



No Boundaries Synthesis:
Responses to Staffing Shortages

Prepared for
No Boundaries Transportation Maintenance Innovations

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Executive Summary

State transportation agencies are struggling to fill maintenance staff vacancies and retain the skilled employees necessary to keep the roads clear and safe. Staffing shortages have generally been an issue for several years—and for some agencies, considerably longer.

This synthesis report documents an effort by the No Boundaries Transportation Maintenance Innovations pooled fund to gather data and anecdotal evidence from pooled fund members that describe the current maintenance staffing environment and highlight the practices member agencies are using to attract and retain maintenance staff. Surveys of No Boundaries members and their human resources (HR) colleagues sought information about the changes and trends in maintenance staffing levels and the ability of state transportation agencies to attract and retain well-trained maintenance staff. The No Boundaries Synthesis Subcommittee was also interested in agency responses to new federal commercial driver's license (CDL) requirements and information about the recruitment and retention practices agencies use to sustain, expand and diversify the applicant pool and retain workers. A limited literature search gathered information to supplement survey results.

Meeting Maintenance Staffing Challenges with Innovative Practices

In keeping with the No Boundaries mission to identify and share transportation maintenance innovations, this synthesis effort identified innovative practices to mitigate maintenance staffing shortages. These are a few of the No Boundaries member practices examined in this synthesis report:



- ◆ **Apprenticeship and training programs.** These programs can be targeted to underrepresented communities or veterans or take a broader approach to bring in entry-level staff for hard-to-fill positions.
- ◆ **Broadened recruitment efforts.** Hosting career fairs, collaborating with universities and other partner agencies, and sponsoring high school and university student events and programs are a few of the ways No Boundaries members are seeking out and engaging with potential maintenance workers.
- ◆ **Innovative payment practices.** No Boundaries members employ a range of payment practices designed to encourage the retention of existing staff and persuade job seekers to join the agency. These include competency pay, equity pay adjustments, geographic pay differentials, longevity premiums, and specialty pay and shift differentials.
- ◆ **Training as a tool to retain staff.** Training academies, career ladders, career progression and succession planning all play a part in cultivating existing talent and retaining maintenance staff.
- ◆ **Employee surveys.** Periodic polls and surveys can assess the level of satisfaction with pay, benefits and workplace culture, and gather critical information about employee needs and interests.

The findings presented in this synthesis offer a window into the experiences of selected transportation agencies from all regions of the country. (Responses were received from 15 of the 21 No Boundaries member states; seven member state HR departments participated.) While not a representative sampling of all state transportation departments, these findings provide useful insight for agencies seeking to mitigate maintenance staffing shortages. Many of the agency programs and practices that are briefly

discussed in this executive summary are described in more detail in the synthesis report with links to supporting documents, when available.

Maintenance Staffing Trends

All members participating in this synthesis are struggling to fill at least some maintenance vacancies, and some have been short-staffed for nine years or more. Anecdotal comments and staffing-related data provided by HR survey respondents both point to staffing shortages and turnover rates that are more pronounced for entry-level maintenance positions, including equipment operators and mechanics. Staffing challenges are generally the same throughout the year, though some seasonal variation exists such as losing summer workers to logging or agriculture.

Factors Impacting Vacancies

The top two reasons for maintenance vacancies reported by almost all member respondents are interrelated: competition from private industry and pay scale. Close behind are insufficient applicants in general and specifically, insufficient qualified applicants; competition from municipal or county agencies; and staff retention. Vacancies are least likely to be caused by the new federal CDL requirements or younger applicants who lack the required experience.

While survey results did not allow for an in-depth data analysis, anecdotally, the findings indicate that maintenance staff vacancies, turnover and separations appear to be more significant for entry-level positions.

Hiring Practices

Details of hiring practices were sought to possibly identify ways to streamline efforts to recruit and retain maintenance staff. Survey responses provided possible insight into the duration of the hiring process and barriers to attracting and retaining staff:

- The time required to hire new staff ranged widely, from 35 days to more than 100.
- Most member agencies do not require maintenance staff to be state residents.
- Only two member agencies enforce some type of residency limitation (response time to a maintenance shed, holding an in-state driver's license).
- Few respondents reported on barriers—legislative, regulatory or administrative—to attracting and maintaining maintenance workers. Those who did highlighted the pay scale and benefits as lacking.

Staffing Shortage Impacts

Maintenance staffing shortages at state transportation agencies can have a range of short- and long-term impacts. Disruptions or delays in clearing winter roads or routine maintenance are more immediate. Over the longer term, agencies may need to change plans, policies or operational processes to optimize the staff they can maintain.

No Boundaries members have many strategies for fulfilling their missions when short-staffed. Most contract with outside resources to perform services, which one member noted can increase costs, or delay or defer services. For respondents delaying or deferring maintenance services, impacts are reflected in the level of service, public dissatisfaction and projects being pushed further out in time. Many respondents reported reallocating nonmaintenance staff to meet service needs, and most use this staff reallocation practice to provide winter maintenance services, generally during weather events.

Insufficient staffing impacts transportation maintenance services differently, with some agencies deferring routine planned maintenance in general and others noting more specific impacts to pavement maintenance. Specific services, including equipment maintenance and fence and guardrail repair, are also impacted when staffing levels are lowered. While some members are unsure how long staffing shortages can be sustained, others have definite—and distinctly different—opinions about the impact of an ongoing shortage. Generally, respondents expect the long-term repercussions of staffing shortages will include a decline in both asset condition and employee morale and increased future repair costs.

Agency Practices Regarding Commercial Driver's Licenses

Some maintenance functions within transportation agencies require drivers who hold a CDL. Maintenance staff shortages may be due, in part, to a failure to attract and retain employees with CDLs when trucking positions with private companies often pay significantly more. Possibly exacerbating the competition for new staff holding a CDL—or interested in obtaining one—are new federal rules, administered by the Federal Motor Carrier Safety Administration, that went into effect in February 2022. The new rules require any facility providing entry-level driver training (ELDT) to potential CDL holders to follow a certain curriculum and be listed on a federal training provider registry. Applicants seeking a CDL must demonstrate certain proficiencies in knowledge and skills.

A literature search indicated that some industry observers expressed concern that the new rules will result in increased training costs and trainees will be hampered by the lack of registered training facilities. While almost all responding members said it is too early to tell if the new federal CDL rules will impact their agencies' operations and abilities to attract and retain maintenance workers, many are making changes to address the new requirements. Member agencies have established new CDL training programs and registered training facilities in the national provider registry, changed their existing training programs or implemented other efforts to facilitate training. Some are expediting preparations to meet the new CDL requirements by using or adapting the comprehensive ELDT materials for maintenance equipment operators produced by a recent Clear Roads pooled fund research project.

While none of the responding members offer sign-on bonuses to encourage new applicants who hold CDLs or are willing to obtain them, some offer a pay differential after a CDL is issued. Responding members typically cover an employee's CDL training costs and require repayment if the employee does not obtain the CDL or leaves the agency's employ before a specified time period (one year, for example).

Recruitment and Retention Strategies

While responding members acknowledge that pay is a prime motivator for employees to take and remain in a job, other practices are also used to mitigate long-term staffing shortages.

Recruiting New Staff

Recognizing the benefits of broadening applicant pools, some agencies are relaxing hiring requirements, broadening minimum qualifications, enhancing benefits, and offering sign-on and retention bonuses and specialty pay for employees with additional licenses. Housing stipends and employee housing are offered in areas where housing costs have become prohibitive for some new employees. Member agencies have established career pipelines for the next generation with apprenticeships and high school student programs. Apprenticeship programs, which vary in length from four months to two years, offer hands-on training to participants and may target specific types of candidates (veterans, for example).

Retaining Existing Staff

Retaining skilled maintenance workers requires intentional effort. Some of the most commonly used strategies include:

- **Career ladder programs.** Several members offer a well-defined career ladder for maintenance positions. These programs often specify the training, testing or certification required to move to the next job classification. For some agencies, advancement from an entry-level to a midlevel or more experienced maintenance position is done entirely within the agency.
- **Employee surveys** can affirm successful practices, identify unmet needs, and provide insight into recruitment, retention and agency culture.
- **Staff engagement** is done through formal training programs, commonly offered by members, or through mentoring or onboarding practices. Learning from staff leaving the agency can also be helpful when information is captured in exit interviews. Formal succession planning and knowledge management programs are less likely to be established by responding member agencies.
- **Innovative payment practices** are supported by most members and include competency or skill-based pay, equity pay adjustments, specialty pay or shift-based differentials, longevity and geographic pay differentials. Maintenance staff prefer compensatory, or comp, time to overtime pay in the survey's small sampling.

Selected Findings from the Literature

A limited literature search of recent publicly available domestic resources sought publications to supplement survey findings. One of the most recent efforts, an NCHRP project slated to conclude in 2022, will produce guidance and strategies to attract, retain and develop the design, construction and maintenance workforce into 2030 and beyond.

States have also assessed the issue through various studies and surveys, including Indiana (2020), Minnesota (2021) and Wisconsin (2017). Most notably, in 2020, the Clear Roads pooled fund undertook an in-depth investigation into recruitment and retention of highway workers and compiled practical strategies for transportation agencies to use to overcome challenges in hiring and retaining skilled plow drivers and other highway maintenance workers. The sampling of publications in this synthesis report also includes resources highlighting training, guidance and differing perspectives on the new federal rules for providing ELDT to potential CDL holders.

Successes and Challenges

All No Boundaries members participating in this synthesis have struggled, some for almost a decade, with shortages of maintenance staff due to difficulties attracting and retaining qualified employees. Some members expect these challenges to continue, citing ongoing concerns with broadening applicant pools, changing employment preferences and looming retirements.

The transportation agencies participating in this synthesis are clearly seeking creative solutions and many have identified successful practices to alleviate the burdens created by staffing shortages. Members reported on job fairs, apprenticeships, training and other practices that have proved to be successful in eliciting interest in working for a transportation agency. Members have found success in retaining maintenance staff by increasing pay and benefits, focusing on workplace culture and providing training to allow staff to advance within the agency. Whether by increasing pay or employing an innovative payment practice, expanding benefits or creating career paths for maintenance staff, agencies are responding to the staffing shortage challenge.

1 Introduction

1.1 Background

Staffing shortages are impacting all areas within state transportation agencies, including maintenance. The No Boundaries Transportation Maintenance Innovations pooled fund was interested in learning how state departments of transportation (DOTs) are responding.

The No Boundaries Synthesis Subcommittee sought information about the challenges to adequately staff a maintenance workforce, including the changes and trends in maintenance staffing levels, external factors that impact workforce staffing levels and the ability of state DOTs to attract and retain well-trained maintenance staff. Additionally the subcommittee was interested in state DOTs' responses to new federal commercial driver's license (CDL) requirements and information about recruitment and retention practices that agencies use to sustain, expand and diversify the applicant pool and retain workers.

1.2 Project Description

CTC & Associates employed a three-part strategy to gather information for this project:

- *No Boundaries member survey.* A survey of No Boundaries members gathered anecdotal evidence to assess the current state of practice regarding the impacts of and responses to maintenance staffing shortages.

Transportation agency human resources supplemental survey. Survey questions requesting data and other information most likely retained by human resources (HR) departments were included in a supplemental survey that No Boundaries members forwarded to their agencies' HR staff for completion.

- *Follow-up consultations.* Follow-up contacts with selected survey respondents provided context for some survey responses.
- *Literature search.* An examination of publicly available domestic resources and in-progress research was conducted to supplement survey findings.

1.3 Organization of This Synthesis Report

An examination of findings from the survey of No Boundaries members, which comprises the most significant portion of this report, begins in Chapter 2. Chapter 3 provides the staffing-related data shared by HR departments and briefly discusses hiring practices. National and state research examining staffing shortages and other workforce-related topics is presented in Chapter 4. (Chapter 4 includes a review of a related narrower synthesis effort on recruitment and retention conducted by the Clear Roads pooled fund.)

While the member survey received responses from almost three-quarters of No Boundaries members, any survey of just No Boundaries member states will not serve as a representative sampling of all state transportation agencies. However, the information presented can inform agency practices in meeting the ongoing challenges of maintenance staffing shortages.

2 Member Survey Findings

2.1 Introduction

CTC & Associates gathered information from state DOTs through an online survey of No Boundaries member state transportation agencies and a supplemental survey that members provided to their HR departments. Additionally, No Boundaries members were asked to complete a brief email survey with supplemental questions about issues related to CDLs.

The 15 No Boundaries members responding to the primary member survey are reflected below; members responding to the supplemental CDL survey questions are marked with an asterisk (*):

- California (Caltrans).*
- Colorado.*
- Connecticut.
- Idaho.
- Indiana.*
- Maine.*
- Maryland.*
- Mississippi.
- North Dakota.
- Ohio.*
- South Carolina.
- Texas.
- Utah.*
- Virginia.
- Wisconsin.

Note: All routine maintenance in Wisconsin is performed by the state's 72 county highway departments. Wisconsin DOT reimburses counties for actual costs, including equipment, fuel and labor, to maintain state highways. The information provided by the Wisconsin DOT member is provided within this context.

Survey questions are provided in [Appendix A](#). The full text of survey responses, including respondent contact information, is presented in a supplement to this report.

While much of the information provided by HR respondents, including staffing-related data, is presented in Chapter 3 of this report, narrative feedback from HR respondents may also be reflected in the following summary of No Boundaries member survey responses.

Among the topics examined in this chapter are:

- Maintenance staffing level trends.
- Staffing shortage impacts.
- Agency practices regarding CDLs.

- Recruitment and retention strategies.
- Agency successes and challenges.

2.2 Maintenance Staffing Trends

State DOT maintenance staffing levels directly impact the extent of services agencies can provide to maintain roads. Results from the No Boundaries member survey indicate that the number of transportation agencies experiencing staffing shortages has increased over the past decade. Staffing level survey responses are summarized below in the following categories:

- Current and past staff capacity.
- Seasonal challenges.
- Shortages across job classifications.
- Reasons for maintenance vacancies.



Refer to [Chapter 3](#) of this report to learn more about maintenance staffing levels, including vacancy rates.

Current and Past Staff Capacity

All responding members reported they are struggling to fill at least some maintenance vacancies. Most agencies have been short-staffed for many years:

- Nine years or longer (*California, Colorado, Maryland and Utah*).
- Several years (*Idaho, Maine, Mississippi, Ohio, South Carolina, Texas and Virginia*).
- Two years or less (*Indiana*).

Colorado DOT, which has experienced a steady increase in employee separations over the past few years as shown in Figure 1, formed a task force nine years ago to broadly consider human resources issues related to the agency’s maintenance workforce. In North Dakota, the staffing challenges are more targeted. The North Dakota member noted that the agency is competitive with pay and can generally fill operator positions. As such, county and city operators migrate to the agency, though there are more challenges in the western part of the state due to competition from higher-paying oil field jobs.

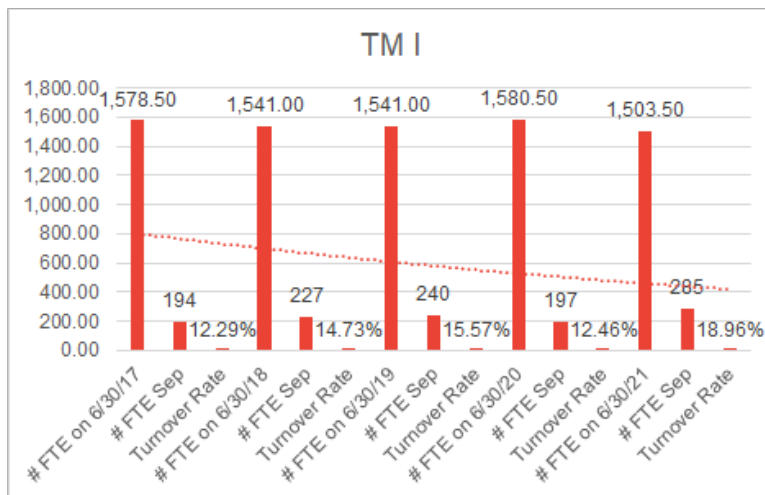


Figure 1. Separation Trends of Colorado DOT Transportation Maintenance Worker I (Source: Colorado DOT)

Seasonal Challenges

Most respondents reported their staffing shortages are the same across summer and winter maintenance staff, though some seasonal challenges were noted:

- **Winter:**
 - *California*. The agency is usually well-staffed in the winter when “permanent intermittent” employees, usually people who work as loggers during the summer, are hired. Overtime pay is offered for regular staff to participate in snow removal operations.
 - *Indiana*. The agency sees increased turnover toward the later part of the winter season.
 - *Ohio*. Winter shortages impact the ability to cover all normal snow and ice routes. While the agency supplements with temporary CDL employees, those positions are also getting harder to fill.
- **Summer:**
 - *Colorado*. Some summer workers are lost to agricultural and construction jobs.
 - *Ohio*. Some maintenance staff members are sent to work as construction inspectors. The agency typically doesn’t get many temporary workers in the summer.

