



**Report to EPA**

**MARYLAND OPERATOR  
CERTIFICATION REPORT  
FOR CALENDAR YEAR 2015**

**June 2016**



**Department of the Environment  
Water Supply Program**

*Larry Hogan, Governor  
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## **EXECUTIVE SUMMARY**

The Safe Drinking Water Act Reauthorization of 1996 requires States to develop, implement and enforce operator certification regulations in cooperation with the Drinking Water State Revolving Funds. This annual program report for the Maryland Operator Certification Program is submitted pursuant to federal guidelines published in the February 5, 1999 Federal Register and in accordance with the guidance provided by the Environmental Protection Agency (EPA) headquarters. Maryland's annual operator certification report provides an update on the implementation of the Operator Certification Program for the period from January 1, 2015 through December 31, 2015.

Maryland currently regulates 1007 community and non-transient non-community water systems. In 2015, 84% of all water systems were in compliance with the operator certification regulations; this is a marked increase compared to the 2001 baseline of 59% of water systems.

Community water systems had an operator certification compliance rate of 91%. Of the 469 community water systems, 427 employed certified operators. In Maryland there are 70 community water systems that serve more than 3,300 people; all but one employed certified operators. The operator certification compliance rate for non-transient non-community water systems was 78%. Certified operators were employed at 418 of Maryland's 538 non-transient non-community water systems. The Maryland Department of the Environment is committed to ensuring that the individuals who operate Maryland's water systems are qualified, well trained, and in compliance with certification requirements. To accomplish this commitment, MDE's efforts are supported by State general funds.

# MARYLAND OPERATOR CERTIFICATION

## BACKGROUND

Under the Safe Drinking Water Act (SDWA) Amendments of 1996, the State primacy agency is required to implement an Operator Certification Program, and to provide annual reports in order to receive the full federal allocation under the Drinking Water State Revolving Fund (DWSRF). The Environmental Protection Agency may withhold 20% of the State's funding if the Operator Certification Program requirements are not met.

The Maryland Department of the Environment (MDE) is the designated State primacy agency. The Board of Waterworks and Waste Systems Operators (Board) is housed in the Water Supply Program (WSP), a unit within the Water Management Administration at MDE. The WSP oversees all aspects of the SDWA requirements. The WSP inspection staff is responsible for verifying whether a system is operated by a State-certified operator when they conduct the sanitary survey of the public water system.

The Board is responsible for the certification in five categories: water, wastewater, industrial, collection, and distribution systems. Within the five categories are 24 classes of facilities, each with a unique certificate defined by treatment technologies. In total, the Board administers the program for more than 5,300 individuals that collectively hold more than 8,400 certificates. While the Board oversees the requirements for the certification of operators, the WSP is responsible for the enforcement of the requirements in accordance with the SDWA. Currently there are 3,107 active certificates for water treatment and/ or distribution.

In response to federal guidelines, the Code of Maryland Regulations for the Operator Certification Program was revised in January, 2001. The Environmental Protection Agency (EPA) approved Maryland's Operator Certification Program on July 13, 2001.

The regulations for the Board of Waterworks and Waste Systems Operators were revised in 2014. Changes included an increase in fees and clarifications to both certification and examination requirements.

## CLASSIFICATION OF WATER SYSTEMS & OPERATOR QUALIFICATIONS

Maryland classifies water facilities according to treatment technology. This ensures that operators are qualified for the process they are certified to operate.

The operator and superintendent must have certification that matches the water system's classification. Certain classifications of certificates also authorize the holder to operate other classifications of facilities. Table 1 presents the classification of water systems and outlines the typical treatment processes found in each classification.

An individual who is employed at a water system working under the direction of a certified operator or superintendent but has not met the experience requirements for the classification or has not passed an examination for the classification is considered an Operator-in-Training. The Operator-in-Training holds a temporary certificate that must match the water system's classification.

**Table 1. CLASSIFICATION OF WATER TREATMENT SYSTEMS**

<b>Plant Classification</b>	<b>Type of Treatment Systems</b>	<b>Typical Processes in Plant</b>
1	Disinfection by Chemical Treatment	Chlorination
2	Other Chemical Treatment	Chlorination, pH control, and fluoridation
3	Simple Iron Removal	Chlorination, pH control, fluoridation, and iron removal utilizing ion exchange or contact oxidation/ filtration
4	Complete Treatment	Chlorination, pH control, fluoridation, aeration, and conventional treatment (coagulation, sedimentation, filtration) for complex iron removal or surface water treatment
5	Site Specific	Alternative technologies not covered by other classifications: reverse osmosis, diatomaceous earth, arsenic removal, filtration for groundwater under direct influence of surface water, and chlorine dioxide
D	Distribution	Water distribution systems
G	No Chemical Treatment	Wells and storage tanks with no treatment or passive treatment: UV disinfection, ion exchange for softening, pH neutralization

## MARYLAND COMPLIANCE

Water system compliance with the Operator Certification Program was, until recently, tracked through the Water Supply Program’s Public Drinking Water Information System (PDWIS) database. The Water Supply Program began transitioning into EPA’s Safe Drinking Water Information System (SDWIS) in the fall of 2015. Currently, the SDWIS database cannot receive updates from the Board’s administrative database. Compliance data for this report was generated using available information in the “frozen” PDWIS database as well as updates of operator coverage through a number of sources including sanitary surveys, monthly operating reports, and electronic communications.

An overview of the progress made by public water systems in Maryland since 2001, when the federal program was established, is shown in Table 2. The number of systems that employ certified operators has increased by 218 since 2001. This represents a significant increase from 59% to 84% of the active community and non-transient non-community water systems. The number of active water systems with certified operators increased slightly over the past year; in 2014, 83% of water systems had certified operators.

