

# T<sup>2</sup> Bulletin

A Newsletter of the Local Technical Assistance Program (LTAP)

Issue 67, Summer 2000

## Impact of Utility Cuts on Pavement Performance in the City of Seattle

Written by: Donald Gatchalian, P.E., Director, Street Maintenance, Seattle Transportation; Susan Chu, P.E., Pavement Manager, Seattle Transportation Street Maintenance Division; Margot Yapp, P.E., Vice President, Nichols, Vallerga & Associates  
Reprinted from Proceedings of the 51st Annual Road Builder's Clinic, Coeur d'Alene, Idaho, March 7-9, 2000

### Background

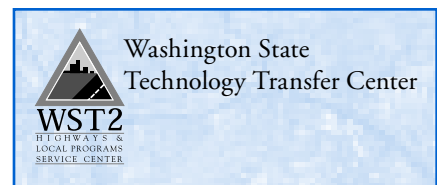
The city of Seattle possesses a transportation system that is vital to the economic health of the city and the enhancement of the city's quality of life. Millions of dollars in public funds have been invested to construct, maintain, and repair streets, and the city holds these streets as a valuable public asset for its citizens.

Public rights-of-way are essential to the economical vitality of the city. The city of Seattle grants utility and telecommunication companies reasonable access to the public rights of way to pro-



vide services to the community. However, in order for utility and telecommunications companies to maintain or upgrade their services, they need to access the pavement structure, and this, in turn, affects pavement performance. The impact of utility

Please continue to next page ↗



## Contents

International Walk Our Children to School Day .....	13
A New Face in the WST2 Center! .....	13
Technology Toolbox, SA is Dead! .....	14
Flagger Safety Rules Change! .....	16
HITEC Evaluation Updates! .....	17
Analysis Document for Emergency Amendments to WAC 296-155-305 Signaling Flaggers .....	18
Leveraging GIS Data Development With Washington State Framework .....	21
H&LP Modem Program a Big Success .....	22
WSDOT and AGC of Washington Education Foundation .....	23
Are You Looking For Funding Sources For Your Bicycle or Pedestrian Project? .....	24
NWPMA News .....	26
Nominations for Pavement Manager of the Year .....	27
2000 NWPMA Pavement Management Conference Scheduled-Register Now! .....	28
New ESA Training on the Horizon! .....	30
Personnel Protection During Bridge Paint Removal .....	31
Effects of Changing Speed Limits in Speed Zones .....	33
WQI News .....	34
Software Available to Help Categorize and Develop Countermeasures for Bicycle and Pedestrian Collisions .....	37
Fluorescent Yellow Green Warning Signs for Schools, Pedestrian & Bicycle Crossings .....	38
WST2 Advisory Committee Changes Leadership .....	39
Pacific Northwest Transportation Technology Expo .....	40
WSDOT Library .....	41
Free Publications From Your WST2 Center .....	42
Opportunities to Enhance Your Skills .....	44
Conferences and Meetings .....	46
Phone Numbers .....	47

[www.wsdot.wa.gov/TA/T2Center/T2hp.htm](http://www.wsdot.wa.gov/TA/T2Center/T2hp.htm)

company activity on pavement performance has been a concern of public agencies for many years. In large cities such as the city of Seattle, thousands of utility cuts are made every year. These cuts are made to install, inspect, or repair buried facilities.

The city of Seattle adopted Resolution 29587, stating the city's intent to review permit fees and rates paid by the public and private utilities and other entities that obtain permits to cut city streets. The review was to determine if such fees and rates cover the full cost of restoring the street to its original condition and to reflect compensation for any loss of, or reduction in, the useful life of the street.

Ordinance 118751, enacted by the city in 1997, seeks to preserve the city's transportation assets and ensure that the street area around utility cuts is restored to its original condition as quickly and efficiently as possible. The Ordinance directs the Director of Transportation to determine a charge from a schedule adopted by Ordinance reflecting the loss in useful life of street, alley, or other public places as a result of utility cuts.

Seattle Transportation initiated this engineering study in 1999 to study the impacts of utility cuts on street pavements. Nichols, Vallerga and Associates (NV&A) was commissioned to perform this study, which was to determine the extent of pavement degradation and costs associated with maintenance, repair, and rehabilitation due to the presence of utility cuts. This is a summary of the results of the study that was conducted in response.

## Recent Studies

Interest in the impact of utility cuts on roadway performance has increased in the last ten years. The results of studies conducted by public agencies show that the presence of utility cuts lowers measured pavement condition scores (indexes) compared to pavements of the same age with no utility cuts (i.e., Impact of Excavation on San Francisco Streets, September 1998). Also, the link between the presence of utility cuts and accelerated pavement deterioration is accepted by most agencies. The recent San Francisco study concedes that high quality workmanship in the repair of utility trenches may reduce the structural damage to pavements, but contends that lower ride quality and increased cracking still result, and therefore service lives are diminished.

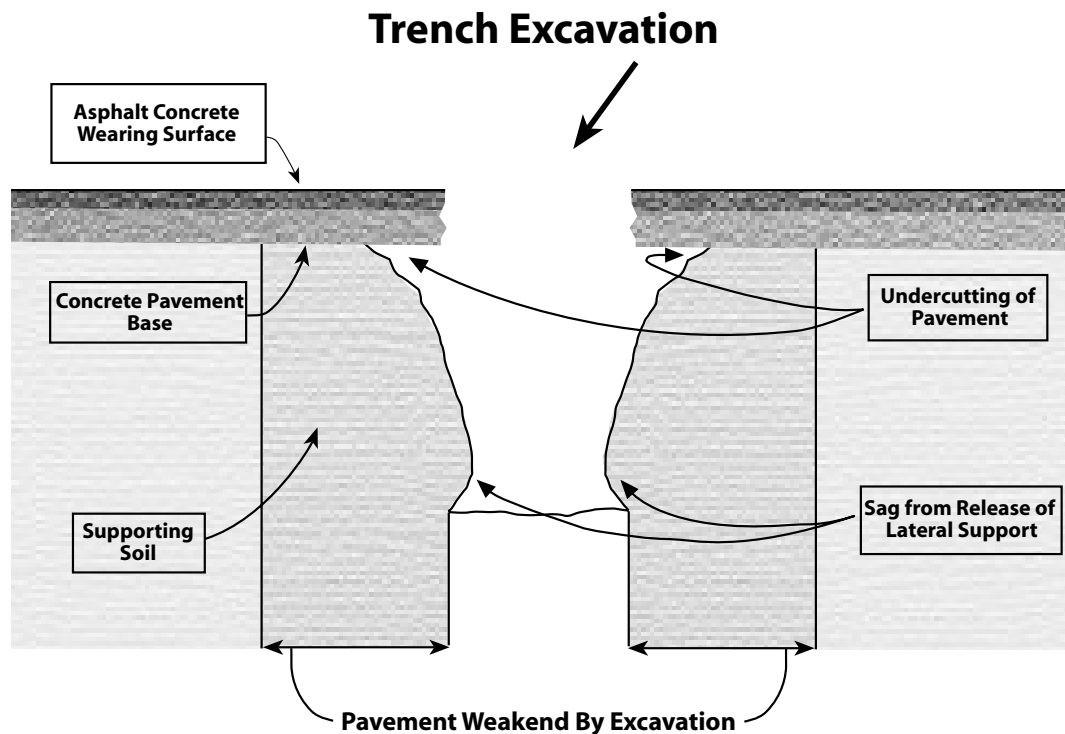
The resulting reduction in pavement life despite high quality workmanship repairing the cut can be explained by considering the trenching operation. Figure 1 shows a schematic of a typical trench excavation. The process of opening the trench causes sagging or slumping of the trench sides as the lateral support of the soil is removed. The degree of sagging is determined in part by the soil type, moisture content of the soil, and depth of the trench. Quantifying the extent of sagging is very complex but regardless of the extent, the adjacent pavement is adversely affected.

This "zone" of weakened pavement adjacent to the utility cut can fail more rapidly than other parts of the pavement. This can be observed in the field by the presence of fatigue (alligator) cracking occurring around the edges of the cut, or spalling around the cut edges.

In addition, the introduction of cuts is much like the introduction of cracks on the pavement. If improperly sealed, water intrusion can occur, resulting in loss of fine materials from the underlying base and subgrade, and consequently, loss of pavement strength. This can occur even with the best patching or backfill practices if the edges of the cut are not properly sealed. The more cuts on a pavement, the higher the possibility of water intrusion and subsequent loss of strength.

Several studies (i.e., Union City and San Mateo County, CA) have quantified or are in the process of quantifying the extent of damage due to utility cuts through deflection testing. Typically, deflection measurements are taken on the trench, adjacent to the trench, and in a control area some distance from the trench. These studies show that trenching operations reduce pavement strength in a zone from 3 to 6 feet either side of the centerline of the trench. By implication, these zones of weaker pavement require more costly rehabilitation and maintenance activity.

The economic impact of utility cuts is often calculated based on the cost of increased overlay thickness required to account for the presence of the utility cut. The increased overlay costs are extrapolated to the entire street section and from the sampled sections to the entire network. Alternatively, the costs associated with shortened cycle times between rehabilitation or maintenance work necessitated by utility cuts are estimated. These costs are then extrapolated to the entire roadway network.



**Figure 1: Typical Trench Excavation**  
(Impact of Excavation on San Francisco Streets, September 1998).

### Overview of Study Approach

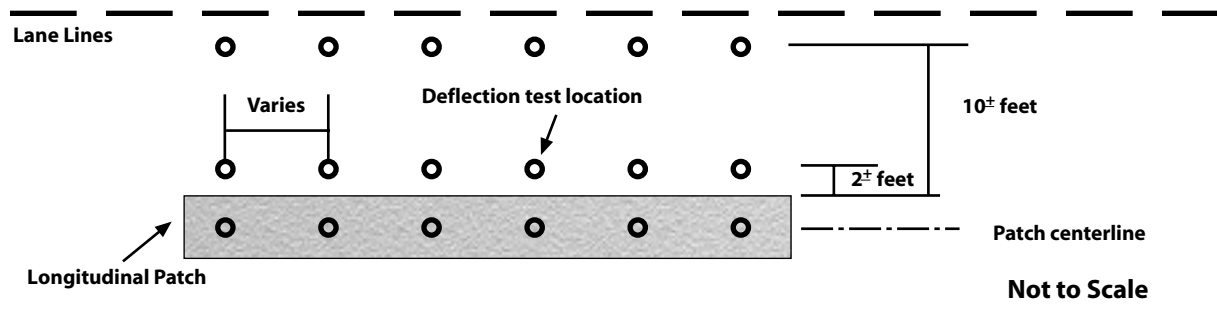
This study for Seattle Transportation relies on two distinct, but related, methodologies to establish the effects of utility trenches and patches on pavement performance and to develop a fee schedule for use by the city. Separately, these two approaches demonstrate the impact of utility trenching on streets in Seattle. When combined, the information allows the development of a utility cut fee schedule that is defensible and specific to the city of Seattle.

The first methodology relies on the city's pavement management system (PMS) to demonstrate differences in pavement performance resulting from the presence of utility cuts. The PMS contains pavement condition indexes for each roadway section as well as inventory information such as pavement age and surface type. Statistical analyses of sections with and without utility cuts should demonstrate that pavement condition scores are lower for pavements of the same type and age with utility cuts. The success of this approach depends on the quality of the PMS database. If the available information on the number

of utility cuts is not available in the PMS database, then field surveys will be conducted to determine the number of cuts.

The second methodology utilizes deflection testing on selected streets to establish the relative loss of structural capacity resulting from the presence of utility cuts. This loss of structural capacity necessitates thicker overlays, thus increasing the cost of rehabilitation for a street with utility cuts over the costs for a street without cuts. Deflection testing was conducted on the utility cut, adjacent to but off the utility cut and approximately 10 feet from the cut as shown in Figure 2.

*Please continue to next page* ↗

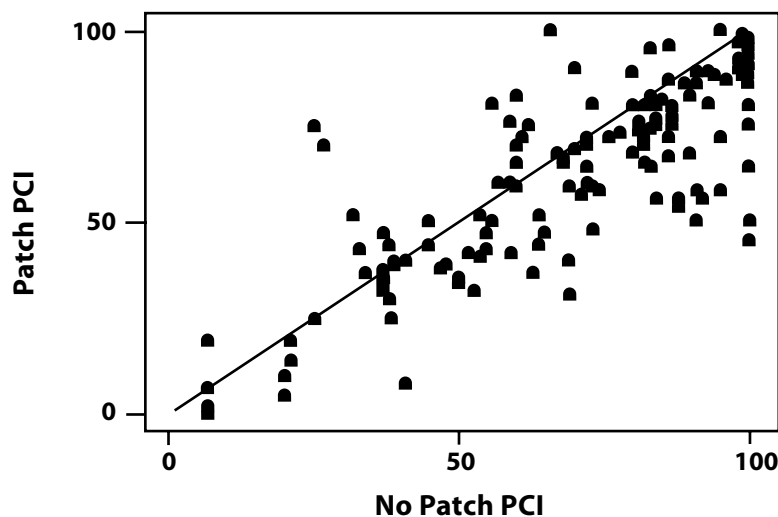


**Figure 2: Description of Deflection Testing Program**

**Utility Cut Condition Surveys**

This phase of the study was to establish the influence of utility cut patching on the pavement by comparing the pavement condition indices of roads with and without utility cut patches.

A total of 380 sections (half had patches, the other half were control sections, i.e., no patches) were surveyed using the MicroPAVER Pavement Condition Index (PCI) procedures. The PCI was computed for all sections and a statistical analysis performed.

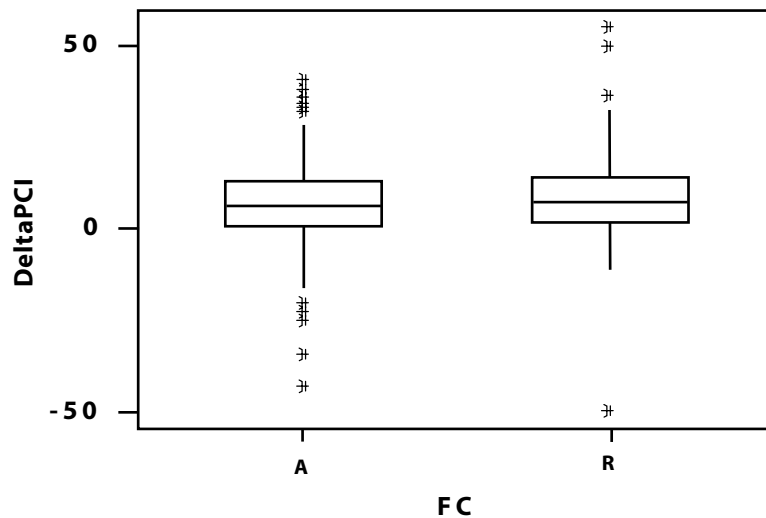


**Figure 3: Patch vs No-Patch PCI Values**

**Comparing Patch and No Patch PCI**

Figure 3 shows a plot of PCI values of patched sections (shown as "Patch PCI") versus sections without patches ("No Patch PCI"). The diagonal line given for reference is Patch PCI = No Patch PCI. Points above the line indicate that the PCI is higher for the patched section for that roadway, while points below the line indicate the PCI is higher for the section without a patch.

The bulk of the points fit the latter category, indicating that for the majority of the sections in this sample, the pavement condition was superior for the sections without patches.



**Figure 4: Boxplots of Delta PCI for Arterials (A) and Residential Streets (R)**

**Comparing Delta PCI for Arterials and Residential Streets**

Figure 4 shows boxplots of the Delta PCI values, separately for arterial and residential streets. Boxplots divide the data into fourths, as follows. The lowest quarter extends from the lowest asterisk to the bottom of the box. The next (second) quarter ranges from the bottom of the box to the median (horizontal) line. The third quarter ranges from the median line to the top of the box, and the highest quarter is from the top of the box to the highest asterisk. The vertical lines extend 1.5 times the length of the box, beyond which individual datapoints are represented with asterisks. Figure 4 shows that the range of the middle half of the Delta PCI values (depicted by the box) is almost identical for arterial and residential streets. In fact, the only difference in the two sets of values is that the highest and lowest values are slightly more extreme for residential streets than for arterials.

The following questions were asked:

***Question 1: Is the average difference between PCI for non-patched and patched sections of roadway significantly different from 0?***

- A 95 percent confidence interval for the average Delta PCI for all roadways similar to those in the sample is 4.6 to 9.4. This interval is consistent with the results of the hypothesis test because the entire interval falls well above 0, indicating that an average difference of 0 is not plausible.
- Even a 99.9 percent confidence interval for the difference does not cover 0, ranging from

3.0 to 11.0. In other words, with 99.9 percent confidence, the interval from 3 to 11 covers the actual difference between PCI for no patch control sections and patched sections of roadway for the population.

