

## ERRATA

- In “Meeting USEPA’s Operator Certification Guidelines in Virginia” by Carrie A. Adam et al (August 2001), the Internet address listed in the references for the Department of Professional and Occupational Regulation should have been <[www.state.va.us/dpor/indexie.html](http://www.state.va.us/dpor/indexie.html)>.

BY CARRIE A. ADAM, ANDREA M. DIETRICH,  
DANIEL L. GALLAGHER, ANDREW J. WHELTON,  
GREGORY D. BOARDMAN, AND MARC A. EDWARDS

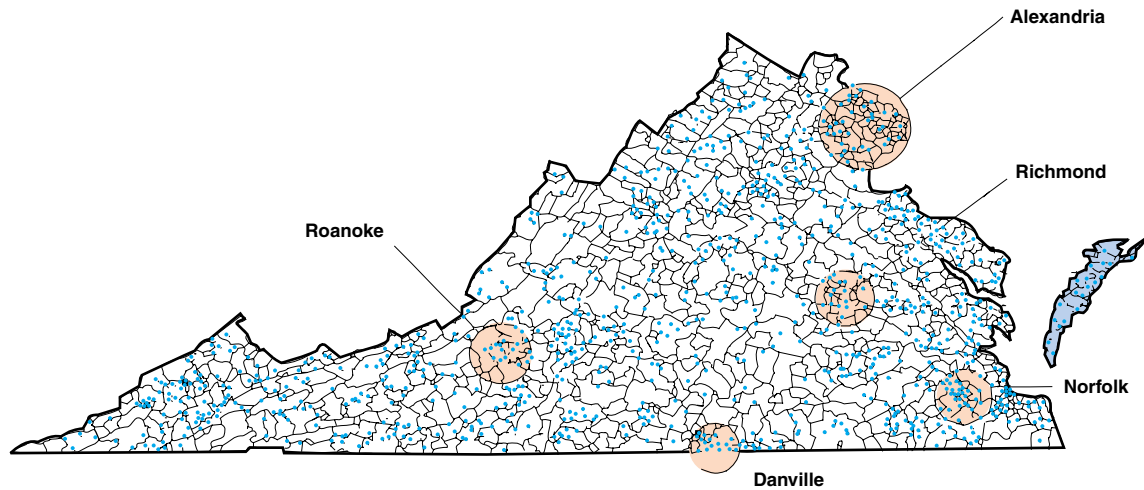
# MEETING USEPA'S OPERATOR CERTIFICATION GUIDELINES IN VIRGINIA

A 42-QUESTION SURVEY MAILED TO 2,011 SMALL PUBLIC WATER SYSTEMS IN VIRGINIA SHOWED THAT THIS IS A DIVERSE, WELL-EDUCATED GROUP OF WATER SYSTEM OWNERS AND OPERATORS WHO COULD RECEIVE THEIR TRAINING FOR VIRGINIA'S NEW LICENSE CLASSIFICATION THROUGH REGIONAL WORKSHOPS, THE INTERNET, DISTANCE LEARNING CLASSES, AND TRADITIONAL TEXTBOOK-BASED METHODS.

**T**his small water system research project was conducted to assist the Virginia Department of Health (VDH) in determining the policies and procedures necessary for the implementation of the US Environmental Protection Agency (USEPA) final guidelines for the certification and recertification of the operators of community water systems (CWSs) and nontransient–noncommunity (NTNC) public water systems (PWSs). These regulations will apply to small water systems serving more than 15 connections or 25 people and fewer than 3,300 people (USEPA, 1999b). These final guidelines were published in the *Federal Register* in February 1999 by USEPA and require that each state must have adopted or implemented a public small water system operator certification program by Feb. 5, 2001. If a state has not adopted or implemented an approved program, the USEPA will withhold 20% of the capitalization grants to which the state is entitled from the Drinking Water State Revolving Fund (DWSRF).

USEPA developed these regulations because systems serving 25–500 people tend to have many more violations per 1,000 people served than any other size category. For every 1 million customers of CWSs serving fewer than 500 people, there are 800 maximum contaminant level (MCL) violations and 7,164 total violations. In systems serving more than 500 but fewer than 10,000 people, there are only 2 MCL violations and 10 total violations per 1 million customers. In addition, 93% of these systems tend to use groundwater and have a potential source of contamination within 2 mi (3.2 km) of their well(s) (USEPA, 1999a).