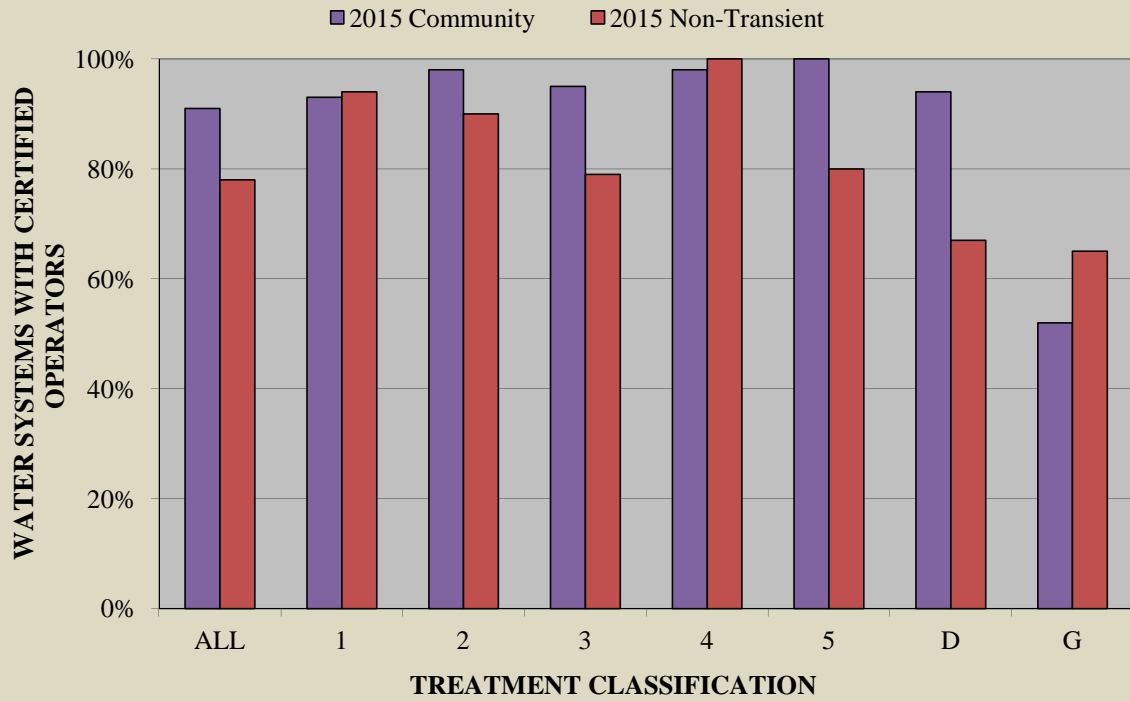
**Table 2. OPERATOR CERTIFICATION COMPLIANCE OVERVIEW**

Water System Type	Number of Systems		Number of Systems with Operators		Percentage of Systems with Operators	
	2015	Baseline 2001	2015	Baseline 2001	2015	Baseline 2001
<b>Community</b>	469	503	427	402	91%	80%
<b>Non-transient Non-community</b>	538	568	418	225	78%	40%
<b>Total</b>	1007	1071	845	627	84%	59%

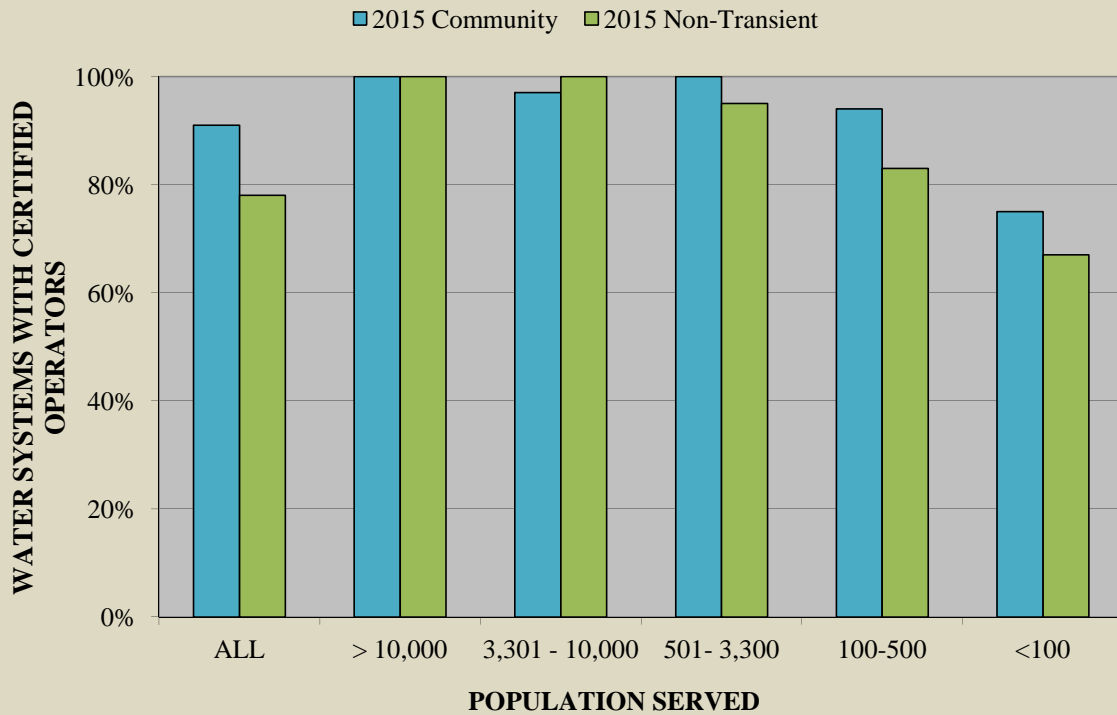
The percentages of Community and Non-Transient Non-Community water systems in compliance with operator certification in 2015, based upon water treatment classification, are shown in Figure 1. The Class G water systems, which are very small and have no treatment or passive treatment, continue to have the lowest number of certified operators. The overall compliance rate for all community water systems with treatment has increased to 95%. Compliance data for water treatment classifications is shown in Appendix A.