***Question 2: Is there a significant difference in the average change in PCI (Delta PCI) for arterial versus residential streets?***

- The null hypothesis is that the average Delta PCI for arterials in the population is the same as the average Delta PCI for residential streets. In other words, the difference in the average Delta PCI for arterials and residential streets is 0. The alternative hypothesis is that the difference in the two averages is not 0.
- The appropriate test in this case is a t-test for two independent samples. The test statistic is  $t = -0.94$ ,  $df = 134$ .
- The p-value = 0.35. In other words, if there really is no difference between the average Delta PCI for arterials and residential streets in the population, then the probability of observing a difference in the sample means as large as or larger than the one observed (6.0 for arterials, 8.3 for residential streets) is 0.35.
- Because the p-value is not small enough to provide evidence against the null hypothesis it is not rejected. In other words, there is no convincing evidence from which to conclude that average Delta PCI differs for arterials and residential streets.

*Please continue to next page ↗*

- A 95 percent confidence interval for the difference in average delta PCI for arterials and residential streets is -7.1 to +2.5. This is consistent with the hypothesis test because a difference of 0 is included in the interval.

**Question 3: Is there a significant relationship between number of cuts in the patched section and Delta PCI?**

- Only a linear relationship was examined. The null hypothesis is that the correlation between number of cuts and Delta PCI in the population is 0. The alternative hypothesis is that the correlation is not 0, indicating a linear relationship between the two variables. An equivalent test is based on the slope of the least-squares line between Delta PCI and number of cuts. The null hypothesis is that the slope is 0, the alternative hypothesis is that it is not 0.
- The appropriate test statistic is a t-test for whether or not the slope is 0. The test statistic is  $t = -0.37$ ,  $df = 150$ .
- The p-value is 0.71. In other words, if the correlation between Delta PCI and number of cuts is really 0, and thus the slope for the least squares line relating them is also 0, then the probability of observing a slope as far from 0 as that observed (-0.14) or more so is 0.71.
- The p-value of 0.71 is large enough to indicate that the slope of the line for the sample, and thus the correlation, is not significantly different from 0. There is not a significant linear relationship between total number of cuts and Delta PCI.
- A 95 percent confidence interval for the slope of the line is -0.86 to +0.59. This is consistent with the hypothesis test, which did not reject a slope of 0 as a plausible value.

### Structural Analysis

The second methodology used in this project was to establish the increased cost of rehabilitation necessitated by the presence of a utility cut patch in a given section of roadway. Asphalt overlays were selected as the appropriate rehabilitation alternative for all roadway types regardless of existing pavement type.

This methodology compares the overlay thickness required in areas with and without utility cuts to estimate the increased costs associated with the

presence of the cut. Overlay thickness was determined for each site using the widely accepted 1993 AASHTO Pavement Design Guide ("AASHTO Guide for the Design of Pavement Structures 1993," American Association of State Highway and Transportation Officials, 1993). The procedure recommends that the thickness design be based on deflection measurements taken on the existing pavement. This approach was used for each site.

A minimum of five measurements were taken at each of three locations; on the cut, approximately 2 feet off the edge of the cut and 10 to 12 feet from the edge of the cut (see Figure 2). The average maximum deflection at each of the three locations was plotted to determine whether the utility cut negatively impacted the roadway. If this comparison showed that the cut did impact the roadway, then an overlay design was completed.

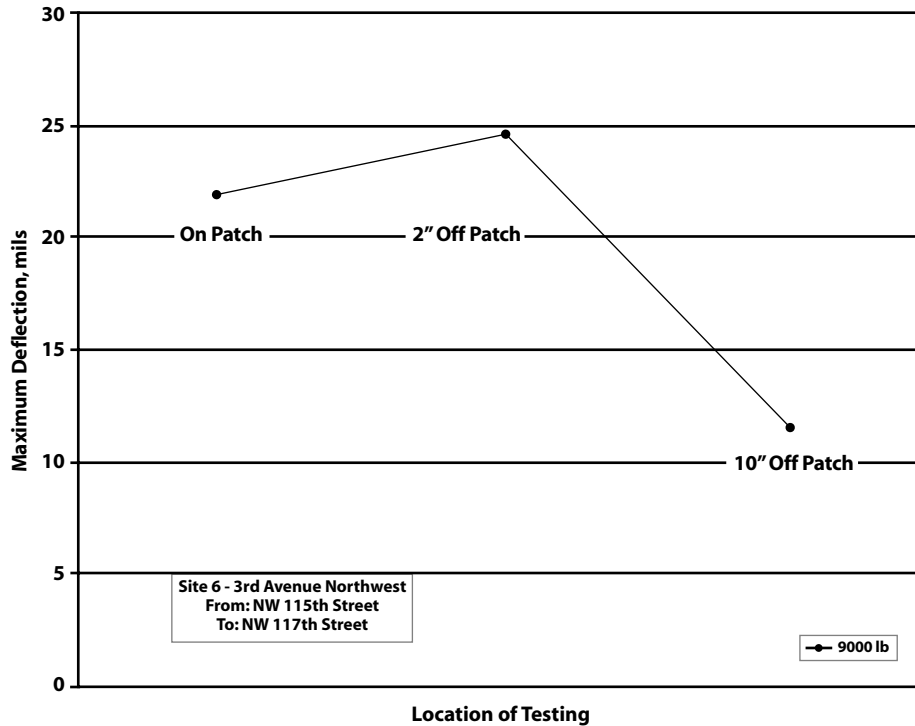
### Results

Thirty-seven test sites were identified for deflection testing using a falling weight deflectometer (FWD). The presence of a longitudinal utility cut and relatively wide lane to accommodate the test equipment were the principal selection criteria. A total of 9 asphalt concrete pavement (ACP), 18 composite sites, and 10 Portland cement concrete sites were tested. This paper only discusses the results for the asphalt concrete pavements.

A review of the maximum deflection plots showed that all nine asphalt sections (ACP) were adversely affected by the presence of the utility cut. A typical plot is shown in Figure 5. In this case, both the average deflection measurements on the cut and adjacent to the cut are higher than the average measurement taken in the control area indicating that the control area would require a thinner overlay than either the area on the patch or 2 foot off the patch. This confirms the slumping of the trench sides described in Figure 1.

Overlay designs were completed for each of the three locations (on-cut, 2ft. off-cut, and 10ft off-cut) for each site. The thickness of the existing pavement layers is not critical to the overlay design provided that within a given site the layers are assumed to be equal. Using this methodology it is the difference in required overlay thickness between the locations that is most important. The AASHTO design procedure allows one to complete the design by holding all design inputs constant for a given design.

The design results show all of the asphalt sections require additional overlay thickness in the area of the utility cut compared to the control area. The increase in overlay thickness varied from 0.3 to 3.3 inches with a mean of 1.6 inches.



**Figure 5: Typical ACP Maximum Deflection Test Results**

**Development of Fee Schedule**

The third phase of this project was to develop a methodology to determine utility cut fees based upon damage induced to the pavement from these cuts. These fees are based upon full recovery of damage caused to pavements from utility cuts.

The results in the previous section indicated that the presence of utility cuts resulted in an additional thickness of 1.6 inches of asphalt concrete. However, Seattle’s management practice is to apply a minimum of 2 inches of asphalt concrete overlay as a minimum. In other words, when an overlay is required, a minimum of 2 inches is used. This is a typical policy for most cities, generally for constructability reasons (i.e., uneven existing surface, maximum size of aggregate used in mix, temperature and density requirements, etc.).

Therefore, for the development of this fee schedule, 2 inches was used instead of 1.6 inches.

In order to develop the fee schedule, it was necessary to ask the question:

- How many or how much area of utility cuts must be present before an overlay will be triggered?

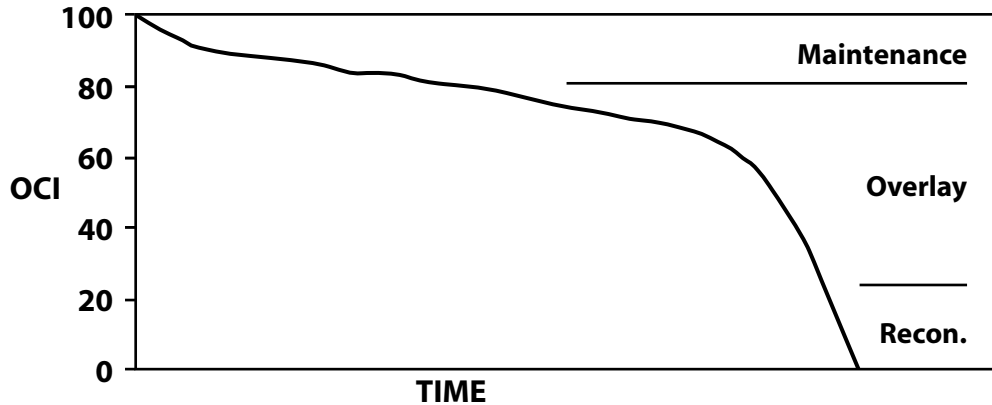
This answer is found in the city’s maintenance policies and practices as detailed in the PMS.

In Seattle’s pavement management system (PMS), trigger levels based upon the Overall Condition Index (OCI) have been established. The lower a pavement’s condition index, the more extensive the repair required. Figure 6 shows a typical OCI versus Time curve. This figure illustrates the trigger points built into the pavement management system.

*Please continue to next page*

From the figure it is evident that routine maintenance is performed on pavements with an OCI greater than 85. A thin overlay is recommended for pavements with condition indices between 85 and 70. Between 70 and 25, different levels of base repairs and other activities are used as the OCI

decreases. Below an OCI of 25, reconstruction is recommended for pavements. Again, it must be emphasized that Figure 6 is an illustration of the city's maintenance and rehabilitation policies and which has been documented in the PMS.



**Figure 6: Typical OCI Versus Time Curve**

A relationship between the degree of utility cut patching and corresponding recommended repair was required to develop the fee schedule. The first step in determining this relationship was to analyze OCI versus patching levels. Seattle's PMS has established deduct values that determine the OCI based on the extent of low severity patching.

The city's maintenance policy indicates that a thin overlay is required when the OCI reaches 85. Further, 10 percent of the pavement surface area must be covered with low severity utility cuts (and no other distresses) before the OCI reaches 85. Therefore, an OCI of 85 is the first trigger level where a thin overlay is required. Similarly, 38.6 percent of the pavement area must exhibit low severity patching before the OCI reaches a value of 70. This is the first "zone" (i.e.,  $70 < \text{OCI} < 85$ ) where a thin overlay is needed.

Since the first trigger level for an overlay is an OCI of 85, this was selected as the basis of the fee schedule. The next step in fee schedule development is to determine the unit costs associated with thin overlays.

Again, the city maintenance policy when an OCI of 85 is triggered is a 2 in. AC overlay. Recall from the previous paragraph that this is the minimum thickness of an overlay used by Seattle for constructability reasons.

The cost breakdown for a 2 in. AC overlay with milling is shown in the table below. These costs are based upon an analysis of maintenance and repair costs from previous project cost records.

<b>Cost Item</b>	<b>Unit Cost \$SY</b>	<b>Comments</b>
2" ACP (asphalt concrete pavement)	5.36	Material Costs.
Digout & New ACP" Base	0.00	No digging or base material required for simple overlay.
Surface Prep., Plane Bituminous Pavement	5.00	Old surface must be miled and cleaned prior to overlay.
Mobilization	1.04	Costs of moving ans setting up equipment at site. Generally 10% of the contract cost.
<b>Total Contractor Cost</b>	<b>11.40</b>	<b>Sum of above items.</b>
Contingency	1.71	At 15%
Design/admin. Cost	1.14	At 10%
Construction Mgt.	1.71	At 15%
<b>Total Project Cost</b> (Materials and Labor)	<b>15.96/Sy</b> <b>\$1.77/SF</b>	

**Note, however, that the costs above do not include:**

- Costs of disruption to businesses, i.e., loss of business due to reduced accessibility or traffic congestion during construction.
- Delay costs borne by the public due to traffic congestion during construction.
- Increased wear and tear and fuel usage on vehicles caused by rougher pavements during construction.
- Health impacts, e.g., increased exposure to dust and noise during construction.
- Safety impacts, e.g., if emergency vehicles are negatively affected by construction.

In short, there has been no consideration or inclusion of user costs in the determination of this fee schedule. The resulting unit cost is therefore lower than if user costs were to be included. It was not within the scope of this study to perform an extensive economic analysis of the factors mentioned above.

The final step is to determine the fees required to repair the damage caused by the cuts. This fee calculation is based upon full recovery of costs. The fee equation was developed with the following rationale.

If the utility cut is large enough (or numerous enough) to require an overlay, then the utility company will pay the full amount of the overlay cost. For small utility cut areas, the fee is based upon the ratio of the cut size to the cut size that results in an overlay (i.e., 10 percent of Area of Section).

For example, the fee for a 10 percent cut would be the total section overlay cost (100 percent) while the fee for a 2 percent cut would be 2 percent/10 percent/20 percent of the total overlay cost. This is explained in detail below.

Total Overlay Cost = Unit Cost x Area of Section to Overlay

*Please continue to next page* ↗

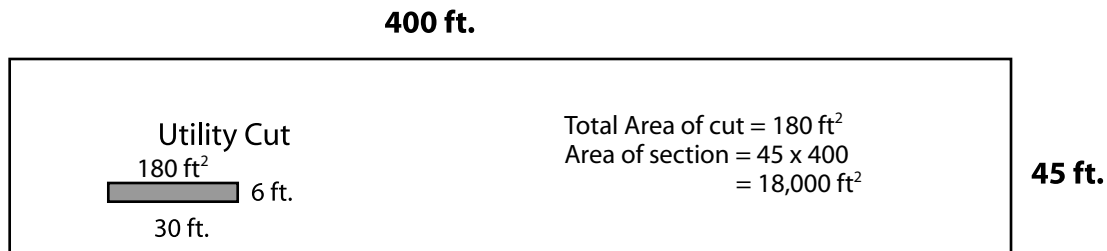
If Area of Cut  $\geq$  10 percent Area of Section:  
 Fee = Total Overlay Cost

Simplifying, by eliminating Area of Section:  
 Fee = (Area of Cut/10 percent) x Unit Cost

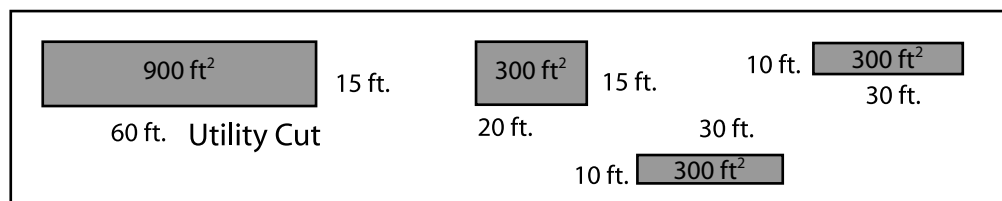
If Area of Cut < 10 percent Area of Section:  
 Fee = (Area of Cut/10 percent Area of Section) x  
 Total Overlay Cost

This concept is illustrated by an example. Figures 4.2a and 4.2b show in plan view a typical pavement section, 45 ft. wide by 400 ft. long with utility cuts. This is a typical block size.

Incorporating Unit Costs:  
 Fee = (Area of Cut/10 percent Area of Section)  
 x(Unit Cost x Area of Section)



**Figure 4.2a: 1% Utility Cut**



**Figure 4.2b: 10% Utility Cut**

In Figure 4.2a, the utility cut constitutes 1 percent of the section area 180SF). Therefore, the fee, assuming \$1.77/SF unit cost is:

✓ Fee =  $180\text{SF} / (10\% \times 18,000\text{SF}) \times \$1.77/\text{SF} \times 18,000\text{SF} = 1,800\text{SF} \times \$1.77/\text{SF} = \$3,186.$

Fee = (Area of cut/10%) x Unit Cost

✓  $(180\text{SF} / 0.1) \times \$1.77/\text{SF} = 1800\text{SF} \times \$1.77/\text{SF} = \$3,186$

✓  $(1800\text{SF} / 0.1 \times \$1.77/\text{SF} = 18000\text{SF} \times \$1.77/\text{SF} = \$31,860$

Both agree with the previous calculations.

In Figure 4.2b, the utility cut constitutes 10 percent of the section area 1800 SF). The fee is the:

✓ Fee =  $1800\text{SF} / (10\% \times 18,000\text{SF}) \times \$1.77/\text{SF} \times 18,000\text{SF} = 18,000\text{SF} \times \$1.77/\text{SF} = \$31,860.$

**Fee = (Area of Cut / 10%) x Unit Cost of Overlay**  
**= (Area of Cut / 10%) x \$1.77/SF**  
**= (Area of Cut) x \$17.70/SF**

✓ In this case, \$31,860 is the total overlay cost.

For comparison purposes, fee schedules from other cities are shown in the following table. The purpose of these fees is to pay for long-term damage. These fees however, are not designed to obtain full recovery of damages.

