

2023 ANNUAL REPORT

Automated Work Zone Speed Enforcement



pennsylvania
DEPARTMENT OF TRANSPORTATION





ACKNOWLEDGEMENTS

75 P.A. C.S. § 3369 authorized the development of the Automated Work Zone Speed Enforcement (AWZSE) program, formerly referred to as Automated Work Zone Speed Enforcement, or AWZSE. This program is a joint safety program supported by the Pennsylvania Department of Transportation (PennDOT), the Pennsylvania Turnpike Commission (PTC), and the Pennsylvania State Police (PSP). 75 P.A. C.S. § 3369(h) (4) requires the following report of the program to the Senate and House Transportation Committee Chairs by no later than April 1, annually.

Throughout 2022, PennDOT, PTC, and PSP continued their close collaboration to administer and refine the pilot program. Executive staff from all three agencies actively participated in the program's Executive Committee, helping to steer the pilot program. Additionally, PennDOT's Bureau of Operations, PTC's Traffic Engineering and Operations division, and PSP's Bureau of Patrol lead daily activities for the pilot program. These groups were supported by a number of others at each agency during 2022, including PennDOT's Engineering Districts, Press Office, and Fiscal Services; PTC's Engineering, Construction, and Maintenance Divisions, Legal Department, Accounting/Finance, and Communications; and PSP's Fiscal Services. The efforts of these parties, along with the Program Administrator and System Administrator, have contributed to the success of the AWZSE pilot program in 2022.

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GLOSSARY

AWZSE Automated Work Zone
Speed Enforcement

PennDOT Pennsylvania Department
of Transportation

PSP Pennsylvania State Police

PTC Pennsylvania Turnpike
Commission

EXECUTIVE SUMMARY



In 2022, Pennsylvania's Automated Work Zone Speed Enforcement program completed its second full calendar year of operation. This program is geared towards improving safety by reducing speeding in work zones on select PennDOT-operated and all Commission-operated highways. The program uses portable automated speed enforcement systems to provide enforcement of excessive speeding (11+ mph) in active work zones.

In 2022, the program continued to fulfill the stated goals of the program:

- **Reduce speeds in work zones.** During 2022's primary construction months (April – October), speeding in AWZSE enforced work zones has been reduced to 17.2% of all traffic, and excessive speeding (11+ mph over the posted speed limit) has been reduced to 2.6% since the start of the program.
- **Promote work zone safety.** Pennsylvania has experienced a reduction in work zone crashes since the start of the program. National and overall Pennsylvania crash trends have increased over this same period. AWZSE has been a successful tool in helping to reduce crashes in work zones.
- **Improve driver behavior.** Measured, sustained speed reductions have been observed in AWZSE enforced work zones, with smaller (but measurable) reductions at times when AWZSE is not in effect in those zones.
- **Save worker and traveler lives.** Since the program began, fatalities in work zones have increased nationally while Pennsylvania work zones have had a slight decrease. AWZSE has been one of the contributing factors in those reductions.
- **Complement existing speed enforcement by the Pennsylvania State Police.** In 2022, Pennsylvania State Police supported 84 projects for \$4.4 million. This support was for work activities where PSP presence remains the most effective tool to enhance safety.

Deployment/Violation History

Since the start of enforcement in March 2020 through the end of 2022, the program has completed 8,868 deployments and issued over 1 million notices of violation. Table 1 shows a breakdown of program statistics through the end of 2022.

	2020 TOTALS	2021 TOTALS	2022 TOTALS	PROGRAM TOTALS
Deployments	2,084	3,302	3,482	8,868
Violations per Deployment	105	129	128	123
Violations Issued	219,214	424,812	444,827	1,088,842
First Violations	191,584 (87.4%)	359,701 (84.7%)	362,260 (81.4%)	913,545 (83.9%)
2 Violations	19,224 (8.8%)	45,982 (10.8%)	57,094 (12.8%)	122,300 (11.2%)
3+ Violations	8,406 (3.8%)	19,129 (4.5%)	25,473 (5.8%)	53,008 (4.9%)

Table 1. Program Statistics by Year

The maturation of the AWZSE pilot program has provided benefits to the crews in work zones around the Commonwealth, as well as for those traveling through these work zones. The data has shown that AWZSE is an effective tool in improving work zone safety across the Commonwealth, counter to national trends of increasing work zone crashes.

Work Zone Safety

The onset of AWZSE enforcement in 2020 has coincided with reductions in work zone crashes across the Commonwealth. In the three years prior to AWZSE enforcement (2017-2019), the number of crashes in work zones was consistent, approximately 1,800 annually. In 2020, the first year of AWZSE program operation, the number of work zone crashes significantly decreased, to just over 1,400. This number can be attributed to the COVID-19 pandemic and associated stay-at-home orders. In 2021, as traffic volumes returned to normal after the pandemic and construction activities returned at close to pre-pandemic levels, the number of work zone crashes was 1,650, an increase from 2020, but still a reduction of roughly 100 crashes from pre-pandemic years. Since the program began in 2020, national work zone crash trends have increased. Pennsylvania's downward trend over this same time period continues, as preliminary data for 2022 indicates a reduction in work zone crashes.

Work Zone Travel Speeds

Since the onset of AWZSE enforcement, travel speeds in work zones across the Commonwealth have reduced. During 2022's primary construction months (April – October), speeding in AWZSE-enforced work zones has been reduced to 17.2% of all traffic, and excessive speeding (11+ MPH over the posted speed limit) has been reduced to 2.6% of all traffic. These trends are most acute when active enforcement is occurring.

Despite no changes in the roadway characteristics when workers are present and the work zone is active versus when workers are absent and the work zone is inactive, speeds in the I-78 Section 12M reconstruction project are 2-8 mph higher when AWZSE enforcement is absent.

One significant trend that has continued to have been observed with the AWZSE program is that the work zones that have been most challenging to gain speed limit compliance are those work zones where the work area is protected by a barrier. Throughout the program, travel speeds adjacent to barrier protected work zones have been higher than travel speeds adjacent to work zones protected only by channelizers (devices such as barrels, cones, or vertical panels). Table 2 shows the percentage of vehicles traveling over the posted work zone speed limit and the percentage of vehicles excessively speeding (11 mph or more over the posted speed limit) in each type of work zone.

	Deployments	% Over Speed Limit	% Excessively Speeding (11+ mph)
Channelizer	68%	18%	3%
Barrier	32%	38%	7%

Throughout the life of the program, the percentage of vehicles over the speed limit and the percentage of vehicles excessively speeding have been more than double in barrier protected work zones than in unprotected work zones.

Table 2. Program Speeding Summary, Through 2022

A National Success Story

Pennsylvania’s program continues to be a national model for the development of sound, effective use of AWZSE as a tool to improve work zone safety. Numerous states across the country have used Pennsylvania’s example to establish their own work zone pilot programs. In particular, in the northeast and mid-Atlantic states, New York and Connecticut are advancing similar statewide pilot programs, and Delaware and Virginia are piloting AWZSE at individual locations. Pennsylvania’s program fits in well with national transportation priorities. The United States Department of Transportation (USDOT) has developed a new National Roadway Safety Strategy, and automated speed enforcement is one key Departmental action for USDOT to enable safe speeds as part of this strategy.

In addition to supporting states currently working to establish programs, Pennsylvania has been coordinating with states that already have operational programs. Successes that the Pennsylvania program has experienced have been shared with these other programs. An example of this has been the enforcement of short-term or maintenance work zones, including some of the most vulnerable work zones statewide. Other states are consulting with Pennsylvania’s program to incorporate similar improvements or enhancements in their programs.

To date, the AWZSE program team has discussed Pennsylvania’s pilot program with 25 other states. Of note, the Indiana Department of Transportation enlisted Purdue University to study data from Pennsylvania’s program to determine the effectiveness of AWZSE enforcement. The study team from Purdue has published a study on their findings, which indicate that AWZSE enforcement is effective in Pennsylvania work zones.



PROGRAM OVERVIEW

Introduction

Act 86 (2018) authorized the development of the Automated Work Zone Speed Enforcement (AWZSE) program. This program is a joint safety program supported by the Pennsylvania Department of Transportation, the Pennsylvania Turnpike Commission, and the Pennsylvania State Police. 75 P.A. C.S. § 3369(h)(4) requires the following report of the program to the Senate and House Transportation Committee Chairs by no later than April 1 annually. This report provides a summary of the status of the program.

The statewide Automated Work Zone Speed Enforcement program began operation in March 2020. After a brief pause due to the pandemic, the program has been operating continuously since April 2020 with 2022 being the second full calendar year of operation. The program has reduced speeds in work zones, decreased the number of crashes in work zones, and improved safety for roadway users.

Program Goals

The passage of Act 86 (2018) recognized that Pennsylvania's highway work zones continue to provide safety hazards for Pennsylvania workers and traveling public. The Automated Work Zone Speed Enforcement program is geared towards improving safety in our highway work zones statewide.