Shortages Across Job Classifications

While Mississippi and North Dakota members reported that staff shortages are the same across maintenance job classifications, other responding member agencies are experiencing greater challenges in filling and retaining certain maintenance positions:

- General entry-level workers (*Colorado* and *South Carolina*).
- General maintenance technicians and road crew (*Indiana, Maine, Maryland, Ohio, Texas, Utah, Virginia* (specifically CDL holders) and *Wisconsin*).
- Equipment operators (*California, Maine, Maryland* and *Wisconsin*).
- Mechanics (*Idaho, Ohio, Maryland* and *Wisconsin*).

The Ohio member noted that while the agency’s Highway Technician vacancies are high, a lot of employees are still working in these classifications so work does get done, but more slowly. Yet with fewer mechanics, shortages are more impactful as mechanics keep the equipment running—everything from string trimmers to heavy equipment. Similarly, the Idaho member reported that mechanics are specialized, and the state cannot pay salaries that are comparable to those in private industry.

Other positions with greater shortages include engineers (*Texas, Virginia* and *Wisconsin*) and specialized positions (*South Carolina*).

Reasons for Maintenance Vacancies

Agencies reported a variety of reasons for maintenance vacancies (Table 1). The top two reasons, which were reported by almost all respondents, are interrelated: competition from private industry and pay scale. Close behind are insufficient applicants in general and specifically, insufficient qualified applicants; competition from municipal or county agencies; and staff retention. Vacancies are least likely to be caused by the new federal CDL requirements (*Virginia*) or younger applicants who lack the required

experience (*California* and *Wisconsin*). No respondents reported that inadequate benefit packages and workplace culture contribute to maintenance vacancies.

Table 1. Reasons for Maintenance Vacancies

State	COVID-19	Not Enough Applicants	Not Enough Qualified Applicants	Can't Retain Staff Once Hired	CDL Requirements Generally	New Federal CDL Requirements
California	X	X	X	X		
Colorado		X		X		
Connecticut	X		X			
Idaho		X	X	X		
Indiana			X			
Maine		X	X			
Maryland		X		X		
Mississippi			X	X		
North Dakota		X	X			
Ohio		X	X	X	X	
South Carolina		X		X	X	
Texas		X		X	X	
Utah		X	X	X		
Virginia	X		X		X	X
Wisconsin		X	X	X	X	
Total	3	11	11	10	5	1

Table 1 (continued). Reasons for Maintenance Vacancies

State	Applicants Trending Younger ¹	Competition from Other State Agencies	Competition from Municipal or County Agencies	Competition from Private Industry	Excess Number of Retirements	Geographic Limitations on Applicant Pool
California	X ²	X	X	X	X	X
Colorado						X ³
Connecticut		X	X	X	X	
Idaho			X	X		X
Indiana			X	X		
Maine			X	X		
Maryland				X		X
Mississippi			X	X		
North Dakota				X	X	X
Ohio			X	X	X	
South Carolina			X	X		X
Texas				X		
Utah			X	X		
Virginia				X		X

State	Applicants Trending Younger ¹	Competition from Other State Agencies	Competition from Municipal or County Agencies	Competition from Private Industry	Excess Number of Retirements	Geographic Limitations on Applicant Pool
Wisconsin	X	X	X	X	X	X
Total	2	3	10	14	5	8

- 1 The full text of this response option: *Applicants are trending younger and lack the experience required.*
- 2 The member noted that younger employees are “not interested in getting a CDL. Many are intimidated by large equipment and have no experience with manual transmissions or backing trailers.”
- 3 Areas of Colorado with an extremely high cost of living present unique challenges in recruiting and retaining staff in those locations.

Table 1 (continued). Reasons for Maintenance Vacancies

State	Inadequate Agency Budget	Inflexible Work Hours	Pay Scale	People Leaving for Different Careers	Lack of Interest in Maintenance
California	X		X		
Colorado		X	X		
Connecticut			X		
Idaho	X		X		
Indiana			X		
Maine			X	X	X
Maryland			X		
Mississippi			X	X	
North Dakota					
Ohio		X	X		
South Carolina			X		X
Texas			X		X
Utah			X		
Virginia			X		
Wisconsin	X	X	X	X	X
Total	3	3	14	3	4

Some pooled fund member and HR respondents offered additional reasons and unique situations causing staffing vacancies:

- *Decreased funding.* Funding decreases over the past decade have forced staff reductions in counties, resulting in less work performed for the state and reducing counties’ resiliency in the face of staffing shortages (*Wisconsin*).
- *Hazardous work.* The hazardous nature of the work and having to work “in the elements” add to staff vacancies (*South Carolina*).
- *Housing issues.* The growth the state is experiencing and the resulting higher costs of living, including a lack of affordable housing, have forced some employees to live in RVs (*Idaho*).
- *Large projects.* A massive, ongoing construction program has created stiff competition for workers of all types (*Virginia*).

- *Urban challenges.* Retaining staff in urban areas, particularly for night shifts, is more difficult because there are more opportunities for employment (*Ohio*).

2.3 Staffing Shortage Impacts

Maintenance staffing shortages at state transportation agencies can have a range of short- and long-term impacts. Disruptions or delays in clearing winter roads or routine maintenance, for example, are more immediate. Over the longer term, however, agencies may need to change plans, policies or operational processes to optimize the staff they can maintain.

Survey responses related to the impacts of staffing shortages are summarized below in these areas:

- Agency responses to staffing shortages.
 - Delaying or deferring services.
 - Reallocating staff.
- Services impacted by staffing shortages.
- Sustained staffing shortages and long-term impacts.

Agency Responses to Staffing Shortages

No Boundaries members have many strategies for fulfilling their missions with insufficient staff. Most member agencies:

- Contract with outside resources to perform services (*California, Colorado, Indiana, Maine, Maryland, Mississippi, Ohio, South Carolina, Utah, Virginia and Wisconsin*).
- Delay or defer services (*California, Colorado, Connecticut, Idaho, Maryland, Mississippi, Ohio, South Carolina, Virginia and Wisconsin*).

Table 2 summarizes member strategies. Following the table is more detailed information about delaying or deferring services and reallocating staff.

Table 2. Agency Responses to Staffing Shortages

State	Services Delayed or Deferred	Services Not Provided	Work Contracted Out	Nonmaintenance Staff Reallocated
California	X		X	
Colorado	X		X	X
Connecticut	X			
Idaho	X	X		X
Indiana			X	X
Maine			X	
Maryland	X	X	X	
Mississippi	X		X	
North Dakota				X
Ohio	X	X	X	X
South Carolina	X		X	X
Texas				
Utah			X	

State	Services Delayed or Deferred	Services Not Provided	Work Contracted Out	Nonmaintenance Staff Reallocated
Virginia	X		X	
Wisconsin	X	X	X	
Total	10	4	11	6

Delaying or Deferring Services

Agencies that are forced to delay or defer services reported both short- and long-term impacts. While the North Dakota member reported minimal impacts, other agencies reported public dissatisfaction as a consequence (*California, Maryland, South Carolina and Virginia*). Table 3 summarizes survey responses on the impacts of delaying or deferring services. Additional comments or clarification were provided by some respondents.

Table 3. Impacts of Delaying or Deferring Services

Impact	State/Respondent Comments
Asset Deterioration	<i>Maryland.</i> Assets are deteriorating at a rate faster than expected due to deferred maintenance. <i>Virginia.</i> Overall asset condition suffers.
Customer Service and Customer Satisfaction	<i>California.</i> Customer service requests and public dissatisfaction have increased. <i>Maryland.</i> Customer complaints have increased significantly due to asset deterioration. <i>South Carolina.</i> The reputation of the agency may be diminished as a result of delayed response. <i>Virginia</i>
Increased Agency Liability	<i>South Carolina</i>
Longer To-Do Lists	<i>Mississippi.</i> The agency’s to-do list gets even longer. <i>Ohio.</i> As with all maintenance activities, work items just get pushed out on the calendar. The respondent noted that “[w]e can absorb it in the short term.”
Minimal Impacts	<i>North Dakota.</i> Currently impacts are minimal. During a major snow event, if one part of the state is heavily impacted by the storm, the agency coordinates to move resources from throughout the state to where they are needed most.
Reactive Approach to Maintenance	<i>Ohio.</i> Safety-sensitive items are prioritized and generally not delayed. Reactive tasks are completed; proactive maintenance is deferred.
Reduced Level of Service	<i>California</i>

Reallocating Staff

Many respondents reported reallocating nonmaintenance staff to meet service needs, and most use this staff reallocation practice to provide winter maintenance services, generally during weather events. Agency practices are summarized below.

- *Colorado.* For the past five years, the agency has pulled resources from other transportation districts to the Interstate 70 (I-70) Mountain Corridor joint operating area (JOA), offering housing and other benefits to reallocated staff members. Those areas from which resources

were drawn for the JOA have experienced reduced asset maintenance. Next year, I-70 maintenance patrols will hire employees and statewide support will wane.

- *Idaho*. Nonmaintenance staff is used to monitor barricades during winter storms when roads are closed. This posting continues until the road is open. The Idaho member also noted that some maintenance staff members will work in other districts on important projects, which can lead to neglect of home district projects.
- *Indiana*. Staff is reallocated primarily for winter operations.
- *Maryland*. Nonmaintenance staff may be reallocated on a voluntary basis to perform winter maintenance for winter events only and return to their normal responsibilities during routine operations.
- *North Dakota*. Mechanics assist with snowplowing only when the agency is short-staffed and during an active snow event. When mechanics are in the field plowing during a snow event, there may be slight delays in repairing equipment that comes into the shop.
- *Ohio*. All agency employees are offered the opportunity to obtain a CDL and drive trucks for snow and ice operations. The redeployed staff members perform these tasks only for the duration of a snow and ice event, and then resume their normal duties.

The types of nonmaintenance staff stepping in to perform snow- and ice-related duties include construction inspectors, engineers, planning and design engineers, mechanics and other managers. In general, normal duties and tasks are simply deferred until these volunteers can catch up. Staff members with time-critical duties typically decline the opportunity to work in snow and ice operations.

- *South Carolina*. Nonmaintenance staff is temporarily assigned to address winter weather.

Two agencies reported on staff reallocation practices related to bridges. Colorado DOT provides cross-training to prepare specialty bridge crews to assist with nonbridge maintenance as assigned. Wisconsin DOT's engineers are sometimes reallocated to perform bridge inspections.

Point of Practice Contracting for Services Can Add to Costs



In some cases, Ohio DOT's maintenance work is contracted out to private companies. Diminished levels of assistance from highway maintenance staff for the agency's construction and capital programs areas have led to the increased use of consultants for project

inspection in these areas, which tends to be more costly than using in-house inspection services. The additional funds used to retain these consultants could have been used to fund more construction projects.

The Ohio member noted that added costs are also associated with using in-house staff. With fewer employees available, the agency requires existing staff to work more hours, which increases overtime costs.

Services Impacted by Staffing Shortages

Insufficient staffing impacts transportation maintenance services, deferring routine planned maintenance in general (*Mississippi, Ohio and South Carolina*) and pavement maintenance specifically (*California, Maine and Maryland*). Specific services, including equipment maintenance and fence and

guardrail repair, are also impacted (*California, Indiana, Maine, Maryland, Texas, Utah* and *Virginia*). The Virginia respondent noted an overall reduction in work completed in part because contractors face similar staffing shortages. Table 4 summarizes survey responses.

Table 4. Services Impacted by Staffing Shortages

Impact	State/Respondent Comments
Decline in Asset Maintenance	<i>Colorado</i> . Asset maintenance has suffered because of the focus on operations. “There are not enough hours to do operations and regular maintenance.”
Deferring Routine Planned Maintenance	<p>Routine planned maintenance:</p> <p><i>Mississippi</i>. The agency has become reactive rather than proactive.</p> <p><i>Ohio</i>. Roadway maintenance activities are deferred or not completed.</p> <p><i>South Carolina</i>. Routine planned maintenance is more difficult to accomplish. Response goals for reactive maintenance are harder to accomplish.</p> <p>Pavement maintenance:</p> <p><i>California</i>. Pavement maintenance is deferred.</p> <p><i>Maine</i>. Pavement maintenance is deferred. “There becomes a dependence on the Herculean efforts of the few.” The respondent noted that this brings with it a higher risk of burnout.</p> <p><i>Maryland</i>. Pavement maintenance is deferred.</p>
General Reduction in Work Completed	<p><i>Virginia</i>. The quantity of work completed is impacted. The respondent also noted that “contractors are facing similar shortages and cannot handle [the] amount of work we would pass to them.”</p> <p><i>Wisconsin</i>. Less work is done by the counties.</p>
Inspection Demands	<i>Texas</i> . Inspectors are being stretched thin.
Level of Service Issues	<p><i>Idaho</i>. All general maintenance levels of service are impacted at some point. “Some just don’t get done.”</p> <p><i>Utah</i>. Services are not provided as often as they should be, with staff members working more than 40 hours per week to try to keep up with demand.</p>
Reprioritized Maintenance	<i>Indiana</i> . The focus has been redirected to primary safety and pavement preservation activities.
Seasonal Challenges	<p><i>North Dakota:</i></p> <p>Summer. With a limited time to get summertime maintenance tasks completed, some tasks are neglected due to the short time frame and lack of staffing.</p> <p>Winter. The agency often supplements winter plowing with staff from other divisions within the district. Mechanics and sign shop maintenance crews are required to have a CDL. When short-staffed, the agency pulls from those divisions to plow snow.</p>

Impact	State/Respondent Comments
<p>Specific Tasks Deferred or Impacted</p>	<ul style="list-style-type: none"> • Equipment maintenance (<i>Maryland</i>). • Fence and guardrail repair (<i>California</i>). • In-house paving that requires heavy equipment operators (<i>Texas</i>). • Litter removal (<i>California</i> and <i>Utah</i>). • Roadside maintenance and any aesthetic projects (<i>Indiana</i>). • Snow removal (<i>Maine</i> and <i>Virginia</i>). • Trouble call-response times (<i>Virginia</i>).

Sustained Staffing Shortages and Long-Term Impacts

While some members are unsure how long staffing shortages can be sustained, others have definite—and distinctly different—opinions about the impact of an ongoing shortage. The Mississippi member reported that his agency could not sustain the shortage much longer, while the Utah member said his agency could sustain the current short-staffed situation indefinitely.

Other members described efforts to combat a sustained staffing shortage. Colorado DOT will focus on developing and investing in employees as the best way to build loyalty to the agency and retain staff. Members also offered these comments:

- *Competing impacts of contracting and retirements.* Contracting out work will allow the agency to sustain a good course, but looming retirements will decrease staff expertise (*Texas*).
- *Level of service tolerances.* How long a staffing shortage can be sustained will depend on agency and public tolerances regarding level of service (*Ohio*).

“We have been doing so much with so little for so long [that] we can practically do anything with nothing!”

—No Boundaries Caltrans member

Respondents also described the long-term repercussions of staffing shortages, as summarized in Table 5. Reductions in public satisfaction, employee morale, and asset condition and maintenance are the most commonly predicted ramifications.

Table 5. Long-Term Repercussions of Staffing Shortages

Impact	State/Respondent Comments
Decline in Asset Condition	<p><i>Colorado.</i> Asset maintenance has declined while operations demands, which do not add value to infrastructure condition, have increased. A rapid decline in the condition of understaffed areas will need to be addressed by large and costly capital reconstruction programs.</p> <p><i>Indiana.</i> Preventive maintenance schedule is impacted.</p> <p><i>Maryland.</i> Reduced asset life cycle is a significant concern to the agency.</p> <p><i>South Carolina.</i> Premature deterioration of infrastructure assets will be associated with the lack of routine/preventive maintenance.</p> <p><i>Texas.</i> The quality of pavement work could possibly be reduced.</p> <p><i>Virginia.</i> Overall asset condition will suffer.</p>
Decline in Employee Morale or Staff Expertise	<p><i>Indiana.</i> Morale and talent retention have decreased.</p> <p><i>Maine.</i> Remaining staff burns out, potentially leading to reduced levels of service.</p> <p><i>North Dakota.</i> Current operators burn out.</p> <p><i>Ohio.</i> The agency may have to contract out activities typically performed in-house.</p> <p><i>Texas.</i> Loss of expertise in more technical work areas requires more contractor work, but the inspectors also need this expertise to properly inspect contractor work.</p> <p><i>Utah.</i> Transportation technicians burn out quickly because they have to work longer hours to make up for insufficient staff within their sheds to support them.</p>
Decreased Public Expectations and Public Satisfaction	<p><i>California.</i> A lack of public trust and decreases in future allocations from the governor and state Legislature are possible.</p> <p><i>Maryland.</i> Customer expectations may be lowered over time due to deferred mowing and litter pickup.</p> <p><i>North Dakota.</i> Public satisfaction has decreased.</p> <p><i>Ohio.</i> The agency may only achieve the safety-sensitive tasks, and many noncritical yet still important tasks won't be accomplished. Eventually, the public will notice incomplete tasks, as it currently does with litter, vegetation control and other aesthetic activities.</p>
Increased Future Repair Costs	<p><i>Ohio.</i> A lack of proactive maintenance will result in more expensive future repairs.</p> <p><i>Virginia.</i> The result is more complex repairs at higher costs.</p>

2.4 Agency Practices Regarding Commercial Driver's Licenses

Many maintenance functions within transportation agencies require drivers who hold a CDL. Maintenance staff shortages may be due, in part, due to attracting and retaining employees with CDLs as trucking positions with private companies may pay significantly more. The Texas member, for example, noted that the agency's CDL drivers tend to leave for oil or tech industry jobs.