Note that in both cases, the fee equation may be simplified to:

City	Fee Schedule	Comments
Sacramento, CA	\$3.50 - 7.50 per L.F.	Decreases with age
Los Angeles, CA	\$3.430 - 14.08 per S.F.	Decreases with age Considering flat fee.
San Francisco, CA	\$3.50 - 1.00 per S.F.	Decreases with age
Union City, CA	\$17.50 per L.F.	Single flat fee
Oxnard, CA	\$0.55 per S.F.	
Bakersfield, CA	\$4.50 - 8.50 per S.F.	
Redlands, CA	\$0.25 - 2.00 per S.F.	Decreases with age and condition
Seattle, WA	\$17.70 per S.F.	Single flat fee

Note, however, that the approach above does not include two very important assumptions:

- From the deflection analysis that was performed, it is clear that there is a weakened zone of influence at least 2 feet away from the edge of the cut. However, the application of the fee schedule would only apply to the cut area itself, not the weakened zone around the cut.
- The selection of 10 percent cuts as the basis for determination of the fee schedule may be on the conservative side. The city rarely has more than 10 percent cuts on any pavement section as a general rule. This is based on observations made by city staff.

### Moratoriums

Many cities have moratoriums in their ordinances. Typically, moratoriums are established for 5-year periods (or less) after a street has been reconstructed, repaved, or resurfaced. The moratorium disallows any excavation or utility cuts within the 5-year period. However, exceptions may be granted in specific cases (usually for "good cause") such as:

- To repair leaks.
- To avoid interruptions to essential utility service.

- To respond to emergencies which may endanger life or property.
- To provide services to buildings where no other reasonable means of providing service exists.
- Work that is mandated by city, state, or federal legislation.
- For potholing to verify utility depth or location.
- For deployment of new technology (as per any applicable city policies) such as trenchless excavations.
- Other situations deemed by the city to be in the best interests of the general public.

### Waivers and Exemptions

As with all ordinances, situations exist where waivers and exemptions are applicable. Typically, the waivers are dependent on the city's objectives and needs. For instance, the city of Sacramento has waivers for fees where utility companies have shown that they coordinate all utility work with the city's paving program. Other situations where Seattle may wish to consider waivers include:

- Utility cuts in Portland cement concrete pavements.

*Please continue to next page ↗*

- Utility cuts in pavements that are not maintained by Seattle Transportation, e.g., alleys, private streets.
- The utility company repaves or reconstructs the entire block (or a minimum area such as 50 feet across all travel lanes) affected by the excavation.
- Excavations are performed to relocate utility facilities to accommodate the city's use of the pavement or right-of-way.
- Excavation on pavements that are older than a defined age, e.g., 20 years or if condition is below a certain OCI (usually where reconstruction is already required).
- Excavation occurring in pavements that are scheduled to be repaved within 2 years.
- Exemption of fee if utility cut activities are coordinated with the city's maintenance/resurfacing programs.

to the city is \$17.70/sf — this includes all engineering design, material, and contract costs. However, costs incurred by the public and businesses affected by the construction have not been included, nor health and safety impacts. Finally, typical situations where the city may want to consider waivers or exemptions are also included.

For a copy of the complete Final Report contact:

City of Seattle  
 Seattle Transportation  
 810 Third Avenue  
 Seattle, WA 98104-1618

## Summary

This paper documents the results of applying the two methodologies used to establish the effects of utility cuts on pavement performance in the city of Seattle.

The first methodology used to establish the impact of utility cuts on the performance of streets in the city of Seattle relies condition survey data of 380 sections. Statistical analysis of these data showed that for the asphalt and composite pavement types, there is a statistical difference between the sections with patches and those with none. These results are significant at the 99.9 percent confidence level.

The second methodology relies on deflection testing and overlay designs to establish the impact of utility cuts on roadways. All asphalt sections require additional overlay thickness as a result of the presence of the utility cut. The average required increase is 1.6 inches.

The development of the fee schedule was based on the deflection testing approach. In addition, the city's maintenance policies indicated that 10 percent of the pavement surface area had to be covered with low severity utility cuts before an overlay was required. For constructability reasons, the minimum overlay applied in the city is 2 inches; therefore, the fee schedule is based on a 2-inch overlay. The fee that is recommended

# International Walk Our Children to School Day

Volume 3, Number 5 - August 2000

**W**ednesday, October 4, 2000, marks the fourth annual Walk Our Children to School Day and the first time the event is being held at the international level. In 1999, more than 300,000 children, parents, government officials, health and safety advocates, and community leaders in 170 cities from 34 states participated in Walk Our Children to School Day events. Communities use this event to address multiple issues, including teaching pedestrian safety skills to children, identifying safe pedestrian routes to schools, and promoting walking as a safe and healthy activity that is also good for the environment.

A number of communities have used Walk Our Children to School Day to advocate for changes that will make their communities safer places to walk. The city government in Hyrum, Utah, is using walkability checklists from the 1999 event to help determine how a \$100,000 grant for pedestrian safety facility improvements can best be used. Columbus, Ohio, has leveraged the enthusiasm and concern generated by its annual event by establishing a pedestrian coordinator's position in its traffic engineering department.



International Walk Our Children to School Day is sponsored by a coalition coordinated by the Partnership for a Walkable America, which can provide communities with resources and advice on how to participate in this event, including walkability checklists, press releases, suggested activities, and brochures. Also available is *Walking with a Mission*, a report on 1999 activities.

For more information, see the International Walk Our Children to School Day website at [www.walktoschool-usa.org](http://www.walktoschool-usa.org) or contact Harold Thompson at 1 (800) 621-7615, ext. 2383, or Sarah Latta at (919) 962-7419.

---

## A New Face in the WST2 Center!

**T**he T2 Center is very pleased to announce that we have a new staff member onboard. David Sorensen started July 17 as our new Traffic Technology Engineer.

David has come to us from the WSDOT Tacoma Project Engineers' Office, where he was the Office Engineer. David has been with the WSDOT for over 16 years and brings broad experience in roadway engineering and traffic. David also has extensive experience working with local agencies and understands their needs and perspective. David provides an enthusiastic addition to the WST2 team.

If you have any questions about traffic issues or safety management, David is the one to call. He can be reached at (360) 705-7385 or e-mail [SorensD@wsdot.wa.gov](mailto:SorensD@wsdot.wa.gov).

Please join us in welcoming David.



**David Sorensen**

# Technology Toolbox, SA is Dead!

*By Roger Chappell, Engineering Systems Specialist, WST2 Center*

May 1, 2000

THE WHITE HOUSE

Office of the Press Secretary

## STATEMENT BY THE PRESIDENT REGARDING THE UNITED STATES DECISION TO STOP DEGRADING GLOBAL POSITIONING SYSTEM ACCURACY

**S**ometimes publishing only four times a year has its disadvantages. For instance, the biggest news to ever hit the GPS community came out just after our last edition on May 1, 2000. Selective Availability (SA) was turned off.

A hushed moment of silence swept over the GPS community as we collectively pondered the depth of what had just transpired. This was then followed by much celebration. With one sweep of the bureaucratic pen, SA was dead!

So what does this historic event mean? Now the only thing between my receiver and the true position of the satellites is "air". Sure cheap clocks, sun spots, multipath, ionospheric and atmospheric conditions still present challenges to positional accuracy, but gone are the challenges created by SA.

If you want sub-meter accuracy you will still need to use DGPS (Differential GPS). For more information on the reasons for using DGPS and how "things" still affect positional accuracy, I would like to refer you to my article, "Unraveling the mystery of GPS (Global Positioning System)" that appeared in the Winter T2 2000 Bulletin. The article is available on the internet at <http://www.wsdot.wa.gov/ta/T2Center/Mgt.Systems/InfrastructureTechnology/Infathp.html>.

The good news is that even your relatively inexpensive receiver just became 10 times better. Most inexpensive hand held receivers, viewing a constellation of 3 or more satellites, should be able to achieve an accuracy of about 3 to 9 meters. The best you could have hoped for with SA turned on and not using DGPS was somewhere within a 100 meter circle.

I talked to a friend who is a surveyor. He has been testing his inexpensive hand held receiver against survey monuments. He said that he has been achieving 3 - 5 meter accuracy. This is "real time", no DGPS, and no post processing. To put this in perspective, most USGS quad maps are only accurate to plus or minus forty feet, so even an inexpensive receiver will put you on the map.

I have included a copy of the White House press release for those of you who have not had a chance to read it:

Today, I am pleased to announce that the United States will stop the intentional degradation of the Global Positioning System (GPS) signals available to the public beginning at midnight tonight. We call this degradation feature Selective Availability (SA). This will mean that civilian users of GPS will be able to pinpoint locations up to ten times more accurately than they do now. GPS is a dual-use, satellite-based system that provides accurate location and timing data to users worldwide. My March 1996 Presidential Decision Directive included in the goals for GPS to: encourage acceptance and integration of GPS into peaceful civil, commercial and scientific applications worldwide; and to encourage private sector investment in and use of U.S. GPS technologies and services. To meet these goals, I committed the U.S. to discontinuing the use of SA by 2006 with an annual assessment of its continued use beginning this year.

The decision to discontinue SA is the latest measure in an on-going effort to make GPS more responsive to civil and commercial users worldwide. Last year, Vice President Gore announced our plans to modernize GPS by adding two new civilian signals to enhance the civil and commercial service. This initiative is on-track and the budget further advances modernization by incorporating some of the new features on up to 18 additional satellites that are already awaiting launch or are in production. We will continue to provide all of these capabilities to worldwide users free of charge.

My decision to discontinue SA was based upon a recommendation by the Secretary of Defense

in coordination with the Departments of State, Transportation, Commerce, the Director of Central Intelligence, and other Executive Branch Departments and Agencies. They realized that worldwide transportation safety, and scientific and commercial interests could best be served by discontinuation of SA. Along with our commitment to enhance GPS for peaceful applications, my administration is committed to preserving fully the military utility of GPS. The decision to discontinue SA is coupled with our continuing efforts to upgrade the military utility of our systems that use GPS, and is supported by threat assessments which conclude that setting SA to zero at this time would have minimal impact on national security. Additionally, we have demonstrated the capability to selectively deny GPS signals on a regional basis when our national security is threatened. This regional approach to denying navigation services is consistent with the 1996 plan to discontinue the degradation of civil and commercial GPS service globally through the SA technique.

Originally developed by the Department of Defense as a military system, GPS has become a global utility. It benefits users around the world in many different applications including air, road, marine, and rail navigation, telecommunications, emergency response, oil exploration, mining, and many more. Civilian users will realize a dramatic improvement in GPS accuracy with the discontinuation of SA. For example, emergency teams responding to a cry for help can now determine what side of the highway they must respond to, thereby saving precious minutes. This increase in accuracy will allow new GPS applications to emerge and continue to enhance the lives of people around the world.

For additional information about GPS and SA visit the following URL's:

[http://www.ngs.noaa.gov/FGCS/info/sans\\_SA/](http://www.ngs.noaa.gov/FGCS/info/sans_SA/)  
<http://www.ngs.noaa.gov/>  
<http://www.igeb.gov>



## **A Reminder to Mark Your Calendar!**

### **Fifth International Conference on Managing Pavements**

**August 11-14, 2001**

**Washington State Convention and Trade Center**

**For Details checkout:**

**[www.engr.washington.edu/epp/pavements](http://www.engr.washington.edu/epp/pavements)**

# Flagger Safety Rules Change! Are You Prepared?

Source: Washington Department of Labor & Industries

In response to Legislative directive, Labor and Industries is adopting emergency rules aimed at improving the safety of highway flaggers. Earlier this year, the Legislature passed, and Governor Gary Locke signed, the "Kim Vendl" bill, named for the 45-year-old Marysville woman who was struck from behind and killed while flagging a construction project in Mill Creek last October. The bill specified that L&I enact the new requirements by June 1, 2000.

To accommodate that deadline, the agency is adopting temporary rules under emergency authority that took effect June 1, and will follow up with proposed permanent rules later this year. The permanent rules must take effect no later than March 1, 2001.

## What's happening?

Even as the bill was signed, L&I convened a meeting of interested parties including the state Transportation Committee, the state Utilities and Traffic Commission, workers, employers, contractors, city government, and others. After gathering information and receiving agreement on a number of issues, the agency has proposed several new requirements that fulfill the Legislature's mandate.

## What's new?

Most of the existing standard will be left intact, pending the permanent adoption process later this year. The new requirements have been written as a "performance-based" rule. This means that instead of specifying how and what employers must do to comply, the updated rules will state the requirement and let the employer decide how best to accomplish the protection. This approach provides employers with more flexibility to ensure that flaggers are protected from roadside hazards.

For instance, a key Legislative requirement was to prevent flaggers from being struck from behind. Instead of specifying use of a mirror or motion detector or some other device, the rule simply reads: "The employer, responsible contrac-

tor and/or project owner must develop and use a method to ensure that flaggers have adequate warning of objects approaching from behind the flagger." Although the rule suggests some methods that employers may use to protect flaggers, employers will have discretion in determining how best to meet that requirement.

## Other new requirements include:

**On-site orientation** - The employer must conduct an on-site orientation when flaggers start a new job. This orientation must include, but not be limited to, the flagger's role and location on the job site, equipment, traffic patterns, communications and hazards specific to the work site.

**Additional warning sign** - On roads allowing speeds of at least 45 mph, the employer must provide an additional warning sign marked "Be Prepared to Stop" or "Flagger Ahead." (This is in addition to the advanced warning signs required by the Manual on Uniform Traffic Control Devices.)

**Highly visible clothing during daylight hours** - While flagging during the day, a flagger must wear:

- A high visibility-warning garment designed in accordance with ANSI-ISEA 107-1999; and
- A high visibility hard hat.

**High visibility clothing during nighttime hours** - While flagging at night, a flagger must wear:

- A high visibility warning garment designed according to ANSI/ISEA 107-1999 specifications over white coveralls or other coveralls or trousers designed according to ANSI/ISEA 107-1999; and
- A high visibility hard hat that is iridescent or marked with reflectorized material.

Please continue to next page ↗

During inclement weather, yellow rain gear may be substituted for white coveralls.

**The rest** - Employers must ensure that:

- Flagger workstations are illuminated at night.
- Warning signs reflect the actual condition of the work zone.
- Flaggers are not assigned other duties while flagging.
- Flaggers do not use devices (i.e.: cell phones, pagers, radio headphones, etc.) that can distract their vision, hearing or attention. Devices such as two-way radios used by flaggers for communications, directing traffic or ensuring flagger safety are acceptable.

### **Economic impacts to small business**

Because the rules are being adopted under emergency authority, an economic analysis to determine if the new regulations will have a disproportional impact on small businesses will not be required.

### **Public testimony**

Likewise, the emergency rule eliminates the requirement for a public hearing. The public hearing and additional requirements will be met in the permanent rule adoption process later this year. Dates and locations will be announced later.