**FIGURE 1** Dot density map of small public water systems in Virginia



*One dot equals one facility; data were provided for 447 of 830 zip codes as of Aug. 25, 1999.*

The new USEPA regulations require that each operator certification program include essential elements from nine baseline standards. These standards require a state to have the legal authority to implement a program and require that systems comply with the appropriate regulations. The program must also classify systems, facilities, and operators. Operator qualifications under these standards include requiring operators to pass a validated exam, have a high school diploma/general equivalency diploma (GED), and possess the defined minimum amount of on-the-job experience. If a state chooses to implement a grandparenting clause, USEPA also specifies additional requirements. The standards require that a state's program be enforced and that it have the resources necessary to fund and sustain it. Other key standards include meeting requirements for certification renewal and recertification. The final standards ensure stakeholder

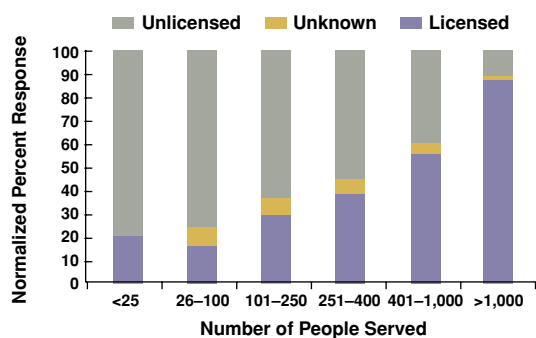
involvement and a review of the program. The regulations also ensure that public health objectives will be met, and they feature an antibacksliding clause, which ensures that a state's standards will not be relaxed.

Currently VDH has responsibility for regulating drinking water quality and water systems. In addition, VDH is responsible for DWSRF grants, which provide funding for construction projects and various technical assistance activities related to drinking water. If 20% of DWSRF grants were withheld because of non-compliance with the new certification and recertification regulations, then a loss of \$3 million would be incurred by the commonwealth of Virginia. The Virginia Board for Waterworks and Wastewater Operators (VBWWO) is responsible for regulating plant operators within the commonwealth through classification, licensing, and prosecution. VBWWO is one of the boards regulated by Virginia's Department of

Professional and Occupational Regulation (DPOR). DPOR has the responsibility to oversee all non-medical professional licensing in Virginia. DPOR acts as an administrative agency that processes licenses and provides recordkeeping, but it does not set policy. VBWWO and DPOR work together to oversee the licensing process in Virginia. Table 1 describes the classification system of water facilities and water system operators used in Virginia.

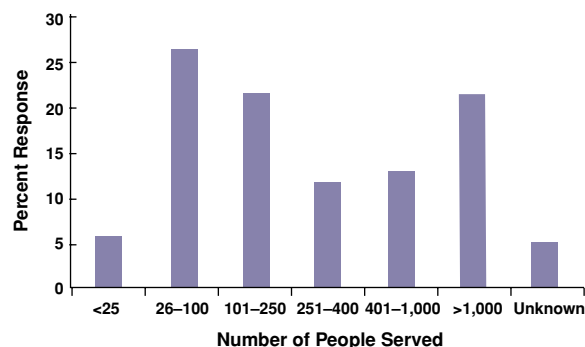
Before February 2001, Virginia had five classes of licensed operators for water systems, and VBWWO needed to incorporate a sixth class for small water systems. VDH requires all water systems serving more than 400 people and providing any sort of treatment to have at least one licensed operator who is in charge of and responsible for the system at all times (CV, 1995). Therefore, the new regulations will mostly affect these smaller systems that serve fewer than 400 people, which were

**FIGURE 2** Licensed and unlicensed operators of Virginia small public water systems by size of population served



Number = 868

**FIGURE 3** Percent response of Virginia small public water systems by size of population served



Number = 987

not previously regulated. Approximately 1,100–1,300 previously unregulated small systems in Virginia will now have to be regulated. Examples of these small systems include systems in mobile home parks, schools, day care centers, and selected state parks, campgrounds, and rest areas. To determine training, testing, and certification needs, VDH needs to know the characteristics of these systems and their owners/operators.

The goals of this research project were as follows:

- review and analyze the appropriate federal and state regulations;
- conduct interviews with personnel from USEPA, VDH, and DPOR to gain additional insights about the interpretation of regulations and problem areas and to review the issue of licensure versus certification;
- develop a geographic information system map of Virginia indicating the locations of small drinking water systems;
- develop a survey and conduct analysis of the responses; and
- provide insight on a practicable plan for VDH.

## METHODS

Information was gathered from interviews with drinking water professionals, a telephone and e-mail survey of those administering certification programs in 15 other states, and a mail survey sent to 2,011 small drinking water systems in Virginia.

**Interviews with drinking water professionals.** Representatives from VDH, DPOR, USEPA, and other agencies were interviewed to gain insight on how the new regulations could be best implemented and where problem areas could develop.

**Other states' programs.** Fifteen other states were contacted by telephone or e-mail to ascertain how small water system certification/licensure was being handled across the United States. The states contacted were Arkansas, California, Connecticut, Florida, Illinois, Kentucky, Maryland, Massachusetts, Montana, New Hampshire, New Jersey, Pennsylvania, South Dakota, Tennessee, and Wyoming.

**Location of small systems in Virginia.** A dot density plot was created using postal zip codes for the 2,011 small drinking water systems

to evaluate the spatial distribution of small systems in Virginia.

