A SNAPSHOT OF SUMMER 2001 WORK ZONE ACTIVITY

Based on Information Reported on State Road Closure and Construction Websites

FINAL REPORT

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TABLE OF CONTENTS

1. Executive Summary

In a study sponsored by the Federal Highway Administration (FHWA), researchers conducted a survey of 789 work zones posted on 13 state road closure and construction websites during a two-week snapshot of the peak summer roadwork season in 2001. The goal of this study was to catalogue the work zone related content of these websites and explore the use of the data obtained to estimate national-level statistics such as the number of miles on the National Highway System (NHS) with work zones during the peak of the summer roadwork season.

The number of work zones as well as the data reported by each state varied widely, because states have different criteria for selecting work zones for posting on the web. Some states reported many work zones but provided fewer data elements while others reported on fewer work zones but provided more data elements. Attributes of roadwork that are determined early and are unlikely to change were more frequently reported, e.g., project duration and purpose (Table 1(a)). Less frequently reported elements included attributes that are difficult to predict in advance or those that change frequently (such as work zone length, and the time-of-day when lane closures occur). Predictions of delay beyond a simple advisory are rare, particularly quantitative estimates of delay.

Work Zone Attribute	Reporting Frequency
Purpose	78%
Project Duration	71%
Number of Lanes Closed	37%
Delay (Advisory)	26%
Closure Duration	22%
Length	18%
Delay (Quantitative)	7%
Cost	4%

Table 1(a). Frequency of Reporting By Work Zone Attributes

For the work zones that reported particular attributes, various statistics could be drawn from the data obtained. For example, looking at reported lane closures by time of day, we estimated that 58% of work zones were active or had lane closures primarily during daylight hours, 33% were primarily night work, and 9% were active nearly around the clock (Table 1(b)). The average work zone had lane closures for 11 hours a day and occupied 6.8 miles of roadway for an average of 125 days.

The most frequent reported purposes for work zones were bridge-related roadwork (28%) and pavement operations (24%). Pavement operations had a much higher frequency of night activity: two-thirds of all resurfacing/paving activity was conducted as night work.

Reported Time of Day, Work Zone Activity or Lane Closures	Frequency
Day Work	58%
Night Work	33%
Continuous Work	9%

Table 1(b). Work Zone Activity By Time of Day

From the data obtained, it was possible to construct rough estimates of several national-level statistics. The 13 states in our sample contain 24.5% of the total miles of NHS. Excluding work zone records associated with non-NHS facilities, we estimated that there were 3,110 work zones on the National Highway System at any time during the peak summer 2001 roadwork season. Similarly, we estimated that these work zones on the NHS covered 20,876 miles of roadway, or 12.8% of the 163,734 miles of NHS-designated roadway.

Further, based on lane closure data we estimated that the work zone activity on the NHS resulted in a loss of over 60 million vehicles of capacity per day. Between 9 AM and 10 AM, the most frequent hour of roadwork activity, the collective impact of work zones on the NHS was estimated as equivalent to 2,672 lane-miles of freeway, or roughly the carrying capacity associated with one direction (three lanes) of a six-lane interstate connecting Washington, DC to St. Louis, MO. National estimates of delay and productivity impacts could not be determined.

2. Introduction

In response to increases in work zone fatalities and evidence of growing traveler frustration with delays associated with work zones, in 2001 the Federal Highway Administration (FHWA) Work Zone Mobility and Safety Program initiated an effort to measure and report national-level statistics on work zone exposure and delay. Lack of data on the number and type of work zones from year to year have made focusing program efforts and formulating national policy on work zone mobility and safety difficult. Increases in fatalities or delay could not be examined with respect to key factors such as the level of nationwide work zone activity or exposure, which may have similarly increased.

One approach to the development of national statistics on work zone activity is the automated capture and interpretation of work zone data posted to state road closure and construction websites. In order to assess the potential value of these web-based resources as a part of national monitoring program, researchers conducted a "snapshot" survey of 789 work zones posted on state road closure and construction websites during a two-week period in the peak summer roadwork season of 2001.

The goal of this study was to estimate the number of miles on the National Highway System (NHS) with work zones during the peak of the summer season, and to estimate total system capacity lost from these activities. Researchers catalogued the work zone-related data elements posted by various states to their road closure and construction websites. These data were captured and analyzed to develop an estimate of work zone activity and its characteristics.

3.1 Methods

Data for this effort was collected from web-based resources linked to the National Traffic and Road Closure Information page (www.fhwa.dot.gov/trafficinfo/). Of the 50 state and other resources listed, data on individual roadway projects and their associated work zones in 13 states were electronically captured and downloaded over the two-week period 25 June – 10 July 2001.

The selected states (Arizona, Idaho, Indiana, Kansas, Kentucky, Montana, Nebraska, Nevada, Oregon, Tennessee, Utah, Virginia, Washington) are shown in Figure 1 with the number of work zones posted by state. In total, these states posted information on 789 work zones on the reviewed websites. The 13 states used for this study were not randomly selected – instead, the states were selected based on the number of work zones described and the amount of detail provided for each work zone. The data were organized differently from state to state, and in many cases descriptions provided in text form, so an analyst was required to inspect and code each record.