Recent federal efforts may further impact the availability of CDL recruits for state DOTs. Historically, applicants holding a CDL have received training from a variety of sources—from family members to costly private trucking schools. Aimed at improving trucking safety, new federal entry-level driver training (ELDT) rules require any facility providing training for entry-level drivers to follow a specified

curriculum and be listed on the federal [Training Provider Registry](#). Applicants seeking a CDL must demonstrate certain proficiencies in knowledge and skills.

Additionally, the [Safe Driver Apprenticeship Pilot Program](#), a three-year pilot program required by recent federal legislation, will allow employers to establish an apprenticeship program for 18- to 20-year-old drivers with an intrastate CDL to operate commercial vehicles in interstate commerce under specific conditions. No Boundaries members described:

- Impacts of recent federal efforts, including agency CDL training programs.
- Strategies to incentivize employees holding CDLs.

Impacts of Recent Federal Efforts

Almost all responding members said it is too early to tell if the new federal CDL rules will impact their agencies' operations and abilities to attract and retain maintenance workers. The Indiana member noted that the agency may change the way it hires if a new apprenticeship program permitting younger CDL drivers moves beyond the pilot stage, and the Connecticut member did not think the new federal CDL rules would have any impacts.

Colorado DOT's focus has pivoted to training new drivers, and the agency's long-established training academy puts it in a good position to do so. (See Table 6 for more information about this effort.) Other members commented on factors that can deplete the pool of CDL candidates, such as higher paying private industries and demands on CDL trainees:

- *Maryland*. Typically, private industry pays significantly more than government agencies, often with sign-on bonuses, and the agency cannot compete. Private industry will be able to draw from this candidate pool, taking away potential employees who might have come to the agency directly from high school or after realizing they weren't suited for college.
- *Ohio*. The change in CDL requirements is increasing the demands on CDL trainees, which could limit the pool of applicants coming into the agency with a CDL.
- *Texas*. Higher salaries in private industry make it difficult for Texas DOT to hire and retain CDL drivers. The new federal CDL requirements will only make this situation more difficult.

*"We'll pay to get them trained and then they'll leave
for higher pay."*

—No Boundaries Texas member

- *Virginia*. Fewer young employees are seeking CDLs during vocational school. The smaller pool of CDL drivers may also be impacted by drug testing laws and newly legal THC products. (*Note*: THC, or tetrahydrocannabinol, is the active ingredient of cannabis.)

Agency Commercial Driver's License Training Programs

To meet the requirements of the new federal CDL rules, several No Boundaries members have established new CDL training programs (*Indiana, Maine, Maryland and South Carolina*); changed their

existing programs (*California* and *Ohio*); or implemented other efforts to facilitate training (*Texas* and *Virginia*). These efforts are summarized in Table 6.

Three respondents reported that their agencies have not instituted any changes to meet the new federal CDL rule requirements (*Connecticut, Idaho* and *North Dakota*); two respondents were unaware of any changes (*Mississippi* and *Utah*).

Table 6. CDL Training Practices

Agency Practice	State/Respondent Comments
Established New Program	<p><i>Colorado.</i> Launched a new in-house CDL training program in 2022 for employees with only two years of general work experience. A two-week in-class boot camp is followed by two weeks of behind-the-wheel training, with participants expected to achieve specific achievement milestones or move past “gates” within specified time periods. The HR respondent noted that CDL drivers trained in-house tend to be more loyal to the agency.</p> <p><i>Indiana.</i> Established a training program and created trainer positions in each district.</p> <p><i>Maine.</i> Worked with training staff to implement CDL training using in-house instructors. The agency is planning to construct a practice track at the agency’s Fairfield training facility.</p> <p><i>Maryland.</i> Adopted training materials from the curriculum developed by the Clear Roads pooled fund for CDL training. (See the Point of Practice, page 19, for more information.)</p> <p><i>South Carolina.</i> Developed and implemented ELDT.</p>
Enhanced Existing Program	<p><i>California.</i> Registered the Maintenance Training Academy in Sacramento to become a certified provider of Federal Motor Carrier Safety Administration (FMCSA) requirements that also meet California Department of Motor Vehicles (DMV) guidelines. The agency provides the necessary training and reimburses employees for DMV costs associated with obtaining the license.</p> <p><i>Ohio.</i> Has certified training sites and enlists internal trainers to spend more time with trainees behind the wheel.</p>
Other Efforts to Facilitate Training	<p><i>Ohio.</i> For nonhighway maintenance staff (including engineers, planners, inspectors and administrative positions): Trains in-house, and covers all time and expenses to obtain a CDL.</p> <p><i>Texas:</i></p> <p>Looking for training facilities throughout the state to provide flexibility in hiring and training CDL drivers.</p> <p>In position descriptions, highlights agency-sponsored CDL training with no up-front monetary commitment from the new employee, who earns a full salary while training and is reimbursed for lodging, transportation and per diem expenses, if necessary.</p> <p>Employees earning a CDL in this manner are required to give one year of agency service or reimburse the agency for all training expenses incurred. New hires who begin the training program but do not obtain a CDL are also required to reimburse the agency’s training expenses.</p> <p><i>Virginia.</i> Covers training costs and extends time to acquire CDL. Employees participating in the training program must meet a one-year service requirement to avoid repaying training expenses.</p>

Point of Practice Meeting the New CDL Requirements in Maryland

To expedite preparations to meet the new federal ELDT requirements, Maryland State Highway Administration (SHA) adopted the curriculum developed by the Clear Roads pooled fund in [Project 20-01](#), Entry-Level Driver Training (CDL) for Maintenance Equipment Operators, adding the agency logo to the template training materials. Almost three-quarters of the agency's two-week CDL training takes students through the Clear Roads theory and behind-the-wheel curriculum. The remainder of the training prepares students to obtain the traffic control certification and complete required forms. CDL training is offered every two months.



SHA CDL trainers coordinate with Maryland DMV testers to ensure that all driver-related data for CDL course participants can be entered into the federal [Training Provider Registry](#) within 48 hours of completion of testing, as is required under the new ELDT regulations.

The agency is considering employing a noncompete agreement for employees completing the agency's CDL training.

Strategies to Incentivize Employees Holding Commercial Driver's Licenses

Many respondents noted difficulties in attracting and retaining employees who hold CDLs because private industry pays more for these positions. To gather more feedback about practices to address this challenge, completed by seven members completed a supplemental survey that addressed whether their agencies:

- Offer a sign-on bonus to new employees who hold a CDL.
- Offer bonuses to current employees who obtain CDL certification.
- Require employees to execute a noncompete agreement after obtaining CDL certification through the agency.
- Provide employees any other benefits related to CDL training and certification.

Bonuses for CDL Employees

None of the seven agencies offer sign-on bonuses to new employees who hold CDLs or a one-time bonus to current employees who obtain a CDL. However, three members noted the potential for pay increases:

- *California*. The respondent shared the agency's pay differential for current employees obtaining CDL certification through Caltrans (Figure 2). The employee begins receiving a monthly pay differential after the CDL is issued. Caltrans does not require a period of service to retain the differential nor does it require repayment.

A. Department of Transportation Commercial License.

1. Permanent full-time employees in the following classifications who are assigned to a position requiring regular operation of vehicles which require a Class A or B driver's license shall receive the following differential per month:

Classification	Amount of Differential
Caltrans Electrical Technician	\$ 163
Caltrans Electrician I	\$ 187
Caltrans Electrician II	\$ 205
Caltrans Heavy Equipment Mechanic	\$ 187
Caltrans Heavy Equipment Mechanic Leadworker	\$ 201
Equipment Materiel Specialist	\$ 167
Foundation Driller (Class A only)	\$ 163
Heavy Equipment Bodyworker/Painter	\$ 170
Heavy Equipment Electrician	\$ 183
Heavy Equipment Mechanic Apprentice, Caltrans	\$ 163
Lead Heavy Equipment Bodyworker/Painter	\$ 178
Mechanic's Helper, Caltrans	\$ 136
Senior Equipment Materials Specialist	\$ 183
Tree Maintenance Worker, Caltrans	\$ 159
Tree Maintenance Leadworker, Caltrans	\$ 175

Figure 2. Caltrans Pay Differentials for CDL Holders (Source: Caltrans)

- *Idaho*. Upon obtaining a CDL, the employee is eligible to drive during winter operations and earn overtime compensation. New employees coming into the agency without a CDL for positions that require it must obtain a CDL within 60 days of hire. Training is provided by the agency.
- *Indiana*. Employees in CDL-required positions receive a \$1 an hour salary increase once they obtain their CDL.

Noncompete Agreements

No respondents currently require employees to execute a noncompete agreement after obtaining CDL certification. However, Maryland SHA's senior agency leadership is considering this requirement. If leaders decide to require an agreement, the issue will be taken before the employee union.

2.5 Recruitment and Retention Strategies

Member agencies use a range of practices to recruit and retain staff, including:

- Broadening applicant pools.
- Identifying effective practices to attract new workers.
- Employing retention strategies such as career ladders, employee surveys and other engagement practices, overtime pay and comp time, and innovative payment practices.
- Applying previous research.

Employee practices in each of these topic areas are examined below.

Broadening Applicant Pools

Member state HR staff weighed in on current practices aimed at broadening applicant pools, which could play a significant role in addressing staffing shortages. The practices they identified, summarized below, involve altering hiring requirements, enhancing benefits, upgrading positions and offering bonuses and specialty pay.

Altering Hiring Requirements

- Broaden minimum qualifications for entry-level staff to require years of experience in labor or driving (Class B CDL), but not both (*Colorado*).
- Consider removing the CDL requirement (*Connecticut*).
- Eliminate requirement for medical exam (*California*).
- Open positions to nonresidents (*Colorado*).
- Relax the minimum experience and education requirements in job postings (*Texas*).

Enhancing Benefits

- Allow flexible work strategies (*Texas*).
- Offer housing stipends of \$500 to \$800 (*Colorado*).
- Supply workforce housing, as available, up to \$800 per month. (*Colorado*). (Historically, this had been a trailer home. The new model is to provide public workforce housing, which is distinct from affordable housing.)
- Increase the pay scale for transportation technician operations positions, transportation operations team leader and mechanics positions (*Idaho*).

Upgrading Positions

- Change transportation maintenance worker job description to transportation maintenance specialist in 2022 (*Colorado*).

Offering Bonuses and Specialty Pay

- Offer a snow bonus program, which provides a bonus to employees who work during all required storms (*Colorado*).
- Offer specialty pay to employees with additional licenses (for example, weed spraying) (*Colorado*).
- Pay a \$1,500 sign-on bonus if an employee stays one year (*Idaho*). (Some position postings offering this bonus indicate that possession of a CDL is preferred and required within 60 days of hire.)
- Pay a \$5,000 retention bonus if an employee stays one year (*Idaho*). (That amount is prorated if the employee departs before the one-year threshold.)
- Pay bonuses for completing coursework required for a position (*Utah*).

Identifying Effective Practices to Attract New Workers

To attract new staff, some agencies are reaching out to the next generation through apprenticeship programs, career and job fairs, and other outreach efforts. Some agencies are connecting with other state agencies to share information and identify prime candidates for recruitment. Still others are focusing on diversity, drafting formalized diversity and inclusion plans and organizing internal employee groups that celebrate diversity. Table 7 summarizes survey responses.

Table 7. Practices to Attract New Workers

Practice	State/Respondent Comments
Establishing Career Pipelines for the Next Generation	<p><i>Indiana.</i> Partnered with the State of Indiana Personnel Department to launch an apprenticeship program.</p> <p><i>Maine.</i> Encourages recruitment staff from the agency’s HR department to attend career fairs occasionally.</p> <p><i>Ohio.</i> Encourages district HR teams and others to participate in various local events. Some outreach is done with local career centers and vocational schools, but the agency does not have a defined program for this type of outreach.</p> <p><i>Texas.</i> Offers a high school cooperative education program. (See the Point of Practice, page 34, for more information.)</p> <p><i>Utah.</i> Visits high schools and job fairs to recruit new staff.</p>
Partnering with Other Organizations	<p><i>California.</i> Partners with the state DMV and California State Parks to attract people with CDLs to equipment operator positions. DMV provides a list of CDL holders, and Caltrans sends recruitment postcards to people on the list.</p> <p><i>Texas.</i> Partners with heavy equipment colleges and technical schools as well as veterans organizations.</p>
Increasing Workforce Diversity	<p><i>California.</i> For decades, has placed a focus on diversity. The Caltrans Office of Race and Equity, officially launched in August 2020, is charged with “advancing racial equity throughout the [d]epartment’s internal and external operations.” The office’s December 2020 equity statement commits to establishing metrics for accountability to people, programs and projects, partnerships and the planet.</p> <p><i>Ohio.</i> Includes commitments for recruitment and retention in its Diversity, Equity and Inclusion Plan (2021-2023).</p> <p><i>Texas.</i> Has established Employee Resource Groups based on different diversities.</p> <p><i>Wisconsin.</i> Included a workforce analysis in the agency’s Equity and Inclusion Plan (2021-2023). The analysis considered data from exit interviews, employee satisfaction surveys and retirement projections.</p>

➤ Refer to the **Point of Practice** below and on page 25 for information about other apprenticeship programs.

➤ Refer to the **Point of Practice** on page 47 for details of a recent change in Ohio DOT’s hiring practices that is expected to encourage diversity and make it easier to bring in new staff.

Point of Practice Giving Apprentices a Leg Up on the Career Ladder



In April 2022, Colorado DOT launched a new two-year [maintenance apprentice program](#) with 10 employees. Each position is entry level, classified as a labor, trades and crafts trainee, with apprentices training and specializing in maintenance, traffic and safety, or tunnel operations. The two years of paid mentorship include hands-on and classroom training. After completing the program, apprentices will earn their CDL, qualify as a highway maintenance specialist and receive full benefits. Qualified applicants must be at least 18 years old and have a valid driver’s license to participate.

Employing Retention Strategies

Strategies and practices designed to retain existing staff are summarized below in the following categories:

- Career progression and career ladders
- Employee surveys
- Other employee engagement
- Overtime pay and comp time
- Innovative payment practices

Career Progression and Career Ladders

Some agencies are in the early stages of discussing how to employ career progression or a career ladder (*California* and *North Dakota*). Other agencies have programs in place to encourage movement from one maintenance position to another:

Maintenance career path. Colorado DOT offers a structured career path for several types of workers. The [maintenance career path](#) includes the agency's most typical highway maintenance workers (who plow snow and perform roadway maintenance), as well as heavy equipment mechanics, electrical tradespeople, welders, storeroom workers, building crew members and general laborers.

The agency's website includes an [introductory video](#), *Transportation Maintenance Worker: A Realistic Job Preview*, about the rewards and challenges of these positions, which account for nearly half of Colorado DOT's employee population. The video addresses advancement and training opportunities, a two-week training academy after initial hire that employees return to for a week of training each year, tuition reimbursement, retirement pension, and health and dental benefits.

Highway Technician series. Ohio DOT's Highway Technician positions (1, 2 and 3) are full-time, permanent positions. The level 2 and 3 positions are filled through automatic progression after successful completion of required coursework, certification (if applicable) and experience.



Refer to the **Point of Practice** on page 25 for more details of Ohio DOT's Highway Technician series.

Transportation Worker program. Maine DOT's employees coming into the agency as a Transportation Worker 1 can participate in progressive courses and certifications that permit them to take tests to advance to the next classification level, Transportation Worker 2.

Employee Surveys

Several member agencies conduct employee surveys to assess how current staff members view their work with the agency:

Gallup Polls (*North Dakota*). The DOT recently conducted a statewide Gallup Poll of employees. Results indicated that the agency could improve on providing maintenance crews with the tools they need. The North Dakota member also noted that "we also had some work to do on listening to input from staff." A state Gallup contract includes Gallup employee engagement training.

Survey of Employee Engagement (*Texas*). Texas DOT conducts the Survey of Employee Engagement (SEE) every two years. This survey includes 48 items designed to "assess how the organization

functions.” Each question is presented with a five-point scale of options that range from strongly disagree to strongly agree. Agency results are presented on an interactive [performance dashboard](#). Scores above 350 indicate that more employees are satisfied than are dissatisfied. A comprehensive score for the organization is supplemented by 14 more granular scores for categories such as pay, benefits, community and workgroup. SEE results are provided to state legislators for use during biennial legislative sessions.

In 2020, the overall employee engagement score was 376, the highest score since the SEE’s launch in 2012.