**Mail survey.** A 42-question survey was developed and conducted using the approach suggested by Dillman (1978). VDH provided a mailing list of 2,011 small systems that served fewer than 3,300 people throughout Virginia. Small systems included both public and private water systems categorized as CWSs, NTNC water systems, and transient–noncommunity (TNC) water systems. An identification number was utilized on the surveys to ensure anonymity and to track the survey responses. Each of the 2,011 systems was sent a questionnaire in September 1999. Reminder postcards and additional mailings were also used to increase the response rate. The reminder postcards were sent out one week after the initial mailing. The second mailing was sent out to systems that had not responded by approximately one month after the initial mailing; this was followed by a second set of reminder postcards a week later.

An eight-page booklet with a cover letter was used for the survey. It was divided into 3 sections and featured 42 questions. The first sec-

## SURVEY COMMENTS INDICATE MONEY IS AN ISSUE

Representative comments from owner/operators who completed the survey regarding the costs of operating their systems included the following:

*The water system that I own is small with only 20 houses being served. I am not making any money with the water system after all the bills are paid. It's all just one great big pain with no returns!*

*We need more money and assistance to upgrade and to improve water quality. Grants are needed to help cut costs on customers' bills.*

*We are a small, nonprofit church day care center and could not afford any big expenses.*

These final guidelines by USEPA require that each state

must have adopted or implemented a public small water system operator certification program by Feb. 5, 2001.

tion, covering owner/operator information, featured 11 questions on job duties and past training. The second section, covering facility characteristics, had 18 questions related to unit operations, licensing, and employment. The final section, covering opinions, included 12 questions that dealt with training times and costs, as well as interaction with state agencies.

### RESULTS

**Interviews with drinking water professionals.** Training suggestions regarding the new regulations included offering training throughout Virginia, having the commonwealth assume some of the cost, and offering the licensure/certification exam at least twice each year. The recommendations regarding licensing were to add a class VI license to DPOR regulations and to make the license fee affordable.

**Other states' programs.** Out of the 15 states surveyed, 10 already had small system programs in place, and 7 states used certification rather than licensure. The average renewal period of the 15 states for certification/licensure was 2 years. The average initial cost was \$36, and the average renewal cost was \$22.

**Location of small systems in Virginia.** The survey found that small PWSs were distributed across the commonwealth. Small PWSs were common in both urban and rural areas. However, many small PWSs were clustered around larger cities such as Danville, Roanoke, Richmond, and Norfolk and in Northern

Virginia around the cities of Alexandria, Arlington, Fairfax, and Manassas and in the counties of Arlington and Fairfax (Figure 1).

### Owner/operator characteristics.

Most of the respondents (88%) were either an operator or an owner/operator of the facility. Small PWS respondents had many occupations. School employees, engineers, blasters, town government and service employees, homeowner association representatives, mayors, and utility employees were only a few of the job descriptions provided. Several respondents indicated that they had no prior training before becoming the operators of their water systems. For example, one respondent wrote "I am married to the owner of the trailer park. I got the job of the well when my mother-in-law died. I know very little about our system except through the State Water Control Board." Most respondents (83%) had worked at a small PWS four or more years. Forty percent of survey respondents reported working for only one water system serving fewer than 3,300 people, whereas 27% reported working for five or more such water systems.

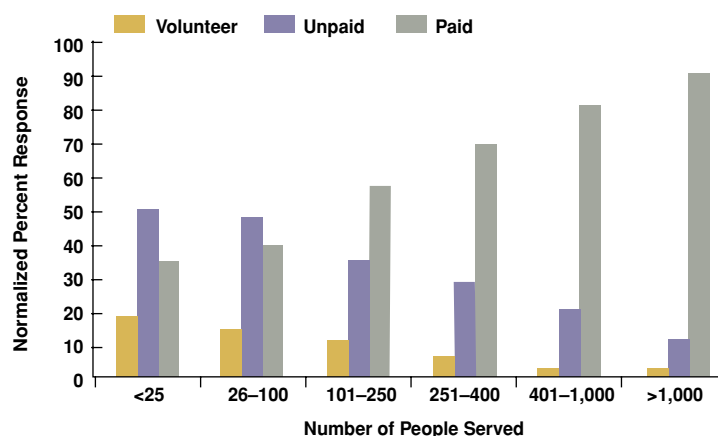
Owner/operators of small PWSs had a high level of formal education (Table 2). Ninety-five percent of the respondents had at least a high school diploma or GED, and more than two thirds had at least some college education. In addition to their formal education, many respondents had received training related to the drinking water industry. More than half of the respondents (55%) had taken classroom-based water-related train-

ing courses, and 27% had taken water-related correspondence courses.

Approximately half (46%) of the respondents possessed a license to operate a water system, with the distribution according to water system classification as follows: class I—2%; class II—4%; class III—14%; class IV—12%; and class V—4%. VDH requires that any system that serves more than 400 people or applies any type of treatment (e.g., chlorination) must have at least one licensed operator on duty at all times. Survey results showed that 48% of the small system respondents apply chlorine and should therefore have at least one licensed operator. The majority (77%) of respondents from systems serving fewer than 100 people did not have a license. This is significant when compared with the systems serving 101–1,000 people—in which more than half (57%) of the respondents possessed an operator’s license (Figure 2).