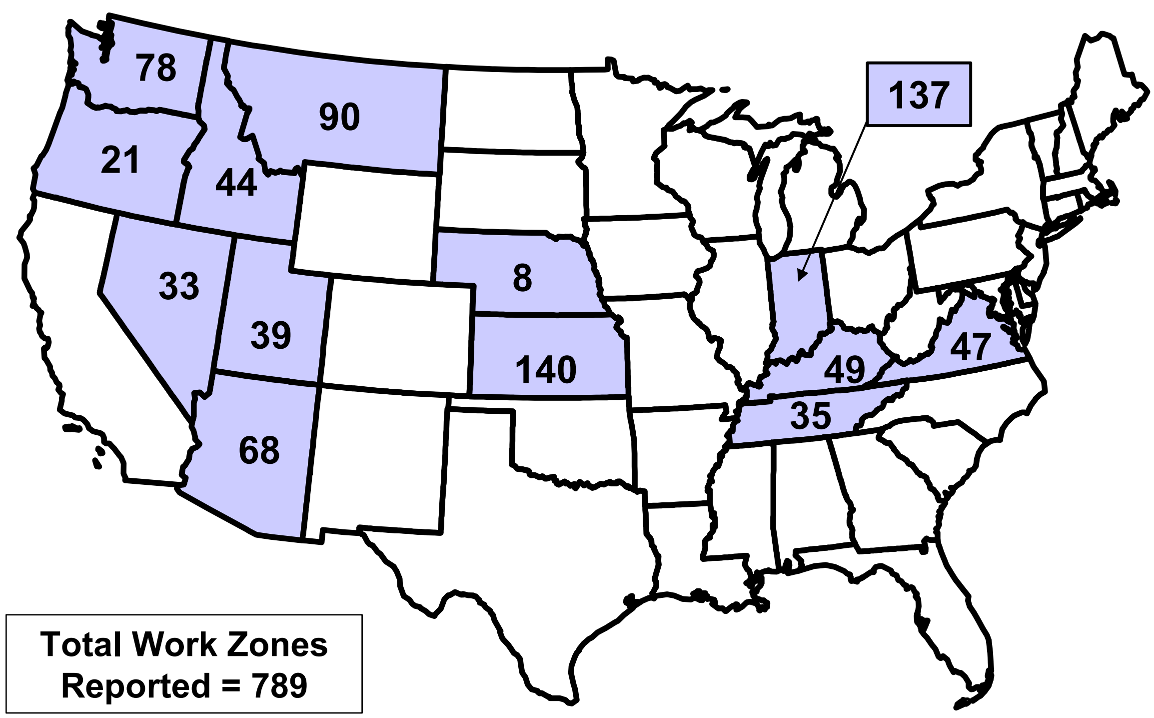

Figure 1. Number of Work Zones Reported By State on Web-Based Resources

The categories of data captured and coded from each web record were:

- State
- Roadway Name
- Facility Type (Interstate or US; State; Local)
- Project or Work Zone Length (miles)
- Project Start Date
- Project End Date
- Closure Type or Capacity Impact Description (text description)
- Capacity Impact Code (None; Shoulder or Adjacent; Number of Lanes Closed; Full Closure)
- Time of Day Lane Work Activity or Lane Closures Begin
- Time of Day Lane Work Activity or Lane Closures End
- Expected Delays (text description or number of minutes)
- Purpose Code (e.g., Bridge Construction/Repair; Pavement Milling/Sealing/Striping)
- Project Cost

Not all data elements were available in each web record. For example, 619 of the 789 work zones (78%) reported the purpose of the project. Also, 175 of the 789 work zones (22%) reported activity or lane closures by time of day. Table 2 summarizes the reporting frequency of each data element for all 789 work zone records.

		Percent (%) of Work Zones Reporting:						
State	**Number of Work Zones Reported**	**Length**	**Project Duration**	**Number of Lanes Closed**	**Closure Duration**	**Delay**	**Purpose**	**Cost**
Arizona	68	57	94	43	96	13	47	0
Idaho	44	0	95	64	9	2	100	36
Indiana	137	5	99	16	2	0	93	0
Kansas	140	8	100	4	0	95	94	0
Kentucky	49	78	2	63	0	43	4	0
Montana	90	6	0	40	1	0	96	3
Nebraska	8	25	100	0	0	0	38	0
Nevada	33	0	45	36	79	3	39	0
Oregon	21	62	57	67	48	5	57	0
Tennessee	35	43	0	94	14	17	86	0
Utah	39	13	95	51	36	33	92	0
Virginia	47	11	94	38	9	26	64	0
Washington	78	3	83	58	62	6	91	15
Average	**61**	**18**	**71**	**37**	**22**	**26**	**78**	**4**

Table 2. Data Element Reporting Frequency by State

Each state reports work zone data independently. The state-by-state data in Table 2 shows that some data elements appear more frequently in some states than in others. One key observation is that some states report on many work zones but provide fewer data elements (e.g., Indiana) while others report on fewer work zones but provide more data elements (e.g., Washington). A second observation is that no state provides all data elements for all work zones.

Table 2 shows that attributes of roadwork that are set early in the planning process and are unlikely to change are more frequently reported. These data elements include such basic attributes as project duration and purpose. Less frequently reported elements are work zone attributes that are difficult to predict in advance or those that may change on a daily, weekly or monthly basis. These data elements include the work zone length, the number of lanes to be closed, and the time-of-day when lane closures occur.