---

## **HITEC Evaluation Updates!**

**Visit the HITEC Web site for updates on any of these evaluations:**

### **Colebrand Bridge Lockup Device:**

<http://www.cerf.org/hitec/eval/ongoing/lockup.htm>

### **Quadricon Modular Bridge System:**

<http://www.cerf.org/hitec/eval/ongoing/quad.htm>

### **Seismic Isolation and Energy Dissipator Devices:**

<http://www.cerf.org/hitec/eval/ongoing/seismic.htm>

### **Acoustical Monitoring System:**

<http://www.cerf.org/hitec/eval/ongoing/pure.htm>

### **Graffiti Removal and Protection Systems:**

<http://www.cerf.org/hitec/eval/ongoing/graffiti.htm>

### **Italgrip Pavement System:**

<http://www.cerf.org/hitec/eval/ongoing/italgrip.htm>

### **NYCEM Concrete Strengthening Product:**

<http://www.cerf.org/hitec/eval/ongoing/nyco.htm>

**Earth Retaining Systems:** <http://www.cerf.org/hitec/eval/ongoing/ers.htm>

**Digital Cameras:** <http://www.cerf.org/hitec/eval/ongoing/cameras.htm>

### **Traffic Sign Retroreflectometers:**

<http://www.cerf.org/hitec/eval/ongoing/retro.htm>

### **Stormwater Best Management Practices:**

<http://www.cerf.org/hitec/eval/ongoing/stormwtr.htm>



# Analysis Document for Emergency Amendments to WAC 296-155-305 Signaling, Flaggers.

## Amendments adopted 5-26-00 and Effective 5-26-00

### Applicable throughout the State

*Project Manager: George Huffman, Technical Resource: Lou Flores*

OSHA 29 CFR 1926.201 Signaling.	WISHA 296-155-305 Signaling, Flaggers	Proposed emergency amendments to WAC 296-155-305
(a) Flagmen.	WAC 296-155-305 Signaling, Flaggers.	WAC 296-155-305 Signaling, Flaggers.
		<p><u>(1) Except as otherwise required in these rules, traffic control devices, signs and barricades must be set up and used according to the guidelines in American National Standards Institute D6.1-1988, Manual on Uniform Traffic Control Devices (MUTCD), Part VI, Standards and Guides for Traffic Controls for Street and Highway Construction, Maintenance, Utility, and Incident Management Operations.</u></p> <p><u>NOTE: Copies of the MUTCD may be obtained by writing:</u>            US Government Printing Office            Superintendent of Documents            Mail Stop: SSOP            Washington DC 20402-9328</p> <p><u>Or</u></p> <p><u>Copies may be read at the Department of Labor &amp; Industries(L&amp;I) Library in Tumwater or at any L&amp;I service location</u></p>
(a)(1) When operations are such that signs, signals, and barricades do not provide the necessary protection on or adjacent to a highway or street, flagmen or other appropriate traffic controls shall be provided.	(2) When operations are such that signs, signals, and barricades do not provide the necessary protection on or adjacent to a highway or street, flaggers or other appropriate traffic controls shall be provided.	(2) When operations are such that signs, signals, and barricades do not provide the necessary protection on or adjacent to a highway or street, flaggers or other appropriate traffic controls shall be provided. <u>Flaggers are to be used only when other reasonable means of control will not adequately control traffic in the work zone.</u>
(a)(2) Signaling directions by flagmen shall conform to American National Standards Institute D6.1-1971, Manual on Uniform Traffic Control Devices for Streets and Highways.	(2) Signaling directions by flaggers shall conform to American National Standards Institute D6.1-1988, Manual on Uniform Traffic Control Devices for Streets and Highways, as amended by the Washington state department of transportation. (M24-01 (HT).)	<del>((2))</del> (3) Signaling directions used by flaggers <del>((shall))</del> <u>must</u> conform to American National Standards Institute D6.1-1988, Manual on Uniform Traffic Control Devices <del>((for Streets and Highways))</del> (MUTCD), Part VI, Standards and Guides for Traffic Controls for Street and Highway Construction, Maintenance, Utility, and Incident Management Operations, as amended by the Washington state department of transportation. (M24-01 (HT).)
(a)(3) Hand signaling by flagmen shall be by use of red flags at least 18 inches square or sign paddles, and in periods of darkness, red lights	(3) Hand signaling by flaggers shall be by use of sign paddles at least 18 inches in diameter with series "C" letters at least 6 inches high or lights approved by the transportation commission. When hand signaling is done in periods of darkness, the sign paddles must be reflectorized or illuminated as required by ANSI D6.1-1988, Manual on Uniform Traffic Control Devices. The "STOP" side of the paddle shall have a red background with white lettering. When a paddle has a "SLOW" side, the background shall be orange and the lettering black. Colors shall conform to ANSI D6.1 current edition.	<del>((3))</del> (4) Hand signaling by flaggers shall be by use of sign paddles at least 18 inches in diameter with series "C" letters at least 6 inches high or lights approved by the transportation commission. When hand signaling is done in periods of darkness, the sign paddles must be reflectorized or illuminated as required by ANSI D6.1-1988, Manual on Uniform Traffic Control Devices. The "STOP" side of the paddle shall have a red background with white lettering. When a paddle has a "SLOW" side, the background shall be orange and the lettering black. Colors shall conform to ANSI D6.1 <del>((current edition))</del> <u>-1988.</u>

(a)(3) *continued*

~~((4))~~ Flaggers shall wear an orange warning garment and a yellow protective helmet while flagging. Warning garments worn at night shall be of reflectorized material. Yellow is specified as the color of helmets, the issue is clearly one of high visibility. Other colors providing equal visibility than the specified yellow will be acceptable. The iridescent or reflectorized hard hats, available in several colors, which provide "high visibility" in both day and night applications, will meet standard specifications.))

(a)(4)  
Flagmen shall be provided with and shall wear a red or orange warning garment while flagging. Warning garments worn at night shall be of reflectorized material.

(4) Flaggers shall wear an orange warning garment and a yellow protective helmet while flagging. Warning garments worn at night shall be of reflectorized material. Yellow is specified as the color of helmets; the issue is clearly one of high visibility. Other colors providing equal visibility than the specified yellow will be acceptable. The iridescent or reflectorized hard hats, available in several colors, which provide "high visibility" in both day and night applications, will meet standard specifications.

(5) (a) While flagging during daylight hours, a flagger must wear:  
• A high visibility warning garment designed according to ANSI/ISEA 107-1999, American National Standard for High-Visibility Safety Apparel specifications; and  
• A high visibility hard hat.  
  
(b) While flagging at night, a flagger must wear:  
• A high visibility warning garment designed according to ANSI/ISEA 107-1999 specifications over white coveralls or other coveralls or trousers designed according to ANSI/ISEA 107-1999; and  
• A ((protective)) high visibility hard hat that is iridescent or marked with reflectorized material.  
(c) During inclement weather, yellow rain gear may be substituted for white coveralls.

NOTE: Copies of ANSI/ISEA 107-1999 may be obtained by writing:

American National Standards Institute  
11 West 42nd Street  
New York, NY 10036

Or

By contacting the ANSI web site at:  
<http://web.ansi.org/>

Or

Copies may be read at the Department of Labor & Industries(L&I) Library in Tumwater

**NO COMPARABLE FEDERAL STANDARD**

(5) Each flagger shall be trained every three years in accordance with the American National Standards Institute (ANSI) D6.1-1988 Manual on Uniform Traffic Control Devices as amended by the Washington state department of transportation (M 24-01 (HT)).

Note: Personnel that have not completed a flagging course may be assigned duties as flaggers only during emergencies when a sudden, generally unexpected, set of circumstances demands immediate attention

(6) Each flagger shall be trained every three years in accordance with the American National Standards Institute (ANSI) D6.1-1988 Manual on Uniform Traffic Control Devices as amended by the Washington state department of transportation (M 24-01 (HT)).

Note: Personnel that have not completed a flagging course may be assigned duties as flaggers only during emergencies when a sudden, generally unexpected, set of circumstances demands immediate attention.

~~((6))~~ Each flagger shall have in their possession a valid certificate which verifies completion of the training prescribed in subsection (5) of this section. Each certificate shall contain the date the card expires.))

(7) Each flagger shall have in their possession either a

*Please continue to next page ↗*

**NO COMPARABLE FEDERAL STANDARD**

(6) Each flagger shall have in their possession a valid certificate which verifies completion of the training prescribed in subsection (5) of this section. Each certificate shall contain the date the card expires.

valid Washington traffic control flagger card or a valid flagger card from a state having flagger training reciprocity with Washington. The card must verify completion of the training prescribed in subsection (6) of this section and contain the date the card expires.

---

(8) The employer, responsible contractor, and / or project owner must develop and use a method to ensure that flaggers have adequate warning of objects approaching from behind the flagger.

The following are examples of methods that may be used to adequately warn flaggers:

- A mirror mounted on the flagger's hard hat.
- Use a motion detector with an audible warning.
- Use a spotter.

---

**NO COMPARABLE FEDERAL STANDARD**

(9) The employer, responsible contractor and / or project owner must conduct an orientation that familiarizes the flagger with the job site each time the flagger is assigned to a new project or when job site conditions change significantly. The orientation must include, but is not limited to:

- The flagger's role and location on the job site;
- Motor vehicles and equipment in operation at the site;
- job site traffic patterns;
- Communications and signals to be used between flaggers and equipment operators;  
and
- Other hazards specific to the job site.

---

**NO COMPARABLE FEDERAL STANDARD**

(10) (a) On roads allowing speeds of at least 45 mph, where flaggers are used, the employer or responsible contractor must provide an additional warning sign marked "be prepared to stop" or "flagger ahead."

(b) This sign is in addition to those required under ANSI D6.1-1988, Manual on Uniform Traffic Control and should be placed between the last two warning signs in the series or on the opposite side of the road on undivided roads.

(c) This additional sign does not increase the required advance warning area. Its purpose is to clearly point out that a flagger will be encountered and the driver should be prepared to stop.

---

**NO COMPARABLE FEDERAL STANDARD**

(11) Employers, responsible contractors and / or project owners must ensure that:

- Flagger workstations are illuminated at night.
- Warning signs reflect the actual condition of the work zone.
- Flaggers are not assigned other duties while engaged in flagging activities.
- Flaggers do not use devices (e.g., cell phones, pagers, radio headphone, etc.) that may distract the vision, hearing, or attention of the flagger. Devices such as two-way radios used for communications between flaggers to direct traffic or ensure flagger safety are acceptable.

---

(b) Crane and hoist signals. Regulations for crane and hoist signaling will be found in applicable American National Standards Institute standards.

# Leveraging GIS Data Development With Washington State Framework

By Carrie Wolfe, Framework Coordinator, Washington State Department of Natural Resources and George Spencer, Cartography & GIS Manager, WSDOT

**G**eographic Information Systems - a technology that promises to make it easier for us to make sense of the data we have to deal with - has always had the stigma of being expensive to get into. Ironically, the major expense has been that very data it promises to help with. Now, Washington State Framework partnership efforts are underway to share the work (and the cost) of the data we all need to do our jobs.

The power of GIS as a management, planning, and decision making tool has become increasingly prominent over the last several years. There are no signs of that trend slowing. Rather, GIS is becoming more mainstream in the information technology world as the issues we deal with become more complex.

Along with the expanded use of GIS, has come tremendous data collection and maintenance activities by all forms of government and private industry. Data collection and maintenance is the most significant cost associated with GIS. In looking for ways to reduce the effort and cost associated with GIS data, we find that the current environment of individual GIS data development results in duplication of effort and redundant data. Oftentimes, the same GIS data are collected by many organizations. In other cases, an organization may lack the institutional capability to collect data that extends beyond their own jurisdictional boundary, even though it may be required for regional planning or analysis activities. The information may be available from another organization, but in many cases it is incompatible due to different standards and geographic bases.

National and state level framework efforts are beginning to address these issues and find ways of leveraging GIS data collection, maintenance, and use within the entire GIS community. The Framework is a partnership effort to create a widely available source of core GIS data and an environment that supports collaborative data collection, maintenance and use of these data.

The Federal Geographic Data Committee (FGDC) initiated the concept of framework data. They identified seven themes of GIS framework data:

1. geodetic control
2. orthoimagery
3. elevation
4. transportation
5. hydrography
6. governmental units
7. cadastral information

FGDC data standards have been developed for some of these themes. The FGDC has also produced some framework development guidance materials.

In the State of Washington, the Washington Geographic Information Council (WAGIC) has endorsed the Framework concept. Last year the WAGIC sponsored the development of a strategic plan for GIS in the state. A priority objective that surfaced in the plan was completion of the framework data layers for our state. The Framework Management Group (FMG), a subcommittee of the WAGIC, has been working on this objective. The FMG consists of multiple federal, state, local, tribal, and private organizations that have come together to advance framework development in Washington. Current development efforts are focused on cadastral, hydrography, and transportation data themes.

So what does this have to do with you? For starters, the Framework will save time, money and effort to acquire and use GIS data. With the Framework in place, you will only have to develop and maintain your own data - something you likely already are doing in one form or another. With the Framework, when you need to look across your boundary for a more regional view, you will be able to grab data from the Framework provided by your neighbors. As long as you follow the standards and practices set up for framework, your data will "fit" with the frame-

*Please continue to next page ↗*

work data just like pieces in a puzzle. For example, the road, the bridge, and the stream will come together at the right place even though the data may come from three different places. When this happens, better decisions and better cooperation will result because we will all be using the same data, the best data that is available.

Of course, this is going to take a lot of cooperation and sharing to make it happen - data isn't going to magically appear. There is no pot of gold to draw from to build the Framework. Rather, for the Framework to happen resources need to be pooled - each of us contributing our piece to the data puzzle. As more organizations become contributing partners, the data gaps will be filled and the overall quality of the data will be improved. Just as important, the cost of the data will be less for each organization because we will only have to maintain the data for which we are responsible.

One thing is certain, we are only going to get to a framework through broad participation.

For more information about Washington State framework efforts or to become a partner organization, contact Carrie Wolfe or George Spencer. Carrie can be reached at phone: (360) 902-1639 or email: [carrie.wolfe@wadnr.gov](mailto:carrie.wolfe@wadnr.gov). George can be reached at phone: (360) 709-5515 or email: [spenceg@wsdot.wa.gov](mailto:spenceg@wsdot.wa.gov). On the web, see Framework at <http://framework.dnr.state.wa.us/> and WAGIC at <http://www.wa.gov/gic/>.

Carrie Wolfe is the Framework Coordinator at the Washington State Department of Natural Resources. George Spencer is the Cartography and GIS Manager at the Washington State Department of Transportation and currently chair of the Framework Management Group.

---

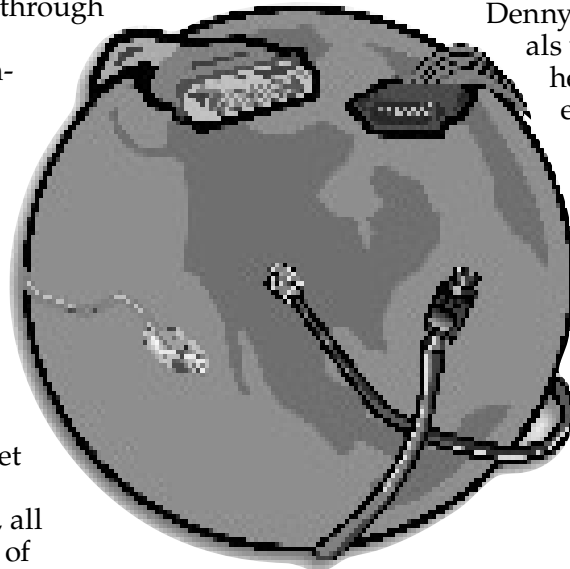
## H&LP Modem Program a Big Success

**H**&LP has announced the end of the successful Local Agency Modem Program. Since 1996, Highways & Local Programs (then TransAid) has worked to assist local agencies in accessing online resources through the Modem Program. Roger Chappell, Technology Integration Specialist for H&LP's WST2 Center, has been administering the program and providing technical expertise for the past few years.

Because of the Modem Program, 182 local agencies, MPO's, RTPO's, ports, and tribal governments have received free modems, Internet software, and training. In a recent survey done by MRSC, all but 19 small cities in the state of Washington were currently using the Internet as a management resource.

In the past two years H&LP has seen a sharp decline in the demand for modems by local

agencies since most computers are now manufactured with modems pre-installed. With the end of this program, we would like to thank former Assistant Secretary of TransAid Denny Ingham and other individuals whose visionary forethought helped these 182 local agencies enter the electronic business world sooner than would otherwise have been possible.



# WSDOT and AGC of Washington Education Foundation

## Ink Partnership to Deliver Soil Erosion Control Training

Source: AGC of Washington Education Foundation

**W**ashington State Department of Transportation (WSDOT) will increase the availability of the Construction Site Erosion and Sediment Control Certification Course training through a partnership with the Associated General Contractors of Washington Education Foundation begun on June 30, 2000.

"The demand for soil erosion control training has grown exponentially since salmon were included on the Endangered Species list. This growing demand, if not addressed, will overwhelm WSDOT's ability to jointly train its staff, contractors, local agencies and other interested parties," stated WSDOT's Statewide Soil Erosion Coordinator, explaining the need to develop this training partnership.

The AGC Education Foundation will manage and deliver the training of contractors, local agencies, and other interested parties. All contractors who complete the Education Foundation course will become certified to work on WSDOT projects. WSDOT will work closely with the Education Foundation to continually maintain the highest standards for erosion control training.

Concurrently, WSDOT will greatly increase training for its employees. Specific courses will be generated to help WSDOT designers and inspectors improve erosion control plan design and implementation. Significant efforts are underway to update and refresh the course material for classes that are scheduled to begin in September 2000. The two-day course is designed to fulfill the requirements for the Certification in Construction Site Erosion and Sediment Control. A certificate of training in Construction Site Erosion and

Sediment Control is required to become an Erosion Control Lead. On designated projects, the general contractor is required to designate a certified person on the project site to oversee erosion and sediment control activities. The activities are described in a general special provision (GSP) to the Standard Specifications for Road, Bridge, and Municipal Construction.

Recertification is required every three years. The same course serves for both initial certification and recertification. Rapidly changing regulatory conditions require

continual updating of curricula and training.

In this training, procedures are presented for the design and implementation of Temporary Erosion and Sediment Control (TESC) plans. Practical examples, WSDOT case studies, and hands-on field work are utilized to

stress the proper installation, maintenance, inspection, and removal of temporary erosion and sediment control Best Management Practices (BMPs). Additionally, two hours of spill control training are included to round out knowledge of managing potentially hazardous materials on the construction site.