Specific program goals include:

- Reduce speeds in work zones
- Promote work zone safety
- Improve driver behavior
- Save worker and traveler lives
- Complement existing speed enforcement by the Pennsylvania State Police

Program Status

The program began enforcement on March 9, 2020. Enforcement activities were placed on hold March 16, 2020, due to the COVID-19 pandemic halting all construction activities statewide. Enforcement

resumed at limited critical and emergency projects on April 20, 2020 and has been in continuous operation since then. Some highlights of enforcement from 2022 include:

- Over 3,400 deployments were completed in support of both construction and maintenance activities, a 5% increase from 2021.
- Issuance of over 440,000 notices of violation to registered owners.
- Lowest percentage of traffic speeding and excessively speeding since the program began.

Field Deployment Approach

Since the start of enforcement in March 2020, the approach to field deployments includes:

- The program has 17 enforcement units available statewide. Generally, ten units are available for eligible PennDOT roadways and seven are available for Commission roadways.
- Units are available for two shifts daily: daylight and overnight shifts.
- Program supports both construction and maintenance activities.
- Program supports both long-term and short-term work zones.

Agency Roles and Responsibilities

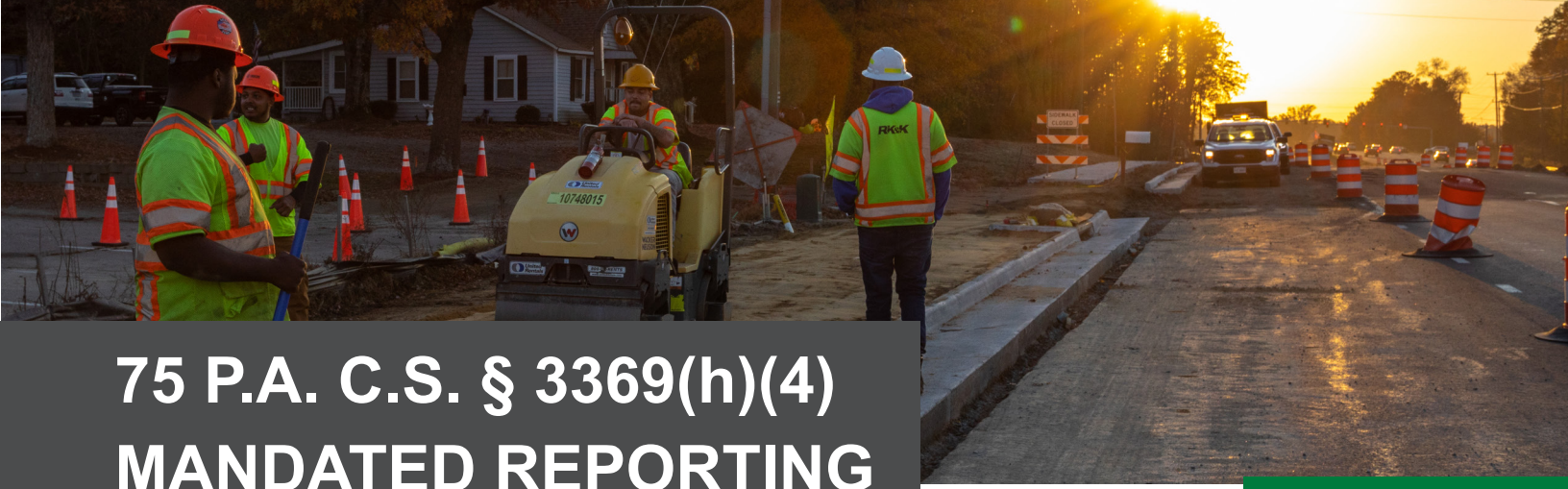
As noted, the Automated Work Zone Speed Enforcement program is a joint program between PennDOT, the Pennsylvania Turnpike Commission, and Pennsylvania State Police. These agencies have jointly developed a program specific Interagency Agreement. Additionally, there are two contracted entities for the program, a Program Administrator and System Administrator. The Program Administrator assists the agencies with program development and execution. The System Administrator is responsible the technical aspects of the program. For additional information, see the “Agency Roles and Responsibilities” section of the Automated Work Zone Speed Enforcement program 2022 Annual Report.

Program Element	Legislative Requirement
Roadway Eligibility §3369(b)	PennDOT: All federal-aid highways with an active work zone Turnpike: All Turnpike highways with an active work zone
Police Validation §3369(d)(1)	Pennsylvania State Police (PSP) Automated Enforcement Unit within the Bureau of Patrol reviews all fine carrying violations
Sign Requirements §3369(b)	<ul style="list-style-type: none">• Two “Active Speed Limit Photo Enforced” signs shall be placed prior to the enforcement location (AWZSE Vendor Responsibility)• One “Active Enforcement Vehicle” sign on Vehicle (AWZSE Vendor Responsibility)• One “End Road Work” or “End Active Work Zone” sign (Construction or Maintenance Responsibility)• Any regulatory speed limit reduction signs need to be placed in conformance with the approved Traffic Control Plan

Table 3. Summary of Program Requirements

Program Element	Legislative Requirement
Violation §3369(c)	11 mph or more over the work zone regulatory speed limit
Active Work Zone Requirement §3369(a)	Workers must be present while AWZSE is active. AWZSE enforcement will occur in the activity area of the work zone. (AWZSE Vendor will be Responsible for documenting this requirement through daily logs and certification that the deployment meets the Legislative requirements)
AWZSE Locations §3369(b)	The agencies will identify potential AWZSE locations on its website (workzonecameras.penndot.gov/locations).
Issuing of Violations §3369(d)	<ul style="list-style-type: none"> Once the Registered Vehicle Owner is identified through state Driver Vehicle Records, the program has 30 days from identification to mail the violation to the Registered Vehicle Owner. <p>Violations must be mailed within 90 days from the date the violation occurred.</p>
Defenses §3369(g)	<ul style="list-style-type: none"> The vehicle was reported stolen at the time the violation occurred. The person receiving the Notice of Violation was not the Registered Vehicle Owner when the violation occurred. Device being used for enforcement was not operating correctly at the time the violation.
Contest Process §3369(j)	<ul style="list-style-type: none"> Registered Vehicle Owner has 30 days from the mail date to request a hearing. First level appeals are heard through an Informal Hearing Officer which is a Law Clerk in PennDOT's Office of Chief Counsel. If the Registered Vehicle Owner wants to contest the finding of liability ruling of the Informal Hearing Officer, the appeal then goes to a 2nd Level Appeal through the District Court System. Second level appeals are heard by the District Justice where the violation occurred, and their finding of liability ruling is considered final.
Penalty Structure §3369(e)	<ul style="list-style-type: none"> First violation – No Monetary Fine Second violation – \$75 fine Third and subsequent violations – \$150 fine per occurrence Fines identified are flat fees except for \$3.75 credit card convenience fees and/or late payment fees. Court costs are applied if a violation is appealed to the District Court system.
Annual Reporting §3369(h)(4)	Annual report to the PA Legislature Transportation Committees by April 1 each year.

Table 3, CONT. Summary of Program Requirements



75 P.A. C.S. § 3369(h)(4) MANDATED REPORTING

75 P.A. C.S. § 3369(h)(4) requires this Annual Report contain specific information regarding the program during the previous calendar year. This section contains that information for calendar year 2022.

Work Zone Crash Information

In 2021, there were 1,649 total crashes in work zones on all Pennsylvania roadways. On PennDOT and Commission roadways, 40.7% of the crashes contained fatalities or injuries, which represents a 5.2% reduction from 2020. There were 893 injured persons resulting from work zone crashes and 16 persons fatally injured, with no fatalities of workers within the work zone. In general, work zone crashes have reduced since the start of the program. Reduction occurred in 2020 due to lower traffic volumes resulting from the COVID-19 pandemic and a lighter than typical construction season. Work zone crashes in 2021 increased by 16.5% over 2020, but were still lower than pre-AWZSE work zone crash numbers.