Uncertainty in the reporting of some data elements is also reflected in increasing ambiguity. In the case of lane closures, it is unclear whether the intervals reported are the times of day when a traveler *may* encounter lane closures or times of day when a traveler *is certain* to encounter a lane closure. Expected delay, particularly quantitative estimates of delay, is very infrequently reported. The dearth in delay reporting reflects the fact that delays are not typically estimated in detail prior to the start of roadwork and are not typically monitored precisely once roadwork is underway. The data elements included on websites also reflects that the target audience for these websites ranges from roadwork contractors and DOT personnel to the traveling public. In many cases data elements that may be of more interest to contractors and DOT personnel (e.g., project location and purpose) are easier to estimate and are frequently reported. Data elements of interest to the traveler (e.g., quantitative estimates of delay) are harder to estimate and are less frequently reported.

The web-based resources report almost exclusively on the facilities that reflect state DOT responsibilities: interstates, US highways, and state routes. Table 3 shows that although some local street work is reported on some websites, the focus of the web-based resources examined is on roadwork contracted and overseen by the state DOT.

Clearly, additional roadwork also occurs within the boundaries of the states considered here. We do not know how many work zones are set up by the state but not reported on the website, nor can we infer a level of work zone activity overseen at the county or local level. Therefore, the data collected in this study from state websites was a subset and should not be construed as a completely representative illustration of all maintenance and construction activity across the nation.

		Percent (%) of Reported Work Zones		
State	Number of Work Zones Reported	Interstate / US Hwy	State Highway	Local
Arizona	68	57	41	1
Idaho	44	68	32	0
Indiana	137	55	46	1
Kansas	140	74	26	0
Kentucky	49	61	43	0
Montana	90	61	38	1
Nebraska	8	50	50	0
Nevada	33	58	15	21
Oregon	21	62	24	0
Tennessee	35	97	0	0
Utah	39	36	23	36
Virginia	47	60	40	0
Washington	78	27	67	4
Average	61	59	37	3

Table 3. Facility Type Reported With Work Zone by State

3.2 Other Web Resources for Work Zone Information

In addition to the web-based resources used for data collection in this study, several of the states also participate in partnerships with various federal, state and local bodies. The partnerships agree to provide regional lane closure information through contracted Web services. Although we did not utilize these resources for this study, we note them here for completeness. For example Ohio, Kentucky, Indiana and the FHWA are in a partnership to provide support for the Advanced Regional Traffic Interactive Management & Information System (ARTIMIS) (www.artimis.org). This web site reports information similar to that collected in this study. An independent contractor operates the system. Likewise, the I-95 Corridor Coalition sponsors a web site (www.i95coalition.org/traveler_info.htm) that provides information on lane closings, bottlenecks and upcoming events throughout the I-95 corridor. Some information is posted weekly. Other information is provided as a yearly forecast of expected traffic disruptions. This site also provides information on broader policy issues of interest to this group. These issues include electronic payment systems, commercial vehicle operations and intermodal transfer of people and goods.

Some states have a few projects that have project specific websites, such as Virginia's Springfield Interchange project (www.springfieldinterchange.com.) These resources are typically maintained by a project contractor or consultant, and feature various combinations of: project histories, newsletters, maps, safety information, alternative modes, technical information, media contact information, and frequently asked question (FAQ) support. Real-time or predicted delays through the work zone are seldom reported for these sites. This information is not typically captured during the construction phase of a project. These sites offer additional detail on work zone operations beyond the information presented in the statewide resources used in this study. However, there are too few of these sites to support statewide or nationwide sampling.

Some private sector websites also post information on work zones. For example, MapQuest (www.mapquest.com/traffic/main.adp) provides a summary of work zone information by location for many large metropolitan areas (64 in late 2001). However, these private sector sites generally provide less detail on work zone activity than public sector resources.

In this section, aggregate statistics are presented on the data elements collected. First each data element is discussed, followed by a characterization of work zone attributes by four major purpose categories. We then present a methodology for the estimation of several national-level statistics from the data collected. This includes the total number of work zones on the NHS, the percent of NHS with a work zone, and a national estimate of capacity loss from work zones.

4.1 Length of Work Zones

The state web sites either directly reported length of work zones or reported data from which length can be inferred for 142 (18%) of the 789 work zones in the analysis. The data obtained by inference here was primarily from web records that report roadwork from one milepost to another on the facility. The average recorded work zone length was 6.8 miles and the median length was 4.0 miles. A histogram of the work zone length data is provided in Figure 2. Note that work zones varied greatly in length, from less than 1 mile to 20 miles or longer. The longest work zone reported in the data covered 88 miles of State Route 260 in Arizona. More than half of the work zones with posted length data came from three states: Kentucky, Arizona and Oregon. Two states (Idaho, Nevada) did not report work zone length for any projects.