The percentages of Community and Non-Transient Non-Community water systems in compliance with operator certification in 2015, based upon population served, are shown in Figure 2. The overall compliance rate among community water systems serving 100 or more persons has increased to 97%. Compliance data for water system populations is shown in Appendix B.

**FIGURE 1. OPERATOR CERTIFICATION COMPLIANCE BY CLASSIFICATION**



**FIGURE 2. OPERATOR CERTIFICATION COMPLIANCE BY POPULATION**





## TEMPORARY, CERTIFIED, & GRAND-PARENTED LICENSES

Individual operator certification status is tracked through the Board of Waterworks and Waste Systems Operators database. The Board maintains the administrative records for all fully-certified water, wastewater, and industrial operators and superintendents in Maryland, along with records of operators with temporary certification who are in training for operator certification. In addition, grand-parented certificates were granted to persons who acted as operators for water treatment facilities that were not required to employ operators prior to February 2001. The grand-parented certificates are site-specific, and were issued to qualified recipients through February 5, 2003; there are currently 64 active grand-parented certificates.

Table 3 summarizes the number of active water Operator and Superintendent certificates in Maryland. (Source: Board of Waterworks and Waste Systems Operators database, April 2016). In the past year, the number of temporary operator certificates decreased slightly from 1,113 to 1,107 while the number of certified operator licenses increased substantially from 1,661 to 1,740; this increase may be due to, in part, by operators with certifications from other States seeking reciprocity for certification in Maryland.

Superintendent licenses are plant specific. Superintendents are required to have a valid operator license in the appropriate classification and have at least one years experience working at the plant for which the license is valid. The number of superintendent licenses also increased since 2014 from 254 to 260. As Table 3 indicates, superintendent licenses are not issued for class G systems.

**Table 3. ACTIVE CERTIFIED AND GRAND-PARENTED LICENSES IN 2015**

<b>CLASS OF WATER SYSTEMS</b>	<b>Temporary</b>	<b>Operator</b>	<b>Superintendent</b>
<b>G</b>	54	29	N/A
<b>1</b>	113	210	40
<b>2</b>	129	261	39
<b>3</b>	102	150	29
<b>4</b>	206	507	103
<b>5</b>	62	63	7
<b>D</b>	441	520	42
<b>Total</b>	<b>1107</b>	<b>1740</b>	<b>260</b>

## **CERTIFICATION RENEWAL**

All certificates issued by the Board are renewed on a triennial basis. Each operator must obtain a minimum number of continuing education units as a condition of renewal; certifications for more complex treatment classifications require at least half of the training credits be for treatment processes, known as the 50% Process Rule. Continuing education is a prerequisite for operator certification and license renewal.

Most operators must obtain 16 units every three years, while those operators at facilities with higher classification levels must obtain 30 hours. All superintendent certificates require an additional seven units of training every three years and must attend a “MDE sponsored” class within the first year of receiving their license. Operators for Class G systems, with no treatment or with passive treatment, must obtain 7 units during the three year period and are exempt from the 50% Process Rule.

Temporary and grand-parented certificate holders must obtain either 24 or 45 units, depending on the classification of the facility at which they work. Temporary certificate holders must take an examination during each three-year period until they pass the examination for their classification and meet training requirements prior to receiving full certification.

Code of Maryland Regulations (COMAR) 26.06.01.13 requires that the Board approve training that operators may take for certification renewal. The Training Review and Evaluation (TRE) Committee was created by the Board to receive, review, and evaluate each application for training approval. The Committee’s comments and recommendations are considered by the Board when determining if training will be approved.

### **Training Approval Process**

The approval process begins when an “Application for Training Program Approval” is submitted to the Board. This can occur before or after the training has taken place. When the Board receives the application, the training is assigned a course code, by which the course is thereafter identified. The TRE Committee evaluates the training’s content and the instructor’s credentials to determine the value and appropriateness for the continuing education of an operator. The committee also determines the certificates, classifications, and Process/ Non-Process status for which the training is appropriate. Following the TRE Committee’s recommendation and the Board’s decision, the applicant will receive a letter detailing the final outcome of the approval request.

## **ENFORCEMENT**

When an operator does not renew a certificate as required, the Board assesses a late renewal fee in addition to the standard renewal fee. If the license is expired for more than 90 days but less than 2 years, the operator must request the Board reinstate the license, submit the appropriate fee, and provide proof of training credits. In the event a license has expired more than 2 years prior, the applicant must apply for a temporary certificate and complete all requirements, including passing the exam again.

The Department’s Office of Attorney General (OAG) provides legal counsel to the Board; a representative attends Board meetings and offers interpretations on the Board’s statutes and regulations as needed. MDE’s Water Supply Program provides investigative support for matters involving enforcement action by OAG against public water system operators. There were no formal enforcement actions in 2015 by the OAG.