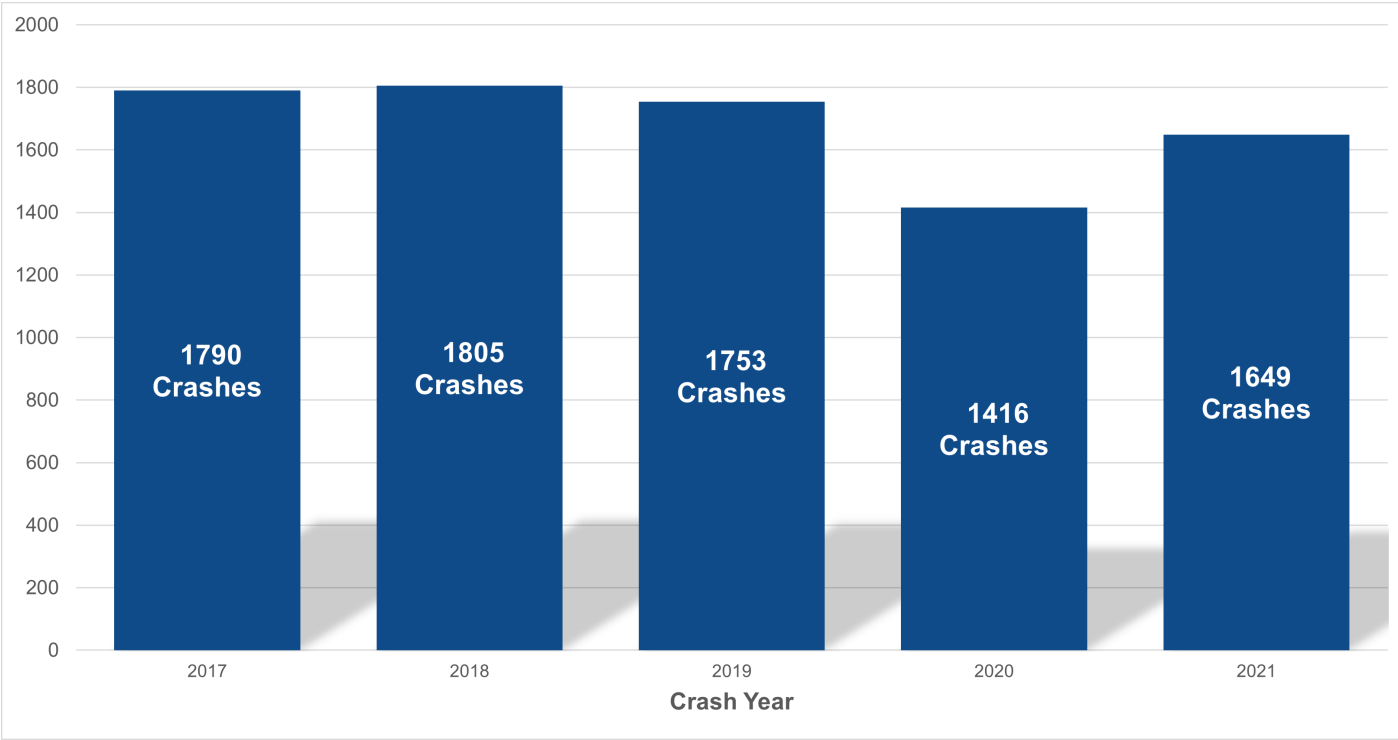


Figure 1. Work Zone Crashes by Year, 2017-2021



A closer look at where these work zone crashes occurred shows that the program is having a measurable effect on reducing crashes. Studying specific work zones where enforcement has been used, the program has seen between a 15 to 50% reduction in the number of crashes when the unit is present versus when the unit is not present.

Automated Work Zone Speed Enforcement program enforcement can also be completed safely and effectively, and often can enforce in portions of the active work zone area where traditional enforcement can be limited due to site constraints. Any crashes that have occurred in a work zone when enforcement is active have not been due to an immediate speed change caused by drivers overreacting to the unit.

Speed Data

Speed data presented in this report represents data collected from January 1, 2022, through December 31, 2022. A full discussion on speed data is presented in the Speed Data section of this report.

Highlights of the speed data include:

- During the peak construction season (April-October), the total percentage of speeding vehicles in AWZSE enforced work zones has been reduced by 38 percent since the start of the program. Similarly, excessive speeding in AWZSE enforced work zones has been reduced by 47 percent since the start of the program.
- July 2022 experienced the lowest percentage of traffic over the posted speed limit in the program history, at 15%. That same month also had the lowest percentage of traffic excessively speeding (11 mph or more over the posted speed limit) in program history, at 2%.
- Speeds are consistently higher in barrier protected work zones than in unprotected (channelizer – barrels, cones, panels) work zones. This is believed to be due to drivers having a false sense of security in these work zones, giving the impression that speeds can be higher in these work zones despite the presence of changed roadway characteristics.

Number of Violations

In 2022, the program issued 444,827 violations. Of the issued notices, 82,567 (18.6%) were repeat violators, incurring fines for 2nd and subsequent violations of the statute.

Program Fines

In 2022, the Transportation Agencies collected \$7,221,372.48 in fine remittance. The program has a payment rate of roughly 76%.

Program Contracts

For calendar year 2022, the amounts paid for contracts related to the program are as follows:

- Program Administrator (Responsible for Program Execution) – \$1,195,589.04
- System Administrator (Responsible for Technical Aspects of the Program) – \$4,234,158.70
- TOTAL – \$5,429,747.74

Program Administrator costs are based on time spent supporting the Transportation Agencies and System Administrator costs are based on a flat fee per deployment. Additionally, PSP costs incurred by the program total \$410k for calendar year 2022, bringing total expenditures for the program to \$5.8 million for calendar year 2022.

The Transportation Agencies (PennDOT and PTC) have operated as a single collaborative program (in partnership with PSP). This includes sharing both the Program Administrator and System Administrator contracts. However, there have been other factors which have led to differences in the overall program finances. The variability of roadway types and characteristics present on the PennDOT roadway network, including deploying at locations with lower traffic volumes than Turnpike locations (on average), have affected income. At the same time, PennDOT expenditures are higher due to a higher deployment number share, leading to a higher share of the billings by contracted entities.

Table 4 provides a consolidated financial overview of the program. To date, the program has expended nearly \$2.5 million more than fine revenue has generated. This difference illustrates the investment that the Department of Transportation and the Turnpike Commission have made to use this program as a tool to enhance work zone safety.

PennDOT	Income	Expenditures	ANNUAL NET	CUMULATIVE NET
2019	\$0.00	\$314,504.97	(-\$314,504.97)	(-\$314,504.97)
2020	\$876,937.03	\$2,404,935.42	(-\$1,527,998.39)	(-\$1,842,503.36)
2021	\$3,061,764.46	\$1,920,117.64	\$1,141,646.82	(-\$700,856.54)
2022	\$2,464,904.76	\$5,821,810.09	(-\$3,356,905.33)	(-\$4,057,761.87)
PTC	Income	Expenditures	ANNUAL NET	CUMULATIVE NET
2019	\$0.00	\$97,010.92	(-\$97,010.92)	(-\$97,010.92)
2020	\$683,798.00	\$741,562.07	(-\$57,764.07)	(-\$154,774.99)
2021	\$2,002,092.88	\$2,461,294.18	(-\$459,201.30)	(-\$613,976.29)
2022	\$5,281,009.72	\$3,137,361.80	\$2,143,647.92	\$1,529,671.63
Overall Program	Income	Expenditures	ANNUAL NET	CUMULATIVE NET
2019	\$0.00	\$411,515.89	(-\$411,515.89)	(-\$411,515.89)
2020	\$1,560,735.03	\$3,146,497.49	(-\$1,585,762.46)	(-\$1,997,278.35)
2021	\$5,063,857.34	\$4,381,411.82	\$682,445.52	(-\$1,314,832.83)
2022	\$7,745,914.48	\$8,959,171.89	(-\$1,213,257.41)	(-\$2,528,090.24)

Table 4. Fine Remittance, Income, and Expenditure, Overall Program, 2019-2022



Prior to October 16, 2019—the effective date of the Interagency Agreement—all costs for the program were divided evenly between the Department and the Commission. After the Interagency Agreement effective date each agency is responsible for program costs that can be directly assigned to each agency, for example each agency pays the direct cost for each individual deployment. Shared program costs are currently split to be reflective of the relative utilization of the program by each agency.

The agency legal teams have made the determination that all outstanding expenditures from the start of the program must be recovered before excess funds calculations can take place. Additionally, PennDOT and PTC should be considered their entities with regards to excess funds, as excess funds realized by one are not transferred to the other agency to cover part or all of a net negative balance.

In 2021, the AWZSE program applied for and received grant money from the Roosevelt Boulevard Automated Speed Enforcement Program (Title 75 Section 3370) to cover the System Administrator's fixed costs, approximately \$2.1 million over a 12-month period. This grant was not included in the program financial summary, but has been used to offset some of the program costs to date.

Number of hours provided by PSP for increased work zone presence

Since the program didn't generate a cumulative surplus of funds over the first three years, the excess revenue breakdown in the statute was not used.

Use of remaining funds under Section 3369 (h) 3. iv.

In 2022, PTC showed a cumulative net surplus of funds, with a cumulative program net of approximately \$1.5 million. Breaking this down by month, PTC did not generate excess funds until March 2022, which was the start of year 4 of the pilot period. Therefore, per Section 3369.h.3.iv, the funds will be used for appropriate safety improvement projects and countermeasures as prescribed in the legislation.