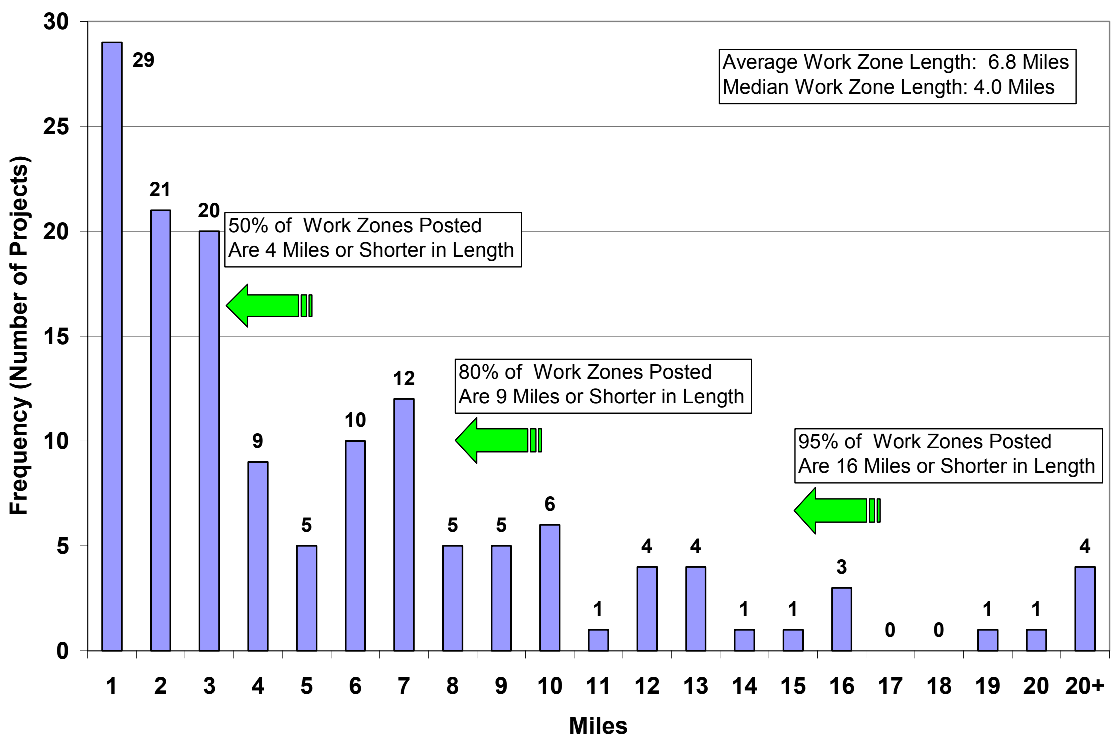

Figure 2. Distribution of Work Zone Length (142 Work Zones)

4.2 Work Zone/Project Duration

Duration is defined as the number of days between the reported start and end date, and is one of the most widely reported statistics. Start and end dates were reported for 563 (71%) of the work zones, with an average duration of 125 days (about 4 months) and a median of 65 days (about 2 months). A histogram of duration is illustrated in Figure 3. Note that the majority of the projects were 1-6 months in duration, which is not surprising given the nature of peak summer construction season activity.

Duration was widely reported in the state websites studied. It was clear that some states are reporting project durations (a year or more in some cases) while others reported the duration of currently posted lane closure or work zone activity. Sometimes it was unclear whether the indicated duration describes a single phase (e.g., a two-week demolition phase) of a larger project (e.g., a multi-year rehabilitation) or the entire project. In many cases there was no data to support categorizing the reported duration as either project, phase or lane closure duration. Because of this ambiguity, we report all durations here in a single category.

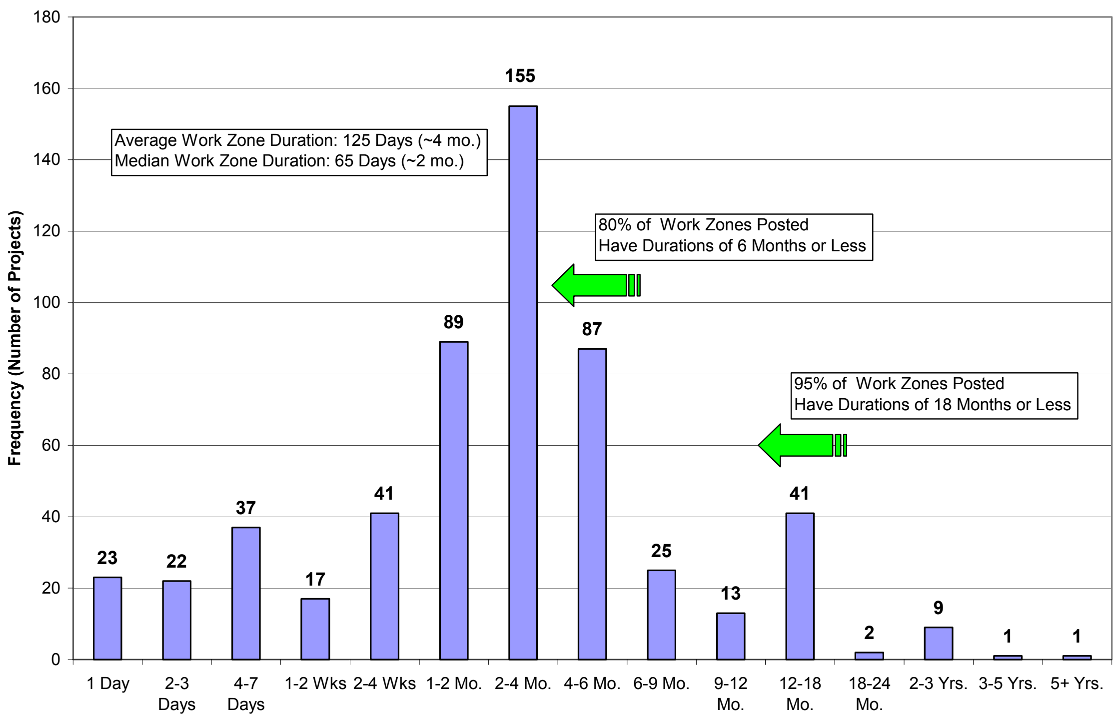

Figure 3. Distribution of Work Zone Duration (563 Work Zones)