The owner/operators of small water systems reported having many responsibilities related to drinking water. Greater than half (52%) of all responding operator/owners performed other job-related duties in addition to operating the water system. Most of the respondents (72%) dealt with their water systems’ administration, and 63% performed bacterial testing. About half of the respondents were responsible for pump maintenance, meter reading, customer assistance, flow measurement, grounds maintenance, consumer confidence reports, pipe maintenance, and maintenance of chlorination equipment. Between 20% and 40% of the respondents tested water for pH, turbidity, hardness, and/or corrosion control, whereas only 10–20% sampled for trihalomethanes, tested for alkalinity, or performed other duties.

**FIGURE 4** Compensation of owner/operators of Virginia small public water systems by size of population served



Number = 818

**TABLE 1** Classification system of water facilities and water system operators in Virginia

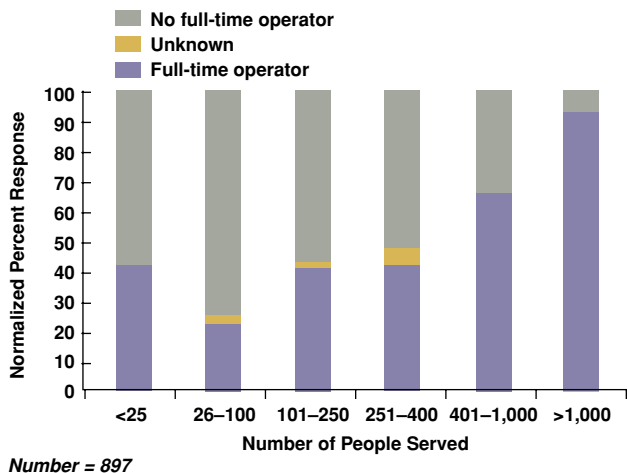
Class	Treatment at Water System	Population Served	Capacity mgd
V	May or may not have chlorine disinfection only	$x^* \geq 400$	NA†
IV	Disinfection, corrosion control, iron/manganese removal, softening, slow sand filtration, rechlorination, and other approved methods of treatment; any combination. No fluoridation	$x \leq 5,000$	NA
III	Chemical coagulation, sedimentation, filtration other than slow sand filtration, disinfection, fluoridation, aeration, corrosion control; any combination	$x \leq 5,000$	$x \leq 0.5$
II	Identical to class III	$5,000 < x \leq 50,000$	$0.5 < x \leq 5.0$
I	Identical to class III	$x > 50,000$	$x > 5.0$

\*x describes the number of people or the capacity.  
†NA—not applicable

**TABLE 2** Distribution of highest level of formal education achieved by the survey respondents

Highest Education Level	Response %
Less than high school graduate	5
High school or general equivalency diploma	20
Trade or vocational school after high school	6
Some college	24
College graduate	30
Graduate or professional school	15

**FIGURE 5** Virginia small public water systems with a full-time operator by size of population served



Most survey respondents (82%) believed that the owner should pay the certification or licensing fee. Almost two thirds of the respondents believed that paying a certification/licensing fee of \$50 or less per year would be reasonable. Sixty-

For most (85%) of the systems, groundwater was the source water; 70% of the responding small PWSs used a single water source. Those systems that did not use groundwater either purchased water from another system or used surface water (which

remainder had three or more full-time employees. About one third of the operators (37%) were not paid to operate the small PWSs. Figure 4 shows the percentages of owner/operators who are paid, who are not paid, or who volunteer to operate small PWSs according to the number of people served.

Close to 70% of systems serving 25–100 people did not employ a person full time. Further, 44% of the systems serving 25–100 people did not have any employees. Figure 5 shows the small PWSs with a full-time operator according to the number of people served.

About half of the small systems (45%) did not have an annual operations and maintenance (O&M) budget. However, as the number of people served increased, the system was more likely to have such a budget. CWSs were the most likely to have such a budget (65%), followed by TNC systems at 38% and NTNC systems at 34%.

Whereas 59% of respondents stated that customers of their water

**Ninety-five percent of the respondents had at least a high school diploma or general equivalency diploma, and more than two thirds had at least some college education.**

two percent of the respondents believed their system could not afford any increase in the operator’s salary if certification or licensing was required.

**Facility characteristics.** Almost all of the respondents surveyed (95%) operated and/or owned a CWS or NTNC PWS. The majority (66%) of the systems were CWSs. Only 2% of the respondents identified themselves as TNC PWSs, and 3% of the respondents were not sure of their system’s classification.

included springs, rivers, creeks, ponds, lakes, or reservoirs). A distribution of small PWSs by size of population served was developed from the survey data (Figure 3). Sixty-four percent of the CWS respondents served 400 or fewer people.

