly related to surface performance, but which may be beneficial to the municipality, can be collected when collecting the basic information listed above. Additional information may include:

- Traffic control devices
- Drainage structures
- Utilities
- Right-of-way width
- Guiderail
- Sidewalks and curbs

It is possible to attempt too much during the initial inventory. It may be better to get started with something simple than to collect too much information. In the next issue of Nuggets & Nibbles we will look at how this inventory information can be used to develop a simple pavement management plan. We will also discuss options for local agencies to preserve their roads.

## Resources

Museum of the Earth's webpage on the Geology of the Marcellus Shale:

[www.museumoftheearth.org/outreach.php?page=92387/352042#unique](http://www.museumoftheearth.org/outreach.php?page=92387/352042#unique)

Cornell Cooperative Extension Natural Gas Development Resource Center:

<http://gasleasing.cce.cornell.edu>

NYS DEC Website on Marcellus Shale:

[www.dec.ny.gov/energy/46288.html](http://www.dec.ny.gov/energy/46288.html)

Geology.com's webpage on the Marcellus Shale:

<http://geology.com/articles/marcellus-shale.shtml>

## Estimating Traffic Volumes

While use of traffic counters is the preferred method of determining the traffic volume along a given stretch of roadway, it can be time consuming and expensive to take traffic counts along every highway. In many cases, an initial estimate can be used to help determine the relative amount of traffic along your system.

A simple rule of thumb takes advantage of the nature of traffic flow throughout the day. During a typical weekday, fifteen percent (15%) of the traffic occurs during the busiest hour of the day in rural areas. Eleven percent (11%) is the typical value for this busiest hour in urban areas. While the morning and evening rush volumes are not the same, they are similar. If you go out to a location during the morning rush when people are going to work (or in the afternoon when they are coming home) and count for 15 minutes, you can use these figures to estimate the traffic:

1. Take a count for 15 minutes.
2. Convert this value to a full one-hour count by multiplying by 4.
3. Divide this number by the estimated percentage of traffic for the busiest hour: 15% in rural areas and 11% in urban areas. Suburban areas will be somewhere in between, usually close to 12%.

Here is an example for a rural area (15% during busiest hour). Let's assume one vehicle per minute or 15 vehicles:

1. Count for 15 minutes:  $T=15$  vehicles
2. Convert to one hour count:  $T \times 4 = 60$
3. Divide by 15%:  $T \times 4 \div 0.15 = 400$



*The estimated traffic on this road is 400 vehicles per day.*

# New Materials from Our Library



The following videos have recently been added to our lending library:

## Construction Workplace Hazard Perception

*CLRP Video #SA446 (60 minutes)*  
*Produced by The Training Network*

This program gets your employees involved and teaches hazard perception through a series of visual challenges. In 5 segments, the video features 30 scenarios focusing on construction hazards:

- Fall Protection
- Work Zone Safety
- Scaffolding
- Fork-lift Safety
- Trenching and Shoring
- PPE (Personal Protective Equipment)
- Hand and Power Tools.

**Suggested Audience:** Highway superintendents, supervisors and crews.

## Spill Cleanup In The Workplace

*CLRP Video #SA004 (23 minutes)*  
*Produced by The Training Network, 2001*

In-depth coverage of spill cleanup: Classes of chemicals, labeling and MSDS; Containment and cleanup of spills; Detection of contaminants; Decontamination procedures.

**Suggested Audience:** Highway superintendents, staff.

## Hearing Conservation: A Refresher Program

*CLRP Video #SA012 (12 minutes)*  
*Produced by The Training Network / Long Island Productions*

Encourage employees to take personal responsibility. Provides 1910.95 required training/ annual retraining and increases awareness of noise as a hazard. Protection: use and advantages of canal caps, ear plugs and earmuffs, when to wear them.

**Suggested Audience:** Highway superintendents, staff.

## Safety Basics Video Series Parts 1-5

*CLRP Video #SA444 (16 minutes)*  
*Produced by Caterpillar Inc., 2007*

Part 1 - Safety Home: Brings home the reasons why everyone should be concerned with safety on the job site.

Part 2 - Seat Belt Safety: One of the most basic and most important safety tool available to operators is the seat belt.