4.3 Hours of Activity or Lane Closures

For a total of 175 work zones (22%), states reported the time of day when either the work zone had lane closures in place or had activity in the work zone that was likely to have an impact on roadway capacity. Like the ambiguity with respect to project and work zone duration, hours of work zone activity and lane closures are reported together here since they cannot be clearly differentiated. For simplicity, we lump these items together as capacity reductions to the roadway. These data elements were dominated by reports from Washington, Arizona and Nevada. However, each state reported lane closures by time of day for at least one of its work zones.

The average number of hours of capacity reduction reported was 11 hours per day, with a median of 10 hours. A histogram showing the various hours of lane closures/activity per day is shown in Figure 4. This data was further stratified into three work zone subgroups:

- those with capacity impacts of 18 or more hours per day
- those that were active (or with lane closures) primarily at night
- those with capacity impacts primarily during daylight hours.

Note that daywork average duration and nightwork average duration were quite similar (roughly 9 hours) but that daywork had wider variation. That is, very short and relatively long days were common for daywork, whereas nightwork was tightly clustered around durations of 7-9 hours – indicating that if nightwork is conducted, it is conducted all night rather than just one portion of the hours of darkness.

The data can also be arranged to show capacity impacts by time of day, broken down by 30-minute periods (illustrated in Figure 5). Figure 5, again stratified by night, day and all-day subgroups, illustrates that 33% of work zones had capacity impacts primarily at night, 58% in the daytime hours, and 9% all day or nearly all day (18+ hours).

The data also show that the most frequent hour of work zone capacity impact was 9 AM to 10 AM, when 67% of the work zones were found to be either active or have lane closures, while the least frequent hour was 6 PM to 7 PM when only 19% of work zones were found to have a capacity impact. Note that some work zones that are primarily nightwork can extend into the mid-morning hours; likewise, work zones that are primarily daywork sometimes extend into the late evening.

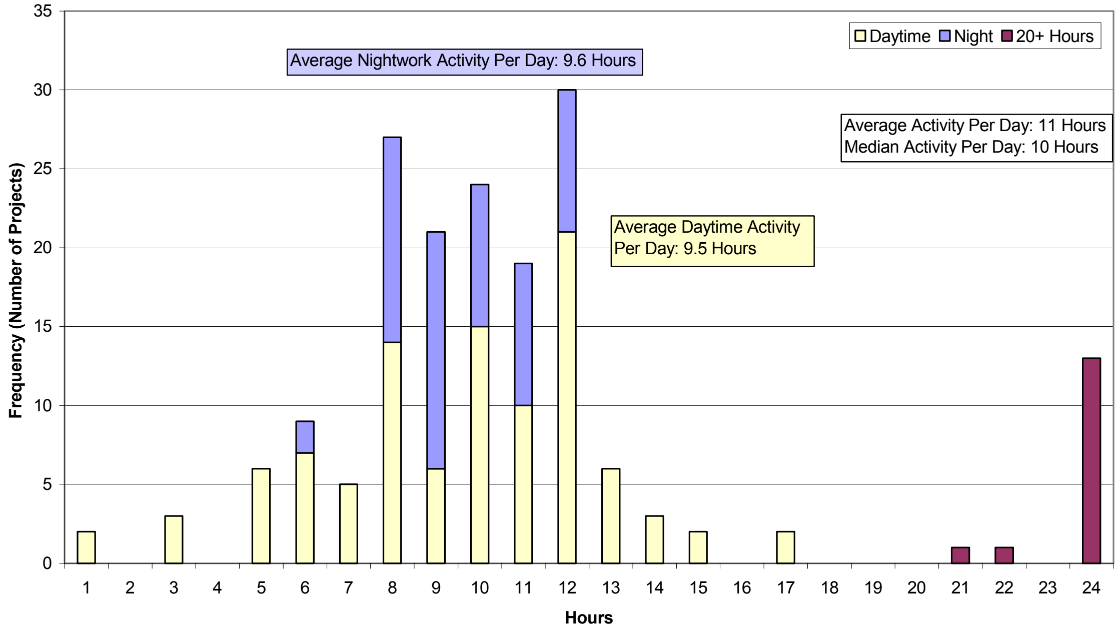

Figure 4. Distribution of Daily Duration, Work Zone Activity/Lane Closures (175 Work Zones)