Quality of Work Life Survey (Ohio). Launched in 2012, Ohio DOT’s Quality of Work Life Survey focuses on three main areas:

- Strategic issues: How do I contribute to the agency’s strategic plan?
- Employee satisfaction: How satisfied are the people of Ohio DOT?
- Working environment: How is the working environment?

The survey began electronic distribution in 2017. Survey results are shared with executive leadership and used to set priorities for improving the workplace. The [March 2017 issue](#) of *Transcript*, Ohio DOT’s employee newsletter, “highlight[s] the positive changes made in improving [e]mployee [s]atisfaction, communicating [s]trategic [i]ssues and enhancing the [w]ork [e]nvironment within ODOT [Ohio DOT].” The agency has seen incremental improvements in its Work Life Index since the survey’s launch, though the Ohio member noted that the agency has not conducted this survey for a few years.

Employee satisfaction surveys (Wisconsin). The agency’s [Equity and Inclusion Plan \(2021-2023\)](#) describes an employee satisfaction survey that was conducted in 2019 and 2020. Survey questions “provided insight to recruitment, retention and agency culture” and included:

- I know how my daily work contributes to providing leadership in the development and operation of a safe and efficient transportation system.
- My job responsibilities are challenging.
- My job responsibilities are rewarding.
- I am able to maintain a work/life balance working at WisDOT [Wisconsin DOT].
- I am provided performance feedback by my supervisor in an honest [manner].
- My work environment is one where every person is respected.
- My work environment is one where diverse cultures are accepted.
- WisDOT management values employee satisfaction.
- Overall, I believe WisDOT is a good place to work.
- I would recommend working at WisDOT to others.
- I intend to continue to work at WisDOT for the foreseeable future.

Other member agencies, including Caltrans and Connecticut, Indiana and Utah DOTs, also conduct annual or periodic employee surveys.

Point of Practice Career Progression for Ohio DOT's Highway Technician Series



Ohio DOT's career progression for Highway Maintenance Workers is supported by an entry-level [apprenticeship program](#). Only the entry-level apprentice and level 1 positions described below are posted externally; advancement to level 2 and 3 positions is done within the agency.

Highway Maintenance Worker 1

This entry-level apprenticeship program serves as a direct feeder to the full-time, permanent Highway Technician 1 position. Candidates are hired for a 12- to 16-week training period and provided internal training to help them obtain a CDL. This is currently an hourly position with no paid benefits, which makes recruitment of new candidates challenging. (A new agreement, described in more detail in the **Point of Practice** on page 47, will allow the agency to post permanent positions in this class that do not require a CDL to be hired.)

The agency has found success transitioning apprentices achieving the CDL who are considered "good employees" into the full-time Highway Technician class. This apprenticeship program has been particularly helpful in reaching underserved communities, veterans and people leaving the corrections system in Ohio.

Job announcements for the position are clearly written and accompanied by a [video](#) describing the agency. The agency promotes that it pays for CDL training and offers access to equipment and experienced drivers. Outreach continues to expand to potential new partners in the apprenticeship program. An increased presence on social media through Facebook and TikTok is expected to help in that outreach.

Highway Technician 1

To qualify for this full-time, permanent entry-level position, candidates must pass a physical ability test (PAT) and a reading, comprehension and math test.

The PAT requires candidates to physically demonstrate the ability to lift, pull, drag and/or maneuver 50 to 100 pounds. The PAT test course includes six events that require the applicant to use equipment and materials commonly found on the job and used by current Highway Technician I staff. Candidates must successfully complete all six events to pass the PAT and be considered for employment.

Currently, candidates entering these positions must have a CDL Class B license.

Highway Technician 2 and 3

These positions are filled through automatic progression after successful completion of required coursework, certification (if applicable) and experience. These positions are not publicly posted.

Other Employee Engagement

Member agencies are actively engaging with employees from the day they begin work to the day they leave the agency's employ using programs and practices such as the following:

- Onboarding practices.
- Mentorship programs.
- Employee training programs.
- Succession planning and knowledge management.
- Exit interviews.

Onboarding practices for new employees were reported by several member agencies. In Ohio, selected candidates complete required forms and are subject to preemployment checks, including a drug test, background and driver's license check, and federal drug and alcohol clearinghouse queries. An electronic Personnel Action Request is generated and approved, and a welcome letter is sent to the new employee.

Mentorship programs were mentioned by several members, including Texas DOT and Wisconsin DOT. Most Ohio DOT work units assign a mentor as part of the onboarding process, and the agency also offers a mentorship program for new managers. Utah DOT has a formal mentoring program "to connect people with continuous learning opportunities." The program is open to all employees who can participate as a mentor or mentee.

Employee training programs are offered by several member agencies, with some reporting on formalized programs.

- *California*. The agency has a robust training program for all job classifications.
- *Indiana*. An online training catalog describes the required courses that must be completed for each operation position in the first and second years of employment.
- *Maine*. Career progression for the agency's Transportation Worker program brings in new employees as a Transportation Worker 1, who are eligible to complete progressive course and complete certifications that permit them to take tests that allow for advancement to Transportation Worker 2.
- *Ohio*. The agency offers a [formalized training program](#) that includes:
 - **Compliance training**. All new agency employees are required to take compliance courses on their first day of work. Offered electronically during new hire orientation, these courses include Fraud and Ethics, Sexual Harassment Awareness Training, Active Aggressor e-Learning and Protect Ohio—Security and Privacy Training.
 - **Internal training**. These training programs, developed and managed by the Office of Employee Development and Lean, include:
 - County Management Training Program.
 - e-Learning.
 - Equipment Training.
 - Highway Technician Academy.
 - Leadership Development.
 - Lead Ohio: Foundations of Supervision.
 - Mechanics, Auto Techs and Auto Body Workers Training.
 - Personal and Professional Development Training.
 - **External training**. Exempt permanent employees may be eligible for tuition and education reimbursement through the Department of Administrative Services for training not offered by Ohio DOT.
 - **Tuition reimbursement**. Reimbursement for college and university coursework is available for eligible permanent exempt employees and bargaining unit employees.
- *Texas*. The agency provides free CDL training, heavy equipment training, LinkedIn learning, career development classes and participation in the National Highway Institute's [Maintenance Leadership Academy](#) for maintenance supervisors, superintendents and managers.

Point of Practice Transportation Technician I Training



Utah DOT's career development program, [Transportation Technician Education Program \(TEP\)](#), "helps technicians improve their knowledge, skills and abilities" and "define[s] how they can advance their career." TEP combines online courses and instructor-led training that can be completed at the employee's preferred pace.

Pay increases are associated with completion of each phase's requirements (with supervisor and trainer approval):

- ◆ Phase I (0-6 months): 6% pay increase.
- ◆ Phase II (6-12 months): 6% pay increase.
- ◆ Phase III (12-18 months): Series promotion from Transportation Technician I to Transportation Technician II. Includes a 6% pay increase and requires Peer Review Board approval.

- *Utah.* The agency's [Transportation Technician Education Program \(TEP\)](#) pairs formalized training for Transportation Technician I and II positions with pay increases. Employees complete all requirements for each phase of the training program at their own pace over a predetermined time period.

TEP training for the second tier Transportation Technician II positions includes training in specialty tracks such as maintenance, inspector, project administrator materials lab and specialty crew.

Transportation Technician III positions are subject to a competitive hiring process. Staff members in Transportation Technician II positions are eligible to apply for open Transportation Technician III positions if they have completed all Transportation Technician II requirements and complete at least one specialty track.

Employees who attend Utah DOT's [TEP Academy](#) receive two weeks of intensive on-the-job training. After an introduction to maintenance and construction concepts, participants receive training to operate a snowplow, excavator and other equipment.

The academy is held every six months, generally in the spring and fall. Participants work with their trainers to determine the optimum time to attend.

Succession planning and **knowledge management** are both critical to the continuing success of an organization. Succession planning is conducted to identify and develop potential future leaders. The term *knowledge management* has been variously defined by researchers and practitioners. However the term is defined, capturing, preserving and building upon professional and institutional knowledge is fundamental to an organization's continued success.

The practices described by a few respondents appear to be more informal practices than well-developed succession planning or knowledge management programs. Texas DOT offers career development classes

and participates in the National Highway Institute’s [Maintenance Leadership Academy](#) for maintenance supervisors, superintendents and managers. The maintenance career path identified by Utah DOT enlists staff members holding Transportation Technician III and IV positions to train Transportation Technician I and II staff.

Point of Practice Caltrans Model for Succession Planning, Knowledge Transfer



The October 2017 edition of Caltrans’ [Knowledge Transfer Guidebook](#) describes efforts by the agency’s Workforce Planning unit in the Division of Human Resources to establish strategic goals related to workforce and succession planning and knowledge transfer. The guidebook includes techniques and tools gathered from an assessment of industry best practices that can be used by supervisors across the agency.

As far back as 2014, more than half of the Caltrans workforce—and almost two-thirds of the agency’s managers and supervisors—were at or within three years of retirement age. Data as of August 2017 reflected slight increases over the 2014 percentages.

Caltrans developed a **model for knowledge transfer** that provides four strategies for specific **tacit knowledge** transfer. (The guidebook notes that tacit knowledge “lends itself to transfer strategies such as mentoring, coaching, communities of practice and the like.” Unlike explicit knowledge, which the guidebook notes is more easily quantified and more readily captured, tacit knowledge “involves soft skills, personal characteristics, development of cooperative partnerships and subjective situational judgments.”)

Examples are provided for each of the four strategies to transfer tacit knowledge—*face-to-face group interactions* (boot camp, communities of practice, knowledge fairs and other practices); *face-to-face individual interactions* (cross-training, job shadowing, mentoring programs, structured on-the-job training and transitional training); *multimedia* (expert interviews, expert storytelling, knowledge maps and wikis); and *rotational programs* (job rotation).

Exit interviews are conducted in Connecticut, Indiana, Ohio and Wisconsin. While the Ohio member notes that the agency hasn’t compiled statewide exit data to identify trends, at least one member agency has conducted a statewide analysis. Wisconsin DOT’s [Equity and Inclusion Plan \(2021-2023\)](#) describes an agency practice for gathering data from exit interview surveys and in-person interviews. This data was summarized and reviewed in 2019 and included the top reasons employees were leaving the agency. Data was broken out by gender, ethnicity, age group and seniority group.

Point of Practice Texas State Agency Offers an Online Exit Survey

Employees leaving the employ of Texas state agencies may elect to take a 5- to 10-minute [exit survey](#) offered by the Texas State Auditor’s Office. The [survey questions](#) gather demographic information and inquire about the reasons for leaving the agency and contributing factors, the former employee’s new role or position and salary, and the changes the former employee would like to see in the agency.



Overtime Pay and Comp Time

No Boundaries members sought a better understanding of maintenance staff preferences when staff is offered overtime pay and extra time off (comp time). Among the small sampling of members addressing this question, comp time is more likely to be favored. Member responses are summarized below.

- *Colorado* staff usage is split evenly between comp time and overtime pay. New employees can use comp time to supplement the leave they might otherwise accrue.
An agency agreement for comp time in lieu of overtime pay for nonexempt employees is described in some detail in [CDOT Form 1220](#), which indicates a limit on the number of comp hours that can be earned or “banked” (the respondent identified this limit as 26.6 hours) and a maximum balance ($26.6 \times 1.5 = 40$ hours maximum per fiscal year).
- *Connecticut* makes overtime pay available to managers only.
- *Idaho* prefers offering comp time, allowing a maximum of 40 hours to be paid out if budgets allow.
- *Ohio* does not currently track this usage statewide. Anecdotally, the member noted that more employees elect to receive comp time than extra pay.
- *South Carolina* does not offer comp time in lieu of overtime pay. Employees covered under the Fair Labor and Standards Act who work overtime during holidays or declared hazardous weather emergencies receive comp time in addition to overtime pay.
- *Texas* employees can receive overtime pay if it is approved by a supervisor and funding is available. Approximately 97% of maintenance staff opt for comp time; approximately 34% receive overtime pay.

Innovative Payment Practices

Member agencies are employing a range of payment practices designed to encourage the retention of existing staff and persuade job seekers to join the agency.

Competency or skill-based pay. This payment practice bases compensation on a particular skill set, knowledge and experience. Caltrans is suggesting that this practice be included as a labor relations bargaining item for 2023. Other agencies have already implemented the practice or the practice is in development:

- *Colorado.* An employee retention practice in development aligns pay increases with requirements for needed competencies to successfully perform the work of a specified position. Competency pay is offered when a supervisor identifies the need for it and defines the needed competencies in writing, with deadlines and evaluation criteria for achievement. Competencies must be required to perform permanent, essential functions assigned to the position. This payment practice requires a written evaluation by the appointing authority and is not retroactive. Increases are limited to no more than two per 12-month period. The increase may be up to 10%.
Proposed base pay increases range from 2% to 5% for specialties such as weed spraying, welding, CDL trainer, explosives, firefighting and bridge inspection.
- *Indiana.* The agency maintains a succession plan for several position types that allows for pay scale changes based on experience and knowledge checks.
- *North Dakota.* The agency’s Transportation Technician III staff members are paid more if they have a special skill set or lead certain specialty crews.

Equity pay adjustment. Wisconsin DOT recently completed an equity pay adjustment for staff members who “haven’t been compensated properly for the time with [the] DOT.” This adjustment was given after the state Legislature refused pay increases for positions the DOT has been unable to fill.

Geographic pay differential. The Society for Human Resource Management (SHRM) [defines geographic pay differential](#) as “additional compensation paid to an employee to account for variations in cost of labor and/or cost of living among geographic locations.” Several No Boundaries members described the application of this payment practice:

- *California* is exploring this practice, especially in the San Francisco Bay Area and the Central California Coast.
- In *North Dakota*, during the height of the oil boom, the DOT paid a differential for operators in western North Dakota, which helped retain some operators. The cost of living was higher there and “competition was fierce with the oil companies.”
- *Maine* offers a pay stipend for its Transportation Worker series. The southernmost region receives a higher stipend than other regions due to a labor market adjustment.
- *Texas* offers an equity adjustment for those living in oil, gas and wind energy production areas.

Longevity premium. While Utah DOT just removed longevity from its pay scales, three other members (*California*, *Maine* and *Ohio*) described a longevity premium that rewards long-serving staff with additional pay. Indiana DOT offers retention incentives for winter seasonal positions that require a shorter time commitment than the three agency practices described below.

- *California*. Caltrans Equipment Operator (CEO) positions are underpaid as compared to other state agencies with similar classifications and to private construction companies. The agency has prepared a proposal for an additional pay range (Range B) for CEO staff members. As proposed, the CEO 2 Range B would provide a 5% increase in salary to an employee who satisfies a set of requirements that include remaining in the classification for three years and keeping CDL qualifications in good standing.
- *Maine*. Longevity is set in collective bargaining and follows the maintenance and operations bargaining unit language below:

Longevity

1. Effective with the pay week commencing closest to October 1, 2019, employees with ten (10) years but less than fifteen (15) years of continuous State service shall receive longevity pay of a total of twenty cents (\$.20) per hour to the base upon eligibility.
2. Employees with fifteen (15) years but less than twenty (20) years of continuous State service shall receive longevity pay of a total of thirty cents (\$.30) per hour to the base upon eligibility.
3. Employees with twenty (20) years but less than twenty-five (25) [years] of continuous State service shall receive longevity pay of a total of forty cents (\$.40) per hour to the base upon eligibility.
4. Employees with twenty-five (25) years or more of continuous State service shall receive longevity pay of a total of fifty cents (\$.50) per hour to the base upon eligibility. Effective with the pay week commencing closest to December 31, 2020, longevity pay for employees with twenty-five (25) years or more of continuous State service shall be increased to sixty cents (\$.60) per hour to the base.

5. Continuous State service is defined as continuous employment, including all authorized leaves of absences since the last date of hire into a status-granting position.
 - *Ohio*. Beginning on the first day of the pay period within which an employee completes five years of total state service, each employee will receive an automatic salary adjustment equivalent to 0.5% times the number of years of service times the first step of the pay rate of the employee's classification up to a total of 20 years. This amount will be added to the step rate of pay.

Specialty pay and shift differential. Three members described additional pay offered to staff members doing particular jobs:

- *Ohio* pays a shift differential pay for employees working a nighttime shift as part of their regular workday.
- *Texas* offers time-and-a-half overtime pay and hazardous duty pay for staff working emergency operations.
- *Utah DOT* offers "snow pay" for plow drivers.

Point of Practice Using Bonuses to Retain Maintenance Staff

Idaho Transportation Department began offering bonuses for hard-to-fill maintenance positions in early 2022. More than 500 of the agency's employees are maintenance technicians and mechanics, and these positions have proved to be hard to fill—and retain.

A sign-on bonus of \$1,500 and retention bonus of \$5,000 both require a one-year commitment. The agency also implemented a 10% pay increase in February 2022.



Applying Previous Research

Like No Boundaries, the [Clear Roads pooled fund](#) focuses on maintenance but from the perspective of winter. A Clear Roads research project completed in August 2021, [Recruitment and Retention of Highway Maintenance Workers](#), produced a compilation of [case studies and recommendations](#) on recruitment programs, retention strategies, and recruitment and retention of underserved communities and the next generation.