The Water Supply Program evaluates operator certification during the Sanitary Survey and will issue a Significant Deficiency for Operator Certification when a risk to public health is determined. A Significant Deficiency may be issued to a water system when the system does not have a licensed operator, or the operator has an expired/invalid class license. A Significant Deficiency requires the water system to set a time-line for corrective action.

## **OPERATIONAL STRUCTURE**

The Board of Waterworks and Waste Systems Operators is a part of the Maryland Department of Environment – Environmental Boards, established by the Maryland General Assembly. The Board was created to certify individuals as superintendents and operators of water, wastewater, and industrial systems. To that effect, the Board verifies continuing education requirements have been met, ensures fees are collected for certification and exam applications, establishes experience requirements for applicants who want to enter the profession, and evaluates professional experience for individuals with out-of-State licenses seeking employment at Maryland water systems. In addition, the Board has authority to take disciplinary action against a licensee who has been determined to be professionally incompetent, falsified records, failed to submit self-monitoring reports, or been negligent in operation and maintenance of the works.

### **Funding**

The administrative staff are funded under a combination of federal funds (Drinking Water State Revolving Fund set-asides), and State general funds.

### **Data Management**

In 2012, MDE-Water Supply Program began to upgrade and consolidate certain databases as part of a conversion to the Safe Drinking Water Information System for States (SDWIS-State) through a third party contract. An auxiliary database, called SDWIS Plus, has been developed to connect SDWIS-State with the Board's current database, Foxpro, to improve data management; however, SDWIS Plus is not yet functional.

### **Written Examinations**

Operator competency is evaluated using examinations based on Board-approved Need-to-Know documents. Written (paper) examinations for operator certification are offered monthly at various locations across the State. The certification program administers the multiple choice exams for the designated classification. The paper exams are forwarded to the Association of Boards of Certification (ABC) for scoring and preparation of an individualized mastery report for the examinee that identifies their performance for each topic and their overall score. An example of a paper exam mastery report is shown in Appendix C. Scores of 70% or above are passing. ABC has a contract with the State that must be renewed annually through State procurement as an outside sole source vendor.

### **Computer-Based Examinations**

In addition to paper examinations, computer-based examinations are available for all categories at select locations in the area. This project is coordinated through the Association of Boards of Certification (ABC). The ABC allows approved third-party contractors to administer the examinations. While this type of testing arrangement is used routinely in other industries, computer-based exams are gradually being accepted by the new generation operators. Some applicants prefer this arrangement because exam locations are more convenient and exam results are available prior to leaving the testing facility. As with the paper exams, computer-based examination scores equal to or exceeding 70% are passing and each examinee receives a mastery report. An example of a computer based mastery report is shown in Appendix D.

There are additional fees associated with the computer-based testing. The computer-based testing facility charges between \$44 and \$81 for an electronic exam, depending on the amount of time allotted for the examination. The testing site fee is the responsibility of the applicant, and it is not covered by MDE. Currently, there are seven locations in Maryland, Virginia, Pennsylvania, and the District of Columbia that are available for electronic testing. The Board has continued to work with stakeholders to promote electronic testing and track electronic testing results separately from paper exam results to evaluate the effectiveness of computer based examinations.

## **Examination Development**

As a fully accredited testing client, Maryland is allowed to make use of the Need-To-Know (NTK) criteria developed by ABC. The Board reviewed all categories of NTK documents for water treatment and determined that this document was acceptable for Maryland examinations. The Board also reviewed and determined ABC exams were acceptable for use for all principal Water classifications (1, 2, 3, and 4), along with distribution examinations. Class 5 exams address alternative processes used in Maryland and were developed by Board representatives. There is no exam available for the Water G classification, although specific study material has been approved.

## **STAKEHOLDER INVOLVEMENT**

### **Board of Waterworks and Waste Systems Operators**

The Board of Waterworks and Waste Systems Operators was created by the Maryland General Assembly in 1967, and consists of eleven voting members who are appointed by the Governor and the Secretary of the Department for four-year terms. Terms may be renewed. The Board members represent various interest groups including municipal government, county government, sanitary commissions, water and wastewater operators, academia, agriculture, and the public. The Board meets once per month, at various sites around the State. The meetings are open to the public. The Board encourages interested operators to attend these meetings to observe the Board's activities. Board members will meet in "closed session" to discuss disciplinary actions and other sensitive topics pertaining to specific license holders.

### **Board Meetings**

Monthly Board meetings are attended by representatives of the various water and wastewater organizations including: American Water Works Association (AWWA) Chesapeake Section, Maryland Water and Wastewater Operators Association (WWOA), Maryland Rural Water Association, and Maryland Environmental Service. The liaisons report on Board activities to their organizations and update the Board on operator concerns. These stakeholders are not voting members of the Board, but they are recognized liaisons who participate in the public meetings.

### **Board Committees**

The Training, Review, and Evaluation (TRE) Committee involves Board members and representatives from the Maryland Center for Environmental Training, Maryland Rural Water Association, AWWA, private industrial wastewater systems, and Chesapeake Water Environment Association (CWEA), and WWOA. The TRE committee meets quarterly to review all requests for training approval, establishes minimum standards for approval of operator training, and makes recommendations to the Board.

The Exam Review (ER) Committee involves Board members and liaisons, representatives from the Maryland Center for Environmental Training, and operators of water and wastewater systems. The ER committee meets as needed to evaluate current examinations and update Need-To-Know criteria in order to streamline study material and ensure the exams reflect the technology in use in Maryland. While several exams were evaluated in 2015, there were no updates made to the Need-To-Know criteria.