2022 AWZSE PROGRAM ACHIEVEMENTS

During calendar year 2022, the program completed its second full calendar year of operation. The program completed 3,482 deployments on PennDOT and Turnpike roadways. Deployments occurred in support of both construction and maintenance activities on both agencies' roadways. The number of deployments completed in 2022 represents a 5% increase over 2021. With the program completing its second full year of active enforcement, the program has focused on continual improvement and enhancement.

Work Zone Crashes

- Work zone crashes have reduced since the start of the AWZSE program.
- A decrease in work zone crashes occurred in 2020 due to impacts from the COVID-19 pandemic and a smaller number of construction activities occurring than usual.
- In 2021, there were 1,649 total crashes in work zones on all Pennsylvania roadways. On PennDOT and Commission roadways, 40.7 percent of the crashes contained fatalities or injuries, which represents a 5.2 percent reduction from 2020. There were 893 injured persons resulting from work zone crashes and 16 persons fatally injured, with no fatalities of workers within the work zone.
- Comparing work zone crashes in 2021 to the pre-pandemic and pre-AWZSE year of 2019, 2021 had roughly 100 fewer crashes than 2019, a reduction of 6%. This is in direct contrast to national trends of increased work zone crashes from pre-pandemic to today.



Program Feedback

The feedback the program has received throughout 2022 is consistent to the feedback the program received in 2021. The message remains the same: Field personnel appreciate the safety the program provides and the noticeable difference seen in motorist behavior when a unit is present within their work zones.

- Feedback received from construction and maintenance personnel has been overwhelmingly positive.
- Field personnel, including the most vulnerable workers in unprotected work zones, have indicated that they perceive that drivers more consistently comply with the work zone speed limit when the AWZSE enforcement unit is present and enforcing. This perception has been supported by research of Pennsylvania work zones conducted by Purdue University (found in the Speed Data section of this document.)
- The use of AWZSE has become a mainstream activity for many agency and field staff. Construction and maintenance personnel at both agencies see the value of AWZSE as a safety enhancement tool, and now proactively request AWZSE enforcement at new project locations.

SPEED DATA

Two primary metrics are used to measure the performance of the AWZSE program's impacts: Percent over the Speed Limit and Percent Excessively Speeding. Percent over the Speed Limit measures the percentage of detected vehicles exceeding the posted work zone speed limit by any amount. Percent Excessively Speeding measures the percentage of detected vehicles going 11 mph or more over the posted work zone speed limit. These metrics are tracked for each deployment completed, which allows for program staff to monitor speeding trends across all projects. This leads to identification of work zones with consistent speeding issues that may benefit from increased enforcement to better manage speeds through those work zones. Figure 2 on the following page provides a summary of speed data captured in 2022.

2022 Speed Statistics

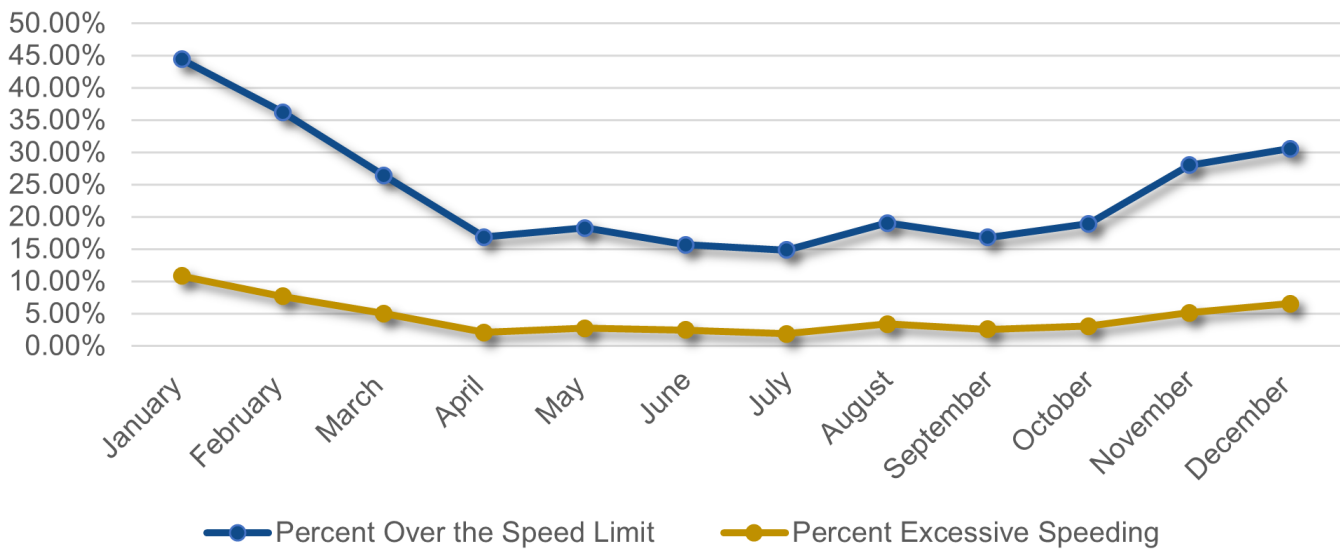


Figure 2 . Percent over Speed Limit and Percent Excessively Speeding, by Month, 2022

Speeds have generally been higher in long-term barrier protected work zones than in short-term unprotected work zones. As the enforcement units have been deployed to the long-term barrier protected work zones, a reduction in speeds has been seen in these work zones. Some of the more vulnerable long-term work zones still have crashes in these barrier-protected long-term work zones; these crashes occur when workers are not present and automated enforcement is not active. This shows that the enforcement units are not only increasing safety for the workers active in the zone, but also for the motorists traveling through these work zones.

Taking a closer look at these long-term barrier-protected work zones, when the enforcement units are present on weekdays, speeds are generally 2-4 mph slower than when the units are absent on weeknights and 4-8 mph slower than when the units are absent on weekends. These speed differences occur despite no change to the work zone or roadway characteristics between when the units are present with workers active and when the units are absent and workers inactive.



2022 AWZSE PROGRAM OPERATION



In 2022, the program focused on expanded deployment and continued improvement. Throughout the year, the program has been effective in meeting its stated goals.

DEPLOYMENT INFORMATION

One of the program goals is to improve driver behavior in Pennsylvania work zones. To achieve this goal, program deployment locations and frequency must strike a balance between statewide coverage and focusing deployments at work zones where speeding has been identified as a major issue. With that in mind, AWZSE deployments were completed to all 11 PennDOT Engineering Districts and to Turnpike roadways across the state. A total of 3,482 individual deployments across 76 different projects were completed in 2022.

As shown, the AWZSE program actively enforced year-round throughout 2022, with no significant interruptions to program operation. During the winter months (December – March), the number of deployments is typically reduced to due to a lower number of active work zones available. Additionally, winter weather events across the state can impact multiple days of deployments to the already lower number of construction activities that are available for deployment in winter. Deployments by month are shown in Figure 3.