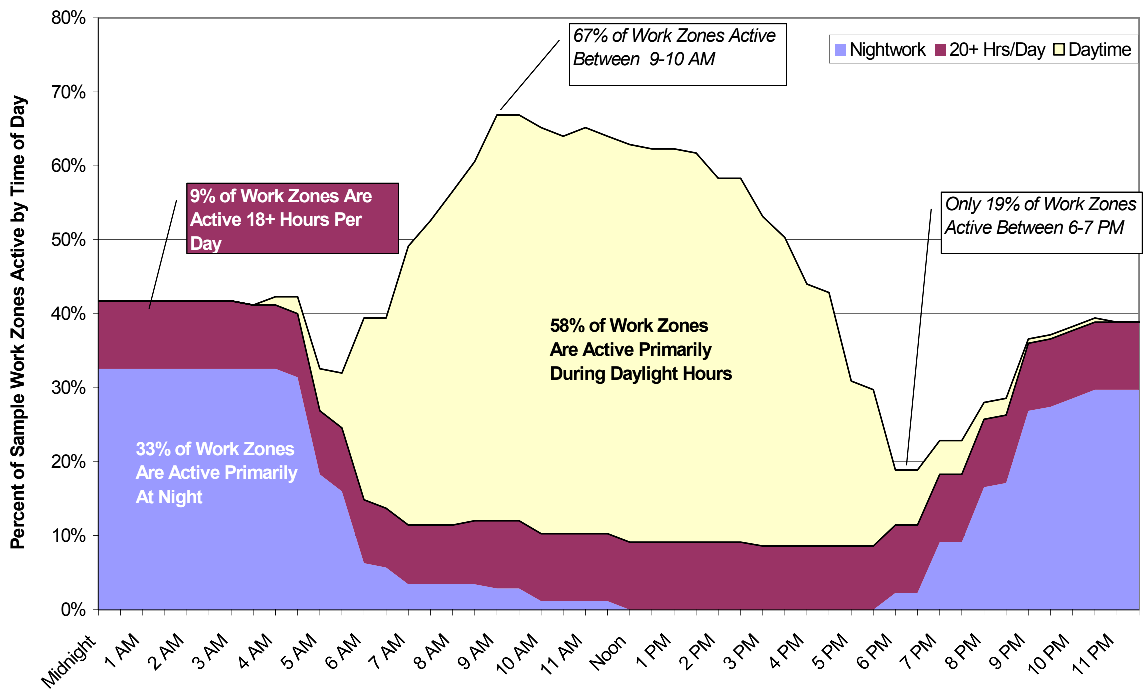

Figure 5. Work Zone Activity/Lane Closures By Time-of-Day (175 Work Zones)

4.4 Delay Impacts Estimation

Expected impacts on delay were reported for 26% of work zones. This included reports stating that no delay was expected. For the other 74% of work zones, the websites did not provide an indication of whether delays could be expected. Quantitative estimates of delay were quite rare, appearing in only 7% of the work zone reports. Of these 56 work zones reporting quantitative delays, the average expected delay was roughly 12 minutes. No site provided expected delays by time-of-day or separate forecasts for approaches to the work zone from various directions of travel.

4.5 Construction/Maintenance Project Purpose

The purpose of the roadwork activity was a widely reported attribute of projects across all states (78% of all work zones). In some cases, there was a state-standard set of purposes, while in other cases freeform text descriptions had to be interpreted. We grouped the records into four categories and nine sub-categories of construction and maintenance work:

- Bridge work (construction or repair)
- Roadway construction/reconstruction
  - Roadway reconstruction
  - New interchange or roadway construction
- Pavement milling/sealing/striping/resurfacing
- Incidental construction/other
  - Shoulder work or installation of roadside equipment
  - Erosion control or grading
  - Demolition
  - Lane-widening
  - Other.

Figure 6 shows the frequency of each activity. Bridge construction was the most likely purpose reported, followed by pavement maintenance and roadway reconstruction. In general, we observed that a work zone was more likely to be posted to a state website if it was a large project or one that closed a facility. This likely over-representation of big projects with road closures helps to explain the large percentage of bridge-related activity posted to the state websites. Clearly, there are many more mobile work zones or short-term maintenance activities in these jurisdictions that cannot be identified by capturing only data posted to state DOT websites.

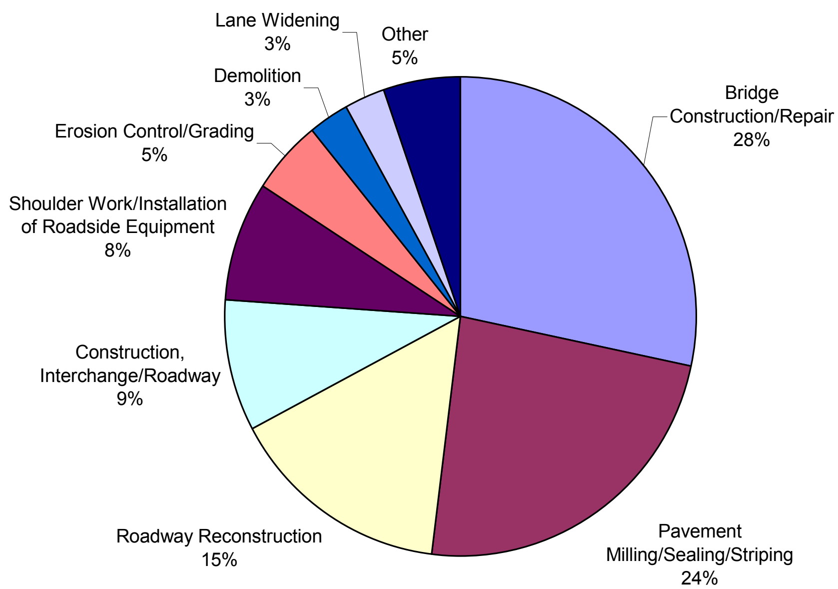

Figure 6. Work Zone Purpose (619 Work Zones)

4.6 Characteristics of Work Zones by Project Purpose

Next, we examined characteristics of work zones for the four project purpose categories:

- Bridge work
- Roadway construction/reconstruction
- Resurfacing/Paving
- Incidental construction/other

To characterize work zone attributes by general category, the data was processed to identify values for project duration, length, and hours of activity per day, as shown in Tables 4(a)-(c). Observations based on the data are presented below.