Part 3 - Walk-Around Inspections: Emphasizes the importance of conducting thorough walk-around inspections, and reviews basic walk-around techniques.

Part 4 - Warning Labels: Briefs viewers on the importance of heeding product warning labels, and also reviews how labels are designed to communicate both hazards and the means of avoiding those hazards.

Part 5 - Personal Protective Equipment: Covers what is frequently the last line of defense between you and injury - personal protective equipment, or PPE.

**Suggested Audience:** Highway superintendents, staff.

## Ordering Information

Printed copies of our in-house publications are available on a first-come, first-served basis. Priority is given to NYS local municipal officials and their employees. PDF versions of most of our publications are available on our website: [www.clrp.cornell.edu/Library/Publications.htm](http://www.clrp.cornell.edu/Library/Publications.htm)

All of the videos, publications and CD-ROMs in our lending library are loaned for a two-week period. Two titles may be borrowed at a time.

To order or borrow materials, please mail or fax a completed copy of the request form provided in this newsletter. You can also call us at (607) 255-8033, or send an email to [clrp@cornell.edu](mailto:clrp@cornell.edu)



## Wonders of the Web



**NYSMSP**  
New York State  
Motorcycle Safety Program

### New York State Motorcycle Safety Program

There is a website dedicated to the New York State Motorcycle Safety Program (NYSMSP), which provides information about getting a New York State motorcycle license, as well as information on their various classroom and on-bike rider courses and other useful information:

<http://nysmsp.org>

### NHI Offers FREE Training

Given the current economic climate, and the financial belt-tightening that every municipality is certainly experiencing, it is more important than ever to take advantage of low-cost or no-cost resources. This is especially true when it comes to training and safety, which no one can afford to neglect, budget troubles or not.

One excellent resource for FREE training is the National Highway Institute (NHI), the training and education branch of the Federal Highway Administration (FHWA).

Through their website at [www.nhi.fhwa.dot.gov](http://www.nhi.fhwa.dot.gov) they offer a wide variety of no-cost web-based training courses specifically designed for local, state and federal transportation personnel, officials and agencies.

Participating in the NHI web-based training requires new visitors to create a user name and password and follow a few basic steps for registration. Clear simple instructions are provided right on the main web page. In the righthand column with the darker background, click on the link to 'Instructions on Enrolling in a Web-based Training Course.' This opens a PDF with all of the necessary information you need to get started!

### NHTSA 'Traffic Tech' Traffic Safety Facts

The National Highway Traffic Safety Administration (NHTSA) publishes an ongoing series of one-page *Traffic Safety Facts*, officially called the 'Traffic Tech - Technology Transfer Series' (usually just referred to as 'Traffic Tech' for short). They have produced and distributed them for many years now. Almost four HUNDRED different fact sheets are available, both in print and online, on a wide variety of safety topics related to roads and highways.

Just this year, they have already published 30 topics on subjects including: *Identifying Situations Associated With Older Drivers' Crashes*; *Buckle Up In Your Truck Program Increases Seat Belt Use in Pickup Trucks*; *National Survey of Pedestrian and Bicyclist Attitudes and Behavior*; *Identifying Strategies to Improve the Effectiveness of Booster Seat Laws*; and many others.

The entire archive of Traffic Tech Traffic Safety Facts is available online, dating back to 1995.

To access the online archive, visit the NHTSA website at [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov) Click on *Traffic Safety* in the main blue navigation bar, then scroll down and click on *Traffic Tech Publications* at the bottom of the *Browse Topics* menu on the left.

The 2009 Fact Sheets load automatically. To view sheets from earlier years, select them in the dropdown menu at the top of the report list.

### Send Us Your Web Discoveries!

If you find a useful, informative, or unique transportation-related website that you think may be useful to our audience, email the web address to us at [clrp@cornell.edu](mailto:clrp@cornell.edu), and we'll put the information in an upcoming "Wonders of the Web."