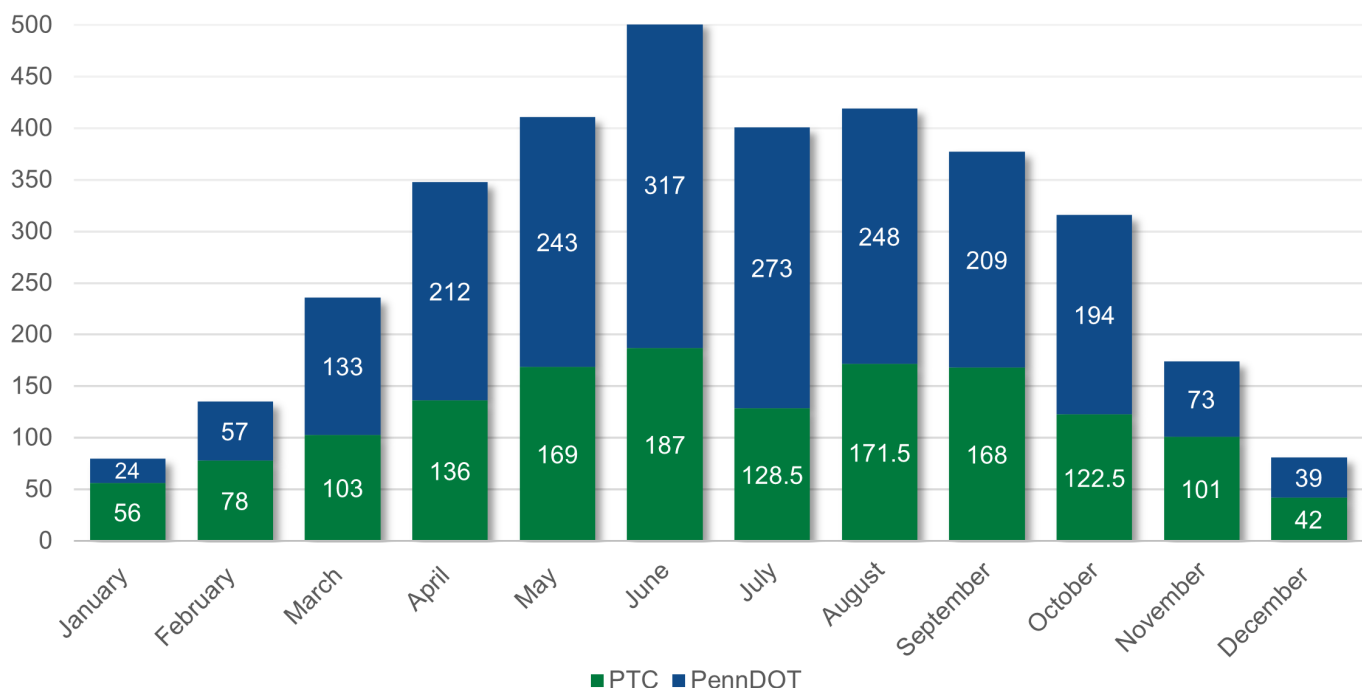


Figure 3. Deployments by Agency by Month, 2022

DEPLOYMENT APPROACH

Work zones selected for AWZSE enforcement continue to be selected and prioritized using a data-driven process to maximize the effectiveness of the systems. To that end, during 2022, PennDOT and the Turnpike Commission deployed to a wide variety of projects under differing conditions. These include (but are not limited to):

- Construction or Maintenance activities
- Barrier-Protected or Channelizer (unprotected) work zones
- Work zones with reduced speed limits vs. work zones with no speed limit reduction

Construction vs. Maintenance Activities

A primary difference in Pennsylvania's program from other peer state programs is the emphasis to pilot on all work zones on the applicable roadways. This includes enforcement in maintenance activities, which are locations where workers are most vulnerable.

- In 2020, the program completed 97 deployments to maintenance activities, representing under 5% of all deployments completed in 2020. In 2022, the program completed 367 deployments to maintenance activities, representing nearly 11% of all deployments completed in 2022.
- The program completed 67% more deployments overall in 2022 than in 2020, and 5% more in 2022 than in 2021. Deployments to maintenance work zones decreased by 5% from 2021 to 2022.
- During the periods of the year when maintenance activities are most active on the Turnpike (April-May and September), one enforcement unit is dedicated to support maintenance activities within each of the five maintenance districts. During the periods of the year when maintenance activities are not as common, when a maintenance activity is scheduled in advance, every effort is made to schedule an enforcement unit to that activity.

During 2022, maintenance activities were 11% of all deployments, with a heavier emphasis in April, May, and September. Generally, the performance of AWZSE in maintenance work zones has been consistent with the performance in short-term, channelized construction zones. For both project types, there have been program operations lessons learned. Enforcements in support of maintenance activities tend to have shorter enforcement durations than enforcements supporting long-term construction projects. This is due to the short-term nature of work zones established for maintenance activities. Enforcements in support of Turnpike maintenance activities rarely exceeded four hours in duration, whereas enforcements supporting construction projects were generally longer than six hours, with many fulfilling the entire eight-hour enforcement shift window. Similarly, AWZSE deployments supporting short-term overnight construction projects are generally shorter due to restricted time windows permitted for contractors to occupy travel lanes to perform work activities.

Barrier-Protected vs. Channelizer (Unprotected) Work Zones

The data-driven process to select work zones for AWZSE deployments considers the work zone configuration as an influencing factor. In particular, the number of travelers speeding and excessively speeding has been much higher in long-term barrier protected work zones than in short-term unprotected work zones. Additionally, barrier-protected long-term work zones continue to experience



crashes when workers are not present and automated enforcement is not occurring. On the other hand, those work zones without barrier protection often pose a higher risk for those working in those zones and reducing speeds adjacent to them is an important factor in improving their safety. Optimizing the balance between barrier and channelizer protected work zones to provide the greatest safety benefits is an on-going evaluation. In 2022 roughly 31% of all deployments were to barrier protected work zones, and 69% were to work zones without barrier protection.

Speed Limit Reductions

Speed limits in work zones are carefully established as they affect the safety of motorists and workers. PennDOT and the Turnpike Commission have slightly different approaches to establishing work zone speed limits, though both are rooted in optimizing safety in work zones. For most Turnpike Commission work zones, the work zone speed limit is reduced from 70 MPH to 55 MPH. The establishment of most work zones along Turnpike roadways introduces hazards that necessitate the reduction of the speed limit for safe travel adjacent to the work areas. Additionally, since most of the Turnpike roadways are homogenous in nature, a consistent work zone speed limit is generally applied systemwide.

PennDOT's highway network is much more varied, requiring that the evaluation of speed limit reductions be conducted on a case-by-case basis. Most work zones on PennDOT highways are located where the normal speed limit is less than 70 MPH; many work zone configurations on PennDOT roadways also may not warrant a reduction. Before and after evaluations through the AWZSE program have enabled PennDOT to refine how speed limit reductions are evaluated. These efforts have resulted in improved speed limit compliance while maintaining work zone safety as the top priority.

The presence of a reduced work zone speed limit is not a selection factor for AWZSE deployments. When a project is selected in a work zone that has a reduced speed limit, the AWZSE unit will enforce at 11 MPH over the reduced work zone speed limit. Similarly, when a project is selected and the speed limit is not reduced, the AWZSE unit will enforce at 11 MPH over the normal posted speed limit.

In 2022, 38 of the 76 projects (50%) that received enforcement did not have a reduced work zone speed limit. All 23 projects on the Turnpike system and 15 of the 53 PennDOT projects (28%) that the program supported in 2022 had a reduced speed limit.

Data Tracking and Reporting

The program has established a set process and format for receiving deployment information from the System Administrator. This information is ingested into a management console that is used for scheduling, providing a single point of information for the program. Through the same management console, the program has instituted a tracking application to show current, paused, and completed deployments on an interactive state map that is pushed to the public facing website. This replaces an earlier manually intensive process to update the project list and map on the public website on a weekly basis in accordance with the enabling legislation.



For calendar year 2022, the program issued 444,827 violations, which is a nearly 84% issuance rate from 532,581 captured events. When an event is captured, a detailed verification and review process occurs to ensure that the event captured can progress forward through the issuance process. Violations are issued to all types and classes of vehicles, with very few exceptions (i.e. active emergency responder). During this multi-step process, events may be rejected for a variety of reasons, but will fall into two main categories: Controllable Rejects and Uncontrollable Rejects.

Controllable Rejects are issues that are within the System Administrator's control that prevent the captured event from being issuable. Uncontrollable rejects are issues with a captured event outside of the System Administrator's control that prevent it from being issuable. Some examples of each type of reject category are:

- Controllable Rejects
- Image Clarity – Plate is illegible and cannot be read
- Image Framing – Cameras are not aligned properly to capture plate images
- Uncontrollable Rejects
- Canadian/Diplomat/Foreign Plate
- No DMV Hit – After three attempts, no registered owner information is available for violation issuance.
- No Plate – Vehicle is fully in view, but no plate is visible in any of the collected images.
- Obstruction – Obstruction of license plate to prohibit plate read (trailer hitch, bike rack, etc.)

The program team is continually reviewing processes to increase the issuance rate. The rejection rate has been reduced from nearly 24% in 2021 to nearly 16% in 2022. Ongoing actions that have been taken to improve the issuance rate include:

- Reviewing and refining deployment locations to make sure as many obstructions resulting from the roadway or work zone configuration are avoided.

- Establishing direct connections with neighboring state DMVs to minimize the number of Out-of-State No DMV hits, reducing the reliance on third party vehicle record lookup services currently resulting in increased “No DMV Hit” rejections. Currently, the accuracy of vehicle records from state DMVs with direct connections are roughly 20% higher than those states relying on third party services.

Additionally, the System Administrator contract includes liquidated damages designed to limit the allowable percentage of controllable rejects. For all violations processed in 2022, the System Administrator has met the contract goals for controllable reject percentage. Table 5 provides a summary of violations captured by the program in 2022. Table 6 provides a breakdown of how many of each tier of violations were issued by the program in 2022.

Potential Violations	Controllable Rejects	Uncontrollable Rejects	Other Rejects	In Process	Issued
532,581	17,296	70,024	56	216	444,827 (84%)

Table 5. Overall Program Violation Summary, 2022

	First Violation (\$0)	Second Violation (\$75)	Third/ Subsequent Violation (\$150)	Issued	Total Repeat Rate
PennDOT	93,432	12,498	5,214	111,144	15.9%
PTC	268,848	44,596	20,259	333,703	19.4%
TOTAL	362,280	57,094	25,473	444,847	18.6%

Table 6. Issued Notice Distribution by Agency, 2022

The program has an approximately 76% payment rate. The only statutory recourse against non-paying violators is to send those violations to a collections agency. Violations can be transferred to collections once all reminder notices have been sent and no payment has been received after 120 days, which at the end of 2022 was approximately 13%. Transfer of eligible notices to collections began in 2022 and is only seeing a 3% collection rate on transferred notices.