Approximately two thirds of small drinking water systems employed two or fewer people. Nearly half of the small PWSs did not have any full-time employees (47%); 13% had one full-time person. Only 6% of PWSs had two full-time employees, and the

systems were metered, 40% did not meter their customers, and 2% did not know whether their customers were metered. The majority (65%) of the CWSs were metered, about half (52%) of the NTNC systems were metered, and only 38% of the TNC systems were metered. Differences are apparent when the systems serving 25–100 people are compared with the systems serving 101–1,000 people. Nearly two thirds of the smaller systems did not meter their customers, whereas 62% of the larger



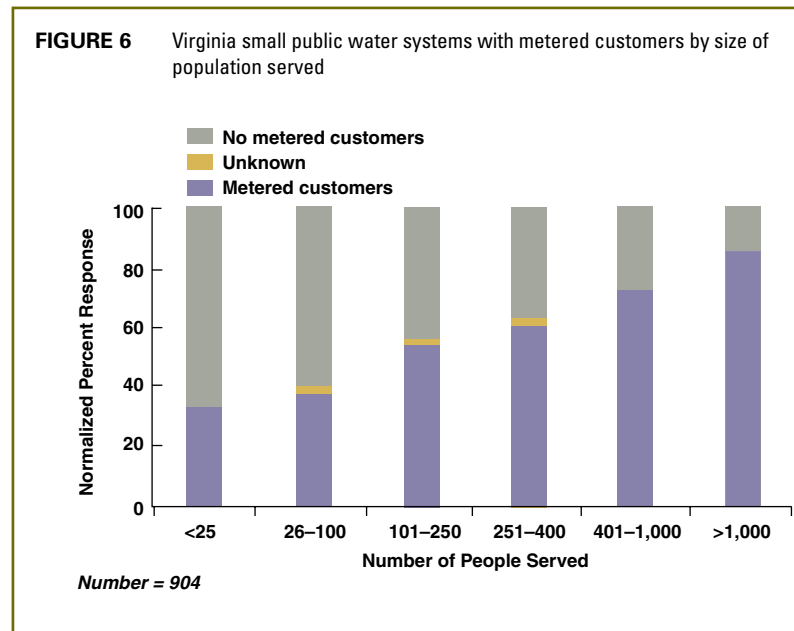
systems metered their customers. Figure 6 shows the distribution of water systems with metered customers according to the number of people served.

Many of the survey respondents were concerned about the costs of operating their water system and the potential increased cost to meet the new certification rules (see the sidebar on page 54).

**Training.** Small systems in Virginia currently receive technical assistance from a wide variety of sources (Figure 7). Nearly two thirds of the respondents contact VDH when they have a problem. Other sources of information included plumbers, other operators, well drillers, consultants, the Virginia Rural Water Association, and AWWA. Systems serving 25–100 people were more likely to contact another operator first, then VDH, then a plumber, and then a well driller.

Forty-two percent of respondents preferred that any type of training occur during the winter. A little more than 20% of survey respondents preferred that training occur during the spring, and less than 20% of the respondents preferred that training occur during summer or fall. Almost three fourths of the respondents (72%) preferred a one-day training session. Only 10% of the respondents preferred that a training session last for at least a week or for several evenings throughout a week or weekend. Some of the survey respondents' opinions on training are reported in Table 3.

Only 28% of small system owner/operators preferred to receive training through the Internet. However, more than two thirds of respondents (68%), regardless of system size or system category, did have access to the Internet at work, at home, at both



work and home, or at another location. This would seem to indicate that the Internet could serve as a valuable resource for offering courses, accessing the locations and times of licensing exams, taking practice exams, and learning relevant information about upcoming training sessions.

## DISCUSSION

### Implementing licensure in Virginia.

Under current Virginia law, VDH regulates drinking water facilities, and VBWWO, in conjunction with DPOR, licenses and regulates the operators of those PWSs. VBWWO has the power to fine an operator and suspend or revoke a license when appropriate.

Many survey respondents said they are most familiar with VDH. More than half of the survey respondents selected VDH as the organization that they would prefer for overseeing a certification program, and close to three fourths of the respondents contacted VDH first when seeking technical assistance. Clearly,

VDH was perceived as a resource on which small PWSs could rely in providing safe drinking water to their communities.

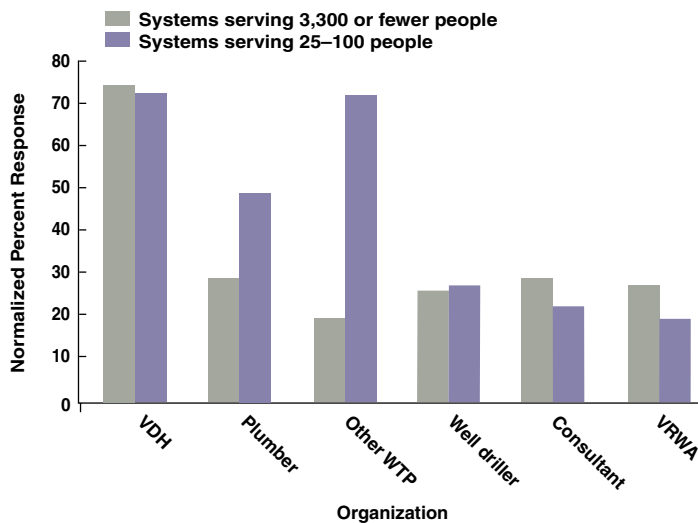
In December 2000, Virginia approved a class VI designation for water facilities and water system operators. The regulations were published in the *Virginia Register* in January 2001 and became effective in February 2001. Specific requirements for licenses are published by DPOR at [www.state.va.us/dpor/indexie.html](http://www.state.va.us/dpor/indexie.html) (DPOR, 2001).