### **Project Earn**

EARN Maryland is a new state-funded, competitive workforce development grant program that is industry-led, regional in focus and a proven strategy for helping businesses cultivate the skilled workforce they need to compete. It is flexible and innovative, designed to ensure that Maryland employers have the talent they need to compete and grow in an ever-changing 21st century economy. Since a large portion of Maryland's workforce within the water and wastewater industries is expected to retire in the coming years, the Water and Wastewater Career Development Partnership for Central Maryland was developed in 2013 to promote Operator careers to high school students and returning veterans funded under the EARN grant. The Program includes pre-testing of individuals in math, reading, and comprehension. Remedial services are available as needed and participants

receive both field and class room training prior to their application for operator-in-training. The Partnership consists of several County utilities and private agencies within the utility and training sectors; it is funded by the State of Maryland’s EARN Grant Program, which is administered by the Maryland Department of Labor, Licensing and Regulation.

## PROGRAM REVIEW

### Internal Reviews

The Board completed a programmatic review and provided a report to the Legislature in 2011. Additional internal assessments of the Board continued in 2015 as part of the regulation review process.

### Examination Performance

In the past, the Board and an ad-hoc committee reviewed the Need-to-Know (NTK) criteria established by ABC for water. The Water NTK criteria were determined to be consistent with the Examination prescription used by the Board for the development of water examinations, and was adopted as Maryland’s NTK where appropriate. The Board currently recommends exam applicants utilize study guides provided by ABC and California State University, Sacramento, for exam preparation.

Table 4 summarizes data for examinations based on the certification classification; since the Class G certification has no applicable examination, it is not included. In total, 358 examinations were attempted in 2015; nine percent of these exams were computer based.

There were 325 attempted written examinations for water treatment and distribution; 205 certificated holders passed (63% passing rate). There were 33 attempted computer-based examinations for water treatment and distribution; 11 certificate holders passed (33% passing rate). The Board tracks written and computer-based results separately to evaluate scores and determine possible factors for scoring discrepancies.

**Table 4. 2015 EXAMINATION PERFORMANCE**

WATER SYSTEM CLASSIFICATION	PAPER EXAMINATIONS			ON-LINE EXAMINATIONS		
	Exams Attempted	Exams Passed	Percentage Passed	Exams Attempted	Exams Passed	Percentage Passed
<b>1</b>	39	29	59%	6	4	67%
<b>2</b>	17	8	47%	6	1	17%
<b>3</b>	30	5	17%	2	1	50%
<b>4</b>	53	19	36%	13	2	15%
<b>5</b>	8	8	100%	0		
<b>D</b>	178	136	76%	6	3	50%
<b>Total</b>	<b>325</b>	<b>205</b>	<b>63%</b>	<b>33</b>	<b>11</b>	<b>33%</b>

Figure 3 shows the number of exams attempted for the last three years and compares paper and computer-based exam attempts in 2015. The graph indicates a general increase in the number of exam attempts and the variability observed between exam classifications. While 257 exams were taken in 2013 and 333 exams were taken in 2014, a total of 358 exams were attempted in 2015.

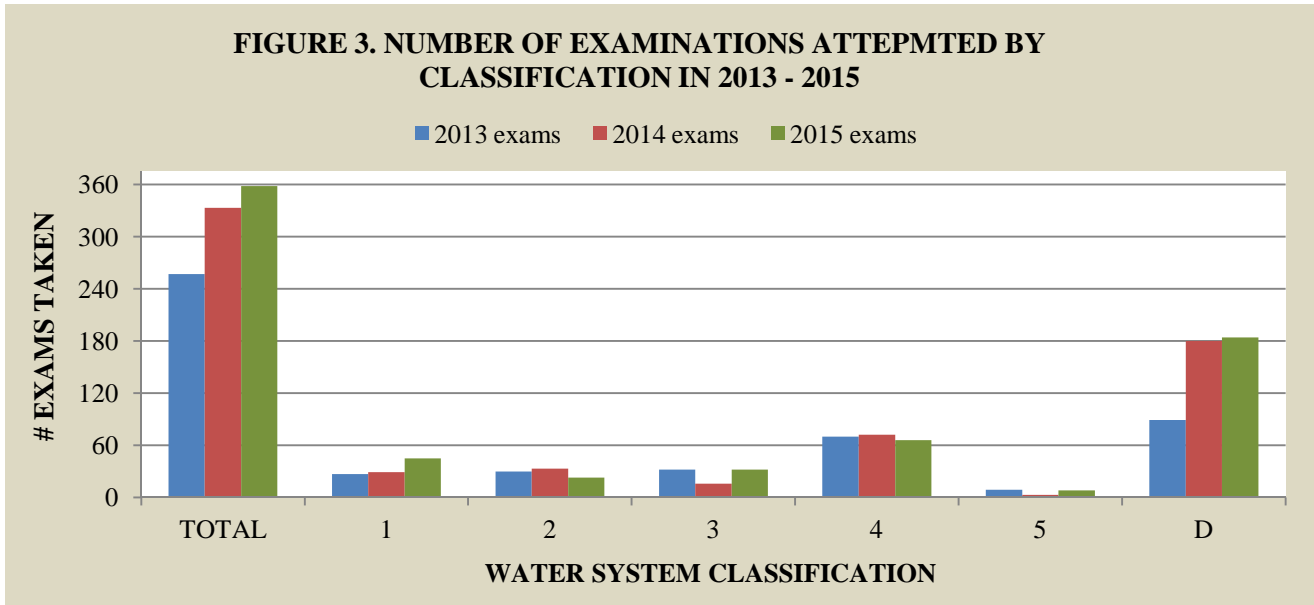


Figure 4 compares the percentage of paper and computer based exams attempted in 2015. While more paper exams have attempted, there is an increasing trend in computer based exams with younger operators. The Board will continue to track the number of paper and computer based exams attempted and resulting scores.