More information is available at the AGC website, [www.agwa.com/soil.asp](http://www.agwa.com/soil.asp), including class schedules, online registration, and course curricula. Or contact Laurel Gray, WST2 Training Coordinator at [GrayL@wsdot.wa.gov](mailto:GrayL@wsdot.wa.gov). Agencies, companies, and activities that require customized training for specific certification and training needs should contact the Education Foundation to arrange a consultation.



# Are You Looking For Funding Sources For Your Bicycle or Pedestrian Project?



Here is a list of funding sources to help you!

For more information on these programs, please contact the agency or person shown in the "contact" box on the far right of the row.



## Nonmotorized Funding Sources (Year 2000)

More Info? Contact Julie Mercer Matlick, 360.705.7505, email [matlicj@wsdot.wa.gov](mailto:matlicj@wsdot.wa.gov)

Program	Who apply	Eligible projects	Type of funding	Cycle	Comments	Contact
<b>Pedestrian Safety and Mobility Program (PSMP)</b>	Local Agency	Pedestrian projects providing access, address system continuity, connectivity of pedestrian facilities.	Funds provided from AIP and TPP Programs. Distributed regionally.	Project call Nov. Due Jan.	Selection criteria includes safety, pedestrian generators, convenience, public acceptance, and project cost.	TIB 360.705.7300 <a href="http://www.tib.wa.gov">www.tib.wa.gov</a>
<b>Small Cities Program (SCP)</b>	Local Agency	Projects selected based on pavement conditions, roadway geometrics, safety.	Receives 13% of the TPP and 5% of the AIP Funds.	Project call Dec. Due Jan.	Agencies w/populations over 500 required 5% match. No match requirements for populations under 500.	TIB 360.705.7300 <a href="http://www.tib.wa.gov">www.tib.wa.gov</a>
<b>WSDOT, Pedestrian Risk and PAL Program</b>	WSDOT Regional Office	Within WSDOT ROW, must meet established at-risk criteria	Varies	Varies	Program to fund pedestrian safety improvements for WSDOT.	Julie Matlick *WSDOT, H&LP 360/705.7505 <a href="mailto:matlicj@wsdot.wa.gov">matlicj@wsdot.wa.gov</a>
<b>TEA-21, Surface Transportation Program - Enhancements</b>	Public Agencies, Local agencies, Tribal Governments, RTPOs	Federal funds for transportation eligible projects.	No max., 13.5% match 11 million available statewide in 1999	Project call July Due October	Eligible projects include bike/ped, landscaping & beautification, abandoned rails.	Stephanie Tax *WSDOT, H&LP 360.705.7389 <a href="mailto:taxs@wsdot.wa.gov">taxs@wsdot.wa.gov</a>
<b>STP - Regional</b>	MPOs, County Lead Agencies	Federal Projects	Varies 13.5% match	Varies	Eligible projects include bike/ped, landscaping & beautification, abandoned rails.	Kathleen Davis *WSDOT, H&LP 360.705.7377 <a href="mailto:davisk@wsdot.wa.gov">davisk@wsdot.wa.gov</a>
<b>Statewide Hazard Elimination Safety Program</b>	Local agencies, RTPOs	Federal funds for eligible safety projects including bikes and pedestrian.	Max. 300,000 10% match	Project call Aug-Sept Due Nov	Projects must have an accident history to be eligible.	Dave Zevenbergen *WSDOT, H&LP 360.705.7384 <a href="mailto:zevenbd@wsdot.wa.gov">zevenbd@wsdot.wa.gov</a>
<b>Public Lands Highway Program</b>	Local Agencies	Planning, interpretive signs, rest areas, visitor centers, bike/ped projects.	Federal share 100%	May	Check website for project listing.	Dave Kaiser *WSDOT, H&LP 360.705.7391 <a href="mailto:kaiserd@wsdot.wa.gov">kaiserd@wsdot.wa.gov</a>

Please continue to next page ↗

Program	Who apply	Eligible projects	Type of funding	Cycle	Comments	Contact
<b>Scenic Byway Program</b>	Certifiable Agency	Tourist amenities, bike/ped, signing, other.	http://www.wsdot.wa.gov/hlrd/hcp/hcp_home.htm			Judy Lorenzo *WSDOT H&LP 360.705.7274 lorzenj@wsdot.wa.gov
<b>Forest Highway Program</b>	WSDOT, Counties, USFS	Projects providing commercial and recreational access to/thru Nat'l forests.	Must be joint projects		Rural development, road related activities such as interpretative signing.	Al King *WSDOT, H&LP 360.705.7375 kinga@wsdot.wa.govMPOs
<b>Congestion Mitigation Air Quality Improvement Program</b>	Non attainment areas	Projects to improve air quality.	Federal funds go directly to locals	Up to TMAs	Seattle has used funds for ADA ramps, bike trails	MPOs
<b>Nat'l Recreational Trail Programs</b>	Nonprofit orgs, cities, counties, feds, tribes.	Develop and maintain trails for recreational use.	Varies: 20% match; \$5k-\$50k for general projects.	Applications due May 1.	Website: www.wa.gov/iac	Greg Lovelady, IAC, EricJ@IAC.WA.GOV 360.902.3000
<b>Section 402 Safety Funds &amp; Cooper Jones Funds</b>	Public Agency	Safety related non-construction projects.	Varies		Education projects, studies, research, enforcement.	Lynn Drake WTSC 360.586.3484
<b>Washington Wildlife and Recreation Program</b>	Municipal subdivisions, including schools, state agencies, tribal governments. Categories: Trails, Local and State Parks, and Water Access.	Pedestrian, equestrian, bicycle, or cross-country ski trails and directly related facilities. Acquisition, development, and renovations.	Minimum 50 percent match, cash or in-kind.	Applications due May 1	Approved plan required for eligibility. Applications for Trails, Water access, and State Parks Programs accepted even number years. Local Parks accepted annually. IAC Administered. www.wa.gov/iac	Eric Johnson, IAC, EricJ@IAC.WA.GOV (360) 902-3000
<b>Nonhighway Road Projects</b>	Municipal subdivisions, including schools, state agencies, tribal governments, and federal agencies (Forest Service, Park Service).	Trails for hikers, equestrians, bicyclists, and other users of trails and other facilities accessed via non-highway roads (that is, public roads not supported by state fuel taxes).	Matching funds are not required, but may increase the likelihood that a project will receive funding. Grants are limited to \$100,000 per phase.	Applications due May 1	Approved plan - required for eligibility. Administered under the IAC's Nonhighway & Off-Road Vehicle Activities Program (NOVA). Applications evaluated each year. www.wa.gov/iac	Eric Johnson, IAC, EricJ@IAC.WA.GOV (360) 902-3001
<b>Non-Motorized Winter Recreation Program</b>	Individuals, private organizations and public agencies. No match is needed but volunteerism is often rewarded.	Each year, a legislatively-created citizen advisory committee reviews, scores and makes recommendations to the State Parks and Recreation Commission. This "pay to play" program is supported solely by revenue received from the sale of Sno-Park permits.				Colleen McGuire State Parks colleenm@parks.wa.gov

\* Highways & Local Programs Service Center website: [www.wsdot.wa.gov/ta/homepage/hlphp.html](http://www.wsdot.wa.gov/ta/homepage/hlphp.html)

**Acronyms:** AIP - Arterial Improvement Program  
H&LP - Highways & Local Programs  
IAC - Interagency Committee for Outdoor Recreation  
MPO - Metropolitan Planning Organization  
ROW - Right of Way

TIB - Transportation Improvement Board  
TPP - Transportation Partnership Program  
USFS - United States Forest Service  
WSDOT - Washington State Department of Transportation  
WTSC - Washington Traffic Safety Commission

# NWPMA News

## “Working Together for Better Pavements”

### Words from our Chair

The weather has been great and I trust that everyone is up to their \_\_\_\_\_ in alligators. Well just don't drain the swamp, get “Pavement Management” working for you. Pavement Management works well and is in the best interest of the public for preserving our infrastructure responsibly.



As busy as you must be during this time of year, please take a few moments to reflect on our NWPMA's purpose for existence. NWPMA's main objective is to develop and maintain a link for the transfer of technology from all sources either public or private and create a learning environment for growth and advancement concerning Pavement Management Issues. With this in mind remember the secret to better decision making is better information.

Our annual “FALL CONFERENCE” will be here before you know it. In this bulletin you will find the registration forms and agenda for the conference. This year's Conference promises to be a very effective learning experience for all that attend. I respectfully encourage everyone's participation. Please register as early as possible to avoid the rush.

In addition to all agenda items taking place at this Conference, there will be three business items that will need ratification by membership vote.

1. Charter changes as presented and discussed at the Spring Conference in Bend, Oregon. If you did not receive a copy of the proposed changes, contact your local chapter representative.
2. Pavement Manager of the Year Award. Included in this bulletin is the nomination form. Please fill one out if you have a person in mind that deserves this prestigious award.
3. Nominations and elections of Officers for the year 2001 will also take place.

Larry Frostad, NWPMA Chair  
Island County



# 2000 NWPMA Pavement Management Conference Scheduled - Register Now!

The Northwest Pavement Management Association (NWPMA) will hold its annual Fall Conference in Portland, Oregon, again this year. The dates for the conference will be October 9 - 12. A very exciting and informative program has been put together by the NWPMA which includes the following:

On Monday October 9, two workshops will be held to assist pavement management practitioners in day-to-day operation of their program. The first workshop will be "How to Become a Pavement Management System Champion". This workshop will provide detailed information on how to successfully implement a pavement management system. It is directed at individuals who have some experience with a pavement management system. The second workshop is for individuals just starting out in pavement management or for people who need a little refresher. The workshop entitled, "Introduction to Pavement Management" will cover the basic elements of pavement management. Each of the concurrent workshops will begin at 8:30 AM and end at 4:30 PM. If you plan to attend one of the workshops, please check the appropriate box on the registration form.

The rest of the Conference is filled with sessions that will assist all public works personnel with their day-to-day pavement management activities. Session topics scheduled at the conference include:

- An update on the Endangered Species Act and its impacts on the maintenance of local agency Streets and Roads
- The impact of utility trenching on the condition of pavements and how Pacific Northwest agencies can work together for solutions

- GASB Statement 34; What is it and how will it impact local agencies in the Northwest?
- Future Pavement Research: What is happening at the Federal, State and Local levels.
- Using pavement management in day-to-day public works activities
- The use of GIS in pavement management
- Many other practical and useful sessions are also scheduled

A complete schedule will be finalized and sent out shortly.



In the meantime, please fill out the attached Registration form and return it to Vicki Griffiths at the address on the form.

If you are interested in being an Exhibitor at the Conference, please contact Dave Whitcher of the County Road Administration Board at (360) 753-5989. He will send you an Exhibitor packet and complete registration information.

**2000 NORTHWEST PAVEMENT MANAGEMENT ASSOCIATION  
FALL CONFERENCE  
October 9-12, 2000**



**REGISTRATION FORM**

Name: \_\_\_\_\_ Title: \_\_\_\_\_

Organization: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code + 4: \_\_\_\_\_

Phone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_

E-Mail Address: \_\_\_\_\_

Name as you want it to appear on your name tag: \_\_\_\_\_

**Workshop Information - 2 Workshops on October 9th, 8:00 am - 4:30 pm (Select 1)**

- I want to attend the "Introduction to Pavement Management for Locals".
- I want to attend the "How to become a Pavement Management System Champion."

**Registration: \$195.00 per person. Make Checks payable to NWPMA**

Additional tickets for Tuesday's Banquet: \$30.00 per person

Please Note: Meals are not included with Monday's Tutorials. The meals included with the conference are Tuesday Lunch and Dinner, Wednesday Breakfast and Lunch and Thursday Breakfast. Other meals are on your own.

Hotel Information: Conference Rate: \$89.00 + 9% tax per night single occupancy and \$99.00 + 9% tax per night double occupancy.

Doubletree Hotel - Columbia River  
1401 N Hayden Island Drive  
Portland, Oregon 97217  
Hotel Reservations: (503)283-2111 ext. 4185 or ext. 4186

TO RESERVE A ROOM AT CONFERENCE RATES, RESERVATIONS MUST BE MADE WITH THE HOTEL BY SEPTEMBER 28, 2000. SAY YOU ARE WITH THE NWPMA TO GET CONFERENCE RATE. MAIL OR FAX REGISTRATION AND PAYMENT OR PURCHASE ORDER FOR CONFERENCE BY SEPTEMBER 28, 2000 To:

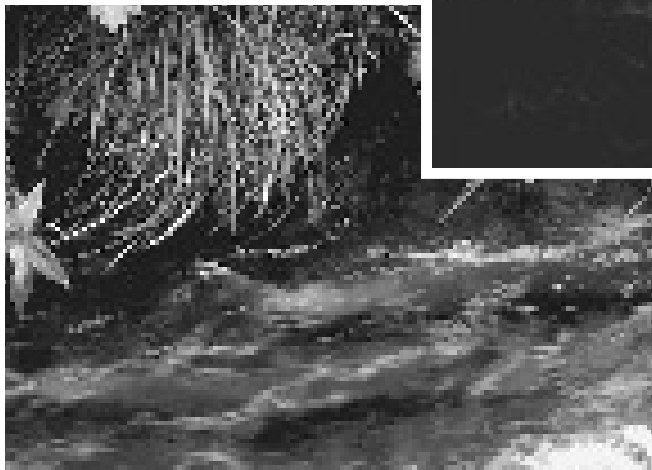
Vicki Griffiths  
Skagit County Public Works  
1111 Cleveland Avenue  
Mt. Vernon, Washington 98273-4215  
FAX: (360)336-9369  
Phone: (360)336-9333 ext. 239

**Make Checks payable to NWPMA**

# New ESA Training on the Horizon!

By Brian Hasselbach, Environmental Engineer, WSDOT-H&LP

Your cries for more training workshops have been heard! Many of you are familiar with and/or have attended the Introduction to the Endangered Species Act/Biological Assessments Workshops developed by WSDOT Highways & Local Programs Service Center in conjunction with the WSDOT Environmental Affairs Office (EAO). At that time the workshops were offered to assist local jurisdictions in understanding the implications of the, then impending, salmonid listings and new requirements that would extend from those listings.



were initially planned for November of this year; however, it will not be possible to have the curriculum developed by then. Agreement has been reached on a February series of classes. It is likely that two to four classes will be offered across the state. It is anticipated that the course will use three or four actual projects, to walk participants through the impact analysis process, including the pertinent discussions and justifications to include in a jurisdiction's biological assessment documentation. These 401 courses will be much more focused on the "nuts and bolts" of developing the biological assessments and meeting the needs of the Services.



While this first (and subsequent) series of these workshops were a huge success in providing introductory training for a number of participants and jurisdictions at the local, state, federal and private levels; the current climate of the ESA requires us to take another step forward. At this point, many of you have a good understanding of the ESA, the Section 7 consultation process and developing biological assessments. What may not be so clear, however, are the Services' new guidelines and criteria, specific impact analysis components, indirect effects, etc., etc.

With this in mind, Highways & Local Programs and the EAO, are in the process of developing an ESA 401 training workshop. The workshops

Information on dates, locations, and content should be available within a few months. In the mean time, if you have any questions regarding the upcoming workshops, please contact Brian Hasselbach, WSDOT H&LP Environmental Engineer, at (360) 705-6975 or [hasselb@wsdot.wa.gov](mailto:hasselb@wsdot.wa.gov).

# Personnel Protection During Bridge Paint Removal

From: Special Projects and Engineering Division, Office of Engineering Research and Development

**M**any steel bridges are currently in need of maintenance. Maintenance operations may range from small component replacement jobs to major maintenance including repainting. Many steel bridges in the highway system are coated with paint that contains toxic heavy metal pigments (e.g., lead and chromate) in varying concentrations. These metals can be hazardous to human health if inhaled or ingested in relatively small quantities in the form of dusts or fumes. It is important to take appropriate measures to protect workers and inspectors potentially exposed to these hazards. Protection measures are straight forward, and when followed, can protect personnel while allowing for safe and productive work.

## The Hazard

Lead is hazardous to human health when it enters the bloodstream. In the bloodstream, lead will replace other useful elements (e.g., calcium, iron) and adversely affect the effectiveness of the blood in carrying oxygen to various organs including the liver, kidneys, reproductive system, and brain.<sup>1</sup> In this manner, lead is particularly dangerous to small children, but can also poison adults. Once in the bloodstream, lead can concentrate in the organs or in the bones and back into the bloodstream over time.

Lead can enter the bloodstream by being breathed and absorbed through the lungs, or by being ingested and absorbed through the digestive system. Lead cannot be absorbed through the skin, but a common form of lead intake is via "hand-to-mouth" ingestion when eating or smoking with lead dust on the hands.<sup>2</sup> Only a very small amount of lead is needed in the bloodstream to exceed the current OSHA limit of 50 mcg/dl (micrograms per deciliter of blood).