VDH is currently reviewing about 1,200 nonclassified small systems to determine which water systems will be designated as class VI; this category will include facilities serving fewer than 400 people that deliver untreated high-quality groundwater or facilities designated as class VI by VDH. The requirements for licensing as a Virginia class VI water system operator are as follows:

- pass a board-approved examination, which is given three times per year, and



**FIGURE 7** Virginia small public water systems' use of technical assistance providers by size of population served



VDH—Virginia Department of Health, WTP—water treatment plant, VRWA—Virginia Rural Water Association  
Number = 987

- have a high school diploma or GED and at least six months of experience as an operator-in-training or have no high school diploma and at least one year of experience as an operator-in-training.

In Virginia, all water system licenses are issued for two years at an initial fee of \$85; a renewal is \$45. According to the survey, more than two thirds of the respondents preferred fees of \$50 or less. Beginning in 2003, all Virginia class VI operators will be required to have at least 4 hours of continuing professional educational credits per two-year renewal period.

From the poll of 15 states referenced earlier in this article, it was found that the majority of the states administer paper exams for PWS operator applicants. Depending on the state, the certification/licensure exams are offered 2–21 times per year at 1–20 locations.

Data gathered from the 15 states also indicated that states have either one- or two-year certification/licensing cycles and that the mean cost of initial small systems certification was \$36 (with a range of \$0 to \$200). Many states require operators to renew their certifications; on-the-job experience and passing an exam were frequently required to obtain or renew a certification/license. The mean renewal cost for the 15 states was \$22 (with a range of \$0 to \$75).

A little more than half of the survey respondents believed that their system would certify existing personnel in order to meet the new regulations. This presumption seems reasonable because more than 80% of the respondents had worked four or more years at their current systems and about half of the respondents were licensed. Certification/licensure could give operators the ability to render their services to other CWSs

and NTNC PWSs, which could increase operator self-esteem (Kerri, 1998). At a regional meeting of the Virginia Section of AWWA (2000), experienced, licensed operators expressed interest in becoming circuit riders, which would allow them to function as the licensed operator for several small systems. This is considered one possible way for small systems to meet the licensed operator requirement, although appropriate agencies in Virginia will have to clearly define the limits for the operator in responsible charge.

**Small water system diversity.** Small water systems are typically defined as systems serving fewer than 3,300 people. However, this category encompasses a variety of water systems from day care centers with one well to small housing developments. CWSs, NTNC PWSs, and TNC PWSs are all part of the small system classification.

When the survey results were further analyzed by number of people served by a system, significant differences were found between systems serving 25–100 people, 101–1,000 people, and more than 1,000 people. For example, only 23% of the employees at systems serving 25–100 people possessed a license to operate a water system. However, 57% of the employees at systems serving 101–1,000 people and 87% of the employees at systems serving more than 1,000 people did have a license. Approximately 70% of the systems serving 25–100 people did not have a full-time employee, and 44% of that group did not have any employees. Sixty-six percent of the systems serving 25–100 people were CWSs, 25% were NTNC systems, and 3% were TNC systems.

Differences can also be found between the system size and the pres-

ence of an annual O&M budget as well as the metering of customers. The majority (62%) of systems serving 25–100 people did not meter their customers, which was in contrast to an unmetered customers figure of only 38% for systems serving 101–1,000 people and one of 6% for systems serving more than 1,000 people. This reflected the national trend. A survey, National Characteristics of Drinking Water Systems Serving Under 10,000, found that very small systems tended to be unmetered—with only 37% of all connections of systems serving 25–100 persons being metered (USEPA, 1999a). Only 38% of the systems serving 25–100 people had an O&M budget, whereas 53% of the systems serving 101–1,000 people and 80% of the systems serving more than 1,000 people had an O&M budget.

One of the biggest challenges facing most state and federal agencies is certifying operators of very small systems (determined by many states to be those systems serving fewer than 100 people) because the classification includes both NTNC systems and CWSs such as mobile home parks (USEPA, 1999a). Previously, only 19 states required a certified operator at these very small systems, but since February 2001 the remaining states have also been required to establish such a program (DeNileon, 2000). If the commonwealth of Virginia is to successfully implement an operator certification/licensure program and provide the appropriate training for this unique category, it is crucial that the diverse nature of small systems be recognized.