Currently, unpaid E-ZPass violations must be paid prior to renewing vehicle registration, which ensures a high payment rate for the Turnpike’s tolling system. The AWZSE program does not have this same level of enforcement, as transferring unpaid violations to collections remains the only recourse.

A breakdown of the payment status of all violations is shown in Figure 4 on the next page. The “other” category includes violations that were currently in process at the end of 2022.

Over the life of the program, 77% of events captured were of vehicles registered in Pennsylvania or states adjacent to Pennsylvania (i.e. Maryland, Ohio, New York, New Jersey, etc.). An additional 14% were other out-of-state registrations, and the final 9% were foreign plates or unidentified plate origin which are unable to be issued. For vehicles captured that are registered in or adjacent to Pennsylvania, this indicates the motorists whose behavior is most important to change through this program. The program is working towards establishing direct lookup agreements with states that represent the highest share of out-of-state violators to ensure greater accuracy and timeliness with Registered Owner information. The breakdown of captured vehicle registrations is shown in Figure 5 (page 20).

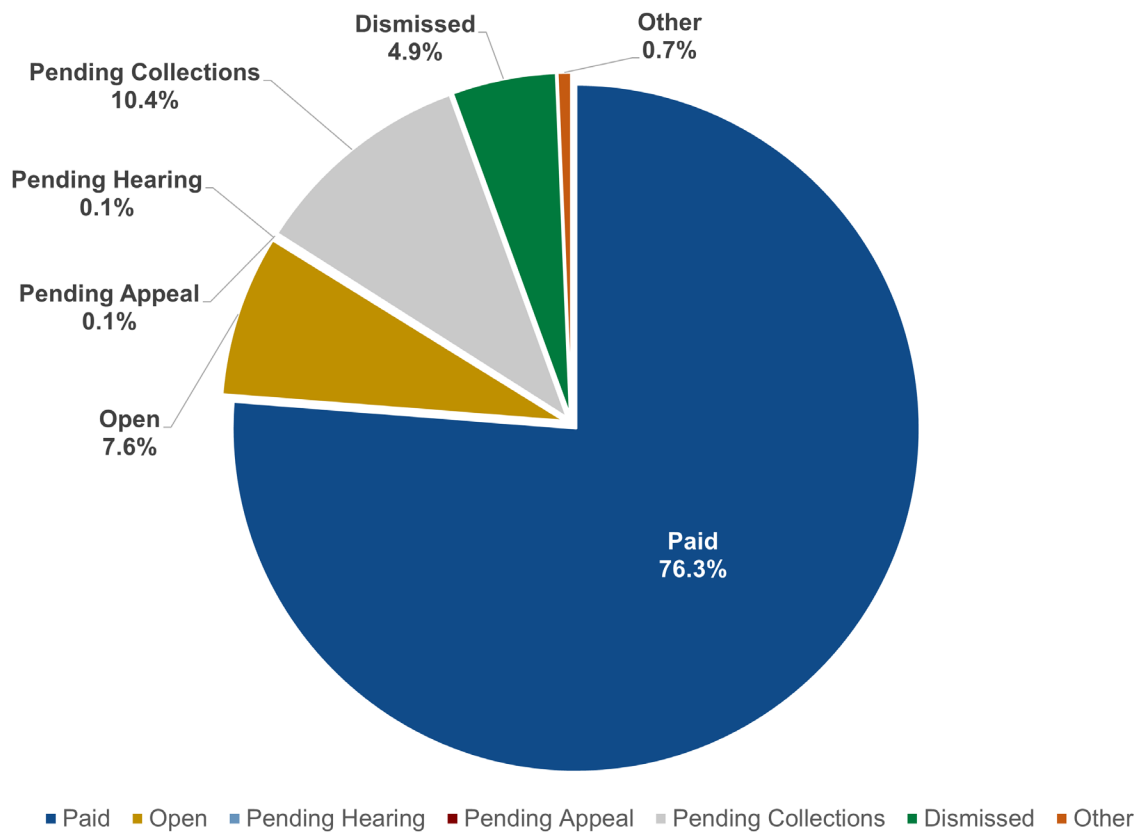


Figure 4. Breakdown of Payment Status, Program Life (2020-2022)

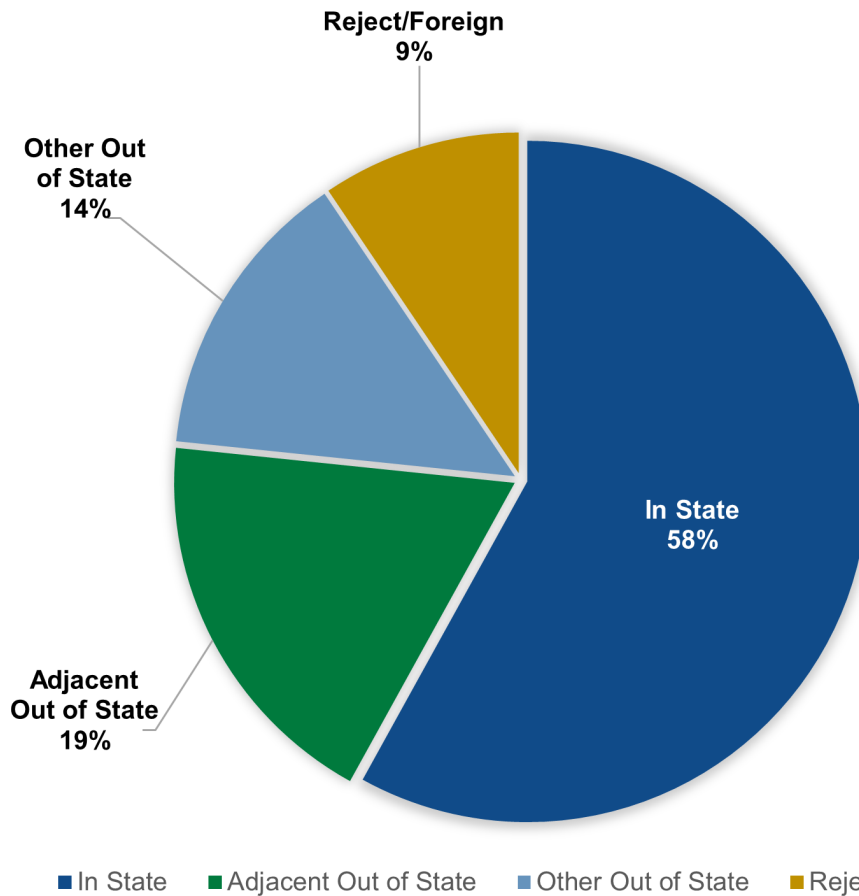


Figure 5. Breakdown of Vehicle Registrations for Events Captured, Program Life (2020-2022)



CONTESTED VIOLATIONS

From the start of the program in March 2020 through the end of 2022, the program received approximately 7,100 informal hearing requests, less than 1% of all violations, from registered owners contesting liability. PennDOT has multiple full-time and part-time AWZSE hearing officer positions to preside over the informal hearings, which began in March 2021. At the current time, all hearings are being conducted virtually.

Numerous hearing requests have been made where the registered owner attempts to void the violation based on a technicality rather than questioning the accuracy of the violation or the applicability of the location of the work zone deployment. Hearings held to date have generally resulted in the registered owner being found liable. “Not liable” findings have typically been associated with one of the three defenses in §3369(g) – a stolen vehicle reported to a police department, evidence that the registered owner was not the owner at the time of the offense, or an error in the speed timing device accuracy. At the time of this report, there have been zero “not liable” findings attributed to the last defense.

Table 7 and Figure 6 (page 22) provide data about informal hearings over the life of the program (March 2020 – December 31, 2022).