Many of the practices identified in the Clear Roads research can be helpful in retaining maintenance staff beyond those operating a snowplow. Given this overlap, members were asked about their familiarity with the Clear Roads research and whether their agencies had applied any of the recommended practices. Almost all respondents were not familiar with the research, and the few members who were familiar with it reported that they have not applied the research in their agencies.

The Ohio member described practices highlighted in the Clear Roads research that have been implemented in the agency:

- **Outreach.** At least one urban district near Cleveland has held bilingual career fairs and other outreach events in Spanish-speaking communities.
- **Apprenticeship programs.** The agency increased use of its Highway Maintenance Apprenticeship Program to find, train and hire full-time Highway Technicians into the agency.

This program offers 12- to 16-week paid positions that provide training on heavy equipment and support participants in obtaining a CDL. The program is “geared towards recruiting and training minority, women and veteran candidates.”

The Helmets to Hardhats apprenticeship program encourages veterans to apply for seasonal Highway Maintenance Worker positions that offer paid training, CDL fee reimbursement and use of agency equipment for testing, the opportunity to work additional seasons with an acceptable performance evaluation, and eligibility to apply for a regular, full-time Highway Technician position after completing the apprenticeship program.



Refer to **Related Research and Resources** on page 52 for more information about the Clear Roads research.

2.6 Agency Successes and Challenges

All transportation agencies have struggled, some for several years, with shortages of maintenance staff due to difficulties attracting and retaining qualified employees. These challenges may continue based on some apparent employment trends. Agencies have sought creative solutions and have found some successful practices to alleviate the burdens created by staffing shortages. Moving forward, members must consider both the challenges and new ideas to stabilize maintenance levels.

Member feedback in the following topic areas is summarized below:

- Issues or trends that may create continued challenges.
- Innovative practices to mitigate staffing shortages.
- Successful practices to attract qualified maintenance workers.
- Successful practices to retain qualified maintenance workers.

Trends Creating Challenges

The majority of respondents did not identify any significant threats on the horizon that are expected to further impact recruitment and retention of maintenance staff. Four agencies, however, suggested areas of ongoing challenge:

Applicant Pools

- New CDL requirements are more burdensome, making potential employees with CDLs harder to find (*Idaho and Texas*).
- Attracting females to maintenance positions can be challenging (*Texas*).
- Competition from private industry makes it difficult to recruit and retain employees (*Texas*).

Employment Preferences

- As the country moves to a post-COVID culture, the workforce seems to trend away from traditional full-time employment (*Ohio*).

Retirements

- Retirements are creating vacancies faster than the agency can hire new employees. The agency can't hire applicants fast enough due to the increased need, so applicants end up accepting positions elsewhere (*California*).

Innovative Staffing Practices

Among the innovative practices that agencies use to mitigate long-term maintenance staffing shortages, the most commonly reported practices were increasing pay or creating career paths (*California, Connecticut and North Dakota*) and utilizing temporary workers (*South Carolina, Utah and Virginia*). Table 8 presents these and other innovative practices.

Table 8. Practices to Mitigate Long-Term Staffing Shortages

Innovative Practice	State/Respondent Comments
Provide Autonomous/Teleoperated Equipment	<i>California</i>
Develop Regional Expertise	<i>Texas</i> . Developing regional crews that will be experts in paving, striping and guardrail work. These crews will train and assist district staff as needed.
Increase Women in Maintenance Workforce	<i>Texas</i> . Encouraging women to attend maintenance conferences and career events, and highlighting women in maintenance on social media.
Provide Pay Increase or Career Path	<i>California</i> . Requesting that the labor relations office work with unions to increase pay through alternate pay ranges to attract and retain staff. <i>Connecticut</i> <i>North Dakota</i> . Allowing some maintenance staff to obtain certifications to perform a variety of tasks on federal aid construction projects. This practice creates a career path and also offers pay increases and summer overtime work for operators.
Implement Succession Planning	<i>Connecticut</i>
Use Temporary Workers	<i>South Carolina</i> . Considering using temporary staffing agencies to do initial screening and hiring for entry-level highway maintenance workers. <i>Utah</i> . Considering outsourcing certain tasks so transportation technicians can focus on maintaining roadways. <i>Virginia</i> . Contracting for partial crews rather than tasks and blending temporary and contract employees.
Establish Workforce Planning	<i>Indiana</i> . Conducting an optimization study for labor allocation by automated, data-driven algorithms for planning.

A **pay study** conducted by Colorado DOT in 2021-2022 sought to address an increase in turnover for the agency's Transportation Maintenance 1 positions. Starting pay was lower than the public competition and staff had no opportunity for salary increases within the job class after the first year.

The study's impact: Colorado DOT increased starting pay by 2.5% and training pay by 5%. New pathways within the job class were offered to encourage employee growth and learning aligned with operational needs. The changes also offered base-building salary increases—not temporary or one-time increases.

Successful Recruiting Practices

Though some members have yet to find practices to improve recruitment, others identified job fairs, apprenticeships, training and other practices that have proved to be successful in eliciting interest in working for a transportation agency.

Job Fairs and High School Events

Three members cited job or career fairs as a successful recruiting practice (*Indiana, Ohio and Utah*); the Ohio and Utah members have also hosted high school events. Ohio DOT hosts Saturday or after-hours hiring events where candidates can apply, have their backgrounds checked and complete an interview and physical ability test all in one day.

Point of Practice Engaging with Texas Students



Texas DOT offers programs for high school and college students who may be interested in maintenance positions:

- ◆ [Summer internship program](#) is designed for high school and college students seeking to gain practical work experience. The agency hires students in various positions and pays them an hourly wage from May 1 through August 15. Qualified students must be at least 17 years old.
- ◆ [Statewide high school cooperative education program](#) “gives high school students an opportunity to gain valuable work experience working in a professional environment. TxDOT hires students part-time for maintenance, engineering and technical positions and pays them an hourly wage.” Students split their time between high school and Texas DOT, attending class for half the day and working half the day.

Apprenticeships and Training

Four members cited apprenticeships and training as successful recruiting strategies (*Colorado, Indiana, Ohio and Texas*). Indiana is considering a high school apprenticeship program.



Refer to the **Point of Practice** on page 22 for more information about Colorado DOT's maintenance apprentice program.



Refer to the **Point of Practice** on page 25 for more information about Ohio DOT's Highway Maintenance Apprenticeship Program.

Point of Practice Broadening Recruitment Approaches at Caltrans

The [July 2018 issue](#) of Caltrans' *Mile Marker* newsletter described a widened approach by agency recruiters to find and retain workers. The article noted that maintenance workers in general were among the types of employees most difficult to recruit. Expanded recruitment efforts included:

- ◆ Hosting career fairs where attendees receive help in navigating the state application process and then meet with hiring managers from various divisions.
- ◆ Doubling the number of recruitment events that Caltrans representatives attend. These include university job fairs and partnering with county probation officers, refugee centers and other agencies.
- ◆ Collaborating with the California Department of Human Resources to consolidate outdated classifications, which reduces the number of exams job candidates must take.
- ◆ Encouraging greater participation in student assistance and volunteer programs.
- ◆ Using social media and other means to promote job fairs and other events.



Other Practices

Below are other recruiting practices reported by No Boundaries members:

- Employee referral program and social media (*Texas*).
- Good interview practices (*Ohio*).
- Housing stipends (*Colorado*).
- Increasing salaries (*Wisconsin*).
- Social media links to job postings (*Indiana*).

Successful Retention Practices

All transportation agencies work to retain good employees once they are hired, though a few member states did not report on successful practices to keep workers. Those that did reported successful retention methods in the areas of pay increases and benefits offered, workplace culture and training.

Salary and Benefits

- Housing stipends (*Colorado*).
- Pay increase after training (*Colorado*).
- CDL acquisition (*Indiana*).
- Progressive pay based on experience gained and knowledge checks (*Indiana*).
- Retirement benefits (*Mississippi, Texas and Utah*). (Utah DOT employees are vested after four years.)
- Medical benefits (*Mississippi and Texas*).

Workplace Culture

- A workplace culture that values good work ethics, keeps staff informed, values their ideas and equips them with what they need to succeed (*Ohio*).
- Use of the Quality of Work Life Survey results to improve the employee experience (*Ohio*).

- Working hours (aside from some winter operations) and available leave (vacation, sick leave, personal leave and holidays) that provide for a good work-life balance (*Ohio*).
- Flexible schedules (for example, four 10-hour days) and work-life balance (*Texas*).

Training

- *Colorado* and *Indiana*. (Colorado DOT provides CDL training at no cost.)
- Career progression, allowing employees to strive for advancement while remaining in the same position within Transportation Worker classes (*Maine*).
- Many opportunities for advancement with tools such as tuition reimbursement; boot and gear credits and tool allotments; and special programs, such as Becoming a Supervisor Someday, Highway Technician apprenticeship program, management apprenticeship program and mentorship programs for new managers (*Ohio*).

3 Supplemental Human Resources Survey Findings

To supplement member feedback, members distributed a second survey to their HR departments that sought staffing data and other information most likely to be retained by an HR department.

Seven No Boundaries member states responded to this supplemental survey:

- California.
- Colorado.
- Connecticut.
- Idaho.
- Ohio.
- South Carolina.
- Texas.

Results from the supplemental survey are summarized below in the following topic areas:

- Current maintenance staffing levels.
- Staff departures.
- Staff turnover.
- Hiring practices.

Survey responses were limited both in number and level of detail. For some of these topics, member feedback supplements the data and comments provided by their HR colleagues.

Survey questions are provided in [Appendix B](#). The full text of survey responses, including respondent contact information, is presented in a supplement to this report.

3.1 Current Maintenance Staffing Levels

HR respondents described their agencies’ current staffing levels for maintenance-related positions in five categories: entry level, midlevel, experienced, supervisor and manager. Not all respondents provided the same level of detail.

Vacancy rates ranged widely, from a low of 2.2% for Connecticut DOT’s crew leader position to a high of 52% for South Carolina DOT’s Highway Maintenance Worker I position. Entry-level positions had the highest average vacancy rates (18.03%), followed by midlevel positions (13.76%), supervisors (8.37%), experienced (7.33%) and managers (1.95%). Tables 9 through 13 summarize survey responses.

Table 9. Current Maintenance Staffing Levels: Entry-Level Positions

State	Position/Category	Vacancy Rate (%)	Description
Colorado ¹	<ul style="list-style-type: none"> • Apprentice/Trainee • Transportation Maintenance I (TM I) 	15.57	<ul style="list-style-type: none"> • <i>LTC</i>: Staff member currently learning the position • <i>TM I</i>: Two years of experience in labor and/or driving • 809.5 total positions

State	Position/Category	Vacancy Rate (%)	Description
Connecticut	Transportation Maintainer 1 and 2	12.1	None provided
Idaho	Transportation Technician Apprentice	Not provided	<ul style="list-style-type: none"> • Three- to five-year horizontal career path • Opportunity to progress through a three-step program, with wage increases after successfully completing each step • Rates of loss (26 employees): <ul style="list-style-type: none"> ○ 77% Personal reasons (primarily pay issues) ○ 12% Failure to complete probation ○ 8% Forced separation ○ 4% Private sector
Ohio	Highway Technician 1	5.8	<ul style="list-style-type: none"> • Approximately 120 vacant positions out of 2,065 total positions • See Appendix C for a position description.
South Carolina	Highway Maintenance Worker (HMW) I	52	General laborer, small equipment operator, bridge crew member
Texas	District maintenance section positions	4.7	<ul style="list-style-type: none"> • Entry-level district jobs responsible for maintaining roads that require minimal experience and education • 2,422 total positions

1 Vacancy rate and total positions are from 2020 data.

Table 10. Current Maintenance Staffing Levels: Midlevel Positions

State	Position/Category	Vacancy Rate (%)	Description
Colorado ¹	TM II	7.42	<ul style="list-style-type: none"> • Work lead or heavy equipment operator specialist • 256 total positions
Connecticut	Transportation Maintainer 3 and 4	11.7	None provided
Idaho	Transportation Technician Operations (TTO) Step 1 and 2	Not provided	None provided
Ohio	Highway Technician 2	N/A	<ul style="list-style-type: none"> • Highway Technician 2 positions filled through automated progression of current Highway Technician 1 workforce • See Appendix C for a position description.
South Carolina	HMW II	33	Medium equipment operator, heavy equipment operator, crew leader

State	Position/Category	Vacancy Rate (%)	Description
Texas	District maintenance section positions	2.9	<ul style="list-style-type: none"> District jobs responsible for maintaining roads requiring some experience (minimum high school education requirement) 863 total positions

N/A Not available

1 Vacancy rate and total positions are from 2020 data.

Table 11. Current Maintenance Staffing Levels: Experienced Positions

State	Position/Category	Vacancy Rate (%)	Description
Colorado ¹	TM III	11	<ul style="list-style-type: none"> Maintenance patrol supervisor 100 total positions
Connecticut	Crew leader	2.2	None provided
Idaho	TTO Step 3	Not provided	<p>Rates of loss — TTO Steps 1-3 (51 employees):</p> <ul style="list-style-type: none"> 39% Retirement 39% Personal reasons 14% Layoff/medical 2% Medical retirement 2% Dismissal
Ohio	Highway Technician 3M	N/A	<ul style="list-style-type: none"> Highway Technician 3M positions filled through automated progression of current Highway Technician 2 workforce See Appendix C for a position description.
South Carolina	<ul style="list-style-type: none"> HMW III HMW IV 	14	<ul style="list-style-type: none"> HMW III: Crew foreman, specialized equipment operator, specialty crew leader HMW IV: Crane operator, resident maintenance foreman (overall crew foreman), section shed supervisor (crew foreman over a section of a county), specialty crew foreman
Texas	District maintenance section positions	2.1	<ul style="list-style-type: none"> District jobs responsible for maintaining roads that require advanced skills and experience (minimum high school education requirement) 647 total positions

N/A Not available

1 Vacancy rate and total positions are from 2020 data.

Table 12. Current Maintenance Staffing Levels: Supervisor Positions

State	Position/Category	Vacancy Rate (%)	Description
Colorado ¹	LTC Operations I	11.54	<ul style="list-style-type: none"> Maintenance area supervisor (multiple patrols) 52 total positions
Connecticut	General Supervisor	6.6	None provided
Idaho	Transportation Operations Team Leader	None	Supervises the development and implementation of transportation projects in operations, and performs related work to ensure quality and efficiency.
Ohio	Transportation Manager 1	10	<ul style="list-style-type: none"> A high volume of these positions filled internally Approximately 19 vacant positions out of 195 total positions See Appendix C for a position description.
South Carolina	<ul style="list-style-type: none"> Engineer (Eng)/Eng Associate II Eng/Eng Associate III 	11	<ul style="list-style-type: none"> <i>Eng/Eng Associate II</i>: Assistant resident maintenance engineer (assistant to engineer overseeing a county maintenance unit) <i>Eng/Eng Associate III</i>: Resident maintenance engineer (engineer overseeing a county maintenance unit)
Texas	District assistant maintenance section supervisors	2.7	36 total positions

1 Vacancy rate and total positions are from 2020 data.

Table 13. Current Maintenance Staffing Levels: Manager Positions

State	Position/Category	Vacancy Rate (%)	Description
Colorado ¹	<ul style="list-style-type: none"> Superintendent Deputy Superintendent 	No data	Multiple area supervisor (position below maintenance superintendent)
Connecticut	Transportation Maintenance Manager	None	None provided
Idaho	District Operations Engineer	0	None provided
Ohio	Transportation Administrator	0	<ul style="list-style-type: none"> A high volume of these positions filled internally Approximately 88 positions statewide See Appendix C for a position description.
South Carolina	<ul style="list-style-type: none"> Eng/Eng Associate III Eng/Eng Associate IV 	5	<ul style="list-style-type: none"> <i>Eng/Eng Associate III</i>: Assistant district maintenance engineer (assistant to engineer overseeing several county maintenance units) <i>Eng/Eng Associate IV</i>: District maintenance engineer (engineer overseeing several county maintenance units).

State	Position/Category	Vacancy Rate (%)	Description
Texas	District maintenance section supervisors	2.8	244 total positions

Several respondents provided additional information about their staffing-related tracking practices:

- *Caltrans* tracks new hires and separations quarterly. Data comes from the State Controller’s Office database. The agency reported an overall vacancy rate for field maintenance positions of 9% (5,627 filled positions, 509 vacant).

A three-year maintenance program attrition history report presents data by district and tracks the number of new hires, separations and the net total. After negative net totals in 2019 (-3) and 2020 (-267), the agency showed a net of 238 positions in 2021 (909 new hires; 671 separations).