# FHWA Urges Road Agencies to Consider the "Top Nine" Life-Saving Strategies

Reproduced from the Federal Highway Administration (FHWA) safety website at: [http://safety.fhwa.dot.gov/policy/memo071008/nine\\_measures.cfm](http://safety.fhwa.dot.gov/policy/memo071008/nine_measures.cfm)

The FHWA Safety Program urges State and local roadway officials to consider implementation of nine safety countermeasures that show great potential to reduce highway fatalities and injuries. As State highway agencies develop plans to address the safety challenges identified in their strategic highway safety plans, they are urged to consider the benefits of investments in these proven roadway safety tools and techniques.

**Road Safety Audits:** A road safety audit (RSA) is a formal safety performance examination of an existing or future road or intersection. Audit teams are independent and multidisciplinary. The team reports on potential road safety issues and identifies opportunities to improve safety for all road users.

**Rumble Strips and Rumble Stripes:** Rumble strips are raised or grooved patterns on the roadway that provide both an audible warning (a humming sound) and a physical vibration to alert drivers that they are leaving the driving lane. They may be installed on the roadway shoulder or on the centerline of undivided highways. Rumble stripes are rumble strips that are placed at the centerline or edgeline.

**Median Barriers:** Median barriers are longitudinal barriers used to separate opposing traffic on a divided highway. They are designed to redirect vehicles striking either side of the barrier. Median barriers can significantly reduce the number of cross-median crashes and the overall severity of median-related crashes.

**Safety Edge:** The Safety Edge asphalt paving technique minimizes vertical drop-off safety hazards. A Safety Edge shape is created by fitting resurfacing equipment with a device that extrudes and compacts the shape of the pavement edge at a specific angle as the paver passes. This mitigates shoulder pavement edge drop-offs immediately

during the construction process and over the life of the pavement. Because the technique involves only a slight modification of paving equipment, it has a minimal impact on project cost. Improved compaction of the pavement near the edge is an additional benefit of the Safety Edge.

**Roundabouts:** A roundabout is a circular intersection where entering traffic yields to vehicles on the circulatory roadway. Roundabouts are designed to channel traffic at the entrance and provide collision deflection around a center island. Modern roundabouts are geometrically designed to reduce speeds and deflect collision forces, which substantially improves safety, while providing excellent operational performance at the intersection.



**Left- and Right-Turn Lane at Stop-Controlled Intersections:** Left-turn lanes are auxiliary lanes for storage or speed change of left-turning vehicles. Left-turn lanes reduce the likelihood of intersection crashes. They also make turning easier for drivers and improve the

intersection's operational efficiency. Right-turn lanes provide a separation at intersection approaches between right-turning traffic and adjacent through-traffic. This reduces conflicts and improves intersection safety.

**Yellow Change Intervals:** Yellow signal lights that are not timed appropriately are a safety hazard. Yellow change intervals that are not consistent with normal operating speeds create a "dilemma zone" in which drivers can neither stop safely, nor reach the intersection before the signal turns red.

**Medians and Pedestrian Refuge Areas in Urban and Suburban Areas:** Medians reduce traffic conflicts and increase safety by providing a buffer area between opposing lanes of traffic. Medians can be open (pavement markings only), or channelized (raised medians or islands) to separate

various road users. Pedestrian Refuge Areas (also known as crossing islands, center islands, refuge islands, pedestrian islands, or median slow points) are raised islands placed in the street to separate crossing pedestrians from vehicles.

**Walkways:** Appropriately designed walkways increase safety for all road users. Types of walkways include:

*Pedestrian Walkway:* A continuous way designated for pedestrians and separated from motor vehicle traffic by a space or barrier.

*Shared Use Path:* A bikeway or pedestrian walkway physically separated from motor vehicle traffic by an open space or barrier, either within a highway right-of-way, or within an independent right-of-way. Shared use paths may also be used by pedestrians, skaters, wheelchair users, joggers, and other non-motorized users. Shared use paths also are referred to as “trails” or “multiple-use trails.”

*Sidewalks:* Walkways that are paved and separated from the street, generally by curb and gutter.

*Roadway Shoulder:* In rural or suburban areas where sidewalks and pathways are not feasible, gravel or paved highway shoulders provide a safer area for pedestrians to walk next to the roadway.