	Duration (number of days)		
Type of Work	Average	Median	Maximum
Bridge Work	130	79	1615
Roadway Construction/Reconstruction	163	90	2193
Resurfacing/Paving	104	65	607
Incidental Construction/Other	89	43	544

Table 4(a). Duration By Purpose Category

	Length (miles)		
Type of Work	Average	Median	Maximum
Bridge Work	3.1	1.5	10.0
Roadway Construction/Reconstruction	3.5	2.5	13.0
Resurfacing/Paving	13.9	10.0	104.0
Incidental Construction/Other	4.6	3.5	20.0

Table 4(b). Work Zone Length by Purpose Category

	Activity Per Day (hours)		
Type of Work	Average	Median	Maximum
Bridge Work	11.2	10.0	24.0
Roadway Construction	12.3	10.8	24.0
Resurfacing/Paving	12.3	11.0	24.0
Incidental Construction/Other	10.2	10.0	24.0

Table 4(c). Activity Per Day by Purpose Category

Bridge Work can be characterized as having relatively short length and long duration. One of the factors leading to a high duration for bridge work is the long cure times for concrete. Roughly two-thirds of all bridge work activity takes place during daylight hours, generally matching the overall observed pattern of two-thirds daywork vs. one-third nightwork.

Roadway Construction/Reconstruction had the longest duration, most likely because this work is largely reconstruction of existing facilities and much time is expended trying to construct new lanes in the midst of existing traffic. The physical length of these projects is relatively short, which is not surprising since these projects are generally intensive in nature. The split of daywork (two-thirds) and nightwork (one-third) followed the average for all roadwork observed.

Resurfacing/Paving demonstrated attributes different from any of the other categories. Pavement operations showed the longest length and fairly short project duration. The majority of this work was likely maintenance work where crews are able to cover a lot of territory in a short period of time. This work can often be performed at night without significant loss in quality and at reduced exposure to traffic. The ratio of nightwork to daywork was reversed for paving operations compared to the other three categories: roughly two-thirds of all pavement operations took place at night.

Incidental Construction/Other had the shortest duration and was performed primarily as daywork. This category is difficult to characterize further as it represents a disparate mix of construction and maintenance activities.

4.7 Estimating Percent of National Highway System With Work Zones

Records pertaining to roadwork on interstates, US highways and state roadways represented 97% of the work zones posted to the state websites. A visual inspection of NHS highway maps and records from both Arizona and Washington revealed that, in addition to all interstate and US highway work zones, the majority of state roadways with work zones were also NHS roadways. The exclusion of local street records yielded 762 NHS work zones. From an analysis of work zone length, an average of 6.8 miles per work zone on interstates, US highways, and state roads was obtained. Multiplying the 762 NHS work zones by the average length of 6.8 miles yielded a total of 5,115 miles of NHS roads with a work zone in the 13 states. Based on NHS statistics (http://www.fhwa.dot.gov/hep10/nhs/index.html), we determined that the 13 sample states represented 24.5% of the 163,734 miles of roadway on the NHS. During the two-week study period in the sample, the 5,115 miles of NHS under construction scaled up to an estimate of 20,876 miles (or 12.8%) of the NHS under construction nationwide. Similarly, we estimated 3,110 work zones on the NHS during the study period.

4.8 Capacity Impacts Estimation

States provided data on likely capacity impacts for 71% of the work zones in the data set (557 sites). Of these, 79% indicated lane closures ranging from a single, hour-long lane closures to the complete closures of roadway facilities. The remainder indicated intermittent lane closures, lane narrowing, or shoulder work that would have some impact on roadway capacity.

Capacity loss from work zones was first calculated by examining the facility type. Interstate and US highways were assumed to have 3 lanes in each direction and have a carrying capacity per lane of 2000 vehicles per lane per hour. State roadways were assumed to have 2 lanes in each direction with per lane carrying capacities of 1500 vehicles per lane per hour. Based on text descriptions of each work zone, each record was coded as either shoulder or indirect work, the number of lanes closed, or full closure. A percentage reduction in roadway capacity was estimated in each case using the Highway Capacity Manual (2000). For example, shoulder work on an interstate was estimated to cause a drop in capacity of 10% (600 vehicles per hour), while a one-lane closure reduced capacity by 50% (3000 vehicles per hour). Using these estimates and the data available for each work zone, these impacts are estimated to generate an average loss of capacity by work zone of 2,565 vehicles per hour. Multiplying this figure by the average work zone duration of 11 hours per day generates a total loss in carrying capacity equal to 28,215 vehicles per day per work zone. Expanding to the work zones in the sample set (excluding local roads), this scales to over 15 million vehicles per day of lost capacity. Scaling to the national level (by the proportion of NHS in each state) we obtain a lost capacity of nearly 60 million vehicles per day from work zones on the NHS.