- *Colorado DOT* tracks vacancy rates and positions in process to fill.
- The *Idaho Transportation Department* respondent noted that mechanics positions experience a high turnover rate due to pay. The respondent noted that “[t]his position is really hard to fill” and provided the data below about 14 position losses:
 - 6 - Retirement
 - 5 - Personal reasons (most about pay)
 - 1 - Layoff/medical
 - 1 - Dismissal
 - 1 - Death
- *South Carolina DOT* does not routinely track staffing levels by classification, instead opting to assess the strength of maintenance units and aggregate highway maintenance population.
- While *Utah DOT’s* HR department did not provide information, the agency’s No Boundaries member reported a 5% vacancy goal for cost-savings purposes and estimates a 12% vacancy rate for Transportation Technicians.

3.2 Staff Departures

Members and their HR departments also described the data tracked and reasons for staff departures. Ohio DOT is working toward gathering and maintaining data on the reasons for staff departure; South Carolina DOT collects data through a pull-down menu in its enterprise HR system. Other respondents described current tracking practices and possible reasons for staff departures:

- The *California Management Information Retrieval System (MIRS)* uses various codes to identify the reason for staff separations at a broad level (such as voluntary resignation, retirement, dismissal and death) but doesn’t systematically gather more qualitative information for the reasons behind these departures. It’s important to note that MIRS only gathers data on departures that are separations from state service. The system doesn’t readily capture departures due to promotions or lateral transfers within Caltrans or to another state agency.

The Caltrans Office of Talent Management will soon introduce a new, more streamlined and electronic exit survey process to attempt to gather and analyze the personal motivations or reasons for staff separating from state service. As with MIRS, this process will not apply to

employees who leave the Caltrans maintenance program for other areas in Caltrans or to another state agency.

- The *Idaho Transportation Department* HR respondent highlighted the growth the state is experiencing and the resulting higher costs of living, including housing costs, and noted that some employees live in RVs as they can't find affordable housing.
- *Texas DOT* tracks termination reasons for all employees using general reasons (for example, voluntary, involuntary, retirement). Employees may elect to take a 5- to 10-minute [exit survey](#) offered by the Texas State Auditor's Office. The [survey questions](#) gather demographic information, reasons for leaving the agency and contributing factors, the former employee's new role or position and salary, and the changes the former employee would like to see in the agency.

Point of Practice Tracking Staff Departures at Colorado DOT

Colorado DOT tracks projected retirements, including retirement eligibility by occupational group. Reasons for staff departures are collected on employee-completed departure forms. Service years and separation reasons for certified and probationary employees are tracked and showed that 75% (55 employees) of probationary separations in fiscal year 2020 were Transportation Maintenance 1 workers.



The Colorado DOT respondents provided additional reasons for maintenance vacancies:

- ◆ Difficult winter working conditions.
- ◆ Rigid shift times during winter maintenance operations.
- ◆ Few opportunities for advancement with little significant pay change.
- ◆ Unequal pay—not based on longevity—for similar positions and no substantial increases.
- ◆ Low pay.
- ◆ Work hours, such as always being on call.
- ◆ Leaving for summer agricultural or construction jobs.
- ◆ Prohibitive housing costs.

3.3 Staff Turnover

Given the limited number of HR survey responses, the staffing data below cannot be considered a representative sampling. However, the small sample described below does indicate a pattern identified in other survey results—entry-level positions have the highest level of turnover among the classification categories examined in the survey. Midlevel positions experienced the next-highest rate of turnover, with the lowest rate of turnover recorded for the manager class.

Tables 14 through 16 identify the turnover percentages by classification for the three most recent calendar years in three member states: Colorado, South Carolina and Texas.

Table 14. Turnover Percentage by Classification (2021)

State	Entry Level (%)	Midlevel (%)	Experienced (%)	Supervisor (%)	Manager (%)
Colorado	26 ¹	No data	No data	No data	No data
South Carolina	68	27	13	6	0
Texas	23.3	10.5	11.5	5.6	11.4

1 This number represents the peak of departures in fall 2021. Data provided for July 1, 2020, through June 30, 2021.

Table 15. Turnover Percentage by Classification (2020)

State	Entry Level (%)	Midlevel (%)	Experienced (%)	Supervisor (%)	Manager (%)
Colorado	15.57	7.42	11	11.54	No data
South Carolina	38	16	9	7	5
Texas	18.1	10.3	8	0	13.1

Table 16. Turnover Percentage by Classification (2019)

State	Entry Level (%)	Midlevel (%)	Experienced (%)	Supervisor (%)	Manager (%)
Colorado	19.36	8.73	13.04	17.31	No data
South Carolina	36	29	9	12	0
Texas	24.5	13	8.7	11.7	10

Other Turnover Data: Separations

Ohio DOT does not track turnover specific to maintenance-related positions. Instead, the agency tracks the total number of separations, which could be resignations and retirements but does not include those who move to other classifications through promotion or another shift. The data is tracked by year for each classification and reflected in Tables 17 through 19. Trends are consistent with the turnover data provided by other respondents: Entry-level positions have the highest rate of separation among the classes tracked.

Table 17. Ohio DOT Separations by Classification (2021)

Classification	Separations
Highway Technician 1	84
Highway Technician 2	62
Highway Technician 3M	25
Transportation Manager 1	1
Transportation Administrator	3

Table 18. Ohio DOT Separations by Classification (2020)

Classification	Separations
Highway Technician 1	79
Highway Technician 2	42
Highway Technician 3M	9
Transportation Manager 1	0
Transportation Administrator	6

Table 19. Ohio DOT Separations by Classification (2019)

Classification	Separations
Highway Technician 1	82
Highway Technician 2	46
Highway Technician 3M	13
Transportation Manager 1	1
Transportation Administrator	4

3.4 Hiring Practices

Details of hiring practices were sought to possibly identify ways to streamline efforts to recruit and retain maintenance staff. The small number of survey responses provided limited insight into the duration of the hiring process and barriers to attracting and retaining staff.

Duration of Hiring Process

Two member agencies track the timing of specific elements of the hiring process; their responses are reflected in Table 20.

Table 20. Timing of Elements of the Hiring Process

State	Recruitment (Weeks)	Interviewing (Weeks)	Selection (Weeks)	Time to Hire (Weeks)	Onboarding (Weeks)
Colorado	3	2	1	6 (42 days)	2
Idaho	2 ¹	2	1	5 (35 days)	2

1 Some positions are continuously open; new employees receive the first paycheck after two weeks.

Other member agencies' hiring processes ranged widely, from 35 days (*Idaho*) to 113 days (*Texas*):

- *Caltrans* does not track the time it takes to complete each step when hiring new maintenance staff members. However, the agency is required to advertise vacancies for 10 days. Currently, hiring a new staff person requires 70 days, on average, as illustrated in the Position Action Request Form (PARF) in Figure 3. This process is longer than the hiring processes described by all but one other member.

January 2021 through December 2021				
District	Approved PARFs	Pending PARFs	Total PARFs	Average Days to Process
01- Eureka	84	37	121	64
02- Redding	98	84	182	66
03- Marysville	308	346	654	68
04- Oakland	345	404	749	87
05- San Luis Obispo	125	74	199	52
06- Fresno	111	73	184	41
07- Los Angeles	401	340	741	88
08- San Bernardino	225	112	337	58
09- Bishop	60	42	102	49
10- Stockton	111	177	288	86
11- San Diego	150	99	249	84
12- Santa Ana	125	77	202	67
56- HQ Maintenance	120	59	179	74
88- OBEO	-	-	-	0
Total	2,263	1,924	4,187	70

OBEO Office of Business and Economic Opportunity

Figure 3. Caltrans Average Days to Process Position Action Request Forms (Source: Caltrans)

- New employees at *Idaho Transportation Department* receive their first paychecks in two weeks; if applicable to their positions, new employees are required to obtain a CDL within 60 days.
- *South Carolina DOT* does not track recruitment, interviewing and selection as distinct phases. The period between the date an advertisement closes and the date a selection is made, which encompasses the interviewing and selection phases, is 17 days. This reflects a slightly condensed portion of the hiring process as compared to Colorado and Idaho (three weeks, or 21 days, for both). The average period between selection and the first day of work is 14 days.
- *Texas DOT* doesn't track the time required for each interim step in the hiring process. Like Caltrans, the agency tracks the total number of days to fill a position, which is reflected below:
 - 2022: 75.8 days.
 - 2021: 83.7 days.
 - 2020: 113.4 days.
 - 2019: 88.1 days.

Residency, Citizenship and Other Requirements

Most member agencies do not require maintenance staff to be state residents. Only Idaho Transportation Department and South Carolina DOT have some type of residency limitation:

- **Response requirement.** Once hired, Idaho Transportation Department maintenance staff members must be able to respond to the maintenance shed they are hired from within 30 minutes.
- **In-state driver's license.** South Carolina DOT requires workers to have or obtain a South Carolina driver's license.

Connecticut DOT requires employees to be U.S. citizens to work at the transportation agency. Legal immigrants with green cards are permitted to work at transportation agencies in California, Colorado,

Ohio, South Carolina and Texas. (The Colorado DOT and Texas DOT respondents noted that their agencies do not offer sponsorships for those not possessing a green card.) In Idaho, employees must complete an [I-9 form](#), provide the necessary documents and attest that they are permitted to work. (Form I-9 is required for use by all U.S. employers to verify the employment eligibility of citizens and noncitizens for each person the employer hires.)

Barriers to Attracting and Maintaining Maintenance Staff

Few respondents reported on barriers—legislative, regulatory or administrative—to attracting and maintaining maintenance workers. Those who did highlighted the pay scale and benefits as lacking. The Utah member noted that pay for Utah DOT maintenance workers can't compete with working at a fast food restaurant. Similarly, Texas DOT's salary pay ranges are "very limiting" for maintenance-related positions. The Caltrans member offered a novel approach: Classify maintenance workers as first responders, which would entitle them to all related benefits such as standby pay, hazardous duty pay and safety retirement.

At Ohio DOT, administrative barriers are precluding the most effective use of [Second Chance Act](#) programs supported by the Ohio Department of Rehabilitation and Correction to hire nonviolent offenders after their release from incarceration. As a [recent diversity plan](#) notes, Ohio DOT's Second Chance initiative, operating within the existing Highway Maintenance Apprenticeship Program, "has assisted seven reformed citizens in obtaining their CDL and offered long-term employment to five." The Ohio member noted that while the framework is in place, administrative barriers must be resolved before expanding the program's implementation.

Point of Practice Addressing Staffing Shortages, Encouraging Diversity

Currently, Ohio DOT's entry-level, apprentice **Highway Maintenance Worker 1** (HMW1) positions are posted as temporary and without benefits, which can make recruitment difficult. A new agreement with the state's Office of Collective Bargaining will allow the agency to post **permanent** HMW1 positions that do not require a CDL to be hired. But making this change will require some adjustments.



Training

- ◆ The agency has a limited number of trainers. The agency must consider its ability to effectively train new hires to obtain their CDL while also conducting other training.
- ◆ HMW1 staff members are not eligible to take Highway Technician training until they advance to that classification.
- ◆ Employees who voluntarily leave or are terminated for cause within two years of their hire date must reimburse the agency for the cost of CDL training (\$6,000) if a CDL was obtained.

Educating Current Staff

- ◆ Outreach to current staff should address the new HMW1 postings and underscore the opportunity for Highway Technician 1, 2 and 3 positions to laterally transfer to another location via a Highway Technician 1 posting. This transfer option also applies to the new HMW1 permanent position.

Timing

- ◆ While there are no official dormant periods when these positions can't be posted, the agency should keep in mind the requirement for the employee to obtain a CDL within six months of hire and the reduced flexibility of work assignments for staff members without a CDL.
- ◆ The one-year probationary period begins at the time of hire and continues when the employee is reassigned as a Highway Technician 1. In other words, there is no reset of the probationary period with the transition to a new classification. The probationary period is a total of one year, regardless of classification changes.

Diversity

- ◆ The new permanent HMW1 position is described by the Ohio member as a "golden opportunity to increase the diversity of ODOT's [Ohio DOT's] workforce," just as the previous HMW1 apprentice program has been.
- ◆ The agency will self-monitor recruitment efforts to assess the impact of this new position, and other agency efforts, in reaching diverse populations.

4 Related Research and Resources

To supplement survey findings, a limited literature search of recent publicly available domestic resources identified publications and other resources presented below in the following topic areas:

- National research and guidance.
- State practices.
- Clear Roads study on recruitment and retention of highway maintenance workers.
- New federal rules for CDLs.
- Related resources.

4.1 National Research and Guidance

NCHRP 02-25: Workforce 2030—Attracting, Retaining and Developing the Transportation Workforce: Design, Construction and Maintenance, Candace Blair Cronin, start date: May 2019, end date: April 2022. (The website notes that “[f]inal deliverables have been received and approved by the panel. The publication was approved and the products are in the publication queue.”)

Project description at <https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4544>

From the project description: The objectives of this research are the following:

1. To produce a roadmap of effective human capital strategies for state DOTs, identifying critical areas necessary in the future to attract, retain and develop a sustainable, qualified transportation design, construction and maintenance workforce;
2. To identify trends, policies and processes critical for developing and maintaining an adaptive organizational framework that will attract, retain and develop a qualified workforce beyond 2030; and
3. To prepare an evidence-based guide that transportation industry organizations may use when developing and establishing an effective human capital program for a qualified workforce into 2030 and beyond.

Identify, Train, Place: A Playbook to Build Tomorrow’s Highway Construction Workforce, Federal Highway Administration, February 2021.

https://www.fhwa.dot.gov/innovativeprograms/centers/workforce_dev/hcwp/pdfs/hcwp_playbook.pdf

This collaborative effort of federal agencies and the private sector produced a pilot program that “provide[d] for partnerships between the highway community and the public workforce system to identify, train and place individuals in highway construction jobs.”

The playbook includes:

- Best practices for organizing state, local and tribal stakeholders.
- Success stories from the pilot locations.
- Observations about issues the pilot working groups faced in identifying, training and placing workers in highway construction jobs.

NCHRP Synthesis 543: Transportation Workforce Planning and Development Strategies, Robert Puentes, Alice Grossman, Brianne Eby and Alex Bond, 2019.

http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_543.pdf

The goal of this project was to synthesize the current state of practice associated with the implementation of transportation workforce planning and development strategies at state DOTs, identifying challenges, opportunities and lessons learned. The synthesis “focuses especially on young adults, second career professionals, veterans and encore careerists. The scope of this research encompasses training, skills building and forecasting only to a limited extent.”

Highway Construction Workforce Partnership (HCWP)/Strategic Workforce Development (SWD), Center for Transportation Workforce Development, Federal Highway Administration, undated.

https://www.fhwa.dot.gov/innovativeprograms/centers/workforce_dev/hcwp/

From the website: The Highway Construction Workforce Partnership’s goal is to increase the capacity and capability of the highway construction workforce. By partnering with key organizations to develop and deploy highway construction training and placement programs, this initiative will increase the number of individuals trained and hired in highway construction trades and crafts.

4.2 State Practices

Illinois

Highway Construction Careers Training Program, Illinois Department of Transportation, undated.

<https://idot.illinois.gov/about-idot/employment-opportunities/specialized-training/highway-construction-careers-training-program>

From the website: In collaboration with the Federal Highway Administration and community colleges statewide, [Illinois DOT’s] Highway Construction Careers Training Program (HCCTP) provides training and skill improvement opportunities that assure the increased participation of minority groups, disadvantaged persons and women in all phases of the highway construction industry.

Indiana

An Assessment of the Workforce and Occupations in the Highway, Street and Bridge Construction Industries in Indiana, Indraneel Kumar, Lionel Beaulieu, Annie Cruz-Porter, Chun Song, Benjamin St. Germain and Andrey Zhalnin, Indiana Department of Transportation, July 2020.

<https://rosap.ntl.bts.gov/view/dot/55680>

From the abstract: This project explores workforce and occupations within the highway, street and bridge construction industries (NAICS 237310) in Indiana. There are five specific deliverables comprised of three data reports, one policy document and a website. The first data report includes an assessment of the workforce based on the eight-part framework, which are industry, occupations, job postings, hard-to-fill jobs, Classification of Instructional Programs (CIP), GAP [a]nalysis, compatibility and automation. ... The policy report includes a set of recommendations for workforce development for [Indiana DOT] and a summary of the three data reports.

Minnesota

Workforce Planning and Human Resource Development Strategies for Minnesota's Public

Transportation Agencies, Kenneth Bartlett, Joshua Collins, Tasha S. Hart-Mrema and Michael Valesano, Minnesota Department of Transportation, March 2021.

Project deliverables available at

<https://researchprojects.dot.state.mn.us/projectpages/pages/projectDetails.jsf?id=20017&type=CONTRACT&jftfdi=&jffi=projectDetails%3Fid%3D20017%26type%3DCONTRACT>

From the project summary: With an aging workforce and a significant number of staff retirements on the horizon, Minnesota's public transportation agencies—like other states' agencies across the country—must attract the next generation of employees or risk service disruptions and other challenges. To improve the pool of qualified applicants and build a healthy workforce pipeline for the future, Minnesota's public transportation agencies sought an objective evaluation of its hiring policies and workplace culture. A team of human resource experts from the University of Minnesota was chosen to investigate and analyze the agencies' practices. The work culminated in a variety of recommendations to enhance the recruitment process and increase on-the-job satisfaction. From targeted marketing campaigns and clearer job descriptions to more opportunities for advancement, the strategies identified by the research team will help Minnesota's transportation agencies attract and retain a younger and more diverse workforce for years to come.