## Regulatory Standards

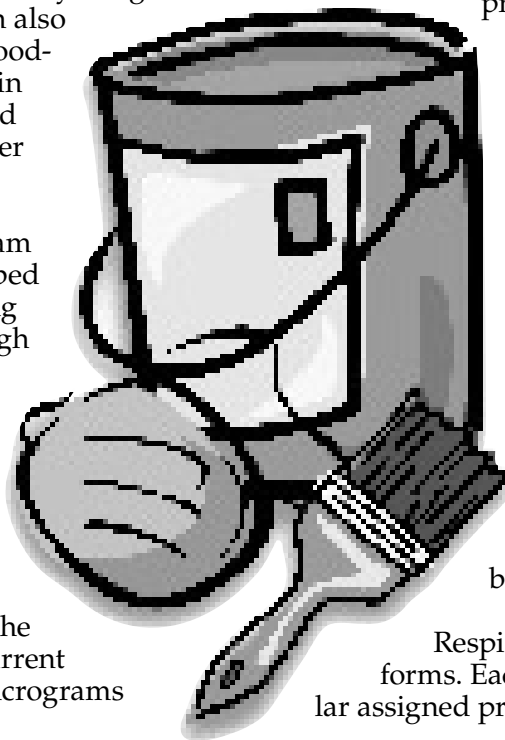
Required measures for worker protection during occupational exposure to lead are covered in the OSHA Lead-in-Construction Standard, 29 CFR 1926.62. This standard addresses the following issues in detail:

- requirements for dedicated work clothes
- controlled lead work areas and warning signs
- requirements for periodic blood lead level checks for workers
- requirements for clean break and eating areas
- hand washing station and showers
- documented respirator use and maintenance program
- proper fit testing, use and storage of respirators
- designation of a "competent person" to deal with hazards on the jobsite

## Protective Measures

**Engineering Controls** - Engineering Controls are any pieces of equipment or modified maintenance procedures which reduce the hazardous dust exposure to workers. Examples are: ventilation equipment (dust collectors) attached to blasting containments; shrouds and vacuum attachments for power tools; and, alternative low-dusting surface preparation methods e.g., wet abrasive blasting. High controls provide a benefit by reducing worker health risks. Each engineering control also has tradeoffs in cost, productivity, or quality of surface preparation (and, hence, durability of the new coating). Engineering controls should be applied as practical without sacrificing the quality of the work and balancing associated costs.

**Respirators** - Respirators come in various forms. Each type of respirator has a particular assigned protection factor. This is the factor of



*Please continue to next page* ↗

hazard reduction associated with the particular respirator. For example, a half-face mask with proper filters and properly fitted reduces the ambient hazard by a factor of 10X. A typical continuous-flow, supplied-air abrasive blasting helmet reduces the hazard by 25X, with certain models designed to provide 1000X protection. Although exposure levels vary from job to job, for abrasive blasting inside of containment, a 1000X rated respirator is generally required.<sup>3,4</sup> For workers outside of containment and for inspection personnel, a half-face, negative pressure respirator with HEPA (high efficiency particulate air) filters (usually bright pink in color) may be sufficient. Since exposure levels for workers vary greatly depending on worker job description, containment design and operation, and other site-specific conditions, respirator selection and use should consider these factors.

**Hygiene Practices** - Workers removing lead-containing paint from bridges will get fine lead dust on their skin and clothes. The key to hygiene practices is to eliminate inhalation and ingestion of that dust by the worker while on the jobsite and to keep the worker from taking the lead hazard off the jobsite to expose others in their personal vehicles or homes. This is best accomplished by using dedicated work clothes which remain on the jobsite and are either disposable or laundered separately; and by supplying reasonable washing facilities for workers to use before they eat, smoke, or leave the jobsite. Specific requirements for these hygiene facilities are contained in the OSHA standard for lead-in-construction.

**Administrative Controls** - Exposures to lead are measured for compliance purposes using an 8-hour, full shift average. Mixing "high-exposure" activities with "low-exposure" may reduce a particular worker's or inspector's overall exposure.

## Monitoring

OSHA requires air and blood monitoring for workers exposed to lead. The OSHA "action level" for lead-in-air is an 8-hour average of 30 :g/m<sup>3</sup>. This action level will be exceeded by almost all abrasive blasting activities, and many power tool-cleaning and torch cutting or demolition activities. Once the action level is exceeded, the contractor must follow all of the guidance of the standard to maintain worker exposure below 50: g/m<sup>3</sup> (the Personal Exposure Limit). Worker blood lead level monitoring is required. Blood

levels above 50: g/dL require removal of the worker from the hazard. Some States require contractors to report worker blood levels as a means for monitoring contractor compliance.

## Supporting Data

Workers working inside of containment during abrasive blasting operations will be exposed to ambient lead levels above the OSHA personal exposure limit. Research data shows that levels between 2000: g/m<sup>3</sup> and 50,000: g/m<sup>3</sup> can be measured in ventilated containments during blasting.<sup>5,6</sup>

Insufficient ventilation of containment can create lead concentration levels exceeding 50,000: g/m<sup>3</sup>.<sup>7</sup> Such conditions create difficulties in protecting workers below mandated OSHA levels. Ventilation systems should be designed specific to the cross-sectional area of the containment and the cross-sectional area should be minimized to maximize efficiency of the available ventilation equipment.<sup>8</sup>

For further information, please contact a member of the Bridge Coatings Technology Outreach Team: Ron Andresen, FL-Cen.; Dan Brydl, IL Div.; Dave Calabrese, MI Div; Mark Clabaugh, FL-East; Dr. Shuang-Ling Chong, HNR-20; Carl Highsmith, Region 3; Joe Huerta, HNG-20; Bob Kogler, HNR-20; Mike Praul, ME Div.; Larry O'Donnell, MA Div.

## References

1. Steel Structures Painting Council "Lead Supervisor/Competent Person Training Course Notes".
2. NIOSH ALERT, Request for Assistance in Preventing Lead Poisoning in Construction Workers, April 1992.
3. 29 CFR 1926.62, Occupational Safety & Health Administration Interim Final Standard for Lead-in-Construction, 1993.
4. FHWA-RD-94-100, Lead Containing Paint: Removal, Containment, and Disposal.
5. Ibid.
6. Data acquired during an ongoing FHWA-sponsored research project. Unpublished to date.
7. "Removal of Lead-based Paint from Steel Bridges in Louisiana", LADOT Rpt. 1989.
8. FHWA-RD-94-100, "Lead Containing Paint: Removal, Containment and Disposal.

# Effects of Changing Speed Limits in Speed Zones

Reprinted from FHWA Research Report, "Effects of Raising and Lowering Speed Limits on Selected Roadway Sections," Turner-Banks Highway Research Center <http://www.tbhrc.gov/safety/rd97002.htm>

All too often, speed limits are considered as a cure-all for a community's traffic ills. Citizens frequently demand speed zone changes in an effort to develop a quick solution to a complicated traffic problem. There is a need, therefore, to determine the effects of changing speed limits on traffic operations and safety for surface (non-freeway) rural and urban roadways.

## Data Collection

Speed and accident data were collected in 22 States at 100 sites before and after speed limits were altered. The speed limits were lowered at 59 sites and raised at 41 sites. The sites included 63 rural sites, 22 small urban sites, and 15 urban sites. The section lengths varied from 0.3 mi. to 12.6 mi. with an average of 1.7 mi. Speed and accident data were collected at 83 similar comparison sites (where the speed limits were not altered) to control for time trends and other factors.

The researcher was notified about sites where speed limits were to be changed by State traffic engineers. Traffic data were collected before and after the speed limits were changed for 24-hour periods using automated roadside units connected to inductive loop mats to record speeds, headways and types of vehicles. Data were collected for more than 1.6 million vehicles.

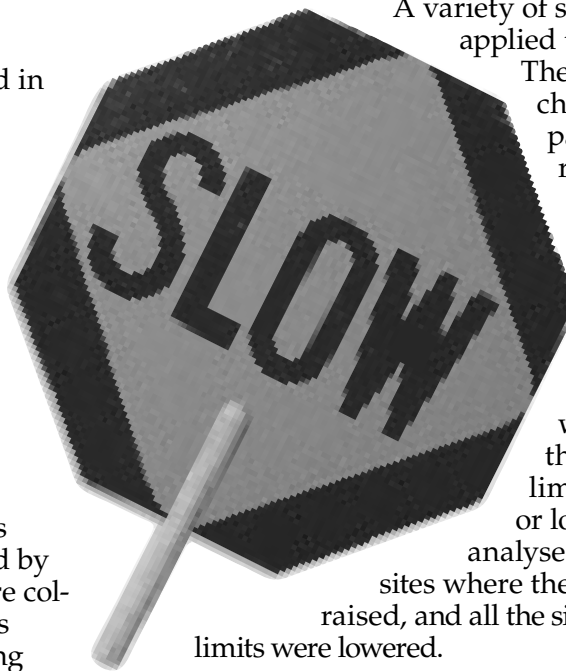
Accident data included more than 6,000 reported accidents. For most sections, accident data were collected for a 3-yr period before and a 2-yr period after the speed limits were changed. Data were coded for accident type, severity, light and surface conditions.

## Data Analysis

The free-flow speeds (vehicles with headways of 4 s or greater) were used for the speed analyses. Mean speeds, standard deviation of the speed

distribution, percentile speeds, and percentage of vehicles exceeding the posted speed limits by 5, 10, 15, and 20 mph were computed for all sites.

Comparisons were made for groups of sites where the speed limits were lowered by 5, 10, 15, and 25 mph.



A variety of statistical tests were applied to the accident data.

The analyses included a check for comparability, paired comparison ratios, cross-product ratios or odd ratios, an empirical Bayes method, and the weighted average logit method.

Because the sample sizes were small when divided up by the increments to limits that were raised or lowered, the main analyses combined all the sites where the speed limits were raised, and all the sites where the speed limits were lowered.

## Results

Neither raising nor lowering the speed limit had much effect on vehicle speeds. The mean speeds and the 85th percentile speeds did not change more than 1 or 2 mph, even for speed limit changes based on the amount the posted speed limit was altered. The percent compliance with the posted speed limits improved when the speed limits were raised. When the speed limits were lowered, the compliance decreased. Lowering the speed limit below the 85th percentile or raising the limit to the 85th percentile speed also had little effect on drivers' speeds. The changes in accidents at the study sites were not statistically significant at the 95th percentile confidence level.

# WQI News

**Congratulations!!!!**

## WQI Recognizes Teams Promoting Quality Through Partnerships

This year's Washington Quality Initiative (WQI) awards program, the Making A Difference Awards, has been designed to recognize projects and organizational teams that have excelled in the area of quality improvement. The State of Washington's awards criteria mirrors that of the National Quality Initiative (NQI) criteria. The four winning projects of the WQI awards have been forwarded to the NQI Steering Committee as nominations for the NQI Making A Difference Awards. The NQI Steering Committee will announce the national award winning teams in the late summer of 2000, and the national awards will be presented during the NQI Workshop to be held in Dallas, Texas, on November 8, 2000.



**Accepting the Partnering Award from H&LP Assistant Secretary, Paula Hammond, right, are (l - r) Arlin Cruz (City of Seattle); Fred Liang (City of Bellevue) and Greg Legge (WSDOT NW Region Traffic Center).**

### WQI Partnering Award

The City of Bellevue, City of Seattle, and the Washington State Department of Transportation (WSDOT) Web Site Teams were awarded the WQI Partnering Award for their Traffic Conditions Web Site project. The Traffic Conditions Web Site is one of the leading traffic information web sites in the nation; providing real-time traffic flow and, indirectly, traffic speeds and congestion for the major north-south freeway system, from Everett to Tacoma, and the key bridge links across Lake Washington.

The Cities of Bellevue and Seattle teams worked out the details of how to make the necessary connection between their cities' video equipment and WSDOT's equipment. The City of Seattle and WSDOT installed a mile of fiber optics to make this connection successful. The City of Bellevue team managed the process that developed the city video camera system and was responsible for the city's portion of the SmartTrek program that enabled the city video on the WSDOT web page. The Traffic Conditions Web Site Team demonstrated originality and ingenuity of innovation by expanding and sharing traffic information among different

agencies so the traveling public has an easy-to-find, overall view of the transportation network.

### WQI Breaking The Mold Award

The City of Shoreline, King County Metro, CH2M HILL, and WSDOT Northwest Region Traffic Engineering received the WQI "Breaking The Mold" Award for the Aurora Avenue North Multimodal Corridor Study. The study was a pre-design planning project for the design and construction of highway improvements to be implemented by the City of Shoreline and its partners. By "breaking the mold" through a great deal of community involvement and consensus-building, the project directly meets local and regional goals as well as satisfying a need for safety improvements.

The City of Shoreline's Planning and Development Services Department was the lead for the Aurora Corridor Study, with support from the Public Works Department. The Shoreline City Council unanimously adopted the Study recommendations on August 23, 1999. King County Metro plans for and provides regional trans-

portation systems including transit, Regional Arterial Roadway networks, and regional transportation coordination. The Capital Planning group participated in the Aurora Study. CH2M HILL's core services include transportation, water/wastewater, environmental, and industrial facilities. The company helps public and private customers realize a greater return on their investments through sustainable infrastructure and environmental technology.

### **WQI Risk Taking Award**

The WQI Risk Taking Award went to WSDOT Olympic Region Traffic Office, WSDOT Olympia Service Center (OSC) Traffic Office, and Tucci and Sons for their I-5/SR 512 Interchange Safety Improvements project. This project significantly reduced extreme congestion at the southbound I-5 off-ramp to SR 512 by utilizing a unique set of three left-turn lanes. The triple left-turn freeway exit design is the first of its kind in Washington State. This "out of the box" concept was the key to the successful solution of a major safety and congestion concern.

WSDOT's OSC and Olympic Region Traffic Offices worked closely together to develop the triple left-turn lane design. WSDOT's OSC Traffic Office performed traffic operations analysis using a traffic signal timing and analysis software program to determine the level of service for the new design. WSDOT's Olympic Region Traffic Office was instrumental in obtaining the necessary funding to develop the project. With funding available, the Olympic Region Tacoma Project Office Design Team was able to incorporate the unique triple left-turn lane design into an overall quality design plan that would deliver the results needed to improve safety and increase capacity in the interchange area. Tucci and Sons has been based in Tacoma for 50 years. Specializing in clearing, earthwork, underground utilities, and asphalt paving, Tucci and Sons has grown and diversified to become one of the largest civil/sitework contractors in Pierce County. WSDOT Northwest Region Traffic Engineering is responsible for all state highway traffic operations serving King, Snohomish, Skagit, Whatcom, and Island Counties.



**(Starting from left to right) H&LP Assistant Secretary, Paula Hammond; Dave McCormick, NWR Traffic Engineer, WSDOT; Shoreline Mayor Scott Jepsen; Ken Madsen, King County Metro; Kirk McKinley, Shoreline Planning Manager, and Tim Bevan, CH2MHill. WQI plaques were given to these representatives of the partners who earned the "Breaking the Mold" Award for safety improvements to the Aurora Avenue Corridor.**

*Please continue to next page ↗*

## WQI State Quality Initiative Award

Associated General Contractors of WA (AGC), Asphalt Paving Association of WA (APAW), and WSDOT teams received the WQI State Quality Initiative Award for Quality In Action. This on-going program is made up of participants who bring continuous improvement and customer-focused ideas to the table which can be evaluated, tested, and implemented on a statewide basis. The membership of the teams ranges from field level project staff to executives from WSDOT and individual companies. The program has paid great benefits over the last decade as contract claims have been reduced and industry-WSDOT relationships have strongly improved.

The AGC-WSDOT Joint Cooperative Committee is organized around four teams. The Lead Team is made up of Executives and senior staff who provide coordination, resources and guidance to three technical teams, the AGC-WSDOT's Administration Team, Roadway Team, and Structure Team. These technical teams are co-chaired by WSDOT and contractor senior staff with membership from WSDOT and contractor project-level personnel from across the state. The APAW-WSDOT Joint Task Force deals with asphalt pavements through representation from the aggregate production industry, asphalt refineries, asphalt paving contractors, and WSDOT materials and construction personnel. A joint policy statement was drafted that emphasizes strengthening relationships in order to provide the highest quality and value to the customer.

## WQI Award Presentations

On Tuesday, May 23, 2000, Paula J. Hammond, WQI Co-Chair, presented three of the four WQI Making A Difference Awards. The WQI Partnering, Breaking The Mold, and Risk Taking Awards were awarded to the respective team members at the Public Works Week Luncheon which was held at McCormick & Schmicks Harborside Restaurant. The AGC Team was presented their WQI State Quality Initiative Award on Saturday, May 20, 2000 at the AGC Annual Meeting. The APAW Team received their award at the APAW Mid-Year



(Starting from left to right) WSDOT H&LP Assistant Secretary, Paula Hammond, presented the award to Mike Fizeete, Tucci & Sons; Jon Nisbet, Olympic Region Traffic Engineer; and State Traffic Engineer Toby Rickman.