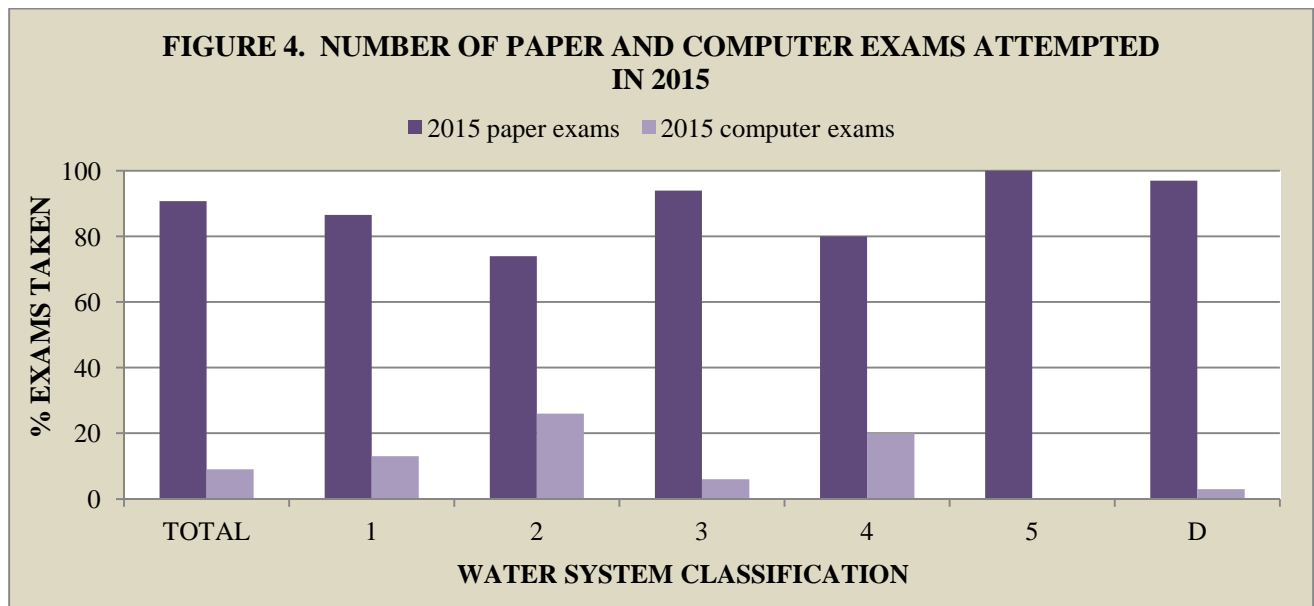
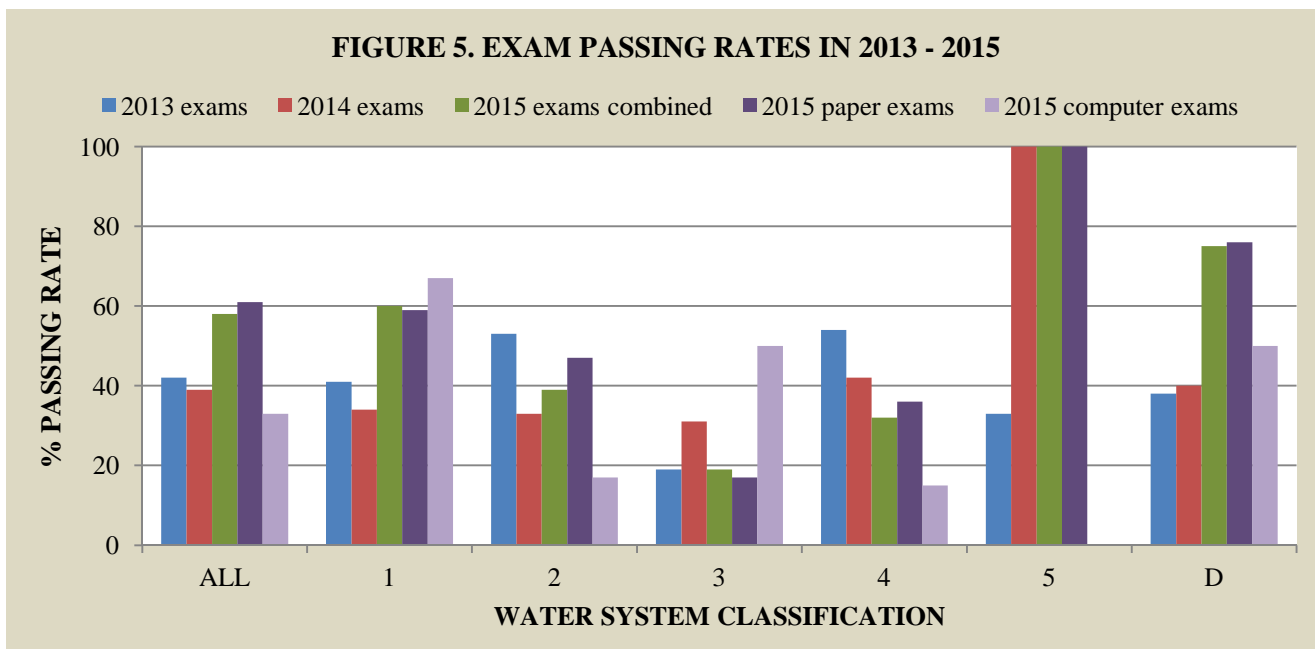


Figure 5 shows exam passing rates for the previous two years compared to paper and computer-based exams attempted in 2015. While total passing rates for all exams in 2013 and 2014 was approximately 40%, the total passing rate for all exams in 2015 increased to 58%. Figure 4 also shows a notable variability in passing rates for the different classifications.