**Financial status of Virginia's small PWSs.** Nationwide, operator certification will be a challenge for many small systems because they often lack sufficient resources and expertise to

**TABLE 3** Distribution of preferred training activities chosen by respondent\*

Preferred Training	Chosen %
Textbook	51
Videotape	58
Internet	28
Distance to workshop less than 200 mi (322 km)	6
Distance to workshop less than 100 mi (161 km)	29
Distance to workshop less than 50 mi (80 km)	51

\*Multiple responses chosen

comply with drinking water regulations (NRC, 1997). Most small PWSs in Virginia have not set aside funds to cover operator certification and training expenses. Many PWS owner/operators who responded to the survey commented on a lack of labor, funds, time, and/or operators regarding their efforts in meeting the upcoming operator certification requirements. Small drinking water systems usually have a small customer base and thus do not generate a large amount of money. This small customer base results in higher unit prices for goods and services, and these increased costs have a greater impact on water rates (Haught et al, 2000). Nationally, the median total water revenue per connection for CWSs serving 25–100 people is zero, which indicates that at least half of the smallest systems do not charge for water through rates or fees (USEPA, 1999a). Results from the Virginia survey mirrored this trend—only 38% of the smallest systems had metered customers.

Two thirds of all small drinking water systems in Virginia stated that if a certified/licensed operator was required, they could not afford any increase in operator salary. One third of the small PWSs did not pay their operators, possibly because:

- many PWSs do not have an annual O&M budget (45%), and
- PWSs lack the capital needed to upgrade a facility and the revenue needed for day-to-day O&M (Williams & Walker, 2000).

If PWSs do not have an annual O&M budget, they make themselves unavailable for loans and grants because loans and grants are usually not available to systems without sufficient operating budgets and/or sufficient water rates (NRC, 1997). If a small PWS was able to adopt an annual O&M budget, it could be more competitive for grants and loans, it might find it easier to certify/license/hire PWS operators, and it could provide money for maintenance.

**Training.** Ninety percent of the survey respondents believed a PWS owner should pay for training sessions, and 20% believed that the cost per training session should be \$50 or less. Training by videotape, textbook, or a combination of the two were the preferred training methods selected by small PWS owner/operators who responded to the survey. USEPA's final operator certification guidelines (USEPA, 1999b) require all PWS operators to take training courses before renewing their certification; however, many operators

will need training in order to be certified or licensed the first time.

According to survey respondents, an ideal training session would be offered as a one-day training session in the winter. Virginia currently has training programs for operators that are offered throughout the state for all PWSs. In the future, some of these programs will incorporate more training for small system operators. Existing Virginia training programs include a one-week operator short school at Virginia Polytechnic Institute and State University at Blacksburg (Virginia Tech), correspondence courses, apprenticeships, college and

university courses, private sector training, distance learning short courses, and video conferencing. At present, a cooperative program between Virginia Tech and VDH uses distance learning to provide monthly 3-hour lectures on water-related topics in the areas of treatment, operations, management, and regulations. These lectures are distributed by a two-way audio/video system to 10 statewide locations—usually community colleges. After the broadcast, the videotapes are available for loan from the VDH central office or six field offices. The map in Figure 1 was used to determine the areas of Virginia that have the highest density of small systems and would thus benefit the most from regional training programs.

Training materials used with existing programs include videotapes, textbooks, slides/overheads, materials presented on the Internet, CD-ROMs, and television. However, the remote locations of some water systems and the part-time or volunteer status of most small system operators can work to discourage these operators from taking advantage of many training resources. In addition, most current training programs are designed for operators of medium and large water treatment systems and therefore fail to provide small system operators with the combination of broad general knowledge and hands-on practical training that they need (NRC, 1997).

### CONCLUSIONS

Through this project, a survey was conducted of the owner/operators at

respondents were unaware that new operator certification/licensure regulations were imminent, and they often did not even consider themselves as owning/operating a small water system. As one survey respondent noted, “We are a church that has a day care and a preschool. Wish we did not have to be classified as a waterworks.” Significant differences were also found when the survey results were analyzed by the number of people served by a water system. Systems serving 25–100 people tended to not have a licensed operator, not have a full-time employee, not meter their customers, and not have an O&M

**Two thirds of all small drinking water systems in Virginia stated that if a certified/licensed operator was required, they could not afford any increase in operator salary.**

2,011 CWSs and NTNC and TNC PWSs that serve 3,300 or fewer people. On the basis of the 987 useful responses, the owner/operators were determined to be an educated group in which 95% possessed a high school education and more than half had some college education. Forty-six percent of the respondents possessed a license to operate a water system, which means that only about half of those surveyed will be affected by the new regulations for certification.

Survey results showed that small systems in Virginia encompass a diverse group of water systems and owner/operators. Some respondents seemed to be aware of the proposed regulations, and they stated their concerns about increased regulation in the water industry. Many respondents wrote statements similar to the following: “Additional government regulations are constantly being added to water systems without additional compensation or help in dealing with customers.” Numerous other survey

budget. As system size increased, the likelihood of each characteristic being present also increased. Each category of system size also had its own unique set of characteristics.