For more information on these countermeasures, visit <http://safety.fhwa.dot.gov> or contact:

**Janet Ewing**

Communications & Outreach Program Manager  
Federal Highway Administration (FHWA)  
(202) 366-8029  
[janet.ewing@dot.gov](mailto:janet.ewing@dot.gov)



## Bidding Limits Increased for Public Works

As of November 12, 2009, the bidding limit for public works contracts in New York State has been increased to \$35,000 (from \$20,000). The threshold for purchases remains at \$10,000.

Note that without additional legislation in the future, this increase will expire on June 1, 2013.

For the full text of the legislation, visit:

<http://assembly.state.ny.us/leg/?bn=S66002&sh=t>

The pertinent information is found in Part D.

## #11 - Quick Dialing for Special Services

You may be aware that 811 is now a Nationwide number for call before you dig services. Whether you are in the Dig Safely New York ([www.digsafelynewyork.com](http://www.digsafelynewyork.com)) region upstate or the Dig Net of New York City and Long Island ([www.dignetnycli.com](http://www.dignetnycli.com)), you only need to know one number: 811.

What you may NOT know is that all of the other three-digit “11” numbers from 211 through 911 have now been assigned for other special purposes. 011 and 111 are used with special telephone services or international calls.

- 211** - Information about local health and human services resources
- 311** - Government information and non-emergency services (active in New York City and other large cities in the US and Canada)
- 411** - Telephone number directory assistance (there is a fee for this service in many places)
- 511** - Traffic and traveler information
- 611** - Used to report a problem with telephone service
- 711** - Used with Telecommunications Relay Service (TRS) for the deaf and hard of hearing
- 811** - Call before you dig
- 911** - Emergency services

# Save Lives With the Safety Edge

Reproduced from the Federal Highway Administration (FHWA) Publication # FHWA-SA-09-023

## Pavement Edges Can Pose Serious Safety Risks

Roadway departures account for 53 percent of fatal crashes. While national data documenting the role of pavement edge configuration in the sequence of events leading to crashes are not available, some State-level studies point to the life-saving potential of safety edges. For example, researchers studying crashes in Iowa during 2002-2004 reported that pavement edges may have been a contributing factor in as many as 18 percent of rural run-off-road crashes on paved roadways with unpaved shoulders. This type of crash was four times more likely to include a fatality than rural crashes overall on similar roads (Hallmark et al: *Safety Impacts of Pavement Edge Drop-Offs*, AAA Foundation for Highway Safety, Washington DC, Sept. 2006.)

## How Pavement Edges Affect Crash Severity

When a tire drops off a paved surface, sometimes just inches from the travel lane, a driver can have difficulty re-entering the roadway if the pavement edge is nearly vertical - especially if the height difference is significantly more than 2 inches. When a driver drifts off the pavement and tries to steer back on, the nearly vertical edge can create a "tire scrubbing" condition that may result in over-steering. If drivers over-steer to return to the paved surface without reducing speed, they are likely to lose control of the vehicle. The vehicle may veer into the adjacent lane, where it may collide with or sideswipe oncoming cars, overturn, or run off the opposite side of the roadway and crash.

## Increase Roadway Safety at No or Low Cost by Specifying the Safety Edge

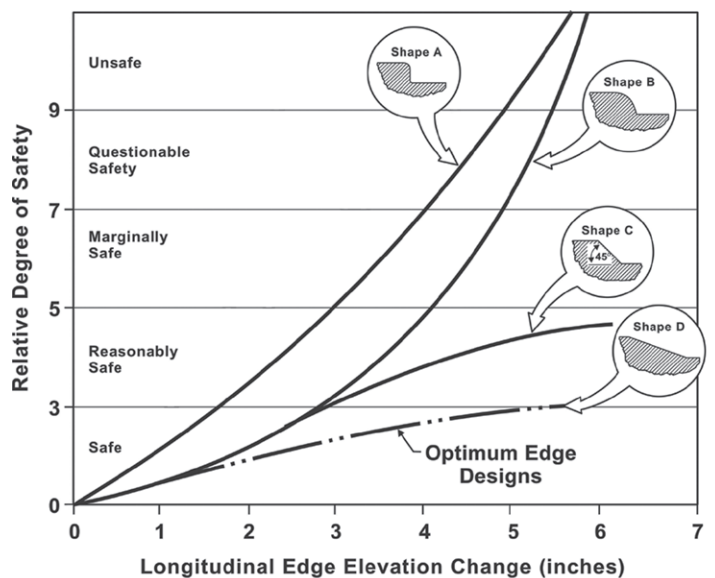
A simple and cost-effective way to promote pavement edge safety is to adopt a standard specification for all resurfacing projects that requires a 30° - 35° angle "Safety Edge." After paving, the adjacent material is graded flush with the top of the pavement.