**FIGURE 5. EXAM PASSING RATES IN 2013 - 2015**



The Water Supply Program has improved methods of tracking exam attempts, scores, and examinees in order to investigate the limited improvement in the pass/ fail ratio over the last decade. Preliminary information suggests two possible issues: (1) low passing rates may be attributed to individuals repeatedly failing the same exams, and (2) current State regulations that allow individual holding any certificate may take any exam with minimal or no experience.

### Examination Update

Class 5 examinations are available for alternative technology processes, including Arsenic Removal, Reverse Osmosis, Diatomaceous Earth filtration and Filtration for Groundwater Under Direct Influence of Surface Water. An examination for chlorine dioxide is pending finalization. The Exam Review Committee evaluated the Water 1, 2, and 3 exams for applicable content and changed some questions on each exam to improve consistency of the material with processes used in Maryland; all changes were made to ensure the Maryland Prescription remained unaltered.

### Training

The Water and Wastewater Operators Association sponsor a week-long training session every June, called the Annual Short Course. Certification exams are given at the end of the week, and the Board has observed increased passing rates for Short Course attendees. The Board will continue to work with MDE and water organizations on possible training opportunities for operators.

MDE negotiated multiple contracts with the Maryland Center for Environmental Training, and Maryland Rural Water Association to provide a wide range of training classes for eligible operators free of charge. MDE's contract with each of the organizations targeted a different training need based in regional location. Collectively, three training partners cover a comprehensive curriculum of all of the training needs.

The Board has approved numerous on-line classes available on the CEU Plan's website. CEU Plan is the largest on-line training provider for the water and wastewater industry. MDE promotes on-line learning for exam preparation and obtaining continuing education credits.

**Fees**

The 2009 Legislative Audit suggested that the Board’s fees were not sufficient to support all of the current Board expenses. In 2012, the Department evaluated the Board’s expenses and determined that additional resources were needed to support the operator certification program. A fee increase of \$25 per certificate was incorporated into the regulation revisions effective October 1, 2014. Fees for examinations and reciprocity were also increased. Current fees are established as follows:

Initial Certification	\$100
Examination Fee (paper)	\$100
Renewal Fee (3 year period)	\$100
Fee to Retake Exam (paper)	\$100
Late Renewal Fee	\$100
Reinstatement Fee	\$150
Reciprocity	\$200

**Regulations**

There were no changes to State regulations in 2015; the regulations were last revised and finalized in 2014:

1. Increased fees for operator certification and examinations;
2. Removed details regarding Limited Certificate which no longer exists;
3. Updated definitions for “Operator-in-Training” to improve consistency in terminology between States;
4. Codified the Training, Review, and Evaluation Committee (TRE).

**ADDITIONAL ACTIVITIES**

The following summarizes the activities that were initiated by the Water Supply Program to educate and target public water system operators:

1. The Water Supply Program staff and Maryland Rural Water Association (MRWA) circuit riders worked directly with small water systems during 2015. This activity is coordinated by the Water Supply Program under a contract with MRWA.
2. The Water Supply Program and Board staff provides training for operators at various annual conferences such as American Waterworks Association (AWWA), Water and Wastewater Operators Association (WWOA), and MRWA.
3. The Water Supply Program (WSP) participates in EPA’s Area Wide Optimization Program (AWOP). AWOP was developed to increase awareness of the need for continuous optimization of surface water plants so that the risk of waterborne disease outbreaks will be reduced. AWOP has developed tools and methods to promote plant optimization. The WSP participates in on-site, multi-state activities to assess and ensure optimized plant performance.
4. The Water Supply Program continued annual notification of the monitoring schedules, water quality data, and general updates to all community and non-transient non-community water systems in 2015.



**APPENDIX A: COMPLIANCE DATA BY TREATMENT CLASSIFICATION**

<b><i>2015 Operator Certification Compliance by Treatment Classification (Data for Figure 1)</i></b>								
<b><i># Systems</i></b>	<b><i>Class 1</i></b>	<b><i>Class 2</i></b>	<b><i>Class 3</i></b>	<b><i>Class 4</i></b>	<b><i>Class 5</i></b>	<b><i>Class D</i></b>	<b><i>Class G</i></b>	<b><i>all classes</i></b>
<b><i># CWS</i></b>	178	88	65	63	12	17	46	469
<b><i># CWS No Operator</i></b>	13	2	3	1	0	1	22	42
<b><i># CWS with Operator</i></b>	165	86	62	62	12	16	24	427
<b><i>% CWS with Operator</i></b>	93%	98%	95%	98%	100%	94%	52%	91%

<b><i>2015 Operator Certification Compliance by Treatment Classification (Data for Figure 1)</i></b>								
<b><i># Systems</i></b>	<b><i>Class 1</i></b>	<b><i>Class 2</i></b>	<b><i>Class 3</i></b>	<b><i>Class 4</i></b>	<b><i>Class 5</i></b>	<b><i>Class D</i></b>	<b><i>Class G</i></b>	<b><i>all classes</i></b>
<b><i># NTNC</i></b>	78	127	82	2	15	3	231	538
<b><i># NTNC No Operator</i></b>	5	13	17	0	3	1	81	120
<b><i># NTNC with Operator</i></b>	73	114	65	2	12	2	150	418
<b><i>% NTNC with Operator</i></b>	94%	90%	79%	100%	80%	67%	65%	78%