Meeting on June 2, 2000, and the WSDOT Team received their award at the June 2000 Transportation Commission Meeting held on June 20, 2000.

## Congratulations Are In Order!!

Please join the WQI Steering Committee in recognizing and congratulating these remarkable teams and their outstanding projects that add value and quality to Washington's transportation system. Be on the look-out for the 2001 WQI Achievement Award Call for Projects coming your way January 2001!

# Software Available to Help Categorize and Develop Countermeasures for Bicycle and Pedestrian Collisions

The Federal Highway Administration (FHWA), in cooperation with the National Highway Traffic Safety Administration (NHTSA), has developed a Pedestrian and Bicycle Crash Analysis Tool (PBCAT) through the University of North Carolina Highway Safety Research Center (HSRC).

PBCAT is software intended to assist state and local bicycle coordinators, planners, and engineers in analyzing and developing countermeasures for bicycle and pedestrian collisions.

PBCAT develops and analyzes a database containing the details of crashes between motor vehicles and pedestrians or bicyclists. One of the details focuses on the type of crash, including the pre-crash actions of the parties involved. With the database developed, the software can then be used to produce reports and select countermeasures to address the problems identified.

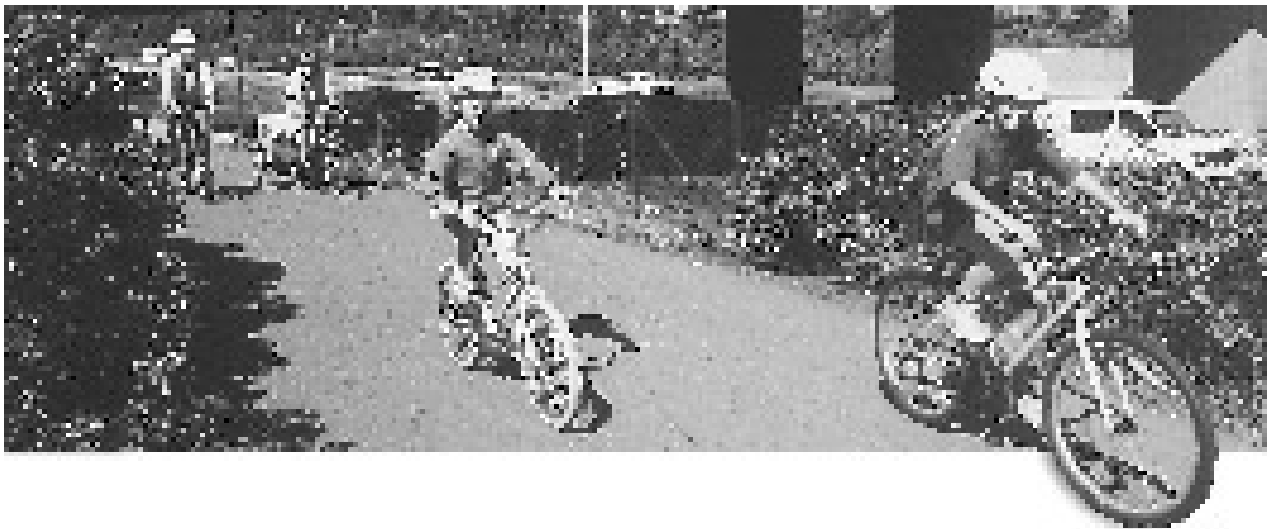
The beauty of the PBCAT is that it goes beyond traditional crash analysis, which includes where pedestrian and bicyclist crashes occur (city, street, intersection, two-lane road, etc.), when they occur (time of day, day of week, etc.), and characteristics

of the victims (age, gender, injury severity, etc.). PBCAT can categorize pedestrian and bicycle crashes into common types to better define the sequence of events and precipitating actions leading to bicycle- and pedestrian-motor vehicle crashes.

PBCAT is designed with the following features:

- Ability to quickly determine the crash type through a series of on-screen questions about the crash, crash location, and maneuvers of the parties involved.
- Ability to customize the database in terms of units of measurement, variables, and location referencing as well as import/export data from/to other data bases.
- Recommended countermeasures linked to specific bicycle and pedestrian crash types and related resource and reference information.

The PBCAT software and a User's Manual (FHWA-RD-99-192) will soon be available. Information on ordering a copy of PBCAT will be available at [www.walkinginfo.org/pbcats](http://www.walkinginfo.org/pbcats) in late July 2000.



# Fluorescent Yellow Green Warning Signs for Schools, Pedestrian & Bicycle Crossings

By Cherie Kittle, FHWA

The Federal Highway Administration's (FHWA) Office of Transportation Operations continues to optimize the performance of the transportation system by ensuring consistency on our roadways.

In 1992, the FHWA initiated a pilot study in conjunction with the National Park Service, which examined the effects of the new color signs on motorist behavior at five pedestrian and bicycle crossings in the Washington, DC, area. Results indicated an increase in motorists slowing and stopping for pedestrians and bicyclists and conflicts decreased.

In 1993, FHWA conducted a 2-year study nationwide to evaluate this color on pedestrian, school, and bicycle crossing signs. A total of 57 jurisdictions were given permission to experiment in this study; 24 jurisdictions completed the experimentation and provided final reports. Our review of the studies and data indicate that fluorescent yellow green (FYG) warning signs improved the conspicuity of the sign message and motorists were able to recognize the sign from greater distances than the standard yellow warning sign. Many studies did not find significant changes in speed data, but motorists frequently commented that the signs caught the attention of the driver from a greater distance, and drivers were more aware of what was going on around them.

**...the signs caught the attention of the driver from a greater distance and drivers were more aware of what was going on around them**

On June 7, 1996, a Notice of Proposed Rulemaking was published proposing the adoption of FYG as an optional color for pedestrian, school, and bicycle crossing signs. A total of 141 comments were received with 100 favorable comments received from local governments, including police departments and public school systems, in addition to special interest groups and the general public.



On June 19, 1998, a Notice of Amendment to the Manual on Uniform Traffic Control Devices (MUTCD) was published in the Federal Register which adopted FYG for optional use for warning signs related to pedestrian, bicycle, and school applications.

Fluorescent yellow green was one of four unassigned colors that the FHWA had reserved for future applications. Studies indicate that fluorescent retroreflective materials are detected with higher frequency and recognized with greater accuracy at further distances than the corresponding standard highway colors. This is due to the greater luminance contrast with surroundings. Pedestrian/bicycle-motor vehicle crashes continue to be a safety problem on our roads. FHWA believed a unique, unassigned color would be most effective in altering motorist behavior and reducing conflicts with pedestrians and bicyclists.

**...fluorescent retroreflective materials are detected with higher frequency, and recognized with greater accuracy at further distances,...**

*Please continue to next page ↗*

The use of FYG for pedestrian, bicycle, and school applications supports the U. S. Department of Transportation's Strategic Safety Goal to promote public health and safety by working toward elimination of transportation-related deaths, injuries, and property damage.

FYG also supports the FHWA strategic goal that targets pedestrian/bicycle as a national because this type of crash accounts for 15 percent of all fatalities. The plan calls for an (reduction in number, rate, and severity) in this area.

Recent physical fitness trends promote walking and bicycling. Emphasis must be placed on utilizing state-of-the-art retroreflective fluorescent signage materials to better communicate with motorists that pedestrians and bicyclists are using the roadway with them.

## **Emphasis must be placed on utilizing state-of-the-art retroreflective fluorescent signage...**

Pedestrians and bicyclists represent significant areas of concern in transportation that would be well served by a unique color for traffic control devices.

This is not a stand-alone effort, but part of our overall goal of optimizing performance through innovation, technology, communications, and partnering with the local community.

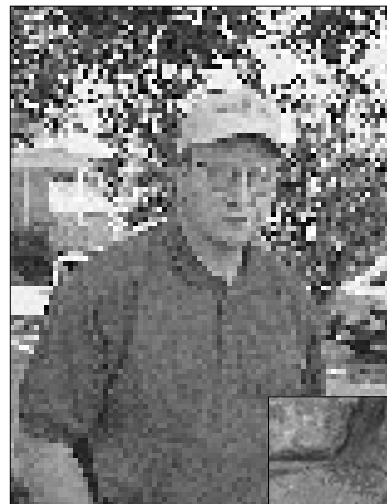
---

## **WST2 Advisory Committee Changes Leadership**

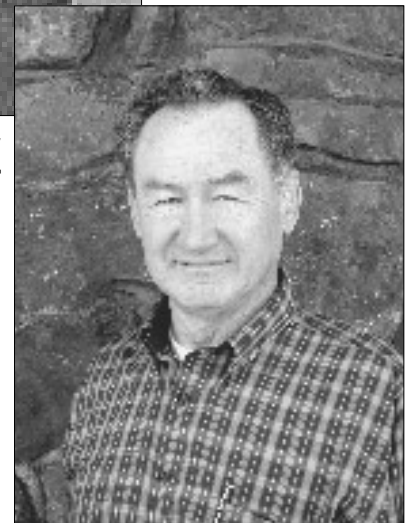
**W**alt Olsen, P.E., Pend Oreille County Engineer, stepped down as Chair of the WST2 Advisory Committee in May. Walt has been an active member of the WST2 Advisory Committee since 1994, and he has chaired the committee since 1996.

The WST2 Center would like to thank Walt for his professionalism, dedication, and support in assisting the Technology Transfer Center identify and meet the technical needs of Washington's local agencies. In these days of diminished resources we are very grateful for the contribution of both his valuable time and his vast experience. Although Walt stepped down as Chair, we are fortunate to keep him on the Committee and look forward to his continued participation.

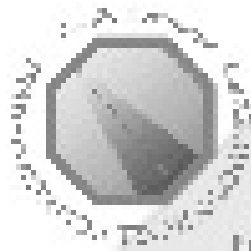
Phil Barto, P.E., Operations Engineer for Spokane County, was elected to carry on the leadership as the new Chair. Phil is a licensed Civil Engineer in both California and Washington and has an extensive background in equipment operation and maintenance. He is a part time management consultant and a five-year veteran of the T2 Advisory Committee. Phil brings with him over 35 years of experience and insight into the training and technical needs of local agency personnel. We are looking forward to working with Phil in his new leadership role.



**Walt Olsen, P.E.,  
Former WST2 Chair**



**Phil Barto, P.E., WST2 Chair**



# STOP

worrying over your transportation technology decisions. Come to the Pacific Northwest Transportation Technology Expo to see and touch the solutions to your problems.

Are you tired of last year's solutions? Are you like us, your head is in the clouds? It's time to get out of the clouds and into the real world. The Expo, September 17-19, will be held at the Convention Center in Tacoma, Washington. We'll have a lot of speakers and exhibitors. Lots of the latest and greatest technology. Lots of people you need to know. Lots of ideas and solutions that will help you solve your transportation problems.

The Expo will showcase the latest in transportation technology. It's a chance to see and touch the solutions to your problems. It's a chance to see and touch the solutions to your problems. It's a chance to see and touch the solutions to your problems.

Why? Because you're going to see the solutions to your problems. It's a chance to see and touch the solutions to your problems. It's a chance to see and touch the solutions to your problems. It's a chance to see and touch the solutions to your problems.

- **Space - \$1000**     - **Space - \$1000**     - **Space - \$1000**

Let's see your innovative ideas—we have lots of space!

Give us your ideas. We'll give you the space to show them. It's a chance to see and touch the solutions to your problems. It's a chance to see and touch the solutions to your problems. It's a chance to see and touch the solutions to your problems.

## Don't miss this opportunity.

Have an idea? We'll give you the space to show them. It's a chance to see and touch the solutions to your problems. It's a chance to see and touch the solutions to your problems. It's a chance to see and touch the solutions to your problems.

What to attend?  
Just show up!  
What to exhibit?  
Complete this form:

You'll be interested in demonstrating or exhibiting at the Pacific Northwest Transportation Technology Expo. Please contact me when you're interested.

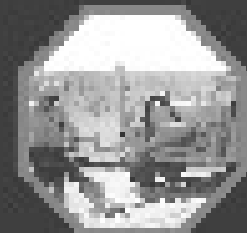
Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Company: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
Phone: \_\_\_\_\_  
E-mail: \_\_\_\_\_

Send this form to: Pacific Northwest Transportation Technology Expo, Convention Center, Tacoma, WA 98401. For more information, call 360-737-7373.

### Dating Shows

Meet the people you need to know. It's a chance to see and touch the solutions to your problems. It's a chance to see and touch the solutions to your problems. It's a chance to see and touch the solutions to your problems.

It's a chance to see and touch the solutions to your problems. It's a chance to see and touch the solutions to your problems. It's a chance to see and touch the solutions to your problems.



Spouse/Partner: \_\_\_\_\_  
Child: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
Phone: \_\_\_\_\_

Send this information to: Pacific Northwest Transportation Technology Expo, Convention Center, Tacoma, WA 98401.



Claudia Devlin, WSDOT Librarian

# Community Transportation Association of America Online

The web page for the Community Transportation Association of America is quite extensive in coverage. Here is some of the information you can find on this Internet site.

*Community Transportation Magazine*, a bi-monthly publication, is available. Not all articles are full text but a sizable portion is online along with selected Department headings of which Medical Transportation and Resource Center News are examples. Back issue articles and a search capability enhance access to this publication.

### Other key areas are:

#### Federal News:

- **News & Notices** with Links to information
- **Federal Flashes** - weekly record of Federal News relating to Community Transportation
- **Press Releases** - Federal Budget, policy initiatives and more
- **Policy Resolution** - CTAA Policy Resolutions for the upcoming year
- **Sample Letters** to send to local, state, or federally elected officials
- **Data Tables** of budget data

#### National Transit Resource Center:

- **Services** - hotline, publications, Peer Program, ITS, Transit Forums, Scheduling & Dispatching
- **Publications** from various sources: RTAP, CTAP, CT Magazine, ITS, access to jobs, DOL publications, Resource Guide, Buyer's Guide, USDA publications
- **Technical Assistance and Loans** - projects, peer program, loan fund
- **Employment Transportation** - joblinks, DOL Project Resources, Conferences, links

- **Rural Transit Assistance Program** - RTAP publications and background
- **Community Transportation Assistance Project** - publications and background
- **Medical Transportation** - publications current practice, conferences, Medicaid, links
- **USDA** - publications and projects
- **University Transit Resource Center** - background, regional centers, national centers and other centers.

#### Training:

- **CCTM** Certified Community Transportation Manager Program
- **PASS** Passenger Service and Safety training & certification
- **VMMI** Vehicle Maintenance Management & Inspection training & certification
- **Certification Council** assures excellence in training courses offered
- **Safety Review** CTAA's Community Transportation Training & Safety Review Program

#### CTAA:

- **Membership**, testimonials, application
- **Contact**, mission, staff, local and state delegates

To reach the Community Transportation Association of America online go to:

<http://www.ctaa.org>

# Free Publications From Your WST2 Center

For Washington residents only due to limited quantities.