Texas

On-the-Job Training and Supportive Services Program, Texas Department of Transportation, 2022.

<https://www.txdot.gov/business/resources/civil-rights/ojt-training.html>

From the website: TxDOT's [Texas DOT's] Texas Construction Career Academy provides talent development, training and assistance to increase the hiring and retention of women, minorities and disadvantaged individuals in today's growing highway construction industry. Organizations participating in the OJT/SS [on-the-job training/supportive services] program are responsible for participant recruitment, screening, selection, delivery, job placement assistance and follow-up.

Vermont

On-the-Job Training Program, Vermont Agency of Transportation, 2022.

<https://vtrans.vermont.gov/civil-rights/employment/edhc/ojt>

From the website: The On-The-Job Training (OJT) is an Equal Employment Opportunity affirmative action program. Primary objectives include training and upgrading of minorities and women toward journeyman status and increasing opportunities for populations who are underrepresented in Vermont's highway construction industry.

....

Every spring and summer we have paid training positions available on highway construction projects all over the state. Successful trainees usually have some experience or a strong interest in highway construction. The typical OJT position is 520 hours, but our goal is for trainees to become permanent, valued members of the contractor's workforce. See the [OJT Program Manual](#) for more information.

Wisconsin

Transportation Alliance for New Solutions (TrANS), Wisconsin Department of Transportation, undated. <https://wisconsin.gov/Pages/doing-bus/civil-rights/labornwage/trans.aspx>

From the website: TrANS is a cost-effective program that helps to fulfill entry-level laborer positions for construction contractors. It is a collaborative effort combining the strengths of industry and labor, community-based organizations, government and the contractors of Wisconsin.

This public-private model for collaboration successfully prepares Wisconsin's untapped workforce with the skills needed to contribute to the transportation construction industry as laborers and apprentices. This untapped workforce that TrANS prepares to enter the construction industry involves those who have been underrepresented historically in the industry, including, but not limited to, women and minorities.

The 2017 Wisconsin Highway Maintenance Workforce Survey, Midwest Transportation Workforce Center, 2018.

Citation at <https://trid.trb.org/view/1528637> (The final report for this project appears to no longer be publicly available.)

From the document description: The Wisconsin Highway Maintenance Workforce Survey gathers the background information about the highway maintenance workforce in Wisconsin needed to develop a career pathway and credentialed training. The report presents supporting information for assessing employer interest and target audience for developing a Wisconsin apprenticeship program in highway maintenance. This report provides survey data that can be used to estimate the numbers of highway maintenance workers from entry to supervisory levels employed by local governments in the state. The report characterizes the scope of highway maintenance jobs in the workforce, prior education and experience of entry-level workers. Survey data can be used to estimate the percentage of employers having difficulties filling positions and the number of positions left unfilled. The survey data includes ranked lists of skills and competencies among the applicants. The survey includes self-assessments on the success of various strategies to recruit, train and retain applicants into entry-level positions. The report characterizes training requirements, sources of training provided by employers, and common reasons why workers leave highway maintenance jobs. The report presents findings on employer interest in and familiarity with apprenticeship programs and the ACT National Career Readiness Certificate. The report summarizes comments and thoughts from employers on the future vision at highway maintenance agencies including rebranding highway maintenance occupations and suggested new occupations.

Related Resource:

"MTWC Survey Analysis Identifies Apprenticeship as Pathway to Highway Maintenance Workforce," Kerri Phillips, News Release, College of Engineering, University of Wisconsin–Madison, July 2018.

<https://engineering.wisc.edu/news/mtwc-survey-analysis-identifies-apprenticeship-pathway-highway-maintenance-workforce/>

From the news release: Results from a statewide survey identify gaps in recruitment, retention, skills and training for a critical segment of the workforce in Wisconsin municipalities.

The Midwest Transportation Workforce Center (MTWC) has published its report on the 2017 Wisconsin Highway Maintenance Workforce Survey. As part of its Highway Maintenance Engineering Career Pathways Initiative, MTWC conducted the survey to capture information about

the demand for entry-level workers, hiring issues, training practices and stakeholder outlook in this field. After analyzing the responses, MTWC researchers conclude there is a clear opportunity to put registered apprenticeship to work creating career pathways for this critical sector.

The results help answer questions around the future of highway maintenance occupations. Like in many occupations today, incumbent baby boomers are retiring in large numbers. At the same time, the skills and competencies required are also changing to keep pace with rapidly advancing technologies like sensors and autonomous vehicles.

....

The survey was part of a two-year endeavor to establish pathways for skilled careers in highway maintenance engineering. The Highway Maintenance Engineering Career Pathways Initiative has identified current and emerging occupations of highest demand and is in the process of developing career pathways for them.

4.3 Clear Roads Study: Recruitment and Retention of Highway Maintenance Workers

In 2020, the Clear Roads pooled fund study undertook a [research project](#) to “provide state DOTs with information that can be used to more effectively recruit and retain highway maintenance workers. A related objective was to develop objective data about state DOTs’ recruitment and retention challenges that can be presented to state legislative committees or upper management in order to influence agency policy.” Selected findings from surveys of HR staff, maintenance managers and winter maintenance workers are highlighted below.

CDL requirement. Most agencies hire workers without a CDL but some require workers to obtain the license within a specified time period. Most winter maintenance managers reported their agencies provide training to obtain or upgrade a CDL and half pay for renewals.

Recruitment:

- **HR respondents** reported on these practices:
 - All use social media, employment websites, state websites and job fairs to post jobs.
 - Job features marketed as a recruitment strategy include:
 - Employee benefit programs (all).
 - Career advancement opportunities and workplace culture (most).
 - On-the-job training and education (half).
 - Most agencies target specific demographics: high school graduates, veterans, women, minorities and underserved populations.
 - HR managers reported a range of 14 to 90 days to fill vacancies.
- **Winter maintenance managers** identified these recruitment challenges:
 - Biggest barriers include pay that is not competitive with private sector (most) or other public sector jobs (half), and difficulty finding candidates with requisite skills and experience (just over half).

- Half said the hiring process was too slow or cumbersome; winter maintenance managers reported a range of one week to two years (average of 73 days) to fill vacancies.
- Word-of-mouth was the most successful recruiting strategy for most agencies.

Retention:

- **HR respondents** described methods and practices to retain staff, including discussing promotions potential, cross-training and job enhancement, and promoting work-life balance. Respondents also reported roadblocks to impacting employee retention that included unions, civil service requirements and state (not agency) control over wages.
- Most **winter maintenance managers** reported some difficulty in retaining employees. The top reasons for leaving included:
 - Competition from private sector.
 - Career change outside of agency.
 - Job change within the agency.

Winter maintenance workers were most likely to find their current jobs through word-of-mouth. Pay scales were identified as the biggest deterrent to working for a transportation agency. Benefits and job security were cited by almost three-quarters or more of respondents when asked what attracted them to state DOT jobs.

Related Resources:

Recruitment and Retention of Highway Maintenance Workers, Laura Fay, Karalyn Clouser, Diana Clonch, Susan Gallagher, Dave Bergner and Natalie Villwock-Witte, Clear Roads Pooled Fund, August 2021.

https://clearroads.org/wp-content/uploads/dlm_uploads/FR_CR.19-02.pdf

From the abstract: The objective of this project was to investigate strategies state departments of transportation (DOTs) can employ to overcome challenges related to recruitment and retention of plow drivers and other highway maintenance workers. The project outcomes include two deliverables: a concise guide of innovative but practical ways for DOTs to recruit and retain a highly proficient, productive, versatile and committed roadway maintenance workforce; and a more detailed final report containing all information captured in this effort.

Recruitment and Retention of Highway Maintenance Workers: Case Studies and Recommendations, Laura Fay, Karalyn Clouser, Susan Gallagher, Diana Clonch and Dave Bergner, Clear Roads Pooled Fund, July 2021.

https://clearroads.org/wp-content/uploads/dlm_uploads/CS-R_CR.19-02.pdf

From the introduction: The objective of this project was to investigate the challenges for state departments of transportation (DOTs) in the recruitment and retention of snowplow drivers and other highway maintenance workers; and identify innovative but practical ways for DOTs to recruit and retain a highly proficient, diverse, productive, versatile and committed roadway maintenance workforce. The focus is on feasible measures to attract, keep and improve a reliable, capable workforce. This document highlights successful strategies and potential solutions, through identification of factors that explain why some employees pursue a position with a DOT, why some employees leave, and why some remain with an agency over time. Since it is often difficult to significantly increase wages, basic information on wages and benefits are reported and key

employment factors within agencies' control to modify in order to increase recruitment and retention are presented.

Strategies to Find and Keep Highway Maintenance Workers, Clear Roads Pooled Fund, September 2021.

https://clearroads.org/wp-content/uploads/Brief_CR.19-02.pdf

This research brief is a two-page overview of the Clear Roads study.

4.4 New Federal Rules for Commercial Driver's Licenses

New federal rules, administered by the Federal Motor Carrier Safety Administration (FMCSA), went into effect in February 2022 that require any facility providing entry-level driver training (ELDT) to potential CDL holders to follow a certain curriculum and be listed on a federal training provider registry. Applicants seeking a CDL must demonstrate certain proficiencies in knowledge and skills.

Guidance and Training

Entry-Level Driver Training (ELDT), Federal Motor Carrier Safety Administration, February 2022.

<https://www.fmcsa.dot.gov/registration/commercial-drivers-license/entry-level-driver-training-eldt>

From the website: FMCSA's Entry Level Driver Training (ELDT) regulations set the baseline for training requirements for entry-level drivers. This applies to those seeking to:

- Obtain a Class A or Class B CDL for the first time;
- Upgrade an existing Class B CDL to a Class A CDL; or
- Obtain a school bus (S), passenger (P) or hazardous materials (H) endorsement for the first time.

The ELDT regulations are not retroactive; individuals who were issued a CDL or an S, P or H endorsement prior to February 7, 2022, are not required to complete training for the respective CDL or endorsement.

If an applicant who obtained a CLP [Commercial Learner's Permit] prior to February 7, 2022, and obtains a CDL before the CLP or renewed CLP expires, the applicant is not subject to the ELDT requirements.

Any individual who meets one of the exceptions for taking a skills test in [49 CFR Part 383](#) is also exempt from the ELDT requirements.

Entry-Level Driver Training (CDL) for Maintenance Equipment Operators, Matthew Camden, Scott Tidwell, Chris Antonik, Katherine Meissner, Laurel T. Glenn, J. Erin Mabry, Mark Golusky and Richard J. Hanowski, Clear Roads Pooled Fund, September 2021.

Project deliverables available at <https://clearroads.org/project/20-01/>

This research project concerned state DOT readiness to comply with new CDL training requirements and developed training materials. *From the report brief:*

The goal of this project was to develop CDL training materials and a process to guide transportation agency efforts to comply with the training and registry requirements of the ELDT rule. Investigators began by reviewing published literature related to CDL training and guidance. Next, they conducted a short online survey of Clear Roads agencies to understand existing CDL training, lessons learned and needed revisions. Finally, investigators carefully reviewed the ELDT rule requirements in preparation for producing the training package.

Additional State Perspective

“New CDL Requirements Add an Extra Step to Becoming a Driver or Adding an Enhancement,” Alix Larsen, KFVRTV (West Dakota Fox), February 9, 2022.

<https://www.kfyrvtv.com/2022/02/10/new-cdl-requirements-add-an-extra-step-becoming-driver-or-adding-an-enhancement/>

From the article: The [North Dakota DOT] says it’s not worried about the additional requirement creating a boundary for new drivers because of the demand for them.

“It’s just a step. I don’t think it’s going to be that demanding. I think for organizations that are registered as a provider, they probably go through a lot of this already with their employees [and] with their staff. So it’s not anything that’s going to be out of the ordinary,” says [North Dakota DOT’s] driver’s license director Brad Schaffer.

Schaffer says there are 90 course providers in the state and 30 of those are public.

“New Rules for CDL Applications: How Can Drivers and Organizations Prepare?” Sophie Koch, *Minnesota LTAP Technology Exchange*, Vol. 29, No. 4, December 2021.

<http://www.mnltap.umn.edu/publications/exchange/2021/December/cdl-rules/index.html>

This short article discusses the impacts of CDL changes, including increased costs of obtaining a license for drivers. Also addressed is the need for organizations seeking CDL drivers to cover training costs; trainers must update their training materials and join the federal registry.

Commercial Perspective

“Viewpoint: FMCSA Finalizes New Training Requirements for CDL,” Dave Heller and Kathryn Pobre, *Freightwaves*, February 3, 2022.

<https://www.freightwaves.com/news/viewpoint-fmcsa-finalizes-new-training-requirements-for-cdl>

From the article: Prior to the ELDT rule, standards for CDL training were regulated by states and varied. While TCA [Truckload Carriers Association] notes that many training programs already meet the new requirements, it is nonetheless beneficial to set a national proficiency minimum that promotes safety and preparedness.

These safety improvements could potentially help reduce the industry’s driver shortage and retention concerns. Increased driver safety and proficiency could improve driver satisfaction and increase career longevity. Currently, the industry is estimated to be around 80,000 drivers short of demand.

Moving forward, it will be important to monitor potential hurdles. Prospective drivers who cannot afford training school or struggle with English literacy may find it difficult to meet the new requirements. Also, if programs do not take the necessary steps to certify and register, there could be too few locations to meet demand.

Entry-Level Driver Training, American Trucking Associations, December 2021.

<https://www.trucking.org/sites/default/files/2021-12/ELDT.pdf%20Myth%20vs%20Fact%20ATA.pdf>

Addressing the trucking industry as a whole, this two-page fact sheet describes the new federal CDL requirements and includes a “myth vs. fact” section addressing a variety of claims about the new rules, including:

MYTH: The new ELDT rule will make it more difficult to hire new drivers and will further exacerbate supply chain challenges.

FACT: Establishing consistent and effective training requirements will help reduce the failure rates for the SDLA [state driver licensing agency]-administered skills test, thereby helping drivers to obtain CDLs more efficiently and improve the supply chain. Most training programs already meet or exceed ELDT requirements and will be able to continue training new drivers without disruption. Additionally, the TPR [Training Provider Registry] will make it easier for new drivers to find qualified training providers, increasing the likelihood that a prospective driver actually signs up for and completes training.

4.5 Related Resources

“Factors Affecting Workforce Resilience in Public Transportation Agencies,” Kristal Metro, Christofer Harper and Susan Bogus, *Journal of Management in Engineering*, Vol. 37, Issue 4, July 2021.

Citation at <https://ascelibrary.org/doi/10.1061/%28ASCE%29ME.1943-5479.0000920>

From the abstract: Ensuring the resiliency of a nation’s transportation infrastructure network requires a skilled and dependable workforce; this relies heavily on a transportation agency’s ability to recruit and retain their employees. Public transportation agencies face unprecedented challenges in preserving the workforce necessary to function effectively and need robust strategies to maintain workforce resiliency by recruiting and retaining quality staff to construct and maintain transportation infrastructure now and into the future. This study identified existing workforce issues and recruitment and retention practices by state [d]epartments of [t]ransportation (DOTs) and compared rural and urban transportation employee outlooks. Results indicated that the primary incentives for current DOT employees to consider private-sector employment are better salary and promotional opportunities. Additionally, rural DOT regions have a more difficult time recruiting and retaining employees, and rural DOT employees feel that DOTs are not fully aware of their needs.

“State DOT Panel Examines Workforce Recruitment, Retention Issues,” AASHTO Spring Meeting, *AASHTO Journal*, May 2021.

<https://aashtojournal.org/2021/05/14/state-dot-panel-examines-workforce-recruitment-retention-issues/>

From the online article: Creating new opportunities for advancement and on-the-job learning for both current and newly recruited employees, along with providing more work-life balance, are becoming key workforce strategies for state departments of transportation now and in the future.

Furthermore, a panel discussion held during the 2021 virtual spring meeting of the American Association of State Highway and Transportation [Officials] fleshed out how those strategies are becoming reality.

“I See Myself in That Career’: Exploring Methods to Attract the Next Generation Transportation Workforce,” Marissa McFadden, Hannah Ullman and Glenn McRae, National Center for Sustainable Transportation, December 2019.

<https://escholarship.org/uc/item/82r0k1ch>

From the executive summary: This project follows on the premise that increasing awareness of career opportunities is essential to attracting new entrants at an early age, and that awareness building should be dynamic. This includes providing views of who works in the transportation field, what their experiences are, and what they value about their work. This paper hypothesizes that first-person glimpses into transportation careers are just as essential for job seekers as knowing job specs,

qualifications, pay scales and opportunities for advancement. In-depth career profiles of workers were developed and showcase individuals, from diverse backgrounds and interests, engaged in work critical to the future of our transportation systems and infrastructure as an inducement to consider future education and training work needed to enter such a field. ... As with other awareness building and talent pipeline development initiatives such efforts need to be made accessible to a wider more diverse audience and metrics for tracking their effectiveness should be developed and implemented. Coordinating and testing these efforts are part of a future stage of program.