<b><i>2015 Operator Certification Compliance by Treatment Classification (Data for Figure 1)</i></b>								
<b><i># Systems</i></b>	<b><i>Class 1</i></b>	<b><i>Class 2</i></b>	<b><i>Class 3</i></b>	<b><i>Class 4</i></b>	<b><i>Class 5</i></b>	<b><i>Class D</i></b>	<b><i>Class G</i></b>	<b><i>all classes</i></b>
<b><i># Total</i></b>	256	215	147	65	27	20	277	1007
<b><i># Total No Operator</i></b>	18	15	20	1	3	2	103	162
<b><i># Total with Operator</i></b>	238	200	127	64	24	18	174	845
<b><i>% Total with Operator</i></b>	93%	93%	86%	98%	89%	90%	63%	84%

**APPENDIX B: COMPLIANCE DATA BY SYSTEM POPULATION**

<b><i>2015 Operator Certification Compliance by Population (Data for Figure 2)</i></b>						
<b># Systems</b>	<b><i>less than 100 people</i></b>	<b><i>100-500 people</i></b>	<b><i>501-3,300 people</i></b>	<b><i>3,301-10K people</i></b>	<b><i>more than 10K people</i></b>	<b><i>all populations</i></b>
<b># CWS</b>	119	174	107	38	31	469
<b># CWS No Operator</b>	30	11	0	1	0	42
<b># CWS with Operator</b>	89	163	107	37	31	427
<b>% CWS with Operator</b>	75%	94%	100%	97%	100%	91%

<b><i>2015 Operator Certification Compliance by Population (Data for Figure 2)</i></b>						
<b># Systems</b>	<b><i>less than 100 people</i></b>	<b><i>100-500 people</i></b>	<b><i>501-3,300 people</i></b>	<b><i>3,301-10K people</i></b>	<b><i>more than 10K people</i></b>	<b><i>all populations</i></b>
<b># NTNC</b>	244	207	86	1	0	538
<b># NTNC No Operator</b>	80	36	4	0	0	120
<b># NTNC with Operator</b>	164	171	82	1	0	418
<b>% NTNC with Operator</b>	67%	83%	95%	100%	100%	78%

<b><i>2015 Operator Certification Compliance by Population (Data for Figure 2)</i></b>						
<b># Systems</b>	<b><i>less than 100 people</i></b>	<b><i>100-500 people</i></b>	<b><i>501-3,300 people</i></b>	<b><i>3,301-10K people</i></b>	<b><i>more than 10K people</i></b>	<b><i>all populations</i></b>
<b># Total</b>	363	381	193	39	31	1007
<b># Total No Operator</b>	110	47	4	1	0	162
<b># Total with Operator</b>	253	334	189	38	31	845
<b>% NTNC with Operator</b>	70%	88%	98%	97%	100%	84%

# APPENDIX C: MASTERY REPORT FOR PAPER EXAM

## INDIVIDUAL MASTERY REPORT

Test: Maryland Water Treatment Class 4 Exam (WMD2041P)  
 Scoring Date: 6/1/2015  
 Score: 63.00% (63.00 of 100.00)

Objective	Score	%	0	100
Characteristics	2.00 of 2.00	100.00		
Chemical Feeders	3.00 of 4.00	75.00		
Clarification	4.00 of 5.00	80.00		
Coagulation	4.00 of 5.00	80.00		
Disinfection	5.00 of 11.00	45.45		
Electrical/Mechanical Equipment	12.00 of 17.00	70.59		
Filtration	6.00 of 9.00	66.67		
Flocculation	3.00 of 3.00	100.00		
Fluoridation	2.00 of 3.00	66.67		
Hydraulic Concepts	1.00 of 3.00	33.33		
Intake	0.00 of 1.00	0.00		
Iron & Magnesium Removal	2.00 of 3.00	66.67		
Lab Skills	1.00 of 3.00	33.33		
Laboratory Tests	2.00 of 4.00	50.00		
General Math	2.00 of 2.00	100.00		
Measuring Systems	1.00 of 2.00	50.00		
Plumbing	4.00 of 7.00	57.14		
Processes	1.00 of 1.00	100.00		
Rules & Regulations	1.00 of 2.00	50.00		
General Safety	2.00 of 3.00	66.67		
Sources	2.00 of 4.00	50.00		
Stabilization	1.00 of 3.00	33.33		
Storage	1.00 of 2.00	50.00		
Taste & Odor Control	1.00 of 1.00	100.00		

# APPENDIX D: MASTERY REPORT FOR COMPUTER EXAM



Maryland Department of the Environment

SCORE REPORT

WATER TREATMENT CLASS II

You have failed this examination. Your score is 64% correct.  
The passing score is 70%.

Content Area	Percent Correct
1. Laboratory Analysis	67%
2. Comply with Drinking Water Regulations	67%
3. Evaluate Characteristics of Source Water	80%
4. Operate and Maintain Equipment	68%
5. Monitor, Evaluate and Adjust Treatment Processes	70%
6. Math	46%
7. Perform Security, Safety and Administrative Procedures	62%
<b>TOTAL</b>	<b>64%</b>

The State Board of Waterworks and Waste Systems Operators regrets to inform you that you received a failing score on the Water Treatment Class II examination. Please direct any questions or concerns about this matter to:

Board of Waterworks and Waste Systems Operators  
1800 Washington Boulevard  
Baltimore, MD 21230-1701  
Phone: (410) 537-3167 or (410) 537-3594  
<http://www.mde.state.md.us>