Name: \_\_\_\_\_ Agency: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

City: \_\_\_\_\_ Zip+4: \_\_\_\_\_

Phone: (     )                      Fax: (     )                      \_\_\_\_\_

Email: \_\_\_\_\_

**Fax, phone, or mail your order to: Fax (360) 705-6858, Phone (360) 705-7386**

**Mailing Address: WST2 Center, WSDOT, H&LP, P.O. Box 47390, Olympia, WA 98504-7390**

**This order form is available on the WSDOT Homepage at: <http://www.wsdot.wa.gov/TA/T2Center/T2PUBS.htm>**

## Check the items you would like to order.

- 1999 Audio Visual Catalog, T2 Center
- Asphalt Seal Coats, WST2 Center (1999 Reprint)
- Basic Metric System, WSDOT
- Engineer's Pothole Repair Guide, US Army Corps of Engineers, 1984
- Evaluation of Automated Pavement Distress Data Collection Procedures for Local Agency Pavement Management, Texas A&M, WSDOT, ODOT, 1996
- Family Emergency Preparedness Plan, American Red Cross, et al.
- Financing Federal Highways, FHWA, 1999.
- Fish Passage through Culverts, FHWA, USDA, 1998
- Fly Ash Facts for Highway Engineers, FHWA July 1986
- Getting People Walking: Municipal Strategies to Increase Pedestrian Travel, Rhys Roth, Energy Outreach Center
- Gravel Road Test Sections Insulated with Scrap Tire Chips, CRREL 94-21
- A Guide to the Federal-Aid Highway Emergency Relief Program, USDOT, June 1995
- A Guide for Local Agency Pavement Managers, NWT2 Center, 1994
- A Guidebook for Residential Traffic Management, NWT2 Center, 1994
- A Guidebook for Student Pedestrian Safety, KJS, 1996
- Highway/Utility Guide, FHWA 1993
- Impact of Excavation on San Francisco Streets, September 1998
- Improving Highway Safety at Bridges on Local Roads and Streets, 1998
- International State-of-the-Art Colloquium on Low-Temperature Asphalt Pavement Cracking, CRREL
- Local Agency Pavement Management Application Guide, NWT2 Center, 1997
- Maintenance of Aggregate and Earth Roads, WST2 Center (1994 reprint)
- Manual of Practice for an Effective Anti-icing Program: A Guide for Highway Winter Maintenance Personnel, FHWA, 1996
- New Generation of Snow and Ice Control, FHWA
- Pavement Surface Condition Field Rating Manual for Asphalt Pavement, NWPMA, WSDOT. 1999

- Pedestrian Facilities Guidebook, WSDOT (\$12.00 + postage outside Washington State) 1977
- Pothole Primer — A Public Administrator's Guide, CRREL, 1989
- Rating Unsurfaced Roads, A Field Manual for Measuring Maintenance Problems, CRREL
- Recommendations to Reduce Pedestrian Collisions, WSDOT, December 1999
- Redevelopment for Livable Communities, Rhys Roth, Energy Outreach Center, 1995
- Snow Fence Guide, SHRP - H - 320, NRC, 1991
- State-of-the-Art Survey of Flexible Pavement Crack Sealing Procedures in the United States, CRREL, 1992
- Superpave System – New Tools for Designing and Building More Durable Asphalt Pavements, FHWA
- Traffic Calming: A Guide to Street Sharing, Michael J. Wallwork, P.E. 1993
- Unsurfaced Road Maintenance Management, CRREL 1992
- Use of Scrap Rubber in Asphalt Pavement Surfaces, CRREL 91-27
- W-Beam Guardrail Repair and Maintenance, FHWA

### **Workbooks and Handouts From T2 Center Workshops**

- Access Management Guidelines for Activity Centers, NCHRP Report 348, TRB/NRC, 1992
- Geosynthetic Design and Construction Guidelines, FHWA/NHI 1995
- Handbook for Walkable Communities, by Dan Burden and Michael Wallwork
- Historic and Archeological Preservation: An Orientation Guide, FHWA/NHI
- Planning and Implementing Pedestrian Facilities in Suburban and Developing Rural Areas, TRB
- Maintenance Welding Techniques and Applications, Tom Cook, April 1991

### **Self-Study Guides**

The following noncredit self-study guides are available through WSDOT Staff Development and can be obtained from the T2 Center. An invoice will be sent with the books.

- Advanced Surveying, \$20
- Basic Surveying, \$20
- Contract Plans Reading, \$25
- Technical Mathematics I, \$20
- Technical Mathematics II, \$20

### **Computer Programs**

The following computer programs may be downloaded from the Internet at: <http://www.wsdot.wa.gov/TA/Operations/Environmental/Soft.htm>

**Design Cost Estimate.** A software database program that calculates cost projections based on standard items.

**Materials Approval Tracking.** A software program designed to track materials data, need, status, and approval of any materials sampling and documentation needed for approval.

**HyperCalc.** A shareware utility for converting between metric and English units.

**Force Account Macros.** A series of ready-made Excel spreadsheets and macros to save you time on daily force account calculations and reports, including wage and equipment rates.

**APWA CAD Symbol Standards and Menus.** A public domain program of standard AutoCAD symbols developed by the Washington Chapter of APWA for use with AutoCAD release 14. The program may also be downloaded at <http://users.ap.net/~fredlee>

**Microsoft Access Runtime Program.** Assists in running the Materials Approval Tracking and Design Cost Estimate Program.

**UTEC System.** A software program consisting of a main menu designed to provide a record base for identifying street locations within an agency.

# Opportunities to Enhance Your Skills

To register for a class, contact the training provider listed in the box, preceding each section.  
For additional needs contact the Washington State T2 Center.

## Washington State T2 Center

Contact Laurel Gray or Wendy Schmidt  
(360) 705-7386, fax (360) 705-6858  
<http://www.wsdot.wa.gov/TA/T2Center/train2.htm>

To register for a class in this section use the contact listed above.

### Snow and Ice Control Chemicals

October 24, Mt. Vernon; October 25, Kent; October 26, Tumwater; October 31, Spokane; November 1, Moses Lake; November 2, Union Gap. Instructor: Dale Keep. \$35. 4 hours.

### Functional Assessment of Wetlands (NHI)

December 11-14, Seattle. \$300.

### Work Zone Traffic Control for Maintenance Operations on Rural Highways (NHI)

November 6, Everett; November 7, Tumwater; November 8, Yakima. (Dates tentative). \$100.

### Applications of Geographic Information Systems for Transportation (NHI)

January 9-11, 2001, Tacoma. \$225.

### Geosynthetics Engineering Workshop (NHI)

March 6-8, 2001, Auburn. \$225.

### Bridge Condition Inspection Update (BCIU)

February 6-7, Ellensburg; February 20-21, Tacoma. Free.

### Bridge Condition Inspection Fundamentals (BCIF)

February 13-15, Tacoma. \$150 for anyone not a Washington state or local agency. (If a person takes the BCIF and then the BCIT in the same year the \$150 will cover both.)

### Bridge Condition Inspection Training (BCIT)

March 5-9 and March 19-23, Tumwater. \$150 for anyone not a Washington state or local agency. (If a person takes the BCIF and then the BCIT in the same year the \$150 will cover both.)

### WSBIS (Washington State Bridge Inventory System)

February 27, 28, March 1, Lacey. Free

### ESA 401: Advanced Biological Assessments

Classes have been postponed until February 2001.

## TRANSPEED, University of Washington

Contact Christy Roop  
(206) 543-5539, fax (206) 543-2352  
<http://www.engr.washington.edu/epp>

To register for a class in this section use the contact listed above.

### Roadway Value Engineering

September 6-8, Lacey. \$220/420.

### Access Management

September 13-15, Seattle. \$265/465.

### Legal Liability for Transportation Professionals

September 14-15, Vancouver. \$180/360.

### Bridge Foundation Design

October 3-5, Seattle. \$265/465.

### Roundabout Design Concepts and Guidelines

October 18-20, Lacey. \$265/465

### Transit Capacity and Quality of Service

October 24-26, Seattle. \$265/465.

### Design and Application of Roadway Safety Features

October 31-November 2, Yakima. \$265/465.

### Pavement Rehabilitation Strategies

November 7-8, Tacoma. \$220/400.

### Fundamentals of Traffic Engineering

November 15-17, Seattle. \$265/465 plus \$30 text fee.

### Site Access and Circulation Design

November 16-17, Seattle.

### Manual on Uniform Traffic Control Devices

November 29-December 1, Lacey. \$265/465  
Plus \$60 materials fee.

### Design of Retaining Walls and Other Structures

December 5-6, Seattle. \$220/400.

### Introduction to Pavement Management

December 7-8, Tacoma. \$220/400.

### Managing Project Delivery

December 12-14, Seattle. \$265/465

## University of Washington

Professional Engineering Practice Liaison  
(PEPL) Program  
Contact Stephanie Strom  
(206) 543-5539, fax (206) 543-2352  
<http://www.engr.washington.edu/epp>  
Select PEPL

To register for a class in this section use the contact listed above.

### Quaternary and Engineering Geology of the Central and Southern Puget Sound Lowland.

September 7-9, Seattle; \$425/455.

### Stormwater Treatment: Chemical, Biological and Engineering Principles

September 12-13, January 24-25, Vancouver; \$495/525.

### Stormwater Treatment by Media Filtration

October 12-13, \$515/545.

### Design and Retrofit of Culverts for Fish Passage in the Northwest

October 18-19, Spokane. \$445/475.

### How to Successfully Use Value Engineering in Capital Projects

November 16-17, Seattle. \$375/405.

### Construction Site Erosion and Pollution Control

December 11-12, Vancouver, WA. \$545/575.

### Alternative On-Site Stormwater Management Techniques

March 20-21, 2001, Seattle. \$445/475.

### Stormwater Treatment: Chemical, Biological and Engineering Principles

January 24-25, 2001,  
Seattle. \$495/525.

## University of Washington Engineering Professional Programs (EPP) Engineering Refresher Courses

Contact Susan Stone  
(206) 543-5539, fax (206) 543-2352  
<http://www.engr.washington.edu/epp>

To register for a class in this section use the contact listed above.

### Cold Regions Engineering Short Course

November 2-6, Seattle; January 4-8, Seattle.  
\$1,095/\$1,155.

### Mechanical Engineering Refresher

September 7-October 17, Seattle.  
Tuesday/Thursday 6:30-9:00 pm. \$495.  
After August 30: \$565.

### Civil Engineering Refresher

September 12-October 17, Seattle.  
Tuesday and Thursday 7:00-9:30 pm. \$395.  
After August 31: \$465.

### Fundamentals/Engineer-In-Training Refresher

September 11-October 18, Seattle.  
Mondays and Wednesdays 6:30-9:00 pm. \$395.  
After August 31: \$465.

### Drilling and Blasting Techniques for Construction and Quarrying

February 5-9, 2001. Contact EPP for further information.

## Associated General Contractors of Washington (AGC)

Contact David Hymel  
(206) 284-4500, fax (206) 284-4595  
<http://www.agcwa.com>

To register for a class in this section use the contact listed above.

### Construction Site Erosion and Sediment Control Certification

Cost: \$159. This course is the same one that has previously been taught by WSDOT, which is no longer available to local agencies. The AGC is working with WSDOT to offer the same course to locals.

### 2000 Schedule

Sept. 6-7 Seattle  
Sept. 20-21 Tacoma  
Oct 17-18 Shoreline  
Oct. 26-27 Spokane  
Nov. 29-30 Kennewick  
Dec. 7-8 Everett  
Dec. 13-14 Mt. Vernon

### 2001 Schedule

Jan 10-11 Vancouver  
Jan. 24-25 Kent  
Feb. 7-8 Olympia  
Feb. 21-22 Seattle  
Mar 7-8 Moses Lake  
Mar. 21-22 Yakima  
Apr. 4-5 Seattle  
Apr. 18-19 Tacoma  
May. 9-10 Shoreline  
May. 16-17 Seattle



## Conferences and Meetings

**Pacific Northwest Transportation Technology Expo**  
September 12-14, 2000, Grant Co. Fairgrounds, Moses Lake, WA. Free. For all engineers, superintendents, supervisors and technicians involved with transportation construction, maintenance, and operations. Three days of demonstrations and displays of the latest tools, materials, and services to make your maintenance and operations dollars go farther. See how current research projects can help you do your work better with practical information you can apply today. No registration, just show up. For information call: Dan Sunde (360) 705-7390, [sunded@wsdot.wa.gov](mailto:sunded@wsdot.wa.gov) or Clay Wilcox (360) 705-7861, [wilcoxc@wsdot.wa.gov](mailto:wilcoxc@wsdot.wa.gov).

**American Public Works Association  
Washington State Chapter Fall Conference**  
September 26-29, 2000, Red Lion Hotel, Kelso. Call Bob Gregory (360) 577-3376 or email: [apwa.fall2K@ci.longview.wa.us](mailto:apwa.fall2K@ci.longview.wa.us) for information.

**Road and Street Maintenance Supervisors' School**  
East: October 3-5, 2000; West: December 5-7, 2000. For further information contact WSU's Conference and Institutes at (509) 335-3530.

**Northwest Pavement Management  
Association Conference**  
October 9-12, 2000, Columbia Doubletree, Portland, OR

**39th Annual Idaho Asphalt Conference**  
Thursday, October 19, 2000, Moscow, Idaho. For information contact the University of Idaho's Conferences and Events at (208) 885-6662.

**Fifth International Conference on  
Managing Pavements**  
August 11-14, 2001, Seattle. For more information contact University of Washington at (206) 543-5539.

**11th Northwest On-Site Wastewater Treatment  
Short Course and Equipment Exhibition**  
September 17-18, 2001. Contact the University of Washington's Engineering Professional Programs at (206) 543-5539 for further information.

## WSDOT Engineering Publications

### CD Library...

- saves money, time, and space timely, convenient, and portable
- searches words and topics throughout the entire CD
- provides quick reference and navigation through hypertext linking
- ensures use of the most up-to-date manual
- allows multiple users via a Local Area Network
- runs on Macintosh, Win 95, Win NT, and Win 3.x
- allows quick, flexible, high quality printing of hard copies
- provides access to standard WSDOT and LAG "intelligent" forms



**A \$15 two-year subscription provides over 41 manuals fully updated every six months along with over 150 standard WSDOT forms. Order yours today!**

**Contact Matt Love, WSDOT Engineering Publications,  
at [LoveM@wsdot.wa.gov](mailto:LoveM@wsdot.wa.gov) or (360) 705-7430.**



## Washington State T2 Advisory Committee

**Phil Barto**, Chairman, Maintenance Engineer  
Spokane County, (509) 477-7429

**Gary Armstrong**, Public Works Director  
City of Snoqualmie, (425) 888-5435

**Joe Bonga**, Road Construction/Maint.  
Bureau of Indian Affairs (503) 231-6712

**Mike Deason**, Public Works Director  
City of Leavenworth/APWA (509) 548-5275

**Randy Hart**, Grants Program Engineer  
County Road Administration Board  
(360) 586-7586

**Marjorie Hutchinson**,  
South Zone Engineer/Wenatchee National  
Forest, USFS  
(509) 653-2205 ext.261

**Will Kinne**, Road Operations Manager  
Pierce County, (253) 798-2953

**Jack Manicke**, Road Maintenance Specialist  
Olympia Service Center, WSDOT  
(360) 705-7852

**Phil Meyer**, Maintenance Coordinator  
Whitman County/EWCRS, (509) 397-6209

**Walt Olsen**, County Engineer  
Pend Oreille County, (509) 447-4513

**Craig Olson**, Government Services Manager  
ENTRANCO, APWA, (360) 709-0301

**Tom Rountree**, Supervisor  
King County Public Works, (206) 296-8100

**Jim Seitz**, Transportation Specialist/NWPMA  
Association of Washington Cities  
(360) 753-4137

## Exofficio Members

**Cathy Nicholas**, Pavement Engineer,  
T2 Coordinator, FHWA, (360) 753-9412

**Ovidiu Cretu**, WSDOT Staff Development,  
(360) 705-7066

**Kathy Lindquist**,  
Research Implementation Manager WSDOT,  
(360) 705-7976

**Richard Rolland**, Director  
NW Tribal LTAP, (509) 358-2225

## Washington State T2 Staff

**Daniel L. Sunde**, WST2 Director  
SundeD@wsdot.wa.gov  
(360) 705-7390

**Roger Chappell**, Technology Integration Specialist  
ChappeR@wsdot.wa.gov  
(360) 705-7539

**Laurel Gray**, Training Coordinator  
GrayL@wsdot.wa.gov  
(360) 705-7355

**Vacant**, Pavement Technology Engineer  
(360) 705-7352

**David Sorensen**, Traffic Technology Engineer  
SorensD@wsdot.wa.gov  
(360) 705-7385

**Wendy Schmidt**, T2 Assistant  
SchmidW@wsdot.wa.gov  
(360) 705-7386

**John Easley**, Road Show Trainer  
(360) 705-7386

**Fax**  
(360) 705-6858

**WST2 Web Site**  
[www.wsdot.wa.gov/TA/T2Center/T2hp.htm](http://www.wsdot.wa.gov/TA/T2Center/T2hp.htm)

**Toll Free Training Number**  
1-800-973-4496



**Washington State Technology Transfer Center**  
WSDOT-H&LP Service Center  
P.O. Box 47390  
Olympia, Wa 98504-7390

[www.wsdot.wa.gov/TA/T2Center/T2hp.htm](http://www.wsdot.wa.gov/TA/T2Center/T2hp.htm)

**Published by:**

WSDOT Highways & Local Programs Service Center  
Washington State Technology Transfer Center  
310 Maple Park Ave. SE  
PO Box 47390  
Olympia, WA 98504-7390

**Secretary of Transportation:**

Sid Morrison

**Assistant Secretary, H&LP:**

Paula Hammond, PE

**Director of Technology Transfer:**

Dan Sunde, PE



**Washington State  
Technology Transfer Center**  
Local Technical Assistance Program



**Washington State  
Department of Transportation**



**U. S. Department of Transportation  
Federal Highway Administration**

**Publication Editor:**

Dan Sunde, PE

**Graphic Designer:**

Laura Walker

**Staff Writers:**

Roger Chappell  
Laurel Gray  
Wendy Schmidt

**Produced by:**

T2 Bulletin  
A Newsletter of the  
Local Technology  
Assistance Program  
(LTAP)

# T<sup>2</sup> Bulletin

**Issue 67, Summer 2000**

**T**he Local Technical Assistance Program (LTAP) is a national program financed by the Federal Highway Administration (FHWA) and individual state transportation departments. Administered through Technology Transfer (T2) Centers in each state, LTAP bridges the gap between research and practice by translating state-of-the-art technology into practical application for use by local agency transportation personnel.

*Any opinions, findings, conclusions, or recommendations presented in this newsletter are those of the authors and do not necessarily reflect the views of WSDOT or FHWA. All references to proprietary items in this publication are not endorsements of any company or product.*