Hearings Requested	Found Liable	Found Not Liable	In Process	Other (Cancelled or Rescheduled)	Appealed to Courts
7,080	5,596	683	55	746	191

Table 7 . Contested Violation Data over Life of Program, March 2020 – December 2022

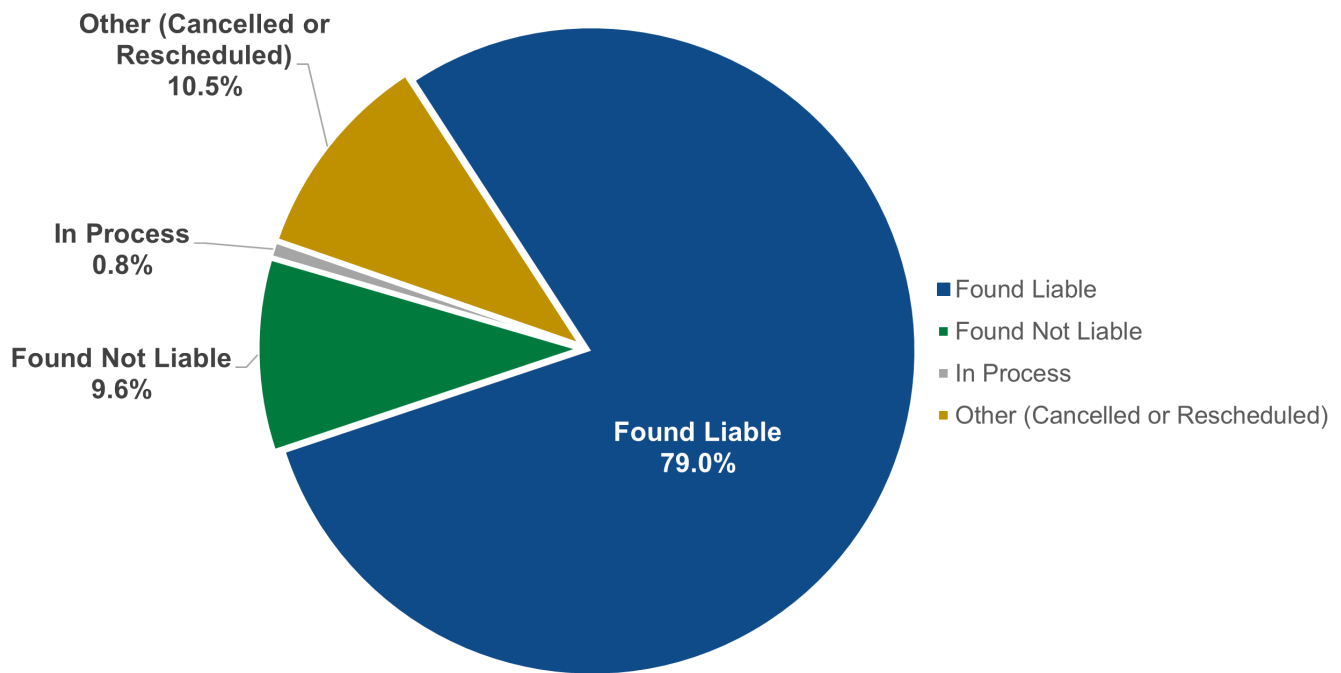


Figure 6. Hearing Data over Life of Program, March 2020 – December 2022

As Table 8 shows, zero-fine first violations have been a majority of the violations contested, though the proportion of first violations contested is significantly less than the proportion of all first violations. While there are no financial implications to the violators, they have expressed several reasons why they contested. First, several violators were concerned about violations impacting their driving record for insurance purposes. While they would often admit their guilt, they would also request leniency in merit points. For these hearings, the program hearing officers explained the program, relayed that the violations are civil in nature and did not impact their driving record, and described the facts in each case. In many of these cases violators were appreciative and indicated that they would change their behavior. This was a common refrain for first violation hearings.

Contested First Violations	Contested Fine Carrying Violations
3,860 (55%)	3,220 (45%)

Table 8. Contested Violation Breakdown by Type, March 2020 – December 2022





PUBLIC OUTREACH

Public outreach is a key element of the program – as it is the cornerstone of the education component of the program principles. Outreach goals have included:

- Overall program awareness
- Program goals
- Enforcement location and approach
- Consequences of violating this law

Program Website

A dedicated program website has been developed and is hosted by PennDOT at workzonecameras.penndot.gov. This website includes program information, locations where AWZSE deployments are active or completed, Frequently Asked Questions (FAQ) about the program, and a contact form for program questions or concerns. In 2022, the website had nearly 204,000 unique page views.

Social Media and Media Relations

Social media has been a key tool to disseminate information about the program and remind motorists of the consequences of speeding in Pennsylvania work zones. In 2022, PennDOT social media posts across four platforms amassed nearly 13,000 impressions.

Throughout the lifespan of the program, media requests have been consistently fielded by the Department and the Commission. In 2022, PennDOT fielded 10 formal media inquiries on the AWZSE program.





PROGRAM CONTROLS

Historically throughout the program, the Program Administrator has performed field QC and backoffice QC activities, and PSP has performed field QC activities. A summary of QC activities traditionally completed by each group include:

- Program Administrator field quality control reviews include:
 - Confirming that both advance warning signs are present and conspicuous.
 - Confirming that the notice is located on the vehicle.
 - Confirming that the end road work sign is present and conspicuous.
 - Confirming that speed limit signs are present and conspicuous.
 - Confirming that the enforcement unit is placed appropriately in relation to the work activity.
- Program Administrator backoffice quality control reviews include:
 - Random sampling of deployment records to ensure that completed deployments meet statutory requirements.
 - Random sampling of rejected events to confirm appropriate reject categorization.
 - Random sampling of prepared notices of violation to confirm accurate details.
- PSP field quality control checks include:
 - Confirmation that speed detection equipment has current certification.
 - Enforcement signing is set up according to the legislation.
 - PSP performed quality control at 194 unique enforcement setups since the start of the program (March 2020) and has found no improper setups per the statute.

Between the Program Administrator and PSP, a total of 4.4% of all deployments that occurred covering 66% of all deployment locations were field quality control checked over the life of the program.



2022 LESSONS LEARNED

In 2022, the program continued to meet its overall program goals:

- **Reduce speeds in work zones.** Generally speaking, work zone speeds have trended downward throughout AWZSE enforced work zones, with a year over year reduction in the percentage of traffic traveling over the speed limit. During 2022's primary construction months (April – November), speeding in AWZSE enforced work zones has been reduced to 17.2% of all traffic, and excessive speeding (11+ MPH over the posted speed limit) has been reduced to 2.6%.
- **Promote work zone safety.** Throughout 2021, the Transportation Agencies (PennDOT and the Turnpike Commission) have promoted the use of AWZSE as a tool to enhance work zone safety. From 2019 to 2020, the first year the program was in operation, there was a 19% reduction in crashes in work zones. A reduction of over 100 crashes annually has occurred in 2020 and 2021 in work zones on Pennsylvania interstates, freeways, and expressways. The agencies have incorporated this messaging into their overall work zone safety messaging programs. Several press articles and efforts have highlighted the effectiveness of the program and have focused on the safety benefits of the program.
- **Improve driver behavior.** Measured, sustained speed reductions have been observed in AWZSE-enforced work zones, with smaller (but measurable) reductions at times when AWZSE is not in effect in those zones.
- **Save worker and traveler lives.** Overall fatality numbers from work zone crashes decreased slightly from 2019 to 2020 and have maintained steady since then. This is counter to national trends where work zone fatalities are increasing.
- **Complement existing speed enforcement by the Pennsylvania State Police.** In 2022, Pennsylvania State Police supported 84 projects for \$4.4 million. This support was for work activities where PSP support remains the most effective tool to enhance safety. PSP also remains a committed program partner and serves a vital role in the program. The combination of existing and automated enforcement continues to be applied in a complementary manner and is yielding benefits in our work zones.

The program will continue operation into 2023:

- Continued and enhanced project screening, deployment scheduling, and data tracking.
- Implementation of enhanced quality control procedures.
- Continued mainstreaming of the program, increasing the pool of projects and activities to which AWZSE can be deployed to on an annual basis.

The AWZSE program is focused on continuing to meet these program goals and is taking steps in 2023 to better meet the program goals and further make Commonwealth work zones safer. All three agencies are committed to increasing the use of this tool in 2023 and building upon the program successes since its beginning in 2020. Applying the lessons learned since the start of the program in March 2020 will be critical to achieving the desired safety improvements and continues to be an emphasis point for all involved in the AWZSE program.



LEGISLATIVE MODIFICATIONS AND INFORMATION

Pennsylvania passed Act 86 of 2018 on October 19, 2018, establishing or modifying various sections within Pa. C.S. Title 75. Specifically, §3369 established automated speed enforcement in active work zones. Adjustments to the language within Title 75 as it relates to automated speed enforcement in work zones would extend the program, improve program operation, and enhance program usefulness.

Pilot Period Successes

Act 86 provided for a five-year pilot program for Automated Work Zone Speed Enforcement (AWZSE), with an effective start date of February 2019. Since the program became operational in 2020, the AWZSE program has demonstrated success in reducing motorist speeds through active work zones and improving crash rates when consistently deployed.

Long-term work zones present hazards to the traveling public regardless of the presence of work activity. These long-term work zones are typically barrier protected. The 15-50% decrease in crashes when the unit is present is based on statistics collected from these types of work zones.



38% reduction
in speeding
(1+ mph over the speed limit)



47% reduction
in excessive speeding
(11+ mph over the speed limit)



15-50% decrease
In work zone crashes when
AWZSE enforcement is present

The AWZSE program has proven to be a successful tool available to the Department and Commission in lowering speeds, reducing crashes, and improving safety for both motorists and workers. This program provides quantifiable benefit to all users of Pennsylvania roadways.