## Solutions to the Pavement Edge Drop-off Risk

- Require a 30° - 35° angle asphalt wedge "Safety Edge" at the graded material interface in asphalt resurfacing projects.
- Routinely resurface shoulders when roadways are resurfaced, and add the Safety Edge.
- Maintain edge drop-off depths at 2 inches or less on high-speed highways.

The asphalt wedge provides a safer roadway edge, and a stronger interface between the pavement and the graded material. The additional cost of the asphalt wedge is minimal when included as part of resurfacing projects. Benefits include the avoided economic and social impacts of fatalities, injuries, and property damage.

The placement of the asphalt wedge during resurfacing operations mitigates the risk posed by edge drop-offs as soon as the paving machine lays down the asphalt mat, allowing the highway agency reasonable time to restore the shoulder or other adjacent graded material.



Graphic Source: Zimmer and Ivey,  
Texas Transportation Institute

# Maintenance of Drainage Features for Safety

Excerpt reproduced from the Federal Highway Administration (FHWA) Publication # FHWA-SA-09-024

This excellent publication on the maintenance of drainage features for safety is available from the FHWA. It can be ordered in printed form or downloaded from their website as a PDF:

[http://safety.fhwa.dot.gov/local\\_rural/training/fhwasa09024/fhwasa09024.pdf](http://safety.fhwa.dot.gov/local_rural/training/fhwasa09024/fhwasa09024.pdf)

## Excerpt:

**Introduction:** Safety on streets and highways, bicycle trails, and sidewalks is essential to motorists, bicyclists, and pedestrians. Drainage systems that remove storm water run-off from streets and highways are an integral feature of a safe system. Water that remains on the roadway surface can contribute to vehicle hydroplaning. In winter, standing water can freeze and cause skidding. In the context of this guide, the roadway includes the travel lanes and shoulders, if any. Streets and highways are considered roadways or roads. The travel way is that portion of the roadway for vehicle travel.

The curbs, gutters, channels, and ditches that carry the run-off away from the roadway can have a serious effect on an errant motorist or bicyclist when not designed and maintained correctly. Erosion along the roadway can also contribute to the severity of a crash or inundate crashworthy systems such as breakaway sign supports. Even headwalls, pipe ends and grates on drop inlets and pipe openings need to be safety treated when they are within the area an errant motor vehicle or bicycle can reach.

Maintaining roadway drainage is important for safety and for ensuring the long life of the roadway by:

- Preventing erosion of the roadway.
- Preventing saturation of the subbase.
- Preventing damage to roadway structures.

This guide is intended to help local road agency maintenance workers understand the importance of maintaining and upgrading drainage features on their road system to avoid an unsafe condition. Its purpose is to highlight common roadway drainage problems that can cause an unsafe condition and suggest inspection methods and corrective action. This guide is not intended to be a design guide.

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- Drainage Structures
- Pedestrian and Bicycle Paths

### III. RECOGNIZING DRAINAGE PROBLEMS

### IV. CORRECTING UNSAFE DRAINAGE FEATURES

- Correcting the Effects of Erosion on Roadway Side Slopes
- Correcting the Effects of Erosion on Roadway Hardware
- Correcting the Effects of Erosion on Culvert and Pipe Ends