During the most frequent hour of activity (9AM to 10AM), we estimate that 2,084 work zones (67% of 3,110 work zones) have lane closures or roadside activity reducing capacity on the NHS by an average of 2,565 vehicles per hour. Collectively, this capacity loss is equivalent to 2,672 lane-miles of interstate roadway (rated at 2000 vehicles per hour per lane), roughly the same as one direction (three lanes) of a six-lane freeway connecting Washington, DC to St. Louis, MO.

While the data obtained can be combined with some rule-of-thumb assumptions to provide a rough estimate of capacity loss, a defensible quantitative estimate of road user delay or loss of productivity caused by these work zones cannot be made from the data. It is clear that a nighttime lane closure on a stretch of rural interstate reduces capacity, but it may have little or no impact on road user delay or productivity. On the other hand, failing to restore a single lane of urban freeway in a timely manner at the start of the afternoon peak travel period may cause extensive delays that persist well into the evening. The impact of work zones on delay and productivity are directly linked to detailed attributes such as temporal travel demand and availability of alternative routes, as well as precise estimates of capacity loss by time of day. These attributes are almost never reported in the state web resources identified in this study. As part of ongoing FHWA work zone efforts, researchers are currently seeking to identify other data sources (contracting records, automated traffic data repositories, etc.) that might be utilized to estimate delay, productivity, worker/road user exposure and other key measures.

5. Implications and Conclusions

The web-based resources examined in this study are an attempt by the states to keep a variety of audiences informed, including the traveling public. When accessing one of these sites, a user can fairly consistently find an approximate roadway location of a work zone, the purpose of the closure, and what type of capacity loss can be expected (e.g., shoulder work or number of lanes closed). From a construction and maintenance standpoint, this is readily available information that changes the least throughout the project. However, there is additional information that is critical for a traveler to know. Information such as lane closure beginning and end time, dates, and expected delay are critical decision factors for a motorist. These data however are far less frequently reported. One possible explanation for this is that this data changes more frequently. For project personnel, coordinating and scheduling the many resources for a lane closure and associated work can be difficult, with dates and times changing often. It is hard to predict months or weeks in advance when certain lane closures may occur. Detailed information almost needs to be reported within hours of a lane closure. Depending on how sophisticated the linkage between the work zone personnel and the web resource, this information may not be posted in time to be useful. The posting of this critical data is limited by the difficulty in obtaining accurate information and making reliable estimates of delay well in advance of the actual lane closure.

Further, many of the critical data elements needed for travelers are not critical to the completion of the roadwork. Measurement of delay, for example, is rarely required of construction and maintenance personnel. Qualitative statements of delay (major or minor) may be posted, most often based on an educated guess or manual count.

Ideally, work zone web resources targeted for traveler use would report the following information on work zone activity:

- Start and end dates
- Lane closures or other roadway capacity impacts by date and time of day
- Location of work zone
- Number of lanes closed
- Estimated delay by direction of approach and time-of-day.

Overall, the web-based resources identified during the snapshot study provide enough detailed data to allow for rough estimation of several national-level measures related to the number, prevalence and capacity impacts of work zones. However, data acquired from these websites are unlikely to be completely representative of all work zones, since, until now, the websites primarily focus on larger projects under state DOT jurisdiction. In addition, there is significant ambiguity in the reporting of several data elements, including project/work zone duration and hours of lane closure or work zone activity. Therefore, the national estimates should be considered indicative rather than authoritative figures.

Based on data collected from a subset of 13 state web resources linked to the Federal Road Closure Information page, we estimated that there were 3,110 work zones on the National Highway System over a two-week period during the peak summer roadwork season. Further, these work zones covered 20,876 miles of NHS roadway, representing 12.8% of the 163,734 miles of roadway designated as part of the NHS. Based on lane closure data, we estimated that the work zones on the NHS result in a loss of over 60 million vehicles of capacity per day. During the hour when roadwork most frequently impacted capacity (between 9AM and 10AM), the collective impact of work zones on the NHS was estimated at 2,672 lane-miles of freeway, or roughly the carrying capacity associated with one direction (three lanes) of a six-lane interstate connecting Washington, DC to St. Louis, MO. National estimates of delay and productivity impacts could not be determined from the data available on the state web resources.

Of the work zones examined, 58% were active or had lane closures primarily during daylight hours, 33% were primarily night work, and 9% were active nearly around the clock. The average work zone had lane closures for 11 hours a day and occupied 6.8 miles of roadway for an average of 125 days.

At least for these measures, compiling data from web-based resources gives federal policy makers some insight into the level of work zone activity at the national level. Data acquisition from the websites is relatively straightforward and can be automated to reduce costs of a potential monitoring program. However, since the data reported is inconsistent and somewhat ambiguous, the interpretation and coding of the data is less easily automated and more costly. Some standardization for basic data elements, or failing that, more careful description of data posted to the websites would assist in the collection and calculation of national-level statistics. Any monitoring program using these data resources must also consider that the tracking of national-level measures over time may also be confounded to some degree by a simple increase in reporting of work zone data to the web. For example, when a state DOT doubles the number of work zones reported on its website, it may reflect a statewide initiative to increase reporting, rather than a doubling of the number of actual work zones on the roadway system.

EDL #: 13793

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