“Maintenance Peer Exchange Supports Workforce Development Efforts,” Kathryn Zimmerman, *TR News*, Issue 323, page 37, September-October 2019.

<https://onlinepubs.trb.org/onlinepubs/trnews/trnews323.pdf>

From the description: The use of technology was a key focus at a recent peer exchange that brought together maintenance practitioners from 27 state departments of transportation (DOTs) to exchange best practices in using technology and data to build performance-based maintenance programs. The findings from the peer exchange included: (1) the importance of maintenance quality assurance (MQA) programs and their value to collected data; (2) examples of formal maintenance training programs to develop leadership skills; (3) addressing skill gaps in new maintenance workers; (4) the addition of data analysts and programmers to maintenance department teams; and (5) the use of tablets and other technological innovations to improve the way maintenance inventories are updated.

“Maintaining the System: Defining Routes for Advancement for the Highway Maintenance Workforce,” Teresa Adams, Maria Viteri Hart and Kerri Phillips, *TR News*, Issue 323, pages 38-44, September-October 2019.

<https://onlinepubs.trb.org/onlinepubs/trnews/trnews323.pdf>

From the description: Highway maintenance workers must perform a remarkable range of duties. They also must be flexible as tasks change priority and must be able to operate a wide range of often-complicated equipment. Across the country, however, state departments of transportation (DOTs) report that filling highway maintenance positions is their biggest workforce challenge. Enter the Midwest Transportation Workforce Center (MTWC), which developed a vision to better understand and address the need for skilled and unskilled highway workers at a time when finding and retaining qualified workers is increasingly difficult. MTWC worked with highway maintenance employers in Wisconsin’s counties and cities to define the curriculum for a new apprenticeship in highway maintenance. This article summarizes findings gathered through surveys, interviews and data analysis and the resulting apprenticeship curriculum model. Specifically, MTWC focused on what it would take to implement apprenticeships to address the highway maintenance workforce needs as identified by hiring managers. At present, the state Bureau of Apprenticeship Standards and the Wisconsin Technical College System are working to implement apprenticeships for this occupation in the state of Wisconsin. The end goal is to provide a model that can be scaled and replicated across the country.

Related Resource:

Roadway Maintenance Technician Apprenticeship, Wisconsin Department of Workforce Development, undated.

<https://dwd.wisconsin.gov/apprenticeship/occupations/roadway-mainttech.htm>

From the website:

Roadway Maintenance Technicians maintain highways, municipal and rural roads, airport runways and rights-of-way. They patch broken or eroded pavement; repair guardrails, highway markers and snow fences; and may mow or clear or plow snow.

This website provides additional information about the apprenticeship program:

- Two years to complete.
- 4,000 hours of on-the-job time.
- 288 hours of related instruction time.

Within the first six months of the program, the apprentice must obtain a CDL Class B permit. Prior to completing the program, the apprentice must obtain the following certifications:

1. OSHA [Occupational Safety and Health Administration] competent person training
2. Confined space certification
3. Flagger Training
4. Mine safety hazard awareness
5. Adult First Aid/CPR/AED [automated external defibrillator]

“Transportation Maintenance Operations Workforce Development: Challenges, Opportunities and Solutions,” Dave Bergner, *International Conference of Transportation and Development*, 2018.

Citation at <https://ascelibrary.org/doi/10.1061/9780784481547.002>

From the abstract: The surface transportation maintenance operations workforce faces major changes as experienced employees retire in large numbers and younger employees replace them. The generational differences are well documented, particularly as to training and career development, thus requiring new approaches to ensure a proficient and productive workforce. Additionally, the job duties and responsibilities are changing due to advanced technologies and more stringent regulations. Both private and public sectors recognize this and are adapting to a more diverse workforce that must be highly competent, adaptable and versatile. Determining what training is needed for the current workforce and how that training is delivered [is] essential. At the same time, it is vital to create a “pipeline” of future workers, by promoting this discipline as a rewarding career. This paper will explore innovative training and career development strategies to build and sustain highly effective maintenance operations workforces.

“Millennials in the Transportation Workforce,” Susan Gallagher and Natalie Villwock-Witte, *Transportation Research Record* 2552, pages 43-47, 2016.

Citation at <https://journals.sagepub.com/doi/pdf/10.3141/2552-06>

From the abstract: This paper contextualizes challenges faced by state departments of transportation within the current research literature on generational differences to identify mutual concerns in addition to successful strategies that state agencies can employ to attract and retain young staff. A literature review was conducted in conjunction with focus group discussions. Six staff from human resource departments representing five state departments of transportation (Alaska, Minnesota, Montana, Oregon and Wisconsin) participated. The study found that state departments of transportation offer many attributes attractive to the younger generation: job security, opportunities for personal and professional development, flexible schedules, and vacation and work expectations that allow for work-life balance. Shared issues of concern included the use of technology and social media, mentorship capacity, attrition and public image. The authors identified a number of opportunities for collaboration among state departments of transportation to share information and leverage resources to meet collective challenges.

Appendix A: Member Survey

The survey below was provided in an online format to No Boundaries members. A follow-up survey, which begins on page 62, was provided by email to gather additional details of member CDL-related practices.

Note: The question below determined how respondents were directed through the survey.

Is your agency struggling to fill vacancies in maintenance-related positions?

- Yes (Proceed to the **Staffing Shortages** section and complete the remaining questions in the survey.)
- No (Skip to the **Commercial Driver's Licenses** section and complete the remaining questions in the survey.)

Staffing Shortages

1. How long has your maintenance division been short-staffed?
2. Are the staffing shortages the same across summer and winter maintenance?
 - Yes
 - No (Please explain the differences between summer and winter maintenance staffing shortages.)
3. Are staffing shortages greater in any specific maintenance job classifications?
 - No
 - Yes (Please explain which job classifications experience greater staff shortages.)
4. What are the primary reasons for the maintenance vacancies? Check all that apply.
 - I don't know.
 - COVID-19.
 - We can't get enough applicants.
 - We can't get enough qualified applicants.
 - We can't retain staff once they're hired.
 - Applicants are trending younger and lack the experience required.
 - CDL requirements generally.
 - New federal CDL requirements.
 - Competition from other state agencies.
 - Competition from municipal or county agencies.
 - Competition from private industry.
 - Excess number of retirements.
 - Geographic limitations on the applicant pool.
 - Inadequate agency budget.
 - Inadequate benefit package.
 - Inflexible work hours.
 - Pay scale.
 - People leaving for different careers.
 - Lack of interest in the maintenance field.
 - Workplace culture.
 - Other (Please describe.)
5. Please provide any other comments you'd like to share about the current status of maintenance-related positions within your agency.

Staffing Shortage Impacts

1. What types of services have been impacted by staffing shortages?
2. How does your agency respond to staffing shortages? Check all that apply.
 - Services are delayed or deferred.
 - Services are not provided.
 - Work is contracted out.
 - Nonmaintenance staff is reallocated to perform maintenance tasks.
 - Other (Please describe.)

Questions 3 through 5 address practices that your agency may not employ. Please skip the questions that don't apply to you.

3. **Reallocating Staff.** If nonmaintenance staff are reallocated to meet service needs, please describe the tasks they're asked to do and how long they generally perform those tasks.
4. **Reallocating Staff.** Please describe the other services that are delayed or deferred because staff has been reallocated.
5. **Delaying or Deferring Services.** If services are delayed or deferred due to the staffing shortage, please describe the impacts to your agency.
6. What do you think are the long-term repercussions of your agency's maintenance staffing shortage?
7. How long do you think your agency can sustain the maintenance staffing shortage?
8. Is your agency considering an innovative practice to mitigate a long-term maintenance staffing shortage?
 - No
 - Yes (Please describe this innovative practice.)

Commercial Driver's Licenses

New federal CDL rules require any facility providing training for entry-level CDLs to follow a certain curriculum and be listed on a federal training provider registry. Applicants seeking a CDL must demonstrate certain proficiencies in knowledge and skills.

A three-year **pilot program** required by recent federal legislation ([Safe Driver Apprenticeship Pilot Program](#)) will allow employers to establish an apprenticeship program for certain 18- to 20-year-old drivers to operate commercial vehicles in interstate commerce.

1. Do you think the new federal CDL rules will have an impact on your agency's ability to attract and retain maintenance workers?
 - I don't know
 - Too early to tell
 - No
 - Yes (Please explain these impacts.)
2. Has your agency instituted any changes to meet the requirements of the new federal CDL rules?
 - I don't know
 - No
 - Yes (Please describe these changes.)
3. What impact to your agency do you anticipate from the new apprenticeship pilot program allowing 18- to 20-year-old drivers to operate commercial vehicles in interstate commerce?
 - I don't know

- No impact
 - Limited longer-term impact if moves beyond a pilot
 - Will change the way we hire if moves beyond a pilot
 - Other (Please describe.)
4. Are you aware of any other legislative, regulatory or administrative barriers to attracting or maintaining maintenance workers?
- No
 - Yes (Please explain these barriers.)

Recruitment and Retention Practices

The Clear Roads pooled fund focuses on winter maintenance issues, including materials, methods, equipment and highway maintenance crews. A Clear Roads research project completed in August 2021, [Recruitment and Retention of Highway Maintenance Workers](#), produced a compilation of [case studies and recommendations](#) on recruitment programs, retention strategies, and recruitment and retention of underserved communities and the next generation.

1. If you're familiar with this recent Clear Roads research effort, has your agency implemented, or does your agency plan to implement, any of the recommendations or ideas from the case studies?
 - Not familiar with the research
 - No
 - Yes (Please explain what your agency is implementing or plans to implement.)
2. Please provide a brief description of any agency efforts in the following areas to attract or maintain maintenance workers.
 - Career pipelines for the next generation, including efforts geared to high school students
 - Career progression and career ladders; revising job descriptions and classifications
 - Employee feedback using job satisfaction surveys, mentoring or exit interviews
 - Employee training programs
 - Increasing workforce diversity
 - Partnerships with other organizations
 - Succession planning/knowledge management
 - Other (Please describe.)
3. If applicable, please describe how your agency is using the innovative payment practices identified below.
 - Competency or skill-based pay (pay based on skill set, knowledge and experience)
 - Geographic pay differential
 - Longevity premium
 - Mission-critical incentive pay
 - Project-based pay
 - Specialty pay
 - Other payment practice (Please describe.)
4. What are your agency's top three most successful or innovative practices to **attract qualified** maintenance workers?
 - Practice 1:
 - Practice 2:
 - Practice 3:

5. What are your agency's top three most successful or innovative practices (other than salary) to **retain** maintenance workers?
 - Practice 1:
 - Practice 2:
 - Practice 3:
6. Has your agency identified significant threats on the horizon that are expected to impact recruitment and retention of maintenance staff?
 - No
 - Yes (Please describe these threats and how your agency is preparing for them.)

Wrap-Up

1. If available, please provide links to documentation that describes your agency's response to maintenance staffing shortages. Send any files not available online to susan.johnson@ctcandassociates.com.
2. Please use this space to provide any comments or additional information about your previous responses.

Follow-Up Survey Questions

The following questions were provided by email to No Boundaries members to seek additional information about their practices regarding CDLs.

1. Does your agency offer a sign-on bonus to new employees entering a position with a CDL?
 - No (Please skip to Question 2.)
 - Yes (Please respond to Question 1A.)
- 1A. Please describe your agency's CDL sign-on bonus program.
 - Bonus amount:
 - When bonus is paid:
 - Required period of service to retain the bonus:
 - Repayment requirements:
 - Other details:
2. Does your agency offer a bonus for current employees obtaining CDL certification through your agency?
 - No (Please skip to Question 3.)
 - Yes (Please respond to Question 2A.)
- 2A. Please describe your agency's CDL bonus program.
 - When eligible:
 - Bonus amount:
 - When bonus is paid:
 - Required period of service to retain the bonus:
 - Repayment requirements:
 - Other details:
3. Does your agency require employees to execute a noncompete agreement after obtaining CDL certification through your agency?
 - No
 - Yes
4. Please describe any other benefits your agency provides employees related to CDL training and certification.

Appendix B: Human Resources Survey

The survey questions below were provided by No Boundaries members to colleagues in their agencies' human resources departments.

Current Maintenance Staffing

1. Please describe your agency's current staffing levels for maintenance-related positions in the general categories identified below.

Entry Level

Position/staffing category name:

Description:

Vacancy rate or other data:

Midlevel

Position/staffing category name:

Description:

Vacancy rate or other data:

Experienced

Position/staffing category name:

Description:

Vacancy rate or other data:

Supervisor

Position/staffing category name:

Description:

Vacancy rate or other data:

Manager

Position/staffing category name:

Description:

Vacancy rate or other data:

- 1A. Please provide any additional comments you'd like to share about the current staffing levels you've described above.
2. If overtime is offered to maintenance staff, roughly what percentage of employees elect to take extra time off (comp time) rather than receive overtime pay?
3. Please describe the statistics your agency tracks with regard to maintenance staffing levels. If you have documentation that presents these statistics, please include a link below. Send any files not available online to susanjohnson@ctcandassociates.com.

Staff Departure and Turnover for Maintenance Staff

4. Does your agency gather and maintain data on the reasons for maintenance staff departure?
 - No
 - Yes (Please briefly describe the data your agency maintains and include a link below to documentation related to maintenance staff departures. Send any files not available online to susanjohnson@ctcandassociates.com.)
5. What are your agency's turnover rates for the last three years for maintenance-related positions in the general staffing categories identified below?

Note: Please enter information using the staffing category label that is **most similar** to yours, as you did in the first survey question.

2021

- Entry level:
- Midlevel:
- Experienced:
- Supervisor:
- Manager:

2020

- Entry level:
- Midlevel:
- Experienced:
- Supervisor:
- Manager:

2019

- Entry level:
- Midlevel:
- Experienced:
- Supervisor:
- Manager:

Hiring Maintenance Staff

6. Please briefly describe and estimate the time required for your agency to complete each step in the process to hire new maintenance staff.
- Recruitment:
 - Interviewing:
 - Selection:
 - Onboarding new hires:
 - Other (Please describe.):

Barriers to Attracting and Retaining Maintenance Workers

7. Does your agency require its workers to be state residents?
- No
 - Yes
8. How does U.S. citizenship impact employment at your agency?
- Employees must be U.S. citizens to work at my agency.
 - Legal immigrants with green cards can work at my agency.
9. Is your agency considering policy changes to broaden applicant pools and address staffing shortages?
- No
 - Yes (Please describe these policy changes.)

Wrap-Up

Please use this space to provide any comments or additional information about your previous responses.

Appendix C: Ohio Department of Transportation Maintenance Position Descriptions

Ohio Department of Transportation provided the maintenance-related position descriptions below.

Highway Technician 1: Works under general supervision and requires working knowledge of highway maintenance. General maintenance duties include basic equipment operation, winter maintenance (operating snowplow with spreader, brine-dispensing equipment, dump truck with attachments). Receives on-the-job and formal training in construction or maintenance-related inspection activities and the operation of standard and complex equipment.

Highway Technician 2: Filled through auto-progression of current Highway Technician 1 workforce. Works under general direction and requires considerable knowledge of highway maintenance and maintenance related inspection items. Duties include operation of standard equipment, project-related inspection, general highway maintenance duties including winter maintenance similar to the Highway Technician I and acting as lead worker as needed providing direction and training. Receives on-the-job and formal training in various types of construction inspection activities and operation of complex equipment.

Highway Technician 3M: The third full performance level class is filled through auto-progression of current Highway Technician 2 workforce, works under general direction and requires considerable knowledge of highway maintenance and construction project inspection in order to operate basic, standard and complex equipment, perform general highway maintenance duties which vary by season and include snow and ice control and related maintenance duties by operation of snowplow with spreader, brine-dispensing equipment, dump truck with attachments, act as lead worker (i.e., provide work direction and training), inspect maintenance projects to ensure contractor compliance with [s]tate specifications, plans and/or proposals, verifies plans quantities and calculations with blueprints, performs field tests on materials proposed for maintenance-related construction projects to determine compliance with [s]tate specifications, signs inspection reports as qualified inspector.

Transportation Manager 1: Many of these positions are filled from within the agency. The first managerial level class works under general direction and requires considerable knowledge of highway maintenance, bridge maintenance and repair, equipment maintenance and repair, or route marking and skill in operation of associated tools and equipment in order to supervise and assist employees engaged in highway maintenance program projects (e.g., bridge maintenance and repair; equipment maintenance and repair; route marking; funded construction projects to include project inspection and materials control and testing).

Transportation Administrator: Many of these positions are filled from within the agency. The administrator level classification works under general direction and requires considerable knowledge of management/supervisory principles and techniques, budgeting, highway maintenance operations and oral and written communication in order to plan and administer entire highway management program for assigned county work unit and supervise lower-level supervisors and/or other personnel.