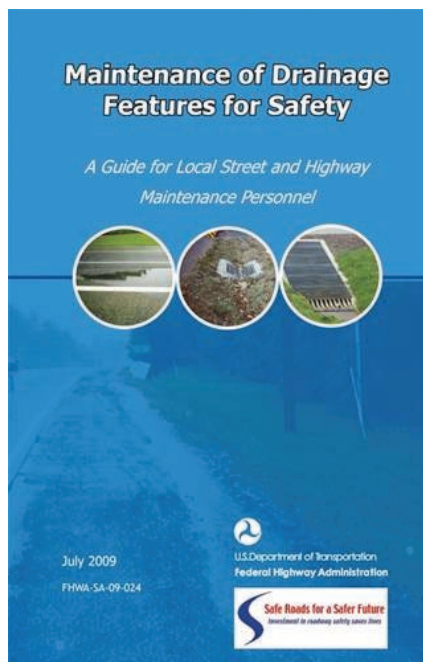
- Correcting the Effects of Erosion on Ditches
- Maintaining and Improving the Safety Characteristics of Inlets
- Eliminating or Improving Hazardous Drainage Headwalls
- Improving Hazardous Pipe and Culvert Ends
- Maintaining Good Drainage at Intersections and Access Points

### V. WORKER SAFETY

### VI. REFERENCES

#### APPENDIX A: CLEAR ZONE DESCRIPTION

#### APPENDIX B. THREE TYPICAL WORK ZONE LAYOUTS FROM MUTCD



*Nuggets & Nibbles* is a publication of the Cornell Local Roads Program and is published quarterly with the assistance and financial support of the New York State Department of Transportation, the Federal Highway Administration Local Technical Assistance Program (LTAP), and Cornell University.

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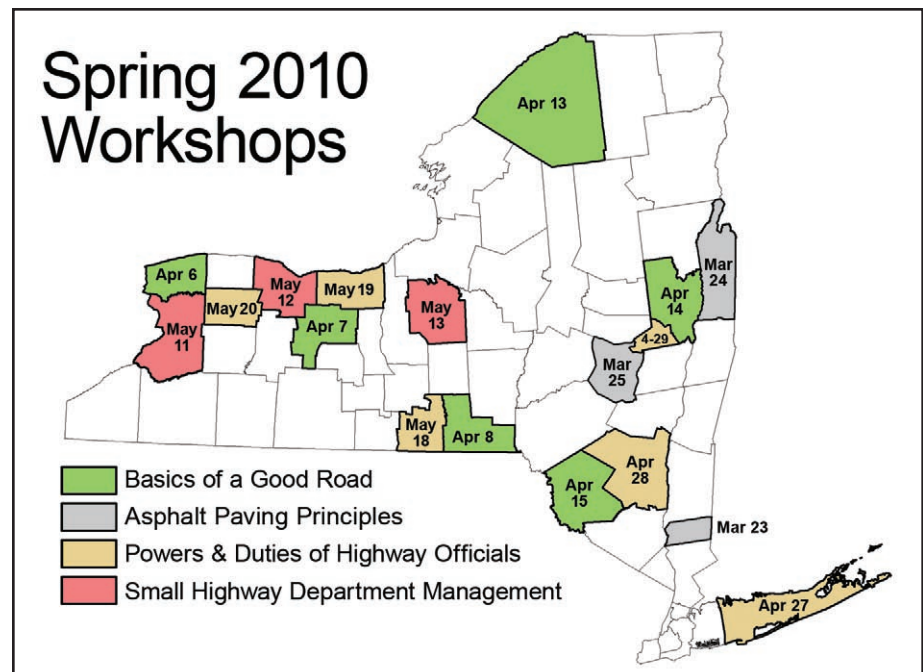
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_____ Asphalt Paving Principles	_____ Road Safety Fundamentals
_____ Basics of a Good Road	_____ Roadway and Roadside Drainage
_____ Complete Streets - Pedestrians and Bikes	_____ Small Highway Department Management
_____ Effective Communication Skills	_____ Snow and Ice Control Operations
_____ Managing People	_____ Surveying Methods for Local Hwy. Depts
_____ Pavement Maintenance	_____ Traffic Signs and Pavement Markings
_____ Powers and Duties of Local Hwy. Officials	_____ Work Zone Traffic Control for Local Roads
_____ Reducing Liability for Local Hwy. Officials	

Quantity:

### *Other Publications*

### *Software - \$25 each*

_____ Flaggers Handbook - Pocket Guide	_____ SIMS
_____ Work Zone Safety - Pocket Guide	_____ RSMS
_____ Traffic Sign Handbook for Local Roads, 3rd Edition	
_____ Inspector's Job Guide and Highway Maintenance Tables	
_____ Video Catalog	
_____ CLRP Program Services Guide	

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