Year over year, the program has seen continual reductions in speeding. To date, the lowest monthly aggregate speeds for percentage over speed limit (15%) and excessively speeding (2%) occurred in July 2022.

Preliminary work zone crash numbers for 2022 indicate a significant reduction in work zone crashes, counter to national trends.

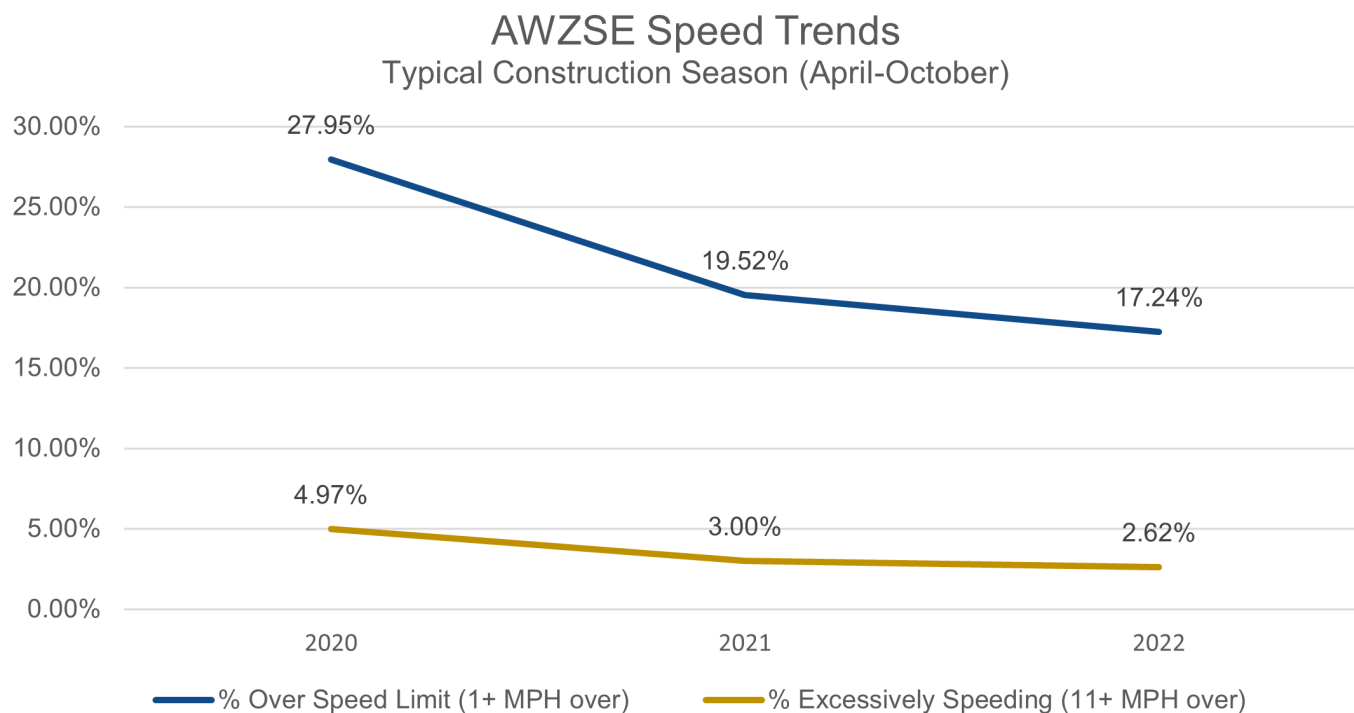


Figure 7. AWZSE Speed Trends 2020-2022

Pilot Period Lessons Learned

Establishing a five-year pilot period allowed the program to grow and mature through growing pains of program development and early deployments. This allowed the program to resolve any issues that occurred and take measures to ensure mistakes were made only once. Through these measures, the program has established itself as one that can work successfully and effectively into the future as a tool in the toolbox of the Department and Commission to improve the safety of work zones for workers and motorists. The following are lessons learned throughout the pilot period:

- Deployments successfully reduced speeds and crashes in the limited allowable use cases.
- The agencies would like to remind motorists that any suitable work zone could have automated speed enforcement at any time. The original legislation restricts the agencies' ability to place an advance informational sign at the start of suitable work zones, similar to how Maryland signs their photo enforced work zones with a reminder at the start of each suitable work zone.

- The original legislation allowed for unpaid violations to be transferred to a collections agency. Experience has shown that this is not enough of a deterrent for non-payment. Approximately 13% of violations have been transferred to collections, and of those, only 3% are paid.
- During COVID, per the Governor's Emergency Orders, the program's informal hearing process moved to a virtual environment. This virtual informal hearing process worked better than anticipated, expanding the accessibility of violators to contest a violation, providing due process and enhancing driver education.
- Limiting deployments to active work zones has tempered potential benefits. Most notably, long-term, barrier protected work zones continue to have higher speeds and crashes persist during inactive conditions. The AWZSE program exists to improve safety for all roadway users in work zones, including both motorists and workers in the work zone. However, some work zones remain in place and create a safety concern for motorists even when workers are not present. In certain situations, consideration should be given to these work zones where motorist safety is still important regardless of worker presence.
- The original legislation states that the registered owner is the responsible party for all violations under the program. This has been challenging with leased vehicles, as typically the lessee is the responsible party for violations incurred while leasing a vehicle. However, the agencies' legal interpretation of the original legislation steers this responsibility to the lessor, which is counter to other similar programs.

Legislative Actions for Program Extension and Enhancement

As the pilot program reaches the end of the legislatively mandated five-year pilot period (expiration of February 16, 2024), legislative action is required in 2023 to permit the use of Automated Work Zone Speed Enforcement as an available tool beyond the AWZSE pilot date. This current sunset date is reflected in all program activities, including the current contractual completion dates for both the System Administrator and the Program Administrator contracts. The certainty that prompt legislative action would provide will allow for the program to continue without interruption; thus continuing the safety benefits that the program provides. Prompt legislative action will also allow for the agencies to properly extend, reauthorize, or re-procure the contracted services. The lessons learned during the pilot program have also identified suggested statutory modifications as noted on the following page.





ISSUE: Current Sunset Date restricts ability to develop and implement long-range planning.

OBJECTIVE: Eliminate the currently scheduled sunset date of §3369 in February 2024.

ANTICIPATED EFFECTS: Provide program stability by allowing the member agencies to plan and ensure adequate staffing levels, improve financial planning with third-party contracted entities, and allow the program to continue as an effective tool in the toolbox for improving motorist and worker safety.



ISSUE: Requirement to indicate if enforcement is “not active” restricts the transportation agencies’ ability to realize benefits of the AWZSE program in all work zones.

OBJECTIVE: Eliminate the requirement to indicate if enforcement is “not active.”

ANTICIPATED EFFECTS: Permit the agencies to place informational signing at the start of appropriate work zones that automated speed enforcement is used in work zones across the state. These informational signs would be in addition to the two signs already used by the vendor to indicate that automated speed enforcement is “active.”



ISSUE: Semantics regarding the two warning signs being placed conspicuously before the active work zone instead of the automated speed enforcement work area.

OBJECTIVE: Adjust language to have the two warning signs be placed prior to the automated speed enforcement work area instead of prior to the active work zone.

ANTICIPATED EFFECTS: Provide clarity on requirements for advance warning sign placement.



ISSUE: Requirement for in-person hearings in five major metro areas is restrictive to individuals contesting violations, such as those from other states.

OBJECTIVE: Allow for informal hearings to be held virtually after pandemic restrictions are lifted.

ANTICIPATED EFFECTS: Improve accessibility for motorists to contest violations and modify behavior.



ISSUE: Zero-fine first violation allows motorists to ignore first notice.

OBJECTIVE: Adjust the penalty structure to a flat fee per violation.

ANTICIPATED EFFECTS: Every violation carries the same financial penalty, streamlining program operation and notice of violation issuance, improving financial planning, and not allowing motorists to ignore any violations.



ISSUE: Transferring fines owed to the program to collection agencies is not enough of a deterrent to non-paying individuals.

OBJECTIVE: Allow for registration renewal to be withheld until unpaid fines are remitted.

ANTICIPATED EFFECTS: Increase restrictions on registration renewals to increase payment rate of violators.



ISSUE: Some work zones have long-term setups that significantly change the characteristics of the existing roadway and may be in place even if workers are not present. Motorist safety is still important in these situations.

OBJECTIVE: Remove requirement for work zones to be “active” to receive enforcement.

ANTICIPATED EFFECTS: Improve motorist safety in certain specific cases when workers are not present. Approval by the appropriate transportation agency with PSP will be required to ensure no agency can act independently to establish enforcement in inactive work zones.



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