To certify all operators of CWSs and NTNC PWSs under the new regulations, Virginia built on its framework of cooperation between VDH and VBWWO/DPOR. A new class VI license was implemented for PWSs that serve fewer than 400 people and use high-quality groundwater that does not require treatment. VDH, in conjunction with other organizations, provides technical assistance and training to any Virginia PWSs, including small systems. Three fourths of the respondents indicated that they call VDH for assistance first. In order to train those small system operators who will need to be licensed, VDH and others will need to target their training efforts to the specific needs and backgrounds of those who are seeking a class VI license. The training materials will need to reflect the

duties/requirements of this group. The owner/operators of small systems who responded to the survey indicated that they preferred one-day training events in the winter held at locations within 50 mi (80 km) of their facilities. They indicated that the most desirable cost range was less than \$50 per event and textbooks or videotapes were the preferred types of training materials. Electronic materials, i.e., training via the Internet, might be used to reach these small systems. Most have access to the Internet, but few are familiar with web-based training.

By licensing CWS and NTNC PWS operators, states will give recognition to these people. Because Virginia's DPOR manages licensing of operators, licensure rather than certification will be implemented in Virginia. Licensure will substantiate that these operators have the knowledge and ability to operate CWSs and NTNC PWSs in Virginia.

### ACKNOWLEDGMENT

This study was funded by a grant from the Virginia Department of

Health (VDH). The authors thank Bennett Ragnauth, Mark Anderson, and Tom Gray of VDH for their support throughout the project. A special thanks is extended to the small water system respondents for making this survey a success. The authors also thank Jerry Higgins of Blacksburg–Christiansburg–VPI Water Treatment Plant and Andy Crocker of Virginia Rural Water Association for their helpful suggestions. Contributions by the Department of Professional Occupational Regulation, Virginia Tech Center for Survey Research, Southeast Rural Community Assistance Project Inc., Virginia Water Resources Research Center, and AWWA were also very significant and greatly appreciated.

### ABOUT THE AUTHORS:

*Carrie A. Adam was a student at Virginia Polytechnic Institute and State University (Virginia Tech) at Blacksburg, Va., completing her master's degree in environmental engineering, when this research was performed. Adam was a Charles E. Via scholar at Virginia Tech, and*

*she received her bachelor's degree in civil environmental engineering from West Virginia University in Morgantown. She is a member of AWWA and the Society of Women*



*Engineers and is currently an environmental engineer at CH2M HILL in Newport News, Va.*

*Andrea M. Dietrich\* is an associate professor at Virginia Tech, 413 Durham Hall, Dept. of Civil and Environmental Engineering, Blacksburg, Va. 24061-0246, <andread@vt.edu>. Daniel L. Gallagher is an associate professor, Andrew J. Whelton is a graduate student, and Gregory D. Boardman and Marc A. Edwards are professors—all at Virginia Tech.*

\*To whom correspondence should be addressed

If you have a comment about this article, please contact us at <journal@awwa.org>.

### REFERENCES

- CV (Code of Virginia), 1995. Waterworks Regulations: Article 2, Operation of Waterworks, 12 VAC 5-590-450 to VAC 5-590-570.
- DeNileon, G.P., 2000. Certification Ensures System Integrity, Process Control. *OPFLOW*, 26:03:07. AWWA, Denver.
- Dillman, D.A., 1978. *Mail and Telephone Survey: The Design Method*. John Wiley & Sons Inc., New York.
- DPOR (Department of Professional and Occupational Regulation), 2001. Regulations for Waterworks and WasteWaterworks Operators; <www.state.va.us.dpor/indexie.html> (updated Feb. 15, 2001; accessed May 23, 2001).
- Haight, R.; Meckes, M.; & Goodrich, J., 2000. An Overview of an EPA Study in the Remote Monitoring and Control of a Small Drinking Water Treatment System in Rural West Virginia. Proc. 2000 Small Drinking Water and Wastewater Systems Intl. Sym. and Technol. Exposition, USEPA, Charleston, W.Va. (Jan.)
- Kerri, K.D., 1998. Operator Training: A Step-by-step Approach. *Jour. AWWA*, 90:10:82.
- NRC (National Research Council), 1997 (1st ed.). *Safe Water From Every Tap: Improving Water Service to Small Communities*. National Academy Press, Washington.
- USEPA, 1999a. National Characteristics of Drinking Water Systems Serving Populations Under 10,000. EPA 816-R-99-010. (July).
- USEPA, 1999b. Final Guidelines for the Certification and Recertification of the Operators of Community and Nontransient–Noncommunity Public Water Systems. *Fed. Reg.*, 64:24:6230 (Feb. 5).
- Virginia Section of AWWA, 2000. Regional Meeting in Roanoke, Va. (Apr.).
- Williams, A. & Walker, J., 2000. Evaluating, Financing, and Rate-setting Options for Small Water Systems. Proc. 2000 Small Drinking Water and Wastewater Systems Intl. Sym. and Technol. Exposition, Virginia Water Resources Res. Ctr., Blacksburg, Va. (Jan.)